CONTENTS

EMISSION CONTROL SYSTEM

Description **17.00.00**

The emission control system fitted is designed to comply with local legislative requirements. Some or all of the following components may be fitted depending on those requirements. The description that follows refers to cars with an emission control system that complies with North American Federal Specification.

Crankcase breather system

To ensure that piston blow-by gas does not escape from the crankcase to atmosphere, a depression is maintained in the crankcase under all operating conditions. This is achieved by connecting the crankcase breather housing, located at the front of the cylinder head, to the air intake system between the air-flow meter and the throttle housing where a depression exists under all engine operating conditions.

Fuel evaporative loss control

The fuel tank venting is designed to ensure that vapours are vented through the control system even when the car is parked on an inclined surface.
A capacity limited device in the fuel tanks ensures sufficient free volume is available after filling to accommodate fuel which would otherwise be displaced as a result of high temperature rise.
Cars have a fuel tank evaporative loss control system fitted as standard equipment to meet U.S. Federal and Californian requirements.
The system operates as follows:
Interconnected tubing attached to the air vents in both fuel tanks conveys petrol vapour via a sealed storage canister to the throttle body.
The system is completely sealed. However, it is essential that routine maintenance operations detailed in this supplement are carried out by your Dealer at the specified mileage intervals.

Catalytic converters

A catalytic converter is fitted into the exhaust system in order to reduce emissions of carbon monoxide, hydrocarbons, and oxides of nitrogen.

Catalytic converter precautions

1. In order to maintain the efficiency of the emission control system it is essential to use UNLEADED gasoline only; this fuel minimizes spark plug fouling, thereby sustaining engine performance.
2. DO NOT tamper with the engine settings: they have been established to ensure that the vehicle will comply with stringent exhaust emission regulations. Incorrect engine settings could cause unusually high catalytic converter temperatures and thus result in damage to the converter and vehicle. If adjustment to the settings is considered necessary this should be performed by a British Leyland Dealer or other qualified service facility.
3. A correctly tuned engine optimizes exhaust emissions performance and fuel economy and it is recommended that the vehicle is maintained as outlined under **MAINTENANCE SUMMARY** of this manual.
4. DO NOT continue to operate the vehicle if any engine malfunction is evident; malfunctions should be rectified immediately. For instance, misfire, loss of engine performance or engine run-on may lead to unusually high catalytic converter temperature and may result in damage to the converter and car.
5. NEVER leave the vehicle unattended with the engine running.
6. The use of a catalytic converter increases exhaust system temperatures (particularly under engine malfunction); therefore do not operate or park the vehicle in areas where combustible materials such as dry grass or leaves may come into contact with the exhaust system.
7. The vehicle is designed for normal road use. Below are examples of abuse which could damage the catalytic converters and car and may lead to a dangerous condition due to excessively high catalytic converter temperatures:
   a. Competition use
   b. Off roadway use
   c. Excessive engine revolutions
   d. Overloading the vehicle
   e. Excessive towing loads
   f. Switching off the engine and coasting in gear.
8. DO NOT run the engine with either a spark plug lead disconnected or a spark plug removed.

   DO NOT use any device that requires an insert into a spark plug hole in order to generate air pressure (e.g. tyre pump, paint spray attachment, etc.), as this could also result in catalytic converter damage.
9. DO NOT push or tow the vehicle to start it; this could damage the catalytic converters. It is recommended that jumper leads are used.
10. Heavy impact on the converter casing must be avoided as it contains ceramic material which is easily damaged.

Fuel filler caps

Unleaded fuel MUST be used on catalyst-equipped cars, and labels to indicate this are displayed on the fuel gauge and the tank filler caps. The filler caps are designed to accommodate unleaded fuel pump nozzles only. The anti-surge flap prevents leaded fuel from being added to the fuel tanks because it does not open when a leaded fuel pump nozzle is entered into the filler neck up to the position of the restrictor and the pump is switched on.

Misfiring

If the engine misfires, the cause must be immediately rectified to prevent catalytic converter damage.
The emission control system fitted to this engine is designed to keep emissions within legislated limits providing ignition timing and fuel injection settings are correctly maintained and the engine is in sound mechanical condition.
It is essential that routine maintenance operations detailed in this Manual are carried out by your Dealer at the specified mileage intervals.

Exhaust Emission—Testing

In order that exhaust emissions are kept within the legislated limits an idle exhaust emission test MUST be carried out after any unscheduled service operations which might affect the emission control system.

CAUTION: CO content must not exceed 1.5% or be less than 0.5% with the electrical lead to the oxygen sensor disconnected.

It is essential that the equipment used for testing purposes is of the following type:

1. An infra-red CO exhaust gas analyser.
2. Engine and ignition diagnostic equipment.
3. Lucas 'EPITEST' fuel injection diagnostic equipment.

EXHAUST GAS RECIRCULATION (E.G.R.)

A vacuum operated E.G.R. valve (Fig. 1) meters a proportion of the exhaust gas into the intake system. The exhaust gas is diverted from the rear exhaust manifold and fed via the E.G.R. valve into the rear of the inlet manifold.

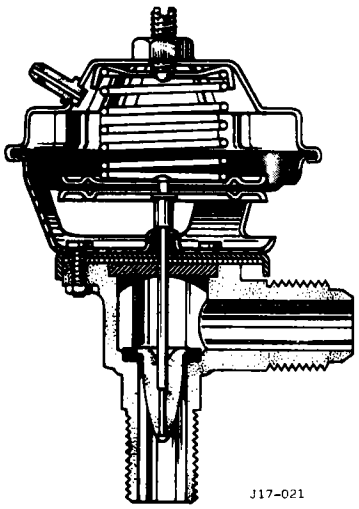

Fig. 1

The vacuum signal 81 mmHg which lifts the valve is obtained from the throttle edge port and is such that no recirculation occurs at idle. The E.G.R. valve has a shaped pintle to give the variation in gas flow required for different engine operating conditions.

THERMAL VACUUM VALVE

With the high rates of E.G.R. required to reduce emission of NO_2 following engine cold starting, it is necessary to inhibit the E.G.R. until the engine is part warm.

A thermal vacuum (Fig. 2) at the rear of water rail senses coolant temperature. The vacuum signal is switched to the E.G.R. valve when its temperature-sensitive bi-metal discs which open the valve on rising temperature (43°C) and close on a falling temperature of 33°C.

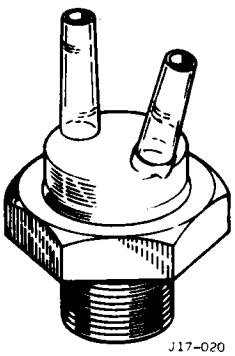

Fig. 2

Another throttle edge vacuum port operates the distributor vacuum capsule (6) rotating the base plate and relative to the reluctor. This vacuum port is positioned such that when the throttle is in the idling or near fully open there is insufficient vacuum to operate the capsule. To delay the operation of the vacuum advance capsule, a delay valve is fitted in the signal pipe between the capsule and the throttle edge port. This valve consists of sintered discs which determines the vacuum delay, and a non-return by-pass valve which allows the vacuum in the distributor capsule to dissipate immediately the signal is removed.

EMISSION CONTROL SYSTEM

Evaporative Loss

Description

Hydrocarbon emissions in the form of fuel vapour are emitted from vehicle fuel tanks (1, Fig. 3).

To prevent these emissions entering the atmosphere the fuel tanks have unvented, sealed filler caps.

The vapour is passed to a vapour storage canister (2, Fig. 3) containing activated charcoal which absorbs the vapours when the vehicle is stationary and desorbs them when the engine is running.

The desorption or purging is obtained by connecting the purge pipe from the canister to a vacuum source via a 3mm restriction located at the junction of the purge pipe and the crankcase breather pipe (3, Fig. 3).

To ensure that piston blow-by gases do not escape from the crankcase a depression is maintained in the crankcase under all operating conditions.

This is achieved by a pipe (with 6mm restriction) connecting the crankcase breather housing (at the front of the cylinder head) to a port in the throttle housing (air cleaner side) upstream of the throttle disc, such that a depression is created in the breather pipe at all times.

The depression is at minimum at closed throttle and maximum at full throttle.

Charcoal canister

The canister is mounted in the R.H. front wheel arch. Filter pads above and below the charcoal prevent the ingress of foreign matter or passage of charcoal into the purge line.

Emissions from the fuel tanks enter at the bottom of the canister and the purging air enters at the top, passing through the charcoal to the purge outlet at the top of the canister to the vacuum source.

Fuel expansion and tank venting

The fuel tanks, mounted in each rear wing, have a 10% expansion volume incorporated, obtained by limiting the amount of fuel into the tank.

A fuel filler tube extends into the tank to the required level.

A 1mm orifice (6, Fig. 3) at the top of the filler neck extension allows the expanding fuel to slowly displace the air from the tank into the venting system via the filler neck and a port in the tanks side panels to vapour separators (4, Fig. 3) in each rear screen pillar.

Condensed vapour drains back to the tanks. Excess vapour is passed to the charcoal canister via a pipe under the floor and a pressure relief valve (5, Fig. 3). The valve controls the flow of vapour.

continued

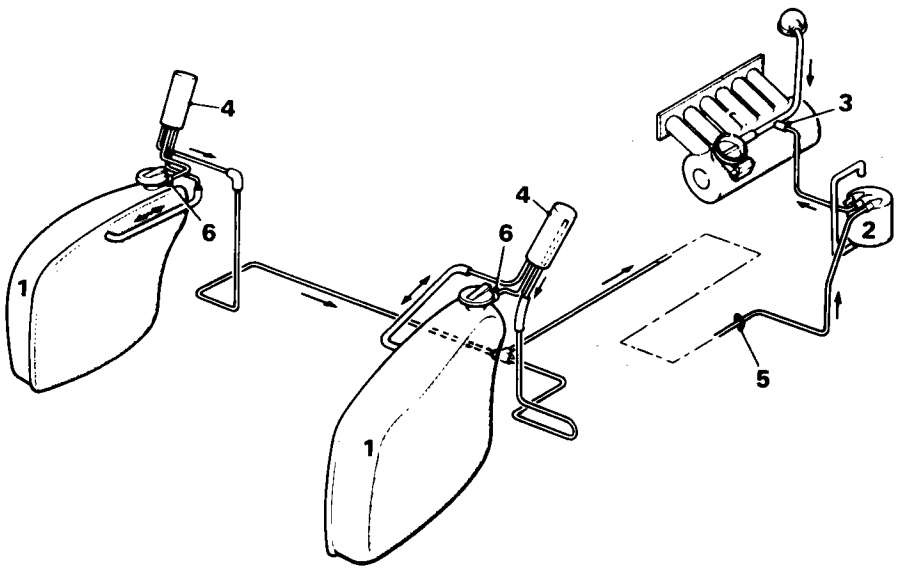

Fig. 3

When the fuel tanks are full and pressurized, to prevent fuel spillage when the filler cap is released it is necessary to lower the level of the fuel below the filler neck extension.
A domed restriction tank is sealed to the inside of the tank side panel. This tank occupies fuel space during refuelling.
To lower the fuel level fuel is allowed to flow into the restriction tank via a 2,5mm orifice.

Fuel filler cap

Each tank has a lockable fuel filler cap incorporating a pressure blow-off facility. A spring-loaded seal is mounted on the filler neck flap and seats on the filler neck face. No vacuum relief is provided. Incorporated in the filler neck is the leaded fuel restriction.

Pressure relief valve

This valve (5, Fig. 3) controls the transfer of vapour from the vapour separators to the charcoal canister (2, Fig. 3), and prevents the transfer until a pre-set pressure is exceeded.
To allow a flow to the tanks from the canister a vacuum relief is incorporated.

EMISSION TEST AND CHECKS (1979)

3.4 Cars

Anti-run-on valve check

Run engine at idle, switch off ignition, listen for operation of E.G.R. valve two to five seconds after the engine has stopped.
Restart engine and idle.
Disconnect black lead from anti-run-on valve solenoid.
Connect —ve lead from battery to anti-run-on valve solenoid.
Engine should stop immediately connection is made.
Remove lead and replace original black lead.
Switch off ignition.

XJ6 Fuel Injection with E.G.R. Valve—Australia—Check E.G.R.

Run engine at idle speed when warm after probe.
Slowly open throttle to 2000 rev/min. Observe movement of E.G.R. valve spindle.

XJ6 Fuel Injection with Catalyst and Oxygen Sensor—U.S.A./Canada/Japan

Remove exhaust manifold sample cap and fit sample pipe to manifold.
Run engine until warm (engine temperature 90). Clamp off extra air valve hose. If idle speed drops, warm up for extra five minutes. Adjust idle speed (750 rev/min) using screw in air distribution block.
Connect exhaust analyser to sample pipe.
Read off CO emission.
Refer to Book 1, Section 05 for exhaust emission CO reading. Adjust screw in air metering unit. Disconnect manifold vacuum pipe from fuel pressure regulator. Blank off pipes.
Observe CO reading. After five seconds reading should increase and after a further few seconds return to original reading.
This indicates correct operation of the oxygen sensor.

XJ6 Fuel Injection—European

Run engine at 2000 rev/min in neutral or 'N' for ten seconds. Close throttle and allow engine to idle for fifteen seconds.
Insert probe into tail pipe or connect sample pipe to manifold. Switch analyser switch to 'T' in Test (Sun-Tester EPA 75).
Read off CO 0.56 to 1.5 %. If incorrect, adjust setting screw in air metering unit to achieve correct CO reading.

XJ6 Fuel Injection with Catalyst and Oxygen Sensor—USA/Canada/Japan

Switch off engine after warm-up. Remove plug from exhaust manifold sample cap and fit sample pipe to manifold. Disconnect oxygen sensor electrical lead.
Run engine at 2000 rev/min for 10 seconds in Neutral or 'N' then close throttle, allow to idle.
Connect exhaust analyser to sample pipe, switch to 'T' or Test.
Refer to Book 1, Section 05 for exhaust emission CO reading. Adjust setting screw in the air metering unit to achieve correct CO reading.
Switch off ignition, remove sample pipe from exhaust manifold. Replace plugs. Restart engine, run at 2000 rev/min, close throttle and allow idle to stabilize. Reconnect oxygen sensor lead.
Insert probe into tail pipe. Read off emission level from analyser.

LUCAS CONSTANT ENERGY IGNITION

A Lucas Constant Energy Ignition System is fitted to XJ 4.2 E.F.I. Models on Series III. The new ignition system operates by maintaining the energy stored in the coil at a constant level, allowing the output voltage to remain constant over a wide range of engine speeds. The power dissipated in both the coil and module compared with equivalent constant dwell systems is greatly reduced.

Constant energy system component description

Amplifier AB 14

The amplifier consists of a solid state electronic module housed in a aluminium case with two pre-wired leads which connect to the low tension terminals on the ignition coil.

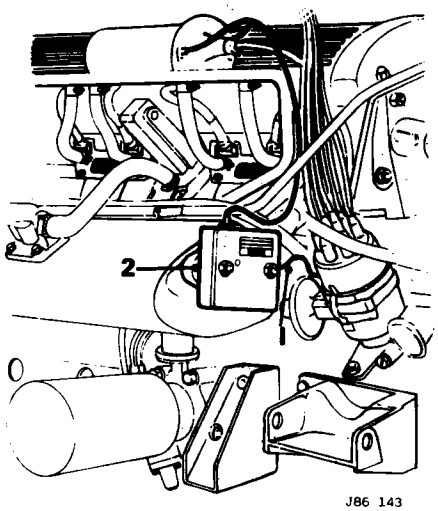

Fig. 4

Connection from the distributor pick-up module is made by an assembly of two leads inside a screening braid which plugs into a socket on the amplifier side (1, Fig. 4). The amplifier mounting is shown in (2, Fig. 4).

Distributor (45 DM)

The distributor incorporates a standard automatic advance system, anti-flash shield (1, Fig. 5), rotor arm, and cover (2, Fig. 5). The previous pick-up and module assembly is replaced by a reluctor and pick-up module (3, Fig. 5). The reluctor is a gear-like component (with as many teeth as there are cylinders) which is mounted on the distributor drive shaft.

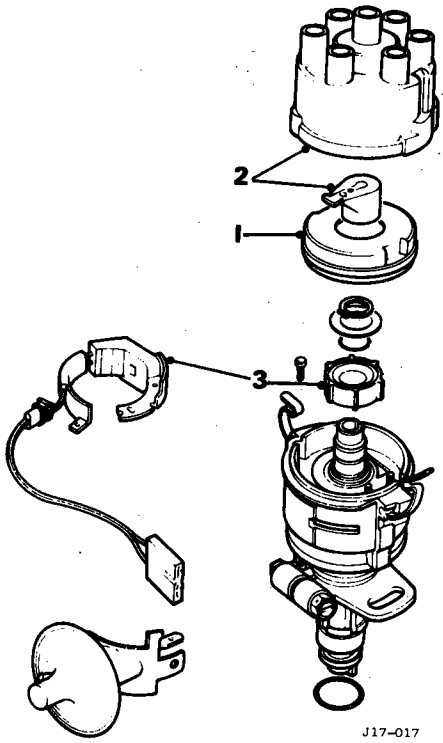

Fig. 5

The pick-up module consists of a winding around a pole-piece attached to a permanent magnet.
The distributor is pre-wired with two leads terminating in a moulded two-pin inhibited connector, which plugs into the amplifier previously described.

During normal service the air gap between the reluctor and the pick-up module does not alter and will only require re-setting if it has been tampered with. If it is necessary to adjust the gap, then it should be set so that the minimum clearance between the pick-up and the reluctor teeth is not less than 0,20 mm (0.008 in). The gap should not be set wider than 0,35 mm (0.014 in) (1, Fig. 6).

The air gap is measured between a reluctor tooth and the pick-up module and should be checked with a plastic feeler gauge. The use of a metal feeler gauge may result in a misleading gauge reading due to the pick-up module contacts being magnetic. However, their use will not affect the electical operation of the pick-up module.

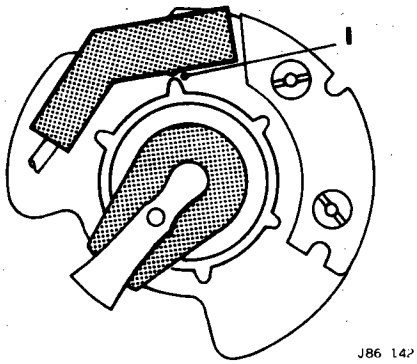

Fig. 6

FAULT FINDING PROCEDURE

SWITCH ON IGNITION

MEASURE BATTERY VOLTS

LESS THAN 11.5 VOLTS—BATTERY DISCHARGED

MORE THAN 11.5 VOLTS—BATTERY O.K.

