4.25 Malfunction Indicator Lamp

4.25.1 Description

The OBD system interfaces with the driver via the MIL, which is located in the instrument pack. A bulb check takes place every time the ignition is switched to ignition position II and until the engine is cranked.

The ECM monitors the driver junction temperature to detect an electrical fault. A fault is detected if the following condition is satisfied: -

1. MIL driver short circuit to battery positive, i.e. the driver stage junction temperature exceeds a temperature threshold.

Malfunction Indicator Lamp								
Component/ System	Fault Codes	Monitoring Strategy Description	Malfunction Criteria	Threshold value	Secondary Parameter	Enable Conditions	Time Required	MIL Illumination
Malfunction Indicator Lamp	P0650	short circuit to battery positive	drive stage junction temperature	> 150 °C	engine speed battery voltage	> 80 rpm 7.5V < Battery positive < 17V	immediately/ continuous	no MIL illumination

If the above table does not include details of the following enabling conditions: - IAT, ECT, vehicle speed range, and time after engine start-up then the state of these parameters has no influence upon the execution of the monitor.

4.26 Hill Descent Control Signal – Discovery Series II Only

4.26.1 Description

HDC operates in conjunction with the anti-lock braking system to provide greater control in off-road situations if necessary. HDC can be selected with the vehicle in any gear, but will only operate when low range gears are engaged with the vehicle traveling at less than 31 mph. During a descent, if engine braking is insufficient to control the vehicle speed, HDC (if selected) automatically operates the brakes to slow the vehicle and maintain a speed relative to the selected gear and the accelerator pedal position.

The ECM transmits throttle angle, engine torque, engine identification (V8 Thor) and transmission type to the SLABS control module to support the HDC system. This information is transmitted via a multiplexed PWM waveform.

The ECM has power stage diagnostics for the signal, with a fault being detected if any of the following conditions is satisfied: -

1. HDC link to the SLABS control module short circuit to battery positive, i.e. the driver voltage is greater than half the battery voltage when the driver is on.
2. HDC link to the SLABS control module short circuit to ground, i.e. the driver voltage is less than one third of the battery voltage when the driver is off.
3. HDC link to the SLABS control module open circuit, i.e. the driver voltage is greater than one third of the battery voltage but less than two thirds of the battery voltage when the driver is off.

Hill Decent Control Signal								
Component/ System	Fault Codes	Monitoring Strategy Description	Malfunction Criteria	Threshold value	Secondary Parameter	Enable Conditions	Time Required	MIL Illumination
Hill Decent Control Signal	P1665	circuit continuity - short to battery positive	voltage - drive on	voltage > 1/2 * Battery positive	engine speed battery voltage	> 80 rpm 7.5V < Battery positive < 17V	immediately/ continuous	two driving cycles
	P1664	circuit continuity – short to ground	voltage - drive off	voltage < 1/3 * Battery positive				
	P1663	circuit continuity – open circuit	voltage - drive off	1/3 * Battery positive < voltage < 2/3 * Battery positive				

If the above table does not include details of the following enabling conditions: - IAT, ECT, vehicle speed range, and time after engine start-up then the state of these parameters has no influence upon the execution of the monitor.

4.27 Engine Speed Signal

4.27.1 Description

The engine speed signal is sent by the ECM to the instrument pack, Body Control Module (BCM) and SLABS/ABS control module via a direct hardwired connection.

The ECM has power stage diagnostics for this signal with a fault being detected if any of the following conditions is satisfied: -

1. Engine speed signal driver short circuit to battery positive, i.e. the driver voltage is greater than half the battery voltage when the driver is on.
2. Engine speed signal driver short circuit to ground, i.e. the driver voltage is less than one third of the battery voltage when the driver is off.
3. Engine speed signal driver open circuit, i.e. the driver voltage is greater than one third of the battery voltage but less than two thirds of the battery voltage when the driver is off.

