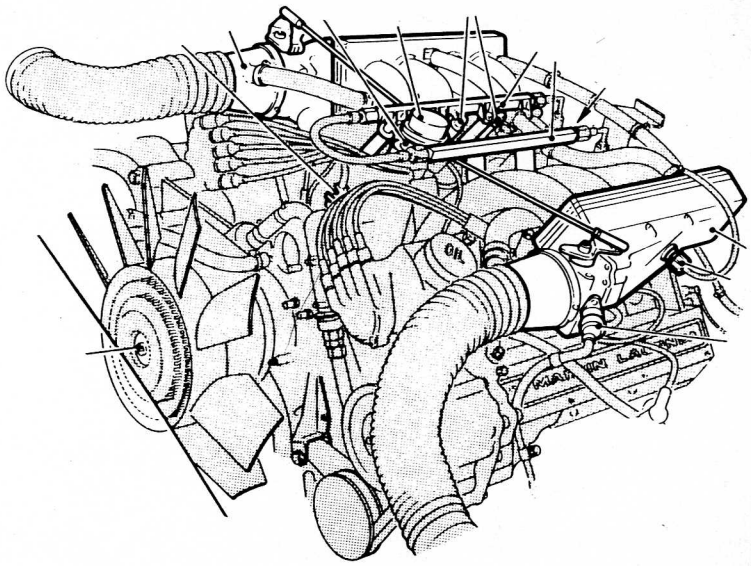
By Appointment to
His Royal Highness the Prince of Wales
Motor Car Manufacturer and Repairer
Aston Martin Lagonda Limited
Newport Pagnell

ASTON MARTIN LAGONDA LIMITED

TRAINING MANUAL

ELECTRONIC FUEL INJECTION

585 ENGINES



CONTENTS

ELECTRONIC FUEL INJECTION

ENGINE SPECIFICATION

Camshafts

Location	AML Part No.
Inlet, RH Bank	095.007.0006
Inlet, LH Bank	095.007.0119
Exhaust, RH Bank	07.11267
Exhaust, LH Bank	07.11268

Compression Ratio

Non-emission (European)	9.3:1
Emission (Federal)	8.1:1

Maximum rpm

Sustained	5750
Intermittent (Restricted by rev. limiter)	6000/6200

Spark Plugs

Non-emission (European) NGK. BPR. 6EY

Emission (Federal) NGK.BPR. 5EV

Note: Spark plugs should be fitted using 'Copaslip', AML Part No. 693355, on the thread and tightened to a torque of 16-19Nm (12-14 lb. ft.).

Gap: 0.030in. (0.76mm)

Valve clearance (Cold)

Inlet	0.41 to 0.46mm (0.016 to 0.018 in.)
Exhaust	0.43 to 0.48 mm (0.017 to 0.019 in.)

Valve Timing at TDC

Inlet	1.52mm (0.060 in.) opening
Exhaust	0.076mm (0.030 in.) closing

Firing Order (Ignition)

'A' Bank Distributor	1, 4, 6, 7
'B' Bank Distributor	5, 2, 3, 8

Injectors firing together
1&5, 4&2, 6&3, 7&8

Ignition Timing Setting

Automatically controlled via the EFI Control Unit.

PRINCIPLES OF OPERATION

The system produces a very precise air/fuel mixture and by optimising the ignition advance/retard setting, extracts an increased horsepower rating from the engine, reduces the fuel consumption and lowers the amount of unburnt exhaust gas.

It operates on the 'Speed/Density' principle. The engine rpm and the air density are used to measure the air intake quantity and once this is known, the required fuel quantity is determined. Further sensing devices in the system correct the mixture proportions and compute the required ignition setting to match the driving conditions.

The quantity of air introduced into each cylinder per cycle depends on the density of air in the inlet manifold, on the cylinder displacement and on the volumetric efficiency. The air density is calculated as a function of the pressure and the temperature of the air in the inlet manifold. The volumetric efficiency is determined by the full operation range of the engine — in terms of rpm and load — and is then stored in the memory of the electronic control unit.

Three inter-related sub-systems combine together to form the complete system, viz:-

1. Fuel The fuel is injected into the inlet manifold before the inlet valve opens.

2. Air The requisite quantity of air is induced into the inlet manifold through a throttle valve which is controlled by monitoring devices during warm up.

3. Electrical The various engine conditions are relayed to the electronic control unit which computes the fuel mixture and ignition advance/retard requirements.

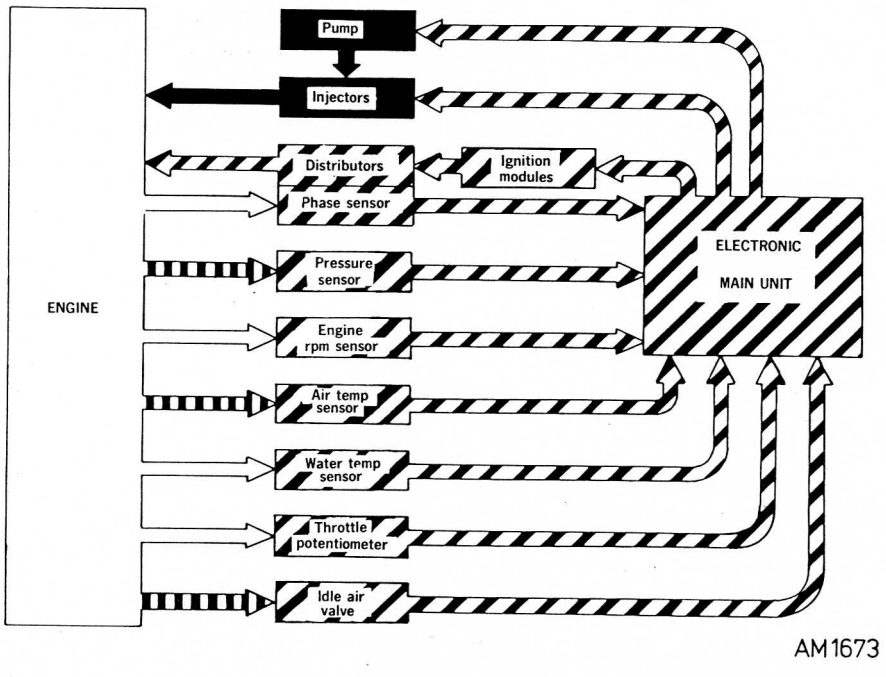
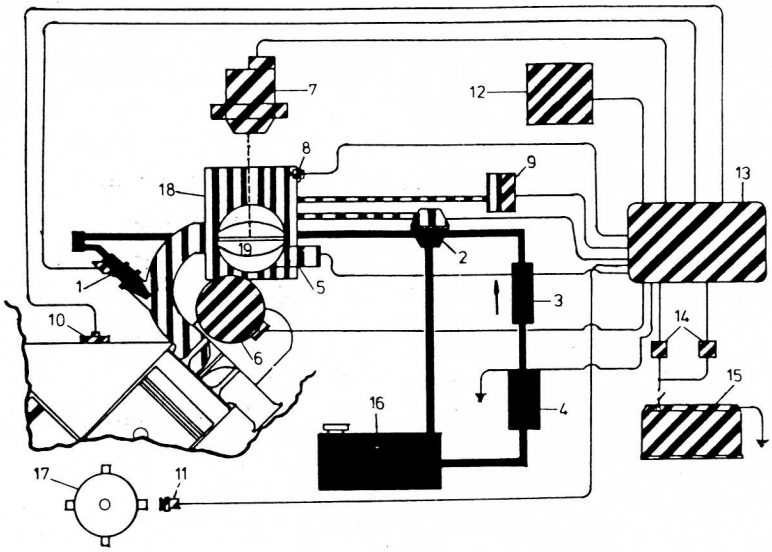


