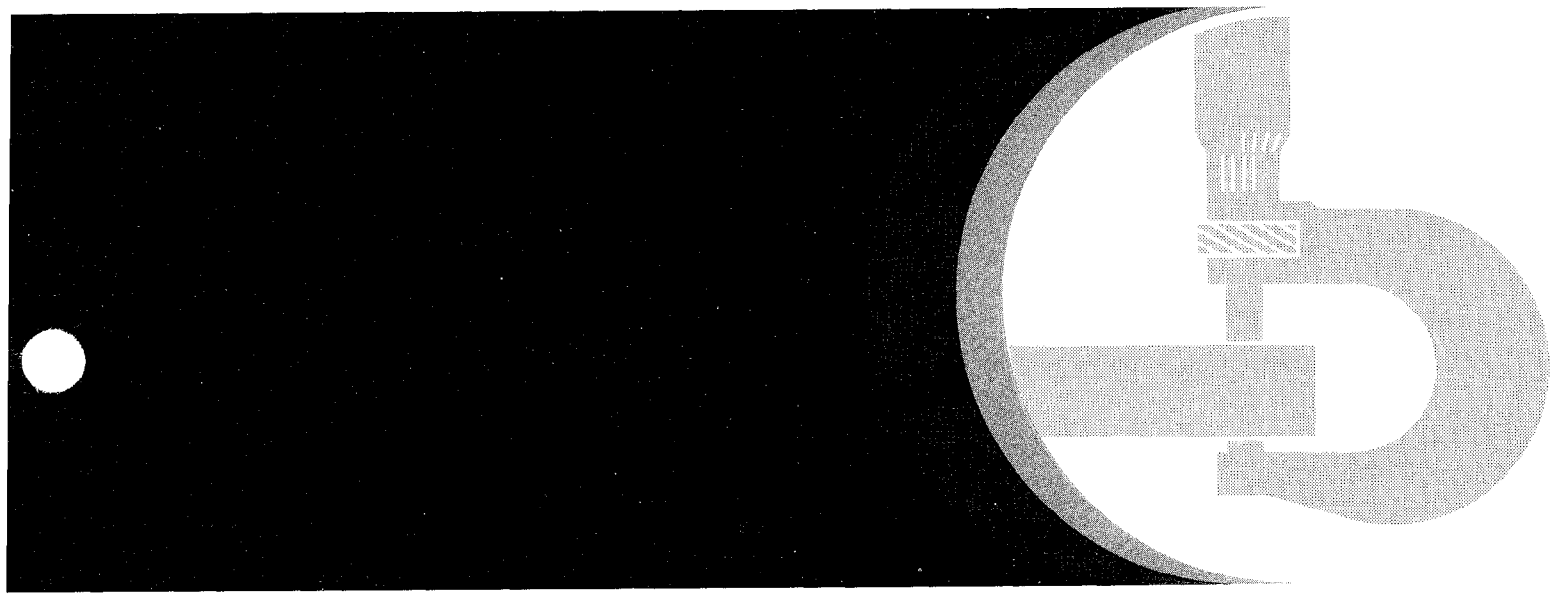
John Deere JD302-A Loader and Backhoe Loader



TECHNICAL MANUAL

John Deere Dubuque Works
TM-1090
LITHO IN U.S.A.

Section 10
GENERAL

CONTENTS OF THIS SECTION

Group 5
GENERAL MACHINE SPECIFICATIONS

(Specifications and design subject to change without notice. Wherever applicable specifications are in accordance with ICED and SAE Standards. Except where otherwise noted, these specifications are based on a unit equipped with 14.9-24, 6 ply rating, R4 rear tires; 11L-15, 8 ply rating, F-3 front tires; 3/4 cu. yd. (0.57 m³) utility bucket, and standard equipment.)

Power (@ 2500 engine rpm):	**SAE**	**DIN**
Gross	52 hp (38.8 kW*)	
Net	50 hp (37.3 kW)	53.2 PS

Net engine flywheel power is for an engine equipped with fan, air cleaner, water pump, lubricating oil pump, fuel pump, alternator, and muffler. Gross engine power is without fan. Flywheel power ratings are under SAE standard conditions of 500 ft. altitude and 85°F. temperature and DIN 70 020 standard conditions of 760 mm Hg barometer (sea level) and 20°C. temperature.

*In the International System of Units (SI), power is expressed in kilowatts (kW).

Engine: John Deere 3-cylinder diesel, valve-in-head, 4-stroke cycle

Bore and stroke	4.02x4.33 in. (102x110 mm)
Piston displacement	164 cu. in. (2 687 cm³)
Compression ratio	16.2 to 1
Maximum torque @ 1,300 rpm	129 lb-ft (175 Nm) (17.8 kg-m)
NACC or AMA (U.S. Tax) horsepower	19.4
Main bearings	4
Lubrication	Pressure system with full flow filter
Cooling	Pressurized with thermostat and fixed bypass
Fan	Suction
Air cleaner	Dry
Electrical system	12 volt with alternator
Batteries (Two 12 volt)	Reserve capacity: 220 minutes

Engine Clutch ..... Foot-operated, single 10 in. (254 mm) plate with reverser; single 11 in. (280 mm) plate without reverser

Transmission:
Constant mesh, 8 speeds forward, 8 reverse. Optional hydraulic direction reverser permits no-clutch reversing in all gears.

Gear:	**Travel Speeds**			
	mph		**km/h**	
	Fwd.	**Rev.**	**Fwd.**	**Rev.**
1	1.3	1.6	2.1	2.6
2	1.9	2.2	3.1	3.5
3	2.9	3.3	4.7	5.3
4	4.0	4.7	6.4	7.6
5	5.3	6.2	8.5	10.0
6	7.6	8.8	12.2	14.2
7	11.2	13.0	18.0	20.9
8	15.7	18.3	25.3	29.4

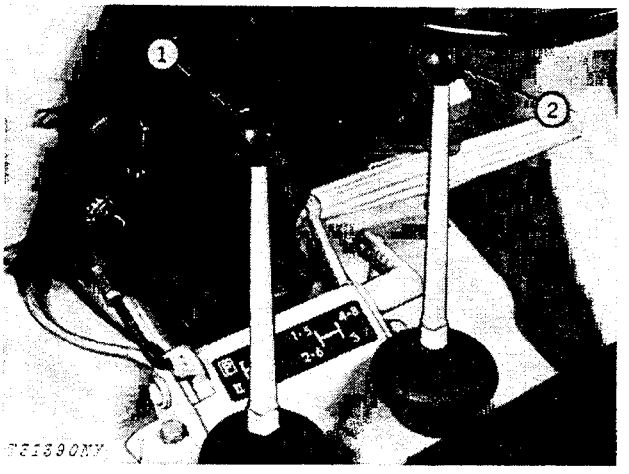
Final Drives ..... Inboard, planetary

Brakes ..... Hydraulically actuated, fully enclosed wet-disk. Self-equalizing. Foot-operated individually or simultaneously

Hydraulic System: Closed-center

Max. pressure	2350 psi (16 203 kPa) (165.2 kg/cm²)
Loader control	Single-lever
Pump	Piston, constant pressure, variable-displacement, 28 gpm (106 L/min) at 2500 engine rpm
Filter	25 micron steel-enclosed paper cartridge in return

16. Transmission Shifting



1—Range Shift Lever **2—Gear Shift Lever**

Fig. 23-Transmission

Check the operation of the unit in all ranges and gears.

Correct any malfunctions.

Transmission shifting checked *Yes* *No*

17. Brakes

Check operation of brakes.

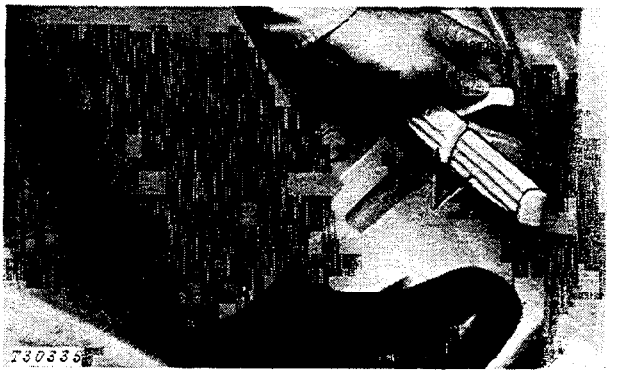


Fig. 24-Hydraulic Brakes

To stop the machine, push down both brake pedals. The machine must not pull to one side when stopping.

Turn to the left (L.H.). Push down the left (L.H.) brake pedal as you turn. Turn to the right (R.H.). Push down the right (R.H.) pedal as you turn.

The operator must feel the braking action pulling the machine to the left (L.H.) or right (R.H.). Brake action must be the same for both brakes.

Hydraulic brakes checked *Yes* *No*

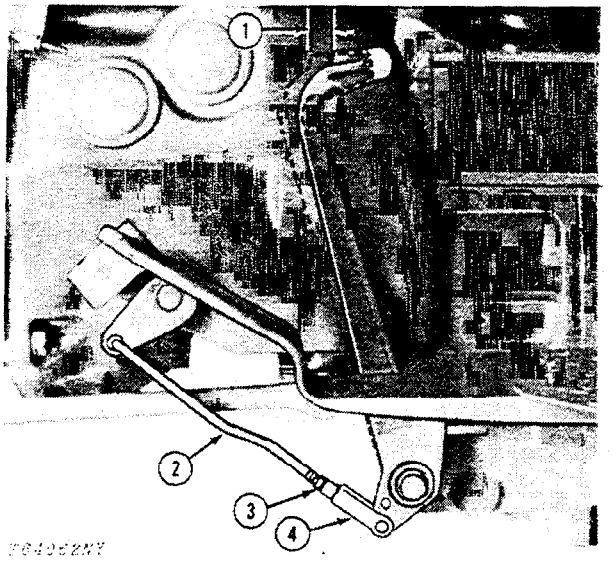
18. Clutch Pedal Free Travel

Without Reverser

Check the free travel of the clutch pedal. Free travel (1, Fig. 25) must be 1/2 in. (13 mm) to 1 in. (25 mm).

IMPORTANT: Do not operate the machine when the free travel of the clutch pedal is less than 1/2 inch (13 mm).

See page 10-10-25 for adjustment of free travel.



1—Specified Free Travel **3—Jam Nut**
2—Clutch Rod **4—Yoke**

Fig. 25-Clutch Pedal Free Travel (Without Reverser)

With Reverser

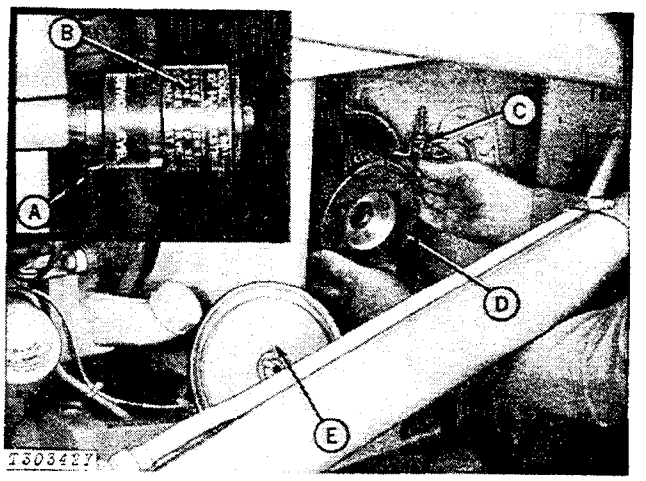
Check the free travel of the clutch pedal. Push the pedal down to the bottom of the first stage detent. In this position the throwout bearing will be against the clutch fingers. The top right (R.H.) edge of the rear of the pad of the clutch pedal must be 5-1/4 in. (133 mm) to 5-3/4 in. (146 mm) from the front of the bolting flange of the clutch housing. See 1, Fig. 26.

If free travel is more than 5-3/4 in. (146 mm), see page 10-10-25 for adjustment.

Run engine two to three minutes to fill oil circuits. Check oil level with machine on level ground, engine running at slow idle, rockshaft and any equipment lowered, reverser lever (if equipped) locked in neutral, parking brake engaged (if equipped), range shift lever in park, and clutch engaged. Remove dipstick and wipe oil off. Insert dipstick with cap resting on threads of tube (not screwed in place). If oil level is down to bottom mark on dipstick, add oil. Remove filler cap on rockshaft housing and add oil specified on page 10-15-1 to bring oil level to top mark on dipstick.

Filter element changed *Yes* *No*
Oil level checked *Yes* *No*
Oil added ____ *qts. (L)*

4. Air Cleaner



A—Restriction Indicator
B—Red Signal
C—Wing Nut
D—Element
E—Cover

Fig. 50-Air Cleaner

Check air filter restriction indicator (A). If red signal can be fully seen, remove element (D) and clean. Replace element if necessary.

Element OK *Yes* *No*

5. Radiator

Check engine coolant level.

⚠ CAUTION: Do not remove radiator filler cap unless the engine is cool. Then loosen the cap slowly to the stop to release pressure before removing the cap.

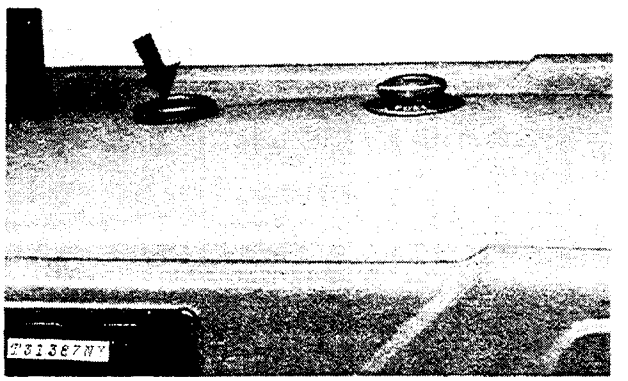


Fig. 51-Radiator Filler Cap

Maintain coolant level midway between the radiator core and the filler neck. If needed add clean soft water for warm weather or a solution of 50% clean water and 50% ethylene glycol (permanent type antifreeze with approved rust inhibitor) for cold weather. Tighten the filler cap.

Check cooling system for loose connections and leaks.

Coolant level checked *Yes* *No*

6. Batteries

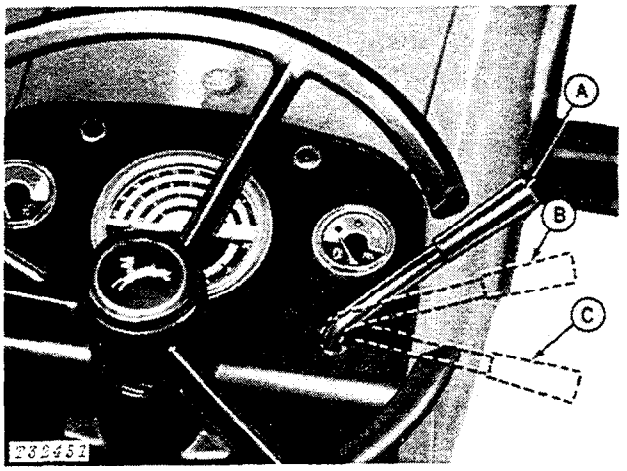
Check battery electrolyte level. If distilled water is not available, use clean soft water. Avoid use of hard water. Remove foreign material from top of battery and coat terminals with petroleum jelly. Check vent holes in battery caps.

IMPORTANT: Never add water to battery in freezing weather unless engine will be run 2 or 3 hours.

Batteries checked *Yes* *No*

24. Hand Throttle

Check operation of hand throttle.



A—Slow Idle
B—PTO Speed
C—Fast Idle

Fig. 83-Hand Throttle

Hand throttle checked *Yes* *No*

25. Lights

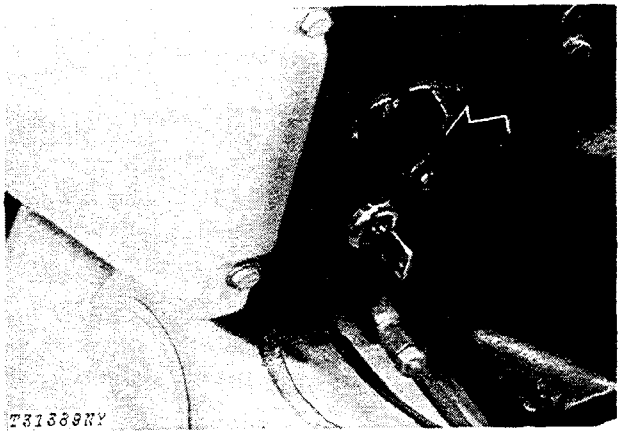


Fig. 84-Light Switch

Position	Headlights	Warning Lamps	Rear Combination Light
OFF	Off	Off	Off
W		On	
F	Dim		White
H	Bright	On	Red
H2	Dim	On	Red

NOTE: If customer desires, wire the lights to turn on when the key switch is off. Remove the purple wire from the "BAT" terminal. Install the unused red wire coming off the circuit breaker. Tape the end of the purple wire.

All lights checked *Yes* *No*

26. Parking Brake

Check the operation of the parking brake.

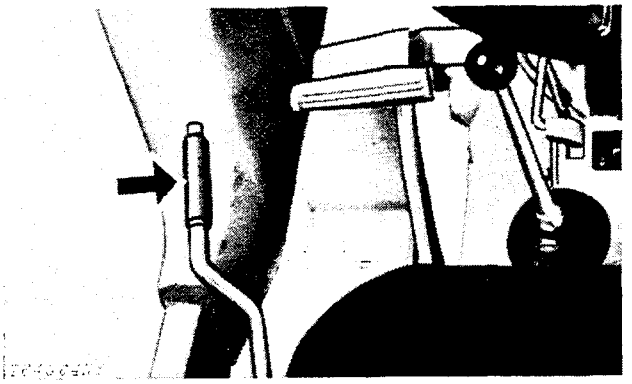


Fig. 85-Parking Brake

1. To engage, pull up.
2. To disengage, press button and push lever down.

Group 5
ENGINE REMOVAL AND INSTALLATION
REMOVAL

Most service procedures on the engine can be accomplished with the engine in the tractor. If the crankshaft is to be removed or in the event of a general overhaul, remove the engine.

Remove the front end support with radiator, fuel tank and main hydraulic pump as instructed in Section 60, Group 5.

Disconnect battery ground straps for safety.

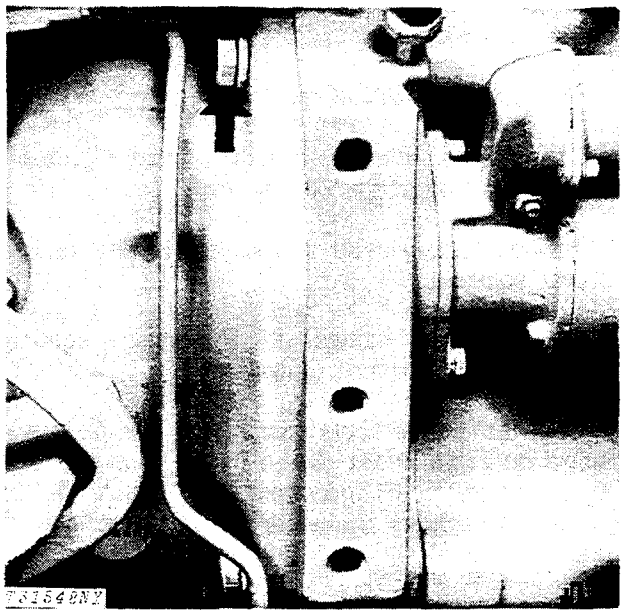


Fig. 1-Engine Attaching Points, Right Side

Disconnect front wiring harness from alternator lead. Also disconnect fuel gauge sender lead.

Remove battery cable and wiring harness from starter solenoid.

Disconnect wiring harness at oil pressure sending unit and at ignition coil (gasoline).

Disconnect and remove tachometer cable from right rear of engine. Remove rubber gasket from tachometer cable (gasket may remain in clutch housing). Replace gasket if damaged.

On diesel engines, disconnect starting fluid line from air intake manifold.

Disconnect pressure line from connection on power steering valve.

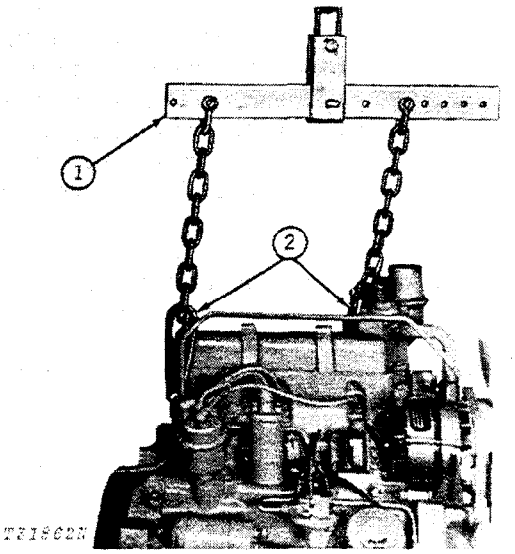
Free hydraulic reservoir bleed line from clamps at top of rocker arm cover.

Disconnect throttle rod from carburetor (gasoline) or fuel injection pump (diesel). Also disconnect choke cable from carburetor on gasoline engines.

Remove water temperature sending unit from water outlet manifold.

Remove battery from cowl. Remove cap screws securing front of cowl to flywheel housing.

Disconnect rear exhaust muffler from manifold (if equipped).



