

CHAPTER 2

THE FUEL SYSTEM

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2:1 Description

3.0 Si, Si A, CSI, CSiA and 3.0 CSL models with 3.15 litre engines are equipped with electronically controlled fuel injection systems, details of which are given in **Section 2:8**. That section also describes the maintenance and servicing procedures which can be carried out without the need for specialised testing equipment.

The remaining models covered by this manual are provided with twin downdraught carburetters fitted with automatic choke units. Fuel from the rear-mounted tank is supplied to the carburetters either by a mechanical (diaphragm) fuel pump mounted on the engine cylinder head and driven by a special eccentric on the lefthand side of the camshaft, or by an electrically operated pump mounted in the engine compartment. Twin renewable paper cartridge-type air filters are fitted in a pressed steel casing which is attached directly to the carburetters. On some models, the air cleaner intake pipe is provided with a main intake pipe and a secondary intake pipe which draws warm air from a point close to the exhaust manifold. A sensor linked to a flap valve operates to control air flow through either or both intakes to regulate the temperature of air supplied to the carburetters.

2:2 Routine maintenance

The air filter elements and fuel line filter cartridge (if fitted) should be renewed at the intervals recommended in the manufacturer's service schedule. The air filter elements should be inspected occasionally between servicing intervals and cleaned, if necessary, as described in **Section 2:3**. The filter gauze fitted to the fuel pump should be periodically cleaned and checked as described in **Section 2:4**.

Fuel line filter renewal:

Slacken the hose clips and remove the mounting screw as shown by the arrows in **FIG 2:1**. Detach the hoses from the connectors then remove and discard the filter element. Fit the new element in the reverse order of removal, making sure that the direction of fuel flow is correct according to the markings on the ends of the filter casing.

2:3 Air cleaner

For access to the air filter elements, remove the top cover from the assembly by releasing the spring clips (see

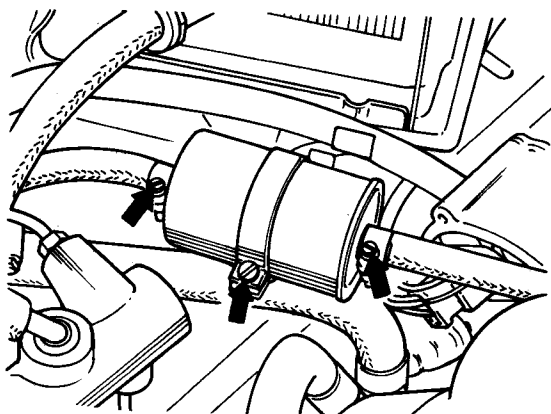


FIG 2:1 Fuel line filter installation

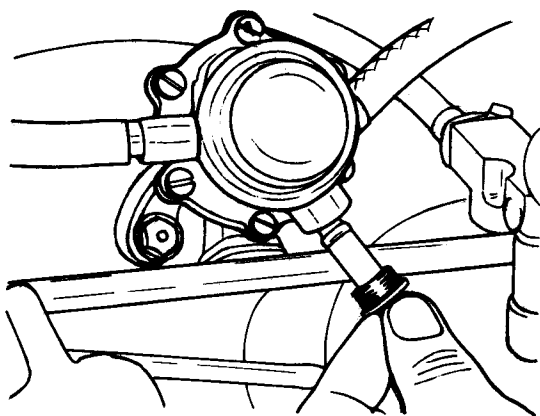


FIG 2:4 Filter removal, diaphragm pump

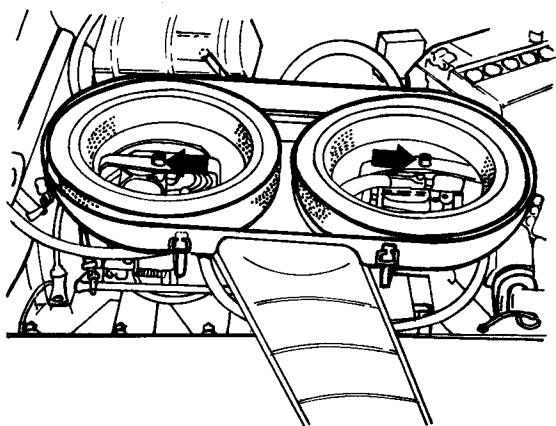


FIG 2:2 Air cleaner with top cover removed

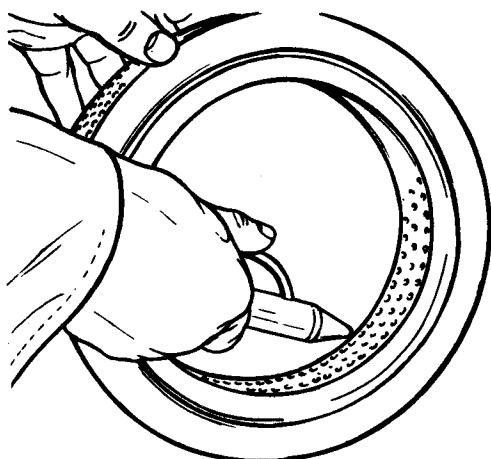


FIG 2:3 Cleaning air filter element

FIG 2:2). If the elements are to be renewed, remove and discard the old elements, wipe clean the inside of the housing and cover, then reassemble using new elements. To clean filter elements between renewal periods, hold the element flat and tap it gently against a solid surface to release loose dust, then blow air from the inside to outside using an air-line as shown in FIG 2:3. Air pressure should not be more than 5 atmospheres (71lb/sq in).

To remove the air cleaner assembly complete, remove the top cover then unscrew the two securing nuts arrowed in FIG 2:2. Lift the assembly from the carburettors and release the hoses from the fittings on the body. Refitting is a reversal of the removal procedure.

2:4 Fuel pump

Testing:

Before testing the pump, ensure that the fuel tank vent system is not blocked. A blockage is indicated if the removal of the fuel filler cap results in a sound of air being drawn into the tank. If so, the fuel tank vent system must be checked and cleaned.

If the vent system is clear and it is still suspected that fuel is not reaching the carburettors, disconnect the carburetter feed pipe and hold a suitable container under the end of the pipe. Turn the engine over a few times with the starter (mechanical pump), or switch on the ignition (electric pump), and watch for fuel squirting from the end of the pipe, which indicates that the pump is working. If so, check the float needles in the carburettors for possible sticking.

Reduced fuel flow can be caused by blocked fuel pipe or a clogged filter. If a clogged fuel line filter is suspected, remove the filter as described in Section 2:2 and check that fuel can flow through it freely. Check the filter gauze at the fuel pump as described later in this section.

If an obstructed pipeline appears to be the cause of the trouble, it may be cleared with compressed air. Disconnect the pipeline at both ends. **Do not pass compressed air through the pump or the valves will be damaged.** Similarly, compressed air must not be passed through the fuel line filter, if fitted. If there is an obstruction

between the pump and the tank, remove the tank filler cap before blowing the pipe through from the pump end.

If the pump delivers insufficient fuel, suspect an air leak between the pump and the tank, dirt under the pump valves or faulty valve seatings. If no fuel is delivered, suspect a sticking valve or a faulty pump diaphragm.

Test the action of the pump valves by blowing and sucking at the inlet and outlet points. Do this with the pump in situ, using a suitable piece of pipe connected to the pump inlet and outlet in turn. It should be possible to blow air in through the pump inlet but not to suck air out, and it should be possible to suck air out of the pump outlet but not to blow air in. If the valves do not work properly according to this test, or if the pump is defective in any other way, the unit must be overhauled or renewed as described later. Note that no servicing is possible in the case of electrically operated pumps.

