

ENGINE MANAGEMENT SYSTEM - SIEMENS

Diagnostics

The ECM incorporates On Board Diagnostics (OBD) software that complies with market legislation current at the time of manufacture. During engine operation the ECM performs self test and diagnostic routines to monitor the performance of the engine and the EMS. If a fault is detected the ECM stores a related Diagnostic Trouble Code (DTC), also known as a 'P' code) in a non volatile memory and, for most faults, illuminates the engine SERVICE ENGINE (MIL) and/or the SERVICE ENGINE SOON warning lamps. Codes are retrieved using TestBook/T4, which communicates with the ECM via an ISO 9141 K line connection from the diagnostic socket.

P Code No.	Component/Signal	Fault Description	Warning Lamp		Drive Cycle
			SERVICE ENGINE (MIL)	SERVICE ENGINE SOON	
0030	Pre CAT LH bank HO2S heater	Open circuit	Yes	No	C
0031	Pre CAT LH bank HO2S heater	Short circuit to earth	Yes	No	C
0032	Pre CAT LH bank HO2S heater	Short circuit to battery	Yes	No	C
0036	Post CAT LH bank HO2S heater	Open circuit	Yes	No	C
0037	Post CAT LH bank HO2S heater	Short circuit to earth	Yes	No	C
0038	Post CAT LH bank HO2S heater	Short circuit to battery	Yes	No	C
0050	Pre CAT RH bank HO2S heater	Open circuit	Yes	No	C
0051	Pre CAT RH bank HO2S heater	Short circuit to earth	Yes	No	C
0052	Pre CAT RH bank HO2S heater	Short circuit to battery	Yes	No	C
0056	Post CAT RH bank HO2S heater	Open circuit	Yes	No	C
0057	Post CAT RH bank HO2S heater	Short circuit to earth	Yes	No	C
0058	Post CAT RH bank HO2S heater	Short circuit to battery	Yes	No	C
0100	MAF sensor signal	Open circuit	No	No	—
0101	MAF sensor signal	Signal implausible	Yes	No	B
0102	MAF sensor signal	Short circuit to earth	Yes	No	A
0103	MAF sensor signal	Short circuit to battery	Yes	No	A
0105	ECM internal ambient pressure sensor	Circuit malfunction	No	No	—
0107	ECM internal ambient pressure sensor	Short circuit to earth	Yes	No	A
0108	ECM internal ambient pressure sensor	Open circuit or short circuit to battery	Yes	No	A
0109	ECM internal ambient pressure sensor	Circuit intermittent	No	No	—
0112	IAT sensor	Short circuit to earth	Yes	No	B
0113	IAT sensor	Open circuit or short circuit to battery	Yes	No	B
0116	ECT sensor	Signal implausible	Yes	No	B
0117	ECT sensor	Short circuit to earth	Yes	No	B
0118	ECT sensor	Open circuit or short circuit to battery	Yes	No	B
0122	Throttle potentiometer 1	Open circuit or short circuit to earth	Yes	Yes	B



