
Cold Start Emission Reduction Monitor

Overview

The cold start emission reduction monitor is an on-board strategy designed for vehicles that meet the low emissions vehicle-II (LEV-II) emissions standards. The monitor works by validating the operation of the components of the system required to achieve the cold start emission reduction strategy. There are 2 types of monitors:

- cold start emission reduction component monitor
- cold start emission reduction system monitor

Cold Start Emission Reduction Component Monitor

Two different tests are carried out during the cold start emission reduction component monitor. The low idle air flow test which checks the performance of the idle air control strategy and the spark timing monitor test which checks the spark timing strategy.

Low Idle Air Flow Test

When the cold start emission reduction monitor is enabled, the powertrain control module (PCM) commands the idle air control system to increase the RPM, which elevates engine air flow. While this cold start emission reduction elevated air flow is requested, the low idle air flow test compares the measured idle air flow from the mass air flow (MAF) sensor to the commanded idle air control strategy. For the purpose of detecting low air flow concerns, the low air flow test uses the measured air flow and the commanded air flow to create a low air flow index.

Low idle air flow test operation:

- DTC: P050A cold start idle air control system performance
- Monitor execution: Once per driving cycle, from start up with the cold start emissions reduction active
- Monitor sequence: none
- Monitoring duration: 7 seconds

Low idle air flow test entry conditions:

- Engine coolant temperature is between 4.4°C (40°F) and 82.2°C (180°F)
- Barometric pressure is between 76.2 kPa (22.5 in-Hg) and 105 kPa (31 in-Hg)
- Engine off soak time is at least 50 minutes
- Throttle is at closed position

Spark Timing Monitor Test

The PCM is equipped with a spark conduction capture circuit which measures the timing and duration of the spark delivered by processing the flyback voltage signal from the primary side of the ignition coil. When the cold start emission reduction monitor is enabled, the spark control strategy in the PCM commands the spark timing strategy to retard the spark timing. While retarded spark timing is requested, the spark timing monitor compares the measured spark timing from the spark conduction capture circuit to the commanded spark timing from the spark control strategy. For the purpose of detecting spark timing failures, the spark timing monitor increments a fault filter if the measured spark timing is advanced by more than 5 degrees from the commanded spark timing. A failure is indicated if the fault filter exceeds a value of 200, equivalent to a failure duration of approximately 4 seconds.

Spark timing monitor test operation:

- DTC: P050B cold start ignition timing performance
- Monitor execution: once per driving cycle, from start up with the cold start emission reduction monitor

active

- Monitor sequence: none
- Monitoring duration: 7 seconds

Spark timing monitor test entry conditions:

- Engine speed is between 400 RPM and 2,000 RPM
- Engine position and cylinder identification are synchronized
- There are no concerns with the ignition coils primary circuits

Cold Start Emission Reduction System Monitor

The PCM uses the cold start emission reduction system monitor to calculate the actual catalyst warm up temperature during a cold start. The actual catalyst warm up temperature calculation uses measured engine speed, measured air mass and commanded spark timing inputs to the PCM. The PCM then compares the actual temperature to the expected catalyst temperature model. The expected catalyst temperature model calculation uses desired engine speed, desired air mass and desired spark timing inputs to the PCM. The difference between the actual and expected temperatures is reflected in a ratio. This ratio is a measure of how much loss of catalyst heating occurred over the period of time and when compared with a calibrated threshold it helps the PCM to determine if the cold start emission reduction system is working properly. This ratio correlates to tailpipe emissions, and a malfunction indicator lamp (MIL) illuminates when the calibrated threshold is exceeded. The monitor is disabled if a concern is present in any of the sensors or systems used for expected catalyst temperature model calculation.

Cold start emission reduction system monitor test operation:

- DTC: P050E cold start engine exhaust temperature out of range
- Monitor execution: once per driving cycle, from start up with the cold start emission reduction monitor active
- Monitor sequence: the monitor collects data during first 15 seconds of the cold start
- Monitoring duration: the monitor completes 300 seconds after initial engine start

Cold start emission reduction system monitor entry conditions:

- Engine coolant temperature at the start of the monitor is between 1.67°C (35°F) and 37.78°C (100°F)
 - Barometric pressure is above 74.5 kPa (22 in-Hg)
 - Catalyst temperature at the start of the monitor is between 1.67°C (35°F) and 51.67°C (125°F)
 - Fuel level is above 15%
 - Power take-off operation is disabled
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