140 HYDROSTATIC TRACTOR

Service Manual
SM-2093-(Jul-73)

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Group 10

SPECIFICATIONS

ENGINE SPECIFICATIONS

Engine Model No.	K321AS
Manufacturer	Kohler
Cylinders	One
Cycle	Four
Bore & Stroke	3.50 x 3.25
Displacement	31.27 cu. in.
Speeds (fast) No load	3800 rpm
Speeds (idle)	1500 rpm
Horsepower (Engine Manufacturer's Rating)*	14 @ 3600 rpm
Normal Compression	110-120 psi
Valve Clearance:	
(Intake) Cold	0.010 in.
(Exhaust) Cold	0.020 in.
Ignition	Battery
Spark Plug Gap	0.025 in.
Breaker Point Gap	0.020 in.

** The horsepower rating shown is established by the engine manufacturer in accordance with Standard Internal Combustion Engine Institute procedure. It is corrected to 60°F. and 29.92 in. Hg. Barometer and is developed from laboratory test engines equipped with standard air cleaner and muffler, less alternator equipment.*

CAPACITIES

Component	Quantity
Fuel Tank	1-3/4 U.S. Gallons
Crankcase	3 U.S. Pints*
Transmission	5 U.S. Quarts*

** Initial capacity or after complete disassembly.*
See page 20-3 of this section.

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BOLT TORQUE CHART

Grade of Bolt		SAE-2	SAE-5	SAE-8	
Min. Tensile Strength		64,000 PSI	105,000 PSI	150,000 PSI	
Grade Marking on Bolt					Socket or Wrench Size
U.S. Standard		TORQUE IN FOOT POUNDS			U.S. Regular
Bolt Dia.	U.S. Dec. Equiv.				Bolt Head / Nut
1/4	.250	6	10	14	7/16 / 7/16
5/16	.3125	13	20	30	1/2 / 1/2
3/8	.375	23	35	50	9/16 / 9/16
7/16	.4375	35	55	80	5/8 / 11/16
1/2	.500	55	85	120	3/4 / 3/4
9/16	.5625	75	130	175	13/16 / 7/8
5/8	.625	105	170	240	15/16 / 15/16
3/4	.750	185	300	425	1-1/8 / 1-1/8
7/8	.875	* 160	445	685	1-5/16 / 1-5/16
1	1.000	250	670	1030	1-1/2 / 1-1/2

Multiply readings by 12 for inch pound values.

** "B" Grade bolts larger than 3/4-inch are sometimes formed hot rather than cold which accounts for the lower recommended torque.*

NOTE: Allow a tolerance of plus or minus 10% on all torques given in this chart.

SET SCREW SEATING TORQUE CHART

Screw Size	Cup Point	Square Head
	Torque in Inch Pounds	
#5	9	--
#6	9	--
#8	20	--
#10	33	--
1/4	87	212
5/16	165	420
3/8	290	830
7/16	430	--
1/2	620	2100
9/16	620	--
5/8	1225	4250
3/4	2125	7700

Divide readings by 12 for foot pound values
NOTE: Allow a tolerance of plus or minus 10% on all torques given in this chart.

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Group 15
Tune-up and Adjustment

IMPORTANT: Before attempting to tune-up the 140 Tractor engine, first determine if it is in a condition whereby performance can be restored by tune-up. Do this by making the preliminary engine tests below.

PRELIMINARY ENGINE TESTING

Operation	Specification	Reference
Cylinder compression	110-120 psi (1000 rpm)	Section 20, Group 5
Crankcase vacuum	5-10 inches of water column	Section 20, Group 5
Battery hydrometer test	1.260-1.280 sp. gr. 100% charged at 80° F.	Section 40, Group 10

MINOR TUNE-UP GUIDE

Operation	Specification	Reference
Change oil	Summer above 32° F.— SAE 30 (AM30730) Winter below 32° F.— SAE 5W-20 (AM30710)	Section 10, Group 20
Clean and regap spark plug	Clean electrodes Clean insulation Replace gasket Set gap at 0.025 in.	Section 40, Group 15
Remove air cleaner and clean by tapping lightly against flat surface	Check air cleaner condition Replace if necessary	Section 30, Group 15
Adjust carburetor	High speed mixture needle Idle mixture needle	Section 30, Group 10
Adjust governor speed	Speed (fast)— 3800 rpm no load; Speed (idle)— 1200-1700 rpm	Section 20, Group 15
Check and clean fuel tank and strainer	Regular gasoline only	Section 30, Group 20

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DIAGNOSING MALFUNCTIONS

Engine

Engine Will Not Crank

Hydrostatic control lever not in neutral.

