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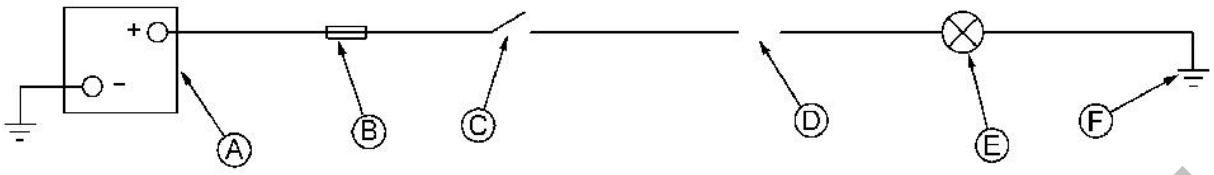
Open Circuit



RW46052

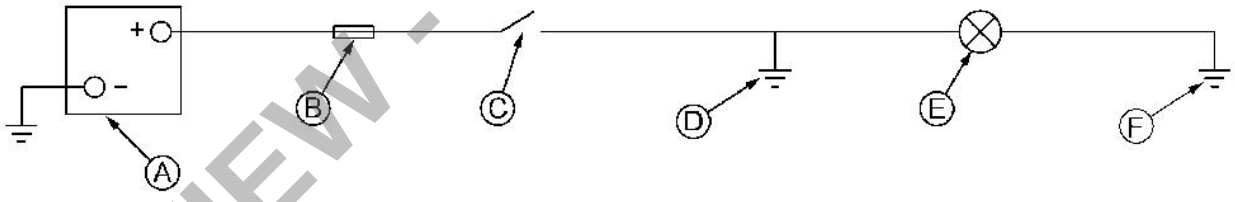
Open Circuit

LEGEND:

A Battery
B Fuse
C Switch
D Open Circuit
E Lamp (Load)
F Ground

An open circuit (D) is a circuit having a break or separation that prevents current from flowing in the circuit.

Grounded Circuit



RW46053

Grounded Circuit

LEGEND:

A Battery
B Fuse
C Switch
D Grounded Circuit
E Lamp (Load)
F Ground

A grounded circuit (D) is a circuit where a voltage wire is in contact with machine frame, providing continuity with the battery ground terminal.

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CCU 524235.05 - MFWD Solenoid Circuit Fault

11

Code caused by: control unit is commanding the MFWD solenoid to be on (MFWD function OFF) and the MFWD valve driver status line is low for two seconds.

Code Diagnosis

Control Unit Response: No Action

Additional References:
Functional Schematics Listing (Section 240, Group 25)
CCU - MFWD Solenoid Theory of Operation (Section 245, Group CCU)
CCU - MFWD Diagnostic Wiring Diagram - Straddle Mount Tractors (Section 245, Group CCU).
CCU - MFWD Diagnostic Wiring Diagram - Cab Tractors (Section 245, Group CCU)

Required Tools:
JT05791—Digital Multimeter (Section 299, Group 10)
JDG774—Solenoid Test Harness (Section 299, Group 10)
DFRW126—Modified Tap Out Harness (Section 299, Group 05)

(1) Preliminary Check

Action:

Check MFWD solenoid harness. For solenoid location, see CCU - Rear EH PTO Switch Diagnostic Wiring Diagram - Straddle Mount Tractors (Section 245, Group CCU).

Result:

YES: GO TO 2.

NO: Correct condition. GO TO 2.

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(4) System Checks

Action:

Perform Hitch Control Unit (HCU) Calibration (Section 245, Group HCU).

Result:

YES: GO TO 2.

NO: Calibration failed. GO TO 5.

(5) Electrical Circuit Checks

Action:

Perform HCU - Rear Hitch Raise Solenoid Circuit Test (Section 245, Group HCU).

Perform HCU - Rear Hitch Position Sensor Circuit Test (Section 245, Group HCU).

Result:

YES: GO TO 6.

NO: Repair as needed. GO TO 2.

(6) Additional Checks and Intermittent Failure Evaluation

Action:

Perform Troubleshooting Unresolved Problems (Section 210, Group 15).

If applicable, perform HCU - Beep Mode Test (Section 245, Group HCU).

Result:

YES: GO TO 2.

