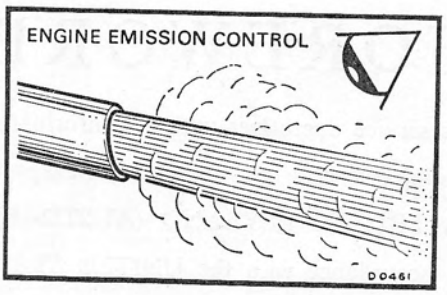
AKD 4957
(8th Edition)

WORKSHOP MANUAL SUPPLEMENT



BRITISH LEYLAND

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FOREWORD

This supplement provides service operatives with the information necessary to carry out the maintenance, servicing, and testing of engine emission and fuel evaporative loss control systems fitted to vehicles manufactured by BRITISH LEYLAND (AUSTIN-MORRIS) LTD. for which a certificate has been issued in accordance with the UNITED STATES CLEAN AIR ACTS and any applicable State Legislation.

Distributors and Dealers are advised to familiarize themselves with the legal requirements, in particular those concerning minimum standards of facilities, personnel, and servicing equipment.

Service operations in Workshop Manuals, where applicable, which may affect the efficiency of the emission or evaporative loss control equipment carry the following symbol, denoting that the control system must be checked on completion of the operation 

INDEX

SECTION 1

EQUIPMENT AND SERVICING

Section 1-A

EQUIPMENT

The recommended equipment for servicing should include at least the following:

Ignition Analyser Oscilloscope
Ohmmeter
Voltmeter
Tachometer
Vacuum Gauge
Pressure Gauge (0–10 lb./sq. in.)
Carburetter Balance Meter
Cam Angle Dwell Meter
Ignition Timing Light
Engine Exhaust Combustion Analyser
Cylinder Leak Tester
Distributor Advance Tester
Carburetter Piston Loading Tool

The following equipment covers most of the requirements for engine testing and tuning vehicles fitted with exhaust emission control devices.

Equipment	*Type/Model*	*Manufacturer*
Oscilloscope Engine Tuning Set and Exhaust Gas Analyser	1020 or 720	Sun Electric Corp.
Engine Analyser	40–162	Marquette
Exhaust Gas Analyser	42–141	Marquette

Equipment made by other suppliers may also be adequate.

It is important that your test equipment has regular maintenance and calibration.

Section 1-B

SERVICING

General

The efficient operation of the exhaust emission control system is dependent on the engine being in good mechanical condition and correctly tuned to the settings given in **'TUNING DATA'.**

Tuning and test procedure for the carburetters, ignition system, and engine are given at the end of the manual. These procedures are the quickest and surest way of locating engine faults or maladjustments and are the only methods that should be used for engine tuning.

Fault diagnosis

After tuning the engine to the correct settings, check for indications of the following symptoms:

Symptoms	Causes	Cure
Backfire in exhaust system	1. Leak in exhaust system	Locate and rectify leak
	2. Leaks in hoses or connections to gulp valve, vacuum sensing pipe or other inlet manifold joint	Locate and rectify leak
	3. Faulty gulp valve	Test gulp valve, and renew if faulty
	4. Leak in intake system	Locate and rectify leak
	5. High inlet manifold depression on over-run—faulty carburetter limit valve	Fit new throttle disc and limit valve assembly

Symptoms	Causes	Cure
Hesitation to accelerate after sudden throttle closure	1. Low carburetter damper oil	Top up to correct level
	2. Leaks in hoses or connections to gulp valve, vacuum sensing pipe or other inlet manifold joint	Locate and rectify leak
	3. Faulty gulp valve	Test gulp valve, and renew if faulty
	4. Leak in intake system	Locate and rectify leak
Engine surges (erratic operation at varying throttle openings)	1. Leaks in hoses or connections to gulp valve, vacuum sensing pipe or other inlet manifold joint	Locate and rectify leak
	2. Faulty gulp valve	Test gulp valve, and renew if faulty
	3. Air supply to adsorption canister restricted	Check air filter pad, vent pipe, and canister for obstruction
Erratic idling or stalling	1. Carburetter damper oil low	Top up to correct level.
	2. Leaks in hoses or connections to gulp valve or vacuum sensing pipe or other inlet manifold joint	Locate and rectify leak
	3. Faulty gulp valve	Test gulp valve, and renew if faulty
	4. Incorrect carburetter settings	Reset to **TUNING DATA**
	5. Carburetter limit valve not seating	Fit new throttle disc and limit valve assembly
	6. Carburetter suction chamber damaged	Replace carburetter or components
Burned or baked hose between air pump and check valve	1. Faulty check valve	Test check valve, and renew if faulty
	2. Air pump not pumping	Test air pump; service or renew if faulty
Noisy air pump	1. Incorrect belt tension	Adjust belt tension
	2. Pulleys damaged, loose or misaligned	Tighten loose pulleys, renew damaged pulleys
	3. Air pump failing or seizing	Test air pump; service or renew if faulty
Excessive exhaust system temperature	1. Incorrect ignition timing	Recheck timing against **'TUNING DATA'**
	2. Choke control system not fully returned	Check choke mechanism for correct operation; instruct driver on correct usage
	3. Fast idle speed too high	Reset fast idle speed—see **'TUNING DATA'**
	4. Air injector missing	Remove air manifold and check injectors
	5. Air pump relief valve inoperative	Test relief valve, and renew if faulty

Symptoms	Causes	Cure
Mixture requires excessive enriching to obtain correct exhaust emission readings	1. Air leak into crankcase	Locate and rectify leak
	2. Early cars—Diaphragm of crankcase control valve perforated or not correctly seated	Locate and rectify leak or control valve
	Later cars—Crankcase breather hose or connections to carburetter leaking	Locate and rectify leak
Fuel leakage	1. Fracture in fuel pipe or fuel vapour ventilation system	Locate and rectify leak
	2. Fuel filler cap not sealing	Check condition of cap and filler seal
	3. Leak on fuel filler tube or tank unit	Locate and rectify leak
Engine stops after short running periods (i.e. fuel starvation)	1. Obstructed vapour line between fuel tank and absorption canister	Locate and clear obstruction
	2. Air supply to absorption canister restricted	Check air filter pad, vent pipe and canister for obstruction
	3. Faulty fuel pump	Check operation and rectify fault
Engine runs after ignition is switched off	1. Fuel grade too low	Refill with correct grade fuel
	2. Ignition retarded	Reset timing to **'TUNING DATA'**
	3. Idle speed too high	Reset to **'TUNING DATA'**
	4. Fuel mixture too weak	Tune carburetter(s)

SECTION 2

CRANKCASE EMISSION CONTROL

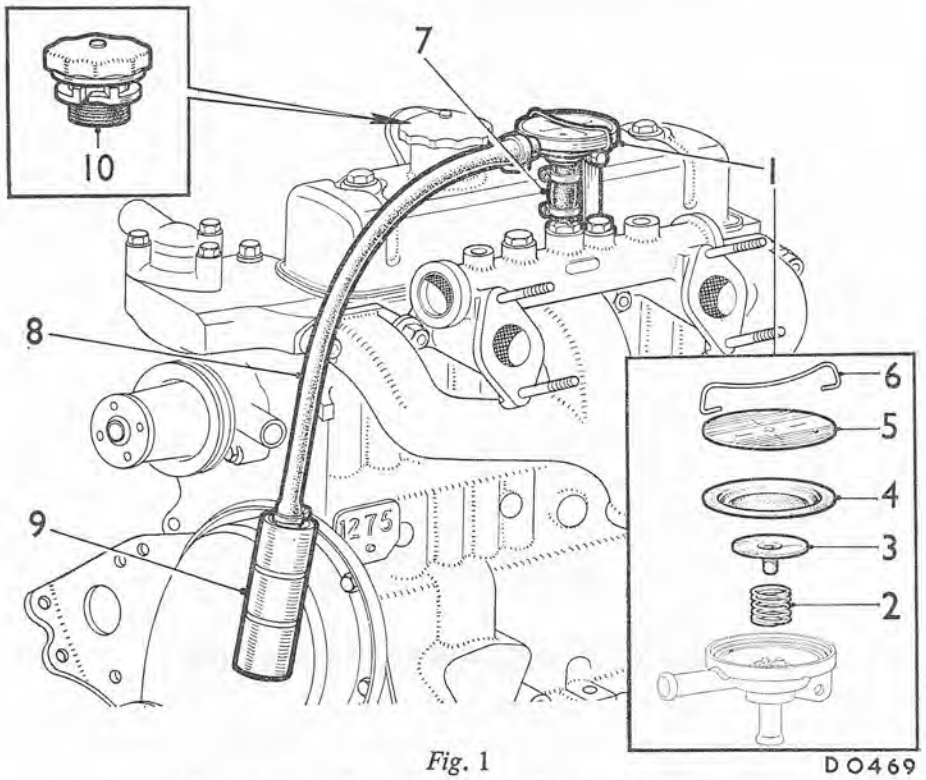


Fig. 1

A typical crankcase emission valve control system

1. Emission control valve.
2. Valve spring.
3. Metering valve.
4. Diaphragm.
5. Cover plate.
6. Spring clip.
7. Manifold connection.
8. Breather hose.
9. Oil separator.
10. Filtered filler cap.

Section 2-A

VALVE CONTROL SYSTEM—General description

The system consists of a diaphragm control valve connected by hoses between the inlet manifold and the engine crankcase. The crankcase outlet connection incorporates an oil separator to prevent oil being pulled over with the vapours leaving the crankcase. On four-cylinder engines a filtered, restricted orifice ($\frac{9}{64}$ in. diameter) in the oil filler cap provides a supply of fresh air into the crankcase as vapours are withdrawn by inlet manifold depression. Six-cylinder engines are fitted with a standard oil filler cap and a tube connected between the rocker cover oil filler tube and the air intake filter provides the supply of fresh air to the engine. The control valve diaphragm varies the opening to the inlet manifold according to the depression or pressure acting on it. With a decrease in manifold depression or when the crankcase obtains a positive pressure the diaphragm opens the valve allowing the crankcase vapours to be drawn into the inlet manifold. During conditions of high manifold depression, e.g. low engine speeds or loads, the diaphragm closes the valve and restricts the flow into the inlet manifold, thus preventing a leaning-off of the air/fuel mixture to the cylinders.

Section 2-B

VALVE CONTROL SYSTEM—Testing

(1) Warm up the engine to normal operating temperature.

(2) With the engine running at idling speed remove the oil filler cap.

(*a*) A rise in engine speed, the change being audibly noticeable, indicates that the control valve is functioning correctly.

(*b*) No rise in speed, service the control valve.

Section 2-C

VALVE CONTROL SYSTEM—Servicing

Oil filler cap (*four-cylinder engines only*)

(1) Renew every 12,000 miles or 12 months.

Control valve

(2) Disconnect the hoses and renew the valve assembly, or clean as follows:

(*a*) Remove the spring clip and withdraw the cover plate, diaphragm, metering valve and spring.

(*b*) Clean all metal parts with a solvent (trichlorethylene, fuel, etc.). **Do not use an abrasive.** If deposits are difficult to remove, immerse in boiling water before applying the solvent.

(*c*) Clean the diaphragm with a detergent or methylated spirit (denatured alcohol).

(*d*) Examine the parts thoroughly for wear or damage, and renew where necessary.

(*e*) Reassemble the valve ensuring that the metering valve fits correctly in its guides and the diaphragm is correctly seated.

(*f*) Refit the valve and check its operation.

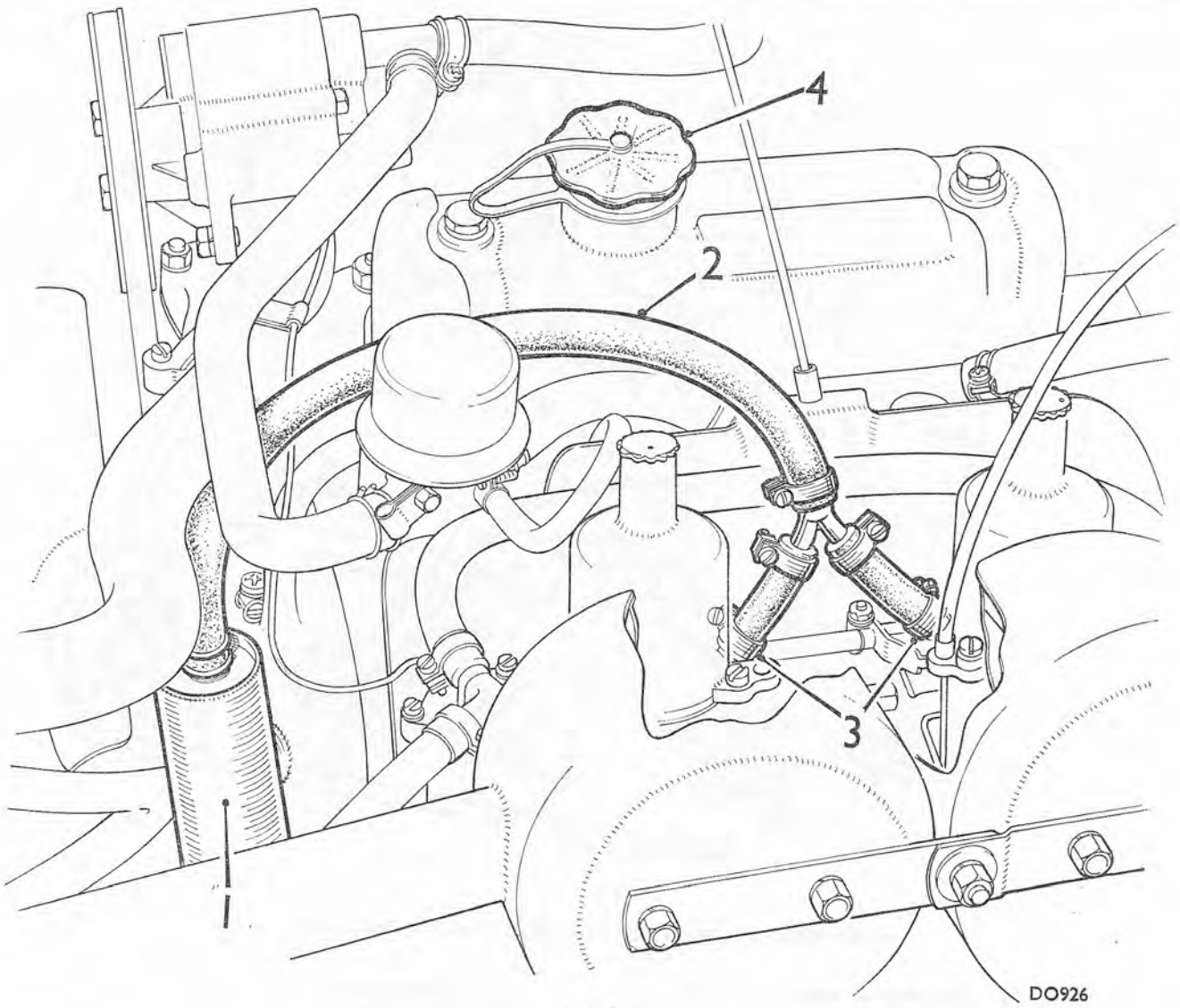


Fig. 2
Carburetter control system

1. Oil separator.
2. Breather hose.
3. Carburetter chamber connection.
4. Filtered filler cap.

Section 2-D

CARBURETTER CONTROL SYSTEM

Description

With this system the engine breather outlet is connected by hoses to the controlled depression chamber; the chamber between the piston and the throttle disc valve, of the carburetter(s). Engine fumes and blow-by gases are drawn from the crankcase by the depression in this chamber, through an oil separator incorporated in the engine outlet connection, and from there to the inlet manifold. Fresh air is supplied to the engine through the combined oil filler cap and filter (four-cylinder engines) or through the air intake filter (six-cylinder engines).

Servicing (Not applicable to vehicles equipped with evaporative loss control systems)

The oil filler cap (four-cylinder engines only) must be renewed every 12,000 miles (20000 km.) or 12 months; no other service is required.

If a failure of the system is suspected, check the hoses and connections for leaks and obstructions. An indication of a failure is loss of crankcase depression.