MEASURE VOLTAGE AT COIL '+' TERMINAL SHOULD BE 1 VOLT MAX. BELOW BATTERY VOLTAGE

INCORRECT

CHECK WIRING TO/FROM IGNITION SWITCH

CORRECT

MEASURE VOLTAGE AT COIL '−' TERMINAL— SHOULD BE THE SAME AS ON THE + TERMINAL

INCORRECT

DISCONNECT WIRE TO AB14 AMPLIFIER FROM COIL '−' TERMINAL

MEASURE VOLTAGE AT COIL '−' TERMINAL

LESS THAN 2 VOLTS—COIL FAULTY

MORE THAN 2 VOLTS—AMPLIFIER FAULTY

CORRECT

DISCONNECT DISTRIBUTOR PICK COIL FROM AMPLIFIER

MEASURE PICK-UP MODULE—RESISTANCE SHOULD BE 2.2 TO 4.8 K OHMS

INCORRECT

CHANGE PICK-UP MODULE

CORRECT

RECONNECT PICK-UP MODULE TO AMPLIFIER

MEASURE VOLTAGE AT COIL '−' TERMINAL CRANK ENGINE

VOLTAGE SHOULD FALL

INCORRECT

AMPLIFIER FAULTY

CORRECT

CHECK H.T. CIRCUIT COIL SECONDARY H.T. LEADS ROTOR ARM DISTRIBUTOR COVER SPARK PLUGS

FAULT FINDING

This chart indicates the possible areas of the cause of the faults. Perform checks and remedial action shown in the order given until the fault is rectified.

Details of the checks and remedial action are given on the respective area charts.

Extra checks shown in brackets refer only to the specific condition shown in brackets after the symptom.

SYMPTOM	POSSIBLE CAUSES IN ORDER OF CHECKING
Will not start (warm engine)	B1, B2, D1, D2, A1, A13, (A5), A5, A3, A6, A7, C1, C2, C3, A20 A8, A18.
Poor or erratic idle (cold engine)	D1, D2, A1, A12, A6, (A5), A3, C4, C6, C3, C5, A10, B4, B3, B6, (A13), E1, E3, E4, E5, A21, A7, A8, A18.
Hestitation or flat spot (cold engine)	D1, D2, A1, A4, (A5), A9, A3, A6, B5, (A13), C4, C6, C3, C5, A15, B4, B3, B6, E1, E3, E4, E5, A7, A8, A18.
Excessive fuel consumption	D3, A4, A5, B5, B4, B3, B6, B8, B7, E1, E3, E4, E5, A21, A7, A19, A8, A18.
Lack of engine braking or high idle speed	A2, A16, A9, A12, A3, A13, A10, C3, B5, A14, B6.
Lack of engine power	D1, D2, A1, A4, A5, A17, A3, B5, A15, A6, C4, C6, C3, C5, B4, B3, B6, E1, E3, E4, E5, A8, A18.
Engine overheating	B7, B8, C4.
Engine cuts out or stalls (at idle)	D1, D2, A1, A7, (A12), (A5), A5, A15, (A3), B4, A6, C4, C6, C3, C5, B6, E1, E3, E4, E5, B3, A8, A18.
Engine misfires	D1, D2, A1, A5, A6, A3, C4, C6, C3, C5, A15, B4, B3, B6, E1, E3, E4, E5, A21, A8, A18.
Fuel smells	D3, A5, E4, E2, E3, E5, A15, A19, A21, A8, A18.
Engine runs on	D1, A12, A16, A10, E4, E3, B7, B8, C3, C5.
Engine knock or pinking	D1, C3, C5, B7, B8.
Arcing at plugs	C4, C6.
Lean running (low CO)	A1, A14, A4, A2, A7, D1, D2, B6, E1, E3, E4, E5, A8, A18.
Rich running (excess CO)	A5, E5, A19, A21, A8, A18.
Backfiring in exhaust	D1, D2, A1, A15, B4, B6, C3, E1, A8, A18.

ELECTRONIC FUEL INJECTION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
A1	Connections	Ensure all connector plugs are securely attached. Ensure electronic control unit (E.C.U.) multi-pin connector is fully made. Ensure all ground connections are clean and tight.
A2	Air leaks	The engine will run weak because air leaking into the manifold is not mo itored by the air-flow metering device. Ensure all hose and pipe connections are secure. Check all joints for leakage and re-make as necessary.
A3	Sticking air flap	Ensure that the air-flow meter flap moves freely. If the flap sticks, the air-flow meter should be replaced.
A4	Throttle switch	Check function of full load switch or vacuum switch.
A5	Cold start system inoperative	Check function of cold start system (see Epitest Section 3).
A6	Triggering system	Check function of triggering system (from coil).
A7	Temperature sensors	Check sensors for open and short circuit.
A8	E.C.U.	As a last resort the E.C.U. should be checked by substitution.
A9	Throttle butterfly adjustment	Reset as per operation.
A10	Throttle by-pass valve	The valve should be suitably adjusted until fault has been rectified and re-check function.
A12	Incorrect idle speed	This should be adjusted by means of the screw on the air distribution block.
A13	Auxiliary air valve inoperative	Test in accordance with operation 19.20.17.
A14	Throttle spindle leaks	Check seals, bearings and spindles for wear. Renew as required.
A15	Air cleaner blocked	Inspect element, and renew as necessary.
A16	Throttle sticking	Lubricate, check for wear and reset.
A17	Throttle inhibited	Check and remove obstructions of free movement of throttle mechanism through total travel. If no obstructions apparent, reset.
A18	Air-flow meter	As a last resort, the air-flow meter should be checked by substitution.
A19	Oxygen sensor	The oxygen sensor should be checked by substitution.
A20	Power resistors	The power resistors should be checked by substitution.
A21	Injector faults	Check function of injectors.

BASIC ENGINE CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
B1	Low battery condition	Check battery condition with hydrometer. Re-charge, clean and secure terminals, or renew as necessary. (If battery is serviceable but discharged, trace and rectify cause of flat battery, e.g. short circuit or insufficient charge from alternator.)
B2	Start system deficient	If starter fails to turn engine briskly, check engagement circuit and connections. Check and clean main starter circuit and connections.
B3	Poor compressions	Check compressions with proprietary tester. If compressions are low or uneven, check/adjust valve clearance and re-test. If compressions are still unsatisfactory remove cylinder head for further examination and rectification.
B4	Exhaust system leaking or blocked	Check, and rectify as necessary.
B5	Faults on areas of vehicle other than engine.	Check for binding brakes, slipping clutch, etc.
B6	Air leaks at inlet manifold	Check inlet manifold/cylinder head joint. Re-make with new gasket if necessary. Check manifold tappings for leaks—seal as necessary.
B7	Cooling system blocked or leaking	Flush system and check for blockage. Check hoses and connections for security and leakage. Renew as necessary. Check thermostat, and renew if faulty.
B8	Cylinder head gasket leaking.	Check cylinder block/head joint for signs of leakage. Renew gasket if necessary.

IGNITION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
C4	System deterioration	Check ignition wiring for fraying, chafing and deterioration. Check distributor cap for cracks and tracking and rotor condition. Renew leads, cap or rotor as necessary.
C5	Advance system faults	Disconnect vacuum pipes and check operation of advance mechanism against advance figures, using stroboscopic timing light. Lubricate or renew as necessary. Re-connect vacuum pipes and check operation of advance unit. Renew or secure vacuum pipes if necessary.
C6	Spark plug faults	Remove spark plugs, clean, reset gap and test on proprietary spark plug testing machine. Renew if in doubt.

FUEL SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
D1	Insufficient, incorrect or contaminated fuel	Ensure that the fuel tank has an adequate level of the correct grade of fuel. If dirt or water contamination is suspected, drain and flush the fuel tank, flush the system and renew the fuel line filter before filling with clean fuel.
D2	Fuel starvation	Check fuel pressure according to operation 19.45.12. if not satisfactory, check fuel feed pipes for leaks or blockage. Renew connectors if damaged or deteriorated. If contamination of fuel is discovered, flush fuel system and renew line filter. If necessary, renew fuel line filter, pressure regulator or fuel pump to rectify.
D3	Leaking fuel	Check fuel system for leaks and rectify as necessary. Renew any doubtful connectors.

EVAPORATIVE AND CRANKCASE VENTILATION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
E1	Engine oil filter cap loose or leaking	Check cap for security. Renew cap if seal is deteriorated.
E2	Fuel filler cap defective	Check seal for condition—renew if deteriorated. Check filler cap for security—rectify or renew as necessary.
E3	Restrictors missing or blocked	Check and clear or renew as necessary.
E4	Hoses blocked or leaking	Check and clear as necessary. Renew any deteriorated hoses.
E5	Charcoal canister restricted or blocked	Inspect, and renew if necessary.

ENGINE BREATHER FILTER

Remove and refit **17.10.02**

Removing

Remove the hose clip securing the rubber cover to breather housing and disconnect.
Remove the rubber cover and lift out the filter (Fig. 7).

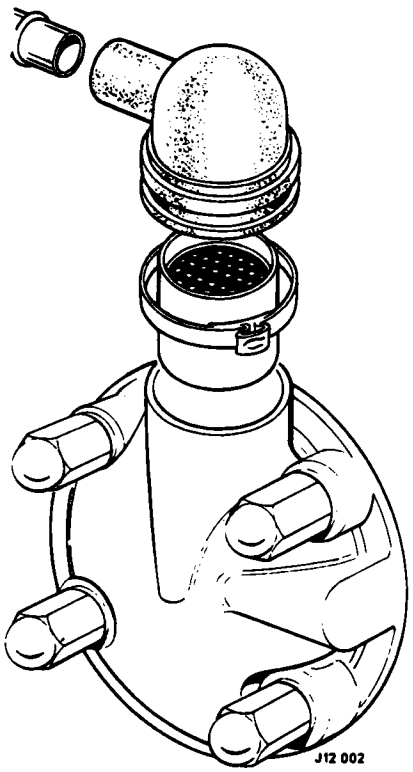

Fig. 7

Refitting

Refitting is a reversal of the above procedure.

ADSORPTION CANISTER

Remove and refit **17.15.13**

Removing

Remove the front right-hand road wheel.
Detach the pipes from the canister (1, Fig. 8).
Remove the nut, spring washer, plain washer and bolt (2, Fig. 8) securing the canister clamp to the mounting strap and withdraw the canister (3, Fig. 8).

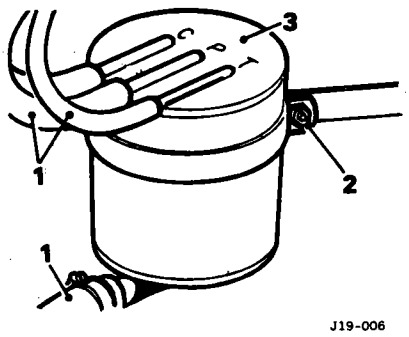

Fig. 8

Refitting

Refitting is a reversal of the above procedure.

CATALYTIC CONVERTER

Remove and refit **17.50.01**

Removing

Raise the vehicle on a ramp.
Remove the nuts, plain washers and bolts securing the flanges, separate the intermediate pipe from the down-pipe. Ensure that the intermediate pipe is adequately supported.
Remove the nuts and plain washers securing the heatshield and down-pipe to the exhaust manifolds; withdraw the heatshield.
Withdraw down-pipe/catalyst (Fig. 9).

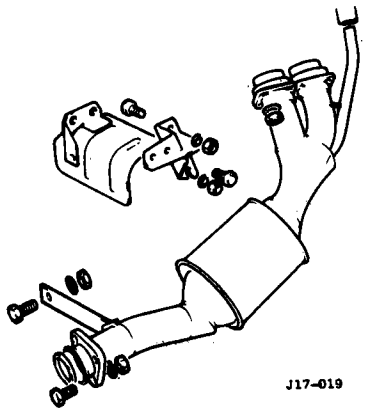

Fig. 9

Refitting

When refitting, first coat all joints with Firegum. Tighten the down-pipe and clamping flange fixings by diagonal selection to avoid distortion.

AIR SWITCHING VALVE VACUUM FEED HOSE

Renew **17.25.46**

Open the bonnet.
Cut and remove the plastic straps securing the vacuum feed hose.
Disconnect the vacuum feed hose from the air switching valve.
Disconnect the hose from the manifold.
Remove the vacuum hose.
Fit the new vacuum hose to the engine.
Connect the hose to the manifold.
Connect the hose to the air switching valve.
Reposition the hose to its mounting position and secure with plastic straps.
Close the bonnet.

HOSE — FEED PIPE TO AIR CLEANER

Renew **17.25.45**

Open the bonnet.
Slacken the air cleaner feed pipe to the air cleaner hose securing clips.
Disconnect the hose from the air cleaner.
Remove the hose assembly from the feed pipe.
Remove the hose clips.

HOSE — AIR SWITCHING VALVE TO AIR CLEANER FEED PIPE

Renew **17.25.44**

Open the bonnet.
Slacken the air switching valve to the air cleaner feed pipe hose clips.
Disconnect the hose from the switching valve.
Remove the hose assembly from the air pipe.
Remove the hose clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose assembly to the air feed pipe.
Connect the hose to the air switching valve.
Tighten the hose clips.
Close the bonnet.

HOSE — CHECK VALVE TO AIR RAIL

Renew **17.25.43**

Open the bonnet.
Slacken the check valve to air rail hose securing clips.
Disconnect the hose from the air rail.
Remove the hose assembly.
Remove the clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose assembly to the check valve.
Connect the hose to the air rail.
Tighten the hose clips.
Close the bonnet.

HOSE — AIR RAIL FEED PIPE TO CHECK VALVE

Renew **17.25.42**

Open the bonnet.
Slacken the air rail feed pipe to check valve hose clips.
Disconnect the hose from the check valve.
Remove the hose assembly from the feed pipe.
Remove the hose clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose assembly to the feed pipe.
Connect the hose to the check valve.
Tighten the hose clips.
Close the bonnet.

HOSE — AIR SWITCHING VALVE TO AIR RAIL FEED PIPE

Renew **17.25.41**

Open the bonnet.
Slacken the air switching valve to air rail feed hose securing clips.
Disconnect the hose from the feed pipe.
Remove the hose from air pump.
Remove the hose clips.
Place the hose aside.
Place the new hose to the front.
Fit the hose clips.
Fit the hose to the air pump.
Connect the hose to the feed pipe.
Tighten the hose clip.
Close the bonnet.

THERMAL SWITCH

Renew **17.25.40**

Open the bonnet.
Remove and refit the pressure cap to the relieve coolant pressure.
Disconnect the switch feed wires.
Undo and remove the switch.
Fit and tighten the new switch.
Connect the switch feed wires.
Close the bonnet.

AIR SWITCHING VALVE

Renew **17.25.38**

Open the bonnet.
Disconnect the switching valve block connector.
Disconnect the switching valve vacuum hose.
Slacken the air cleaner feed pipe hose securing clip.
Disconnect the hose from valve.
Slacken the air rail feed pipe hose securing clip.
Disconnect the hose from valve.
Undo and remove the switching valve to **lower** air pump securing nuts.
Remove the air switching valve.
Remove and discard the switching valve gasket.
Clean the gasket faces.
Fit the new valve gasket.
Fit the new switching valve.
Fit and tighten the switching valve securing nuts.
Connect the air rail feed pipe hose to the valve.
Tighten the hose clip.
Connect the air cleaner feed pipe hose to the valve.
Tighten the hose clip.
Connect the valve vacuum feed hose.
Connect the valve block connector.
Close the bonnet.

CHECK VALVE/NON RETURN VALVE

Renew **17.25.21**

Open the bonnet.
Slacken the valve hose securing clips.
Disconnect the air rail feed hose from the valve.
Remove the check valve assembly.
Undo and remove the check valve from the union.
Fit and tighten the check valve to the union.
Fit the check valve assembly to the feed hose.
Connect the air rail feed hose.
Tighten the hose clips.
Close the bonnet.

AIR RAIL — SINGLE

Renew **17.25.17**

Open the bonnet.
Slacken the air rail feed hose clip.
Disconnect the hose from air rail.
Undo and remove the heat shield to air rail securing nuts.
Remove clamp halves.
Displace the rear plug lead bracket for access.
Remove the heat shield.
Undo the air rail to cylinder head union nuts.
Remove the air rail assembly.
Remove and discard the air rail olives.
Finally remove the union nuts.
Place the air rail aside.
Clean the air rail, seatings and olives.
Place the new air rail to the front.
Fit the air rail union nuts.
Fit the new sealing olives.
Fit and seat the air rail assembly to the head.
Seat the air rail sealing olives.
Tighten the union nuts.
Fit the heat shield to the air rail.

Fit the heat shield clamps.
Fit and tighten the heat shield securing nuts.
Reposition and secure the plug lead bracket.
Connect the air rail feed hose.
Tighten the hose clip.
Close the bonnet.

AIR PUMP DRIVE BELT

Renew **17.25.15**

Open the bonnet.
Undo the link arm adjusting nut.
Slacken the link arm trunnion nut.
Slacken the link arm pivot bolt.
Slacken the pump pivot nut/bolt.
Pivot the pump to the engine.
Release the drive belt from the pulley.
Slacken the power steering pump adjuster link trunnion.
Slacken the adjuster link eye bolt at the power assisted steering pump.
Slacken the power steering pump pivot bolt/nut.
Slacken the adjuster link lock nut.
Pivot the power steering pump towards the engine.
Release the power steering pump from the air pump drive belt pulley.
Reposition the air pump belt from the pulley and into the fan cowl.
Release the drive belt from the fan blades.
Remove the air pump drive belt.
Clean the pulley registers.
Fit the new belt to engine.
Engage the belt over fan blades.
Reposition the air pump belt behind the P.A.S. belt.
Reposition the P.A.S. belt over the pullies.
Tighten the adjusting nut.
Check the tension and tighten the locknut.
Tighten the adjuster link trunnion bolt.
Tighten the adjuster link eye bolt.
Tighten the pump pivot nut/bolt.
Engage the drive belt over the air pump pulley.
Pivot the pump from the engine.
Tighten the link arm adjusting nut to obtain the correct belt tension.
Tighten the lock nut.
Tighten the link arm trunnion nut.
Tighten the link arm pivot bolt.
Tighten the air pump pivot bolt.
Close the bonnet.