NO: Problem identified. Repair as needed. GO TO 2.

NO: Problem not identified. Replace control unit. Perform setups and calibrations as required.

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HCU 524016.04 - HCU Switched Supply Voltage Low/Rear Hitch Solenoids

24

Code caused by: 12 V supply to hitch solenoids below 9.0 V.

Code Diagnosis

Alarm Level: Information
Displayed Text: Rear Hitch System
Control Unit Response: Limited Function

Additional References:
Functional Schematics Listing (Section 240, Group 25)
ElectroHydraulic Control Unit General Information (Section 245, Group 05)
HCU - Control Unit Theory of Operation (Section 245, Group HCU)
ElectroHydraulic Control Unit Power Supply Wiring Diagram - Straddle Mount Tractors (Section 245, Group 15)
ElectroHydraulic Control Unit Power Supply Wiring Diagram - Cab Tractors (Section 245, Group 15)

Required Tools:
JT05791—Digital Multimeter (Section 299, Group 10)

(1) Preliminary Checks

Action:

Visually inspect around the batteries and alternator for any visual signs of damage or accumulated debris.

Result:

YES: GO TO 2.

NO: Perform any maintenance. GO TO 2.

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(4) System Checks

Action:

No system checks required.

Result:

YES: GO TO 5.

(5) Electrical Circuit Checks

Action:

Perform the following:

PTR - Seat Switch Circuit Test (Section 245, Group PTR)
PTR - Directional Reverser Switch Circuit Test (Section 245, Group PTR)

Result:

YES: GO TO 6.

NO: Problem identified. Repair as needed. GO TO 2.

(6) Additional Checks and Intermittent Failure Evaluation

Action:

Perform Troubleshooting Unresolved Problems (Section 210, Group 15).

If applicable, perform PTR - Control Unit Beep Mode Test With Speed Sensors (Section 245, Group PTR).

Result:

YES: GO TO 2.

NO: Problem identified. Repair as needed. GO TO 2.

NO: Problem not identified. Replace control unit. Perform setups and calibrations as required.

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Group 60 - Steering and Brakes

Steering and Brake System Problems

85

This provides an entry path for diagnosing steering and brake problems.

General Information

- Steering Preliminary Check (Section 260, Group 10)
- Steering Operational Check (Section 260, Group 10)
- Rear Brakes Preliminary Check (Section 260, Group 10)
- Rear Brake Operational Test (Section 260, Group 10)
- Steering Valve Operation - Neutral and Manual Steering (Section 260, Group 20)
- Steering Valve Operation - Power Steering (Section 260, Group 20)
- Brake System Operation (Section 260, Group 20)
- Brake Valve Operation (Section 260, Group 20)

Complete System Diagnosis

- Steering System Diagnosis (Section 213, Group 60A)
- Rear Brake System Diagnosis (Section 213, Group 60B)

→NOTE:

For electrical information concerning the brake switches, see references for EH MFWD in group 56 of this section.

Mechanical/Hydraulic References

- Install Test Equipment - Steering and Brake (Section 260, Group 05)
- Steering Pump Flow Test (Section 260, Group 15)
- Steering Valve Relief Test (Section 260, Group 15)
- Steering Leak Test (Section 260, Group 15)
- Checking Toe-In - Adjustable Front Axle (Section 260, Group 15)
- Adjusting Toe-In - Adjustable Front Axle (Section 260, Group 15)
- Checking Toe-In - MFWD (Section 260, Group 15)

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I Fuel Transfer Pump
J Fuel Cooler Supply Line
K Fuel Cooler
L Injection Pump Supply Line
M Return Port
N Low Pressure Fuel Line
O Drain Port
P Cold Start Advance Solenoid
Q Fuel Sender

4.5 L PTM engines are equipped with a rotary-type fuel injection pump.

Fuel supply pump (I) draws fuel under vacuum from fuel tank (F), through tank fuel strainer (E). Fuel supply pump (I) pressurizes fuel, which then flows to fuel filter/water separator (C). Water is separated from the fuel as it passes through the fuel filter and then flows to the fuel cooler (K) though supply line (J).

Fuel further flows to fuel injection pump (A) through injection pump supply line (L).