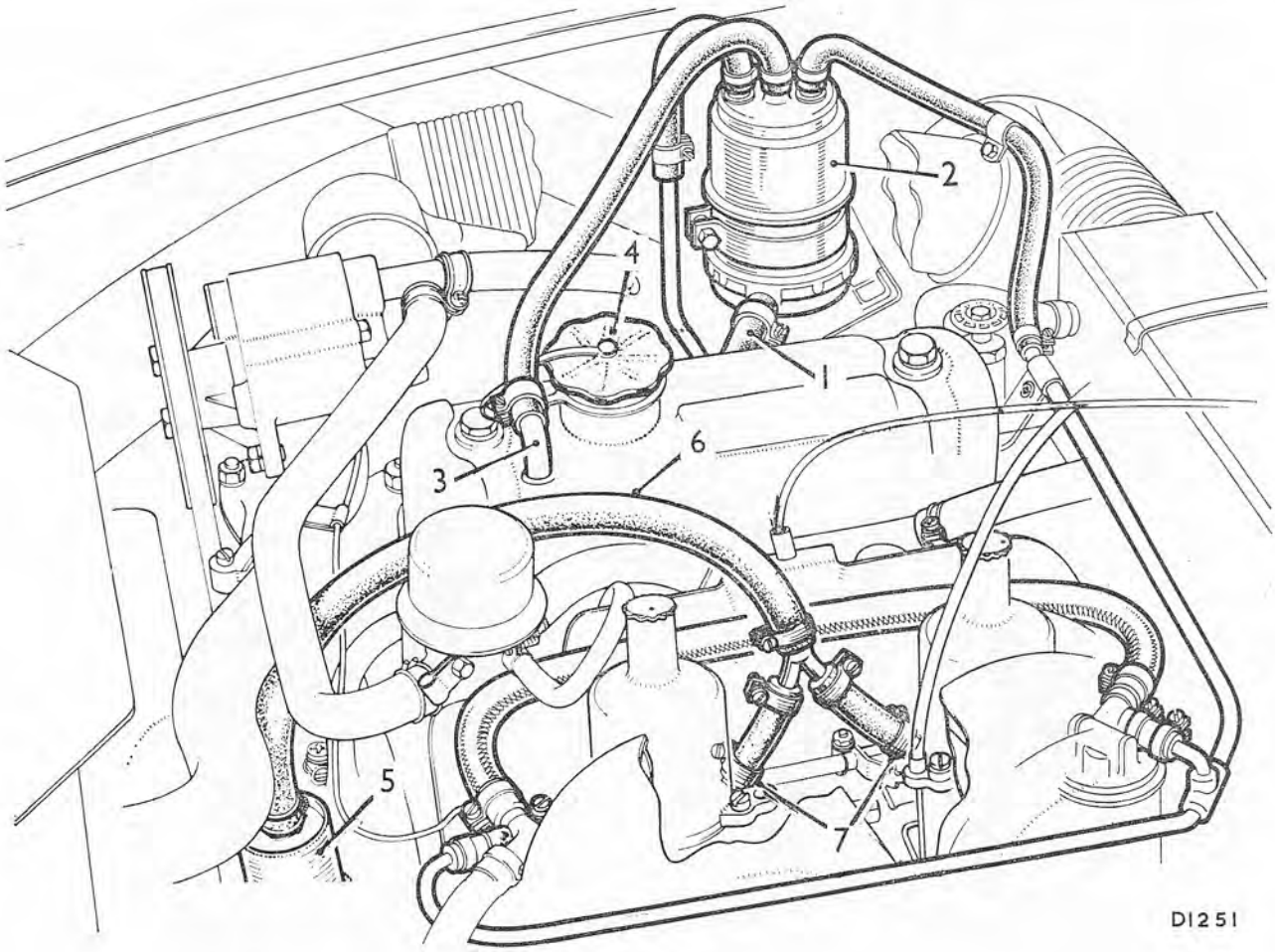


Fig. 3

A carburetter control system with fuel evaporative loss control

1. Ventilation air intake.
2. Absorption canister.
3. Restricted connection to rocker cover.
4. Sealed oil filler cap.
5. Oil separator.
6. Breather hose.
7. Carburetter chamber connections.

Section 2-E

CARBURETTER CONTROL SYSTEM— with evaporative loss control

This system incorporates most of the components of the carburetter control system, with the exception of the combined oil filler cap and filtered air intake. Its operation differs in that air for engine breathing is drawn through the filtered absorption canister of the evaporative loss control system into the engine valve rocker cover. A restrictor in the rocker cover connection reduces the air flow to ensure crankcase depression under all conditions.

Engine fumes and blow-by gases are drawn from the crankcase, through an oil separator, into the inlet manifold by the controlled depression chamber of the carburetter.

Servicing

No direct servicing of the system is required. The air intake filter pad in the absorption canister is renewed at the intervals required by the fuel evaporative loss control.

If a failure of the system is suspected, check the hoses and connections for leaks and obstruction. An indication of a failure is loss of crankcase depression.

SECTION 3

EXHAUST EMISSION CONTROL
(Exhaust Port Air Injection)

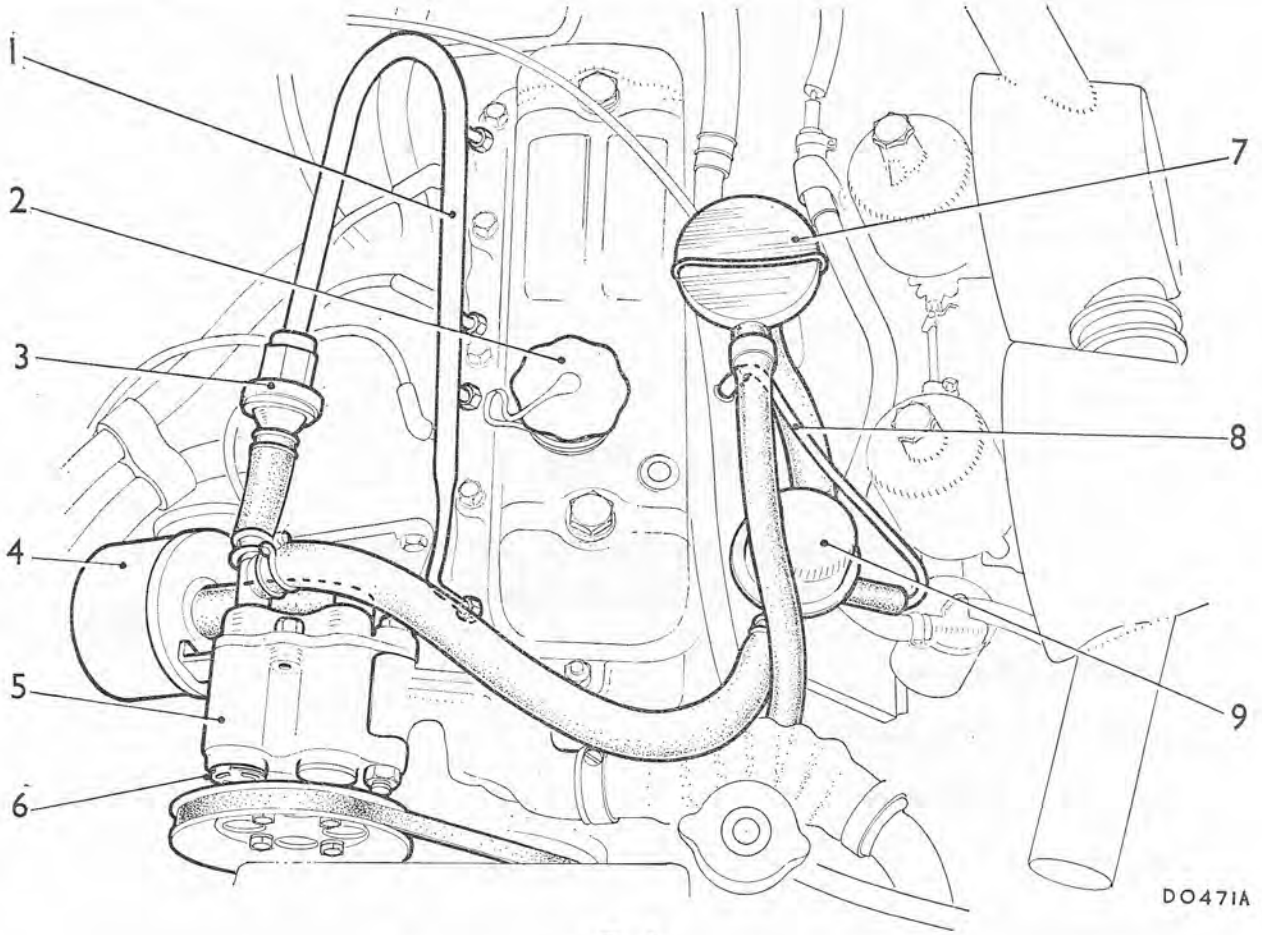


Fig. 1

A typical engine emission control system layout

1. Air manifold.
2. Filtered oil filler cap.
3. Check valve.
4. Emission air cleaner.
5. Air pump.
6. Relief valve.
7. Crankcase emission valve.
8. Vacuum sensing tube.
9. Gulp valve.

Section 3-A

GENERAL DESCRIPTION

Air is pressure-fed from an air pump via an injection manifold to the cylinder head exhaust port of each cylinder. A check valve in the air delivery pipe prevents blow-back from high pressure exhaust gases. The pump also supplies air through a gulp valve to the inlet manifold to provide air during conditions of deceleration and engine over-run.

IMPORTANT. The efficient operation of the system is dependent on the engine being correctly tuned. The ignition and spark plug settings, valve clearances, and carburetter adjustments given for a particular engine (see **'TUNING DATA'**) must be strictly adhered to at all times.

Air pump

The rotary vane type air pump is mounted on the front of the cylinder head and is belt driven from the water pump pulley. Provision is made for tensioning the belt.

Air is drawn into the pump through a dry-type renewable element filter. A relief valve in the pump discharge port allows excessive air pressure at high engine speeds to discharge to the atmosphere.

Check valve

The check valve, fitted in the pump discharge line to the injection manifold, protects the pump from the back-flow of exhaust gases.

The valve shuts if the air pressure ceases while the engine is running; for example, if the pump drive belt should break.

Gulp valve

The gulp valve, fitted in the pump discharge line to the inlet manifold, controls the flow of air for leaning-off the rich air/fuel mixture present in the inlet manifold immediately following throttle closure after running at full throttle opening (i.e. engine over-run).

A sensing pipe connected between the inlet manifold and the gulp valve maintains manifold depression directly to the underside of the diaphragm and through a bleed hole to the upper side. Sudden increases in manifold depression which occur immediately following throttle closure act on the underside of the diaphragm which opens the valve and admits air to the inlet manifold. The

bleed hole allows the differences in depression acting on the diaphragm to equalize and the valve closes.

On some engines a restrictor is fitted in the air pump discharge connection to the gulp valve, to prevent surging when the gulp valve is operating.

Carburetter

The carburetters are manufactured to a special exhaust emission control specification and are tuned to give optimum engine performance with maximum emission control.

A limit valve is incorporated in the carburetter throttle disc which limits the inlet manifold depression ensuring that under conditions of high inlet-manifold depression the mixture entering the cylinders is at a combustible ratio.

Section 3-B

AIR PUMP (four-cylinder engines)

Drive belt tension

When correctly tensioned, a total deflection of ½ in., under moderate hand pressure, should be possible at the midway point of the longest belt run between the pulleys.

To tension the belt:

(1) Slacken the air pump mounting bolt and adjusting link bolts (see Fig. 3).

(2) Using hand pressure only, move the pump in the required direction until the correct tension is obtained.

(3) Tighten the mounting and adjusting bolts to a torque figure of 10 lb. ft.

Testing

(1) Check the drive belt for correct tensioning.

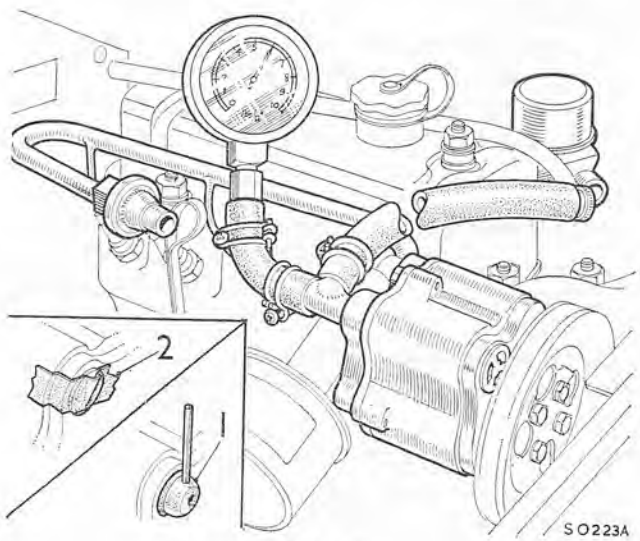


Fig. 2

The pressure gauge connected (four-cylinder engines)

1. Relief valve test tool. 2. Tape used to duct air.

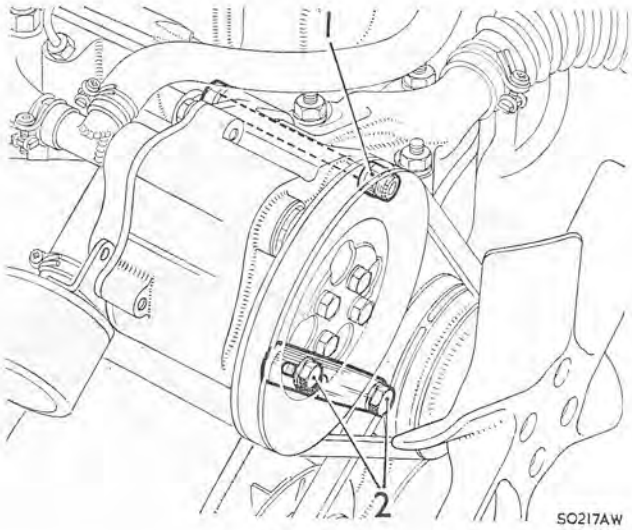


Fig. 3

Air pump (four-cylinder engines)

1. Pump mounting bolt. 2. Adjusting link bolts.

(2) Connect a tachometer to the engine in accordance with the instrument-maker's instructions.

(3) Disconnect the gulp valve air supply hose at the gulp valve and securely plug the hose.

(4) Disconnect the air manifold supply hose at the check valve, and connect a pressure gauge to the hose (see Fig. 2).

(5) Run the engine at the air pump test speed given in **'TUNING DATA':** a gauge reading of not less than 2·75 lb./sq. in. should be registered.

(*a*) If a lower reading is obtained, remove, dismantle and clean the pump air cleaner. Reassemble using a new element, refit the air cleaner and repeat the test.

(*b*) If the reading is still unsatisfactory, temporarily blank off the relief valve and repeat the test; if the reading is now correct, renew the relief valve.

(*c*) If a satisfactory reading is still unobtainable, remove and service the air pump.

(6) Stop the engine and fit a temporary air duct over the face of the relief valve. Two methods of doing this are shown in Fig. 2. The tool (1) may be fabricated from grommet (Part No. 1B 1735) and a short length of metal brake tube, or (2) by using a piece of adhesive tape to form the duct.

DO NOT ATTEMPT TO CHECK AIR FLOW FROM THE RELIEF VALVE BY PLACING A FINGER BETWEEN THE VALVE AND THE DRIVING PULLEY.

(*a*) Start the engine and slowly increase the speed until air flow from the relief valve duct is detected, when a gauge reading of 4·5 to 6·5 lb./sq. in. should be registered.

(*b*) If the relief valve fails to operate correctly, remove the pump and renew the valve.

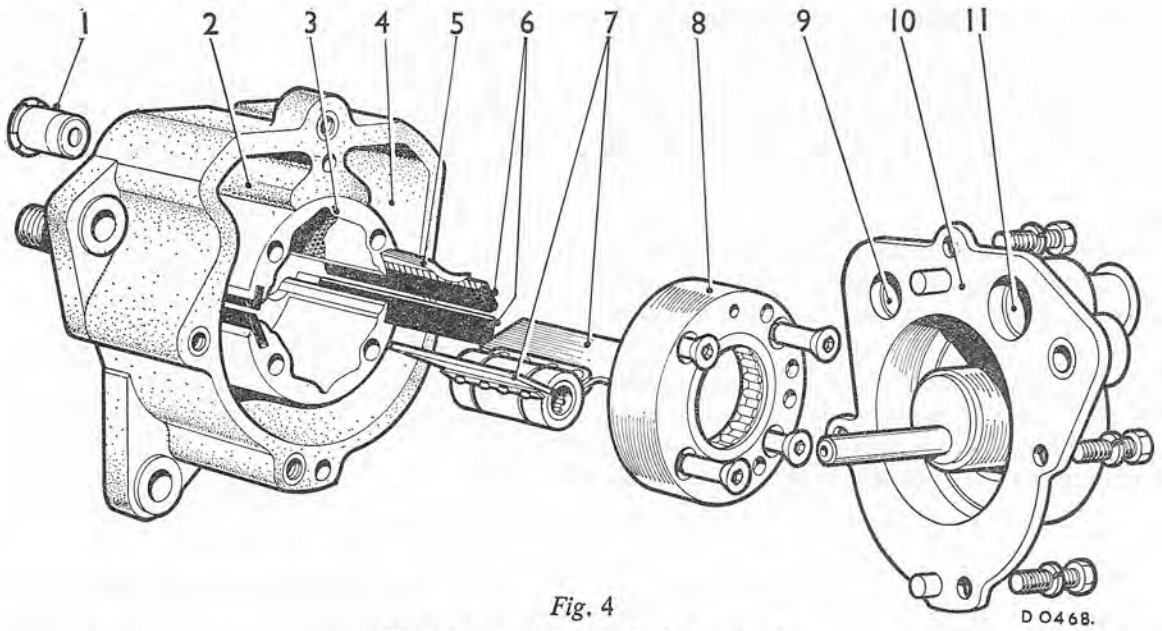


Fig. 4

The air pump (four-cylinder engines)

1. Relief valve.
2. Inlet chamber.
3. Rotor.
4. Outlet chamber.
5. Spring.
6. Carbons.
7. Vane assemblies.
8. Rotor bearing end plate.
9. Outlet port.
10. Port-end cover.
11. Inlet port.

Removing

(1) Disconnect the air hoses from the pump connections and remove the air cleaner.
(2) Slacken the mounting and adjusting link bolts and slip the drive belt from the pump pulley.
(3) Remove the top adjusting link bolt and the nut securing the pump mounting bolt.
(4) Support the pump, withdraw the mounting bolt and lift the pump from the engine.

Dismantling

(1) Remove the four port-end cover retaining bolts and withdraw the cover.
(2) Remove the four screws securing the rotor bearing end plate to the rotor and remove the end plate.
(3) Lift out the vane assemblies.
(4) Remove the carbon and spring assemblies from the rotor.

Servicing

(1) Wipe the interior and components of the pump clean, using a lint-free cloth.

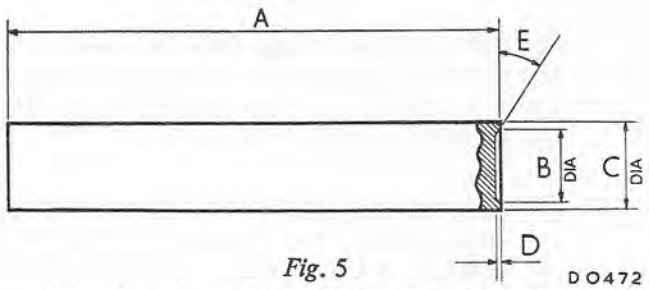


Fig. 5

The dimensions of the relief valve replacing tool

A = 5 in. B = ·986 in. C = 1·062 in.
D = ·05 in. E = 30°.

