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MODEL:

## 310 Loader Backhoe

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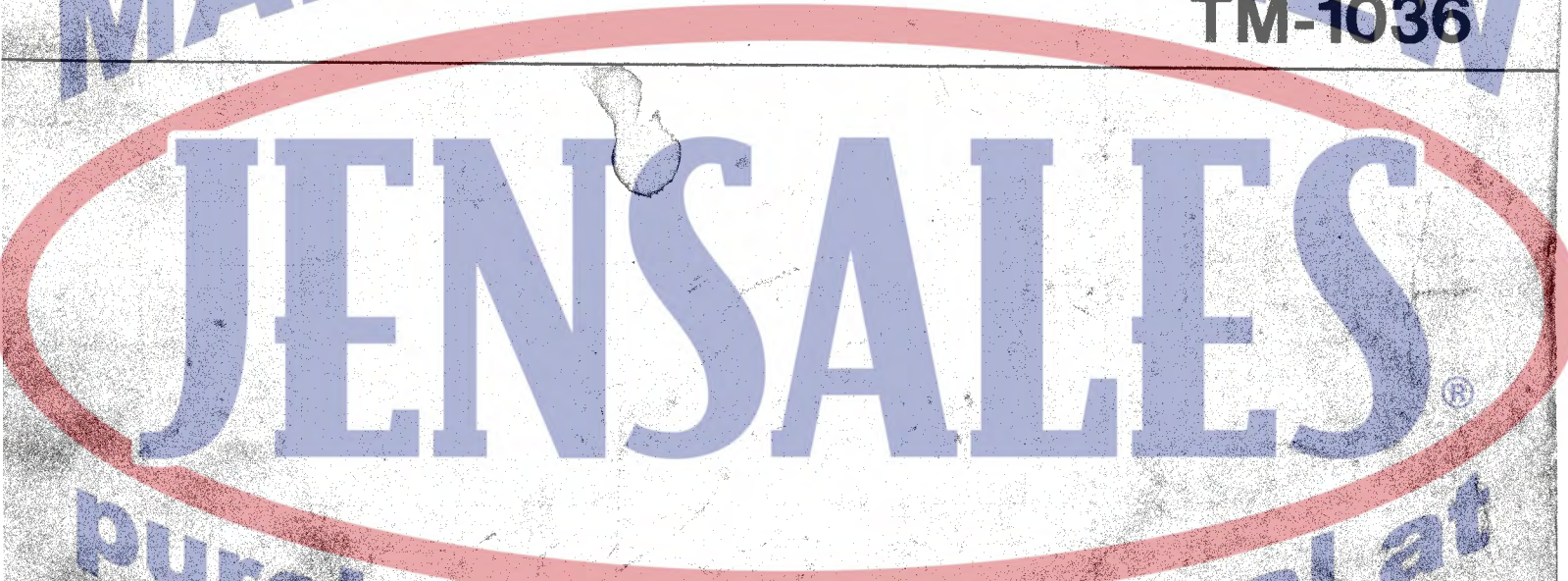
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# JD310 LOADER BACKHOE

Technical Manual  
TM-1036-(Apr-73)

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**GENERAL**

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**Group 5<sup>®</sup>**  
**GENERAL MACHINE SPECIFICATIONS**

**Engine**

	Gasoline	Diesel
Flywheel Horsepower (net) (observed at 2500 rpm)	50	50
Number of Cylinders	3	3
Bore and Stroke	4.02 x 4.33	4.02 x 4.33
Displacement	164	164
Compression Ratio	7.5 to 1*	16.2 to 1
Firing Order	1-2-3	1-2-3
Engine Speeds		
Slow Idle	600 rpm	800 rpm
Fast Idle	2650 rpm	2650 rpm
Governed Speed Range (rpm)	600-2650 rpm	800-2650 rpm
Valve Clearance		
Intake	0.014 in.	0.014 in.
Exhaust	0.022 in.	0.018 in.