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P Code No.	Component/Signal	Fault Description	Warning Lamp		Drive Cycle
			SERVICE ENGINE (MIL)	SERVICE ENGINE SOON	
0123	Throttle potentiometer 1	Short circuit to battery	Yes	Yes	B
0125	ECT sensor	Open circuit, short circuit to ground or signal implausible	No	No	—
0128	Thermostat monitoring sensor	Low coolant temperature – thermostat stuck open	Yes	No	B
0130	LH bank front HO2S signal	Open circuit	Yes	No	C
0131	LH bank front HO2S signal	Short circuit to earth	Yes	No	C
0132	LH bank front HO2S signal	Short circuit to battery	Yes	No	C
0133	LH bank front HO2S signal	Slow response	Yes	No	C
0134	LH bank front HO2S signal	Signal not switching	Yes	No	C
0135	LH bank front HO2S heater circuit	Open circuit or short circuit to battery or earth	No	No	—
0136	LH bank rear HO2S signal	Open circuit	Yes	No	C
0137	LH bank rear HO2S signal	Short circuit to earth	Yes	No	C
0138	LH bank rear HO2S signal	Short circuit to battery	Yes	No	C
0139	LH bank rear HO2S signal	Slow response	Yes	No	C+
0140	LH bank rear HO2S signal	No activity	Yes	No	C+
0141	LH bank rear HO2S heater circuit	Open circuit or short circuit to battery or earth	No	No	—
0150	RH bank front HO2S signal	Open circuit	Yes	No	C
0151	RH bank front HO2S signal	Short circuit to earth	Yes	No	C
0152	RH bank front HO2S signal	Short circuit to battery	Yes	No	C
0153	RH bank front HO2S signal	Slow response	Yes	No	C
0154	RH bank front HO2S signal	Signal not switching	Yes	No	C
0155	RH bank front HO2S heater circuit	Open circuit or short circuit to battery or earth	No	No	—
0156	RH bank rear HO2S signal	Open circuit	Yes	No	C
0157	RH bank rear HO2S signal	Short circuit to earth	Yes	No	C
0158	RH bank rear HO2S signal	Short circuit to battery	Yes	No	C
0159	RH bank rear HO2S signal	Slow response	Yes	No	C
0160	RH bank rear HO2S signal	No activity	Yes	No	C+
0161	RH bank rear HO2S heater circuit	Open circuit or short circuit to battery or earth	No	No	—
0171	LH bank lambda control	Fuelling too lean	Yes	No	C
0172	LH bank lambda control	Fuelling too rich	Yes	No	C
0174	RH bank lambda control	Fuelling too lean	Yes	No	C
0175	RH bank lambda control	Fuelling too rich	Yes	No	C
0201	Fuel injector 1	Open circuit	Yes	No	A
0202	Fuel injector 2	Open circuit	Yes	No	A
0203	Fuel injector 3	Open circuit	Yes	No	A
0204	Fuel injector 4	Open circuit	Yes	No	A
0205	Fuel injector 5	Open circuit	Yes	No	A
0206	Fuel injector 6	Open circuit	Yes	No	A
0222	Throttle potentiometer 2	Open circuit or short circuit to earth	Yes	Yes	B
0223	Throttle potentiometer 2	Short circuit to battery	Yes	Yes	B
0261	Fuel injector 1	Short circuit to earth	Yes	No	A
0262	Fuel injector 1	Short circuit to battery	Yes	No	A
0264	Fuel injector 2	Short circuit to earth	Yes	No	A
0265	Fuel injector 2	Short circuit to battery	Yes	No	A
0267	Fuel injector 3	Short circuit to earth	Yes	No	A

