

## DTC P0120, P0122, P0123, P0220, P0222, P0223, or P2135

### Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category

### DTC Descriptors

**DTC P0120:** Throttle Position Sensor 1 Circuit Malfunction

**DTC P0122:** Throttle Position Sensor 1 Circuit Low Input

**DTC P0123:** Throttle Position Sensor 1 Circuit High Input

**DTC P0220:** Throttle Position Sensor 2 Circuit Malfunction

**DTC P0222:** Throttle Position Sensor 2 Circuit Low Input

**DTC P0223:** Throttle Position Sensor 2 Circuit High Input

**DTC P2135:** Throttle Position Sensor 1-2 Correlation

### Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
TP Sensor 1 Signal	P0122	P2135	P0122	P0123	P0068, P0121
TP sensor 1 5-Volt Reference	P0122	P2135	P0122	P0123	--
TP sensor 1 Low Reference	--	P2135	P0123	--	--
TP Sensor 2 Signal	P0222	P2135	P0223	P0223	P0068, P0121
TP sensor 2 5-Volt Reference	P0222	P2135	P0222	P0223	--
TP sensor 2 Low Reference	--	P2135	P0223	--	--

### Typical Scan Tool Data

#### TP Sensor 1 and 2

Circuit	Normal Range	Short to Ground	Open or High Resistance	Short to Voltage
© 2013 General Motors Corporation. All rights reserved.				

TP Sensor 1 Signal	0.35-4.65 V	0 V	0 V	5 V
TP Sensor 1 5-Volt Reference	4.9-5.1 V	0 V	0 V	5 V
TP Sensor 1 Low Reference	0 V	--	5 V	--
TP Sensor 2 Signal	0.35-4.65 V	0 V	5 V	5 V
TP Sensor 2 5-Volt Reference	4.9-5.1 V	0 V	0 V	5 V
TP Sensor 2 low Reference	0 V	--	5 V	--

## Circuit/System Description

The throttle actuator control (TAC) system uses two throttle position (TP) sensors to monitor the throttle position. The TP sensors 1 and 2 are located within the throttle body assembly. Each sensor has the following circuits:

- A 5 volt reference circuit.
- A low reference circuit.
- A signal circuit.

Two processors are also used to monitor the TAC system data. Both processors are located within the engine control module (ECM). Each signal circuit provides both processors with a signal voltage proportional to throttle plate movement. Both processors monitor each other's data to verify that the indicated TP calculation is correct.

## Conditions for Running the DTC

### **P0120, P0122, P0123, P0220, P0222, and P0223**

- DTC P0601, P0602, P0603, P0604, P0606, P0607, P0641, P0651 are not set.
- The system voltage is more than 4.9 volts.
- The ignition is in the Unlock/Accessory or Run position.
- DTC P0120, P0122, P0123, P0220, P0222 or P0223 run continuously when the above conditions are met.

### **P2135**

- The system voltage is more than 4.9 volts.
- The ignition is in the Unlock/Accessory or Run position.
- DTC P0120, P0220, P0641, P0651 are not set.
- DTC P2135 runs continuously when the above conditions are met.

## Conditions for Setting the DTC

### **P0120**

TP sensor 1 voltage is less than 0.325 volt or more than 4.75 volts for more than 200 milliseconds.

### **P0122**

The ECM detects that the TP sensor 1 voltage is less than 0.325 volt for more than 200 milliseconds.

### **P0123**

The ECM detects that the TP sensor 1 voltage is more than 4.75 volts for more than 200 milliseconds.

### **P0220**

The TP sensor 2 voltage is less than 0.25 volt or more than 4.59 volts for more than 200 milliseconds.

### **P0222**

The ECM detects that the TP sensor 2 voltage is less than 0.25 volt for more than 200 milliseconds.

### **P0223**

The ECM detects that the TP sensor 2 voltage is more than 4.59 volts for more than 200 milliseconds.

### **P2135**

The difference between the TP sensor 1 and TP sensor 2 exceeds a predetermined value for more than 200 milliseconds.

## **Action Taken when the DTC Sets**

DTCs P0120, P0122, P0123, P0220, P0222, P0223 or P2135 are type B DTCs.