**Electrical System**

Voltage	12
Battery Ground	Negative
Battery Specific Gravity	1.260

\* 8.6:1 High-Altitude Pistons

Litho in U.S.A.

**Capacities**

Fuel Tank	19-1/2 gals.
Cooling System	12 qts.
Engine Crankcase (with filter)	7 qts.
Transmission-Hydrau- lic Reservoir	20-1/2 gals.

**Clutch**

Single-stage, spring-loaded,  
dry-disk, foot-operated.

**Transmission**

Collar-shift with hydraulic reverser containing hy-  
draulic wet clutches provide 8 speeds forward and  
4 rearward.

**Differentials and Final Drives**

Planetary-reduction final drives with spiral bevel  
gear drive differential.

Differential lock: foot-operated mechanical lock,  
spring-loaded out of engagement.

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**Group 15**

**TUNE-UP**

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**GENERAL INFORMATION**

Before tuning up a machine, determine whether a tune-up will restore operating efficiency. When there is doubt, the following preliminary tests will help to

determine if the engine can be tuned up. If the condition is satisfactory, proceed with the tune-up. Choose from the following procedures only those necessary to restore the unit.

**PRELIMINARY ENGINE TESTING**

Operation	Specification	Section-Group Reference
Dynamometer Test (at 2500 engine rpm)	Compare with previous recorded output; compare with output after tune-up	FOS 30
Compression Test		
Diesel	300 psi (min)*	FOS 30 ENGINES
Gasoline	120 psi (min)*	20-30
Manifold Depression Test (gasoline)	15 to 20 inches of mercury (fast idle)	FOS 30 ENGINES, 20-30
Engine Coolant Check Test	No air bubbles or oil film in radiator	FOS 30 ENGINES

**ENGINE TUNE-UP**

<b>Air Intake System</b>		
Service air cleaner and check system for leaks.		FOS 30 ENGINES
Check restriction indicator operation.		
Diesel	22 to 27 inches at 2500 rpm (full load)	FOS 30 ENGINES
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Check muffler and exhaust pipe for restrictions.		FOS 30 ENGINES
<b>Crankcase Ventilating System</b>		
Check system for restrictions.		FOS 30 ENGINES
<b>Cooling System</b>		
Clean grille screen, radiator core, and oil cooler core.		20-25
Clean and flush system; check thermostat.		20-25
	Starts to Open	Fully Open
180°	177°F.-184°F.	202°F.
205° (diesel)	201°F.-207°F.	213°F.
Check pressure cap.	6.25 to 7.50 psi	20-30

\* The difference between cylinders should be no more than 30 psi on gasoline engines and 50 psi on diesel engines.