Fuel pump filter:

If a diaphragm pump is fitted, remove the air cleaner assembly as described in **Section 2:3**. Unscrew and remove the cap and filter gauze as shown in **FIG 2:4**. If an electrically operated pump is fitted, disconnect the fuel inlet hose and remove the filter gauze as shown in **FIG 2:5**.

Carefully wash the filter gauze in clean petrol, using a small brush to remove stubborn deposits. If the filter is damaged or will not clean up properly it should be renewed.

Carefully install the filter in the reverse order of removal. If the air cleaner was removed, refit as described in **Section 2:3**.

Fuel pump removal:

Diaphragm pump:

Remove the air cleaner assembly as described in **Section 2:3**. Disconnect the fuel pipes from the pump, then plug or clamp the ends of the pipes to prevent fuel loss. Unscrew the two fixing nuts and remove the pump from the insulating flange. Check the condition of the pump pushrod and insulating flange, which are shown in **FIG 2:6**. If new components are required, note that pushrod length **A** and insulating flange thickness **B** for replacement parts must be the same as those of the originals.

Refit the pump in the reverse order of removal, using new gaskets at the insulating flange. Tighten the mounting nuts alternately and evenly to avoid distortion of the flange.

Electrically operated pump:

Disconnect the plug at the fuel pump as shown in **FIG 2:7** pulling on the plug body only, never directly on the cables. Disconnect the fuel inlet pipe and remove the filter gauze to prevent it from being damaged. Disconnect the fuel delivery hose from the expansion vessel attached to the pump, then plug or clamp the ends of the hoses to prevent fuel loss. Remove the fuel pump together with expansion vessel. Disconnect the expansion vessel from the pump as shown in **FIG 2:8**. Note that the fuel pump must be renewed complete if it is faulty, as no repairs are possible.

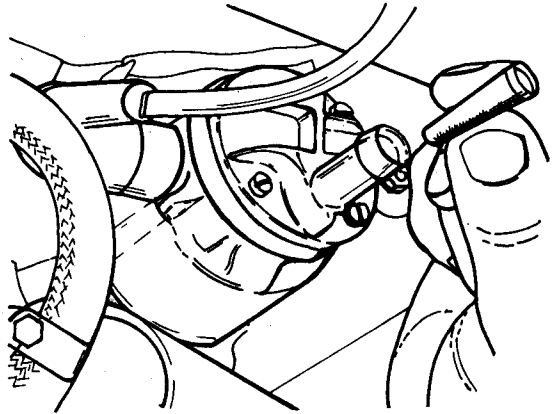


FIG 2:5 Filter removal, electrically operated pump

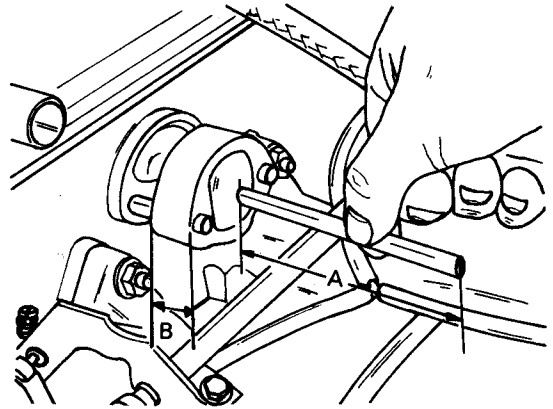


FIG 2:6 Diaphragm pump pushrod and insulating flange

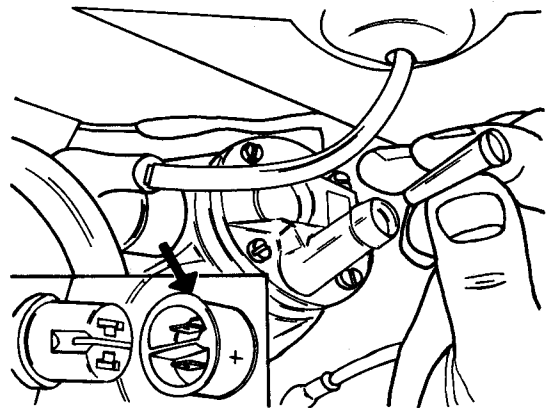


FIG 2:7 Electrically operated pump removal

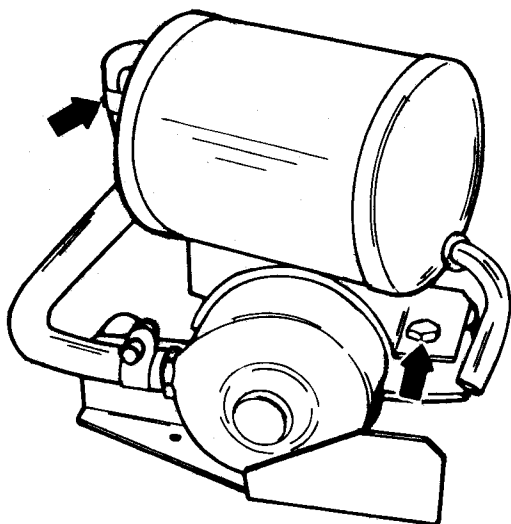


FIG 2:8 Removing expansion vessel

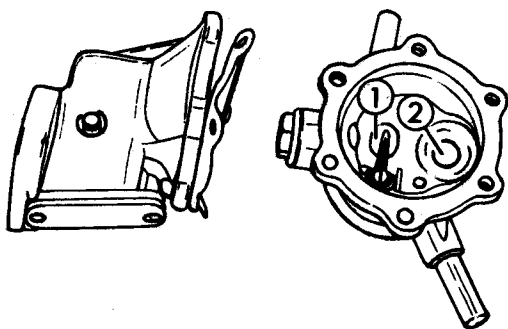


FIG 2:9 Inlet valve 1 and outlet valve 2

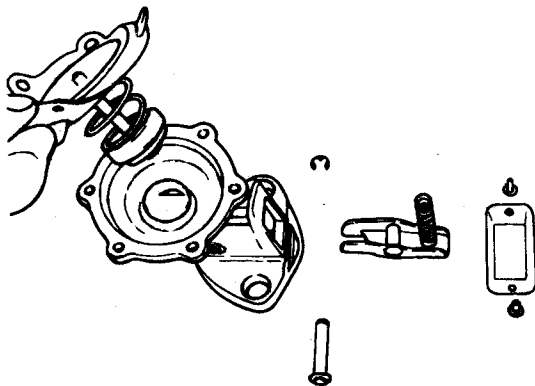


FIG 2:10 Pump lower components

Refit the pump in the reverse order of removal, making sure that the plug is correctly connected as shown in FIG 2:7. The projection in the socket must fit in the plug groove.

Diaphragm pump overhaul:

Remove the pump as described previously. Mark the pump upper and lower parts so that they can be re-connected in their original relative positions, then remove the screws and separate the two parts. Refer to FIG 2:9. Remove and check inlet valve 1 and make sure that its sealing surface is in good condition. Check outlet valve 2 for correct operation, by pushing gently against its spring and allowing it to return. Carefully wash the pump upper part in petrol to remove any dirt or sediment. Remove and clean the filter element as described previously.

Refer to FIG 2:10 and dismantle the pump lower components. Remove the retaining washer, cup and spring from the diaphragm pushrod. The diaphragm should be discarded and a new one fitted whenever the pump is overhauled. Check all other components for wear or damage and renew as necessary. Clean the pump lower body with petrol to remove dirt and sediment.