(2) Clean the vane carrier roller bearings and the rotor end plate bearing and repack the bearings with Esso 'Andok' 260 lubricant.
(3) Inspect the vane assemblies for signs of having fouled the pump wall, and for grooving in area of contact with the carbons. Renew worn or damaged vanes.
(4) Fit new carbons (the original springs may be reused if serviceable). Note that the slots which carry the carbon and springs are the deeper ones, and the carbons are all fitted with the chamfered edge to the inside.

Reassembling

(1) Reassemble the pump by reversing the dismantling procedure and noting that the underside of the heads of the rotor bearing end plate screws must be smeared with 'Locktite' before tightening.

Refitting

(1) Position the pump in the mounting bracket and fit, but do not tighten, the pump mounting bolt.
(2) Screw in, but do not tighten, the adjusting link bolt.
(3) Fit and tension the drive belt.
(4) Reconnect the hoses and refit the air cleaner.

Relief valve—replacing

(1) Remove the air pump.
(2) Remove the pump pulley.
(3) Pass a ½-in. diameter soft metal drift through the pump discharge connection so that it registers against the relief valve, and drive the valve from the pump.

(4) Fit a new copper seating washer to the new relief valve and enter the valve into the pump body.
(5) Using a tool made to the dimensions shown in Fig. 5, drive the valve into the pump until the copper seating washer is held firmly, but not compressed, between the valve and the pump.
(6) Refit the pulley and refit the air pump.

Section 3-C

AIR PUMP (six-cylinder engines)

Drive belt tension

When correctly tensioned, a total deflection of $\frac{1}{2}$ in., under moderate hand pressure should be possible at the midway point of the longest belt run between the pulleys.

To tension the belt:

(1) Slacken the air pump mounting bolt and adjusting link bolts (see Fig. 6).
(2) Using hand pressure only, move the pump in the required direction until the correct tension is obtained.
(3) Tighten the mounting and adjusting link bolts to a torque figure of 10 lb. ft.

Testing

Faulty operation of the air pump is indicated by excessive pump noise. If excessive noise is present and the air pump is suspected, remove the air pump drive belt and run the engine to check that the noise is not from another source. If this check shows that the air pump is excessively noisy renew the air pump assembly or proceed as follows:

(1) Check the drive belt for correct tensioning.
(2) Run the engine at idle speed and check the air supply hoses and connections for leaks and for intermittent contact with other parts of the vehicle.

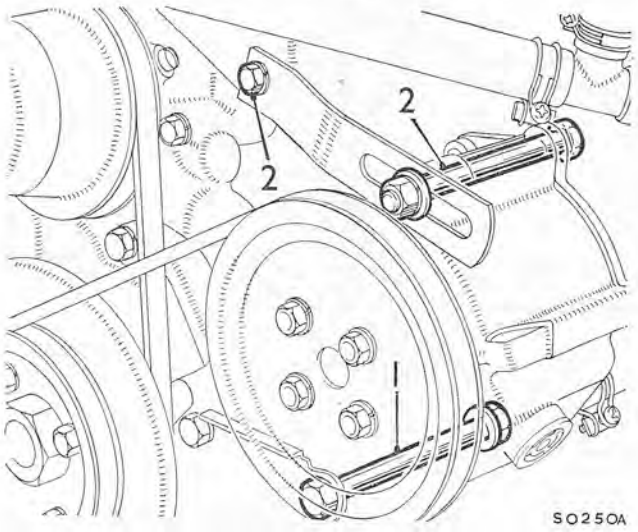


Fig. 6

Air pump (six-cylinder engines)

1. Pump mounting bolt. 2. Adjusting link bolts.

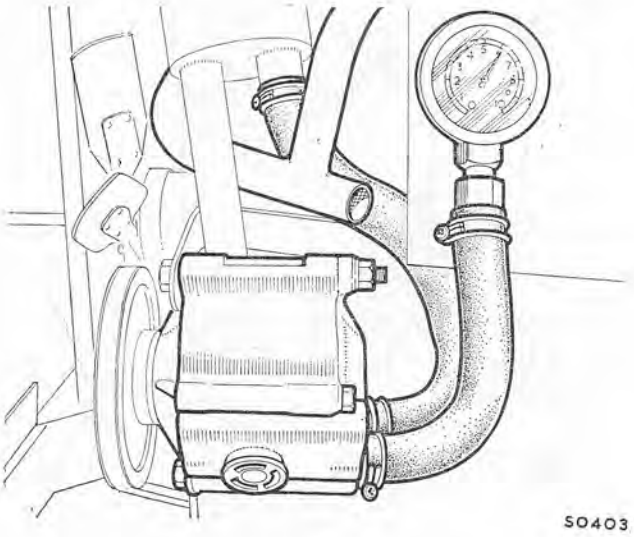


Fig. 7

The pressure gauge connected (six-cylinder engines)

(3) Connect a tachometer to the engine in accordance with the instrument maker's instructions.
(4) Disconnect the air supply hose tee connection from its connection with the air pump discharge hose.
(5) Connect a pressure gauge to the air pump discharge hose (see Fig. 7).
(6) Run the engine at the air pump test speed given in **'TUNING DATA'.** A gauge reading of not less than 2·75 lb./sq. in. should be registered.
  (*a*) If a lower reading is obtained, remove, dismantle, and clean the pump air cleaner. Reassemble using a new element, refit the air cleaner, and repeat the test.
  (*b*) If the reading is still unsatisfactory, temporarily blank off the relief valve and repeat the test; if the reading is now correct, renew the relief valve.
  (*c*) If a satisfactory reading is still unobtainable the air pump assembly must be replaced.
  (*d*) From idling speed, slowly increase the engine speed until air flow from the relief valve is detected, this should occur before the gauge reading exceeds 10 lb./sq. in.
  (*e*) If the relief valve fails to operate correctly, remove the pump and renew the valve.
(7) If the foregoing tests fail to remedy or locate the cause of the air pump noise renew the air pump assembly.

Removing

(1) Disconnect the hoses from the pump connections and remove the air cleaner.
(2) Slacken the mounting and adjusting link bolts and slip the drive belt from the pump pulley.
(3) Remove the nut from the adjusting link bolt, support the pump and withdraw the bolt.
(4) Unscrew the mounting bolt and remove the pump.

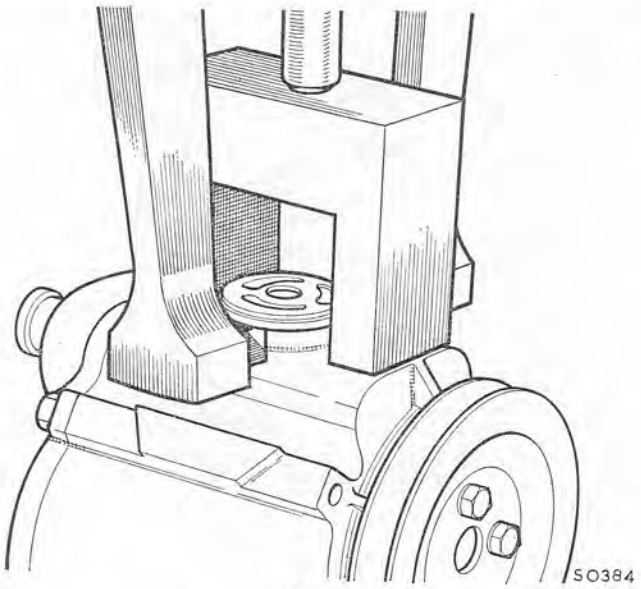


Fig. 8

Removing the relief valve (six-cylinder engines)

Relief valve—replacing

(1) Remove the air pump.

(2) Using a gear puller and a fabricated bridge as shown in Fig. 8, withdraw the relief valve from the pump body.
DO NOT HOLD THE PUMP BY CLAMPING IT IN A VICE.

(3) Enter the new relief valve into the pump body.

(4) With a protective plate over the valve, carefully drive the valve into the pump until its flange registers lightly on the pump body.

(5) Insert the pressure setting plug into the relief valve, using a suitable tool, apply pressure to the centre of the plug until the legs of the plug lock under the relief valve cage.

Section 3-D

CHECK VALVE

Removing

(1) Disconnect the air supply hose from the check valve connection.

(2) Hold the air manifold connection to prevent it twisting and unscrew the check valve.

Testing

(1) Blow through the valve, orally, in turn from each connection. Air should only pass through the valve when blown from the air supply hose connection. If air passes through when blown from the air manifold connection, renew the check valve.
On no account may an air blast be used for this test.

Refitting

(1) Hold the air manifold connection to prevent it twisting, screw in and tighten the check valve.

(2) Reconnect the air supply hose to the check valve.

Section 3-E

AIR MANIFOLD AND INJECTORS

Testing

(1) Disconnect the air manifold from the cylinder head connections.

(2) Slacken the air supply hose clip at the check valve connection.

(3) Rotate the manifold about its connection axis until the injector connections are accessible.

(4) Tighten the air supply hose clip.

(5) Run the engine at idle speed and observe the flow of air from each of the manifold connection tubes. Should the flow of air from any of the connections be restricted, remove the manifold and clear the obstruction using an air blast.

(6) With the engine running at idle speed, check that exhaust gases blow from each of the cylinder head injectors.

IMPORTANT.—The injectors may be free in the cylinder head and care must be taken to ensure that they are not displaced during this test.

To clear a restricted injector:

(*a*) Crank engine until the exhaust valve below the injector is closed.

(*b*) Using a hand drill (not power-driven), pass a $\frac{1}{8}$-in. drill through the injector bore, taking care that the drill does not contact the exhaust valve stem after passing through the injector. Damage may result if a power-driven drill is used.

(*c*) Insert an air-blast nozzle into the injector connection to clear carbon dust from the exhaust port.

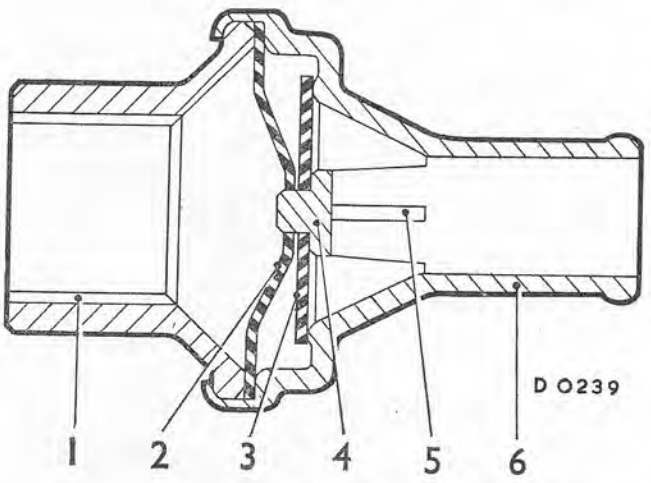


Fig. 9

A section through the check valve

1. Air manifold connection.
2. Diaphragm.
3. Valve.
4. Valve pilot.
5. Guides.
6. Air supply connection.

Section 3-F

GULP VALVE

Testing

(1) Disconnect the gulp valve air supply hose from the air pump connection.

(2) Connect a vacuum gauge, with a tee connection to the disconnected end of the gulp valve air hose.

(3) Start the engine and run it at idle speed.

(4) Temporarily seal the open connection on the gauge tee and check that a zero gauge reading is maintained for approximately 15 seconds; if a vacuum is registered, renew the gulp valve. It is most important that the engine speed is not increased above idling during this test.

(5) With the gauge tee connection temporarily sealed, operate the throttle rapidly from closed to open; the gauge should then register a vacuum. Repeat the test several times, temporarily unsealing the tee piece connection to destroy the vacuum before each operation of the throttle. If the gauge fails to register a vacuum, renew the gulp valve.

Removing

(1) Disconnect the air hoses.

(2) Unscrew the mounting screw and remove the gulp valve.

Fig. 10

The vacuum gauge connected for testing the gulp valve

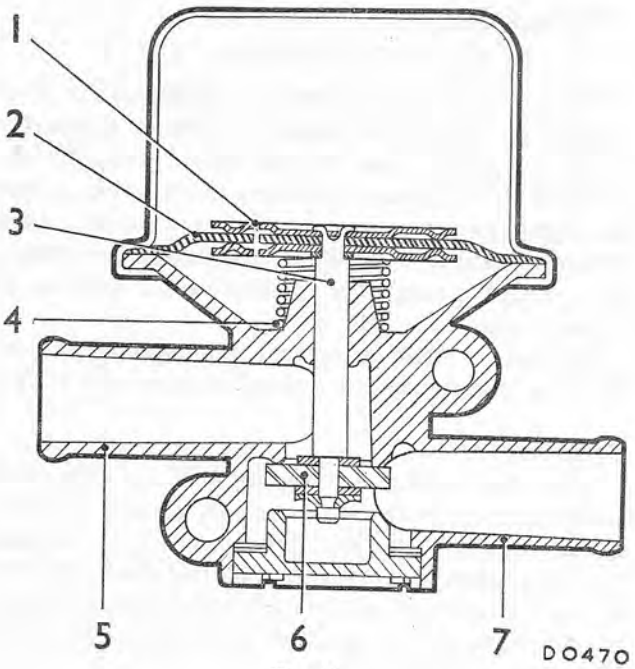


Fig. 11

A section through the gulp valve

1. Metering balance orifice.
2. Diaphragm.
3. Valve spindle.
4. Return spring.
5. Inlet manifold hose connection.
6. Valve.
7. Air pump hose connection.

Refitting

(1) Reverse the removing procedure.

Section 3-G

LIMIT VALVE (INLET MANIFOLD DEPRESSION)

Testing

(1) Disconnect the gulp valve sensing pipe from the inlet manifold.

(2) Connect a vacuum gauge to the sensing pipe connection on the inlet manifold.

(3) Connect a tachometer in accordance with the instrument maker's instructions.

(4) Warm the engine at fast idle speed until normal operating temperature is reached.

(5) Increase the engine speed to 3,000 r.p.m. then release the throttle quickly; the vacuum gauge reading should immediately rise to between 20·5 and 22 in. Hg. If the gauge reading falls outside these limits the carburetter must be removed and the throttle disc and limit valve assembly renewed. After refitting, the carburetter must be tuned as described in Section 4-A.

Section 3-H

RUNNING ON CONTROL VALVE

The solenoid operated valve is connected by hoses between the adsorption canister ventilation connection of the evaporative loss control system and the inlet manifold. A third hose connected to the valve is open to atmosphere for canister ventilation while the engine is running normally. The electrical circuit of the solenoid is connected through the ignition switch and an oil pressure operated switch.

The valve is fitted to prevent prolonged running on (dieseling) which may occur when using low octane fuels.

Operation

When the ignition is switched off the solenoid is energized through an oil pressure switch and the valve closes, shutting off the ventilation connection and opening the connection to the inlet manifold. Inlet manifold depression then acts on the fuel in the carburetter float chamber(s) to prevent fuel flow and the engine is stopped by fuel starvation.

Testing

If the running on valve is suspected of being faulty the control electrical circuit and operation of the valve should be checked as follows:

(1) Check the control valve line fuse.
(2) Turn the ignition switch to the off position.
(3) Disconnect the control valve electrical lead at the oil pressure switch.
(4) Touch the disconnected lead to a good earth point on the vehicle. If the control electrical circuit and valve are satisfactory, the valve will be heard to operate as the control lead is earthed.

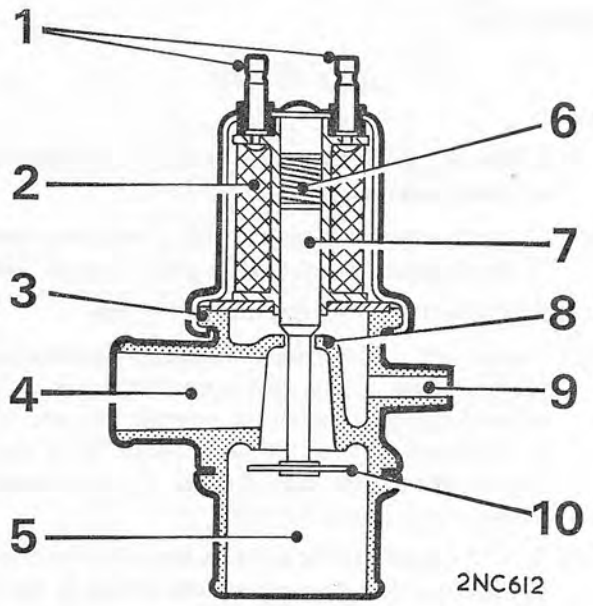


Fig. 12
A section through the running on control valve

1. Electrical terminals.
2. Solenoid.
3. Valve body.
4. Adsorption canister hose connection.
5. Air vent hose connection.
6. Spring.
7. Valve spindle.
8. Primary valve.
9. Inlet manifold hose connection.
10. Secondary valve.