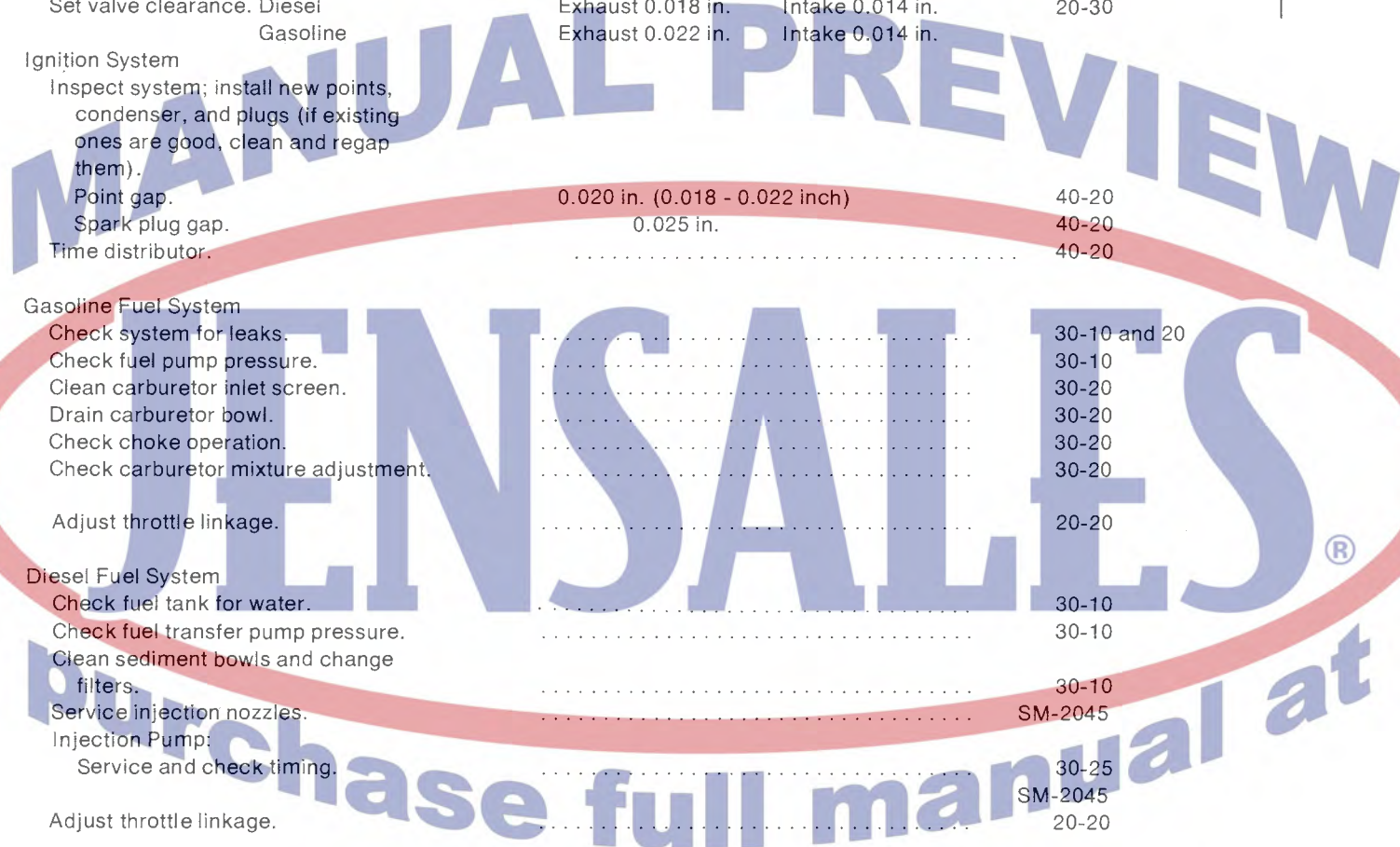
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**ENGINE TUNE-UP—Continued**

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Operation	Specification	Section-Group Reference
<b>Cylinder Head and Valves</b>		
Tighten cylinder head cap screws.	110 ft-lbs in sequence	20-30
Set valve clearance. Diesel	Exhaust 0.018 in. Intake 0.014 in.	20-30
Gasoline	Exhaust 0.022 in. Intake 0.014 in.	
<b>Ignition System</b>		
Inspect system; install new points, condenser, and plugs (if existing ones are good, clean and regap them).		
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		SM-2045
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Check battery water consumption and electrolyte level.		FOS 20 ELECTRICAL SYSTEMS
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**ENGINE TUNE-UP—Continued**

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**FINAL ENGINE TEST**

Carburetor mixture	Use exhaust gas analyzer and dynamometer.	FOS 30 Engines
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**UNIT TUNE-UP**

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## Section 20

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## Pump Gears

Measure width of gears (early units - 1.4163 to 1.4183 inch - later units 1.6203 to 1.6223 inch).

Install gears in housing in running position and measure radial clearance (0.0030-inch to 0.0060-inch) between gear teeth and body. Excessive clearance can be corrected only by replacement of worn parts.

Place a straightedge across top of housing (to represent cover) and measure clearance (0.0012 inch to 0.0062 inch) between gears and straightedge.