Reassemble the pump in the reverse order of dismantling. Make sure that the rocker arm correctly engages the lower end of the diaphragm pushrod. When the two halves of the pump body are fitted together, the diaphragm should be properly positioned. This is best carried out by fitting the lower part of the pump to tool 5125. If this tool is not available operate the rocker arm by hand until the diaphragm is in the central (flat) position, then hold in this position while fitting the upper part of the pump and alternately and evenly tightening the retaining screws.

2:5 Carburettor tuning and adjustment

Note that tuning and adjustment procedures will only be effective if the sparking plugs, contact points and ignition system are in good order and the valve clearances correctly set. Accurate tachometer equipment will be needed to correctly set engine idle speed and suitable flow meter equipment will be necessary to ensure correct synchronising of the carburetters. If carburetters with mixture bypass system are fitted, suitable exhaust gas analysing equipment will be needed to check the CO (carbon monoxide) content of the exhaust gas to ensure that it is maintained at the specified level. If suitable equipment is not available, the work should be carried out at a fully equipped service station.

Slow-running adjustments:

Carburetters without mixture bypass system:

Make sure that the engine is at normal operating temperature. Switch off the engine, then remove the air cleaner assembly as described in Section 2:3. It may also be necessary to remove the air cleaner mounting studs from the carburetters, according to the type of flow meter equipment to be used. To obtain a basic setting, tighten the idle mixture screws indicated by the lower arrows in FIG 2:11 until they gently contact their seats, then unscrew each by one and a half to two full turns.

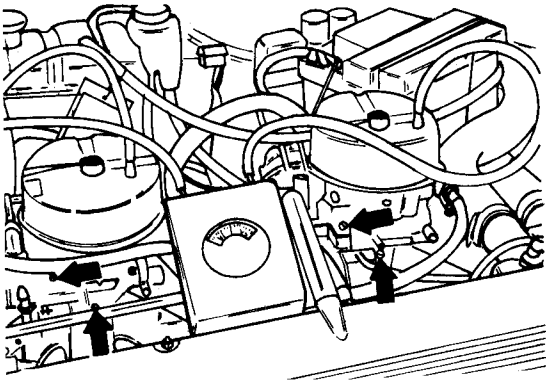


FIG 2:11 Typical installation of synchronising equipment. Carburettor adjustment screws are arrowed

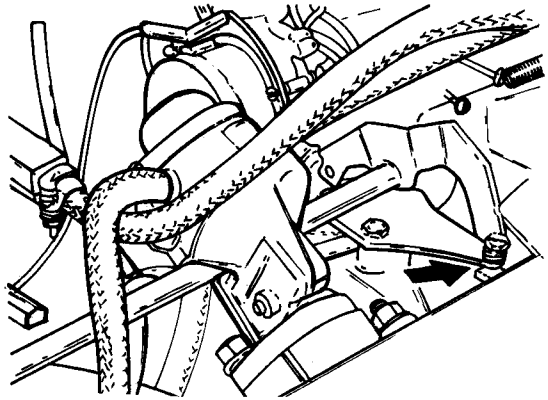


FIG 2:12 Rotary shaft adjustment screw

Make sure that the rotary shaft adjustment screw arrowed in FIG 2:12 is well clear of its stop. Note that this screw is intended for use only when it is necessary to raise engine speed temporarily when checking such items as distributor vacuum advance and retard characteristics. The adjustment screw must never be used to modify engine idling speed for normal running conditions. Disconnect the linkage connector shown in FIG 2:13.

Connect the tachometer and flow meter equipment according to the manufacturer's instructions. Start the engine and allow it to idle. Adjust the screws indicated by the upper arrows in FIG 2:11 equally to raise the idling speed to 900rev/min, then alternately as necessary to obtain the same flow meter reading at each carburettor. Now adjust the idle mixture screws indicated by the lower arrows in FIG 2:11 to obtain the fastest possible idling speed, then readjust the idle speed screws to correct engine speed. Repeat these procedures as necessary until a smooth idle at the specified engine speed together with the same flow meter reading at each carburettor is obtained. Make adjustments a little at a time and always make final adjustments at the idle mixture screws.

When engine idle speed adjustments have been correctly carried out, adjust the length of the linkage connector at the knurled nut arrowed in FIG 2:13 until the connector can be refitted to the linkage without moving the linkage and affecting idle speed. Make sure that clearance exists between the rotary shaft adjustment screw and the stop (see FIG 2:12). Switch off the engine, remove the flow meter equipment then refit the air cleaner assembly as described in Section 2:3. Idle speed will drop by approximately 100rev/min when the air cleaner is installed, so the engine should be restarted and the idle mixture screws readjusted by exactly equal amounts to increase idle speed to 900rev/min.

Carburetters with mixture bypass system:

Make sure that the engine is at normal operating temperature, then switch off. Remove the air cleaner assembly as described in Section 2:3. Remove the screw plugs from the exhaust manifolds and insert test probes 7062 as shown in FIG 2:14. Connect the exhaust gas analysing equipment. Connect the tachometer and flow meter equipment according to the manufacturer's instructions.

