P0638: THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Intermediate
Repair Cost	:	**$250-$700**
Can I Still Drive?	:	No

What Does The P0638 Code Mean?

Some newer vehicles are equipped with drive by wire systems – where the throttle body is controlled by a sensor on the gas pedal, the Powertrain Control Module / Engine Control Module (PCM/ECM), and an electric actuator motor in the throttle body.

The PCM/ECM uses the throttle position sensor (TPS) to monitor the actual throttle blade position and when the actual position is out of range with the target position, the PCM/ECM will set the DTC P0638. Bank 1 refers to the side of the engine with cylinder number one, however most vehicles use one throttle body for all cylinders. This code is similar to code P0639.

Most throttle bodies of this type are not serviceable and need to be replaced. The throttle body is spring actuated to hold at an open position in the event of a motor failure, in some cases with a complete failure the throttle will be unresponsive and the vehicle will only be capable of driving at a slow speed.

Note: If there are any DTC codes associated with the throttle position sensor, be sure to correct those before diagnosing the P0638 code.

What Are The Symptoms Of The P0638 Code?

Symptoms of a P0638 trouble code may include:

- Check Engine Light illuminated (Malfunction Indicator Lamp)
- The vehicle may feel like it hesitates on acceleration

What Are The Potential Causes Of The P0638 Code?

Causes of this DTC may include:

- Pedal position sensor malfunction
- Throttle position sensor malfunction
- Throttle actuator motor malfunction
- Dirty throttle body
- Wiring harness, loose or dirty connections
- PCM/ECM Malfunction

How Can You Fix The P0638 Code?

Step 1

Pedal position sensor- The pedal position sensor is located on the gas pedal. There are usually three wires used to determine the pedal position, a 5 volt reference supplied by the PCM/ECM, ground, and sensor signal. A factory wiring diagram will be necessary to determine which wire is used. Make sure the connection is secure and there are no loose wires in the harness.

Check for good ground using a digital volt ohm meter (DVOM) set to the ohms scale by connecting one lead to the ground at the sensor connector and the other to chassis ground – resistance should be very low. Check for 5 volts reference voltage from the PCM by using the DVOM set to volts scale with the positive lead at the wiring harness connector and the negative lead on a known good ground with the key in the run or on position.

Check for reference voltage using the DVOM set to volts scale with the red lead on the reference signal and the negative lead on a good known ground with the key in the run / on position – the signal voltage should increase as the gas pedal is pushed down further.

Typically the voltage ranges between 0.5 volts with the pedal not pressed and 4.5 volts at wide open throttle position. It may be necessary to check the signal voltage at the PCM as well to determine if there is a voltage difference between the sensor and what the PCM is reading. The position sensor signal should also be checked with a graphing multimeter or oscilloscope to determine if the voltage increases smoothly with no dropouts throughout the entire range of motion.

If an advanced scan tool is available, the positions sensor is usually displayed as a percentage of desired throttle input, make sure the desired value is similar to the actual pedal position.

Step 2

Throttle position sensor- The throttle position sensor monitors the actual position of the throttle body blade. The throttle position sensor is located on the throttle body. There are usually three wires used to determine the pedal position, a 5 volt reference supplied by the PCM/ECM, ground, and sensor signal. A factory wiring diagram will be necessary to determine which wire is used.

Make sure the connection is secure and there are no loose wires in the harness. Check for good ground using a digital volt ohm meter (DVOM) set to the ohms scale by connecting one lead to the ground at the sensor connector and the other to chassis ground – resistance should be very low.

Check for 5 volts reference voltage from the PCM by using the DVOM set to volts scale with the positive lead at the wiring harness connector and the negative lead on a known good ground with the key in the run or on position.

Check for reference voltage using the DVOM set to volts scale with the red lead on the reference signal and the negative lead on a good known ground with the key in the run / on position – the signal voltage should increase as the gas pedal is pushed down further. Typically the voltage ranges between 0.5 volts with the pedal not pressed and 4.5 volts at wide open throttle position.

It may be necessary to check the signal voltage at the PCM as well to determine if there is a voltage difference between the sensor and what the PCM is reading. The throttle position sensor signal should also be checked with a graphing multimeter or oscilloscope to determine if the voltage increases smoothly with no dropouts throughout the entire range of motion.

If an advanced scan tool is available, the positions sensor is usually displayed as a percentage of actual throttle position, make sure the desired position value is similar to the commanded position value.

Step 3

Throttle actuator motor- The PCM/ECM will send a signal to the throttle actuator motor based on the pedal position input and a predetermined output value depending on operating conditions. The pedal position is known as the desired input because the PCM/ECM controls the throttle blade position and may limit its performance under certain conditions.

Most actuator motors are duty cycle controlled. Check the throttle actuator motor for correct resistance by unplugging the harness connector using the DVOM set to the ohms scale with the positive and negative lead on either end of the motor terminals. The resistance should be within factory specifications, if it is too high or low, the motor may not move to the commanded position.

Check the wiring by testing for power using a factory wiring diagram to locate the proper wires. The power feed wire can be checked using the DVOM set to volts scale with the positive lead on the

power wire and the negative lead on a known good ground.

Voltage should be close to battery voltage with the key on in the run or on position, if there is a significant power loss, the wiring may be suspect and should be traced back to determine where the voltage drop is occurring.

The signal wire is grounded through the PCM and turned on and off by a transistor. The duty cycle can be checked with a graphing multimeter or oscilloscope set to the duty cycle function with the positive lead spliced into the signal wire and the negative lead on a good known ground – a standard volt meter will only display an average voltage which may be harder to determine if there are any dropouts in voltage over time.

The duty cycle should match the percentage commanded by the PCM/ECM. It may be necessary to check the commanded duty cycle from the PCM/ECM using an advanced scan tool.

Step 4

Throttle body- Remove the throttle body and check for any obstructions or accumulation of dirt or grease around the throttle blade that would prevent normal movement. A dirty throttle blade may cause the throttle blade to not respond correctly when commanded to a certain position by the PCM/ECM.

Step 5

PCM/ECM- After checking all other functions at the sensors and motor, the PCM/ECM can be checked for desired input, actual throttle position and commanded motor position using an advanced scan tool that will display the input and output as a percentage. If the values do not match the actual numbers obtained from the sensors and motor, there may be excessive resistance in the wiring.

The wiring can be checked by unplugging the sensor harness and the PCM/ECM harness using the DVOM set to ohms scale with the positive lead and negative lead on either end of the harness.

It will be necessary to use a factory wiring diagram to locate the proper wires for each of the components. If the wiring has excessive resistance, the numbers displayed by the PCM/ECM may not match the desired input, target output and actual output and the fault code will set.

Reference Sources

Diagnostic Trouble Code (DTC) Guide for P0638 - Ominitek Advanced Technologies, pages 124-125.