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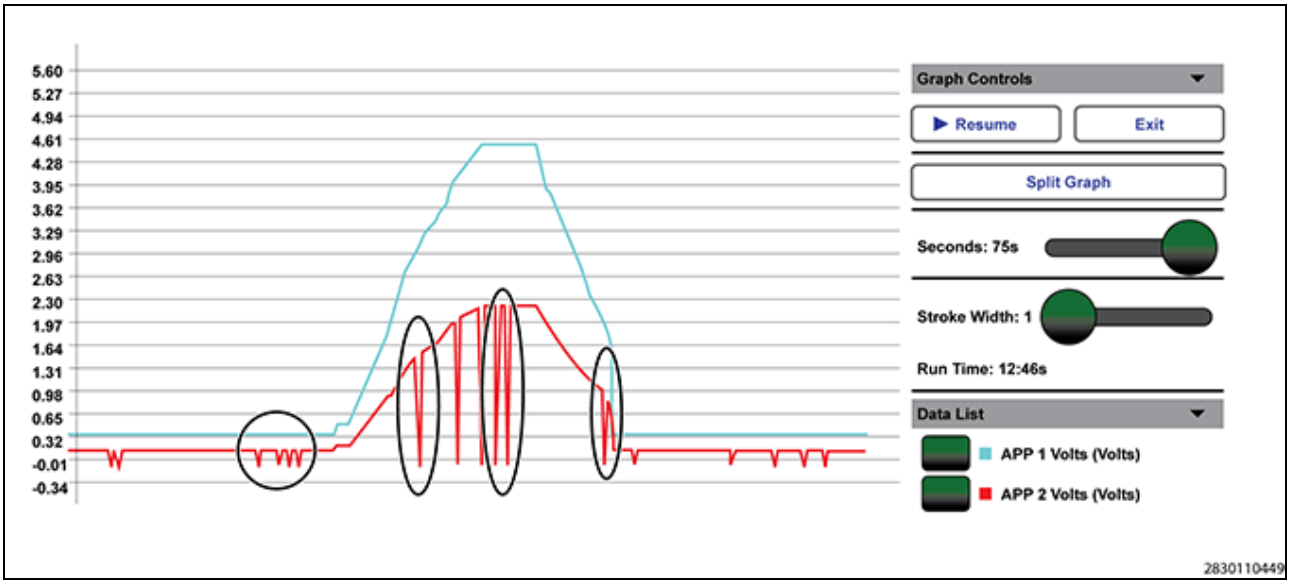
YMMS: 2019 Jeep Wrangler Unlimited Rubicon Jan 9, 2021
Engine: 3.6L Eng License:
VIN: Odometer:

P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION

For a complete THROTTLE CONTROL SYSTEM wiring diagram, **refer to the appropriate Wiring Information** .

THEORY OF OPERATION

Accelerator Pedal Position (APP) Sensor applications today use Induction/Hall Sensors (non-contact). The Electronic Throttle Control (ETC) system uses two Accelerator Pedal Position (APP) Sensors to monitor the accelerator pedal position. The APP Sensors 1 and 2 are integrated into one assembly located at the pedal assembly. Each sensor has a 5 volt reference circuit, a low reference circuit, and a signal circuit. The Powertrain Control Module (PCM) reads the two signals individually and then compares the two signals as a redundant check of the pedal position. The APP 1 signal will fluctuate somewhere between 0 volts and 5.0 volts. The APP 2 signal will fluctuate somewhere between 0 volts and 2.5 volts. The fluctuation of the two sensors should move proportionately. When operating properly, the voltage reading of the APP 2 will always be approximately half of the voltage reading of the APP 1. The signal for APP 2 is also used by the PCM for an internal ground check. This test runs a couple of times per second and is the reason why the APP 2 signal spikes to ground regularly during normal operation. If graphing the APP 1 and APP 2 signals for diagnostic purposes, view the figure below to see how the signals will look on a normally functioning APP system.



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WHEN MONITORED

This diagnostic runs continuously when the following conditions are met:

- With the ignition on.

- Battery voltage greater than 10.4 volts.
- No Accelerator Pedal Position (APP) Sensor 1 DTCs present.
- No Accelerator Pedal Position (APP) Sensor 2 DTCs present.

SET CONDITION

- The Powertrain Control Module (PCM) detects that the correlation between APP Sensor 1 and APP Sensor 2 is not plausible.

DEFAULT ACTION

- The MIL will illuminate.
- The ETC light will flash.
- The Throttle input and vehicle speed are limited.

