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Hydraulic System: Closed-center
Max. pressure ..... 2350 psi (162 bar) (165.2 kg/cm²)
Loader control ..... Single-lever
Backhoe control ..... Two-lever
Pump ..... Piston, constant pressure, variable-displacement, 38 gpm (144 L/min) @ 2500 engine rpm
Filter ..... 25-micron steel-enclosed paper cartridge in return

Gear: **Travel Speeds**

	mph		km/h	
	Fwd.	**Rev.**	**Fwd.**	**Rev.**
1	1.4	1.6	2.3	2.6
2	2.0	2.3	3.2	3.7
3	3.0	3.5	4.8	5.6
4	4.3	4.8	6.8	7.7
5	5.5	6.3	8.9	10.1
6	7.9	9.0	12.7	14.5
7	11.7	13.5	18.8	21.7
8	16.4	18.7	26.4	30.1

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

Hydraulic Cylinders:	**Bore**	**Stroke**
Loader boom	3.25 in. (83 mm)	28.7 in. (729 mm)
Loader bucket	3.25 in. (83 mm)	16.7 in. (424 mm)
Backhoe boom	4.5 in. (114 mm)	36.75 in. (932 mm)
Backhoe crowd	4.5 in. (114 mm)	35.5 in. (902 mm)
Backhoe bucket	3.5 in. (89 mm)	27.37 in. (695 mm)
Backhoe swing	4 in. (102 mm)	9.31 in. (236 mm)
Stabilizer	3.5 in. (89 mm)	16.94 in. (429 mm)
Cylinder rods	Ground, heat-treated, chrome-plated, polished	
Loader boom, backhoe swing and stabilizer cylinder rods	1.75-in. (44 mm) dia.	
Loader bucket cylinder rods	1.50-in. (38 mm) dia.	
Backhoe crowd, boom and bucket cylinder rods	2.25-in. (57 mm) dia.	

Tires: **Front**	**Rear**
11L-16, 10 ply rating, F3	16.9-24, 8 ply rating, R4
7.50/8.00-16, 10 ply rating F3	18.4-24, 8 ply rating, R4
	18.4-24, 10 ply rating, R4
	19.5L-24, 8 ply rating, R4
	21L-24, 8 ply rating, R4

Wheel Treads:
Front ..... 61 in. (1.55 m)
Rear ..... 66 in. (1.63 m)

Capacities:	**U.S.**	**Liters**
Cooling system	13 qt.	12.3
Fuel tank	19.5 gal.	73.8
Engine lubrication, including filter	9 qt.	8.5
Transmission and hydraulic system	20.5 gal.	77.6
Transmission only	10 gal.	37.8

Special Equipment:
Front axle counterweight
Cab w/heater, pressurizer, front and rear windshield wiper (includes ROPS)
Ripper tooth for backhoe
Bolt-on stabilizer street pads
Locking instrument panel cover
Parking brake
Extendable dipperstick
Backup alarm
Reversible stabilizer pads

Additional Standard Equipment:
Horizontal muffler w/vertical exhaust
Key switch w/push-button safety start
Oil pressure indicator light
Alternator charge indicator light
Water temperature gauge
Fuel gauge
Electric hour meter
Rigid-mount platform
Differential lock
Fenders
Bucket level indicator
Deluxe swing-around seat
Foot throttle
Electrically operated destroke valve for hydraulic pump
Antifreeze
Rear reflector
Lights
Cigar lighter
Transistorized voltage regulator
ROPS and seat belt w/canopy
Cold weather starting aid
Tachometer
Air cleaner restriction indicator
Horn

SAE Operating Weight ..... 14,210 lb. (6446 kg)

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OPERATING INFORMATION

BACKHOE

Lifting capacity:
Boom at full reach and full height ..... 1950 lb. (884 kg)
Dipper lifting, boom holding, full height ..... 3300 lb. (1497 kg)
Digging force (bucket cylinder in power-dig position) ..... 9650 lb. (43.25 kN) (4377 kg)
Digging force, crowd cylinder ..... 7158 lb. (32.08 kN) (3247 kg)

Buckets:

	Struck Capacity	Width
Standard	2.5 cu. ft. (0.071 m³)	12 in. (305 mm)
	3.6 cu. ft. (0.102 m³)	16 in. (406 mm)
	4.4 cu. ft. (0.125 m³)	18 in. (457 mm)
	6.0 cu. ft. (0.170 m³)	24 in. (610 mm)
	7.6 cu. ft. (0.215 m³)	30 in. (762 mm)
	7.2 cu. ft. (0.204 m³)	36 in. (914 mm)
Heavy-duty	4.4 cu. ft. (0.125 m³)	18 in. (457 mm)
	6.0 cu. ft. (0.170 m³)	24 in. (610 mm)
	7.6 cu. ft. (0.215 m³)	30 in. (762 mm)
Ejector	4.2 cu. ft. (0.119 m³)	24 in. (610 mm)

LOADER

Lifting capacity, full height ..... 5000 lb. (2268 kg)
Breakout force ..... 7500 lb. (33.62 kN) (3402 kg)
Raising time to full height ..... 4.6 sec.
Bucket dump time ..... 1.3 sec.
Lowering time (power) ..... 2.9 sec.

Buckets:

Nominal Heaped Capacity	Width
1 cu. yd. (0.76 m³)	89.4 in. (2.27 m)
1-1/4 cu. yd. (0.96 m³)	89.4 in. (2.27 m)

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Check brushes for continuity between points "A" to "C" and "B" to "D" (Fig. 12). Check insulated brush for grounds. When checking, wiggle the brush and lead to locate poor connections or intermittent ground.

Replace brush assembly if brush exposed length is 1/4 inch or less.

Diodes

A humming or growling sound with considerably low output (6 to 10 amps.) is caused by a shorted diode. If maximum output is slightly low (30 amps.) a diode may be open-circuited.

If available, use a diode tester and follow the manufacturer's instructions. Do not use 110-volt test lamp to check diodes.

If using a 12-volt test lamp, the lamp should light only when the diode is connected in a forward bias.

With a 1-1/2-volt ohmmeter, a good diode will give a high and a low reading. If the high and low readings are identical, all diodes are good. A slightly different reading indicates that the diode is probably defective. Disconnect defective diode and recheck diodes.

Refer to Chapter 4 of FOS, ELECTRICAL SYSTEMS for additional diode test information.

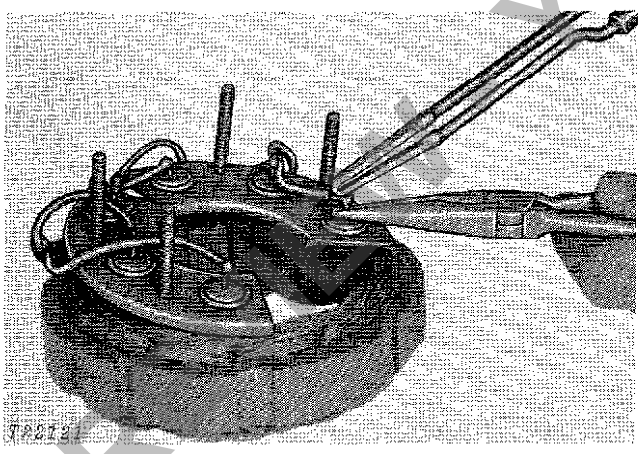


Fig. 13-Pliers Used as a Heat Sink

When soldering a diode lead, use a pair of pliers as a heat sink (Fig. 13). Use solder with melting point of 360°F. or higher. Never use an acid-core solder.

If a diode is defective, replace the diode assembly. Note the insulator locations on the positive diode assembly to aid in correct assembly. The diode connections and polarity must be correct. A positive diode has red printing and a negative diode has black printing.

Stator

Examine stator for insulation failure or defects. Shorted stator windings are usually discolored and smell. Replace stator only after other electrical components have been proven to be satisfactory.

Disconnect "Wye" connected stator leads (Fig. 14). An armature tester or test lamp may be used. After testing, connect leads. Make sure that the three common leads (A,B,C) are soldered together.

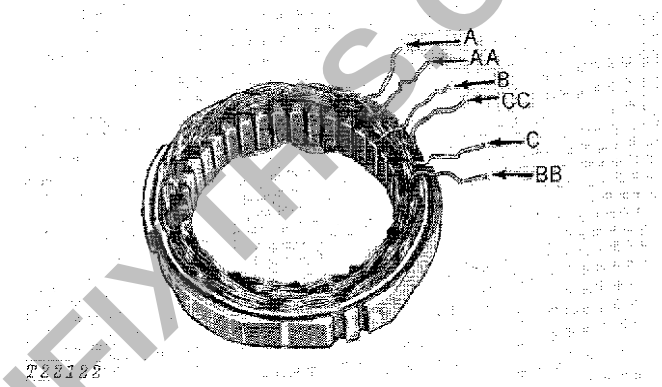


Fig. 14-Stator Leads

Open Circuit Tests.

The test lamp should light when connected to points: A to AA, B to BB, and C to CC.

Grounded Winding Test.

The test lamp should not light when one lead is connected to the metal frame and the other lead to point A, then to point B, then to point C.

Short-Circuited Test.

The test lamp should not light when connected to points: A to B, B to C, and A to C.

