EMM.l - A EMM SECTIONS EXPLAINED

Introduction - EMM.l

This section starts with a general description of the fuel injection and engine management system to provide an overview of the system and its components. The operation of the malfunction indicator lamp is explained, together with the concept of the fault codes. The 'Tech 1' scanner tool is introduced, and its operation explained, together with other special tools required to service and diagnose the system.

Description of Ooeration - EMM.2

This section explains the function of each individual component and where it is fitted, in order that the operation of the system may be thoroughly understood.

Individual Comoonent Diaanosis & Replacement - EMM.3

This section contains the circuit diagrams, fault finding charts and test procedures necessary to diagnose faults in each component. Replacement procedures and torque figures are also included.

Fault Diaanosis - EMM.4

Individual component diagnosis and replacement procedures.

EMM.l - B GENERAL DESCRIPTION

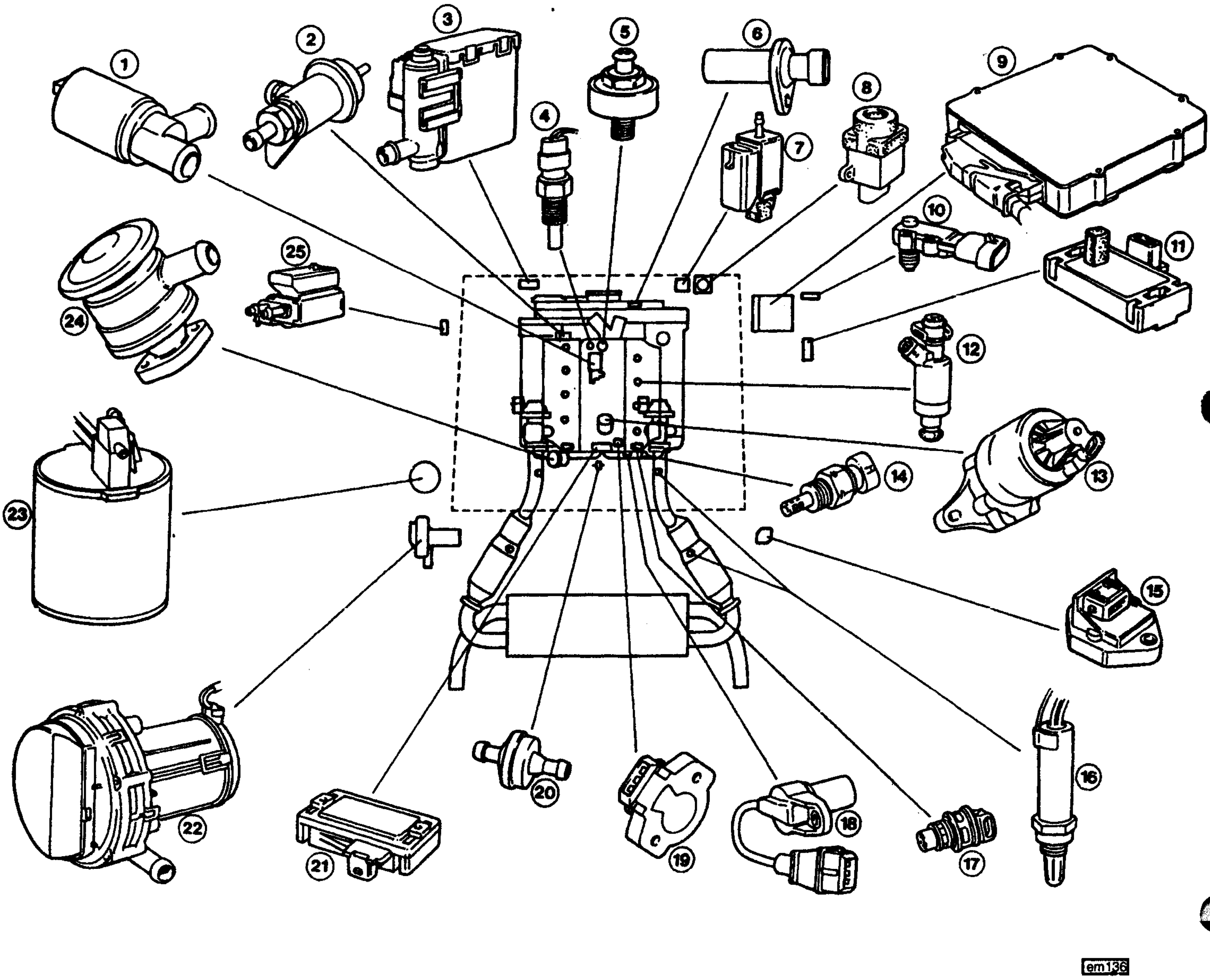
The engine management system used on the Lotus Esprit V8 is a Lotus designed fully electronic microprocessor based system controlling the fuel injection, ignition and emission control systems. Individual fuel injectors are used in the inlet tracts of all eight cylinders, and are operated sequentially for optimum efficiency, with a further pair of 'secondary' injectors mounted in the intake plenum to supply extra fuel only under conditions of maximum demand. The injectors are supplied with fuel at constant pressure (relative to inlet manifold pressure) from a common fuel rail, with the quantity of fuel delivered to the engine being controlled by the length of time (pulse width) for which the solenoid operated injectors are opened. The eight port injectors are normally pulsed once during each cylinder's complete cycle (sequential injection), with the main fuel delivery into the inlet port timed to occur just after the inlet valve closes, in order to cool the valve, and ensure full atdmisation of the fuel/air mixture. A second, shorter period of injection at the non-firing TDC, is used to top up the fuelling requirement wtien necessary.

