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Diagnostic Trouble Codes Overview

SPN.FMI Codes

Diagnostic Trouble Codes (DTC) are based on the CAN ISO and J1939 SAE Standards. These are worldwide standards for automotive and off-highway vehicles and are controlled by an ISO industry committee. There are two main parts that make up a DTC:

SPN - 'Suspect Parameter Number' - this is intended to identify where the problem exists. An example is '94' which the standard defines as "Fuel Delivery System". Any vehicles using the '94' in the DTC will therefore be defining a problem with the fuel delivery system. The list of possible SPNs is too large to provide here, but basically, codes in the lower numbers (at this time, below 5000) are 'assigned' numbers that are set standards. SPNs that contain 6 digits, such as 524255 are called 'proprietary', and are set up in blocks. An example would be 520000 – 540000 which might be assigned to John Deere Waterloo to use for parameters that are not already defined. At some point, if these proprietary numbers are approved by SAE and the CAN committee, they may be assigned a lower number and become available industry-wide.

FMI - 'Failure Mode Indicator' - this is a standard set of numbers that defines how the SPN failed. FMIs are defined by the J1939 standard.

By combining the SPN and FMI, the code 000094.03 would mean the Fuel Delivery System input voltage is high. With the universal standard, this would apply to any CAN based vehicle.

Failure Modes:

FMI	Condition
00	Data valid but above normal operating range- most severe level
01	Data valid but below normal operational range - most severe level
02	Data erratic, intermittent or incorrect
03	Voltage above normal, or shorted to high source
04	Voltage below normal, or shorted to low source
05	Current below normal or open circuit
06	Current above normal or grounded circuit
07	Mechanical system not responding or out of adjustment
08	Abnormal frequency or pulse width or period
09	Abnormal update rate
10	Abnormal rate of change
11	Root cause not known
12	Bad intelligent device or component
13	Out of calibration
14	Special instructions
15	Data valid but above normal operating range - least severe level
16	Data valid but above normal operating range - moderately severe level
17	Data valid but below normal operating range - least severe level
18	Data valid but below normal operating range - moderately severe level
19	Received network data in error
20	Data drifted high
21	Data drifted low
22-30	Reserved for SAE assignment
31	Not available or condition exists

WS68074,000026A -19-22APR14-1/1

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Step 2	Disconnect the fuel solenoid. Check for continuity between pin A fuel solenoid and ground. Is continuity indicated?	**YES:** Repair short to ground in harness or replace harness. **NO:** Go to next step.

WS68074,00005BF -19-15MAY14-4/5

Step 3	Disconnect ICC connector. Check for continuity between pin 3A on ICC connector and ground. Is continuity indicated?	**YES:** Repair short to ground in harness or replace harness. **NO:** Perform Troubleshooting Unresolved Problems.

WS68074,00005BF -19-15MAY14-5/5

ICC 000677.05 — Engine Starter Motor Relay Current Below Normal or Open Circuit

Code Cause: Starter output is shorted to battery or open circuit.

WS68074,00005C0 -19-15MAY14-1/4

Procedure:

WS68074,00005C0 -19-15MAY14-2/4

Step 1	Disconnect K01 or K02 starter relay and test. See Relay Test. Does relay test good?	**YES:** Go to next step. **NO:** Replace relay.

WS68074,00005C0 -19-15MAY14-3/4

Step 2	Disconnect instrument control cluster connector. Disconnect K01 or K02 starter relay. Check for continuity between pin 3N on ICC connector and pin 86 of starter relay. Is continuity present?	**YES:** Repair open circuit on harness or replace harness. **NO:** Perform Troubleshooting Unresolved Problems.

WS68074,00005C0 -19-15MAY14-4/4

ICC 000677.06 — Engine Starter Motor Relay Current Above Normal or Grounded Circuit

Code Cause: Starter output is shorted to ground.

WS68074,00005C1 -19-15MAY14-1/4

Procedure:

WS68074,00005C1 -19-15MAY14-2/4

Step 1	Disconnect K01 or K02 starter relay and test. See Relay Test. Does relay test good?	**YES:** Go to next step. **NO:** Replace relay.

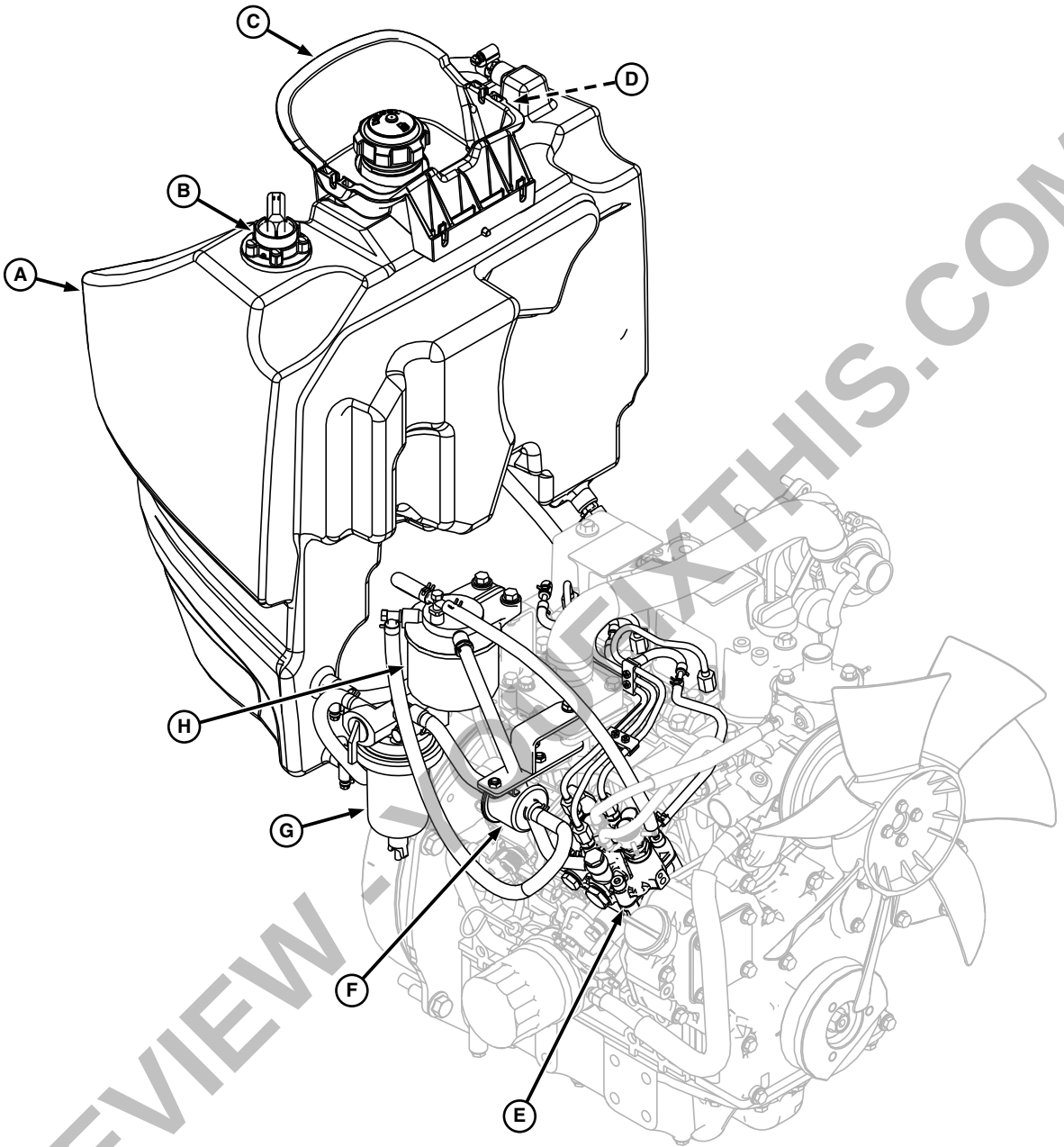
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WS68074,00005C1 -19-15MAY14-3/4

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Fuel Supply Components (Open Station)



LV17586 —UN—09MAY13

Engine without Aftertreatment Device

A—Fuel Tank
B—Fuel Level Sender
C—Fuel Overflow Bowl
D—Fuel Overflow Drain Hose
E—Injector Pump
F—Electrical Fuel Pump
G—Primary Fuel Filter/Water Separator
H—Secondary Fuel Filter

Continued on next page

AP43109,0000354 -19-21JUN13-3/4

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Fuel Supply Pump Pressure Test

Reason:

To determine supply pump operating pressure.

Equipment:

- JDG356 Fuel Pump Pressure Test Kit

Test Conditions:

- Fuel temperature 15°—25 °C (59—79 °F)

Flow Test:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Raise hood.
4. Disconnect fuel shutoff solenoid wire.

