90
Skid-Steer
Loader

JOHN DEERE

TECHNICAL MANUAL

90 Skid-Steer
Loader

TM1205 (01NOV78) English

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John Deere
Lawn & Grounds Care Division
TM1205 (01NOV78)

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90 SKID-STEER LOADER

TECHNICAL MANUAL
TM-1205 (NOV-78)

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(All information, illustrations, and specifications contained in this technical manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.)

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Group 05
SPECIFICATIONS

ENGINE

Make	Onan
Model	NHC-MS3406C
Fuel	Gasoline (Regular)
Cooling System	Air
Cylinders	2
Displacement	60 cu. in. (983.2 cm³)
Bore	3.56 in. (90.4 mm)
Stroke	3.0 in. (76.2 mm)
Horsepower	23 hp (17.1 kW)
Maximum Governed rpm	3200 rpm
Maximum Torque	41 ft-lbs (56 Nm) @ 2200 rpm
Electrical System	12-Volt with 20 amp flywheel and regulator
Battery	12-volt — 60 amp hr.
	Cold cranking amps rating
	@ 0°F — 500
	@ −20°F — 380
Ignition System	
Point Gap	0.020 in. (0.58 mm)
Spark Plug	
Gap	0.025 in. (0.64 mm)
Type	Resistor

HYDRAULIC SYSTEM

Pump Capacity	7.5 gpm (28.4 L/min)
	@ 3600 rpm gear type

Control
- Main Valve: Dual pedal, two-spool control valve
- Auxiliary Valve: Single pedal, single-spool control valve

Relief Valve Setting
- Main Valve: 1750 psi (120 bar) (123 kg/cm²)
- Auxiliary Valve: 1600 psi (112.5 kg/cm²) (110 bar)

