4.21 Air Conditioning System (Discovery Series II Only)

4.21.1 Description

The air conditioning system comprises of the Heating and Ventilation Control (Air Conditioning) Module (HeVAC), the air conditioning compressor and the condenser fans. The ECM controls the compressor clutch via a relay.

The control strategy of the relay features hysteresis to avoid the compressor clutch cycling while the engine is running. When there is a need for the compressor to be activated, the HeVAC module sends a request signal to the ECM, which in turn activates the compressor clutch relay. The condenser fan relay is controlled separately by both the ECM and the HeVAC module, and again, the control strategy features hysteresis to avoid the cooling fans cycling while the engine is running and the engine coolant and/or condenser temperatures fluctuate around a given threshold. When there is a need for condenser cooling for air conditioning performance the HeVAC module sends a request signal to the condenser fan relay. If there is a requirement for condenser cooling due to ECT, the ECM will send the request signal to the condenser fan relay.

When the HeVAC module requests air conditioning, the signal it sends to the ECM is through two binary switches, which sense the minimum and maximum refrigerant pressure and an evaporator thermostat. If the pressure or the temperature is below or above certain levels the binary switches will be open circuit and effectively disable the A/C request line to the ECM, which in turn will disengage the compressor clutch.

The air conditioning system is in standby mode if the HeVAC module is on and economy mode is not selected.

There are four diagnostic checks of the air conditioning system during which a fault is detected if: -

1. The A/C compressor clutch relay short circuit to battery positive, i.e. the driver voltage is greater than half the battery voltage when the driver is on.
2. The A/C compressor clutch relay short circuit to ground, i.e. the driver voltage is less than one third of the battery voltage when the driver is off.
3. The A/C compressor clutch relay is 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.
4. A/C has been requested when the system is not in standby mode, i.e. a signal rationality check.

Air Conditioning System								
Component/ System	Fault Codes	Monitoring Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameter	Enable Conditions	Time Required	MIL Illumination
Air Conditioning System	P1538	circuit continuity - short to battery positive	voltage - drive on	voltage > 1/2 * Battery positive	battery voltage	7.5V < Battery positive < 17V	immediately/ continuous	no MIL Illumination
	P1537	circuit continuity - short to ground	voltage - drive off	Voltage < 1/3 * Battery positive				
	P1536	circuit continuity - open circuit	voltage - drive off	1/3* Battery positive < voltage < 2/3* Battery positive	engine speed	> 80 rpm		
	P1535	signal rationality check	A/C requested when not in standby mode				0.5 sec	

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.