

ELECTRONIC ENGINE CONTROLS

General Information

The fuel injection system (CFI, EFI or SFI), is operated along with the ignition system to obtain optimum performance and fuel economy while producing a minimum of exhaust emissions. The various sensors described in this section are used by the computer control module for feedback to determine proper engine operating conditions. As the Taurus and Sable changed through the years, so did the name of the computer control module. Depending on the year of the vehicle it was called the EEC-IV Processor, Electronic Control Assembly (ECA), Electronic Control Unit (ECU) or Powertrain Control Module (PCM). Keep in mind, that even though the name of the component may have changed, its function did not.

When dealing with the electronic engine control system, keep in mind that the system is sensitive to improperly connected electrical and vacuum circuits. The condition and connection of all hoses and wires should always be the first step when attempting to diagnose a driveability problem. Worn or deteriorated hoses and damaged or corroded wires may well make a good component appear faulty.

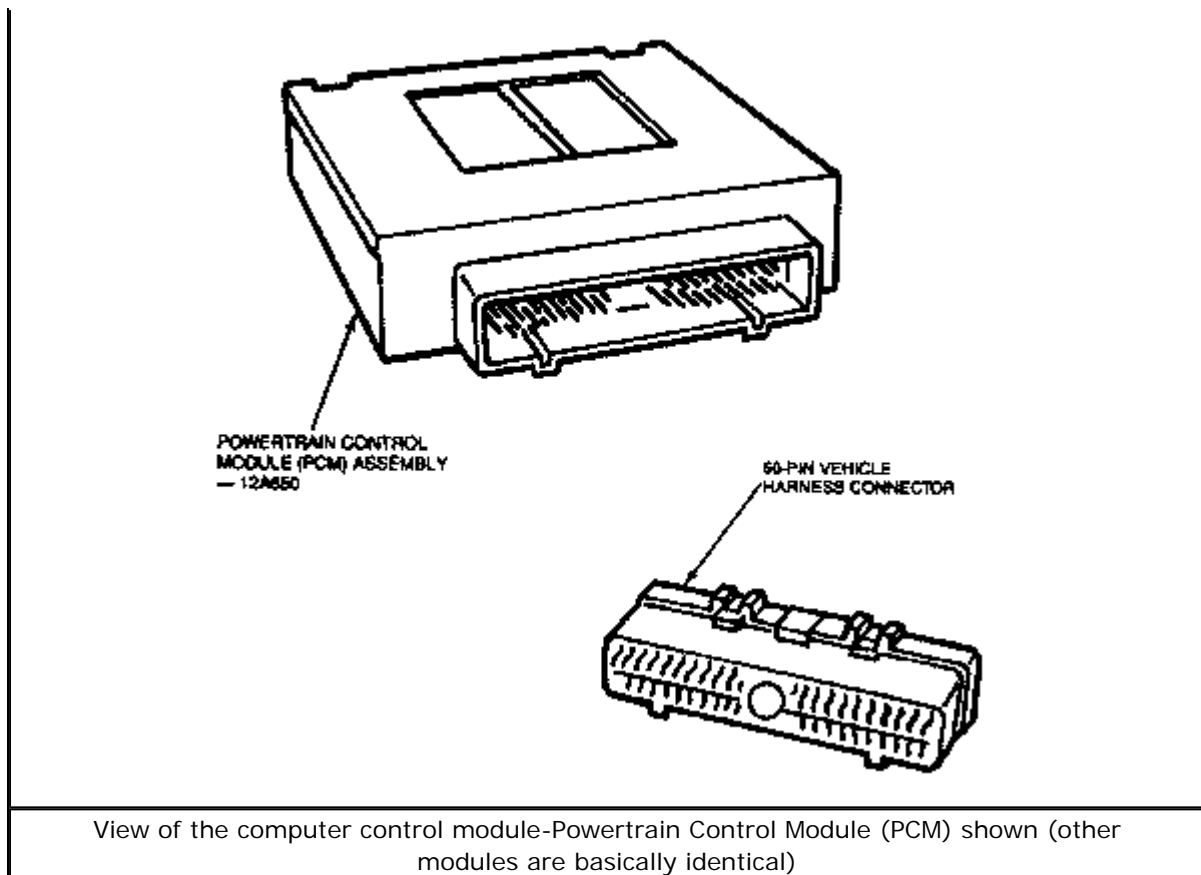
When troubleshooting the system, always check the electrical and vacuum connectors which may cause the problem before testing or replacing a component.