Fig.1 Block Daigram of System

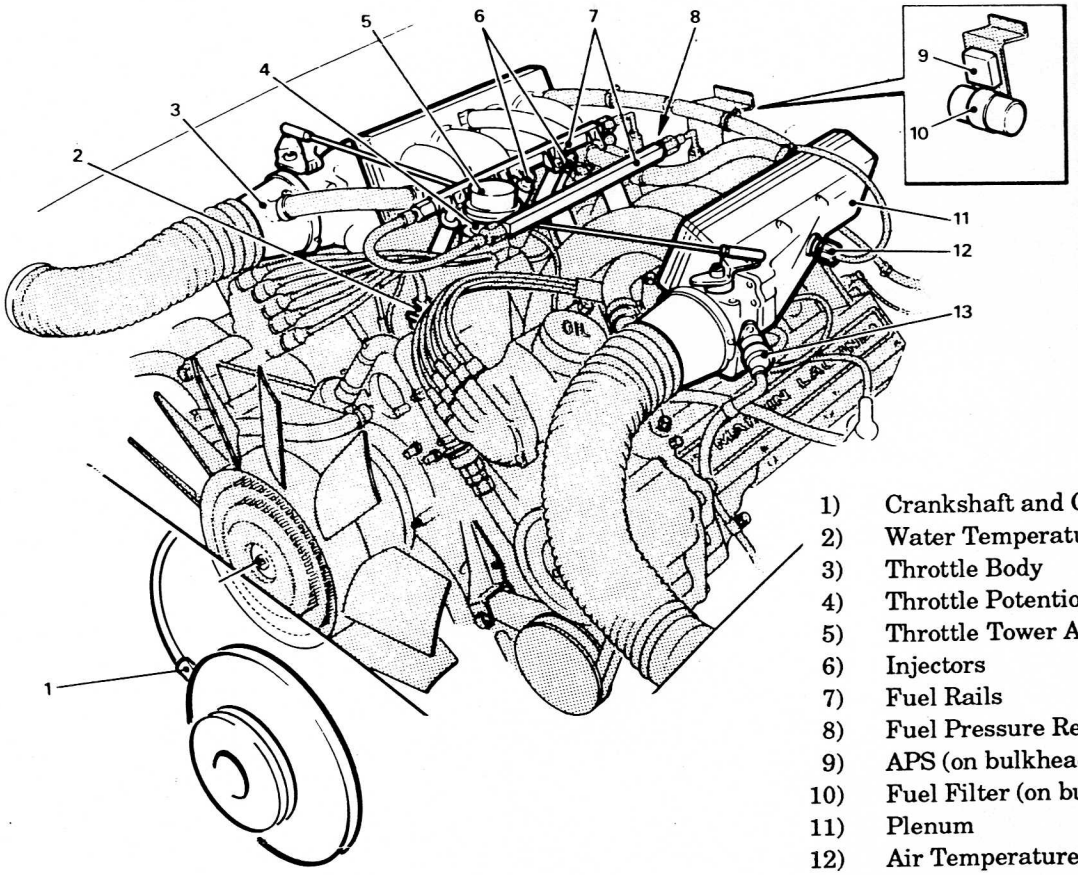


Key

1) Electric Injectors
2) Pressure Regulator
3) Fuel Filter
4) Fuel Pump
5) Additional Air Valve
6) Phase Sensors
7) Throttle Potentiometer
8) Air Temperature sensor
9) Absolute Pressure Sensor
10) Water Temperature Sensor
11) Engine rpm Sensor
12) Ignition Group
13) Electronic Main Unit
14) Relays
15) Battery
16) Tank
17) Engine Shaft Pulley
18) Inlet Manifold
19) Throttle Valve Body

Fuel System Air System Electrical System

Fig.2 Schematic Layout of Components



1) Crankshaft and Crank Pick-up
2) Water Temperature Sensor
3) Throttle Body
4) Throttle Potentiometer
5) Throttle Tower Assembly
6) Injectors
7) Fuel Rails
8) Fuel Pressure Regulator
9) APS (on bulkhead)
10) Fuel Filter (on bulkhead)
11) Plenum
12) Air Temperature Sensor
13) Idle Air Valve
14) Ignition Module

Fig.3 Layout of Components of Engine

STARTING AND RUNNING

Starting

As soon as the starter motor turns, the control unit activates the fuel pump. At the same time it receives signals from the sensors which indicate the atmospheric pressure and engine temperature. When the engine starts, the required injection and ignition conditions are determined by the main control unit as a result of rpm and phase signals.
During cold starting, a rich fuel mixture is provided and an optimised ignition setting.
When the engine is running the control unit will vary the ignition advance angle.
An additional feature for emission control cars is an automatic, twelve-second fast idle.
During warm up, the enrichment and idle speed are progressively reduced.

Normal Running

When the normal running temperature of the coolant has been reached, the control unit calculates the phase angle, injection and ignition advance in relation to the manifold air density and engine speed.
From these values, the exact quantity of fuel which is required is determined and this quantity is injected into each cylinder at the precise instant in relation to the engine speed for maximum economy and power.

Acceleration

During acceleration, the air pressure in the inlet manifold varies and as a result of a signal from the relevant sensor, together with a signal from the water temperature sensor, the control unit computes the increase in the amount of fuel which will be required to give the desired acceleration.

Deceleration

The control unit recognises this condition by means of the throttle position sensor, the pressure in the inlet manifold and the engine rpm. It then regulates the amount of fuel which in injected into the cylinders. This increases the braking effect of the engine and reduces the fuel consumption.

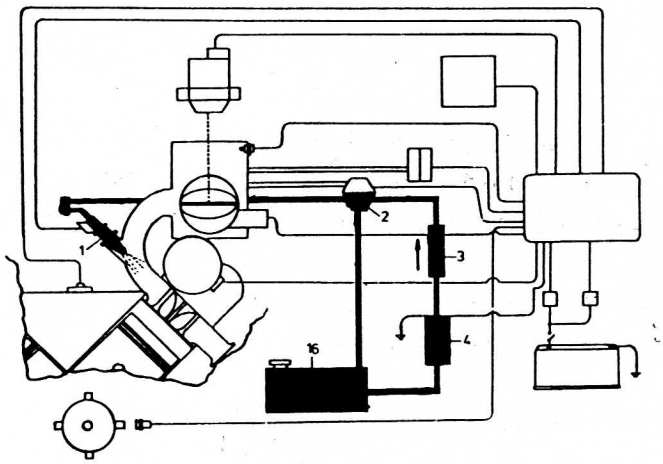
Full Load Conditions

Under full load conditions, it is necessary to provide a richer mixture in order to maintain maximum engine performance. This is because the basic mixture value is aimed at providing a low fuel consumption figure. This is automatically determined by the control unit which recognises this full load condition by signals from the throttle position sensor, the inlet manifold pressure sensor and the engine rpm sensor.

THE FUEL SYSTEM

GENERAL DESCRIPTION

The electric pump draws fuel through a small, non-serviceable filter in the tank and pumps it through a filter to the fuel rail, which is made up of several branches. Each branch contains an injector. The pressure in the system is kept constant in relation to the inlet manifold by a pressure regulator which ensures that any excess fuel is returned to the tank.



