

2022 CHEVROLET CORVETTE SERVICE MANUAL

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Throttle Actuator Control (TAC) System Description

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The engine control module (ECM) is the control center for the throttle actuator control (TAC) system. The ECM determines the driver's intent based on input from the accelerator pedal position sensors, then calculates the appropriate throttle response based on the throttle position sensors. The ECM achieves throttle positioning by providing a pulse width modulated voltage to the throttle actuator motor. The throttle blade is spring loaded in both directions, and the default position is slightly open.

Modes Of Operation

Normal Mode

During the operation of the TAC system, several modes, or functions, are considered normal. The following modes may be entered during normal operations:

- Minimum pedal value – At key-up, the ECM updates the learned minimum pedal value.
- Minimum throttle position values – At key-up, the ECM updates the learned minimum throttle position value. In order to learn the minimum throttle position value, the throttle blade is moved to the closed position.
- Ice break mode – If the throttle blade is not able to reach a predetermined minimum throttle position, the ice break mode is entered. During the ice break mode, the ECM commands the maximum pulse width several times to the throttle actuator motor in the closing direction.
- Battery saver mode – After a predetermined time without engine speed, the ECM commands the battery saver mode. During the battery saver mode, the TAC module removes the voltage from the motor control circuits, which removes the current draw used to maintain the idle position and allows the throttle to return to the spring loaded default position.

Reduced Engine Power Mode

When the ECM detects a condition with the TAC system, the ECM may enter a reduced engine power mode. Reduced engine power may cause one or more of the following conditions:

- Acceleration limiting – The ECM will continue to use the accelerator pedal for throttle control, however, the vehicle acceleration is limited.
- Limited throttle mode – The ECM will continue to use the accelerator pedal for throttle control, however, the maximum throttle opening is limited.
- Throttle default mode – The ECM will turn OFF the throttle actuator motor, and the throttle will return to the spring loaded default position.
- Forced idle mode – The ECM will perform the actions listed below:
 - Limit engine speed to the idle position
 - Ignore the accelerator pedal input.

Engine Shutdown Mode

There are 4 reasons the ECM commands shutdown. All 4 reasons involve a throttle that has been commanded to default position – Reduced Engine Power. Default Throttle is latched for the key-cycle, disabling the throttle motor and letting the spring return the throttle to its default position. Default Throttle by itself does not cause a commanded shutdown. Shutdown will only occur with Default Throttle and another issue. A throttle is commanded to Default Throttle when any of the following occurs:

- SENT Sensor Communication Faults – P16A0, P16A2, U0606, or U0607

- Performance Faults P0068, P2101, or P2176
- Sensor Reference Voltage Fault P06A3
- Analog Sensor Faults (P0122 or P0123) & (P0222, or P0223), or P2135

The ECM commands engine shutdown when any of the following occurs:

- Default Throttle & Catalyst Temperature to high In order to idle in Default Throttle the spark is often retarded quite a bit, dumping a lot of heat into the catalyst.
- Default Throttle & P2119 High The throttle sensors detect that the throttle position is higher than default position and throttle hasn't safely returned to default position.
- Default Throttle & (P16F3 or P0606) Calibration does not trust the ECM to determine if the throttle has safely returned to default position.
- P0068 and (Any SENT Communication Faults or Reference Voltage Fault, or any of the 5 Analog Sensor Faults) MAF/MAP are detecting excess air flow based on expected default throttle position suggesting that we are at a throttle position higher than default. Also calibration does not trust the faulted throttle sensors to determine if the throttle has safely returned to default position.

Throttle/Idle Learn or Throttle Body Idle Air Flow Compensation Reset

The engine control module (ECM) learns the airflow through the throttle body to ensure the correct idle. The learned airflow values are stored within the ECM. These values are learned to adjust for production variation and will continuously learn during the life of the vehicle to compensate for reduced airflow due to throttle body coking. Anytime the throttle body airflow rate changes, for example due to cleaning or replacing, the values must be relearned.

An engine that had a heavily coked throttle body that has been cleaned or replaced may take several drive cycles to unlearn the coking. To accelerate the process, the scan tool has the ability to reset the learned value back to zero. A new ECM will also have values set to zero. Cleaning the throttle body when the ECM is replaced can reduce the time it takes for the ECM to relearn the minimum idle speed.

The idle may be unstable or a DTC may set if the learned values do not match the actual airflow.

A un-metered air leak in the induction system or a small vacuum leak may not set a DTC. If the condition goes undetected, the ECM may learn an incorrect Throttle Body Idle Airflow Compensation value over time. The incorrectly learned value may cause various symptoms to occur such as rough or unstable idle speeds, and/or engine stall. If this condition is detected and repaired it will be necessary to perform the Throttle/Idle Learn or Throttle Body Idle Air Flow Compensation Reset procedure to ensure any symptoms are corrected.