



2 Check Engine light (fault codes) and electronic control system components



Caution:

This video is for familiarization purposes only. Read below for specific information on your vehicle.

Check Engine light (Fuel-injected models only)

1 The Check Engine light, located at the lower left corner of the instrument cluster, comes on each time the ignition key is turned to the On position. It should stay on for three seconds. This lets you know the Check Engine light is functioning properly.

2 If the SMEC receives an incorrect signal or no signal from certain sensors or emission related systems, the Check Engine light will illuminate and the SMEC will revert to a “limp in” mode, allowing the vehicle to be driven in for servicing. If the Check Engine light comes on while the vehicle is being driven, service the vehicle as soon as possible. On fuel-injected models, the first step in servicing should be checking to see what fault code(s) are stored. These codes can be very helpful in diagnosing the problem(s).

Obtaining fault codes (Fuel-injected models only)

3 The “Check Engine” light flashes any stored fault code(s) after the ignition switch is cycled twice from On to Off, then to On within five seconds.

4 The codes are two-digit numbers. The start of test (88) code (eight flashes, a pause and eight more flashes) is flashed first. After this code, any stored fault codes will be flashed in order. After the last code is flashed, the end of code output (55) code (five flashes, a pause and five more flashes) is flashed.

5 Refer to the accompanying fault code chart to determine the problem(s) indicated by the code(s). Most of the fault codes identify a problem in a particular circuit or component. Check the vacuum hoses, wires and connections in the circuit identified. Make sure all vacuum hoses are routed properly (refer to the EAR label attached to the inside of the hood). Keep in mind that replacing the component identified may not solve the problem in all cases. If you’re not sure what’s causing the problem in the circuit, take the vehicle to a dealer service department for further diagnosis. Remember that electrical parts usually cannot be returned, and many of the sensors and actuators used on these vehicles are quite expensive.

Note:

These codes apply only to fuel-injected models. Codes cannot be retrieved from carbureted models.

Fault code	Circuit or component affected
88 (8 flashes, pause, 8 flashes)	Start of test
11 (2.5L models) (1 flash, pause, 1 flash)	Engine not cranked since battery was disconnected
11 (3.9L and 5.2L models) (1 flash, pause, 1 flash)	No distributor input signal
12 (1 flash, pause, 2 flashes)	Memory standby power lost
13* (1 flash, pause, 3 flashes)	MAP sensor vacuum circuit
14* (1 flash, pause, 4 flashes)	MAP sensor electrical circuit
15** (1 flash, pause, 5 flashes)	Vehicle speed/distance sensor circuit
16* (1 flash, pause, 6 flashes)	Loss of battery voltage
17 (1 flash, pause, 7 flashes)	Engine running too cold
21** (2 flashes, pause, 1 flash)	Oxygen sensor circuit
22* (2 flashes, pause, 2 flashes)	Coolant temperature sensor circuit
23 (2 flashes, pause, 3 flashes)	Throttle body temperature sensor circuit (2.5L and 3.9L models).
	Charge air temperature sensor circuit (5.2L models)
24* (2 flashes, pause, 4 flashes)	Throttle position sensor circuit
25** (2 flashes, pause, 5 flashes)	Idle Speed Control (ISC) motor driver circuit
26* (2.5L OHC models) (2 flashes, pause, 6 flashes)	Peak injector current has not been reached
26 (3.9L models) (2 flashes, pause, 6 flashes)	Injector circuit(s) have high resistance
27* (2.5L models) (2 flashes, pause, 7 flashes)	Fuel injector control circuit
27 (3.9L and 5.2L models) (2 flashes, pause, 7 flashes)	Injector output circuit not responding
31** (3 flashes, pause, 1 flash)	Canister purge solenoid circuit
32** (3 flashes, pause, 2 flashes)	EGR system
33 (3 flashes, pause, 3 flashes)	A/C clutch cutout relay circuit

34 (3 flashes, pause, 4 flashes)	Speed control vacuum or vent control solenoid circuit(s)
35 (3 flashes, pause, 5 flashes)	Idle switch circuit or radiator fan control relay circuit
36* (3 flashes, pause, 6 flashes)	*Air switching solenoid circuit
37 (3 flashes, pause, 7 flashes)	Part throttle unlock solenoid driver circuit (Automatic transmission only)
41 (4 flashes, pause, 1 flash)	Charging system excess or lack of field current
42 (4 flashes, pause, 2 flashes)	Automatic shutdown relay driver circuit
43 (4 flashes, pause, 3 flashes)	Ignition coil control circuit
44 (4 flashes, pause, 4 flashes)	Battery temperature sensor voltage out of range
45** (4 flashes, pause, 5 flashes)	Governor pressure solenoid circuit
46* (4 flashes, pause, 6 flashes)	Battery voltage too high
47 (4 flashes, pause, 7 flashes)	Battery voltage too low
51** (5 flashes, pause, 1 flash)	Oxygen sensor stuck at lean position
52** (5 flashes, pause, 2 flashes)	Oxygen sensor stuck at rich position
53 (5 flashes, pause, 3 flashes)	Module internal problem
55 (5 flashes, pause, 5 flashes)	End of code output
62 (6 flashes, pause, 2 flashes)	Emissions reminder light mileage is not being updated
63 (6 flashes, pause, 3 flashes)	EEPROM write denied
64** (6 flashes, pause, 4 flashes)	Catalytic converter efficiency failure
65** (6 flashes, pause, 5 flashes)	Power steering switch failure
71** (7 flashes, pause, 1 flash)	Auxiliary 5 volt supply output low
72** (7 flashes, pause, 2 flashes)	Catalytic converter efficiency failure

* Activates Check Engine light

** Activates Check Engine light (California models only)

Electronic control system components

Note:

The following information is for some of the components used in the engine's electronic control system. The other Sections in this Chapter have checking and component replacement information for other emissions control system components.

