Figure 80-1 - The throttle pedal is connected to the accelerator pedal position (APP) sensor. The electronic throttle body includes a throttle position sensor to provide throttle angle feedback to the vehicle computer. Some systems use a Throttle Actuator Control (TAC) module to operate the throttle blade (plate).

Figure 80-2 - The opening of the throttle plate can be delayed as long as 30 milliseconds (0.030 sec.) to allow time for the airflow of fuel needed to catch up to the opening of the throttle plate.

Figure 80-3 - The opening of the throttle plate can be delayed as long as 30 milliseconds (0.030 sec.) to allow time for the airflow of fuel needed to catch up to the opening of the throttle plate.
A typical accelerator pedal position (APP) sensor, showing two different output voltage signals that are used by the PCM to determine the position of the pedal. Two (or three in some applications) are used as a double check because this is a safety-related sensor.

FREQUENTLY ASKED QUESTION: What Is the Spring Test?

The spring test is a self-test performed by the PCM whenever the engine is started. The PCM operates the throttle to check if it can react to the command and return to the default (home) position. This self-test is used by the PCM to determine that the spring and motor are working correctly and may be noticed by some vehicle owners by the following factors:

- A slight delay in the operation of the starter motor. The PCM performs this test when the ignition switch is turned to the on position. While it takes just a short time to perform the test, it can be sensed by the driver that there could be a fault in the ignition switch or starter motor circuits.
- A slight clicking sound may also be heard coming from under the hood when the ignition is turned on. This is normal and is related to the self-test on the throttle as it opens and closes.

FREQUENTLY ASKED QUESTION: Why Not Use a Stepper Motor for ETC?

A stepper motor is a type of motor that has multiple windings and is pulsed by a computer to rotate a certain number of degrees when pulsed. The disadvantage is that a stepper motor is too slow to react compared with a conventional DC electric motor and is the reason a stepper motor is not used in electronic throttle control systems.
Figure 80-4: The default position for the throttle plate is in a slightly open position. The servomotor then is used to close it for idle and open it during acceleration.

Figure 80-5 (a): An H-bridge circuit is used to control the direction of the DC electric motor of the electronic throttle control unit.

Figure 80-5 (b): To reverse the direction of operation, the polarity of the current through the motor is reversed.
Figure 80-6 - Schematic of a typical electronic throttle control (ETC) system. Note that terminal #5 is always on (constant) and that terminal #6 is always connected, but both power and ground are switched to change the direction of the motor.

Figure 80-7 - The two TP sensors used on the throttle body of an electronic throttle body assembly provide opposite outputs as the throttle is opened. The total voltage of both combined at any throttle plate position is 5 volts.

FREQUENTLY ASKED QUESTION: How Do You Calibrate a New APP Sensor?

Whenever an accelerator pedal position (APP) sensor is replaced, it should be calibrated before it will work correctly. Always check service information for the exact procedure to follow after APP sensor replacement. Here is a typical example of the procedure:

STEP 1 Make sure accelerator pedal is fully released.
STEP 2 Turn the ignition switch on (engine off) and wait at least 2 seconds.
STEP 3 Turn the ignition switch off and wait at least 10 seconds.
STEP 4 Turn the ignition switch on (engine on) and wait at least 5 seconds.
STEP 5 Turn the ignition switch off and wait at least 10 seconds.
Figure 80-8 (a) A "reduced power" warning light indicates a fault with the electronic throttle control system on some General Motors vehicles.

Figure 80-8 (b) A symbol showing an engine with an arrow pointing down is used on some General Motors vehicles to indicate a fault with the electronic throttle control system.

Figure 80-9 A wrench symbol warning lamp on a Ford vehicle. The symbol can also be green.
Figure 80-10 A symbol used on a Chrysler vehicle indicating a fault with the electronic throttle control.

Figure 80-11 The throttle plate stayed where it was moved, which indicates that there is a problem with the electronic throttle body control assembly.

Figure 80-12 A corroded electronic throttle control assembly shown with the cover removed.
REAL WORLD FIX: The High Idle Toyota

The owner of a Toyota Camry complained that the engine would idle at over 1200 RPM compared with a normal 600 to 700 RPM. The vehicle would also not accelerate. Using a scan tool, a check for diagnostic trouble codes showed one code: P2101—TAC motor circuit low.

Checking service information led to the inspection of the electronic throttle on the throttle body assembly. With the key turned to the OFF position and the engine at room temperature, the technician used a orangepaint stick to push gently to see if the throttle plate worked. Normal operation—The throttle plate should move and then return back quickly to the default position.

Abnormal operation—If the throttle plate sticks or stays where it is moved or does not return to the default position, there is a fault with the throttle body assembly.

Resolution: The technician removed the throttle body assembly and inspected the small motor gear. A replacement was required. The technician disassembled the throttle body and found it was corroded inside due to moisture entering the unit through the vent hose. SEE FIGURE 80–12.

WARNING: The electric motor that operates the throttle plate is strong enough to cut off a finger. SEE FIGURE 80–13.