Computer Control Module

The heart of the electronic control system which is found on vehicles covered by this manual is a computer control module. Depending on the year of the vehicle, this module was called the EEC-IV Processor, Electronic Control Assembly (ECA), Electronic Control Unit (ECU) or Powertrain Control Module (PCM).

The computer control module is a microprocessor that receives data from sensors, switches, relays and other electronic components, then uses this information to control fuel supply and engine emission systems. The module contains a specific calibration for optimizing emissions, fuel economy and driveability. Based on information received and programmed into it's memory, the module generates output signals to control the fuel injection system. On the vehicles covered by this manual, the computer control module is located ahead of the glove box.





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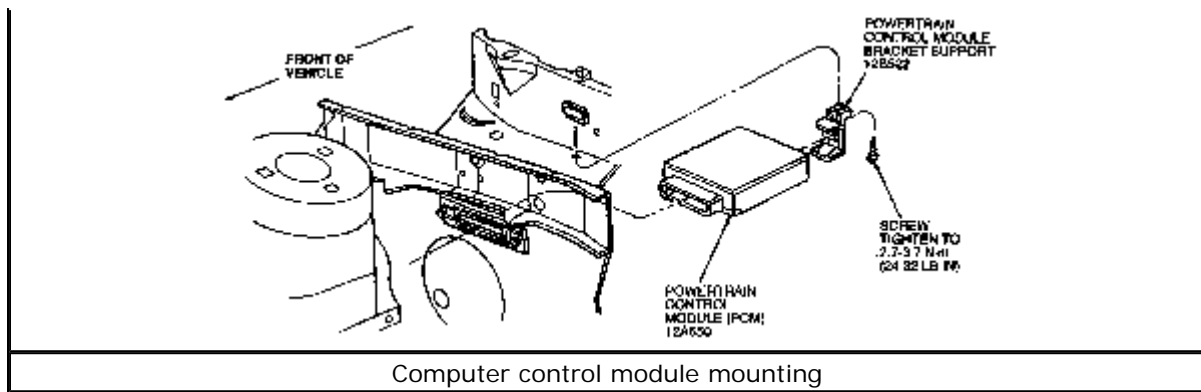
Regardless of the name, all computer control modules are serviced in a similar manner. Care must be taken when handling these expensive components in order to protect them from damage. Carefully follow all instructions included with the replacement part. Avoid touching pins or connectors to prevent damage from static electricity.

CAUTION

To prevent the possibility of permanent control module damage, the ignition switch **MUST** always be OFF when disconnecting power from or reconnecting power to the module. This includes unplugging the module connector, disconnecting the negative battery cable, removing the module fuse or even attempting to jump you dead battery using jumper cables.

REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. If necessary, remove the glove box or kick panel.
3. Loosen the engine control sensor wiring to the computer control module connector retaining bolt. Remove the wiring connector from the module.
4. Loosen the module bracket support screw, located forward of the glove compartment. Remove the bracket, then remove the computer control module.