Assembly

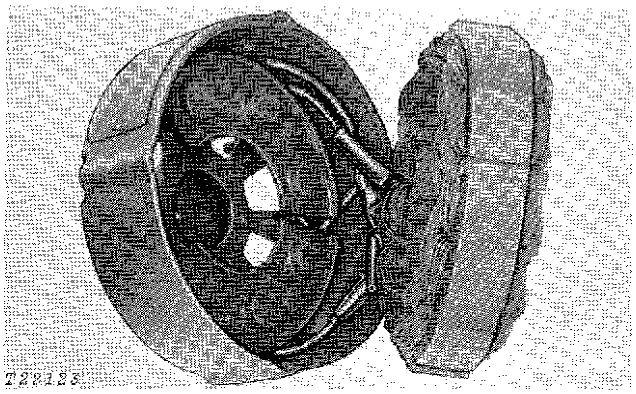


Fig. 15-Stator and Slip Ring End Frame

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ALTERNATOR AND REGULATOR TEST SPECIFICATIONS

35 AMP ALTERNATOR

Test	Reading
Circuit Tests	
Test No. 1 - Key off	0.0 volts
Test No. 2 - Key on	2.0 to 3.0 volts
Test No. 3 - Key on, engine running at 1400 rpm	0.8 to 1.2 volts plus temperature correction
Test No. 4 - Key off	1.9 to 2.6 amperes
Test No. 5 - Key on, engine running at 800 rpm	15 volts

REGULATOR VOLTAGE (After 15 Minutes Operation and at 1500 rpm):

Temperature*	Voltage
40°F.	14.4 - 14.9 volts
60°F.	14.3 - 14.7 volts
80°F.	14.2 - 14.6 volts
	14.0 - 14.4 volts
120°F.	13.8 - 14.3 volts
140°F.	13.6 - 14.1 volts

** Measured 1 inch from regulator case.*

55 AMP ALTERNATOR

Test	Reading
Circuit Tests	
Test No. 1 - Key off	0.0 volt
Test No. 2 - Key on	1.5 to 2.0 volts
Test No. 3 - Key on, engine running @ 1400 rpm	15.4 volts
Test No. 4 - Key off	2.0 to 2.5 amps.
Test No. 5 - Key on, engine running @ 800 rpm	15 to 16 volts

REGULATOR VOLTAGE (After 15 minutes operation and at 1500 rpm):

Temperature* *	Voltage
40°F.	14.4 - 14.9 volts
60°F.	14.3 - 14.7 volts
80°F.	14.2 - 14.6 volts
100°F.	14.0 - 14.4 volts
120°F.	13.8 - 14.3 volts
140°F.	13.6 - 14.1 volts

** * Measured 1 inch from regulator.*

ALTERNATOR

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POWER TRAIN

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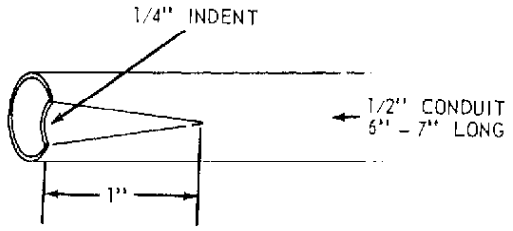
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SPECIAL TOOLS



R5632

Fig. 12-Tool For Transmission Shifter Interlock Balls

The procedure to make the tool is as follows:

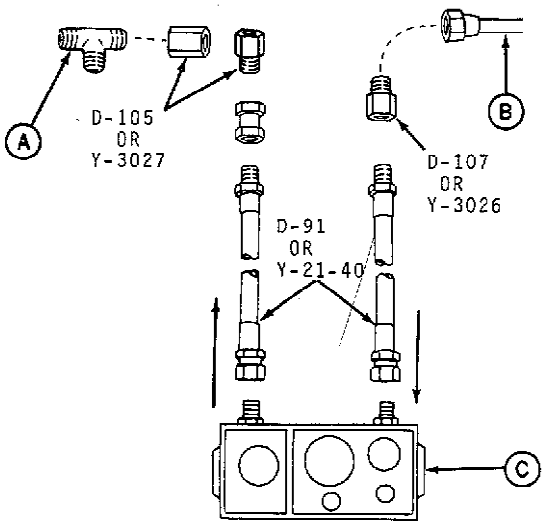
1. Cut a 6- to 7-inch length of 1/2-inch electrical conduit.

2. Make an indentation 1/4 inch deep on one end, tapering the identation out 1-inch along the tube.

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TESTING HYDRAULIC CIRCUITS



A—To Pressure Control Valve
B—From Hydraulic Pump
C—Hydraulic Tester(In-Line Only)

Fig. 11-Hydraulic Circuit Test

With engine shut off, operate loader or backhoe functions to bleed down accumulator before disconnecting lines.

Connect hydraulic tester (in-line type only) for testing hydraulic circuits as shown in Fig. 11.

Open hydraulic tester pressure loading valve. Start engine, adjust to 2500 rpm and run until normal operating temperature of 170° to 190°F is reached.

With all components in neutral, tester should show no flow. If flow is present, isolate components and check for leakage.

Backhoe may be isolated, by installing tester (in-line) between pressure and return circuits located under rear platform panel. Use two Y3021 or D-89 and D-88 fittings to connect tester.