Key

1) Electric Injectors
2) Pressure regulator
3) Fuel filter
4) Fuel pump
16) Tank

Fig. 4 Schematic Layout of Fuel System Components

COMPONENTS

Injectors

The injector controls the quantity of fuel which is delivered into the cylinder. It has two alternative positions — ON or OFF.

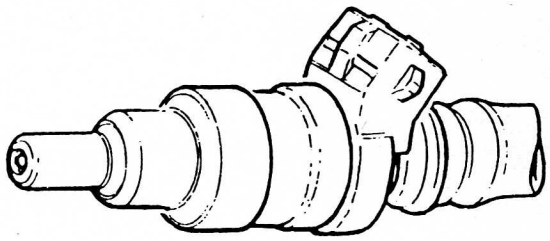
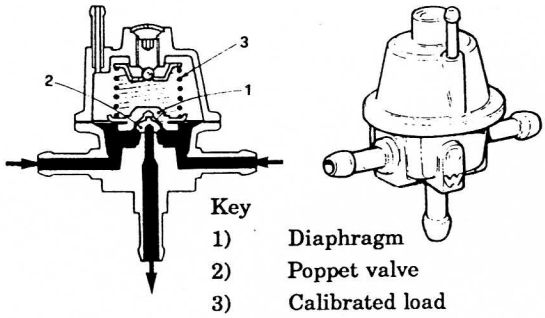


Fig.5 Injector

Pressure Regulator

This prevents sudden changes of pressure being applied to the injectors. It is of the differential diaphragm type and it is calibrated to operate at 2.5 bar (36.5 lb. in.).



Key
1) Diaphragm
2) Poppet valve
3) Calibrated load

Fig. 6 Pressure Regulator

Fuel Filter

This is fitted between the pump and the pressure regulator. The arrow shows the direction of flow of the fuel. It contains a paper filter. There is an additional filter in the fuel tank.

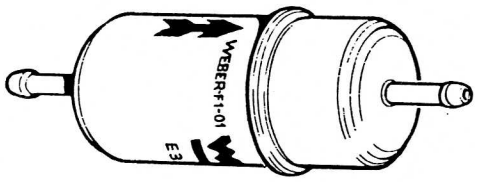


Fig. 7 Fuel Filter

The Fuel Pump

This is a motor-driven, volumetric, roller pump, the motor being immersed in the fuel. The volume of the fuel is limited by rollers which are pressed against the outer ring when the motor is rotating. A non-return valve is provided to prevent the fuel system from emptying the pump when it is not operating

An over-pressure valve short circuits the delivery if the pressure reaches — 5 bar (72 lb/in). This prevents the motor from overheating and sustaining possible damage.

WARNING: DO NOT OPERATE THE FUEL PUMP DRY

The system must be de-pressurised before any fuel connection is disturbed. The system must be primed after any fuel connection has been disturbed. This includes the draining and refilling of the fuel tank.

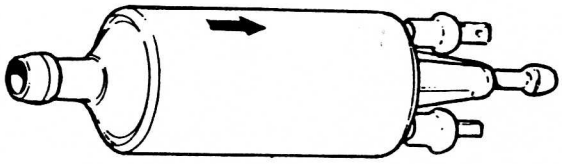
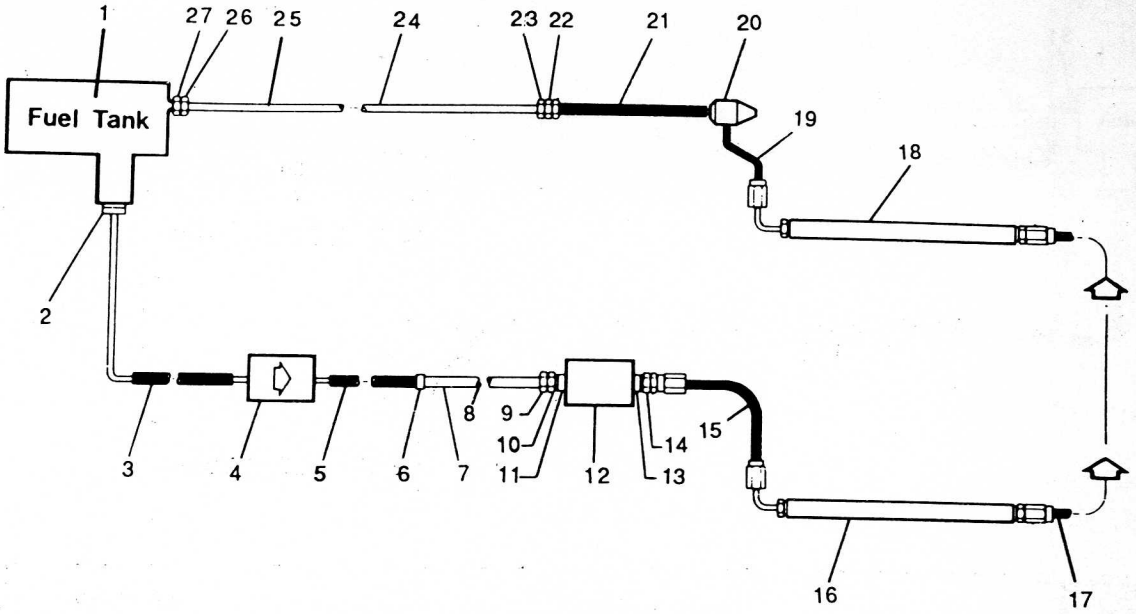