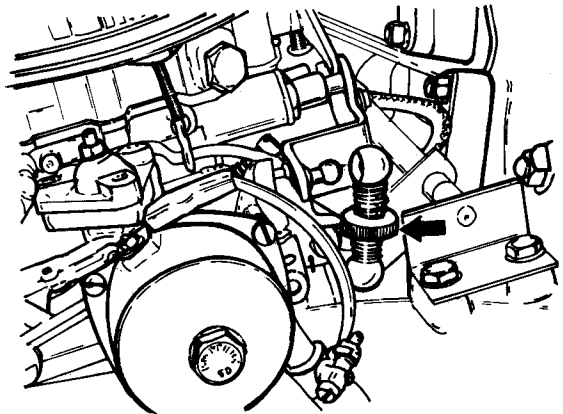


FIG 2:13 Carburettor linkage connector

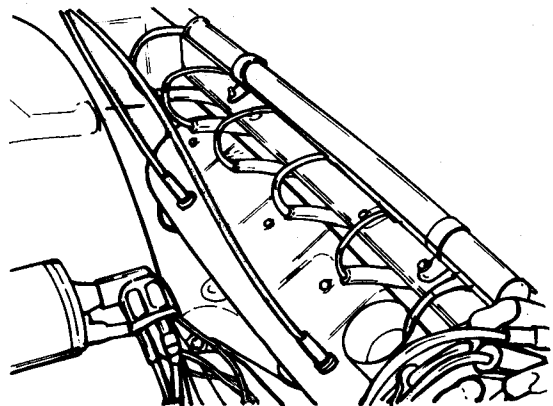


FIG 2:14 Installing test probes to exhaust manifold

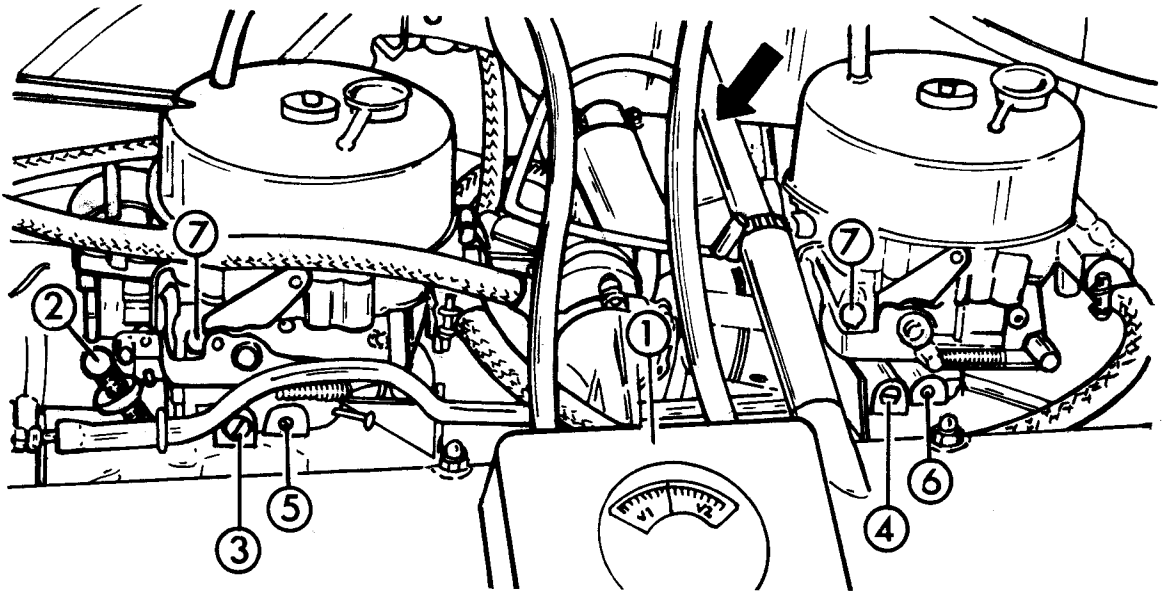


FIG 2:15 Adjusting carburetters having mixture bypass system. The tool used to compensate for the absence of the air cleaner is arrowed

Key to FIG 2:15 1 Synchroniser indicator 2 Connector 3, 4 Additional mixture regulating screws 5, 6 Idle mixture regulating screws 7 Stop screws

Refer to **FIG 2:15**. If tool 130000 is available, it can be installed as shown. This avoids the need for resetting idle speed after the air cleaner assembly has been refitted, but it is not essential. Detach connector 2 from the carburettor linkage.

Start the engine and adjust the two additional mixture regulating screws 3 and 4 until flow meter reading is the same at each carburettor and an idle speed of 900 to 1000rev/min is obtained. Now carry out further adjustments as necessary to the same screws until a CO reading of 2.0 ± 0.5 per cent is obtained, while maintaining equal flow meter readings at the carburettors. If these final adjustments cause the idle speed to alter, repeat the adjustment procedure. If repeated attempts to

obtain the correct settings are unsuccessful, check the stop screw adjustment as described later.

When slow-running adjustments are complete, adjust the length of linkage connector by means of knurled nut arrowed in **FIG 2:13** until it can be refitted without moving the linkage or changing the idle speed at all. Remove the flow meter equipment and install the air cleaner assembly as described in **Section 2:3**. When the air cleaner is fitted, idle speed will drop by approximately 100rev/min, so the additional mixture regulating screws 3 and 4 (see **FIG 2:15**) must be finally adjusted by exactly equal amounts until the specified engine idle speed is obtained, while maintaining the specified exhaust gas CO content.

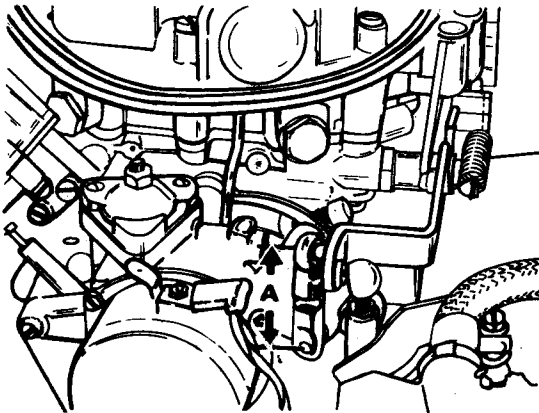


FIG 2:16 Pushrod length A must be 40mm (1.57in)

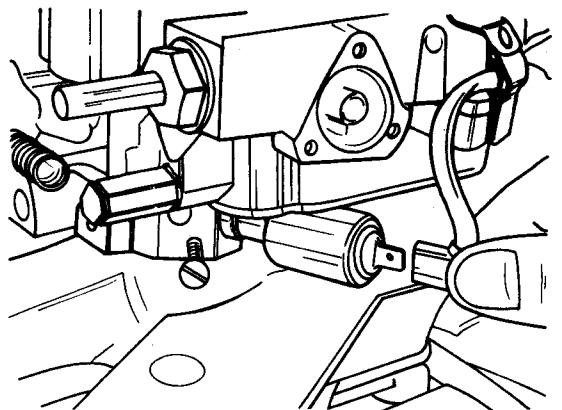


FIG 2:17 Disconnecting idle valve wiring

Stop screw adjustment:

The stop screws 7 on carburetters with mixture bypass system are correctly set by the manufacturers and their positions should not be modified except in exceptional circumstances, for instance if the specified idle speed and exhaust gas CO content cannot be obtained with the adjustment procedure described previously. If this is the case, detach connector 2 from the carburetter linkage and screw both additional mixture regulating screws 3 and 4 fully in. Remove the plastic caps and adjust stop screws 7 to obtain an engine idle speed of 700rev/min with the carburetters synchronised, at the same time adjusting the CO content to 3 per cent per carburetter by means of idle mixture regulating screws 5 and 6. This done, refit the plastic caps to screws 7 and reset idle speed to 900 to 1000rev/min and CO content to 2.0 ± 0.5 per cent using additional mixture regulating screws 3 and 4 and idle mixture regulating screws 5 and 6, making sure that the carburetters remain synchronised. If it is difficult to obtain the same flow meter reading for each carburetter, check the length of the pushrod shown in FIG 2:16 and adjust if necessary so that dimension A is 40mm (1.57in).

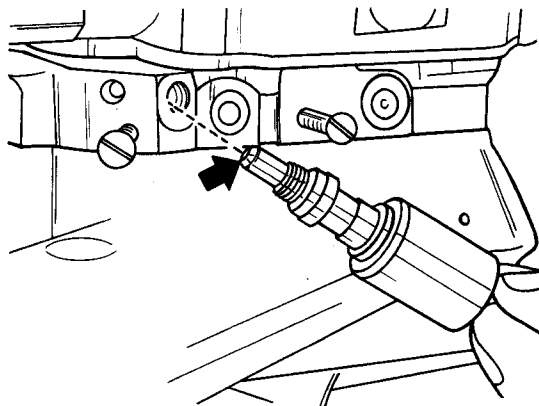


FIG 2:18 Idle valve taper sealing surface

Checking idle valves:

Electrically operated idle valves are fitted to the carburetters to prevent the engine from running on when it is hot and the ignition is switched off. A faulty valve will cause the engine to idle roughly and at a slower speed. If both valves are faulty the engine will cut when the throttle linkage is returned to the idle position.

To check valve operation, set the engine to run at idle speed and pull the connector from the idle valve on one of the carburetters as shown in FIG 2:17. When this is done, the engine should idle noticeably slower and less smoothly. When the cable is connected again, a slight clicking noise should be audible. Repeat the test at the second carburetter. If an idle valve does not operate correctly, it must be renewed. To do this, pull off the electrical connector and unscrew the valve from the carburetter. When installing a valve, make sure that the taper sealing surface arrowed in FIG 2:18 is in perfect condition and thoroughly clean. Do not overtighten the valve, the correct torque figure being 0.25mkp (1.8lb ft).

