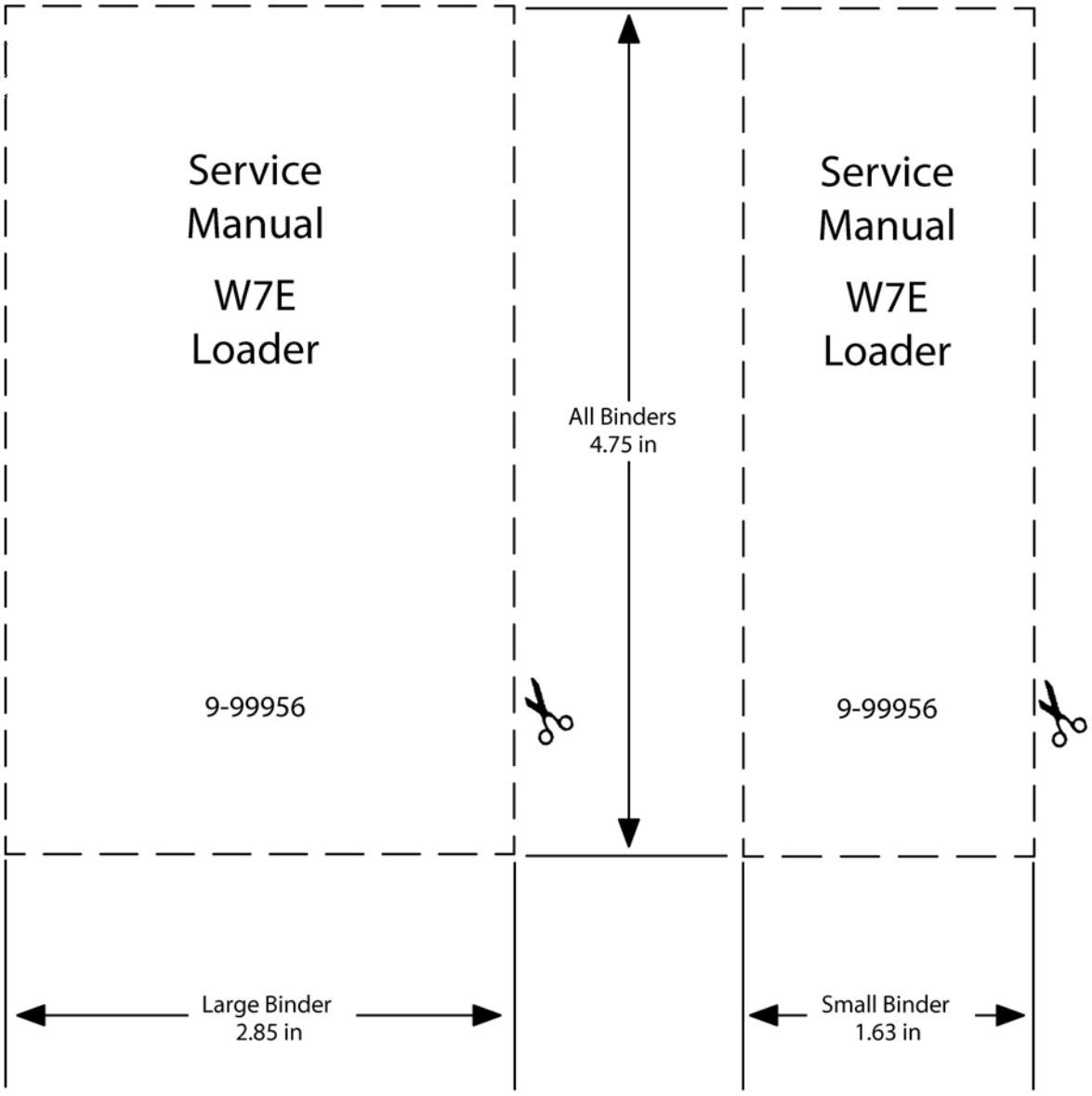

Service
Manual
W7E
Loader
9-99956
All Binders
4.75 in
Service
Manual
W7E
Loader
9-99956
Large Binder
2.85 in
Small Binder
1.63 in

CYLINDER HEAD AND COMPONENTS

Four Cylinder, 267B, 301B, 336BD and 336BDT Engines

(Refer to Figure 5)

Removal

Remove the muffler and hood from vehicle. Disconnect the exhaust system and air cleaner from the manifolds. Steam clean the entire area where service work is to be performed.

1. Drain the cooling system. **CAUTION** If the engine is hot, do not remove the radiator cap until the coolant has had sufficient time to cool. Loosen the cap to the first stop carefully to relieve any excess pressure before removing it completely. Remove the upper radiator and water pump hoses.

2. Disconnect the high pressure fuel lines from the injectors and the leak-off tubes between the cylinder heads. Cap them to prevent any foreign particles from entering. Remove the injectors as described in Section 33 of the Service Manual.

3. Remove the breather tube (1) and discard the gaskets (2). Remove the manifold brace (5) and spacer (6), if equipped.

4. Remove the intake elbow (3) and gasket (4), if equipped and discarding the gasket.

5. Remove the intake manifold (7) and discard the gaskets (8).

6. Remove the exhaust stack (9) or cover plate (10) if equipped. Remove the exhaust elbow (11) if equipped.

7. Remove the exhaust manifold (12) and discard the gaskets (13).

8. Remove the water manifold (14) and discard the gaskets (15). **NOTE** If the thermostat is to be serviced, remove the thermostat housing (28) and refer to Section 25 of the Service Manual.

9. Remove the valve cover nuts (14), bevel washers (15), gaskets (16), valve cover (17) and cover gasket (18). Discard gaskets (16 and 18).

10. Remove the studs (19), washers (20) and rocker arm assemblies (21). **NOTE** Tag the rocker arm assemblies for proper assembly. See Page 22-16 for servicing. Remove the push rods (22) and tag them for proper assembly.

11. Remove the cylinder head bolts and washers (23). Remove the cylinder head assembly (24), fire rings (25) and head gaskets (26). Discard the fire rings and head gaskets. See Page 22-18 for servicing of the cylinder head.

ROCKER ARM ASSEMBLY

(Refer to Figure 12)

Disassembly

Be sure the rocker arm assemblies are tagged so they are installed on the same cylinder head they were removed from. Tag component parts for proper assembly. Do not intermix parts from one assembly to another.

1. Remove the oil tube (1) with the "O" ring (2). Remove the "O" ring and discard it. Remove the snap rings (3) and spacer washers (5). Keep count of the number of washers used at each end of the shaft (4). Tag each rocker arm for original location. Remove the exhaust rocker arms (6) and the shaft brackets (7) from the shaft (4).

2. Remove the intake rocker arms (8) and the shaft spring (9).

Inspection

Check the shaft spring for damage and proper tension.

Spring Specifications:

Total Coils (Working coils) ---------- 4
Wire Diameter ---------- .080"
Compressed to 1-9/16 -------- 10 lbs.

Flush the shaft to remove any residual material. Inspect the shaft for worn spots on the bottom side of the shaft. Replace the shaft if a worn condition exists.

Inspect the rocker arms by installing each rocker arm on the shaft in its proper location. The rocker arm must be free on the shaft without any side wobble. If any is noted, replace the rocker arms. Clean the oil holes in the rocker arms to insure free oil flow. Inspect the valve stem contact area on the rocker arm for wear. Replace if worn. Inspect the tappet adjusting screw for wear marks or pitting.

Assembly

With all components parts cleaned thoroughly and worn parts replaced, coat them with clean engine oil.

1. Install the shaft spring (9) and the two intake rocker arms (8) on the shaft (4). When installing the rocker arms, keep the shaft oil holes toward the valves, See Inset A.

2. Install the shaft brackets (7) on the shaft (4) with the split side toward the push rod side of the engine.

3. Install the exhaust rocker arms (6) on the shaft (4). Install the same number of spacer washers (5) at each end of the shaft as were removed during disassembly.

4. Install the snap rings (3) at each end of the shaft. Check the rocker arms for free movement. Install the oil tube (1) with a new "O" ring (2). Install the adjusting screws (10) and lock nuts (11) if they were removed for replacement.

5. Install the rocker arm and shaft assembly as instructed on Page 22-12 and 22-14.

6. Check the exhaust rocker arms for excessive end play. One or more spacer washers can be used between the exhaust rocker arms (6) and snap rings (3) to remove excessive end play. A clearance of .010"to .030"must be maintained at each end of the shaft and can be checked in the area shown in Inset B.

CYLINDER HEAD ASSEMBLY
(Refer to Figure 7)
Disassembly

1. Using a valve spring compressor, compress the spring (1) enough to remove the valve retainer locks (2). Release the spring compressor and remove the intake valve spring retainer (3) or exhaust valve rotator (4). Remove the valve spring (1), valve stem oil seals (5) and valve spring seats (6). **NOTE** Remove any carbon from the valve stems before they are removed from the cylinder head.

2. Remove the intake valves (7) and the exhaust valves (8) from the cylinder head (14) and set them in a rack or holder. Mark them on removal so they may be installed in their original location.

3. Drive the intake valve guide (9) and exhaust valve guide (10) down through the head using an arbor.

4. The exhaust valve seats (11) can be removed with a specail seat removing tool, Inset C. **NOTE** Never attempt to remove a valve seat with a center punch, cold chisel or pry bar.

5. To remove the expansion plugs (12), they must be drilled and pryed out.

NOTE Refer to Inspection and Servicing on Pages 12,13,14 and 15 prior to assembly.

Assembly

1. If the valve guides have been replaced, install the new guides (9 and 10) using an arbor. Press the guides into the head from the top of the cylinder head. The guides must protrude above the cylinder head (intake and exhaust) .953", Inset A.

2. To install new exhaust valve seats (11), clean the recess in the cylinder head. Place the valve seats in dry ice to shrink them. Insert the valve seats in the head and press them in place, using a suitable press.

3. Lubricate the intake valves (7) and exhaust valves (8) with clean engine oil and install them in their original locations.

4. Install the valve spring seats (6), valve springs (1), intake valve retainers (3) or exhaust valve rotators (4). Compress the valve springs so the valve stem seals (5) can be installed in the lower grooves of the valve stems. Install the valve retainer locks (2). **IMPORTANT** Assemble the exhaust valve rotators with the original exhaust valves because they tend to wear in as matched parts. If it is necessary to install a new exhaust valve, always install a new rotator and retainer locks.

5. Install new plugs (12) Inset B, if they were removed. If the manifold studs (15) are to be replaced, install until snug.

NOTE When engine assembly is complete, a check of the operation of the rotators must be made. It is impossible to determine whether or not the rotator is turning without an identifying mark.

Place a dab of white paint on each of the rotators and note it's position. Start the engine and observe whether or not the rotator is turning. DO NOT attempt repairs on rotators.

There is not a 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.

SPECIFICATIONS

NOTE All dimensions are given in inches. Specifications apply to all engines unless noted.

			Maximum Limit Including Wear
CYLINDER SLEEVES			
I.D. of sleeve	(336BD)	4.6250 to 4.6260	.005
	(267BD)	4.1260 to 4.1360	.005
	(301BG and 301BD)	4.3750 to 4.3760	.005
Sleeve out-of-round			.006
Clearance to bottom of piston skirt	(336BD, 267BD)	.0040 to .0060	
	(301BG)	.0030 to .0050	
	(301BD)	.0051 to .0071	
Taper			.001
PISTON			
Type		Cam Ground	
Material		Aluminum Alloy	
O.D. at bottom of skirt: 90° to piston pin	(336BD)	4.620 to 4.621	
	(301BG)	4.3710 to 4.3720	
	(301BD)	4.3689 to 4.3699	
	(267BD)	4.1200 to 4.1210	
I.D. of piston pin bore	(336BD)	1.8000 to 1.8002	.001
	(301BG)	1.3586 to 1.3589	.001
	(267BD)	1.4997 to 1.4999	.001
	(301BD)	1.4995 to 1.4998	.001
Width of 1st ring groove	(267BD and 301BD)	.097 to .098	
	(301BG)	.096 to .097	
Width of 2nd ring groove	(336BD and 301BD)	.097 to .098	
	(301BG)	.0955 to .0965	
	(267BD)	.096 to .097	
Width of 3rd ring groove		.2505 to .2515	
PISTON RINGS			
No. 1 Compression	(336BD)	Chrome Keystone Type	
	(267BD, 301BG and 301BD)	Chrome Face	
Width	(336BD)	.1140 to .1145	
	(301BG, 267BD and 301BD)	.0930 to .0935	
End gap in	4.625 I.D. sleeve (336BD)	.015 to .025	
	4.125 I.D. sleeve (267BD)	.013 to .023	
	4.375 I.D. sleeve (301BG)	.013 to .025	
	4.375 I.D. sleeve (301BD)	.015 to .025	
Side clearance	(336BD)	None	
	(267BD and 301BD)	.035 to .0050	
	(301BG)	.0025 to .0040	
No. 2 Compression		Tapered Face	
Width	(336BD)	.0925 to .0935	
	(267BD, 301BD and 301BG)	.0930 to .0935	
End Gap in	4.625 sleeve (336B)	.013 to .023	
	4.125 sleeve (267BD)	.013 to .023	
	4.375 sleeve (301BD) and 301BG)	.013 to .025	

ENGINE BLOCK, OIL PAN, SEAL RETAINER AND BALANCER WITH OIL PUMP

(Refer to Figure 2)

Disassembly

1. Remove the oil pan drain plug (1) with gasket (2) to drain the engine oil.

2. Remove the oil pan bolts (3), lockwashers (4) and plain washers (5), reinforcement (6), (stamped steel pan only).

3. Remove the stamped steel oil pan (7) and gasket (6) or the cast iron oil pan (9) and gasket (10).

4. Remove the oil pan gasket material from the oil pan and engine block.

5. Remove the dipstick (23 or 26). Remove the the dipstick socket (24 or 25) if it needs replacing.

6. Remove the rear oil seal retainer (29) bolts (31) with lockwasher and gasket (28). Press seal (30) from retainer (29).

7. Remove any cup plugs (33) that need replacing by drilling a hole in them and pulling them out.

8. To remove the Diesel tachometer drive (32). A puller can be made from an old tachometer drive cable. Cutting off the end that screws into the drive and welding a stud to it. With this tool, pull the tachometer drive.

9. Loosen fitting (15) and remove oil pump outlet tube (18) or (14) inset F.

10. Remove the lube oil manifold tube (21) and adpater (22) or lube oil tube (17), inset F.

11. Remove the balancer mounting bolts (12) with lockwashers and shims (13). Remove the balancer assembly (11 or 20) from the block.

12. Pull the oil pump outlet tube (18) from the two gear balancer (20) and discard "O" ring (19).

SPARK IGNITION ENGINE TIMING GEAR COVER

(Refer to Figure 7)

Removal and Disassembly

1. Remove the crankshaft pulley retaining bolt and washers (1).

2. Use a pulley to remove the crankshaft pulley (2) and the key (3). **NOTE** Do not hammer or pry on the pulley when removing or installing.

3. Remove the governor (4) and gasket (5).

4. Remove the auxiliary pump cover (6) and gasket (7).

5. Remove the timing gear cover (8), gasket (9), spacer (10).

6. Remove the oil seal (11) from the timing gear cover (8). If the locating dowel sleeves (12) are to be replaced, remove from the timing cover.

7. If the governor shaft bushing (13) is to be replaced, press out with a proper size arbor. Remove the governor locating pins (14) if replacement is required.

Inspection

Replace all gaskets and oil seals. Remove all remaining gasket material remaining on contact surfaces.

If the governor is to be serviced, refer to Section 26 of this Service Manual.

Check the I.D. of the governor shaft bushing (13). If it is .4495" or more, the bushing must be replaced.

Replace the locating dowel sleeves or the governor locating pin if any damage is noticed.

Check the backlash between the camshaft and the crankshaft gears, inset D. If it exceeds .011", replace the necessary gears. **NOTE** Excessive backlash between the timing gears can also be caused by worn camshaft bushings.

Assembly and Installation

1. Install the locating dowel sleeves (12), Inset A, and the governor locating pins (14), Inset B, if they were removed.

2. Press the governor shaft bushing (13) into the timing cover (8) as shown in Inset B, with the oil groove in the horizontal position.

3. Install the timing gear cover (8) and the auxiliary pump cover (6) with new gaskets (9) and (7) to the engine block with the mounting bolts and spacer (10). Torque the bolts 35 to 42 foot pounds.

4. Coat the outer surfaces of the oil seal (11) with Permatex No. 2 and lubricate the inner surface with engine oil. Install the oil seal (11) into the timing cover (8) with the seal lip in and "TOP" mark up, until .060" to .090" below the outer edge of the timing cover bore. Use Case Tool, Part No. A60533, Inset C, and the pulley retaining bolt (1) to install the oil seal.

5. Install the crankshaft pulley (2) on the crankshaft, aligning the key (3) and the slot in the pulley. Retain in place with lockwasher, plain washers and bolt (1). Torque the bolt 100 to 110 ft. lbs.

6. Install the governor (4) with new gasket (5) to the timing cover (8). Be careful when contacting the governor gear with the camshaft gear , to not damage gear teeth. Retain with mounting bolts and torque 35 to 42 ft. lbs.

CYLINDER SLEEVES
Deglazing

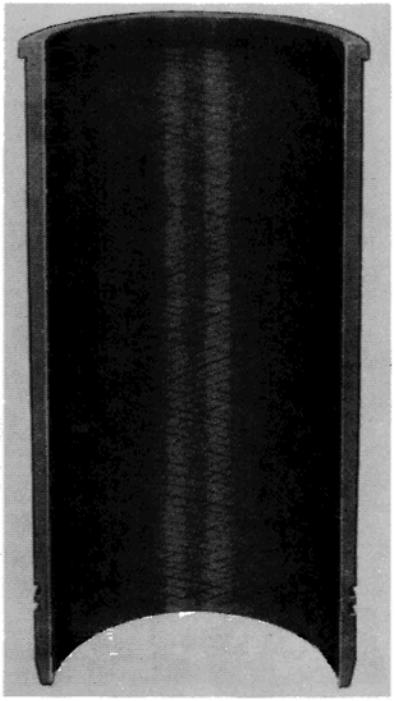
Figure 16 illustrates a self-centering power brush deglazer that can be used to remove the glaze formed on the inner surface of the cylinder sleeves.

The glaze must be removed so that the piston rings can properly seat themselves within a reasonable period of run-in-time.

The necessary deglazing can be done by using 180 grit silicone carbide double spiral brush. The necessary size brush can be purchased from the J I Case Co. Service Parts Supply, Racine, Wis.

Part No.	Bore Range
A42451	3.00" thru 3.50"
A42452	3.50" thru 4.00"
A42453	4.00" thru 4.50"
A42454	4.50" thru 5.00"

POWER BRUSH DEGLAZER



CROSS HATCHED SLEEVE

Figure 16

Power the brush with a 3/8" or 1/2" drill with a 300 to 350 RPM speed and using a good grade of oil as a lubricant. The heavier the lubricant, the finer the finish.

The brush must be rotating before entering the cylinder sleeve and when removed to prevent scratches and to insure an even finish. This will also bring the cross hatching up and out on removal.

Actuating the brush up and down at a rate of 30 to 40 times per minute, a fast even and perfect cross hatch finish is obtained in 20 to 30 seconds, Figure 16.

IMPORTANT Use the following procedure to protect the engine from abrasives.

1. Before brush deglazing:
   Cover the crankshaft journals with clean rags to prevent abrasives and dirt, resulting from the brushing operation, from dropping onto the crankshaft.

2. After brush deglazing:
   Wipe as much of the abrasives from the cylinder sleeves as possible, then swab each sleeve with a clean cloth dampened in warm water and a mild detergent soap. After swabbing the sleeves with the damp cloth, wipe them out with SAE 10W engine oil.