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P Code No.	Component/Signal	Fault Description	Warning Lamp		Drive Cycle
			SERVICE ENGINE (MIL)	SERVICE ENGINE SOON	
0268	Fuel injector 3	Short circuit to battery	Yes	No	A
0270	Fuel injector 4	Short circuit to earth	Yes	No	A
0271	Fuel injector 4	Short circuit to battery	Yes	No	A
0273	Fuel injector 5	Short circuit to earth	Yes	No	A
0274	Fuel injector 5	Short circuit to battery	Yes	No	A
0276	Fuel injector 6	Short circuit to earth	Yes	No	A
0277	Fuel injector 6	Short circuit to battery	Yes	No	A
0301	Cylinder 1	Misfire detected	Yes	No	B
0302	Cylinder 2	Misfire detected	Yes	No	B
0303	Cylinder 3	Misfire detected	Yes	No	B
0304	Cylinder 4	Misfire detected	Yes	No	B
0305	Cylinder 5	Misfire detected	Yes	No	B
0306	Cylinder 6	Misfire detected	Yes	No	B
0313	Misfire detection	Misfire detected at low fuel level	Yes	No	B
0327	LH bank knock sensor	Open circuit	Yes	No	B
0332	RH bank knock sensor	Open circuit	Yes	No	B
0335	CKP sensor	Open circuit or No signal	No	No	A
0336	CKP sensor	Signal implausible	No	No	A
0337	CKP sensor	Short circuit to earth	No	No	—
0338	CKP sensor	Short circuit to battery	No	No	—
0339	CKP sensor	Open circuit/no signal	No	No	—
0340	CMP sensor	Open circuit/no signal	Yes	No	A
0341	CMP sensor	Signal implausible	Yes	No	A
0351	Ignition coil 1	No spark	No	No	A
0352	Ignition coil 2	No spark	No	No	A
0353	Ignition coil 3	No spark	No	No	A
0354	Ignition coil 4	No spark	No	No	A
0355	Ignition coil 5	No spark	No	No	A
0356	Ignition coil 6	No spark	No	No	A
0420	LH bank catalytic converter	Efficiency below threshold – light off too long	Yes	No	C
0430	RH bank catalytic converter	Efficiency below threshold – light off too long	Yes	No	C
0441	Diagnostics	EVAP purge flow test failure	Yes	No	B
0442	EVAP system	Minor leak	Yes	No	F
0443	Purge valve	Short circuit to battery	Yes	No	A
0444	Purge valve	Open circuit	Yes	No	A
0445	Purge valve	Short circuit to earth	Yes	No	A
0455	EVAP system	Major leak	Yes	No	F
0500	Vehicle speed signal	Signal implausible	Yes	No	B
0505	ECM idle speed control	System malfunction	Yes	No	A
0600	CAN Bus	CAN bus off	Yes	No	A
0606	ECM	Processor fault	Yes	No	A
1071	LH bank front HO2S	Too lean	Yes	No	C
1072	LH bank front HO2S	Too rich	Yes	No	C
1074	RH bank front HO2S	Too lean	Yes	No	C
1075	RH bank front HO2S	Too rich	Yes	No	C
1101	MAF sensor	Signal implausible for throttle angle	No	No	—



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P Code No.	Component/Signal	Fault Description	Warning Lamp		Drive Cycle
			SERVICE ENGINE (MIL)	SERVICE ENGINE SOON	
1113	ECM internal ambient pressure sensor	Automatic section failure	No	No	—
1115	Thermostat monitoring sensor	Coolant temperature stuck high	No	No	B
1117	Thermostat monitoring sensor	Short circuit to earth	Yes	No	B
1118	Thermostat monitoring sensor	Open circuit or short circuit to battery	Yes	No	B
1119	Thermostat monitoring sensor	Short circuit to earth	No	No	—
1122	APP sensor potentiometer 1	Open circuit or short circuit to earth	No	Yes	—
1123	APP sensor potentiometer 1	Short circuit to battery	No	Yes	—
1132	LH bank front HO2S	Heating defective	Yes	No	C
1133	RH bank front HO2S	Heating defective	Yes	No	C
1134	LH bank front HO2S	Slow response time	Yes	No	C
1135	LH bank front HO2S	Rich to lean time slow	Yes	No	C
1136	LH bank front HO2S	Lean to rich time slow	Yes	No	C
1141	Throttle potentiometer 1	Ratio of throttle potentiometer 1 signal to air flow implausible	Yes	Yes	B
1142	Throttle potentiometer 2	Ratio of throttle potentiometer 2 signal to air flow implausible	Yes	Yes	B
1146	LH bank lambda control	Downstream fuel trim above lean delay time	Yes	No	C
1147	RH bank lambda control	Downstream fuel trim above lean delay time	Yes	No	C
1148	LH bank lambda control	Downstream fuel trim above rich delay time	Yes	No	C
1149	RH bank lambda control	Downstream fuel trim above rich delay time	Yes	No	C
1150	LH bank lambda control	Downstream fuel trim fault at low fuel level	Yes	No	C
1151	RH bank lambda control	Downstream fuel trim fault at low fuel level	Yes	No	C
1152	RH bank front HO2S	Slow response	Yes	No	C
1153	RH bank front HO2S	Rich to lean time slow	Yes	No	C
1154	RH bank front HO2S	Lean to rich time slow	Yes	No	C
1155	LH bank rear HO2S	Heating defective	Yes	No	C
1160	RH bank rear HO2S	Heating defective	Yes	No	C
1161	LH bank front HO2S	Too rich	Yes	No	C
1162	LH bank front HO2S	Too lean	Yes	No	C
1163	RH bank front HO2S	Too rich	Yes	No	C
1164	RH bank front HO2S	Too lean	Yes	No	C
1165	LH bank lambda control	HO2S fault detected at low fuel level	Yes	No	C
1166	RH bank lambda control	HO2S fault detected at low fuel level	Yes	No	C
1167	LH bank rear HO2S	Signal implausible	No	No	C
1168	RH bank rear HO2S	Signal implausible	No	No	C
1180	LH bank rear HO2S	Slow response	Yes	No	C+
1181	RH bank rear HO2S	Slow response	Yes	No	C+