Automatic Idle Speed Motor (AIS) (all four-cylinder and 1992 and later V6 and V8 engines)

General description

6 The AIS motor is an output device controlled by the SMEC or SBEC II. It controls the idle rpm according to engine load.

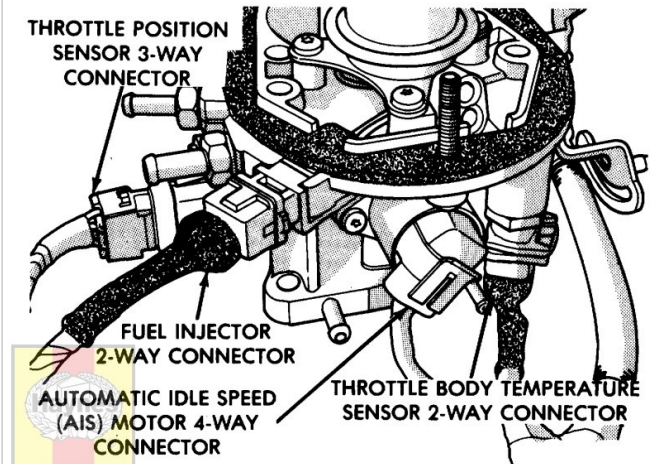
Replacement

7 Disconnect the negative cable at the battery.

8 Remove the air cleaner assembly.

9 Unplug the connector on the AIS motor (see the accompanying illustration or illustration 16.4 in [Chapter 4](#))

2.9 Throttle body electrical connector details (2.5L OHC engine models)



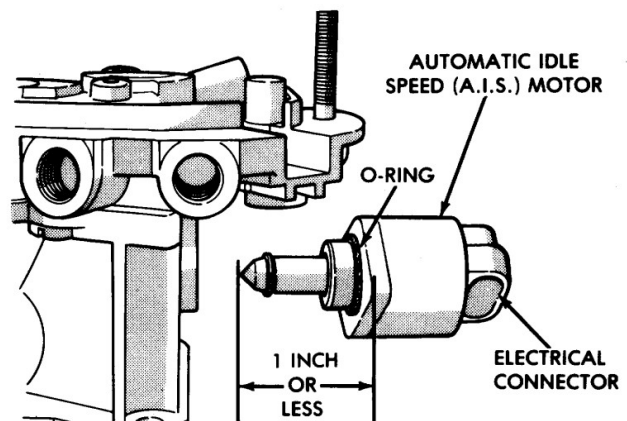
10 On 2.5L engines, remove the throttle body temperature sensor.

11 Remove the two Torx retaining screws.

12 Withdraw the AIS motor from the throttle body, making sure that the O-ring does not fall into the throttle body opening.

13 On 2.5L engines, prior to installation, make sure the pintle is in the retracted position. If the retracted pintle measurement is more than one inch (25 mm) (see illustration) , the AIS motor must be taken to a dealer service department or properly equipped shop to be retracted.

2.13 Be sure the AIS pintle extends one inch or less (2.5L OHC engine)



14 Install a new O-ring and insert the AIS motor into the housing, making sure the O-ring is not dislodged.

15 Install the two retaining screws and tighten them securely.

16 Plug the four-way connector into the AIS motor.

17 On 2.5L engines, install the throttle body temperature sensor.

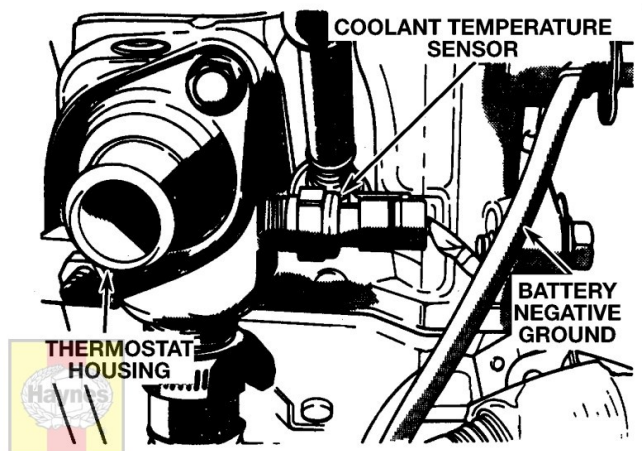
18 Install the air cleaner assembly and connect the negative battery cable.

Coolant temperature sensor

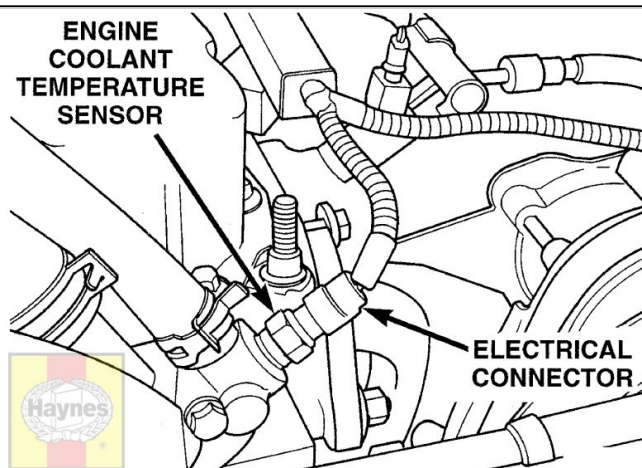
General description

19 Located on or near the thermostat housing (see illustrations) , this temperature sensitive variable resistor inputs the coolant temperature to the SCC, SMEC or SBEC II.