IMPORTANT SWAB AND WIPE OUT THE CYLINDER SLEEVES UNTIL A CLEAN WHITE CLOTH WILL REMAIN ABSOLUTELY CLEAN WHEN IT IS RUBBED ON THE SLEEVE. ONE SWABBING - WIPING OPERATION IS NOT ENOUGH!

CAUTION DO NOT USE GASOLINE, DIESEL FUEL OR KEROSENE TO CLEAN THE SLEEVES AS THIS WILL NOT REMOVE THE ABRASIVES FROM THE SURFACE OF THE SLEEVES.

LOCATING TOP DEAD CENTER

On engines equipped with the timing marks on the flywheel, it is required that the flywheel be set on the TDC mark with the pointer in the flywheel housing, Figure 26. Then scribe a mark on the front crankshaft pulley in line with front timing pointer. This will be an aid when the flywheel has to be removed and installed. When the flywheel is installed, line up the TDC marks with the pointers. Then proceed as follows to check the timing pointer in the flywheel housing.

1. Crank the engine until the 25°, BTDC mark on the crankshaft pulley is aligned with the timing pointer or the 25° BTC mark on the flywheel is aligned with the timing pointer.

2. Remove the valve cover from No. 1 and 2 cylinders.

3. Compress the exhaust valve spring on the No. 1 cylinder and remove the keepers, valve retainer or valve rotator, spring and retainer. This will allow the valve to follow the movement of the No. 1 piston.

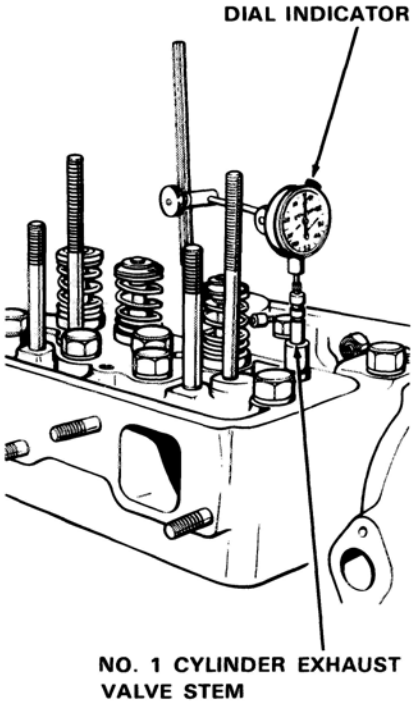


Figure 25

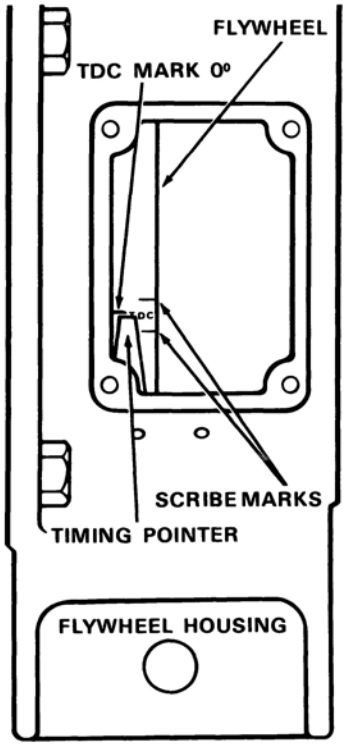


Figure 26

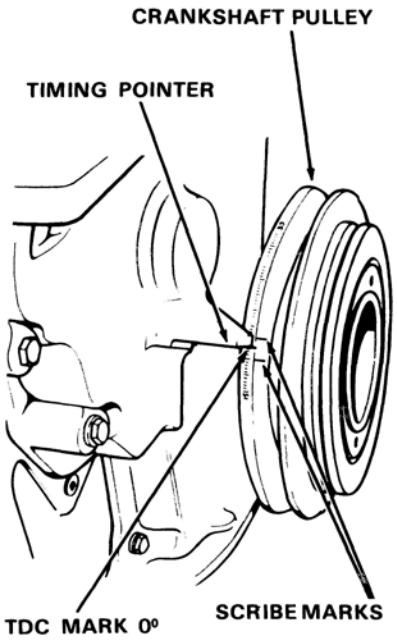


Figure 27

4. Install a dial indicator so the indicator finger is under slight pressure on the top end of the exhaust valve stem of No. 1 cylinder, Figure 25.

5. Crank the engine clockwise until the dial indicator hand stops moving. Reset the dial indicator to zero.

6. Crank the engine clockwise (3 or 4 degrees) until a reading of .010" shows on the dial indicator.

7. Scribe a mark on the crankshaft pulley Figure 27, or flywheel Figure 26, in line with the timing pointer.

8. Crank the engine counter-clockwise (3 or 4 degrees) past the zero mark of the dial indicator, until reading of .010" shows on the indicator. Again scribe a mark on the crankshaft pulley or flywheel in line with the timing pointer.

9. Half the distance between these two marks on the crankshaft pulley or flywheel will be the TOP Dead Center Mark.

10. The timing pointer, Figure 26, used with the timing marks on the flywheel should then be adjusted so it lines up with the TDC mark.

(Refer to Figure 1, 2 and 3)

IMPORTANT Clean the filter head, filters and the engine area adjacent to the filters.

1. Close the fuel tank shut-off valve and remove the drain plug (3) from the first stage filter (1).

2. Use a clamp type filter wrench to remove the filters. Turn filters (1 and 2) counterclockwise, Figure 1 for removal.

3. Remove the stud gasket (4) from the 2nd stage filter mounting stud and install new gasket.

4. Apply a thin film of oil or grease to the gaskets on the new Case filters. Install the filters by turning clockwise until the gasket contacts the filter head. Hand tighten 1/2 to 3/4 of a turn to obtain a proper seal. ***NOTE*** Excessive tightening will damage the gaskets and filters.

5. Fill the fuel tank and open the fuel tank shut off valve.

6. Open the bleed valve (6) on the first stage filter - Operate the hand primer pump (7), if equipped or actuate the fuel pump if equipped - Close the bleed valve (6) when clear bubble free fuel appears.

7. Open the bleed valve (8) on the second stage filter - Operate the hand primer pump (7), if equipped or actuate the fuel pump if equipped - Close the bleed valve (8) when clear bubble free fuel appears. ***NOTE*** Tighten the hand primer pump handle securely if equipped, before starting the engine.

8. If the filters have been changed, the fuel system has been bled and the engine still lacks power under full load, the fuel system pressure could be low because of a weak relief valve spring (10). Fuel system pressure can be checked by installing a 0 to 50 PSI gauge in the inlet fitting on the injection pump (9). The fuel system operating pressure should be 14 to 21 PSI. If it is above or below this, service the relief valve. Check the relief valve spring (10). If the relief valve spring (10) does not meet the specifications below, it must be replaced.

   Relief valve specifications:
   No. of coils (active) ---------- 19
   Free Length ---------- 1.268"
   Wire Diameter ---------- .033"
   O.D. of spring ------ .218" to .238"
   Compressed to 1.109" -- 28 to 30 oz.

9. Before installing the relief valve plunger (11), the spring (10) must be assembled so that the last coil is snapped into the recess of the plunger, Figure 1, Inset A.

10. Install a new "O" ring (12) to the plug (13) before installation.

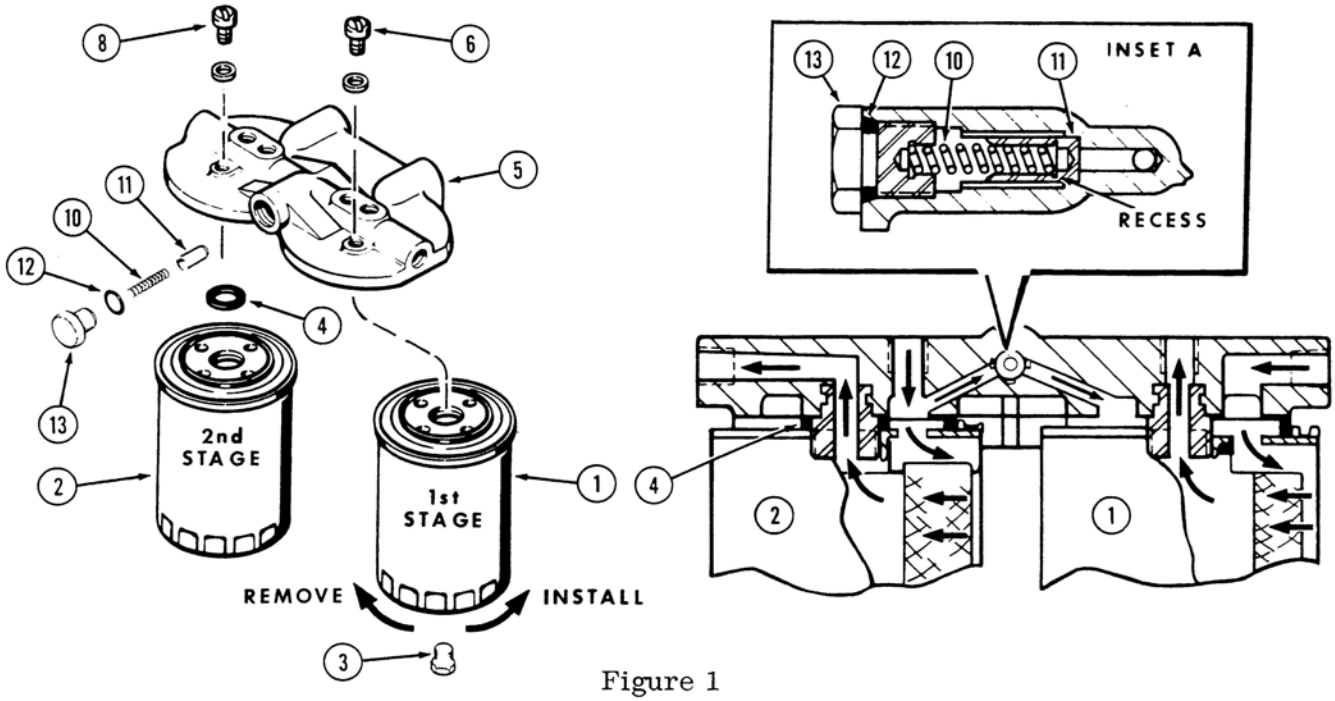


Figure 1

Altitude Adjustment

Case Diesel Engines are designed to give their best performance and fuel economy when the exhaust is practically as clean as a Gasoline Engine exhaust under normal operating conditions.

The full load fuel delivery adjusting screw has been set at the factory to deliver the correct amount of fuel to the engine under normal operating conditions.

Case Diesel Engines that are operated 3000 feet or more above sea level, may exhaust heavy black smoke while the engine is running under full load at rated speed. This condition can be a result of incomplete combustion caused by the reduction of oxygen in the air at higher altitudes or by one or more of the conditions, refered to in steps 1 thru 13 on Page 32-6. If none of these conditions exist and heavy black exhaust smoke still exists when running under full load at rated speed, the full load fuel delivery adjustment can be made.

CAUTION This adjustment is very sensitive and if the full load fuel delivery screw is turned too far, the fuel injection pump will have to be removed from the engine and re-calibrated on a test stand.

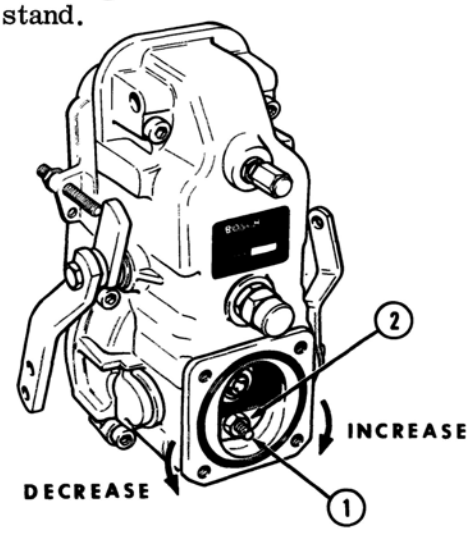


Figure 15

1. Remove the injection pump rear cover seal, bolts and rear cover.

2. When making this adjustment turn the full load delivery screw (1), Figure 15, counter-clockwise in small increments of 5 degrees or less, until a light brown haze is visible when running under full load at rated speed and normal operating temperature.

3. If there is a lack of power and no haze or smoke is visible when running under full load at rated speed, it is an indication that the full load delivery screw (1) has been turned counter-clockwise to far. This decreases the amount of fuel to the engine.

4. Turn the full load delivery screw (1), Figure 15, clockwise in small increments of 5 degrees or less, until a light brown haze is visible and no lack of power exists when running under full load at rated speed and normal operating temperature.

5. After each adjustment is made tighten the locknut (2), Figure 15, while keeping the full load delivery screw (1) from turning. Install rear cover, bolts and reseal the rear cover.

Installing Injectors

Clean the injector bore in the cylinder head and blow out with compressed air. **NOTE** Use bore cleaning tool Case No. A43277 and gradually turn it by hand into the bore. Always turn the tool in a clockwise direction. Turning in counter-clockwise will dull the tool. Clean and inspect the cylinder head, injector inlet fittings and seal surfaces. Dirt or burrs on the sealing surfaces can cause injector distortion when clamping injector in place, resulting in a sticking valve.

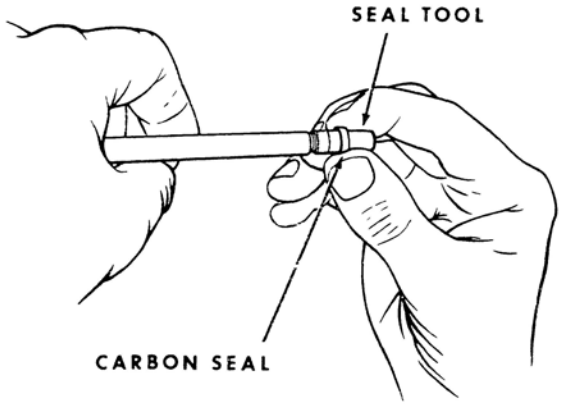


Figure 9

Remove protective caps from the injectors. Install a new compression seal (6) and new carbon seal (7) using the carbon seal tool, Case No. A42449, Figures 9 and 10.

Install the injector into the cylinder head bore using a twisting motion. DO NOT lubricate. Install spacer (4) the clamp assembly (2) and (3) engaging the locating plate (5), Figure 10. Connect and hand tighten inlet connection (1) to the tube. Torque injector clamp capscrew 20 ft. lbs. Install tee and leak-off lines. Crank the engine with the starter until the fuel flows from the loosened injector inlet fitting.

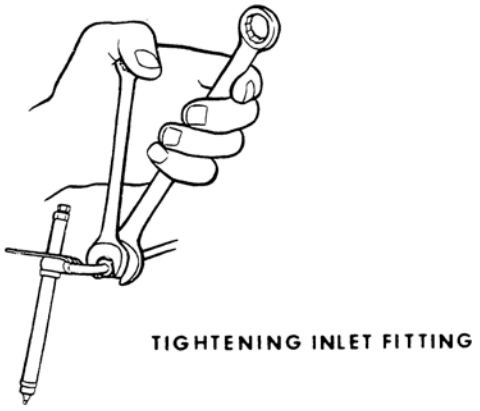
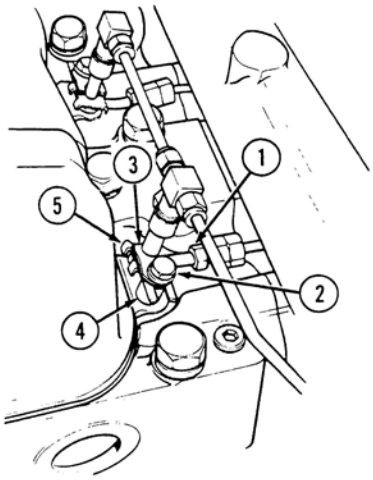


Figure 11

Then tighten the inlet fitting using the one-hand two-wrench squeeze method, Figure 11. Start the engine and check for leaks.



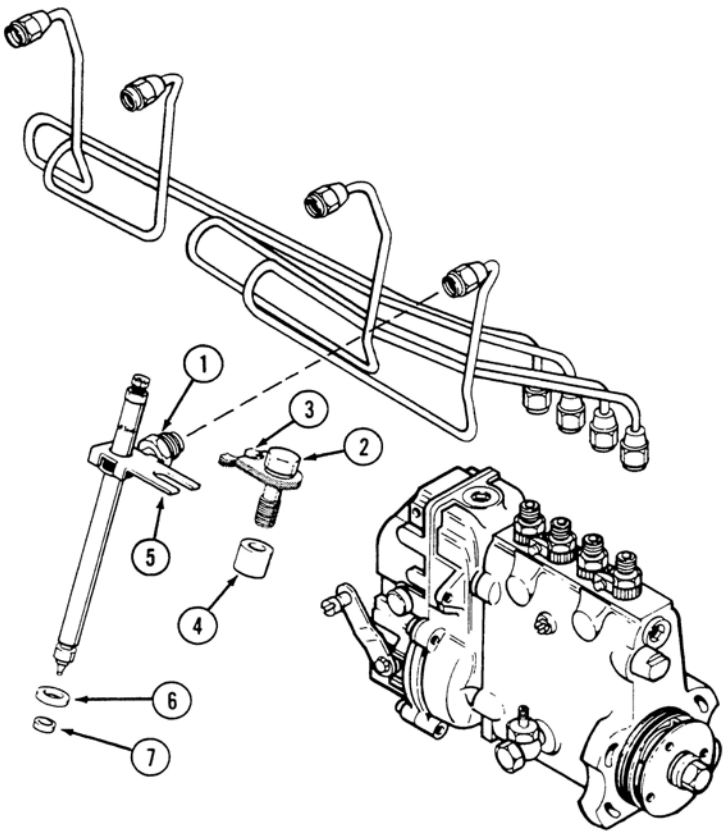


Figure 10

INTRODUCTION

(Refer to Figure 1)

The Zenith Model 267-L10 Carburetor, Figure 1, used on the Case 301B Gasoline Engine is an updraft of single venturi design. The fuel bowl is located near the centerline of the carburetor and together with the twin float, makes it possible to maintain proper metering of air and fuel to the engine without flooding when operated at extreme angles. The carburetor is sealed and balanced in that all air for the fuel bowl metering, well venting and for idling, must come through the air cleaner.

HOW IT WORKS

(Refer to Figure 2)

High Speed System

The high speed system exerts its influence throughout the governed range of the engine.

The system consists of a venturi, controlling the maximum volume of air admitted into the engine; the main jet, which regulates the flow of fuel from the float chamber to the discharge jet; the well vent, which maintains a uniform mixture ratio under changing carburetor suction and engine speeds and a discharge jet, which delivers the fuel into the air stream. The main jet determines the maximum amount of fuel which may be obtained by reducing the amount when the adjustment needle is turned toward its seat (clockwise) or by increasing the amount of fuel when the adjustment needle is turned away from its seat (counter-clockwise). The flow of fuel from the main jet is controlled by the size of the well vent and the size of the discharge jet.

NOTE The main jet on this carburetor is equipped with a magnetic solenoid that is electrically energized when the ignition key switch is turned "on", holding the main jet off of its seat at a distance predetermined by the main jet adjusting screw. When the ignition key switch is turned "off", the magnet releases the main jet and the spring pressure holds the jet needle firmly against its seat preventing any fuel from entering the venturi.

The purpose of the magnetic solenoid on the main jet is to provide an immediate and positive fuel shut-off within the carburetor, when the ignition key switch is turned off.

Idling System

The idling system consists of the idling jet, idling needle and passages. The idling jet receives the fuel from the main jet through passage (A). The fuel is metered through the idling jet and is mixed with air which is admitted from behind the venturi through passage (B). The idle adjusting needle controls the amount of fuel and air which is admitted to the system and functions only at idling and low engine speeds. At these speeds the throttle plate is almost closed and causes a very strong suction past the edge of the throttle plate. This suction draws the mixture of fuel and air from the idling jet which is discharged into the air stream through the primary passage.