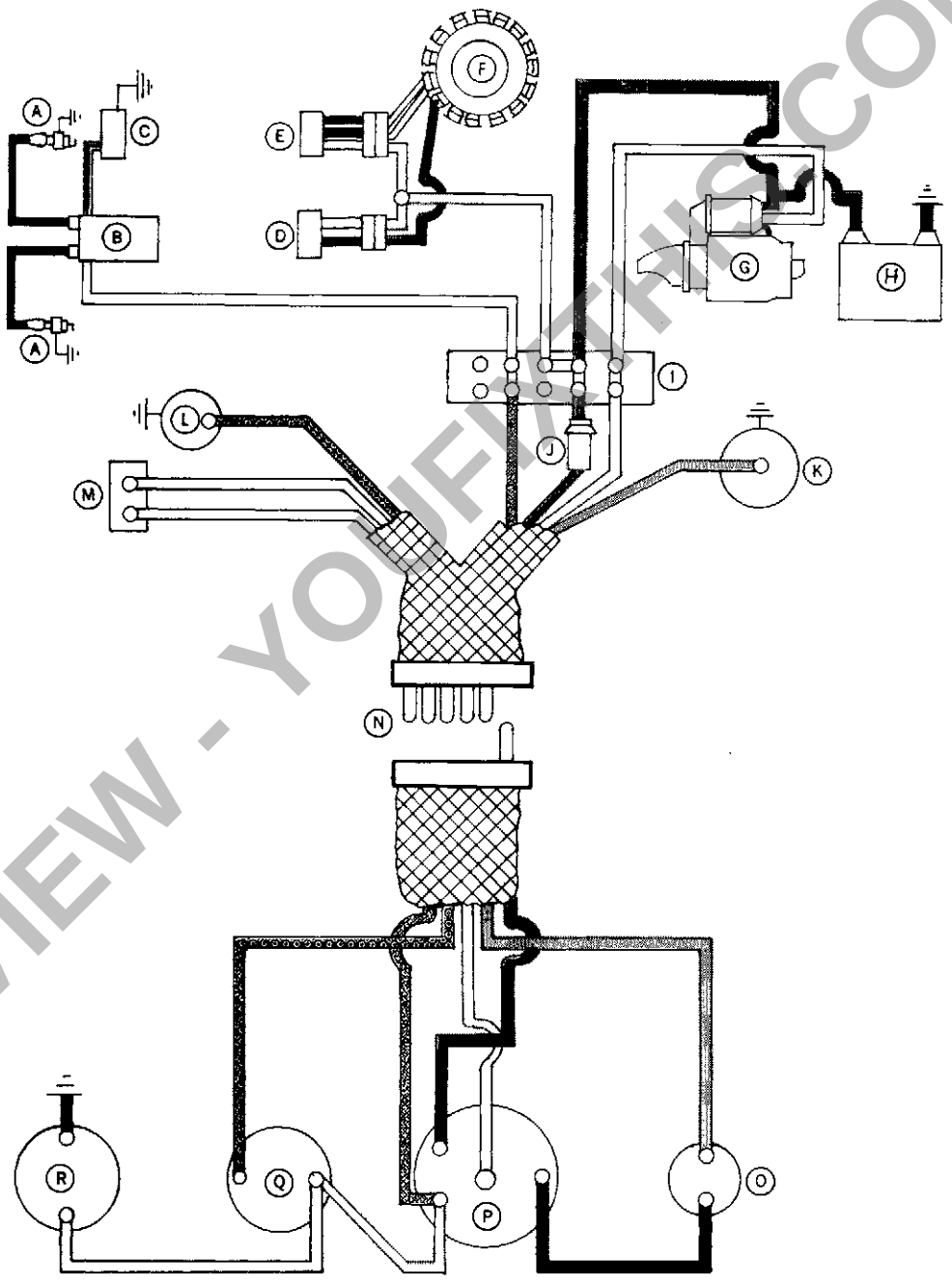
Filters	
Hydrostatic	10 micron
Hydraulic	100 mesh screen
Hydraulic Cylinders	
Lift (Double Acting):	
Bore Diameter	2 in. (50.8 mm)
Rod Diameter	1 in. (25.4 mm)
Stroke	22 in. (558.8 mm)
Tilt (Double Acting):	
Bore Diameter	2-1/2 in. (63.5 mm)
Rod Diameter	1-1/4 in. (31.8 mm)
Stroke	13-1/8 in. (333.4 mm)

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Group 10
SYSTEM OPERATION

WIRING DIAGRAM



A—Spark Plugs
B—Coil
C—Points
D—Rectifier
E—Regulator
F—Stator
G—Starter
H—Battery
I —Terminal
J —Fuse
K—Oil Sender
L —Fuel Sender
M—Neutral-Start Switch
N—Harness
O—Oil Pressure Gauge
P—Ignition Switch
Q—Fuel Gauge
R—Hour Meter