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P Code No.	Component/Signal	Fault Description	Warning Lamp		Drive Cycle
			SERVICE ENGINE (MIL)	SERVICE ENGINE SOON	
1227	APP sensor potentiometer 2	Open circuit or short circuit to earth	No	Yes	—
1228	APP sensor potentiometer 2	Short circuit to battery	No	Yes	—
1231	Fuel pump relay	Short circuit to earth	No	No	A
1232	Fuel pump relay	Short circuit to battery	No	No	A
1320	Misfire detection	Reluctor adaption fault	No	No	B
1321	Misfire detection	Reluctor tooth pattern fault	No	No	B
1322	Ignition system	Ignition fault on more than two cylinders	No	No	A
1351	Ignition coil 1	Short circuit to battery	No	No	A
1352	Ignition coil 2	Short circuit to battery	No	No	A
1353	Ignition coil 3	Short circuit to battery	No	No	A
1354	Ignition coil 4	Short circuit to battery	No	No	A
1355	Ignition coil 5	Short circuit to battery	No	No	A
1356	Ignition coil 6	Short circuit to battery	No	No	A
1383	Ignition feedback resistor	Open circuit	No	No	A
1391	Ignition coil 1	Spark duration too short	No	No	A
1392	Ignition coil 2	Spark duration too short	No	No	A
1393	Ignition coil 3	Spark duration too short	No	No	A
1394	Ignition coil 4	Spark duration too short	No	No	A
1395	Ignition coil 5	Spark duration too short	No	No	A
1396	Ignition coil 6	Spark duration too short	No	No	A
1450	DMTL pump motor	Change-over valve stuck	Yes	No	A
1451	DMTL pump motor	Reference current unstable	Yes	No	A
1452	DMTL pump motor	Reference current below limit	Yes	No	A
1453	DMTL pump motor	Reference current above limit	Yes	No	A
1454	DMTL change-over valve	Short circuit to battery	Yes	No	A
1455	DMTL change-over valve	Short to earth	Yes	No	A
1456	DMTL change-over valve	Open circuit	No	No	—
1470	VIS balance valve motor	Valve always open	No	No	B
1471	VIS balance valve motor	Valve always closed	No	No	B
1472	VIS power/ butterfly valves motor	Valves always open	No	No	B
1473	VIS power/ butterfly valves motor	Valves always closed	No	No	B
1474	VIS balance valve motor	Short circuit to battery	No	No	B
1475	VIS balance valve motor	Open circuit or short circuit to earth	No	No	B
1476	VIS power/ butterfly valves motor	Short circuit to battery	No	No	B
1477	VIS power/ butterfly valves motor	Open circuit or short circuit to earth	No	No	B
1488	DMTL pump motor	Open circuit or short circuit to earth	Yes	No	—
1489	DMTL pump motor	Short circuit to earth	Yes	No	A
1490	DMTL pump motor	Short circuit to battery	Yes	No	A
1537	A/C compressor clutch relay	Short circuit to earth	No	No	A
1538	A/C compressor clutch relay	Short circuit to battery	No	No	A
1540	APP sensor	Both signals implausible	Yes	Yes	B
1541	APP sensor	Signal implausible	No	Yes	—
1564	Cruise control interface ECU	MFL signal bit pattern implausible	No	No	A