Choke System

The choke system consists of a valve and plate mounted on a shaft located in the air entrance and operated mechanically by a lever mounted externally on the shaft with a choke cable. The choke valve is of a semi-automatic type, having a poppet valve, which is controlled by a spring. The poppet valve opens automatically when the engine starts and immediately admits enough air to avoid over choking of the engine.

IDLING SPEED AND MIXTURE ADJUSTMENTS

(Refer to Figure 7)

NOTE Adjustments for idling speed and idling mixture can best be made together when the engine is running and at the proper engine operating temperature.

Idle Speed Adjustment

Idling Speed Adjustment is made at the idle speed screw which determines how far the carburetor throttle valve will close when the engine is idling. The idling speed adjustment should be set so the engine operates at a speed of 600 to 650 RPM (1900 RPM Rated Engine Speed) and 725 to 775RPM (2000 RPM Rated Engine Speed).

Idle Mixture Adjustment

Idling Speed Mixture Adjustment is determined by turning the idle mixture adjustment screw out until the engine operates roughly, then turn the screw in until the engine idles smoothly. The correct adjustment is approximately 1-1/4 turns open (1900 RPM Rated Engine Speed) and approximately 1-1/2 turns open (2000 RPM Rated Engine Speed).

Load Adjustment

To obtain a starting point, operate the engine at no load governed engine speed RPM. Be sure the engine is up to the correct engine operating temperature. Turn the load adjustment screw in (clockwise) until the engine misfires and power falls off; then turn it out (counter-clockwise) until the engine runs smoothly. Turning the adjustment out produces a richer mixture, while turning it in produces a leaner mixture. The correct setting is approximately 2-3/4 turns open.

After the preliminary load adjustment has been made however, it may be necessary to slightly readjust the carburetor load setting when the engine is under load.

Run the engine under load and carefully observe how it reacts. If there is backfiring through the carburetor, loss of power,or if the engine tends to stall when the load is applied, it indicates the setting is too lean. Turn the load adjustment screw out (counter-clockwise) not more than 1/8 of a turn and again try the engine under load. Continue to do this until the engine pulls smoothly when the load is applied.

IMPORTANT Avoid the use of lean mixtures. Operating the engine with too lean a carburetor load mixture causes loss of power and high valve temperatures.

Although it is not necessary or advisable to constantly readjust the carburetor settings, they can be reset when the load conditions or the fuel quality is changed radically. Operating an engine under light loads with an overly rich carburetor setting not only wastes fuel, but may cause undue wear and damage from engine oil dilution. Operating under heavy loads with too lean a carburetor setting will cause general engine overheating, loss of power and will burn the valves.

1. Turn control knob of battery/starter tester to OFF position.

2. Turn voltmeter selector switch to 16 Volts.

3. Connect test leads as shown:
   Red clips to positive battery post.
   Black clips to negative battery post.

   NOTE: Voltmeter clips must contact the battery posts.

4. Turn control knob until ammeter reading is exactly three times the ampere hour rating of the battery. (Example: 180 amperes for a 60 AH battery).

   NOTE: If the battery under test has been designed for use in high temperature climates, turn the control knob until the ammeter reading is exactly two and a half times the ampere hour rating of the battery. (Example; 150 amperes for a 60 AH battery).

5. Maintain load for 15 seconds, note voltmeter reading, then turn control knob back to OFF position.

If the voltmeter reading was within the green band or no lower than 9.6 volts the battery has good output capacity. Test specific gravity as instructed on page 9, and if necessary charge battery before placing back in service.

If the voltmeter reading was out of the green band or lower than 9.6 volts proceed with the Three Minute Charge Test to determine if the battery is discharged or defective.

Three Minute Charge Test

Use only on batteries which fail the Capacity Test.

Procedure

1. Turn voltmeter selector switch to 16 Volts.

2. Connect battery charger and voltmeter leads as shown in Figure 2:
   Red clips to positive (+) battery post.
   Black clips to negative (-) battery post.

   NOTE: Voltmeter clips must contact battery posts.

3. Turn charger ON.

4. Turn charger time switch past 3 minutes and back to 3 minutes.

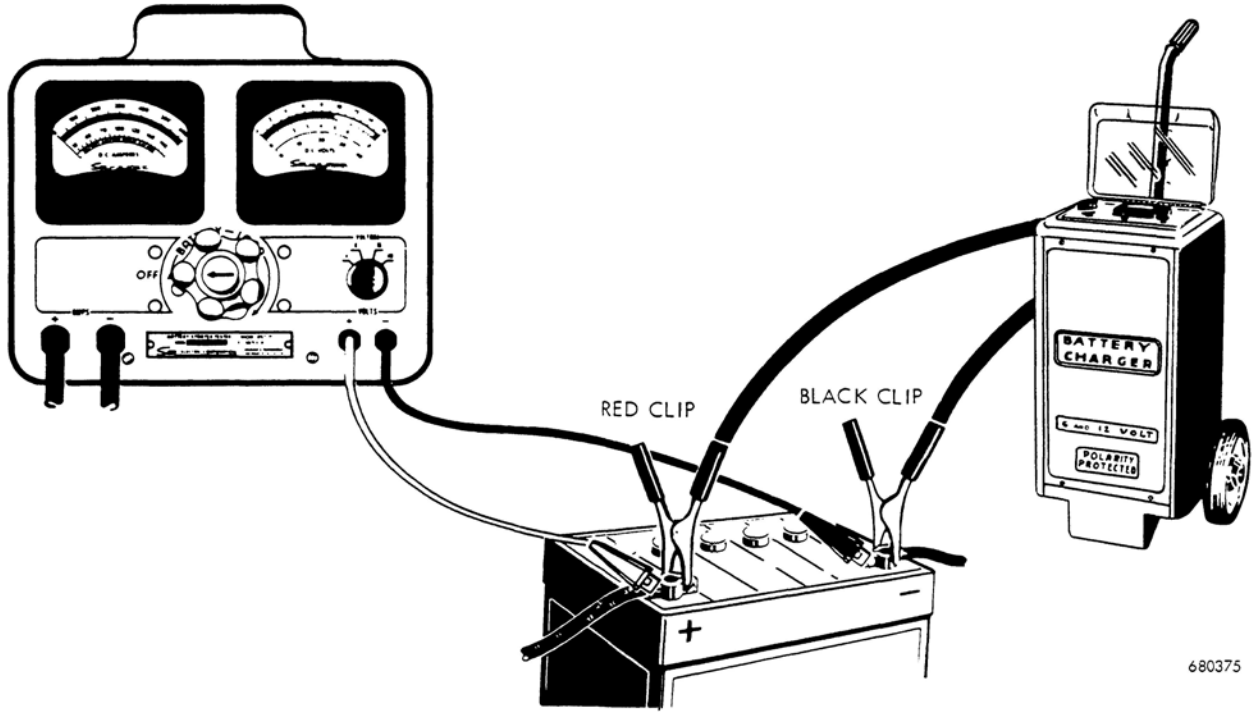


Figure 2

Armature Short Test

1. Have armature in same position as previous test. Turn on power.

2. Using steel blade provided with tester, hold the blade parallel with and touching the armature core segment.

3. Slowly rotate the armature one or more revolutions. If the armature is shorted, the steel blade will vibrate.

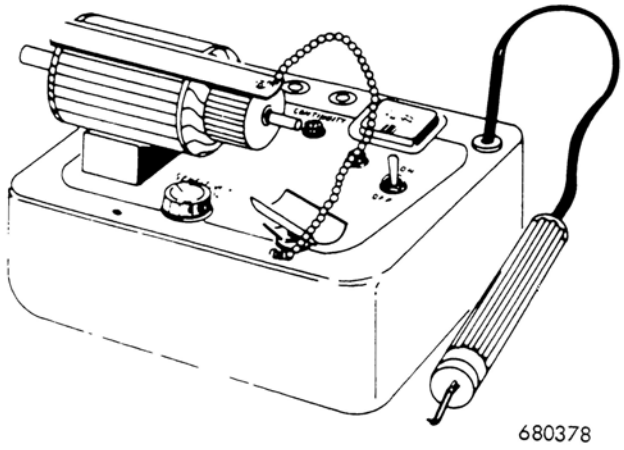


Figure 10

Armature Coil Balance Test

1. Have armature in growler and turn on power.

2. Follow directions provided with tester and test the commutator bars for abnormal readings which will indicate a short, open, or poor connection. A satisfactory commutator will give uniform readings.

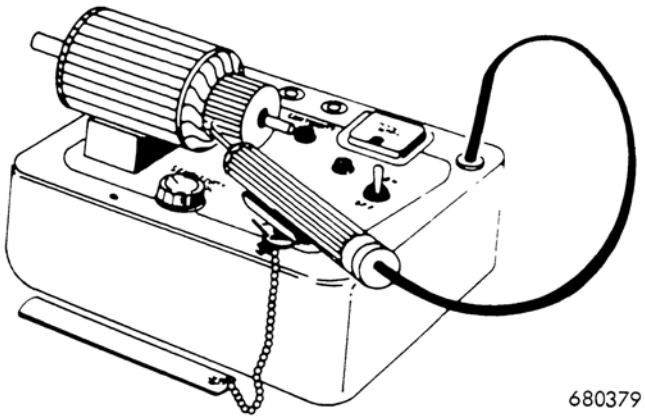


Figure 11

Field Coil Ground Test

1. Disconnect all field circuit leads connected to starter frame and brush holders.

2. Touch one test probe to starter frame and the other probe to each field lead, brush holder, and terminal in turn. If the test lamp lights, part being tested is grounded.

Field Coil Continuity Test

1. Touch the test probes to each end of the field coil windings. If the test lamp does not light, the field coils are open.

Test No. 4 Oil Pressure Switch Test

Condition: Engine Not Running, Oil Pressure Switch Open

1. Set test ammeter to 0-100 scale.

2. Connect the voltmeter positive lead to the alternator side of the oil pressure switch and the negative lead to the alternator ground terminal. The voltmeter should read zero. If the voltmeter reads above zero the oil pressure switch may be shorted. Connect the voltmeter positive lead to the other oil pressure switch terminal. If the voltmeter reads above zero the oil pressure switch is shorted and must be replaced.

3. The test ammeter should read zero.

Condition: Engine Running, Oil Pressure Switch Closed

4. Connect the voltmeter positive lead to the alternator side of the oil pressure switch and the negative lead to the alternator ground terminal.

5. Start the engine and run at 1800 RPM.

6. The voltmeter should read battery voltage. If the voltmeter reads zero, check the continuity of the oil pressure switch by touching the probes of the test lamp to the oil pressure switch terminals. With the engine running, the test lamp should not light. Replace the oil pressure switch if the test lamp lights.

7. The test ammeter will indicate charging and load current.

rotor leads and passage.

c. Install ALLEN head screw and torque to 45 inch pounds.

3. Place front bearing retainer and felt seal on rotor shaft. Then press front bearing and bearing sleeve onto shaft.

4. Press rotor assembly into front housing. Then secure bearing retainer to front housing with three screws and lockwashers.

5. Install new seal in front housing.

6. Place stator on work bench with diode assemblies up. Place rear housing over stator. Install terminal stud insulators and secure stator to housing with nuts and lockwashers. Torque the nuts to 20-30 inch pounds.

7. Assemble front and rear housing assemblies. The alternator mounting foot should be opposite the brush cover. Install the four thru bolts and torque evenly to 50-60 inch pounds. Spin the rotor by hand to check freedom of bearings.

8. Position brush assembly in rear housing and secure with screws and lockwashers. Torque the screws to 16-20 inch pounds.

9. Position brush cover and gasket on rear housing and secure with screws. Torque the screws to 20-30 inch pounds.

10. Install Woodruff key, fan spacer, fan, pulley spacer and pulley on rotor shaft.

11. Install lockwasher and nut on rotor shaft and torque the nut to 35-50 foot pounds.

ALTERNATOR BELT ADJUSTMENT

The alternator drive belts should be checked for excessive looseness and wear every 500 hours of operation. The proper belt adjustment will give a deflection of 1/2 of an inch (or 60 to 75 lbs. tension) between the fan and crankshaft pulley, Figure 21. When the tension is too tight, the alternator and water pump bearings and fan belt will wear excessively. When belt tension is too loose it will permit excessive belt wear and slippage, also low or no alternator output.

The most accurate method of checking belt tension is with a Belt Tension Gauge, Figure 21.

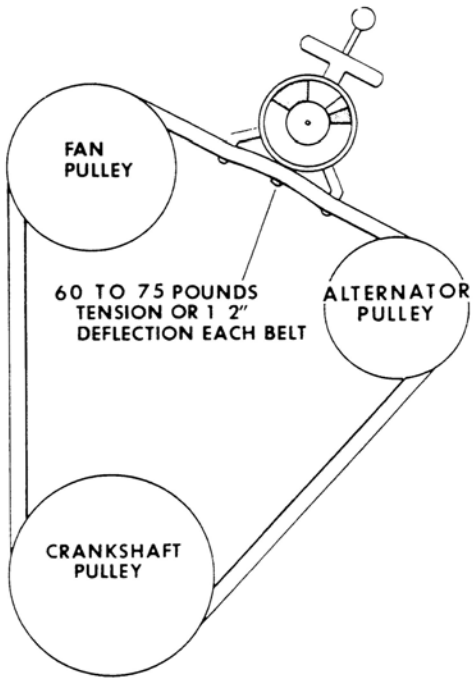


Figure 21

BREAKER POINT SPRING TENSION

The proper breaker spring tension is necessary for efficient engine operation and normal point life. If the spring tension is too great, rubbing block wear will be excessive, resulting in the closing of the point gap and retarding the ignition timing. If the spring tension is weak, the breaker arm will flutter at high engine RPM and cause the engine to miss.

To check the breaker point spring tension, place the hooked end of a spring tension gauge over the breaker arm. Pull the gauge at a right angle (90 degrees) to the point face until the points begin to open. If the tension is not within the specifications listed on page 44, adjust spring tension as required. To decrease tension, loosen the terminal clip screw and move the spring away from the breaker arm pivot and tighten screw. To increase spring tension, loosen the terminal clip screw and move the spring toward the breaker arm pivot and tighten screw.

IGNITION TIMING - STATIC

1. Crank the engine to position No. 1 piston at TDC on its compression stroke.

2. Remove the distributor cap, rotor and dust shield. Note the position of the breaker points, the points should just be starting to open.

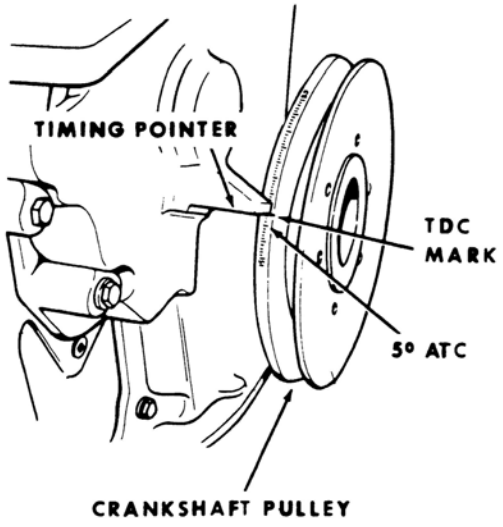


Figure 32

   a. If the ignition timing is correct, the rubbing block will just be in contact with the cam lobe.

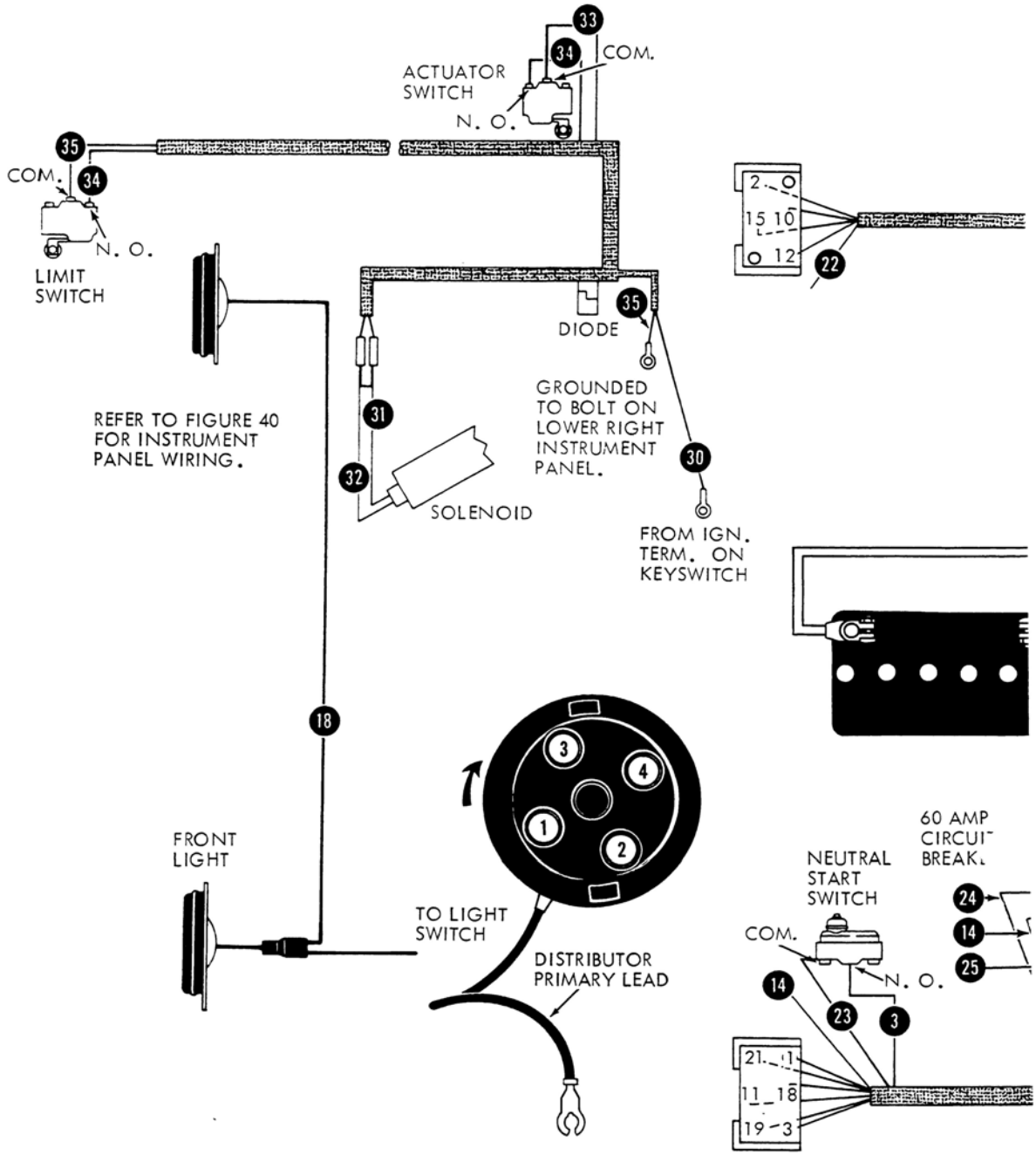
   b. If the rubbing block is past the center of the cam lobe, the ignition timing will have to be retarded. Turn the distributor clockwise to retard the timing.

   c. If the rubbing block has not came in contact with the cam lobe, the timing will have to be advanced. Turn the distributor counter-clockwise to advance the timing.

3. To assure proper ignition timing, connect a timing light to the No. 1 spark plug according to the test equipment manufacturers instructions. Start the engine and run at 2000 RPM. The No. 1 spark plug should be firing at 27° BTDC. If the spark plug is not firing at 27° BTDC recheck the initial timing and if necessary, remove the distributor and check the mechanical advance mechanism for proper operation.