1—JDG-1 or JDG-23 Engine Lifting Sling
2—JD-244 Lifting Adapter (or JDG-19 Lifting Bracket)

Fig. 2-Removing Engine

CYLINDER BLOCK, LINERS, PISTONS, AND RODS

REMOVAL

Remove the pistons and connecting rods noting the following:

1. Engine normally need not be removed from unit to service pistons, connecting rods, and cylinder liners. If engine has to be removed, see Group 5 of this section.
2. Do not rotate crankshaft with cylinder head removed unless all cylinder liners are bolted down. Bolt down cylinder liners before removing pistons.
3. Keep rod bearing inserts with their respective rods and caps to assure correct reassembly.
4. Each connecting rod and piston must be reinstalled in the cylinder bore from which it was removed. Observe the word "FRONT" stamped on the head of all pistons and in the rib of the diesel connecting rods. These must face toward the fan end of the engine at the time of reassembly. *Observe the "pip" marks on both the connecting rod and cap of a gasoline engine. These "pip" marks must both face towards the camshaft side of the engine at the time of assembly.*

IMPORTANT: Installing or removing connecting rod and main bearing cap screws using pneumatic wrenches may cause thread damage.

REPAIR

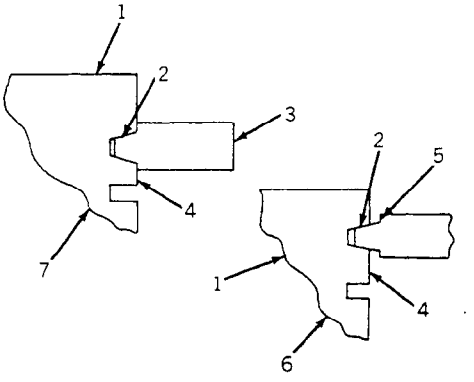
Inspect all parts and compare with "Specifications". Refer to "Basic Engine" in FOS Manual - ENGINES - for additional repair information.

Use a strong household detergent to remove all dirt and carbon from pistons. Clean carbon from piston ring grooves. Wash all parts thoroughly in cleaning solvent.

Inspect and measure piston pin, pin bore in piston, and connecting rod bushing for wear or damage. Excessive wear can cause scored pistons or broken connecting rods. Specifications are as follows:

Item	New Part	Wear Tolerance
O.D. of Pin	1.3748 to 1.3752 in. [34.920 to 34.930 mm]	0.005 in. [0.0127 mm]
I.D. of Bore	1.3753 to 1.3757 in. [34.9362 to 34.9428 mm]	0.0010 in. [0.0254 mm]
I.D. of Bushing	1.376 to 1.377 in. [34.950 to 34.976 mm]	0.0020 in. [0.0508 mm]

Use keystone ring groove wear gauge (JDE-62) as shown in Fig. 11 to measure wear to the top piston ring groove. If gauge shoulder touches ring land, the top groove is excessively worn and the piston should be replaced.



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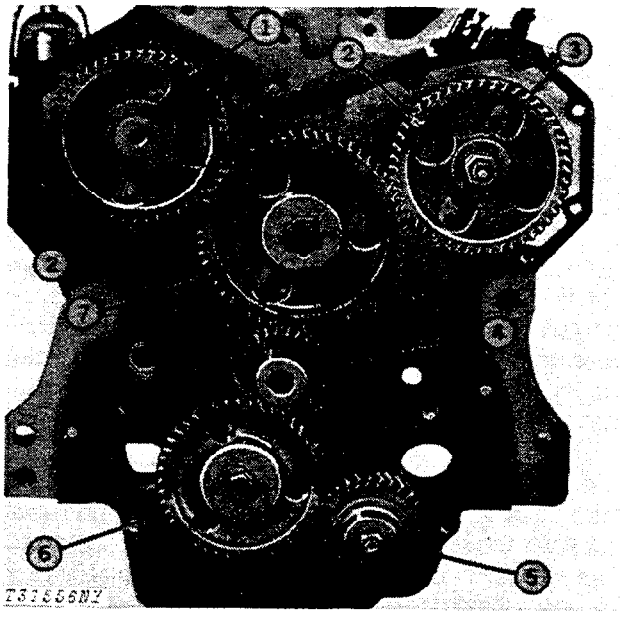
1—Piston
2—Keystone Ring Groove
3—Wear Gauge
4—Ring Land
5—Gauge Shoulder
6—Good Ring Groove
7—Worn Ring Groove

Fig. 11-Using Ring Groove Wear Gauge

Check the other two grooves for wear by inserting a new ring in the proper groove at several points around the piston. Measure clearance with a feeler gauge. If the clearance exceeds 0.008 inch [0.203 mm], replace the piston.

Check clearance between piston and cylinder liner bore to determine if replacement is necessary. Measure clearance with a feeler gauge at the bottom of piston skirt 90° to pin bore. To establish taper and out-of-round, check liner 1 inch [25.4 mm] from bottom and 1 inch [25.4 mm] from top, lengthwise and crosswise. Wear limits are as follows:

Specifications	Measurement
Liner Taper (max.)	0.0020 in. [0.0508 mm]
Liner Out-of-Round (max.)	0.0020 in. [0.05080 mm]
Clearance Between Liner and Piston at Bottom of Skirt (max.)	0.0080 in. [0.20 mm]



1—Camshaft Gear
2—Timing Mark
3—Injection Pump Gear (Diesel)
4—Crankshaft Gear
5—Oil Pump Gear
6—Lower Idler Gear
7—Upper Idler Gear

Fig. 25-Engine Timing Gear Train

REPAIR

For gear inspection and repair, refer to the section and group in the manual which covers the assemblies which the gears drive. The camshaft and crankshaft must be removed from the engine to replace their gears.

Checking Gear Train Backlash

Gear train noise can be an indication of excessive gear lash or damaged teeth. Check backlash before removing gears. Specified timing gear train backlash is as follows:

Gear	Backlash
Crankshaft to upper idler	0.0027 to 0.0116 in. [0.0686 to 0.2946]
Upper idler to camshaft	0.0028 to 0.0135 in. [0.0711 to 0.3429 mm]
Upper idler to injection pump	0.0028 to 0.0135 in. [0.0711 to 0.3429 mm]
Crankshaft to lower idler	0.0027 to 0.0137 in. [0.0686 to 0.3480 mm]
Lower idler to oil pump	0.0016 to 0.0147 in. [0.0432 to 0.3734 mm]
Upper idler to governor	0.0023 to 0.0127 in. [0.0584 to 0.3226 mm]
Camshaft to distributor	0.0005 to 0.0075 in. [0.0127 to 0.1905 mm]

Replace gears as necessary.

Idler Gears

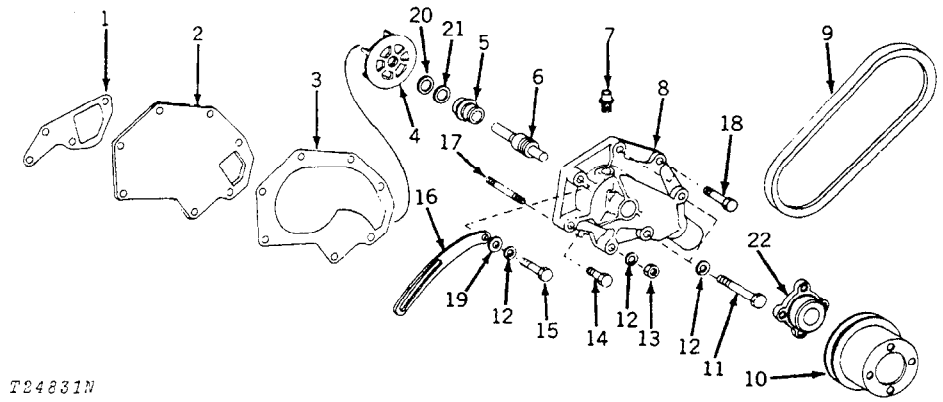
Be sure that oil hole in upper idler gear is open.

Check both idler gears for excessive end play. New part end play should be 0.0010 to 0.0070 inch [0.0254 to 0.1778 mm]. A maximum 0.0150 inch [0.381 mm] end play is acceptable.

Measure I.D. of bushing and O.D. of shaft to determine oil clearance of 0.0015 to 0.0035 inch [0.0381 to 0.0889 mm]. A maximum 0.0061 inch [0.1524 mm] clearance is acceptable. New bushing I.D. is 1.7520 to 1.7530 inches [44.5008 to 44.5262 mm]. New shaft O.D. is 1.7495 to 1.7505 inches [44.4374 to 44.4627 mm].

If excessive wear or oil clearance is indicated, use JD-252 Bushing Driver to install new bushing flush with either side of gear.

If idler gear shaft replacement is necessary, press in new spring pins to 0.20 to 0.28 inch (5.08 to 7.112 mm) above shaft.



1—Gasket	**7—Nipple**	**13—Nut**	**18—Cap Screw**
2—Cover	**8—Housing**	**14—Cap Screw**	**19—Washer**
3—Gasket	**9—Fan Belt**	**15—Cap Screw**	**20—Cup**
4—Impeller	**10—Fan Pulley**	**16—Belt Adjusting Strap**	**21—Insert**
5—Seal	**11—Cap Screw (2 used)**	**17—Stud**	**22—Fan Hub**
6—Bearing	**12—Lock Washer (2 used)**		

Fig. 3-Water Pump and Related Parts

Support water pump housing and allow sufficient clearance for impeller at center of support. Use a JD262-A water pump bearing driver or any tubular type driver that contacts only the outer race of bearing and press bearing assembly from housing.

Support impeller and press out bearing shaft using a drift which is slightly smaller than the bearing shaft. Remove seal from bearing shaft. Note location of cup and insert in impeller.

Inspection

Any leakage at the drain hole in bottom of housing generally indicates a leaking seal.

Assembly

Install a new seal in the pump housing. Coat outside of pump seal metal retainer with joint sealing compound and wipe off any excess (spring-loaded type seal only). Apply a thin coat of light oil to sealing lip of seal before installing.

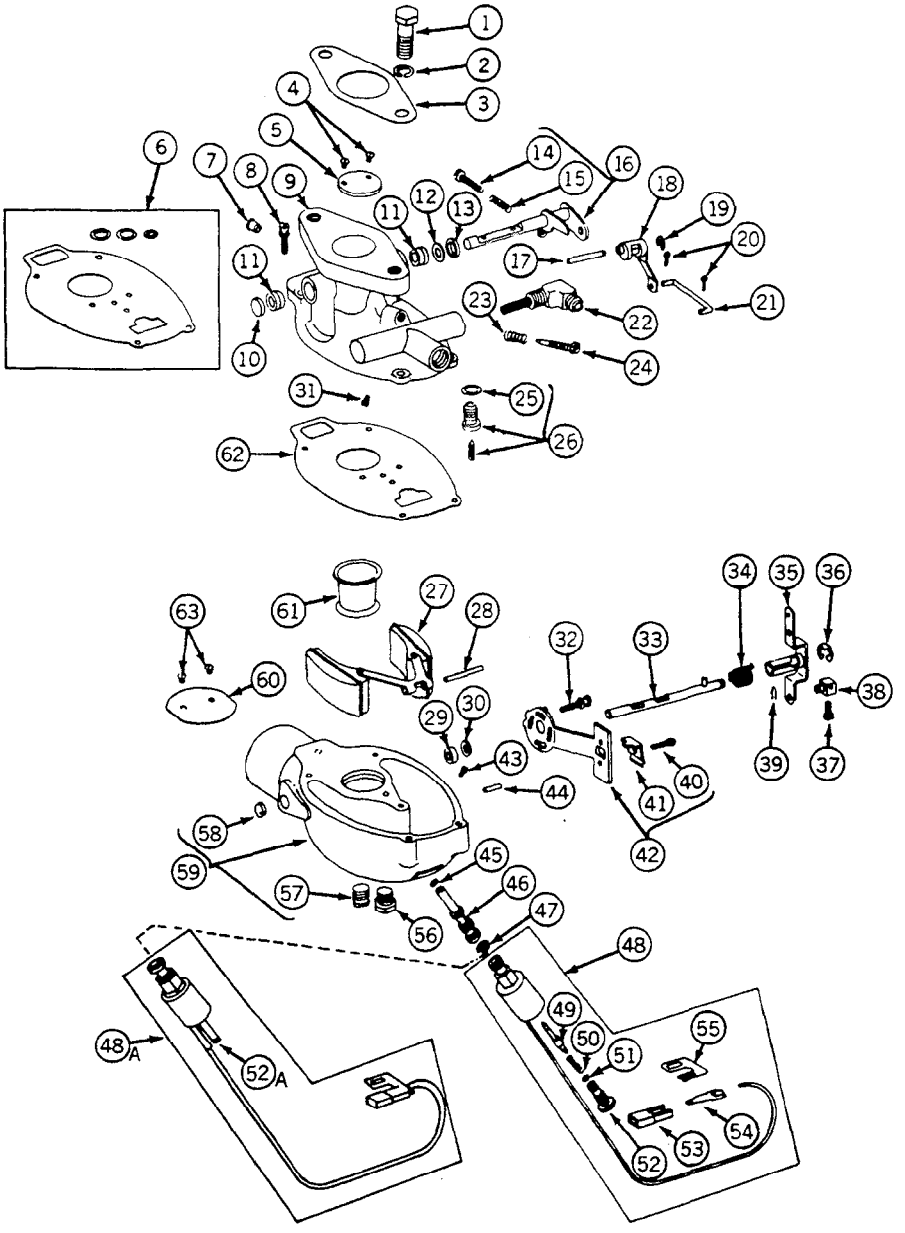
Install by hand as shown in Fig. 2. Rubber sealing surface that contacts housing should be clean and dry.

Use a tubular type driver that contacts only the outer metal portion of the seal and press new seal (metal side first) into pump housing. Press in until metal flange bottoms on housing.

Using a JD262A water pump bearing driver or any tubular type driver that contacts only the outer race of bearing, press shaft and bearing assembly into housing until outer metal case is flush with pump housing.

Install impeller insert and cup in impeller. Place insert in cup with "V" groove on insert toward cup. Be sure parts are dry and clean. Dip cup and insert in oil and install in impeller (cup to bottom of counterbore in impeller). Insert should be flat and edge of cup uniform around insert when installed in impeller.

Support pump assembly on end of bearing shaft and press impeller (fins toward housing) into position. Impeller should be pressed in until fins are flush (within 0.010 inch [0.254 mm]) with metal rim of pump housing. Check with a straightedge and feeler gauge as shown in Fig. 4.



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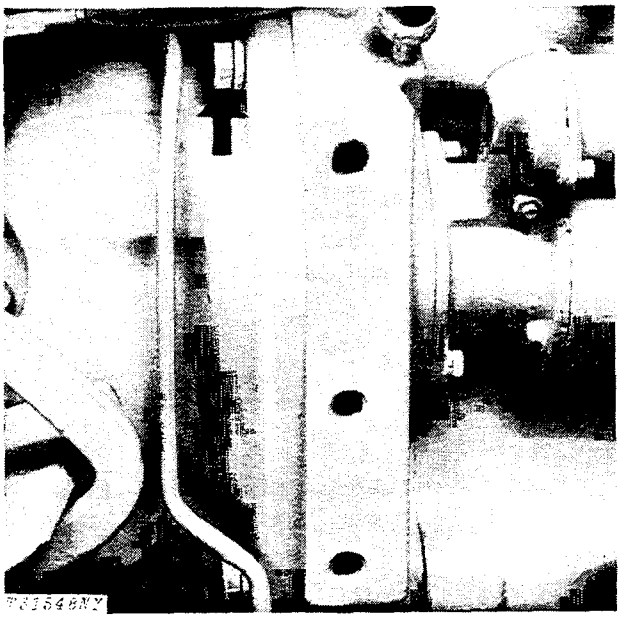
1—Cap Screw (2 used)
2—Lock Washer (2 used)
3—Gasket
4—Screw (2 used)
5—Throttle Fly
6—Gasket Set
7—Nameplate Plug
8—Screw (4 used)
9—Throttle Body
10—Throttle Shaft Cup
11—Throttle Shaft Bearing (2 used)
12—Throttle Shaft Packing
13—Retainer
14—Machine Screw
15—Spring
16—Throttle Shaft Assembly
17—Fast Idle Lever Pin
18—Fast Idle Cam Lever
19—Snap Ring
20—Cotter Pin (2 used)
21—Fast Idle Link
22—Strainer and Elbow
23—Spring
24—Idle Adjusting Needle
25 —Gasket
26 —Valve Assembly
27 —Float and Lever Assembly
28 —Float Shaft
29 —Packing
30 —Washer
31 —Idle Jet
32 —Screw (2 used)
33 —Choke Shaft Assembly
34 —Spring
35 —Choke Lever
36 —Retainer
37 —Screw
38 —Choke Swivel
39 —Snap Ring
40 —Screw
41 —Choke Bracket Clip
42 —Choke Bracket Assembly
43 —Power Jet
44 —Spring Pin
45 —Nozzle Gasket
46 —Main Nozzle
47 —Gasket
48 —Solenoid Assembly
(-xxxxxx)
48A—Solenoid Assembly
(xxxxxx-)
49 —Load Needle
50 —Spring
51 —O-Ring
52 —Load Adjusting Screw
(-xxxxxx)
52A—Load Adjusting Screw
(xxxxxx-)
53 —Male Terminal
54 —Terminal Connector
55 —Clip
56 —Drain Plug
57 —Plug
58 —Choke Shaft Plug
59 —Bowl
60 —Fly Choke
61 —Venturi
62 —Gasket
63 —Screw (2 used)

Fig. 12-Carburetor

Group 40
SPECIFICATIONS AND SPECIAL TOOLS

ENGINE REMOVAL AND INSTALLATION

SPECIFICATIONS AND TORQUE VALUES



Engine to clutch housing cap screw torque ..... 170 lb-ft (230 Nm) (24 kg-m)

Fig. 1-Engine to Clutch Housing Cap Screws

ENGINE REMOVAL AND INSTALLATION

SPECIAL TOOLS

Convenience Tools

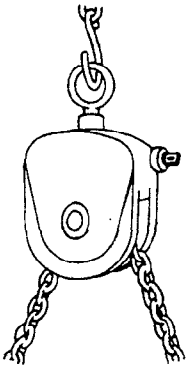
Tool	Tool Number	Use
 T47209N	D01043AA	Load Positioning Sling—To remove and install engine in unit. Comes with one set of JDG-19 Lifting Bracket.

Fig. 2-Load Positioning Sling

BASIC ENGINE

SPECIFICATIONS AND TORQUE VALUES—Continued

ENGINE BREAK-IN

NOTE: Whenever possible, use a dynamometer to provide a more accurate break-in, assuring proper initial seating of new piston rings.

Time	Load*	Engine Speed	Remarks
5 Minutes	No Load	800 rpm (Slow Idle)	Check oil
5 Minutes	No Load	1500 to 2000 rpm (1/2 Throttle)	pressure,
5 Minutes	1/4 Load	1900 to 2200 rpm	coolant
10 Minutes	1/2 Load	(3/4 Throttle)	temperature,
10 Minutes	1/2 to 3/4 Load	(use PTO stop	and leakage.
10 Minutes**	3/4 to Full Load	position if	
100 Hours+	All Loads	so equipped)	Field Only

**Loads can be simulated in the field by controlled machine operation.*

***After this run, loosen cylinder head bolts 5 to 10 degrees; then retighten bolts one at a time, in sequence, to 110 lb-ft (15.2 kg-m). Check and reset valve clearance. Loosen intake and exhaust manifold bolts (gasoline engines); then retighten to 35 lb-ft (4.8 kg-m).*

+After break-in, drain crankcase oil, and remove filter. Install new filter and fill crankcase with oil of proper viscosity and service classification.

FUEL SYSTEM

SPECIFICATIONS AND TORQUE VALUES—Continued (JDB331MD2406-AR49904)

Automatic Speed Advance
rpm
325 to 525 ..... 1°
750 to 850 ..... 5°
by 1125 ..... 8° minimum

Minimum cranking speed
delivery (75 rpm)
Volume ..... 30 cm^3/1000 strokes
Transfer pump pressure
(minimum) ..... 12 psi
(1 bar) (1 kg/cm^2)

Fuel delivery (1250 rpm)
Volume ..... 48 to 51 cm^3/1000 strokes
Maximum variation
between cylinders ..... 3 cm^3/1000 strokes

Fuel delivery (750 rpm)
Volume ..... 50 to 53 cm^3/1000 strokes
Maximum variation
between cylinders ..... 5 cm^3/1000 strokes

High idle (WOT) (1340 rpm)
Volume ..... 10 to 12 cm^3/1000 strokes
Maximum variation
between cylinders ..... 4 cm^3/1000 strokes

Governor cut-off (1365 rpm)
Volume ..... 5 cm^3 max/1000 strokes

Low idle (400 rpm)
Volume ..... 10 to 12 cm^3/1000 strokes
Maximum variation
between cylinders ..... 4 cm^3/1000 strokes

Check shut-off at (200 rpm)
Volume ..... 2 cm^3 max/1000 strokes

REMOVAL

Remove batteries as follows:

1. Open cowl door and remove left-hand cowl panel (4, Fig. 1).

2. Note carefully the location of the positive (+) terminals so that the batteries are installed in the same way.

3. Disconnect the ground cables (1) first. Use only a box end wrench to loosen clamps on terminals. Remove clamps using a screw-type puller. DO NOT hammer on the battery posts.