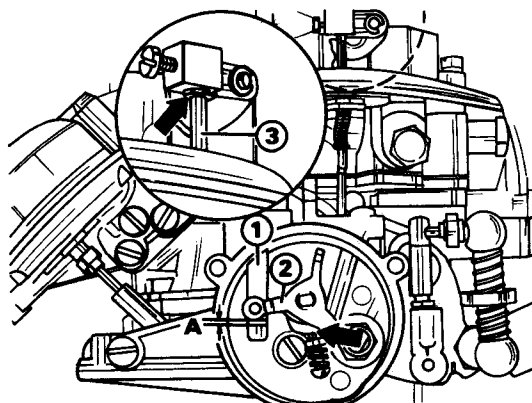


FIG 2:19 Choke adjustment, first stage

Choke flap adjustment:

Remove the air cleaner assembly as described in Section 2:3. Remove the three screws from the automatic choke flange and detach the choke cover leaving the water hoses connected. Do not loosen the choke housing central bolt. Hold the choke flap in the fully closed position by hand, then loosen the bolt for the pivot unit which is shown in the inset in FIG 2:19. With the adjustment screw aligned with the upper notch of the stepped disc as shown by the lower arrow, set the play between rod 1 and actuating disc lever 2 to 1.5mm (0.059in) as shown at A. With this position held, tighten the pivot unit bolt to lock against rod 3, then press the circlip on the rod firmly up against the pivot unit.

Refer to FIG 2:20. With the adjusting screw still against the upper notch on the stepped disc, press rod 1 upwards and actuating disc 2 as shown. Now use a drill or rod of the correct diameter to check the gap between

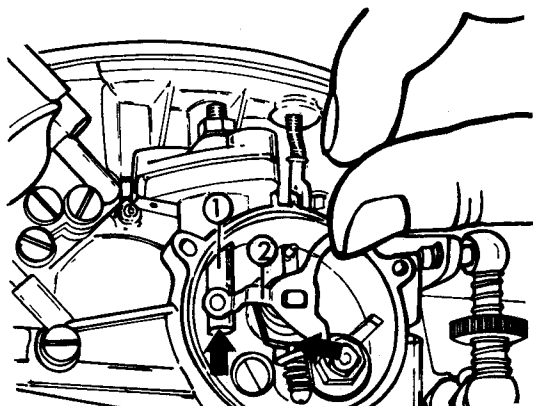


FIG 2:20 Choke adjustment, second stage

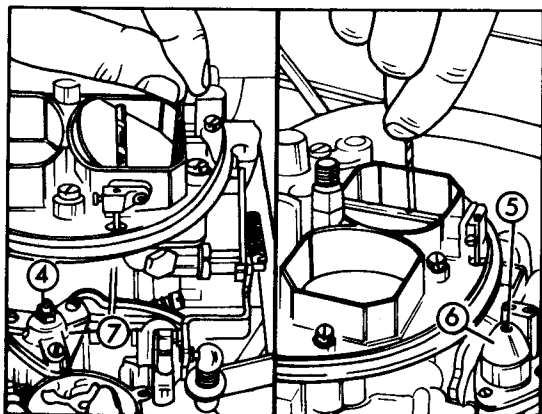


FIG 2:21 Choke adjustment, third stage

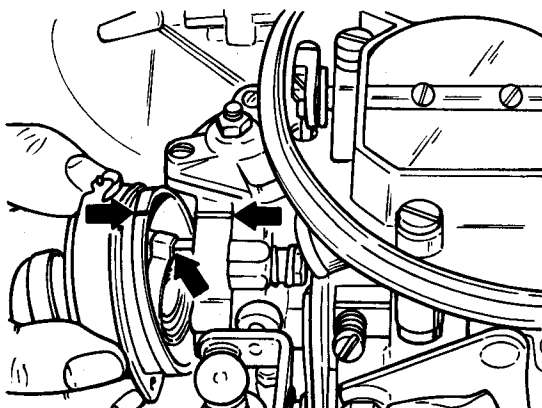


FIG 2:22 Installing choke cover

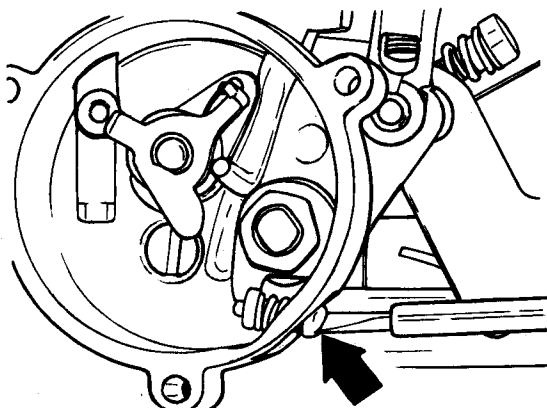


FIG 2:23 Fast-idle speed adjustment screw

choke flap and carburettor air intake as shown in FIG 2:21, referring to **Technical Data** to determine the correct measurement. To adjust the gap on earlier models, slacken the locknut and turn adjusting screw 4 as necessary. Tighten the locknut on completion. On later models, adjust by turning bolt 5 in cover 6. Lock the bolt after adjustment by applying a dab of paint or sealing compound. If the engine does not run smoothly when started from cold on models having the later type of choke mechanism 6, it is possible to convert to the earlier type with valve cover 7 as the necessary replacement parts can be obtained from a BMW agent.

When adjustments at both carburetters are complete, refit the choke cover, making sure that the peg on the mechanism engages the spring correctly and that the notch on the cover aligns with the projection on the housing as shown in FIG 2:22. Install the air cleaner assembly as described in **Section 2:3**.

Fast-idle speed adjustment:

The fast-idle linkage serves to increase engine idle speed when the automatic choke is operating. This prevents the engine from cutting out after starting from cold. Linkage adjustments must only be carried out when the engine is at normal operating temperature and after the slow-running adjustments have been correctly carried out as described previously. The air cleaner assembly must be removed as described in **Section 2:3**. On models fitted with distributors having vacuum advance and retard, the vacuum retard hose must be pulled from the fitting at the distributor (see **Chapter 3**).

Run the engine until it is at normal operating temperature, then switch off. Remove the cover from the choke unit as described previously. Detach the connector from the carburettor linkage as shown in FIG 2:13. Lift the throttle linkage for the rear carburettor by approximately $\frac{1}{8}$ in, then close the choke flap by hand until there is a gap of 2.4mm (0.094 in) between the edge of the flap and the air intake. Measure the gap in the manner shown in FIG 2:21, using a drill or rod of the correct diameter. This procedure will set the fast-idle adjustment screw on the second step of the cam in the choke unit. Release the choke flap.

Without touching the throttle linkage, start the engine. The fast-idle speed should be 1400rev/min. If above or below this figure, switch off the engine to make adjustments, which are carried out as shown in FIG 2:23. Push the carburettor linkage to the full throttle position to bring the screw to the adjustment position shown. Turn the screw anticlockwise to reduce fast-idle speed, clockwise to increase. One turn of the screw corresponds to approximately 300rev/min. After each adjustment, reset the linkage as described previously and check fast-idle speed. When the speed is correct, switch off the engine and raise the throttle linkage at the rear carburettor approximately $\frac{1}{8}$ in then release, so that the fast-idle linkage disengages. Repeat the entire operation at the front carburettor.