DISTRIBUTOR CAP

Clean the distributor cap with a soft bristle brush and a mild cleaning solvent or mineral spirits. Dry the cap with compressed air. Remove dirt and/or corrosion from the spark plug and coil wire sockets with a wire brush. Replace the distributor cap if any of the following defects are found: cracks, permanent carbon paths, broken carbon button or excessively burnt spark plug terminals.



Wire	From	To	Color
1.	Ign. Switch I Terminal	Ignition Resistor	Purple & White
2.	Ign. Switch I Terminal	Carb. Shut-Off Solenoid	Brown
3.	Ign. Switch S Terminal	Neutral Start Swtich	Red & White
4.	Ign. Switch A Terminal	Engine Temp. Gauge	Purple
5.	Ign. Switch A Terminal	Horn	Purple
6.	Ign. Switch A Terminal	Engine Oil Press. Gauge	Purple
7.	Ign. Switch B Terminal	Ammeter Positive Terminal	Orange & Black
8.	Engine Oil Press. Gauge	Fuel Gauge	Purple
9.	Engine Temp. Gauge	Converter Temp. Gauge	Purple
10.	Fuel Gauge	Fuel Level Sender	Tan & Black
11.	Engine Oil Press. Gauge	Engine Oil Press. Sender	Yellow & Black
12.	Engine Temp. Gauge	Engine Temp. Sender	Pink & Black
13.	Ammeter Positive Terminal	40 Amp Circuit Breaker	Orange & Black
14.	Ammeter Negative Terminal	60 Amp Circuit Breaker	Red & Black
15.	Converter Temp. Gauge	Converter Temp. Sender	Light Blue
16.	40 Amp Circuit Breaker	Light Switch B Terminal	Orange
17.	Light Switch R Terminal	Front Lights	Pink

INTRODUCTION

The 2000 Series Transmission used in Case 4 Wheel Drive Unit Loaders is a constant mesh type with a power (hydraulic) shift in forward - reverse and in 2 speed ranges used in combination with 2 mechanical speed ranges.

The desired mechanical speed range can only be selected where the Loader is completely stopped because the operator must manually shift a collar on the transmission output shaft.

The hydraulic range can be selected while the Loader is moving because the operator simply dumps the oil in one clutch and directs pressurized oil to the other clutch - The forward clutch and the reverse clutch works the same as the hydraulic range clutches.

How It Works

(Refer to Figures Y-1 thru Y-5)

The Transmission consists of a Control Valve, Direction Clutches (forward and reverse), Power Range Clutches (high and low) and Manual Range (2 speed) output section. The Transmission also houses the rear axle shift out which disconnects the power train to the rear wheels for high speed transportation and economy of operation.

The Transmission Control Valve is located on the transmission cover. The function of the control valve is to direct pressurized oil to the direction clutches and power range clutches. The control valve also contains a clutch cut out spool that disengages the forward and reverse clutches when the left hand brake pedal is applied.

The Direction Clutches (Forward and Reverse) directs the power from the input shaft to the power range clutches.

The Power Range Clutches (High and Low) directs the power from the direction clutches to the manual range (2 speed) output section.

The Manual (2 Speed) Output Section directs the power from the direction clutches and power range clutches to the output shaft through either the large (low range) gear or small (high range) gear on the output shaft.

The Rear Axle Shift Out is located at the rear of the transmission and driven by the output shaft. The power train to the rear axle can be connected or disconnected by manually moving a splined collar. The rear axle shift out is used to disconnect the steering axle for highway travel. The rear axle shift out lever is located directly below the operator's seat.

DISASSEMBLY OF THE TRANSMISSION CLUTCHES

(Refer to Figure Y-12)

The disassembly procedure for either the Forward, Reverse, Low or High clutches is the same unless otherwise noted.

IMPORTANT On the high range clutch only, the oil sealing rings must be removed before starting disassembly.

A. Remove the bearing retaining ring.

B. Using a puller, remove the clutch disc hub and front bearing. See inset A.

C. Using a puller, remove the clutch disc hub inner bearing. See inset B.

D. Remove the backing plate snap ring, backing plate and clutch plates.

E. To remove the clutch piston return spring a common piece of pipe having a 2-1/2" I.D. and 2-3/4" O.D. 5" long with a portion removed can be used with a puller to compress the spring so the snap ring can be removed. See inset C.

F. Remove the piston spring retainer washer, spring and piston.

G. Remove the oil sealing rings, bearing retaining snap ring and bearing from the opposite end of the shaft.

INSPECTION

A thorough visual examination of all parts should be made before assembly. Any parts that show excessive wear or damage must be replaced. Small nicks or burrs can be removed with a hone or crocus cloth.

Bearings - Inspect all ball bearings for smooth free action. If the bearing action is "sloppy" or "rough" or if the bearing is sticking replace the bearing.

Clutch Piston Spring must be carefully checked to assure full disengagement of the clutch plates. The clutch piston spring specifications are as follows:

Free Length ---------- 3-7/16"

Total Coils ---------- 6

Active Coils ---------- 4

103 to 127 pounds required to compress spring to a height of 1-5/8".

Replace all gaskets, oil seals, oil sealing rings and "O" rings during assembly.

The use of grease is recommended when positioning new gaskets in their respective locations. Also, coat all "O" rings and oil sealing rings with Automatic Transmission Fluid Type "A" to facilitate assembly.

TRANSMISSION PRESSURE CHECK

The check point for checking the transmission clutch pressure is located on the Transmission - Converter Regulator Valve.

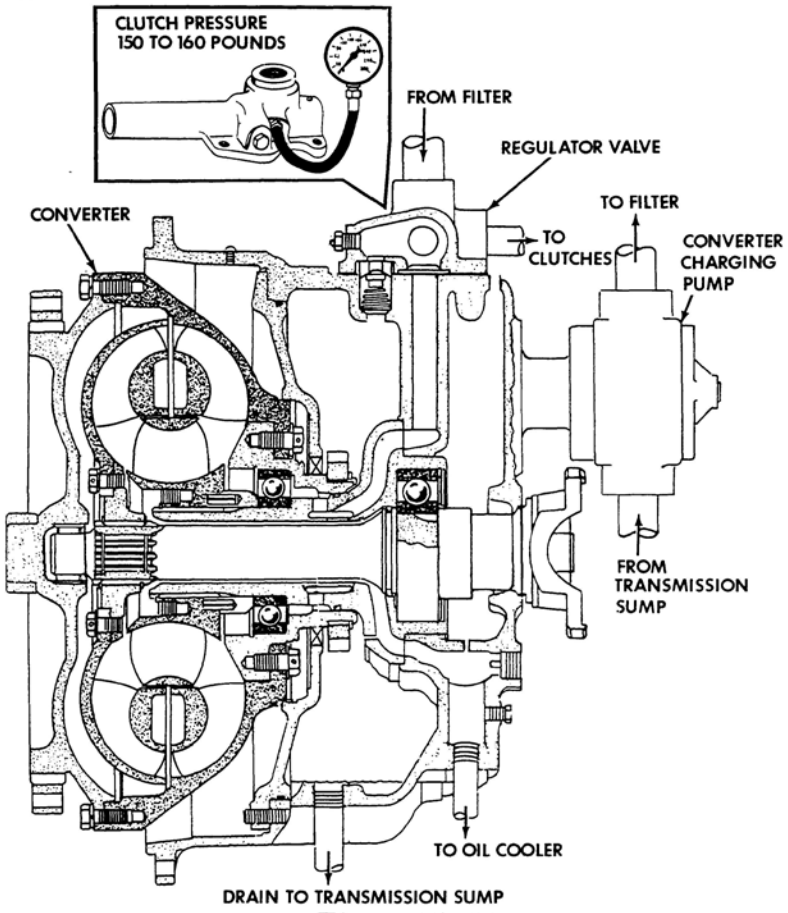


Figure Y-17

When making the transmission pressure check, the oil level in the transmission must be up to the "Full" level plug with the engine operating. Refer to Section X, Page X-6, Figure X-3. The oil must also be at operating temperature as indicated on the instrument panel gauge (center green zone or 200° F). The A20172 Gauge for checking transmission pressure (Figure Y-17) can be purchased from the J. I. Case Co., Service Parts Supply, Racine, Wisconsin.

Clutch Pressure ---------- 150 - 200 PSI @ 1500 Engine RPM

There must always be 150 - 200 PSI at the clutch check point whenever the engine is running - even with all clutches in neutral.

The pressure to each individual clutch can be checked by engaging the clutch and checking the pressure - it must be 150 to 200 PSI @ 1500 Engine RPM.

If any one clutch registers less than 150 PSI - it indicates possible leakage somewhere in that particular clutch.

If all clutches register less than 150 PSI check the transmission - converter regulator valve - as it is the only pressure regulator valve that influences all clutches. (Refer to Section X for servicing regulator valve).

CONVERTER CHARGING PUMP DISASSEMBLY

(Refer to Figure X7)

The converter charging pump has an aluminum body and cover so care must be used in disassembly and reassembly to prevent damage to the machined surfaces.

A. Mark the pump body and cover so it can be reassembled with the suction and pressure ports in the same location as they are before disassembly.

B. Remove the pump cover from the pump body and remove the 10 thrust plate springs, 5 from each outer thrust plate.

C. Remove the drive and driven gear assemblies, remove the "O" rings, fiber washers and outer thrust plates from the gear assemblies.

D. Lift out the inner thrust plates with your finger keeping them straight as they are removed. ***CAUTION*** They will bind and will not come out if they are cocked.

E. Remove the seal retainer snap ring and lift the seal assembly out with your finger. It may require tapping the mounting flange of the pump on a wood surface to remove the seal assembly.

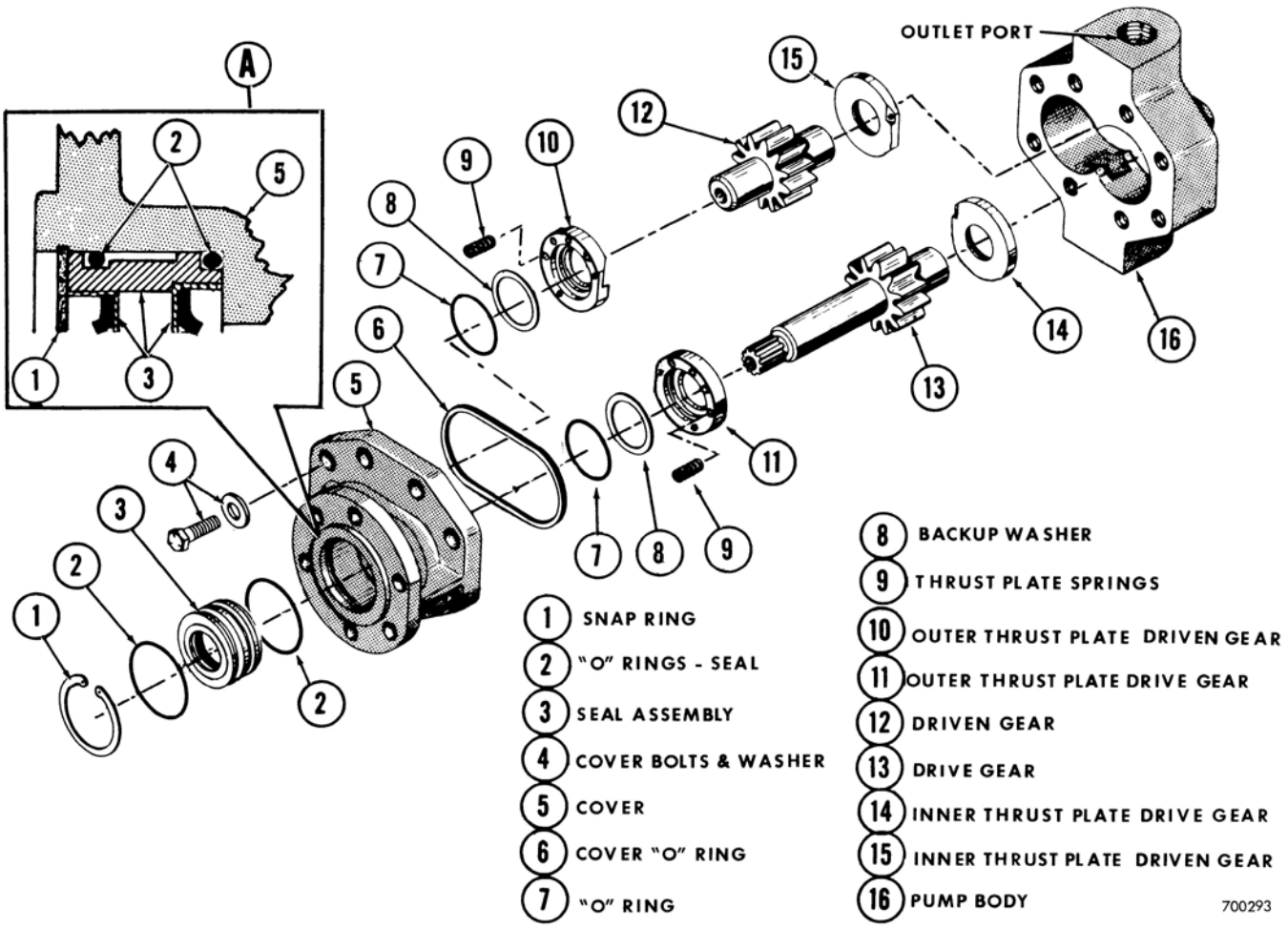


Figure X-7

AXLE SHAFT REMOVAL - STEERING AXLE

1. Disconnect the tie rod yoke by removing the tie rod yoke bolt, Figure T-21.

2. Disconnect the rear steering drag link, Figure T-21.

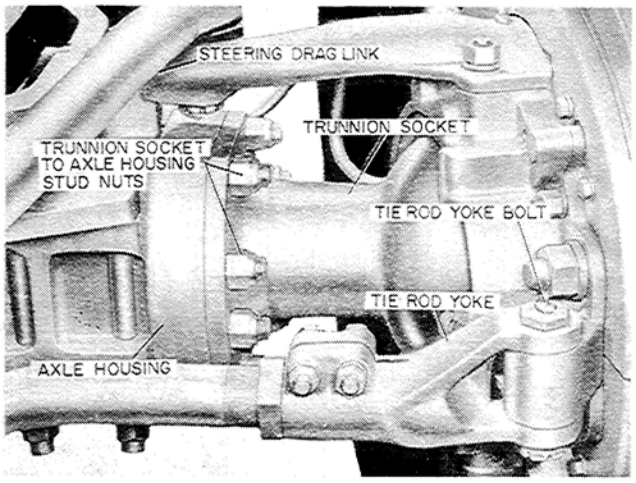


Figure T-21. Steering Yoke

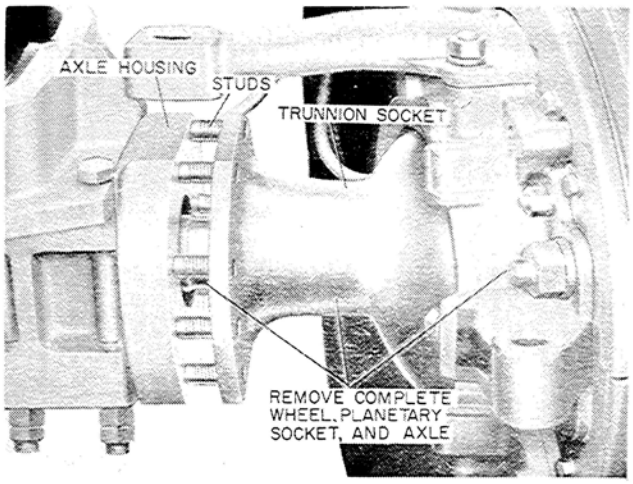


Figure T-22

3. Use either a chain hoist or roller jack to support the wheel and planetary so the weight is not allowed to rest on the axle shaft.

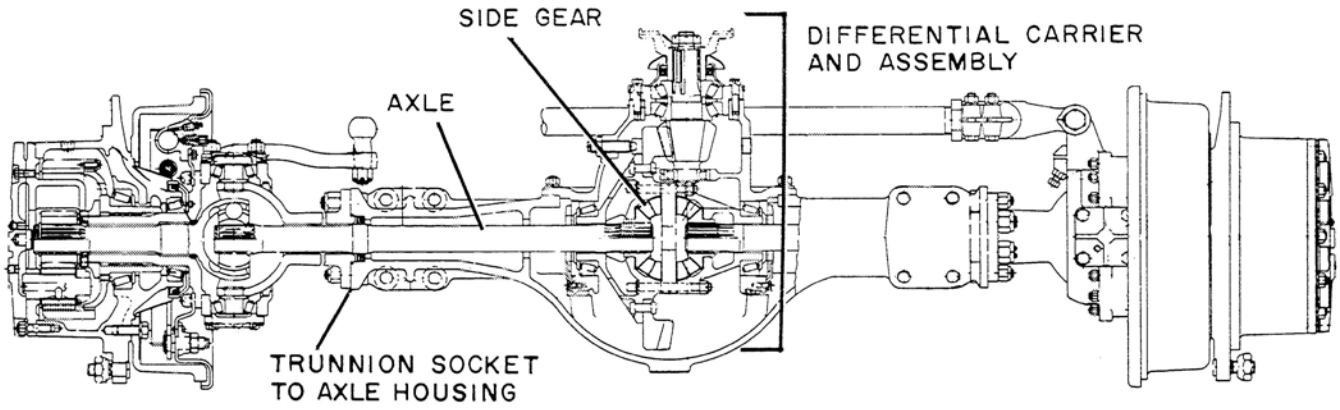


Figure T-23. Steering Axle

4. Remove the trunnion socket to housing stud nuts shown in Figure T-21

5. Now the complete wheel, planetary, socket and axle can be pulled outward far enough so the axle shaft can be disengaged from the differential side gear, Figures T-22 and T-23.

DIFFERENTIAL - Re-Assembly

Before starting to assemble the differential assembly make sure all parts are thoroughly cleaned inspected and all worn or damaged parts replaced. Prior to assembly coat all parts with axle lubricant.

Assembly Of The Pinion And Cage Assembly

1. Press the rear thrust bearing and radial bearing firmly against the pinion shoulders with a sleeve that will bear only on the bearing inner race, Figure T-51.

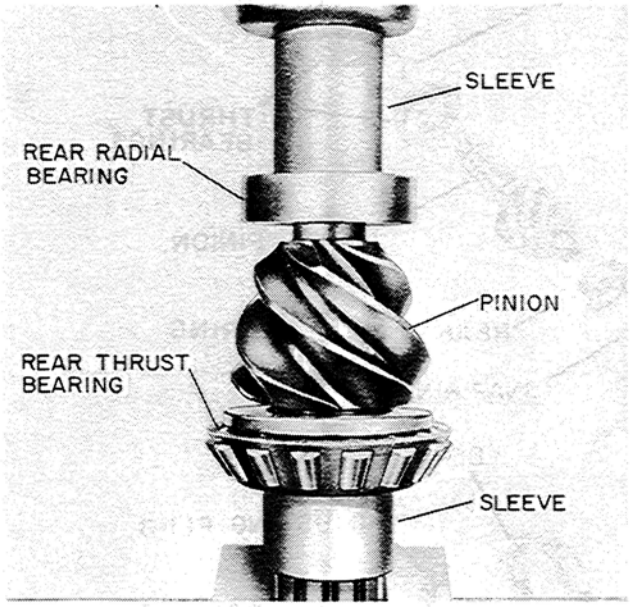


Figure T-51

2. Install the radial bearing lock ring after the bearing is pressed in place, Figure T-52.

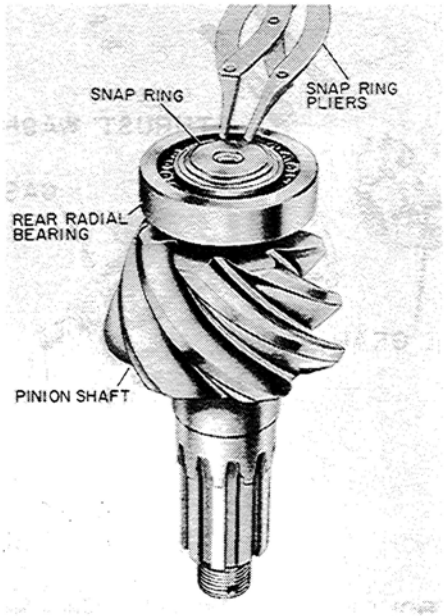


Figure T-52

3. If new bearing cups (one on each side) are to be installed, press them into the bearing cage until the cup bottoms against the shoulder in cage, Figure T-53.

