

3020 Tractor (123,000-)



TECHNICAL MANUAL

**3020 Tractor
(123,000-)**

TM1005 (01OCT73) English

**John Deere Tractor Works
TM1005 (01OCT73)**

**LITHO IN U.S.A.
ENGLISH**



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BEFORE DELIVERING TRACTOR—Continued

Service	Specifications	Reference
Check engine speeds; corresponding 1000 rpm PTO shaft speed given in parenthesis	Diesel - 800 (387) rpm, 2270 (1097) rpm, 2650 (1281) rpm Gasoline and LP-gas - 800 (387) rpm, 2360 (1140) rpm, 2690 (1300) rpm.	Section 20, Group 35
<u>Operation</u>		
Check transmission clutch free travel (Syncro-Range transmission).	Approximately 1-1/2-inch free travel (at least 3/4 in.)	Operator's manual
Check engine disconnect clutch (Power Shift transmission).	No tendency for tractor to creep with disconnect clutch disengaged.	Section 50, Group 15
Shift transmission through all speeds.		Operator's manual
Check Power Front Wheel Drive operation.		Operator's manual
Check power takeoff operation		Operator's manual
Check differential lock operation.		Operator's manual
Check brakes and accumulator	3 in. maximum travel for one emergency application immediately after stopping engine	Operator's manual
Check hydraulic system operation: Rockshaft, steering, and remote cylinder		Operator's manual
Check implement hitch operation.		Operator's manual
Check seat operation.		Operator's manual
Adjust headlights and check operation		Operator's manual
<u>General</u>		
Tighten accessible nuts and cap screws.		
Clean tractor and touch up paint		

Section 10

GENERAL

CONTENTS OF THIS SECTION

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Group 5

GENERAL TRACTOR SPECIFICATIONS

PTO HORSEPOWER (Official test at 2500 engine rpm with syncro-range transmission)

Diesel.	71.26 hp.
Gasoline.	71.37 hp.
LP-gas.	70.66 hp.

ENGINE

Type . . . 4-stroke cycle, 4-cylinder in-line, valve-in-head

Bore and Stroke:

Diesel	4-1/4 x 4-3/4 in.
Gasoline and LP-gas	4-1/4 x 4-1/4 in.

Displacement:

Diesel	270 cu. in.
Gasoline and LP-gas	241 cu. in.

Compression ratio:

Diesel	16.5 to 1
Gasoline	7.5 to 1
LP-gas	9.0 to 1

Firing order 1-3-4-2

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ENGINE—Continued

Engine speeds:

Normal slow idle.	800 rpm
Working range.	1500 to 2500 rpm

COOLING SYSTEM

Type. Pressurized system with centrifugal pump

Engine temperature control . . . Heavy-duty thermostat

LUBRICATION SYSTEM

Type Force-feed, pressurized with full-flow oil filter.

FUEL SYSTEM

Diesel . . . Direct injection, inlet metering, distributing-type.
Diaphragm-type fuel pump.

Group 20

LUBRICATION

GENERAL INFORMATION

Carefully written and illustrated instructions are included in the tractor operator's manual. Remind your customer to follow the recommendations in these instructions.

For your convenience when servicing the tractor, the following chart showing capacities and type of lubricant for the various components has been included. Additional lubrication information is on page 20-2.

Component	Capacity	Type of Lubricant	Interval of Service
Engine crankcase	7 U.S. quarts 8 U.S. quarts with filter change	See "Engine Lubricating Oils" on page 20-2	10 Hours - Check level 100 Hours - Change oil 200 Hours - Change filter
Transmission and Hydraulic System	*8 U.S. gallons (Syncro-Range) *11 U.S. gallons (Power Shift)	John Deere Type 303 Special-Purpose Oil	200 Hours - Check level 600 Hours - Replace filter 1200 Hours - Change oil
Hi-Crop Final Drive Housing	1-3/4 U.S. quarts	Above 32° F., SAE 90 Multipurpose-type gear lubricant; Below 32° F., SAE 80 Multipurpose-type gear lubricant	200 Hours - Check level 1200 Hours - Change oil
Belt Pulley	2-1/2 U.S. pints	John Deere Type 303 Special-Purpose Oil	200 Hours - Check level 600 Hours - Change oil
Front Wheel Bearings		Wheel Bearing Grease	1200 Hours - Repack bearing
Grease Fittings		John Deere Multi-Purpose Lubricant or an equivalent SAE multipurpose-type grease	See Operator's Manual
Distributor Cam	Trace	Cam Lubricant	200 Hours

*Add 4-1/2 gallons to capacity if equipped with Power Front Wheel Drive.

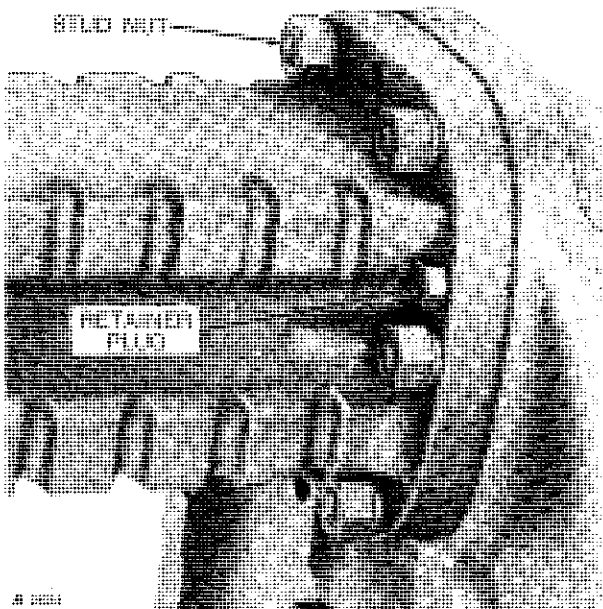


Fig. 26—Stud Nuts and Retainer Plug

INSTALLATION

Reverse the removal procedures to install the final drive assemblies.

IMPORTANT: To prevent serious damage, be sure that the sun pinion does not work outward far enough to allow the brake disk to drop inside the sun pinion teeth when installing the final drive housing.