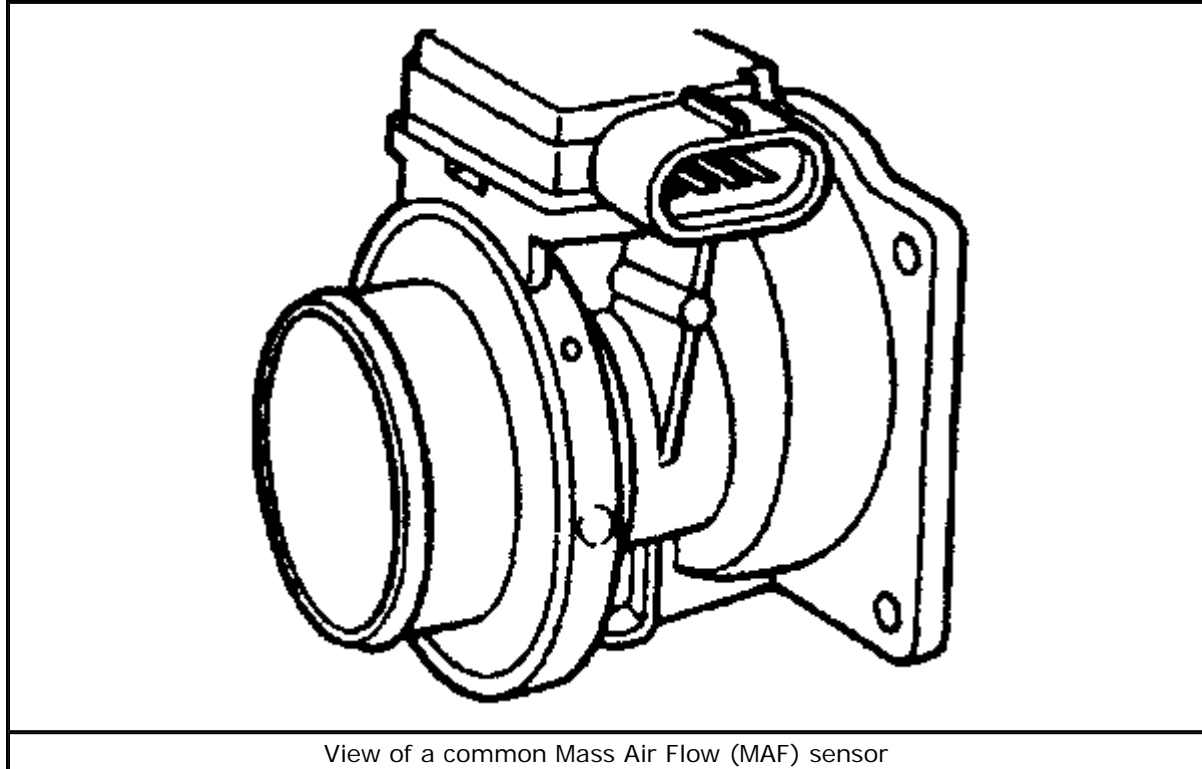


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5. Installation is the reverse of the removal procedure. Tighten the module retaining screw to 24-32 inch lbs. (2.7-3.7 Nm). Tighten the engine control sensor wiring connector retaining bolt to 32 inch lbs. (3.7 Nm).

Mass Air Flow (MAF) Sensor

The Mass Air Flow (MAF) sensor directly measures the mass of the air flowing into the engine. The sensor output is an analog signal ranging from about 0.5-5.0 volts. The signal is used by the ECU to calculate the injector pulse width. The sensing element is a thin platinum wire wound on a ceramic bobbin and coated with glass. This "hot wire" is maintained at 11°F (200°C) above the ambient temperature as measured by a constant "cold wire". The MAF sensor is located in the outlet side of the air cleaner lid assembly.



TESTING

1. Make sure the ignition key is OFF.
2. Connect Breakout Box T83L-50EEC-IV or equivalent, to the computer control

module harness, then connect the control module.

3. Start the engine and let it idle.
4. Use a voltmeter to measure the voltage between test pin 50 of the breakout box and the battery negative post.
5. Replace the MAF sensor if the voltage is not 0.36-1.50 volts.

REMOVAL & INSTALLATION

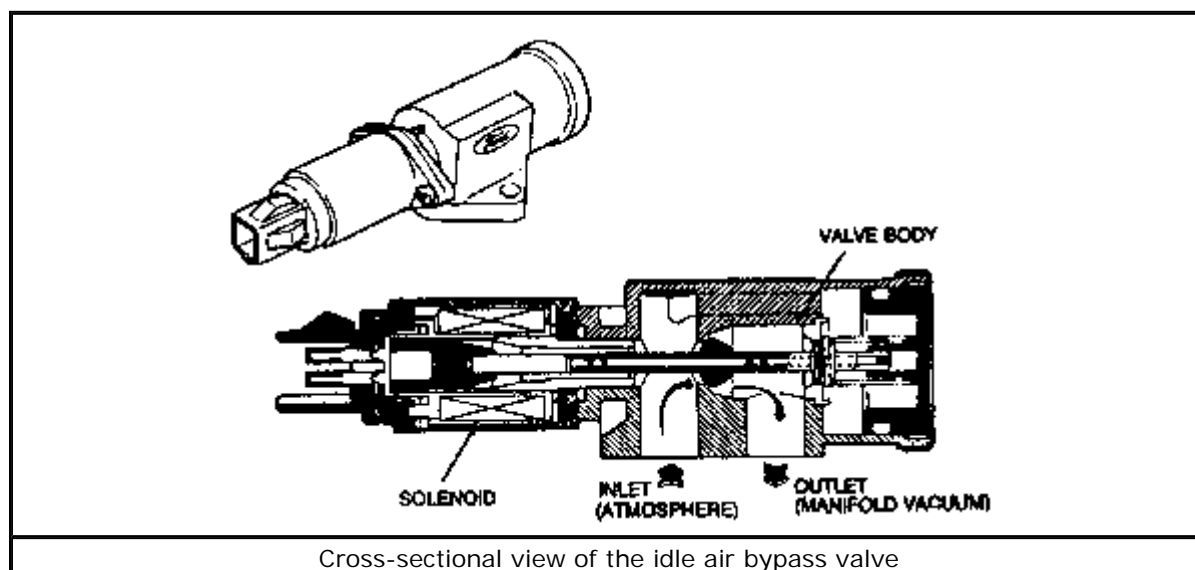
1. Disconnect the negative battery cable.
2. Remove the air intake tube.
3. Detach the MAF sensor electrical connector.
4. Unfasten the sensor attaching screws, then remove the sensor.

Inspect the MAF sensor-to-air cleaner lid gasket for any signs of deterioration. Replace the gasket, as necessary. If scraping is necessary, be careful not to damage the air cleaner lid or the MAF sensor gasket surfaces.

4. Installation is the reverse of the removal procedure.

Idle Air Bypass Valve

The idle air bypass valve is used to control engine idle speed and is operated by the computer control module, or in response to engine coolant temperature change, depending upon vehicle application. The valve allows air to flow into the intake air stream to control cold engine fast idle, no touch start, dashpot, over temperature idle boost and engine idle load correction. The air bypass valve, which is used on all EFI and SEFI systems, is located on the throttle body housing.



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TESTING

1. Make sure the ignition is in the OFF position.

2. Disconnect the air bypass valve.
3. Use an ohmmeter to measure the resistance between the terminals of the valve solenoid.

Due to the diode in the solenoid, place the ohmmeter positive lead on the VPWR pin and the negative lead on the ISC pin.

4. If the resistance is not between 7-13 ohms, replace the air bypass valve.

REMOVAL & INSTALLATION

1. Disconnect the negative battery cable.
2. Disengage the idle air bypass valve electrical connector from the wiring harness.
3. Remove the two retaining screws, then remove the idle air bypass valve and gasket assembly from the vehicle.

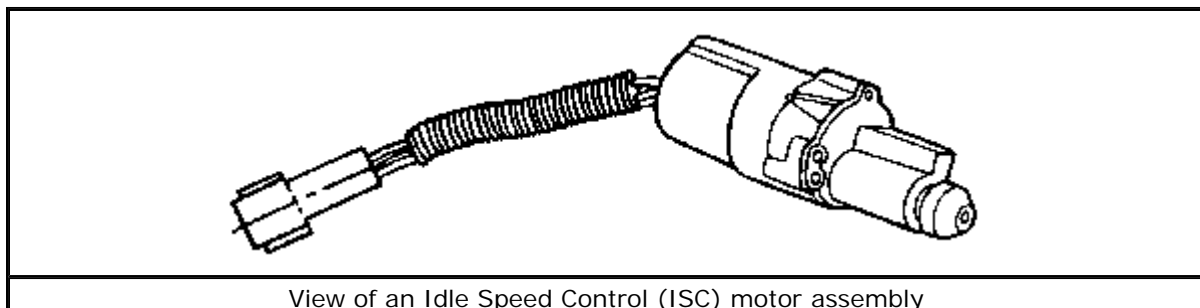
If scraping is necessary to clean the gasket mating surfaces, be careful not to damage the air bypass valve or throttle body gasket surfaces or drop any material into the throttle body.

