Throttle Body System Overview

The throttle body system meters air to the engine during idle, part throttle, and wide open throttle (WOT) conditions. The throttle body system consists of single or dual bores with butterfly valve throttle plates and a throttle position (TP) sensor.

The major components of the throttle body assembly include the TP sensor and the throttle body housing assembly. For additional information on the intake air system components, refer to Engine Control Components in this section.

Features Of The Throttle Body Assembly Include:

1. A preset stop to locate the WOT position.
2. A throttle body mounted TP sensor.
3. A coating sealant on the throttle bore and throttle plate makes the throttle body airflow tolerant to engine intake sludge accumulation. Some vehicles have a decal advising not to clean.
4. A non adjustable stop screw for close plate idle airflow.

Intake Manifold Runner Control (IMRC) And Intake Manifold Tuning Valve (IMTV)

WARNING: Substantial opening and closing torque is applied by this system. To prevent injury, be careful to keep fingers away from lever mechanisms when actuated. Failure to follow these instructions may result in personal injury.

There are 2 basic types of intake air subsystems:

- IMRC
- IMTV

There are several different styles of hardware used to control airflow within the engine air intake system. In general, the devices are defined based on whether they control charge motion or manifold tuning.

The IMRC modifies the air charge motion in the intake manifold. The IMRC is located at the rear of the intake manifold. The IMRC system must have a monitor feedback system in order to meet OBD II regulations.

The IMTV modifies the airflow volume of the manifold by connecting multiple plenums or inlets within the intake manifold. The IMTV control valve is located in the center of the intake manifold. The IMTV system does not have to be monitored for OBD II regulations.

These subsystems provide increased intake airflow to improve torque, emissions and performance. The overall volume of air metered to the engine is controlled by the throttle body.

Intake Manifold Runner Control (IMRC) System

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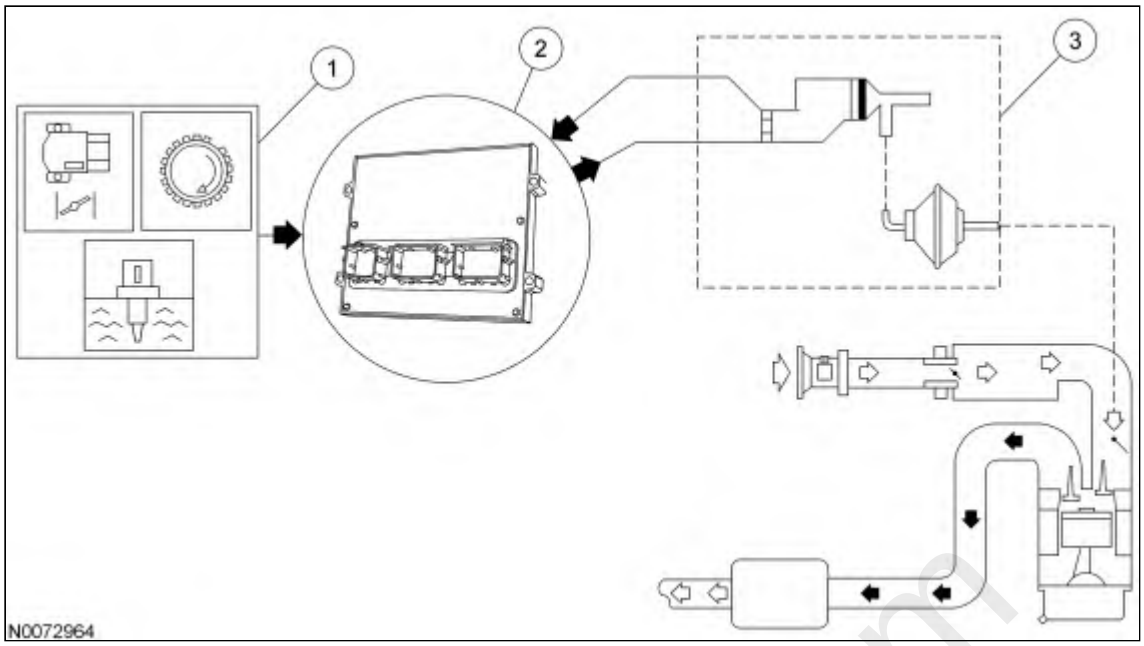
The IMRC system consists of a manifold mounted vacuum actuator and a PCM controlled electric solenoid. For additional information on IMRC vacuum actuated components, refer to Engine Control Components in this section. The linkage from the actuator attaches to the manifold plate lever. The IMRC vacuum actuator and manifold has a single intake air passage for each cylinder. The passage has a valve plate that blocks a large percentage of the opening when actuated, leaving the top of the passage open to generate turbulence. The housing uses a return spring to hold the valve plates open. The IMRC sensors provide feedback to the PCM indicating the valve plate position.

