

DRIVE CYCLES > OBD II DRIVE CYCLES & TRIPS

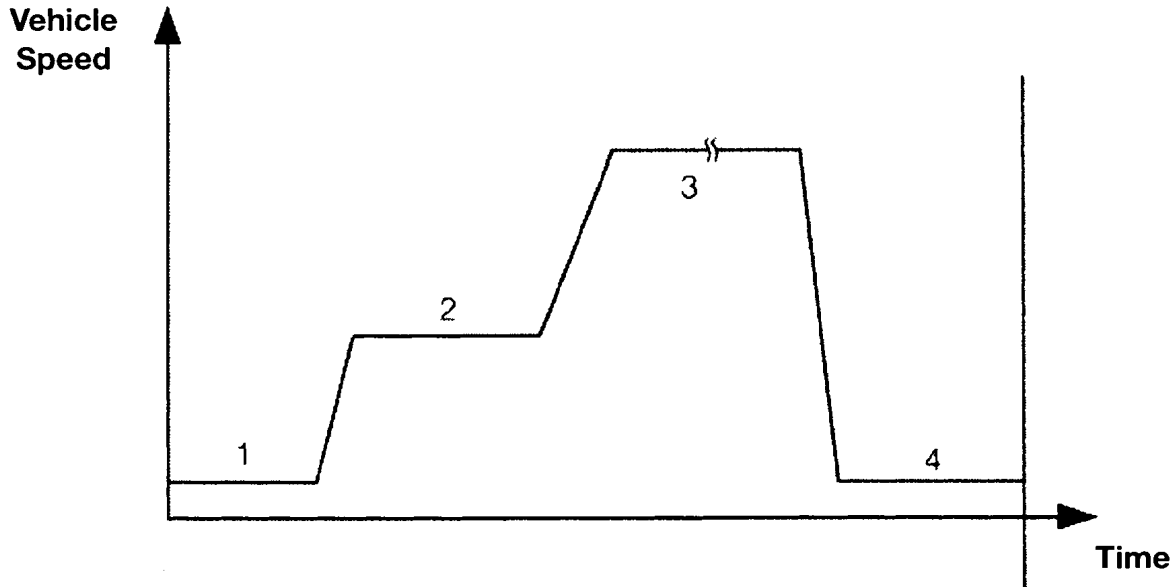
A "Drive cycle" consists of engine startup and engine shutoff. "Trip" is defined as vehicle operation (following an engine-off period) of duration and driving style so that all components and systems are monitored at least once by the diagnostic system except catalyst efficiency or evaporative system monitoring. This definition is subject to the limitations that the manufacturer-defined trip monitoring conditions are all monitored at least once during the first engine start portion of the Federal Test Procedure (FTP). Within this text the term "customer driving cycle" will be used and is defined as engine start-up, operation of vehicle (dependent upon customer drive style) and engine shut-off.

Federal Test Procedure (FTP) is a specific driving cycle that is utilized by the EPA to test light duty vehicle emissions. As part of the procedure for a vehicle manufacturer to obtain emission certification for a particular model/engine family the manufacturer must demonstrate that the vehicle(s) can pass the FTP defined driving cycle two consecutive times while monitoring various components/systems. Some of the components/systems must be monitored either once per driving cycle or continuously. Systems and their components required to be monitored once within one driving cycle: Oxygen Sensors, Catalyst Efficiency and Evaporative Vapor Recovery System.

Due to the complexity involved in meeting the test criteria within the FTP defined driving cycle, all tests may not be completed within one "customer driving cycle". The test can be successfully completed within the FTP defined criteria, however customer driving styles may differ and therefore may not always monitor all involved components/systems in one "trip".

Components/systems required to be monitored continuously: Cylinder Misfire Detection, Fuel system, Oxygen Sensors and all emissions related components/systems - EMS or EML (comprehensive component monitoring). The graph shown below is an example of the driving cycle that is used by BMW to complete the FTP.

Fig 1: MINI Drive Cycle



Example of a Drive Cycle for Completing all OBD II Relevant Checks

1. Engine cold start, idling, approximately 3 minutes. Evaluated:

- **Secondary Air System**
- **Evaporative Leak Detection (LDP Equipped Vehicles)**

2. Constant driving at 20 to 30 MPH, approximately 4 minutes. Evaluated:

- **Oxygen Sensors - Achieved "Closed Loop" Operation**
- **Oxygen Sensors - Response Time and Switching Time (Control Frequency)**

3. Constant driving at 40 to 60 MPH, approximately 15 minutes (sufficient vehicle coasting phases included). Evaluated:

- **Catalytic Converter Efficiency**
- **Oxygen Sensors - Response Time and Switching Time (Control Frequency)**

4. Engine idling, approximately 5 minutes. Evaluated:

- **Tank-Leak Diagnosis (DM TL Equipped Vehicles after KL 15 is switched OFF)**

NOTE: The diagnostic sequence illustrated above will be interrupted if:

- **The engine speed exceeds 3000 RPM.**
- **Large fluctuations in the accelerator pedal position.**
- **The driving speed exceeds 60 MPH.**

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The diagnostic routine shown above will be discontinued whenever: Engine speed exceeds 3000 RPM, Large fluctuations in throttle angle, Road speed exceeds 60 MPH. Driving criteria shown can be completed within the FTP required - 11 miles in a controlled environment such as a dyno

test or test track. A "customer driving cycle" may vary according to traffic patterns, route selection and distance traveled, which may not allow the "diagnostic trip" to be fully completed each time the vehicle is operated.

DRIVE CYCLES > OBD II DRIVE CYCLES & TRIPS > READINESS FLAGS

Readiness Flags provide status of required emissions system monitoring. The systems available for readiness flag status are: Misfiring Stage A (Catalyst Damaging Misfire), Misfiring Stage B1 (Sum of the Emission Increasing Misfires in the first 1000 Revs), Misfiring Stage B4 (Sum of the Emission Increasing Misfires 1000 Revs), EVAP 1, EVAP 2, EVAP 3, EVAP 4, Catalytic converter, Oxygen Sensor Control, Oxygen Sensor 1 (Pre-Cat) and Oxygen Sensor 2 (Post-Cat). Complete System Test Results are indicated by Test Completed or Not Completed. A "Readiness Code" must be stored after any clearing of fault memory or disconnection of the EMS2000. A readiness code of "0" will be stored after a complete diagnostic check of all components/systems, that can turn on the "Malfunction Indicator Light" is performed. The readiness code was established to prevent anyone with an emissions related fault and a "Malfunction Indicator Light" on from disconnecting the battery or clearing the fault memory to manipulate the results of the emissions test procedure.

The complete readiness code is equal to "one" byte (eight bits). Every bit represents one complete test and is displayed by the scan tool, as required by CARB/EPA. 1 = EGR Monitoring (=0, N/A with MINI), 0 = Oxygen Sensor Heater Monitoring, 1 = Oxygen Sensor Monitoring, 1 = Air Conditioning (=0, N/A with MINI), 0 = Secondary Air Delivery Monitoring (N/A with MINI), 1 = Evaporative System Monitoring, 1 = Catalyst Heating (=0, N/A with MINI at this time), and 0 = Catalyst Efficiency Monitoring. Drive the car in such a manner that all tests listed above can be completed (refer to the FTP cycle). When the complete "readiness code" equals "0" then all tests have been completed and the system has established its "readiness".