

3.3 Throttle Actuator Control (TAC) System

Description

The throttle actuator control (TAC) system is used to improve emissions, fuel economy and driveability. The TAC system deletes the mechanical link between the accelerator pedal and the throttle plate and eliminates the need for a cruise control module and idle air control motor. The TAC system consists of:

- an accelerator pedal assembly which includes:
 - accelerator pedal,
 - accelerator pedal position (APP) sensor 1,
 - accelerator pedal position (APP) sensor 2;

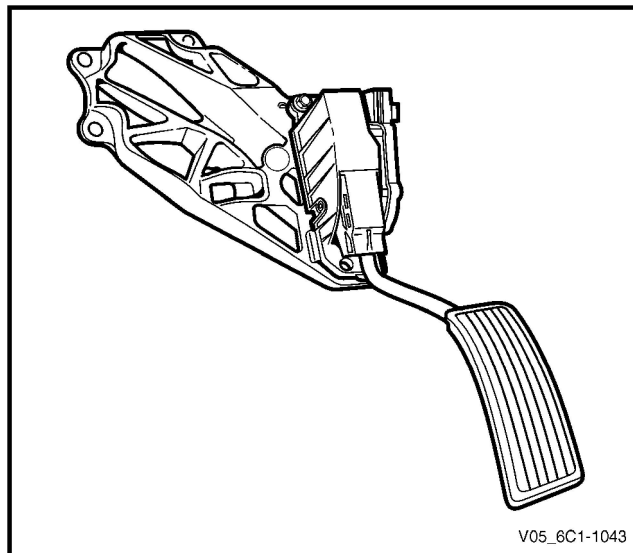


Figure 6C3-1 – 8

WARNING

To avoid serious personal injury, never attempt to rotate the throttle plate manually whilst the throttle body harness connector is connected to the throttle body.

- a throttle body assembly which includes:
 - throttle position (TP) sensor 1,
 - throttle position (TP) sensor 2,
 - throttle actuator control motor, and
 - throttle plate;

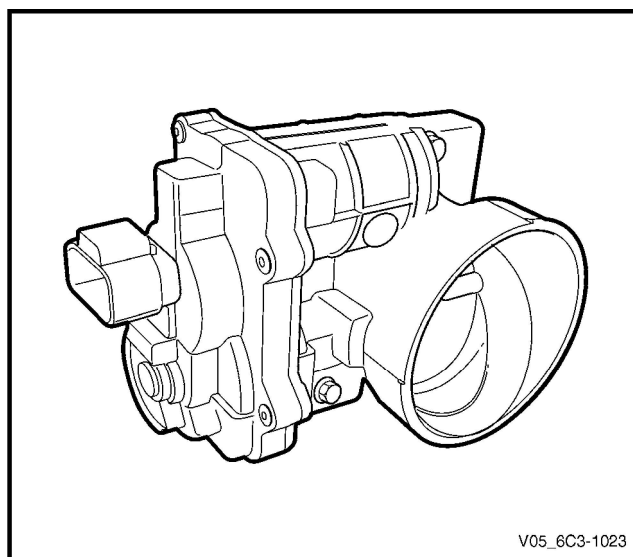


Figure 6C3-1 – 9

- a throttle actuator control module (TACM);
- a powertrain control module (PCM).

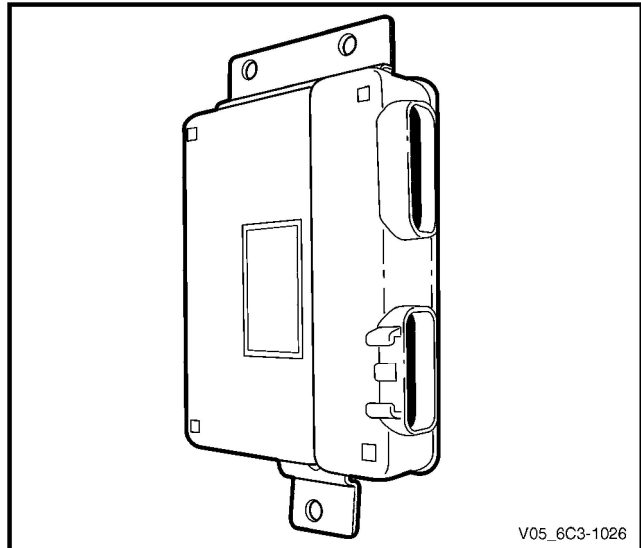


Figure 6C3-1 – 10

The TACM monitors the accelerator pedal position through the two APP sensors and forwards this signal to the PCM via a dedicated serial data line. The PCM processes this information along with other system sensor inputs to command the throttle plate to a certain position. This throttle position request is sent back the TACM along the same serial data line, and the TACM sends a pulse width modulated signal to the throttle body.

A direct current motor called the throttle actuator control motor controls the throttle plate. The TACM can operate this motor in the forward or reverse direction by controlling battery voltage and/or ground to two internal drivers. When there is no current flowing to the actuator motor, the throttle plate is held at a rest position of 7 percent open using a constant force return spring.

The TACM monitors the throttle plate angle through two TP sensors. Using this information, the TACM can precisely adjust the throttle plate.

The TACM performs diagnostics that monitor the voltage levels of both APP sensors, both TP sensors and the throttle actuator control motor circuit. It also monitors the spring return rate. These diagnostics are performed at different times based on whether the engine is running, not running, or whether the TACM is currently in a throttle body relearn procedure. This information is sent to the PCM for external diagnosis purposes.

Two sensors within the accelerator pedal assembly and throttle body assembly are used to provide redundancy. If a malfunction is detected, the throttle plate is moved to a pre-determined position.

Every ignition cycle, the TACM performs a quick throttle return spring test to ensure the throttle plate can return to the 7 percent rest position from the 0 percent position. This is to ensure that the throttle plate can be brought to the rest position in case of an actuator motor circuit failure.

Throttle Body Relearn Procedure

The TACM stores values that include the lowest possible TP sensor positions (0 percent), the rest positions (7 percent), and the spring return rate. These values will only be erased or overwritten if the TACM is reprogrammed or if a throttle body relearn procedure is performed.

NOTE

If the battery has been disconnected, the PCM performs a throttle body relearn procedure once the battery has been reconnected and the ignition turned on.

The TACM performs a throttle body relearn procedure anytime the ignition is turned on and the following conditions have been met:

- the engine has been off for longer than 29 seconds,
- the engine speed is less than 40 RPM,
- the vehicle speed is 0 km/h,
- the engine coolant temperature (ECT) is between 5 – 60°C; if Tech 2 is used to perform the relearn procedure, the ECT is between 5 – 100°C,
- the intake air temperature (IAT) is more than 5 – 60°C; if Tech 2 is used to perform the relearn procedure, the IAT is between 5 – 100°C,
- the APP sensor angle is less than 15 percent, and
- ignition voltage is more than 10 volts.

The throttle body relearn procedure is performed 29 seconds after the ignition is turned on. The TACM commands the throttle plate from the rest position (7 percent open) to full closed (0 percent), then to around 10 percent open. This procedure takes about 6 – 8 seconds. If any faults occur in the TAC system, a DTC sets. At the start of this procedure, the Tech 2 TAC Learn Counter parameter should display 0, then count up to 11 after the procedure is completed. If the counter did not start at 0, or if the counter did not end at 11, a fault has occurred and a DTC should set.