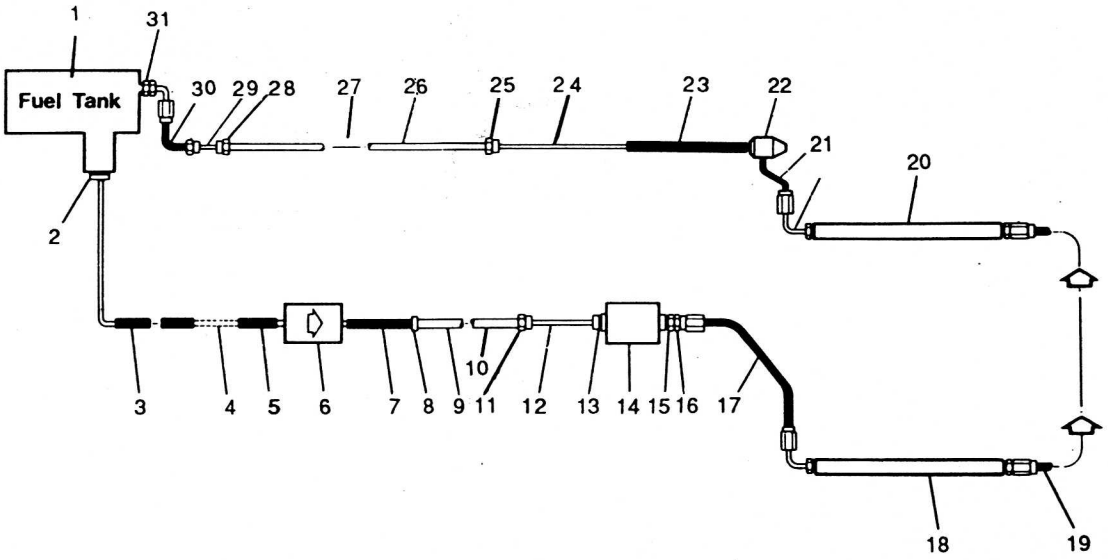
Fig. 8 Fuel Pump



Note: *Japanese and USA Federal cars are fitted with a fuel intercooler.*

ITEM No.	DESCRIPTION	PART No.
1	Fuel tank, Saloon	095.34.0020
	Fuel tank, Volante	34.12798
2	Fuel pick-up assembly	34.21890
3	Hose assembly, pick-up to fuel pump, Saloon	34.22011
	Hose assembly, pick-up to fuel pump, Volante	34.22019
4	Fuel pump	34.20007
5	Hose assembly, fuel pump to fuel line	34.22012
6	Reducing connector	34.21172
7	Main feed line 1/2" OD, 4600mm long	690444
8	Clear PVC sleeve, 5/8" ID, (for bend protection)	691951
9	Main feed line connection, 3/8" fir tree	080.34.0119
	Main feed line connection, 16mm sleeve nut	691516
10	Adaptor, 16mm to 14mm, male union	691523
11	Copper washer 14mm ID	691534
12	Fuel filter	34.20882
13	Copper washer, 12.3mm ID	693356
14	Connector, male M12 to 9/16", UNF JIC	34.21902
15	Hose assembly, fuel filter to fuel rail	34.22006
16	Fuel rail assembly, L.H.	08.20305
17	Hose assembly, fuel rail to fuel rail	08.22007
18	Fuel rail assembly, R.H.	08.20306
19	Hose assembly, fuel rail to pressure regulator	08.22008
20	Pressure regulator assembly	08.21527
21	Hose assembly, pressure regulator to return line	34.22013
22	Connector 9/16" UNF male to 1/4" BSP male	693304
23	Return line connection, 1/4" fir tree	690430
	Return line connection, 1/4" BSP nut	690431
24	Return line	691493
25	Clear PVC sleeve, 1/2" ID (for bend protection)	693732
26	Return line connection, 1/4" fir tree	690430
	Return line connection, 1/4" BSP nut	690431
27	Double ended union, 1/4" BSP	119626

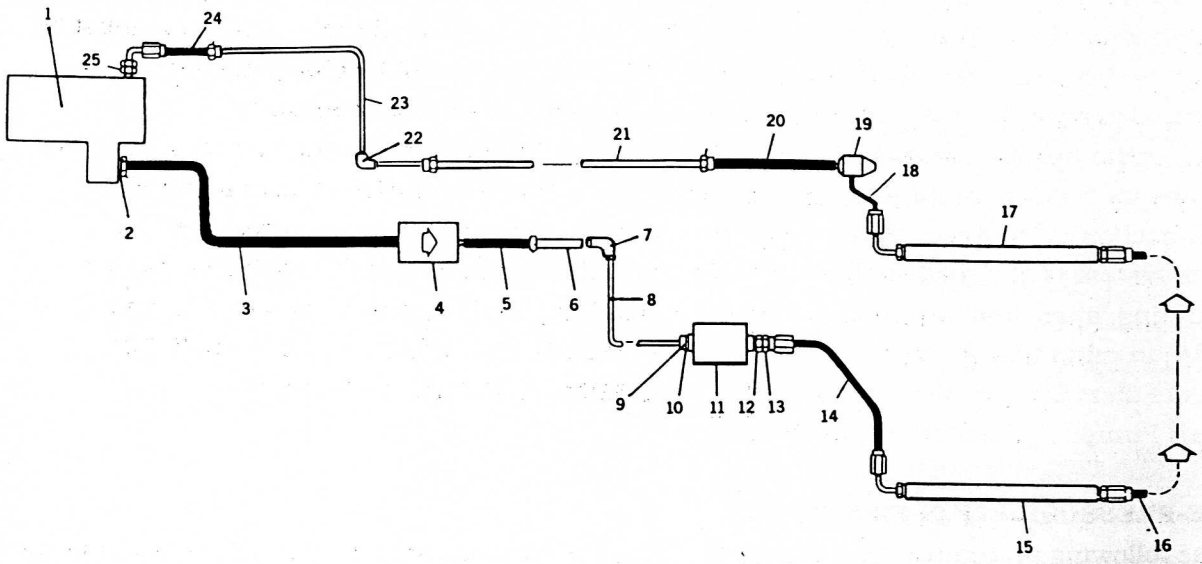
Schematic Layout of Fuel System Components — Aston Martin



ITEM No.	DESCRIPTION	PART No.
1	Fuel tank	34.20809
2	Fuel pick-up assembly	34.21890
3	Hose assembly - fuel pick-up to over-axle pipe	34.22003
4	Feed pipe over axle	34.21894
5	Hose assembly - over axle feed pipe to fuel pump	34.22004
6	Fuel pump	34.20007
7	Hose assembly - fuel pump to feed line	34.22005
8	Reducing connector	34.21172
9	Main feed line, 1/2" OD, 2400mm long	690444
10	Clear PVC sleeve, 5/8" ID, (for bend protection)	691951
11	Main feed line connection, 3/8" fir tree	080.34.0119
	3/8" BSP nut	691878
12	Fuel feed line forward assembly	34.21566
13	Copper washer, 14mm ID	691534
14	Fuel filter	34.20882
15	Copper washer, 12.3mm ID	693356
16	Connector, male M12 to 9/16" UNF JIC	34.21908
17	Hose assembly - fuel filter to fuel rail	34.22323
18	Fuel rail assembly, L.H.	08.20305
19	Hose assembly - fuel rail to fuel rail	08.22007
20	Fuel rail assembly, R.H.	08.20306
21	Hose assembly - fuel rail to pressure regulator	08.22008
22	Pressure regulator assembly	08.21527
23	Hose assembly - pressure regulator to return pipe	34.22013*
		34.22009**
24	Return line pipe forward assembly	34.21177
25	Return line connection, 1/4" fir tree	690430
	1/4" BSP nut	690431
26	Return line, 2700mm long	691493
27	Clear PVC sleeve, 1/2" ID (for bend protection)	691950
28	Return line connection, 1/4" fir tree	690430
	1/4" BSP nut	690431
29	Return pipe assembly - over axle	34.21897
30	Hose assembly - over-axle pipe to tank	34.22010
31	Connector, 9/16" UNF JIC male to 1/4" BSP male	693304

* For use with item 24 with screw-on union at one end
** For use with item 24 with two plain ends

Schematic Layout of Fuel System Components — Early Lagonda



Note: *Japanese and USA Federal cars are fitted with a fuel intercooler.*

ITEM No.	DESCRIPTION	PART No.
1	Fuel tank	34.22962
2	Fuel pick-up assembly	34.21890
3	Hose assembly, pick-up unit to fuel pump	34.24168
4	Fuel pump	34.24167
5	Hose assembly, fuel pump to feed pipe	34.24169
6	Fuel feed pipe assembly, rear section	34.24170
7	Elbow, male/male, 9/16" JIC	693813
8	Fuel feed pipe assembly, front section	34.24172
9	Adaptor, male/male, 9/16". JIC to M14 1.5	693810
10	Copper washer, 14mm ID	691534
11	Fuel filter	34.20882
12	Copper washer, 12mm (nominal) ID	693356
13	Adaptor, male/male, M12 to 9/16" JIC	34.21902
14	Hose assembly, fuel filter to fuel rail	34.24174
15	Fuel rail assembly, LH bank	08.20305
16	Hose assembly, fuel rail to fuel rail	08.24207
17	Fuel rail assembly, RH bank	08.20306
18	Hose assembly, fuel rail to pressure regulator	08.24208
19	Pressure regulator	08.21527
20	Hose assembly, pressure regulator to return pipe	34.24175
21	Fuel return pipe assembly, front section	34.24176
22	Elbow, male/male, 1/2" JIC	693816
23	Fuel return pipe, rear section	34.24170
24	Hose assembly, return pipe to tank	34.24180
25	Adaptor, male/male 9/16" JIC to 1/4" BSP	693304

Schematic Layout of Fuel System Components — Current Lagonda

SAFETY PRECAUTIONS

It is of vital importance to the correct operation of the system that the fuel supply to the injector nozzles is kept free of contaminants. For this reason, all fuel connections must be cleaned prior to assembly or dis-assembly. The fuel filter must be changed regularly at normal service intervals. **No sealants must be used on any connections.**
The entire fuel system from the pump is pressurised even after the engine is switched off, therefore it is important for safety that the system is de-pressurised before any fuel connection is loosened. Refer to de-pressurisation procedure for the correct method.
The system is designed so that the fuel pump will not run unless the engine is cranked or running, apart from an initial period after switching on the ignition. However, it should be born in mind that the FUEL PUMP WILL BE DESTROYED IF ALLOWED TO RUN DRY.
Fuel Filter: Service Life: 10,000 miles (16,000Km) AML Part No. 34.20882
Fuel Pump: AML Part No. 34.20007

DE-PRESSURISATION PROCEDURE

The following procedure must always be carried out to reduce fuel system pressure prior to loosening any fuel connection.