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P Code No.	Component/Signal	Fault Description	Warning Lamp		Drive Cycle
			SERVICE ENGINE (MIL)	SERVICE ENGINE SOON	
1565	Cruise control interface ECU	MFL signal switch state implausible, circuit high voltage	No	No	—
1566	Cruise control interface ECU	MFL signal period time error, circuit low voltage	No	No	—
1567	Cruise control interface ECU	MFL signal SET/+ switch state implausible	No	No	A
1569	Cruise control interface ECU	MFL signal time out	No	No	A
1572	Brake pedal sensor	BLS signal defective or BTS signal active	No	No	—
1573	Brake pedal sensor	BTS signal defective	No	No	—
1574	Brake pedal sensor	Signals implausible	No	No	A
1575	Brake pedal sensor	APP sensor to brake sensor inputs implausible	No	Yes	B
1576	Brake pedal sensor	APP sensor to brake sensor inputs high	No	No	B
1577	Brake pedal sensor	APP sensor to brake sensor inputs low	No	No	B
1621	Serial link with immobilisation ECU	Timeout	No	No	A
1624	Serial link with immobilisation ECU	Code not accepted	No	No	A
1625	ECM, throttle monitoring/ self test	Internal fault	Yes	Yes	A
1626	ECM, throttle monitoring/ self test	Engine torque monitoring problem	Yes	Yes	B
1627	ECM, throttle monitoring/ self test	Engine speed monitoring problem	Yes	Yes	B
1628	ECM, throttle monitoring/ self test	PWM signal 1 duty cycle threshold exceeded for <1 second	Yes	No	B
1629	ECM, throttle monitoring/ self test	PWM signal 2 duty cycle threshold exceeded for >1 second	Yes	Yes	B
1630	ECM, throttle monitoring/ self test	Throttle position control deviation	Yes	Yes	B
1631	Throttle	Motor power stage fault	Yes	Yes	A
1636	ECM, throttle monitoring/ self test	Throttle motor adaptation not completed	Yes	Yes	A
1637	ECM, throttle monitoring/ self test	Throttle motor lower adaptation not plausible	Yes	Yes	A
1638	ECM, throttle monitoring/ self test	Throttle motor upper adaptation not plausible	Yes	Yes	A
1639	ECM, throttle monitoring/ self test	Throttle motor spring test not completed	Yes	Yes	A
1641	CAN bus	Bus off	No	No	—
1645	CAN bus link with ABS ECU	Timed out	No	No	A
1646	CAN bus link with EAT ECU	Timed out	Yes	No	A
1647	CAN bus link with instrument pack	Timed out	No	No	A
1666	Serial link with immobilisation ECU	Wrong code	No	No	A
1669	ECM cooling fan signal	Open circuit or short to battery	No	No	A
1670	ECM cooling fan signal	Open circuit	No	No	A

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P Code No.	Component/Signal	Fault Description	Warning Lamp		Drive Cycle
			SERVICE ENGINE (MIL)	SERVICE ENGINE SOON	
1671	ECM cooling fan signal	Short to battery	No	No	A
1672	Serial link with immobilisation ECU	Code implausible	No	No	A
1676	ECM, throttle monitoring/ self test	Engine torque versus driver demand implausible	No	Yes	B
1677	ECM, throttle monitoring/ self test	Engine speed versus driver demand implausible	No	No	B
1678	Throttle	Potentiometer 1 defective	Yes	Yes	B
1679	Throttle	Potentiometer 2 defective	Yes	Yes	B
1689	Brake vacuum enhancer solenoid valve - Up to 2003 model year	Short circuit to battery	No	No	A
1690	Brake vacuum enhancer solenoid valve - Up to 2003 model year	Short circuit to earth	No	No	A
1691	Brake vacuum enhancer solenoid valve - Up to 2003 model year	Open circuit	No	No	A
1692	Main relay	Main relay fault	No	No	A
1697	Ambient pressure	Value not plausible	No	No	A
1698	Ambient pressure	Failure value stored	No	No	A
1699	Ambient pressure	Learning not successful	No	No	A
2122	APP sensor - Potentiometer 1	Short circuit to earth or open circuit	Yes	Yes	A
2123	APP sensor - Potentiometer 1	Short circuit to battery	Yes	Yes	A
2127	APP sensor - Potentiometer 2	Short circuit to earth or open circuit	Yes	Yes	A
2128	APP sensor - Potentiometer 2	Short circuit to battery	Yes	Yes	A
2138	APP sensor - Potentiometer comparison	Switch D/E voltage correlation	No	Yes	B