On completion, attach the connector to the carburettor linkage and set both carburetters to the fast-idle position as described previously. Start the engine without touching the accelerator linkage and check that fast-idle speed is 1800 to 2000rev/min. Refit the choke covers and air cleaner assembly as described previously.

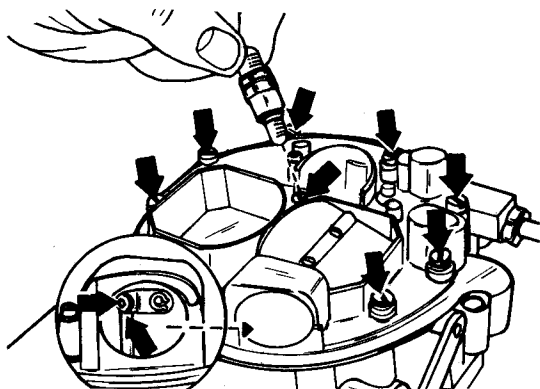


FIG 2:24 Carburettor top cover attachment screws and choke linkage connection

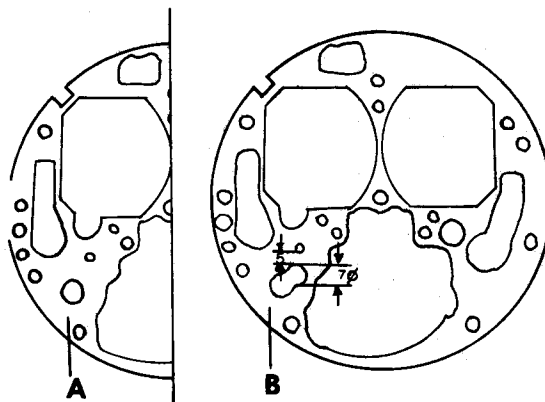


FIG 2:26 Alternative carburettor cover gaskets A and B

2:6 Carburettor servicing

It is not necessary to remove the carburettors to carry out this work. If poor engine performance is traced to carburettor operational faults which cannot be cured by the servicing procedures described in this section and the tuning and adjustment procedures described in **Section 2:5**, the car should be taken to a BMW service station for more detailed checks to be carried out.

Remove the air cleaner assembly as described in **Section 2:3**, then disconnect the fuel pipe from the carburettor. Refer to **FIG 2:24**. Unscrew the air cleaner mounting stud and fixing screws for the top cover. Press the circlip shown by the lower arrow in the inset hard against the joint, then slacken the bolt on the joint to release the rod. The top cover can then be detached. When the cover is installed, the choke flap should be held in the fully closed position then the joint pushed on to the rod until it contacts the circlip before tightening the bolt. This ensures that the choke linkage is reconnected in the original position.

Note that the carburettor may be fitted with either of the types of float chamber vent shown in **FIG 2:25**, the appropriate gaskets being shown in **FIG 2:26**. Cover type **A** may be fitted with gasket **A** or **B**, but cover type **B** must be fitted with gasket **B** or a gasket **A** suitably modified as shown in the illustration, the dimensions being in millimetres.

Refer to **FIG 2:27** and remove the idling jet, then remove the two securing screws arrowed and detach the carburettor body. Refer to **FIG 2:28** and remove main jet 1 pump suction valve 2, pump pressure valve 3 and

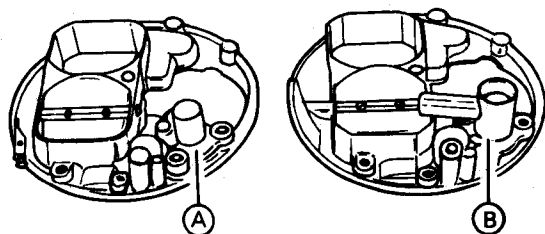


FIG 2:25 Alternative carburettor vents A and B

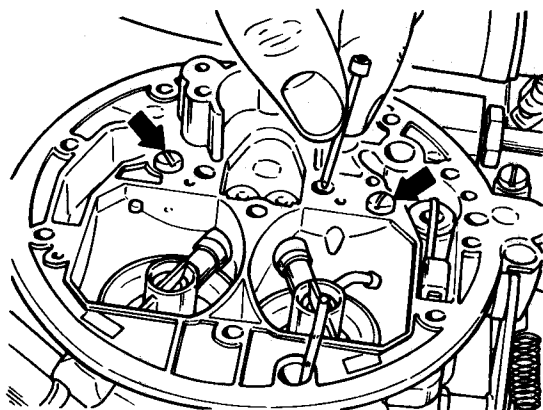


FIG 2:27 Idle jet and body securing screws

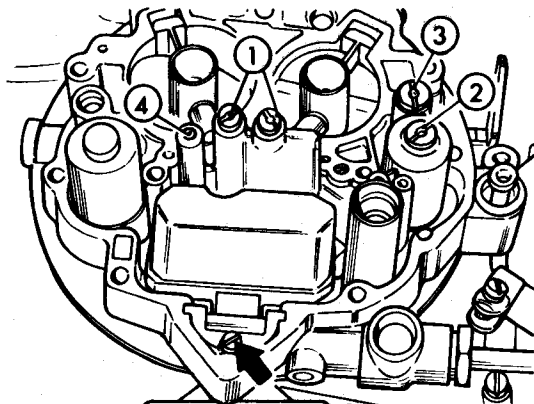


FIG 2:28 Removing float, jets and valves

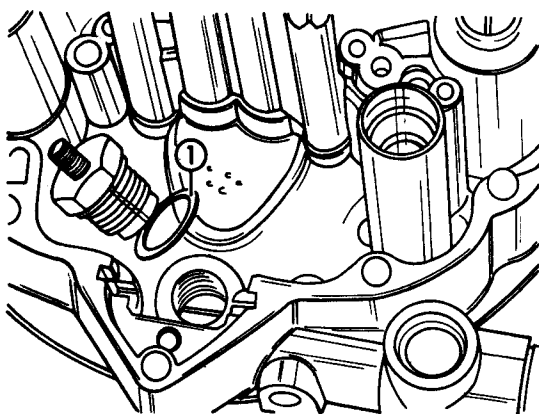


FIG 2:29 Needle valve assembly

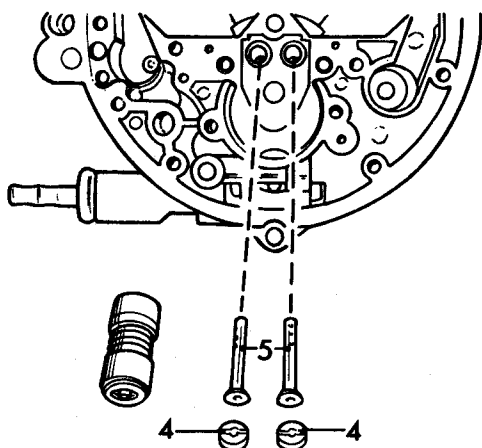


FIG 2:30 Removing air corrector jets, mixture tubes and pump plunger

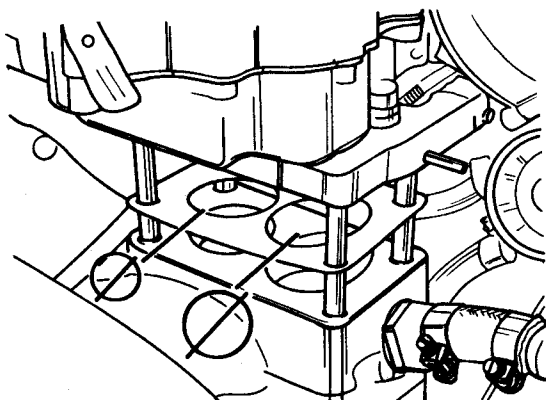


FIG 2:31 Carburettor flange gasket

intermediate jet 4, taking care to keep these parts in the correct order for installing in their original positions. Remove the fixing screw arrowed and detach the float. Unscrew and remove the needle valve assembly, collecting sealing washer 1 (see FIG 2:29). A sealing washer of the correct thickness must always be fitted to the needle valve assembly as this ensures correct float level. Refer to FIG 2:30 and remove air corrector jets 4, mixture tubes 5 and pump plunger. Take care not to mix the tubes and jets as they are differently calibrated for primary and secondary bores.