1. Disconnect the electrical feed to the fuel pump. (The easiest way to do this is to raise the plunger in the fuel cut off inertia switch, or by disconnecting the positive wire to the fuel pump).
2. Crank engine for 30 seconds.
   In the case of a disabled engine/vehicle, an alternative method or reducing system pressure would be to run through the injector group test with the CAR-TEST equipment.

NOTE: Nominal fuel system pressure is 2.5 bar/37 psi.

LAYOUT

Fuel is delivered to the injectors by a high pressure fuel pump situated close to the fuel tank. After passing through a filter the fuel is distributed to the injectors via the fuel rail assembly. A pressure regulator maintains the fuel at 2.5 bar over absolute manifold pressure. Excess fuel, not required by the engine is returned to the tank.
The fuel pressure regulator is supported on a bracket mounted on the rear of the valley plate, with the outlet (end) connection point rearwards.
The vacuum connection is connected to one of the small tapping points in the centre of the balance pipe using flexible tubing.
The fuel filter is supported on a bracket fixed to the bulkhead.

PRIMING

To prime the fuel system from dry, turn the master switch ON and with the ignition switch OFF take a jump lead from the fuse number six to the white cable in the chassis harness plug (righthand side of the righthand footwell) this will run the fuel pump continuously.
To prime a wet system that has had the fuel tank drained (air can be trapped in the feed pipe to the pump, particularly on Lagondas). All that is required is to remove the blue plug connector from the water temperature sensor, short circuit the two connectors in the plug together and turn on the ignition. The fuel pump will operate for approximately 10 seconds which will suffice to purge the system. After turning the ignition back to off, the blue plug should be replaced onto the water temperature sensor in the normal manner. DO NOT OPERATE THE FUEL PUMP DRY.

THE AIR SYSTEM

GENERAL DESCRIPTION

This consists of two throttle body assemblies, (which include the idle air control valves), inlet manifolds absolute pressure and air temperature sensors.

Key

2) Pressure regulator
5) Additional air valve
7) Throttle potentiometer
8) Air temperature sensor
9) Absolute pressure sensor
18) Inlet manifold
19) Throttle valve body

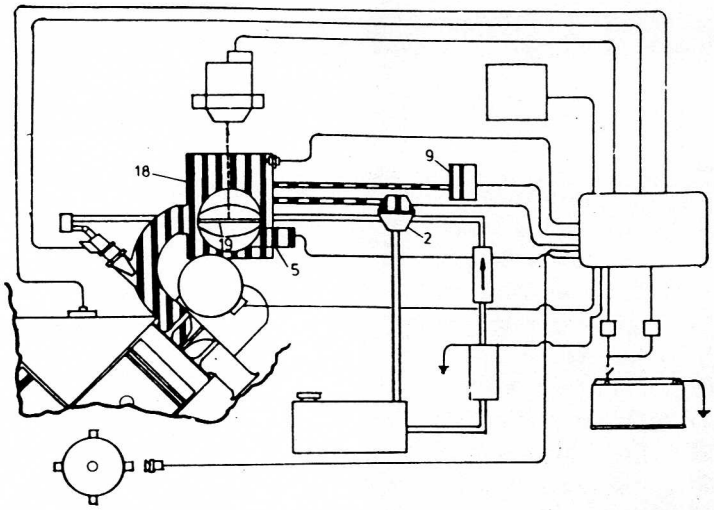
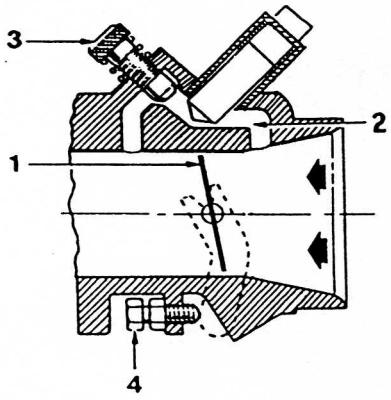


Fig. 9 Schematic Layout of Air System Components

COMPONENTS

Throttle Body Assembly

The quantity of air taken in is regulated by the throttle plate which is part of the throttle body assembly, located in the inlet manifolds. The throttle plate closing position is limited by a screw (3). This screw is used for adjusting the idling characteristics. Under running conditions, when the engine coolant has reached its normal temperature, the mixture is regulated by an output signal from the electronic control unit. This output signal is determined by input data from the pressure and temperature sensors. The throttle pedal controls the throttle plate and the resultant air flow is detected by sensors which send signals to the electronic control unit.



Key

1) Throttle valve
2) By-pass duct
3) Throttle positioning screw (factory set only)

Fig. 10 Throttle Body Assembly

Idle Air Control Valves (See Fig. 10)

Each valve is fitted into a throttle body assembly and has a variable-sized orifice, through which air flows, by-passing the throttle plate. The valves are controlled by the electronic control unit and maintain a suitable engine idling speed during the warm-up period. When the coolant temperature rises above 78°C, the feature becomes inoperative but it will be momentarily re-activated if the idling speed falls below 500 rpm.

The Absolute Pressure Sensor

The Air Temperature Sensor

These devices provide information to the control unit on their respective conditions in the inlet manifold.

THE ELECTRICAL SYSTEM

COMPONENTS

Key

1) Electric injectors
4) Electric fuel pump
6) Distributor & phase sensor
7) Throttle potentiometer
8) Air temperature sensor
9) Absolute pressure sensor
10) Water temperature sensor
11) Engine rpm and TDC sensor
12) Coil with power modules
13) Electronic injection ignition unit
14) Relays
15) Battery

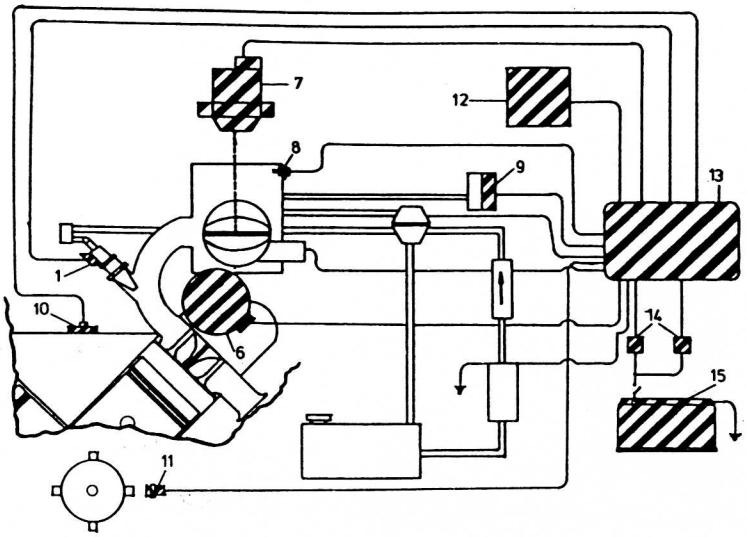


Fig. 11 Schematic Layout of Electrical Components

Electronic Control Unit (E.C.U.)