SECTION 3A

EXHAUST EMISSION CONTROL
(Engine Modifications System)

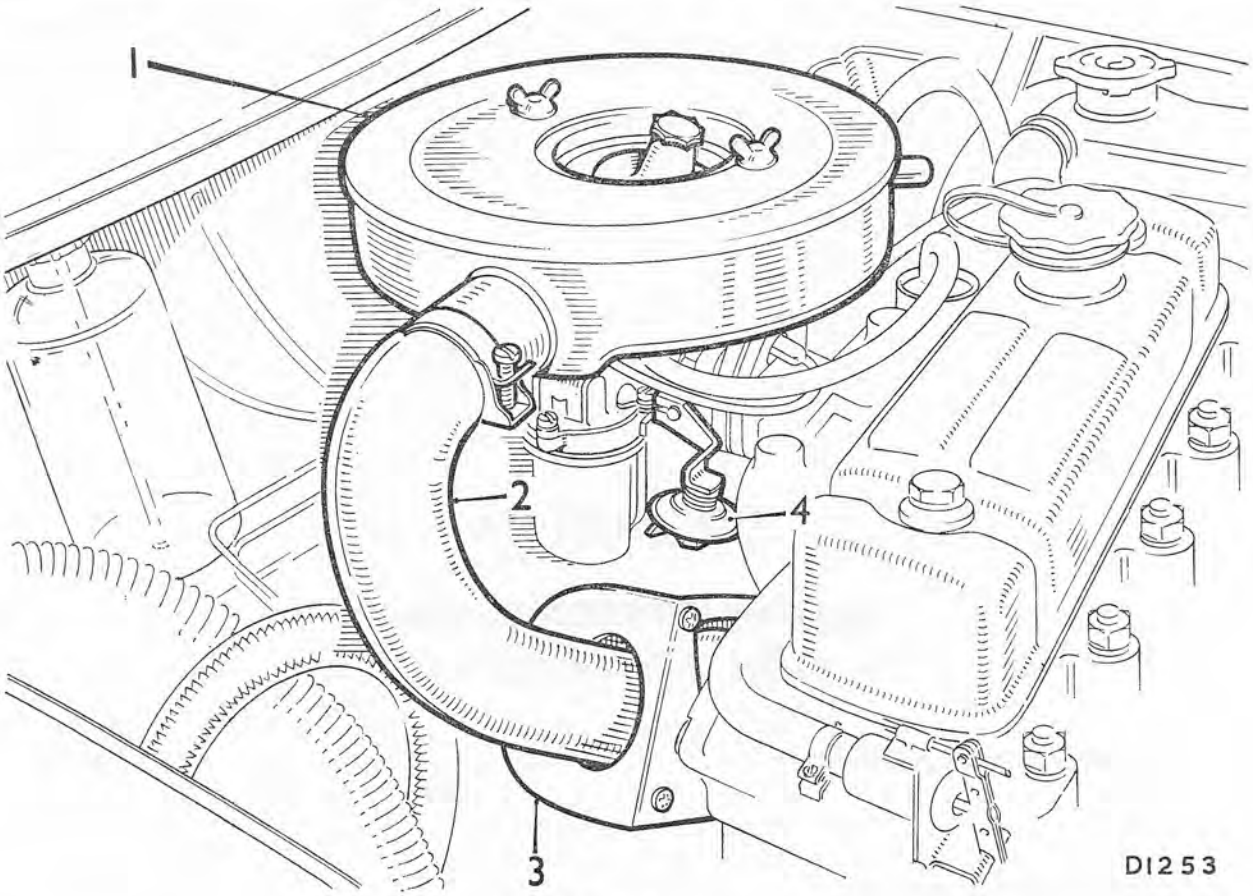


Fig. 1
An engine modification exhaust emission control system showing the air intake tube in the low ambient temperature operating position

1. Air cleaner.
2. Air intake tube.
3. Manifold shroud.
4. Throttle damper.

Section 3A-A

GENERAL DESCRIPTION

This system incorporates modifications to a high compression ratio engine and using a carburetter manufactured to a special exhaust emission control specification.

IMPORTANT. The efficient operation of the system is dependent on the engine being correctly tuned. The settings given for a particular engine (see **'TUNING DATA'**) must be strictly adhered to at all times.

Carburetter

The carburetter is tuned to give optimum engine performance with maximum exhaust emission control.

A limit valve is incorporated in the carburetter throttle disc which limits the inlet manifold depression ensuring that under conditions of high inlet-manifold depression the air/fuel mixture entering the cylinders is at a combustible ratio.

Throttle damper

A damper is fitted to act on the throttle lever as it returns to the closed position ensuring a gradual closing of the throttle valve giving smooth deceleration. Provision is made for adjusting the damping effect; the correct setting is given in **'TUNING DATA'.**

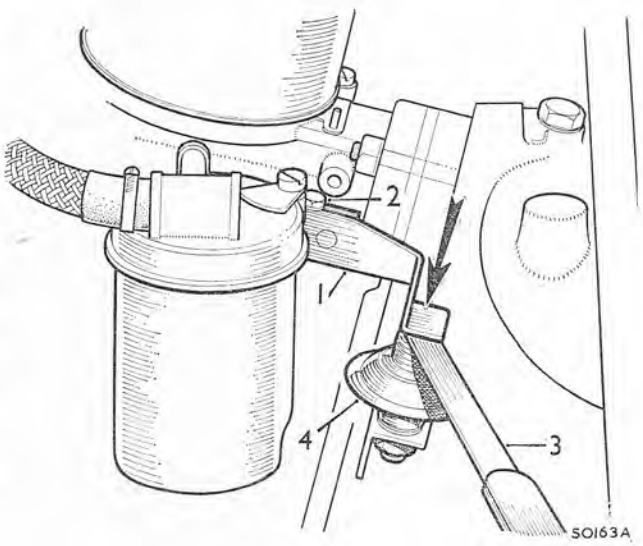


Fig. 2
Adjusting the throttle damper setting

1. Throttle lever.
2. Clamp screw.
3. Feeler gauge.
4. Throttle damper.

Air intake

In low ambient temperature conditions the intake tube of the air cleaner is positioned in a shroud formed over a section of the exhaust manifold. Air drawn through the cleaner to the carburetter is warmed by heat given off by the manifold.

In high ambient temperature conditions the air intake tube is positioned away from the manifold and air entering the carburetter is drawn into the air cleaner from the engine compartment at ambient temperature.

Section 3A-B

THROTTLE DAMPER

Adjusting

(1) Slacken the clamp nut on the damper operating lever.

(2) Insert a feeler gauge (see **'TUNING DATA'**) between the damper plunger and the operating arm.

(3) With the carburetter throttle disc valve in the fully closed position, press the operating lever down until the plunger is fully depressed.

(4) Hold the lever in this position and tighten the clamp nut.

(5) Remove the feeler gauge.

Section 3A-C

AIR INTAKE

Repositioning

(1) Slacken the intake tube securing clip.

(2) Slacken the air cleaner wing nuts.

(3) Withdraw the intake tube from the air cleaner and manifold shroud.

(4) Refit the intake tube with its entry positioned adjacent to the end of the rocker cover.

(5) Tighten the wing nuts and securing clip.

Section 3A-D

AIR BLEED COMPENSATOR

Description

An air bleed temperature compensator is fitted to some engines equipped with twin type HS carburetters required to conform with European E.C.E. or E.E.C. exhaust emission control regulations.

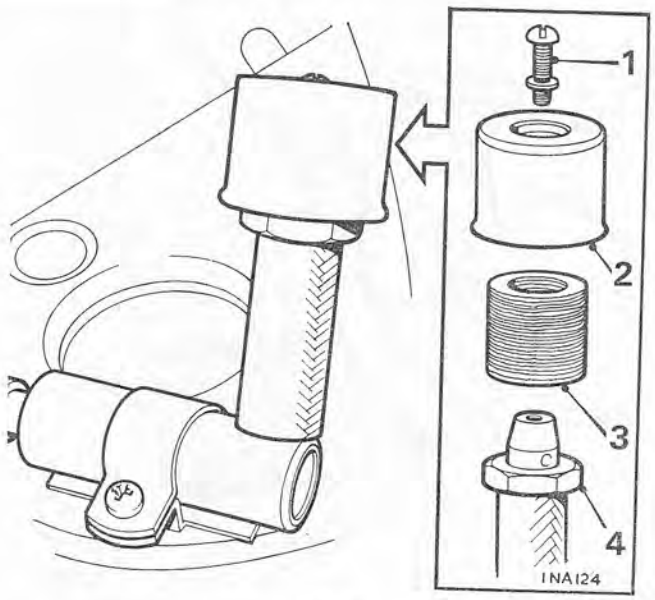


Fig. 3
The air bleed temperature compensator (showing the cap type air filter components)

1. Cap retaining screw.
2. Filter cap.
3. Filter element.
4. Filter base.

The air bleed temperature compensator is fixed to the underside of the carburetter air cleaner and consists of a bi-metal air control valve and an air filter. It is connected by hoses to the constant depression chambers, between the piston and the throttle disc valve, of the carburetters.

With an increase in engine or engine compartment air temperature, the valve will open and allow air at ambient temperature to be drawn through the air filter and into the carburetter constant depression chambers.

The controlled admission of air into the carburetter chambers reduces the velocity and volume of air passing the needles of the carburetters, causing the pistons to fall and subsequently reduce the amount of fuel supplied, thus giving a constant air/fuel mixture ratio.

Servicing

The air bleed temperature compensator air filter must be renewed every 12,000 miles (20000 km.) or 12 months.

(1) Disconnect the air cleaner to carburetter hoses.

(2) Remove the air cleaner.

(3) *Push-on type filters:* withdraw and discard the filter. *Cap type filters:* unscrew the filter cover retaining screw, remove the cover, and discard the filter element. Clean the base and cover of the filter, fit a new element, refit the cover and retaining screw.

(4) Refit the air cleaner and reconnect the hoses.

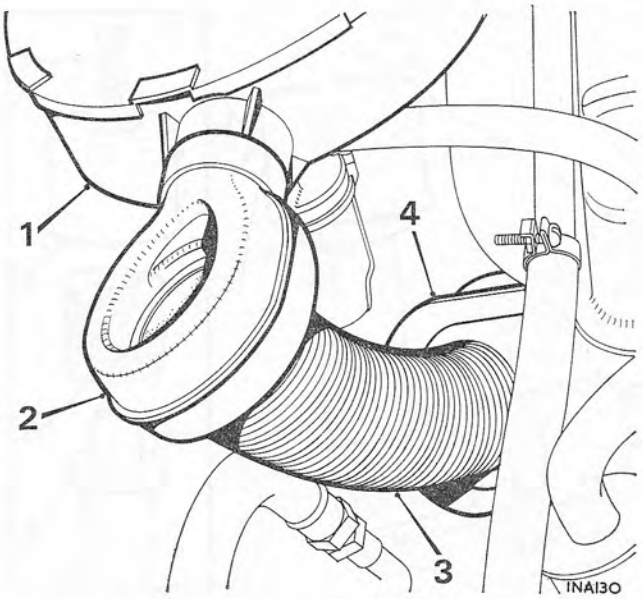


Fig. 4
The air intake temperature control

1. Air cleaner.
2. Air intake temperature control.
3. Air intake tube.
4. Exhaust manifold shroud.

Section 3A-E

AIR INTAKE TEMPERATURE CONTROL

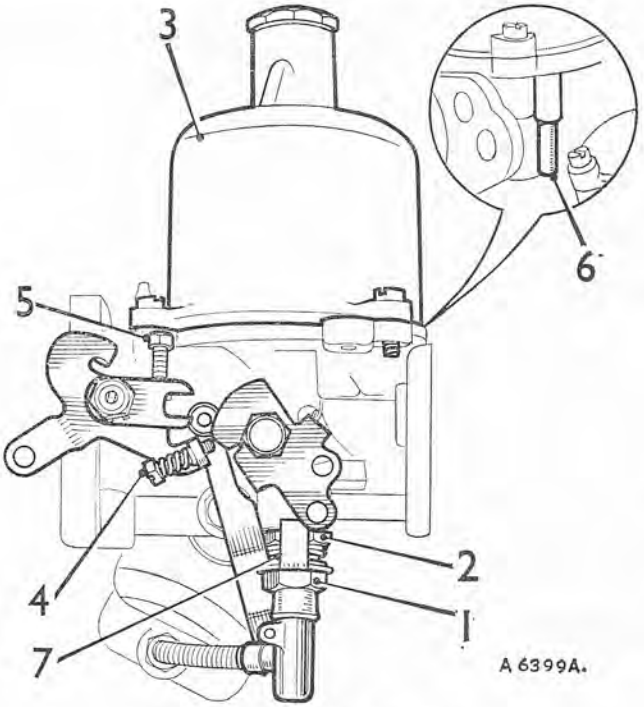
An air intake temperature control is fitted to some engines equipped with single Type H.S. carburetters required to conform with European E.C.E. or E.C.C. exhaust emission control regulations.

The control consists of a bi-metal operated valve, fitted in the air intake of the carburetter air cleaner, and is designed to maintain the temperature of the ingoing air within predetermined limits.

When the engine is cold, air is drawn into the air cleaner from the shrouded area adjacent to the exhaust manifold. As the temperature of the air entering the air cleaner rises, the valve opens and admits cooler air at ambient temperature to mix with the hot air and maintain a constant temperature.

SECTION 4

CARBURETTERS



The type HS carburetter

1. Jet adjusting nut.
2. Jet locking nut.
3. Piston suction chamber.
4. Fast-idle adjusting screw.
5. Throttle adjusting screw.
6. Piston lifting pin.
7. Jet adjustment restrictor.

Section 4-A

CARBURETTER TUNING—BASIC

GENERAL

The carburetters fitted to cars equipped with engine emission control systems are balanced to provide maximum performance with maximum pollution control. Under no circumstances may they be interchanged, or parts substituted.

Tuning must be carried out with the engine emission control equipment connected and operating, and is confined to the following procedure. If the required settings cannot be obtained, the service procedure detailed under **'CARBURETTER SERVICING'** must be carried out and then the carburetter tuned in accordance with the procedure given in **'CARBURETTER TUNING —COMPLETE'.**

Tuning conditions

To ensure that the engine temperature and mixture requirements are stabilized, tuning must be carried out in accordance with the following setting cycle.

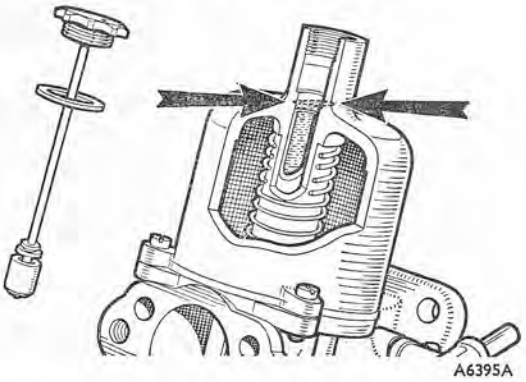
(1) Connect a tachometer in accordance with the instrument-maker's instructions.

(2) Warm the engine at a fast idle to normal operating temperature, preferably with the car standing in an ambient temperature of between 16 and 27° C. (60 to 80° F.). Run the engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by the sudden rise in temperature of the radiator header tank.

(3) Set the engine speed at 2,500 r.p.m., at no load, and run for one minute.

(4) Tuning operations may now be commenced and must be carried out in the shortest possible time. If the time for settings exceeds a three-minute period, open the throttle and run the engine at 2,500 r.p.m. for one minute then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

SINGLE CARBURETTERS



NOTE.—In no case should the jet adjustment restrictor be removed or repositioned. Only mixture adjustments within the limits of the restrictor are available for tuning. If satisfactory adjustment is not obtainable within the limits of the jet adjustment restrictor refer to **'CARBURETTER SERVICING'.**

(1) Top up the piston damper with the recommended engine oil until the level is ½-in. above the top of the hollow piston rod.

NOTE.—On dust-proofed carburetters, identified by a transverse hole drilled in the neck of the suction chambers and no vent hole in the damper cap, the oil level must be ½-in. below the top of the hollow piston rod.

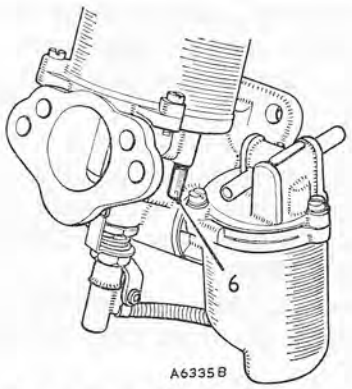
(2) Check throttle control action for signs of sticking.

(3) Check the idling speed (Tachometer) against the figure given in **'TUNING DATA'.**

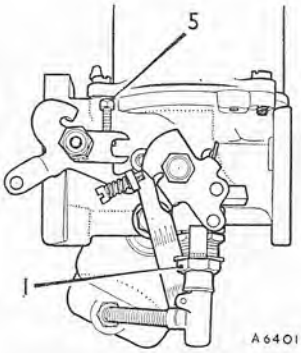
(*a*) If the reading is correct and the engine runs smoothly, proceed to operations (7) and (8).

(*b*) If the reading is not correct, adjust the speed by turning the throttle adjusting screw in the required direction until the correct speed consistent with smooth running is obtained, then proceed to operations (7) and (8).

(*c*) If a smooth idle at the correct speed is not obtainable by turning the throttle adjusting screw, carry out operations (4) to (8).

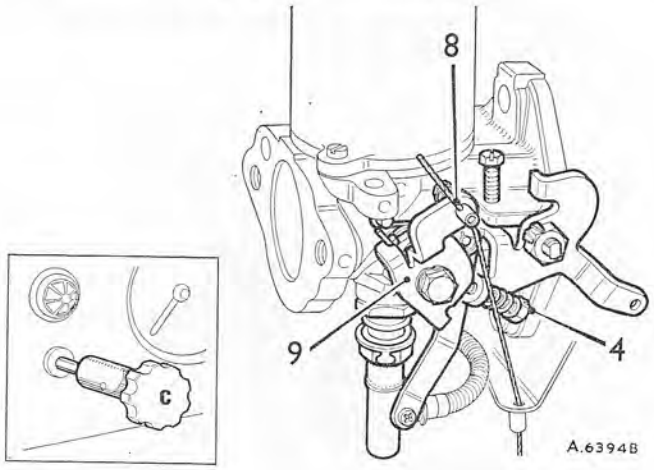


(4) With the engine stopped, check that the piston falls freely onto the bridge, indicated by a distinct metallic click, when the lifting pin (6) is released. If not refer to **'CARBURETTER SERVICING'.**



(5) Turn the jet adjusting nut (1) to cover the full range of adjustment available within the limits of the restrictor, selecting the setting where maximum speed is recorded on the tachometer consistent with smooth running.

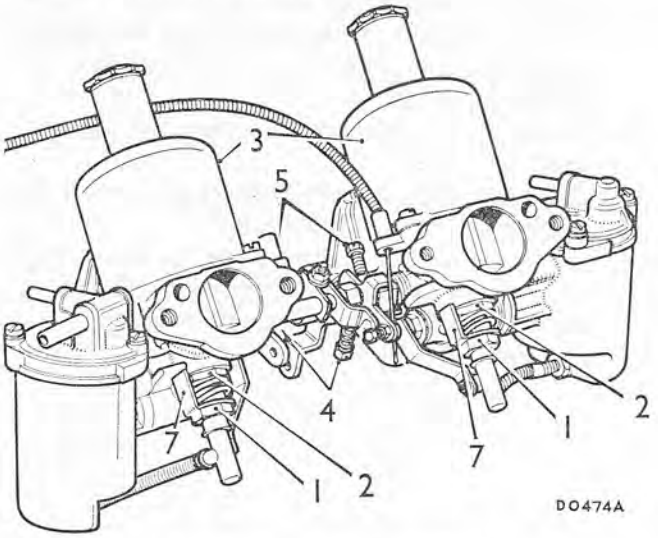
(6) Readjust the throttle adjusting screw (5) to give the correct idling speed if necessary.