TORQUES FOR HARDWARE

Item	Torque (ft.-lbs)
Hydraulic pump drive coupling.	25
Hydraulic pump support to cylinder block.	85
Side frames-to-engine front support and flywheel housing.	250
Clutch housing-to-engine.	1/2 in.— 85 3/4 in.—300
Clutch housing-to-transmission case screws and nuts.	5/8 in.—170 3/4 in.—300
Axle housing-to-transmission case.	130
Axle housing-to-Roll-Gard.	300
Cab rear mounting bolts-to-axle housing (Stolper).	300
Cab rear mounting bolts-to-axle housing (Hinson).	55
Cab front mounting bracket-to-clutch housing cap screws (Hinson).	85
Nylon hydraulic bleed line	Finger tight, then 1/6 to 1/3 turn more

			
Bolt Diameter	Plain Head*	Three Radial Dashes*	Six Radial Dashes*
1/4	6	10	14
5/16	13	20	30
3/8	23	35	50
7/16	35	55	80
1/2	55	85	120
9/16	75	130	175
5/8	105	170	240
3/4	185	300	425
7/8	160**	445	685
1	250**	670	1030

*The types of bolts and cap screws are identified by head markings as follows:

Plain Head: regular machine bolts and cap screws.

3-Dash Head: tempered steel high-strength bolts and cap screws.

6-Dash Head: tempered steel extra high-strength bolts and cap screws.

**Machine bolts and cap screws 7/8-inch and larger are sometimes formed hot rather than cold, which accounts for the lower torque.

SPECIAL TOOLS

No.	Name	Use
JDE-63*	Engine Lift Brackets	Engine removal
JDG-1*	Engine Sling	Engine removal
JDG-2*	Support Stands	Tractor separation.
.....	Pulling Tool (See Page 25-12)	PTO clutch gear removal
.....	Lift Brackets (See Page 25-12)	Clutch housing assembly lifting
.....	Clutch Pack Installation tool (See page 25-12)	Install transmission pump and clutch pack assembly
.....	Cab Lifting Brackets (Fig. 30)	Removing Roll-Gard Cab (Stolper)

*Order from: Service Tools, Inc., 1901 Indiana Avenue, Chicago, Illinois 60616.

Group 5

GENERAL INFORMATION AND DIAGNOSIS

GENERAL INFORMATION

The engine is a 4-cylinder valve-in-head, vertical in-line four cycle engine. Three types of fuel each with the appropriate fuel delivery device are available--gasoline, LP-gas, and diesel.

 For basic theory of engine operation see the FOS Manual 30--ENGINES.

DIAGNOSING MALFUNCTIONS

WILL NOT START

Fuel System Malfunction--See Section 30

- Foreign matter in fuel
- Improper fuel
- Faulty fuel pump
- Fuel shut off at tank
- Restricted air intake system
- Faulty injection nozzles
- Plugged fuel filter
- Carburetor malfunction
- Sticking choke

Electrical System Malfunction--See Section 40

- Corroded or loose battery connections
- Faulty or loose wiring
- Weak battery
- Faulty key switch
- Faulty safety start switches
- Faulty ignition system

UNEVEN RUNNING OR FREQUENT STALLING

Basic Engine Problem--See This Section

- Improper valve clearance
- Cylinder head gasket leaking
- Valves sticking or burned
- Worn or broken compression rings
- Low compression
- Incorrect timing
- Coolant temperature below normal
- Engine overheating

Fuel System Malfunction--See Section 30

- Low fuel supply
- Restricted fuel lines or filters
- Faulty fuel pump
- Faulty injection pump

- Faulty injection nozzles
- Exhaust system restricted
- Carburetor adjusted incorrectly
- Leaking carburetor or intake manifold gaskets

Electrical System Malfunction--See Section 40

- Faulty ignition system

ENGINE MISSES

Basic Engine Problem--See This Section

- Worn camshaft lobes
- Weak valve springs
- Incorrect valve clearance
- Burned, warped, pitted or sticking valves
- Low compression
- Incorrect timing
- Engine overheating
- Faulty governor
- Detonation or pre-ignition

Fuel System Malfunction--See Section 30

- Air in fuel
- Faulty injection nozzles
- Faulty injection pump
- Water in fuel
- Mixture of gasoline and diesel fuels
- Faulty fuel pump
- Faulty carburetor

Electrical System Malfunction--See Section 40

- Incorrect type spark plugs (pre-ignition)
- Leaks in wiring
- Faulty ignition system

LACK OF POWER

Basic Engine Problem--See This Section

- Blown cylinder head gasket
- Worn camshaft lobes
- Incorrect valve clearance
- Burned, warped, pitted or sticking valves
- Weak valve springs
- Incorrect timing
- Low compression
- Wrong oil viscosity
- Coolant temperature above or below normal
- Engine overheating
- Incorrect throttle linkage
- Governor binds