The E.C.U. is a very sophisticated piece of equipment and should be treated with care. The E.C.U. receives information from various engine sensors from which it computes the exact amount of fuel required as well as the optimum ignition advance for any given operating condition. In addition to this, the E.C.U. also controls the fuel pump and idle speed, via the idle air control valves.

The E.C.U. is located underneath the passenger's dash top roll, refer to SB12, 8.86, for V8 variants for access. To gain access to the E.C.U. for Lagonda variants, remove the passengers side, trimmed knee panel, wooden facia and dash top roll.

Always ensure the ignition is switched off prior to connecting or disconnecting the E.C.U.

Always remove the E.C.U. prior to using any type of electrical welding equipment.

Do not run the engine with the battery disconnected. Do not expose to environmental temperature above 50°C/122°F eg. certain paint process ovens.

Care must be exercised when using a fast boost type battery charger as a starting aid.

Maximum continuous voltage to the injection system is 16 volts, 18 volts may be applied for a maximum of 60 seconds only.

Note: *It is vital that the seals on this unit remain intact and no attempt is made to open it under any circumstances whatsoever. Failure to comply with this instruction will automatically nullify any warranty which covers the E.C.U. If, when removing the idle adjustment screw plug any part inadvertently falls inside the unit, no attempt should be made to retrieve it. Because it is a plastic plug it will have no detrimental effect on the operation of the unit and its presence inside the compartment will in no way affect the manufacturers warranty.*

Earth Points

Two ring terminals to the rear left hand valley plate screws. One ring terminal to each ignition coil heat sink.

Ignition Coils

Two ignition coils are fitted to the E.F.I. systems and are located one on each inner wing, adjacent to the throttle bodies.

Relays

Three relay plugs are incorporated on all E.F.I. variants. On V8 under the passengers blower motor and on Lagonda, above the blower motor. Two relay plugs have all 5 terminals used and are fitted with a 4 RA type relay AML Part No. 37.21063. Both of these are used on all variants.

The other relay plug has only 4 terminals used and is fitted with a 20/30 amp type relay AML Part No. 37.14905 and is used only on emission (Federal) engines. This disables the cold start fast idle feature when reverse or drive is selected. On V8 and later Lagondas fitted with VF instrumentation, the fast idle is also disabled by depressing the foot brake.

Fuses

Two 16 amp, ceramic, inline fuses are fitted in the main E.F.I. harness and are located in the left hand front footwell area towards the transmission tunnel corner on all variants. On Lagondas from Chassis No. 13510, these fuses are in the in-car fusebox, numbers 1 and 2.

Engine RPM and TDC Sensor

This sensor is of the variable reluctance type. It is located opposite the engine crankshaft pulley timing disc which has four protruding teeth, around the periphery, at 90 degrees to each other. As each tooth passes the sensor, an alternate electrical signal is delivered to the distributor. The frequency of this signal enables the information relating to the rpm, combined with the signals delivered by the phase sensor (inside the distributor), to be diagnosed by the control unit and interpreted to recognise the position of the different cylinders as related to their compression TDC. The rpm sensor air gap is pre-set and is NOT adjusted during servicing.

If any adjustment becomes necessary, tool Part No. 693457 should be used. It forms part of the tool kit, AML Part No. 693730. The method of setting the correct clearance is as follows:

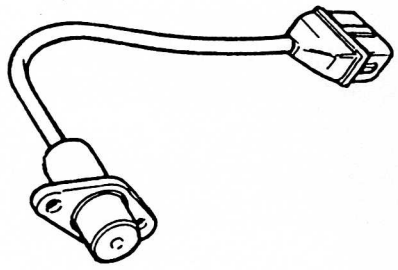
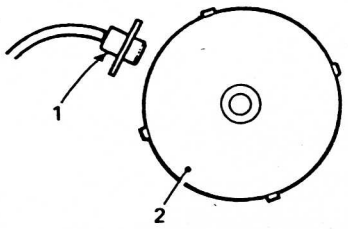


Fig. 12 Engine RPM and TDC Sensor



1) Engine rpm and TDC Sensor
2) Pulley

Fig. 13 Location of Sensor and Pulley

1. Remove crankshaft pulley/TV damper assembly.
2. Slide clearance setting tool onto crankshaft.
3. Check clearance between sensor and edge of tool using brass feeler gauges Part No. 693459 (which are included in the tool kit) taking great care not to damage the sensor.
4. If outside of tolerance then adjust by slackening retaining screws of the support bracket and moving the sensor towards or away from the tool as necessary.
5. Tighten the screws and re-check clearance.
6. Remove tool and re-fit pulley/TV damper (See TV damper/Trigger Disc Check).

6a.Tv damper/Trigger Disc Check. It is important that the trigger disc fingers are accurately positioned in relationship to the crankshaft pulley keyway, be concentric to within 0.05mm (0.002in) and have rotational outside diameter of 139.65mm to 139.75mm (5.498 to 5.502in). The concentricity and diameter may be checked using special tool Part No. 693458 (included in the tool kit).

Technical Data

Crankshaft sensor to trigger disc clearance:		0.4 - 1.0mm (0.016 - 0.040in.)
	Optimum:	0.7mm (0.028in.)
Tightening torque:	Crankshaft sensor bracket screw -	5 lb.ft. (7Nm)
	TV damper pulley nut -	200 lb.ft. (272Nm)
Trigger Disc:	Concentric -	Within 0.05mm (0.002in.)
	Outside diameter -	139.7mm ± 0.05mm (5.5 ±0.002in.)

Phase sensor

Another inductive sensor is fitted inside the R.H. distributor. It is located opposite a cam which has two teeth at 90 degrees to each other. as each tooth passes the sensor alternate signals of the same type as generated by the rpm sensor are delivered to the electronic control unit. These signals, together with that of the rpm sensor, identify the phase of each cylinder.

1) Distributor body
2) Phase sensor

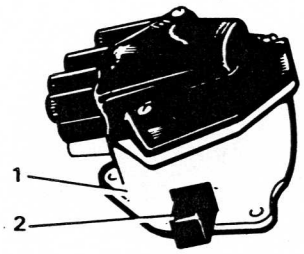


Fig. 14 Phase Sensor

Distributor phase sensor/rotor clearance (to be checked at both points on rotor) - 0.2 - 0.3mm (0.008 - 0.012in.).

Absolute Pressure Sensor

This detects the pressure of the air in the inlet manifold and delivers a voltage signal, the value of which is directly proportional to the air pressure, to the electronic control unit.

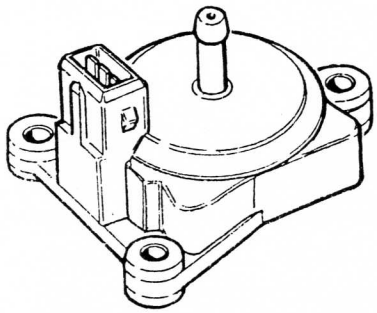


Fig. 15 Absolute Pressure Sensor

Air Temperature Sensor

This detects the temperature of the air in the inlet manifold and delivers a signal to the electronic control unit. This signal is combined with that received from the absolute pressure sensor to calculate the air density.