(7) Check, and if necessary adjust, the mixture control wire (8) to give a free movement of approximately $\frac{1}{16}$-in. before it starts to pull on the jet lever (9).

(8) Pull the mixture control knob until the linkage is about to move the carburetter jet and adjust the fast-idle screw (4) to give the engine fast-idle speed (Tachometer) given in **'TUNING DATA'.**

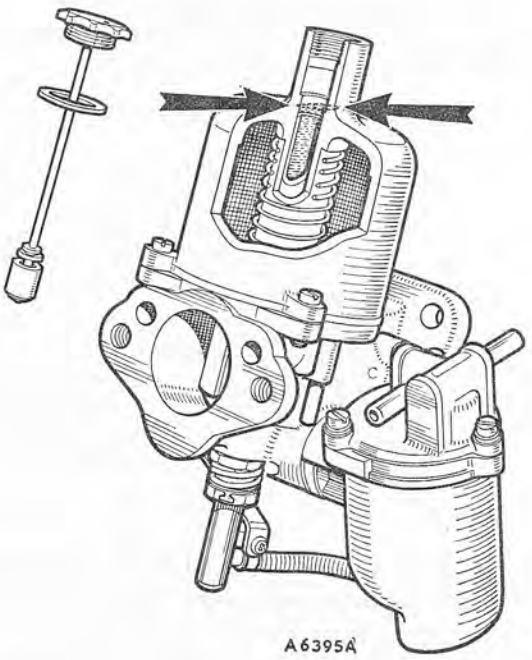
TWIN CARBURETTERS



A twin-carburetter installation

1. Jet adjusting nuts.
2. Jet locking nuts.
3. Piston/suction chambers.
4. Fast-idle adjusting screws.
5. Throttle adjusting screws.
7. Jet adjustment restrictors.

NOTE.—In no case should the jet adjustment restrictor be removed or repositioned. Only mixture adjustments within the limits of the restrictor are available for tuning. Balancing of twin carburetters must only be carried out with the use of an approved balancing meter. If satisfactory adjustment or balancing is not obtainable within the limits of the jet adjustment restrictor, refer to **'CARBURETTER SERVICING'.**



(1) Top up the piston damper with the recommended engine oil until the level is $\frac{1}{2}$-in. above the top of the hollow piston rod.

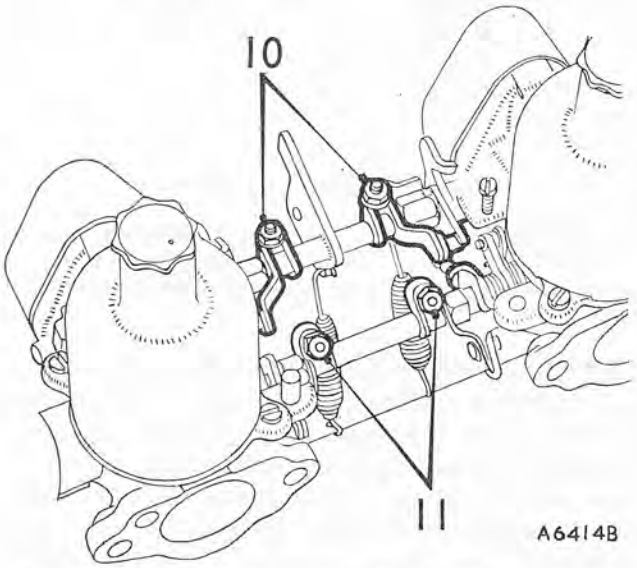
NOTE.—On dust-proofed carburetters, identified by a transverse hole drilled in the neck of the suction chambers and no vent hole in the damper cap, the oil level must be ½-in. below the top of the hollow piston rod.

(2) Check the throttle control action for signs of sticking.

(3) Check the idling speed (Tachometer) against the figure given in **'TUNING DATA'.**

(*a*) If the reading is correct and the engine runs smoothly, proceed with operations (11) to (17).

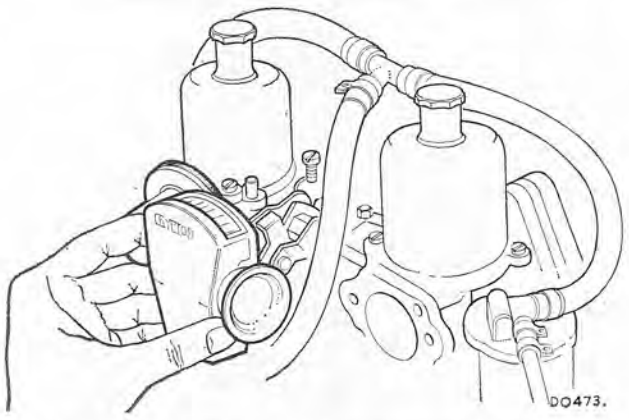
(*b*) If the reading is not correct, carry out operations (4) to (17).



(4) Stop the engine and remove the air cleaners.

(5) Slacken both of the clamping bolts (10) on the throttle spindle interconnections.

(6) Disconnect the jet control interconnection by slackening the clamping bolts (11).



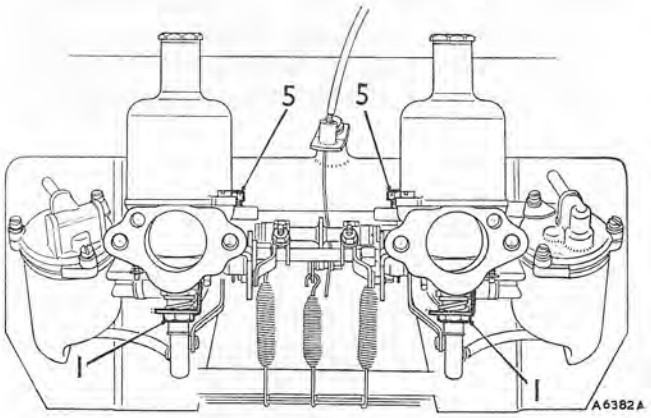
(7) Restart the engine and adjust the throttle adjusting screws on **both** carburetters to give the correct idling speed as registered by the tachometer.

(8) Using an approved balancing meter in accordance with the maker's instructions, balance the carburetters by altering the throttle adjusting screws; the idling speed obtained during this operation must be as given in **'TUNING DATA'.**

(*a*) If after this operation the balance is satisfactory and consistent with smooth running at the correct idle speed, proceed with operations (14) to (17).

(*b*) If correct balance cannot be obtained, check the intake system for leaks (i.e. brake servos, engine emission control equipment); if still unsatisfactory, refer to **'CARBURETTER SERVICING'.**

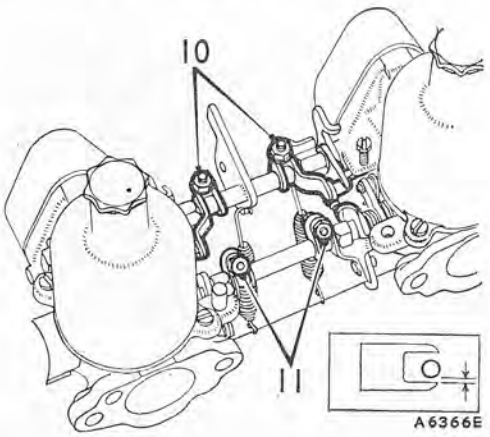
(*c*) If with the carburetters correctly balanced the idling is still erratic, carry out operations (9) to (17).



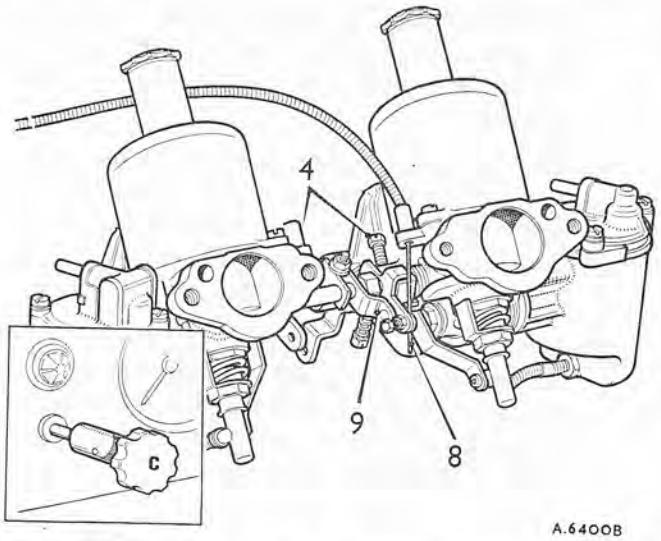
(9) Turn the jet adjusting nut (1) on both carburetters to cover the full range of adjustment available within the limits of the restrictor, selecting the setting where maximum speed is recorded on the tachometer consistent with smooth running.

(10) Readjust the throttle adjusting screws (5) to give the correct idling speed (see **'TUNING DATA'**) if necessary, ensuring that both carburetters are adjusted by an equal amount.

If the correct idling speed consistent with smooth running cannot be obtained, refer to **'CARBURETTER SERVICING'.**



(11) Set the throttle interconnection clamping levers (10) so that the link pin is ·012 in. away from the lower edge of the fork (see inset). Tighten the clamp bolts ensuring that there is approximately $\frac{1}{32}$ in. end-float on the interconnection rod.



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(12) With both jet levers at their lowest position, set the jet interconnection lever clamp bolts (11) so that both jets commence to move simultaneously.

(13) Run the engine at 1,500 r.p.m. and, using the balance meter, check that the carburetters are balanced. If they are not balanced, reset the levers, rebalance at idle speed, then recheck at 1,500 r.p.m.

(14) Check, and if necessary adjust, the mixture control wire (1) to give approximately $\frac{1}{16}$ in. free movement before it starts to pull on the jet levers (9).

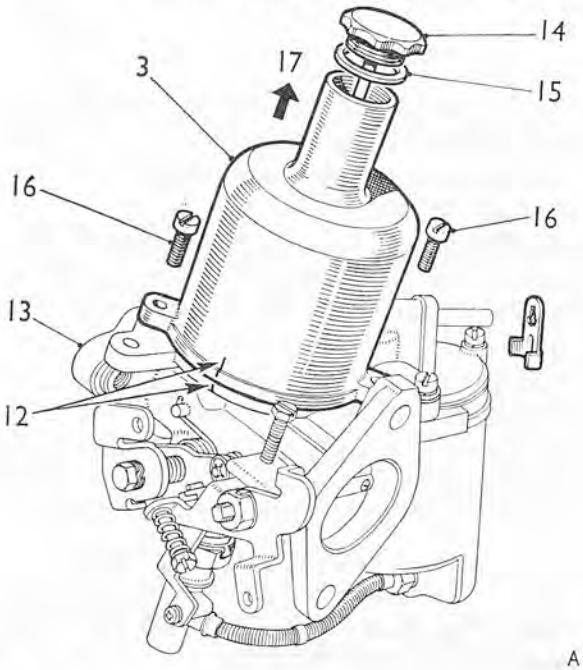
(15) Pull the mixture control knob until the linkage is about to move the carburetter jets.

(16) Using the carburetter balancing meter to ensure equal adjustment, turn the fast idle adjusting screws (4) to give the correct fast idling speed (see **'TUNING DATA'**).

(17) Refit the air cleaners.

Section 4-B

CARBURETTER SERVICING



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Dismantling

Carburetters—all types

(1) Thoroughly clean the outside of the carburetter.

(2) Mark the relative position (12) of the suction chamber (3) and the carburetter body (13).

(3) Remove the damper (14) and its washer (15). Unscrew the chamber retaining screws (16).

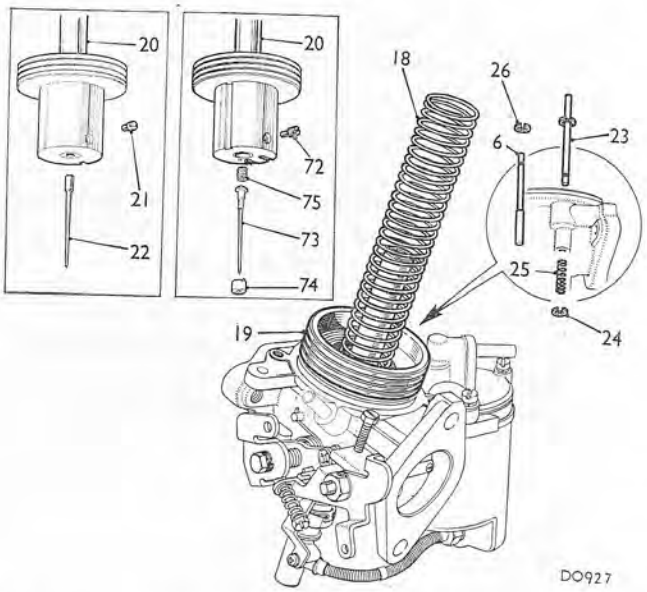
(4) Lift off the chamber in the direction of arrow (17) without tilting.

(5) Remove the piston spring (18).

(6) Carefully lift out the piston assembly (19) and empty the damper oil from the piston rod (20).

Carburetters—fixed needle type

(7) Remove the needle locking screw (21) and withdraw the needle (22). If it cannot easily be removed, tap the needle inwards first and then pull outwards. Do not bend the needle.



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Carburetters—spring-loaded needle type

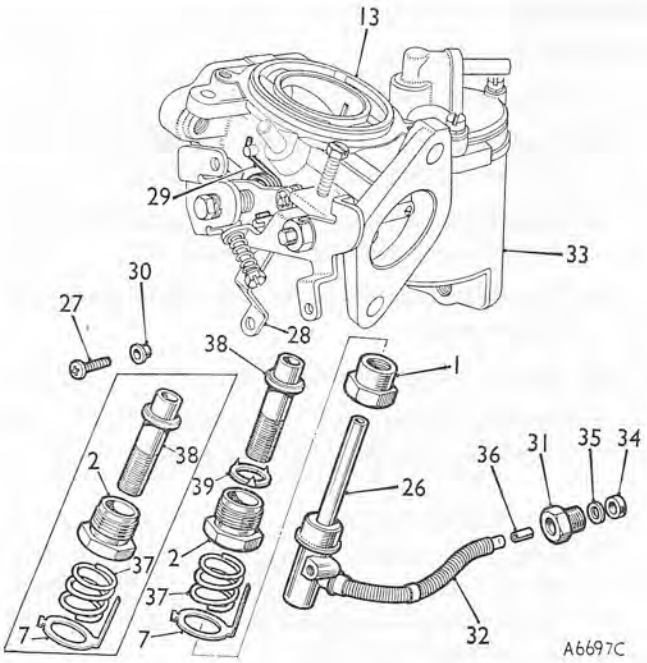
(8) Remove the guide locking screw (72), withdraw the needle assembly (73), needle support guide (74) and spring (75), taking care not to bend the needle.

(9) Withdraw the needle from the guide and remove the spring from the needle assembly.

Carburetters—all types

(10) If a piston lifting pin (23) with an external spring is fitted, remove the spring retaining circlip (24) and spring (25), then push the lifting pin upwards to remove it from its guide. With the concealed spring type (6) press the pin upwards, detach the circlip (26) from its upper end, and withdraw the pin and spring downwards.

(11) Support the moulded base of the jet (26) and slacken the screw (27) retaining the jet pick-up link (28).



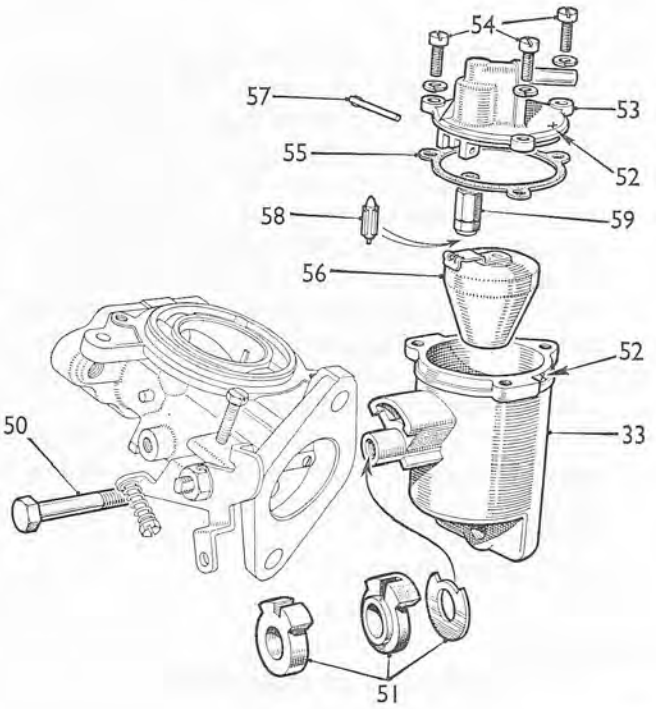
(12) Relieve the tension of the pick-up lever return spring (29) from the screw and remove screw and brass bush (30) (when fitted).