## **Conditions for Clearing the MIL/DTC**

DTCs P0120, P0122, P0123, P0220, P0222, P0223 or P2135 are type B DTCs.

## **Reference Information**

### **Schematic Reference**

[Engine Controls Schematics](#)

### **Connector End View Reference**

[Component Connector End Views](#)

## Electrical Information Reference

- [Circuit Testing](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

## Scan Tool Reference

### [Control Module References](#)

## Circuit/System Verification

1. Ignition ON, engine OFF, observe the DTC information on the scan tool.  
If DTC P0641 or P0651 is also set, diagnose those DTCs first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
2. With the accelerator pedal in the rest position, observe the TP sensor 1 parameter with the scan tool. The voltage should be between 4.75-0.33 volts.  
If the voltage is outside of the range, continue with Circuit/System Testing.
3. Observe the TP sensor 2 parameter with the scan tool. The voltage should be between 0.25-4.59 volts.  
If the voltage is outside of the range, continue with Circuit/System Testing.
4. Observe the TP sensors 1 and 2 parameter with the scan tool. The sensors should indicate Agree.  
If the sensors indicate Disagree, continue with Circuit/System Testing.
5. Clear the DTCs with a scan tool.
6. Ignition OFF for 60 seconds.
7. Operate the vehicle within the conditions for running the DTCs.
8. Ignition ON, engine OFF, observe the previous TP sensor parameters and DTC information, with the scan tool.  
If DTC P0120 or P0220 is set, and all of the previous TP sensor parameters are normal, replace the ECM.  
If any of the previous TP sensor parameters are now abnormal or out of range, continue with Circuit/System Testing.

## Circuit/System Testing

1. Ignition OFF.
2. Disconnect the throttle body harness connector.
3. Ignition ON, engine OFF, observe the TP Sensor 1 parameter on the scan tool. The voltage should be less than 0.1 volt.  
If the voltage is more than 0.1 volt, test the TP sensor 1 signal circuit for a short to voltage. If the circuit tests normal, replace the ECM.
4. Observe the TP Sensor 2 parameter on the scan tool. The voltage should be more than 4.8 volts.  
If the voltage is less than 4.8 volts, test the TP sensor 2 signal circuit for a short to ground. If the circuit tests normal, replace the control module.
5. Measure for 4.8-5.2 volts between the 5-volt reference circuit and a known ground.  
If the voltage is more than 5.2 volts, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the ECM.

If the voltage is less than 4.8 volts, test the 5-volt reference circuit for open/high resistance or a short to ground. If the circuit tests normal, replace the ECM.

6. Install a 3-A fusible link wire between the signal circuit and the 5-volt reference circuit of the TP sensor 1. Observe the TP Sensor 1 parameter on the scan tool. The voltage should be more than 4.8 volts.

If the voltage is less than 4.8 volts, test the TP sensor 1 signal circuit for an open or a short to ground. If the circuit tests normal, replace the ECM.

7. Install a test lamp between the signal circuit of the TP sensor 2 and the negative terminal of the battery. Observe the TP Sensor 2 parameter on the scan tool. The voltage should be less than 0.1 volt.

If the voltage is more than 0.1 volt, test the TP sensor 2 signal circuit for an open. If the circuit tests normal, replace the ECM.

If the test lamp illuminates, test the TP sensor 2 signal circuit for a short to voltage. If the circuit tests normal, replace the ECM.

8. Measure for 4.8-5.2 volts between the 5-volt reference circuit and the low reference circuit.

If the voltage is less than 4.8 volts, test the low reference circuit for an open or high resistance. If the circuit tests normal, replace the ECM.

9. Ignition OFF.

10. Disconnect the ECM harness connector, and measure the 5-volt reference, the low reference, and each of the signal circuits between the ECM and the throttle body for less than 5 ohms.

If the resistance is more than 5 ohms, repair the affected circuit.

11. Test the signal circuits for continuity between them.

If continuity exists between the signal circuits, repair the short.

12. If all circuits test normal, replace the throttle body.

## **Repair Instructions**

Perform the [Diagnostic Repair Verification](#) after completing the diagnostic procedure.

- [Engine Control Module Replacement](#) for engine control module replacement, setup and programming.
- [Throttle Body Assembly Replacement](#)