2. Measure the reference signal of the MAP sensor. If the DVOM voltage reading is as indicated in the table, the sensor is okay.
   a. Turn the ignition **OFF**.
   b. Disconnect the vacuum hose from the MAP sensor and connect a vacuum pump in its place.
   c. Apply 18 in. Hg of vacuum to the MAP sensor.
   d. If the MAP sensor holds vacuum, it is okay. If the MAP sensor does not hold vacuum, it must be replaced.

REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. Detach the electrical connector and the vacuum line from the sensor.
3. Remove the sensor mounting bolts and remove the sensor.
4. Installation is the reverse of the removal procedure.

Throttle Position Sensor

OPERATION

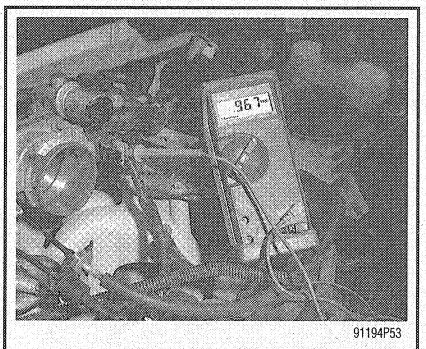
The Throttle Position (TP) sensor is a potentiometer that provides a signal to the PCM that is directly proportional to the throttle plates position. The TP sensor is mounted on the side of the throttle body and is connected to the throttle plate shaft. The TP sensor monitors the throttle plate's movement and position, and transmits an appropriate electrical signal to the PCM. The PCM uses these signals to adjust the air/fuel mixture, spark timing, and EGR operation according to engine load at idle, part throttle, or full throttle. The TP sensor is not adjustable.

The TP sensor receives a 5-volt reference signal and a ground circuit from the PCM. A return signal circuit connects to a wiper that runs on a resistor internally in the sensor. The more the throttle opens the further the wiper moves along the resistor. At wide open throttle, the wiper essentially creates a loop between the reference signal and the signal return, returning the full, or nearly full 5 volt signal back to the PCM. At idle the signal return should be approximately 0.9 volts.

TESTING

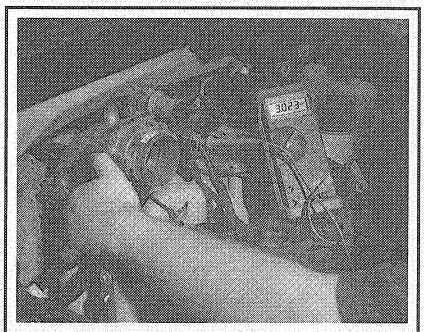
See Figures 57, 58, 59 and 60

1. With the engine **OFF** and the ignition **ON**, check the voltage at the signal return circuit of the TP sensor by carefully backprobing the connector using a DVOM.
2. Voltage should be between 0.2 and 1.4 volts at idle.
3. Slowly move the throttle pulley to the wide-open throttle (WOT) position and watch the voltage on the DVOM. The voltage should slowly rise to slightly less than 4.8v at Wide Open Throttle (WOT).
4. If no voltage is present, check the wiring harness for supply voltage (5.0v) and ground (0.3v or less), by referring to your corresponding wiring guide. If supply voltage and ground are present, but no output voltage from TP, replace the TP sensor. If supply voltage and ground do not meet specifications, make necessary repairs to the harness or PCM.



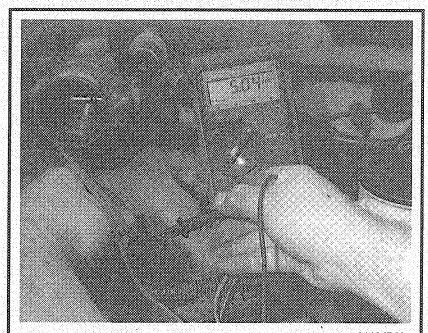
91194P53

Fig. 57 Testing the TP sensor signal return voltage at idle



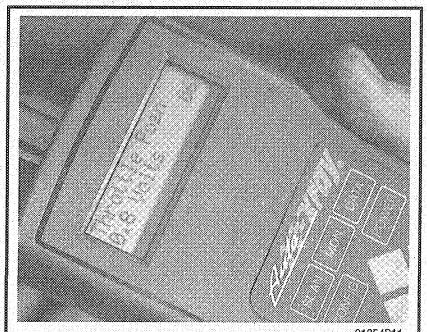
91194P55

Fig. 58 Test the operation of the TP sensor by gently opening the throttle while observing the signal return voltage. The voltage should move smoothly according to the amount the throttle is opened



91194P52

Fig. 59 Testing the supply voltage at the TP sensor connector



91054P11

Fig. 60 The TP sensor can be monitored with an appropriate and Data-stream capable scan tool

REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.

On a 4.6L engine, it may be necessary to remove the throttle cover from the engine.

2. Disconnect the wiring harness from the TP sensor.
3. Remove the two sensor mounting screws, then pull the TP sensor off of the throttle shaft.

To install:

4. Carefully slide the rotary tangs on the sensor into position over the throttle shaft, then rotate the sensor clockwise to the installed position..

CAUTION

Failure to install the TP sensor in this manner may result in sensor damage or high idle speeds.

The TP sensor is not adjustable.

5. Install and tighten the sensor mounting screws to 27 inch lbs. (3 Nm).
6. Connect the wiring harness to the sensor.
7. If removed, install the throttle cover.
8. Connect the negative battery cable.

Camshaft Position Sensor

The Camshaft Position Sensor (CMP) is only outfitted on the 4.6L engine.

The camshaft position sensor (CMP) is a variable reluctance sensor that is triggered by a high point on the left-hand exhaust camshaft sprocket. The CMP sends a signal relating camshaft position back to the PCM and that signal is used by the PCM to check engine timing.

TESTING

1. Check voltage between the camshaft position sensor terminals PWR GND and CID.
2. With engine running, voltage should be greater than 0.1 volt AC and vary with engine speed.
3. If voltage is not within specification, check for proper voltage at the VPWR terminal.
4. If VPWR voltage is greater than 10.5 volts, sensor may be faulty.

REMOVAL & INSTALLATION

4.6L Engine

See Figures 61, 62 and 63

1. Disconnect the negative battery cable.
2. Detach the electrical connector for the CMP sensor.
3. Remove the CMP sensor retaining bolt(s) and remove the CMP sensor from the front cover.

To install:

4. Installation is the reverse of removal.