FEDERAL TEST PROCEDURE (FTP) Drive Cycle

The Federal Test Procedure (FTP) is a **specific driving cycle** that is utilized by the EPA to test light duty vehicles and light duty truck 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 <u>must be monitored either once per driving cycle or continuously.</u>

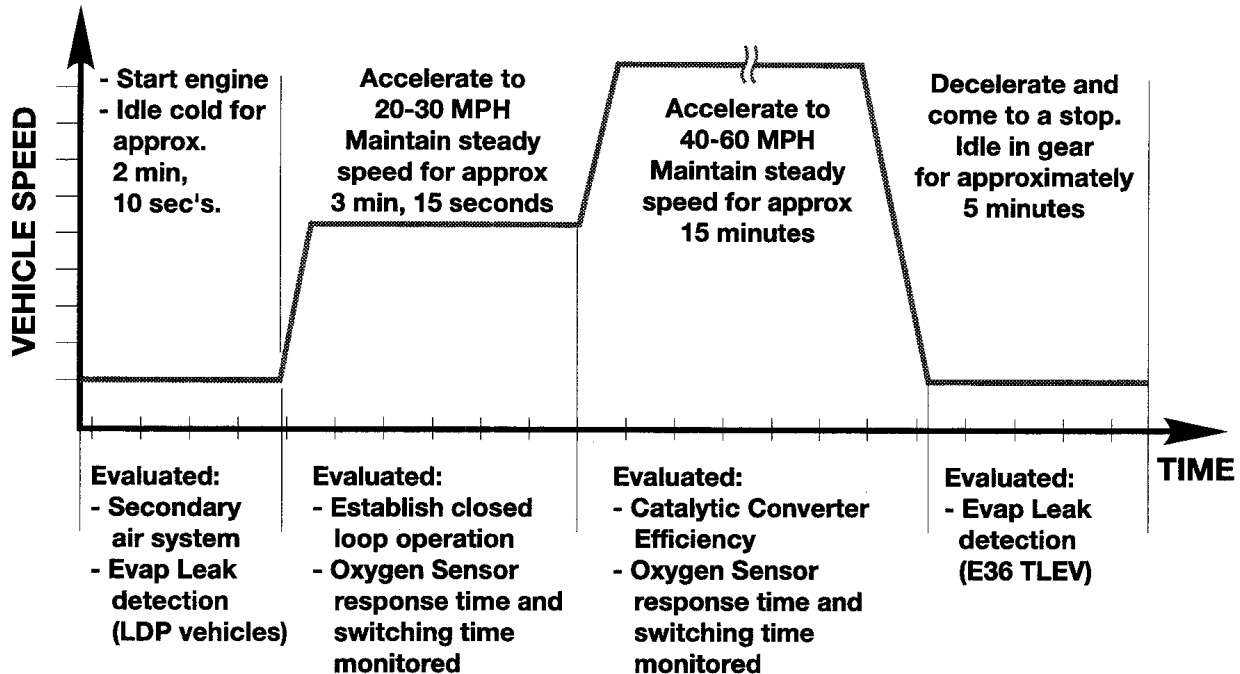1. Components/systems required to be monitored **once within one driving cycle:**

- Oxygen Sensors

- Secondary Air Injection System

- Catalyst Efficiency

- Evaporative Vapor Recovery System

<u>NOTE:</u> 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:**

- Misfire Detection

- Fuel system

- Oxygen Sensors

- All emissions related components/systems providing or getting electrical connections to the DME, EGS, or EML.

The graph shown below is an **example** of the driving cycle that is used by BMW to complete the FTP.

VEHICLE SPEED →

- **Start engine**
- **Idle cold for approx. 2 min, 10 sec's.**

Accelerate to 20-30 MPH Maintain steady speed for approx 3 min, 15 seconds

Accelerate to 40-60 MPH Maintain steady speed for approx 15 minutes

Decelerate and come to a stop. Idle in gear for approximately 5 minutes

TIME

Evaluated:
- **Secondary air system**
- **Evap Leak detection (LDP vehicles)**

Evaluated:
- **Establish closed loop operation**
- **Oxygen Sensor response time and switching time monitored**

Evaluated:
- **Catalytic Converter Efficiency**
- **Oxygen Sensor response time and switching time monitored**

Evaluated:
- **Evap Leak detection (E36 TLEV)**

The diagnostic routine shown above will be discontinued whenever:

- Engine speed exceeds 3000 RPM

- Large fluctuations in throttle angle

- Road speed exceeds 60 MPH

NOTE: The 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.

OBD II FUNCTION: "CHECK ENGINE" (MIL) LIGHT

In conjunction with the CARB/OBD II regulations the "CHECK ENGINE" light (also referred to as the Malfunction Indicator Light - MIL) is to be illuminated:

- Upon the completion of the **second consecutive driving cycle** where the previously faulted system is monitored again and the emissions relevant fault is again present.

- Immediately if a catalyst damaging fault occurs (see Misfire Detection).

The illumination of the check engine light is performed in accordance with the Federal Test Procedure (FTP) which requires the lamp to be illuminated when:

- A malfunction of a component that can affect the emission performance of the vehicle occurs and causes emissions to exceed 1.5 times the standards required by the (FTP).

- Manufacturer-defined specifications are exceeded.

- An implausible input signal is generated.

- Catalyst deterioration causes HC-emissions to exceed a limit equivalent to 1.5 times the standard (FTP).

- Misfire faults occur.

- A leak is detected in the evaporative system

- The oxygen sensors observe no purge flow from the purge valve/evaporative system.

- Engine control module fails to enter closed-loop operation within a specified time interval.

- Engine control or automatic transmission control enters a "limp home" operating mode.

- Key is in the "ignition" on position before cranking (Bulb Check Function).

Within the BMW system the illumination of the check engine light is performed in accordance with the regulations set forth in CARB mail-out 1968.1 and as demonstrated via the Federal Test Procedure (FTP). The following information provides several examples of when and how the "Check Engine" Light is illuminated based on the "customer drive cycle" (DC):

TEXT NO.	DRIVE CYCLE # 1			DRIVE CYCLE # 2			DRIVE CYCLE # 3			DRIVE CYCLE # 4			DRIVE CYCLE # 5			* DRIVE CYCLE # 43		
	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE SET	MIL STATUS CHECK ENGINE	FUNCTION CHECKED	FAULT CODE ERASED	MIL STATUS CHECK ENGINE
1.	YES	YES	OFF															
2.	YES	YES	OFF	YES	YES	ON												
3.	YES	YES	OFF	NO	NO	OFF	YES	YES	ON									
4.	YES	YES	OFF	YES	NO	OFF	YES	NO	OFF	YES	YES	OFF	YES	YES	ON			
5.	YES	YES	OFF	YES	YES	ON	YES	NO	ON	YES	NO	ON	YES	NO	OFF			
6.	YES	YES	OFF	YES	YES	ON	YES	NO	ON	YES	NO	ON	YES	NO	OFF	YES	FAULT CODE ERASED	OFF

1. A fault code is stored within the respective control module upon the first occurrence of a fault in the system being checked.

2. The "Check Engine" (MIL) light will not be illuminated until the completion of the second consecutive "customer driving cycle" where the previously faulted system is again monitored and a fault is still present or a catalyst damaging fault has occurred.

3. If the second drive cycle was not complete and the specific function was not checked as shown in the example, the engine control module counts the third drive cycle as the "next consecutive" drive cycle. The check engine light is illuminated if the function is checked and the fault is still present.

4. If there is an intermittent fault present and does not cause a fault to be set through multiple drive cycles, two **complete** consecutive drive cycles with the fault present are required for the Check Engine light to be illuminated.

5. Once the "Check Engine" light is illuminated it will remain illuminated unless the specific function has been checked without fault through three complete consecutive drive cycles.

6. The fault code will also be cleared from memory automatically if the specific function is checked through 40* consecutive drive cycles without the fault being detected or with the use of either the DIS, MODIC or Scan tool.

   * **NOTE:** In order to clear a catalyst damaging fault (see Misfire Detection) from memory, the condition under which the fault occurred must be evaluated for 80 consecutive cycles without the fault reoccurring.

With the use of a universal scan tool, connected to the "OBD" DLC an SAE standardized DTC can be obtained, along with the **condition associated** with the illumination of the "Check Engine" light.

Using the DIS or MODIC, a fault code and the conditions associated with its setting **can be obtained prior to the illumination of the "Check Engine" light.**