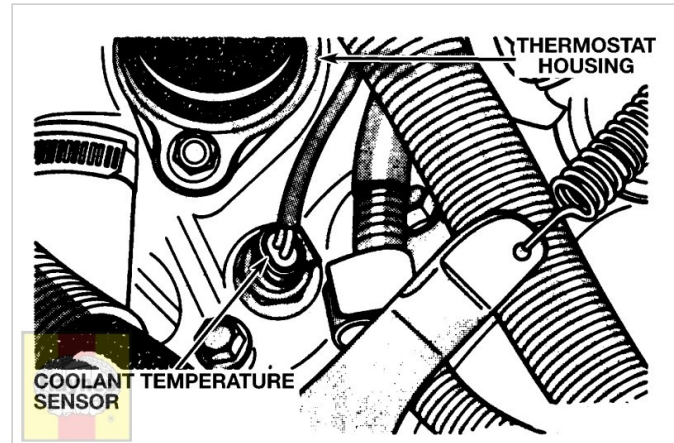
2.19a The location of the coolant temperature sensor (four-cylinder OHC engines)



2.19b The location of the coolant temperature sensor (four-cylinder OHV engines)



2.19c The location of the coolant temperature sensor (V6 and V8 engine)



Replacement

- 20 Disconnect the electrical connector.
- 21 Unscrew the sensor from the engine.
- 22 Wrap the threads of the sensor with Teflon tape.
- 23 Install the sensor and tighten it securely.

Emissions maintenance (MAINT REQD) reminder light

- 24 This light illuminates to remind the driver that it is time to have the emissions control devices checked for proper operation.
- 25 After servicing the required emissions systems according to the maintenance schedule, reset the service reminder light (see [Chapter 1](#)). **Note:** A special DRB-II scan tool is required to reset the MAINT REQD light on 1989 and later models. Take the vehicle to a dealer service department that has the correct tool.

Idle speed control actuator (fuel-injected V6 and V8 engines through 1991)

General description

- 26 The idle speed control actuator is an output device controlled by the SMEC. It controls idle rpm according to engine load.

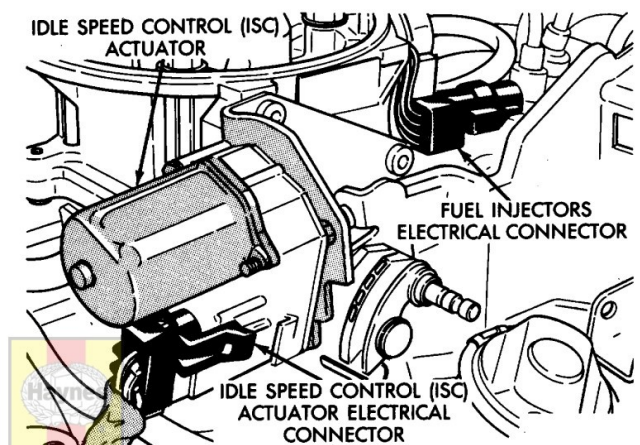
Replacement

- 27 Remove the air cleaner.

28 Disconnect the negative cable from the battery.

29 Disconnect the electrical connector from the actuator (see illustration) .

2.29 Lightly pry on the retaining clip and remove the ISC actuator electrical connector



30 Remove the three nuts and detach the actuator from the bracket.

31 Install the new actuator in the bracket with the three nuts and washers.

32 Attach the electrical connector.

33 Connect the negative battery cable.

34 Start the engine and allow it to run for two minutes.

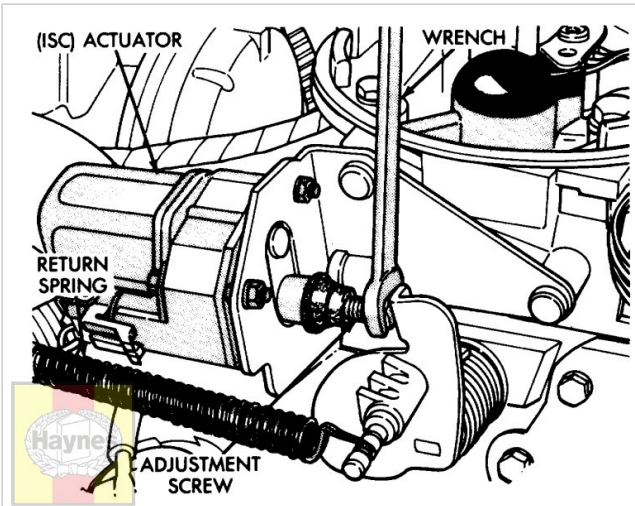
35 Shut off the engine and allow 60 seconds for the actuator to fully engage.

36 Disconnect the electrical connector from the actuator.

37 Disconnect the electrical connector from the coolant temperature sensor.

38 Hook up a tachometer, start the engine and adjust the adjustment screw on the actuator until the rpm is between 2500 and 2600 (see illustration) .

2.38 Turn the adjustment screw until the specified rpm is obtained



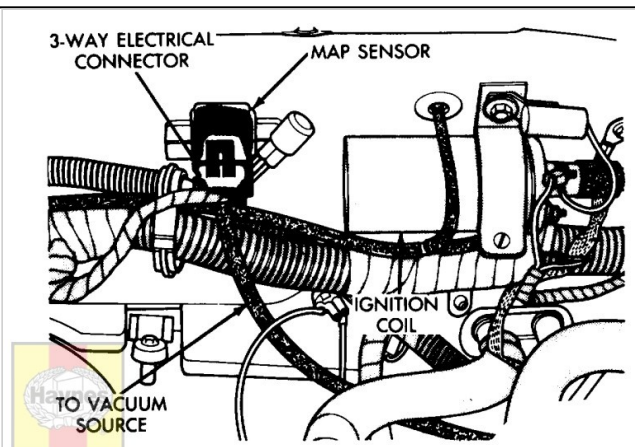
39 Shut off the engine, remove the tach-ometer and reconnect the actuator and coolant temperature sensor.

Manifold Absolute Pressure (MAP) sensor (fuel-injected models)

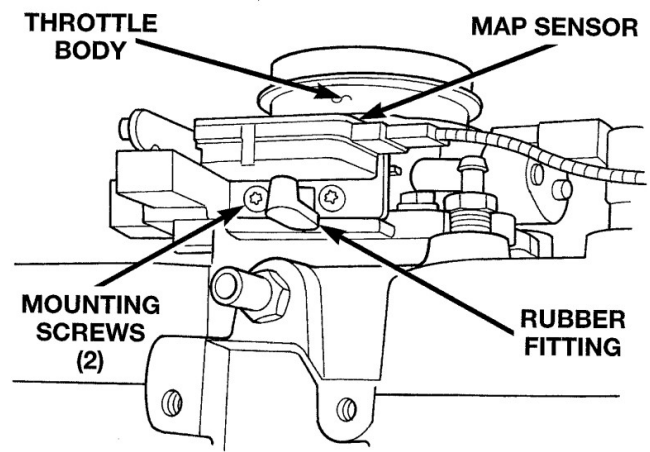
General description

40 This sensor provides an intake manifold vacuum signal to the SMEC or SBEC II. The MAP sensor is located on the engine compartment side of the firewall (see illustration) on four-cylinder OHC and 1988 V6 engines. On four-cylinder OHV and 1989 through 1991 V6 and V8 engines the MAP sensor is mounted on the throttle body (see illustrations) . On 1992 and later V6 and V8 models it is also located on the throttle body (see illustration 16.4 in [Chapter 4](#)).

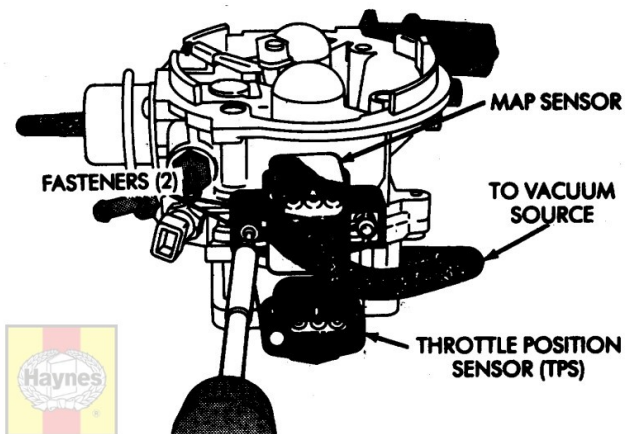
2.40a Manifold Absolute Pressure (MAP) sensor mounting details (all four-cylinder and 1988 V6 engines)



2.40b Manifold Absolute Pressure (MAP) sensor mounting screws (four-cylinder OHV engines)



2.40c Manifold Absolute Pressure (MAP) sensor mounting details (1989 through 1991 V6 and V8 engines)



Replacement (four-cylinder and 1989 through 1991 V6 and V8 engines)

41 Remove the vacuum hose and electrical connector from the sensor.

42 Push down on the mounting clip and remove the sensor.

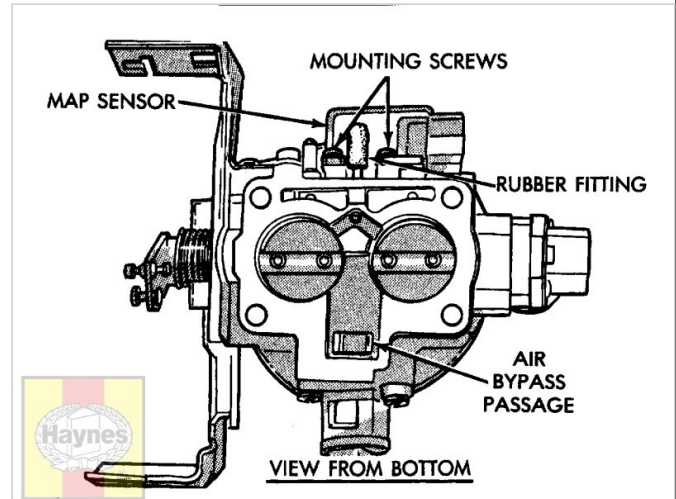
43 Installation is the reverse of the removal procedure.

Replacement (1992 and later V6 and V8 engines)

44 Remove the throttle body. (see [Chapter 4](#)).

45 Remove the MAP sensor mounting screws. While removing the MAP sensor, slide the vacuum rubber L-shaped fitting from the throttle body. (see illustration) .