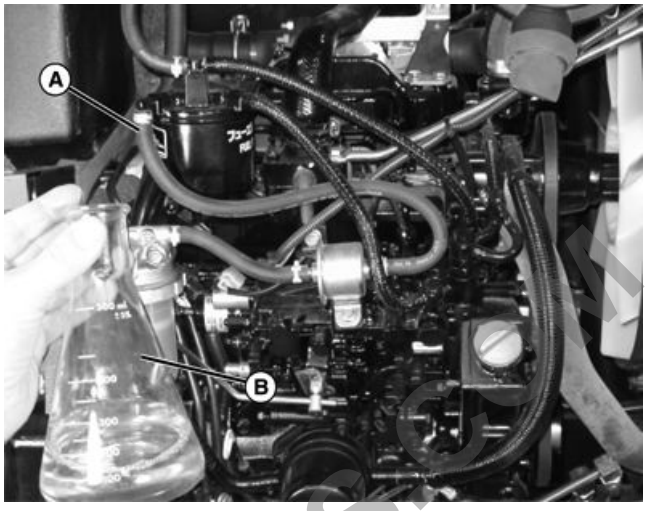
NOTE: Do not start engine for this test. The electric fuel pump operates with the key switch ON.

5. Disconnect fuel supply pump outlet hose (A) from fuel filter and place end of hose into a clean graduated container (B).
6. Collect fuel in graduated container (B) as key switch is turned ON for 15 seconds.
7. Compare fuel amount to specification.

Specification	
Fuel Flow in 15 seconds—Volume	100 mL (minimum) (3.4 oz.)

Pressure Test:

1. Install the hose and gauge to outlet hose (A).



LVAL13755 —UN—18NOV10

Open station model shown.

A—Fuel Supply Pump Outlet Hose **B—Graduated Container**

2. Place key switch in ON position.
3. Record fuel pressure reading on gauge.

Results:

- If the pressure does not meet specification, replace the fuel pump.

Specification	
Fuel Pressure (maximum)—Pressure	37.3 kPa (0.37 bar) (5.4 psi)

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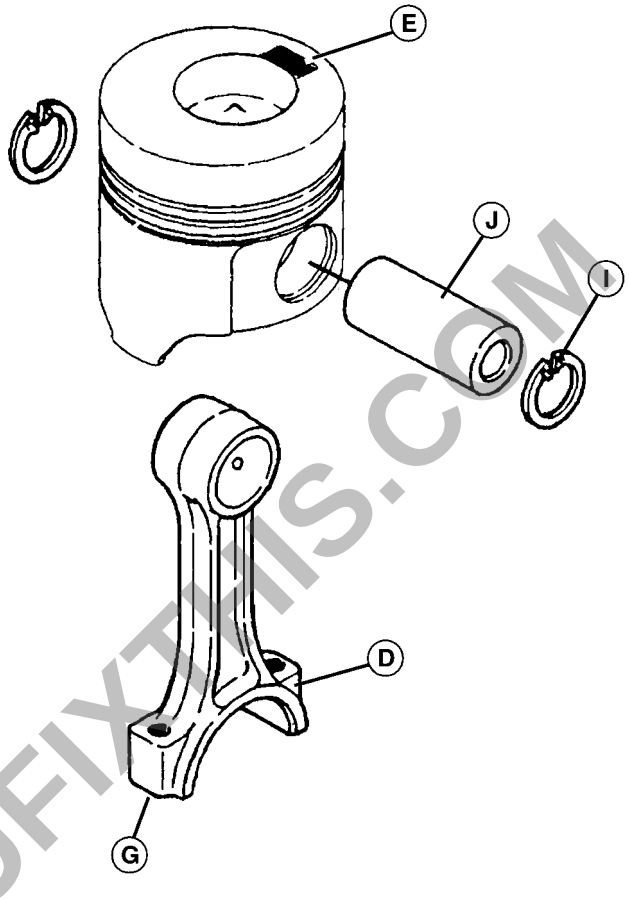
Assembly:

- Apply new engine oil to all parts during assembly.

IMPORTANT: Avoid Damage! The pistons must be installed on the same connecting rod they were removed from.

1. Assemble the piston to the connecting rod with piston mark (E) on the same side as the connecting rod stamped mark (D). If a new connecting rod is used, assemble the piston to the connecting rod with piston mark opposite the connecting rod bearing insert groove (G). Be sure that the oil hole in the piston pin bushing is aligned with the hole in the connecting rod.
2. Install the piston pin (J) and snap rings (I).
3. Install an oil ring expander in the bottom ring groove of the piston, with the ends above either end of the piston pin.

D—Connecting Rod Stamped Mark
E—Piston Mark
G—Bearing Insert Groove
I— Snap Rings
J— Piston Pin



LVAL13830 —UN—18NOV10

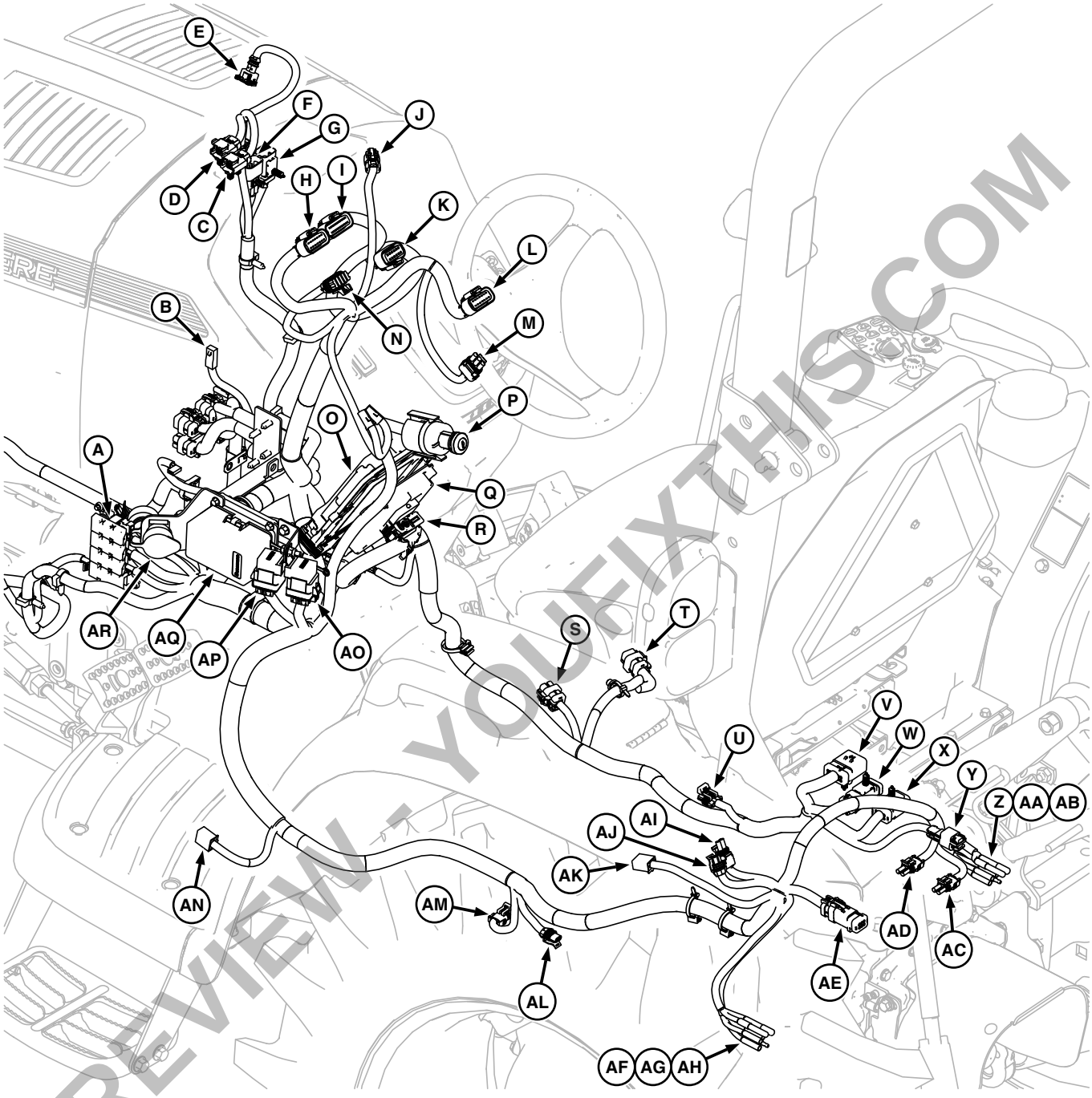
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W1 Chassis Wiring Harness Component Location (Rear) (Open Station)