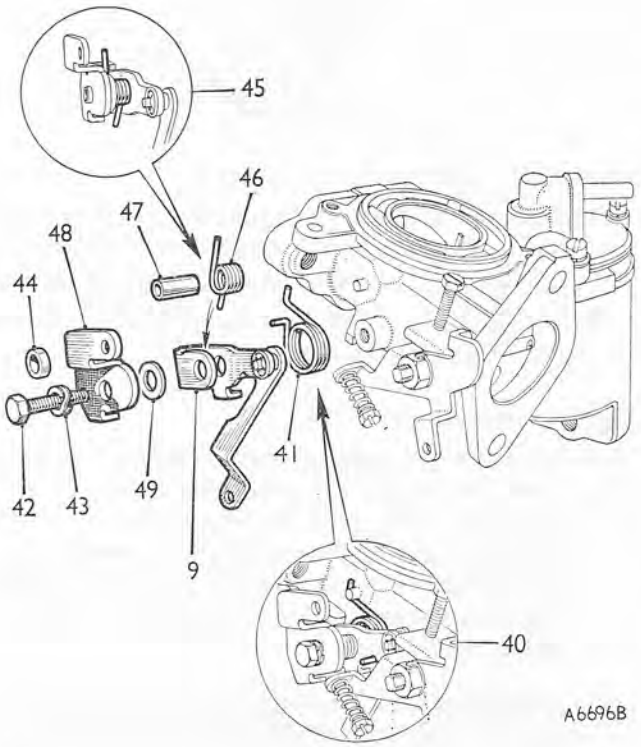
(13) Unscrew the brass sleeve nut (31) retaining the flexible jet tube (32) to the float-chamber (33) and withdraw the jet assembly (26) from the carburetter body (13). Note the gland (34), washer (35), and ferrule (36) at the end of the jet tube.

(14) Bend back the small tag on the restrictor (7) to clear the jet adjusting nut, and remove the jet adjusting nut (1), restrictor (7), and spring (37). Unscrew the jet locking nut (2) and detach the nut and jet bearing (38). Withdraw the bearing from the nut, noting, on fixed needle carburetters only, the locking washer (39) under the shoulder of the bearing.

(15) Note the location points (see inset, 40) of the two ends of the pick-up lever return spring (41). Unscrew the lever pivot bolt (42) together with its double-coil spring washer (43), or spacer (44). Detach the lever assembly (9) and return spring.

(16) Note the location (see inset, 45) of the two ends of the cam lever spring (46) and push out the pivot bolt tube (47) (or tubes), taking care not to lose the spring. Lift off the cam lever (48), noting the skid washer (49) between the two levers.





(17) Slacken and remove the bolt (50) retaining the float-chamber (33) to the carburetter body. Note the component sequence of the flexibly mounted chambers (33) and (51).

(18) Mark (52) the location of the float-chamber lid (53). Unscrew the lid retaining screws (54) and detach the lid and its gasket (55) complete with float assembly (56).

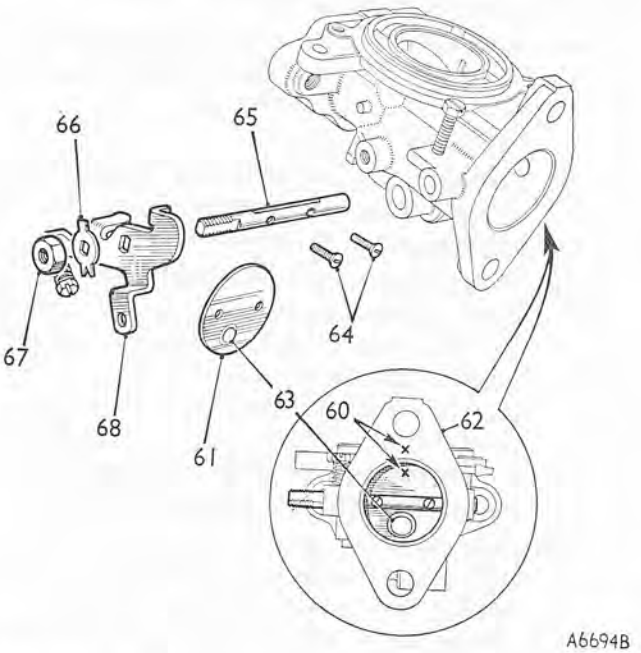
(19) Push out the float hinge pin (57) from the end opposite its serrations and detach the float.

(20) Extract the float needle (58) from its seating (59) and unscrew the seating from the lid, using a wrench ·338 in. across the flats. Do not distort the seating.

(21) Close the throttle and mark (60) the relative positions of the throttle disc (61) and the carburetter flange (62). **Do not mark the throttle disc in the vicinity of the limit valve** (63).

(22) Unscrew the two disc retaining screws (64). Open the throttle and ease out the disc from its slot in the throttle spindle (65). The disc is oval and will jam if care is not taken; store the disc in a safe place until required for reassembly.

(23) Tap back the tabs of the tab washer (66) securing the spindle nut (67). Note the location of the lever arm (68) in relation to the spindle and carburetter body; remove the nut and detach the arm.



A6694B

Reassembling

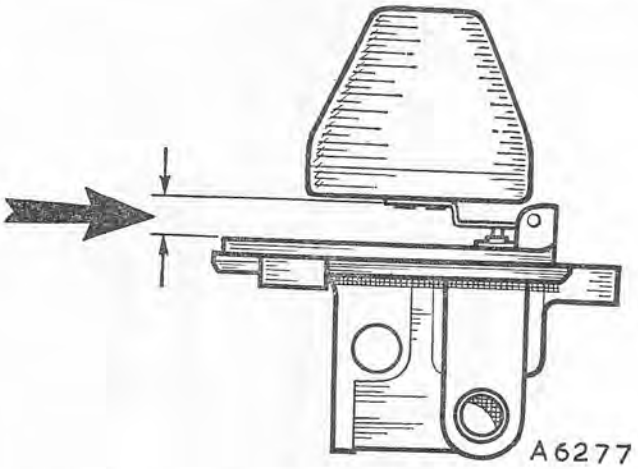
Carburetters—all types

NOTE.—Before reassembling, examine all components for wear and damage. Renew unserviceable components, ensuring that only parts to the correct specification (see **'TUNING DATA'**) are used.

(1) Examine the throttle spindle and its bearings in the carburetter body. Check for excessive play. Renew parts as necessary.

(2) Refit the spindle to the body. Assemble the operating lever with tab washer and spindle nut, to the spindle. Ensure that when the stop on the lever is against the abutment on the carburetter body (i.e. throttle closed position) the countersunk ends of the holes in the spindle face outwards. Tighten the spindle nut and lock with the tab washer.

(3) Insert the throttle disc in the slot in the spindle in its original position as marked. Manœuvre the disc in its slot until the throttle can be closed, snap the throttle open and shut to centralize it in the bore of the carburetter, taking care not to damage the throttle limit valve. When assembled, the valve must be positioned at the bottom of the disc with the head of the valve towards the engine. Fit two new disc retaining screws but do not fully tighten. Check visually that the disc closes fully, and adjust


A6277

its position as necessary. With the throttle closed there must be clearance between the throttle lever and the carburetter body. Tighten the screws fully and spread their split ends just enough to prevent turning.

(4) Examine the float needle and seating for damage. Check that the spring-loaded plunger in the end of the plastic-bodied needle operates freely.

(5) Screw the seating into the float-chamber carefully. Do not overtighten. Replace the needle in the seating, coned end first. Test the assembly for leakage with air pressure.

(6) Refit the float and lever to the lid and insert the hinge pin and invert the float-chamber lid. With the needle valve held in the shut-off position by the weight of the float only, there should be a $\frac{1}{8}$ to $\frac{5}{16}$ in. gap (arrowed) between the float lever and the rim of the float-chamber lid.

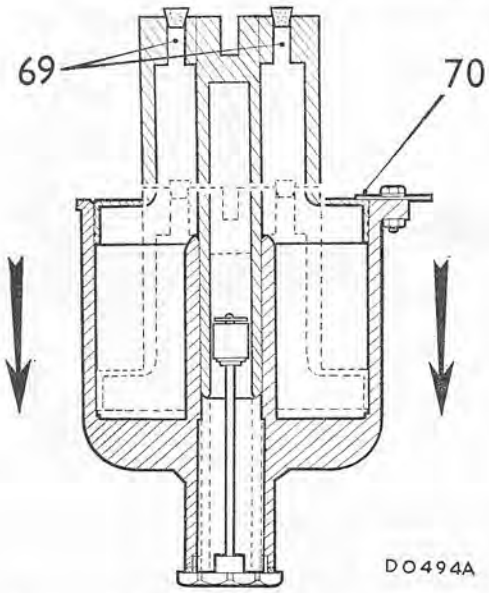
(7) Examine the lid gasket for re-use. Assemble the gasket on the lid and refit the lid to the float-chamber in the position marked on dismantling. Tighten the securing screws evenly.

(8) Refit the float-chamber assembly to the carburetter body and tighten the retaining bolt fully, making sure that the registers on the body and the chamber engage correctly.

(9) Refit the piston lifting pin, spring and circlip.

(10) Examine the piston assembly for damage on the piston rod and the outside surface of the piston. The piston assembly must be scrupulously clean. Use gasoline or methylated spirit (denatured alcohol) as a cleaning agent. **Do not use abrasives.** Wipe dry, using a clean dry cloth.

(11) Clean inside the suction chamber and piston rod guide using gasoline or methylated spirit (denatured alcohol) and wipe dry. Refit the damper and washer. Temporarily plug the piston transfer holes (69) and fit the piston into the suction chamber. Fit a nut and screw, with a large flat washer under the head of the screw into one of the suction

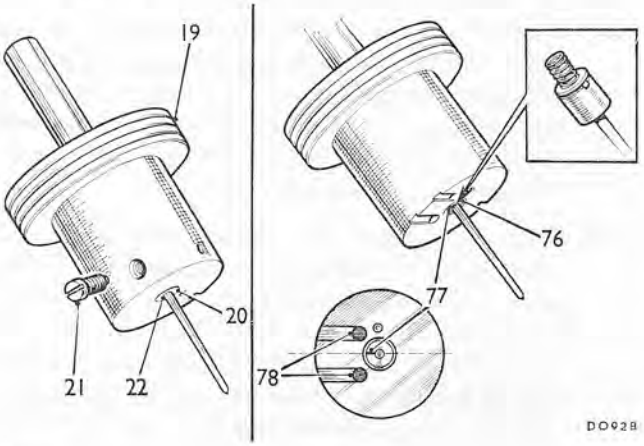


chamber fixing holes, positioning the washer (70) so that it overlaps the suction chamber bore (see illustration). Check that the piston is fully home in the suction chamber and invert the assembly to allow the chamber to fall away from the piston until the piston contacts the flat washer. Check the time taken for the suction chamber to fall the full extent of the piston travel. For HS2-type carburetters of $1\frac{1}{4}$ in. bore the time taken should be 3 to 5 seconds, and for larger carburetters 5 to 7 seconds. If these times are exceeded check the piston and suction chamber for cleanliness and mechanical damage. If after rechecking the time taken is still not within these limits, renew the suction chamber and piston assembly.

Carburetters—fixed needle type

(12) Refit the needle to the piston assembly (19). The lower edge of the needle shoulder (22) must be level with the bottom face of the piston rod (20).

(13) Fit a new needle locking screw (21) and tighten. Invert the suction chamber and spin the piston assembly inside it to check for concentricity of the needle.



(14) Check the piston key for security in the carburetter body. Refit the piston assembly to the body and replace the piston spring over the piston rod.

(15) Fit the suction chamber and retaining screws, taking care not to wind up the spring; tighten the securing screws evenly.

(16) Refit the jet bearing, a new locking washer, and the locking nut; do not tighten the nut.

(17) Centralize the jet as follows:

(*a*) Enter the end of the nylon feed tube into the base of the float-chamber, without the gland or washer fitted. Loosely secure with the retaining nut.

(*b*) Feed the jet into the jet bearing; do not fit the jet nut spring, jet adjustment restrictor, or adjusting nut at this stage.

(*c*) With the carburetter positioned with its inlet flange downwards, insert the piston loading tool into damper tube at the top of the suction chamber and screw in until fully home. Screw the tool back until the arrow, on the tool, points towards the inlet flange of the carburetter. **The tool and carburetter must remain in this position throughout the centering operation.**

(*d*) With the piston at the bottom of its travel (on the bridge), and the jet hard up against the jet bearing, slowly tighten the jet locking nut. During the tightening process ensure that the jet is not binding in its bearing when drawn in and out. If any tightness between the jet and bearing is detected, the jet locking nut must be slackened and the process repeated.

(*e*) Remove the jet loading tool.

(18) Withdraw the jet and tube; refit the spring, restrictor and jet adjusting nut. Fit the gland and washer to the flexible tube. The end of the tube should project a minimum of $\frac{3}{16}$ in. beyond the gland. Refit the jet and tube. Tighten the sleeve nut until the neoprene gland is compressed. Overtightening can cause leakage.

Carburetters—spring-loaded needle type

(19) Refit the jet bearing, fit and tighten the jet locking nut. No jet centering is required with the spring-loaded type jet needle.

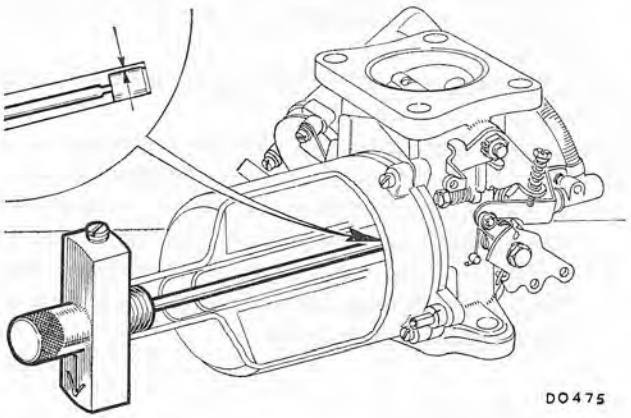
(20) Fit the jet nut spring and adjustment restrictor. Fit the jet adjusting nut and screw it up as far as possible.

(21) Feed the jet into the jet bearing. Fit the sleeve nut, washer and gland to the end of the flexible tube. The tube must project a minimum of $\frac{3}{16}$ in. (4·8 mm.) beyond the gland. Tighten the sleeve nut until the gland is compressed. Overtightening can cause leakage.

(22) Refit the spring to the jet needle assembly, ensuring that it locates completely in the groove of the needle support.

(23) **IMPORTANT.** Spring-loaded needles are supplied complete with shouldered spring seats; no attempt should be made to alter the position of the spring seat or convert a fixed-type needle to spring-loaded application. The raised 'pip' formed in the needle guide ensures that the needle is correctly centralized. Under no circumstances must the 'pip' be removed or repositioned.

Fit the needle assembly into its guide and fit the assembly into the piston. The lower edge of the guide (76) must be flush with the face of the piston and the guide positioned so that the etched locating mark (77) on its lower face is adjacent to and in line with the midway point between the two piston transfer holes as illustrated.



Alternative needle guides have a flat machined on the guide which must be positioned so that the guide locking screw tightens down onto the flat. If the guide is incorrectly positioned so that the locking screw has not tightened down on the flat, the head of the screw will protrude from the piston

(24) Fit a new guide locking screw. **NOTE.**—Guide locking screws for spring-loaded needles are shorter than the needle locking screws used with fixed needles.

(25) Check the piston key for security in the carburetter body. Refit the piston assembly to the body and place the piston spring over the piston rod.

(26) Fit the suction chamber and retaining screws, taking care not to wind up the spring; tighten the securing screws evenly.

Carburetters—all types

(27) Refit the damper and washer.

(28) Reassemble the pick-up lever, cam lever, cam lever spring, skid washer, and pivot bolt tube or tubes in the positions noted on dismantling.

(29) Place the pick-up lever return spring in position over its boss and secure the lever assembly to the carburetter body with the pivot bolt. Ensure that the double-coil spring washer or spacer fits over the projecting end of the pivot bolt tube.

(30) Register the angled end of the return spring in the groove in the pick-up lever, and hook the other end of the spring around the moulded peg on the carburetter body.

(31) Fit the brass ferrule to the hole in the end of the pick-up link. Relieve the tension of the return spring and fit the link to the jet with its retaining screw. When finally tightening the screw, support the moulded end of the jet.

(32) Without removing the suction chamber, screw the jet adjusting nut until the top face of the jet is flush with the bridge of the carburetter.

(33) Turn down the jet adjusting nut to the initial jet setting given in **'TUNING DATA'.**

(34) Refit the carburetter(s) to the engine, following the instructions given in the relevant vehicle Workshop Manual.

Tune the carburetters in accordance with the instructions given in **'CARBURETTER TUNING —COMPLETE'.**

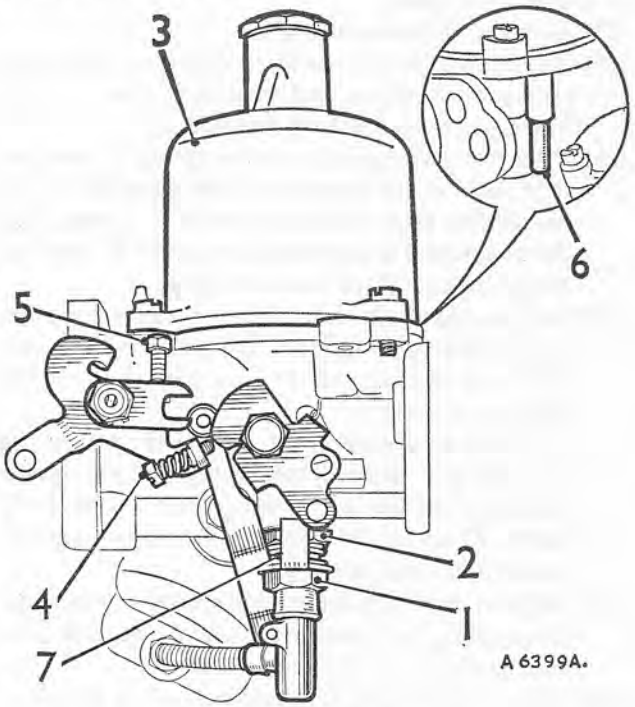
Section 4-C

CARBURETTER TUNING—COMPLETE

The following instructions apply only to new carburetters or carburetters which have been serviced as described in **'CARBURETTER SERVICING'.**

The tuning must be carried out with the engine emission control equipment connected and operating.

