

## **TSB 94-26-4**

### **ISSUE:**

The following Throttle Position Sensor (TPS) TSB has been developed for service use. This TSB includes the following topics:

- Description And Background Of TPS
- (A1) and (A2) - Diagnostic Trouble Codes (*Service Tips*)
- (B) - Troubleshooting The TPS
- (C) - TPS Application Charts

### **ACTION:**

If TPS diagnosis or repair is required, refer to the following procedures for service details.

### **DESCRIPTION**

The Throttle Position Sensor (TPS) is a rotary potentiometer that provides a voltage signal to the Powertrain Control Module (PCM) that is linearly proportional to the throttle plate/shaft angular position. The TP sensor has a three-blade electrical connector that is plated. The plating increases the corrosion resistance on terminals and increases the connector durability. The TP sensor is mounted on the throttle body and is non-adjustable. As the TP sensor is rotated by the throttle shaft, four (4) operating conditions are determined by the PCM from the TP sensor.

The four (4) vehicle operating conditions are:

- Closed throttle (*idle or deceleration*)
- Part throttle (*cruise, moderate acceleration*)
- Wide open throttle (*maximum acceleration, de-choke on crank and A/C shut-off*)
- Throttle angle rate.

### **BACKGROUND**

Recently, revisions have been made to the TPS, which have improved reliability and durability.

#### **(A1) - DIAGNOSTIC TROUBLE CODES (DTC)**

A key difference between EEC-IV, OBD I and EEC-V, OBD II is the monitors. EEC-IV monitors are designed to identify system and component issues. EEC-V monitors are designed to measure the ability of systems and components to maintain low emission levels.

To minimize the replacement of good components, be advised that the following non-EEC areas may be the issue:

- Excessive blow-by
- PCV malfunction
- Vacuum leaks
- Fuel pressure
- Throttle sticking or linkage binding.

## (A2) - EEC-IV DIAGNOSTIC TROUBLE CODES (DTC)

When a Diagnostic Trouble Code (DTC) 121, 124 or 125 are set in continuous memory, the technician is directed to Pinpoint Test G of the Powertrain Control/Emissions Diagnosis (PC/ED) Manual. Pinpoint Test G is named: In-Range MAF/TP/Fuel Injector Pulse Width Test. The description of the test is as follows:

- EEC-IV DTC Code 121, 124, and 125 Description.

This In-Range Self-Test was designed to identify in-range concerns of the MAF sensor, TP sensor, or the fuel delivery system. The PCM will use information from these three (3) areas based on vehicle load to generate three (3) independent values. The three (3) independent values will be continuously monitored by the PCM. If one (1) of the values differs significantly from the others during normal vehicle operation, a Continuous Memory Diagnostic Trouble Code (DTC) will be stored.

EEC codes for the TPS are intended as a supplemental aid to diagnostics. They do not indicate the root cause since more than one (1) component can set the same code.

For example: EEC-IV, OBD I Codes 122 and 123 and EEC-V, OBD II Codes P0122 and P0123 for "TP circuit too low" or "TP circuit too high", limit the condition to the TP circuit, connector, or vehicle harness.

EEC-IV, OBD I Codes: 121, "TP inconsistent with air meter", 124, "TP higher than expected", 125, "TP lower than expected" and OBD II Code P1121, "TP inconsistent with MAF sensor" are a result of a comparison of the TP signal to a given airflow. Any un-metered air (*downstream of MAF*) that enters the engine, either due to a mechanical situation or electrical sensor condition, may result in these codes. PC/ED Pinpoint Tests will guide you to the root cause and avoid customer repeat repairs.

EEC-IV (OBD I) Codes 124 and 125 are set in memory as follows: Codes 124-125 are a comparison of a given airflow to the TPS voltage (*throttle plate position*).

Code 124: The PCM has indicated that the airflow rate is too low for the position of the throttle plate angle.

Causes for EEC-IV, OBD I Code 124:

Air bypass solenoid flow low/blocked (*MAF may indicate low during the event*).

- Throttle body obstructed.
- EGR flow low.
- TPS circuit concern when accompanied by Codes 122 or 123.
- BP sensor low.

Code 125: The PCM has indicated that the airflow rate is too high for the position of the throttle plate.

Causes of EEC-IV, OBD I Code 125:

Air bypass solenoid high/stuck open (*MAF may indicate high during this event*).

- Throttle plate not closing.
- EGR flow high.
- TPS circuit concern when accompanied by Codes 122 or 123.
- BP sensor high.

These codes are designed to set while in the part throttle drive mode, and often the MIL light flashes on and off until the condition is gone. In some cases, it is difficult to repeat the codes in a test drive since the PCM requires a long drive time to

calculate the error in the system. At other times, it may be difficult to repeat because the condition that set the code may be intermittent. Pinpoint Test G of the PC/ED Manual will guide you to the root cause.

Causes of EEC Codes 122: TPS sensor circuit voltage above maximum.