1. The PCM monitors the TP sensor, cylinder head temperature (CHT) sensor, and CKP sensor signals to determine activation of the IMRC system. There must be a positive change in voltage from the TP sensor along with the increase in RPM at the correct engine temperature to open the IMRC valve plates.
2. The PCM uses the information from the input signals to control the IMRC solenoid based upon changes in the throttle position, the engine temperature, and the RPM.

3. The PCM energizes the IMRC solenoid with the ignition ON and the engine running. Vacuum is then applied to the actuator to pull the valve plates closed.



IMRC Vacuum Actuated System

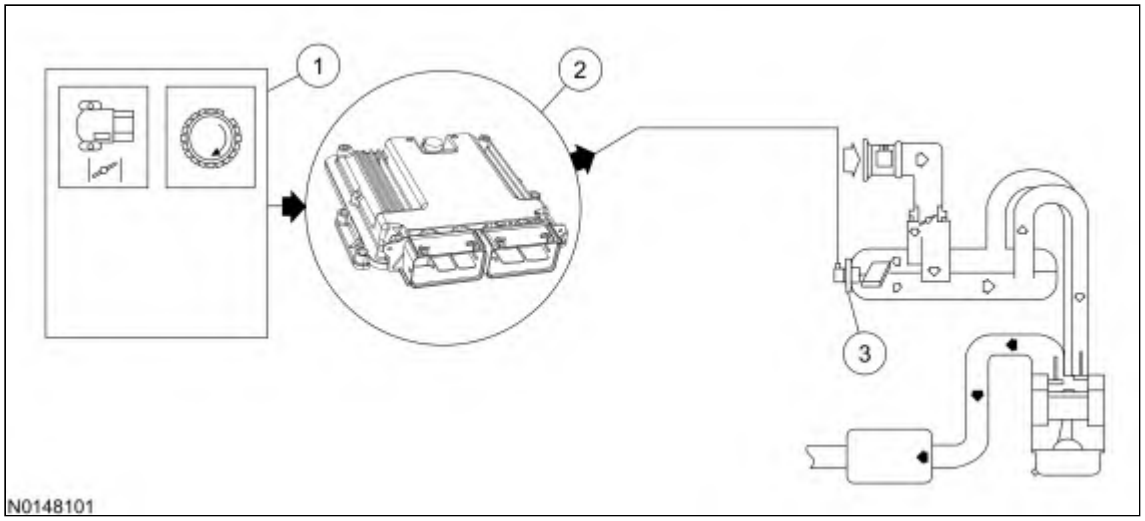
Intake Manifold Tuning Valve (IMTV) System

WARNING: Substantial opening and closing torque is applied by this system. To prevent injury, be careful to keep fingers away from lever mechanisms when actuated. Failure to follow these instructions may result in personal injury.

The IMTV is a motorized actuated unit mounted directly to the intake manifold. For additional information on IMTV components, refer to Engine Control Components in this section.

The motorized IMTV unit is disabled below a calibrated RPM. The shutter is in the closed position preventing airflow blend in the intake manifold. Above a calibrated RPM the motorized unit is enabled. The motorized unit is initially commanded ON by the PCM at a 100 percent duty cycle to move the shutter to the open position, and then falling to approximately 50 percent to continue to hold the shutter open.

1. The PCM uses the TP sensor and CKP sensor signals to determine activation of the IMTV system. There must be a positive change in voltage from the TP sensor along with the increase in RPM to open the shutter.
2. The PCM uses the information from the input signals to control the IMTV.
3. When commanded ON by the PCM, the motorized actuator shutter opens up the end of the vertical separating wall at high engine speeds to allow both sides of the manifold to blend together.

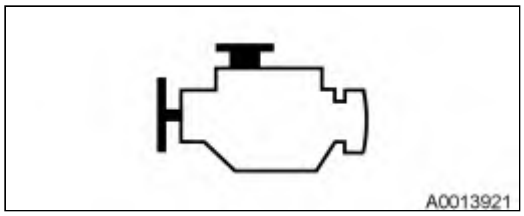


IMTV

Malfunction Indicator Lamp (MIL)

The MIL notifies the driver the PCM has confirmed an on board diagnostic (OBD) emission related component or system concern. When this occurs, an OBD DTC sets.

- The MIL is located in the instrument panel cluster (IPC) and the international standards organization (ISO) standard engine symbol.
- The MIL is illuminated with the ignition ON, engine OFF, until the engine is cranked for starting. The MIL will turn OFF after engine start if no concerns are present.
- The MIL may flash after 17 seconds with the ignition ON, engine OFF, unless the OBD inspection/maintenance (I/M) readiness indicators indicate all of the OBD monitors have completed since the last keep alive memory (KAM) reset or since the PCM DTCs have been cleared with a reset command from the scan tool.
- The MIL will remain illuminated after engine start if a confirmed emission related concern or an OBD DTC exists.
- If the MIL flashes at a steady rate, after engine start, a severe misfire condition may exist.
- The MIL will remain OFF with the ignition ON, engine OFF, if a MIL indicator or IPC concern is present.
- To turn OFF the MIL after a repair, a reset command from the scan tool must be sent, or 3 consecutive drive cycles must be completed without a concern.
- If the MIL flashes erratically, a low battery voltage concern may be present causing the PCM to reset during cranking.
- For all MIL concerns, go to Section 3, Symptom Charts.