Battery discharged or defective.

Neutral-start switch and bracket loose or not properly adjusted.

PTO drive engaged.

Defective safety switch (es).

Defective starter.

Defective solenoid.

Loose electrical connections.

Defective key switch

Engine seized

Engine Cranks But Will Not Start

Empty fuel tank.

Retricted fuel tank vent.

Fuel shut-off valve closed (valve below fuel tank).

Clogged, restricted or air-locked fuel line.

Breaker points worn or pitted.

Spark plug fouled or pitted.

Battery not fully charged.

Loose electrical connections.

Faulty condenser.

Defective ignition coil.

Dirt in fuel system.

Frayed wire (s) causing ground (s).

Engine Starts Hard

Spark plug pitted or fouled.

Breaker points worn, pitted or out of adjustment.

High-tension wire shorted.

High-tension wire loose at spark plug or coil.

Loose electrical connections.

Restricted fuel tank vent.

Clogged fuel line or air lock.

Broken choke or throttle cable.

Dirt or water in fuel system.

High speed and idle mixture needles not properly adjusted.

Wrong valve clearance.

Head gasket leaking.

Low compression.

Engine Starts But Fails to Keep Running

Restricted fuel tank vent.

High speed and idle mixture needles not properly adjusted.

Broken choke cable.

Dirt or water in fuel system.

Carburetor float leaking or not properly adjusted.

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.

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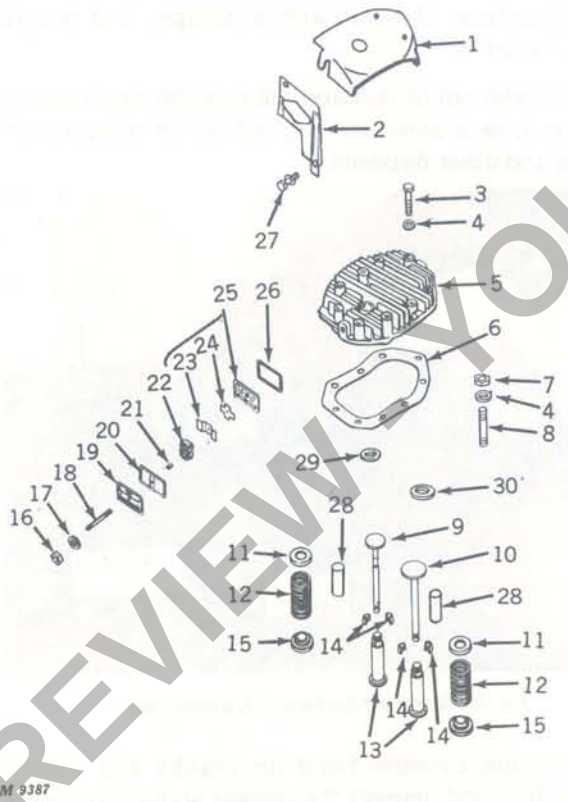
Fig. 5 - Gummy Valve Causing Valve to Stick

Using gasoline which has been left in the tank a long time is a common cause of sticking valves.

Sometimes this gummy substance can be seen on the valve. When this condition is found, it is also likely that the carburetor also contains gum deposits and will require a complete cleaning.

Advise customer always to use fresh gasoline and always to drain gas from all fuel lines and carburetor before storing tractor.