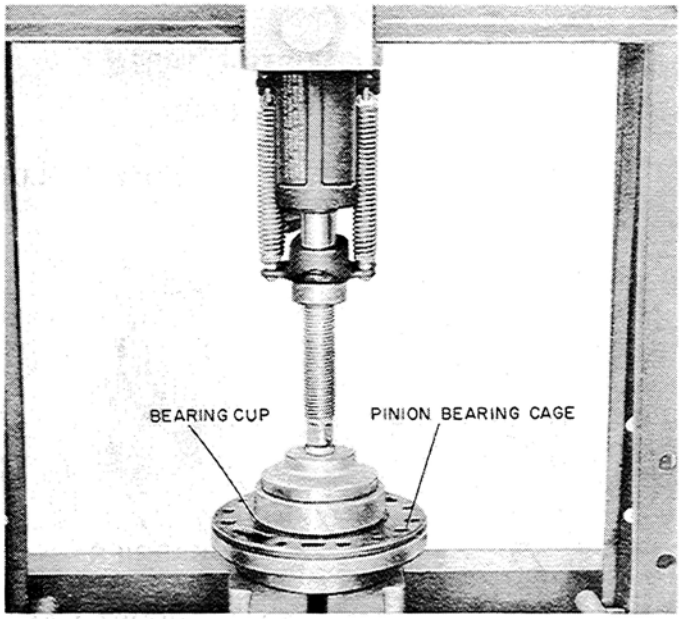


Figure T-53

4. Place the pinion cage over the pinion and bearing assembly and install spacer over the pinion shaft, Figure T-54.

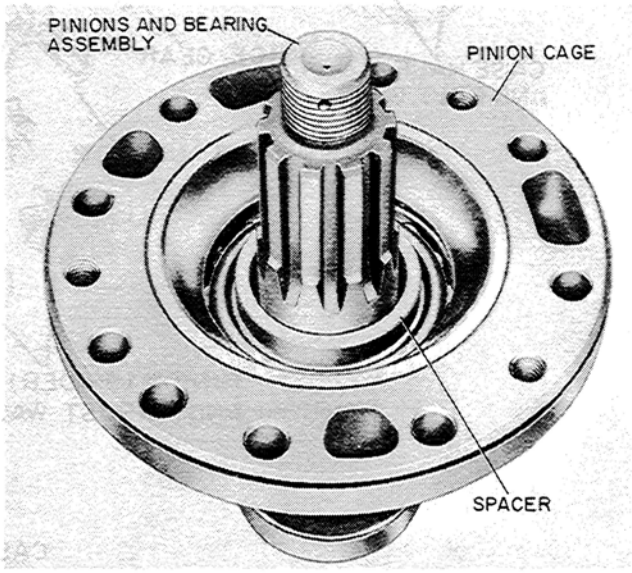


Figure T-54

SERVICE SUGGESTIONS

Vibration

CAUSE	REMEDY
1. Vibration due to improper pre-load on ring gear.	1. Check end play and ring gear setting according to Page T-26.
2. Vibration due to worn bearings.	2. Replace worn bearings.
3. Vibration due to damaged gear teeth.	3. Replace any damaged gears.
4. Vibration due to loose pinion shaft nut (excessive end play and loose pinion shaft bearings).	4. Torque pinion shaft nut as described on Page T-22 (extensive damage to pinion shaft bearings and gear will result from a loose pinion shaft.)

Noise

CAUSE	REMEDY
1. Noise due to worn or damaged bearings.	1. Replace worn or damaged bearings.
2. Noise due to worn or damaged gears.	2. Replace worn or damaged gears.
3. Noise in turns due to worn or damaged spider, pinion (spider) gears or side gears.	3. Replace worn or damaged spider, pinions (spider) gears or side gears.
4. Noise due to worn differential thrust washers.	4. Replace thrust washers and worn parts.
5. Noise caused by improperly set backlash or pinion and ring gear tooth contact.	5. Check backlash and tooth contact as described on Pages T-26 and T-27.

Loss Of Lubrication

CAUSE	REMEDY
1. Loss of lubricant due to damaged bearing cover gasket or oil seal.	1. Replace bearing cover oil seal and gasket.
2. Loss of lubricant due to loose carrier stud nuts.	2. Torque carrier stud nuts to proper torque. Refer to Page T-28.
3. Loss of lubricant due to damaged carrier flange or cracked carrier.	3. Replace carrier if cracked or damaged.

Differential - The Differential, Figure U-3, also increases torque through gear reduction. This further gear reduction is approximately 5.3 to 1.

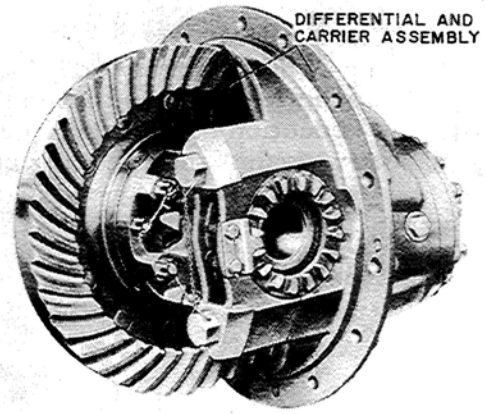


Figure U-3

Planetaries - The Planetaries, Figure U-4, also use gear reduction to multiply torque. This reduction is approximately 3.3 to 1.

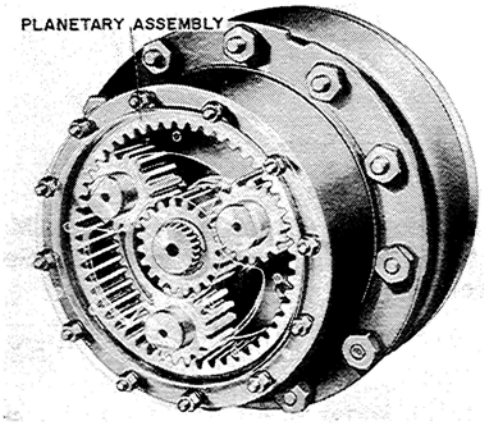


Figure U-4

The total gear reduction to obtain maximum torque at the drive wheels is 92 to 1. This means that 92 revolutions of the transmission input shaft results in 1 revolution of the wheels.

If we were to make this 92 to 1 reduction with only two gears, we would have a small drive gear having 10 teeth and a 4 inch diameter - the large gear would have approximately 940 teeth and be 12 feet in diameter, Figure U-5. This would be rather impractical for a loader application.

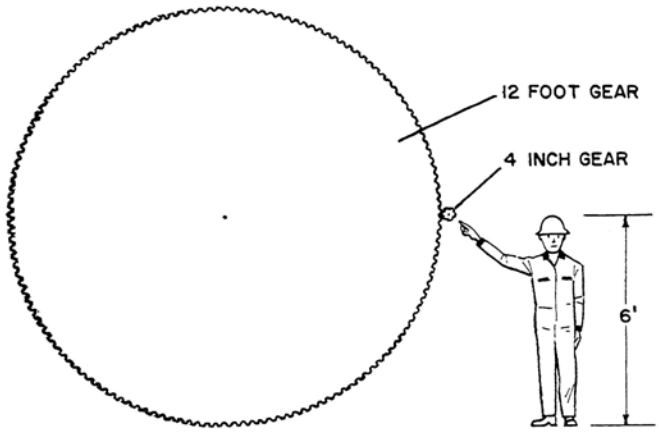


Figure U-5

Thus we can see that by performing this torque multiplication at four points in the power train rather than one or two, we eliminate the use of large cumbersome parts which would be required to transmit the higher torque to its point of application. Use of these large cumbersome parts would unnecessarily increase the weight the engine would have to haul around, thereby resulting in a smaller portion of the engine power being used for moving the pay load.

The outstanding feature of the planetary axle is its ability to perform the final torque multiplication at the point which the torque is applied - the drive wheels.

Now that we have some idea as to the purpose of the planetary axle system, let's take a closer look at just what part the planetary gearing has in this system.

Disassembly of The Universal Joint

If it is necessary to remove the universal joint flange assembly, refer to Sections O and Q for removal of the drag link and tie rod. With the steering linkage disconnected, remove and disassemble the universal joint flange assembly as follows:

1. Remove the trunnion to axle housing stud nuts, Figure U-34. Then remove the universal joint flange assembly, Figure U-34.

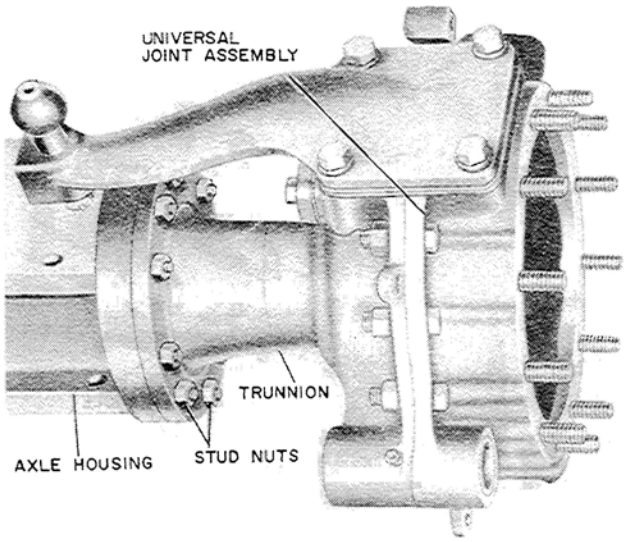


Figure U-34

2. Remove the steering arm capscrews, washers, steering arm and shim pack, Figure U-35.

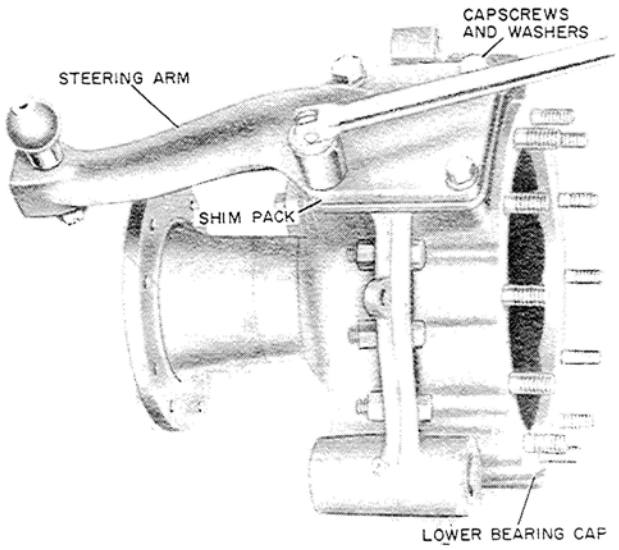


Figure U-35

3. Remove the lower bearing cap bolts, washers, bearing cap and shim pack, Figure U-35.

4. Lift off the bearing cups. Then remove the nuts and bolts that hold the flange halves together. Remove the flange halves from the trunnion socket, Figure U-36. The inner flange half must be tipped at an angle to clear the inner connecting flange.

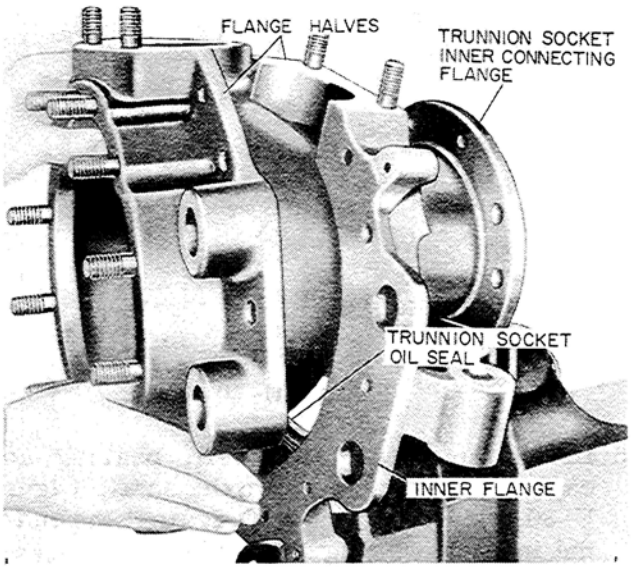


Figure U-36

5. If the trunnion socket bearings are damaged remove them, using the OTC No. 515 and 951 pullers, Figure U-37. The steering axle planetary and universal joint are now completely disassembled.

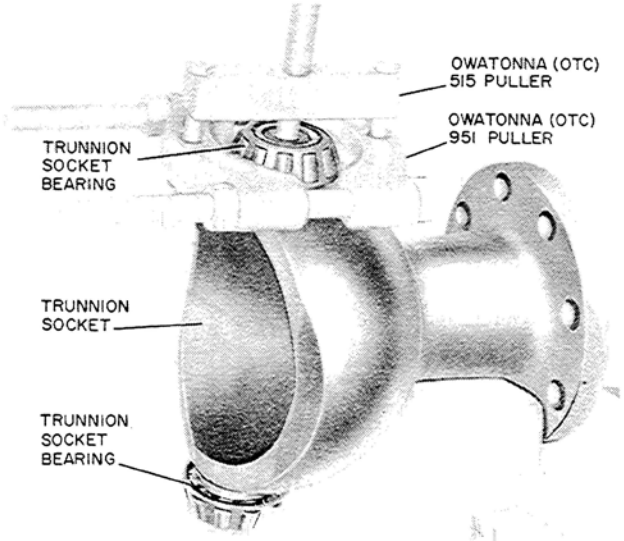


Figure U-37

WHEEL BEARING ADJUSTMENT
(Both Rigid and Steering Axles)

It will always be necessary to adjust the wheel bearings - anytime the wheel bearing adjusting nut has been removed.

The wheel bearing adjustment must be checked (and if necessary re-adjusted) - anytime the spider is removed from the planetary housing.

To check and adjust the wheel bearing, proceed as follows:

1. Raise the wheel being checked, off the floor far enough so the wheel rotates freely - Make sure brakes are not dragging.

   Block loader securely so it will not roll or tip.

2. Make sure the wheel bearing adjusting nut is tight against the planetary ring gear hub. IMPORTANT: If it is necessary to tighten the adjusting nut - the wheel must be rotated slowly while the nut is being tightened. (Remove adjusting nut lock before tightening.)
   NOTE: Use the 3856-D-4 Special Wrench to tighten the adjusting nut on 100 Series Axles and the 3856-E-5 Series Wrench on 150 and 200 Series Axles. Both Wrenches are available from the J. I. Case Co., Central Service Division, Racine, Wisconsin.

3. Install one spider capscrew into the planetary housing until it bottoms.

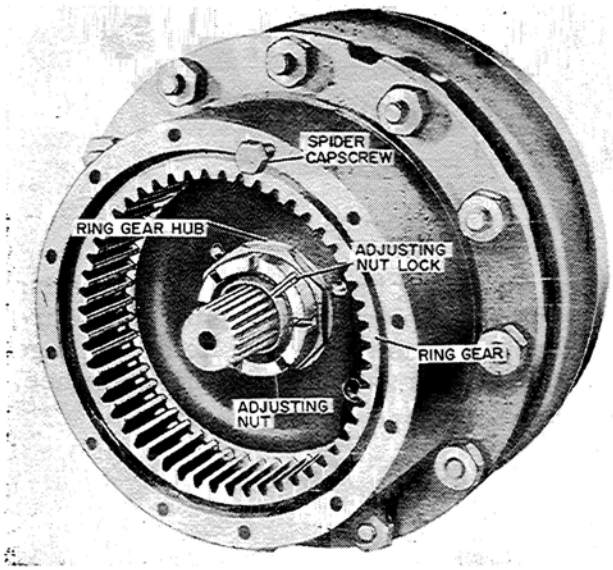


Figure U-57

4. Now check the bearing adjustment by measuring the rolling torque of the wheel - Place a torque wrench on the spider capscrew, Figure U-58, and note the amount of torque required to rotate the wheel.

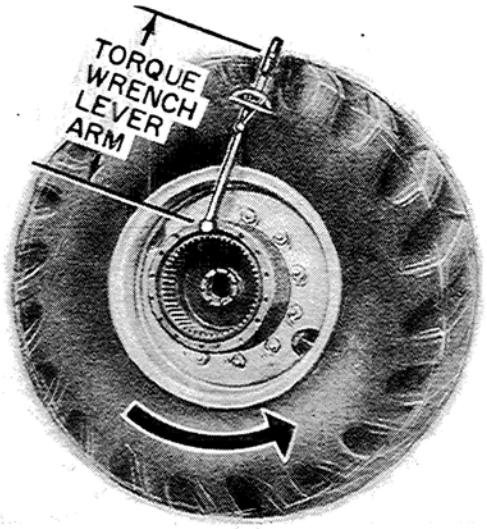


Figure U-58

If the lever arm length, Figure U-58, of the torque wrench is 18 inches - 10 foot pounds will be required to rotate the wheel and tire when the bearing is properly adjusted.

If the lever arm length of the torque wrench is 12 inches - 13 foot pounds will be required to rotate the wheel and the when the bearing is properly adjusted.

Loosen nut to decrease rolling torque.

Tighten adjusting nut to increase rolling torque.

IMPORTANT - You will note that slightly more effort will be required to start the wheel rotating - but only 10 or 13 foot pounds (depending on size of torque wrench) will be required for slow continuous rotation.

DO NOT ATTEMPT TO CHECK THIS ADJUSTMENT WITH BALLAST IN THE TIRES AS IT WILL ONLY RESULT IN A FALSE TORQUE READING.

5. After the bearing is properly adjusted loosen up the bearing adjusting nut just enough to align the slots in the nut for installation of the nut lock.

WHEEL CYLINDER

The wheel cylinder should be rebuilt or replaced whenever new brake linings are installed or the cylinder shows signs of leaking.

Any time it is necessary to service a wheel cylinder the planetary system must be removed first. Refer to Section IV, Differentials, Planetaries and Axles.

Removal

After the planetary system has been removed proceed as follows:

1. Remove the brake shoe return spring and expand the brake shoes as far as possible.

2. Disconnect the brake line at the wheel cylinder and remove the two mounting cap screws, Figure 5. Then remove the wheel cylinder from the backing plate.

Disassembly And Inspection

1. Remove the boots and push rods from the ends of the wheel cylinder.

2. Remove the pistons, cups and spring from the wheel cylinder, Figure 6.

3. Inspect the cylinder bore for pitting and scoring. If the cylinder bore is heavily pitted or scored use a cylinder hone to "clean up" the cylinder bore. If pitting and scoring is light, honing the cylinder is optional.