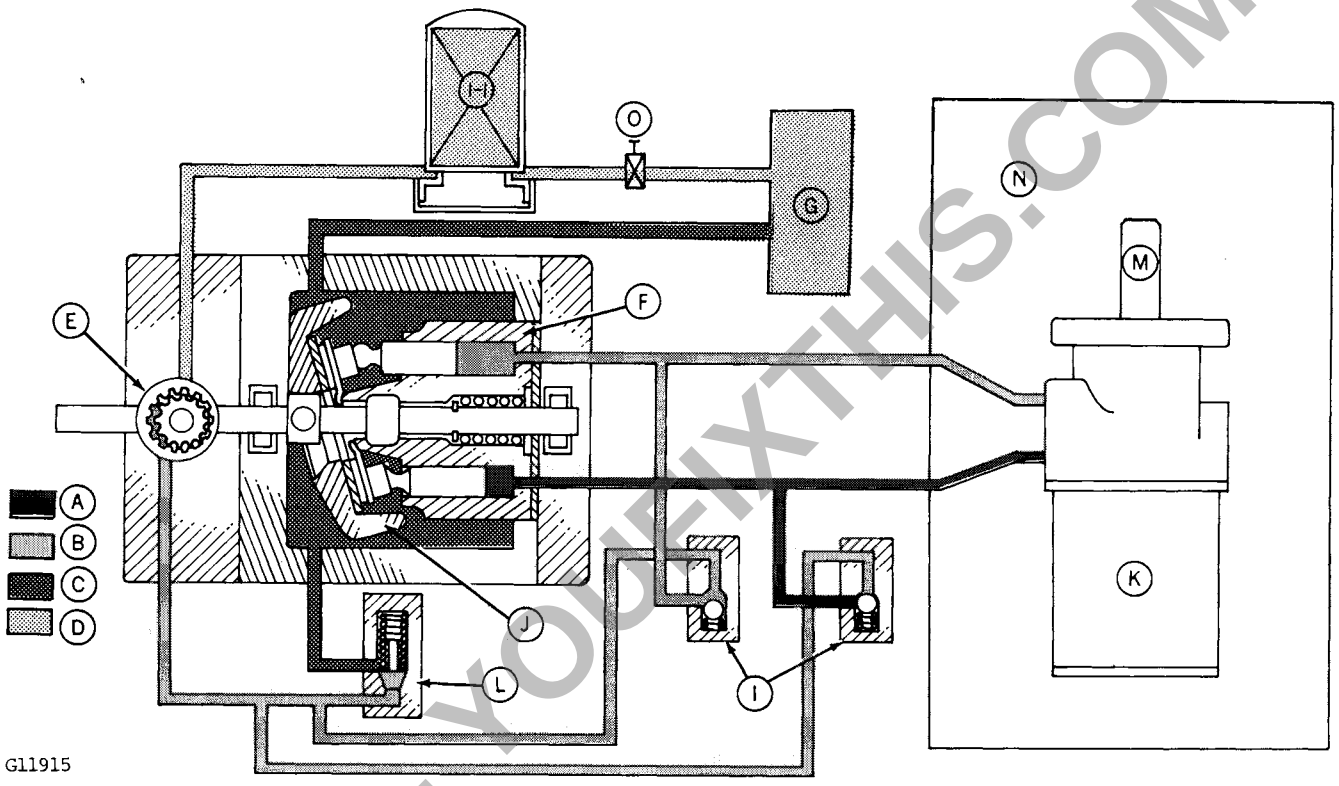
Fig. 1-Wire Diagram

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Group 10
SYSTEM OPERATION

HYDROSTATIC DRIVE



A—High-Pressure Fluid
B—Return Fluid (Charge Pressure)
C—Bleed-off Fluid
D—Suction Fluid
E—Charge Pump
F—Pump Cylinder Block
G—Reservoir
H—Filter
I —Check Valves
J—Pump Swash Plate
K—Hydrostatic Motor
L—Charge Relief Valve
M—Output Shaft
N—Chain Case
O—Shut-off

Fig. 1-Hydrostatic Flow

A belt from the engine drives the hydrostatic pumps in a counterclockwise direction when viewed from the rear. The charge pump (E) draws fluid (D) from the reservoir (G) through the filter (H). The charge pump (E) provides flow to the check valves (I). The check valves restrict the flow that builds up charge pressure (B) to the pump cylinder block. Depending on the angle of the variable swash plate (J), high-pressure fluid (A) is directed to the cylinder block when the swash plate is moved off center as shown. Bleed-off fluid (C) lubricates all moving parts. This fluid returns to the reservoir.