REPAIR



1 - Head Baffle
2 - Side Baffle
3 - Cap Screw (8 used)
4 - Washer (9 used)
5 - Cylinder Head
6 - Head Gasket
7 - Hex. Nut
8 - Stud
9 - Exhaust Valve
10 - Intake Valve
11 - Upper Spring Retainer (2 used)
12 - Valve Sprihg, Intake and Exhaust (2 used)
13 - Tappet (2 used)
14 - Spring Keeper (4 used)
15 - Rotator, Intake and Exhaust (2 used)
16 - Hex. Nut
17 - Lock Washer
18 - Stud
19 - Cover
20 - Outer Gasket
21 - Seal
22 - Filter
23 - Baffle
24 - Reed
25 - Breather Plate Assembly
26 - Inner Gasket
27 - Cap Screw (4 used)
28 - Valve Guides (2 used)
29 - Exhaust Valve Insert
30 - Intake Valve Insert

Fig. 6 - Exploded View of Cylinder Head, Valves and Breather

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PRINCIPLE OF OPERATION

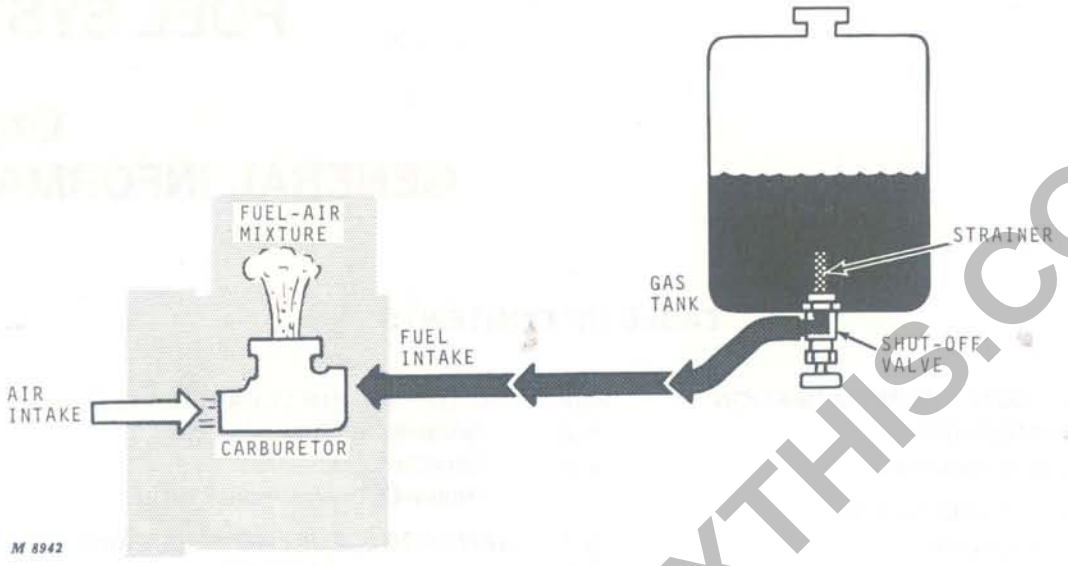


Fig. 1-Gravity Flow Fuel System for 140 Tractor

The gas tank is mounted above the engine and carburetor to allow gravity feed of the fuel, eliminating the need for a fuel pump.

Gasoline flows from the tank through an in-line strainer to the fuel shut-off valve. When the valve is open, fuel is free to flow through the gas line to the carburetor.

The side-draft carburetor used on the 140 Hydrostatic Tractor has three adjustments: high speed and idle mixture needles, and an idle stop screw.