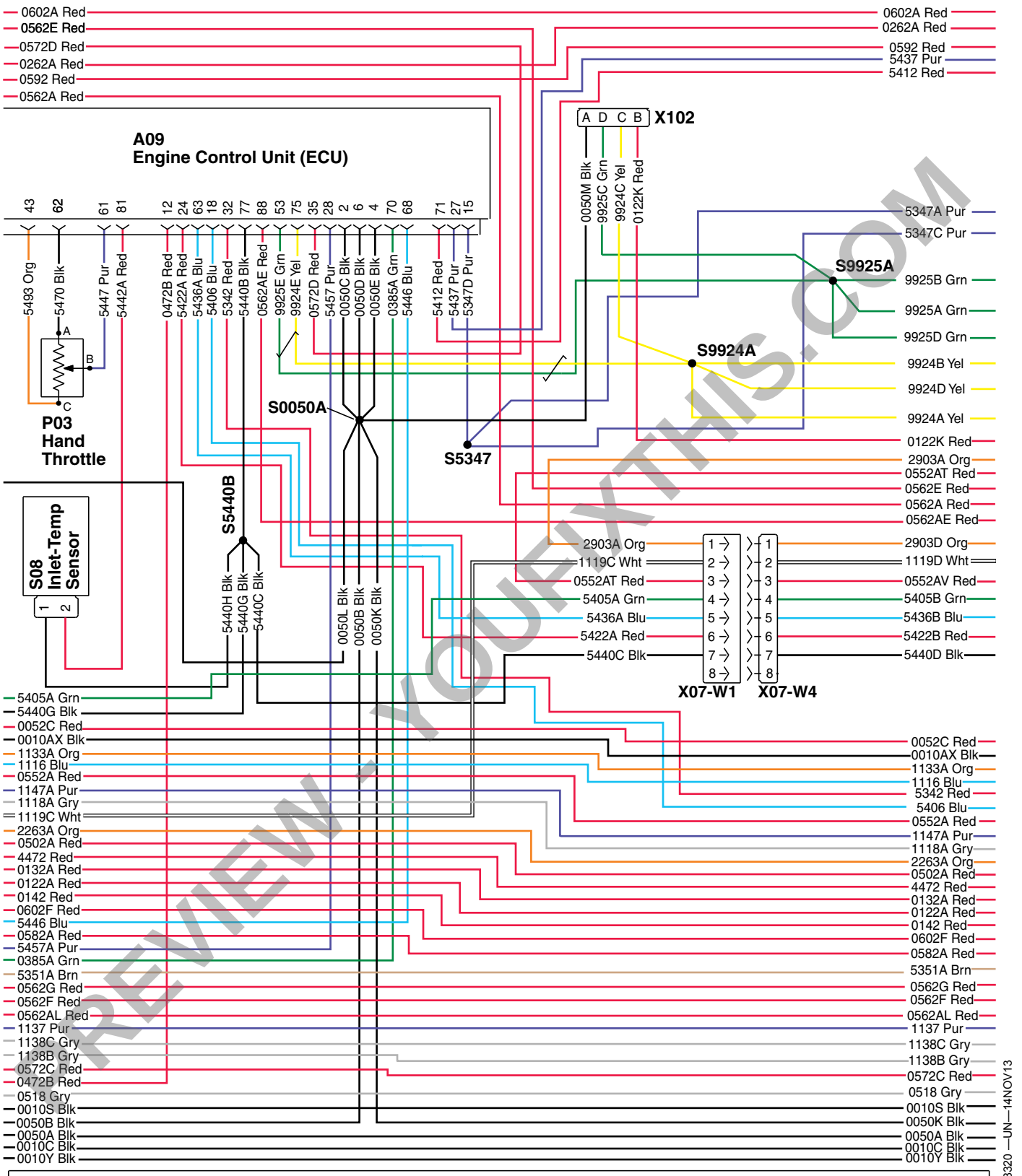
Sheet 2 of 2

A—Fuse Block
B—Glow Plug
C—DPF Mid Temp Sensor
D—DPF Inlet Temp Sensor
E—Air Restriction Switch
F—Junction Block Power
G—DPF Interconnect
H—Display J3
I— Display J2
J—Fuel Guage Sensor
K—Display J1
L—Dash Panel Module
M—Hand Throttle Sensor
N—Display J4
O—Engine Control Unit (ECU)
P—Key Switch
Q—Transmission Control Unit (TCU)
R—TCU Connector
S—Forward Pedal Pot
T—Reverse Pedal Pot
U—MFWD Speed Sensor
V—Right Fender Interconnect 1
W—Creep to Repo Harness Connector
X—Right Fender Interconnect 2
Y—Backup Alarm
Z—Right Turn Tail Ground/Hazard Light
AA—Right Tail Lamp/Turn Lamp
AB—Right Work Light/Ground
AC—Rear PTO Sensing Switch
AD—Mid PTO Sensing Switch
AE—7 Pin Trailer Connector
AF—LeftTurn Tail Ground/Hazard Light
AG—Left Tail Lamp/Turn Lamp
AH—Left Work Light/Ground
AI— Air Ride Seat
AJ—Seat Switch
AK—Park Brake Switch
AL—PTO Solenoid
AM—MFWD Sensing
AN—Brake Switch
AO—Starter Relay
AP—Glow Plug Relay
AQ—Load Center
AR—Service Advisor Diagnostic Interface

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SE6 - Engine

Main Wiring Schematic Open Station (4 of 11)

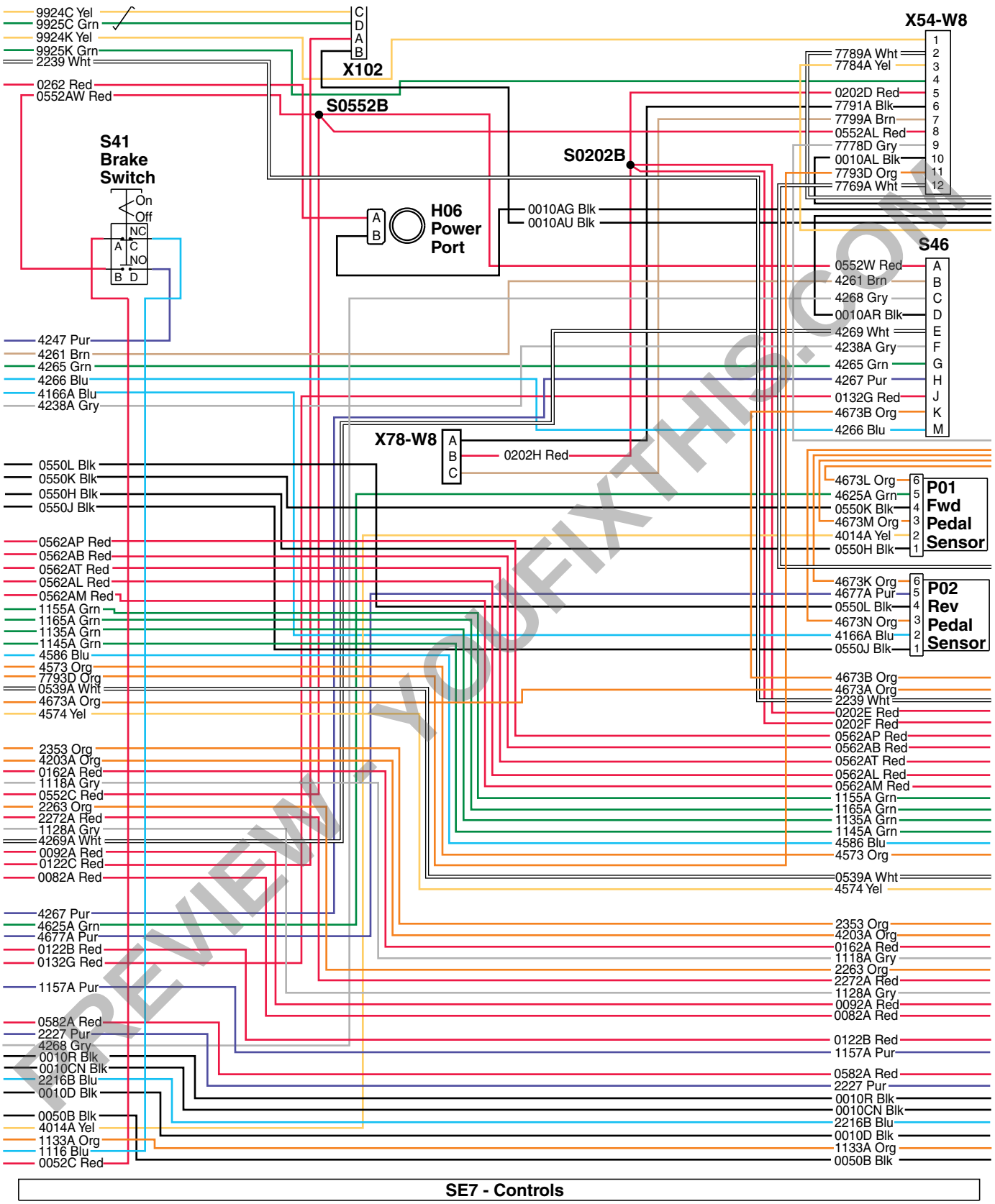
A09— Engine Control Unit (ECU)
P03— Hand Throttle
S08— Inlet Temperature Sensor
X07-W1—Chassis to Hood Harness Interconnect
X07-W4—Hood to Chassis Harness Interconnect
X102— Service Advisor

Continued on next page

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SE7 - Controls

H06— Power Port
S41— Brake Switch
S46— Cruise Module
P01— Forward pedal Sensor
P02— Reverse Pedal Sensor
X54 - W8—Rear Harness to Load Center Interconnect
X78 - W8—Lower Cab to EH Handle Harness
X102— Service Advisor

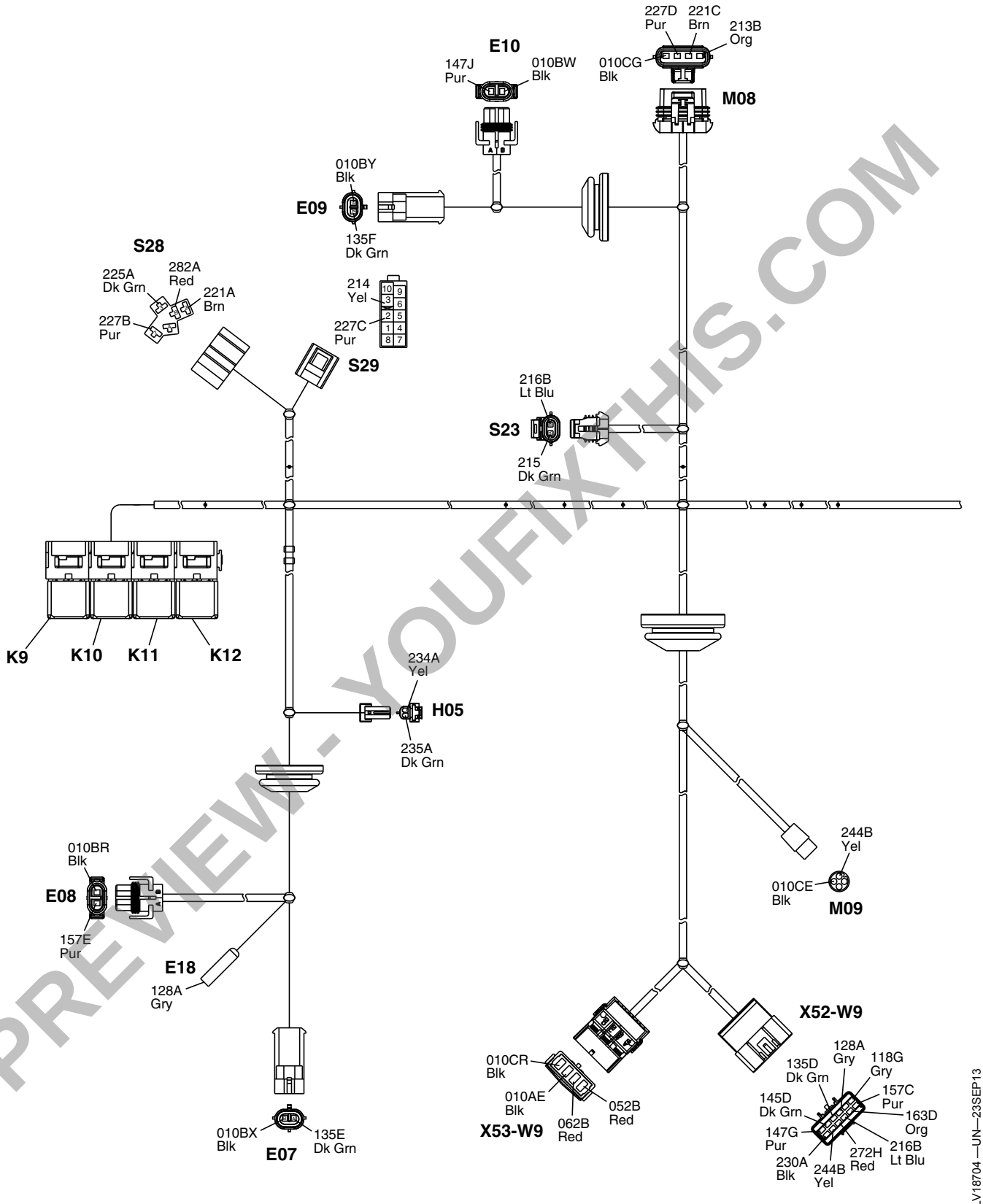
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KS04205,0006AF6 -19-24JUL14-19/22

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W9 Upper Wiring Harness (Cab)



W9 Upper Cab Wiring Harness (1 of 2)

Continued on next page

KN52281,10049B5 -19-10OCT13-1/4

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Starting Motor Solenoid Test

Reason

To determine if the starting motor is defective.

Equipment

- Jumper wire

CAUTION: Avoid Injury! This test will cause engine to turn over. Engine may start. Ensure fuel shutoff solenoid is disconnected, transmission is in neutral, and PTO(s) are off.

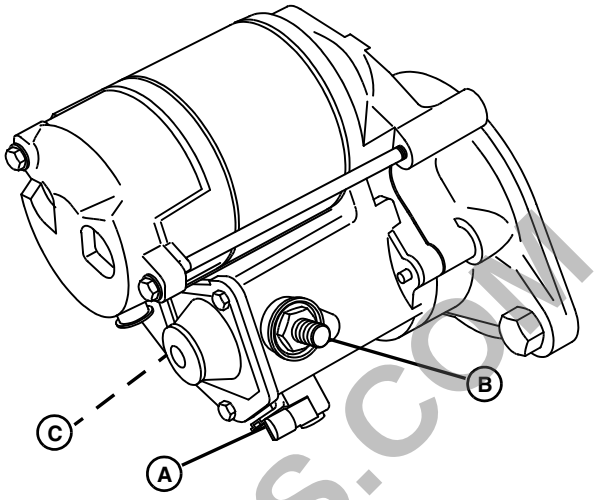
Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Disconnect fuel shutoff solenoid wire connector.
4. Disconnect Wht wire from starting motor solenoid terminal (A).
5. Connect jumper wire to positive (+) battery terminal and briefly jump to starting motor solenoid terminal (A).

Results:

- Starting motor runs—solenoid is good, test cranking circuit wiring.
- Starting motor does not run—go to next step.

1. Connect jumper wire between starting motor solenoid large terminals (B and C).



LVAL12978 —UN—05NOV10

A—Solenoid Terminal
B—Solenoid Large Terminal
C—Solenoid Large Terminal

Results:

- Starting motor runs—replace starting motor solenoid.
- Starting motor does not run—check battery cables. If ok, replace starting motor.