POSSIBLE CAUSES

Possible Causes
HIGH RESISTANCE IN A 5-VOLT SUPPLY CIRCUIT
HIGH RESISTANCE IN THE APP SENSOR SIGNAL 1 CIRCUIT
HIGH RESISTANCE IN THE APP SENSOR 1 GROUND CIRCUIT
HIGH RESISTANCE IN THE APP SENSOR SIGNAL 2 CIRCUIT
HIGH RESISTANCE IN THE APP SENSOR 2 GROUND CIRCUIT
ACCELERATOR PEDAL POSITION SENSOR
POWERTRAIN CONTROL MODULE (PCM)

Always perform the PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE before proceeding. Refer to PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE .

DIAGNOSTIC TEST

1. **READ AND RECORD DTCS AND ENVIRONMENTAL DATA - ERASE DTCS AND CHECK FOR THE DTC TO RETURN**
    1. With the scan tool, read DTCs in all Electronic Control Units (ECUs) and record on the repair order.
    2. For future reference, with the scan tool, run and save a vehicle Scan Report and all related recorded data.
    3. With the scan tool, erase all DTCs.
    4. Turn the ignition off for a minimum of 10.0 seconds.
    5. Turn the ignition on.
    6. Using the When Monitored and Set Conditions above and recorded data, operate the vehicle in the conditions that set the DTC.
    7. With the scan tool, read DTCs.

    Did the DTC return?

Yes

1. Go To 2

No

1. Perform the INTERMITTENT CONDITION diagnostic procedure. Refer to INTERMITTENT CONDITION .

2. **CHECK THE APP SENSOR HARNESS CONNECTOR AND TERMINALS**

   1. Turn the ignition off.
   2. Check the APP Sensor harness connector for proper connection at the APP Sensor.
   3. Verify that the connector is completely plugged in and locked prior to disconnecting.
   4. Disconnect the APP Sensor harness connector and check for pushed out or spread terminals, brineling on terminals, discoloration from excessive heat, or corrosion and water intrusion.
      Were any issues found with the connector or terminals?

      Yes

      1. Repair the found issues in accordance with the service information or properly connect and lock the APP Sensor harness connector.
      2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

      No

      1. Go To 3

3. **ISOLATE AND CHECK THE (K852) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

   1. The ignition must be off when checking the continuity of a circuit.
   2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
   3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
   4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
   5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

> **CAUTION:** *Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install the GPEC Diagnostic Adaptor to perform the diagnosis.*

   1. If it is necessary to probe a terminal at a PCM harness connector, connect the (special tool #10436, Adapter, GPEC Diagnostic) to the appropriate PCM harness connector.

NOTE: *The GPEC Diagnostic Adaptor can add up to 1.5 Ohms of resistance to the circuit.*

Is the resistance below 3.0 Ohms?
Yes
1. Go To 4

No
1. Repair the circuit for an open or high resistance.
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

4. **ISOLATE AND CHECK THE (K23) APP SIGNAL 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

CAUTION: *Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install the GPEC Diagnostic Adaptor to perform the diagnosis.*

1. If it is necessary to probe a terminal at a PCM harness connector, connect the (special tool #10436, Adapter, GPEC Diagnostic) to the appropriate PCM harness connector.

NOTE: *The GPEC Diagnostic Adaptor can add up to 1.5 Ohms of resistance to the circuit.*

Is the resistance below 3.0 Ohms?
Yes
1. Go To 5

No
1. Repair the circuit for an open or high resistance.
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

5. **ISOLATE AND CHECK THE (K167) SENSOR GROUND 1 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
    3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
    5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

    CAUTION: *Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install the GPEC Diagnostic Adaptor to perform the diagnosis.*

    1. If it is necessary to probe a terminal at a PCM harness connector, connect the (special tool #10436, Adapter, GPEC Diagnostic) to the appropriate PCM harness connector.

        NOTE: *The GPEC Diagnostic Adaptor can add up to 1.5 Ohms of resistance to the circuit.*

        Is the resistance below 3.0 Ohms?
        Yes
        1. Go To 6

        No
        1. Repair the circuit for an open or high resistance.
        2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

6. **ISOLATE AND CHECK THE (K854) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

    1. The ignition must be off when checking the continuity of a circuit.
    2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
    3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
    4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.

5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

CAUTION: *Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install the GPEC Diagnostic Adaptor to perform the diagnosis.*

1. If it is necessary to probe a terminal at a PCM harness connector, connect the (special tool #10436, Adapter, GPEC Diagnostic) to the appropriate PCM harness connector.

