GENERAL VEHICLE SPECIFICATIONS

TORQUE VALUES, NON-STANDARD FASTENERS

All torque specifications are subject to final verication.

NOTE: Torques listed in this GROUP apply ONLY to "special" and/or NON-STANDARD fasteners. Unless otherwise specified, STANDARD fasteners should be torqued per "TORQUE VALUES, STANDARD METRIC METRIC FASTENER" or 'TORQUE VALUES, STANDARD INCH FASTENER".

GASOLINE ENGINE

Engine Mounting Cap Screws	80 N•m (60 lb-ft)
Valve Clearance Adjusting Nut	9 N•m (79 lb-in.)
Carburetor Mounting Nuts	17 N•m (12 lb-ft)
Intake Manifold Cap Screw (Final)	6 N•m (53 lb-in.)
Pressure Relief Plug	15 N•m (133 lb-in.)
Thermostat Housing Cap Screws	6 N•m (53 lb-in.)
Rocker Arm Adjuster Screw Lock Nut	9 N•m (79 lb-in.)
Cylinder Head Cap Screw (Final)	21 N•m (186 lb-in.)
Spark Plug	20 N•m (177 lb-in.)
Crankcase Cover Cap Screw	21 N•m (186 lb-in.)
Crankcase Drain Plug	23 N•m (204 lb-in.)
Connecting Rod Cap Screw	21 N•m (186 lb-in.)
Coolant Pump Cap Screw	8 N•m (70 lb-in.)
Crankcase Cover Cap Screw	23 N•m (17 lb-ft)
Oil Pump Cover Cap Screw	7.8 N•m (69 lb-in.)
Ignition Coil Cap Screws	9.8 N•m (87 lb-in.)
Starting Motor Mounting Cap Screw	15.3 N•m (135 lb-in.)
Governor Arm Nut	7.8 N•m (69 lb-in.)

Flywheel:

Flywheel Nut	108 N•m (80 lb-ft)
Flywheel Sheave	15 N•m (130 lb-ft)
Fan Belt Drive Sheave Screw	15 N•m (133 lb-in.)

Carburetor—425:

Throttle Shaft Retaining Screw	2 N•m (17 lb-in.)
Drain Screw	1.2 N•m (10 lb-in.)
Choke and Throttle Valve Screw	0.88 N•m (7.8 lb-in.)
Solenoid Valve Torque	9.8 N•m (87 lb-in.)
Main Jet and Main Air Jet Torque	1.0 N•m (8.9 lb-in.)
Air Horn Mounting Screws	2.9 N•m (26 lb-ft)

Throttle Body—445:

Throttle Shaft Retaining Screw	2.0 N•m (17 lb-ft)
Throttle Plate Screws	2.0 N•m (17 lb-ft)
Mounting Stud Nuts Torque	17 N•m (12 lb-ft)

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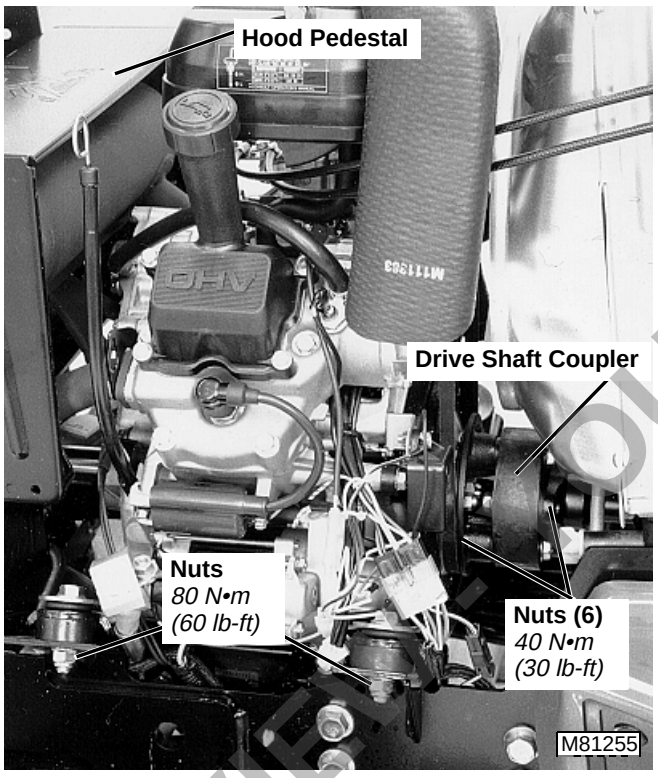
REPAIR

ENGINE—REMOVAL/ INSTALLATION—425

c CAUTION

Release of fluids from pressurized fuel system can cause serious injuries. Relieve fuel system pressure and be sure engine is cool before servicing.

.



Left Side View

1. Remove side shields, grille, hood and hood pedestal.
2. Disconnect and remove battery.

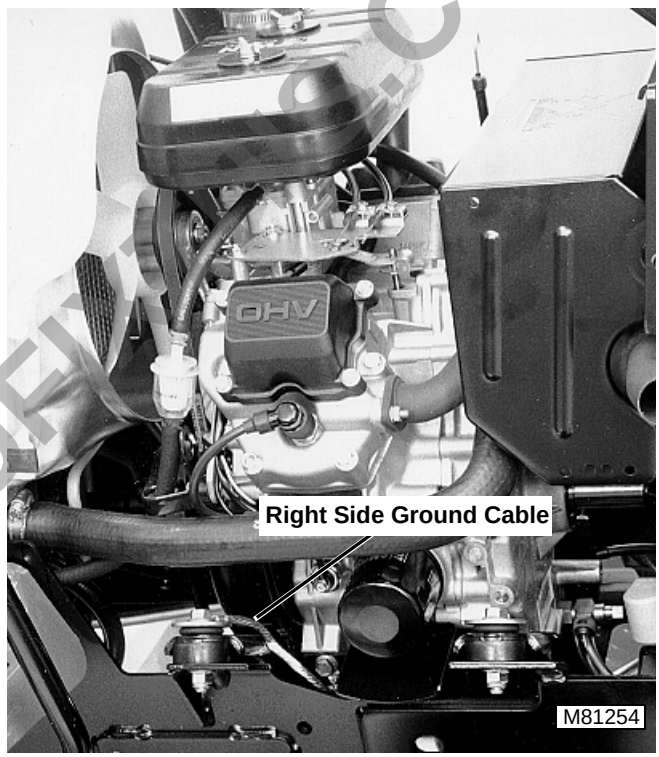
NOTE: Cooling system capacity is approximately 2.8 L (3.0 qt).

3. Drain coolant and remove upper and lower radiator hoses.
4. Disconnect all hoses, wiring connectors and cables.
5. Remove muffler. (See MUFFLER REMOVAL/ INSTALLATION in the Miscellaneous Section.)
6. Disconnect throttle and choke cables.
7. Disconnect drive shaft coupler.
8. Install lift bracket to aid in engine removal/ installation.
9. Remove four mounting cap screws, washers and nuts, and right side ground cable.

IMPORTANT: When lifting engine, simultaneously move engine forward and away from radiator, so fan clears radiator shroud; otherwise, damage to radiator, cooling fan, or shroud may occur.

10. Safely attach overhead hoist and carefully remove engine making sure not to damage radiator, fan, or fan shroud.
11. Make repairs to engine as necessary.

.



Right Side View

IMPORTANT: Ground cable must not be stretched tight after tightening engine mounting nut to prevent failure of cable from engine vibration.

Installation is done in the reverse order of removal.

- Carefully install engine so damage is not caused to radiator, fan, or fan shroud.
- Install right side ground cable between head of rear engine mounting bolt and washer.
- Tighten engine mounting hardware to **80 N•m (60 lb-ft)**, drive shaft coupler hardware to **40 N•m (30 lb-ft)**, and hood pedestal hardware to standard torque specifications.
- Close drain valve and fill radiator with proper mixture of coolant to top of filler neck.
- Start engine and allow it to reach proper operating temperature.
- Visually check radiator, hoses, and connections for leaks. Adjust coolant level in recovery tank only.

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CARBURETOR—EXPLODED VIEW

ATTENTION!