To install:

4. Make sure the gasket mating surfaces are clean. Install a new gasket on the throttle body surface, then mount the valve assembly. Secure using the two retaining screws tightening them to 84 inch lbs. (9.5 Nm).
5. Engage the idle air bypass valve electrical connector to the wiring harness, then connect the negative battery cable.

Idle Speed Control (ISC) Motor

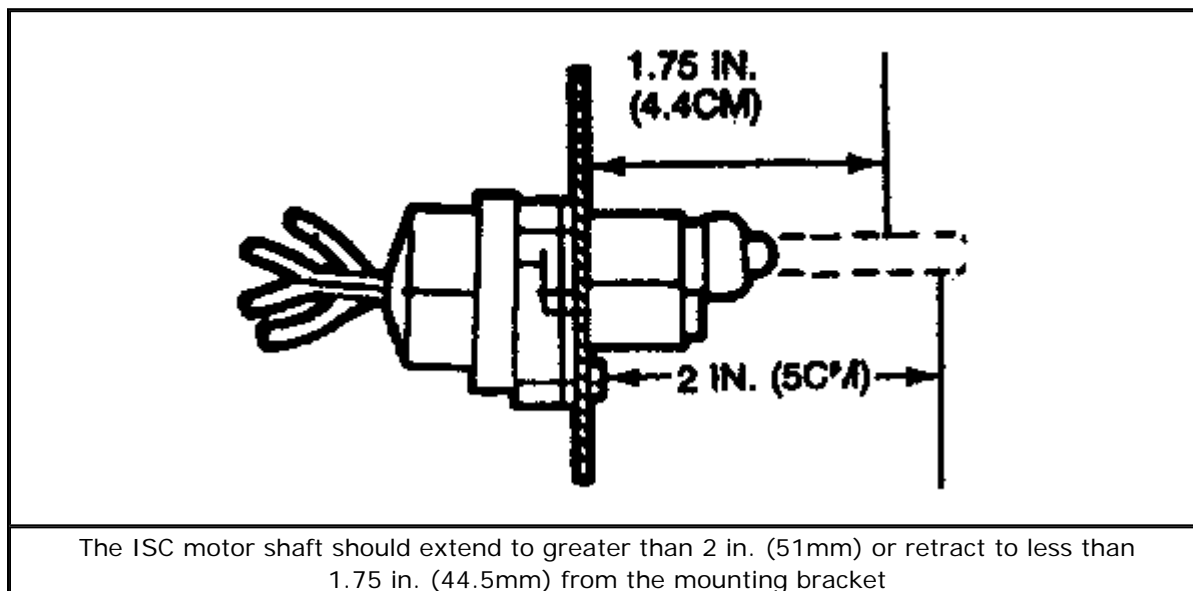
The Idle Speed Control (ISC) motor, which is used in the CFI system, controls idle speed by moving the throttle lever. It regulates airflow to maintain the desired engine rpm for both warm and cold engine idles. An idle tracking switch, integral to the motor, is utilized to determine when the throttle lever has contacted it, thereby signalling the need to control engine rpm. The motor extends or retracts a linear shaft through a gear reduction system. The motor direction is determined by the polarity of the applied voltage.



TESTING

1. Connect Breakout Box T83L-50EEC-IV, or equivalent, to the ECU wiring harness.
2. Use a jumper wire to connect the positive circuit of the ISC motor, test pin 21, to the positive battery terminal and connect another jumper wire between the

- negative circuit of the motor, test pin 41, to battery ground for 4 seconds.
- Reverse the jumper wires, connecting the positive circuit of the ISC motor to battery ground and the negative circuit to battery positive for 4 seconds.
 - The ISC motor shaft should extend to greater than 2 in. (51mm) or retract to less than 1.75 in. (44.5mm) from the mounting bracket. If it does not, replace the ISC motor.