AIR PUMP BELT

Tensioning **17.25.13**

Open bonnet.
Slacken the air pump pivot nut/bolt.
Slacken the link arm pivot bolt.
Slacken the link arm trunnion nut.
Slacken the link arm locknut.
Tighten the link arm adjusting nut to give the correct belt tensioning.
Tighten the link arm locknut.
Tighten the link arm trunnion nut.
Tighten the link arm pivot bolt.
Tighten the air pump pivot nut/bolt.
Close the bonnet.

AIR PUMP

Renew **17.25.07**

Open bonnet.
Disconnect the switching valve block connector and the switching valve vacuum hose.
Slacken the air cleaner feed pipe hose securing clip.
Disconnect the hose from the valve.
Slacken the air rail feed pipe hose securing clip.
Disconnect the hose from the valve.
Manually tension the air pump drive belt and break 'Sticktion' of pump pulley securing bolts.
Undo the link arm adjusting nut.
Slacken the link arm trunnion nut.
Undo and remove the air pump pivot nut only.
Undo the link arm pivot bolt.
Pivot the pump to the engine.
Disconnect the drive belt from the pulley.
Finally remove the pump pulley securing bolts.
Remove the pump pulley.
Finally remove the link arm pivot bolt.
Pivot the link arm aside.
Remove the link arm spacer.
Finally remove the pump pivot bolt.
Remove the air pump assembly.
Undo and remove the air switching valve securing nuts.
Remove the switching valve.
Remove and discard the gasket.
Undo and remove the air switching valve studs.
Place the pump aside.
Clean the gasket faces.
Place the new air pump to front.
Fit and tighten the switching valve studs.
Fit switching valve gasket.
Fit switching valve to pump.
Fit and tighten the switching valve securing nuts.
Fit the pump assembly to engine.
Fit but do not tighten the pump pivot nut/bolt.
Align the pump and link arm and fit the spacer.
Fit but do not tighten the link arm pivot bolt.
Fit the pump pulley to pump.
Fit but do not tighten the pump securing bolts.
Engage the drive belt over the pump pulley.
Pivot the pump from the engine.
Tighten the link arm adjusting nut to obtain the correct belt tension.
Tighten the lock nut.
Tighten the link arm trunnion nut.
Finally tighten the link arm pivot bolt.
Finally tighten the pump pivot bolt/nut.
Manually tension the belt.
Finally tighten the pump pulley securing bolts.
Connect the air rail feed hose to the valve.
Tighten the hose clip.
Connect the air cleaner feed pipe hose to valve.
Tighten the hose clip.
Connect the vacuum feed hose to the valve.
Connect the valve block connector.
Close the bonnet.

CONTENTS

DATA 19.15.00

Needle type	BDW
Spring	RED
A.E.D. unit type	TZX 1002

Torque figures

All fuel feed hoses 0,20 to 0,23 kgf m (17 to 21 lbf in).

Description 19.15.00

The HIF (Horizontal Integral Floatchamber) carburetter is functionally similar to preceding SU designs and operates on the variable choke/constant depression principle. This instrument has been designed as part of a carburation system which can achieve the precise induction of mixture required to control exhaust emissions to within statutory limits.

The HIF employs the familiar suction chamber/piston assembly together with a single jet-needle fuel metering system.

Main design changes are to be found in the position and layout of the float chamber, the incorporation of a fuel temperature compensating device and the arrangement for mixture setting.

Float chamber design

The float chamber is integral with the main body casting. Access to the chamber is obtained by removing the bottom cover-plate. The moulded float is shaped so that it surrounds the jet tube and is pivoted along a line parallel to the inlet flange. The float is retained by a spindle which screws into the body casting.

Entry of fuel into the float chamber is through a brass tube in the side of the carburetter body via a needle valve assembly.

The jet is pressed into the top of an aluminium tube which is in turn pressed into a plastic moulding. This hollow moulding known as the jet head is open at the lower end allowing fuel to enter the jet tube.

Mixture adjustment

The jet tube is moved in the vertical plane to provide mixture adjustment only.

Fuel temperature compensation

This device alters the jet position in relation to the metering needle to compensate for changes in fuel viscosity which takes place with changes in fuel temperature.

The jet head is attached to a bi-metal blade. This bi-metal blade is immersed in fuel in the float chamber and will move in the vertical plane in response to changes in fuel temperature. The jet will be raised to a weaker position on the jet needle when the fuel temperature rises and will be lowered to a richer position when the temperature falls.

From this it will be seen that once the jet position has been selected by adjusting the mixture screw, alterations of fuel temperature will bring about slight alterations in jet position to compensate for the change in fuel viscosity.

The effect of this device is that driveability is improved over wide ranges of temperature, and exhaust emissions kept within closer limits during cold starting and warm-up period. Temperature compensation also allows carburetters to have the mixture setting pre-set and sealed before a vehicle is delivered.

AIR CLEANER

Remove and refit 19.10.01

Removing

Disconnect the flexible inlet pipe and the air duct flexible pipe (1, Fig. 1).

Pull the vacuum pipe from the flap valve servo motor (3, Fig. 1).

Release the hose clip securing the vent hose to stub pipe on the inner face of the backplate (2, Fig. 1).

Release the toggle clips and withdraw the air

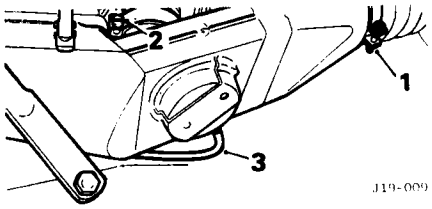

Fig. 1

cleaner cover (1 & 2, Fig. 2).

Lift out the filter element (3, Fig. 2).

Remove the outer pair of nuts and bolts securing the backplate to the carburetter flanges and spacers (4, Fig. 2).

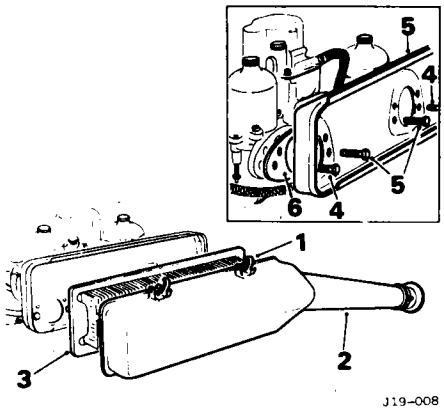

Fig. 2

Support the A.E.D. unit and remove the inner pair of nuts and bolts. Collect spacers (5, Fig. 2).

Move the backplate away from the carburetters and disconnect the vacuum pipe from the temperature sensor unit and the vent hose from the stub.

Lift out the backplate; remove and discard the gaskets (6, Fig. 2).

When refitting, use new gaskets.

RAM TUBE

Remove and refit 19.10.21

Remove the nuts, bolts and washers securing the expansion tank pipe and radiator bleed pipe clips. Retain the cable harness clips (1, Fig. 3).

Remove the setscrews, washers and locknuts securing the fan cowl brackets (2, Fig. 3).

Remove the two self-tapping screws securing the headlamp relay (3, Fig. 3).

Pull the connectors from the headlamp relay and fuse boxes (4 Fig. 3), noting the connections.

Carefully pull the cable harness from the top rail grommet.

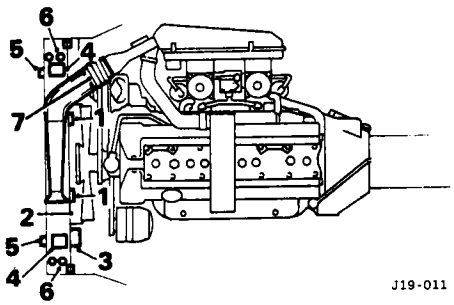

Fig. 3

Cars fitted with air conditioning only

Remove the Phillips head screws, washers and rubber bushes securing the condenser unit (5, Fig. 3). Support the condenser, using suitable padding.

All cars

Remove the six setscrews and two nuts, bolts and washers securing the radiator top rail (6, Fig. 3).

Release the clip securing the flexible inlet pipe.

Lift the ram tube and radiator top rail assembly from car.

Release the clips (7, Fig. 3) and remove the fuse boxes from the top rail.

CARBURETTERS—CAR SET

Tune and adjust 19.15.02

NOTE: Carburetter mixture adjustment is preset and sealed and should not normally be altered. The only adjustments that should be made are to idle speed setting and throttle controls.

Before making any adjustment to carburetters or throttle controls, check and if necessary rectify, spark plug conditions and gaps, contact breaker gap, ignition timing, distributor centrifugal advance mechanism and compression pressures. Check tappet clearances if compression pressures are uneven.

If satisfactory results are not achieved by carrying out the procedure detailed below it will be necessary to refer to 'Mixture Controls, Adjust and Reset'.

NOTE: The operations may not be undertaken unless suitable CO metering equipment is available for emission testing, and it is a legal

requirement for cars in the United Kingdom that the tamperproofing seals fitted to the carburetters of these cars may not be removed unless such equipment is provided. Tamperproof seals MUST be renewed after current emission regulations have been met in test.

Remove the air cleaner element.
Unscrew the damper cap of one carburetter (2, Fig. 4).

CAUTION: (Early models only) It is essential that in lifting the cap, the damper retainer clip fitted below it is not displaced from its position in the position rod. If the retainer is inadvertently displaced it must be refitted by pressing fully into the piston rod.

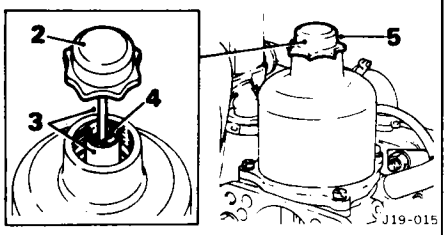

Fig. 4

Carefully withdraw the damper, by raising the cap, until the piston and damper TOGETHER reach the limit of upward travel, and inspect the oil level in the damper retainer (3, Fig. 4).
If the oil is not visible in the retainer, add engine oil (preferably S.A.E. 20) to the recess in the retainer until it is just visible at the bottom of the retainer recess (4, Fig. 4). Move the damper GENTLY up and down to 'pump' any trapped air out of the reservoir.
Replace the cap and tighten firmly by hand.
Repeat on the other carburetter (5, Fig. 4).
Check that the throttle linkage and cable to pedal operate smoothly.
Remove the lids of the tamperproof caps over the slow-running adjusting setscrews (1, Fig. 5). Detach the setscrews, remove the tamperproof seals and replace with new seals. Refit the adjusting screws and screw in until they almost contact the throttle levers. DO NOT close the lid on this operation.

NOTE: If the tamperproof cap is not fitted, unscrew the slow-running adjusting screws until they no longer contact the throttle levers.

Slacken the nuts of the clamp bolts on the throttle operating spindles on both sides of rear carburetter (2, Fig. 5).
Raise the piston in each carburetter with a finger and, using the mirror, inspect to check that both butterfly valves are fully closed and that the over-run valves are correctly seated.
Screw down both of the adjusting screws until they just contact the throttle levers, then screw down another one turn (1, Fig. 5).
Start the engine and run until it reaches normal operating temperature; stop the engine.
Check that the mixture pipe from the A.E.D. unit is warm (3, Fig. 5).
Start the engine again and using a rubber tube as a 'listening tube', compare the intensity of hiss of air entering each choke. Alter the setting of the adjusting screws until hiss is the same on both carburetters.

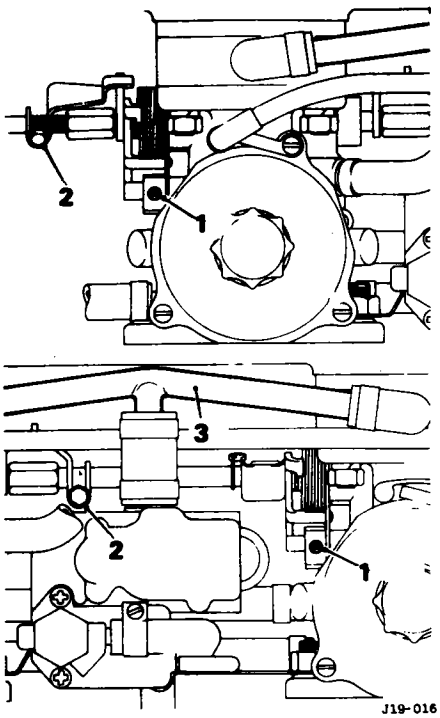

Fig. 5

NOTE: This operation may, if preferred, be carried out using a balance meter to makers' instructions.

Alter the settings of both adjusting screws by the same amount to achieve correct idling speed, i.e. 750 rev/min (1, Fig. 5).
When the correct idling speed is achieved, recheck the balance of the carburetters, alter the settings of the adjusting screws if necessary to secure the correct balance and idling speed.
Stop the engine.
Re-tighten the clamp bolts on the throttle operating rods (2, Fig. 5) to secure the correct opening characteristics on throttle. On automatic transmission cars there should be no backlash between the tongue and upper arm of yoke behind the rear carburetter, or between the tongue and the lower arm of the yoke between carburetters: both butterflies should start to open as soon as throttle cable is moved. On manual transmission cars there should be a gap of up to 0,9 mm (0.036 in) between the tongue and the lower arm of yoke between carburetters, so that the rear butterfly opens by up to 3° before front butterfly starts to open.
There should be no backlash between the tongue and the upper arm of yoke behind the rear carburetter.
Slacken the locknuts on the outer throttle cable and adjust the position of the cable in abutment so that the throttle operating lever rests against the back stop, yet the inner cable is not slack; tighten the locknuts (1, Fig. 6).
Check the operation of the throttle cable; the cable should pick up linkage immediately the pedal is moved (2, Fig. 6).
Slacken the locknut and wind back the operating lever to stop screw (3, Fig. 6).
Press the operating lever (4, Fig. 6) to open the butterfly valves and turn the stop screw (5, Fig. 6) to contact the lever. Tighten the locknut (3, Fig. 6).
Depress the pedal and ensure that the operating lever moves to touch the stop screw with the pedal at the end of its travel.
Adjust the pedal stop so that cable is not under due strain when the pedal is fully depressed.
Check the operation of the kick-down cable on cars fitted with automatic transmission (6, Fig. 6).
Refit the air cleaner element. Check CO emissions, using approved equipment, and correct if necessary to bring within current requirements.
Secure the lids of the tamperproof caps over the slow-running adjustment setscrews.

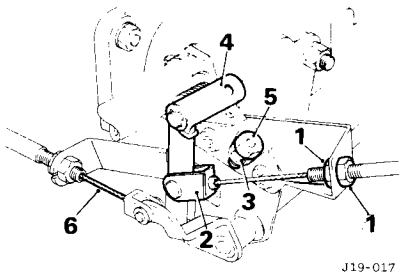

Fig. 6

MIXTURE CONTROL

Adjust and reset 19.15.06

NOTE: Do not adjust the mixture control on carburetters until all other possible factors which could cause faulty carburation have been eliminated; control setting has been correctly set and sealed before delivery, and should not require alteration.
Resetting mixture controls necessitates a check of emissions, using an exhaust gas analyser; regulation regarding emissions must be strictly adhered to. Ensure that equipment required for emission check is available before commencing mixture adjustment, and proceed as follows:
If possible, choose a location with an ambient temperature of between 15° and 26°C (60° to 80°F) to carry out the job. Place selector at 'P' on automatic transmission cars.
Remove the air cleaner.
Remove the plugs and sealant from both carburetter jet adjustment screws (1, Fig. 7).
Turn the jet adjusting screws clockwise, if necessary, (to lower jets) until jets are below level of the transverse bridges in the carburetter bores (2, Fig. 7).
Lift one carburetter piston by hand and insert straight-edge approximately 13 mm (0.5 in) wide alongside the needle in a vertical plane (3, Fig. 7).

continued

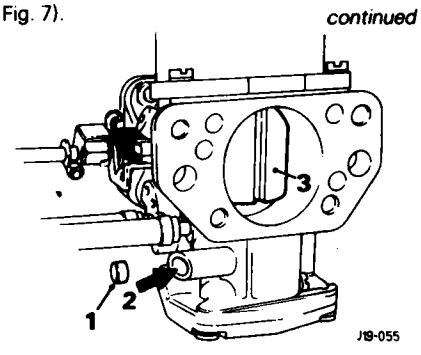

Fig. 7

Turn the adjusting screw anti-clockwise until the jet just contacts the steel rule. The jet is then accurately positioned level with the carburetter bridge.
Screw in the adjusting screw 3⅓ turns, bringing jet 2,97 mm (0.117 in) below carburetter bridge. This is the datum position at 20°C (68°F) from which final adjustments are to be made.
Repeat on the second carburetter.
Check the oil level in the carburetter piston bores.
Start the engine and run until fully warm, for at least five minutes after thermostat opens.
Run the engine at approximately 2500 rev/min for one minute; stop the engine.

NOTE: Adjustment may now be carried out for three minutes, then engine must be run again for one minute at 2500 rev/min before any further adjustment is made.

This cycle of operations—run for one minute, adjust for three—may be repeated as often as necessary.
Check that the idling speed is 750 rev/min and, if not, adjust to this figure.
Turn each jet adjusting screw clockwise to enrich the mixture or anti-clockwise to weaken, turning each screw by the same small amount until fastest idling speed is indicated.
Turn each screw anti-clockwise, each by the same amount, until engine speed just begins to fall.
Turn each screw clockwise by the same very small amount until maximum speed is regained.
Re-adjust the tickover, if necessary, to 750 rev/min.
Connect a suitable exhaust gas analyser to the vehicle exhaust and allow it to stabilise for at least one minute before checking CO emission
If necessary, adjust the mixture screws further to bring emissions just within current regulation limit.
Seal the mixture setting screws and close the aperture with a red plug.
Refit the air cleaner

CARBURETTERS—CAR SET

Remove and refit **19.15.11**

Removing.

Remove the air cleaner and the A.E.D. unit (1, Fig. 8).
Disconnect the crankcase breather pipes from the carburetters (2, Fig. 8).
Disconnect the fuel pipes from the carburetters, and plug the fuel supply pipe (3, Fig. 8).
Disconnect the vacuum pipe from the rear carburetter (4, Fig. 8).
Release the external circlips from the throttle rod and lower pin in linkage (1, Fig. 9). Withdraw the pin.
Disengage the links from the lever on the rod and draw the rod back until its forward end disengages from the nut on the rear carburetter spindle (2, Fig. 9).
Remove the eight nuts and spring washers securing the carburetters to the manifold, and slide the carburetters off the studs (5, Fig. 8).