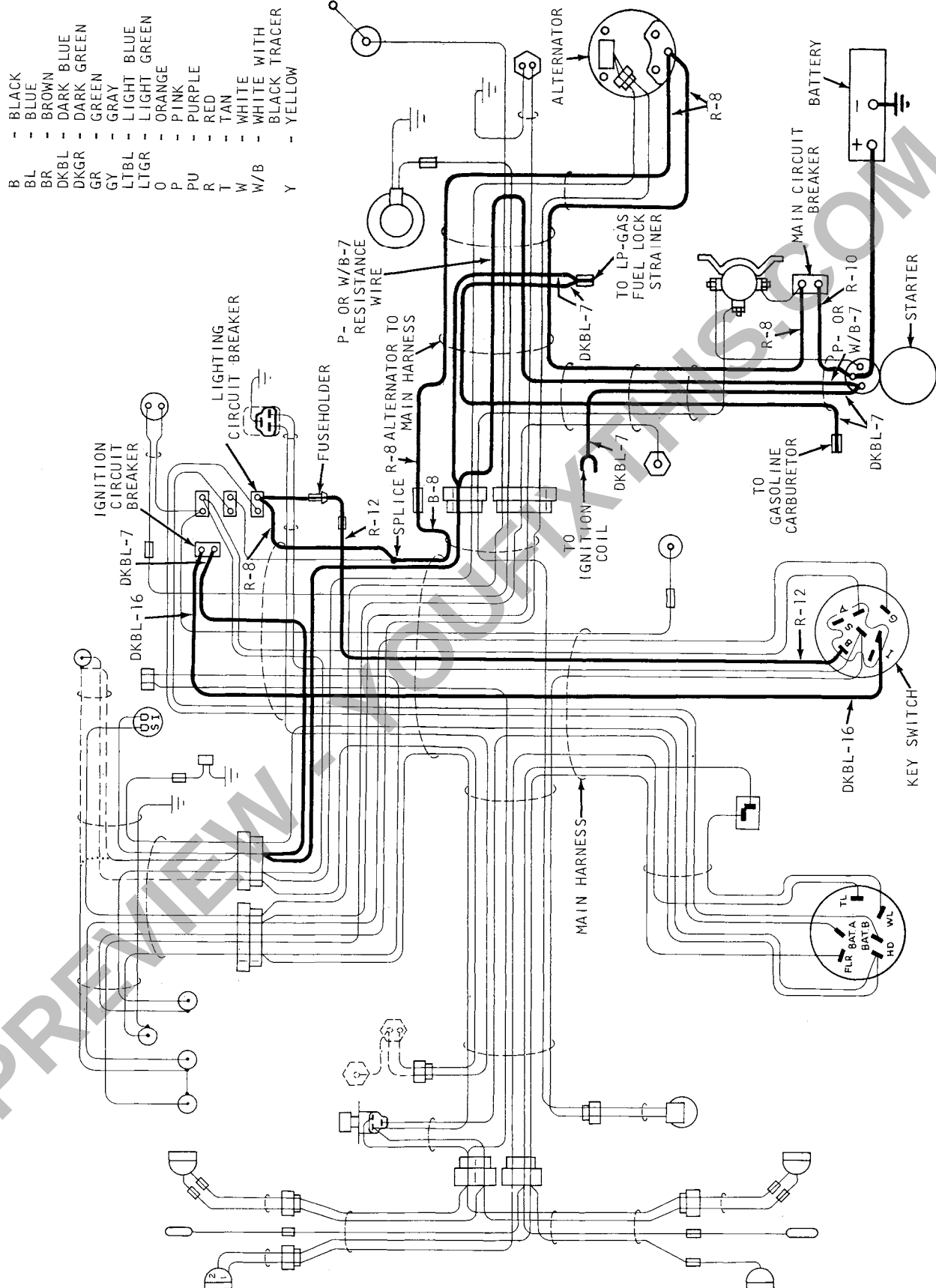
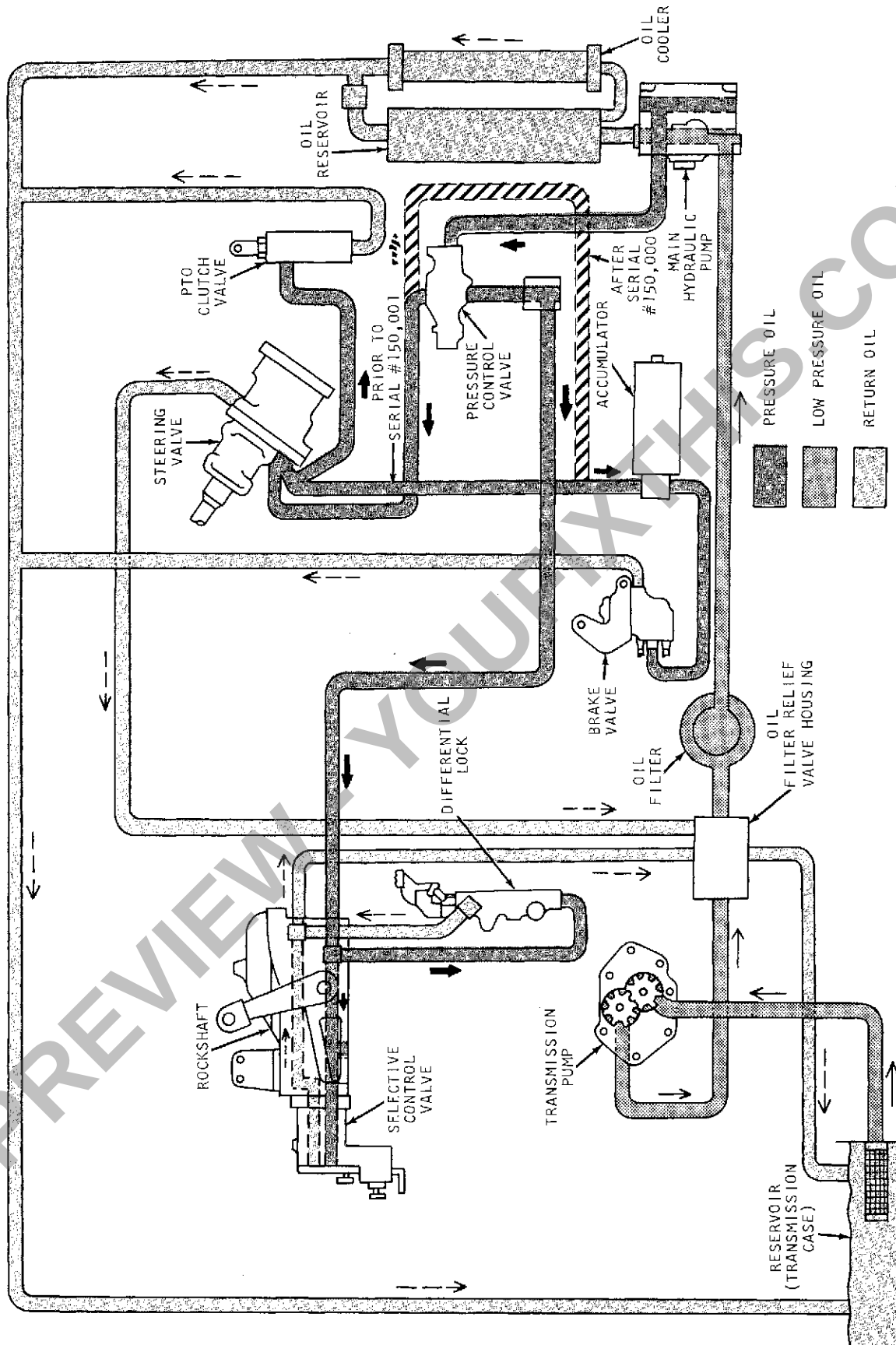