REMOVAL & INSTALLATION

- Disconnect the negative battery cable.
- Detach the electrical connector from the ISC motor.
- Unfasten the ISC motor mounting screws and remove the ISC motor.
- Installation is the reverse of the removal procedure.

Throttle Position (TP) Sensor

The Throttle Position (TP) sensor is mounted to the throttle shaft and is used to supply a voltage output change proportional to the change in the throttle position. The TP sensor is used by the ECU to determine engine operation mode: closed throttle, part throttle and wide-open throttle. The proper fuel mixture, spark and EGR will be output only when the operation mode has been determined correctly.

REMOVAL & INSTALLATION

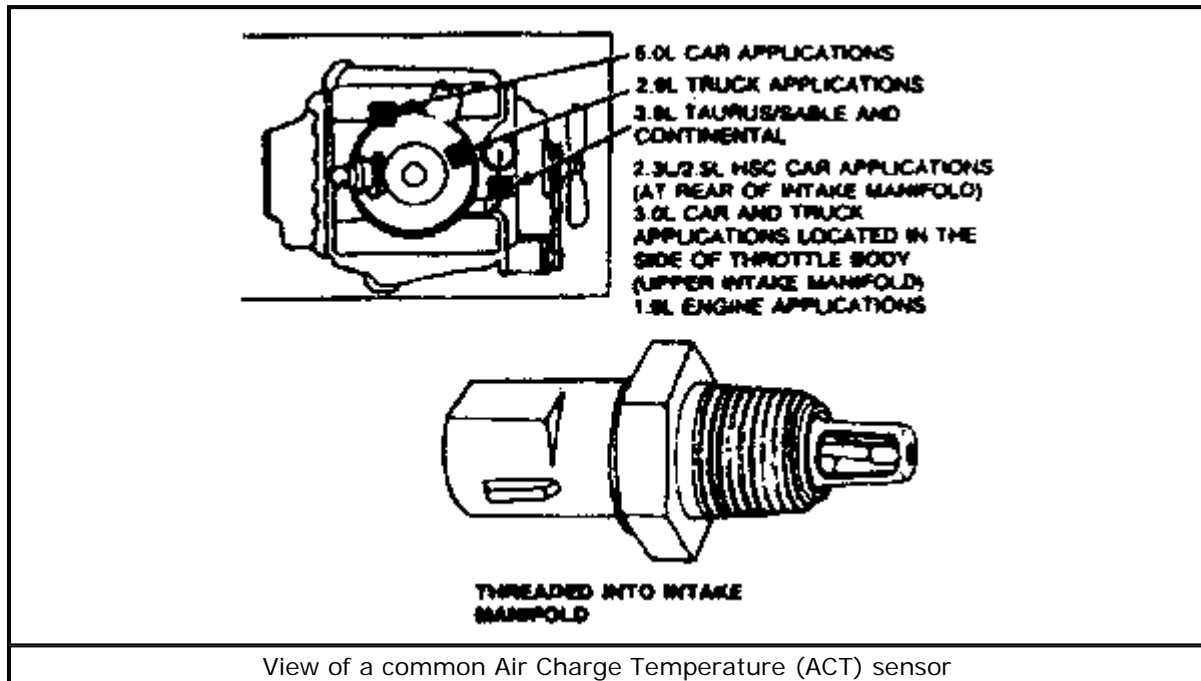
- Disconnect the negative battery cable.
- Detach the electrical connector from the TP sensor.
- Unfasten the TP sensor mounting screws and remove the TP sensor.
- Installation is the reverse of the removal procedure.
- Adjust the sensor, if necessary.

Air Charge Temperature (ACT) Sensor

The Air Charge Temperature (ACT) sensor in systems with vane air flow meters is

used to measure the temperature of the incoming air and send the information to the computer control module. In all other systems, the sensor provides the computer control module with mixture, fuel and air temperature information.

The air temperature sensor is located in the meter in vane air flow meter systems. Otherwise, it is located in the air cleaner assembly or in the side of the throttle body.