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WIRING DIAGRAM

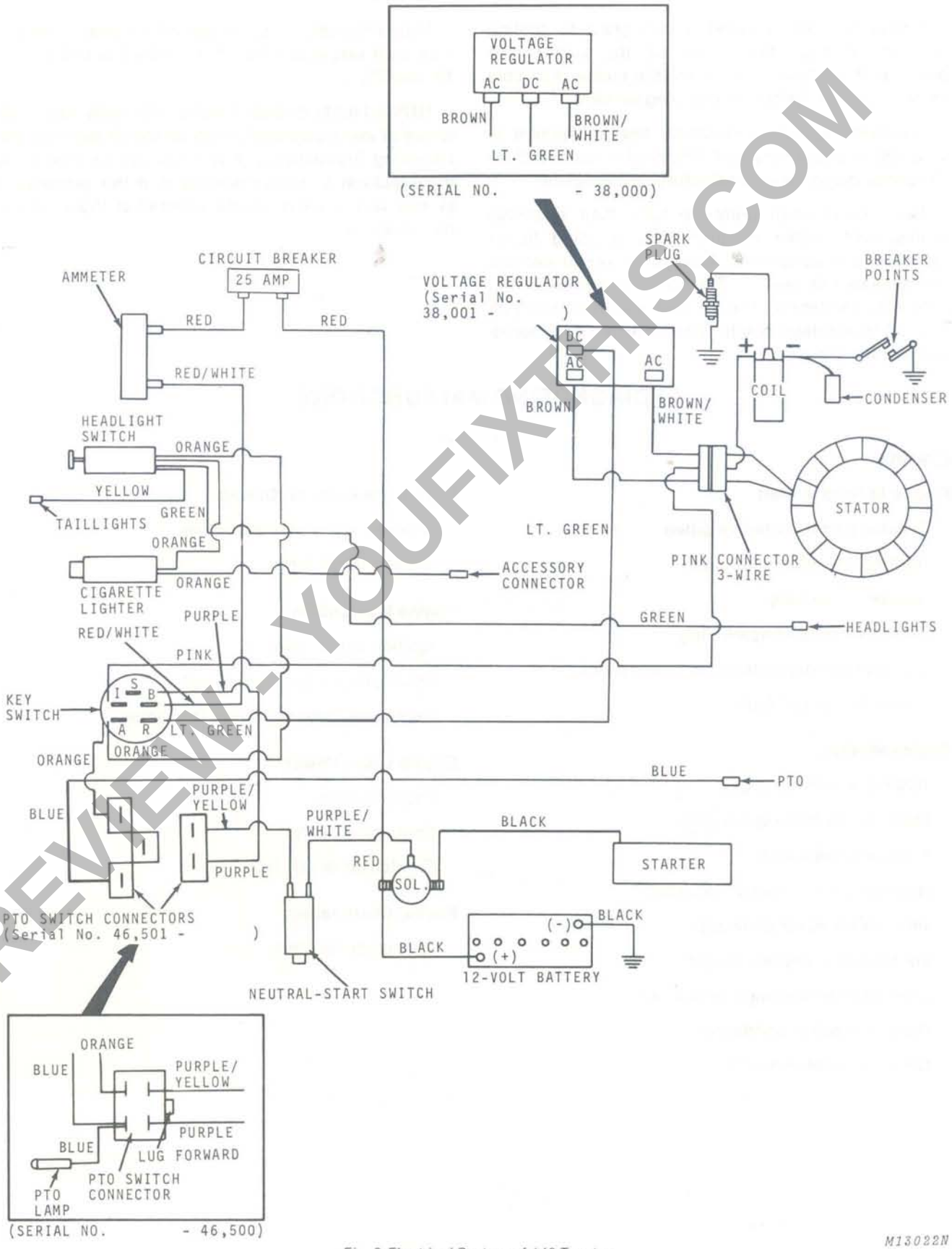


Fig. 2-Electrical System of 140 Tractor

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Principle of Operation

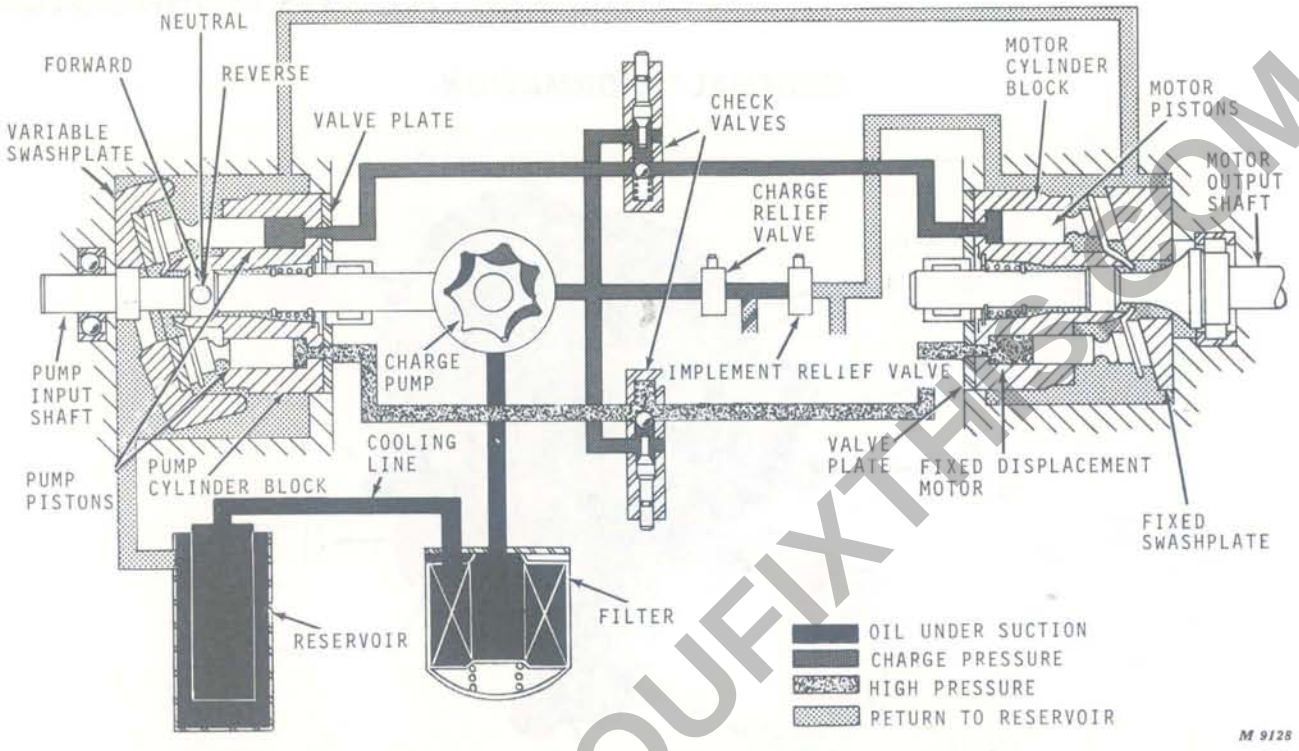


Fig. 2-Hydrostatic Oil Flow Diagram

Charge Pump

A rotor type charge pump Figure 2, supplies oil to the piston pump and circulates oil for cooling. The pump also supplies high pressure oil for the hydraulic lift system.

Piston Pump

The piston pump input shaft Figure 2 is coupled to the engine drive shaft. A cylinder block with nine pistons is connected to the input shaft. As the cylinder block revolves, the pistons move back and forth. The angle of the swashplate on which the piston slippers ride controls the distance the pistons travel, varying the volume of oil displaced to the piston motor.

The variable swashplate is mounted on trunnions supported by needle bearings in the transmission case. The swashplate does not rotate but merely tilts back and forth from a vertical position. The vertical position is neutral or "Zero Output" because the pistons do not reciprocate when the swashplate is in this position. This results in no oil flow from pump to motor.