4. Remove the positive connector cable and positive cable (2).

5. Remove the battery clamp (3) and remove batteries.

6. Check cables for worn or frayed insulation. Replace cable clamps or bolts if corroded.

INSPECTION

Cleaning Batteries

Wipe batteries with a damp cloth. If terminals are corroded, use a stiff brush and wash with an ammonia solution or a solution of baking soda (1/4 pound added to a quart of water). Keep vent plugs tight while washing. After washing, flush battery and compartment with clear water. Then coat terminals with petroleum jelly to protect against corrosion. Be sure vent holes in vent plugs are open.

Checking Electrolyte Level

Check electrolyte level in each cell. Proper level is to bottom of filler neck. Always add distilled water if available. If not, use clean soft water. Avoid hard water.

NEVER ADD ACID TO THE BATTERY unless electrolyte is lost by spilling.

Always wait until after checking specific gravity before you add water to the battery. This will assure a true reading. If level is too low to check specific gravity, add water, operate engine for a few minutes to let water and electrolyte mix, then check.

In freezing weather, never add water to the battery unless it will be operated immediately to allow proper mixing of water with electrolyte.

TESTING

Testing the battery will tell you whether the battery is usable, requires recharging or should be replaced. Regular periodic testing provides a means of anticipating battery failure.

Specific Gravity Cell Comparison Test

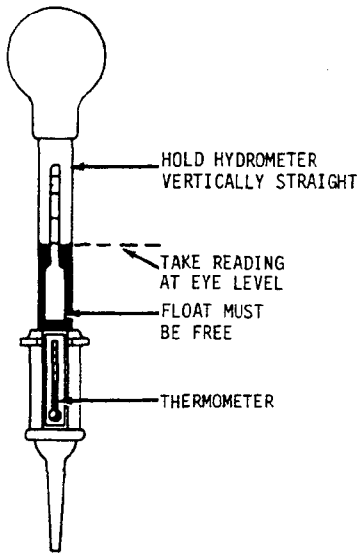


Fig. 2-Checking Specific Gravity

Check the specific gravity of each cell with an accurate hydrometer equipped with a thermometer. Hold the hydrometer vertically and take the reading at eye level.

Shorted stator coil or shorted insulating washers or sleeves on positive diode assembly would make diodes appear to be shorted.

To check the negative diode assembly, connect tester to test points 1 and 2 as shown in Figure 16. Then successively check the two remaining diodes in the same manner (to ground terminal and diode lead).

To check the positive diode assembly, connect tester to the output terminal and one of the positive diode terminals. Repeat operation for remaining two positive diodes.

Rectifier Diode Test Using a Test Lamp

Test lamp will not indicate an open condition unless ALL THREE DIODES of either assembly are open. However, a shorted diode can be detected. This test is not completely reliable, but can be used when an in-circuit diode tester is not available.

DO NOT USE A 12-VOLT TEST LAMP. USE A 12-VOLT DC TEST LAMP ONLY; otherwise diodes will be damaged.

A. Negative Diodes - Connect test lamp probes to test points 1 and 2 (Fig. 16), then reverse test probes. The test lamp should light in one direction but not in the other direction. If the test lamp lights in both directions, one or more of the rectifier diodes of the assembly being tested is shorted. If the test lamp does not light in either direction, ALL THREE DIODES IN THE ASSEMBLY ARE OPEN. Recheck diodes individually after disassembly to ascertain findings (Fig. 19).

A shorted stator coil to core would appear as a shorted negative rectifier diode assembly. Also check stator for shorts after disassembly. (See next page.)

B. Positive Diodes - Connect test probes to auxiliary terminal and to terminal of top position diode. Then reverse test probes. The same procedure and results apply as in paragraph "A" above.

Rotor Leakage (Shorts) Test

This test checks the field coil for leakage or shorts to rotor poles. An ohmmeter to test lamp (12-volt or 120-volt) may be used.

A. Remove the brush assembly.

B. Connect ohmmeter or test lamp test probes to one of the slip rings and ground terminal.

Ohmmeter resistance should be infinite (test lamp should not light). If resistance is not infinite (test lamp lights), leakage or a short exists between field coil and rotor.

Repeat test after rotor has been removed from alternator to ascertain findings. Connect test probes to one of the slip rings and to rotor shaft.

In-Circuit Stator Leakage (Shorts) Test

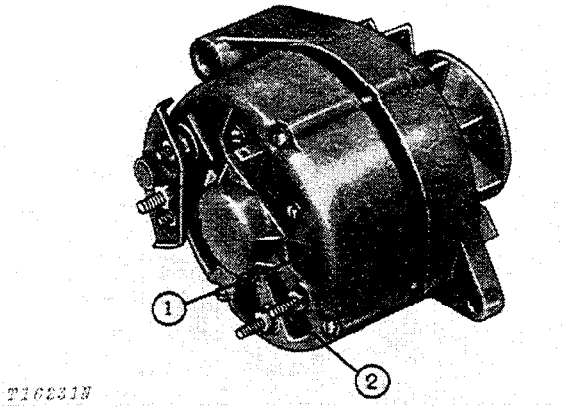
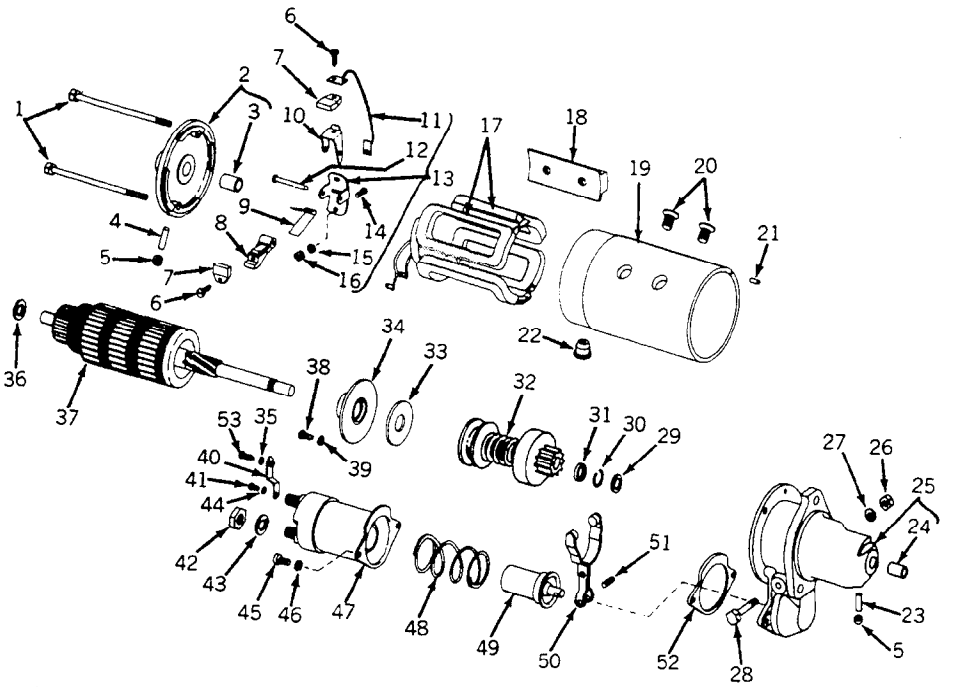


Fig. 16-In-Circuit Stator Leakage (Shorts) Test

When making the "in-circuit" stator leakage test, some consideration must be given to the rectifier diodes that are connected to the stator winding. The negative rectifier diode assembly will conduct in one direction when properly polarized. A shorted diode in the negative rectifier diode assembly would make stator appear to be shorted. For this reason, the rectifier diode plate assembly and stator must be checked individually after alternator has been disassembled if the problem is localized to the stator.



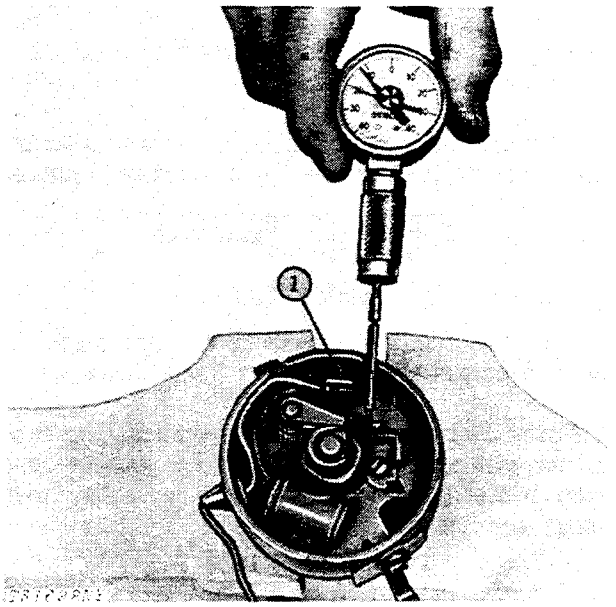
1—Through Bolt (2 used)
2—Commutator End Frame
3—Commutator Bushing
4—Commutator End Wick
5—Pipe Plug (2 used)
6—Drive Screw (4 used)
7—Brush (4 used)
8—Insulated Brush Holder (2 used)
9—Brush Spring (4 used)
10—Ground Brush Holder (2 used)
11—Lead Assembly (2 used)
12—Brush Pin (2 used)
13—Brush Support Package
14—Machine Screw (4 used)
15—Lock Washer (4 used)
16—Nut (4 used)
17—Field Coil Assembly
18—Pole Shoe (4 used)
19—Frame
20—Pole Shoe Screw (8 used)
21—Dowel Pin
22—Grommet
23—Drive End Wick
24—Drive End Bushing
25—Drive Housing
26—Jam Nut
27—Lock Washer
28—Shift Lever Screw
29—Drive End Thrust Collar
30—Retaining Ring
31—Piston Stop
32—Motor Drive
33—Brake Washer
34—Center Bearing Plate
35—Lock Washer
36—Commutator End Spacer Washer
37—Armature
38—Center Bearing Screw
39—Lock Washer
40—Connector
41—Machine Screw
42—Nut
43—Lock Washer
44—Internal Tooth Lock Washer
45—Machine Screw (2 used)
46—Lock Washer (2 used)
47—Solenoid Switch Assembly
48—Plunger Return Spring
49—Solenoid Switch Plunger
50—Shift Lever
51—Spring Pin
52—Solenoid Gasket
53—Machine Screw

Fig. 7-Starting Motor

Assembly

Install cam spacer on shaft and weight plate assembly. Fill upper housing bearing lubrication hole and lubricate bearing bore of cam and the advance weights with a cam lubricant or other suitable high-temperature grease. Install advance springs, weights, cam and cam retaining ring.

Lubricate the drive shaft with SAE 20W oil and place the outer and inner thrust washers on drive shaft. Install drive shaft in distributor housing. Place inner and outer thrust washers, spacer, and drive gear on distributor shaft. Install spring pin with one end of spring pin exposed (0.060 inch [1.52 mm] max.) to indicate position of rotor. Distributor shaft end play is 0.002 to 0.010 inch [0.05 to 0.25 mm].



1—Spring Attaching Screw

Fig. 7-Checking Breaker Spring Tension

Install breaker plate, distributor wire, condenser, and point assembly. Check point alignment. Bend only the stationary contact to align contacts. Set the contact gap to 0.020 inch [0.51 mm]. Check breaker spring tension with a scale and pull on a line perpendicular to the contact face. The tension should be 17 to 22 ounces [465.95 to 623.76 g] at the center of contact or 19 to 24 ounces [522.65 to 680.46 g] when measured beside the contact (Fig. 7). Spring may be adjusted by sliding spring in or out on the attaching screw or by bending the spring.

The contacts should be cleaned with a few drops of lighter fluid on a strip of lint-free cloth. Then pull a dry strip through points to remove residue. Observe caution when using lighter fluid. If present, oxide on the points can be removed with a cloth soaked in water.

Apply a trace of cam lubricant to the cam. DO NOT OVERLUBRICATE.

TEST AFTER ASSEMBLY

Mount distributor in syncrograph, using flexible drive connection. Connect lead to distributor terminal. Turn switch to "CAM ANGLE." With contact points closed, adjust "SET" knob until pointer is at "SET" on meter dial.

Operate distributor at 950 rpm. Cam angle should be 96 to 102 degrees. Do not set contact gap outside of limits of 0.018 to 0.022 inch [0.46 to 0.56 mm] to obtain specified cam dwell. Replace cam if difficulty is encountered.

Correct point opening can be set with a feeler gauge only when points are new or in good condition, because of the irregularity of worn points.

CHARGING SYSTEM

SPECIFICATIONS AND TORQUE VALUES—Continued

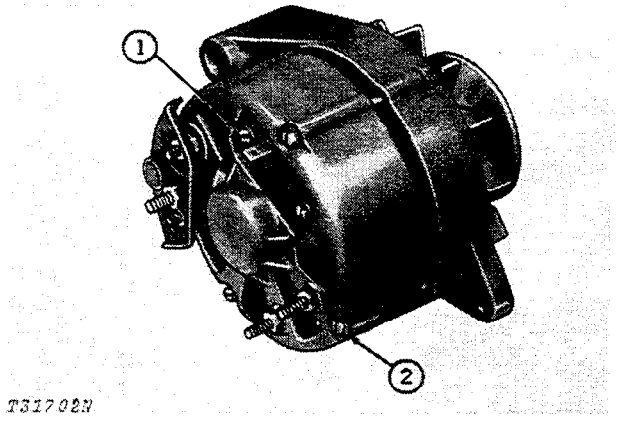


Fig. 5-Alternator Brush Screws and Through Bolts

1 - Brush screws.....20 to 30 lb-in. [0.230 to 0.346 kg-m]
2 - Through bolts.....50 to 60 lb-in. [0.576 to 0.691 kg-m]

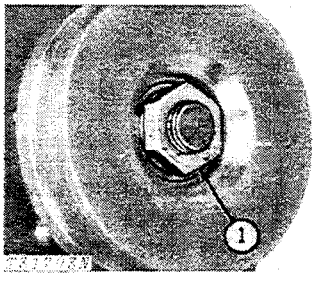
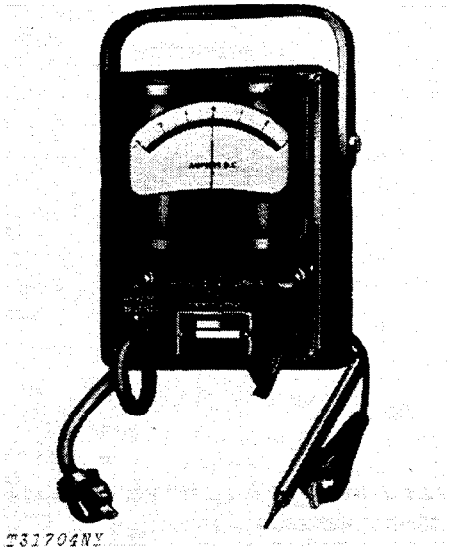


Fig. 6-Alternator Pulley Nut

1 - Pulley nut.....40 to 50 lb-in. [0.46 to 0.58 kg-m]

SPECIAL TOOLS

Essential Tools

Tool	Tool No.	Use
	- - - - -	To test diodes

T31704NX

Fig. 7-Alternator Diode Tester

IGNITION SYSTEM

SPECIAL TOOLS—Continued

Convenience Tools—Continued

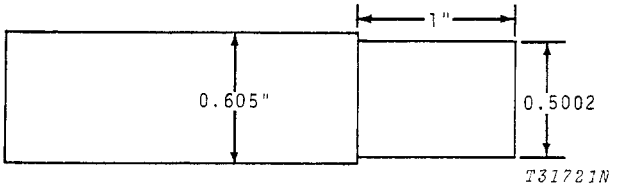
Tool	Tool No.	Use
	------	To press bushings into distributor housing.

Fig. 28-Bushing Arbor

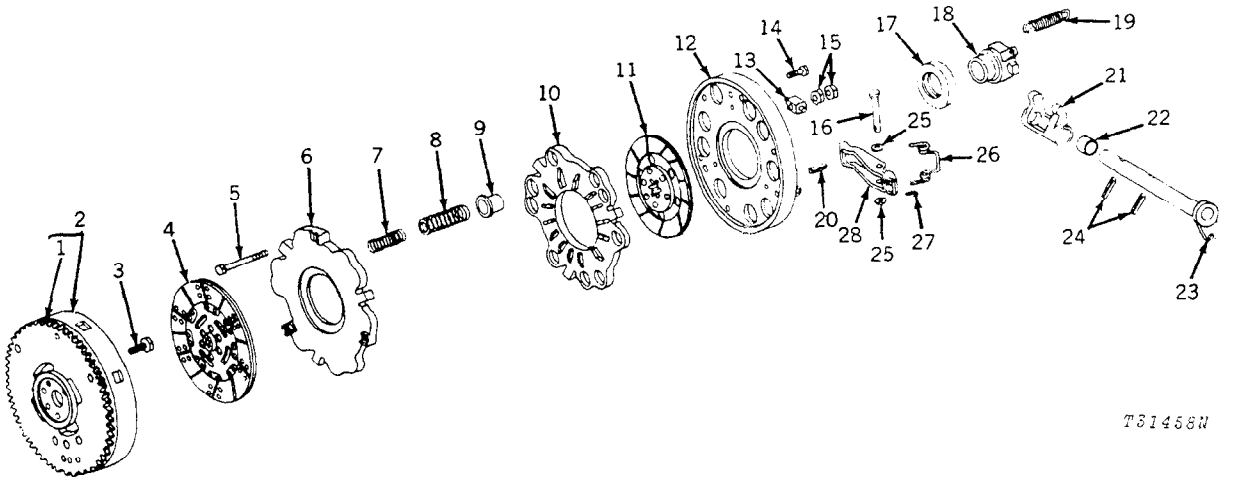
GAUGES AND SWITCHES

SPECIFICATIONS AND TORQUE VALUES

Bulbs
- Indicator lamps 1895R
- Dash lamp 1816
- Front lights 4411
- Rear combination light
  - Sealed beam 4428
  - Bulb 1003
- Warning lights 1156

Circuit breaker ..... 20 amps
- Reset time ..... 30 seconds

Engine oil pressure switch ..... closes below 5.5 to 10.5 psi (0.38 to 0.72 kg/cm²)



1—Ring Gear
2—Flywheel
3—Special Cap Screw (4 used)
4—Clutch Disk
5—Special Bolt (3 used)
6—Clutch Plate
7—Clutch Spring (6 used)
8—Outer Spring (9 used)
9—Spring Retainer (9 used)
10—PTO Clutch Plate
11—Disk
12—Clutch Cover
13—Lever Bar (3 used)
14—Cap Screw (6 used)
15—Jam Nut (6 used)
16—Headed Pin (3 used)
17—Clutch Release Bearing
18—Carrier
19—Spring
20—Special Dowel Pin (3 used)
21—Fork
22—Fork Shaft Bushing
23—Fork Shaft
24—Spring Pin (2 used)
25—Washer (6 used)
26—Spring (3 used)
27—Cotter Pin (3 used)
28—Clutch Lever (3 used)

Fig. 8-Engine and PTO Clutch and Flywheel (With Continuous-Driven PTO) (Without Reverser)

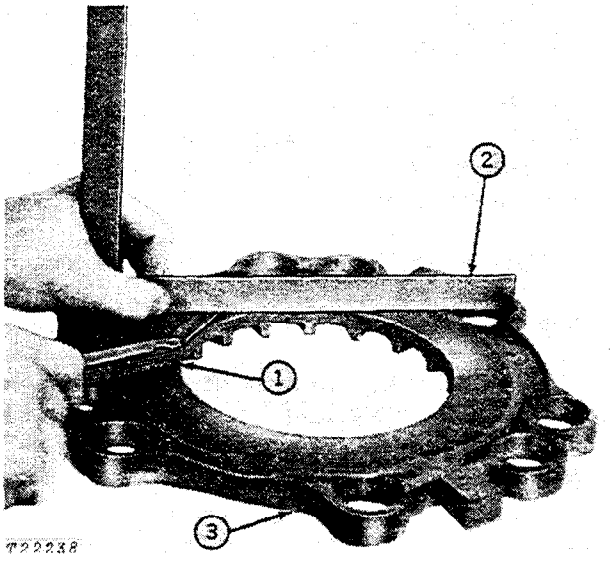
Remove clutch operating bolt jam nuts and lever bars. Loosen jack screw nuts evenly until spring pressure is released. Remove jack screws and lift off cover assembly. Lift out clutch components.

Clutch disk facings must be smooth, even and free from grease. The disk must not be warped. Check hub for cracks or loose rivets and hub splines for excessive wear.

If facing rivets are loose or if the facings are worn down to the rivets, the disk should be replaced.

Check friction driving surfaces (see Fig. 9) with a straightedge and a feeler gauge. If the surface is not true within 0.006-inch [0.1524 mm], or if groove or scores are present, the plate must be replaced.

If the PTO clutch plate has to be replaced, carefully drive the spring retainer cups out with a soft hammer. Support clutch plate area under each spring retaining cup and install cups.