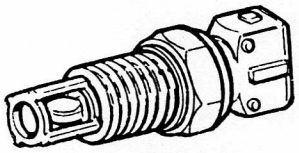


Fig. 16 Air Temperature Sensor

Coolant Temperature Sensor

This detects the temperature of the engine coolant. The signal is delivered to the electronic control unit and is used to achieve corrections to the basic fuel mixture and the idle speed control.

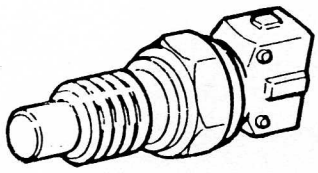


Fig. 17 Coolant Temperature Sensor

Throttle Potentiometer

This sends a signal to the control unit identifying different throttle positions:
Closed - Partially Closed - Fully Open
This information is used to correct the basic mixture control and for the cut-off function.
The potentiometer is fitted at the top of the throttle tower assembly in the centre of the 'V'.

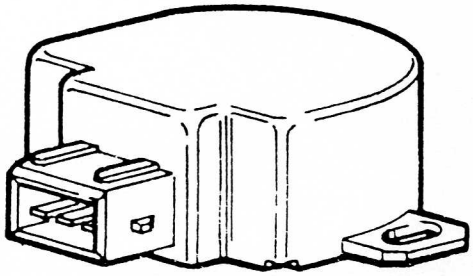
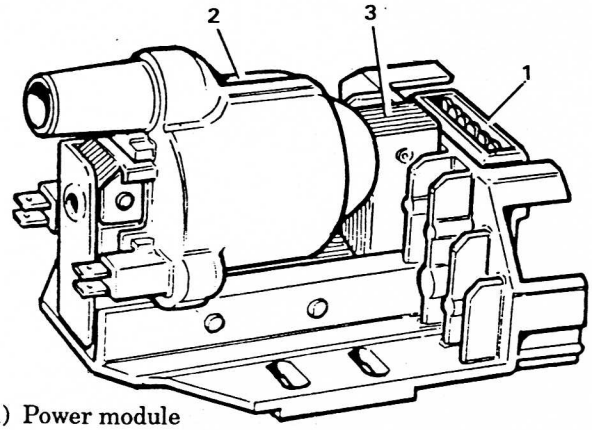


Fig. 18 Throttle Potentiometer

Coil with Power Module

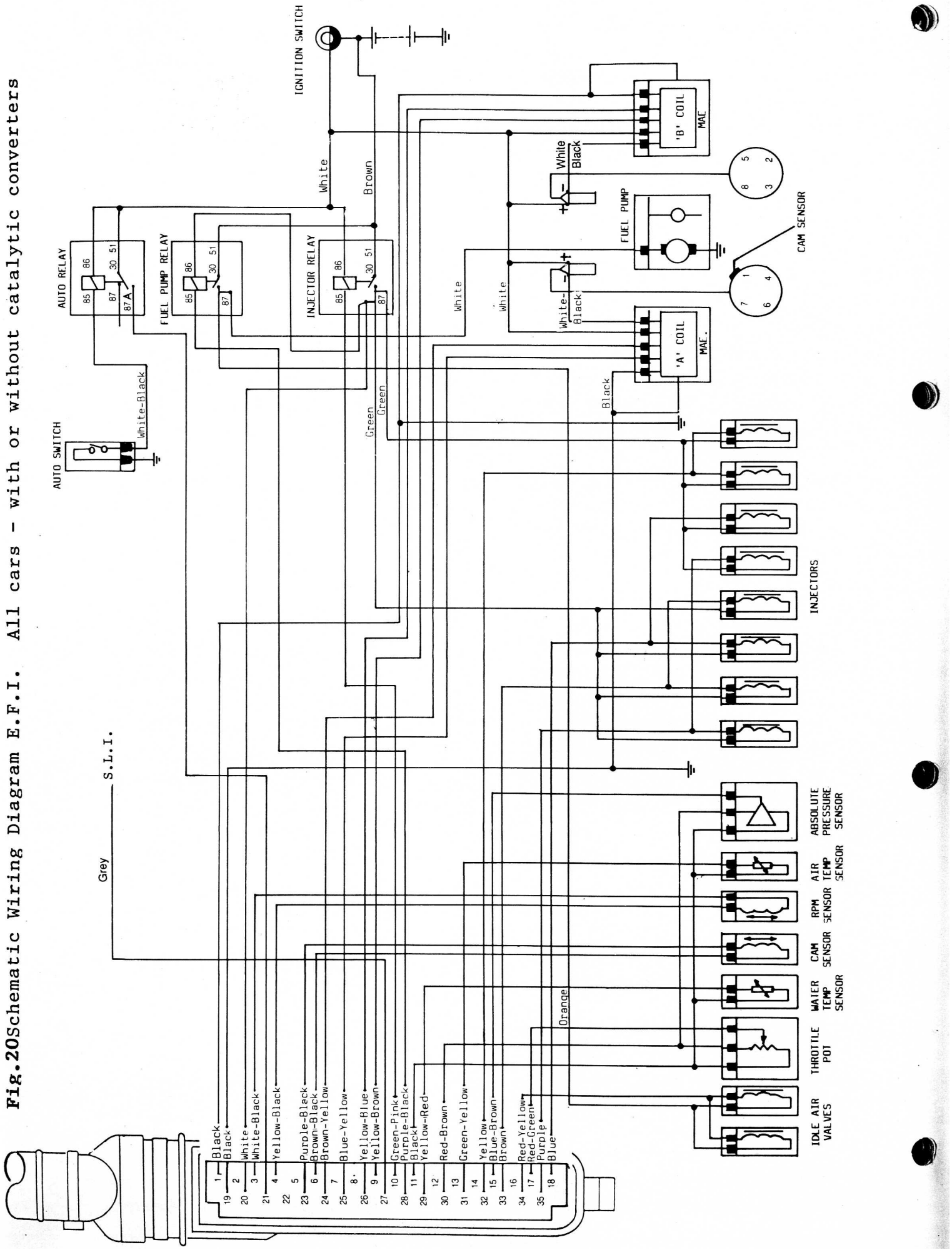
Two coils are fitted. Each unit is the type which has an inductive discharge. It receives a signal from the control unit which determines the ignition advance. The power module ensures a constant energisation of the coil. Each coil and its module is fitted into a specially designed heat dissipator.



1) Power module
2) Coil
3) Dissipator

Fig. 19 Coil with Power Module

Fig.20 Schematic Wiring Diagram E.F.I. All cars - with or without catalytic converters



SERVICING PROCEDURES

THROTTLE LINKAGE ADJUSTMENTS

Before adjusting the throttle settings, it is important to ensure that the engine is fully warm and that all engine associated components are operating correctly. All hoses should be checked for signs of deterioration and all manifold connections checked for air leaks. The ignition system must be in good working order.