KN52281,10049BC -19-19SEP13-1/1

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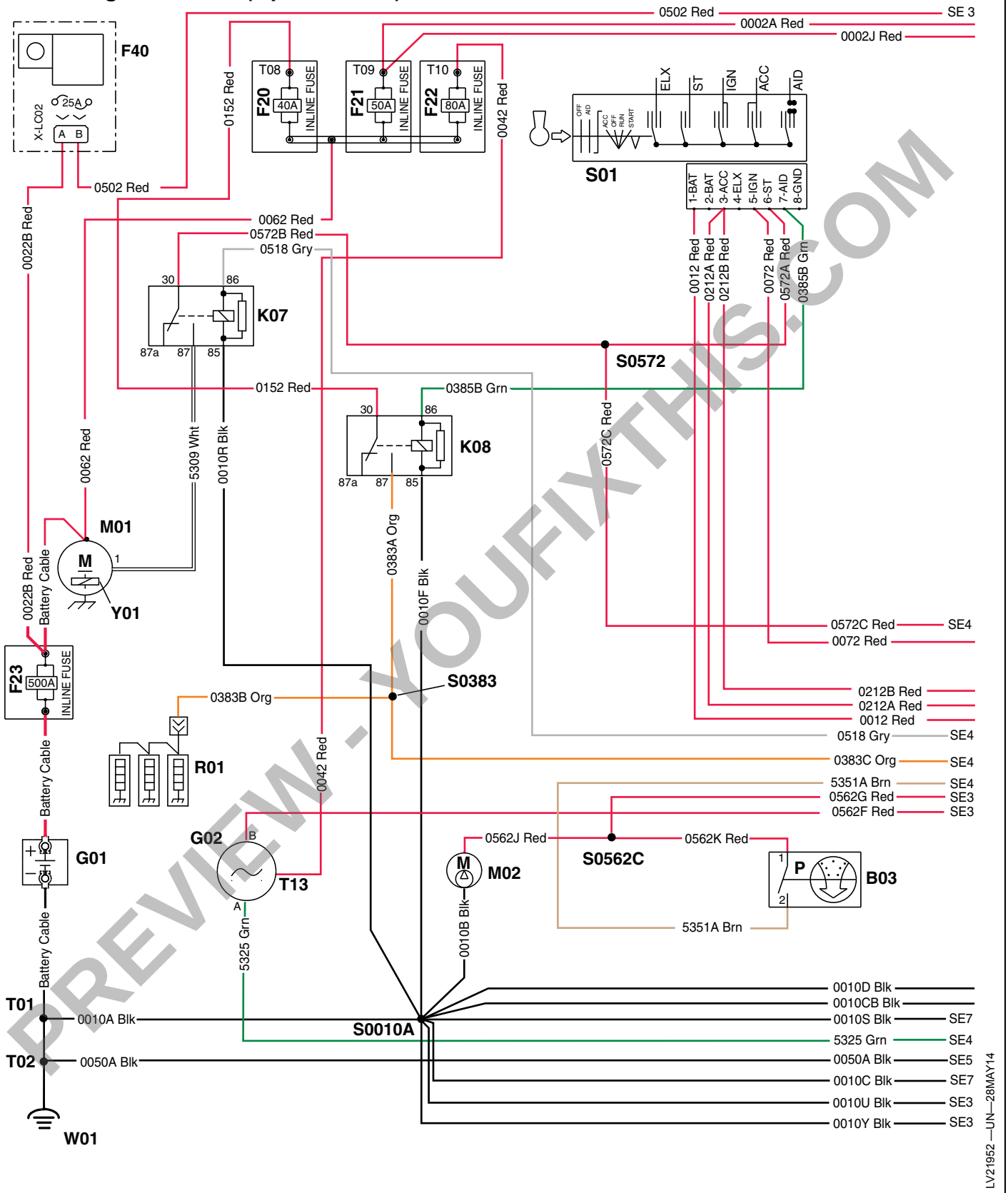
A—Air Restriction Switch
B—Cab Chassis Connect
C—Display J3
D—Display J2
E—Fuel Gauge Sensor
F—Display J1
G—Dash Panel Module
H—Display J4
I— Front PTO Switch
J—Horn
K—Key Switch
L—Transmission Control Unit (TCU) Connector
M—HST Connect
N—Forward Pedal Pot
O—Reverse Pedal Pot
P—MFWD Speed Sensor
Q—Right Fender Connect 1
R—Right Fender Connect 2
S—Backup Alarm
T—Right Turn Hazard Lamp & Ground
U—Right Front & Rear Marker
V—Right Stop Lamp & Left Marker Ground
W—Rear PTO Sensing Switch
X—Mid PTO Sensing Switch
Y—7 Pin Trailer Interconnect
Z—Left Turn Hazard Lamp & Ground
AA—Left Front & Rear Marker
AB—Left Stop Lamp & Marker Ground
AC—Air Ride Seat
AD—Seat Switch
AE—Park Brake Switch
AF—Rear PTO Solenoid
AG—MFWD Sensing
AH—Brake Switch
AI— Manifold Heater Relay
AJ—Starter Relay
AK—Load Center
AL—Service Advisor Diagnostic Interface
AM—Fuse Block

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Main Wiring Schematic (Open Station)—PowrReverser Transmission—EEC



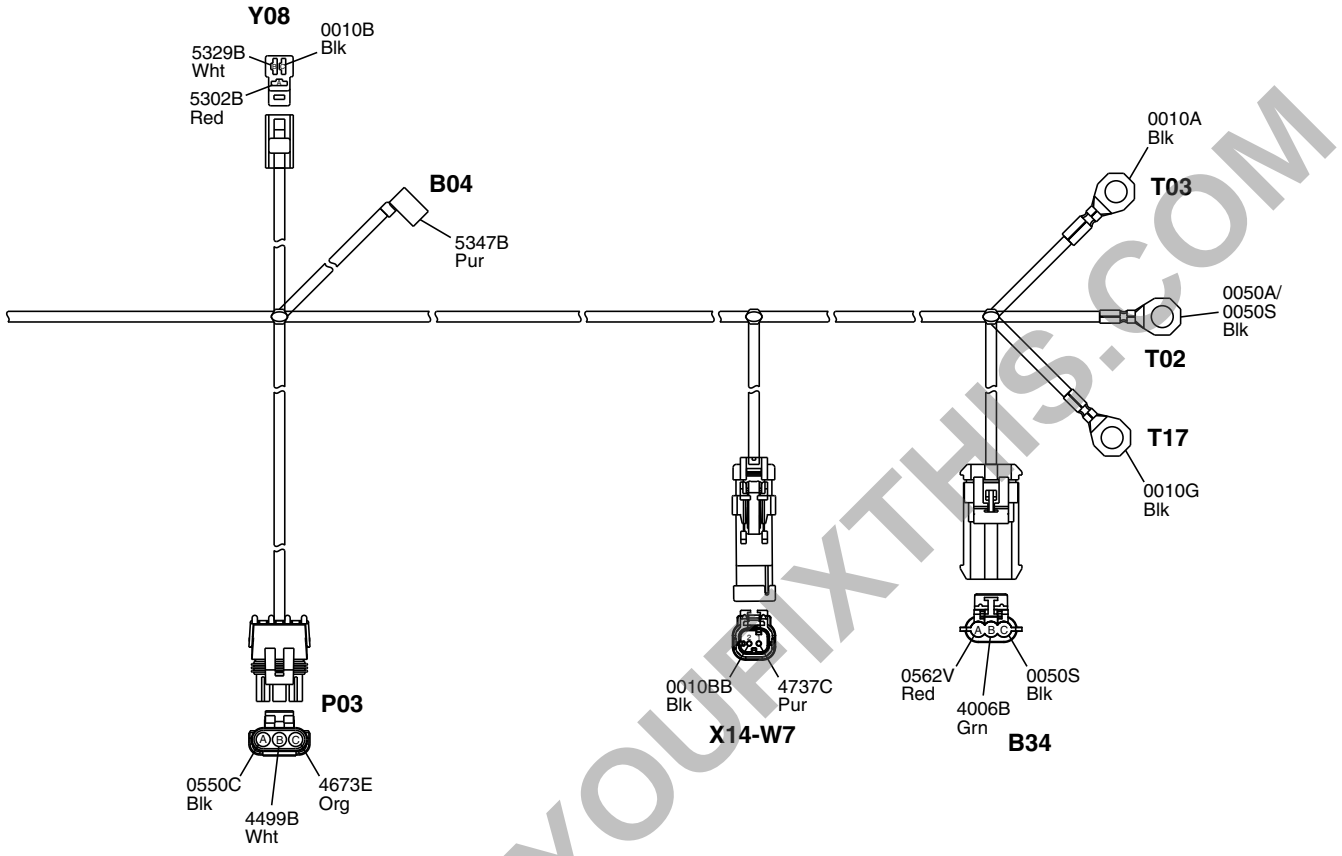
SE1—Starting and Charging

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AP43109,0006C6D -19-27MAY14-1/13

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LV18795 —UN—23OCT13

W7 Chassis Wiring Harness (Cab) (3 of 3)

B04— Engine Oil Pressure Switch
B34— Mid Mount Proxy Sensor
P03— Hand Throttle
T02— Ground Terminal
T03— Ground Terminal
T17— Ground Terminal
X14-W7—Chassis to Front PTO Harness Interconnect
Y08— Upper Hydraulic Solenoid Valve

WS68074,00000AD -19-19NOV13-5/5

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CAN Bus Theory of Operation

The Controller Area Network (CAN-BUS) is used to allow communication between control units on a vehicle. When the key switch is turned on, the electronic control units start to send and receive information over the CAN-BUS. Information may also continue to be transmitted by some controllers for a short time after the key switch is turned off. Some of the information is broadcast more frequently then others, depending on what the data is and which controller is sending it.

The CAN bus has a terminating resistor after the last physical controller on the bus. The terminating resistor is required to reduce faults in the communication lines.

Each control unit can send and receive digital messages to and from any other control unit via the CAN-BUS. The message sent by one control unit can be addressed to another specific control unit or broadcast for all control units to use. The receiving control units will use this information to monitor or control the machine.

In order to regulate the information being received, each electronic control unit has an interface controller built in. While the electronic control unit is fully occupied performing its own tasks, the interface controller manages the vast amount of information being broadcast on the CAN-BUS and only passes required information onto the control unit.

Diagnostic Trouble Codes (DTCs) are based on the CAN ISO and J1939 SAE Standards. These are worldwide standards for automotive and off-highway vehicles and are controlled by an ISO industry committee. There are two main parts that make up a DTC:

OUO1023,00039CC -19-24OCT13-1/1

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A—Flexible Coupler
B—Input Shaft
C—Hydrostatic Pump
D—Swash Plate
E—Drive Motor
F—Pressure Reducing Valve
G—Pressure Reducing Valve
H—Servo Piston
I— Pistons
J—Input Drive Shaft
K—Fixed Swash Plate
L—High Pressure Oil Passages (Forward/Reverse)
M—Charge Pressure Oil
N—Side View
O—Top View

Function:

The hydrostatic system transfers power from the engine to the three speed range transmission and then the final drive for the wheels. It provides infinitely variable speed control, forward or reverse, by foot pedal operation.