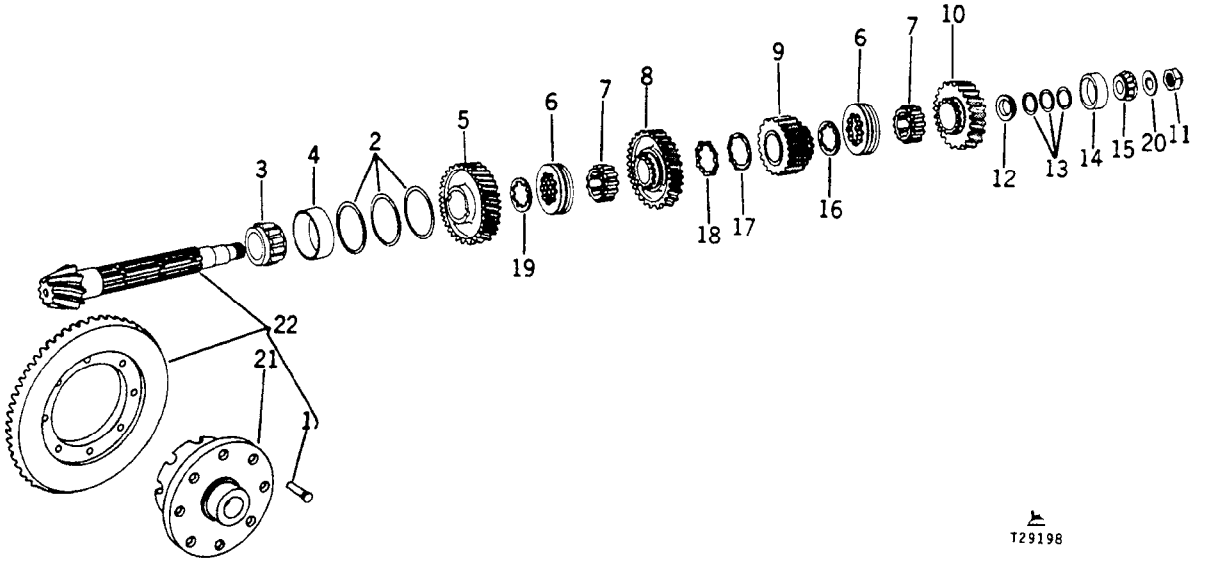


1—Feeler Gauge
2—Straightedge
3—PTO Clutch Plate

Fig. 9-Checking Friction Surface (Clutch Plate Shown)

REPAIR

Differential Drive Shaft



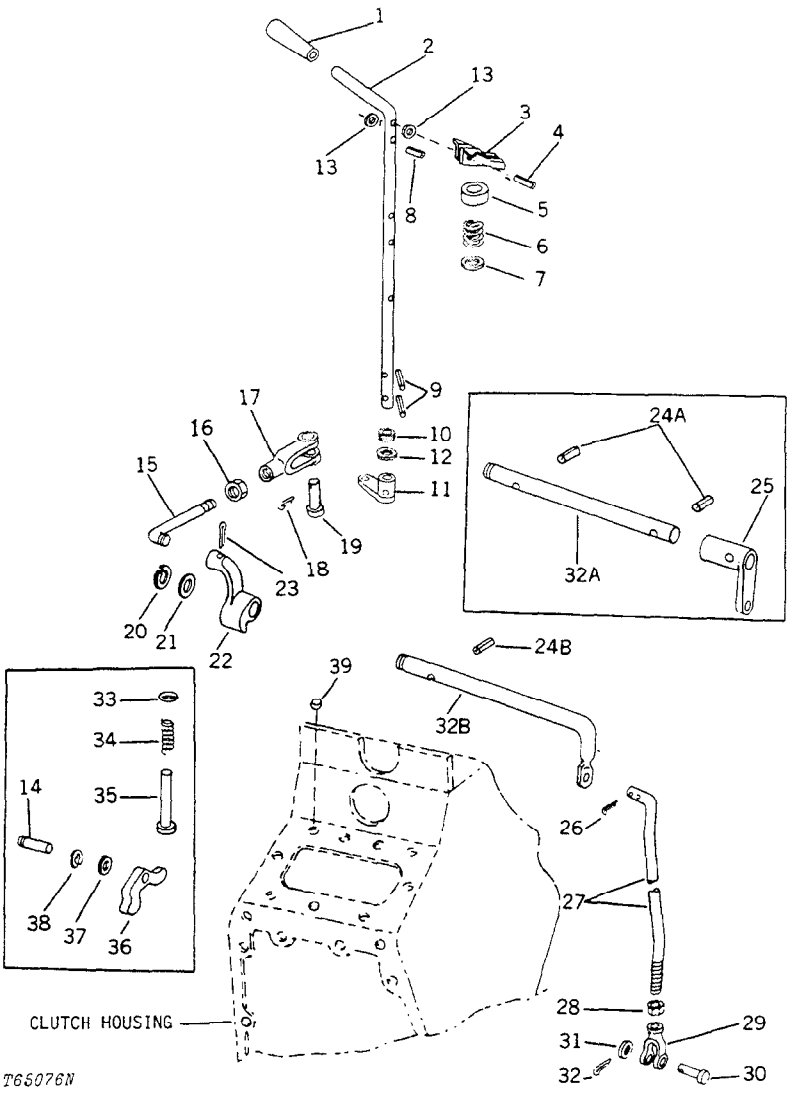
1—Rivet (8 used)
2—Shim (As Required)
3—Bearing Cone
4—Bearing Cup
5—First and Fifth Speed Gear (40 teeth)
6—Collar (2 used)
7—Shifter Collar Sleeve (2 used)
8—Second and Sixth Speed Gear (36 teeth)
9—Fourth and Eighth Speed Gear (27 teeth)
10—Third and Seventh Speed Gear (31 teeth)
11—Special Nut
12—Spacer
13—Shim (As Required)
14—Bearing Cup
15—Bearing Cone
16—Thrust Washer
17—Retaining Washer
18—Thrust Washer
19—Thrust Washer
20—Special Washer
21—Differential Housing
22—Ring Gear and Pinion

Fig. 9-Differential Drive Shaft

If the differential drive shaft is no longer serviceable and must be replaced, also replace the ring gear as described Section 40, Group 25. These parts are furnished as matched sets and are not available individually for replacement.

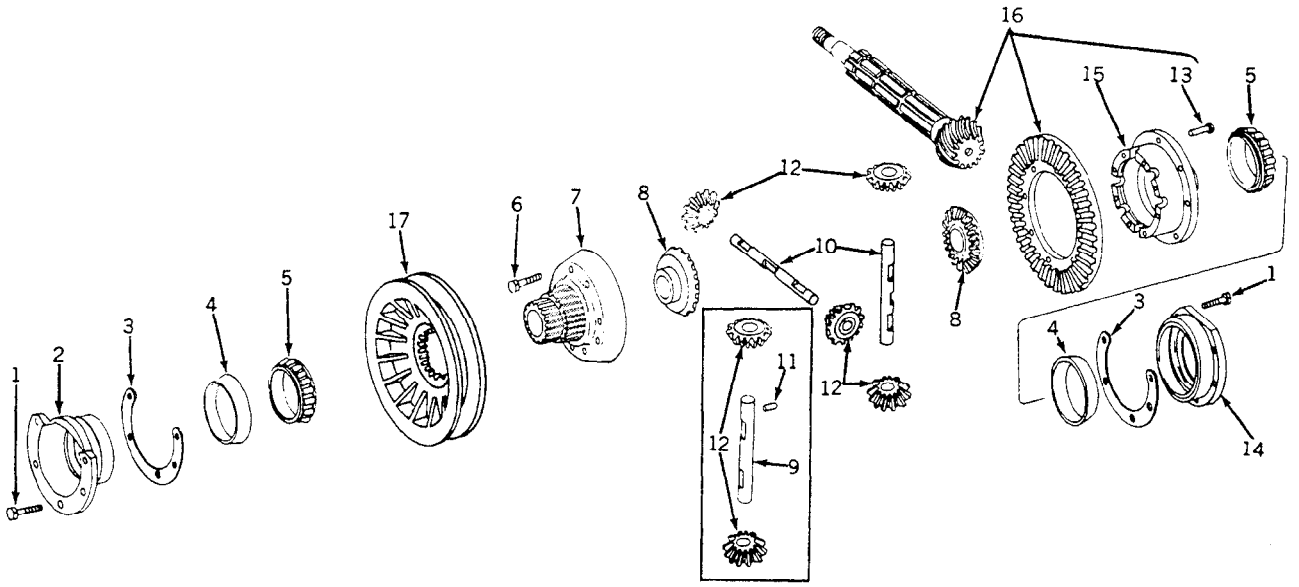
If either a new transmission case, differential assembly, or differential drive gear with bearing cups and cones is to be installed, it will be necessary to (1) check and adjust differential drive shaft preload and cone point as explained further on in this group and (2) set proper backlash between drive shaft and differential assembly as explained in Section 40, Group 25.

Reverser Control Lever and Linkage



1—Knob
2—Transmission Control Lever
3—Neutral Latch
4—Spring Pin
5—Washer
6—Spring
7—Washer
8—Spring Pin
9—Spring Pin (2 used)
10—Bushing
11—Control Arm
12—Washer
13—Washer (use as required) (-268782)
14—Pin (-277181)
15 —Link
16 —Nut
17 —Adjustable Yoke
18 —Cotter Pin
19 —Pin
20 —Retaining Ring
21 —Washer
22 —Control Shaft Arm
23 —Cotter Pin
24A—Spring Pin (2 used) (-240680)
24B—Spring Pin (240681-)
25 —Control Lever Rod Upper Arm (-240680)
26 —Cotter Pin (2 used)
27 —Control Lever Rod
28 —Jam Nut
29 —Yoke
30 —Headed Pin
31 —Washer
32A—Shaft (-240680)
32B—Shaft (240681-)
33 —O-Ring (-277181)
34 —Spring (-277181)
35 —Headed Pin (-277181)
36 —High-Speed Lockout Arm (-277181)
37 —Washer (-277181)
38 —Snap Ring (-277181)
39 —Plug (277182-)

Fig. 6-Reverser Control Lever and Linkage



1—Bolt (10 used)
2—Quill (L.H.)
3—Shim (as required)
4—Bearing Cup
5—Bearing Cone
6—Cap Screw (8 used)
7—Differential Housing (L.H.)
8—Differential Bevel Gear (2 used)
9—Bevel Pinion Shaft (-194772)
10—Bevel Pinion Shaft (2 used) (194773-)
11—Dowel Pin (-194772)
12—Differential Bevel Pinion (2 used) (-194772) (4 used) (194773-)
13—Rivet (8 used)
14—Quill (R.H.)
15—Differential Housing (R.H.)
16—Ring Gear and Pinion
17—Parking Brake Drum

Fig. 2-Differential Assembly

ADJUSTMENT

Differential Preload Adjustment

The differential assembly bearings must have a preload of 0.002 to 0.005 in. (0.05 to 0.13 mm).

To establish preload, proceed as follows:

Install bearing quills. Use shims under right bearing quill (Fig. 2).

With clearance between the differential drive shaft and the ring gear, check the end play of the differential assembly with a dial indicator.

If necessary, add shims under the right bearing quill until a measurable amount of end play is obtained.

NOTE: To obtain a more accurate preload adjustment, introduced end play should not exceed 0.002 inch (0.05 mm).

Record measured end play shown by the dial indicator. Take from the shim pack the thickness of shims equal to end play reading plus an additional 0.003 inch (0.08 mm) to give the desired preload of 0.002 to 0.005 inch (0.05 to 0.13 mm).

NOTE: At no time during preload adjustment should the differential drive shaft pinion be in contact with the ring gear. If adjustment cannot be made without gears touching, refer to Group 10 of this Section and remove differential drive shaft from transmission.

Cone Point Adjustment

Refer to page 40-10-8 for Cone Point Adjustment.

Differential Backlash Adjustment

After bearing preload has been established, mount the dial indicator to check the backlash between the differential drive shaft pinion and the ring gear.

Proper backlash is 0.006 to 0.008 inch (0.15 to 0.20 mm). Adjust backlash by transferring differential bearing quill shims from one side of the case to the other.

CLUTCH ASSEMBLIES

SPECIFICATIONS AND TORQUE VALUES—Continued

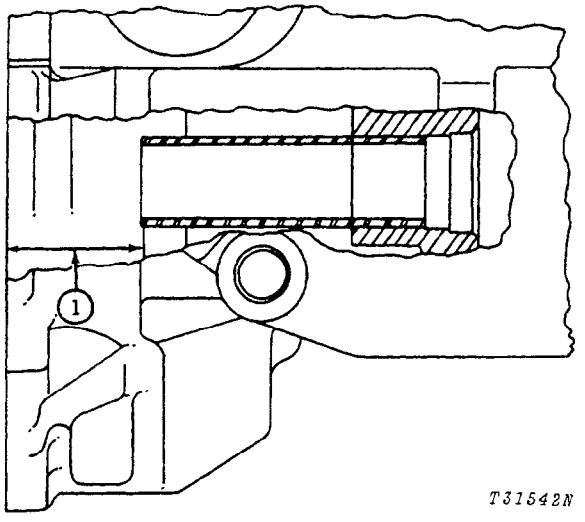


Fig. 6-Carrier Sleeve

1. Dimension from end of sleeve to the engine mounting surface of the clutch housing 2-13/16 in. [71.374 mm]

SPECIAL TOOLS

Essential Tools

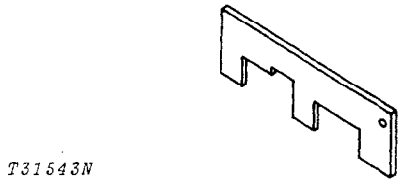
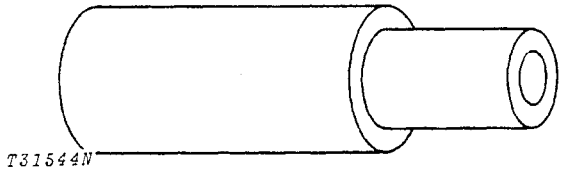
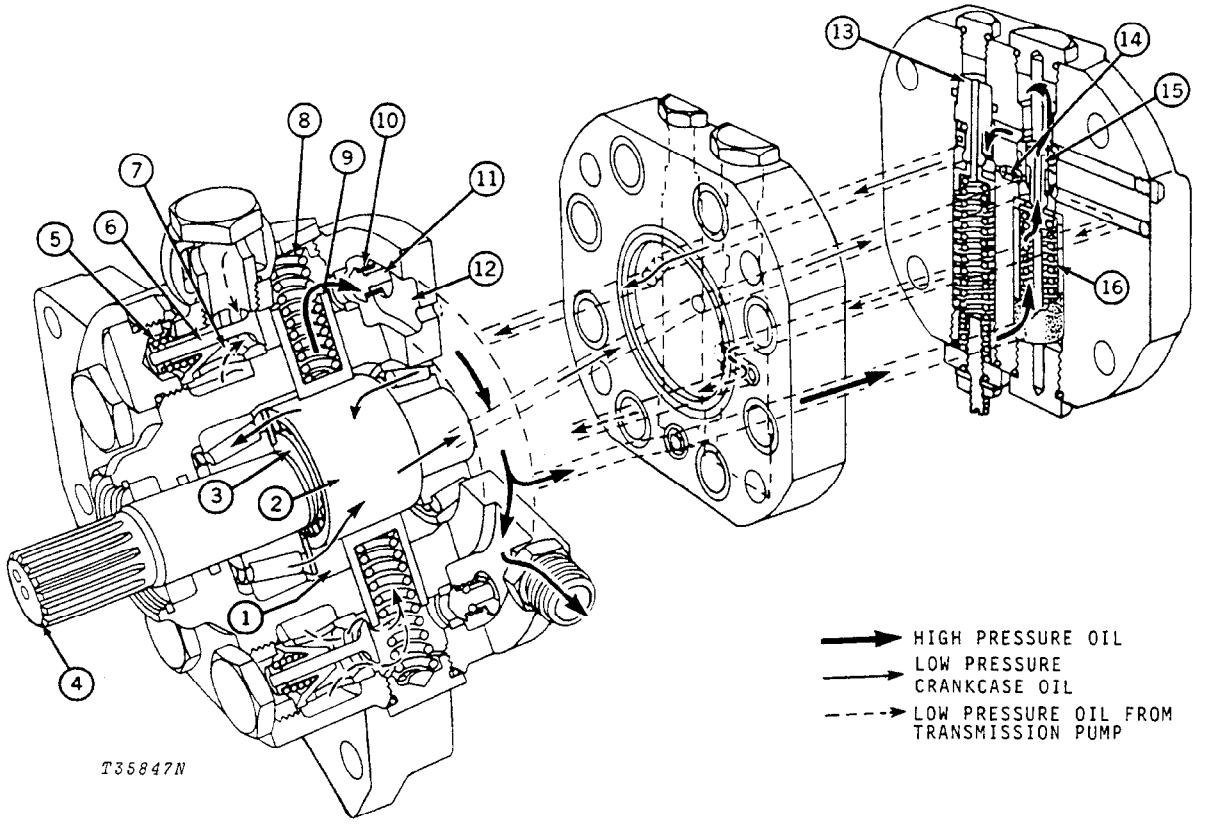
Tool	Tool Number	Use
 T31543N	JD-7	Adjusting engine clutch pressure plate finger height (without continuous-running PTO) (with reverser)
	JD-227	Adjusting engine clutch finger
 T31544N	JDE-52-1	To properly line up clutch disc

Fig. 7-Clutch Adjusting Gauge

Fig. 8-Dual Stage Adapter

Group 10
MAIN HYDRAULIC PUMP

GENERAL INFORMATION



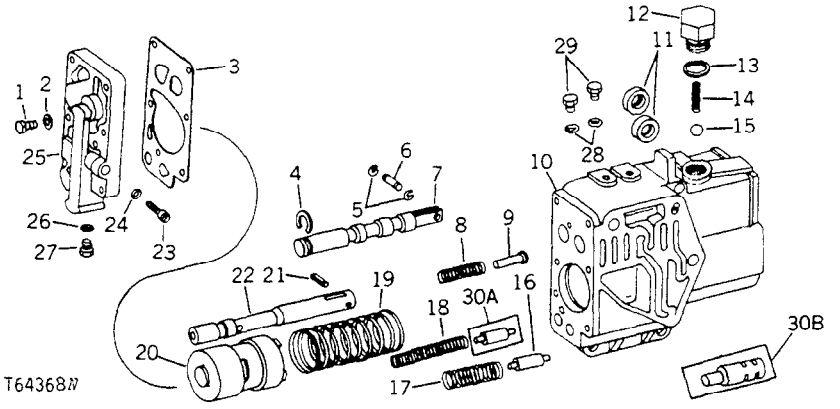
1—Pump Crankcase
2—Race
3—Cam
4—Pump Shaft
5—Inlet Valve Spring
6—Inlet Valve
7—Inlet Gallery
8—Piston Spring
9—Piston
10—Discharge Valve Spring
11—Discharge Valve
12—Outlet Gallery
13—Stroke Control Valve [1.524 mm]
14—0.060 Inch [1.524 mm] Bleed Hole
15—Crankcase Outlet Valve
16—Crankcase Outlet Valve Spring

Fig. 1-Oil Flow Through Main Hydraulic Pump

The main hydraulic pump is a variable displacement, constant pressure, radial piston type.

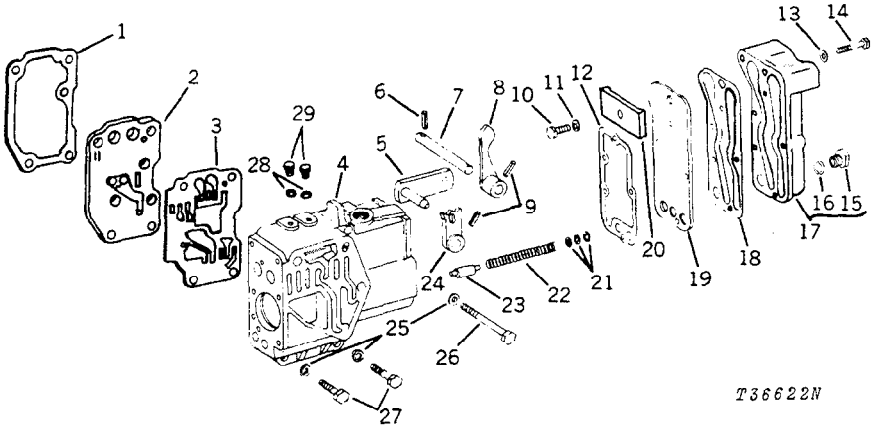
FOS

See "Radial Piston Pumps" in FOS Manual—"HYDRAULICS" for additional description and theory of operation.



1—Cap Screw (6 used)
2—Lock Washer (6 used)
3—Gasket
4—Retaining Ring
5—Retaining Ring (2 used)
6—Pin
7—Clutch Control Valve
8—Spring
9—Stop
10—Valve Housing
11—Oil Seal (2 used)
12—Plug
13—O-Ring
14—Spring
15—Ball
16—Valve
17—Spring
18—Spring
19—Spring
20—Accumulator Piston
21 —Spring Pin
22 —Clutch Pressure Valve
23 —Special Screw
24 —O-Ring
25 —Cover
26 —O-Ring
27 —Plug
28 —O-Ring (2 used)
29 —Plug (2 used)
30A—Cooler Relief Valve (early units)
30B—Cooler Relief Valve (late units)

Fig. 2-Reverser Clutch Control Valve and Piston Assembly



1—Gasket
2—Control Valve Housing Plate
3—Gasket
4—Valve Housing
5—Clutch Control Valve Shaft
6—Spring Pin
7—Shaft
8—Arm
9—Spring Pin
10—Cap Screw
11—Lock Washer
12—Gasket
13—Washer (5 used)
14—Cap Screw (5 used)
15—Plug
16—O-Ring
17—Cover
18—Gasket
19—Plate
20—Block
21—Shim (6 used)
22—Spring
23—Valve
24—Inner Arm
25—Washer (3 used)
26—Cap Screw
27—Cap Screw (2 used)
28—O-Ring (2 used)
29—Plug (2 used)

Fig. 3-Reverser Clutch Control Valve Shaft and Arm Assembly

ASSEMBLY

Replace all O-rings and backup rings when reassembling the power steering assembly. Dip all internal parts in oil before assembly.