PRESSURE CONTROL VALVE CHECK (-246127)

Testing Without Pressure Gauge

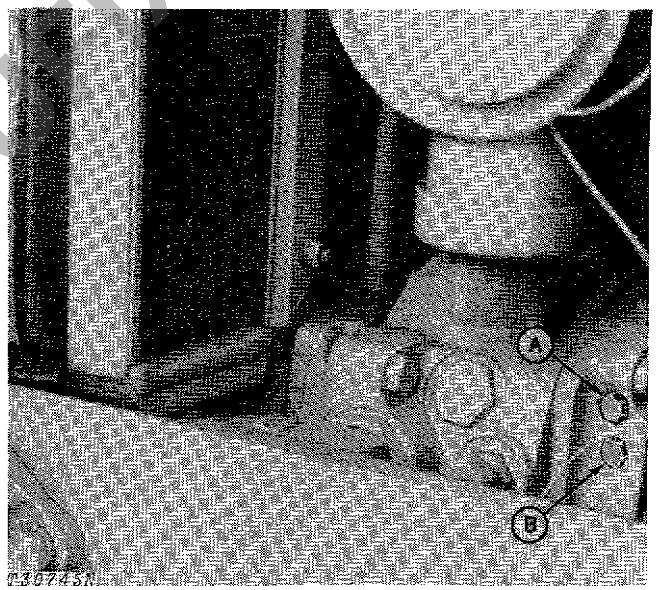
NOTE: This check should only be used when it is not practical or possible to use a pressure gauge. DO NOT attempt to adjust the pressure control valve setting using this check.

Run the engine at slow idle.

Turn the steering wheel back and forth, noting effort required and the system response.

Now operate a loader function and at the same time turn the steering wheel back and forth. There should be no change in steering effort or response. Any loss of steering indicates a problem with the pressure control valve.

Testing with a 3000 PSI Pressure Gauge

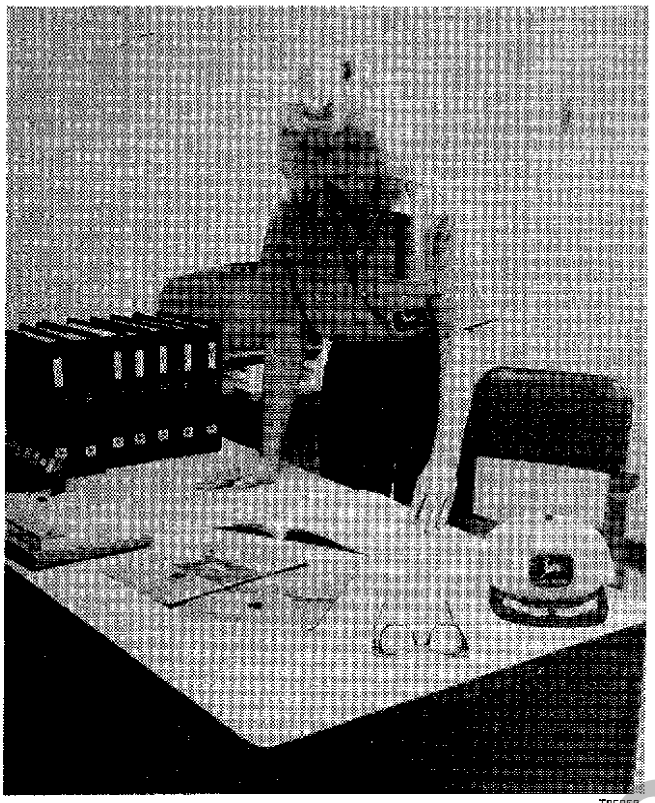


A—Outlet Pressure Tap
B—Inlet Pressure Tap

Fig. 12-Main Hydraulic Pump Pressure Taps

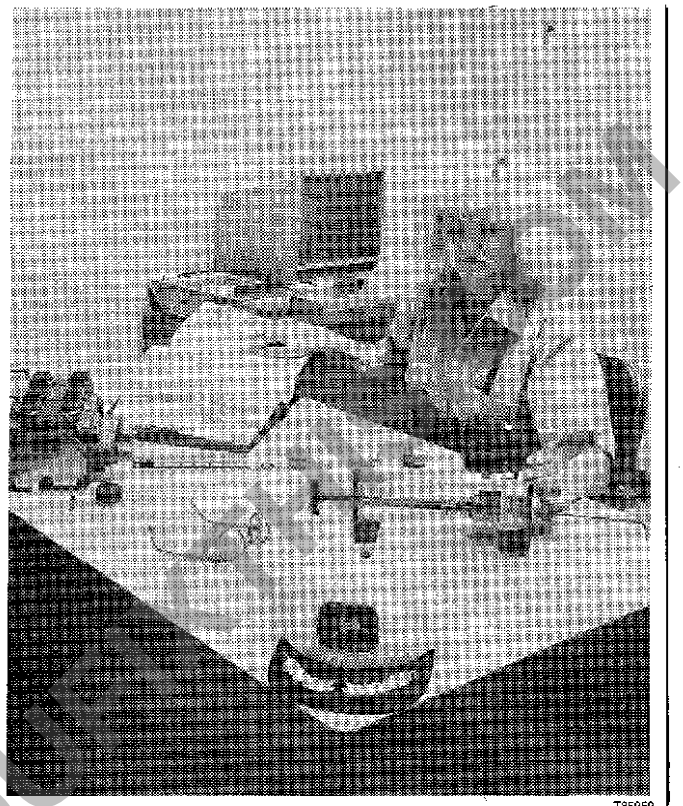
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INTRODUCTION



T85958

Use FOS Manuals for Reference



T85959

Use Technical Manuals for Actual Service

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

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

- **FOS Manuals — for reference**

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 personnel and for reference by experienced technicians.