NOTE: *The GPEC Diagnostic Adaptor can add up to 1.5 Ohms of resistance to the circuit.*

Is the resistance below 3.0 Ohms?
Yes
1. Go To 7

No
1. Repair the circuit for an open or high resistance.
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

7. **ISOLATE AND CHECK THE (K29) APP SIGNAL 2 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

CAUTION: *Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install the GPEC Diagnostic Adaptor to perform the diagnosis.*

1. If it is necessary to probe a terminal at a PCM harness connector, connect the (special tool #10436, Adapter, GPEC Diagnostic) to the appropriate PCM harness connector.

NOTE: *The GPEC Diagnostic Adaptor can add up to 1.5 Ohms of resistance to the circuit.*

Is the resistance below 3.0 Ohms?
Yes
1. Go To 8

No
1. Repair the circuit for an open or high resistance.
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

8. **ISOLATE AND CHECK THE (K400) SENSOR GROUND 2 CIRCUIT FOR AN OPEN/HIGH RESISTANCE**

1. The ignition must be off when checking the continuity of a circuit.
2. Isolate the circuit by disconnecting the Electronic Control Unit (ECU) and the component harness connector containing the circuit being tested. **Note:** Use the wiring diagram as a guide to follow the path of the circuit.
3. Before measuring the resistance of any circuit, first measure the resistance between the two leads of the DVOM. **Note:** The meter leads can add resistance to the measurement value.
4. Connect one lead of the DVOM to the circuit being tested at the component harness connector.
5. Connect the other lead to the circuit being tested at the GPEC Adaptor and measure the resistance of the circuit.

CAUTION: *Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install the GPEC Diagnostic Adaptor to perform the diagnosis.*

1. If it is necessary to probe a terminal at a PCM harness connector, connect the (special tool #10436, Adapter, GPEC Diagnostic) to the appropriate PCM harness connector.

NOTE: *The GPEC Diagnostic Adaptor can add up to 1.5 Ohms of resistance to the circuit.*

Is the resistance below 3.0 Ohms?
Yes
1. Go To 9

No
1. Repair the circuit for an open or high resistance.
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

9. **CHECK RELATED PCM AND APP SENSOR CONNECTIONS**

1. Disconnect all related in-line harness connections (if equipped).
2. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:
   1. Proper connector installation.
   2. Damaged connector locks.
   3. Corrosion.
   4. Other signs of water intrusion.
   5. Weather seal damage (if equipped).
   6. Brineling on terminals of sensor or harness connector.
   7. Bent terminals.
   8. Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
   9. Terminals that have been pushed back into the connector cavity.
   10. Check for spread terminals and verify proper terminal tension.

   Repair any conditions that are found.

> **NOTE:** *Before reconnecting the harness connectors, clean the terminals with Mopar electrical connector cleaner and apply a light application of dielectric grease to the face of the connector with your finger. This will aid in preventing any future issues with the sensor terminals and connector pins; excessive amounts of dielectric grease can cause damage to the sensor terminals, connector pins, and weather seals.*

3. Reconnect all PCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
4. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
5. Reconnect the APP Sensor harness connector. Be certain that the connectors is fully seated and the connector locks are fully engaged.
6. With the scan tool, erase DTCs.
7. Test drive or operate the vehicle in accordance with the when monitored and set conditions.
8. With the scan tool, read DTCs.
   Did the DTC return?
   Yes
   1. Go To 10

   No
   1. The wiring or poor connection problem has been repaired.
   2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

10. **REPLACE THE APP SENSOR AND RETEST FOR DTCS**

    1. Replace the APP Sensor in accordance with the Service Information. After installation is complete, perform the ETC RELEARN function.
    2. Connect the component and Electronic Control Unit (ECU) harness connectors.
    3. Turn the ignition on.
    4. With the scan tool, erase DTCs.
    5. Using the Environmental Data or When Monitored Conditions above, operate the vehicle within the conditions that set the DTC.
    6. With the scan tool, read DTCs.

Did the DTC return?

Yes

1. Replace and program the Powertrain Control Module (PCM) in accordance with the Service Information. Refer to MODULE, POWERTRAIN CONTROL (PCM), REMOVAL AND INSTALLATION .
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .

No

1. Replacing the faulty component repaired the fault.
2. Perform the POWERTRAIN VERIFICATION TEST. Refer to POWERTRAIN VERIFICATION TEST .