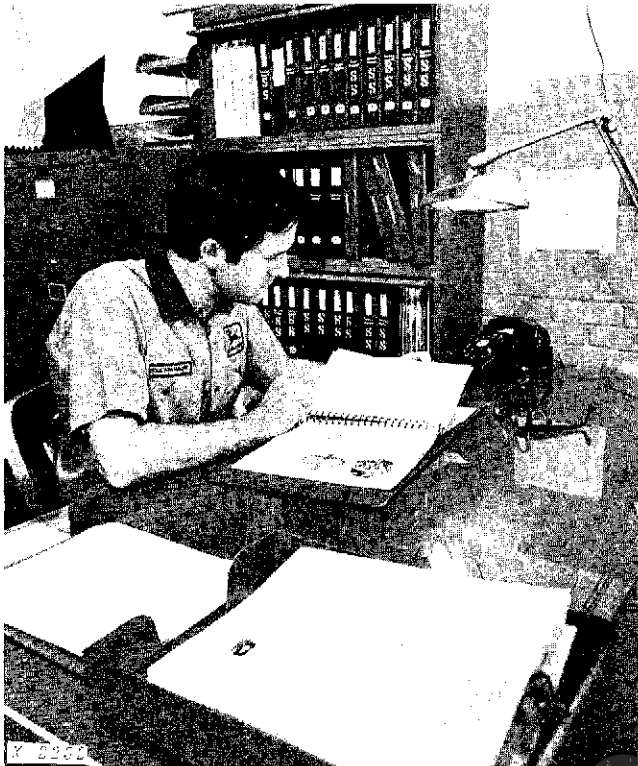
Fig. 6-Ignition Circuit for Tractors Serial Number 150,001 and After (Shown in Bold Line)



R 17195

Fig. 1-Circuit Flow Diagram

INTRODUCTION



Use FOS Manuals for Reference



Use Technical Manuals for Actual Service

This technical manual is part of a twin concept of service:

- **FOS Manuals—for reference**
- **Technical Manuals—for actual service.**

The two kinds of manuals work as a team to give you both the general background and technical details of shop service.

Fundamentals of Service (FOS) Manuals cover basic theory of operation, *fundamentals* of trouble shooting, *general* maintenance, and *basic* types of failures and their causes. FOS Manuals are for training new men and for reference by experienced men.

Technical Manuals are concise service guides for a *specific* machine. Technical Manuals are on-the-job guides containing only the vital information needed by a journeyman mechanic.



When a serviceman should refer to a FOS Manual for more information, a FOS symbol like the one at the left is used in the TM to identify the reference.

Some features of this technical manual:

- *Table of contents at front of whole manual*
- *Contents at front of each Section*
- *Specifications at end of each Group*
- *Special tools at end of each Group*



This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

This technical manual was planned and written for you—a journeyman mechanic. Keep it in a permanent binder in the shop where it is handy. Refer to it whenever in doubt about correct service procedures or specifications.

Using the technical manual as a guide will reduce error and costly delay. It will also assure you the best in finished service work.

Item	New Part	Wear Tolerance
CAMSHAFT		
O.D. of camshaft bushing journals	2.3745 to 2.3755 in.	0.0010 in.
I.D. of camshaft bushings	2.3775 to 2.3795 in.	
End thrust taken at front by	thrust plate	
End play	0.0025 to 0.0085 in.	0.0150 in.
Thrust plate thickness	0.187 to 0.189 in.	0.0050 in.

TORQUES FOR HARDWARE

Location	Torque (ft-lbs)
Rocker arm cover to head	20
Rocker arm shaft clamps to head	55
Cylinder head to block.	130 $\pm$ 5
Injection nozzles	20
Fan to fan hub	35
Water manifold to head	35
Intake manifold to head	35
Exhaust manifold to head	35
Camshaft thrust plate to block	20
Camshaft gear to camshaft.	85
Timing gear cover to block	30
Fan drive damper pulley to crankshaft.	150
Hydraulic pump support to block.	85
Hydraulic pump drive coupling	20
Side frames to cylinder block.	250

SPECIAL TOOLS

No.	Name	Use
1002**	Knurling Tool	Knurl valve guides
JDE-41296*	Puller	Remove cylinder head valve seat inserts
JDE-8*	Valve Seat Insert Driver	Install LP-gas cylinder head exhaust valve seat inserts
JDE-66*	Valve Seat Insert Driver	Install diesel cylinder head exhaust valve seat inserts (if applicable)
JDE-67*	Valve Seat Insert Driver	Install diesel cylinder head intake valve seat inserts (if applicable)
ND425***	Magnetic Holding Tool	Hold cam followers
JDE-6	Bushing Replacement Set	Replace camshaft bushings

*Order from: Service Tools, Inc., 1901 Indiana Avenue, Chicago, Illinois, 60616

**Order from: Unted Tool Processes Corp., Box 914, New Canaan, Connecticut, 06840

***Order from: NuDay Tool Co., 14615 Wyoming Avenue, Detroit, Michigan, 48238

REMOVAL

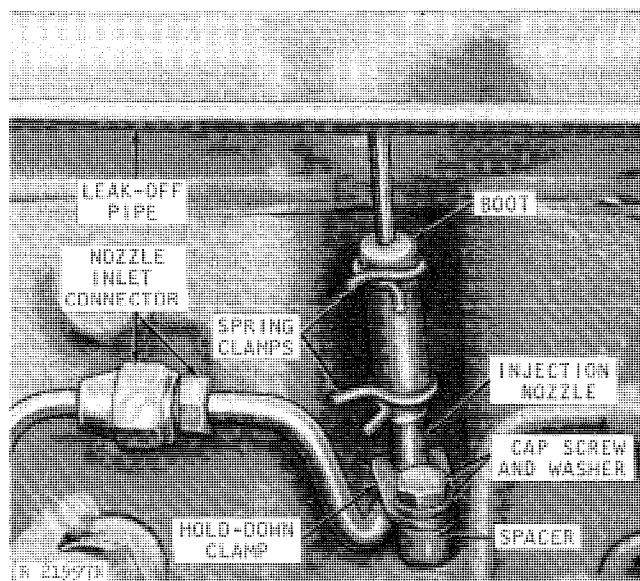


Fig. 13—Injection Nozzle Removal Steps

IMPORTANT: Disconnect battery ground cables before working on nozzles close to the alternator to prevent accidental short circuits through tools.

Disconnect nozzle from fuel pipe at connector (Fig. 13), using two wrenches.

Disconnect leak-off pipe from nozzle by removing leak-off boots and clamps.

Remove nozzle hold-down cap screw, washer, clamp, and spacer.