Clean all dismantled parts in petrol or an approved carburettor cleaner, then examine them for wear or damage. Renew any faulty parts. Clean jets, mixture tubes, valves and passages thoroughly using compressed air, clean petrol and a small stiff brush. **Do not use cloth for cleaning purposes as small fibres may remain after cleaning and clog the jets or passages. Never use a wire probe as this will damage or enlarge the jets or passages.**

Make sure that all sediment is cleared from the float chamber and inspect the float for damage or leakage, either of which will dictate renewal of the float. Float leakage can usually be detected by shaking the float and listening for the sound of fuel splash inside. Another method is to immerse the float in warm water and look for a stream of air bubbles which will indicate a hole in the unit.

The needle valve assembly should be cleaned thoroughly and inspected for wear or damage. Check that the valve operates correctly by blowing through from the feed end. The air flow should be cut off completely when the needle is held in to the body by gentle finger pressure. Renew the assembly if there is any doubt about its condition.

When servicing is complete, reassemble the carburettor in the reverse order of dismantling, then carry out the tuning and adjustment procedures described in Section 2:5.

2:7 Removing and refitting carburetters

Remove the air cleaner assembly as described in Section 2:3, then disconnect the fuel and vacuum hoses, and the electrical connector if fitted, from the carburettor. Note the connections of the vacuum hoses on the carburettor fittings, so that they can be reconnected correctly when the carburettor is refitted. Disconnect the linkage connector as shown in FIG 2:13.

If the carburettor is being removed to renew flange gaskets or for access to other components, there is no need to disconnect the water hoses to the automatic choke unit. Instead, detach the choke cover with hoses attached as described in Section 2:5. Remove the fixing nuts and detach the carburettor and flange gasket as shown in FIG 2:31. If the insulating flange is to be renewed, disconnect the pushrod shown in FIG 2:16 and disconnect the joint from the rod shown in the inset of FIG 2:19. Remove the throttle valve housing from the main carburettor body, then detach the insulating flange. Refit the carburettor in the reverse order of removal, noting the following points:

Always renew all gaskets. When installing the flange gasket, the graphite-coated side must face towards the inlet manifold (see FIG 2:31). Earlier type gaskets had

holes of different sizes, which must be correctly located with the smaller hole towards the cylinder head as shown in the illustration. Later type gaskets have holes of equal size and an interrupted centre web, which enables them to be fitted either way round, and they may be used to replace the earlier type. On completion, adjust the automatic choke and carry out the slow-running adjustments described in **Section 2:5**.

If the carburettor is to be detached complete, drain the cooling system as described in **Chapter 4** and disconnect the two water hoses from the automatic choke unit. Detach fuel return hose, if fitted. Remove the complete carburettor assembly from the inlet manifold, collecting the flange gasket. When refitting, make sure that the flange gasket is correctly installed carrying out tuning and adjustment as described in **Section 2:5**.

2:8 Fuel injection system

Fuel from the rear-mounted tank is supplied to the injector pump for the system by means of an electric fuel pump. The injector pump is responsible for the delivery of a timed and metered quantity of fuel to each of the six cylinders in the engine in the correct firing order. There are a number of control devices to ensure the correct timing and metering of this fuel injection charge, according to the ambient and engine temperature and the engine operating conditions at any moment. Apart from the items covered in this section, no attempts should be made to dismantle or adjust any part of the system. All such work should be carried out only by a BMW service station having the necessary special equipment and trained personnel.

Air cleaner:

The air filter element should be renewed at the intervals recommended in the manufacturer's service schedule. Between these periods, the filter element should occasionally be examined, and cleaned if necessary. To remove the element, release the spring clips and detach the air cleaner cover. Lift out the element. If renewal is necessary, discard the old element, wipe the inside of the air cleaner body and cover to remove dirt and grease, then reassemble using a new element. Note that the side of the element marked 'TOP' must be uppermost.

If the element is to be cleaned and refitted, blow out dirt using an air-line with pressure not more than 5 atmospheres (71lb/sq in). Apply the air jet from the bottom of the filter element only. Install the element as described previously.

To remove the air cleaner assembly complete, refer to **FIG 2:32**. Loosen the clamp on the throttle butterfly manifold and lift the air cleaner assembly from the guide rails. Detach the assembly by pulling the hose from the front panel. Refit in the reverse order of removal, releasing the catches securing the top cover before doing so. Relocate the catches on completion.

Slow-running adjustment:

Note that slow-running adjustments will only be effective if the sparking plugs, contact points and ignition system are in good order and the valve clearances correctly set. The injection system must also be operating correctly. Note that an accurate tachometer will be