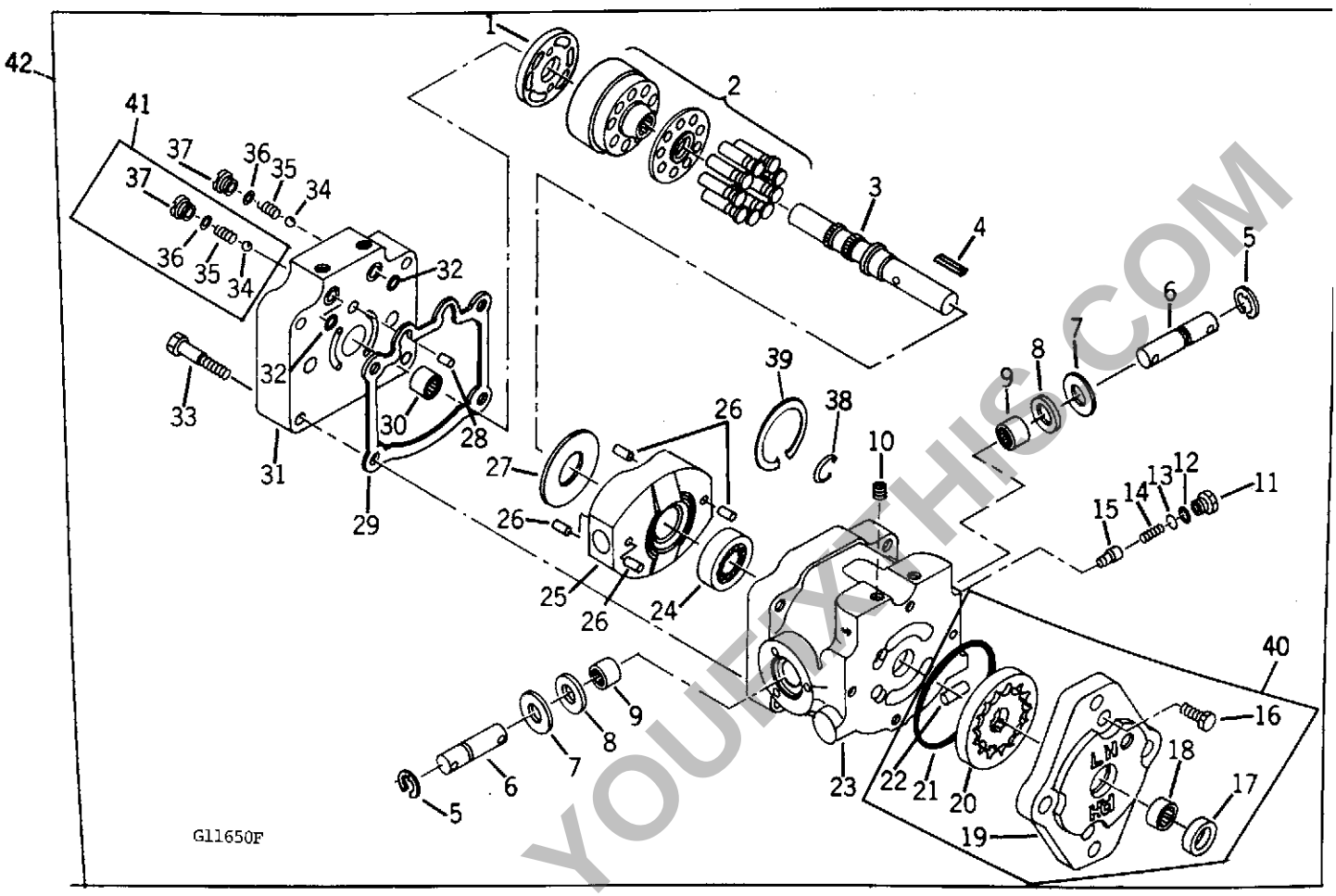
The greater the angle of the swash plate (J) the more fluid pumped to the hydrostatic motor (K). (At neutral, no fluid is pumped to motor.)

The hydrostatic motor is a gerotor-type.

High-pressure fluid enters the motor and turns the motor output shaft (M) which is connected to the drive sprocket.