Principles of Operation:

The hydrostatic system is a closed loop fluid power system that consists of a charge pump on the left front side of the engine, and a piston pump/motor assembly, which is driven by a flexible coupler (A) attached to the flywheel.

Charge Pump

The charge pump is a gear type positive displacement pump mounted to the left front side of the engine.

This pump provides pressurized fluid to the SCU (Steering Control Unit). Return oil from the SCU is routed through an in-line filter, and then into the hydrostatic pump to provide replacement fluid to the closed loop of the hydrostatic transmission.

Hydrostatic Pump

The hydrostatic pump is an axial piston, variable displacement piston pump. It is mounted directly to the front of the tunnel. The input shaft (B) splines are driven by the flexible coupler attached to the engine flywheel. Any time the engine is running the input shaft is rotating (and the coupled output shaft to the PTO).

NOTE: The PTO drive shaft is splined to the other end of the input shaft.

The hydrostatic pump (C) is splined to the center of the input shaft. The pistons ride on the swash plate (D). As long as the swash plate is level, the pistons do not move in or out of the drive pump as it rotates.

Oil flow from the cylinder block to the drive motor (E) is controlled by changing the angle of the swash plate. This angle is changed when the forward or reverse pedals are pushed. Pushing a forward or reverse pedal will change the output of the forward or reverse position sensor. The voltage value coming from the pedal position sensor is fed into the electronic control module, which sends a variable signal to the coils on the forward or reverse proportional pressure reducing valves (F and G).

The proportional valves control the flow of hydraulic oil to each end of the servo piston (H) which is directly linked to the swash plate.

NOTE: The control module will only send a signal to a valve coil if all logic input signals are present within correct value ranges. Only one valve will open at a time. Oil will be provided to only one end cylinder of the servo piston at a time.

When a valve opens, hydraulic oil is routed to an end of the servo piston (H). The hydraulic oil moves the servo piston either forward or backward. A pin from the swash plate rides in a groove on the servo piston and the swash plate rotates when the servo piston moves.

As long as the forward and reverse pedals are released, the swash plate is level and no oil is being pumped.

Rotating the swash plate off center changes the distance the pistons (I) travel inside the piston bore of the rotating assembly. Because the input shaft rotates in one direction, the direction that the swash plate is rotated from center determines the direction of fluid flow to the drive motor (forward or reverse). The amount the swash plate is rotated, determines how much fluid will be displaced (speed).

The hydrostatic pump provides hydraulic fluid to the hydrostatic drive motor (E) through passages in the center section. Hydraulic fluid in the power train circulates in a closed loop. Fluid leaves the hydrostatic pump and flows through the hydrostatic motor and is returned to the hydrostatic pump, not the reservoir. Fluid that leaves this closed loop circuit, via leakage to case drain, is replenished by fluid from the charge pump. Fluid may also be dumped from the high pressure side of the loop to the low pressure side if the machine encounters a heavy load or stalls out. This happens through the high pressure relief valves.

Hydrostatic Motor

The hydrostatic motor (E) is a high torque axial piston motor. The motor is located on the rear of the center section. The hydrostatic motor drives the input shaft (J) for a three speed range gear transmission which transfers power to the wheels. See Final Drive Section.

When high pressure oil is pumped to the hydrostatic motor it is provided to one side of the motor cylinder or the other. The high pressure oil forces pistons out of the motor cylinder. The pistons follow the contour of the fixed swash plate (K) creating rotary motion of the motor cylinder. The delivery side determines rotary direction.

The pistons continue to move out of the cylinder and follow the fixed angle swash plate until they are no longer aligned with the oil delivery port. Since oil is no longer being displaced to the pistons, they no longer add to the rotary motion of the motor. But, the next pistons in line are filling with oil and the rotary motion is continued.

As the motor group continues to rotate, its pistons are pressed by the fixed angle swash plate and oil is forced from the piston bores. The displaced oil is returned to the hydrostatic pump through the center section.

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A—Damper Disk
B—Input Shaft
C—Clutch Cylinder
D—Key
E—Pressure Oil
F—Bored Hole in The Input Shaft
G—Clutch Piston
H—Clutch Friction Plates
I— Clutch Gear
J—Idler Gear
K—Transfer Shaft Gear, 42T
L—Drive Shaft
M—To 4 Speed Transmission
N—PTO Shaft
O—Power Flow

AP43109,0006C2D -19-06MAY14-2/2

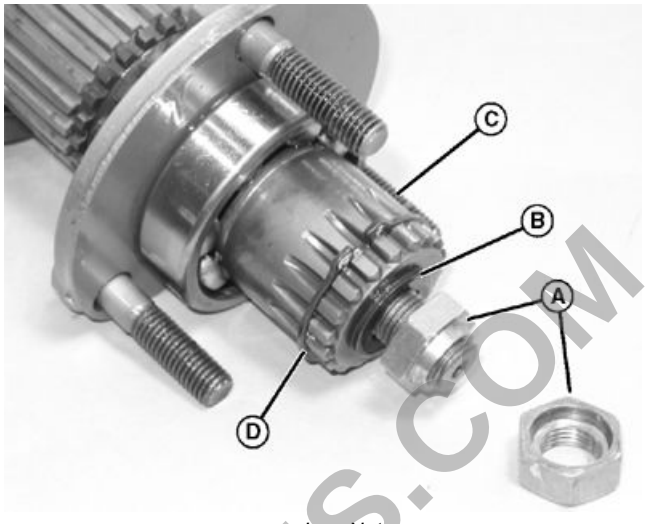
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Drive/Pinion Shaft Disassembly, Inspect, and Assembly:

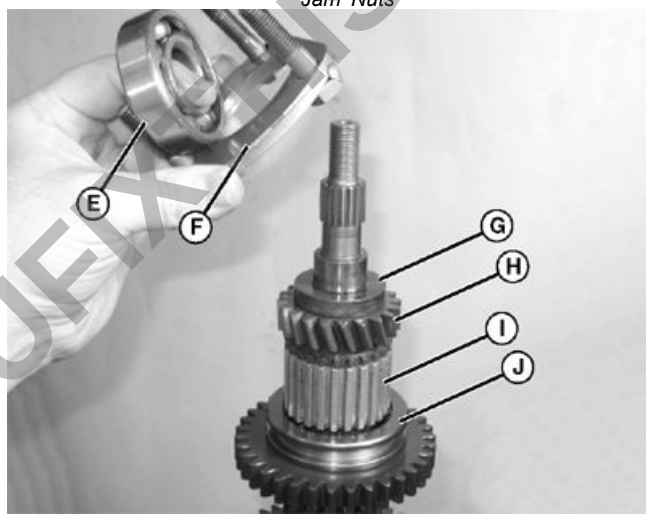
1. Remove the jam nuts (A), spacer (B), and coupler gear (C). It is not necessary to remove the retaining ring (D) from the coupler gear unless, the retaining ring is damaged.
2. Using a knife edge bearing puller, remove end bearing (E) and retainer (F) from shaft.
3. Remove the spacer (G), gear-20T (H), long splined collar (I), and shift collar (J).
4. Remove the retaining rings (K), spacer (L), and gear-35T (M).

A—Jam Nut
B—Spacer
C—Coupler Gear
D—Retaining Ring
E—End Bearing
F—Retainer
G—Spacer
H—Gear-20T
I— Long Splined Collar
J— Shift Collar
K—Retaining Ring
L—Spacer
M—Gear-35T



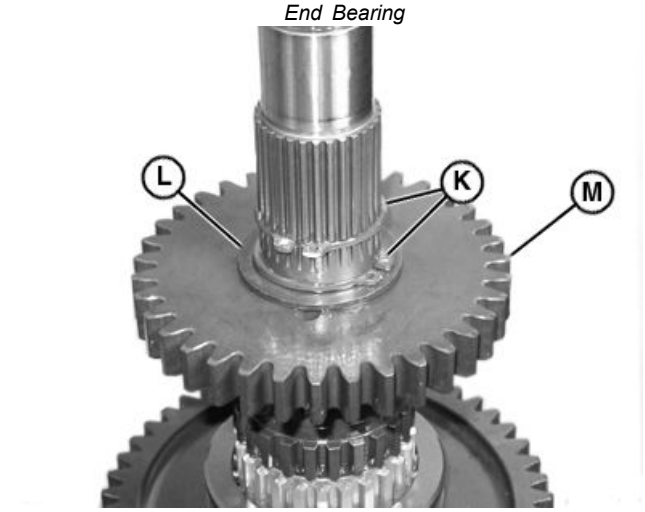
LVAL12175 —UN—29OCT10

Jam Nuts



LVAL12176 —UN—29OCT10

End Bearing



LVAL13886 —UN—17DEC10

Retaining Ring

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AP43109,0006C45 -19-05JUN14-21/31