## Oil Pressure Regulating Valve

Remove oil pressure regulating plug, shims, spring, and valve. Save all shims for correct reassembly.

Inspect regulating valve seat in front of cylinder block for damage (especially at raised rim of bushing).



Fig. 4-Installing Pressure Regulating Valve Bushing

Press new bushing into block using JD248 tool. Press in bushing until outer recessed edge of bushing is flush with bottom of counterbore in block. Do not press on raised inner rim of bushing. This rim is the regulating valve seat.

Check oil pressure regulating spring. Free length is 4.68 inches and test length is 1.63 inches at  $15 \pm 1.5$  lbs. pressure.

Check pressure regulating valve plug threads for damage.

## Oil Filter

Unscrew filter element from engine and discard it. Inspect oil passages at mounting point on cylinder block (early diesel and all gasoline engines) or oil cooler base (later diesel engines) for obstructions. If filter base nipple in block is damaged refer to Section 20, Group 10 for replacement details. If filter base nipple in oil cooler is damaged, repair or replace as necessary.

## ASSEMBLY

Press idler shaft (11) into pump housing until flush with outer surface of housing.

Place gear and shaft in housing. Install pump idler gear on idler shaft in housing. Check to see that both gears rotate freely in housing.

Install new O-ring (13) in oil outlet opening in oil pump cover.

## INSTALLATION

### Oil Pump

Place pump housing with gears and drive shaft in position in engine. Install drive gear on shaft. Tighten hex. nut to 35 to 45 ft-lbs and then stake nut to shaft.

Position oil pump cover and screen up against pump housing. Install pump outlet oil tube in cover. Fasten cover in place with four cap screws and lock washers. Tighten to 35 ft-lbs.

Place valve and spring in valve hole in engine timing gear cover. With an aluminum washer on valve plug and same number of shims in plug counterbore as removed, install plug in timing gear cover. This is a preliminary setting to be used until oil pressure can be checked.

### Oil Filter

Install new filter element. Turn element down until sealing ring just contacts mounting pad; then turn down an additional 1-1/2 turns.

Check for leaks around filter element. Retighten if necessary, but do not overtighten.

**Section 30**

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		FUEL INJECTION NOZZLES
		(See SM-2045, "Testing and Servicing Fuel Injection Pumps and Nozzles.")

**Group<sup>®</sup> 5**

**DIAGNOSIS**

**DIAGNOSING FUEL SYSTEM MALFUNCTIONS**

The following is a guide for diagnosing fuel system difficulties. For specific diagnosis of fuel system components, refer to the groups which cover complete servicing.

**Engine Hard to Start or Will Not Start**

- No fuel.
- Old gasoline in tank.
- Fuel shut off valves closed.
- Screen in fuel tank shut-off valve dirty.
  - Clean screen.
- No gasoline in carburetor.
  - Clean fuel line and carburetor.
- Air leak on suction side of fuel system.
  - Look for leaks at all connections.
- Improper type of fuel.
  - See operator's manual for correct fuel.
- Water, dirt, or air in fuel system (diesel).
  - Drain, flush, and refill. Bleed system (diesel).
- Water in gasoline.
  - Drain gasoline and clean spark plugs.

- Clogged fuel filter (diesel).
  - Replace first-stage filter element and bleed system.
- Dirty or faulty injectors (diesel).
  - Service injectors.
- Cranking speed too slow.
  - Check starting circuit to increase cranking speed.
- Incorrect timing.
  - See Group 25.
- Fuel pump primer lever left on upward end of stroke.
  - Move lever to lowest point of stroke.