With fuel injection pump charged with fuel by fuel supply pump (I), injection pump plunger pressurizes fuel to approximately 50 000 kPa (500 bar) (7255 psi). Delivery lines are used to route this high-pressure fuel to fuel injection nozzles (B).

Fuel enters injection nozzle at a pressure enabling nozzle valve opening. When nozzle valve opens, fuel is forced out through orifices in nozzle tip and atomizes as it enters combustion chamber.

Incorporated into fuel system is a means of returning excess (or unused) fuel back to fuel tank. Excess fuel comes from two sources:

[1] - Fuel Injection Pump: A quantity of fuel greater than that required by engine is supplied to fuel injection pump.

[2] - Fuel Injection Nozzles: A small amount of fuel seeps past nozzle valve for lubrication purposes.

Excess of fuel flows through low-pressure fuel line (N), and then to fuel tank (F) through fuel return line (H) and return port (M).

Vented fuel cap (G) will open to permit air to escape if fuel tank becomes pressurized. Vented fuel cap will also open to permit air to enter tank if sufficient vacuum is created.

Any air in the system is bled out with return fuel through fuel return line (H) to the fuel tank. Manual bleeding of fuel system is usually necessary only after servicing components of fuel

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(2) Circuit 072 Check

Action:

1. Place key switch in the RUN position.
2. Check for battery voltage at terminal F of VEC black connector, circuit 032.
3. If battery voltage is not available to terminal F, check circuit 032 between terminal 4 of key switch and terminal F of VEC black connector.
4. Test key switch.
5. Check for battery voltage at terminal E of VEC black connector, circuit 072.

Result:

YES: Circuits check good. GO TO 4.

NO: Battery voltage not available to terminal E of VEC black connector. GO TO 3.

(3) Fuse F18 Circuit Check

Action:

1. Disconnect black connector from VEC.
2. Remove fuse F18.
3. Check for continuity between fuse F18 supply terminal and VEC battery terminal.
4. If continuity is not present, replace VEC.
5. Check for continuity between fuse F18 output terminal and terminal E of VEC black connector.
6. If continuity is not present, replace VEC.

Result:

YES: Circuit checks good. GO TO 4.

NO: Repair as needed.

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(3) Fuse F1 Circuit Check

Action:

1. Remove and check fuse F1 and replace if failed.
2. If fuse is found good, check for battery voltage at fuse supply terminal.
3. If battery voltage is not available to fuse supply terminal, check for continuity between fuse supply terminal and vehicle electrical center (VEC) battery terminal.
4. If continuity is not present between fuse supply terminal and VEC battery terminal, replace VEC.
5. Check for battery voltage at VEC battery terminal.
6. If battery voltage is not present, check circuit 002 between VEC battery terminal and fuse link.
7. Disconnect VEC green harness connector.
8. With fuse F1 installed, check for battery voltage at terminal E of VEC green connector.
9. If voltage is not available to terminal E of VEC green connector, replace VEC.

Result:

YES: Circuit checks good. GO TO 4.

NO: Repair as needed.

(4) Key Switch (S1) Circuit Check

Action:

1. Turn key switch to RUN position.
2. Check for battery voltage at terminal 1 of key switch, circuit 012.
3. If battery voltage is not available to terminal 1 of key switch, check circuit 012 between terminal 1 of key switch and terminal E of VEC green harness connector.
4. Check for battery voltage at terminal 4 of key switch, circuit 032.
5. If battery voltage is not available to terminal 4 of key switch, replace key switch.

Result:

YES: GO TO 5.

NO: Repair as needed.

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(7) Blower Motor Resistors (R3) Circuit Check

Action:

1. Place key switch (S1) in the RUN position.
2. Place blower switch (S10) in the LOW speed position.
3. Check for battery voltage at terminal 1 of blower motor resistors (R3).
4. If battery voltage is not available to terminal 1, check circuit 205 between terminal 3 of blower motor resistors and terminal 1 of blower switch.
5. If circuit 205 checks good, replace blower motor resistors (R3).
6. Place blower switch in the MED speed position.
7. Check for battery voltage at terminal 1 of blower motor resistors.
8. If battery voltage is not available to terminal 1, check circuit 205 between terminals 1 and 2 of blower switch.
9. Place blower switch in the HIGH speed position.
10. Check for battery voltage at terminal 1of blower motor resistors.
11. If battery voltage is not available to terminal 1, check circuit 206 between terminal 2 of blower motor resistors and terminal 3 of blower switch.
12. If circuit 206 checks good, replace blower motor resistors (R3).
13. Place blower switch in the PURGE position.
14. Check for battery voltage at terminal 1of blower motor resistors.
15. If battery voltage is not available to terminal 1, check circuit 207 between terminal 2 of blower motor resistors and terminal 4 of blower switch.
16. If circuit 207 checks good, replace blower motor resistors (R3).

Result:

YES: Circuits check good. GO TO 8.

NO: Repair as needed.

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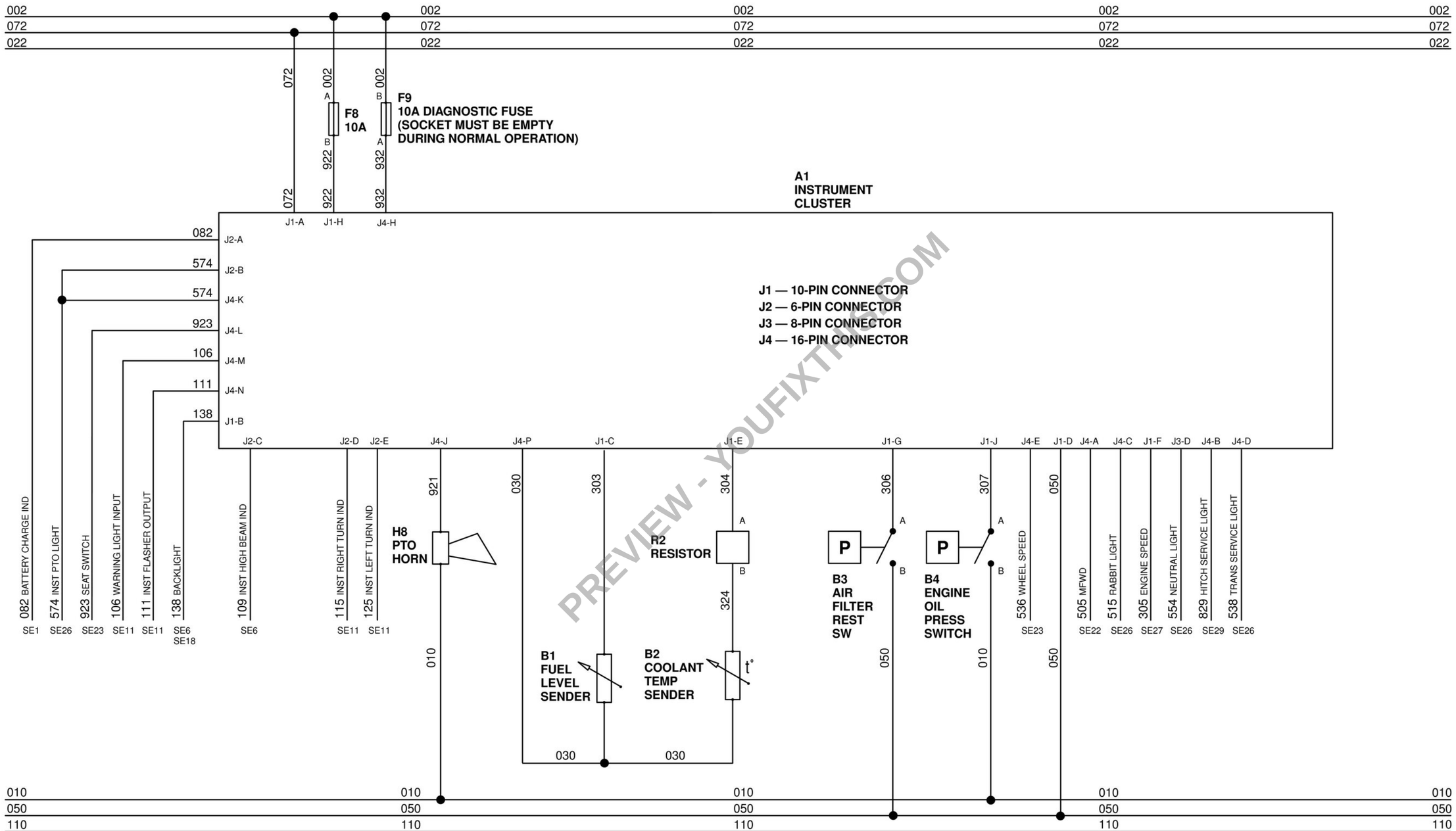