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1—Pump Valve Plate
2—Cylinder Block Kit
3—Pump Shaft
4—Key
5—Retaining Ring
6—Trunion Shaft
7—Washer
8—Lip Seal
9—Bearing
10—Pipe Plug
11—Plug
12—O-Ring
13—Shim
14—Charge Relief Spring
15—Charge Relief Cone
16—Cap Screw
17—Lip Seal
18—Bearing
19—Charge Pump Housing
20—Gerotor
21—O-Ring
22—Drive Pin
23—Pump Housing
24—Bearing
25—Swash Plate
26—Spring Pin
27—Thrust Plate
28—Locating Pin
29—Gasket
30—Bearing
31—Pump End Cap
32—O-Ring
33—Cap Screw
34—Charge Check Ball
35—Charge Check Spring
36—O-Ring
37—Plug
38—Retaining Ring
39—Retaining Ring
40—Housing Kit
41—Check Plug Kit
42—Complete Pump

Fig. 8-Hydrostatic Pump

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ASSEMBLY TORQUES

	Ft-Lbs	Nm	(kgm)
Cylinder Head Nuts	13-15	(18-20)	(1.8-2.1)
Other 3/8" Cylinder Block Nuts	18-23	(24-31)	(2.5-3.2)
Rear Bearing Plate	25-28	(34-38)	(3.5-3.9)
Connecting Rod Bolt	27-29	(37-39)	(3.7-4.0)
Flywheel Cap Screw	35-40	(48-54)	(4.8-5.5)
Starter Mounting Bracket-to-Oil Base Screws	25-28	(34-38)	(3.5-3.9)
Gear Case Cover	8-10	(11-14)	(1.1-1.4)
Oil Pump	7-9	(10-12)	(9.7-1.2)
Intake Manifold	20-23	(27-31)	(2.8-3.2)
Exhaust Manifold	20-23	(27-31)	(2.8-3.2)

TOOLS

Order tools from: Onan; 1400-73rd Avenue, N.E.; Minneapolis, MN. 55432

Crankshaft Gear Pulling Ring	420-0248
Flywheel Puller	420-0100
Combination Bearing Remover, Main and Cam	420-0325
Combination Bearing Driver, Main and Cam	420-0324
Valve Guide Driver	420-0300
Valve Seat Driver	420-0308
Valve Seat Staker	
Intake	420-0309
Exhaust	420-0310
Valve Seat Cutter	420-0311
Oil Seal Guide and Driver	
Bearing Plate	420-0181
Gear Cover	420-0313
Timing Advance Mechanism Cover Driver	420-0296
Piston Ring Spreader	420-0146
Piston Groove Cleaner	420-0332

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Group 20
DIAGNOSING MALFUNCTIONS

DIAGNOSING MALFUNCTIONS

Engine Will Not Crank

Battery discharged or defective.

Neutral-start switch defective, or not properly adjusted.

Defective starter.

Defective solenoid.

Loose electrical connections.

Defective key switch.

Engine seized.

Engine Cranks But Will Not Start

Empty fuel tank.

Clogged, restricted, or air-locked fuel line.

Defective fuel pump.

Breaker points worn or pitted.

Spark plug fouled or pitted.

Loose electrical connections.

Faulty condenser.

Defective ignition coil.

Frayed wire(s) causing ground(s).

High-tension wire shorted.

Engine Starts Hard

Spark plug pitted or fouled.

Breaker points worn, pitted, or out of adjustment.

High-tension wire loose at spark plug or coil.

Engine Starts Hard—Continued

Loose electrical connections.

Clogged fuel line or air lock.

Broken choke or throttle linkage.

High-speed and idle mixture needles not properly adjusted.

Air leakage at carburetor.

Head gasket leaking.

Low compression.

Engine Starts But Fails to Keep Running

High-speed and idle mixture needles not properly adjusted.

Broken choke linkage.

Dirt or water in fuel system.

Carburetor float not properly adjusted or leaky float.