**Engine Knocks**

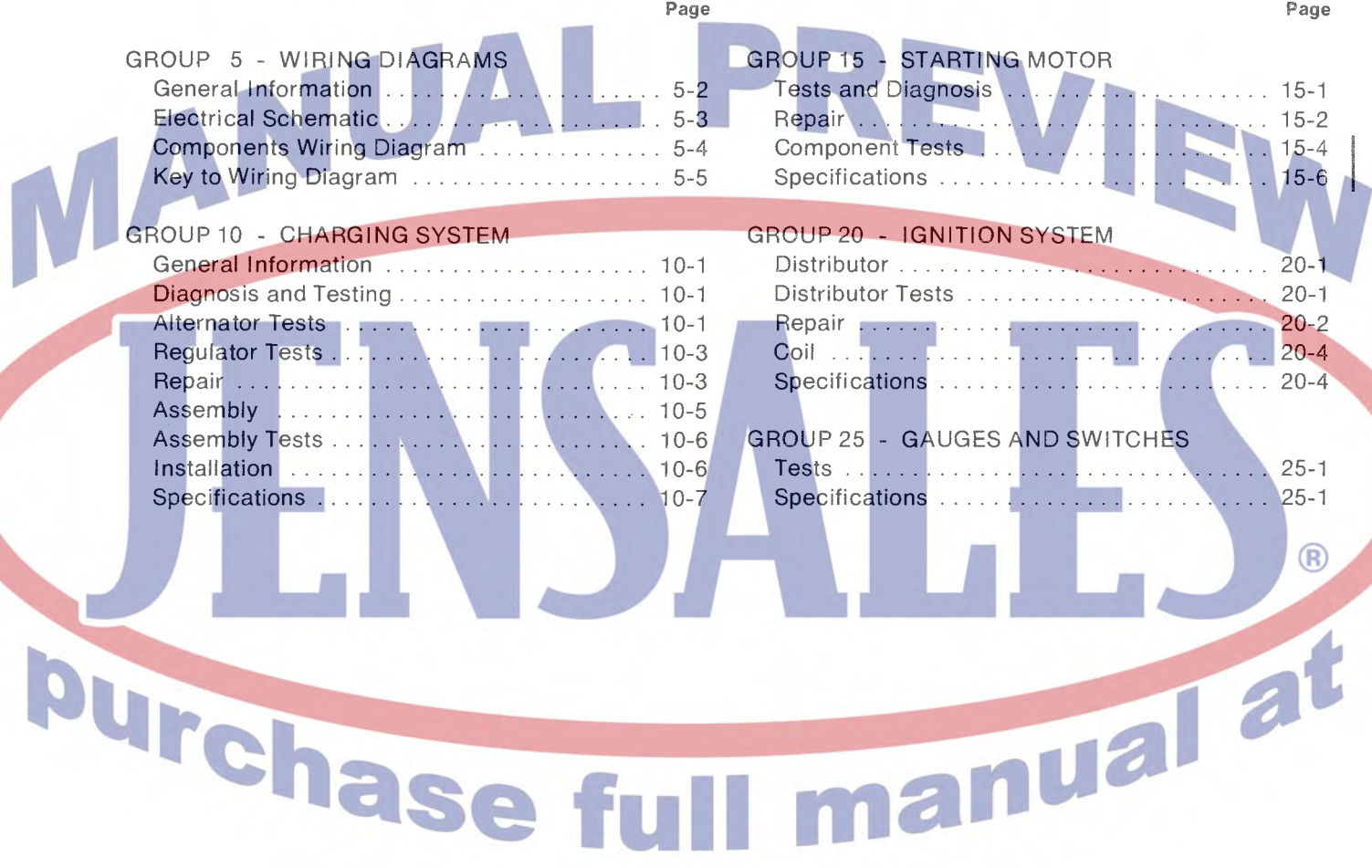
- Dirt in air intake system.
  - Clean filter.
- Injection pump or distributor out of time.
- Low octane gasoline.

## Section 40

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# POWER TRAIN

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## Section 60

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## Group 5 HYDRAULIC BRAKES

### GENERAL INFORMATION

The main closed-center constant pressure hydraulic system provides oil to the brakes.

For circuit diagrams on how the brake circuit fits into the main hydraulic system, refer to Section 70.



For additional basic hydraulic brake information refer to FOS Manual - HYDRAULICS.