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Disassembly:

1. Remove bearings from differential.
2. Remove differential lock collar (D).

D—Differential Lock Collar



LVAL13465 —UN—15NOV10

OUO1082,000355D -19-28FEB12-2/7

3. Remove fourteen cap screws (E) securing ring gear to differential. Remove ring gear.

E—Cap Screw (14 used)



LVAL13466 —UN—15NOV10

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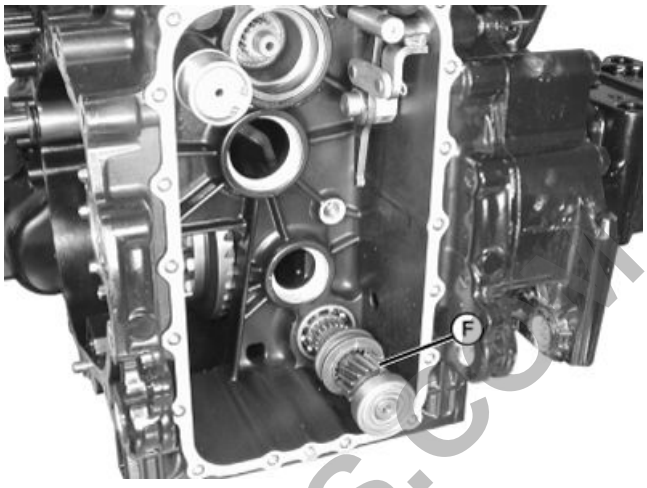
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10. Remove mid PTO gear shaft assembly (F).

F—Mid Gear Shaft Assembly



LVAL13537 —UN—15NOV10

OUO1082,000356C -19-28FEB12-5/12

11. Carefully drive mid PTO shaft (G) rearward of transmission until it is clear of mid PTO bearing. Remove shaft from transmission housing.
12. Inspect mid PTO shaft bearings for wear or damage. Replace if necessary.
13. Remove four cap screws (H) and mid PTO housing from transmission housing.

Installation:

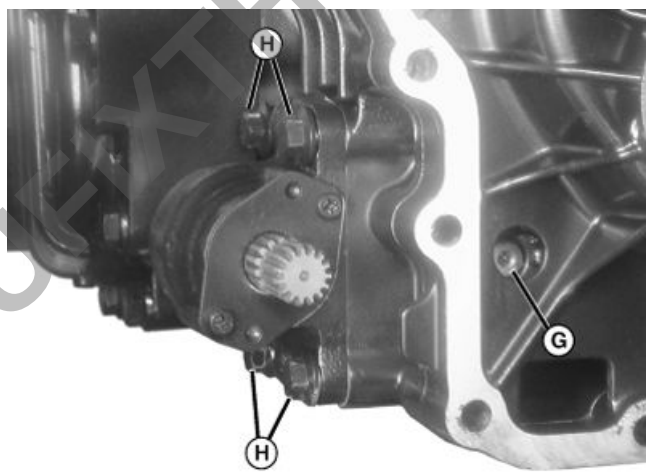
Installation is the reverse of removal. (See PTO Drive Shaft and Gears in Section 70, Group 50.)

- Apply grease to packings and seal lips when installing.
- Tighten cap screws securing mid PTO cover to transmission housing to specification.

Specification	
Mid PTO Cover-to-Transmission Cap Screws—Torque	45—50 N·m (33—37 lb.-ft.)

- Replace mid PTO cover to transmission housing gasket.
- Tighten four mounting mid PTO cap screws to specification.

Specification	
Mid PTO Mounting Cap Screws—Torque	80 N·m (59 lb.-ft.)



LVAL13538 —UN—15NOV10

G—Mid PTO Shaft **H—Cap Screw (4 used)**

NOTE: Replace O-rings. Old O-rings will leak.

Continued on next page

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The filtered oil then is regulated to a pressure of **2000 kPa (290 psi)** for the traction clutches and hydraulic system. The flow that goes through the modulation valve then is used for lubrication. The lube circuit also has a relief valve. If the lube pressure rises too high the valve opens and allows the pressure to be relieved.

The oil that is regulated to **2000 kPa (290 psi)** travels through the clutch pedal valve to the forward/reverse valve to the traction clutches. The forward/reverse valve spool controls the oil going to the traction clutches. When the direction is selected, the pressure oil is supplied to one side of the clutch and the oil in the other side of the clutch is released to the sump.

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5. Disconnect top two oil lines (A).
6. Disconnect bottom four oil lines (C).
7. Remove two flange screws and nuts. (B)
8. Remove SCV.
9. Repair or replace as needed.

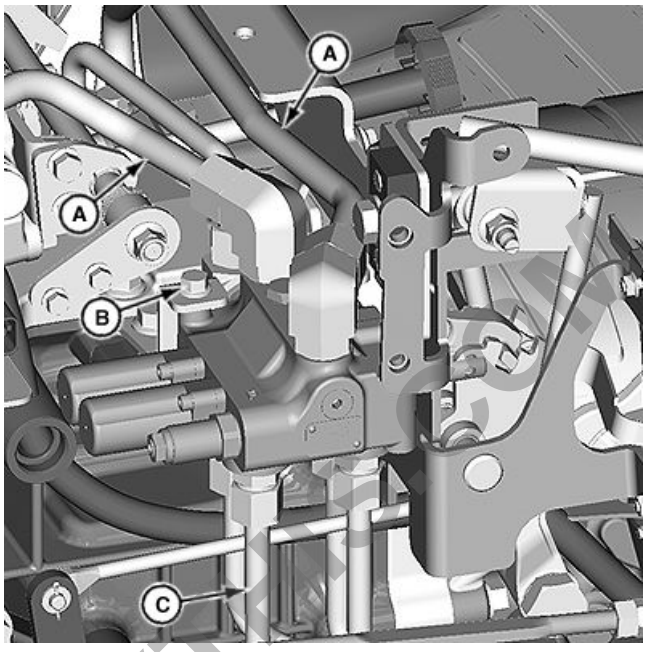
Installation is done in reverse order of removal.

- Replace O-rings.

IMPORTANT: Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

- Transfer over elbows fittings.
- Tighten SCV fitting and lines to specification.

A—Oil Line (2 used)
B—Flange Screw and Nut (2 used)
C—Oil Line (4 used)



LV21829 —UN—12MAY14

AP43109,0006C53 -19-14MAY14-2/2

Selective Control Valve (SCV) Removal and Installation (Cab)

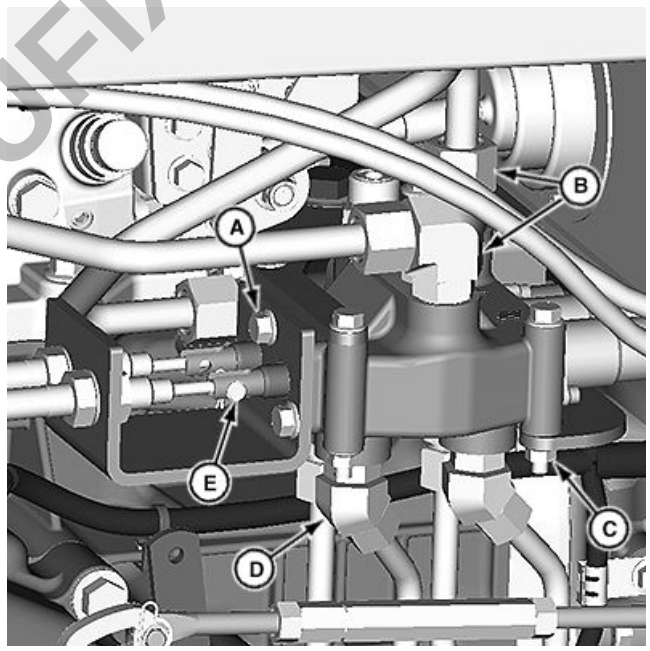
1. Remove right rear wheel. See Rear Wheel Removal and Installation.
2. Remove cotter pin, washer, and clevis pin (E) (one for each SCV spool).
3. Remove cap screws (A) and bracket.
4. Disconnect top two oil lines (B).
5. Disconnect bottom four oil lines (D).
6. Remove 3 flange screws and nuts. (C)
7. Remove SCV.
8. Repair or replace as needed.

Installation is done in reverse order of removal.

- Replace O-rings.

IMPORTANT: Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

- Transfer over elbows fittings.
- Tighten SCV fitting and lines to specification.



LV21889 —UN—15MAY14

A—Cap Screw (2 used)
B—Oil Line (2 used)
C—Flange Screw and Nut (2 used)
D—Oil Line (4 used)
E—Cotter Pin, Washer, and Clevis Pin (2 used)

AP43109,0006C69 -19-14MAY14-1/1

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Brakes

The brakes are mechanical wet disk brakes.