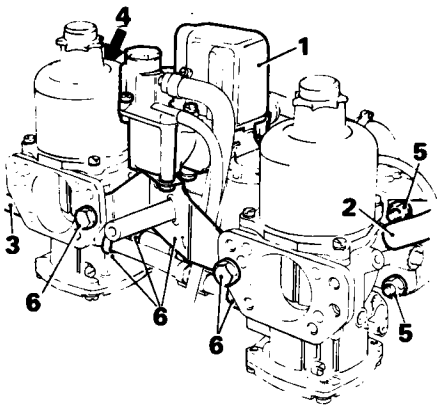

Fig. 8

Discard the flange gaskets but replace two nuts on studs to retain the adaptors and insulating spacers in their original positions.
Release the clips off fuel and vent pipes, remove the A.E.D. bracket and draw the front carburetter with throttle linking rod away from the rear carburetter (6, Fig. 8).

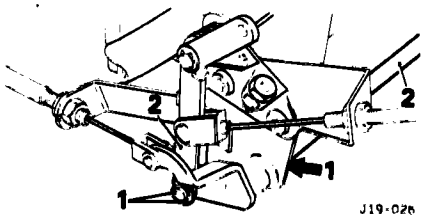

Fig. 9

Refitting

Slide new 'O' clips over the fuel and vent hoses and fit the hoses over the stubs on the carburetters. Do not tighten the clips at this stage.
Engage the rear end of the throttle linking rod with hollow nut on front of the rear carburetter spindle and engage the tongue of clamping bracket with the yoke.
Remove the nuts from manifold studs, place new gaskets in position and offer up carburetter to the studs.
Fit the spring washers and retaining nuts and tighten the nuts by diagonal selection. Ensure that the fuel and vent hoses between the carburetters are not twisted or distorted and secure the 'O' clips retaining them to the stubs.
Move throttle rod forward, engaging its ball-end with the hollow nut on the rear throttle spindle, and the tongue of the clamping bracket with the yoke.
Replace the link pin and circlips.

NOTE: Ensure that the circlips are replaced on the rod and pin. They are not interchangeable.

Check that both of the throttle butterflies are fully closed.
Refit the A.E.D. unit and connect the fuel, breather and vacuum hoses. Tune and adjust the carburetters. Refit the air cleaner.

CARBURETTER

Overhaul **19.15.17**

Dismantling

NOTE: Overhaul procedure is given for rear carburetter. Front carburetter differs in fuel supply and vent pipe connections, throttle spindle details and in absence of vacuum take-off stub.

Service tools: Replacer damper assembly retainer (early models only).

Unscrew the cap of the suction chamber, lift until resistance is felt, support the piston (with a finger through the intake) at the top of its travel and pull the cap firmly upwards to release the damper retainer from the piston rod. Remove the damper (1, Fig. 10).
Unscrew the suction chamber retaining screws and remove the identity tag (2, Fig. 10).
Slightly rotate the suction chamber to free it, and lift vertically from the body without tilting (3, Fig. 10).
Remove the spring, lift out the piston and needle assembly and empty the oil from the piston rod (4, Fig. 10).
Mark the lower face of the piston (to locate the

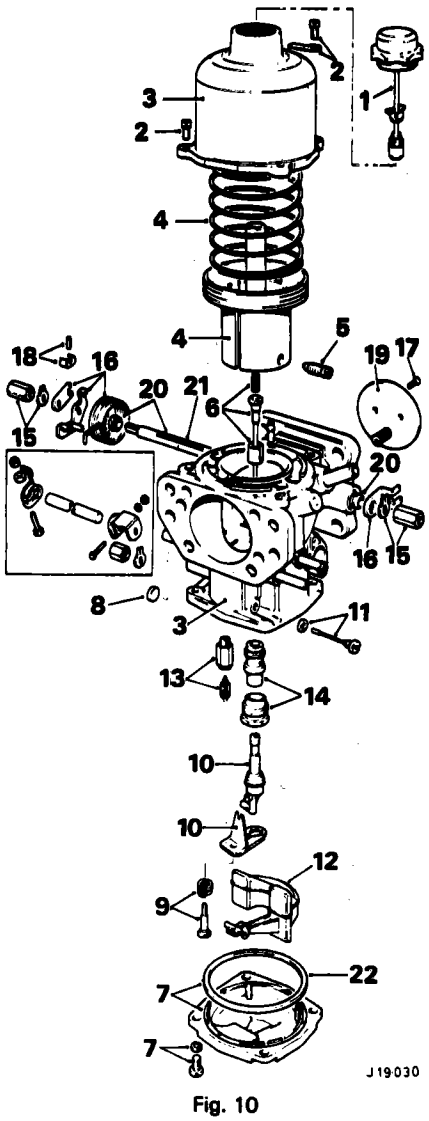

Fig. 10

position of 'V' mark on needle guide for correct reassembly) and remove the needle guide locking screw. Discard the screw (5, Fig. 10).
Withdraw the needle with guide and spring (6, Fig. 10).
Remove the bottom cover-plate retaining screws and the spring washers and detach the cover-plate with the sealing ring (7, Fig. 10).
Only if it is essential, remove the jet adjusting screw, plug and sealing from its counterbore and withdraw screw; and 'O' ring is carried in a groove in its head (8, Fig. 10).
Remove the jet adjusting lever retaining screw. Collect the spring (9, Fig. 10).
Withdraw the jet and adjusting lever together and separate the lever from the jet (10, Fig. 10).
Unscrew and remove the float pivot spindle. Collect washers from between the pin head and carburetter body (11, Fig. 10).
Withdraw the float (12, Fig. 10).
Remove the needle valve and unscrew the valve seat (13, Fig. 10).
Unscrew the jet bearing locking nut and withdraw the jet bearing (14, Fig. 10).
Bend back the lock washer tabs and unscrew the nut retaining the throttle levers and return spring. Note location of levers and spring (15, Fig. 10).
Remove the yoke lever and the return spring (16, Fig. 10).
Remove the throttle disc retaining screws (17, Fig. 10).
Remove the slow-running adjustment grub screw, tamperproof cap, and spring clip (18, Fig. 10).
Close the throttle and mark the position of the throttle disc in relation to the carburetter flange. Do not mark the disc in the vicinity of the over-run valve. Open the throttle and carefully withdraw the disc from the throttle spindle, taking care not to damage the over-run valve (19, Fig. 10).
Withdraw the throttle spindle and remove its seals, noting the way it is fitted in relation to the carburetter body to ensure correct reassembly (20, Fig. 10).

Inspection

Examine the throttle and its bearings in the carburetter body; check for excessive play, and renew parts as necessary (21, Fig. 10).
Examine the float needle and seating for damage and excessive wear; examine the nylon body of the needle for cracks; renew both the needle and the seat if necessary (13, Fig. 10).
Examine all the rubber seals and 'O' rings for damage or deterioration; renew as necessary. The cover-plate sealing ring must be renewed.
Examine the carburetter body for cracks and damage and for security of brass connections and piston key (3, Fig. 10).
Clean inside of the suction chamber and the piston rod guide with fuel or methylated spirit (denatured alcohol) and wipe dry. Abrasives must not be used.
Examine the suction chamber and piston for damage and signs of scoring.
Check that all balls are in piston ball-race (2 rows, 6 per row).
Fit the piston into the suction chamber, without the damper and spring; hold the assembly in a horizontal position and spin the piston. The piston should spin freely in the suction chamber without any tendency to stick.

Reassembling

Fit the new seals to the carburetter body and replace the spindle. Press the seals just inside the spindle housing bosses (1, Fig. 11).
Insert the throttle disc in the spindle, ensuring that it is positioned as previously marked (2, Fig. 11).
Fit two new throttle disc retaining screws. Ensure that the throttle closes correctly before tightening the screws fully, and spread their slotted ends sufficiently to secure. Do not overspread (3, Fig. 11).
Replace the return spring, lever and yoke on throttle spindle (4, Fig. 11).
Fit the new lock washer and replace the nut on throttle spindle. Tighten to 0,43 kgf m (37 lbf in) and secure by bending over tabs (5, Fig. 11).
Replace the slow-running adjusting grub screw, with new spring clip and tamper-proof cover. DO NOT CLOSE LID OF COVER (6, Fig. 11).
Replace the jet bearing and tighten the locking nut 1,38 to 1.65 kgf m (10 to 12 lbf ft) (7, Fig. 11).
Replace the needle valve seat and refit the needle (8, Fig. 11).
Replace the float and spindle with washer and tighten to 0,07 kgf m (6 lbf in) (9, Fig. 11).

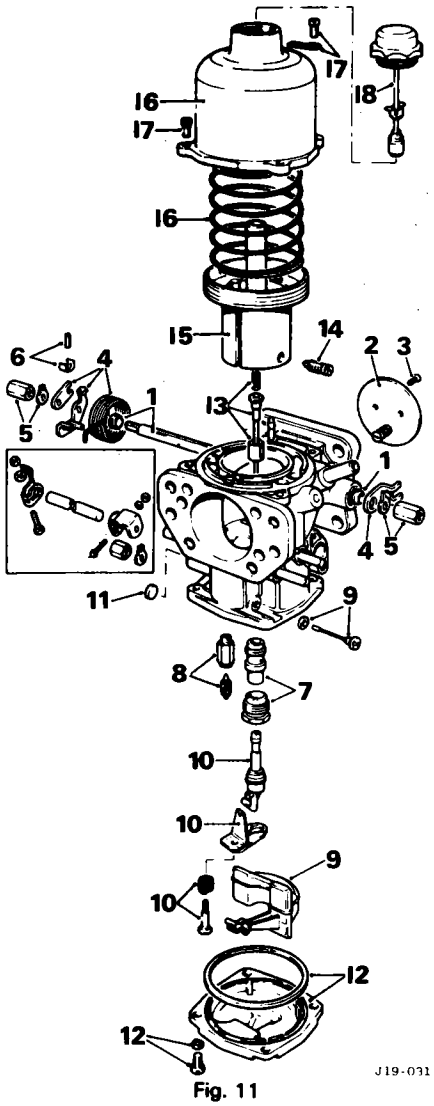

Fig. 11

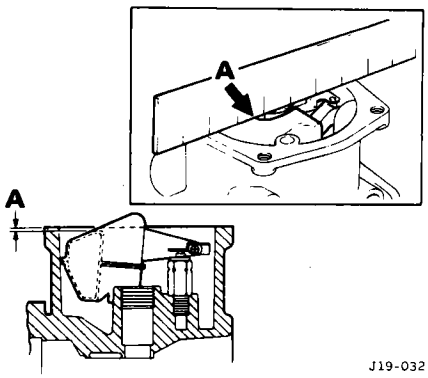

Fig. 12

Invert the carburetter so that the needle valve is held on the seat by the weight of the float. Check that the lowest point indicated on float as 'A' in illustration (Fig. 12) is 1,0 ± 0,5 mm (0.04 ± 0.02 in) below the level of the float chamber face. Adjust if necessary by carefully bending the brass arm. Check that the float pivots correctly about the spindle.
Assemble the jet and the adjusting lever and plate in position in body, engaging the forked end of the lever with the reduced diameter of the adjusting screw. Fit the retaining screw and spring, but tighten finger-tight only initially (10, Fig. 11).
Check that the jet head is free to move in the cut-out in the adjusting lever and slides easily in the jet bearing. Fully tighten the retaining screw.
If the adjusting screw has been removed, fit new 'O' ring to it and insert carefully ensuring that its reduced tip diameter engages the slot of the adjusting lever. Screw in until jet is flush with the bridge of the body, then screw in a further 3⅔ turns, to bring jet 3,0 mm (0.117 in) below bridge (11, Fig. 11).
Fit a new sealing ring to the bottom cover-plate and refit as marked. Replace the four retaining screws and spring washers and tighten the screws (12, Fig. 11).
Refit the spring to needle, ensuring that the spring is located in its groove (13, Fig. 11).
Slide the needle guide over the needle (with open end of slot adjacent to the projection in flange) and insert in the piston as previously marked.
Insert NEW needle retaining screw in the piston, position the needle guide flush with the bottom face of the piston and tighten the screw to 0,14 to 0,17 kgf m (12 to 15 lbf in) (14, Fig. 11).
Carefully replace the piston and the needle assembly in the carburetter body (15, Fig. 11).
Replace the spring on the piston, and lower the suction chamber carefully over the spring, avoiding turning the chamber as it compresses the spring (to prevent the spring from twisting the piston) (16, Fig. 11).
Fit the three screws and the identity tag (17, Fig. 11).
Insert the damper piston in bore of the piston rod using tool, press the damper retainer fully into top of rod (18, Fig. 11).
Fill the bore of the piston rod with engine oil, preferably S.A.E. 20, up to the bottom of damper retainer and tighten suction chamber cap firmly by hand.
Replace carburetters.

AUTOMATIC ENRICHMENT DEVICE (A.E.D.)

Remove and refit **19.15.38**

Removing

Disconnect the battery, the fuel inlet and overflow pipe (1, Fig. 13).
Disconnect the air delivery pipe and the mixture delivery pipe (2, Fig. 13).
Remove the bolts and spring washers securing the A.E.D. unit to mounting bracket; lift off the A.E.D. unit (3, Fig. 13).

Refitting

Reverse the above procedure, use new clips on the hot air inlet and mixture delivery pipes.

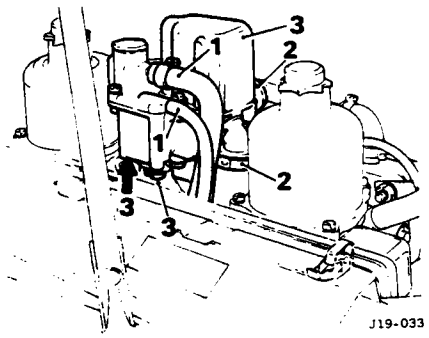

Fig. 13

DIAPHRAGM

Remove and refit **19.15.40**

Remove the A.E.D. unit (1, Fig. 14) and invert.
Remove the four screws and the spring washers securing the diaphragm cover (2, Fig. 14).
Withdraw the cover, spring, diaphragm and locating dowel (3, Fig. 14).

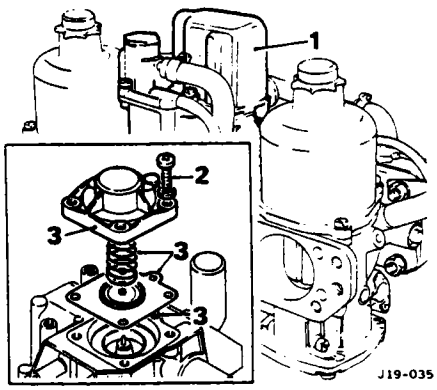

Fig. 14

Refitting

When refitting, ensure that the bore of the locating dowel is clean.
Push the dowel into the hole in the A.E.D. unit.
Locate the diaphragm on the A.E.D. unit.

NOTE: The rivet head must face toward the A.E.D. unit.

Insert the spring in the diaphragm cover.
Position diaphragm cover and spring squarely over the diaphragm, ensuring that the spring is seated in the diaphragm plate.
Push the cover down, ensuring that the locating dowel enters the hole in cover.
Refit the four securing screws and refit the A.E.D. unit.

NEEDLE VALVE

Remove and refit **19.15.42**

Removing

Remove the A.E.D. unit.
Carefully prise off the insulation cover (1, Fig. 15).
Remove the three screws and spring washers securing the float chamber cover (2, Fig. 15).
Lift off cover (3, Fig. 15).

CAUTION: Do not move cover sideways.

Remove and discard the gasket (4, Fig. 15).
Unclip the needle valve from the float arm (5, Fig. 15).

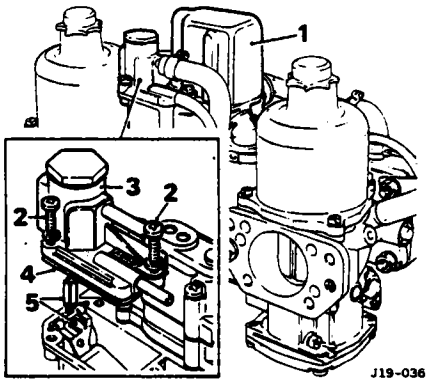

Fig. 15

Refitting

Lift float from the chamber.
Position the needle valve in the recess in the cover.
Clip the needle valve to the float arm by using a steel rule; hold the float against the cover.
Position the new gasket on the A.E.D. body—do not use jointing compound or grease.

Lower the cover on to the A.E.D. unit, ensuring that the float and needle valve are not displaced.
Ensure that the float hinge pin is correctly located before fitting the three securing screws and insulation cover. Refit the A.E.D. unit.

A.E.D. FILTER

Remove, clean and refit **19.15.43**

Disconnect the battery. See operation 86.15.20.
16).
Withdraw the filter element, wash it in petrol and dry using clean, dry compressed air (2, Fig. 16).

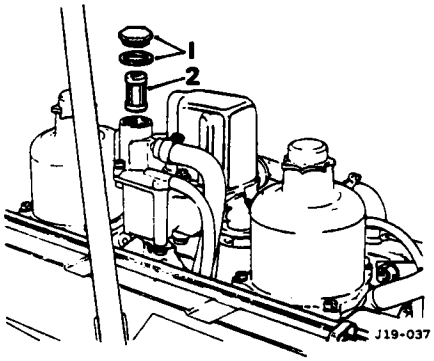

Fig. 16

HOT AIR PICK-UP UNIT

Remove and refit **19.15.44**

Slacken the clamping bolt and withdraw the air delivery pipe from the outlet tube (1, Fig,. 17).
Remove the bolts securing the pick-up unit to the exhaust manifold, withdraw the pick-up unit together with the air filter (2, Fig. 17).

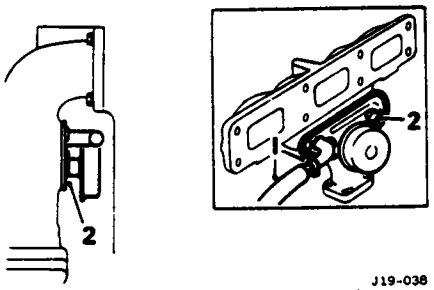

Fig. 17

HOT AIR DELIVERY PIPE

Remove and refit **19.15.45**

Slacken the clamping bolt and withdraw the air delivery pipe from the outlet tube.
Remove the nut and bolt securing the pipe clip to the support bracket.
Disconnect the delivery pipe from the A.E.D. unit.
Use a new clip to secure the delivery pipe to the A.E.D. unit when refitted.