High-tension wire loose at spark plug or coil.

High-tension wire shorted.

Breaker points not properly adjusted.

Loose connections.

Defective head gasket.

Faulty condenser.

Exhaust valve sticking in excessively tight valve guide.

Breaker point push rod sticking.

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PERIODIC SERVICE

Component	As Required	Reference Page
1. Fuse	Replace.	10-10-5
2. Hydraulic Pump Drive Belt	Check tension.	10-10-5
3. Hydrostatic Pump Drive Belt	Check tension.	10-10-5
10 Hours or Daily		
4. Air Cleaner	Check element.	10-10-7
5. Engine Crankcase Oil	Check oil level.	10-10-7
6. Hydraulic/Hydrostatic System Reservoir	Check level.	10-10-8
7. Brakes	Check tension.	10-10-8
8. Fuel Tank	Check fuel level.	10-10-8
50 Hours or Weekly		
9. Tires	Check inflation.	10-10-8
10. Engine Air Cleaner	Check element.	10-10-8
100 Hours		
11. Ignition Points and Condenser	Replace.	10-10-9
12. Spark Plugs	Clean and regap.	10-10-10
13. Engine Crankcase Oil and Filter	Drain. Replace filter and refill.	10-10-10
200 Hours		
14. Hydraulic Pump Drive Belt	Check tension.	10-10-11
15. Hydrostatic Pump Drive Belt	Check tension.	10-10-11
16. Hydrostatic System Filter	Replace element.	10-10-11
17. Chain Case Breathers	Remove and clean.	10-10-11
18. Chain Case Reservoir	Check level.	10-10-12
19. Drive Chains	Check and adjust.	10-10-12
500 Hours		
20. Fuel Filter	Replace filter	10-10-13
21. Hydrostatic Pump Mounting Bolts	Check tightness.	10-10-13
22. Engine Cooling System	Clean air passages.	10-10-13
23. Engine Combustion Chambers	Remove deposits.	10-10-13
1000 Hours or Annually		
24. Engine Speed	Check rpm.	10-10-14
25. Engine Valve Tappets	Adjust clearance.	10-10-14
26. Fuel Tank	Drain and refill.	10-10-14
27. Crankcase Breather	Remove and clean.	10-10-14
28. Hydraulic/Hydrostatic System Reservoir and Strainer	Drain, inspect strainer and refill.	10-10-14
29. Battery	Clean terminals.	10-10-15
30. Chain Case Reservoir	Drain chain case.	10-10-16

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AS REQUIRED

1. Fuse

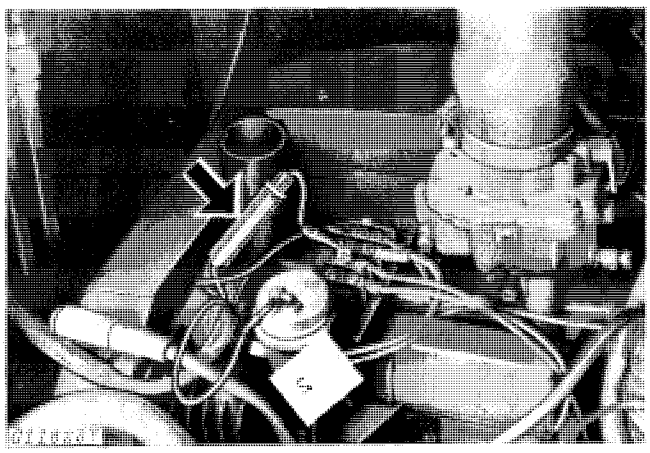


Fig. 2-Fuse

A 30-amp starter solenoid fuse is located on the left-hand side of the carburetor in the engine compartment.

A burned out starter solenoid fuse indicates a dead short in the wiring harness.

2. Hydraulic Pump Drive Belt

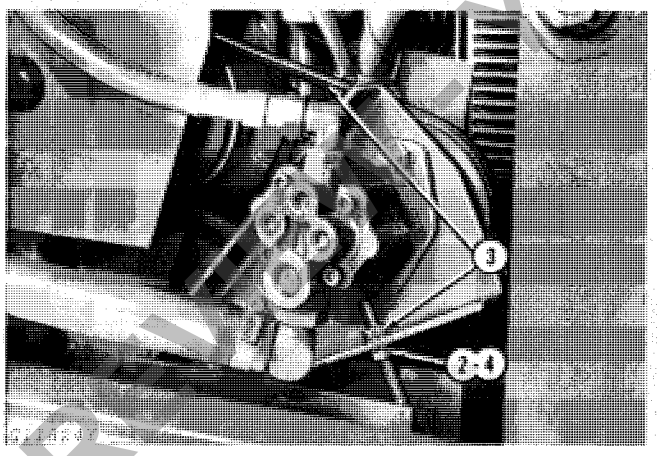


Fig. 3-Hydraulic Pump Drive Belt

1. (Not illustrated.) Open rear guard grille.

2. Loosen bottom lock nut on pump bracket.

3. Tighten top adjustment nut until belt has 3/8-inch (10 mm) deflection at 20 pounds (9 kg) pressure midway between sheaves.

4. Tighten bottom lock nut.

3. Hydrostatic Pump Drive Belt

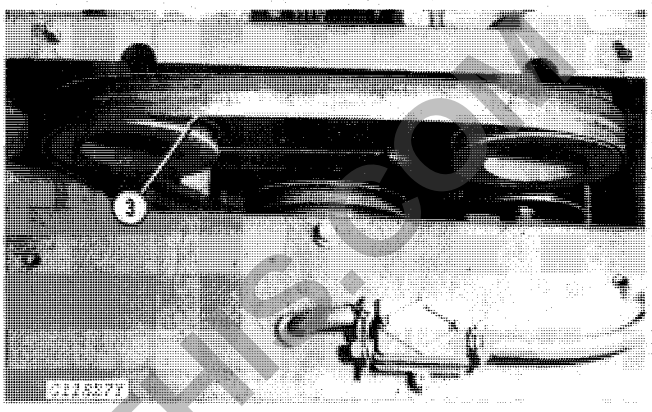


Fig. 4-Checking Belt Tension

1. (Not illustrated.) Remove seat.

2. (Not illustrated.) Remove screen.

3. With clutch lever engaged, check belt tension midway between pump sheaves.

Belt deflection should be 1/2-inch (15 mm) at 20 pounds (9 kg) pressure.