Place connecting rod (small end first) in open end of steering piston rod. Connect to piston rod with pin. Press pin to flush with outside surface of piston rod.

Power steering valve parts must be "stacked" on steering wheel shaft before installation in valve housing.

Install sealing ring in groove on piston.

Stack parts on steering wheel shaft as follows:

Slide special washer over shaft then slide lower needle thrust bearing with thrust washers over shaft.

Be sure to install thrust washer so large chamfered surface will be toward the lower valve body.

Install lower operating sleeve, lower valve body with lower spacer, and shims.

Place the two special washers over the shaft. Then install upper operating sleeve, upper spacer, shims, and upper valve body.

Slide upper needle thrust bearing and thrust washers onto shaft.

Install snap ring.

Be sure to install thrust washer so large chamfered surface is toward the upper valve body.

Install thrust washer spring and snap ring retaining washer.

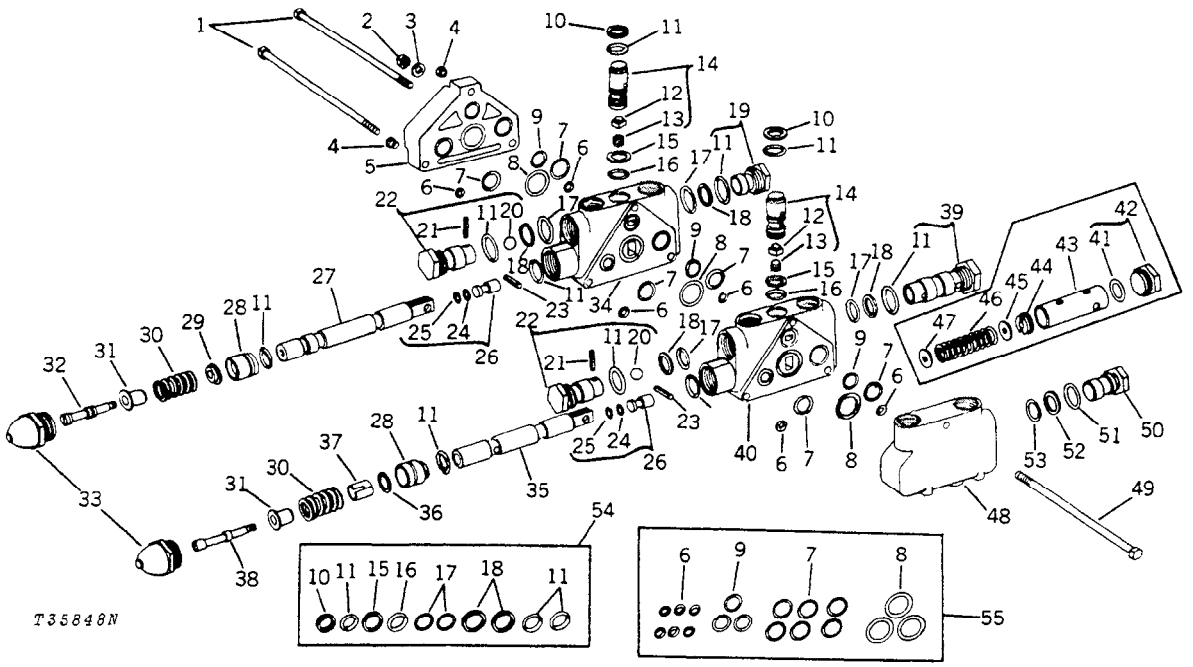
Install snap ring on shaft and push down into groove.

Slide piston rod guide onto piston rod and intall in steering valve housing.

Fit steering wheel shaft and components into housing and thread shaft into the piston rod. Install sleeve (10, Fig. 4) over shaft.

Install O-ring on adjuster (with bushing and oil seal). Coat seal lips with Lubriplate before installing adjuster. Coat adjuster bushing with grease. While protecting seal with suitable sleeve, slip adjuster over end of steering wheel shaft and screw adjuster into valve housing.

Using a spanner wrench, tighten adjuster to 50 lb-ft. [6.91 kg-m]. Hold adjuster with spanner wrench and tighten lock nut to 30 lb-ft [4.15 kg-m].

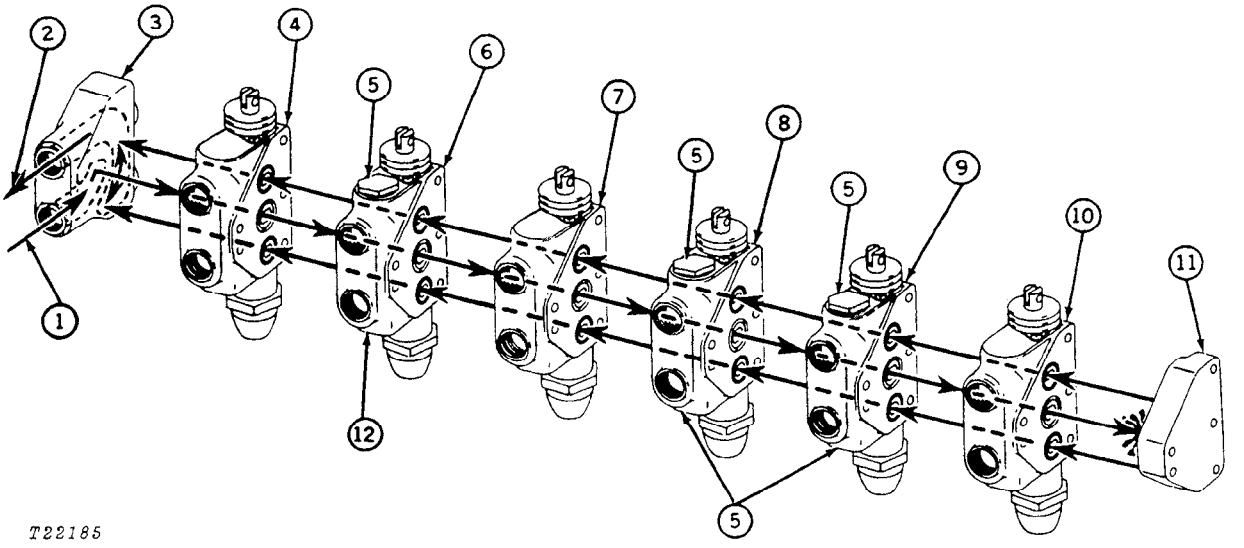


1—Special Cap Screw (2 used)
2—Hex. Nut
3—Lock Washer
4—Sealing Washer (2 used)
5—End Plate
6—O-Ring (6 used)
7—O-Ring (6 used)
8—O-Ring (3 used)
9—O-Ring (3 used)
10—Backup Washer (3 used)
11—O-Ring (10 used)
12—Lift Check Poppet (2 used)
13—Check Spring (2 used)
14—Lift Check Assembly (2 used)
15—Backup Washer (2 used)
16—O-Ring (2 used)
17—O-Ring (4 used)
18—Backup Washer (4 used)
19—Plug
20—Steel Ball (2 used)
21—Spring Pin (2 used)
22—Check Valve (2 used)
23—Spring Pin (2 used)
24—Backup Washer (2 used)
25—O-Ring (2 used)
26—Plug Assembly (2 used)
27—Boom Spool
28—Spool Sleeve (2 used)
29—Spring Washer
30—Centering Spring (2 used)
31—Spring Washer (2 used)
32—Detent Screw
33—Spool Cap
34—Housing
35—Bucket Spool
36—Washer
37—Spool Sleeve
38—Screw
39—Relief Valve Cartridge
40—Housing
41—O-Ring
42—Plug (-198912)
43—Flow Control Spool (-198912)
44—Orifice Plate (-198912)
45—Orifice Disk (-198912)
46—Spring (-198912)
47—Washer (As Required) (-198912)
48—Port Plate
49—Cap Screw
50—Plug (198913-)
51—O-Ring (198913-)
52—Backup Washer (198913-)
53—O-Ring (198913-)
54—Repair Kit (Between Sections)
55—Repair Kit (Bucket or Boom Valve)

Fig. 5-Loader Control Valve

Group 40
9250 BACKHOE CONTROL VALVE

GENERAL INFORMATION



1—Pressure Oil
2—Return Oil
3—Port Plate
4—Stabilizer Valve
5—Relief Valve
6—Crowd Valve
7—Bucket Valve
8—Swing Valve
9—Boom Valve
10—Stabilizer Valve
11—End Plate
12—Plug

Fig. 1-Oil Flow Through Backhoe Control Valve Stack

The backhoe hydraulic functions control valve is a closed-center, six spool, stack-type valve.

There is no continuous flow of oil through the closed-center control valve when the valve is in neutral. Because the main hydraulic pump delivers oil only on demand, oil flows through the control valve only when the control lever is moved.

Fig. 1 shows the flow of oil through the backhoe control valve with all valve sections in neutral. Note that the oil is blocked when it reaches the end plate.

Valve Construction

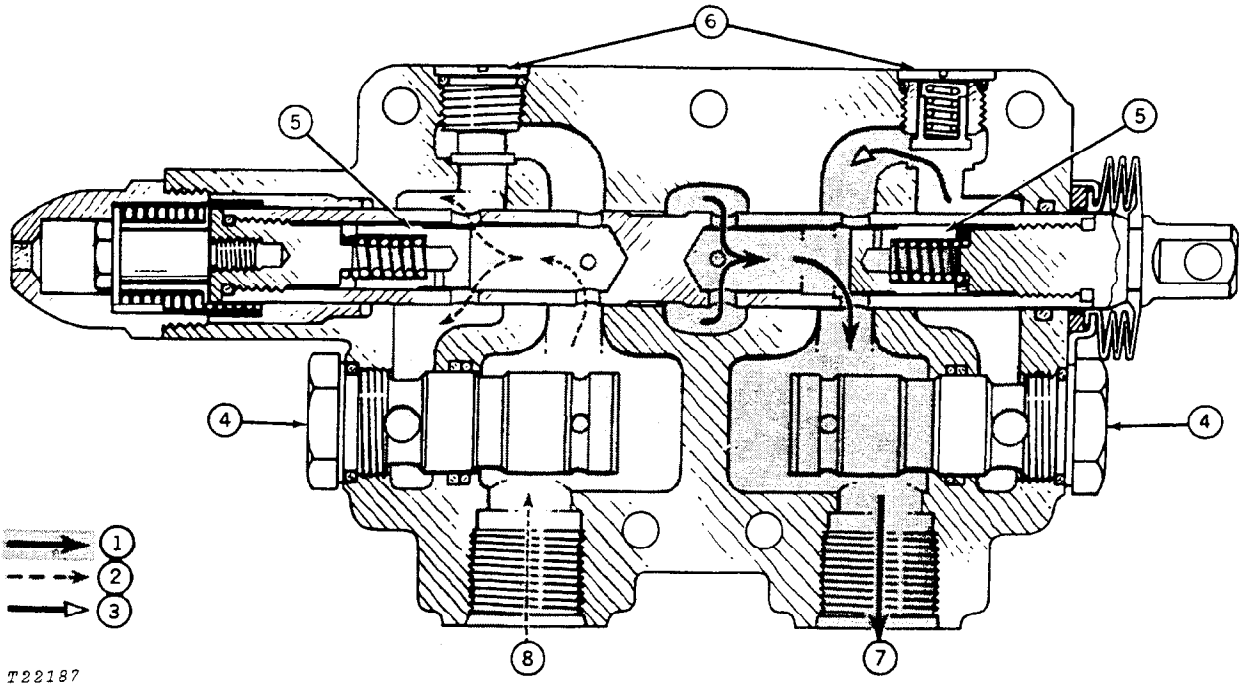
All valve sections are separate bodies containing single spools.

The crowd, boom, and swing sections each contain relief valves to protect their circuits from excessive pressures.

The stabilizer, boom, and swing valve sections contain orifice plates to slow the action of the cylinders.

The boom and swing valve sections contain anti-cavitation check valves.

The pressure and return ports are both located in the port plate. The end plate on the control valve assembly is completely blocked.



1—Pressure Oil
2—Return Oil
3—Anti-Cavitation Oil
4—Relief Valve
5—Lift Check
6—Anti-Cavitation Check Valve
7—To Cylinder
8—From Cylinder

Fig. 3-Swing Section (Left Swing Circuit Shown)

REMOVAL

Operate backhoe control valve levers until all hydraulic pressure is relieved.

Discharge the accumulator by turning the machine steering wheel back and forth until it no longer operates freely.

Label control valve ports and lines to aid assembly.

If control valve stack is to be removed for servicing and it is believed that fragments of failed valve parts may have entered the hydraulic system, completely drain the system and replace the hydraulic filters.

REPAIR

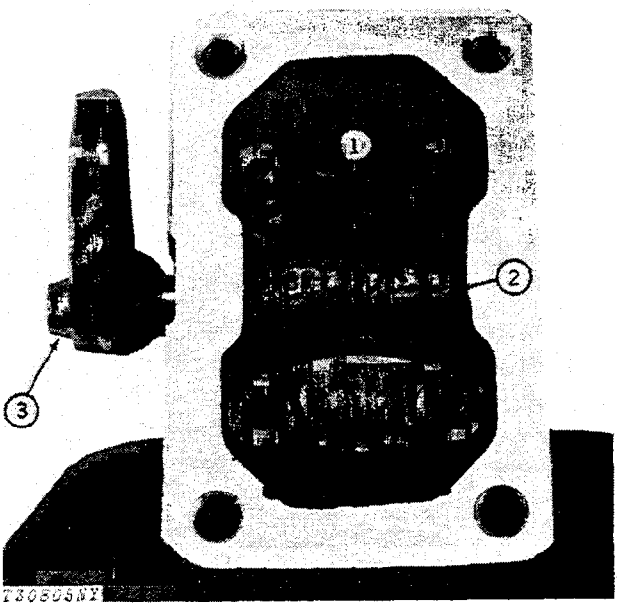
Service individual valves separately. Be sure valve bodies and their spools are kept together because these parts are matched assemblies.

Remove tie bolts and separate valve sections.

Remove end caps and remove spools from valve housings.

Clean and dry all parts thoroughly and inspect for wear or damage.

Discard old O-rings and use new O-rings and seal kits when assembling.



1—Pin **3—Control Shaft**
2—Rocker

Fig. 5-Rocker Assembly Removal

Rotate valve housing in vise so rocker assembly (Fig. 5) faces upward.

Drive out pin holding control arm shaft to the rocker assembly. Remove cam holding screws and remove rocker assembly from housing. Remove valve operating cams. Note assembled position of these parts for assembly.

If necessary, remove inner detent guide by removing follower and driving out guide with a brass drift.

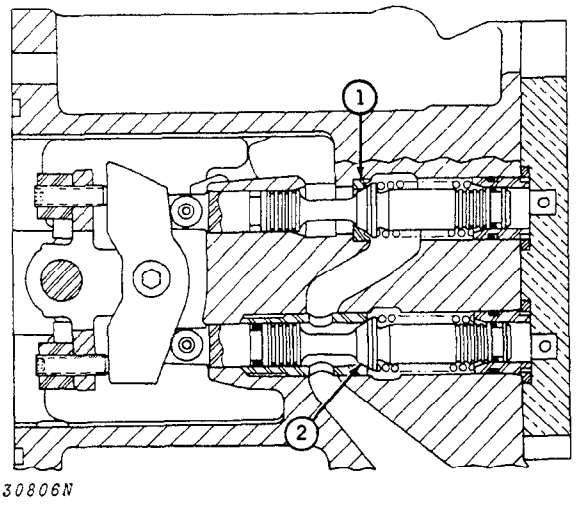
Inspect cap (41, Fig. 4) for damage. Replace if cracked.

Replace flow control valve stop pin (38) if damaged. Be sure that pin's exposed length is 0.9375 in. [23.812 mm] from cap. A pin that is too short can cause jerky valve operation.

Inspect housing for wear or damage. Remove nicks and burrs with a fine file. Replace housing if cracked.

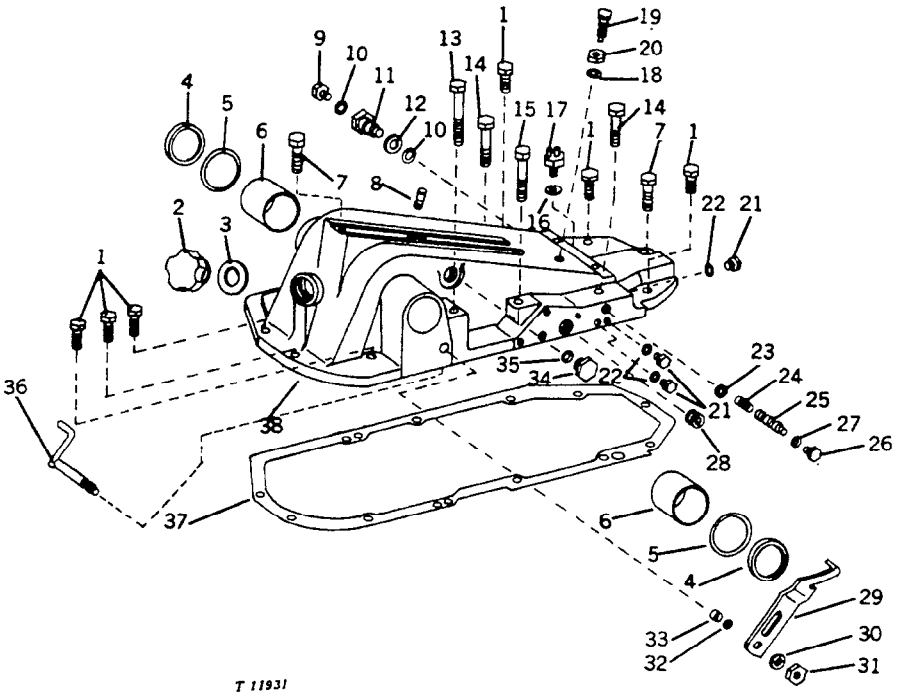
Check valve bores in housing. Replace housing if bores are badly scored.

Check valve seats (Fig. 6) for damage. Seats are not replaceable, but may be repaired using NJD150 valve seat repair kit. Use kit exactly as directed by the manufacturer.



1—Return Valve Seat **2—Pressure Valve Seat**

Fig. 6-Valve Seats



1—Cap Screw (9 used)
2—Oil Filler Cap
3—Packing
4—Retainer (2 used)
5—O-Ring Packing (2 used)
6—Bushing (2 used)
7—Cap Screw (4 used)
8—Special Pin
9—Plug
10—O-Ring Packing (2 used)
11—Remote Cylinder Outlet Adapter
12—Gasket
13—Cap Screw
14—Cap Screw (2 used)
15—Cap Screw
16—Special Aluminum Washer (2 used)
17—Starter Safety Switch
18—O-Ring Packing
19—Rate-of-Drop Screw
20—Hex. Nut
21—Plug (2 used)
22—O-Ring Packing (2 used)
23—Plain Washer
24—Spring
25—Flow Control Valve
26—Plug
27—O-Ring Packing
28—Pipe Plug
29—Load Selector Lever
30—Washer
31—Hex. Jam Nut
32—O-Ring Packing
33—Selector Arm Shaft Bushings
34—Plug
35—O-Ring Packing
36—Load Selector Arm
37—Gasket
38—Rockshaft Housing

Fig. 6-Rockshaft Housing

Examine rockshaft control lever and quadrant using Fig. 7 as a guide.

Replace any damaged or worn parts.

Check rockshaft friction spring washers for wear or flattened condition.

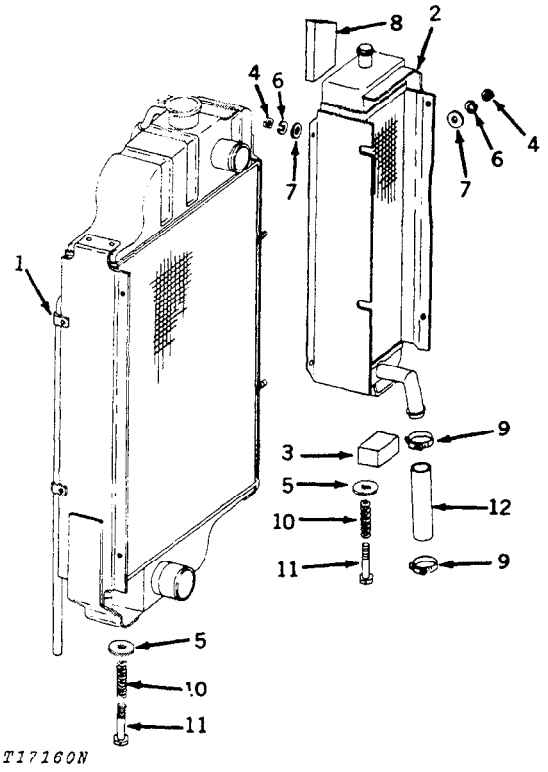
Rockshaft Cylinder and Valve Housing (Fig. 3)

Slide valve seats (small end first) into pressure and discharge valve bores. Install valves (smaller diameter first) in seats. Place sleeve (chamfered end first) behind valves and install valve springs.

With packing on outside of valve plugs and packing and back-up ring inside, secure plugs in valve bores with retaining rings. Use care when inserting valve in valve plug.