Engine Speed Signal								
Component/ System	Fault Codes	Monitoring Strategy Description	Malfunction Criteria	Threshold value	Secondary Parameter	Enable Conditions	Time Required	MIL Illumination
Engine Speed Signal	P0654	circuit continuity - short to battery positive	voltage - drive on	voltage > 1/2 * Battery positive	engine speed battery voltage	> 80 rpm 7.5V < Battery positive <17V	immediately/ continuous	no MIL illumination
	P0654	circuit continuity – short to ground	voltage - drive off	voltage < 1/3 * Battery positive				
	P0654	circuit continuity – open circuit	voltage - drive off	1/3 * Battery positive < voltage < 2/3 * Battery positive				

If the above table does not include details of the following enabling conditions: - IAT, ECT, vehicle speed range, and time after engine start-up then the state of these parameters has no influence upon the execution of the monitor.

4.28 Environmental-Box Cooling Fan – Range Rover 38A Only

4.28.1 Description

This function is required to control the Environmental-Box (E-Box) mounted cooling fan. This fan provides cabin air into the E-Box to provide a cool temperature environment for the ECM fitted in the under-bonnet mounted E-Box. The temperature is determined by an internally (to the ECM) mounted temperature sensor. The fan will be switched on at 40 °C • •15°C and also tested for 2 seconds every engine start.

The ECM has power stage diagnostics for this signal with a fault being detected if any of the following conditions is satisfied: -

1. E-Box cooling fan driver short circuit to battery positive, i.e. the driver voltage is greater than half the battery voltage when the driver is on.
2. E-Box cooling fan driver short circuit to ground, i.e. the driver voltage is less than one third of the battery voltage when the driver is off.
3. E-box cooling fan driver open circuit, i.e. the driver voltage is greater than one third of the battery voltage but less than two thirds of the battery voltage when the driver is off.

Environmental-Box Cooling Fan – Range Rover 38A Only								
Component/ System	Fault Codes	Monitoring Strategy Description	Malfunction Criteria	Threshold value	Secondary Parameter	Enable Conditions	Time Required	MIL Illumination
E-Box Cooling Fan (Range Rover 38A only)	P1671	circuit continuity - short to battery positive	voltage - drive on	voltage > 1/2 * Battery positive	engine speed battery voltage	> 80 rpm 7.5V < Battery positive < 17V	20 sec/ continuous	two driving cycles
	P1670	circuit continuity – short to ground	voltage - drive off	voltage < 1/3 * Battery positive				
	P1669	circuit continuity – open circuit	voltage - drive off	1/3 * Battery positive < voltage < 2/3 * Battery positive				

If the above table does not include details of the following enabling conditions: - IAT, ECT, vehicle speed range, and time after engine start-up then the state of these parameters has no influence upon the execution of the monitor.

4.29 Low Range Signal

4.29.1 Description

The transmission range switch information and calculated range data are transmitted from the automatic TCM via the CAN bus.

The ECM performs a rationality test between these signals, a fault is detected if one the following conditions are satisfied: -

1. The transmission range switch information indicates low range and the calculated range information indicates high.
2. The transmission range switch information indicates high range and the calculated range information indicates low.

Low Range Signal								
Component/ System	Fault Codes	Monitoring Strategy Description	Malfunction Criteria	Threshold value	Secondary Parameter	Enable Conditions	Time Required	MIL Illumination
Low Range Signal	P1700	plausibility check of the transfer gear signal	**or**	lever position = low range and gear information = high range lever position = high range & gear information = low range	throttle position vehicle speed engine load engine speed time after start	> 19.92% > 62.15 mph > 4.0 msec > 2000 rpm > 5.0 sec	5.0 sec/ continuous	no MIL illumination (diagnostics all default to enabled)

If the above table does not include details of the following enabling conditions: - IAT, ECT, vehicle speed range, and time after engine start-up then the state of these parameters has no influence upon the execution of the monitor.

4.30 Controller Area Network System

4.30.1 Description

The CAN is a high-speed serial interface for sharing dynamic signals between control modules. CAN communications are 'self checked' for errors, if an error is detected the message is ignored by the receiving control module. Due to the high rate of information exchange (500K baud) the system has a high degree of latency. This allows for a high amount of errors to be present without reducing the data transfer rate.