2.45 Remove the MAP sensor mounting screws and, while removing the MAP sensor, disconnect the L-shaped vacuum fitting from the throttle body



46 Installation is the reverse of the removal procedure.

Oxygen feedback solenoid (carbureted models)

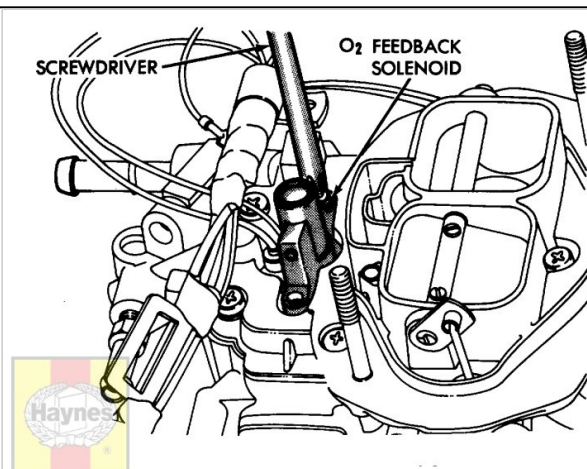
General description

47 This output device is controlled by the Spark Control Computer (SCC). It is located in the carburetor and is controlled in response to the oxygen sensor input.

Replacement

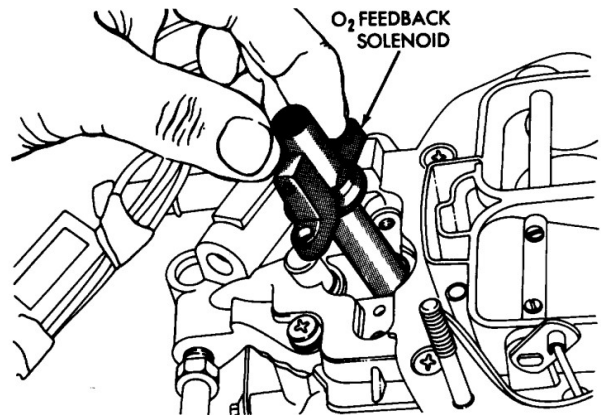
48 Remove the two screws retaining the feedback solenoid (see illustration) .

2.48 Remove the screws retaining the oxygen feedback solenoid



49 Disconnect the electrical connector and lift the solenoid from the carburetor (see illustration) .

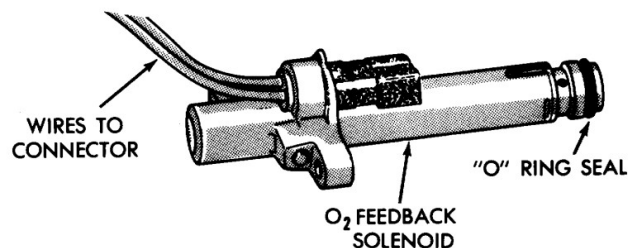
2.49 Pull up on the solenoid and remove it from the carburetor



50 Position a new solenoid gasket on the carburetor.

51 Install a new O-ring on the solenoid (see illustration) .

2.51 Before installing the solenoid, replace the O-ring and lubricate it with a thin film of grease



52 Apply a thin film of grease to the O-ring and install the solenoid assembly into the carburetor.

53 Install and tighten the retaining screws securely.

Oxygen sensor

General description

54 By measuring the exhaust content, this input device reports to the computer how rich or lean the engine is running. This sensor is located in the exhaust manifold or on the exhaust down pipe.

55 Unlike other inputs it is not a variable resistor; it actually produces up to one volt of electricity (at full rich condition). **Caution:** *Never use a voltmeter without a 10 mega- ohm impedance to check the output of the oxygen sensor.*

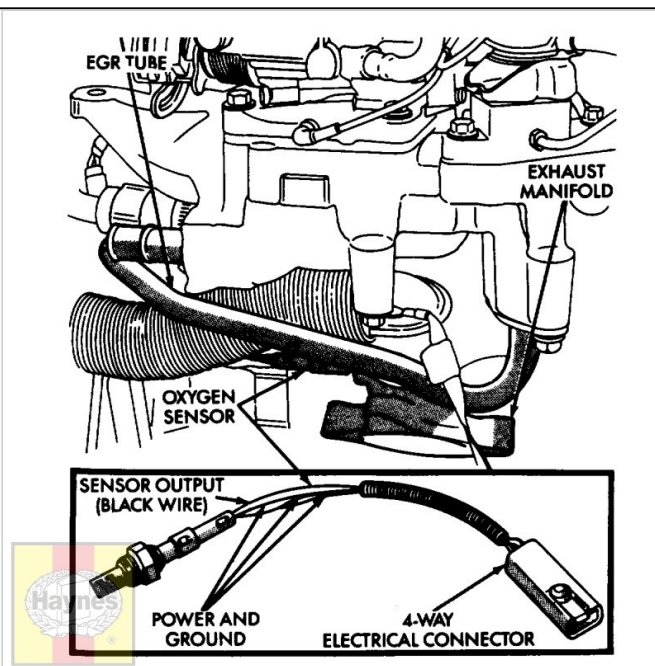
56 The oxygen sensor must be replaced at the specified interval (see [Chapter 1](#)). The sensor is threaded into the exhaust manifold. On some models it may be necessary to raise the front of the vehicle and support it securely

on jackstands to gain access from the underside of the engine compartment.