When a service technician 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.

- **Technical Manuals — for actual service**

Technical Manuals are concise service guides for a *specific* machine. Technical manuals are on-the-job guides containing only the vital information needed by an experienced service technician.

This technical manual was planned and written for you — an experienced service technician. 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.

Some features of this manual:

- Inside front cover - "Table of Contents" and "Maintenance Without Accident".
- Section 10 - General specifications and services.
- Sections 20 through 60 - Removal, repair, testing (components removed), installation, and adjustment.
- Section 70 - Detailed explanation of system operation, diagnosis, visual inspection, testing, and adjustments.
- Specifications and Special Tools grouped and illustrated at the end of each section.

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11. Plug backhoe hydraulic lines to prevent dirt from entering the system.

12. Plug pressure and return lines on machine so that machine may be moved.

13. If tie bar removal is required, remove pins (Fig. 2).

Installation

Install tie bars on tractor if removed.

Connect backhoe hydraulic hoses (2, Fig. 1).

Use stabilizers to align mounting pin holes and install pins.

Reverse the removal procedure to install backhoe on tractor.

Tie bar mounting pins (4, Fig. 1) must be driven in from the inside.

Be sure to tighten all connections and inspect for leaks.

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Basic Engine

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		and leakage.
10 Minutes**	3/4 to Full Load		
100 hours +	All Loads		Field Only

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

***After this run, loosen and retighten cylinder head bolts one at a time, in sequence with 95 lb-ft torque. Loosen rocker arm support cap screws; then retighten with 35 lb-ft torque. Check and reset valve clearance. Loosen intake and exhaust manifold cap screws and nuts; then retighten to 35 lb-ft.*

+ Refer to the operator's manual for proper operation and service. After break-in, drain crankcase oil, and remove filter. Install new filter and fill crankcase with oil of proper viscosity and service classification.

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Group 15
STARTING MOTOR

GENERAL INFORMATION

The starting motor has a totally enclosed shift lever and solenoid plunger to seal out dirt, icing conditions, and splash. Positive lubrication to the bushings is provided by oil saturated wicks.

An overrunning clutch is used with the starting motor.

Refer to "Starting Circuits" in FOS Manual - ELECTRICAL SYSTEMS for additional starting motor information.

TESTS AND DIAGNOSIS

Disconnect battery ground straps before removing starter.

Check the armature shaft for freedom of movement. If it does not turn freely, the motor should be disassembled without testing.

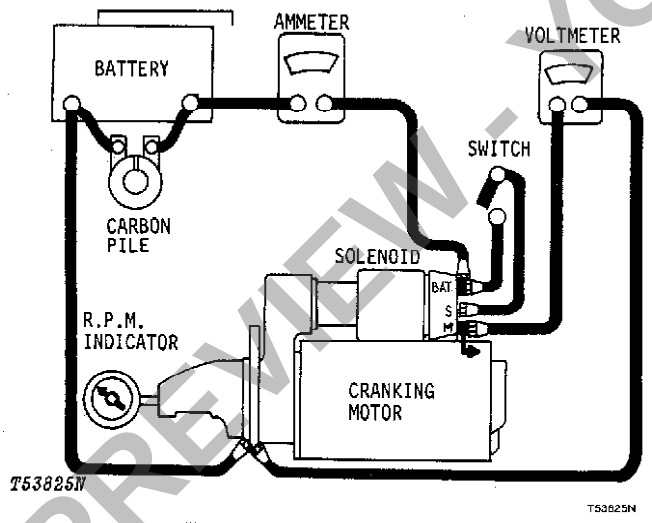


Fig. 1-No-Load Test Hook-Up

No-Load Test

Make the hook-up as shown in Fig. 1. Do not run the motor for more than 20 seconds at a time or overheating will result. Allow motor to cool at least 2 minutes before running it again.

1. Rated current draw and no-load speed indicates normal condition of the motor.

2. Low free speed and high current draw indicate:

a. Bad bearings, bent armature shaft, or loose pole shoes causing armature to drag.
b. Shorted armature (check on a growler after disassembly)
c. Grounded armature or fields. Check after disassembly.

3. Failure to operate and high current draw indicate:

a. Direct ground in the terminal or fields.
b. Frozen bearings (determined by turning armature by hand).