Causes of EEC codes 123: TPS sensor circuit voltage below minimum.

- Harness damage.
- Connector damage or water in connector.
- Defective TPS, open or short.
- Check VREF for correct output.

## **(B) - TROUBLESHOOTING THE TPS**

The following is a list of vehicle symptoms which have been associated with the TPS, but can also be related to other vehicle components.

- Check engine light
- Stalls/quits
- Hesitation/stumble
- Fast idle

If an EEC error code has identified the TPS as suspect, perform PC/ED Manual pinpoint tests on the TPS.

Testing the TPS in the vehicle electrical circuit:

The TPS is supplied with a 5.0 volt reference signal. As the TPS senses throttle plate rotation, the output voltage changes to a value in the range of 0.4 volts to 4.8 volts depending on vehicle application. A voltmeter, New Generation Star Tester (NGS) or Service Bay Diagnostics System (SBDS) is the recommended test equipment for checking the TPS output.

The reason SBDS or NGS are the preferred tools is that they allow TPS voltage monitoring without disturbing the connector. Many conditions can be caused by loose, dirty, oxidized, or poor connections that may correct themselves for a short time if the connector is disturbed during testing. This can mislead technicians into replacing a TPS that is okay, and the true cause, a bad connection, may return at some future time.

Measuring the TPS voltage at idle is key when diagnosing a TPS since most of its operational life is within 10 degrees of idle. A guide to TPS output voltages for 1993-95 model year vehicles is below.

<b>Passenger Car</b>		<b>Engine</b>	<b>1993 Service Part</b>	<b>Voltage at Idle</b>
Thunderbird/Cougar	V6	3.8L EFI	F2SZ-B	.66-1.22
Thunderbird	V6 SC	3.8L SC	F2SZ-C	.70-1.31
Thunderbird/Cougar	V8 (4.6)	4.6L EFI		
Thunderbird/Cougar	V8 (5.0)	5.0L HO	F2SZ-C	.70-1.31

<b>Passenger Car</b>		<b>Engine</b>	<b>1994 Service Part</b>	<b>Voltage at Idle</b>
Thunderbird/Cougar	V6	3.8L EFI	F2SZ-B	.66-1.22
Thunderbird	V6 SC	3.8L SC	F2SZ-C	.70-1.31
Thunderbird/Cougar	V8 (4.6)	4.6L EFI	F2SZ-A	.65-1.26
Thunderbird/Cougar	V8 (5.0)	5.0L HO		

<b>Passenger Car</b>		<b>Engine</b>	<b>1995 Service Part</b>	<b>Voltage at Idle</b>
Thunderbird/Cougar	V6	3.8L EFI	F2SZ-B	.66-1.22
Thunderbird	V6 SC	3.8L SC	F2SZ-C	.70-1.31
Thunderbird/Cougar	V8 (4.6)	4.6L EFI	F2SZ-A	.65-1.26
Thunderbird/Cougar	V8 (5.0)	5.0L HO		

The TPS voltage increases when the throttle is depressed. Idle is typically in the 0.4 volt to 1.2 volt range. (*Refer to idle voltage range chart.*) As the TPS senses plate rotation toward Wide Open Throttle (WOT), the voltage increases. WOT is typically in the 4.0 volt range. A voltmeter, NGS, or SBDS is the recommended test equipment for checking the TPS output.

**CAUTION:**

**MANY VOLTMETERS WILL AUTOMATICALLY CHANGE RANGES WHEN MEASURING TPS OUTPUT FROM IDLE TO WOT. WHEN A VOLTMETER IS USED TO MEASURE TPS OUTPUT FROM IDLE TO WOT, THE METER SCALES OR CHANGES RANGES AUTOMATICALLY. THERE MAY BE AN ERRONEOUS METER DISPLAY UNTIL THE VOLTMETER HAS LOCKED TO THE APPROPRIATE VOLTAGE READING. THE ERRONEOUS METER DISPLAY DOES NOT REPRESENT A DEFECTIVE TPS.**

**NOTE:**

**IT IS RECOMMENDED THAT THE "RANGE LOCK" FEATURE ON MANY METERS BE SET FOR CHECKING TPS VOLTAGE.**

Use the 0.00 range to measure TPS voltage.

If your voltmeter does not change ranges automatically and the meter is set to millivolt scale when reading full range voltages, the meter display may not indicate a valid value. This can be misinterpreted as an open circuit or suspect TPS. Ensure the meter is set to volts for measuring full range voltage levels.

**(C) - APPLICATION CHARTS**

Figures 2 and 3 are 1993-95 Throttle Position Sensor Service Part Application Charts for car and light truck. The charts also contain TPS idle voltage ranges. These idle voltage values should be used instead of the values published in the 1993-95 PC/ED Manuals.

OTHER APPLICABLE ARTICLES: NONE

WARRANTY STATUS: INFORMATION ONLY