Replacement

57 Disconnect the oxygen sensor wire by unplugging the connector (see illustration) .

2.57 It's sometimes easier to remove the oxygen sensor with the engine warmed up - be careful not to burn yourself on the hot exhaust manifold! (2.2L and 2.5L oxygen sensor shown; others are similar)



58 With the engine warmed up, use a wrench to unscrew the sensor.

59 Use a tap to clean the threads in the exhaust manifold.

60 New sensors should already have anti-seize compound on their threads, so you shouldn't need to apply any.

61 Install and tighten the sensor.

62 Plug in the connector.

Single Module Engine Controller (SMEC) (TBI fuel injection) or Single Board Engine Controller II (SBEC II) (MPI fuel injection)

63 This is the computer for fuel-injected engines. It makes calculations based on inputs from the various sensors and in turn sends out signals to control the various output controlled devices. See [Chapter 5](#) for more information on this component.

Spark Control Computer (SCC)

64 This is the computer for carbureted engines. It makes calculations based on inputs from the various sensors and in turn sends out signals to control the various output controlled devices. See [Chapter 5](#) for more information on this component.

Throttle body temperature sensor (fuel-injected four-cylinder models)

General description

65 This is a temperature sensitive variable resistor acting as an input for the SMEC. It is mounted on the throttle body and reports the throttle body temperature.

Replacement

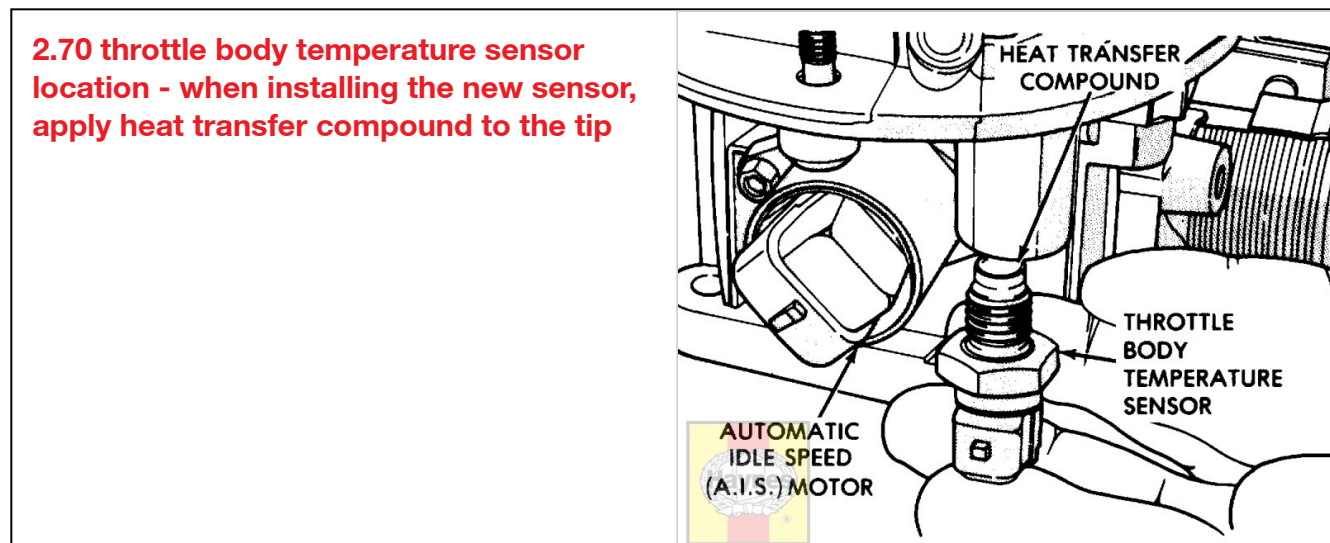
66 Disconnect the negative cable at the battery.

67 Remove the air cleaner assembly.

68 Disconnect the throttle cable from the throttle body, remove the two cable bracket screws and lay the bracket aside.

69 Unplug the electrical connector by pulling down on it.

70 Remove the sensor by unscrewing it (see illustration) .



71 Apply a thin coat of heat transfer compound to the tip of the new sensor.

72 Screw the new sensor into the throttle body and tighten it securely.

73 Plug in the electrical connector.

74 Connect the throttle cable and bracket.

75 Install the air cleaner and connect the negative battery cable.

Throttle Position Sensor (TPS) (fuel-injected models)

General description

76 The throttle position sensor is a variable resistor acting as an input for the SMEC. It is located on the throttle shaft and reports the throttle position.

Replacement (four-cylinder models)

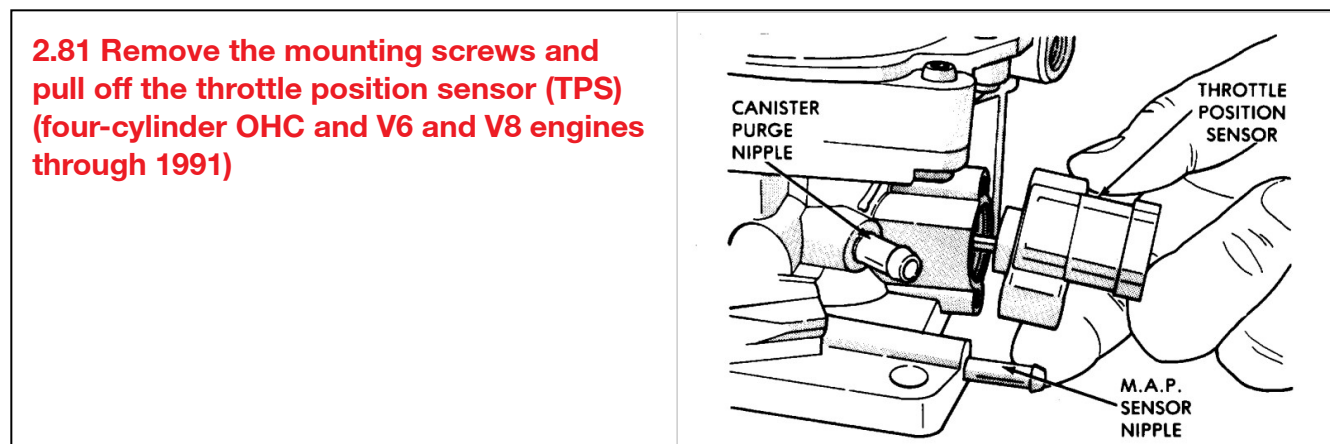
77 Disconnect the negative cable at the battery.