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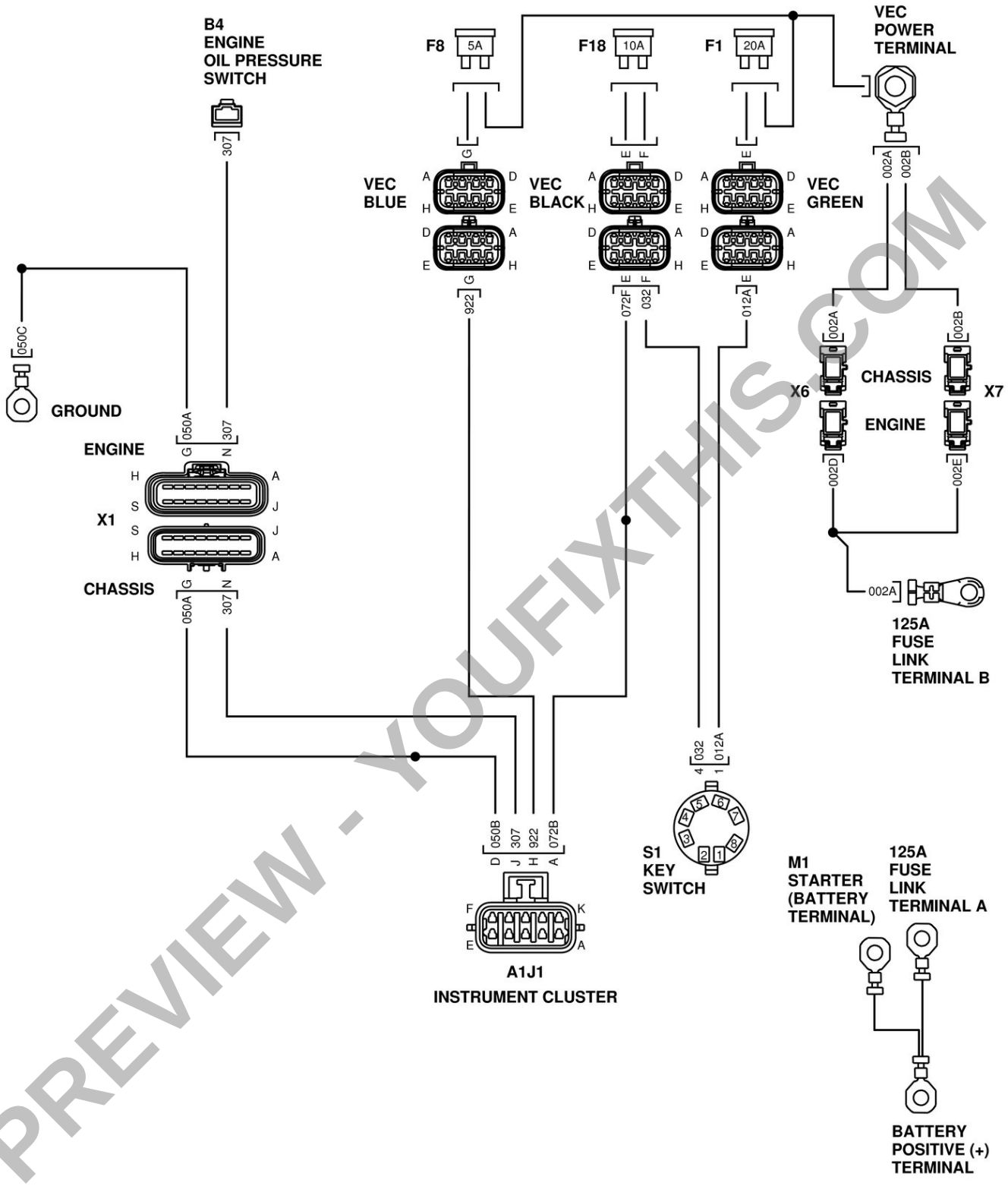