4. Inspect the pistons for pitting and scoring and replace if necessary.

5. Inspect the spring for signs of cracks, distortion or other defects.

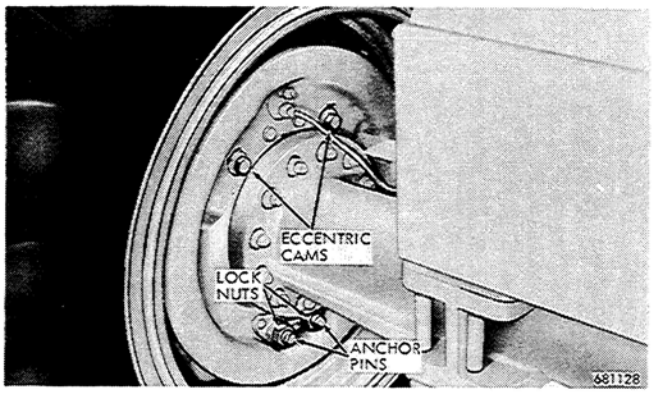


Figure 5

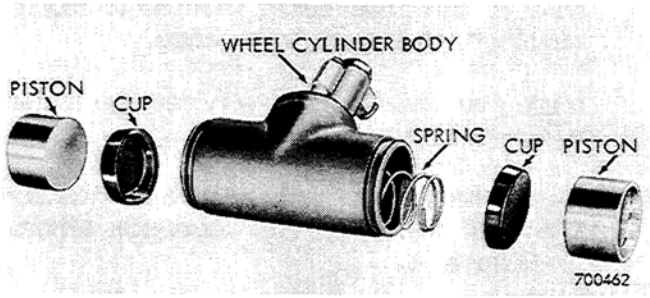


Figure 6

Assembly

1. Prior to assembly lubricate the wheel cylinder bore, pistons and cups with brake fluid.

2. Position one cup and piston in the cylinder bore. Then install the spring and the remaining cup and piston.

3. Install the boots and push rods on the ends of the wheel cylinder.

Installation

1. Position the wheel cylinder on the backing plate and secure with two mounting capscrews. Then connect the brake line to the wheel cylinder.

2. Turn the eccentric cams to the fully released position and reinstall the brake shoe return spring.

3. After reinstalling the planetary system bleed and adjust the brake as instructed on page 8.

FLOW DIAGRAM

Engine Running - Brakes Not Applied

(Refer to Figure 3W-2)

With the engine running and the brakes not applied, the vacuum pump or engine intake manifold is drawing air from the hydrovac cylinder assembly and reservoir.

As the rotor turns, the vanes are forced out against the pump body bore by centrifugal force. Air is drawn from the air intake or vacuum port and trapped between the vanes. This trapped air is then carried from the vacuum port to the air and oil discharge port which in turn is discharged to the injection pump drive housing.

The pump lubricating oil enters the pump at the rear end plate port. The lubricating oil then is ported through the hole in the bronze bushing to the outside diameter of the rotor shaft. A slight amount of oil flows between the rotor shaft and the bronze bushing. The remainder of the oil enters three radially drilled holes leading to the center of the rotor shaft. The oil then flows through the center of the rotor shaft and then outward through the holes in the shaft to the vanes. A film of oil is formed around the vanes. A seal is thereby provided between the vanes and rotor and between the vanes and pump body.

Some oil enters the front end plate assembly through the holes in the baffle plate and flows through the ball bearing. The flow of oil is aided at this point by the vacuum at the front side of the bearing. The oil at the front side of the bearing is drawn back to the vacuum or discharge port through the passage at the top of the end plate. The lubricating oil is then carried to the air and oil discharge port which in turn is discharged to the injection pump drive housing.

A check valve is located in the system between the pump and the hydrovac cylinder assembly. With the engine running the check valve is always open allowing the vacuum pump or intake manifold to draw air from the system.

With the engine running and the brakes not applied, the atmospheric poppet is closed and the vacuum poppet is open allowing the vacuum pump to draw air from both sides of the power piston. The fluid in the master cylinder and the hydrovac hydraulic cylinder is static.

The residual check valve located in the hydrovac cylinder is closed at all times when the brakes are not applied.

DISASSEMBLY OF THE HYDROVAC CYLINDER ASSEMBLY (Refer to Figure 3W-7)

1. Loosen the hydraulic cylinder lock nut (1) and unscrew the hydraulic cylinder (2).

2. Clamp the end cap (3) in a vise and remove the rubber seal (4) lock nut (1) and cylinder (2).

3. Remove the copper gasket (5) snap ring (6) stop washer (7) return spring (8) residual valve (9) and bleed screw (10) from the end cap (3).

4. Scribe alignment marks across the cylinder shell (11) end plate (12) valve body (13) and cover (14).

5. Loosen the vacuum hose clamps (15) and slide the vacuum hose (16) forward on the control valve tube (17).

6. Remove the atmosphere tube snap ring (18) tube (19) gasket (20) and poppet spring (21).

7. Remove the control valve cover capscrews (22) cover (14) valve seat spring (23) diaphram (24) and valve cover gasket (25).

8. Remove the poppets, unscrew the staked nut (A) from the vacuum poppet and shaft (B). Remove small atmospheric poppet (C) and large atmospheric poppet (D) as shown in inset A.

9. Remove the hydraulic valve piston assembly (26). Then remove the snap ring (27) stop washer (28) and piston (29) from fitting (30) and fitting gasket (31).

10. Remove the cylinder assembly hook bolt nuts (32) and bolts (33). Then pull the end plate (12) and piston assembly (34) out of the cylinder shell (11).

CAUTION When removing the hook bolt nuts, do not lose the hydrovac identification tag.

11. Push the end plate (12) down so the hydraulic piston (35) protrudes from the end plate (12) and remove the retainer pin (36) that holds the piston (35) to the push rod (37).

12. To disassemble the hydraulic piston remove the snap ring (A) ball retainer (B) return spring (C) ball (D) from the piston (E). Refer to inset B.

13. Remove the end cover (12) cover "O" ring (38) and return spring (39).

14. Remove rubber seal (40) snap ring (41) piston stop washer (42) spring (43) expander washer (44) retainer (45) rubber cup (46) guide washer (47) and seal (48).

15. Clamp the push rod (37) in a vise and remove the push rod nut (49) retainer plate (50) expander ring (51) wick (52) inner plate (53) leather packing (54) rubber seal (55) piston plate (56) and stop washer (57).

DISASSEMBLY OF THE VACUUM PUMP

(Refer to Figure 3W-14)

1. Remove the cotter pin and castellated nut from the end of the rotor shaft.

2. Remove the pulley from the shaft using OTC No. 1002 Puller. The pulley is keyed to the pump rotor shaft. Unless the key is damaged, the pulley should come off the shaft very easily.

3. Scribe alignment marks between the housing and both end plates to assure correct assembly of the end plates to the housing. Remove the six nuts from the bolts and drive the bolts out of the end plates and housing using a 3/16" diameter rod.

4. Using a fibre mallet if necessary, remove the rear end plate and front end plate-rotor assembly from the housing.

5. Remove the flat rubber ring from the front end plate and the flat rubber ring and oil port gasket from rear end plate.

6. Remove the oil port gasket retainer.

IMPORTANT

DO NOT REMOVE THE BUSHING FROM THE REAR END PLATE. DO NOT REMOVE THE TWO DOWEL PINS IN THE HOUSING UNLESS THEY ARE TO BE REPLACED.

7. Remove the three rotor vanes from the rotor.

CAUTION

USE CARE NOT TO SCRATCH THE POLISHED SURFACE OF THE ROTOR SHAFT.

8. Place the outer edge of the machined surface of end plate on wood blocks and drive out the baffle plate and ball bearing. Use a 1/4 to 3/8 inch diameter rod through the opening on the pulley side of the end plate.

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

10. Using the special tool, inset A, drive out the oil seal and seal gasket from the end plate.

PRESSURE CHECKS

(Refer to Figure 3W-20)

Vacuum Power Check

1. With the engine shut off, apply the brake pedal several times to remove all vacuum from the system.

2. Depress the brake pedal and start the engine.

3. If the vacuum system is operating properly, the brake pedal will move downward.

4. If no action is indicated, the vacuum system is not operating correctly. Inspect the system for disconnected or restricted vacuum lines.

Vacuum Check Valve

1. Disconnect the check valve from the filter.

2. Install a vacuum gauge in the check valve opening.

3. Start the engine and run at idle speed for 1 minute. Note the gauge reading.
   a. If the gauge registers less than 16 inches of mercury vacuum, inspect the check valve and line to the engine intake manifold or pump for restriction. Also check opening at intake manifold or pump.
   b. If the engine is the cause of the low vacuum the engine must be serviced.

4. Shut off the engine and check the rate of vacuum drop.
   a. If the rate of vacuum drop is greater than 2 inches of mercury vacuum in 15 seconds, excessive leak past the check valve is indicated.
   b. Service or replace check valve if excessive leakage is indicated.

Vacuum Supply Line and Hydrovac

1. Remove the pipe plug from the hose adapter that screws into the tee at the reservoir.

2. Install a vacuum gauge.

3. With the engine running at idle, the vacuum gauge should register approximately 20 inches of mercury vacuum.

4. Stop the engine and note the rate of vacuum drop. If the rate of vacuum drop is greater than 2 inches of mercury vacuum in 1 minute, excessive air is leaking into the system. Check the complete system for leaks. Tighten all connections. If leakage is still found, the hydrovac is probably at fault and should be removed and repaired.

NOTE

IF THE VACUUM GAUGE READING OF 20 INCHES OF MERCURY VACUUM CANNOT BE OBTAINED, IT WILL BE DIFFICULT TO OBTAIN THE CORRECT HYDRAULIC PRESSURE.

SERIES "01" HYDRAULIC BRAKE MASTER CYLINDER

How It Works

The following pages of this section contain a series of schematic flow diagrams of the Series "01" Hydraulic Brake Master Cylinders used on Case 4 Wheel Drive Unit Loaders. The flow diagram with the accompaning descriptions will aid you in understanding the brake system and help you locate, diagnose and properly correct any difficulties which may occur in the system.

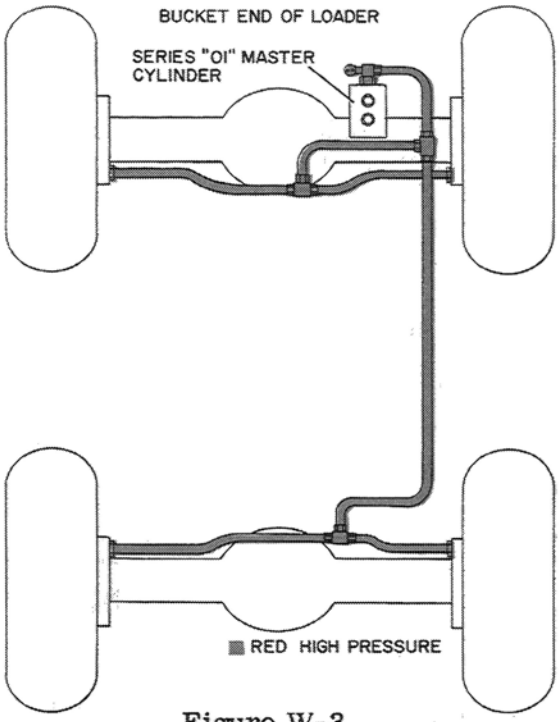


Figure W-3

Figure W-3, illustrates the location of the Series "01" Master Cylinder in the brake system.

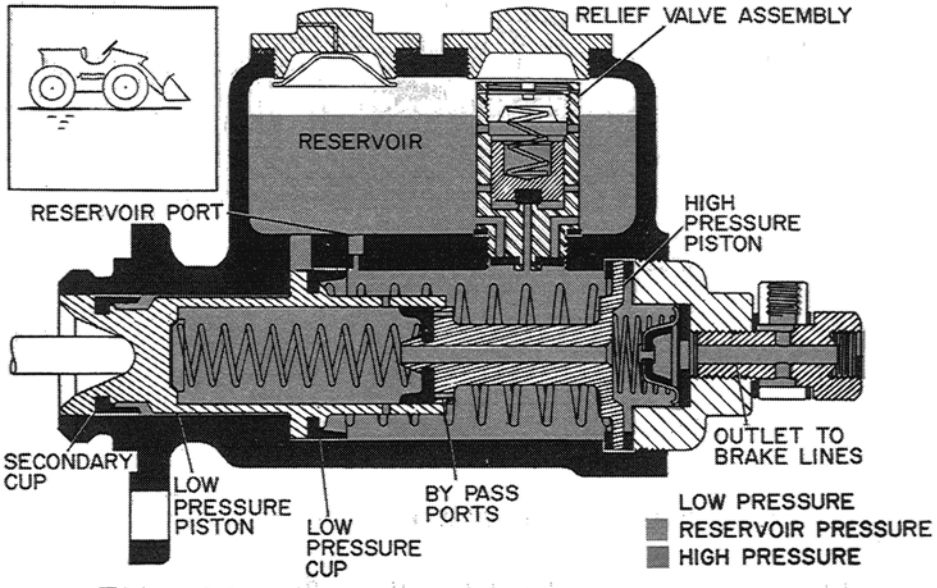


Figure W-4. Brakes Not Applied(Neutral)

The hydraulic brake fluid from the reservoir enters the low pressure chamber thru the reservoir port located slightly ahead of the low pressure cup. When the brake pedal is applied the low pressure piston moves forward building up pressure in the low pressure chamber.See Figure W-5.

ASSEMBLY OF THE BRAKE MASTER CYLINDER

STEP 1

Place the cylinder housing, threaded end up, in a vertical position in a vise. Set a socket (about 5/8" size) on the vise beam so that it will project onto the smaller bore of the cylinder housing. This socket will hold the secondary piston up so that the high pressure piston may be installed in a later step.

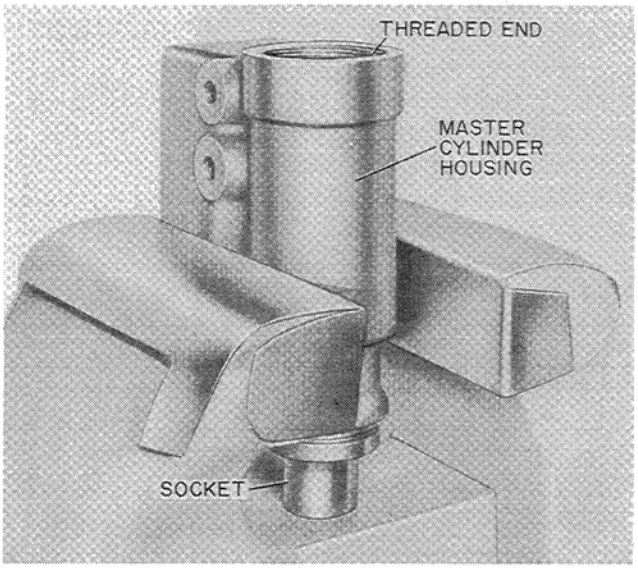


Figure W-18. Step 1

STEP 2

Tighten the vise securely with the cylinder housing resting on the vise beam. Next insert the low pressure piston, Figure W-19.

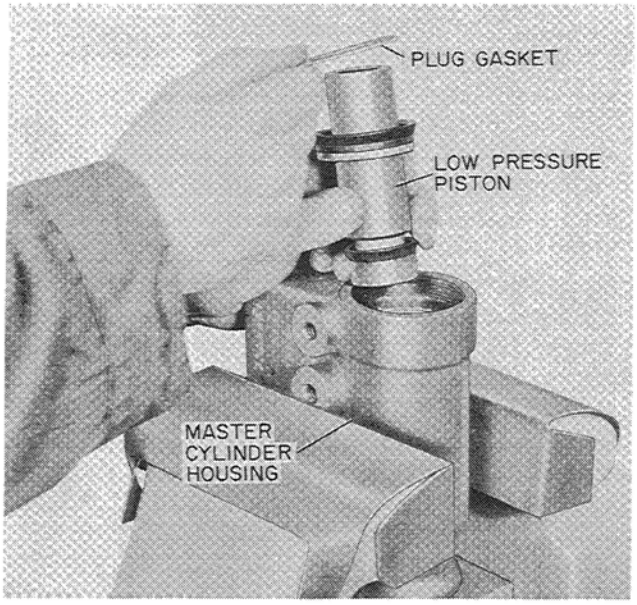


Figure W-19. Step 2

When doing this make certain that the two cups are on correctly. The open or forward side of these cups must be in the same direction as the open or cylinder end of the low pressure piston. Push the low pressure piston down until it stops against the socket standing in the small bore. Insert this inside plug gasket, being certain that this gasket is up square and snug to its shoulder within the cylinder housing, Figure W-19.

STEP 3

Insert the small return spring into the high pressure cylinder of the low-pressure piston. Next insert the large return spring, Figure W-20.

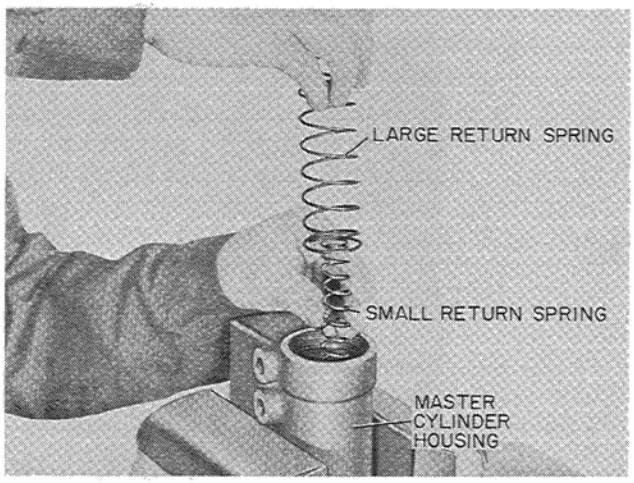


Figure W-20. Step 3

STEP 4

Pre-assemble the high pressure piston check valve, check valve seat, check valve spring plug gasket and end plug in position shown, Figure W-21.

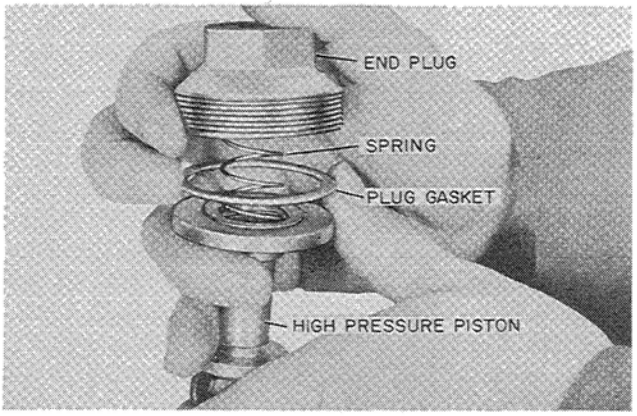


Figure W-21. Step 4

ASSEMBLY OF THE "DH" SERIES BRAKE

1. Install the wheel cylinder and push rods.

2. Install the adjusting bolts and turn in fully.

3. Position the brake shoe lever so that the ends mate with the push rod at the top and the adjusting bolt at the bottom. There are right and left hand levers. Refer to Figure W-34.