Moving the hydrostatic control lever forward tilts the swashplate forward. This results in forward rotation of the fixed displacement motor, causing the tractor to move forward.

Reversing the tilt of the pump swashplate reverses the flow through the oil delivery ports. This results in reverse rotation of the fixed displacement motor, causing the tractor to back up.

IMPORTANT: To prevent hydrostatic transmission damage during WINTER weather, RUN engine until the hydraulic lift system functions before moving hydrostatic lever from neutral position.

Extremely cold weather can cause charge pump cavitation for a short period of time. If the piston motor is put in stroke during this time, the slippers and the slipper retainer can be damaged.

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TESTING

Implement Circuit Pressure Test

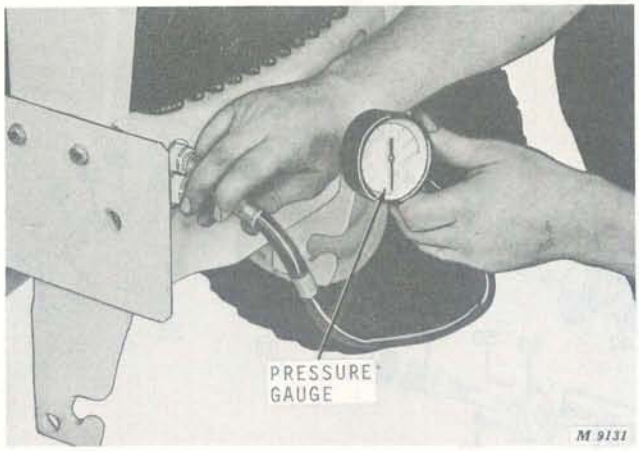


Fig. 5-Checking Implement Circuit Pressure.