The brake assembly is bolted in the final drive housing and operates off the pinion shaft (A). There are three friction disks (B) and two friction plates (C) that are alternated between the actuator (D) and the brake cover (E). The brake cover and the actuator act like friction plates. The only components that rotate with the axle are the brake disks, which are splined to the pinion driveshaft.

When the brake pedal is pushed, the brake rod pulls the brake lever (F) forward. The brake lever is keyed to the brake shaft. This rotates the cam lever (G) which rotates the actuator (D). There are balls set in sockets in the final drive housing that the actuator rests on. The sockets in the actuator are ramped. As the actuator rotates, the balls force it toward the brake cover. This compresses the disks between the friction plates and stops rotation of the pinion shaft.

When the brake pedal is released, the return springs on the pedals pull the pedals back to the original position. When that occurs the cam lever rotates back allowing the actuator plate to go back to its original position, releasing the brakes.

Parking Brake—North America

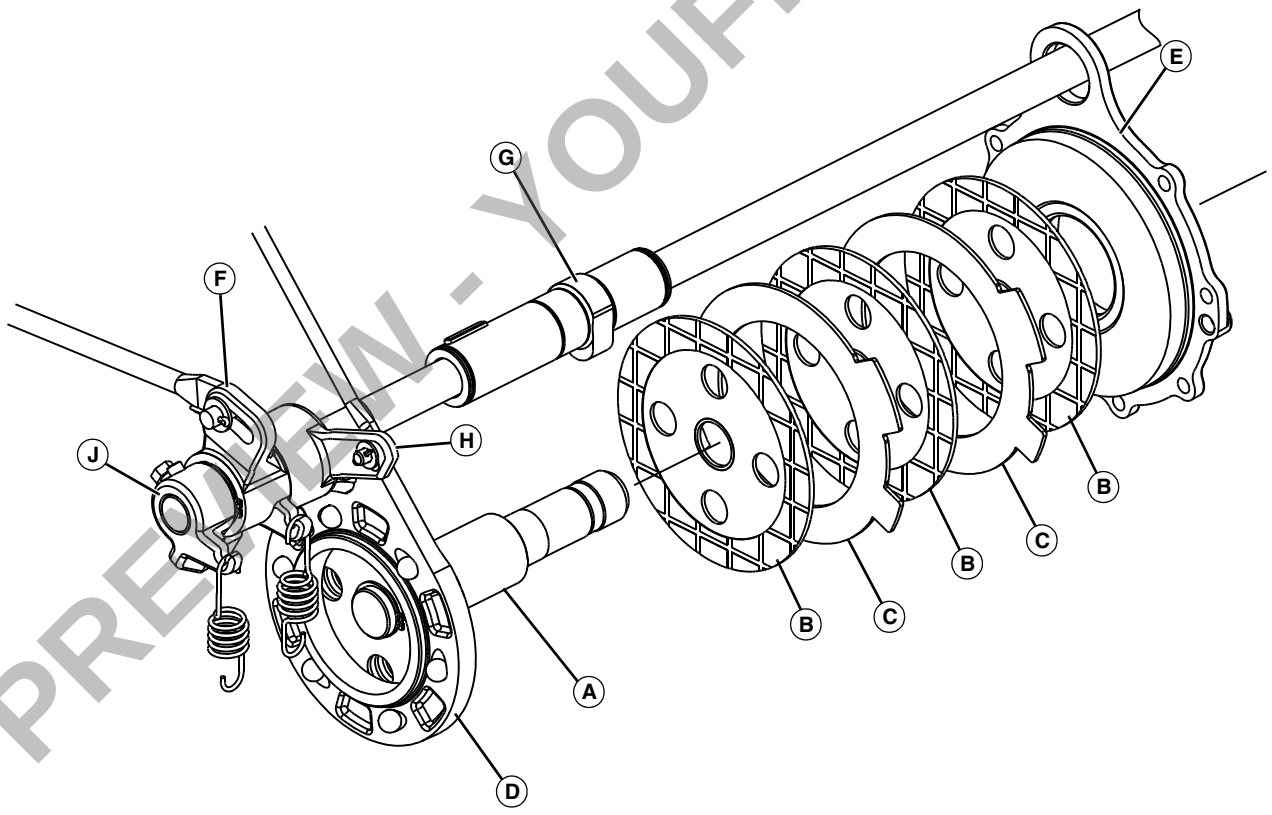
The parking brake operates by locking the brake pedals in the engaged position.

The parking brake is operated by pressing down on and holding the brake pedals and then pulling out on the park brake knob. When the knob is pulled out, the parking brake pawl rotates forward. The pawl engages the teeth on the lock lever holding the brakes in the locked on position.

The brake pedal return springs and the trapped energy on the brakes maintain force which holds the parking brake lock lever in position. The parking brake is released by pushing down on the brake pedals which allows the pawl to disengage from the teeth on the lock lever.

Parking Brake—Export

The parking brake uses a lever, and a cable that rotate the park brake shaft and bell crank that are on the brake shaft. When the lever is pulled up, the cable rotates the park brake shaft. This rotates the parking brake shaft assembly and engages the brakes. The park brake is locked in position by a ratchet on the park brake lever. The brakes are held in position until the park brake release button is pushed, and the park brake lever is pushed down.



LVAL13651 —UN—12NOV10

Left Side Shown

A—Pinion Shaft
B—Friction Disc (3 used)
C—Friction Plate (2 used)
D—Actuator
E—Brake Cover
F—Brake Lever
G—Cam Lever

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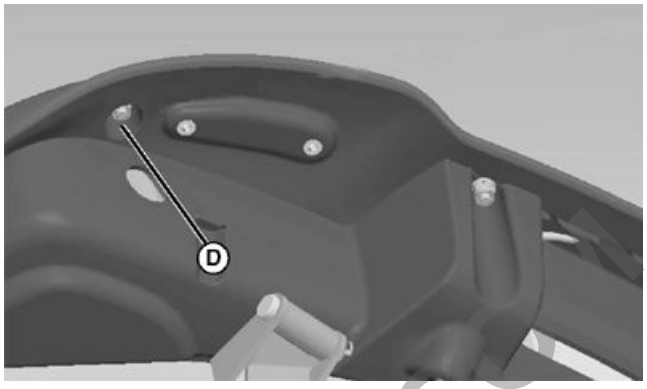
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3. Remove thirteen nuts (D) around outside of cab and lift off top outer cab roof (E).
4. Repair or replace outer roof as necessary.

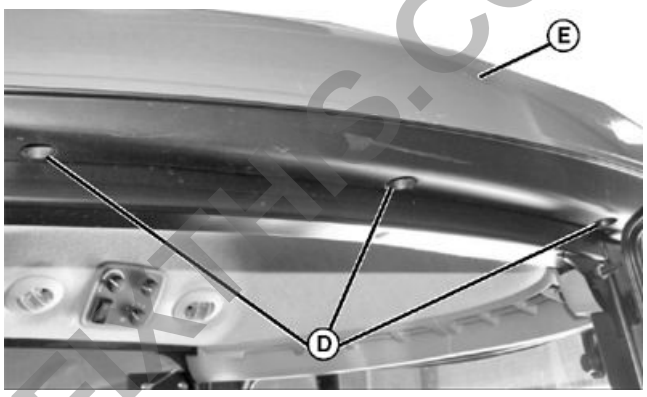
Installation:

Installation is the reverse of removal.

D—Nut (13 used) **E—Top Outer Cab Roof**



LVAL13705 —UN—08NOV10



LVAL13706 —UN—08NOV10

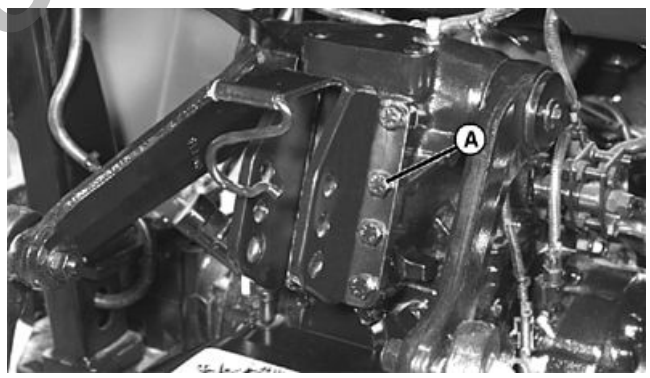
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Center Link Bracket Removal and Installation

1. Remove eight cap screws (A) and center link bracket.
2. Install parts in reverse order using the following special instructions:
   - Be sure that dowel pins are properly aligned before tightening cap screws.
   - Tighten cap screws on center link bracket to specification.

Specification

Cap Screw-to-Center Link Bracket—Torque.....90 N·m (66 lb.-ft.)



LVAL13726 —UN—08NOV10

A—Cap Screw (8 used)

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