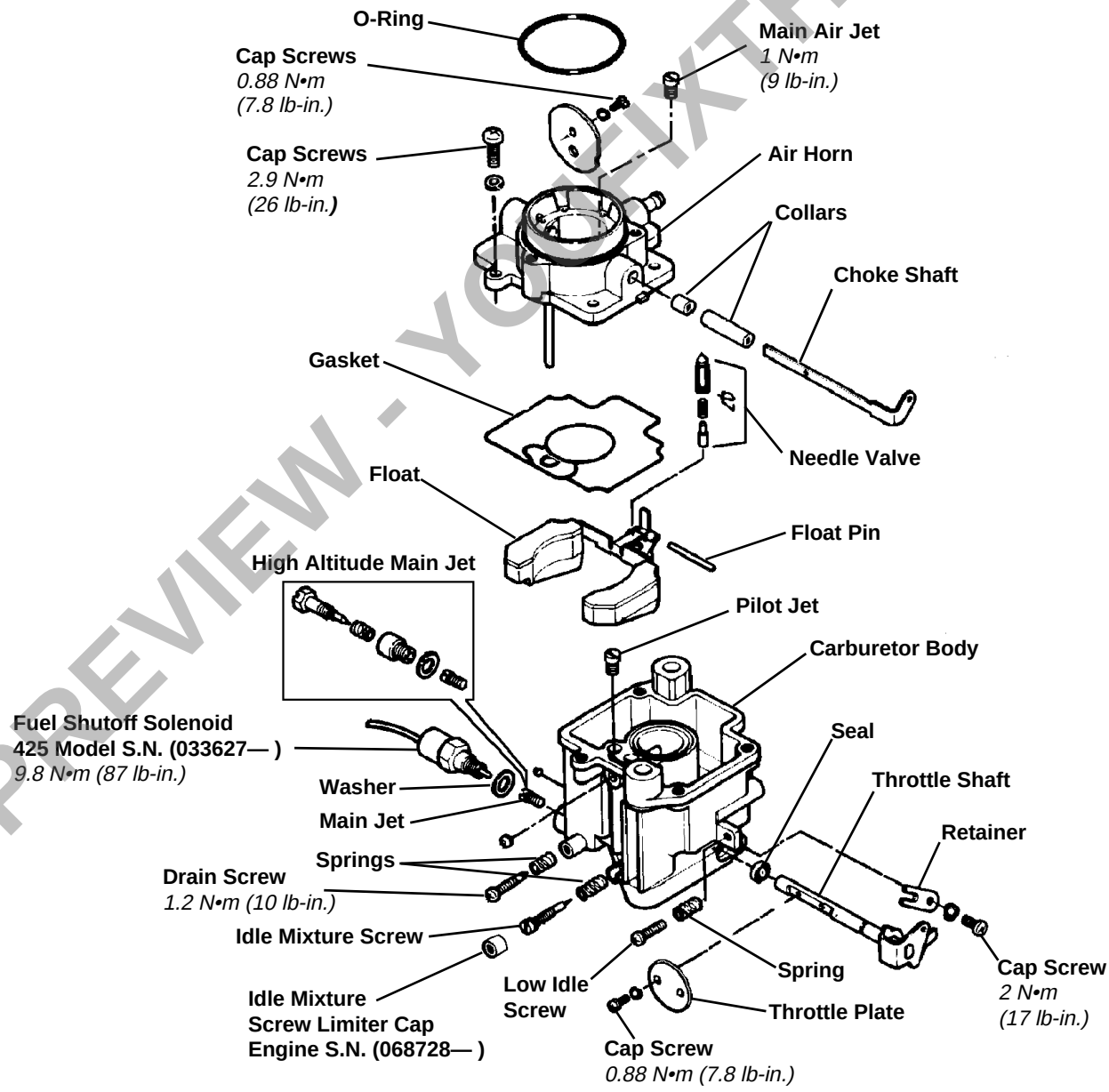
Do not attempt to rebuild or adjust carburetor unless you are a factory trained technician with authorization to service California Air Resources Board/Environmental Protection Agency (CARB/ EPA) Certified engines.

c CAUTION

Gasoline is extremely flammable. Do not smoke. Always work in a ventilated area away from open flame or spark producing equipment, this includes equipment that utilizes pilot lights.

Refer to the illustration and the following notes for disassembly and assembly.

NOTE: Late model 425 certified carburetors - Engine S.N: (068728—) have a limiter cap on the idle mixture screw . This capped idle mixture screw requires a special procedure for adjustment. 425 Model S.N. (033627—) use fuel shut-off solenoid. 425 Model S.N. (—033626) use carburetor vent tubes.



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TROUBLESHOOTING—425 CARBURETED ENGINES

NOTE: See Electrical Section for fuel injection chart.

Problem or Symptom / Check or Solution	Engine cranks but will not start.	Loss of power.	Engine runs erratically.	Engine misses at high rpm.	Engine misses at low rpm.	Excessive fuel consumption.	Excessive oil consumption.	Engine backfires.	Engine knocks.	Coolant leakage.	Engine overheats.
Worn or burned valves or improper clearance.											
Worn valve stem(s) or valve guide(s).											
Warped cylinder head.											
Broken valve spring.											
Defective head gasket.											
Low oil level.											
Too much oil in crankcase.											
Carburetor out of adjustment.											
Air/fuel passages clogged.											
Carbon deposits in exhaust pipe/ muffler.											
Carbon deposits in combustion chamber.											
Lack of coolant.											
Governor linkage out of adjustment.											
Faulty governor spring.											
Governor gear assembly binding or broken.											
Air being drawn through carburetor or intake manifold flanges.											
Incorrect timing gear alignment.											

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RADIATOR BUBBLE TEST

Reason:

To determine if compression pressure is leaking past head gaskets and into cooling system.

Procedure:

1. With coolant at proper level and radiator cap tight, start and run engine to bring it to operating temperature.
2. Disconnect overflow hose from coolant recovery tank.



3. Put end of hose in a container of water.
4. Check for bubbles coming from hose.

Results:

- If bubbles are present, replace head gaskets.

RADIATOR CAP PRESSURE TEST

Reason:

To test radiator cap for operating in correct pressure range.

Test Equipment:

- D05104ST Cooling System Pressure Pump
- JDG692 Adapter

Procedure:

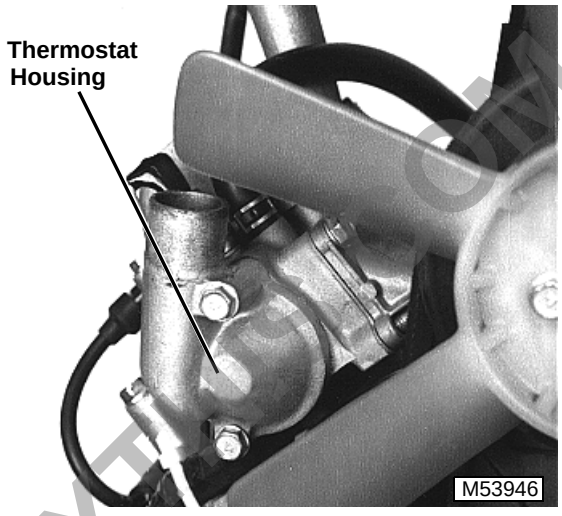
1. Install radiator cap on pressure pump.
2. Apply pressure and observe when cap relieves.

Specifications:
Opening Pressure . . . . . 83—96 kPa (12—14 psi)
Minimum Pressure . . . . . 76 kPa (11 psi)

Results:

- If cap leaks, retighten and test again. Replace cap if pressure is not according to specifications.

THERMOSTAT TEST



Temperature gauge (on tractor) will read slightly higher than normal until thermostat opens. Check thermostat using a thermostat tester. Heat thermostat in water to check opening temperature. Replace, if not according to specifications.

Thermostat Specifications

Begin Opening . . . . . 66—66°C (145—150°F)
Fully Open. . . . . .80°C (176°F)

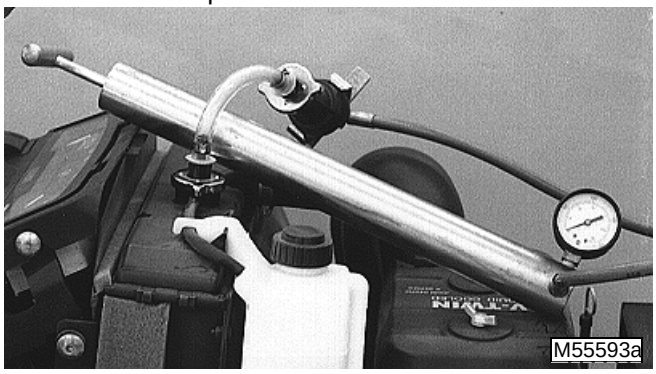
COOLING SYSTEM TEST

Reason:

Inspect cooling system for leaks.

Test Equipment:

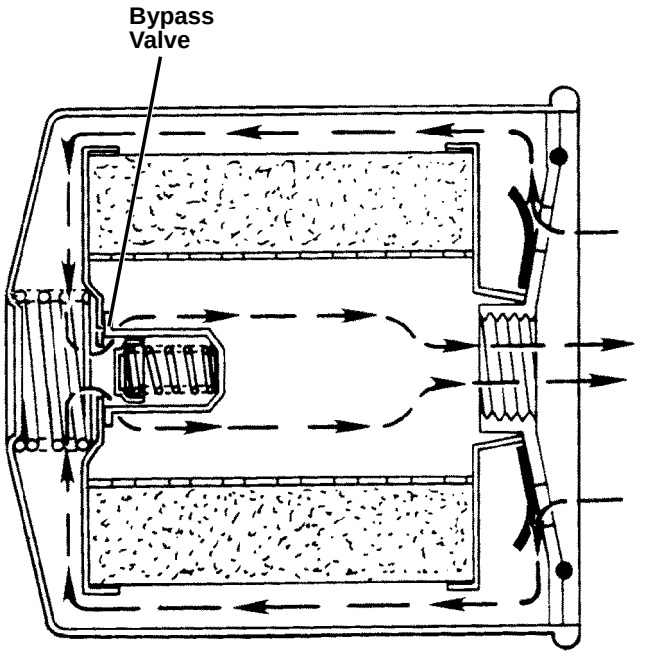
- D05104ST Cooling System Pressure Pump
- JDG692 Adapter



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OIL FILTER OPERATION



Function:

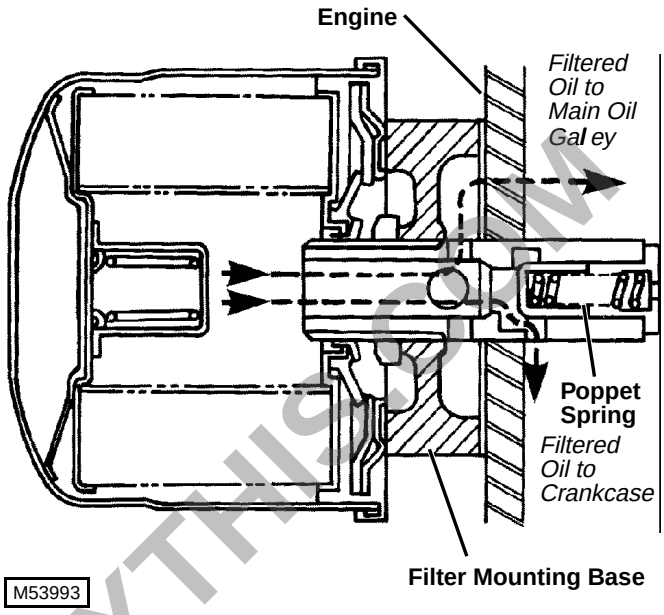
Filters contaminants from the oil between oil/filter changes.