Using a 0 to 1000 psi pressure gauge, check implement pressure at the front hydraulic outlets, Figure 5. The gauge should read 500 psi ± 50 psi when hydraulic lift lever is actuated fully. If readings fall below 450 psi, inspect implement relief valve and spring. Replace spring and cone, if required, or shim up spring with shim kit, and retest. If pressure is still inadequate, charge pump service is required.

Charge Pressure Test

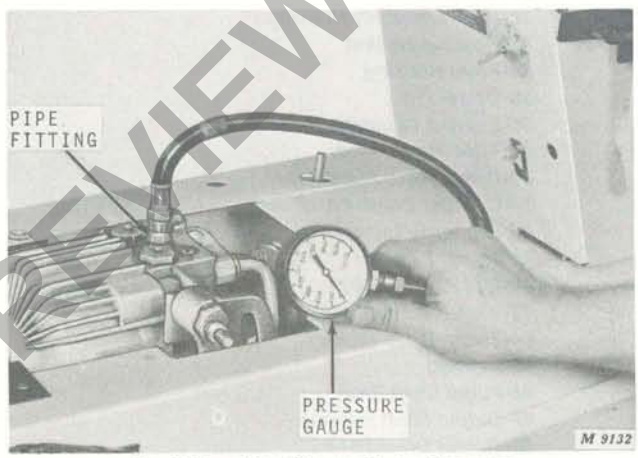


Fig. 6-Checking Charge Pump Pressure

Remove pipe plug and install a pipe fitting and pressure gauge, Figure 6. At half throttle, pressure should be in the 75 to 110 psi range. This test is not necessary unless relief valves have been changed.

REMOVING TRANSMISSION FROM TRACTOR

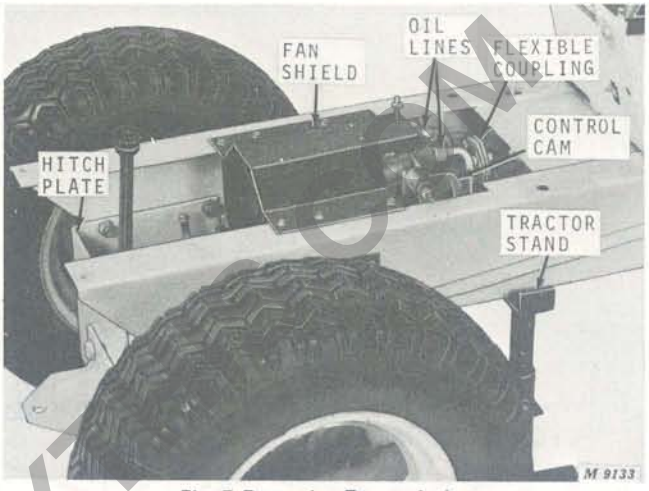


Fig. 7-Removing Transmission

NOTE: The transmission does not have to be removed to service check valves, relief valves, trunnion shaft oil seals, charge pump or rear PTO oil seal. Before removing and disassembling the transmission, read "Diagnosing Malfunctions" and the "Testing" information in this group.

Remove fender-deck assembly. Wipe dirt and grass from the transmission and the area around it. Remove fan shield and transmission fan.

⚠ CAUTION: Keep hands and tools away from transmission fan when operating tractor with fender deck removed.

Disconnect drive shaft at flexible coupling and PTO shaft extension, if so equipped. Disconnect control rod at cam. Disconnect brake links at brake levers.

Disconnect hydraulic oil lines.

Remove hitch plate cap screws and transmission mounting bracket cap screws.

With tractor properly supported and with the wheels still in place, roll axle, transmission, and hitch plate assembly rearward away from tractor.

Disconnect oil intake pipe from transmission and remove the four cap screws securing transmission to axle.

Use a safe cleaning solvent and thoroughly clean the outside of the transmission. Move the transmission to a clean, well lighted work area and use clean tools for the service procedure.

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Section 10
GENERAL

Group 5
TRACTOR IDENTIFICATION

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Testing DC Amperes

To check amperage, the battery must be in need of some charge value. If battery is partially discharged, proceed. If not, remove spark plug wire and crank engine 15 seconds to partially discharge battery. Install spark plug wire.