OIL COOLER

General Information



1—Radiator
2—Oil Cooler
3—Baffle (2 used)
4—Nut (4 used)
5—Rubber Washer (2 used)
6—Lock Washer (4 used)
7—Washer (4 used)
8—Baffle
9—Clamp (2 used)
10—Spring (2 used)
11—Cap Screw (2 used)
12—Hose

Fig. 4-Oil Cooler

The oil cooler prevents excessive oil temperatures generated by the hydraulic system and reverser units (if used).

Removal

Clean area around hose connections before removing the oil cooler. Remove oil cooler being careful not to damage the radiator or oil cooler fins.

Repair

FOS

Clean oil cooler thoroughly as described for radiators in FOS Manual, "ENGINES".

Installation

Replace hoses showing any deterioration. Be sure hose connections are clean before installing hoses.

AUXILIARY RESERVOIR

General Information

The auxiliary reservoir stores oil for use whenever the transmission oil pump is unable to meet the demands of the main hydraulic pump.

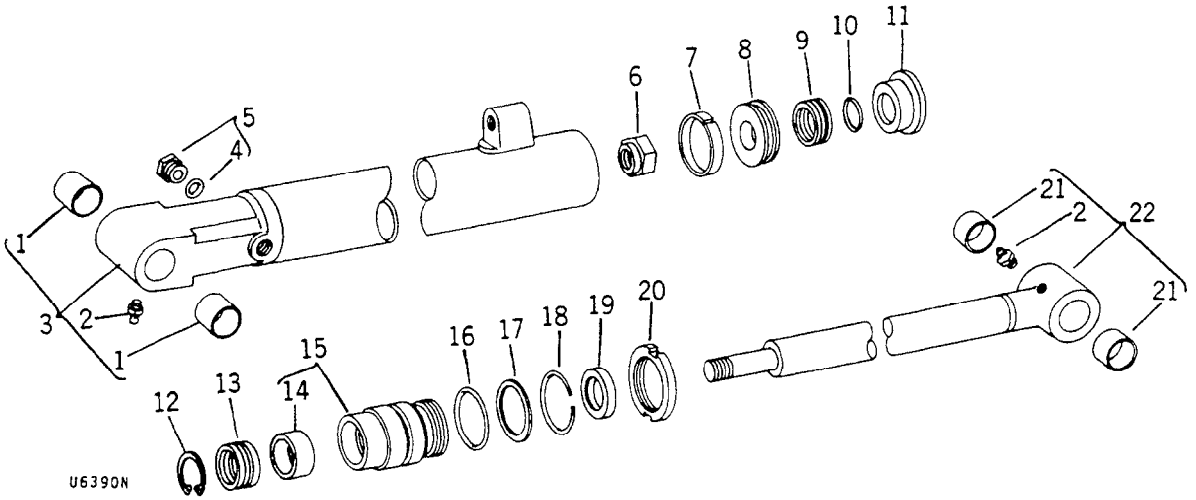
Removal

Reservoir check valve ball and spring will remove with special adapter on top of reservoir. Use care not to dislodge check valve assembly when withdrawing screw as it may fall into reservoir.

Repair

Once reservoir is removed, clean and thoroughly flush reservoir, and check for leaks or broken seams.

LOADER BOOM CYLINDERS



1—Bushing
2—Grease Fitting (2 used)
3—Barrel
4—O-Ring
5—Plug
6—Lock Nut
7—Wear Ring
8—Retainer
9—V-Packing
10—O-Ring
11—Piston
12—Snap Ring
13—V-Packing
14—Wear Ring
15—Rod Guide
16—O-Ring
17—Backup Washer
18—Snap Ring
19—Wiper Seal
20—Spanner Nut
21—Bushing (2 used)
22—Piston Rod

Fig. 3-Loader Boom Cylinder

Removal

Operate control valve lever until all hydraulic pressure is relieved.

Remove cylinders and cap all openings to prevent dirt entry.

If cylinder packings have failed, some fragments of the deteriorated parts may have entered the system. Completely drain the system and replace the filters.

Repair

Clamp the cylinder in a vise to prevent it from turning.

Remove rod guide and pull piston assembly from barrel.

Clamp the cylinder rod end in a vise, using care to prevent damage to the piston rod. Remove nut from end of rod. Slide parts from rod.

Wash all parts thoroughly with diesel fuel and inspect as follows:

Check barrel, rod guide, and rod for scoring. Check O-rings for surface damage.

Check V-packings and wear rings for breaks, cuts, or embedded foreign material.

Check piston rod seal and wiper for wear or damage. Remove sharp edges from piston rod with emery cloth.

Refer to page 50-60-4 for service of the V-packings and rod guide.

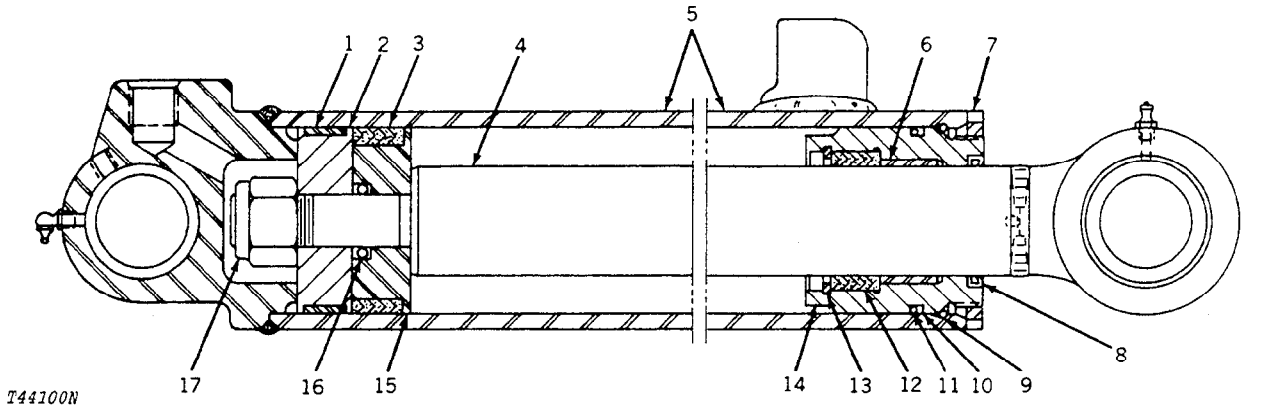
Tighten lock nut (6, Fig. 3) to 150-250 lb-ft (21-35 kg/m) and spanner nut (20) to 250-300 lb-ft (35-41 kg/m).

Installation

Install cylinder on unit. Be sure oil line fittings are clean before connecting the lines to the cylinder.

Group 62
9250 BACKHOE CYLINDERS

GENERAL INFORMATION



1—Piston Wear Ring
2—Piston Retainer
3—Piston V-Packing
4—Piston Rod
5—Head and Barrel Assembly
6—Rod Guide
7—Spanner Nut
8—Wiper Seal
9—Snap Ring
10—Backup Washer
11—O-Ring
12—Rod Guide V-Packing
13—Snap Ring
14—Rod Guide
15—Piston
16—O-Ring
17—Stop Nut

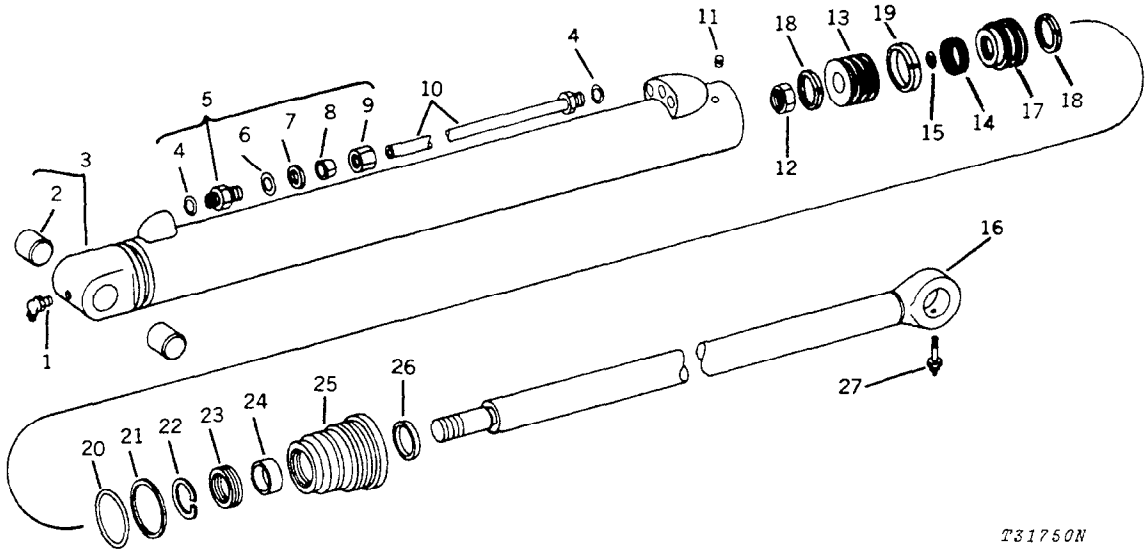
Fig. 1-Cutaway View of Assembled Backhoe Bucket Cylinder

The hydraulic cylinders used for backhoe functions are double acting with V-packings. Piston pins are heat treated, chrome plated and polished. Replaceable non-metallic wear rings are used on the piston retainers to prevent scoring at the cylinder barrels.

The backhoe crowd, boom, and swing cylinders are hydraulically cushioned. This prevents harsh stops when the cylinder reaches the end of its stroke.

See "Hydraulic Cylinders" in FOS Manual "HYDRAULICS" for additional information on cylinders and an explanation of the hydraulic cushion design.

BOOM CYLINDER



1—Grease Fitting	7—Backup Washer	14—V-Packing	21—Backup Washer
2—Bushing (2 used)	8—Sleeve	15—O-Ring	22—Snap Ring
3—Barrel	9—Nut	16—Piston Rod	23—V-Packing
4—O-Ring (2 used)	10—Return Tube	17—Piston	24—Wear Ring
5—Connector	11—Set Screw	18—Brake Seal (2 used)	25—Rod Guide
6—O-Ring	12—Special Lock Nut	19—Wear Ring	26—Wiper Seal
	13—Piston	20—O-Ring	27—Grease Fitting

Fig. 3-Backhoe Boom Cylinder Assembly

Removal

Extend the boom and dipperstick. Rest the bucket on the ground.

Operate control valve lever until all hydraulic pressure is relieved.

Remove cylinders and cap all openings to prevent dirt entry.

If cylinder packings have failed, some fragments of the deteriorated parts may have entered the system. Completely drain the system and replace the filters.

Repair

Clamp the cylinder in a vise to prevent it from turning.

Remove rod guide and pull piston assembly from barrel.

Clamp the cylinder rod end in a vise, using care to prevent damage to the piston rod. Remove nut from end of rod. Slide parts from rod.

Wash all parts thoroughly with diesel fuel and inspect as follows:

Check barrel, rod guide, and rod for scoring. Check O-rings for surface damage.

Check V-packings and wear rings for breaks, cuts, or embedded foreign material.

Check piston rod seal and wiper for wear or damage. Remove sharp edges from piston rod with emery cloth.

Refer to page 50-63-7 for service of the V-packings and rod guide.

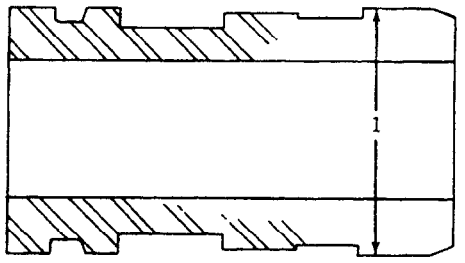
Tighten special lock nut (12, Fig. 3) to 950 - 1050 lb-ft (131 - 145 kg/m) and rod guide (25) to 250 - 300 lb-ft (35 - 41 kg/m).

Installation

Install cylinder on unit. Be sure oil line fittings are clean before connecting the lines to the cylinder.

MAIN HYDRAULIC PUMP

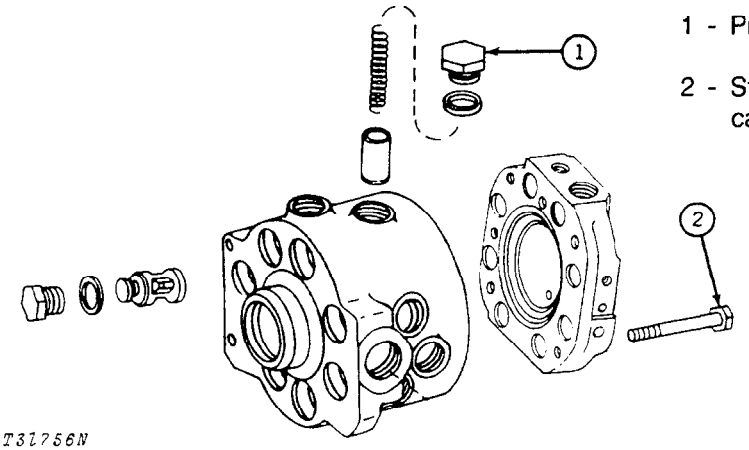
SPECIFICATIONS AND TORQUE VALUES—Continued



T27826N

Fig. 12-Crankcase Outlet Sleeve

1 - O.D. of crankcase outlet sleeve.....0.7481 to 0.7485 in. [19.002 to 19.012 mm].



T31756N

Fig. 13-Torque Values

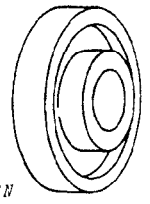
1 - Piston plug torque.....100 lb-ft. [13.8 kg-m]

2 - Stroke control valve housing to main pump cap screw torque.....85 lb-ft. [11.8 kg-m].

SPECIAL TOOLS

Essential Tools

Tool	Tool Number	Use
	JDH-18	To install seal into bore of hydraulic pump.



T27836N

Fig. 14-Pump Seal Driver

LOADER CONTROL VALVE

SPECIFICATIONS AND TORQUE VALUES—Continued

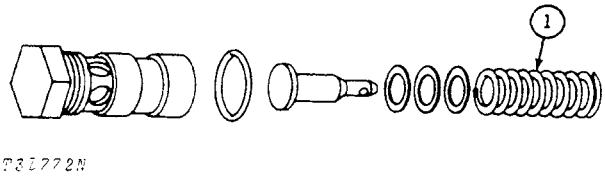


Fig. 37-Relief Valve

1 - Relief valve spring test
length ..... 1.50 in. [38.10 mm]
with 122 lbs. [55.34 kg]

9250, 9250-A BACKHOE CONTROL VALVE

SPECIFICATIONS AND TORQUE VALUES

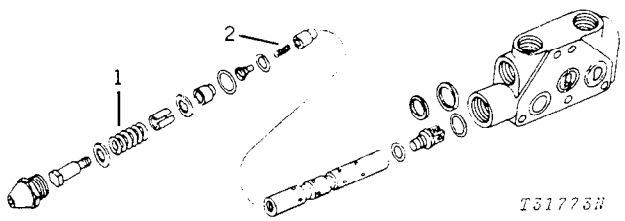


Fig. 38-Backhoe Valve Spring Valves

1 - Spool spring test
length..... 1.19 in. [50.23 mm]
with 27 lbs. [12.25 kg]

2 - Lift check spring test
length..... 0.81 in. [20.57 mm]
with 0.50 lb. [0.23 kg]

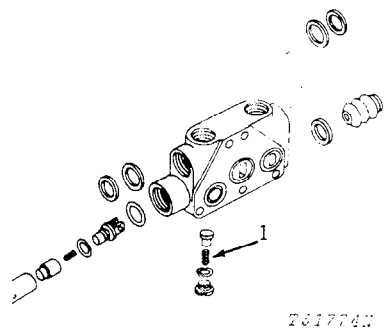


Fig. 39-Anti-Cavitation Check Valve Spring

1 - Anti-cavitation check valve
spring ..... 0.625 in. [15.87 mm]
with 0.75 lbs. [0.3 kg]

Section 60
MISCELLANEOUS

CONTENTS OF THIS SECTION

GENERAL INFORMATION

The front end support serves as a mounting for the radiator, hydraulic pump, fuel tank, and air cleaner.

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

FRONT END SUPPORT REMOVAL

⚠ **CAUTION: Remove battery ground strap for safety.**

Remove loader (see Group 10 of this section).

Remove front ballast (if used).

Group 5
FRONT END ASSEMBLY

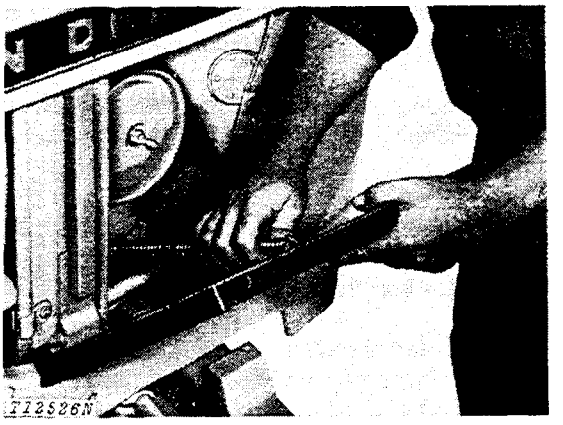
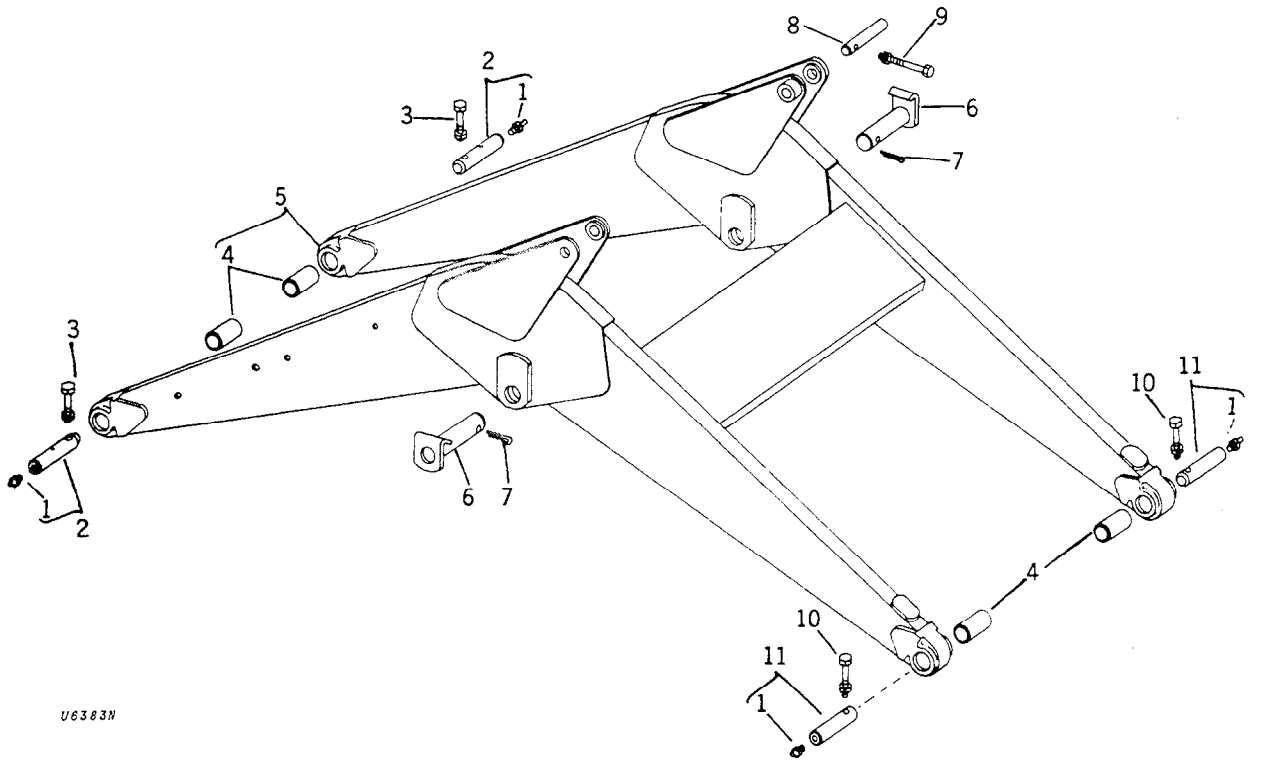


Fig. 1-Removing Grille Screens

Pull out on top edge of each grille screen. Lift screen to clear pins in front end support. Disconnect springs (Fig. 1) and remove screens.



1—Grease Fitting (4 used)
2—Pin (2 used)
3—Cap Screw (2 used)
Lock Nut (2 used)
4—Bushing (4 used)
5—Boom
6—Pin (2 used)
7—Cotter Pin (2 used)
8—Pin (2 used)
9—Cap Screw (2 used)
Lock Nut (2 used)
10—Cap Screw (2 used)
Lock Nut (2 used)
11—Pin (2 used)

Fig. 3-Loader Boom

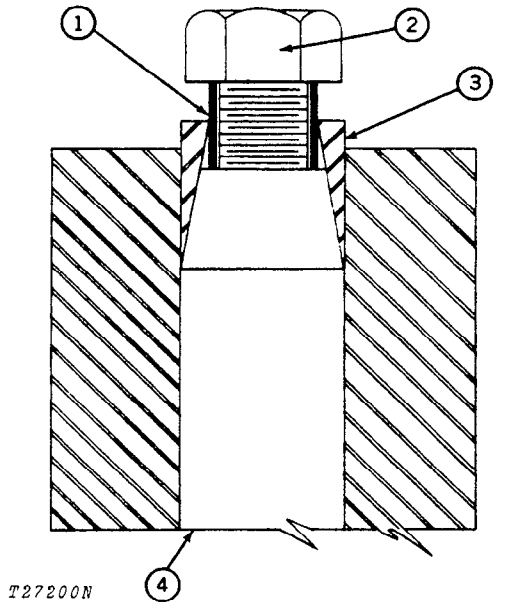
CAUTION: To avoid possible injury always stop machine and lower or block up boom and bucket before servicing loader units.