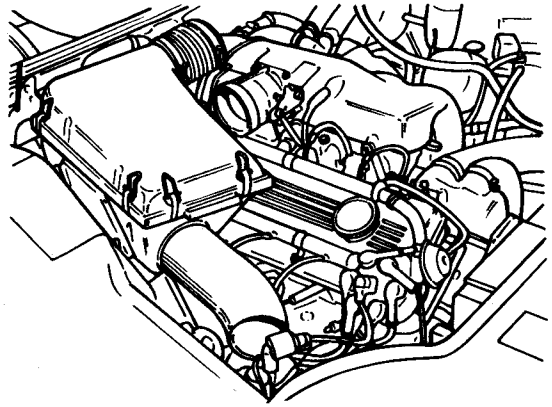


FIG 2:32 Air cleaner used with fuel injection system

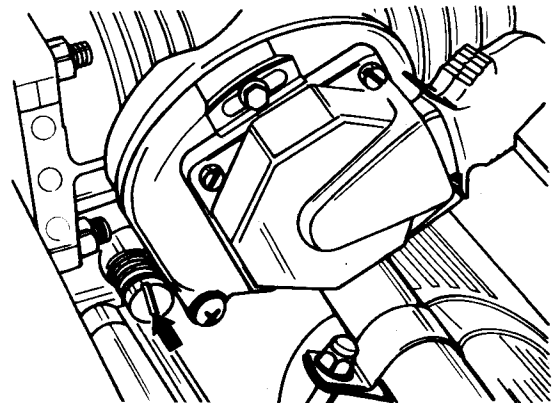


FIG 2:33 Idle air adjustment screw

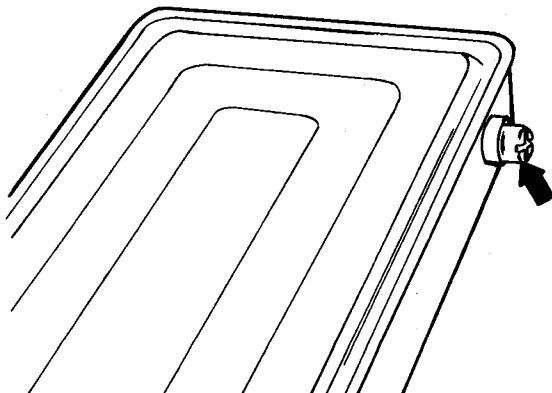


FIG 2:34 Fuel flow potentiometer

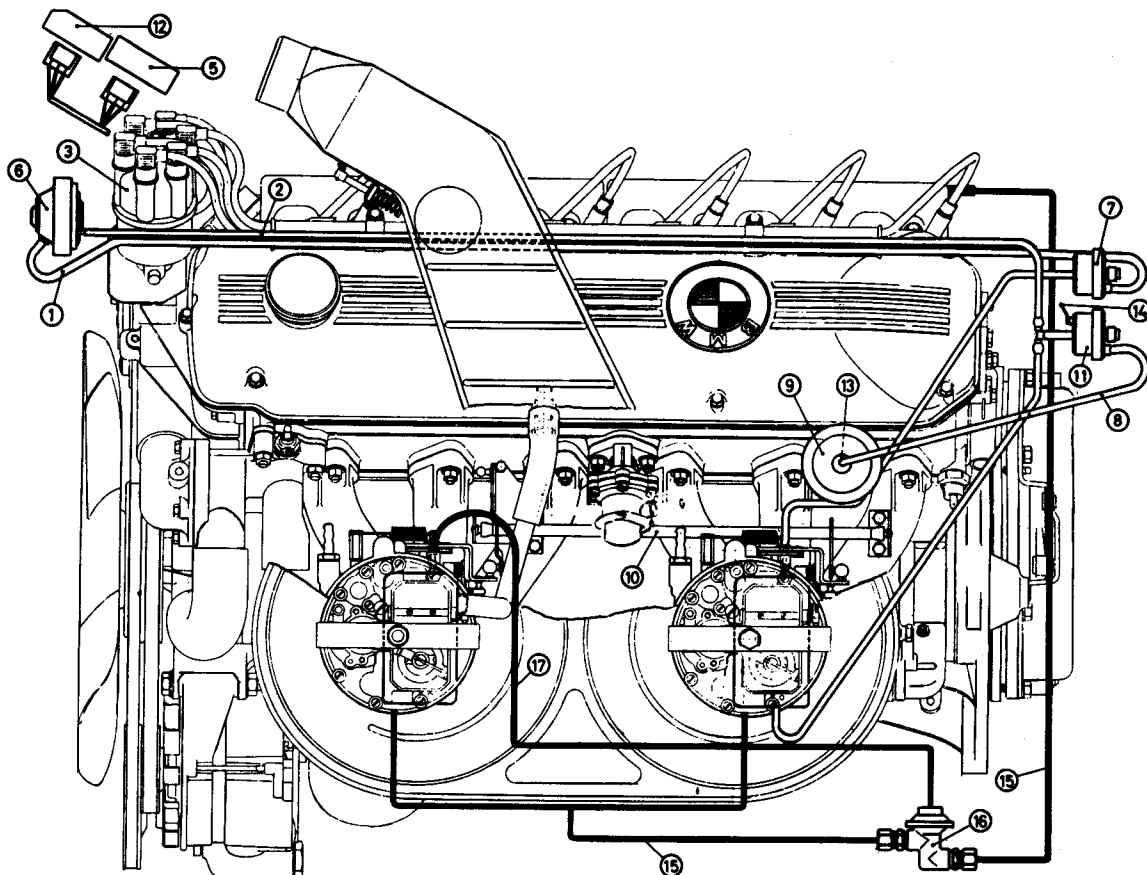


FIG 2:35 Layout of emission control system for 3.0 S-US and 3.0 CS-US models

Key to FIG 2:35 1 Vacuum hose, advance side 2 Vacuum hose, retard side 3 Ignition distributor 4 Stop screw (not shown) 5 Speed relay for solenoid valve 7 6 Double-acting vacuum unit 7 Two-way solenoid valve (advance side) 8 Vacuum hose from closure damper to two-way solenoid valve 9 Closure damper 10 Throttle control linkage 11 Two-way solenoid valve (retard side) 12 Speed relay for solenoid valve 13 Adjustment pad of closure damper 14 Cable connection 15 Exhaust recirculation line 16 Control valve 17 Control pressure line

needed to check engine idle speed and suitable analytical equipment will be necessary to measure CO (carbon monoxide) content of the exhaust gas. If suitable equipment is not available for this purpose, the work should be carried out by a fully equipped service station.

It is most important that the engine is at normal operating temperature, with a coolant temperature of approximately 80°C (176°F) and an oil temperature of approximately 60°C (140°F). Make sure that the air cleaner element is in good condition as described previously.

Start the engine and adjust to an idle speed of 850 to 1000rev/min for European models, 900 to 950rev/min for USA models, using the idle air screw arrowed in FIG 2:33. Now adjust the fuel flow potentiometer arrowed in FIG 2:34 to adjust the CO content of the exhaust gas. Turning anticlockwise will reduce emissions. CO content must be 1 to 2 per cent by volume for Europe,

1.5 to 2.0 per cent by volume for USA. Repeat the entire adjustment procedure if adjustment at the potentiometer alters engine idle speed beyond the stated limits. If the correct CO content cannot be obtained at the specified idle speed, the car should be taken to a service station for detailed checks to be made on the fuel injection system.

2:9 Emission control systems

The layout of the emission control system on USA export models is shown in FIG 2:35, a slightly simpler system using fewer components being fitted to later European models. The system functions to finely control fuel/air mixture at the carburetters and ignition timing advance and retard at the distributor. This ensures optimum engine operating conditions throughout the speed range to maintain toxic emissions from the engine and fuel system at the low level required by legislation.

The hoses and pipes in the system should periodically be checked for leaks or other damage and for tightness at the connections. If faulty operation of any of the components in the system is suspected, the car should be taken to a fully equipped service station so that the system can be thoroughly checked using special equipment.

2:10 Fault diagnosis

(a) Leakage or insufficient fuel delivered

- 1 Tank vent system blocked
- 2 Fuel pipes blocked
- 3 Air leaks at pipe connections
- 4 Fuel filter blocked
- 5 Pump diaphragm defective
- 6 Pump valves sticking or seating badly
- 7 Electric pump wiring or connections defective

(b) Excessive fuel consumption

- 1 Carburetter(s) incorrectly adjusted
- 2 Fuel leakage
- 3 Sticking or incorrectly adjusted choke unit
- 4 Dirty air cleaner
- 5 Worn carburetter jet(s)
- 6 Excessive engine temperature

(c) Idling speed too high

- 1 Rich fuel mixture
- 2 Throttle control sticking
- 3 Mixture control or choke sticking
- 4 Worn throttle valves

(d) Poor idling

- 1 Carburetter(s) incorrectly adjusted
- 2 Faults in ignition system
- 3 Engine valve clearances incorrect
- 4 Faulty or maladjusted choke unit
- 5 Faulty idle valve(s)

(e) Noisy fuel pump

- 1 Loose pump mountings
- 2 Air leaks on suction side of pump
- 3 Obstruction in fuel pipeline
- 4 Clogged fuel filter

(f) No fuel delivery

- 1 Float needle valve stuck
- 2 Tank vent system blocked
- 3 Defective fuel pump
- 4 Pipeline obstructed
- 5 Bad air leak on suction side of pump

NOTES