⚠ CAUTION: Do not ground connections or make contact between the loose leads when making this test.

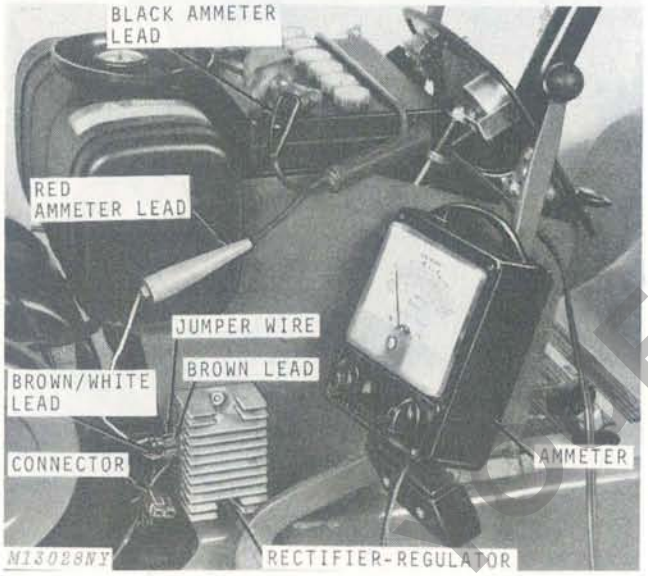


Fig. 8-Testing DC Amperes

Disconnect rectifier-regulator and remove the brown and brown/white leads from connector, Figure 8. Install loose leads on correct (AC) terminals of rectifier-regulator and a jumper wire on remaining (B+) terminal. Install red ammeter lead on jumper wire and black ammeter lead on positive battery terminal and start engine.

Adjust polarity on meter. Ampere reading should be from 8 to 10 amps on tractors (Serial No. - 38,000) and from 12 to 15 amps on tractors (Serial No. 38,001-), depending on battery condition.

If ampere reading is below these ranges, the rectifier-regulator is not functioning properly. Replace rectifier-regulator.

If ampere reading is within or above these ranges, and no charge is being received by the battery, follow the procedure for testing DC charging circuit at right.

Testing DC Circuit

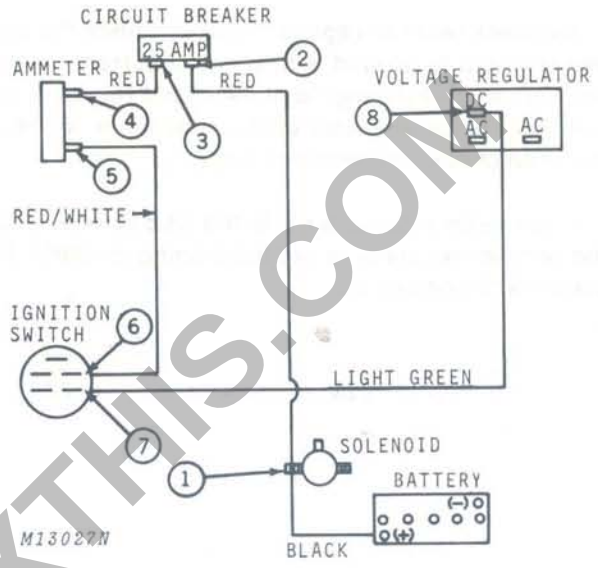


Fig. 9-Testing DC Circuit

Disconnect the positive battery terminal and turn the key switch to the "RUN" position. Connect one lead from a continuity tester to the disconnected battery cable and the other lead to each of the eight check points shown in Figure 9, in the following order.

1. Solenoid post. This eliminates a faulty battery cable.
2. Circuit breaker terminal. This eliminates a faulty red lead.
3. Circuit breaker terminal. This eliminates a faulty circuit breaker.
4. Ammeter terminal. This eliminates a faulty red lead.
5. Ammeter terminal. This eliminates a faulty ammeter.
6. Ignition switch terminal. This eliminates a faulty red/white lead.
7. Ignition switch terminal. This eliminates a faulty ignition switch.
8. Regulator end of light green lead. This eliminates a faulty light green lead.

Replace any faulty components.

Reinstall positive battery cable.

If no faulty components were discovered, follow procedure for testing DC voltage on the next page.

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