System Operation:

Pressurized oil is directed from the oil pump to the oil filter. Oil flows through the filter element to the main oil galley and to the engine components.

The oil filter is equipped with a bypass valve to ensure adequate engine lubrication if the filter is clogged or oil viscosity is too heavy to properly flow through the filter. The bypass valve opens at **96 kPa (14 psi)** pressure differential.

OIL PRESSURE REGULATING VALVE OPERATION



Function:

Regulates engine oil pressure.

System Operation:

The oil pressure regulating valve is located in the oil filter mounting base stud. Filtered oil passes through the pressure regulating valve to the main oil galley.

If oil pressure is higher than the valve is set for, a poppet spring is overcome, opening the relief valve. When opened, a passage is opened to route oil back to the crankcase.

The oil pressure regulating valve is set to maintain a pressure of **294—440 kPa (43—64 psi)**.

NOTE: Al pressure regulating valves operate the same. The most common mounting location is shown.

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425, 445, and 455 Lawn and Garden Tractors

TECHNICAL MANUAL

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John Deere
Worldwide Commercial and Consumer Equipment Division

TM1517 (Sep99)
Replaces TM1517 (15Sep96)

Litho in U.S.A

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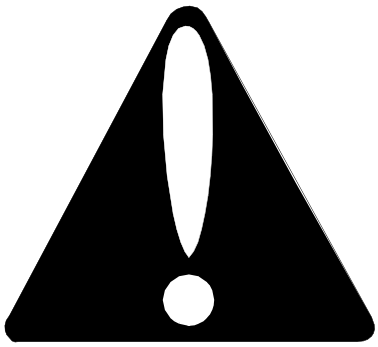
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RECOGNIZE SAFETY INFORMATION



This is the safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

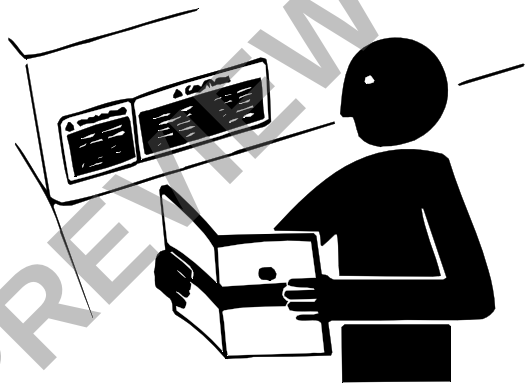
Follow recommended precautions and safe servicing practices.

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

REPLACE SAFETY SIGNS

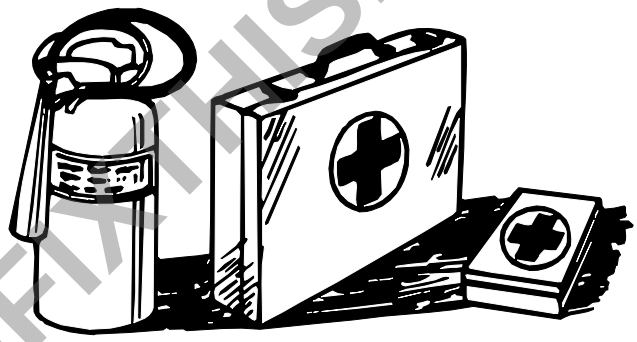


Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

HANDLE FLUIDS SAFELY—AVOID FIRES

Be Prepared for Emergencies





When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.

Be prepared if a fire starts.

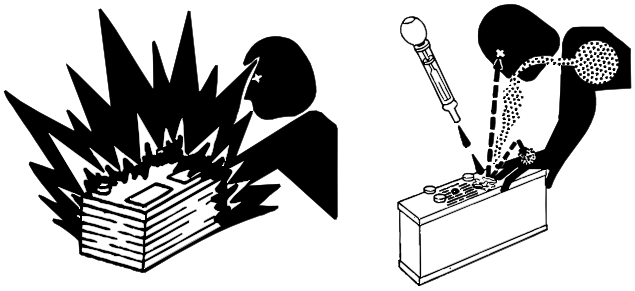
Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

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USE CARE IN HANDLING AND SERVICING BATTERIES



Prevent Battery Explosions

- Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.
- Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
- Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

Prevent Acid Burns

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

- **Avoid acid burns by:**

1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Using proper jump start procedure.

- **If you spill acid on yourself:**

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10—15 minutes.
4. Get medical attention immediately.

- **If acid is swallowed:**

1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.

USE CARE AROUND HIGH-PRESSURE FLUID LINES

Avoid High-Pressure Fluids



Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid injury from escaping fluid under pressure by stopping the engine and relieving pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high-pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.

Avoid Heating Near Pressurized Fluid Lines



Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area.

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DIAGNOSIS—425

ENGINE SYSTEM DIAGNOSIS—425 CARBURETED ENGINES

Test Conditions:

- Machine parked on level surface.
- Park brake locked.
- PTO switch off.
- Key switch off.
- Spark plug connected to D-05351ST Spark Tester.

Test/Check Point	Normal	If Not Normal
1. Engine dipstick and exterior engine surface—ENGINE OIL DIPSTICK. See engine oil dipstick in this section.	Oil level between "L" and "H" marks. Oil not burnt, or contaminated with metal particles or coolant. (A small amount of fuel is acceptable.) No external leakage, filter clean.	Change oil and inspect for source of contamination. Check gaskets, seals, plugs, cylinder head, block, and intake manifold. Change oil filter.
2. Coolant tank and radiator—cooling system check.	Coolant level between marks on tank when engine is warm. Coolant in radiator full to top. Coolant not contaminated with oil or fuel or discolored brown. Radiator/screen free of debris. Hoses not cracked or leaking, clamps and radiator cap tight. Fan belt tight, not glazed or cracked. Fan blades not damaged or warped.	Add proper coolant mix. Drain and flush system. Check for source of contamination. Clean or replace hoses. Pressure test radiator and cap. Replace and adjust belt tension. Replace fan.
3. Fuel tank, pump, lines, filters and shutoff valve—fuel system check.	Fuel level correct, not contaminated or stale smelling, no water in fuel. Fuel pump filter and in-line filter free of debris. Fuel shutoff valve in on position. Fuel hoses not cracked or leaking. Fuel hose clamps tight. Fuel tank does not have vacuum.	Drain and clean fuel tank. Add fresh fuel. Replace filters. Move to on position Replace or tighten. Replace fuel tank check valve.
4. Air filter, side screen.	Side panel air intake screen free of debris. Air filter hose not cracked, clamps tight. Primary and secondary elements not plugged. Air filter housing sealed, no dirt tracking inside filter element.	Clean intake screen. Replace and tighten clamps. Replace elements or housing. Replace air restriction indicator.
5. Spark plug (key switch in start position).	Steady blue spark. Engine must crank.	If spark is weak (yellow) or no spark, install new spark plug and test again. If still weak or no spark, see IGNITION CIRCUIT DIAGNOSIS—425 in ELECTRICAL section. See CRANKING CIRCUIT DIAGNOSIS. in the ELECTRICAL section.
6. Spark plug (key switch off).	Plug dry.	Check carburetor inlet needle for debris, choke, and mixture adjustment.

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REPAIR SPECIFICATIONS (continued)

Piston OD

Distance A	8 mm (0.315 in.)
Standard Size Piston	
Standard	71.922—71.952 mm (2.832—2.833 in.)
Wear Limit	71.81 mm (2.827 in.)
0.25 mm (0.010 in.) Oversize Piston	
Standard	72.17—72.20 mm (2.841—2.842 in.)
Wear Limit	72.06 mm (2.837 in.)
0.50 mm (0.020 in.) Oversize Piston	
Standard	72.42—72.45 mm (2.851—2.852 in.)
Wear Limit	72.31 mm (2.847 in.)