The injectors are controlled by a processor called an Electronic Control Module (ECM) which calculates the amount of fuel required by the engine under the operating conditions at any particular time. Information is fed into the ECM by a series of sensors measuring air and coolant temperature, barometric and intake plenum gas pressure, engine and vehicle speed, throttle position and any detected combustion knock. This data is used by the ECM to calculate the quantity of fuel required, the ignition timing, allowable turbocharger boost pressure and idle speed. Various systems are used to minimise noxious combustion and evaporative emissions. Catalytic converters are used in the exhaust system for each cylinder bank, with oxygen feedback to

Kev to Schematic Diaaram

1. Primary fuel pump.
2. Secondary fuel pump.
3. Fuel filter.
4. Port fuel injector (x 8).
5. Plenum (secondary) fuel injector (x 2).
6. Fuel Pressure Regulator Valve (PRV).
7. Manifold Absolute Pressure (MAP) sensor.
8. Exhaust Gas Recirculation (EGR) valve.
9. Idle Air Control (IAC) valve.
10. Throttle body.
11. Throttle Position (TP) sensor.
12. Coolant Temperature Sensor (TPS).
13. Intake Air Temperature **(IAT)** sensor,
14. Air cleaner (x 2).
15. Turbocharger (x 2).
16. Wastegate capsule (x 2).
17. Camshaft sensor.
18. Ignition high tension coilpacks (x 2).
19. H.T. lead/plug cap/spark plug (x 8).
20. Knock sensor.
21. Crankshaft sensor.
22. Air injection (AIR) control valve.
23. Air pump.
24. Pre cat. oxygen **(O_2)** sensor (x 2).
25. Starter catalytic converter.
26. Post cat. oxygen **(O_2)** sensor (x 2).
27. Main catalytic converter (x 2).
28. Exhaust muffler.

Component Location & Identification Diaaram



Key to Component Location & Identification Diaaram

1. Idle Air Control (IAC) valve.
2. Fuel Pressure Regulator Valve (PRV).
3. Charcoal canister vent close valve.
4. Coolant Temperature Sensor (CTS).
5. Knock sensor.
6. Crankshaft sensor.
7. Wastegate solenoid valve.
8. Inertia switch.
9. Electronic Control Module (ECM).
10. Fuel tank pressure sensor.
11. Barometric (BARO) sensor.
12. Port fuel injector.
13. Exhaust Gas Recirculation (EGR) valve.
14. Intake Air Temperature **(IAT)** sensor.
15. Rough road sensor.
16. Oxygen **(O_2)** sensor.
17. Plenum (secondary) injectors.
18. Camshaft sensor.
19. Throttle Position (TP) sensor.
20. Non-return valve (breather).
21. Manifold Absolute Pressure (MAP) sensor.
22. Air pump.
23. Charcoal canister.
24. Air injection (AIR) control valve.
25. Air injection (AIR) solenoid valve.