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Engine Oil Pressure Switch Diagnostic Wiring Diagram—Straddle Mount

LEGEND:

A1J1	Instrument Cluster Connector (10-pin)
B4	Engine Oil Pressure Switch
F1	20-Amp Fuse
F8	5-Amp Fuse

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CCU	225	Display	Software Part Number Configuration
CCU	226	Display	Software Version Number Configuration
CCU	227	Display	CCU Boot Block Program Part Number
CCU	228	Display	CCU Boot Block Program Version Number
CCU	229	Display	EOL Software Part Number
CCU	230	Display	EOL Software Version Number
CCU	232	Display	Operating System Software Version Number
CCU	233	Display	CCU Software Part Number
CCU	234	Display	CCU Software Version Number
CCU	235	Display	CCU Part Number
CCU	236	Display	CCU Serial Number
CCU	237	Display	Software Assembly Part Number
CCU	238	Display	Software Assembly Version Number
CCU	245	Display	CAN Bus Off Retries Number
CCU	246	Display	CAN Bus OFFs Intervals
CCU	247	Display	Current Vehicle Model Number
CCU	248	Display	Current Vehicle Serial Number
CCU	251	Display	Current Vehicle John Deere PIN

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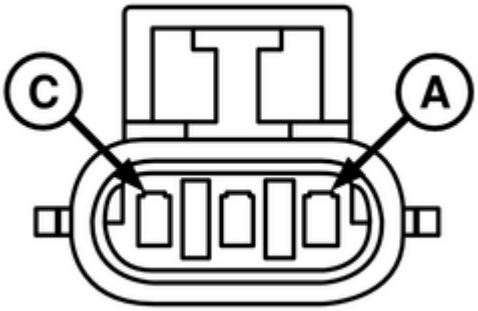
(5) Ground Circuit Test

Action:



Wheel Speed Sensor Connector

LEGEND:

A Circuit 072
B Circuit 536
C Circuit 050

Use a JT05791—Digital Multimeter to measure between terminals A and C and check multimeter for following display:

Item	Measurement	Specification
Wheel Speed Sensor		
Supply Voltage	Key Switch in RUN Position (engine off)	12.5—14.5 V

Result:

YES: GO TO 6.

NO: See CCU - Wheel Speed Sensor Diagnostic Wiring Diagram—Straddle Mount Tractors (Section 245, Group CCU). Repair circuit 072 as needed. GO TO 1.

NO: See CCU - Wheel Speed Sensor Diagnostic Wiring Diagram - Cab Tractors (Section 245, Group CCU). Repair circuit 072 as needed. GO TO 1.

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→NOTE:

The HCU Calibration Procedure begins at address 016. The configurations that effect rear hitch performance and operator preferences are all accessible and calibratable independently of all others.

Entering a number other than the value specified may alter the operation of that circuit or system. If Service ADVISOR™ is being used, consult for instructions for calibrating with computer. The following procedure is written calibrating address values on the Performance Monitor.

(1) Clear Codes

Action:

Recall, record, and clear codes before beginning HCU Calibration. See Performance Monitor General Operation (Section 245, Group 05).

Result:

YES: To begin HCU Calibration: GO TO 2.

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(3) Install Test Equipment

Action:

No test equipment is necessary for testing this circuit.

Result:

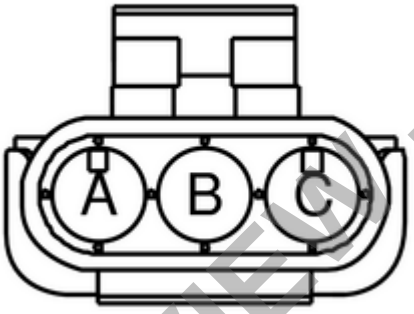
YES: GO TO 4.

(4) Component Supply Voltage Test

Action:

→NOTE:

Use a chassis ground point rather than the ground circuit at the connector to test for supply voltage. This step of the procedure is only to test the integrity of the supply voltage circuit.