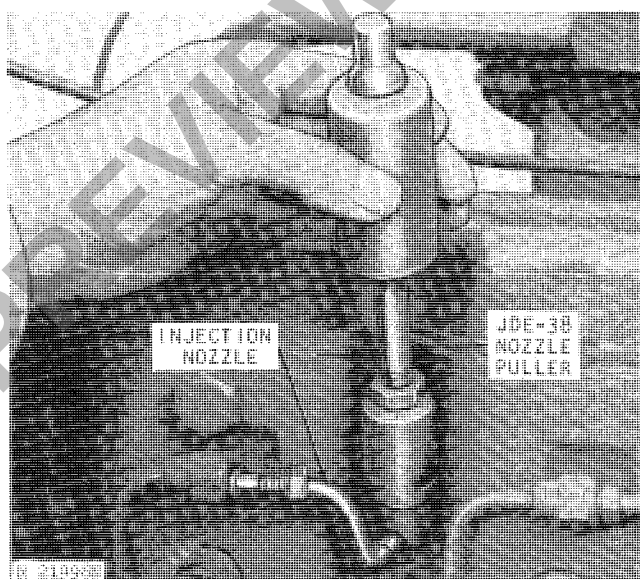


Fig. 14—Pulling Injection Nozzle

Remove injection nozzle. If nozzle cannot be easily removed from cylinder head, use a JDE-38 nozzle puller (Fig. 14).

IMPORTANT: Do not use a screwdriver or similar tool to pry injection nozzles from cylinder head. Doing so may cause distortion and permanent damage to the nozzles.

REPAIR

IMPORTANT: Do not attempt to test or disassemble nozzles unless the proper service tools are available. Service Manual SM-2045 "Testing and Servicing Fuel Injection Pumps and Nozzles" contains specifications, special service tools, and testing procedures necessary to service the Roosa Master injection nozzles.

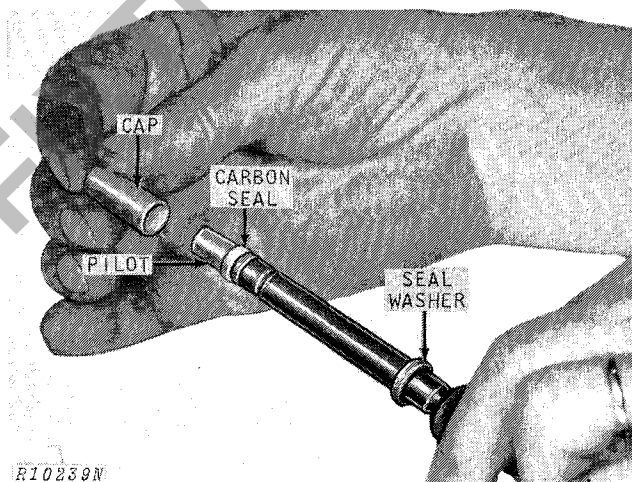


Fig. 15—Installing Sealing Washer and Carbon Stop Seal

Clean nozzle with specified brass brush. See "Special Tools."

Install new sealing washer (Fig. 15).

Install new carbon stop seal using pilot tool.

INSTALLATION

Use Special Tool JDE-39 to clean nozzle bore in engine cylinder head. Insert nozzle using a twisting motion. Turn injector-locating clamp until fork fits over inlet line.

Install cap screw and leaf spring around injector and position round spacer on end of cap screw under leaf spring.