HOT AIR FILTER

Remove, clean and refit **19.15.46**

Slacken the clamping bolt and move the filter towards the cylinder block to withdraw it (1, Fig. 18).
Wash the filter in petrol and dry with compressed air (2, Fig. 18).
Lightly oil the filter gauze with engine oil and refit.

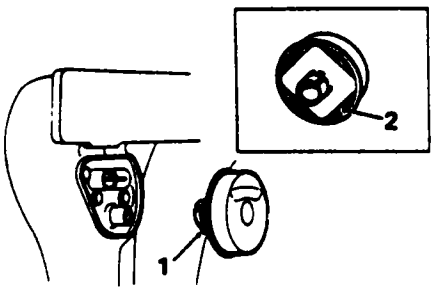

Fig. 18

THROTTLE LINKAGE

Check and adjust **19.20.05**

Fully depress the throttle pedal and ensure that the butterfly valve operating lever comes to a position just touching the operating lever stop screw (1, Fig. 19). If the lever does not touch the stop screw, and linkage was initially correctly set up, adjust as follows:
Slacken the locknuts at the outer throttle cable abutment (2, Fig. 19).
Adjust the position of the outer cable in abutment to place the inner cable under light tension but NOT to move throttle operating lever; secure the locknuts (3, Fig. 19).
Re-check adjustment as above.
Slacken locknuts on outer throttle cable and adjust position of cable in abutment so that throttle operating lever rests against back stop, yet inner cable is not slack; tighten locknuts.

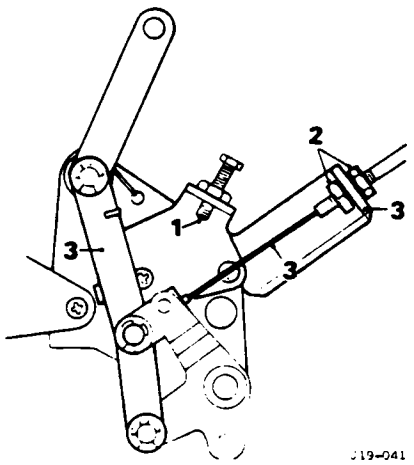

Fig. 19

Depress throttle pedal and ensure that operating lever moves to touch stop screw with pedal at end of its travel. Adjust pedal stop so that cable is not under due strain when pedal is fully depressed.
Check operation of kick-down cable (see 44.30.02—cars fitted with Model 66 automatic transmission only).

THROTTLE OPERATING ROD BUSHES

Remove and refit **19.20.10**

Remove the throttle pedal.
Remove the under-scuttle casing.
Prise the spring clips from the steering-column universal joint cover; detach the covers and padding—left-hand-drive cars only.
Remove the split pin at the top end of the operating rod (1, Fig. 20).
Disengage the sleeve and nipple from the rod (2, Fig. 20).
Remove the two self-locking nuts and draw the pedal arm from the stubs—right-hand-drive cars only.
Remove the split pin from the operating rod pivot (3, Fig. 20).
Pull the rod from the pivot. Recover the plain washer (4, Fig. 20).
When refitting, remove worn bushes and fit new ones where necessary (5, Fig. 20).

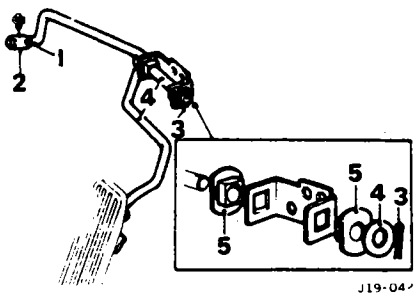

Fig. 20

FUEL PIPE ARRANGEMENT (Fig. 21) (Carburetter cars only)

Description **19.40.00**

The system utilizes two fuel pump assemblies and draws from two fuel tanks fitted in the rear wings.
When the left-hand tank is selected on the instrument panel switch, voltage is applied to the left-hand fuel pump and fuel is passed via the filter to the two carburetter float chambers.
Selection of the right-hand tank energizes the right-hand fuel pump.
The outlet non-return valve of the inoperative pump prevents fuel passing from one tank to the other.

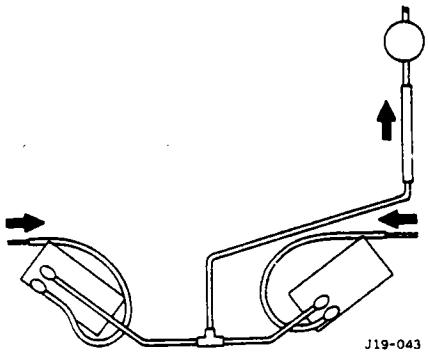

Fig. 21

Separate non-return valves are fitted in the flexible hoses near the tanks.
Air-conditioned cars are equipped with fuel coolers, attached to the hot air duct near the carburetters.
Special precautions detailed below must be taken before working on the fuel cooler.

FUEL COOLER

Remove and refit **19.40.40**

WARNING: Exposure to refrigerant gas, which is released if a refrigerant hose is detached from the cooler, can cause blindness. It is therefore essential to depressurize the air-conditioning system before disconnecting a refrigerant hose.

Fire precautions are also essential as fuel may be spilled when fuel hoses are disconnected.

Disconnect the battery.
Depressurize the air-conditioning system.
Disconnect the refrigerant inlet and outlet hoses from the cooler.
Clamp the fuel hoses.
Disconnect the fuel hoses.
Remove the two self-tapping screws and washers securing the fuel cooler. Collect the mounting clips and insulating sleeve.

After refitting, re-charge the air-conditioning system.

FUEL PUMP

Remove and refit (either side) 19.45.08

Place the car on a ramp, NOT over a pit.
Disconnect the battery.
Remove the rear wheel adjacent to the pump to be removed.
Drain the fuel tank.

WARNING: Take all due precautions against fire and explosion when draining fuel.

Remove the four screws securing the circular cover-plate to the rear vertical wall of the wheel arch. Withdraw the cover along the flexible hose (1, Fig. 22).
Disconnect the electrical leads from the pump (2, Fig. 22).
Release the hose clips and detach the flexible hose from the pump (3, Fig. 22).
Turn the locking flange anti-clockwise to release the pump and withdraw the pump and sealing washers, taking care to avoid damage to the filter as the pump is removed.
Discard the sealing washer (4, Fig. 22).
Remove all sealant from the pump, mounting flange and tank.
When refitting, ensure that the mounting faces of the pump flange and fuel tank are clean, and that the correct pump assembly is being refitted—C45442 is R.H. pump and C45443 is L.H. pump.
Fit new sealing washer and introduce the pump carefully into tank, securing in position with the locking flange.
Refit the flexible hose to the pump outlet pipe and tighten the hose clip screw to not more than 0,07 kgf m (6 lbf in).
Fit the electrical connections and smear the terminals with waterproof grease.
Replace the cover-plate and secure with the four screws.
Make good the sealing around the cover and screw leads by coating with Flintkote or similar protective covering.

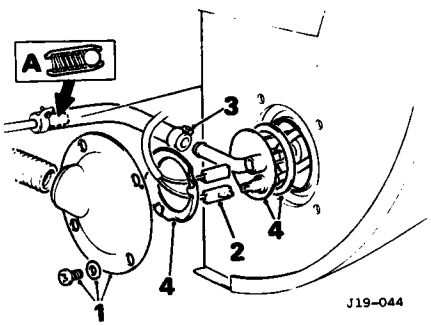

Fig. 22

NOTE: If it is found necessary to detach the forward end of the flexible hose, or to fit a new hose, it is most important that a non-return valve fitted in the forward end of the flexible hose is correctly installed. The purpose of the non-return valve is to prevent fuel from draining into the lower tank when the car is tilted, and therefore the ball must be at rear, or tank, end of fitting, as shown in illustration at 'A'.

NOTE: This type of fuel pump cannot be overhauled and must be renewed if found to be defective.

FUEL TANK

Remove and refit—either 19.55.01

Removing

Drain the fuel tank (1, Fig. 23) and disconnect the battery.
Remove the side section of rear bumper.
Remove the cross-head screws and washers securing the rear quarter fuel tank cover (2, Fig. 23).
Remove the setscrews and nuts, spring and plain washers securing the rear quarter fuel tank cover (3, Fig. 23). Remove the cover.
Remove the self-tapping screw securing the forward end of the luggage compartment side casing. Remove the casing.
Remove the four screws and shakeproof washers securing the flange of the fuel tank filler cap (4, Fig. 23).
Taking care to avoid damaging the paintwork, prise the flange (5, Fig. 23) from the body.
Pull the vent pipe (6, Fig. 23) from the stub where applicable.
Remove the gasket and 'O' ring seal.

NOTE: On carburetter cars fitted with submerged fuel pumps omit above operation and reach up between rear of tank and tail/stop/flasher light units to detach leads from the fuel gauge tank unit. (Submerged pump replaces gauge unit in forward tank aperture.) Detach the leads and flexible hose from pump before withdrawing tank.

Remove the bolt, special washer and shakeproof washer at the side of the luggage boot.
Release the fuel pipe connector at the base of the tank. Separate the connection and push the pipe carefully inwards flush with the panel (8, Fig. 23).
Remove the two bolts, special washers and shakeproof washers in the silencer tunnel and recover wedges (9, Fig. 23).
Release Nyloc nut at the hanger bolt (10, Fig. 23).
Carefully lower the fuel tank, note connections and detach the cables from the tank unit (11, Fig. 23).
On cars with an evaporative control system lower tank until vent pipe (7, Fig. 23) is accessible and detach pipe from stub.

Refitting

On cars with an evaporative control system offer up the tank and attach the vent pipe to stub.

All cars

Lift the tank and connect cables to the tank unit and submerged pump where applicable.
Lift the tank and engage the hanger bolt in bracket; secure with Nyloc nut.
Fit the bolts and special shakeproof washers at the upper and forward location. Do not tighten them at this stage.
Fit the bolt, special and shakeproof washer at the rear location. Fit wedges between the fuel tank and the side panel. Do not tighten at this stage.
Fit new 'O' ring seal in the fuel tank neck.
Press vent pipe onto filler neck stub, where applicable.
Use new gasket at the petrol filler cap flange

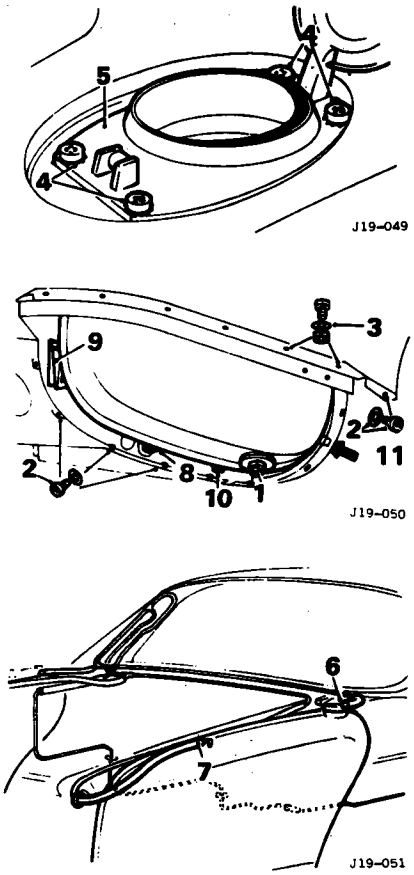

Fig. 23

and secure using the four screws and shakeproof washers.
From beneath, firmly press the fuel tank up to locate on the filler cap flange spigot and tighten the rear mounting bolt on wedges.
Secure the hanger bolt nut. Do not overtighten.
Tighten the remaining two mounting bolts.
Secure the supply pipe union to tank; connect the hose to pump on cars with submerged pumps.
Pour 2 to 3 gallons Imp. (9 to 13 litres) of specified fuel into the tank.
Connect the battery.
Switch on the ignition and select the fuel tank that has been changed.
Check to ensure that there are no leaks at the unions and that the fuel gauge registers.
Switch off the ignition.
Fit and secure the rear quarter fuel tank cover and the side section of the rear bumper.

FUEL TANK

Drain **19.55.02**

WARNING: Petrol (gasoline) must not be extracted or drained from a vehicle standing over a pit.
Petroleum or gasoline vapour is highly flammable and in confined spaces is also very explosive and toxic.
When petrol/gasoline evaporates it produces 150 times its own volume in vapour, which when diluted with air becomes an ignitable mixture. The vapour is heavier than air, and will always fall to the lowest level and it can readily be distributed throughout a workshop by air currents. Even a small spillage of petrol or gasoline is potentially very dangerous.
Extracting or draining petrol (gasoline) from a vehicle fuel tank must be carried out in a well-ventilated area, preferably outside the workshop. All forms of ignition must be extinguished or removed, any hand lamps used must be flameproof and kept clear of any spillage. The receptacle used to contain the petrol drained or extracted must be more than adequate to receive the full amount to be drained.

Open the fuel tank filler cap.
Place a suitable receptacle beneath the fuel tank drain plug.
Remove the drain plug, allow the fuel to drain.
Check the condition of the sealing washer and replace the plug. Do not overtighten.

FUEL FILLER CAP ASSEMBLY

Remove and refit **19.55.08**

Remove the four screws and shakeproof washers (1, Fig. 24) securing the flange of the fuel tank filler cap.
Taking great care to avoid damaging paintwork, prise the flange (2, Fig. 24) from the body.
Pull the vent pipe (3, Fig. 24) from the stub—evaporative loss control cars only.
Remove the gasket and 'O' ring seal.

When refitting use a new gasket and 'O' ring seal.

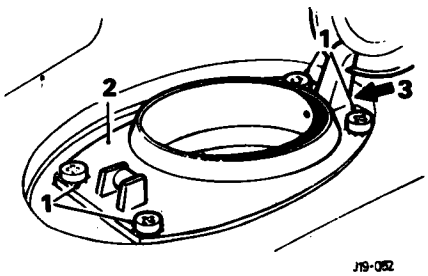

Fig. 24

FUEL FILLER LOCK

Remove and refit **19.55.09**

Open the filler cap lid.
Cover the filler hole with rag or adhesive tape.
Remove the screw and washer securing the ward to the lock barrel.
If the key is available, insert it in the lock, and press the barrel from inside to out.
If the key is not available, insert a piece of stiff wire to lift the tumblers and turn the barrel to mid position (1, Fig. 25).
Keep the barrel in this angular position and press from the lid (2, Fig. 25).

When refitting, insert the key in the barrel of the replacement lock and offer into the lid.
Remove the key (3, Fig. 25).
Secure the ward to the barrel using the screw and washer (4, Fig. 25).
Test-operate the lock and ensure that the ward turns to a position in line with, and facing, the lid catch. Unlock (5, Fig. 25).
Remove the obstruction from the filler hole and close the lid.

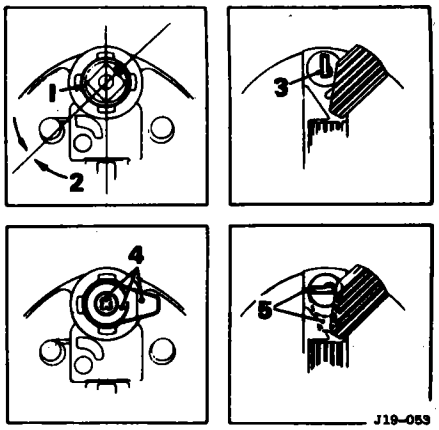

Fig. 25

CONTENTS

ELECTRONIC FUEL INJECTION

Description

The electronic fuel injection 'L' system can be divided into two separate systems interconnected only at the injectors.

The systems are:

1. A fuel system delivering to the injectors a constant supply of fuel at the correct pressure.
2. An electronic sensing and control system which monitors engine operating conditions of load, speed, temperature (coolant and induction air) and throttle movement. The control system then produces electrical current pulses of appropriate duration to hold open the injector solenoid valves and allow the correct quantity of fuel to flow through the nozzle for each engine cycle.

As fuel pressure is held cons ant, varying the pulse duration increases or decreases the amount of fuel passed through the injector to comply precisely with engine requirements.

Pulse duration, and therefore fuel quantity, is also modified to provide enrichment during starting and warming-up and at closed throttle, full throttle and while the throttle is actually opening.

All the injectors are simultaneously operated by the Electronic Control Unit (E.C.U.) twice per engine cycle.

The induction system is basically the same as that on a carburetted engine: tuned ram pipe, air cleaner, plenum chamber and induction ports. The air is drawn through a paper-element cleaner to a single throttle butterly valve and to individual ports for each cylinder leading off the plenum chamber. The injectors are positioned at the cylinder head end of each port so that fuel is directed at the back of each inlet valve.

Fuel system

Fuel supply

Fuel is drawn from the tanks (1, Fig. 1) at the rear of the car by a fuel pump (3, Fig. 1) via a solenoid operating change-over valve (2, Fig. 1) to a fuel rail, through an in-line filter (5, Fig. 1) and a pressure regulator (7, Fig. 1). Fuel is controlled so that the pressure drop across the injector nozzle is maintained at a constant 2,5 bars (36.25 lbf/in²). Excess fuel is returned to the tank from which it was drawn via a fuel cooler (4, Fig. 1)—on air conditioned cars only—and a solenoid-operated shut-off valve. The six fuel injectors (8, Fig. 1) are connected to the fuel rail (6, Fig. 1) and are electro-mechanically operated to inject into each inlet port. Fuel is also supplied to a cold start injector (9, Fig. 1) which is only operated during the starting of a cold engine.

SCHEMATIC DIAGRAM

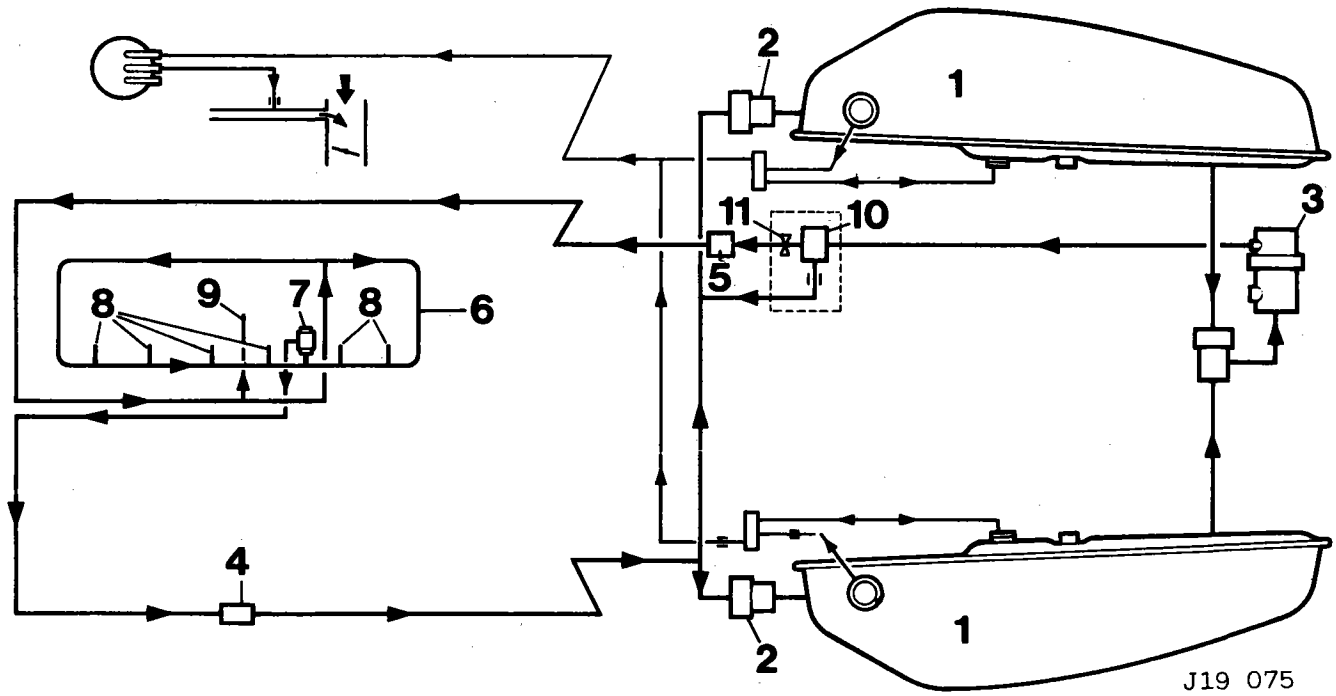

Fig. 1

1. Fuel tank
2. Change-over valve
3. Fuel pump
4. Fuel cooler
5. Fuel filter
6. Fuel rail
7. Fuel pressure regulator
8. Injectors
9. Cold start injector
10. Air bleed valve
11. Non return valve

ENGINE COMPONENT LOCATION (U.K. AND EUROPEAN)

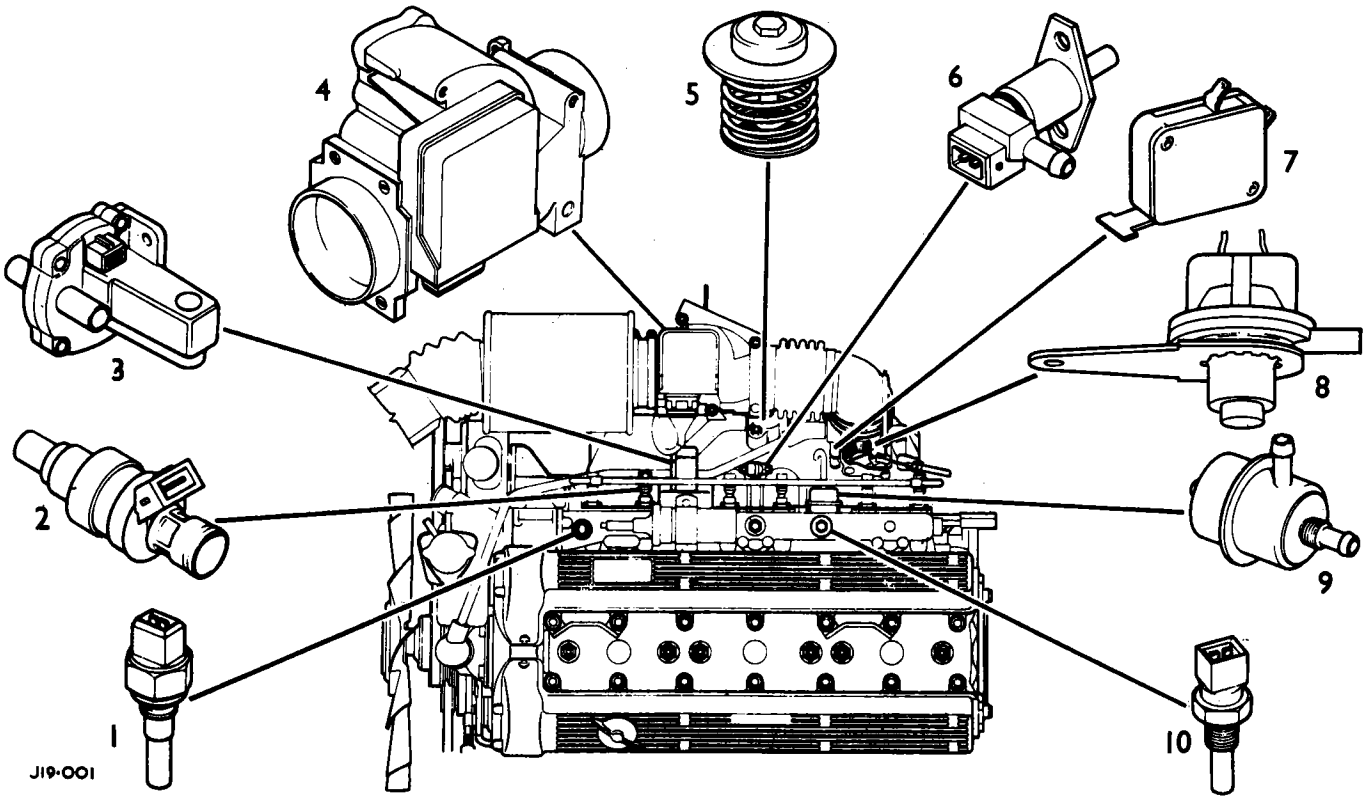

Fig. 2

1. Thermotime switch
2. Fuel injector
3. Auxiliary air valve
4. Air-flow meter
5. Over-run valve
6. Cold start injector
7. Micro-switch (automatic cars only)
8. Vacuum throttle switch
9. Fuel pressure regulator
10. Water temperature sensor

Air intake system

Air is drawn from the air cleaner through the air meter and throttle into the engine. The air passing through the air meter deflects the flap inside against a spring to a position dependent on the rate of air flow. A potentiometer connected to the flap spindle converts the flap angular position to a voltage. This voltage is transmitted to the E.C.U. as a measure of air flow.

Electronic system

The Electronic Control Unit (E.C.U.) receives information from the sensors placed about the engine. It computes the quantity of fuel required and therefore the time for which the injectors must remain open. An ignition L.T. circuit triggers all injectors simultaneously at every third spark. The injectors open twice per engine cycle, each time delivering half the fuel requirement of each cylinder.

Ballast resistor

In order to open and close the injectors a fairly high current drive is needed, about 1.5 amps per injector. The E.C.U. has an output stage designed to deliver this current, but to protect the output transistors of the E.C.U. from injector faults and short circuits there is a ballast resistor wired in series with each injector. These resistors will limit fault current to a safe value, thus protecting the E.C.U. The ballast resistors for each injector are housed in a single unit which is secured to the right-hand front engine valance by two screws.

Idle speed adjustment

The idle speed adjusting screw is located in the air distribution block and controls air flow to the extra air valve.

Auxiliary air valve

The auxiliary air valve consits of a variable orifice controlled by a bi-metal element. The unit is mounted on the water rail and also responds to coolant temperature. A heater is fitted around the bi-metal element to speed up the bi-metal response. The heater is connected in parallel with the fuel pump and so is energized as long as the engine is running.

Temperature sensors

The temperature sensor of the air being taken into the engine through the inlet manifold, and the temperature of the coolant in the cylinder block are constantly monitored. The information is fed directly to the E.C.U. The air temperature sensor has a small effect on the injector pulse width, and should be looked upon as a trimming rather than a control device. It ensures the fuel supplied is directly related to the weight of air drawn in by the engine. Therefore, as the weight (density) of the air charge increases with falling temperature, so the amount of fuel supplied is also increased to maintain optimum fuel/air ratio.
The coolant temperature sensor has a much greater degree of control although its main effect is concentrated while the engine is initially warming-up. The coolant temperature sensor operates in conjunction with the cold start system and the auxiliary air valve to form a completely automatic equivalent to a carburetter choke.

Flooding protection system

With the ignition switched on, the pump will not operate until the engine is cranked. The system prevents flooding should an injector or injectors become faulty (remain in the open position), and the ignition is left switched on.

ENGINE COMPONENT LOCATION (FEDERAL)

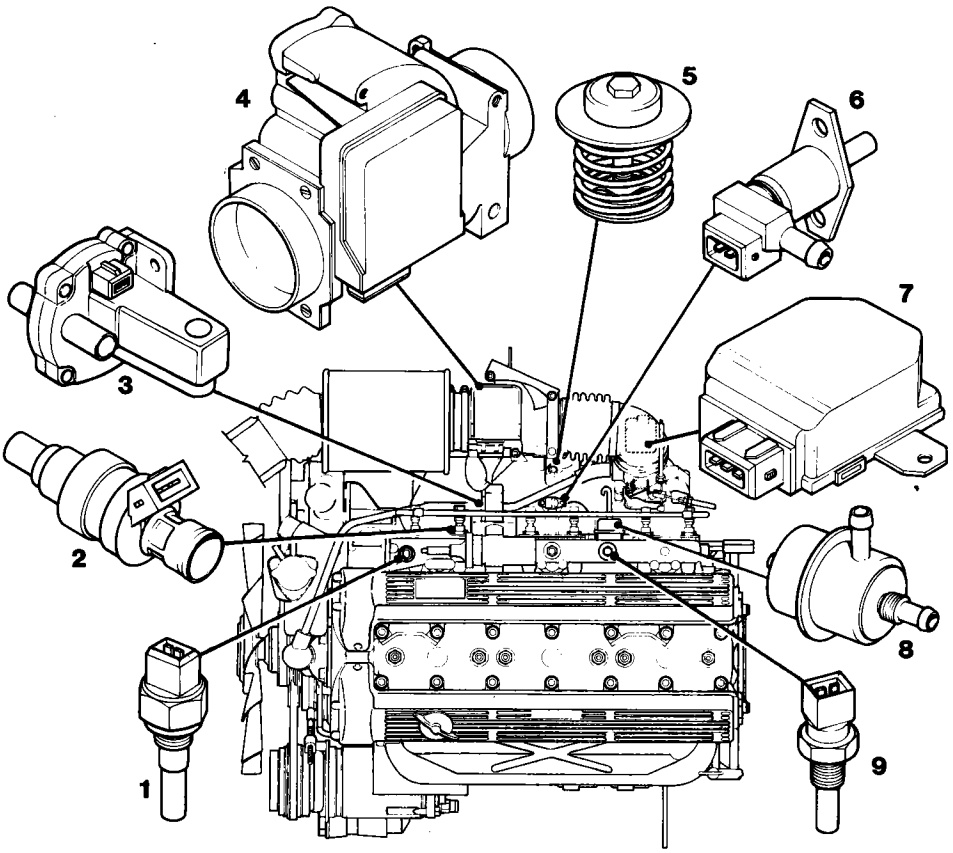

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Fig. 3

1. Thermotime switch
2. Fuel injectors
3. Auxiliary air valve
4. Air-flow meter
5. Over-run valve
6. Cold start injector
7. Throttle switch
8. Fuel pressure regulator
9. Water temperature sensor

Cranking enrichment

The E.C.U. provides an increased pulse duration during engine cranking in addition to any enrichment due to the coolant temperature sensor or the cold start injectors. The additional signal reduces slightly when cranking stops, but does not fall to normal level for a few seconds. This temporary enrichment sustains the engine during initial running.

Throttle switch (Federal)

The throttle switch mounted on the throttle spindle, signals the position of the throttle to the E.C.U.

In addition to a richer air/fuel mixture during cold starting and warm-up a slight additional amount of fuel is required during idle. The E.C.U. supplies this additional amount of fuel on European cars in response to the closed throttle contact on the throttle switch. This contact is fitted, but not used, on cars to the U.S.A. and certain other countries.

Fuel return valves are situated in the left-hand and right-hand rear wheel arches, in line with the rearmost edge of the tyres. Care must be taken when changing them as they are NOT interchangeable, side for side.

The left-hand valve has a fixing bracket spot-welded to it that prevents it being incorrectly fitted (it would contact the wheel). It has an arrow showing direction of fuel flow (towards the rear).

Vacuum full throttle switch (U.K. and European only)

A vacuum switch is fitted to the throttle cable mounting bracket wired into the full throttle enrichment circuit. This senses inlet manifold depression and switches the fuelling from the generally weak condition required for emission control or minimum fuel consumption to a richer condition necessary for maximum engine power. On cars fitted with an automatic gearbox there is an over-run fuel cut-off micro-switch mounted on one of the throttle body mounting bolts, which is mechanically operated by the throttle mechanism when the throttle is fully closed. The switch is controlled by a circuit incorporated in the E.C.U.

When the engine is over-running with the throttle in the closed position the fuel remains cut off until the engine speed falls to below 1400 rev/min.

The control unit circuit will not re-activate the fuel cut-off function until the engine speed exceeds 1470 rev/min.

Cold start

For cold starting, additional fuel is injected into the inlet manifold by the cold start injector. This is controlled by the cold start relay and Thermotime switch. The Thermotime switch senses coolant temperature, and depending on the temperature it senses, interrupts or completes the ground connection for the relay. When the starter is operated the cold start relay is energized with its circuit completed via the Thermotime switch. The Thermotime switch also limits the length of time for which the relay is energized, to a maximum of 12 seconds under conditions of extreme cold. This enrichment is in addition to that provided by the coolant temperature sensor.

If the coolant temperature is above 35°C the switch does not operate at all, no starting enrichment additional to cranking enrichment being required.

Fuel pressure regulator

The fuel pressure regulator operates to maintain a constant pressure drop across the injector nozzles. It is connected one side to a manifold depression and is operated by a spring-loaded diaphragm. Excess fuel is returned to the tank from which it was drawn via a solenoid-operated shut-off valve.

FAULT FINDING

It is assumed that the vehicle has sufficient fuel in the tanks, and that purely engine functions, e.g. ignition timing, valve timing, and the ignition as a whole are operating satisfactorily. If necessary, these functions must be checked before the fuel injection system is suspected.

Symptoms	
Will not start*	Difficult cold start
Difficult hot start	Starts but will not run
Misfires and cuts out	Runs rough
Idle speed too fast	Hunting at idle
Low power and top speed	High fuel consumption

* Before proceeding with checks, hold the throttle fully open and attempt a start. If the engine then starts and continues to run, no further action is necessary.

Possible causes in order of checking	
Battery:	Battery depleted, giving insufficient crank speed or inadequate spark. Check battery condition with hydrometer or by battery condition indicator on 'Freedom Battery'. Re-charge, clean and secure terminals, or renew as necessary.
Connections:	Ensure that all connector plugs are securely attached. Pull back rubber boot and ensure that plug is fully home. While replacing boot press cable towards socket. Ensure that Electronic Control Unit (E.C.U.) multi-pin connector is fully made. Ensure that all ground connections are clean and tight.
Ignition System:	Check ignition system as detailed in the Electrical Section.
Fuel System:	Open filler cap of fuel tank being used. Change tank being used. Check for fuel pipe failure (strong smell of fuel) and retention of in-line fuel pressure. Check inertia switch closed. If necessary, clear fuel tank vents or supply pipe.
Cold Start System:	Fault conditions could cause cold start system to be inoperative on a hot engine. If engine is either very hot, or cold, these particualr faults will cause the engine to run very rich. Check cold start system, see 19.22.32.
E.C.U.:	If the E.C.U. is faulty it is possible that injectors will be inoperative. The E.C.U. may also be responsible for any degree of incorrect fuelling. Before suspecting the E.C.U. for fuelling problems, however, all other likely components should be proved good.
Air Leaks:	Ensure that all hose and pipe connections are secure. Engine is, however, likely to start more easily with air leaks if cold, as air leaking augments that through the auxiliary air valve. A leak, or failed air valve is shown up, however, by a very high idle speed when engine is warm and air valve main passage should be closed.
Temperature Sensors:	If either sensor is short-circuited, starting improves with high engine temperature. Engine will run very weak, improving as temperature rises, but still significantly weak when fully hot. If a sensor is open-circuit, or disconnected, engine will run very rich, becoming worse as temperature rises. Engine may not run when fully hot, and will almost certainly not restart if stalled. Effect of air temperature sensor will be less marked than coolant temperature sensor.
Extra Air Distribution Block:	Check opening throttle. If engine immediately starts, unscrew idle speed adjustment, and re-check start with closed throttle. Re-set idle speed when engine hot. Check cold start. Check throttle return springs and linkage for sticking or maladjustment as a sticking throttle may have enforced incorrect idle speed adjustment on a previous occasion.
Throttle Switch:	Check operation of throttle switch. Incorrect function or sequence of switching will give this fault.
Throttle Butterfly:	Check adjustment of the throttle butterfly valve, ensure that return springs are correctly fitted, and throttle not sticking open.
Over-run Valve:	Check operation of over-run valve.
Compression:	Low compressions: a general lack of engine tune could cause this fault. Check engine timing, ignition timing, and function of ignition system complete. If necessary, check valve condition.
Idle Fuel Control Setting:	Check exhaust gas CO level. If necessary, adjust fuelling trim control in air metering unit. **CAUTION: This knob MUST NOT be moved unless correct test equipment and skilled personnel are in attendance to monitor changes made.**
Air Filters:	Remove air filter and check for choked filter element.
Throttle Linkage:	Check throttle linkage adjustment and ensure that throttle butterfly valve can be fully operated.

For further information relating to 'L' electronic fuel injection refer to the 'Lucas Epitest' operating instructions and test procedures.

MAINTENANCE

There is no routine maintenance procedure laid down for the electronic fuel injection system other than that, at all service intervals, the electrical connectors must be checked for security. The fuel filter must be discarded and a replacement component fitted at intervals specified in the Maintenance Summary.

CAUTION

The following instructions must be strictly observed:

Always disconnect the battery before removing any components.

Always depressurize the fuel system before disconnecting any fuel pipes.

When removing fuel system components always clamp fuel pipes approximately 38 mm (1.5 in) from the unit being removed. Do not overtighten clamp.

Ensure that material is available to absorb possible fuel spillage.

When reconnecting electrical components, always ensure that good contact is made by the connector before fitting the rubber cover. Always ensure that ground connections are made to clean bare metal, and are tightly fastened using correct screws and washers.

AIR CLEANER ELEMENT

The air cleaner element is of the paper type and is situated between the air intake trumpet and the air-flow meter.

Remove and refit **19.10.08**

To renew the element:

Slacken the clips (1, Fig. 4) securing the inlet and outlet hoses; slide the air cleaner assembly forward until the bracket is clear of the mounting spigots.

Release the spring clips securing front cover (2, Fig. 4) and the Nyloc nut (3, Fig. 4) securing the end-plate, withdraw the end-plate filter element and gasket (4, Fig. 4).

Remove dirt, grease, etc., from the air cleaner casing.

Do not overtighten the Nyloc nut when refitting.

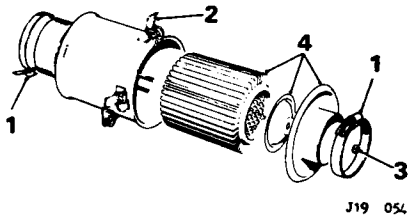

Fig. 4

THROTTLE PEDAL

Remove and refit **19.20.01**

Removing

Fold the carpet away from the base of the throttle pedal.

Remove the nuts and washers securing the base of the pedal to the mounting plate (1, Fig. 5).

Pull the base of the pedal away from the mounting plate and disengage the spring from the pedal (2, Fig. 5).

Examine the spring for wear, and renew if necessary (3, Fig. 5).

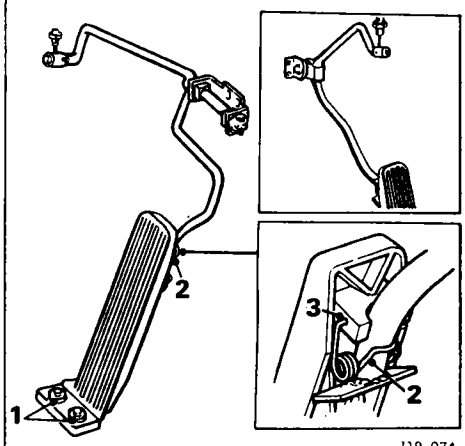

Fig. 5

Refitting

Engage the rod with the pedal. Position the spring on the pedal and push the base of the pedal to locate on the mounting studs, fit nuts and tighten.

THROTTLE SWITCH

U.K. and European Automatic Transmission

Check and adjust **19.22.37**

Check that the throttle butterflies are adjusted correctly with 0,05 mm (0.002 in) between valve and housing when closed. See 19.20.11 for full details.

To adjust throttle micro-switch, connect Continuity Tester across switch terminals (1, Fig. 6).

When throttle lever (2, Fig. 6) is held in direction of arrow by spring (3, Fig. 6) contacts are closed, bulb is on.

Pull lever against spring until spigot (4, Fig. 6) contacts the opposite side of slot (5, Fig. 6). Bulb is off.

Slacken screws (6, Fig. 6) to adjust micro-switch as required. Re-tighten screws.

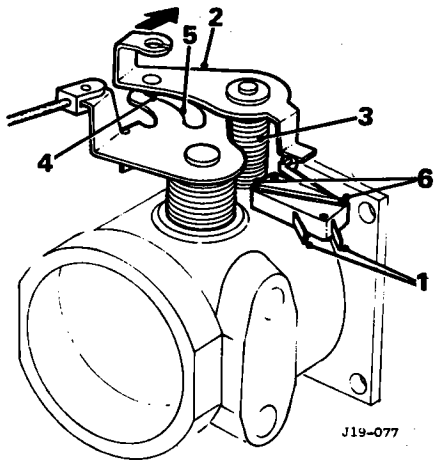

Fig. 6

THROTTLE LINKAGE

Check and adjust **19.20.05**

Checking

Ensure that the throttle return springs are correctly secured and that the throttle moves freely and rests against the closed stop when released.

Ensure that the throttle butterfly closed stop screw has not been moved. If it has, check and if necessary, adjust.

Adjusting

Slacken the locknuts at the outer throttle cable abutment (1, Fig. 7).

Adjust the position of the outer cable in abutment to place inner cable under light tension but NOT to move the throttle operating lever.

Tighten locknuts.

Re-check adjustment.

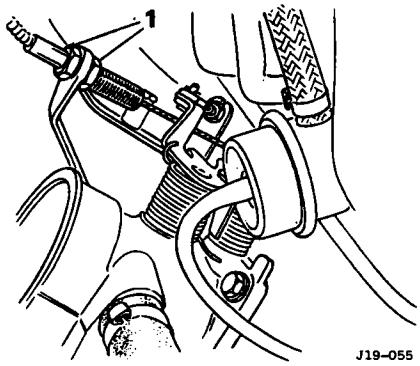

Fig. 7

THROTTLE CABLE

Remove and refit **19.20.06**

Removing

Disengage the throttle return spring from the throttle operating lever.
Slacken the locknuts at the outer throttle cable abutment and draw the cable clear.
Remove the 'C' clip securing the cable yoke clevis pin and detach inner cable from the operating lever: temporarily replace clevis pin.
Slacken the locknut on the top surface of footwell.
Remove the under-scuttle casing.
Remove the split pin at the top end of the operating rod (1, Fig. 8).
Disengage the sleeve and nipple from the rod (2, Fig. 8).
Remove the nut (3, Fig. 8) from the cable sheath and draw the cable assembly into the engine compartment. Recover the operating rod abutment plate.

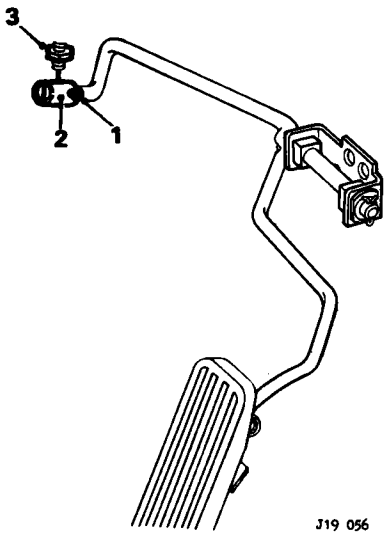

Fig. 8

Refitting

Examine the grommets for wear, and renew as necessary.
Reverse above procedure. Apply sealing compound around thread on top surface of footwell.

THROTTLE BUTTERFLY VALVE

Adjust **19.20.11**

Remove the elbow and convolute hose to expose the throttle body.
Slacken the throttle butterfly locknut and stop screw to ensure that the throttle butterfly valve closes fully.
Insert 0,05 mm (0.002 in) feeler gauge between top of valve and housing to hold valve open (Fig. 9).
Set the stop screw to just touch the stop arm and tighten locknut with the feeler in position.
Press the stop arm against the screw and withdraw the feeler.
Seal the threads of the adjusting screws and locknuts using a spot of paint.
Refit the elbow and convolute hose.
Check the throttle linkage adjustment, operation of the throttle switch and the kickdown switch adjustment.

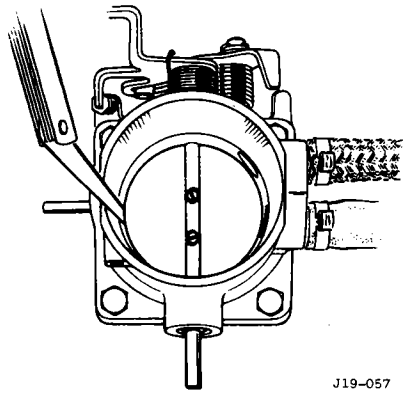

Fig. 9

AUXILIARY AIR VALVE

Description

The auxiliary air valve (Fig. 10) is mounted on the water outlet rail and is controlled by coolant temperature. The valve opens to pass additional air into the inlet manifold under cold start and cold idle conditions.

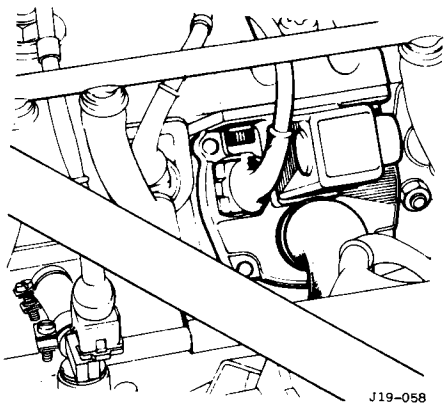

Fig. 10

Remove and refit **19.20.16**

Removing

NOTE: This procedure MUST ONLY be carried out on a cold or cool engine.

Disconnect the battery.
Carefully remove the pressure cap from the remote expansion tank to release any cooling system residual pressure. Replace the cap tightly.
Slacken the clips securing the air hoses to the auxiliary air valve. Pull the hoses clear.
Remove the two screws and washers securing the auxiliary air valve to coolant pipe and lift clear.
Clean all traces of gasket from the coolant pipe, taking care not to damage seating area.

Refitting

Refit the air valve by reversing the above procedure.
Coat the new gasket with suitable non-hardening sealing compound.
Check the coolant level at the remote header tank, and if necessary, top-up.

AUXILIARY AIR VALVE

Test **19.20.17**

Remove the electrical connector from the auxiliary air valve.
Connect a voltmeter across the terminals of the connector.
Crank the engine: battery voltage should be obtained. If there is no voltage there is a fault in the electrical system: check cables for loose connections or open circuit. When power is reaching the extra air valve, the heating coils resistance should be checked.
Connect an ohmmeter between the terminals of the air valve. A resistance of 33 ohms should be obtained. If there is no resistance the air valve should be replaced.
Remove the extra air valve mounting plate from the water rail.
Place the air valve in cold water, do not let water into the electrical terminals or into the by-pass channel. The blocking plate should fully expose the by-pass orifice.
Immerse the air valve mounting plate in hot water. The blocking plate should gradually close the by-pass orifice.

IDLE SPEED

Adjust **19.20.18**

Ensure that the engine is at normal operating temperature.
Check the throttle linkage for correct operation, and that return springs are secure and effective.
Start the engine and run for two to three minutes.
Set the idle speed adjustment screw on air distribution block to achieve 800 rev/min.

NOTE: If it proves impossible to reduce idle speed to specified level carry out the following:

Check ALL pipes and hoses to inlet manifold for security and condition.
Check security of injectors and cold start injectors.
Ensure that all joints and inlet manifold to cylinder head fastenings are tight.
Ensure that throttle butterfly is correctly adjusted.
Check operation of over-run valve.
If the above do not reduce the idle speed, check operation of auxiliary air valve.

OVER-RUN VALVE—Cars fitted with Emission Control

Description

An over-run valve is fitted beneath the air distributor block. The valve is calibrated to open and limit manifold depression under conditions

continued

of closed throttle over-run. This ensures that air is available to maintain a combustible air/fuel ratio under all conditions. Air bleeds into the inlet manifold at 564 mm/Hg 22.2 in/Hg depression.

Test **19.20.21**

Slacken the hose clip securing the over-run valve air feed hose to the throttle body and block the hose.
Start the engine; idle speed should remain correct.
If the idle speed is not correct, renew the over-run valve.

Remove and refit **19.20.22**

Disconnect the battery.
Remove the air-flow meter.
Slacken the securing clip and disconnect the auxiliary air hose from the air distribution block (1, Fig. 11).
Slacken the clip securing the hose from the throttle butterfly housing.
Remove the three screws securing the air distribution block to the inlet manifold.
Lift the air distribution block from the inlet manifold and disconnect the air hose.
Withdraw the over-run valve (2, Fig. 11).
Reverse the above procedure to refit.

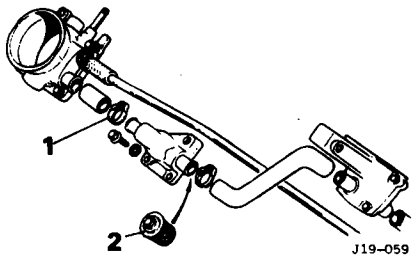

Fig. 11

FUEL CUT-OFF INERTIA SWITCH

Remove and refit **19.22.09**

Removing

Disconnect the battery.
Unclip the switch cover at passenger side of fascia.
Disconnect cables from switch and switch from spring clips.

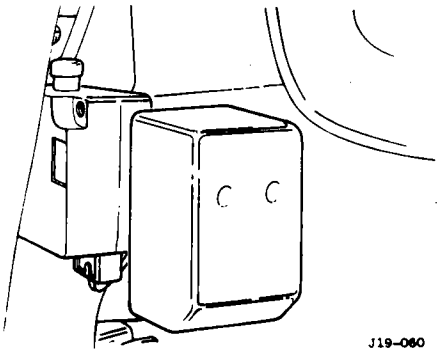

Fig. 12

Refitting

Press switch into spring clips with the ribs towards rear of car and terminals at bottom. Ensuring that the switch is raised in clips to abut on top lip of bracket.
Connect cables and press in plunger at top of switch.
Fit cover and re-connect battery.

OXYGEN SENSOR

Description

The oxygen sensor is located in the exhaust down-pipe. The sensor monitors the oxygen content in the exhaust and sends a proportional signal to the E.C.U., thus maintaining close air/fuel ratio control under all operating conditions.

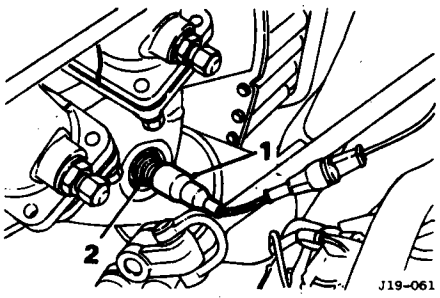

Fig. 13

Remove and refit **19.22.16**

Disconnect the battery.
Disconnect the electrical connector on the oxygen sensor and remove (1, Fig. 13).
Clean the sensor sealing face (2, Fig. 13) and fit new oxygen sensor.
Reset the Service Interval Counter.

COOLANT TEMPERATURE SENSOR

Description

The coolant temperature sensor (Fig. 14) is located at the rear of the water rail.
The sensor comprises a temperature-sensitive resistor with a negative temperature coefficient, that is, the electrical resistance decreases with increasing temperature. The sensor provides the E.C.U. with a coolant temperature parameter that controls the injector signal pulse with respect to engine temperature. Practically, the sensor establishes a rich level of fuelling at low temperature, and a weaker level at high temperature. In conjunction with the auxiliary air valve the coolant temperature sensor forms an equivalent to a carburetter automatic choke.

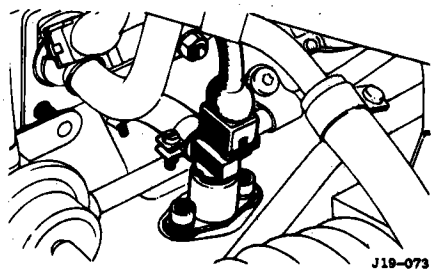

Fig. 14

Remove and refit **19.22.18**

NOTE: This procedure MUST ONLY be carried out on a cold or cool engine.

Disconnect the battery and the connector from the coolant temperature sensor.
Carefully remove the pressure cap from the remote header tank to release any cooling system residual pressure. Replace the cap tightly.
Ensure that the sealing washer is located on a replacement temperature sensor and coat the threads with suitable sealing compound, then remove the temperature sensor from the water rail and screw the replacement temperature sensor into position.
Refit the electrical connector, re-connect the battery and check the coolant level at the remote header tank. If necessary, top-up.

Test **19.22.19**

Disconnect the battery.
Disconnect the cable from the temperature sensor.
Connect a suitable ohmmeter between the terminals; note the resistance reading. The reading is subject to change according to temperature and should closely approximate to the relevant resistance value given in the table.
Disconnect the ohmmeter.
Check the resistance between each terminal in turn and the body of the sensor. A very high resistance reading (open circuit) must be obtained.
Re-connect cable to sensor and re-connect the battery.

Coolant Temperature (°C)	Resistance (kilohms)
−10	9.2
0	5.9
+20	2.5
+40	1.18
+60	0.60
+80	0.325

THERMOTIME SWITCH

Description

The Thermotime switch (Fig. 15) is located at the front of the water rail. The switch comprises a bi-metallic contact opened and closed by coolant temperature and, in addition, auto-excited by a heating element. The switch controls the cold start injector through the cold

start relay and is energized by operation of the starter motor. While the start system is in operation a voltage is applied to the bi-metallic switch contact heating element which then tends to open the contact and isolate the relay and injector. The time that this takes depends upon the initial temperature of the bi-metallic element and can be up to eight seconds under conditions of extreme cold. When the engine is warm, or at normal operating temperature, there will be no fuel supplied by the cold start injector.

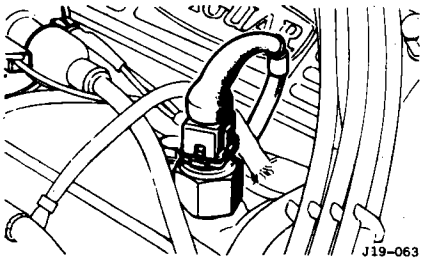
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Fig. 15

Remove and refit 19.22.20

NOTE: This procedure MUST ONLY be carried out on a cool or cold engine.

Disconnect the battery and the connector from the Thermotime switch.
Carefully remove the pressure cap from the remote header tank to release any cooling system residual pressure. Replace the cap tightly.
Ensure that a new sealing washer is located on replacement Thermotime switch and coat the threads with a suitable sealing compound.
Remove the Thermotime switch from the front of the water rail.
Screw replacement Thermotime switch in position.
Refit electrical connector and re-connect battery.
Check coolant level at remote header tank, and top-up if necessary.

Test 19.22.21

Equipment required: Stop watch, ohmmeter, single-pole switch, jump lead for connecting switch to battery and Thermotime switch, and a thermometer.

NOTE: Check coolant temperature with thermometer and note reading before carrying out procedures detailed below. Check rated value of Thermotime switch (stamped on body flat). The test must be carried out with coolant temperature below the operating temperature to ensure correct operation of the switch.

Disconnect the battery earth lead and the electrical connector from the Thermotime switch.
Connect ohmmeter between terminal 'W' and earth. A very low resistance reading (closed circuit) should be obtained.
Connect 12V supply via isolating switch to terminal 'G' of Thermotime switch.
Using stop watch, check time delay between making isolating switch and indication on ohmmeter changing from low to high resistance. Delay must closely approximate to time stated below.
Renew Thermotime switch if necessary and re-connect the battery.

Coolant Temperature	Delay
−20°C	8 seconds
0°C	4½ seconds
+10°C	3½ seconds
+35°C	0 seconds

AIR TEMPERATURE SENSOR

Description

The air temperature sensor is an integral part of the air-flow meter. The sensor provides information to the E.C.U. relating to the ambient air density and temperature thus maintaining an optimum fuel/air ratio.