Crankcase Extension Housing

Flywheel Housing/Plate-to-Extension Cap Screw Torque	49 N•m (36 lb-ft)
Seal Case-to-Extension Cap Screw Torque	26 N•m (19 lb-ft)

Crankshaft, Main Bearings and Flywheel

Crankshaft Rear Oil Seal	
Seal Case-to-Block Cap Screw Torque	11 N•m (96 lb-in.)
Seal Case-to-Extension Cap Screw Torque	9 N•m (78 lb-in.)
Crankshaft and Main Bearings	
Main Bearing Cap Screw Torque	79 N•m (58 lb-ft)
Crankshaft Maximum Bend	0.02 mm (0.0007 in.)
Connecting Rod Journal OD	
Standard	39.97—39.98 mm (1.5736—1.5740 in.)
Wear Limit	39.92 mm (1.572 in.)
Main Bearing Journal OD	
Standard	43.97—43.98 mm (1.7311—1.7315 in.)
Wear Limit	39.92 mm (1.572 in.)
Main Bearing ID	
Standard	44.00—44.042 mm (1.732—1.734 in.)
Wear Limit	44.07 mm (1.735 in.)
Clearance	0.15 mm (0.0059 in.)

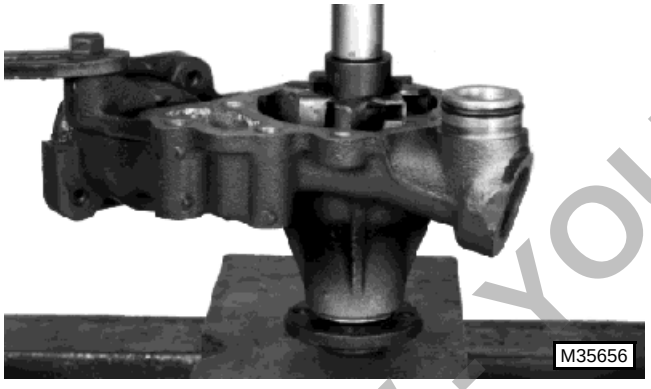
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3. Place water pump housing on a press table. Support housing on bearing shaft using a driver disk.
4. Install pulley flange onto shaft with straight hub facing away from housing.
5. Press pulley flange onto bearing shaft until flange is flush with end of shaft.

IMPORTANT: DO NOT touch lapped sealing surface of ceramic seal with bare hands. It must be clean and dry.

6. Install seal cup and ceramic seal in impeller.
7. Install a knife-edge puller around bearing shaft, between pulley flange and pump housing. Place pump housing, with knife-edge puller down, on a press table.
8. Install impeller with ceramic seal toward shaft seal.
9. Press impeller on bearing shaft until top of impeller is even with end of shaft.



10. Install new gasket, plate and screws. Tighten to **9 N•m (78 lb-in.)**.
11. Install coolant temperature sensor. (See COOLANT TEMPERATURE SENSOR.)
12. Install thermostat. (See THERMOSTAT.)

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LEGENDS FOR ELECTRICAL COMPONENTS—425

LEGEND FOR ELECTRICAL COMPONENTS—425 (S.N. —070000)

A1—Ignition Delay Module (SE1)
A2—Ignition Module (SE1)
B1—Left Pulser Coil (SE1)
B2—Right Pulser Coil (SE1)
B3—Not Used
B4—Not Used
B5—Fuel Gauge Sensor (SE4, W1)
B6—Oil Pressure Switch (SE5)
B7—Coolant Temperature Sensor (SE5)
E1—Ignition LED (SE1)
E2—PTO LED (SE2)
E3—Left Spark Plug (SE1)
E4—Right Spark Plug (SE1)
E5—Left Dash Light (SE6)
E6—Right Dash Light (SE6)
E7—Left Head Light (SE6)
E8—Right Head Light (SE6)
E9—Left Tail Light (SE6)
E10—Right Tail Light (SE6)
F1—Fusible Link
F2—Not Used
F3—Light Fuse (SE1)
F4—Power Fuse (SE1)
G1—Battery (SE1)
G2—Stator (SE3)
H1—Front PTO Light (SE2)
H2—Rear PTO Light (SE2)
H3—Charge Light (SE3)
H4—Oil Pressure Light (SE5)
K1—Start Relay (SE1)
K2—Ignition Relay (SE1)
K3—PTO Relay (SE2)
M1—Starting Motor (SE1, W1)
M2—Fuel Pump (SE5)
N1—Rectifier/Regulator (SE3, W1)
P1—Fuel Gauge (SE4)
P2—Coolant Temperature Gauge (SE5)
P3—Hour Meter (SE5)
S1—Key Switch (SE1)
S2—Seat Switch (SE1, W1)
S3—Brake Switch (SE1, W1)
S4—PTO Switch (SE1, W1)
S5—Light Switch (SE6, W1)
T1—Left Ignition Coil (SE1)
T2—Right Ignition Coil (SE1)
W1—Main Wiring Harness
W2—Rear PTO Wiring Harness
X1—Power Connector (SE1, SE2, W1)
X2—Control Connector (SE1, SE2, W1)
X3—Dash Panel Connector (SE3, SE4, SE5, SE6, W1)
X4—Rear PTO Connector (SE1, W1)
X5—Front PTO light Connector (SE2, W1)
X6—Rear PTO Connector (SE1, W1)
X7—Rear PTO Connector (SE1, W1)
X8—Fuel Pump Shut-Off Connector (SE5, W1)
X9—Engine Connector (W1)
Y1—Fuel Shut-Off/Carburetor Vent Solenoid (SE1)
Y2—PTO Solenoid (SE2, W1)

LEGEND FOR ELECTRICAL COMPONENTS—425 (S.N. 070001—)

A1—Ignition Delay Module (SE1)
A2—Ignition Module (SE1)
A3—Control/Fuse Module (SE1)
A4—Seat Switch Delay Module (SE2)
A5—Instrument Panel (SE3, W1)
B1—Left Pulser Coil (SE1)
B2—Right Pulser Coil (SE1)
B3—Coolant Temperature Sensor (SE1)
B4—Engine Oil Pressure Switch (SE1)
B5—Fuel Gauge Sensor (SE3)
E1—Left Spark Plug (SE1)
E2—Right Spark Plug (SE1)
E3—PTO LED (SE1)
E4—Ignition LED (SE1)
E5—Left Head Light (SE3, W1)
E6—Right Head Light (SE3, W1)
E7—Left Tail Light (SE3, W1)
E8—Right Tail Light (SE3, W1)
G1—Battery (SE1)
G2—Stator (SE1)
H1—Engine Oil Pressure Light (SE3)
H2—Front PTO Light (SE3)
H3—Rear PTO Light (Option) (SE3)
H4—Discharge Light (SE3)
H5—Dash Light (SE3)
H6—Dash Light (SE3)
K1—Start Relay (SE1)
K2—Ignition Relay (SE1)
K3—PTO Relay (SE2)
K4—RIO Latch Relay (SE1)
K5—RIO Unlatch Relay (SE1)
M1—Starting Motor (SE1, W1)
M2—Fuel Pump (SE3)
N1—Rectifier/Regulator (SE1, W1)
P1—Fuel Gauge (SE3)
P2—Hour Meter (SE3)
P3—Coolant Temperature Gauge (SE3)
S1—Key Switch (SE1)
S2—PTO Switch (SE2, W1)
S3—Seat Switch (SE2, W1)
S4—RIO Switch (SE2, W1)
S5—Brake Switch (SE2, W1)
S6—Light Switch (SE3, W1)
T1—Left Ignition Coil (SE1)
T2—Right Ignition Coil (SE1)
W1—Main Wiring Harness
W2—Rear PTO Wiring Harness
X1—Key Switch Power connector (SE1, W1)
X2—Control Connector (SE1, SE2, W1)
X3—Power Connector (SE1, SE2, W1)
X4—Ignition Delay Module/Starting Motor Connector (SE1)
X5—Ignition Delay Module Connector (SE1)
X6—Ignition Delay Module/Ignition Module Connector (SE1)
X7—Ignition Delay Module/Ignition Coils Connector (SE1)
X8—Ignition Module/Ignition coils Connector (SE1)
X9—Ignition Module/Pulser Coils Connector (SE1)
X10—Engine Connector (SE1, W1)
X11—Rear PTO Module (Option) Connector (SE2, W1)
X12—Rear PTO Module (Option) Connector (SE2, W1)
X13—Rear PTO Harness (Option) Connector (SE2, W1)
X14—Front PTO Light Connector (SE2, W1)
X15—PTO Solenoid Connector (SE2, W1)
X16—Fuel Pump Shut-Off Connector (SE3, W1)
X17—Fuel Pump and Fuel Gauge Sensor Connector (SE3, W1)
X18—Instrument Panel Connector (SE3, W1)
X19—Left Head Light Ground Connector (SE3, W1)
X20—Left Head Light Power Connector (SE3, W1)
X21—Right Head Light Ground Connector (SE3, W1)
X22—Right Head Light Power Connector (SE3, W1)
X23—Left Tail Light Connector (SE3, W1)
X24—Right Tail Light Connector (SE3, W1)

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IGNITION CIRCUIT OPERATION—425 (S.N. —070000)

Function:

To create a spark at the correct time, that ignites the fuel/air mixture in the cylinders.

Operating Conditions:

To produce a spark, the key switch must be in the run or start position, and the operator must be on the seat (seat switch closed) or with the operator off the seat, the brake pedal must be depressed (brake switch closed) and the PTO switch must be off (PTO switch closed).