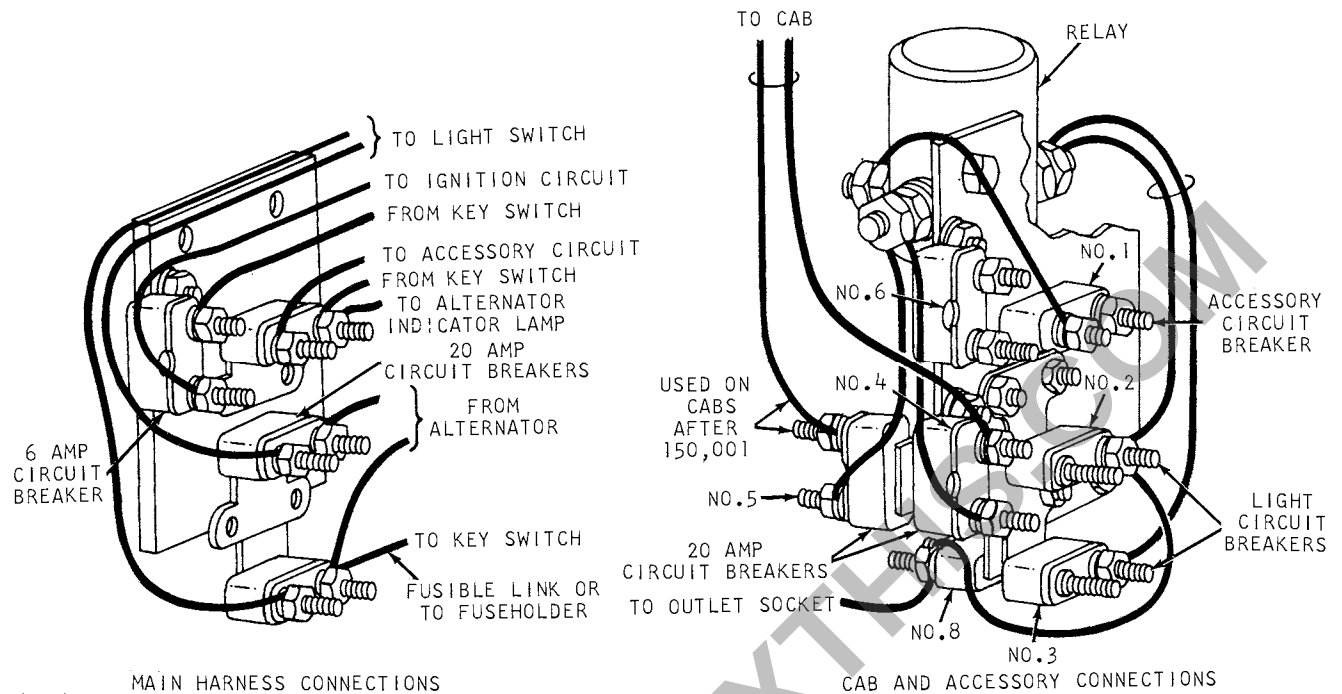


Fig. 17—Connections to Circuit Breakers at Electrical Load Center

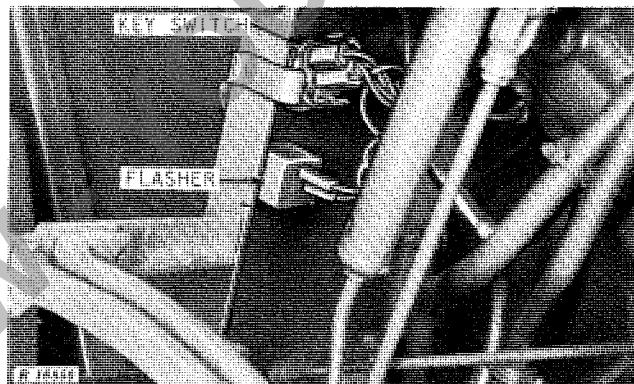


Fig. 18—Flasher

Remove the transmission clutch shaft and the PTO clutch shaft (Fig. 1) from the tractor as a unit. Withdraw the shafts carefully to prevent damaging oil seal in the clutch housing.

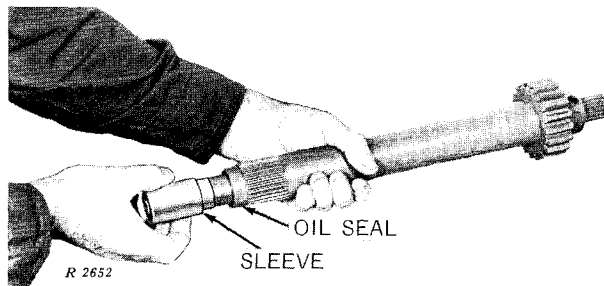


Fig. 2—Installing JDE-27 Sleeve

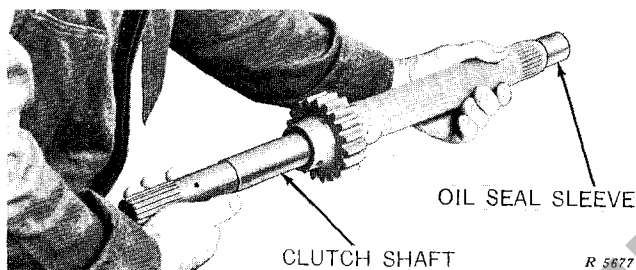


Fig. 3—Removing Clutch Shaft

Grease the small end of special sleeve JDE-27 and work it carefully into the seal (Fig. 2). Carefully withdraw the transmission clutch shaft from the PTO clutch shaft (Fig. 3). (If oil seal is to be replaced, disregard this step.)

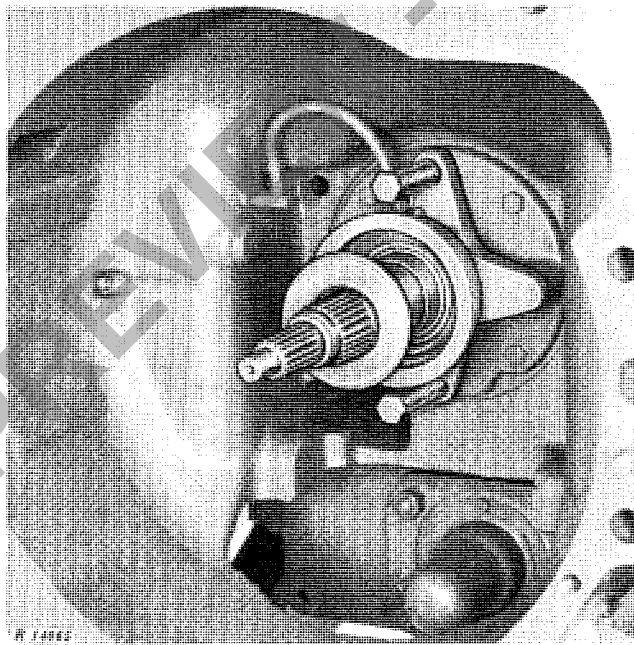


Fig. 4—Clutch Housing

If the clutch operating sleeve assembly (Fig. 4) is to be serviced, separate the tractor between the engine and the clutch housing. See Section 10, Group 25 for instructions.

If the clutch shafts are removed as instructed, the operating sleeve assembly can be removed as a unit for service.

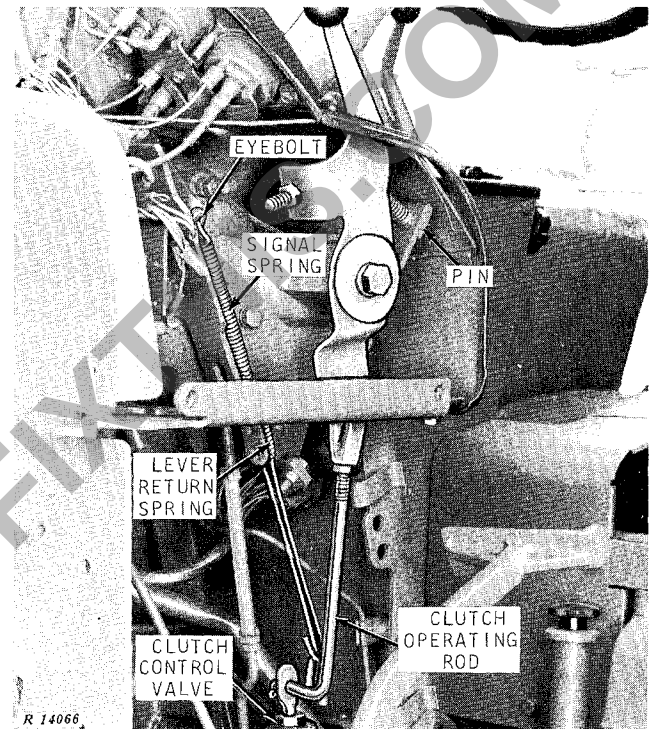


Fig. 5—PTO Clutch Control Lever

The PTO clutch control valve (Fig. 5) can be removed for service.

Do not remove PTO control lever assembly unless parts must be replaced.

REPAIR

If the bushing inside the PTO clutch shaft is worn, use JDE-25 driver to install a new one. Install new bushing with closed end of groove toward oil seal.

If the oil seal in the PTO clutch shaft is replaced, use the JDE-27 sleeve as a driver to install a new seal.

Use the JDE-27 sleeve to protect oil seal when installing the transmission clutch shaft into the PTO clutch shaft.