[Click to enlarge](#)

TESTING

Without Vane Air Flow Meter

1. Disconnect the temperature sensor.
2. Connect an ohmmeter between the sensor terminals and set the ohmmeter scale on 200,000 ohms.
3. Measure the resistance with the engine off and cool. Then measure the resistance with the engine running and warmed up. Compare the resistance values obtained with the accompanying chart.
4. Replace the sensor if the readings are incorrect.

Temperature		Engine Coolant/Air Charge Temperature Sensor Values	
°F	°C	Voltage (volts)	Resistance (K ohms)
248	120	.27	1.18
230	110	.35	1.55
212	100	.46	2.07
194	90	.60	2.80
176	80	.78	3.84
158	70	1.02	5.37
140	60	1.33	7.70
122	50	1.70	10.97
104	40	2.13	16.15
86	30	2.60	24.27
68	20	3.07	37.30
50	10	3.51	58.75

ACT and ECT temperature sensor value chart

[Click to enlarge](#)

With Vane Air Flow Meter

1. Unfasten the vane air flow meter connector.
2. Access the sensor in the meter.
3. Monitor the temperature near the sensor.

If using a hot air gun to heat the sensor, be careful not to melt any plastic or rubber components.

4. Measure and record the resistance between the meter VAT terminal and the meter Signal Return (SIGRTN) terminal.
5. Compare the resistance readings with the accompanying chart. If the readings are incorrect, replace the sensor.

REMOVAL & INSTALLATION

Without Vane Air Flow Meter

1. Disconnect the negative battery cable.
2. Disengage the electrical connector from the air temperature sensor.
3. Remove the sensor.
4. Installation is the reverse of the removal procedure.

With Vane Air Flow Meter

The air charge temperature sensor is an integral component of the vane air flow meter. If the temperature sensor is defective, the vane air flow meter must be replaced.

Engine Coolant Temperature (ECT) Sensor

Temperature		Engine Coolant/Air Charge Temperature Sensor Values	
°F	°C	Voltage (volts)	Resistance (K ohms)
248	120	.27	1.18
230	110	.35	1.55
212	100	.46	2.07
194	90	.60	2.80
176	80	.78	3.84
158	70	1.02	5.37
140	60	1.33	7.70
122	50	1.70	10.97
104	40	2.13	16.15
86	30	2.60	24.27
68	20	3.07	37.30
50	10	3.51	58.75

ACT and ECT temperature sensor value chart

[Click to enlarge](#)

The Engine Coolant Temperature (ECT) sensor detects the temperature of engine coolant and supplies that information to the computer control module. The ECT sensor is located on the cylinder head or on the intake manifold. The sensor signal is used to modify ignition timing, EGR flow and air/fuel ratio as a function of engine coolant temperature.

TESTING

1. Disconnect the temperature sensor.
2. Connect an ohmmeter between the sensor terminals and set the ohmmeter scale on 200,000 ohms.
3. Measure the resistance with the engine off and cool. Then, measure with the engine running and warmed up. Compare the resistance values obtained with the chart.
4. Replace the sensor if the readings are incorrect.

REMOVAL & INSTALLATION

5. Disconnect the negative battery cable.
6. Drain the cooling system to a level below the sensor.
7. Disengage the electrical connector from the ECT sensor.
8. Remove the ECT sensor.
9. Installation is the reverse of the removal procedure. Properly refill and bleed the cooling system.

Manifold Absolute Pressure (MAP) Sensor

The MAP sensor measures manifold vacuum using a frequency. This gives the computer control module information on engine load. It is used as a barometric sensor for altitude compensation, updating the control module during key ON, engine OFF and every wide-open throttle. The ECU uses the MAP sensor for spark advance, EGR flow and air/fuel ratio.

TESTING

1. **Disconnect the vacuum supply hose from the MAP sensor.**
2. **Connect a suitable vacuum pump to the MAP sensor and apply 18 in. Hg (61 kPa) of vacuum.**
3. **If the MAP sensor does not hold vacuum, it must be replaced.**

REMOVAL & INSTALLATION

1. **Disconnect the negative battery cable.**
2. **Disengage the electrical connector and the vacuum line from the sensor.**
3. **Unfasten the sensor mounting bolts, then remove the sensor.**
4. **Installation is the reverse of the removal procedure.**

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