Computers and Control Systems: Testing and Inspection Procedures P0420

CIRCUIT DESCRIPTION

To control emissions of hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx), a 3-way catalytic converter is used. The catalyst within the converter promotes a chemical reaction which oxidizes the HC and CO present in the exhaust gas, converting them into harmless water vapor and carbon dioxide. The catalyst also reduces NOx by converting the NOx to nitrogen. The converter also has the ability to store excess oxygen and release the stored oxygen to promote these reactions. This oxygen storage capacity (OSC) is a measurement of the catalysts ability to control emissions. The powertrain control module (PCM) monitors this process using a heated oxygen sensor (HO2S) located in the exhaust stream past the three-way converter. When the catalyst is functioning properly, the HO2S 2 is slow to respond to a large change in the HO2S 1 signal. When the HO2S 2 responds quickly to a large change in the HO2S 1 signal, the OSC and efficiency of the catalyst is considered to be bad and if subsequent tests also indicate a failure DTC P0420 will set.

CONDITIONS FOR RUNNING THE DTC

1. Meet the conditions for engine warm up. Use the scan tool catalyst data list in order to verify the following:
   - ^ DTCs P0101, P0102, P0103, P0107, P0108, P0112, P0113, P0116, P0117, P0118, P0121, P0122, P0123, P0130, P0131, P0132, P0133, P0134, P0135, P0137, P0138, P0140, P0141, P0171, P0172, P0201-P0206, P0300, P0336, P0341, P0401, P0403, P0404, P0405, P0410, P0412, P0418, P0440, P0442, P0443, P0446, P0449, P0502, P0503, P0506, P0507, P1133, P1134, P1336, P1351, P1352, P1361, P1374, or P1441 are not set.
   - ^ The engine has been running more than **10 minutes**.
   - ^ The engine coolant temperature (ECT) is above **70°C (158°F)** and below **124°C (255°F)**.
   - ^ The barometric pressure (BARO) is above **75 kPa**.
   - ^ The vehicle is in Closed Loop.
   - ^ The intake air temperature (IAT) is above **-20°C (-4°F)**, and is less than **+100°C (+212°F)**.
   - ^ The battery voltage above **10.7 volts**
2. Warm the catalyst.
   - ^ Fully open the hood.
   - ^ Transmission is in park (automatic) or neutral (manual).
   - ^ Set the parking brake.
   - ^ Press and hold the service brake.
   - ^ Each time the engine is started the diagnostic can run up to 18 times. After the **10-minute** run time and before the diagnostic runs the first time, the engine must run an additional **5 minutes** between **1,500-2,500 RPM**.

     Any additional tests on the same key cycle, the engine speed must be between **1,500-2,500 RPM** for **1 minute**.
   - ^ To activate the diagnostic, return to idle and put the vehicle in drive (depress the clutch for manual).
3. Test the catalyst.
   - ^ Transmission is in drive (automatic) or neutral (for manuals with the clutch depressed).
   - ^ VIN K California Emissions-Within **60 seconds** the air fuel ratio will go rich below 14.1 for up to **6 seconds**, then may go lean above 15.3 for up to **8 seconds**.
   - ^ VIN K FED Emissions-Within **60 seconds** the air fuel ratio will go lean above 15.3 for up to **6 seconds**, then may go rich below 14.1 for up to **7 seconds**.
   - ^ VIN 1-Within **60 seconds** the air fuel ratio will go rich below 14.1 for up to **7 seconds**, then may go lean above 15.3 for up to **9 seconds**.
   - ^ Verify if DTC P0420 has passed or failed this key cycle using the scan tool.

CONDITIONS FOR SETTING THE DTC

The PCM determines that the catalysts oxygen storage capacity is below a threshold considered acceptable.

ACTION TAKEN WHEN THE DTC SETS

- ^ The control module illuminates the malfunction indicator lamp (MIL) when the diagnostic runs and fails.
- ^ The control module records the operating conditions at the time the diagnostic fails. The control module stores this information in the Freeze Frame/Failure Records.

CONDITIONS FOR CLEARING THE MIL/DTC

- ^ The control module turns OFF the malfunction indicator lamp (MIL) after 3 consecutive ignition cycles that the diagnostic runs and does not fail.
- ^ A current DTC, Last Test Failed, clears when the diagnostic runs and passes.
- ^ A history DTC clears after 40 consecutive warm-up cycles, if no failures are reported by this or any other emission related diagnostic.
- ^ Clear the MIL and the DTC with a scan tool.

DIAGNOSTIC AIDS

- ^ The PCM will NOT enable the catalyst test until following conditions are met:
  - The engine idle speed is within **150 RPM** of the desired idle.
  - The throttle position is **1.5 percent** or less.
  - The short term integrator is between 20 to **+20 percent**.
- ^ The catalyst test will abort if the vehicle falls outside the conditions listed below while the test is running: