



## Comprehensive Component Monitor

The Comprehensive Component Monitor (CCM) is an on-board strategy designed to monitor a failure in any electronic component or circuit that provides input or output signal to the powertrain control module (PCM) and is not exclusively monitored by another monitor system. Inputs and outputs are considered inoperative when at a minimum a failure exists due to an open circuit, out-of-range value, or a failed rationality check.

The CCM covers many components and circuits and tests them in various ways depending on the hardware, function, and type of signal. For example, analog inputs are typically checked for opens, shorts, and out of range values. This type of monitoring is performed continuously. Some digital inputs rely on rationality checks. These tests may require the monitoring of several components and can only be performed under the appropriate test conditions. Outputs are checked for opens and shorts by monitoring the Output State Monitor (OSM) or circuit associated with the output driver when the output is energized or de-energized. Other outputs, such as relays, require additional OSM circuits to monitor the secondary side of the component. Some outputs are also monitored for proper function by observing the reaction of the control system to a given change in the output command. An example of this would be the idle air control (IAC) valve.

In general, the CCM covers a broad range of individual component and circuit checks, and testing is performed under various conditions. The CCM is enabled shortly after the engine is started but requires certain conditions to occur for some components before it can complete. A Diagnostic Trouble Code (DTC) is stored in continuous memory when a fault is detected, and the malfunction indicator lamp (MIL) is activated if the fault detected affects emissions. Most of the CCM Monitor tests are also performed during on demand self-test.

The following is an example of some of the input and output components monitored by the CCM. The components monitored may belong to the engine, ignition, transmission, air conditioning, or any other PCM supported subsystem.

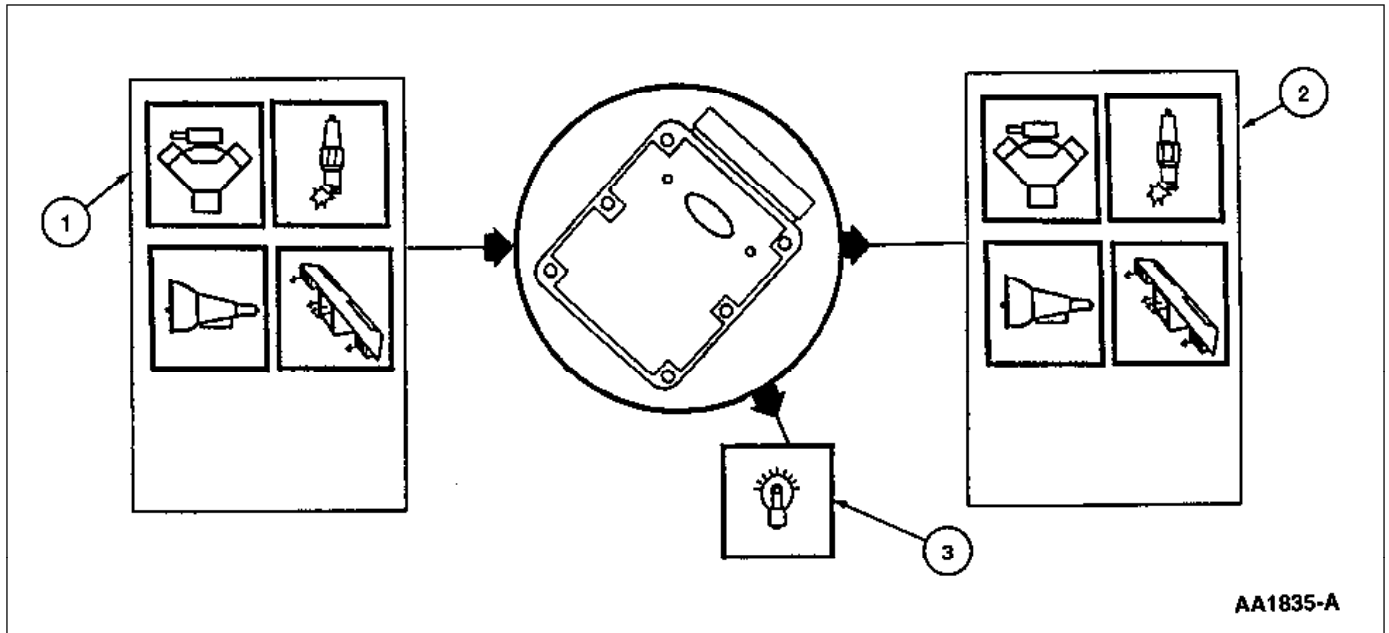
1. Inputs:

mass air flow (MAF) sensor, intake air temperature (IAT) sensor, engine coolant temperature (ECT) sensor, throttle position (TP) sensor, camshaft position (CMP) sensor, air conditioning pressure sensor (ACPS), fuel tank pressure (FTP) sensor.

2. Outputs:

fuel pump (FP), wide open throttle A/C cutout (WAC), idle air control (IAC), shift solenoid (SS), torque converter clutch (TCC) solenoid, intake manifold runner control (IMRC), EVAP canister purge valve, canister vent (CV) solenoid.

3. The MIL is activated after a fault is detected on two consecutive drive cycles, if the fault detected affects emissions.



**Figure 9: Comprehensive Component Monitor**