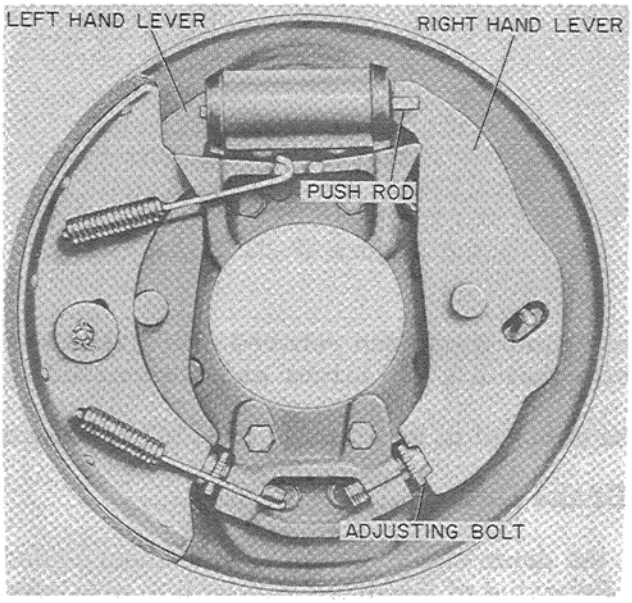


Figure W-34

4. Hook the short ends of both brake shoe springs into the brake shoe web holes.

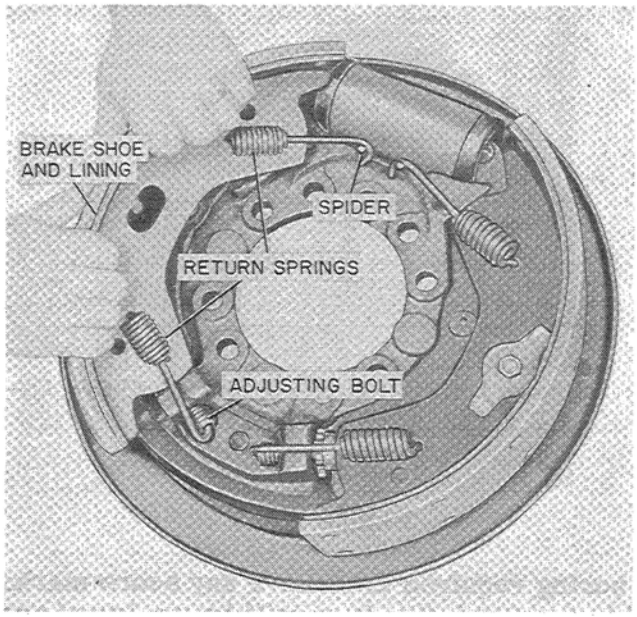


Figure W-35

5. Hook the long end of the upper spring on the spider and the long end of the lower spring in the adjusting bolt end. Refer to Figure W-35.

6. With both hands rotate the brake shoe over the brake lever and guide into position.

7. Hold the brake shoe against the lever with one hand and install the guide bolt washer and nut.

8. Tighten the guide bolt nut so that the brake shoe and lever will have a clearance of .015" at the guide bolt washer. Refer to Figure W-36.

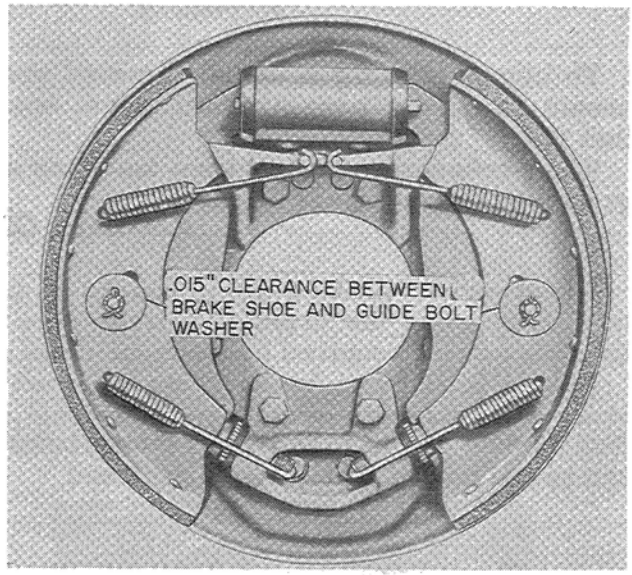


Figure W-36

9. Install the cotter key in the guide bolt nut.

10. Connect the brake lines. Bleed the brake system after all brakes have been reassembled and the lines connected. Refer to Page W-18.

11. Adjust the brake shoes as described on Page W-20.

SERVICE SUGGESTIONS

No Brakes, Brake Pedal Fades To Floor

CAUSE	REMEDY
1. Insufficient Brake Fluid in master cylinder.	1. Refill reservoir with a grade 70R1 hydraulic brake fluid. Bleed brake system of air.
2. Loss of brake fluid due to broken hydraulic brake line or failure of wheel cylinder rubber cup.	2. Replace defective parts.
3. Ruptured high pressure cup (Figure W-53) - (17) or low pressure cup (Figure W-53) - (18)	3. Install master cylinder repair kit as outlined in disassembly and assembly section.
4. Loss of pressure in the low pressure chamber due to a defective relief valve check disc (Figure W-53) - (8)	4. Refer to remedy #3.
5. Loss of pressure in the low pressure chamber due to a broken relief valve spring (Figure W-53) - (5) or relief valve piston held open due to dirt (Figure W-53) - (5)	5. Clean or replace relief valve as required.

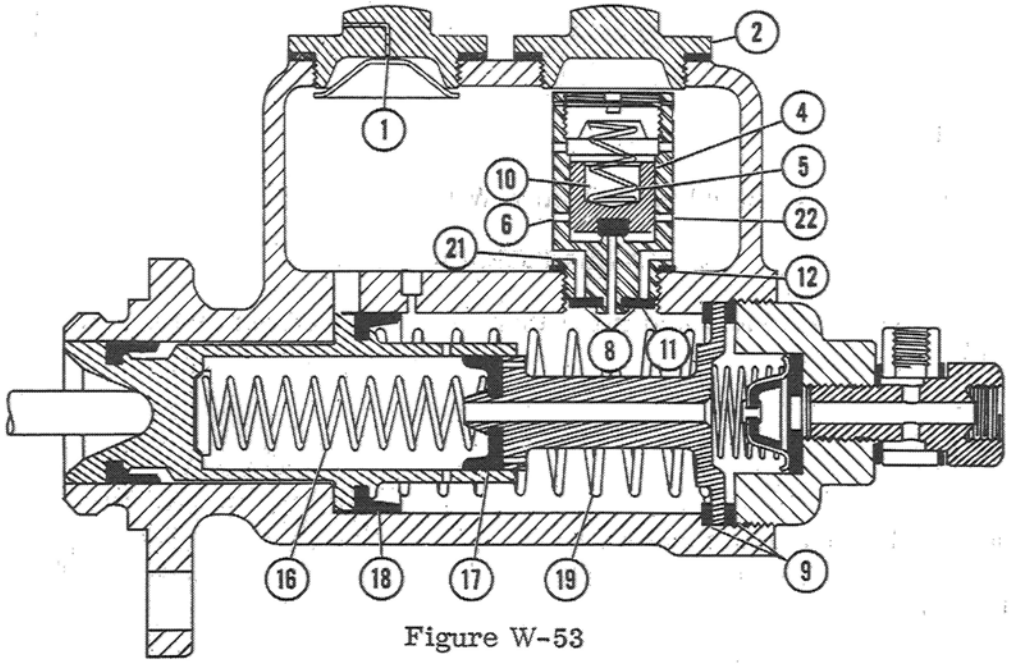


Figure W-53

6. Loss of pressure in the high pressure chamber due to defective high pressure piston gaskets (Figure W-53) - (9)	6. Refer to remedy #3.
7. Defective check valve spring, disc or gasket (Figure W-53) - (10) (11) (12)	7. Refer to remedy #3.
8. Brake shoes out of adjustment.	8. Adjust brake shoes, See Page W-18 and W-18.

PROBLEM	POSSIBLE CAUSES	REMEDY
Pump Is Damaged	4. Drive shaft broken.	4. Check coupling for damage or misalignment.
	5. Gear damaged or broken.	5. Replace both gears. Possible causes include contaminated oil, misaligned shaft coupling, high relief valve setting, damaged shaft bearing.
	6. Discolored shaft at roller bearing surface or sides of gears.	6. Use clean Case Hi-Lo TCH oil in system. Check oil level and condition of filters.
	7. Gear housing cover cracked.	7. Check main relief valve pressure setting.
	8. Set screw plug in shaft end cover improperly installed.	8. Plug should be on pressure side of cover.

Control Valve Problems

PROBLEM	POSSIBLE CAUSES	REMEDY
High or Low Pressure	1. Incorrect main relief valve setting.	1. Check setting at loader. Adjust as required.
	2. Broken main relief valve spring.	2. Replace spring and check the pressure setting.
	3. Dirty main relief valve.	3. Remove and thoroughly clean valve with solvent.
Internal Leakage	1. Defective "O" ring seal on high pressure carryover fitting.	1. Replace "O" ring seal.
	2. Main relief valve leaking.	2. Check seat, poppet, "O" rings, etc. for damage.
	3. Excessive clearance between spool and spool bore.	3. Replace spool.
	4. Valve spool not in proper position.	4. Check spool travel and control lever linkage.
	5. Secondary relief valve held open by chip or foreign matter.	5. Inspect secondary relief valve. Clean thoroughly in solvent.
Spool Leaks Oil	1. Defective spool seals.	1. Replace seals.
Spool Binds	1. Bent spool.	1. Replace spool. Check setting of secondary relief valve. Also check and adjust main relief valve.
	2. Burr on spool.	2. Remove burr with crocus cloth.
	3. Scored spool bore.	3. Replace valve. Check for contaminated oil.
	4. Cap full of oil.	4. Replace spool seal at cap end.
	5. Valve distorted.	5. Shim valve where valve is mounted.
	6. Sludge in valve.	6. Clean valve.

Spools in Neutral

When all spools are in neutral, the flow of oil is through the open center passage side of the valve to the reservoir. When a spool is in neutral it also blocks the work ports. This blocking action prevents oil from entering or leaving the cylinders, thus holding the bucket in position.

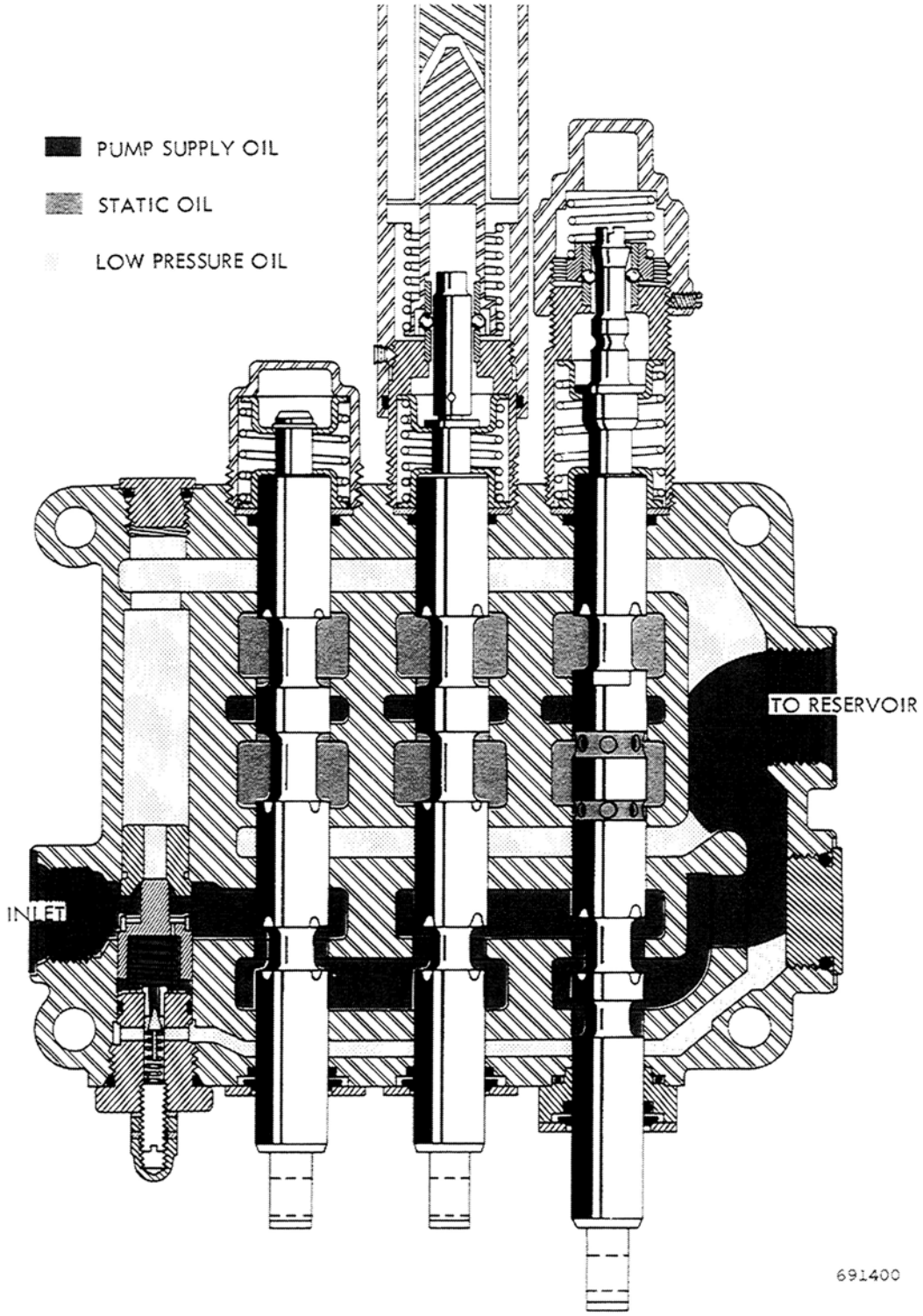


Figure 5

7. Screw solenoid housing down until the plunger bottoms against the plunger stop. Then back off solenoid housing two turns and tighten set screw.

8. Install "O" ring, "O" ring retainer, wiper and retainer plate over eye end of spool. Secure plate in position with screws and lockwashers.

CLAM SPOOL

Refer to Figure 10.

1. Place "O" ring retainer and "O" ring on spring end of spool. Then clamp spool in a SOFT JAWED vise and install inner spring retainer, spring, outer spring retainer and snap ring on spool. Make sure snap ring is seated in groove on spool.

2. Install spool in valve body. Then screw spool cap into valve body.

3. Install "O" ring, "O" ring retainer, wiper and retainer plate over eye end of spool. Secure plate with screws and lockwashers.

Installation

1. Place mounting bolts (3) in control valve and install valve on Loader. Torque the nuts to 65 foot pounds.

2. Connect return line and pressure tubing to control valve.

3. Connect solenoid wiring. Then connect control levers to valve spools.

4. Start engine and operate bucket through several complete cycles to bleed air from hydraulic system.

5. Check for oil leaks and check hydraulic reservoir oil level and add oil as required.

Relief Valve Pressure Check and Adjustment

1. Rest bucket flat on ground or floor.

2. With the engine shut off operate bucket control levers back and forth to relieve system pressure.

3. Remove plug from control valve and install a 0-2000 PSI pressure gauge, Figure 16.

4. Start engine and run at 1000 RPM. Slowly pull the tilt control lever rearward until the bucket is in the full tilt position. Hold the lever in this position so hydraulic pressure will build and force the relief valve open.

5. Increase engine speed to 1500 RPM and observe the pressure gauge reading. The gauge should register 1600 PSI.

6. If the gauge registers above or below 1600 PSI the relief valve must be adjusted. Proceed as follows:

   a. Remove acorn nut from relief valve adjusting screw and loosen jam nut.

   b. With the engine running at 1500 RPM and the tilt lever all the way rearward turn the adjusting screw in or out until the gauge registers 1600 PSI. Then tighten jam nut and reinstall acorn nut.

7. Rest bucket flat on ground or floor. Then remove pressure gauge and reinstall plug in valve.

8. Check hydraulic reservoir oil level and add oil as required.

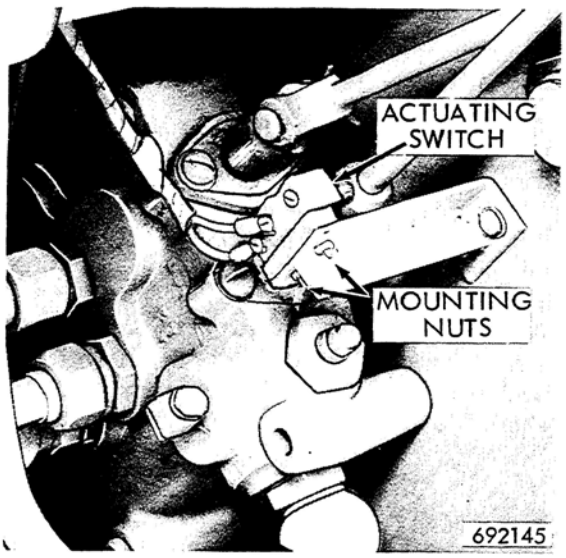


Figure 16

Instructions for Installing Replacement Piston Rod Eye Assembly

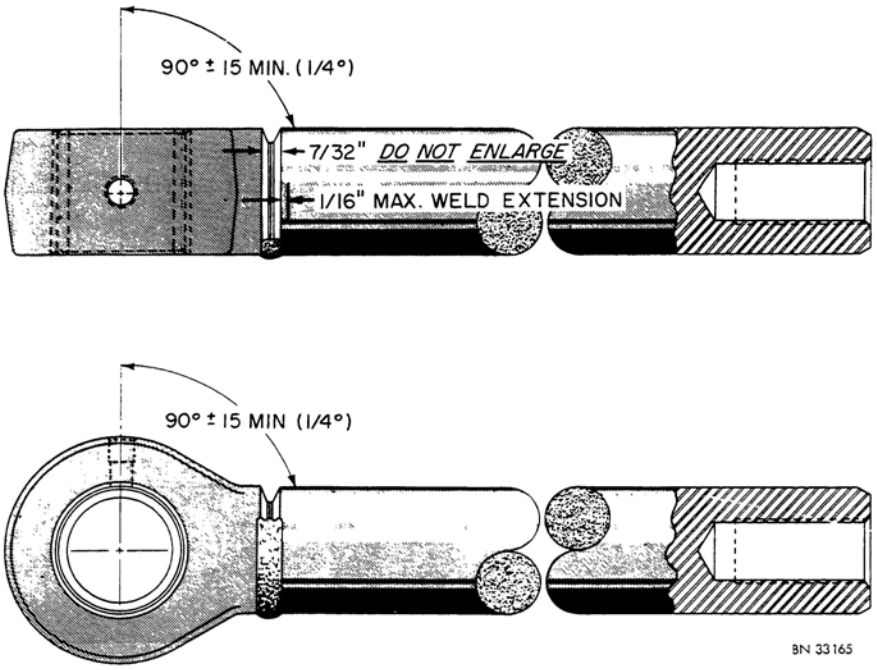


Figure 36

1. Disassemble the cylinder and remove the piston rod. Use care not to nick or scratch the piston rod when handling.

2. Grind all old weld from the piston rod. DO NOT ENLARGE THE ORIGINAL GROOVE. Protect the piston rod with tape or a cardboard sleeve while grinding.

3. Prepare to weld by positioning the eye assembly with respect to the piston rod.

   a. Center the eye assembly so that the centerlines of the eye assembly and the piston rod coincide.

   b. Position the eye assembly so that it is square with the piston rod and not "cocked" in any direction. See **Figure 36.**

   c. When the eye assembly is properly positioned, tack weld the eye assembly to the piston rod on one side. Use a 1/8" L.H. rod (A.W.S. Class E-9018).

4. Start on the side opposite the tack weld and weld the eye assembly to the piston rod. Turn the piston rod while welding to obtain a 2 or 3 pass weld.

IMPORTANT!

5. After welding, check to make certain the following conditions have been met:

   a. Weld is not extended over 1/16" back from the edge of the groove onto the piston rod. Excess weld on the piston rod could damage the wiper seal in the cylinder gland.

   b. The eye assembly is centered so that the centerlines of the eye assembly and the piston rod coincide with each other.

   c. The eye assembly is square with respect to the piston rod.

under the straightedge, replace the gear housing.

3. Pressure pushes the gears against the housing on the low pressure side. As the hubs and bearings wear, the cutout becomes more pronounced. Excessive cutout in a short period of time indicates excessive pressure or oil contamination.

4. Where cutout is moderate, .005" or less, the gear housing is in good condition and may be reused.

Driven Gear

1. Any wear on gear hubs detectable by touch, or in excess of .002", means replacement of the gears. Other reasons for replacement include scoring, grooving, or fretting of teeth surfaces. Gears are replaceable in pairs only.

Drive Shaft And Drive Gear Assembly

1. Replace if there is any wear detectable by touch in the seal area. .002" wear is the maximum allowable.

2. Any wear on gear hubs detectable by touch, or in excess of .002", means replacement of the gears. Other reasons for replacement include scoring, grooving or burring of the O.D. of the teeth or nicking, grooving or fretting of the teeth surfaces. Gears are replaceable in pairs only.

3. Wear in the shaft seal area indicates oil contamination.

4. Replace if there is damage to the shaft splines.

Thrust Plates

1. The thrust plates seal the gear sections at the sides of the gears. Wear here will allow internal leakage of oil from the high pressure side back to the low pressure side of the pump.

2. .002" is the maximum wear allowable on the gear surface of the thrust plate. Replace thrust plates if they are scored, eroded or pitted.

3. Check the center of the thrust plates where the gears mesh. Erosion here indicates oil contamination.

4. Pitted thrust plates indicate cavitation or oil aeration.

5. Discolored thrust plates indicate overheating, possibly from insufficient oil.

Bearings

1. If gears are replaced, bearings must be replaced. Bearings should fit into the bore with a light press fit. A neat hand fit is allowable. If bearings can fall out, bore may be oversize.

Seals And Gaskets

1. Replace all rubber and polymer seals whenever disassembling pump. Include all "O" rings, pocket seals, shaft seals, and gasket seals.

Plug

1. Make sure the high pressure side of the shaft end cover is plugged with an Allen plug.

Assembly

NOTE: Air blast all parts and wipe dry with lint free cloth before assembly.

Shaft End Cover

1. If the double lip seal was removed, install a new seal:

   a. coat outside of seal and its recess with purple Loctite Seal Retainer.

   b. With the metal side up, press the seal into the shaft end cover. Wipe off excess Loctite. Be sure seal is firmly seated in recess.

2. If the two roller bearings were removed, install new bearings:

   a. Install a new ring seal behind the bearing for the drive shaft. The slot must face the bearings.

POWER STEERING ACTUATOR, VALVE AND CYLINDER

HOW IT WORKS

(Refer to Figure G-7)

The Hydraulic Power Steering is a combination of the standard worm and gear type mechanical unit and a hydraulic cylinder connected to the steering drop arm to reduce the steering effort.

The combined power steering cylinder and valve unit used on Case 4 Wheel Drive Unit Loaders consists primarily of three parts:

The Actuator

The Actuator consists of an outer sleeve and extension tube, an inner sliding sleeve and a ball stud. When the steering wheel is turned in either direction, it moves the steering drop arm which is linked to the ball stud mounted inside the inner sliding sleeve. When the steering wheel is turned, the combination of the drop arm, drag link and the ball stud moves the inner sliding sleeve either forward or rearward. The sliding sleeve in turn moves the control valve spool.

The Control Valve

The Control Valve consists of the valve body, valve spool, reaction limiting plunger and the check valve assembly. When the control valve spool is activated, the lands and grooves on the control valve spool either open or close ports and passages, directing fluid to the cylinder as well as redirecting fluid back to the reservoir. The reaction limiting plunger helps to maintain a constant turning effort. If the engine stops for any reason a check ball incorporated in the control valve unseats and the fluid in the power cylinder is then free to flow back to the reservoir. In this way the Loader can be steered manually without a lock up of fluid in the power steering cylinder. Whenever the engine is running, the check ball is seated.

The Power Cylinder

The Power Steering Cylinder contains the piston, piston rod, rings and packing. The force of pressurized oil directed by the control valve spool, is exerted on the piston either extending or retracting the cylinder.

REMOVAL OF THE ACTUATOR - VALVE AND CYLINDER

(Refer to Inset - Figure G-12)

A. Disconnect the pressure and return lines at the control valve.

NOTE Cap the lines and the ports in the control valve immediately to prevent the entry of dirt or foreign material into the steering system.

B. Disconnect the actuator ball stud from the control link.

C. Remove the nut from the cylinder tie rod end and disconnect the tie rod from the chassis.

D. Remove the nut from the actuator tie rod end and disconnect the tie rod from the intermediate steering lever. The steering cylinder can now be removed from the Loader.

DISASSEMBLY OF THE ACTUATOR - VALVE AND CYLINDER

(Refer to Figure G-12)

A. Remove the three bolts attaching the outer sleeve to the valve housing and cylinder.

B. Disconnect the outer sleeve and valve housing from the cylinder and remove the lock nut from the spool bolt.

C. Remove the valve housing to flange plate.

D. Remove the dust shield and grease fitting.

E. Slide the ball stud forward as far as possible in the outer sleeve and remove the stop screw lock pin.

F. Turn the stop screw out from the inner sleeve.

G. Remove the stop screw, spring stop, ball stud spring and valve spool bolt from the inner sleeve.

H. Remove the inner sleeve, ball stud seats and ball stud.

CAUTION

SPECIAL CARE MUST BE TAKEN TO PROTECT THE SPOOL EDGES AND THE BORE OF THE CONTROL VALVE HOUSING FROM DAMAGE DURING DISASSEMBLY.

I. Before removing the valve spool, remove the bushing and seal from either end of the spool - then remove the valve spool. WHEN INSTALLING THE VALVE SPOOL INSTALL IT IN THE SAME POSITION IT WAS REMOVED.

J. If the flared tube seats in the valve are damaged, scored or cracked, remove them by using an "easy out." Turn the "easy out" into the seat and pull the seat out using a pliers.

K. Remove the check valve plug by pushing it out with a Allen Head Wrench.

L. Unscrew the check valve from the control valve body.

M. To remove the reaction limiting plunger, use a needle nose plier to remove the plug on the cylinder side of the control valve. The spring, washer and plunger can be removed. The plug, washer and spring on the actuator side of the valve can then be removed.

N. Clean the seal cavity at the piston rod end of the cylinder with solvent and compressed air.

O. Remove the snap ring which retains the oil seals.

P. Remove the seal components by inserting an air hose in the fluid port of the cylinder and plugging the remaining port.

CAUTION

DO NOT ALLOW ANYONE TO STAND IN FRONT OF THE PISTON ROD. EXTREME AIR PRESSURE IS BUILT UP AND WILL PUSH THE SEALS FORWARD WITH EXTREME FORCE.

TL SERIES STEERING GEAR BOX

Introduction

The steering gear is a cam and twin lever sliding stud type. Both studs of the twin lever engage the cam for normal straight ahead steering. As the steering wheel is turned either to the right or left, one of the studs is disengaged from the cam. The effective leverage of the single stud greatly increases as the turn becomes sharper. As the Loader operator turns the steering wheel, the gear ratio changes from one ratio to another to suit the requirements of steering stability at high speeds and easy wheel turn in tight operations.

How It Works

The steering gear consists of two main parts:

THE CAM --- THE LEVER SHAFT

The cam is an integral part of the steering shaft. The steering wheel is splined to the steering shaft - thus the steering wheel and cam operate as a single unit.

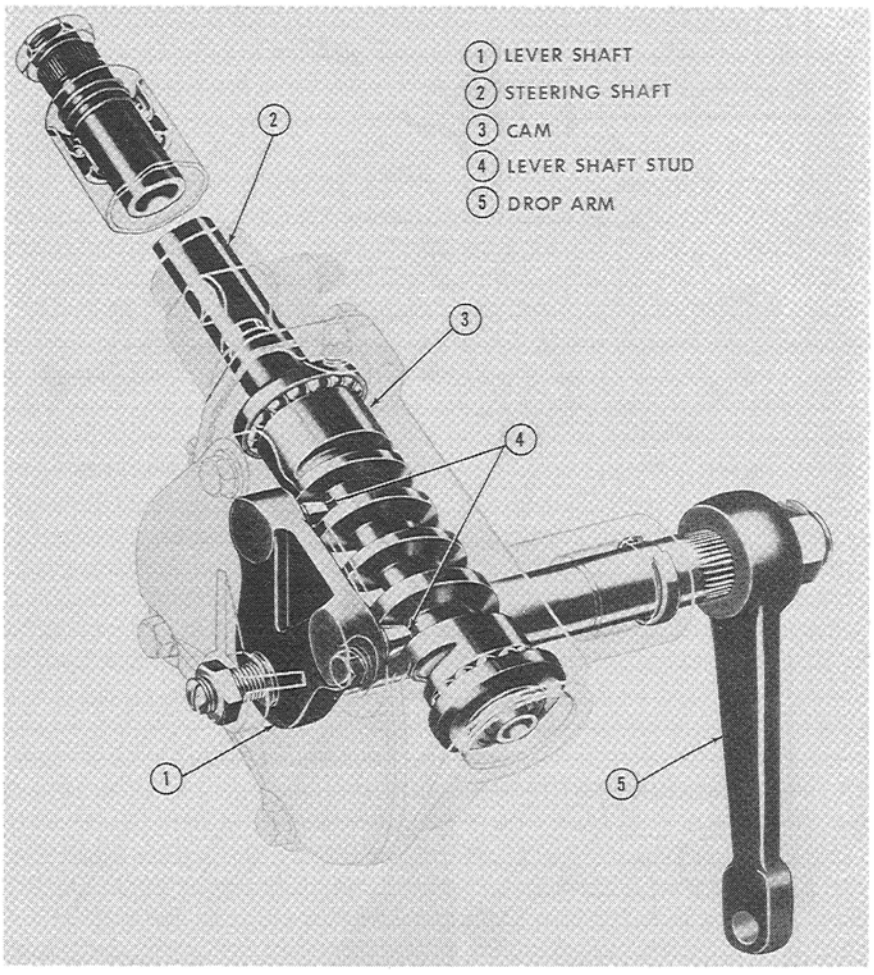


Figure G-20

The two lever shaft studs move along the groove in the cam as the steering wheel is turned. The lever shaft studs rotate the lever shaft and move the drop arm which is splined to the lever shaft. The drop arm is connected to the power steering control valve by the steering link. The amount of movement is determined by the amount of turning of the steering wheel.

BLEEDING THE POWER STEERING SYSTEM

Remove the reservoir filler cap and carefully fill the reservoir with clean Automatic Transmission Fluid Type A until the oil level reaches the full "F" mark on the filler cap dipstick, Figure G-26.

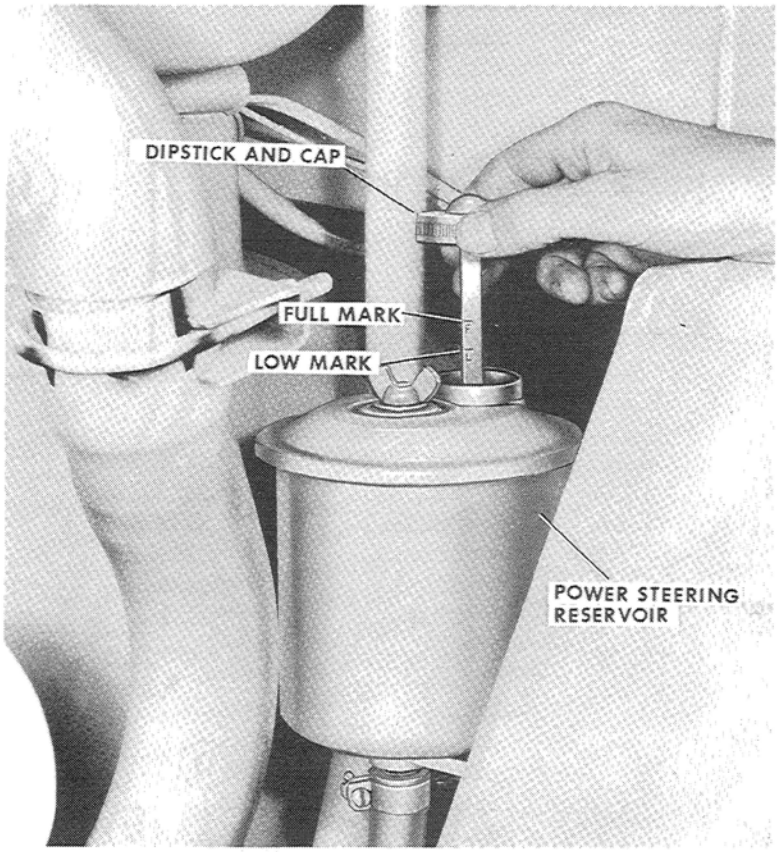


Figure G-26

Replace the reservoir filler cap and start the engine. Turn the steering wheel through several turns. Then stop the engine and refill the reservoir until the oil level reaches the full "F" mark on the filler cap dipstick, Figure G-26. Overfilling the reservoir will cause the oil to surge out of the breather hole in the cap.

Do this until the fluid level ceases to drop after turning the steering wheel. The system is then completely filled and bled of air.

NOTE

The first few times you turn the steering wheel, do not make full turns. Make full turns only after a sufficient amount of fluid is added to the system. When making a full turn, do not hold the wheels against the stops. This can result in damaging the pump relief valve from excessive pressure and overheating in the pump.

IMPORTANT

While bleeding air from the system, operate engine at low idle (approximately 750 RPM).

POWER STEERING PUMP
RELIEF VALVE PRESSURE CHECK

(Refer to Figure PP-6)

The pressure relief valve in the VTM vane type power steering pump has a 1000 PSI opening pressure. The valve is replaceable. It is not adjustable.

To check if the relief valve is functioning properly:

1. Remove the 1/8" pipe plug from the pump cover.

IMPORTANT

On some models, disconnect the pressure hose from the pressure tube. Install a D-26337 Test Tee between the pump pressure hose and the pressure tube.
NOTE: The D-26337 Test Tee can be ordered through the J. I. Case Central Parts Division, Racine, Wisconsin.

2. Install the 4501AA or A22791 Pressure Gauge in the pump cover or the test tee in the pressure line.

NOTE The 4501AA or A22791 Pressure gauge can be used on All Case Unit Loaders and purchased from the J. I. Case, Central Parts Division, Racine, Wisconsin.

3. Start the Loader engine and run at approximately 1500 RPM.

4. Place the Loader parallel with a solid wall so when the steering wheel is turned, the tires must come in contact with the wall before contact is made with the drop arm steering stops.

5. Observe the pressure gauge reading. The pressure gauge should read 950 to 1050 PSI with the engine running at 1500 RPM. This pressure gauge reading must be observed carefully. When the relief valve opens the pressure will drop off sharply.

IMPORTANT

As the pressure drops off, do not continue to hold the tire against the wall, as it may cause damage to the power steering pump relief valve.

6. If the pressure gauge registers below 950 or above 1050 PSI, the relief valve must be replaced. Refer to Page PP-12.

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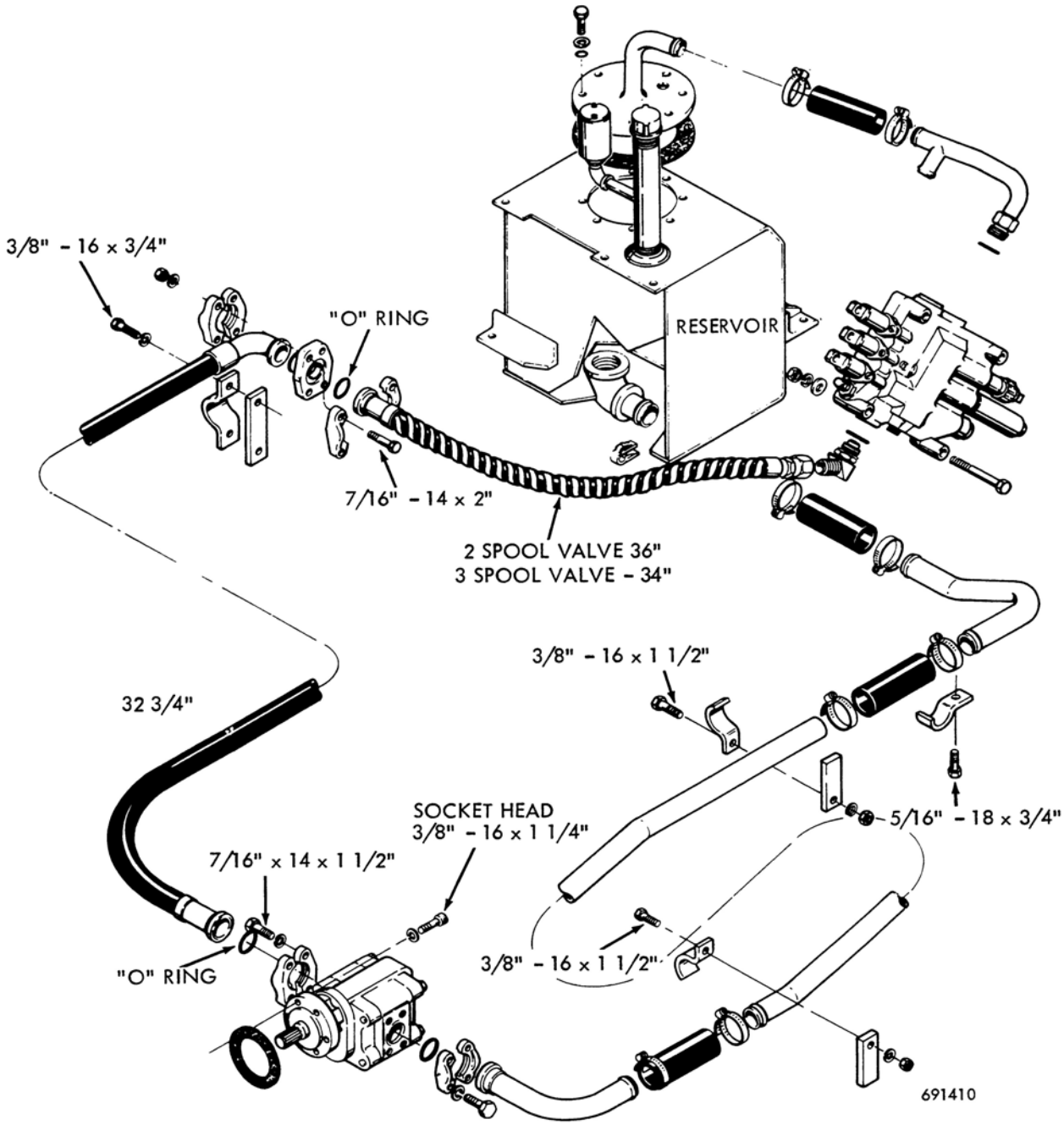

Figure 9 - Pump Suction and Pressure Line Hydraulics

FUEL

Diesel Fuel

Recommended Fuel

Case diesel engines are designed to operate most efficiently with No. 2 diesel fuel. Most well known refiners and distributors market a good grade of diesel fuel and there should be no difficulty in obtaining it.

Do not confuse No. 2 diesel fuel with No. 2 furnace oil which is similar but does not always meet specifications for diesel engines.

CAUTION: No. 1 diesel fuel is not recommended for normal operating conditions. This is a lighter fuel which can result in loss of engine power, increased fuel consumption, and lessened injection pump life.

Fuel Specifications

There can be considerable variation in diesel fuels marketed as No. 2. The American Society for Testing Materials (ASTM) has established a widely recognized specification, ASTM Designation D975, which is used in the United States, Canada, and many other areas of the world. Any fuel purchased for use in a Case engine should meet this ASTM specification.

However, there is no world-wide standardization of diesel fuels and ASTM specifications are not used everywhere. Following are the most important specifications of an acceptable diesel fuel:

Pour point, maximum	10° F. below lowest atmospheric temperature at which engine must start and operate.
Cetane number, minimum	40 (45-55 for winter or high altitudes).
Sulphur, by weight, maximum	.50 of 1%
Water and sediment, by volume, maximum	.05 of 1%
Ash, by weight, maximum	.01 of 1%
Carbon residue on 10%, maximum	.20 of 1%
Distillation, 90% point	540° - 625°
End point	675°
Flash point, minimum	125° or legal
Viscosity, centistokes at 100° F.	2.0 - 4.3
Saybolt Universal Seconds at 100° F.	32 - 40
Corrosion, copper strip, 3 hours at 212° F.	No. 3 ASTM
API gravity, minimum	30

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