System Operation:

The ignition system is a transistor controlled battery ignition design. The battery (G1) supplies current to the ignition coils (T1 and T2). Ignition timing is controlled by the ignition module and is not adjustable. The engine is shut off by de-energizing the ignition relay and ignition delay module which stops current flow to the ignition module. The ignition delay module allows the sparks plugs to fire for 1 additional second after the key switch is turned off to burn any remaining fuel in the cylinder. The ignition delay module is used with the carburetor vent solenoid (serial numbers 033626 and below) fuel shut-off solenoid (serial numbers 033627 and above) to prevent backfire. When the key switch is turned off, current flow from the ignition relay stops. A timer in the ignition delay module allows current from the starting motor B terminal to flow to the ignition module and both ignition coils for the extra 1 second spark.

Current (A) flows from the battery (G1) to the starting motor (M1), fusible links (F1), key switch terminal B (S1), ignition delay module (A1), left ignition coil (T1), and right ignition coil (T2). Current cannot flow to the ignition delay module (A1) or the ignition module (A2) until the ignition relay (K2) is energized.

With the operator off the seat and the key switch in the run position, current flows from key switch terminal B to terminal A, power fuse (F4), ignition relay terminal 87, brake switch (S3) (brake pedal depressed), PTO switch (S4) (PTO disengaged), ignition relay coil terminal 85, and ignition LED(E1). The ignition LED indicates that power is available to the ignition relay coil. With the ignition relay energized, current (C) flows to the PTO switch, and ignition delay module. The ignition delay module allows current (D) to flow to the ignition module.

An alternate current path is provided to keep the ignition relay energized when the PTO is engaged or the brake pedal is released. With the operator on the seat (seat switch (S2) closed), current (E) flows to the ignition relay coil, keeping the relay energized. If the operator leaves the seat with the PTO engaged or the brake pedal released, current to the ignition relay coil is stopped. The ignition relay opens, which stops current flow to the ignition delay module and the ignition module, stopping the engine. A delay capacitor in the ignition module provides current for 1/2 second to keep the ignition relay coil energized if the operator bounces on the seat.

As the flywheel turns, a tab on the flywheel travels past the pulser coils and produces current in the pulser coils by electromagnetic induction. Two pulser coils, one for each cylinder, are mounted in a fixed position next to the flywheel. Pulser coil current flows to a transistor inside the ignition module and energizes the transistor. With the transistor energized, a path to ground is provided for the ignition coil primary winding circuit. The ignition coils (T1 and T2) consist of iron cores with two sets of wires wound around them. The primary windings are connected to the ignition module. The secondary windings connect to the spark plugs (E3 and E4) through the high tension leads. There are more windings in the secondary coil than in the primary coil.

As the flywheel rotates prior to spark plug firing, the ignition module allows battery current flow through the primary windings (F) of the coil. At the correct time, pulser current flow to the ignition module transistor stops and the transistor is de-energized. The transistor opens and breaks the path to ground for ignition coil primary current. When the current flow stops, the primary coil electromagnetic field collapses and induces high voltage current in the secondary coil (G). The high voltage current flows through the ignition coil wire to the spark plug. The voltage is now high enough to jump the spark plug gap and a spark is produced. Each spark plug fires on both the compression and exhaust strokes. The spark produced during the exhaust stroke does not affect engine operation because there is no compression or combustible mixture in the cylinder.

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COOLANT TEMPERATURE GAUGE CIRCUIT DIAGNOSIS— 425 (S.N. 070001—)

Test Conditions:

- PTO switch in off position.
- Park brake engaged.
- Coolant temperature sensor lead (A) disconnected.
- Key switch in run position.
- Meter negative (–) lead on battery negative (–) terminal.
- Meter positive (+) lead on numbered test point.
- Check connection for corrosion and loose terminals when testing.

Test/Check Point	Normal	If Not Normal
1. Battery positive terminal.	11.8—13.2 volts.	Test battery.
2. Instrument panel connector terminal 14.	Battery voltage.	Check power circuit diagnosis.
3. Instrument panel connector terminal 2.	Battery voltage.	Replace instrument panel
4. Coolant temperature sensor.	Battery voltage.	Check 300 org/wht wire and yel wire lead.

Test Conditions:

Key switch in off position.

Test/Check Point	Normal	If Not Normal
5. Instrument panel connector terminal 11.	Maximum 0.1 ohms resistance.	Check battery negative cable, engine ground connection, 100 and 135 blk wires.

Test Conditions:

- Key switch in run position.
- Check coolant temperature gauge needle position with coolant temperature sensor lead disconnected and then grounded.

Test/Check Point	Normal	If Not Normal
6. Coolant temperature gauge.	Needle at cold position with lead disconnected and hot position with lead grounded.	Replace instrument panel.

Test Conditions:

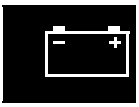
- Key switch in off position.
- Coolant temperature sensor lead disconnected.

Test/Check Point	Normal	If Not Normal
7. Coolant temperature sensor.	Continuity to ground—resistance depends on engine temperature. Sensor threads not corroded.	Replace coolant temperature sensor.

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NOTES



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PTO CIRCUIT OPERATION—445 (S.N. 070001—)

Function:

To provide power to energize or de-energize the PTO solenoid when desired by the operator.

Operating Conditions:

The key switch must be in the run position, with the brake pedal released (brake switch closed), the PTO switch off, and the operator on the seat to initially provide power to the PTO switch for PTO solenoid operation.

System Operation:

The PTO circuit uses the seat switch (S3), ignition relay (K2), and PTO relay (K3) to stop current flow to the PTO solenoid (Y2) if the operator gets off the seat with the PTO engaged. Also, the PTO will be disengaged if the brake pedal is depressed with the PTO switch on.

Current (A) flows from the battery (G1) to the starting motor (M1), fusible link (F2), and terminal B of key switch (S1). With the key switch in the run position, current flows from key switch terminal B to terminal A, power fuse (F5), ignition relay terminal 87, and the seat switch. Current cannot flow to the PTO relay until the ignition relay is energized. Energizing current for the ignition relay comes from the seat switch circuit (B). With the seat switch closed, current flows to the ignition relay coil terminal, and the ignition LED (E4). The ignition LED indicates that power is available to the ignition relay coil.

With the ignition relay energized, current (C) flows to the PTO relay terminal 87. Current cannot flow to the PTO switch (S2) until the PTO relay is energized. Energizing current for the PTO relay must come from the PTO switch, the brake switch (S5), and RIO switch (S4). The PTO safety circuit is used to prevent the PTO relay from energizing, if the PTO switch is in the ON position. The brake switch prevents the PTO relay from energizing if the brake pedal is depressed. With the PTO switch off, current flows to the PTO relay terminal 30, brake switch (brake pedal released), RIO switch, PTO LED (E3), PTO relay coil and energizes the coil, closing the relay. PTO relay circuit current (D) is available to operate the PTO solenoid (Y2) and front PTO light (H2) when the PTO switch is turned on. The PTO LED indicates that power is available to the PTO relay coil.

When the PTO switch is moved to the ON position, current flows to the PTO solenoid and energizes the solenoid to engage the clutch. At the same time, current also flows to the front PTO light.

If the operator leaves the seat or depresses the brake pedal with the PTO engaged, current to the ignition and PTO relay coil is stopped. The relays open and current flow to the PTO solenoid stops, disengaging the PTO clutch. The operator must return to the seat, release the brake pedal, and turn the PTO switch to OFF before the PTO relay will energize again. A delay capacitor in the control/fuse module provides current for 1/2 second to keep the ignition relay coil energized if the operator bounces on the seat.

When the PTO is engaged and the operator changes to reverse, current flow to the PTO relay coil is stopped, de-energizing the relay. With the PTO relay de-energized, current flow to the PTO switch and PTO solenoid is also stopped, preventing the PTO solenoid from energizing and the PTO is disengaged.