1. Switch off ignition
2. Disconnect the link rods from both throttle levers.
3. Clamp the balance pipe between the inlet plenums.
4. Connect dual vacuum manometers to the inlet plenums. The most convenient place is to disconnect both vacuum hoses together with one-way valves and using an adaptor, AML Part No. 097.34.0120, fit manometer pipes to the protruding hoses from the inlet manifold.
5. Connect a suitable tachometer. Note that any take off from ignition module or coil should be treated as 4 cylinder.
6. Start engine.
7. Set specified idle speed with equal depression in each plenum by adjusting throttle stop screws and observing manometers and tachometer.
8. Stop engine
9. Re-connect link rods and ensure that both throttles are resting on their stops. If not then adjust the link rods as follows:
   a) Release lock nuts
   b) Rotate rod
   c) Re-lock nuts

   Note: *Link rods have both left and right hand threads.*

10. Start engine and have an assistant hold speed at approximately 1500rpm using the throttle pedal. Observe manometers and if necessary adjust balance lever on top of right hand throttle body to give equal depression in each plenum.
11. Return to idle.
12. Switch off ignition and check that both throttle levers are still on their respective stops. If not repeat steps 9 to 11.
13. Check and if necessary, set throttle potentiometer position with Unitester using grey cable:
    Idle/Full Throttle - **'on'** at idle
    'off' when throttles are open 0.010 - 0.020in. (0.25 - 0.5mm).
14. Remove manometers and re-connect brake servo pipes.
15. Remove clamp from balance pipe.
16. Start engine and check idle speed.

Technical Data

Idle setting speed:	Manual Variants	800 - 900rpm
	Automatic Variants	800 - 850rpm (In neutral)

CHECKING AND ADJUSTING OF IDLE MIXTURE

Temperature Stabilisation

It is important that checking or setting of the idle mixture is carried out with the engine at a stabilised temperature. In the case of an engine starting from cold, the idle mixture must be set with the oil temperature between 50 and 70°C as the engine warms up. Once engine oil temperature has risen about 70°C the vehicle should be taken for a short drive to stabilise the oil temperature to 50 to 70°C. The idle mixture can then be set with the time interval of two to four minutes of coming to rest.

The engine should not be stopped and restarted during the temperature stabilisation process.

Checking Procedure

Ensure that all engine associated components are functioning correctly and that the engine is in good mechanical condition. All hoses should be checked for signs of deterioration and all manifold connections checked for air leaks.

The idle mixture must be checked and set accurately to the specified limits using an accurate CO meter. The exhaust content is sampled from both manifold downpipe sample points to provide a combined sample on Federal vehicles, and from the exhaust tailpipe on European variants.

Federal (Catalyst Equipped) Cars

1, Remove bungs from the tapping points located in the front manifolds.
2. Fit sample pipe stubs Part No. 08.25416 with copper washers, Part No. 693061.
3. Connect CO meter sample line to both sample pipe stubs via a two-into-one connector. Ensure that CO meter is fully warm and that it is correctly calibrated and in test mode.
4. Note reading.

Setting Procedure

The idle mixture is altered by the trim screw which is mounted on the printed circuit board inside the E.C.U. Great care must be taken when adjusting this so as to avoid damage to the unit. Access to the trim screw is via a hole in the control unit casing which is sealed with tamper proof plug.

1. Remove necessary trim panels to expose E.C.U.
2. After carefully removing the tamper proof plug, use a small screw driver to turn the screw. (clockwise to weaken the mixture and anti-clockwise to richen). Do not try to force the screw beyond its natural stop or apply unnecessary pressure.
3. After setting the correct CO content, a new tamper proof seal must be fitted.
4. Ensure 35-way plug is fully seated.
5. Replace trim panels.
6. Disconnect CO meter and refit bungs to tapping points in exhaust ensuring that copper washers are in good condition.

Technical Data

1. Idle CO% (Checking)

European	0.5%CO ± 0.25%
Federal	0.6%CO ± 0.2%
Fed Auto	1.0%CO ± 0.5%

2. Idle CO% (Setting)

European	0.5%CO ± 0.25%
Federal	0.6%CO ± 0.1%
Federal Auto	1.0%CO ± 0.2%

Tamper Proof Plug

Colour	Black
Application	Service
Part No.	693250

CHECKING ELECTRONIC INJECTOR SEALS AND FUEL CIRCUIT PRESSURE

WEBER IAW

Connect pressure gauge (AML Part NO. 694102) into the pressure regulator hose assembly/ fuel rail joint with the tap open (the handle should be in line with gauge body). The tap should be situated between the pressure regulator and the pressure gauge as shown in Fig. 21.

The water temperature sensor should be disconnected and a two-pin shorting plug (supplied with the IAW car Tester) inserted into the harness plug. Turning the ignition key to position 'II' should activate the fuel pump for around ten seconds: check pressure gauge unions for leaks. If the vehicle has not been run for some time, run the engine or activate the fuel pump for more than one cycle to purge the system of air.

Test 1

Once the fuel system has been purged of air, activate the fuel pump - the tap should be open. The pressure gauge should read: 2.5 + 0.2 bar (pump on)
2.2 + 0.2 bar (pump off)

The latter pressure should be held for a few minutes. If the system does not hold pressure then carry out Test 2.

Test 2

Energise the fuel pump. Whilst it is running, close the pressure gauge tap. A minimum of 5 bar should be seen on the pressure gauge: this test should not be repeated without opening the pressure gauge tap and running the fuel pump for at least one cycle.

Conclusion

Decaying or Low Fuel Pressure

a) Fail Test 1, pass Test 2:
This should indicate that the fuel pressure regulator is faulty and should be replaced.

b) Fail Test 1, fail Test 2:
This would indicate that there is a fuel injector leak, a feed line blockage or a fuel pump failure.

Injector Leak

If the specified fuel pressures are reached but decay rapidly once the pump is switched off, then one of the injectors is not working properly. Use the IAW car tester or run the vehicle and selectively remove and replace injector electrical connectors to isolate the problem.

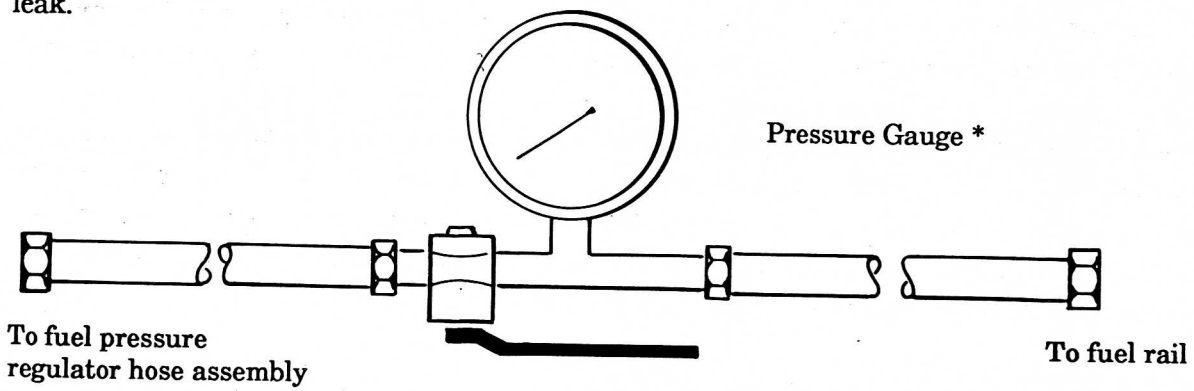
Fuel Pump Failure or Feed Line Blockage

If the specified fuel pressures are not reached at all, then check the service record to see when the fuel filter was last replaced (service interval is 10,000 miles).
To check the fuel pump: if the unit is heard running but fails to register any fuel pressure, it should be replaced.

High Fuel Pressure

The return line should be checked for blockages if the fuel pressure exceeds the specified limits.

Once complete, the fuel system joints should be re-assembled, checking that none of them leak.



* PRESSURE GAUGE ASSEMBLY (AML Part No. 694102) comprising :-
Pressure gauge (AML Part No. 694103) - one off
Hose assembly (AML Part No. 694104) - two off
Jig male connector, 9/16 in., double-ended, (AML Part No. 694105) - not shown

Fig. 21 Fuel Pressure Gauge Installation