Frame and Boom

Refer to Figs. 2 and 3 when disassembling and assembling boom, frame, and bucket.

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

After assembling frame and boom, grease all fittings before resuming operation.



1—Pipe Spacer or Washers **3—Tapered Bushing**
2—Cap Screw **4—Tapered Pin**

Fig. 12-Removing Tapered Pins and Bushings

Place a pipe spacer or washer (1, Fig. 12) between the cap screw (2) and tapered pin (4). This will transfer the force applied at the cap screw to the tapered pin and not the bushing.

Tighten cap screw to standard torque.

Strike head of cap screw to drive tapered pin and bushing from bore.

If neither of the previous procedures will remove tapered pin and bushings, use both procedures simultaneously.

When installing tapered pins use the following procedure:

1. Before inserting pins and bushings, be sure bushing bores are clean, dry and unpainted.

2. Assemble parts loosely. Center pin assembly in pin joint within 0.12 inch [3.05 mm].

3. Tighten bolts as follows:

A. Tighten all bolts associated with the tapered pin assembly to a minimum of one-half the standard torque.

B. Shock both wedge bushings with a brass, lead, or aluminum hammer.

   a. If the washers are accessible and large enough, strike both washers in three places.

   b. If the washers are not accessible or are too small to strike directly, place a spacer over the bolt head or bolt nut and strike the spacer three times.

NOTE: Do not pound on bolt head or nut.

C. Tighten bolts to full torque.

D. Repeat step B.

E. Check torque.

F. Repeat steps B and C alternately until shocking the assembly does not reduce the torque reading on bolts.

G. Recheck for centered position.

INSTALLATION

IMPORTANT: Relieve pressure in the closed-center hydraulic system before removing hoses from the dead-end block. With engine shut off, operate the steering controls to relieve pressure in the system.

Attach the pressure and return hoses to the backhoe main frame as illustrated in Fig. 1.

Carefully raise the backhoe main frame with the hydraulic system by extending the stabilizers.

Remove the fender extensions and tie bars.

Carefully back the tractor to align the tractor attaching points with the main frame.

Secure each side of main frame to tractor with pins and cotter pins.

Position tie bars on loader side frames, and secure each with pins and cotter pins. Replace fender extensions.

Litho in U.S.A.

Group 10
ENGINE

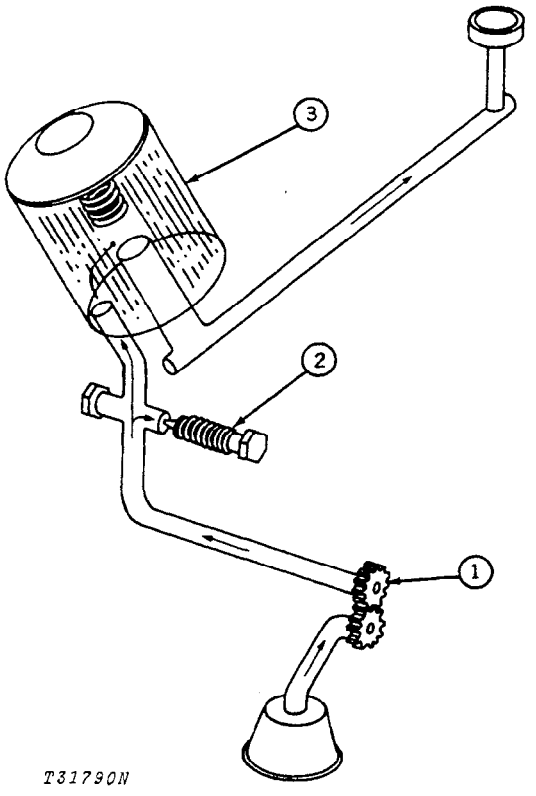
GENERAL INFORMATION

Basic Engine

The JD302-A Loader and Backhoe Loader has either a 3 cylinder 164 cubic inch [2687 cm^3] gasoline engine or a 3 cylinder 164 cubic inch [2687 cm^3] diesel engine.

Both engines are valve in-head vertical in-line four cycle engines. Both engines consists of a lubrication system, cooling system, fuel system and air intake system.

Engine Lubrication System



1—Oil Pump **3—Oil Filter**
2—Pressure Regulating Valve

Fig. 1-Engine Lubrication System

The components of the lubrication system are the oil filter and a gear driven positive displacement oil pump and an engine oil pressure regulating valve (Fig. 1).

The oil pump draws lubricant from the oil pan through a system of gears and sends it through an internal passage to the engine oil filter.

The oil filter is a spin-on replaceable element. It removes contaminants from the engine oil. From the filter the oil goes through the main gallery to the oil pressure regulating valve.

The oil pressure regulating valve is used to maintain and regulate engine oil pressure.

After oil flows past the regulating valve it flows into oil gallerys and is dispensed to lubricate the internal moving parts of the engine.

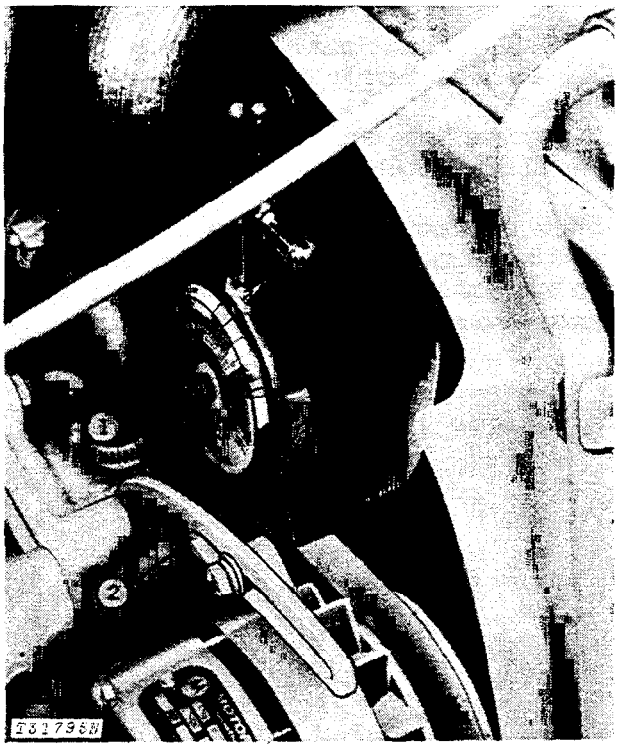
Engine Cooling System

The components of the cooling system are the radiator, water pump and fan, and thermostat and housing (Fig. 2).

The radiator is equipped with a pressure cap which acts as a relief valve to keep pressure at a specified level in the system.

The water pump draws coolant from the radiator and sends it into the main coolant gallery. Coolant from the gallery circulates through the engine to cool the block, cylinder liners, and head and then flows into the water manifold into the thermostat housing.

Fan Belt Tension Adjustment



1—Belt Tension Gauge 2—Alternator Bracket

Fig. 8-Checking Fan Belt Tension

Adjust fan belt tension by loosening the alternator bracket and adjusting cap screws and apply outward pressure to the front alternator frame to determine if the fan belts are adjusted properly, apply approximately 20 pounds (9.07 kg) of force on the belt with the thumb about midway between the pulleys. The belt deflection should be 0.75 inch (19.05 mm).

More consistent belt tension will result and the belts will last longer if the tension is set with a belt tension gauge. When a belt tension gauge is used, the initial reading should be 100 to 110 pounds [45.4 to 49.9 kg] strand tensions. After 3 minutes of operation recheck the belt tension. The gauge should read a minimum of 80 pounds [36.29 kg] strand tension.

Fuel System

⚠ CAUTION: Live sparks, smoking or fire of any nature should not be permitted when testing the fuel system.

Fuel Supply Pump Vacuum Test

Tee a D05022ST Water Vacuum gauge at the inlet to the fuel supply pump.

Start the engine. Let it run at low idle and observe the gauge, the reading on the gauge should be 2.0 to 2.5 inches (5.0 to 6.2 mbar) of water.

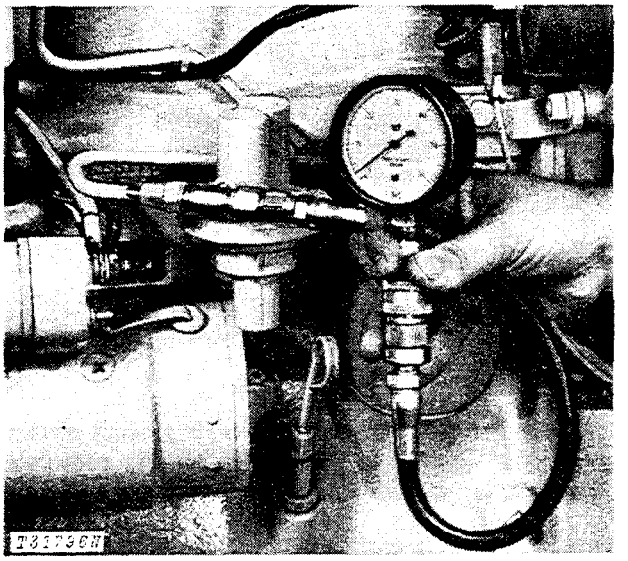


Fig. 9-Fuel Supply Pump Vacuum Test

The pump can also be tested by teeing a low pressure gauge between the pump and the fuel filter (diesel) or carburetor (gasoline). The pressure should be 2 to 2.5 psi [0.14 to 0.17 kg/cm^2].

Block Diagram (Fig. 6)

A block diagram is a simple picture of the power flow in the electrical system. It provides an easy to follow description of the system components and their relationship to other components.

Use the block diagram (Fig. 6) to follow the basic power distribution to the various circuits.

Trace the current by starting at the battery positive terminal and follow the connecting lines from box to box. Current flows from the batteries to the starting motor and then to the alternator and key switch. As you can see this provides a very basic and simple picture of the current or power distribution in the system.

By looking at the output of the key switch, you can see that the current flow is further distributed out of three terminals: "ACC", "IGN" and "ST".

The components in each of these circuits can be determined very easily by following the connecting lines from box to box.

Now let's use the block diagrams to solve a problem.

Problem: Lights do not work, but the alternator and engine oil pressure indicator lamps are lit when key switch is in "ACC" position.

Solution: By referring to the block diagram (Fig. 6) you can see that there is power to the key switch. Therefore, the problem must be in the lead wire from the key switch "ACC" terminal through the regulator connector to the light switch "BAT" terminal or the light switch itself.

Schematic Diagram (Fig. 7)

The schematic diagram is a detailed "How It Works" picture of the electrical system. It provides the theory of operation in a simple, easy-to-understand manner. The schematic is especially helpful in trouble-shooting to isolate a problem to a given component.

To use a schematic diagram, it is essential that you know and understand the basic symbols used in an electrical schematic.

FOS

For explanation of basic symbols of an electrical schematic, refer to FOS Manual—ELECTRICAL SYSTEMS, page IV.

To use the electrical schematic, you must think of the electrical current as flowing from the positive (+) terminal of the batteries through the various circuits and components to ground, and from ground back to the negative (−) terminal of the battery.

If circuit is complete to ground, positive current flow is from the batteries to the starting motor solenoid "B" terminal, to the alternator and on to the key switch.

Now let's use the schematic to solve a problem.

Problem: Horn will not work, but cigar lighter works.

Solution: By referring to the schematic diagram you can see that the cigar lighter and horn get their power from the same terminal on the circuit breaker. So the problem is either in the switch, the horn or the wiring from the circuit breaker to horn switch or from horn switch to horn.

Precautions

Certain precautions should be followed when testing or servicing the electrical system.

⚠ CAUTION: To avoid injury from a spark or short circuit, DISCONNECT THE BATTERY GROUND STRAP when working on any part of the electrical system. This will also prevent accidental starting.

When removing the batteries, disconnect the battery ground strap first. When installing the battery, connect the ground strap last.

NEVER REVERSE THE POLARITY OF THE BATTERY CONNECTIONS. Reversing the polarity may damage some components and wiring in the system.

The following is an explanation of Fig. 8 - Component Wire Routing.

No.	Color	Routing
1A	Red	Alternator output terminal to circuit breaker
1B	Red	Alternator output terminal to circuit breaker
2A	Purple	Alternator output terminal to solenoid "BAT" terminal
2B	Purple	Regulator connector to key switch "ACC" terminal
2C	Purple	Key switch "ACC" terminal to alternator indicator light connector
2D	Purple	Alternator indicator light connector to engine oil pressure indicator light connector
2E	Purple	Engine oil pressure indicator light connector to small terminal on fuel gauge
3	Black	Key switch "ST" terminal to neutral start switch
4	White	Neutral start switch to solenoid "S" terminal
5	Black	Engine oil pressure indicator light to engine oil pressure switch
6	Black	Fuel gauge to fuel gauge sender connector
7A	Orange	Regulator connector to alternator indicator light
7B	Orange	Alternator indicator light to alternator regulator terminal
8	Red	Circuit breaker to key switch "BAT" terminal
9	Green	Alternator field terminal to regulator connector
10	Black	Alternator ground terminal to regulator connector
11B	Light Blue	Solenoid "R" terminal to coil
11C	. . . . .	2.2 ohm., 20 watt resistance wire from coil to key switch "G" terminal
11D	Gray	Key switch "IGN" terminal to fuel shut-off solenoid
12	Pink	Circuit breaker to horn switch
13	Yellow	Horn switch to horn
14	Black	Circuit breaker to cigar lighter
15	Black	Coil to distributor

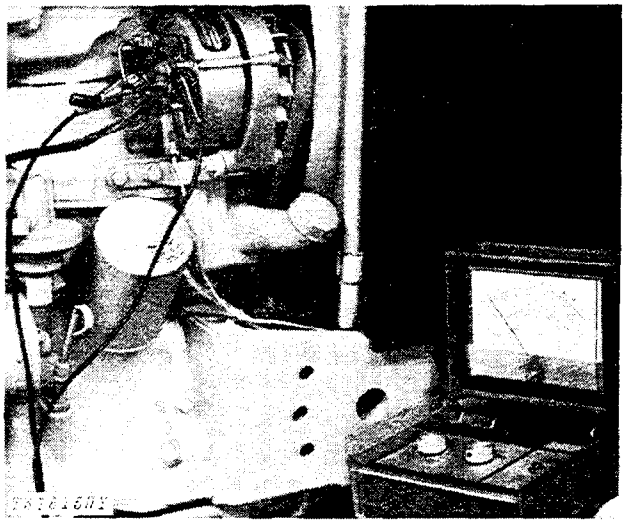
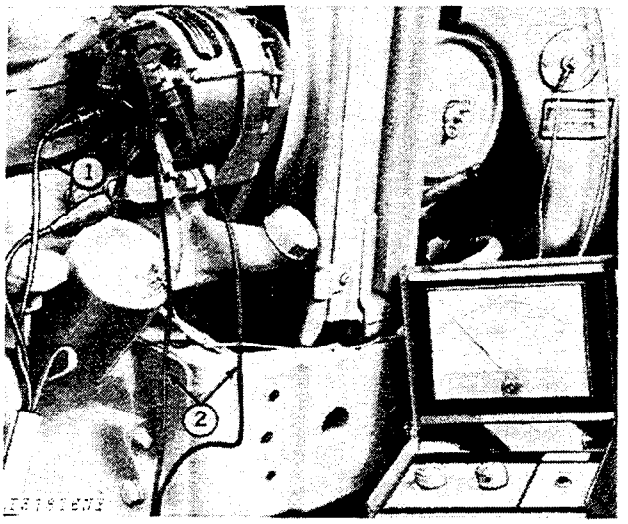


Fig. 22-Jumper Wire Connected to Field and Output Terminals and Voltmeter Connected to Regulator Terminal

If voltage at regulator terminal rises to 15-16 volts now, when it did not with regulator connected in test No. 3, then the regulator is defective and should be replaced.

If voltage does not rise at regulator terminal and the field circuit was okay in test No. 4, then the stator or rectifier diodes are defective. See Section 30, Group 10 for testing diodes and stator.

Test No. 6 - Alternator Output



1—Ammeter Leads **2—Voltmeter Leads**

Fig. 23-Ammeter and Voltmeter Connected to Output Terminal

If not using JDST-23 tong type ammeter, disconnect wire from alternator output terminal and connect ammeter (Fig. 23). Connect voltmeter negative lead to ground and connect positive lead to output terminal. Connect a carbon pile resistor (turned off) to the battery.

Run engine at approximately 1400 rpm. Use a master tachometer to measure rpm. Adjust carbon pile to obtain maximum alternator output at 13 to 15 volts. Ammeter should read 25 amps or more.

Test No. 7 - Testing Regulator

The regulator must be checked with an alternator that is in good condition. If the alternator is questionable, check it as previously instructed.

Connect voltmeter with ± 0.1-volt accuracy to the alternator output terminal and ground terminal (Fig. 20). With charged batteries and the regulator brought to operating temperature (fifteen minutes operation), the voltage should be as specified for the surrounding air temperature. See chart below. If battery is partially discharged, it may be necessary to connect a 1/4-ohm resistor in series with the ammeter.

Regulator Voltage (After Fifteen Minutes Operation and at 1500 rpm)

Temperature*	Voltage
40°F. [4.4°C.]	14.4 - 14.9 volts
60°F. [15.6°C.]	14.3 - 14.7 volts
80°F. [26.7°C.]	14.2 - 14.6 volts
100°F. [37.8°F.]	14.0 - 14.4 volts
120°F. [48.9°C.]	13.8 - 14.3 volts
140°F. [60.0°C.]	13.6 - 14.1 volts

**Measured one inch (25 mm) from regulator.*

If voltage is not within the limits in the above chart, stop engine and with key switch off, replace the regulator. If voltage with new regulator is not correct, the difficulty must be in the system wiring or the isolation diode.

Transmission Drive Shaft

The transmission drive shaft is located at the top of the transmission. It operates as a solid unit comprised of the shaft and four gears which transmit power at various speeds from the countershaft to the differential drive shaft or directly to the differential drive shaft in high range.

Differential Drive Shaft

The differential drive shaft is located directly below the transmission drive shaft. Four driven gears are mounted on the differential drive shaft, and are selectively engaged to the shaft by means of two collar-type speed change shifters. Power is transmitted to the differential assembly by the bevel pinion at the rear of the differential drive shaft.

Countershaft

The countershaft is located to the left and slightly below the transmission drive shaft. It carries two range pinions (low and reverse) to provide low range shifting between the countershaft and the transmission drive shaft, and reverse range shifting between the countershaft and the differential drive shaft.

Input power is transmitted from the clutch shaft to the countershaft by a transmission drive gear which is located between the clutch shaft and the transmission drive shaft.

Shifter Controls

Transmission gears are selected manually by two shift levers mounted on top of the clutch housing. The range shift lever (left-hand) is used to select low, high, or reverse ranges; a park position is also provided. The gear shift lever (right-hand) can be used to select first, second, third, or fourth gears when the range shift lever is in low range position; it can be used to select fifth, sixth, seventh, or eighth gears when the range shift lever is in high range position. When the range shift lever is in reverse range, reverse gears comparable to first, second, third, or fourth can be obtained (- 277181)

A neutral start switch is provided. The range shift lever must be in neutral or in park (P) position before the engine can be started.

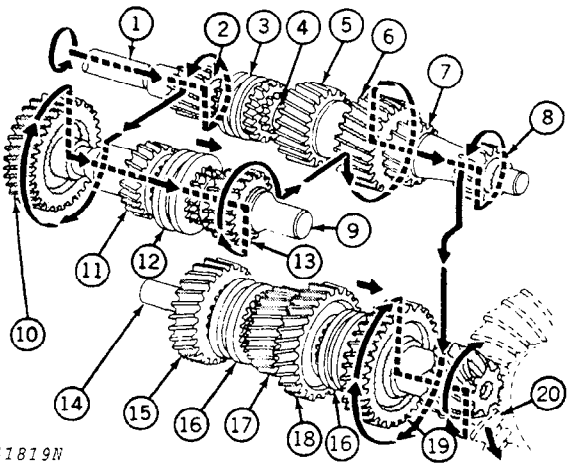
Park Position

Place the right-hand shift lever in any gear and the left-hand in park position. This locks the differential drive shaft to the transmission drive shaft and the transmission drive shaft to the drive shaft front quill which is secured to the transmission case.

Tow Position

Place both gear shift levers in neutral position.

Never tow the tractor at speeds greater than 15 mph [24 km/h]. When towing the tractor to start it, never tow at speeds greater than normal for the gear the tractor is being started in. Tow the tractor only in sixth, seventh, or eighth gear at these times.