PLANETARY PACK

Removing Planetary Pack

Separate clutch housing from engine and remove clutch pack. See Section 10, Group 25 for instructions.

Remove snap ring and pull PTO drive gear with bearings from housing.

Remove reduction gear shaft bearing retainer from inside differential case. Use a long brass drift to reach through bore in planetary pack

from the front. Drive reduction gear shaft back enough to free bearing cup and shaft.

Use a simple tong type lifting tool to lift the planetary pack.

Repairing Planetary Pack

Inspect bushings in the C3 clutch piston housing (11 and 12, Fig. 32). Front bushing I.D. is 1.691 to 1.692 inches. Rear bushing I.D. is 1.753 to 1.754 inches. Rear bushings must be installed with the large chamfer on inside diameter to the outside.

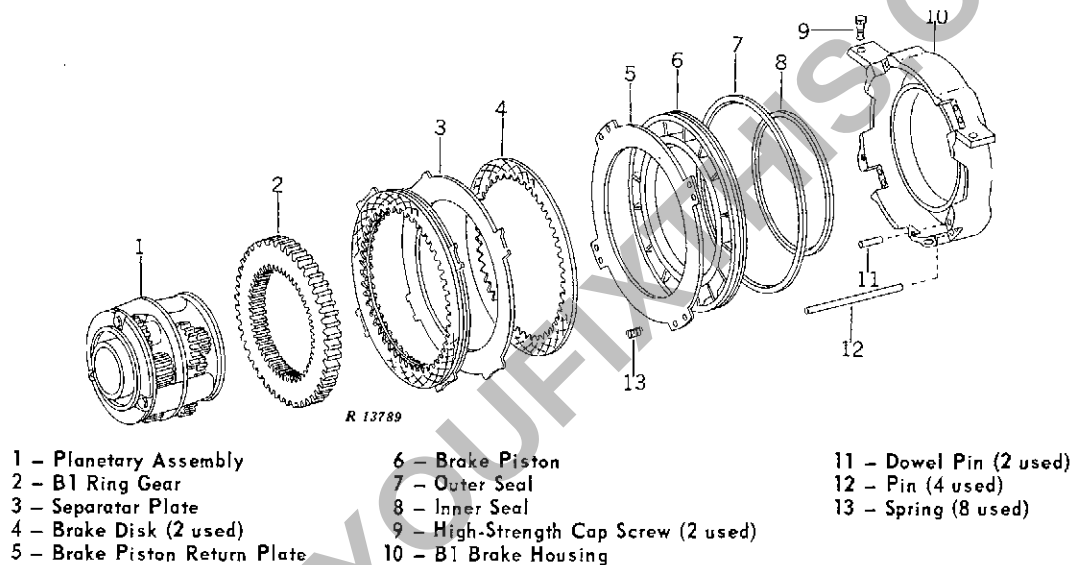


Fig. 29-B1 Planetary Brake Parts

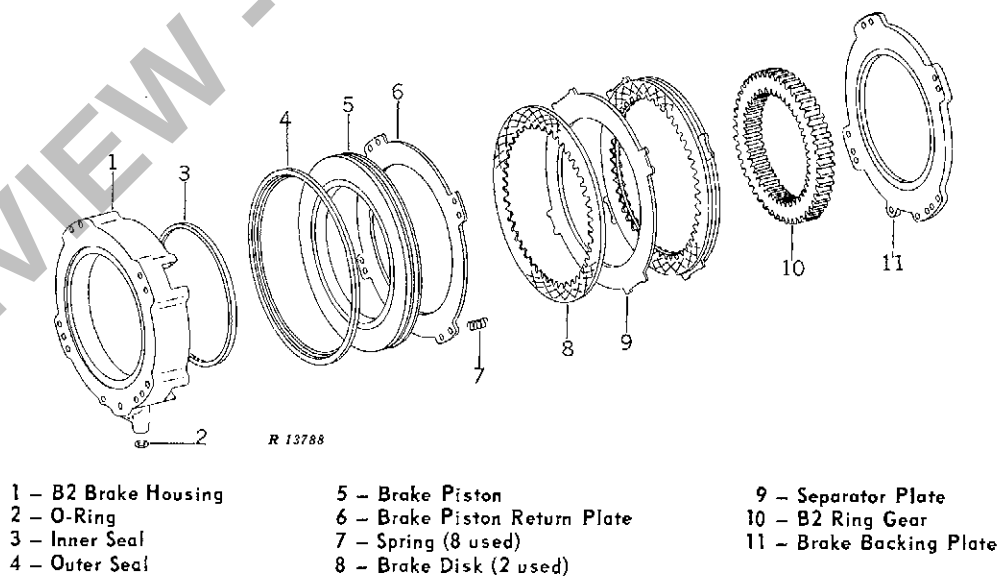


Fig. 30-B2 Planetary Brake Parts

Condition No. 1 is for end play; condition No. 2 for preload. Vary the shims located behind bearing race in front wheel hub according to feeler gauge measurement until wheel bearing is adjusted from 0.004 inch preload to 0.002 inch end play.

Install oil seal (11, Fig. 13) with the small holes in the seal facing toward the inner bearing.

Make up a simple driver to install the seal, or if a seal driver is not used, use a brass drift to drive the seal flush to 0.010-inch below shoulder on hub. The inner bearing can also be used to install the seal, but be sure to clean the bearing thoroughly before re-using.

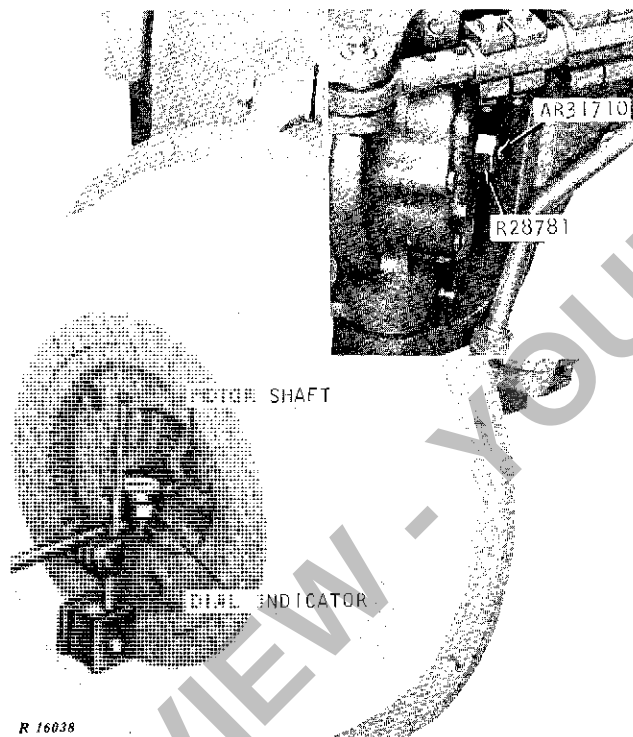


Fig. 20—Measuring Wheel Motor Shaft End Play

Correct end play of motor shaft is 0.006 to 0.012 inch.