Rear Hitch Position Sensor Connector

LEGEND:

A	Circuit 803
B	Circuit 828
C	Circuit 801

Use a JT05791—Digital Multimeter to test for supply voltage on terminal A of rear hitch position sensor connector according to the specification below:

Record this value:_____

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5. Press the set/save button to change the value displayed. The value will then begin to flash, indicating that the value may now be changed.
6. Using the number pad on the performance monitor, key in the desired value.

   Change address 100 as follows:

   100:

   1 —Come-Home Mode Enabled

   OR...

   100:

   0 —Come-Home Mode Disabled

   →NOTE:

   Once come-home mode has been enabled, the control unit will generate DTC 524081.31 and the transmission lamp on the instrument panel will flash until power down.

   Press the set/save button to save the changed value. The value will then stop flashing, indicating that the value has been saved.

   →NOTE:

   When come-home mode is entered, the control unit must see that the operator is on the seat. Therefore, the seat switch must be toggled from open to closed before the control unit will enable come-home mode.

   If come-home mode is enabled and the operator is out of the seat for more than one second, the control unit will command neutral.

   Operator off seat and then operator on seat.

Result:

YES: GO TO 29.

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(6) Ground Circuit Test

Action:

→NOTE:

The value displayed on the multimeter should be within ± 0.2 V of the value recorded at step 4. See PTR - Enable Pressure Sensor Diagnostic Wiring Diagram (Section 245, Group PTR) to diagnose a circuit malfunction.



Clutch Enable Pressure Sensor Connector

LEGEND:

A	Circuit 801
B	Circuit 803
C	Circuit 527

Use a JT05791—Digital Multimeter to bridge between terminals B and A and check multimeter for following display:

Item	Measurement	Specification
Clutch Enable Pressure Sensor		
Multimeter Voltage	Key in RUN Position (engine off)	4.80—5.20 V

Result:

YES: Replace component. GO TO 1.

NO: See PTR - Enable Pressure Sensor Diagnostic Wiring Diagram (Section 245, Group PTR). Repair circuit 801 as needed. GO TO 1.

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Transmission Operational Checks

Operational check steps as listed below are divided into individual parts of the system. They all can be performed as a complete system check or individually to check area of concern.

1. Setup for Operational Checks
2. Check for All Speeds and Ranges
3. Modulation Checks
4. Clutch Pedal Checks

→NOTE:

Checks should be performed with hydraulic oil heated to 60 °C (140 °F).

This Operational Check is written to provide a means of checking transmission operations. It can be used as a pre-delivery check or a method of becoming familiar with the PowrReverser ™ operation.

Reference

(1) Setup for Operational Checks

Action:

1. Recall, record, and clear codes. See Performance Monitor General Operation (Section 245, Group 05).

   Do not attempt to troubleshoot codes at this time, unless code prevents performing the Operational Check.
2. Heat transmission oil to 60°C (140 °F).
3. Place gearshift lever in Park position and electrohydraulic (EH) directional reverser lever in Neutral position.
4. Turn MFWD ON (this will shut oil supply OFF to MFWD clutch, eliminating possible internal leakage).
5. Start vehicle.

Result:

YES: Continue operational checks. GO TO 2.

NO: Return to diagnosis in process.

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Lubrication Oil Flow

When reverse clutch pack passage (C) is pressurized, pressurized oil (T) forces shuttle valve (G) to shift, allowing lubrication oil (U) to flow from shuttle valve inlet passage (B), through the shuttle valve to PowrReverser™ lubrication passage (E). Lubrication oil then flows through a drilled passage in the clutch housing, lubricating the forward and reverse clutch packs of the PowrReverser™.

PowrReverser™ Control Valve Return to Neutral

When neutral is commanded by the EHC, enable proportional valve (O) cuts off pressurized oil flow between inlet passage (A) and enable valve outlet passage (P). Reverse solenoid valve (N) also closes, cutting off pressurized oil from inlet passage (A). Pressurized oil from the reverse solenoid valve that is holding the reverse pilot valve open, is returned to tank through the reverse solenoid valve to return-to-tank passage (L). The pilot valve then closes and allows pressurized oil from reverse clutch pack passage (C) to return to tank through return-to-tank passage (L).