4. Failure to operate and no current draw indicate:

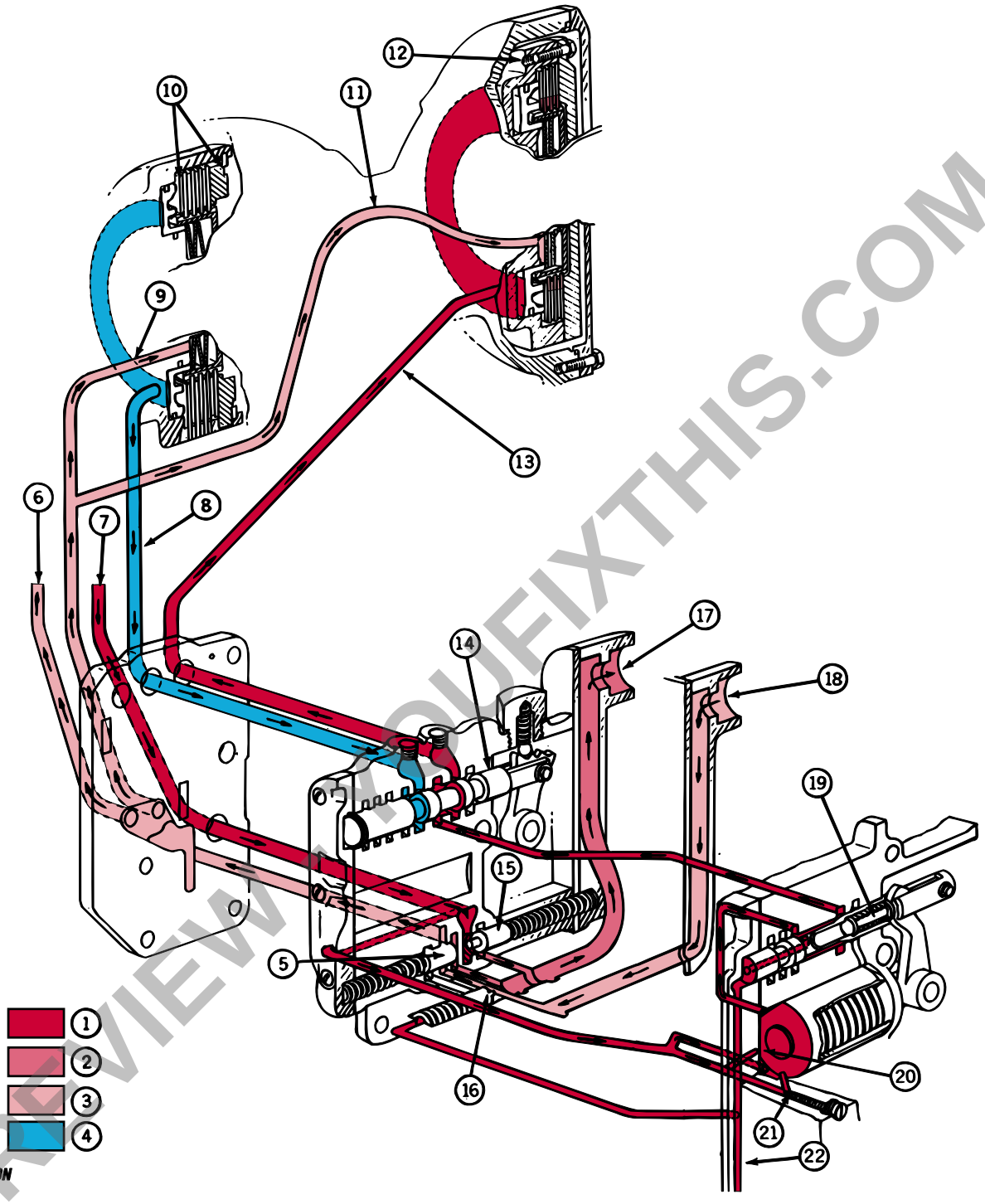
a. Open field circuit. Check by inspecting internal connections and tracing circuit with a test lamp.
b. Open armature coils. Check commutator for badly burned bars.
c. Broken brush springs, worn brushes, high insulation between commutator bars, or other causes preventing good contact between brushes and commutator.

5. Low no-load speed and low current draw indicate:

a. High internal resistance due to poor connections, defective leads, dirty commutator, and causes listed under item 4.

6. High free speed and high current draw indicate shorted fields. Replace field coil assembly and check for improved performance.