Drive Cycles

A number of different drive cycles are defined by OBD legislation for fault diagnosis. Each drive cycle is a precise routine which the engine or vehicle must undergo to produce the conditions that enable the ECM to perform diagnostic routines. TestBook/T4 can be used to view the status and results of the diagnostic routines performed by the ECM. When a fault code is stored, it will indicate, via TestBook/T4 and the Diagnostic P code list, the drive cycle required to verify a repair.

When a fault has been rectified and the fault P codes cleared from the applicable ECU using TestBook/T4, the following drive cycles must be performed to ensure that the fault has been corrected and to ensure that no other fault codes are subsequently stored. The above P Code table shows the applicable drive cycle required when a particular P code has been recorded.

WARNING: Ensure that the drive cycles are performed in a safe area and do not endanger other road users. Observe all local highway laws when performing the drive cycles.

The following drive cycle procedures relate to the drive cycle letters shown in the Diagnostic P Code table

Drive Cycle A

- 1 Move the ignition switch to position II for 30 seconds.
- 2 Make sure that the engine coolant temperature is less than 60 °C (140 °F).
- 3 Start the engine and allow to idle for 2 minutes.
- 4 With TestBook/T4 connected to the vehicle diagnostic socket, check for fault codes.
- 5 Investigate and rectify any fault codes found and perform the relevant drive cycle procedure for the fault codes.

Drive Cycle B

- 1 Move the ignition switch to position II for 30 seconds.
- 2 Make sure that the engine coolant temperature is less than 60 °C (140 °F).
- 3 Start the engine and allow to idle for 2 minutes.
- 4 Perform two light accelerations (0 to 35 mph with light throttle pedal pressure).
- 5 Perform two medium accelerations (0 to 45 mph with moderate throttle pedal pressure)
- 6 Perform two hard accelerations (0 to 55 mph with heavy throttle pedal pressure).
- 7 With the vehicle stationary, allow the engine to idle for 2 minutes.
- 8 With the engine still running and TestBook/T4 connected to the vehicle diagnostic socket, check for fault codes.
- 9 Investigate and rectify any fault codes found and perform the relevant drive cycle procedure for the fault codes.

Drive Cycle C

- 1 Move the ignition switch to position II for 30 seconds.
- 2 Make sure that the engine coolant temperature is less than 60 °C (140 °F).
- 3 Start the engine and allow to idle for 2 minutes.
- 4 Perform two light accelerations (0 to 35 mph with light throttle pedal pressure).
- 5 Perform two medium accelerations (0 to 45 mph with moderate throttle pedal pressure)
- 6 Perform two hard accelerations (0 to 55 mph with heavy throttle pedal pressure).
- 7 Cruise at a constant 60 mph for 8 minutes.
- 8 Cruise at a constant 50 mph for 3 minutes.
- 9 With the vehicle stationary, allow the engine to idle for 3 minutes.
- 10 With the engine still running and TestBook/T4 connected to the vehicle diagnostic socket, check for fault codes.
- 11 Investigate and rectify any fault codes found and perform the relevant drive cycle procedure for the fault codes.

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Drive Cycle C+

- 1 This is an extended Drive Cycle C to enable the internal diagnostic process to be completed which is not achieved by Drive Cycle C. Perform this additional drive cycle after the 3 minute idle is completed and when prompted by TestBook/T4.
- 2 Perform medium acceleration to 60 mph and hold for 10 seconds.
- 3 Release the throttle pedal and allow the vehicle to decelerate to 50 mph.
- 4 Perform a second medium acceleration to 60 mph and hold for 10 seconds.
- 5 Release the throttle pedal and allow the vehicle to decelerate to 50 mph.
- 6 Repeat steps 4 and 5 a further 13 times until 15 acceleration/decelerations cycles have been performed.
- 7 With the engine still running and TestBook/T4 connected to the vehicle diagnostic socket, check for fault codes.
- 8 Investigate and rectify any fault codes found and perform the relevant drive cycle procedure for the fault codes.