With no pressurized oil in reverse clutch pack passage (C), lubrication shuttle valve (G) closes, preventing lubrication oil from reaching the PowrReverser™ forward and reverse clutch packs. Any pressurized oil remaining in PowrReverser™ lubrication passage (E) is bled off through the PowrReverser™.

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(4) MFWD Isolation Check

Action:

1. Disconnect MFWD drive shaft.
2. Try to rotate left front wheel.

Result:

YES: Wheel rotates with drive shaft removed. GO TO 5.

NO: Wheel does not rotate with drive shaft removed. GO TO 6.

(5) Possible Causes for Locked-Up MFWD Clutch

Action:

Inspect for the following MFWD clutch malfunctions:

- MFWD clutch piston stuck
- MFWD oil passage in MFWD drop box blocked or restricting oil from getting to the piston

Result:

NO: Repair as needed and confirm repair. GO TO 1.

(6) Possible Causes for Locked-Up MFWD Axle

Action:

Inspect for the following MFWD axle malfunctions:

- MFWD planetary failure
- MFWD differential failure

Result:

NO: Repair as needed and confirm repair. GO TO 1.

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E Brake Piston
F Pressure Equalizing Valve
G Spring
H Equalizing Passage
I Outlet Check Valve
J To Brake Housing
K Pressure-Free Oil
L Trapped Oil

Brake Pedal Released:

When brake pedals are released, oil in brake housing is pressure-free and flows back to main brake valve. At the same time, brake piston (E) is forced back by spring (D). Just before the pistons reach their final position, inlet check valves (C) open and oil can flow back into brake valve reservoir (A). The orifice in outlet check valves (I) prevents the oil from returning to the brake valve reservoir too quickly and thus making an interruption in the oil flow.

As piston reaches its final position, spring (G) forces equalizing valve (F) closed, trapping oil in equalizing passage (H).

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Hydraulic System Operation—New Machines

LEGEND:

1 Sump
2 Sump Screen
3 Transmission Pump
4 To Transmission
5 Pump Housing (Implement and Steering)
6 Hydraulic Filter Manifold
7 Hydraulic Filter
8 Check Valves
9 Bypass Valve with Orifice
10 Hydraulic Oil Cooler
11 To Transmission
12 Check Valves
13 Steering System Relief Valve
14 Control Valve
15 Metering Pump
16 Steering Valve
17 Steering Cylinder
18 Brake Valve
19 Brake Reservoir
20 Inlet Check Valves
21 Brake Valve Plunger
22 Brake Pedals
23 Outlet Check Valves
24 Brake Pistons
25 Load Sensing Valve
26 Raise Valve
27 Hitch Load Sense Relief Valve
28 Lower Valve
29 Main Relief Valve (Excess Flow)
30 Surge Relief Valve
31 Rockshaft Cylinder
32 EH Hitch Control Valve
33 Diagnostic Test Port
34 Load Check Valves
35 Mid-Mount Valve I with Float
36 Mid-Mount Valve II with Regeneration
37 Dual Mid-Mount SCV
38 To Triple Rear SCV
39 Dual Rear SCV
40 Rear SCV I Spool Valve
41 Rear SCV II Spool Valve
42 From Triple Rear SCV Tank
43 Power Beyond Pressure Port
44 Triple Rear SCV
45 From Dual Mid-Mount SCV
46 Pressure Compensated Flow Control with Bypass to SCV II and III
47 Load Check Valves
48 Rear SCV I Spool Valve

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(5) Circuit 209 Test

Action:

Turn the key switch ON, and the blower switch to PURGE position.

Check for voltage and continuity to ground at both circulation blower motor connectors.

→NOTE:

If repairs are made, perform Air Conditioning Operational Checks (Section 290, Group 10).

Result:

YES: Repair or replace circulation blower motor as needed. Return to diagnosis in progress.

NO: Voltage not present at connector. See A/C schematics to diagnose a circuit malfunction. See Functional Schematics Listing (Section 240, Group 25). Repair circuit 209 as needed. Perform operational check and return to diagnosis in progress.

NO: No continuity to ground or high resistance indicated at connector. See A/C schematics to diagnose a circuit malfunction. See Functional Schematics Listing (Section 240, Group 25). Repair circuit 010 as needed. Perform operational check and return to diagnosis in progress.

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