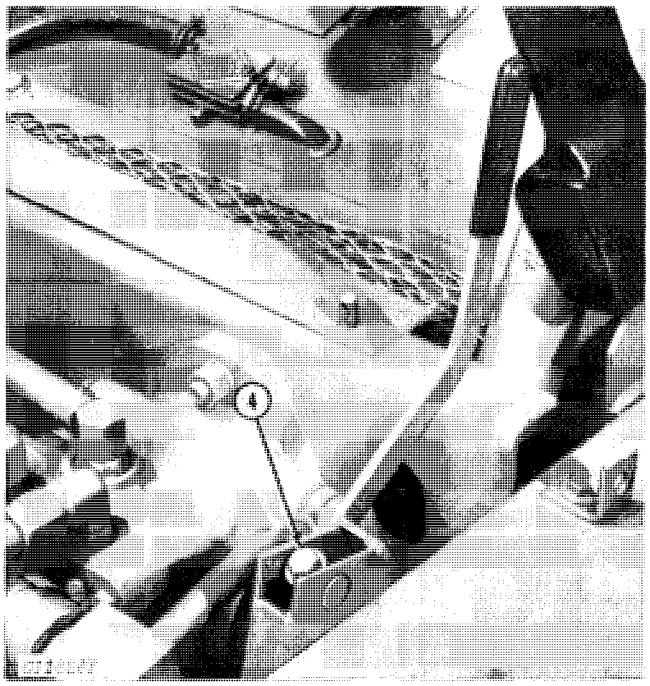


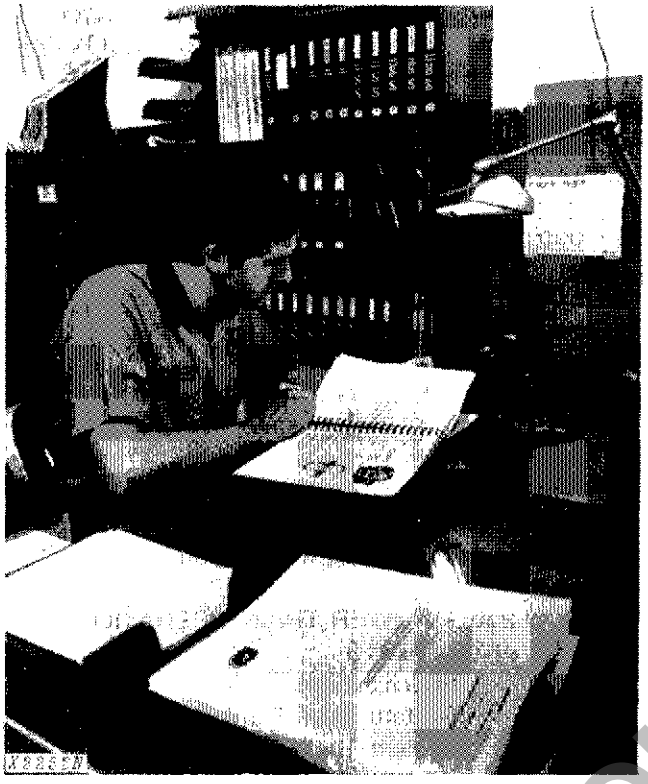
Fig. 5-Adjusting Belt Tension

4. Tighten adjustment screw at the base of the clutch lever until correct deflection is reached.

NOTE: Check drive belt for signs of wear or damage and replace if necessary.

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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 gackground 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 on-the-job service guides containing only the vital information needed for a specific machine.

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 manual*
- *Exploded views showing parts relationship*
- *Photos showing service techniques*
- *Specifications grouped for easy reference*

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.

SI UNITS OF MEASURE

Because John Deere sells its products world-wide, U.S. units of measure are shown with their respective Metric equivalents throughout this technical manual. These equivalents are the SI (International System) Units of Measure.

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9. Remove washer and lip seals.

10. Position spring pins parallel with shaft. Using a small punch, drive spring pins out. Slip trunion shafts out and remove swash plate.

11. Remove shaft and bearing.

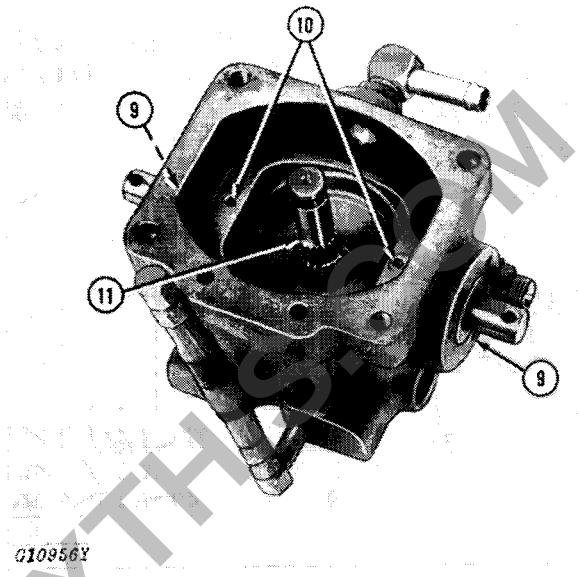


Fig. 7-Swash Plate

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