The CAN communication system is a differential bus using a twisted pair, which is normally very reliable. If either or both of the wires of the twisted pair CAN bus is open or short-circuited a CAN time out fault will occur and the automatic TCM defaults to third gear. In order to alert the driver the 'sport' and 'manual' warning lights in the instrument pack will flash alternatively.

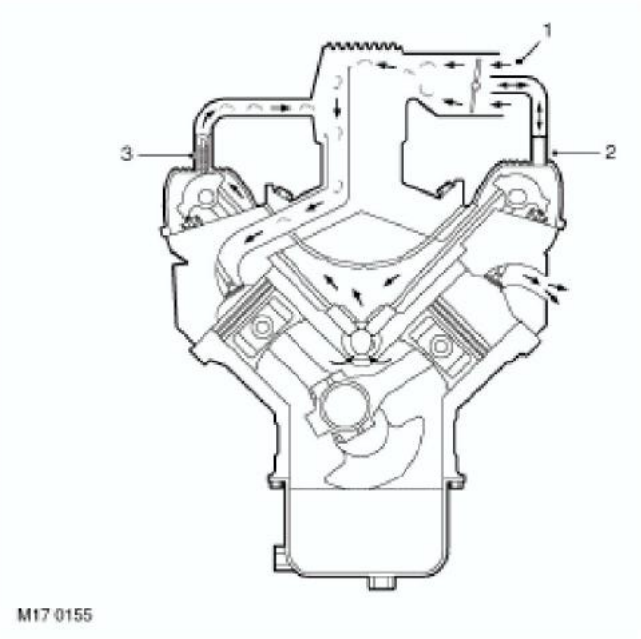
An error is detected if the ECM receives no CAN messages for at least 0.8 seconds or the duration of the automatic TCM retard request is greater than 10 seconds.

CAN System								
Component/ System	Fault Codes	Monitoring Strategy Description	Malfunction Criteria	Threshold value	Secondary Parameter	Enable Conditions	Time Required	MIL Illumination
Transmission Interface	P1776	TCM ignition retard plausibility test	duration of retard request	> 10.0 sec	vehicle speed	> 24.86 mph	10.0 sec/ continuous	no MIL illumination (MIL request by TCM)
	P0600	CAN Time-out (bus check)	no CAN messages	> 0.80 sec			immediately/ continuous	two driving cycles

If the above table does not include details of the following enabling conditions: - IAT, ECT, vehicle speed range, and time after engine start-up then the state of these parameters has no influence upon the execution of the monitor.

4.31 Positive Crankcase Ventilation System Monitoring

4.31.1 Description



1. Intake air
2. Left hand rocker cover breather tube
3. Oil separator in right hand rocker breather tube

A spiral oil separator is located in the stub pipe to the ventilation hose on the right hand cylinder head rocker cover, where oil is separated and returned to the cylinder head. The rubber ventilation hose from the right hand rocker cover is routed to a port on the right hand side of the inlet manifold plenum chamber where the returned gases mix with the fresh intake air passing through the throttle butterfly valve. This pipe is primarily for part-load breathing and is connected to the engine via a restrictor that prevents an excessive vacuum building up in the crankcase at small throttle openings.

The stub pipe on the left hand rocker cover does not contain an oil separator or a restrictor and the ventilation hose is routed to the throttle body housing at the air inlet side of the butterfly valve. This pipe is for breathing at higher loads. Flow through this second pipe is negligible under normal driving conditions.

The ventilation hoses are attached to the stub pipes by metal band clamps.

Disconnection of the part-load breather is likely to result in a tendency of the engine to stall when returning to idle and the quantity of un-metered air, which flows into the intake manifold, will result in the detection of a fuel system fault by the OBD system.

For this reason, there are no separate monitors for compliance with the requirements of Positive Crankshaft Ventilation (PCV) monitoring.