78 Remove the air cleaner assembly.

79 Unplug the electrical connector at the TPS.

80 Remove the two TPS-to- throttle body screws.

81 Pull the TPS off the throttle shaft (see illustration) .



82 Remove the O-ring.

83 Install the TPS with a new O-ring on the throttle body and install the screw. Tighten the screw securely. **Note:** *On OHV models, the TPS must be installed so it is able to rotate a few degrees after installation. If the TPS will not rotate, install the TPS with the socket tangs on the other side of the throttle shaft (see illustration 2.91) .*

84 Plug in the electrical connector at the TPS.

85 Install the air cleaner assembly.

86 Connect the negative battery cable.

Replacement (V6 and V8 engines)

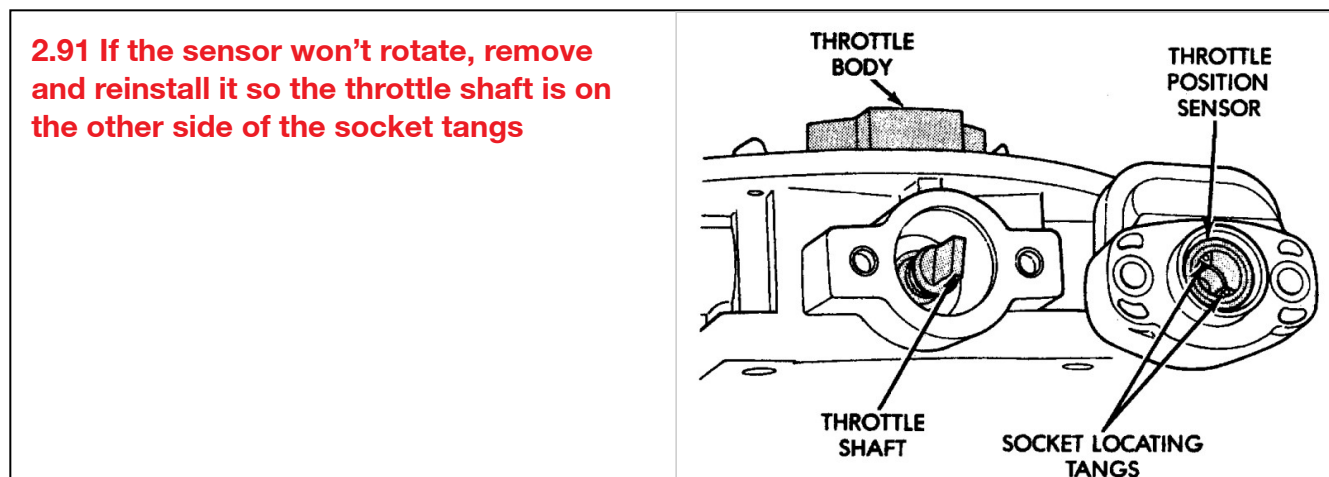
87 Remove the air cleaner assembly.

88 Disconnect the negative cable from the battery.

89 Disconnect the electrical connector from the throttle position sensor.

90 On V6 and V8 engines through 1991, remove the two screws and lift the throttle position sensor off the throttle shaft (see illustration 2.81) . On 1992 and later V6 and V8 engines, remove the two screws and remove the throttle position sensor from the throttle shaft.

91 Installation is the reverse of the removal procedure. On 1992 and later V6 and V8 engines, install the throttle position sensor onto the throttle shaft so that it can be rotated a few degrees in either direction. If the sensor won't rotate, remove the sensor and reinstall it so the throttle shaft is on the other side of the socket tangs (see illustration) , then tighten the screws securely.



Crankshaft Position Sensor (CPS) (four-cylinder OHV and 1992 and later V6 and V8 engines)

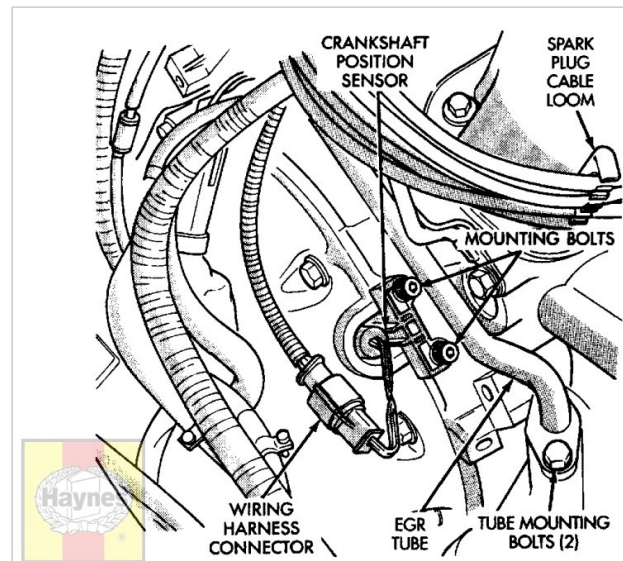
General description

92 The crankshaft position sensor is located at the rear of the engine next to the flywheel. It measures flywheel or flexplate rotations and sends signals to the SBEC II. The output from the CPS and distributor sync signal is used to differentiate between spark or fuel injection events.

Replacement (1992 and later V6 and V8 engines)

93 Remove the spark plug wire loom and spark plug wires from the right valve cover mounting stud (see illustration) . Position the spark plug cables on top of the valve cover.

2.93 Crankshaft position sensor and related components (1992 and later V6 and V8 engines)



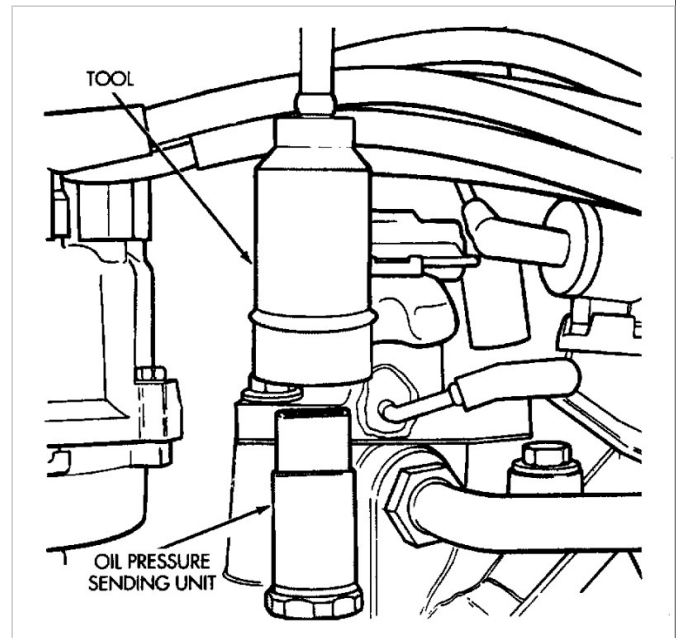
94 Disconnect the two hoses from the EGR valve. Mark the hoses to ensure proper reinstallation.

95 Disconnect the wire connector and hoses from the EGR transducer. Mark the hoses to ensure proper reinstallation.

96 Remove the mounting bolts and the EGR valve and gasket.

97 Disconnect the electrical wire from the engine oil pressure sending unit. Use a special tool, available at most auto parts stores, and remove the oil pressure sending unit from the engine (see illustration) .

2.97 Removing the oil pressure sending unit from the engine



98 Loosen the EGR tube mounting nuts on the intake manifold. Remove the mounting bolts at the exhaust manifold and remove the EGR tube, discarding the gasket at the exhaust manifold end.

99 Disconnect the electrical wire from the crankshaft position sensor (see illustration 2.93) .

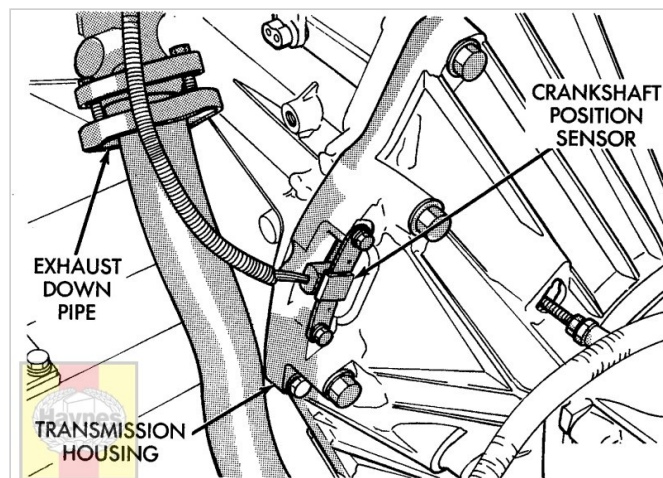
100 Remove the sensor mounting bolts and remove the sensor.

101 Installation is the reverse of the removal procedure. Apply thread sealant to the oil pressure sending unit prior to installation. Don't let any of the sealant into the sending unit opening. Install new gaskets where applicable.

Replacement (four-cylinder OHV engines)

102 Disconnect the electrical connector from the crankshaft position sensor (see illustration) .

2.102 Crankshaft position sensor (four-cylinder OHV engine)



103 Remove the nut securing the sensor wire clip to the fuel rail mounting stud.

104 Remove the sensor mounting bolts or nuts and remove the sensor.

105 Installation is the reverse of the removal procedure. On some models, the two bolts used to mount the sensor are specially machined to correctly space the sensor to the flywheel. Do not attempt to install any bolt other than these special bolts.

Vehicle Speed Sensor (four-cylinder OHV, 1992 and later V6 and V8 engines)

General description

106 The sensor input is used to determine vehicle speed and distance traveled.

Replacement

107 Raise the vehicle and support it securely on jackstands.

108 Disconnect the wire connector from the sensor and unscrew the speedometer cable.

109 Remove the speed sensor mounting bolts and remove the sensor from the transmission extension housing or transfer case.

110 Installation is the reverse of the removal procedure.