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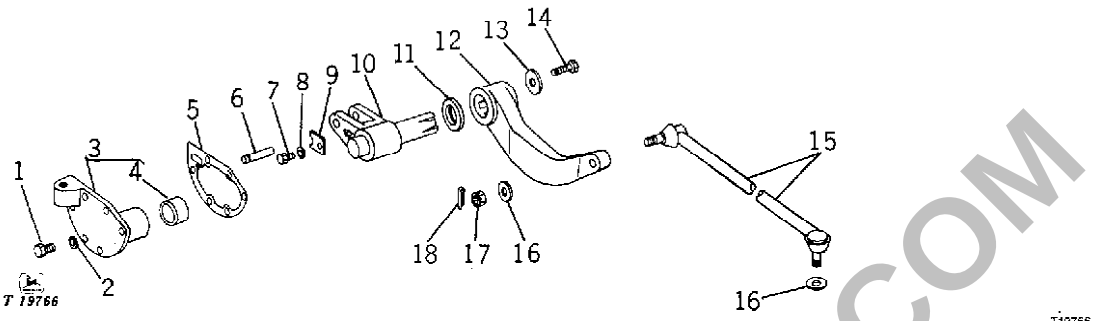
1—Pressure Oil
2—Inlet Oil To Main Hydraulic Pump
3—Lube Oil From Cooler
4—Return Oil To Sump
5—Cooler Bypass And Relief Valve
6—Lube Oil To Transmission
7—Oil From Transmission Oil Pump
8—Oil Line To Reverse Brake
9—Reverse Brake Lube Oil Line
10—Reverse Brake Assembly
11—Forward Clutch Lube Oil Line
12—Forward Clutch Assembly (Engaged)
13—Oil Line To Forward Clutch
14—Shift Valve
15—Pressure Regulating Valve
16—Lube Oil Reduction Valve
17—To Cooler
18—From Cooler
19—Clutch Control Valve
20—Fixed Charging Orifice
21—Adjustable Charging Orifice
22—Test Port

Fig. 1-Reverser Clutch Control Valve

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Lower Steering Linkage



1 —Cap Screw (6 used)
2 —Lock Washer (6 used)
3 —Cover
4 —Bushing
5 —Gasket
6 —Pin
7—Cap Screw
8—Lock Washer (Internal Tooth)
9—Pin Plate
10—Steering Shaft
11—Oil Seal
12—Steering Arm
13—Washer
14—Cap Screw
15—Drag Link
16—Washer (2 used)
17—Slotted Nut (2 used)
18—Cotter Pin (2 used)

Fig. 5-Power Steering Arm and Drag Link

Refer to Fig. 5 as a parts guide.

Inspect steering gear shaft and yoke cover for damage. Replace if necessary.

Examine bushing (4) in steering gear shaft and yoke cover for wear or damage. If replacement is required, use JD252 to press in bushing to specifications.

Check bushing at opposite end of steering and yoke shaft on left side of clutch housing in knockout plug opening. If required, press in new bushing to specifications.

Inspect the steering arm (12) to determine if it is interfering with the clutch housing.

Inspect steering and yoke shaft (10) for damage. Replace if necessary.

Check steering and yoke shaft oil seal (11) on left side of clutch housing for damage or deterioration.

Apply T43514 John Deere LOCTITE® Plastic Gasket or an equivalent bore in clutch housing before installing oil seal.

Install new oil seal in clutch housing with sealing lips facing bottom of oil seal bore and opposite side flush with bottom of oil seal bore chamfer.

Inspect drag link (15) for damaged or bent condition. Replace if necessary.

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CLOSED-CENTER HYDRAULIC SYSTEM TEST RECORD

Date _____

Work Order No. _____

[Attach to Hydraulic System Pretest Check Sheet]

TEST SPECIFICATIONS:

Hydraulic Oil Temperature: 100 To 110 °F (38 To 43 °C)

High Pressure Circuit Test: While main pump outlet pressure is at 2000 PSI, engine speed must not be greater than 2025 rpm.

Transmission Pump Test: _____ Use 0.187 in orifice, Part No. 403665. With transmission pump pressure at 175 PSI (Bar) engine speed must not exceed 2250 RPM.

(1)

ENGINE RPM	MAIN PUMP OUTLET PRESSURE		MAIN PUMP INLET PRESSURE		TRANS. PUMP OUTLET
	In Stroke	Standby	In Stroke	Standby	Standby
1000	560 PSI MIN.	2250 TO 2400 PSI	30 To 130 PSI	35 To 130 PSI	155 To 165 PSI
2200		2300 TO 2400 PSI	50 To 130 PSI	55 To 130 PSI	155 To 165 PSI
2025 MAX	2000 PSI	HIGH PRESSURE CIRCUIT TEST			
		TRANSMISSION PUMP TEST			

TEST RECORD (2)

	ENGINE RPM	MAIN PUMP OUTLET PRESSURE		MAIN PUMP INLET PRESSURE		TRANS. PUMP OUTLET
		In Stroke	Standby	In Stroke	Standby	Standby
TEST 1	1000	1150 PSI N	2300 PSI N	55 PSI N	45 PSI N	157 PSI N
	2200		2350 PSI N	25 PSI L	35 PSI L	162 PSI N
	1625 N	2000 PSI	HIGH PRESSURE CIRCUIT TEST			
T68605			TRANSMISSION PUMP TEST			

1—Test Specifications **2—Test Readings**

Fig. 11-Example of Test Record for Closed-Center Hydraulic System

6. Compare test readings (2, Fig. 11) to test specification (1, Fig. 11). Mark classification next to each reading (Fig. 11). Use following classifications:

H = High pressure and high rpm
N = Normal pressure and normal rpm
L = Low pressure
P = Pulsing pressure - Pulsing is combined with other classifications. For example, NP means pressure is normal but unsteady.