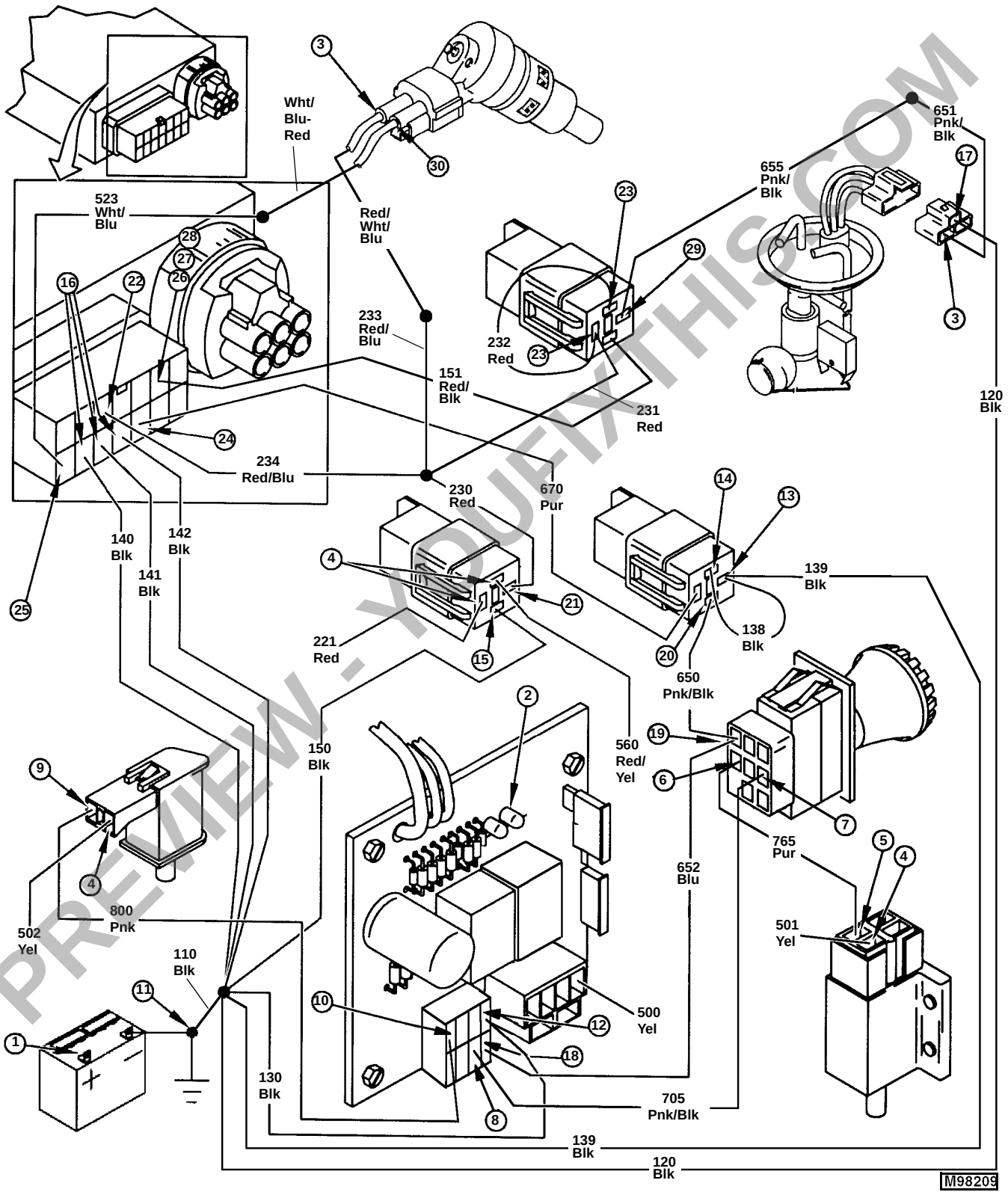
If the PTO switch is placed in the RIP position before changing to reverse, current will flow to the RIO latch relay coil. The RIO latch relay allows current to flow to the PTO relay. Once reverse motion has begun the RIO switch is open, current to the RIO latch relay must come from the brake switch and is routed through the RIO latch relay contacts and RIO unlatch relay contacts back to the RIO latch relay coil to keep it latched.

When forward or neutral is resumed, the RIO switch closes and current flows to the RIO unlatch relay coil and energizes the relay, stopping current flow to the RIO latch coil and de-energizes it and stops current flow to the PTO relay, PTO switch, and PTO solenoid. After the PTO relay is de-energized by changing to reverse, it cannot be energized again until the PTO switch is returned to the OFF position.

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FUEL INJECTOR AND PUMP CIRCUIT TEST POINTS—445 (S.N. 070001—)

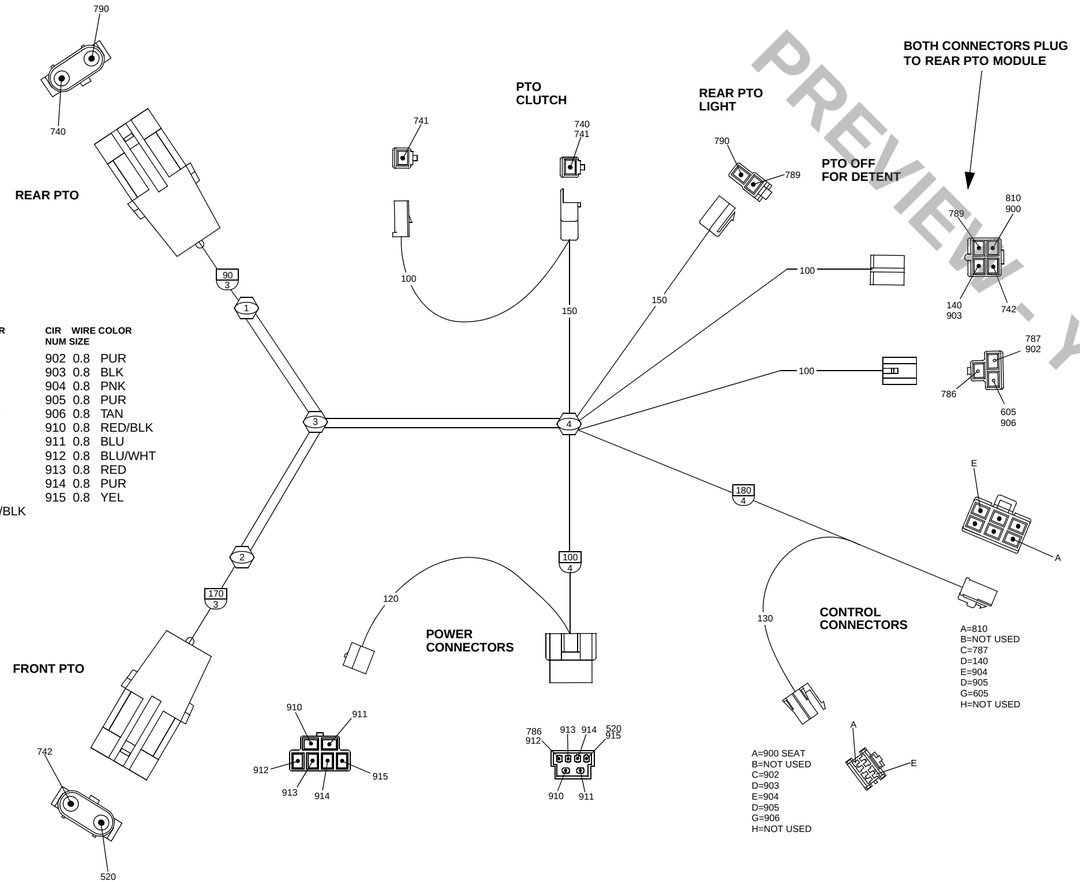


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REAR PTO WIRING HARNESS (W2)—455 LATER MODELS

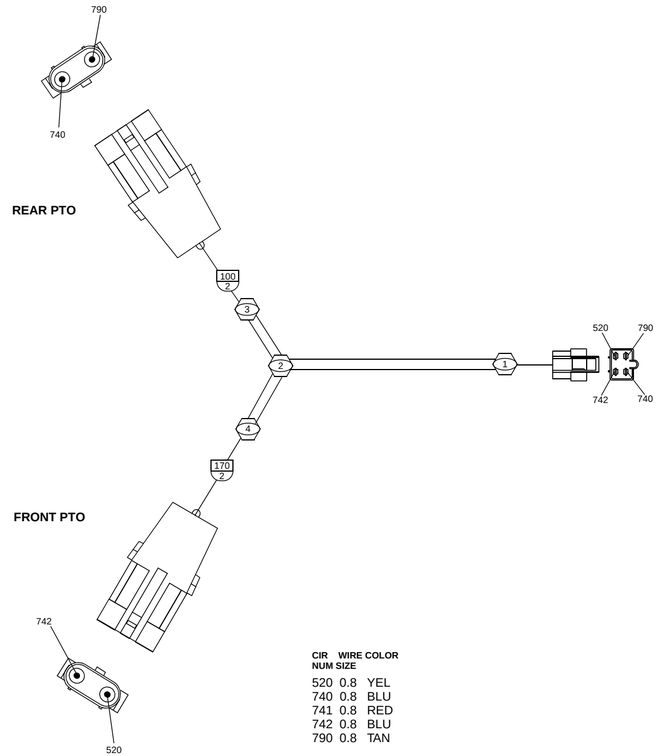
TWO-WHEEL STEER (S.N. —031477)
ALL-WHEEL STEER (S.N. —030384)



CIR NUM	WIRE SIZE	COLOR
140	0.8	BLK
520	0.8	YEL
605	0.8	TAN
740	0.8	BLU
741	0.8	RED
742	0.8	BLU
786	0.8	BLU
787	0.8	PUR
789	0.8	PUR
790	0.8	TAN
810	0.8	PNK
900	0.8	PNK/BLK

CIR NUM	WIRE SIZE	COLOR
902	0.8	PUR
903	0.8	BLK
904	0.8	PNK
905	0.8	PUR
906	0.8	TAN
910	0.8	RED/BLK
911	0.8	BLU
912	0.8	BLU/WHT
913	0.8	RED
914	0.8	PUR
915	0.8	YEL

TWO-WHEEL STEER (S.N. 031478—)
ALL-WHEEL STEER (S.N. 030385—)



CIR NUM	WIRE SIZE	COLOR
520	0.8	YEL
740	0.8	BLU
741	0.8	RED
742	0.8	BLU
790	0.8	TAN

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PTO CIRCUIT DIAGNOSIS—455 (S.N. —070000) (continued)

Test Conditions:

- Key switch in run position.