Place a dial indicator on the front end of the wheel motor shaft. Remove plug from rear side of manifold. Use an R28781 bushing and an AR31710 adjusting screw as a tool to push the motor shaft forward to check motor shaft bearings (Fig. 20). Remove the washer from the AR31710 adjusting screw.

The above tool is necessary because of the spring in the motor housing. If the spring load is not relieved, a false reading will be obtained on the bearing adjustment.

Adjust motor shaft end play by adding or removing shims (17, Fig. 16).

ADJUSTMENTS

A low setting of the pressure control valve in relation to the tractor pressure control valve causes slow response of the rockshaft or remote cylinders. This is especially true at slow engine speeds in 4th gear with the power front wheel drive in high torque.

A high setting of this valve in relation to the pump pressure restricts flow, limiting the torque of the front wheels at higher speeds and causing overheating of the oil. (These same symptoms can be caused by internal leakages.)

The pressure control valve need not be reset unless one of the above conditions is present, in which case the pump pressure or the tractor pressure control valve setting should also be checked.

Install the correct number of shims (3, Fig. 17) to obtain 1930 to 1970 psi pressure at 2100 engine rpm. The oil must be at operating temperature to obtain a correct setting. This can be done by raising the front of the tractor and operating the front-wheel drive in high torque.

CAUTION: Be sure to observe all safety precautions. Use a hoist, not a jack, to raise the front of the tractor. Place transmission in park position and use a jumper wire to engage the high torque solenoid.

The pressure can be measured at any location which is at system pressure while the front drive is running at high torque.

Group 25 POWER BRAKES

GENERAL INFORMATION

The brake valve assembly contains operating valves to direct the flow of hydraulic oil to the brake cylinders. The operating valves can be operated separately or together.

Equalizing valves between the operating valves assure equal pressure to the brakes when both operating valves are open.

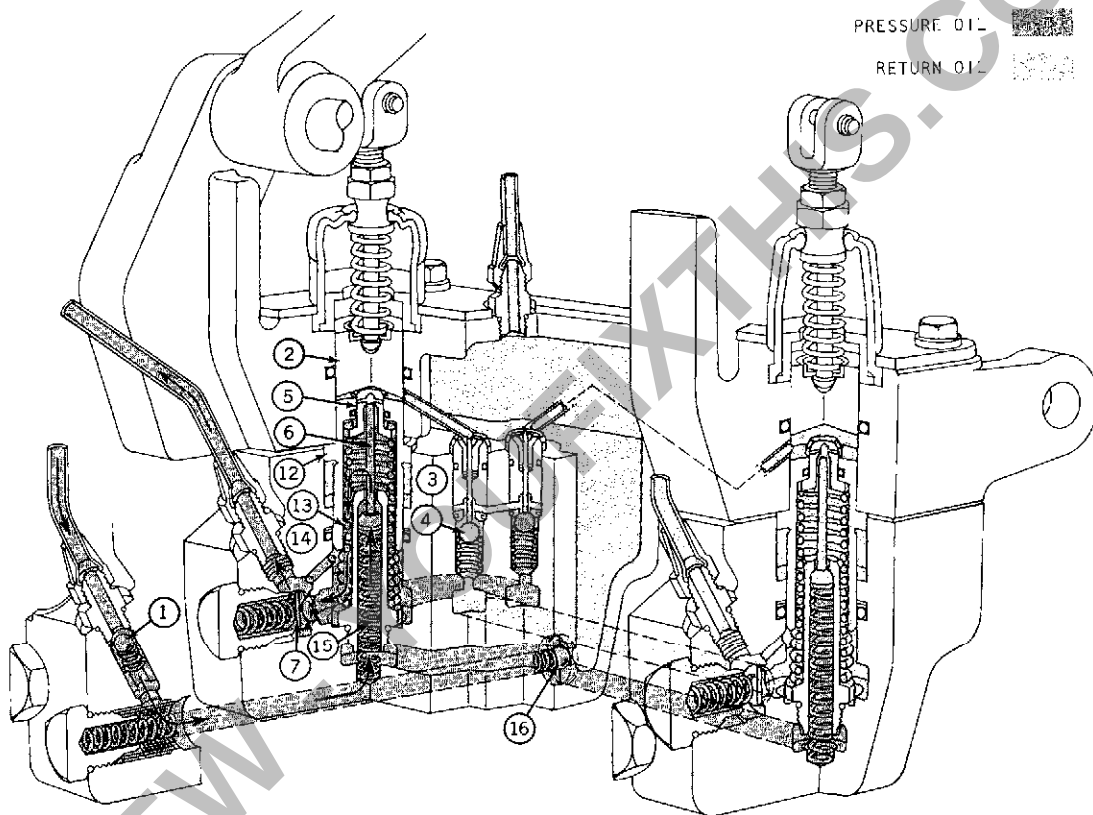


Fig 1-Power Brake Operation

OPERATION

INDIVIDUAL BRAKING

As one brake is applied, the equalizing valve opposite of it is opened in the first $\frac{3}{4}$ inch of pedal travel (see fig. 2).

Further travel of the pedal of approximately $\frac{1}{8}$ inch causes the operating rod (2) to move brake valve plunger (5) down and open the brake valve (6).

Pressure oil through the open brake valve forces the check valve disk (7) open and aids in keeping the applied brake equalizing valve closed.

The upper end of the brake valve seats in the brake valve plunger to prevent pressure oil flow into the reservoir area.

The pressure oil enters the wheel brake cylinders forcing the brake pistons and pressure plate against the brake disk. The disk is splined to the final drive shaft and sun pinion of the planetary assembly. The pressure plates move the brake disk against the brake backing plate to provide the braking action.

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