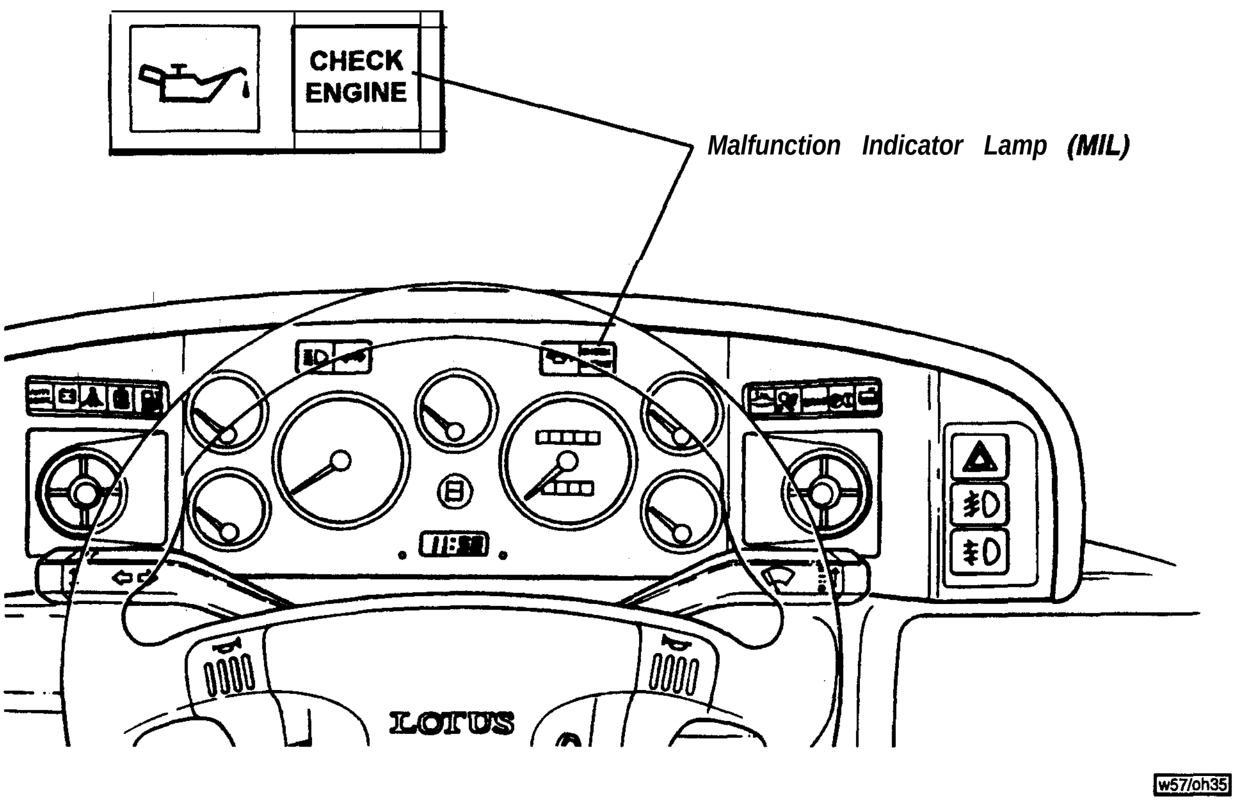
control the air fuel ratio to that required to ensure optimum catalyst efficiency. Exhaust gas recirculation (EGR) is used to reduce the emission of oxides of nitrogen. Evaporative emissions from the fuel tank are fed into a charcoal canister, and, under the control of the ECM, into the engine. The ECM also controls the switching of the radiator cooling fans and air conditioning, and provides a diagnostic function for the complete system.

The ECM monitors the signals received from the various sensors and compares them with pre-programmed tolerance bands to enable it to recognise 'faults' in the system and light a 'malfunction indicator lamp' (MIL), labelled 'Check Engine', on the instrument panel. This informs the driver that a fault has been detected and furthermore stores in its memory a 'trouble code' for the particular type of fault detected, which can then by accessed by a technician who will be guided to the problem area. A hand held electronic scanner tool ('Tech 1') with an LED display panel may be plugged into a special harness connector, and is able to communicate with the ECM and display trouble codes and sensor readings to facilitate speedy fault diagnosis.

The ignition system dispenses with the need for a distributor by using four 'double ended' H.T. coils mounted within the engine vee. The ECM uses signals received from an engine speed sensor reading from the crankshaft front pulley, and an engine position sensor reading from the rear end of the RH inlet camshaft, and fires the spark plugs in pairs once every crankshaft revolution, on the 'wasted spark' principle. The ECM controls ignition timing based on data including inlet air temperature and pressure, engine speed and throttle opening, and any detected detonation 'knock'.

EMM.I - C MALFUNCTION INDICATOR LAMP (MIL)

A 'malfunction indicator' lamp (MIL) with the legend Check Engine' is provided in the instrument panel in order to indicate to the driver that an engine management problem has occurred and that the vehicle should be taken for check/repair as soon as is practicable.



As a bulb and system check, the lamp will light with the ignition on, and should go out when the engine is started. If, however, the lamp remains on, or comes on whilst driving, this indicates that the self diagnostic system has detected a problem and a trouble code has been stored in the memory. If the fault cures itself, or