Test/Check Point	Normal	If Not Normal
8. Control/fuse module terminal E.	Battery voltage.	Replace control/fuse module.
9. Diesel module terminal 4.	Battery voltage.	Check 653 blu wire.
10. PTO switch.	Battery voltage.	Check 652 pnk/blu (blu/blk) wire.
11. PTO switch.	Battery voltage.	Test PTO switch.
12. Control/fuse module terminal 3.	Battery voltage.	Check 750 blu wire.
13. Brake switch.	Battery voltage.	Check 751 blu wire.
14. Brake switch.	Battery voltage.	Test brake switch.
15. Engine high temperature relay terminal 30.	Battery voltage.	Check 770 pur/wht wire.
16. Engine high temperature relay terminal 87A.	Battery voltage.	Test engine high temperature relay.
17. Control/fuse module terminal C.	Battery voltage.	Check 770 pur wire.

Test Conditions:

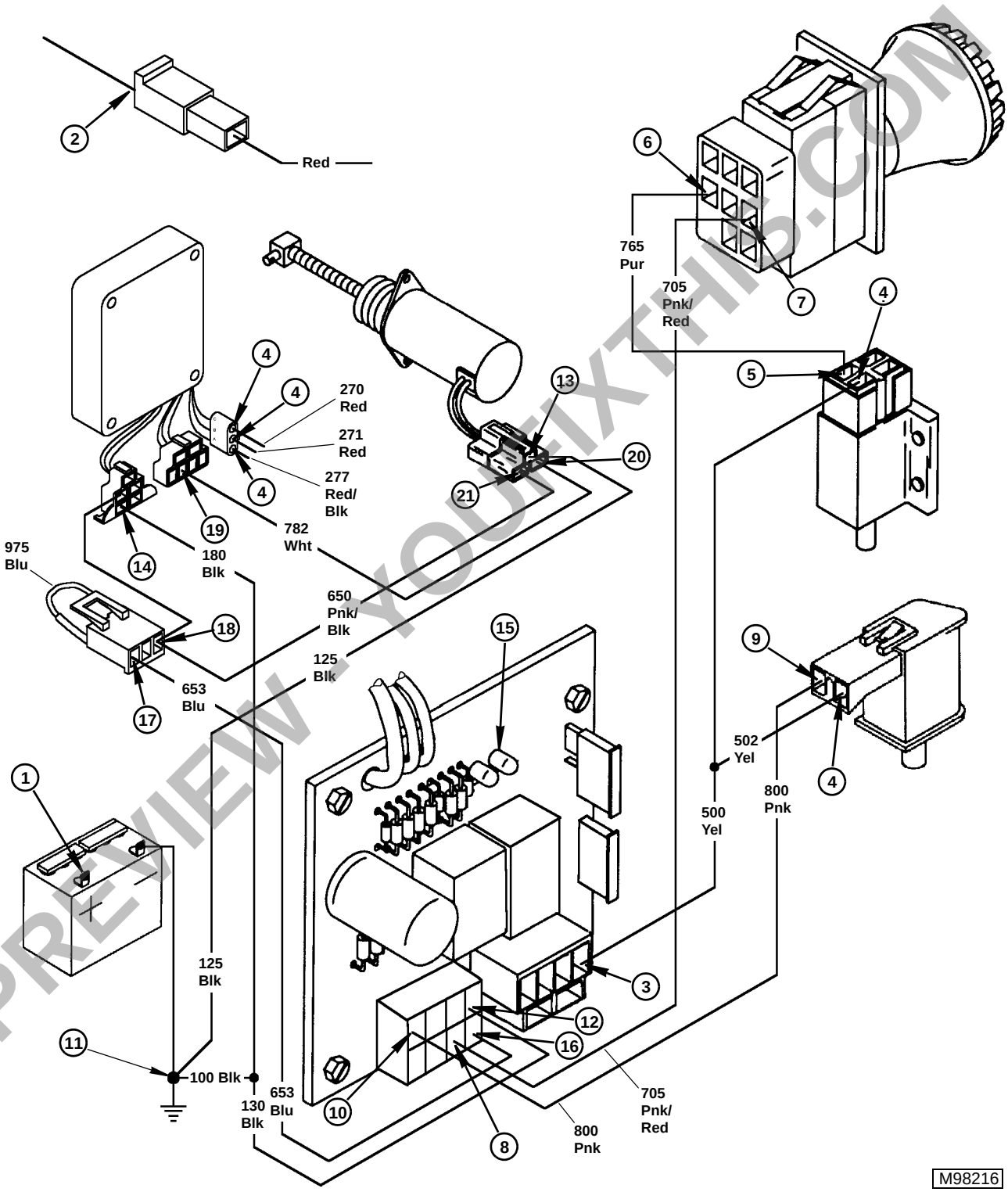
- PTO switch on.

Test/Check Point	Normal	If Not Normal
18. PTO switch.	Battery voltage.	Replace control/fuse module.
19. PTO solenoid.	Battery voltage.	Check 755 blu wire, if ok replace PTO solenoid.
20. Dash panel.	Battery voltage.	Check 756 blu, 757 yel wire, and PTO light, if ok replace dash panel module.

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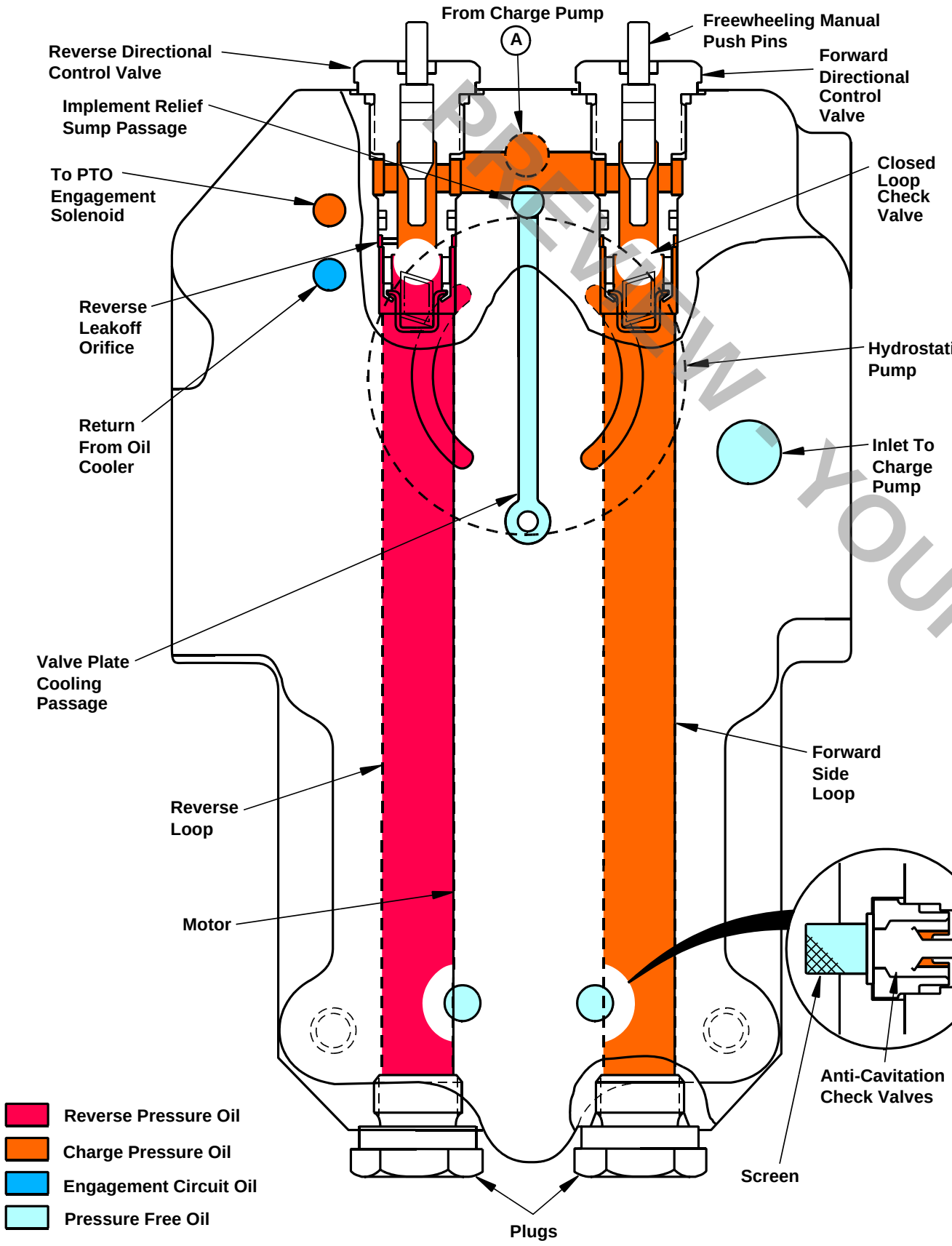
FUEL SHUT-OFF SOLENOID CIRCUIT TEST POINTS—455 (S.N. 070001—) (continued)