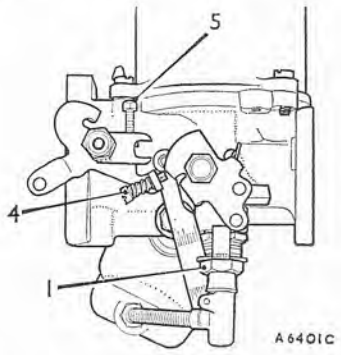
SINGLE CARBURETTERS



The type HS carburetter

1. Jet adjusting nut.
2. Jet locking nut.
3. Piston suction chamber.
4. Fast-idle adjusting screw.
5. Throttle adjusting screw.
6. Piston lifting pin.
7. Jet adjustment restrictor.

Initial setting



(1) Disconnect the mixture control (choke) wire if fitted.

(2) Unscrew the fast-idle screw (4) until it is well clear of the cam.

(3) Unscrew the throttle adjusting screw (5) until it is just clear of its stop and the throttle is closed.

(4) Set the throttle adjusting screw one full turn open.

(5) The jet adjusting nut must not be altered at this stage as it will be initially set to a datum setting at the factory or during the carburetter servicing procedure.

Tuning conditions

To ensure that the engine temperature and mixture requirements are stabilized, tuning must be carried out in accordance with the following setting cycle.

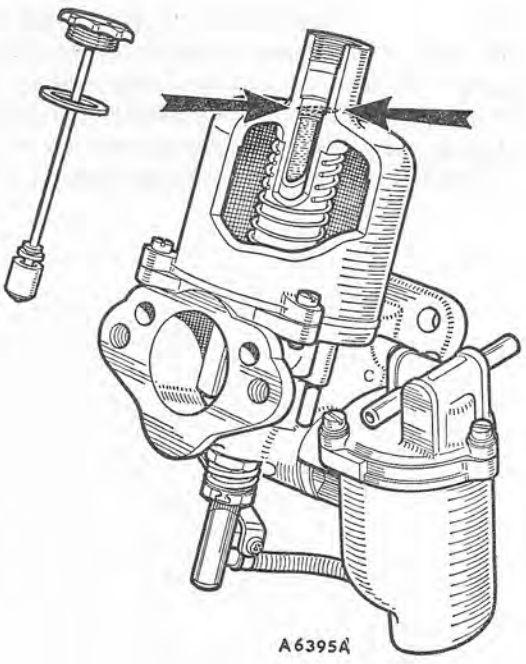
(1) Connect the tachometer and an approved exhaust gas analyser in accordance with the instrument-maker's instructions.

(2) Warm the engine at a fast idle to normal operating temperature preferably with the car standing in an ambient temperature of between 16 and 27° C. (60 to 80° F.). Run the engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by the sudden rise in temperature of the radiator header tank.

(3) Set the engine speed at 2,500 r.p.m., at no load, and run for one minute.

(4) Tuning operations may now be commenced and must be carried out in the shortest possible time. If the time for settings exceeds a three-minute period, open the throttle and run the engine at 2,500 r.p.m. for one minute then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

Tuning procedure



(1) Top up the piston damper with the recommended engine oil until the level is ½ in. above the top of the hollow piston rod.

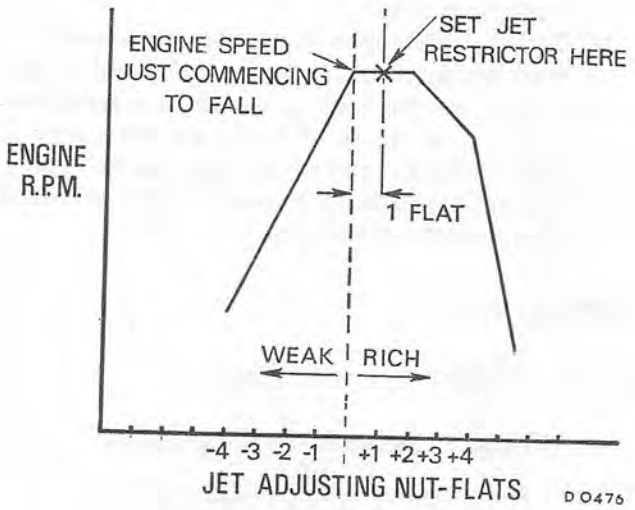
NOTE.—On dust-proofed carburetters, identified by a transverse hole drilled in the neck of the suction chambers and no vent hole in the damper cap, the oil level must be ½ in. below the top of the hollow piston rod.

(2) Warm up the engine as described in **'Tuning conditions'.**

Turn the throttle adjusting screw until the idling speed given in **'TUNING DATA'** is obtained.

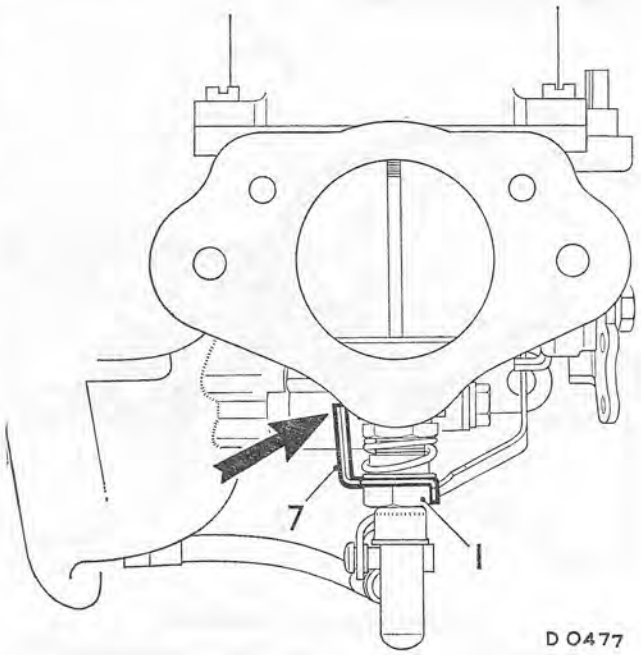
(3) During the following procedure, just before the readings of the tachometer and exhaust gas analyser are taken gently tap the neck of the suction chamber with a light non-metallic instrument (e.g. a screwdriver handle).

Turn the jet adjusting nut up to weaken, down to richen, until the fastest speed is recorded on the tachometer. Turn the jet adjusting nut very slowly up (weaken) until the engine speed just commences to fall, then turn the nut one flat down (rich). Check the idling speed against the figure given in **'TUNING DATA'**, and adjust if necessary using the throttle adjusting screw.



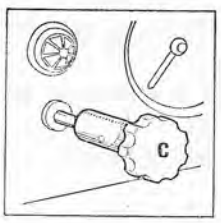
(4) Using the exhaust gas analyser, check that the percentage CO reading is within the limits given in **'TUNING DATA'.**

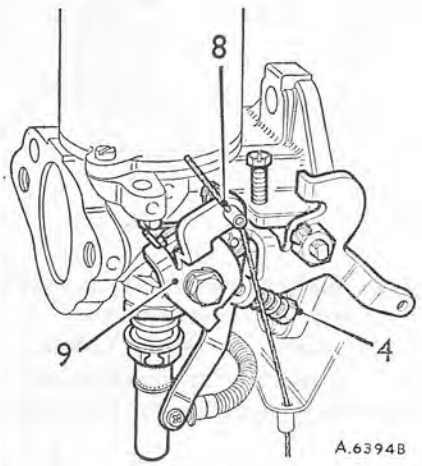
If the reading falls outside the limits given, reset the jet adjusting nut by the minimum amount necessary to bring the reading just within the limits. If an adjustment exceeding two flats is required to achieve this the test equipment should be checked for correct calibration.



(5) Hold the jet adjusting nut (1) to prevent it turning, and rotate the adjustment restrictor (7) round the nut until the vertical tag contacts the carburetter body on the left-hand side when viewed from the air cleaner flange (see illustration). In this position, bend the small tag on the adjustment restrictor down so that the restrictor locks to the nut and will follow its movements.

(6) Paint the small tag of the jet adjusting nut restrictor and the adjacent flat of the jet nut to identify the locking position.



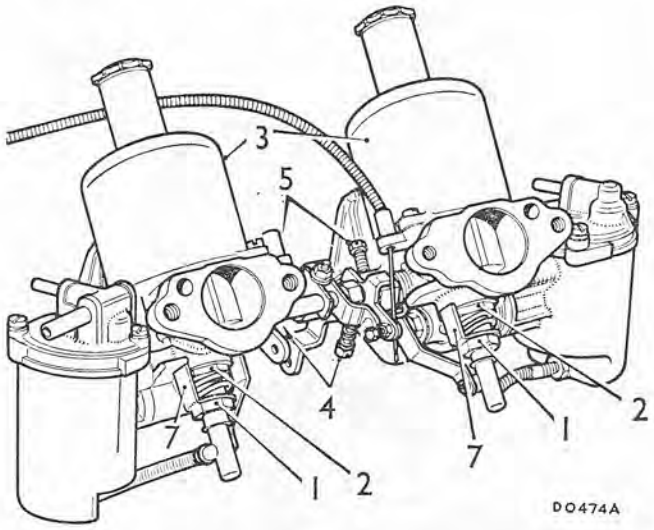


(7) Reconnect the mixture control wire (8) with approximately $\frac{1}{16}$ in. free movement before it starts to pull on the jet lever (9).

(8) Pull the mixture control knob until the linkage is about to move the carburetter jet and adjust the fast-idle screw (4) to give the engine fast-idle speed.

(9) Check and if necessary adjust the throttle damper setting—if fitted (see **'TUNING DATA'**).

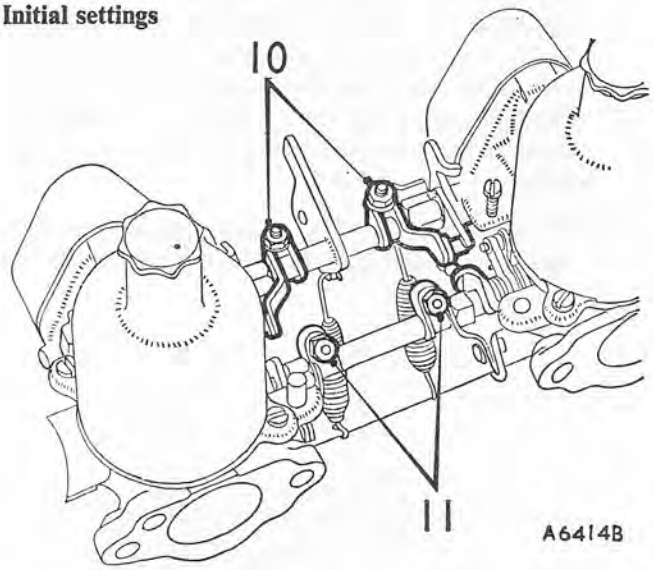
TWIN CARBURETTERS



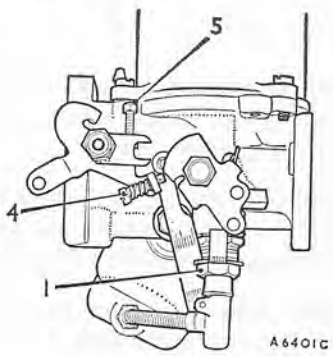
A twin-carburetter installation

1. Jet adjusting nuts.
2. Jet locking nuts.
3. Piston/suction chambers.
4. Fast-idle adjusting screws.
5. Throttle adjusting screws.
7. Jet adjustment restrictors.

Initial settings



(1) Slacken both clamping bolts (10) on the throttle spindle interconnections.
(2) Disconnect the jet control interconnection by slackening the clamping bolts (11).
(3) Disconnect the mixture control wire if fitted.



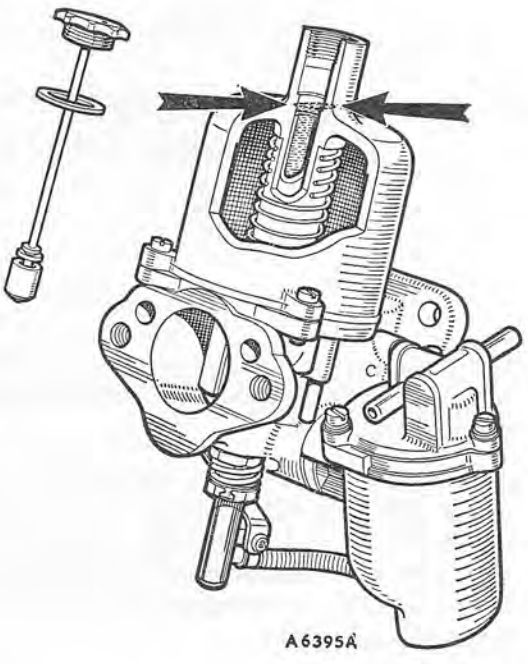
(4) Unscrew the fast-idle screw (4) on both carburetters until they are well clear of the cams.
(5) Unscrew the throttle adjusting screw (5) on both carburetters until they are just clear of their stops and the throttles are closed.
(6) Set the throttle adjustment screws on both carburetters half a turn open.
(7) The jet adjusting nuts must not be altered at this stage as they will be initially set to a datum setting either at the factory or during the carburetter servicing procedure.

Tuning conditions

To ensure that the engine temperature and mixture requirements are stabilized, tuning must be carried out in accordance with the following setting cycle.

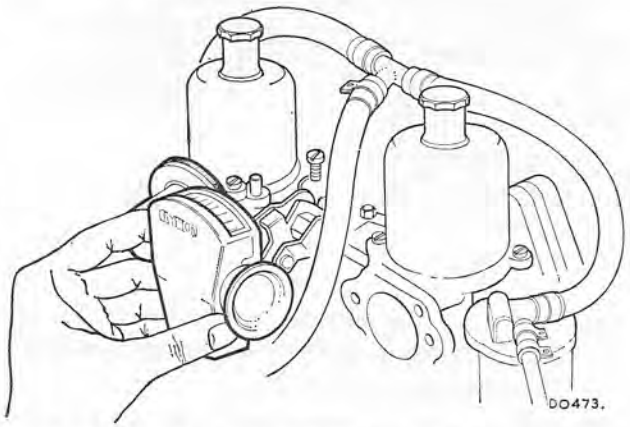
(1) Connect a tachometer and an approved exhaust gas analyser in accordance with the instrument-maker's instructions.
(2) Warm the engine at a fast idle to normal operating temperature preferably with the car standing in an ambient temperature of between 16 and 27° C. (60 to 80° F.). Run the engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by the sudden rise in temperature of the radiator header tank.
(3) Set the engine speed at 2,500 r.p.m., at no load, and run for one minute.
(4) Tuning operations may now be commenced and must be carried out in the shortest possible time. If the time for settings exceeds a three-minute period, open the throttle and run the engine at 2,500 r.p.m. for one minute then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

Tuning procedure



(1) Top up the piston damper with the recommended engine oil until the level is ½ in. above the top of the hollow piston rod.

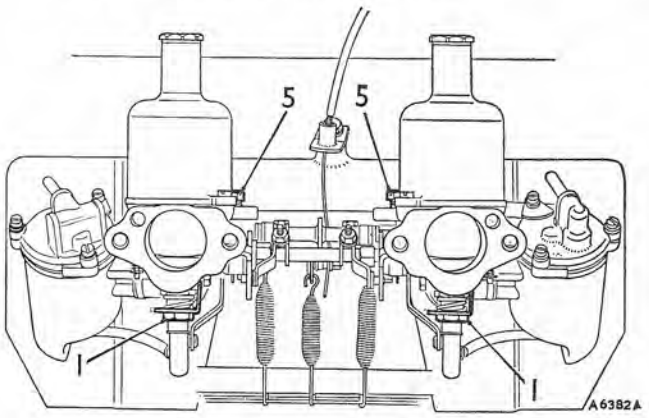
NOTE.—On dust-proofed carburetters, identified by a transverse hole drilled in the neck of the suction chambers and no vent hole in the damper cap, the oil level must be ½ in. below the top of the hollow piston rod.



(2) Warm up the engine as described in **'TUNING CONDITIONS.'**

(3) Turn the throttle adjusting screw on both carburetters until the idling speed given in **'TUNING DATA'** is obtained.

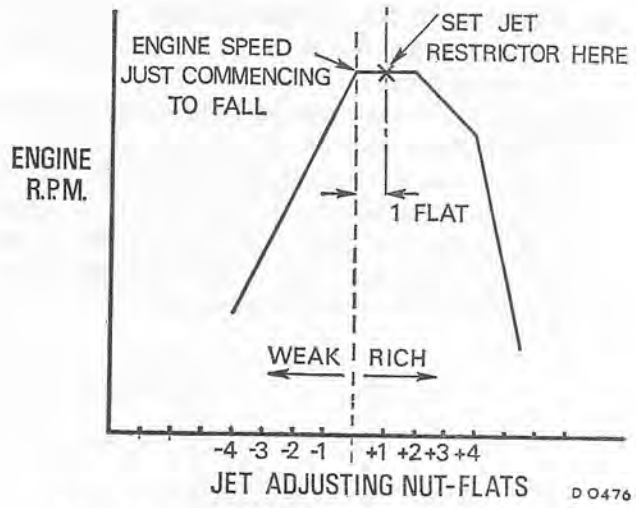
(4) Using an approved balancing meter in accordance with the maker's instructions, balance the carburetters by altering the throttle adjusting screws; the idling speed obtained during this operation must be as given in **'TUNING DATA'.**



(5) During the following procedure, just before the readings of the tachometer and exhaust gas analyser are taken, gently tap the neck of each suction chamber with a light non-metallic instrument (e.g. a screwdriver handle).

Turn the jet adjusting nut (1) on both carburetters up to weaken, down to richen, the same amount until the fastest speed is recorded on the tachometer.