The hydraulic brake assembly is activated by two brake pedals, allowing individual or simultaneous operation of the hydraulic brake pressure plates lo-

calated in annular cylinders in each final drive housing.

Braking is fully hydraulic with no mechanical connection between the valve and pressure plate.

The brake valve reservoir is filled with oil by the transmission oil pump via the transmission lubrication circuit (See Section 70).

As long as there is oil in the brake valve reservoir, hydraulic braking is possible with the engine either running or stopped.

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**REMOVAL**

1. Disconnect battery. Use a puller to remove steering wheel. Loosen dash panel and turn sideways so that cowl cover slips up over dash. Remove cowl cover and steering shaft support.

2. Disconnect inlet pressure line and drain oil at plug on right side of clutch housing.

3. Remove steering gear shaft and yoke cover and locate steering shaft pin and retainer plate (inset, Fig. 2). Remove retainer plate cap screw and plate. Screw a 3/8-inch cap screw in steering shaft pin and pull pin from steering shaft yoke.

4. Turn steering wheel from stop to stop to remove oil in the steering cylinder. Have container at drain plug.

5. Disconnect drag link from steering shaft arm and take out button plug on left side of clutch housing (Fig. 2).

6. Remove steering shaft arm retaining cap screw and washer. Support steering shaft arm and pull steering and yoke shaft from right side of clutch housing. Remove steering shaft arm.



1—Arm Attaching Cap Screw  
 2—Steering Shaft Arm  
 3—Drag Link

Fig. 2-Removing Steering Assembly

**REPAIR**



T22163

- 1—Snap Rings
- 2—Special Washers
- 3—Thrust Washers
- 4—Upper Valve Body Assembly with Spacer and Shims
- 5—Lower Valve Body Assembly with Spacer and Shims
- 6—Thrust Washers

- 7—Shims
- 8—Needle Thrust Bearing
- 9—Upper Operating Sleeve
- 10—Special Washers
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- 12—Thrust Bearing

Fig. 3-Power Steering Valve

**Section 70**

**HYDRAULIC SYSTEM**

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**Group 5**

**GENERAL INFORMATION, TESTING AND DIAGNOSIS**

**GENERAL INFORMATION**

**CAUTION:** Escaping fluid under pressure can have sufficient force to penetrate the skin causing serious personal injury. Before disconnecting lines, be sure to relieve all pressure. Before applying pressure to the system, be sure all connections are tight and that lines and hoses are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than the hands, to search for suspected leaks.

For general information and repair on the hydraulic brakes and power steering components refer to Section 60.



See FOS Manual "HYDRAULICS" for additional description and theory of operation for hydraulic components.

The hydraulic system is a closed-center, constant pressure type system (Fig. 1).

It hydraulically operates the steering, loader and backhoe. System oil is contained in the transmission case which serves as the reservoir.

# Section 80

# MISCELLANEOUS

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### Group 5

## FRONT AXLE AND FRONT SUPPORT FRONT AXLE

### GENERAL INFORMATION

The heavy-duty swept-back front axle mounts on the front end support. Swept-back axles give a shorter turning radius for sharper turns in close quarters.

Remove cotter pin, slotted hex. nut, washers, shim pack, and special cap screw from axle assembly. Slide axle assembly toward the rear until clear of support pivot pins.

### REPAIR

### Disassembly and Assembly

#### Removal

Refer to Fig. 1 during disassembly and assembly of the front axle.

Place transmission in park position and attach hoist to tractor front end support.

Inspect all parts for wear or damage and repair or replace as necessary.

Remove drag link from steering bell crank and steering shaft arm.

Refer to "Assembly Notes" (see "Specifications") when installing front axle pivot pin and all axle bushings. Install rear pivot pin bushing with grease holes lined up.

**CAUTION:** Place a floor jack under the axle assembly during removal.

Install thrust bearing onto spindle shaft with numbered side of bearing away from knuckle.



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