T31819N

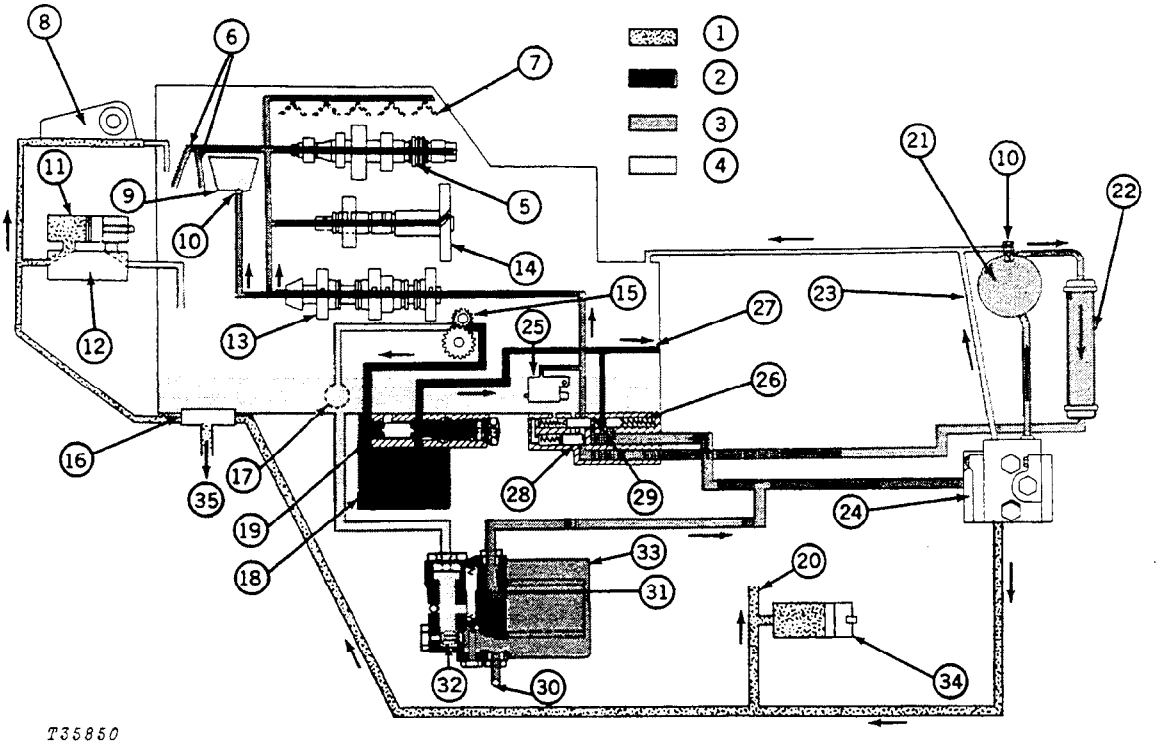
1—Clutch Shaft
2—Drive Gear
3—High Range Shifter Collar
4—Transmission Drive Shaft
5—Third and Seventh Speed Drive Gear
6—Fourth and Eighth Speed Drive Gear
7—Second and Sixth Speed Drive Gear
8—First and Fifth Speed Drive Gear
9—Countershaft
10—Countershaft Drive Gear
11—Reverse Range Pinion
12—Shifter Collar
13—Low Range Pinion
14—Differential Drive Shaft
15—Third and Seventh Speed Driven Gear
16—Shifter Collar (2 used)
17—Fourth and Eighth Speed Driven Gear
18—Second and Sixth Speed Driven Gear
19—First and Fifth Speed Driven Gear
20—Differential

Fig. 2-Collar Shift Transmission (Power Flow in First Speed Illustrated)

The above illustrates the collar shift transmission parts. Gear combinations to obtain first gear are also shown.

Group 25
HYDRAULIC SYSTEM

GENERAL INFORMATION



1—High Pressure Oil
2—Intermediate Pressure Oil
3—Low Pressure Oil
4—Pressure Free Oil
5—Transmission Drive Shaft
6—Lube to Final Drives
7—Transmission Oil Spray
8—Rockshaft
9—Transmission Oil Cup
10—Check Valve
11—Remote Cylinder
12—Selective Control Valve
13—Differential Drive Shaft
14—Countershaft
15—Transmission Oil Pump
16—Pressure Control Valve
17—Intake Screen
18—Transmission Filter
19—Relief Valve
20—To Power Steering Valve
21—Hydraulic Reservoir
22—Oil Cooler
23—Bleed Line
24—Main Hydraulic Pump
25—Brake Valve
26—Pressure Regulating Valve
27—To Reverser Control Valve
28—Lube Reduction Valve
29—Cooler Bypass Relief Valve
30—Return from Mounted Equipment
31—Relief Valve
32—Surge Relief Valve
33—Auxiliary Filter
34—Accumulator
35—To Loader Control Valve

Fig. 1-Hydraulic System (Without Backhoe)

TESTING AND ADJUSTMENT

Transmission Oil Pump Flow Test

Start the engine and operate functions to heat the oil to 100°F (38°C).

Stop the engine and check transmission oil level.

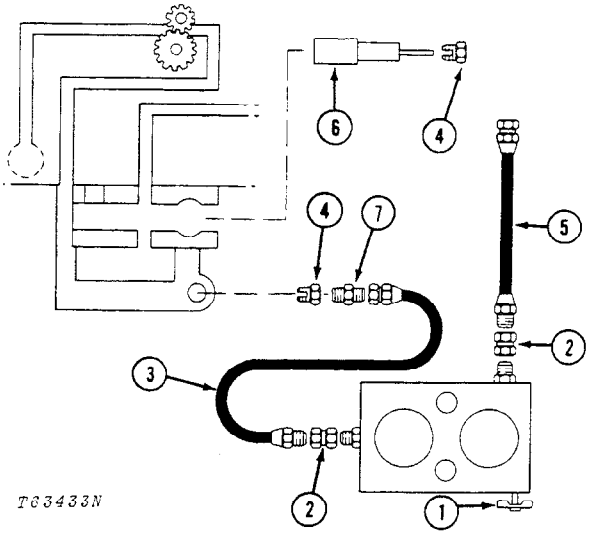
Remove the transmission filter cover and filter.

Install the dummy filter and flow meter as shown in Figure 4 or 5.

NOTE: If dummy filter assembly leaks, grind a step back on the filter housing cover assembly JD-293-1 as shown in Figure 6.

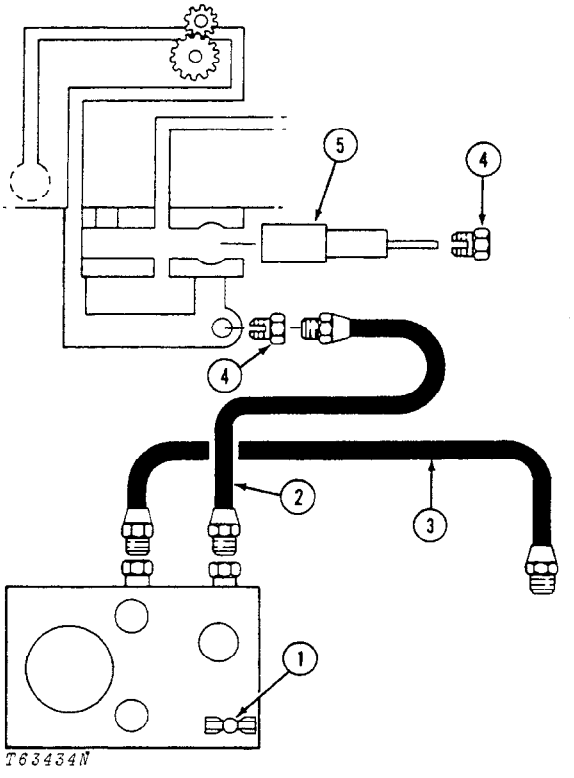
The tester inlet hose attaches to the filter housing cover using a D-89 fitting.

The tester outlet hose should be inserted into the transmission filler neck.



1—Pressure Loading Valve Handle
2—D-96
3—D-91 Tester Inlet Hose
4—D-89
5—D-91 Tester Outlet Hose (to trans. filler neck)
6—Dummy Filter Relief Valve Spool
7—D-88

Fig. 4-Transmission Oil Pump Test Using Nuday Hydraulic Tester



1—Pressure Loading Valve Handle
2—Tester Inlet Hose
3—Tester Outlet Hose (to trans. filler neck)
4—D-89 Fitting
5—Dummy Filter Relief Valve Spool

Fig. 5-Transmission Oil Pump Test Using OTC Hydraulic Tester

Remove transmission oil filter relief valve plug.

Remove oil filter relief valve cartridge.

Install dummy filter relief valve spool (JD-293-4).

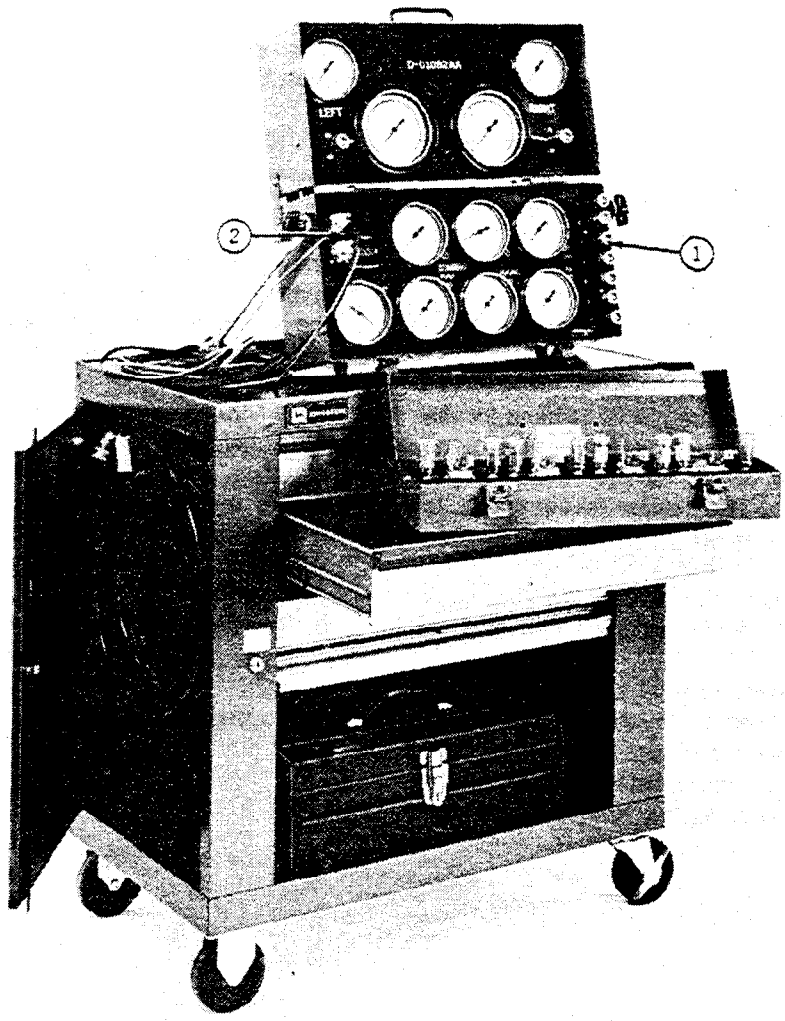
Secure the spool assembly JD-293-4 into the relief valve port with the D-89 fitting. Do not cap the fitting.

NOTE: If oil leaks from the D-89 fitting during test, stop and check the dummy filter for proper installation of components or leaking O-rings.

HYDRAULIC SYSTEM ANALYZER

Group 26
HYDRAULIC SYSTEM (ANALYZER)

GENERAL INFORMATION



1—Master Hydraulic System Analyzer **2—Tachometer/Temperature Reader**

Fig. 1-Hydraulic System Analyzer

HYDRAULIC OIL TEMPERATURE: 122 to 131°F (50 to 55°C) sensor on main pump inlet line.
ORIFICE USED: 202836, 0.125 in. (3.18mm), remove the circuit relief valve for bucket dump and install orifice.
SETTING OF THUMB DIALS: 142

ENGINE RPM	MAIN PUMP OUTLET PRESSURE		MAIN PUMP INLET PRESSURE		TRANSMISSION PUMP OUTLET
	IN STROKE	STANDBY	IN STROKE	STANDBY	STANDBY
1000	1450 psi min. (100 bar min)	2200 to 2300 psi (152 to 159 bar)	10 to 35 psi (0.7 to 2.41 bar)	15 to 40 psi (1.03 to 2.76 bar)	145 to 160 psi (9.99 to 11.03 bar)
2200		2200 to 2400 psi (152 to 165 bar)	30 to 130 psi (2 to 9 bar)	30 to 130 psi (2 to 9 bar)	145 to 170 psi (9.99 to 11.72 bar)
1510 MAX.	2000 psi (138 bar)	HIGH PRESSURE CIRCUIT TEST			

T68729

Fig. 10-Test Specifications

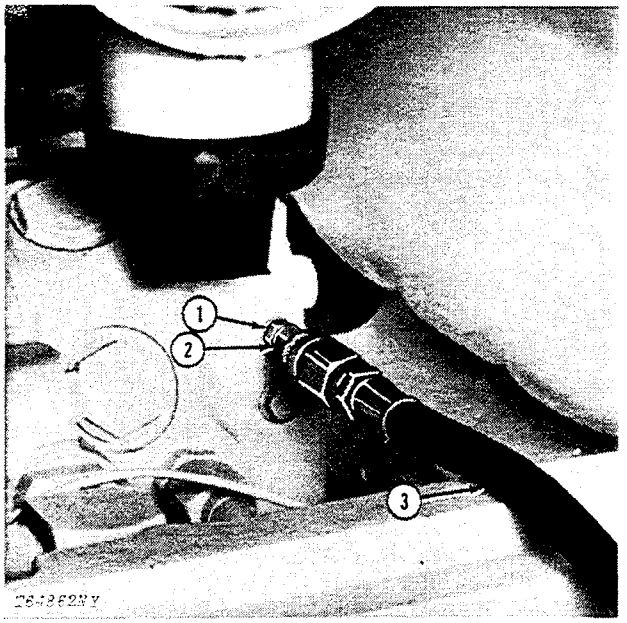
Hold the engine at 1000 rpm and follow the procedure below:

1. Put the main pump in stroke. Write the pressure for main pump outlet on Test Record.
2. Put the main pump in standby. Write the pressure for main pump outlet on Test Record.
3. Put the main pump in stroke. Write the pressure for main pump inlet on Test Record.
4. Put the main pump in standby. Write the pressure for main pump inlet on Test Record.
5. Put the main pump in standby. Write the pressure for transmission pump outlet on Test Record (units with reverser).

Hold the engine rpm at 2200 rpm and follow the procedure below:

1. Put the main pump in standby. Write the pressure for main pump outlet on Test Record.
2. Put the main pump in stroke. Write the pressure for main pump inlet on Test Record.
3. Put the main pump in standby. Write the pressure for main pump inlet on Test Record.
4. Put the main pump in standby. Write the pressure for transmission pump outlet on Test Record (units with reverser).
5. Run the engine at low idle. Put the main pump in stroke. Slowly increase engine rpm until there is 2000 psi (138 bar) at main pump outlet. Write the rpm for high pressure circuit test on Test Record.

Standby Pressure Test



1—202853 Straight Fitting (Pump Outlet Pressure)
2—202850 Coupling Adapter
3—36953 Hose Assembly with Valve 144 in. (3 658 mm)

Fig. 17-Main Pump Test Connection

⚠ CAUTION: Operate the steering valve and loader control valve to release hydraulic pressure in the system.

Slowly remove plug from test port of main pump to release any hydraulic pressure remaining in system.

Install fittings (1 and 2, Fig. 17) and hose assembly (3) into test port. Connect hose assembly to No. 1 coupling adapter on Hydraulic Analyzer.

Install the Tachometer/Temperature Reader as shown in System Test, page 70-26-8.

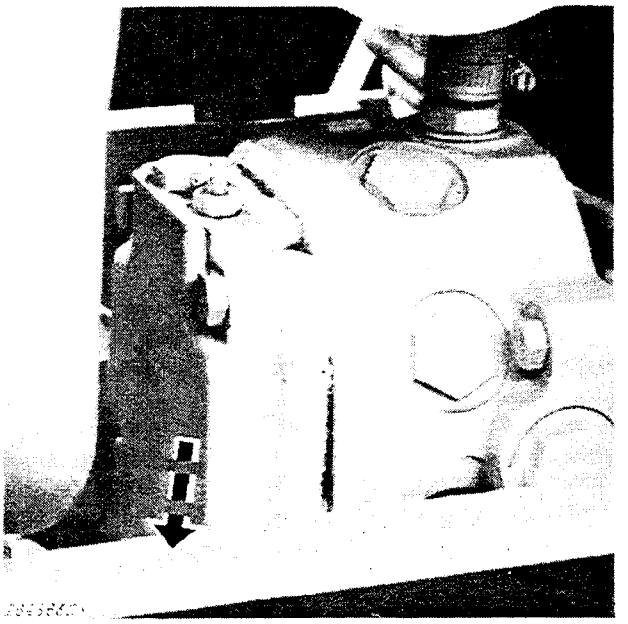


Fig. 18-Standby Pressure Adjustment Screw Location

Start engine and run at fast idle. Operate the loader or backhoe functions to heat the hydraulic oil to 122 to 131°F (50 to 55°C).

NOTE: If orifice is installed, use orifice flow to heat the hydraulic oil.

After the hydraulic oil is heated, let the pump return to standby.

Run the engine at 2500 rpm. Read the standby pressure on the pressure gauge. Standby pressure is 2350 ± 50 psi (162 ± 3 bar).

If an adjustment is necessary, turn the screw (Fig. 18) clockwise to increase standby pressure or counterclockwise to decrease standby pressure.

Group 35
SPECIFICATIONS AND SPECIAL TOOLS

ENGINE

SPECIFICATIONS AND TORQUE VALUES

Basic Engine	Minimum compression readings: Diesel ..... 300 psi (21.09 kg/cm²) Gasoline ..... 120 psi (8.49 kg/cm²) The most important factor in compression readings is the difference between cylinders. This difference should be no more than 25 psi (1.8 kg/cm²) for gasoline engines and no more than 50 psi (3.6 kg/cm²) for diesel engines.
Engine Lubrication System	Oil pressure at 2500 rpm with engine at normal operating temperature ..... 50 ± 15 psi (3.5 ± 1 bar)
Engine Cooling System	Fan Belt Adjustment With Gauge (initial) ..... 100 to 110 lbs. (45.4 to 49.9 kg) tension (after 3 minutes of operation) ..... 80 lbs. minimum (36.3 kg) Without gauge ..... 3/4-inch (19.0 mm) flex at 25 lbs. force (11.3 kg)
Fuel System	Fuel supply pump at low idle Vacuum ..... 2 to 2.5 inches of water (5.0 to 6.2 mbar) Pressure ..... 2 to 2.5 psi (0.14 to 0.17 kg/cm²) Injection pump cam advance JDB331-AL2406 Marks on timing window are two pump degrees apart.

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POWER TRAIN

SPECIFICATIONS AND SPECIAL TOOLS

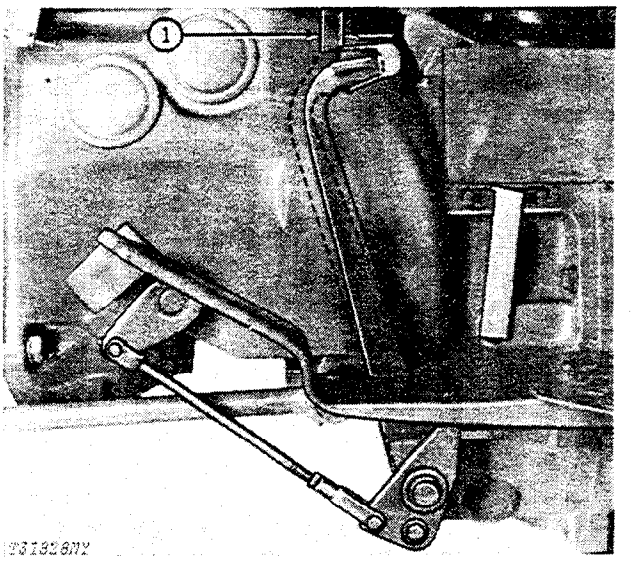

Fig. 14-Clutch Pedal Free Travel (Units Without Reverser)

1. Free travel (units with continuous PTO) ..... 1-in. (25.400 mm)

   Distance from the pedal arm to where the arm hits the pedal stop (units with independent or no PTO) ..... 5 in. (127 mm)

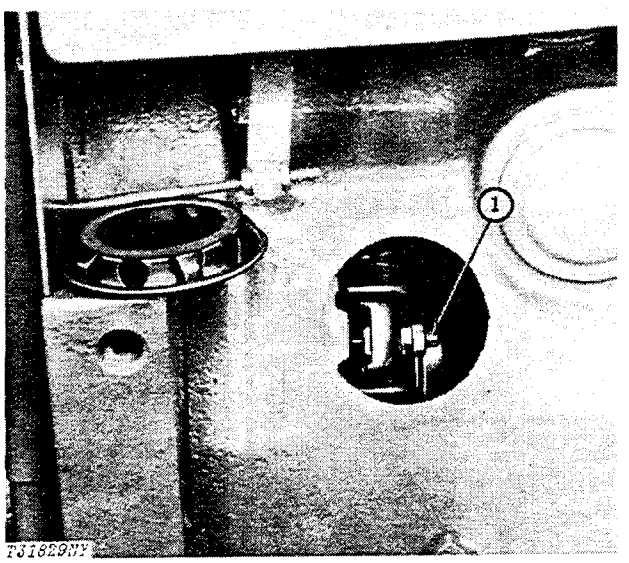

Fig. 15-Adjusting Clutch Operating Levers

1. Loosen the three clutch operating bolt nuts until the clutch operating lever contacts the powershaft clutch plate pins. Rotate flywheel and tighten operating bolt nuts 2-1/2 turns.