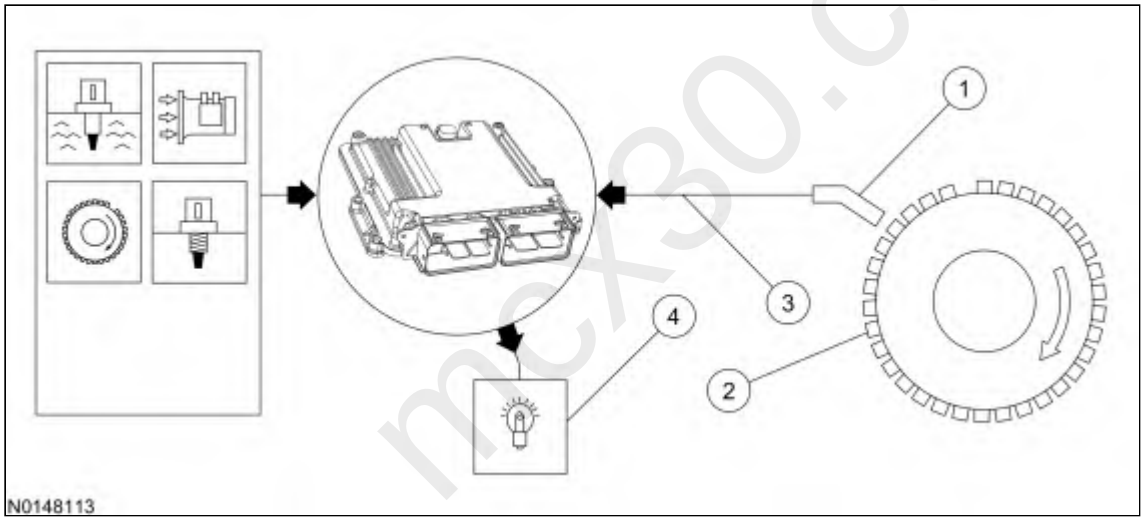


Typical MIL

Misfire Detection Monitor

The misfire detection monitor is an on board strategy designed to monitor engine misfire and identify the specific cylinder in which the misfire has occurred. Misfire is defined as lack of combustion in a cylinder due to absence of spark, poor fuel metering, poor compression, or any other cause. The misfire detection monitor is enabled only when certain base engine conditions are first satisfied. Input from the engine coolant temperature (ECT) or cylinder head temperature (CHT), intake air temperature (IAT), and mass airflow (MAF) sensor (if equipped) is required to enable the monitor. The misfire detection monitor is also carried out during an on-demand self-test.

1. The PCM synchronized ignition spark is based on information received from the crankshaft position (CKP) sensor. The CKP sensor signal generated is also the main input used in determining cylinder misfire.
2. The input signal generated by the CKP sensor is derived by sensing the passage of teeth from the crankshaft position wheel mounted on the end of the crankshaft.
3. The input signal to the PCM is then used to calculate the time between CKP sensor signal edges and the crankshaft rotational velocity and acceleration. By comparing the accelerations of each cylinder event, the power loss of each cylinder is determined. When the power loss of a particular cylinder is sufficiently less than a calibrated value and other criteria are met, then the suspect cylinder is determined to have misfired.
4. The malfunction indicator lamp (MIL) is activated after one of the above tests fail on 2 consecutive drive cycles.



Misfire Detection Monitor

Misfire Monitor Operation

The signal from the crankshaft position sensor and timing wheel is processed by the PCM into individual tooth period measurements and provided to the misfire monitor. The misfire monitor uses the tooth period measurements to calculate crankshaft acceleration signals for misfire detection.

A low data rate (LDR) and high data rate (HDR) are the 2 different types of misfire monitoring systems used. The LDR system is capable of meeting the federal test procedure monitoring requirements on most engines and is capable of meeting the full range of misfire monitoring requirements on 3 and 4 cylinder engines. It is also used on 6 cylinder engines with rear mounted crank sensors. The HDR system is capable of meeting the full range of misfire monitoring requirements on 8 cylinder engines. The HDR system on these engines meets the full range of misfire phase-in requirements specified in the on board diagnostic (OBD) regulations. The PCM software allows for detection of any misfires that occur 6 engine revolutions after initially cranking the engine. This meets the OBD requirement to identify misfires within 2 engine revolutions after exceeding the warm drive, idle RPM.

The monitor includes a diagnostic check on the crank sensor input that checks the number of tooth period measurements received on each cylinder event. If the monitor receives an invalid number of tooth period measurements, DTC P033F or