NOTE: DRIVE CYCLE C and C+ – Faults in the following areas also have an associated 'Readiness Test' that must be flagged as 'completed' before the technician can verify that the problem in that area is rectified:

- Catalytic Converter fault
- Evaporative Loss System (EVAP) fault
- HO2S fault
- HO2S heater fault.

Although these tests are normally completed within Drive Cycle C, select the 'Readiness Test' icon on the TestBook/T4 screen to verify that the test has been flagged as completed.

Drive Cycle D

- 1 Move the ignition switch to position II for 30 seconds.
- 2 Make sure that the engine coolant temperature is less than 60°C (140 °F).
- 3 Start the engine and allow to idle for 2 minutes.
- 4 Perform two light accelerations (0 to 35 mph with light throttle pedal pressure).
- 5 Perform two medium accelerations (0 to 45 mph with moderate throttle pedal pressure)
- 6 Perform two hard accelerations (0 to 55 mph with heavy throttle pedal pressure).
- 7 Cruise at a constant 60 mph for 5 minutes.
- 8 Cruise at a constant 50 mph for 5 minutes.
- 9 Cruise at a constant 35 mph for 5 minutes.
- 10 With the vehicle stationary, allow the engine to idle for 2 minutes.
- 11 With the engine still running and TestBook/T4 connected to the vehicle diagnostic socket, check for fault codes.
- 12 Investigate and rectify any fault codes found and perform the relevant drive cycle procedure for the fault codes.

Drive Cycle E

- 1 Make sure that the fuel tank is at least $\frac{1}{4}$ (25%) full.
- 2 Perform Drive Cycle A.
- 3 Switch off the engine and allow the vehicle rest undisturbed for 20 minutes.
- 4 Move the ignition switch to position II.
- 5 With TestBook/T4 connected to the vehicle diagnostic socket, check for fault codes.
- 6 Investigate and rectify any fault codes found and perform the relevant drive cycle procedure for the fault codes.

Drive Cycle F

- 1 For P codes requiring this drive cycle, TestBook/T4 will provide guidance to force the actuator or function through a diagnostic routine to confirm correct operation.



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Operation

Engine Starting

When the ignition switch is in position II a power feed is connected from the ignition switch to the ECM relay and the ECM. The ECM then initiates 'wake up' routines and energises the main and fuel pump relays.

When the engine cranks, provided a valid mobilisation signal is received from the immobilisation ECU, the ECM initiates throttle control, fuelling and ignition to start and maintain control of the engine as necessary to meet driver demand. If no mobilisation code is received from the immobilisation ECU, or the code is invalid, the ECM inhibits fuel injection and ignition to prevent the engine from starting.

The electrical circuit from the fuel pump relay to the fuel pump is routed through the fuel cut-off inertia switch, located below the E-box in the engine compartment. In the event of a collision the switch breaks the circuit to prevent further fuel being delivered to the engine. The switch is reset by pressing down the centre of the rubber cover on the top of the switch.

During the start sequence, the ECM also illuminates the MIL, as a bulb check. While the ignition switch is in position II the MIL is continuously illuminated. The MIL is extinguished when the ignition switch turns to position III and the engine starts.

Engine Stopping

When the ignition switch is turned to position I, the ECM switches off the ignition coils and fuel pump to stop the engine and the ECM relay de-energises to disconnect the power feed to the fuel injectors. The ECM continues to energise the main relay until the power down functions are completed. Power down functions include the fuel tank leak check, engine cooling and memorising data for the next start up. If neither a fuel tank leak check nor engine cooling are required, the power down process takes approximately 10 seconds.

When the power down process is completed, the ECM de-energises the main relay and enters a low power mode. In the low power mode, maximum quiescent drain is 0.5 mA.