7. Determine probable cause by comparing test pattern with test pattern(s) on Test Pattern Analysis Chart pages 70-6-13 and 70-6-14.

Sample test pattern in Fig. 11 compares with the second test pattern from the Test Pattern Analysis Chart and indicates a cooler bypass relief valve stuck open or weak or broken spring.

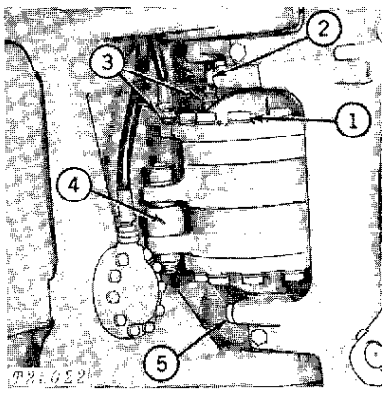
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1—Cap Screw
2—Top Coupling
3—Hoses
4—Bushing
5—Bottom Coupling

Fig. 2-Removing Swing Cylinder

DISASSEMBLY

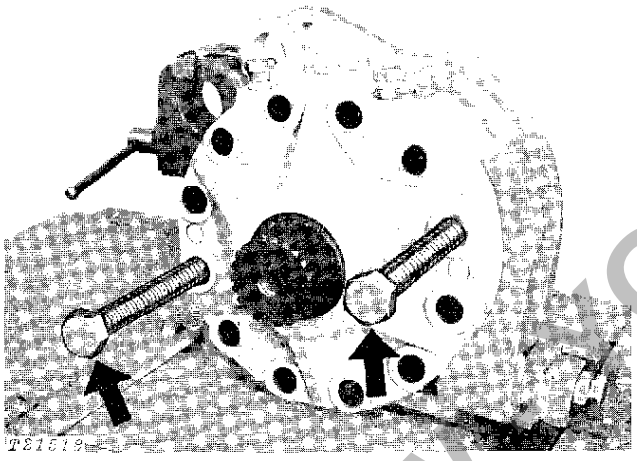


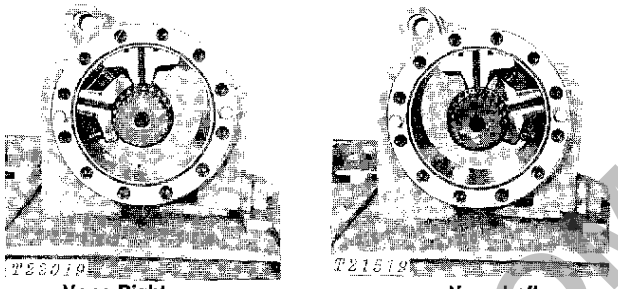
Fig. 3-Removing Top Plate

Clamp swing cylinder in special fixture (Fig. 3). Drawings of this fixture are shown in "Special Tools."

Use two 7/8-inch cap screws as jack screws (Fig. 3) and force the top plate from the cylinder barrel.

Turn jack screws alternately and evenly so that top and bottom plates are always square.

Slide top plate from splined shaft being careful not to damage O-ring and backup washer.



Vane Right
Vane Left

Fig. 4-Removing Shaft Vane

The shaft vane must contact either the right or left side of the barrel vane (Fig. 4) before it can be removed. Rotate it either to the right or left position.

Remove the shaft vane being careful not to scratch the barrel surface.

Support the barrel vane so it cannot drop inside the barrel, and remove the barrel vane.

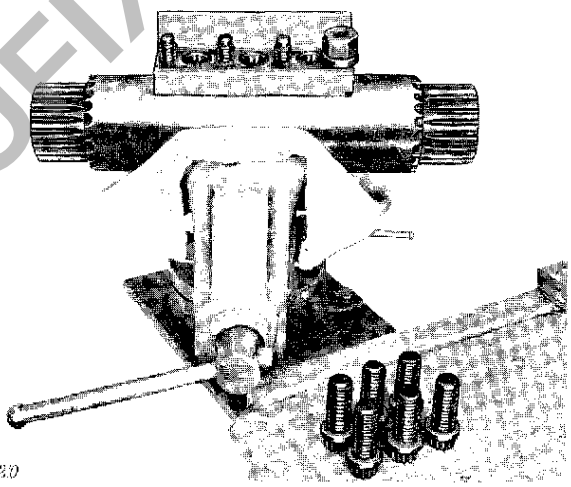


Fig. 5-Removing Shaft Vane

Place splined shaft in vise being careful not to scratch the shaft. Mark the shaft and vane before disassembly so the vane can be installed in exactly the original position.

To remove dowel pins, place a spacer and nut on a pin (Fig. 5) and tighten to end of threads. Remove the nut, add a second spacer, install the nut and tighten until pin is removed.

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