Test 19.22.23

Disconnect the battery and remove the multi-pin electrical connector from the air-flow meter.
Connect a suitable ohmmeter between terminals 6 and 27 of the air-flow meter.

Ambient Air Temperature (°C)	Resistance (kilohms)
−10	9.2
0	5.0
+20	2.5
+40	1.18
+60	0.60

Note the resistance reading. The reading is subject to change according to the temperature and should closely approximate to the relevant resistance value given in the table above.
Disconnect the ohmmeter.
Re-connect the multi-pin connector and battery.

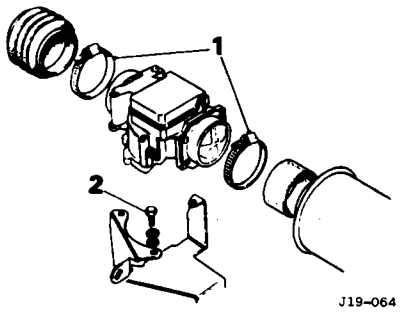
AIR-FLOW METER

Description

The air-flow meter is located between the air cleaner and the inlet manifold mounted throttle butterfly. The flap in the air-flow meter is opened when the air is drawn into the engine. The E.C.U. uses the flap angle to compute fuel requirements.

Remove and refit 19.22.25

Disconnect the battery.
Slacken the two clips which secure the air-intake hoses on each side of the air-flow meter (1, Fig. 16).
Disconnect the electrical connector from the air-flow meter.
Remove the three screws which secure the air-flow meter to its mounting bracket (2, Fig. 16), remove the air-flow meter and withdraw the air-intake hoses.
After refitting reset idle mixture screw using correct equipment.



J19-064

Fig. 16

COLD START SYSTEM

Test 12.22.32

WARNING: This test results in fuel vapour being present in the engine compartment. It is therefore imperative that all due precautions are taken against fire and explosion.

NOTE: The ambient temperature and the engine temperature must be below 35°C in order for the system to work and be testable.

Remove the electrical connector from the cold start injector.
Connect a voltmeter across the terminals of the connector.
Crank the engine: battery voltage should be obtained.
Remove the setscrew and washer securing the cold start injector to the inlet manifold. Remove the cold start injector.
Arrange a container to collect sprayed fuel, and refit the connector.
Check for fuel leaking past the nozzle.
Crank the engine. The cold start injector should spray fuel out for a few seconds until the Thermotime switch switches off the injector. When the engine is warm the injector should not spray fuel during engine cranking.

ELECTRONIC CONTROL UNIT (E.C.U.)

Description

The E.C.U. is mounted in the luggage compartment against the front bulkhead (Fig. 17). The E.C.U. receives all electrical input signals from the various sensors. This information is used to determine the correct period of time for which the injectors are held open in each engine cycle.

continued

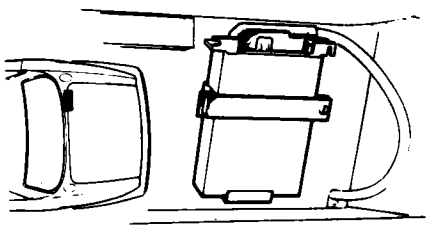

J19-065

Fig. 17

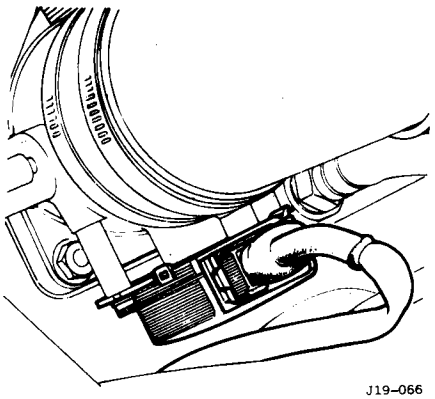
Remove and refit **19.22.34**

Disconnect the battery.
At the forward end of the luggage compartment, remove the E.C.U. cover.
Remove the retainer band and cable clamp clip.
Unclip the end cover.
Locate handle on the harness plug and withdraw the plug, lift out the unit.

THROTTLE SWITCH (FEDERAL CARS)

Description

The throttle switch (Fig. 18) is located on the end of the throttle spindle. The switch closes when the throttle nears the wide-open position and provides information to the E.C.U. of fuel quantity required by the injector for maximum power output at full throttle.



J19-066

Fig. 18

Remove and refit **19.22.36**

Disconnect the battery.
Pull the electrical connector from the throttle switch.
Remove the two screws, plain and shakeproof washers securing the throttle switch and lift the switch from the spindle. Collect spacers.
Refit by reversing the above procedure.

Test **19.22.37**

NOTE: Before commencing the following tests ensure that the throttle butterfly valve and throttle linkage are correctly adjusted.

Disconnect the battery.
Remove the electrical connector from the throttle switch.
Connect a powered test lamp between terminals 3 and 18 of the throttle switch.
Open the throttle; the bulb should light up when the throttle nears the wide open position.
If the bulb does not light, replace the throttle switch.
Refit the electrical connector to the switch.
Re-connect the battery.

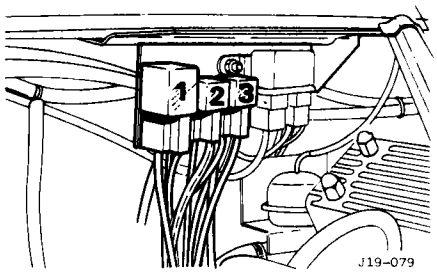
THROTTLE SWITCH (U.K. and EUROPE)—Manual Gearbox only

A micro-switch actuated by the throttle is fitted to U.K. and European cars. This switch replaces the Federal switch. A full load vacuum switch is also fitted all European cars.

MAIN RELAY/PUMP RELAY/ DIODE UNIT

Description

Three relays, main relay cold start (2, Fig. 19), pump relay (3, Fig. 19), diode unit (1, Fig. 19) are mounted on the engine rear bulkhead next to the vehicle battery. When the ignition key is turned, the main relay is activated, connecting the battery circuit to the ballast resistors and the injectors. The relay also allows current to flow to the E.C.U. and the pump switch on the air-flow meter.
When the engine is cranked for starting, the diode unit is activated and thus energizes the auxiliary air valve, the cold start system and the fuel pump.



J19-079

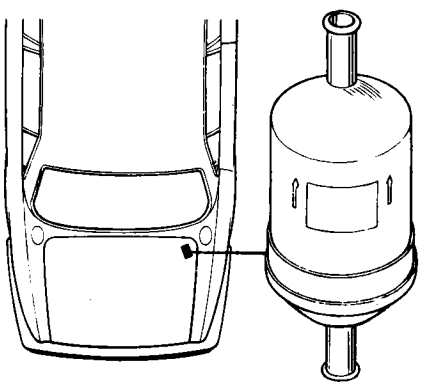
Fig. 19

FUEL LINE FILTER

Remove and refit **19.25.01**

WARNING: The spilling of fuel is unavoidable during this operation. It is therefore imperative that all due precautions are taken against fire and explosion.

The fuel filter (Fig. 20) is located in the luggage compartment mounted on the right-hand side under the floor.



J19-067

Fig. 20

NOTE: Early Series III cars were built with the fuel filter mounted in the engine compartment on the R.H. valance under the air cleaner.

Disconnect the battery and remove the luggage compartment floor.
Remove the bolt securing the filter and draw the filter clear of the clamp.
Clamp the inlet and outlet pipes.
Slacken the pipe clips on either side of the filter and remove the filter unit.
Fit a new filter, observing the direction of flow denoted by arrows on the filter.
After fitting a new filter check for leakproof joints by running the engine before fitting the luggage compartment floor.

FUEL TANK CHANGE-OVER VALVE

Description

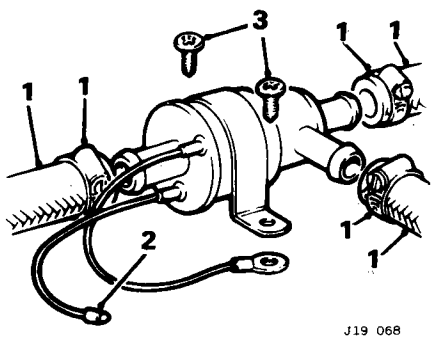
The change-over valve is located in the luggage compartment adjacent to the fuel pump. When energized by the change-over switch, the valve opens the outlet pipe from the right-hand fuel tank. When de-energized, the valve opens the outlet pipe from the left-hand fuel tank.

Remove and refit **19.40.31**

Disconnect the battery.
Remove the spare wheel.
Clamp the inlet and outlet pipes, release the pipe clips and pull the pipes from the change-over valve.
Disconnect the cable to the valve.
Remove the valve by unscrewing the clamp securing screws.

Refitting

When refitting ensure that the ground lead is secured by one foot of securing clamp.



J19 068

Fig. 21

FUEL TANK CHANGE-OVER VALVE

Test **19.40.32**

Depressurize the fuel system and disconnect the battery.
Remove the spare wheel.
Clamp the inlet and outlet pipes, release the pipe clips and pull the pipes from the change-over valve.
Disconnect the cable to the valve.
Push a suitable length of rubber pipe on the centre inlet port of the valve.
Blow through the rubber pipe. Air should flow from the outlet union through the body of the solenoid.
Apply 12V d.c. to the valve cable.
Blow through the rubber pipe. Air should flow from the outlet union towards the opposite side.
If the results are satisfactory, reverse the above procedure.
If the results are not satisfactory, fit new valve.

FUEL COOLER

Remove and refit **19.40.40**

Removing

WARNING: Refrigerant gas can cause blindness. It is therefore essential to depressurize the air conditioning system prior to disconnecting refrigerant hose to fuel cooler. See Air Conditioning System.

Depressurize the fuel and air conditioning systems.
Disconnect refrigerant inlet and outlet hoses (1, Fig. 22). Plug hoses.
Clamp the fuel hoses and disconnect (2, Fig. 22).
Remove setscrews, washers and Spire nuts securing the fuel cooler to the compressor (3, Fig. 22).

Refitting

Test systems after refitting.

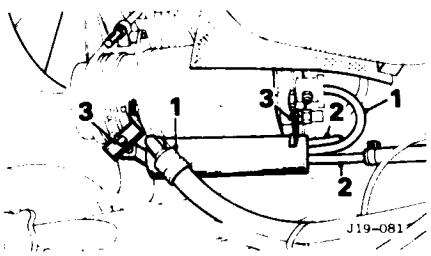


Fig. 22

FUEL RETURN VALVES

Remove and refit **19.40.44**

Removing

Depressurize the fuel system.
Place the vehicle on stands and remove the rear wheel(s).
Remove the valve cover (1, Fig. 23).
Remove screws securing valve to body (2, Fig. 23).
Fit hose clamps both sides of the valve and slacken the hose to valve clips (3, Fig. 23).
Disconnect the solenoid cables from the valve and remove valve (4, Fig. 23).

Refitting

Reverse the above procedure, ensuring tight connections. Check for fuel leaks.

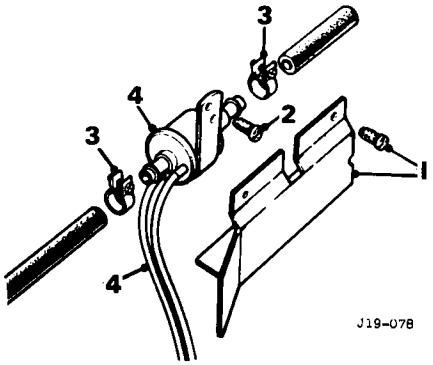


Fig. 23

FUEL PUMP

Description

The fuel pump is located beneath the luggage compartment floor. It is flexibly mounted and secured using noise- and shock-absorbing material. The pump is a roller-type machine delivering a continuous flow of fuel under pressure.

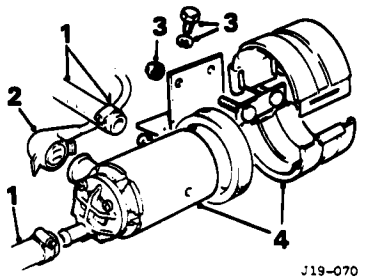


Fig. 24

Remove and refit **19.45.08**

Disconnect the battery
Remove the spare wheel.
Clamp the inlet and outlet pipes, release the clips and pull the pipes from the pump unions (1, Fig. 24).
Remove the electrical connector (2, Fig. 24).
Remove the screws securing the pump mounting bracket (3, Fig 24).
Remove securing nuts from clamp and withdraw the pump (4, Fig. 24).
Reverse above procedure to refit, locating the earth wire on bright metal beneath one securing screw.

FUEL PRESSURE REGULATOR

Description

The fuel pressure regulator is mounted on the inlet manifold and is connected to the fuel rail on one side and inlet manifold depression on the other (Fig. 25). The regulator maintains the correct fuel pressure in the fuel rail.

Remove and refit **19.45.11**

Depressurize the fuel system and disconnect the battery.
Remove two setscrews and washers (1, Fig. 25) securing the pressure regulator mounting bracket and carefully pull regulator and brackets upwards. Note orientation of regulator in bracket.

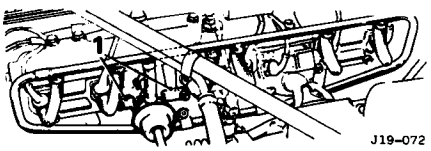


Fig. 25

Clamp inlet and outlet pipes of regulator, release the clips and pull the pipes from the regulator unions.
Remove the nut and washer and release the regulator from the bracket.
When refitting, locate the regulator in the bracket orientated as noted; ensuring that pipes are not kinked or twisted.

Check **19.45.12**

Depressurize the fuel system:
Slacken the pipe clip securing the cold start injector supply pipe to the fuel rail and pull the pipe from the rail.
Connect the pressure gauge pipe to the fuel rail and tighten the pipe clip.

CAUTION: The pressure gauge must be checked against an approved standard at regular intervals.

Pull the '−ve' L.T. lead from the ignition coil and switch ignition on.
Check reading on pressure gauge: reading must be 2,55 ± 0,05 kgf/cm² (36.25 ± 0.725 lbf/in²).

NOTE: The pressure reading may drop slowly through either the regulator valve seating or the pump non-return valve. A slow, steady drop is permissible; a rapid fall MUST be investigated.

Operate fuel change-over switch on centre instrument panel.
Re-check the pressure gauge reading.

NOTE: If satisfactory results have been obtained, depressurize the fuel system. Disconnect the pressure gauge. If satisfactory results have not been obtained replace the regulator with a new unit.

FUEL SYSTEM

Depressurize 19.50.02

CAUTION: The fuel system MUST always be depressurized before disconnecting any fuel system component.

Remove the fuel pump relay socket.
Switch on and crank the engine for a few seconds.
Switch the ignition off and re-connect the pump relay socket.

INJECTORS

Description

The six injectors are mounted on the induction ram pipes so that the fuel jet is directed onto the back of each inlet valve. The injectors are solenoid-operated valves which are controlled by the E.C.U.

Remove and refit 19.60.01

Depressurize the fuel system, and then disconnect the battery.
Clamp the fuel inlet pipe adjacent to the fuel rail.
Pull the electrical connector from the injector(s) to be removed.
Remove the two setscrews securing the fuel rail to the inlet manifold.
Release the clips securing the supply rail to the return rail.
Pull the manifold pressure pipe from the inlet manifold.
Remove the six nuts and spring washers securing the injector clamps to the induction ram pipes.
Carefully lift the fuel rail complete with injectors sufficient for injectors to clear the induction ram pipes. Ensure that adequate material is to hand to absorb spilled fuel.
Suitably plug or cover the injector holes in ram pipes to prevent ingress of dirt or foreign matter.
Slacken the pipe clip(s) of injector(s) to be removed.
Note position of electrical sockets and pull injector(s) from fuel rail.
Remove two rubber sealing 'O' rings from ALL injectors.
When refitting the injectors the sealing rings MUST be renewed.

INJECTORS — SET

Injector winding check 19.60.02

Use an ohmmeter to measure the resistance value of each injector winding, which should be 2.4 ohms at 20°C (68°F).
Check for short-circuit to earth on winding by connecting ohmmeter probes between either injector terminal and injector body. Meter should read ∞ (infinity).
If any injector winding is open-circuited or short-circuited, replace the injector.

FUEL RAIL

Remove and refit 19.60.04

Depressurize the fuel system and disconnect the battery.
Pull the manifold pressure pipe from the inlet manifold.
Clamp the fuel pipe adjacent to the supply fuel rail.
Release the clips securing the return fuel rail to the supply rail and the return fuel rail to the regulator outlet hoses and fuel return pipe. Pull the hoses from the rail.
Release the clips securing the supply fuel rail to main fuel rail, cold start injector and regulator inlet hoses. Pull the hoses from the supply rail.
Remove supply and return fuel rails.
Pull electrical connectors from injectors and cold start injector.
Remove the six nuts and spring washers securing the injector clamps to the induction ram pipe.
Carefully lift the fuel rail complete with injectors from the induction ram pipes. Ensure that adequate material is to hand to absorb spilled fuel.
Suitably plug or cover the injector holes in the ram pipes to prevent the ingress of dirt or foreign matter.
Slacken the clips securing the injectors to the fuel rail stubs, pull the injectors from fuel rail.

NOTE: If necessary, transfer clips and insulation to replacement fuel rail.

When refitting fit new 'O' rings to each injector and test for leaks.

COLD START INJECTOR

Description

A cold start injector (Fig. 26) is mounted in the inlet manifold, aligned to spray a finely atomized mist of fuel towards the throttle butterfly valve. The injector is controlled by the cold start relay and the Thermotime switch and is only operative during the first few seconds of a cold engine starting cycle.

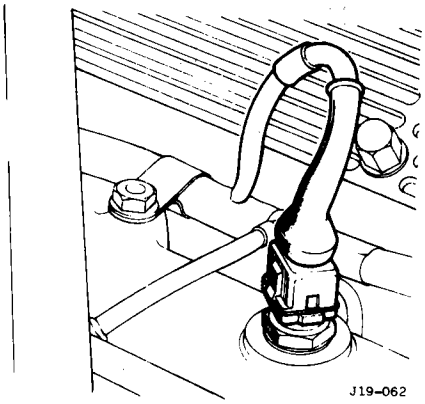


Fig. 26

Remove and refit 19.60.06

Depressurize the fuel system and disconnect the battery.
Pull the electrical connector from the injecto
Fit clamp on the supply pipe to the injecto slacken the clips and pull pipe from the injector
Remove the two setscrews securing the injector to the inlet manifold.
Check the condition of the gasket, and renew as necessary.
To test the system see operation 19.22.32, 'Cold start system — test'.