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CENTER SECTION AND DIRECTIONAL CONTROL VALVES—REVERSE SYSTEM OP



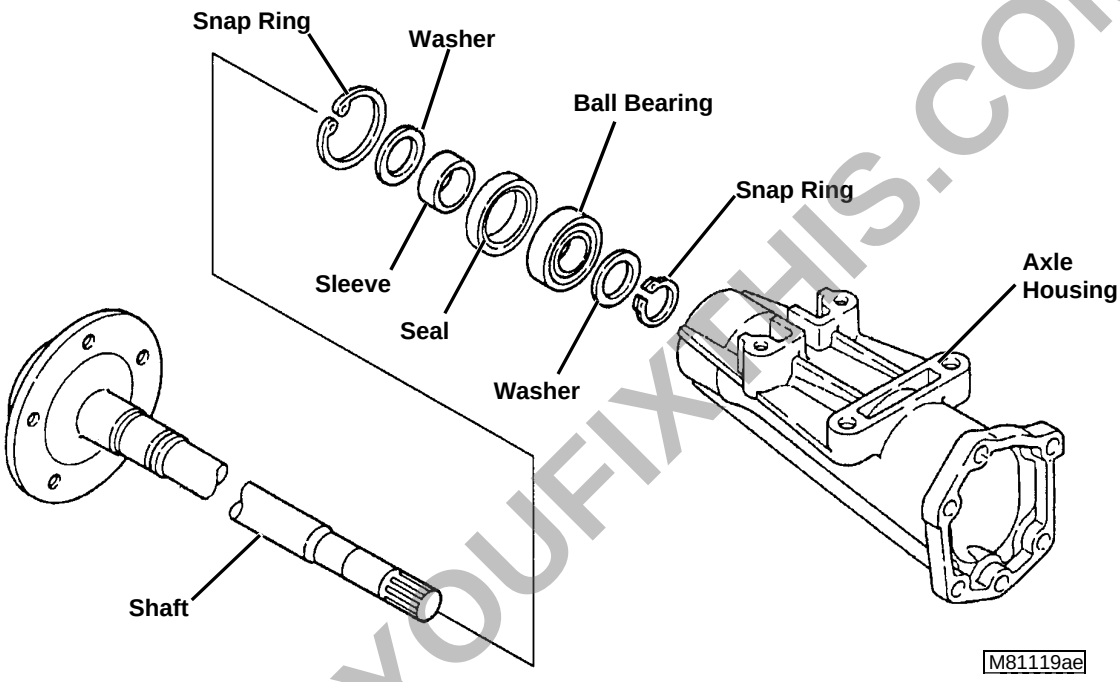
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REAR AXLE ASSEMBLY—REMOVAL/INSTALLATION

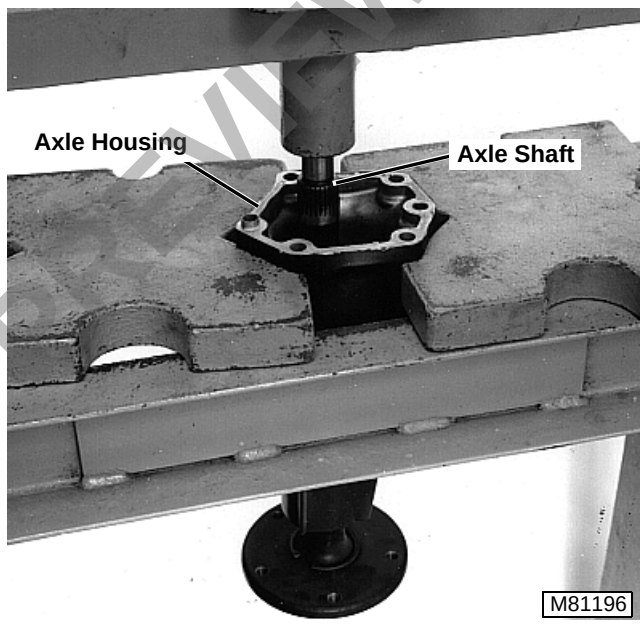
1. Remove transaxle. (See TRANSAXLE—REMOVAL/INSTALLATION.)
2. For AWS models, remove rear steering linkage. (See REAR STEERING LINKAGE—REMOVAL in the STEERING section.)
3. Remove rear axle assembly.
4. Clean axle housing and transaxle mating surfaces. Apply a bead of John Deere Form-in-Place Gasket to mating surface.

NOTE: For AWS models, longer caps screws are installed in the bottom three holes.

5. Repeat for other side if necessary.



REAR AXLE ASSEMBLY (TWO WHEEL STEER MODELS)—DISASSEMBLY/ASSEMBLY



1. Remove snap ring from groove of axle housing.
2. Use a press to remove axle shaft from axle housing.
3. Remove remaining snap ring to remove axle shaft components.
4. Inspect axle shaft and housing for wear or damage. Replace parts as necessary.
5. Inspect bearing for smooth rotation. Replace if necessary.

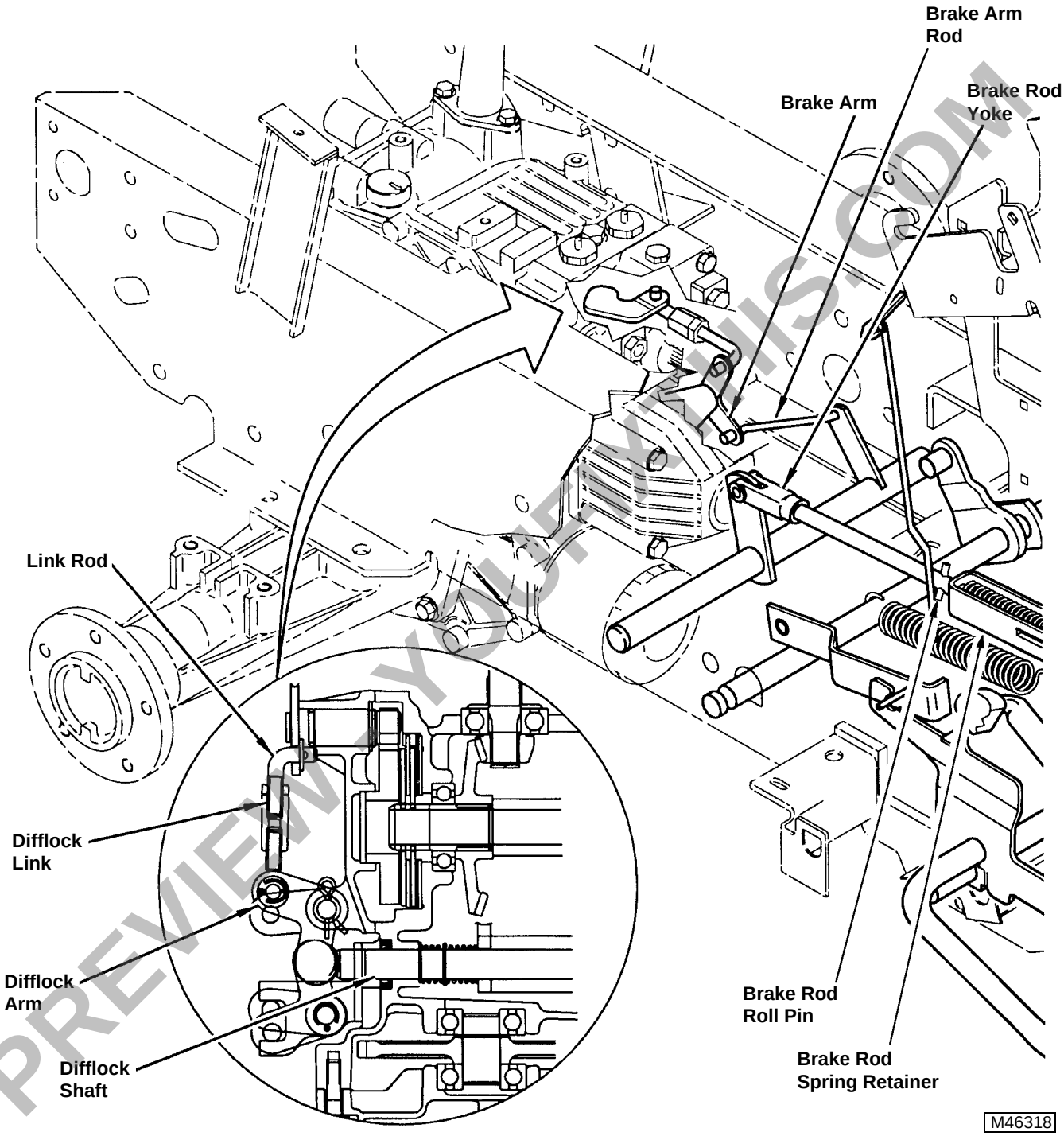
NOTE: Ball bearing is not pressed into housing. When placed in axle housing it may be loose. A clearance up to 0.38 mm (0.015 in.) is normal.

6. Install bearing, seal and snap ring into axle housing. Put spring-side of seal into housing first.
7. Apply petroleum jelly to lips of seal and inner diameter of sleeve.
8. Install snap ring, washer and sleeve on axle shaft. Use a piece of pipe with a minimum inside diameter of 31 mm (1-3/16 in.) to push sleeve and washer tight against shoulder of shaft.

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BRAKE/DIFFERENTIAL LINKAGE—DISASSEMBLY/ASSEMBLY



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