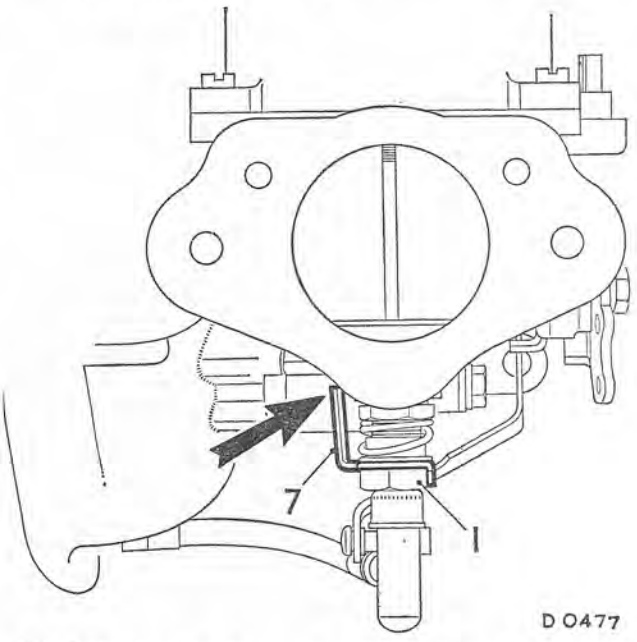
Turn both adjusting nuts very slowly up (weaken) until the engine speed just commences to fall, then turn both adjusting nuts one flat down (rich).



Check the idling speed against the figure given in **'TUNING DATA'**, and adjust if necessary by altering both throttle adjusting screws, each by the same amount. Using the balancing meter, check that the carburetters are balanced.

(6) Using the exhaust gas analyser, check that the percentage CO reading is within the limits given in **'TUNING DATA'.**

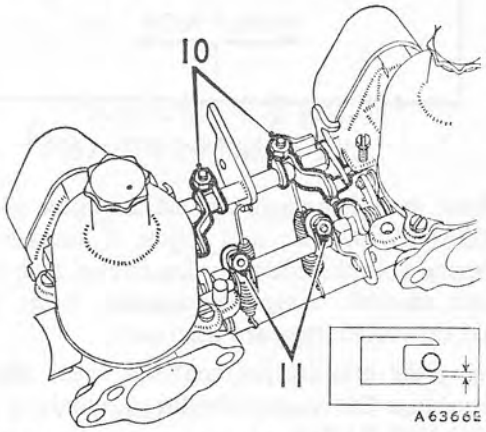
If the reading falls outside the limits given, reset both jet adjusting nuts by the minimum amount necessary to bring the reading just within the limits. If an adjustment exceeding two flats is required to achieve this the test equipment should be checked for correct calibration.



(7) Hold the jet adjusting nut (1) on each carburetter, to prevent it turning, and rotate the adjustment restrictor (7) round the nut until the vertical tag contacts the carburetter body on the left-hand side when viewed from the air cleaner flange (see illustration). In this position, bend the small tag on the adjustment restrictor down so that the restrictor locks to the nut and will follow its movements.

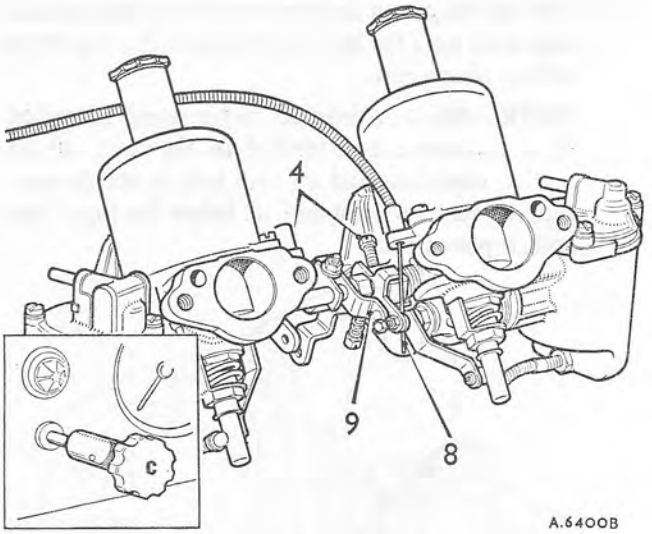
(8) Paint the small tag of the jet adjusting nut restrictor and the adjacent flat of the jet nut to identify the locking position.

(9) Set the throttle interconnection clamping levers (10) in accordance with the instructions given in the relevant vehicle Workshop Manual, so that a clearance exists between the link pin and the lower edge of the fork (see inset). Tighten the clamp bolts ensuring that there is approximately $\frac{1}{32}$ in. end float on the interconnection rod.



(10) With both jet levers at their lowest position, set the jet interconnection lever clamp bolts (11) so that both jets commence to move simultaneously.

Run the engine at 1,500 r.p.m. and, using the balance meter, check that the carburetters are balanced.



(11) Reconnect the mixture control wire (8) with approximately $\frac{1}{16}$ in. free movement before it starts to pull on the jet levers (9).

(12) Pull the mixture control knob until the linkage is about to move the carburetter jets.

(13) Using the carburetter balancing meter to ensure equal adjustment, turn the fast-idle adjusting screws (4) to give the correct fast idling speed (see **'TUNING DATA'**).

(14) Refit the air cleaners.

Section 4-D

TYPE HIF CARBURETTERS—TUNING
(Fitted to MGB from 1972 Model Year)

General

The carburetters fitted to cars equipped with engine emission control systems are balanced to provide engine performance with pollution control. Under no circumstances may they or their components be interchanged or substituted with normal carburetters.

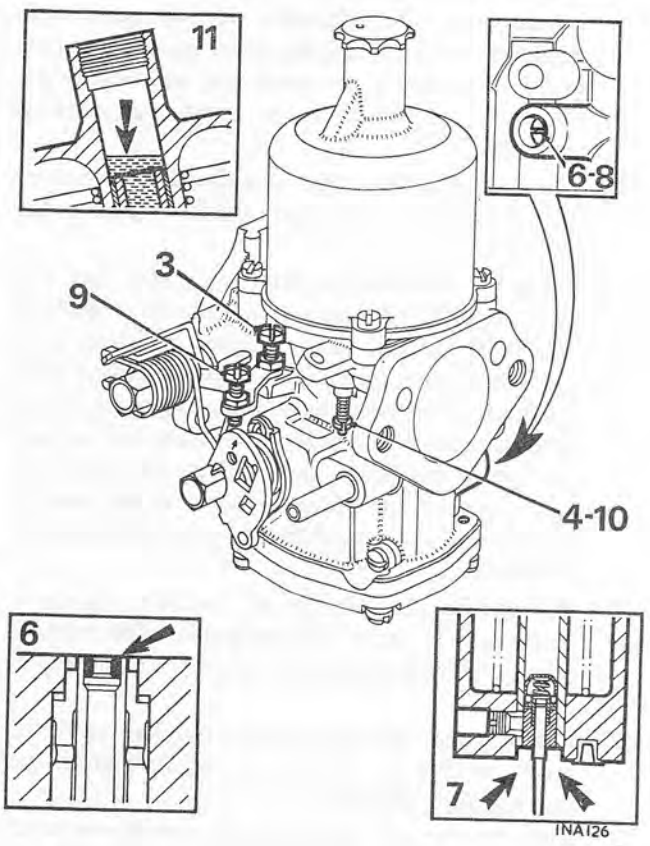
Tuning must be carried out with the engine emission control equipment connected and operating.

IMPORTANT.—Before servicing or tuning a carburetter in an endeavour to rectify poor engine performance, make sure that the maladjustment or fault is not from another source by checking the following:

Valve clearance
Spark plug condition
Contact breaker (dwell angle)
Ignition timing and advance
Presence of air leaks into the induction system

Single and twin carburetters

(1) Remove the air cleaner(s).
(2) Check the throttle for correct operation and signs of sticking.
(3) Unscrew the throttle adjusting screw (both screws on twin carburetters) until it is just clear of the throttle lever, with the throttle closed, then turn the screw clockwise two full turns.
(4) Raise the piston of each carburetter with the lifting pin and check that it falls freely onto the bridge when the pin is released. If the piston shows any tendency to stick, the carburetter must be serviced.
(5) Lift and support the piston clear of the bridge so that the jet is visible; if this is not possible due to the installed position of the carburetter, remove the suction piston chamber.
(6) Turn the jet adjusting screw anti-clockwise until the jet is flush with the bridge or as high as possible without exceeding the bridge height. Ensure that both jets on twin carburetters are in the same relative position to the bridge of their respective carburetters.
(7) Check that the needle guide(s) is flush with the bottom of the piston groove.
(8) Turn the jet adjusting screw two turns clockwise (both screws on twin carburetters).
(9) Turn the fast idle adjusting screw anti-clockwise (both screws on twin carburetters) until it is well clear of the cam.
(10) Refit the suction piston chamber if it has been removed and, using the lifting pin, check that the piston falls freely onto the bridge.
(11) Top up the piston damper reservoir(s) with a recommended oil until the level is ½ in. (13 mm.) above the top of the hollow piston rod.



(12) Connect a reliable tachometer to the engine in accordance with the instrument manufacturer's instructions.

(13) Start the engine and run it at a fast idle speed until it attains normal running temperature, then run it for a further five minutes.

(14) Increase the engine speed to 2,500 r.p.m. for thirty seconds.

(15) Connect an approved exhaust gas analyser to the engine in accordance with the instrument manufacturer's instructions.

NOTE.—Tuning can now commence. If the correct setting cannot be obtained within three minutes, increase the engine speed to 2,500 r.p.m. for thirty seconds and then recommence tuning. Repeat this clearing operation at three-minute intervals until tuning is completed.

Single carburetters

(16) Adjust the throttle adjusting screw until the correct idle speed (see **'TUNING DATA'** and/or Vehicle Emission Control Information Label) is obtained.

NOTE.—During the following procedure, just before the readings of the tachometer and exhaust gas analyser are taken, gently tap the neck of the suction chamber with a light-metallic instrument (e.g. a screwdriver handle).

(17) Turn the jet adjusting screw, clockwise to enrich or anti-clockwise to weaken, until the fastest speed is indicated on the tachometer; turn the screw anti-clockwise until the engine speed just commences to fall. Turn the screw clockwise very slowly the minimum amount until the maximum speed is regained.

(18) Check the idle speed, and re-adjust it as necessary with the throttle adjusting screw to obtain the correct setting.

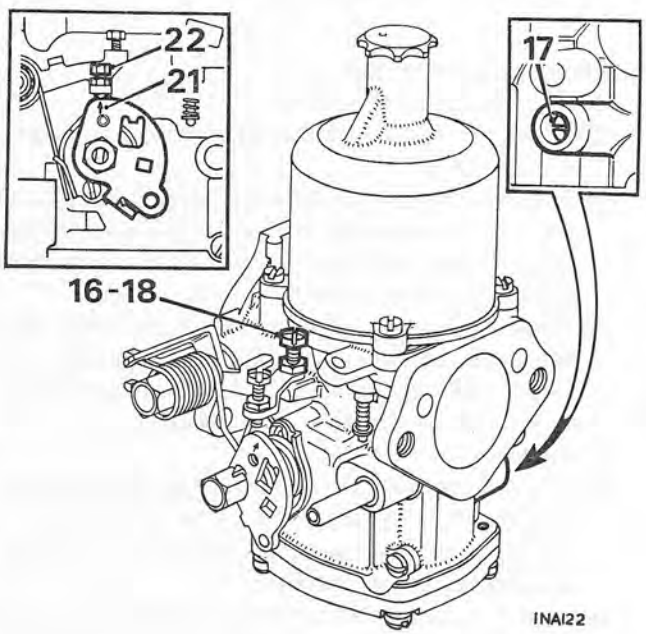
(19) Using the exhaust gas analyser, check that the percentage CO reading is within the limits given in **'TUNING DATA'** and/or Vehicle Emission Control Information Label. If the reading falls outside the limits given, reset the jet adjusting screw by the minimum amount necessary to bring the reading just within the limits. If an adjustment exceeding half a turn of the adjusting screw is required to achieve this, the carburetter must be removed and overhauled.

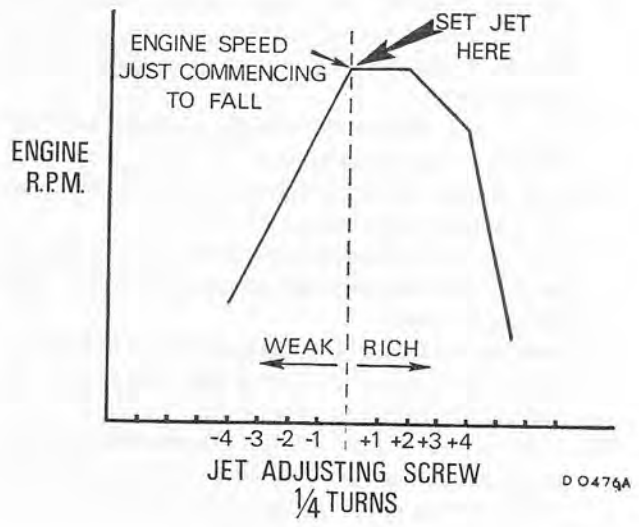
(20) With the fast idle cam against its return stop, check that a $\frac{1}{16}$ in. (1·5 mm.) free movement of the mixture control (choke) cable exists before the cable moves the cam.

(21) Pull out the mixture control (choke) until the arrow marked on the cam is positioned under the fast idle adjusting screw.

(22) Turn the fast idle adjusting screw clockwise until the correct fast idle speed (see **'TUNING DATA'** and/or Vehicle Emission Control Information Label) is obtained.

(23) Refit the air cleaner.

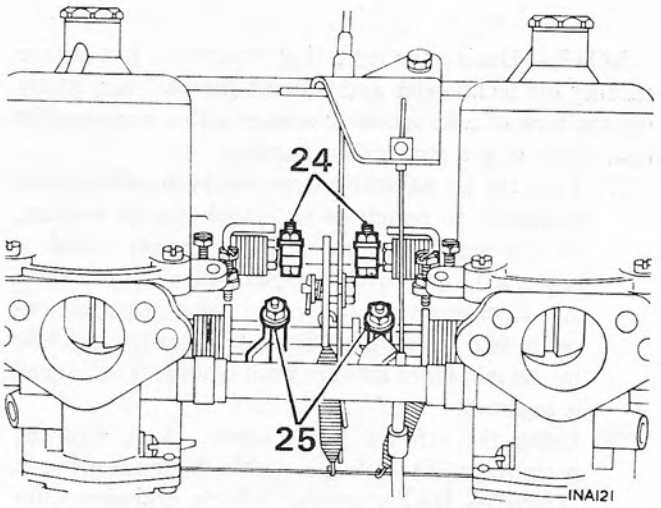




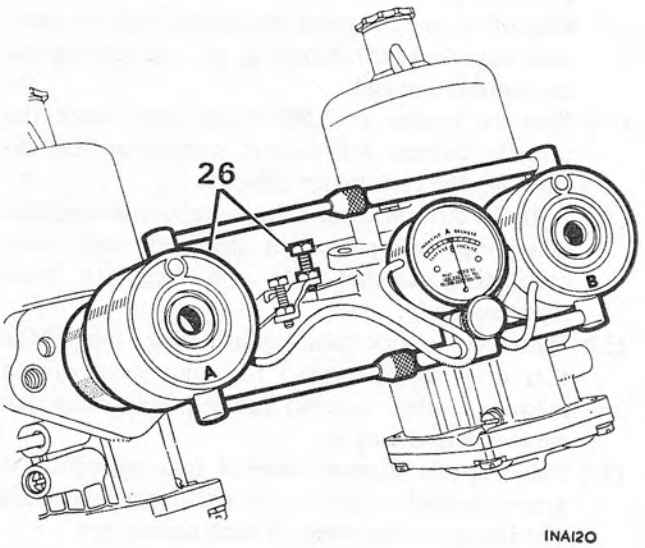
Twin carburetters

(24) Slacken both clamping bolts on the throttle spindle interconnections.

(25) Slacken both clamping bolts on the cold start interconnections.



(26) Using an approved balancing meter in accordance with the maker's instructions, balance the carburetters by altering the throttle adjusting screws until the correct idle speed and balance is achieved.



NOTE.—During the following procedure, just before reading the tachometer and exhaust gas analyser, gently tap the neck of each suction chamber with a non-metallic instrument (e.g. a screwdriver handle).

(27) Turn the jet adjusting screw on both carburetters clockwise to enrich or anti-clockwise to weaken, by the same amount until the fastest speed is registered on the tachometer; turn both screws anti-clockwise until the engine speed just commences to fall. Turn both screws very slowly clockwise by the minimum amount until the maximum speed is regained.

(28) Using the exhaust gas analyser, check that the percentage CO reading is within the limits given in **'TUNING DATA'** and/or Vehicle Emission Control Information Label. If the reading falls outside the limits given, reset both jet adjusting screws by the minimum amount necessary to bring the readings just within the limits. If an adjustment exceeding half a turn is required to achieve this the carburetters must be removed and overhauled.

(29) Set the throttle interconnection clamping levers, in accordance with the instructions given in the relevant vehicle Workshop Manual, so that a clearance exists between the link pin and the lower edge of the fork. Tighten the clamp bolts, ensuring that there is approximately $\frac{1}{32}$ in. end-float on the interconnection rod.

(30) Run the engine at 1,500 r.p.m. and check the throttle linkage for correct connection by re-checking the carburetter balance.

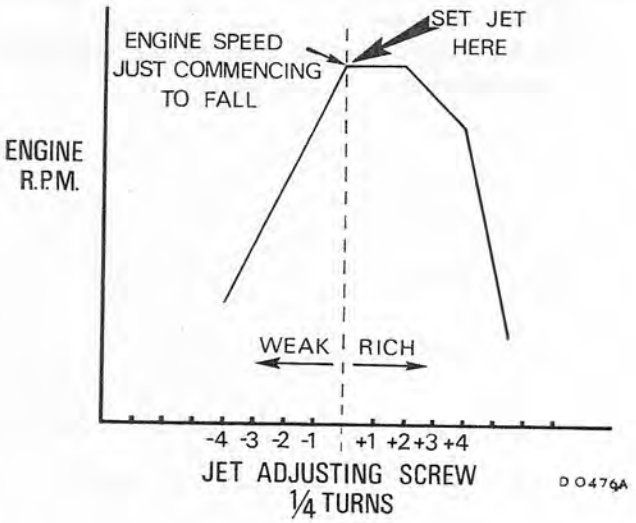
(31) With the fast idle cams of both carburetters against their respective stops, set the cold start interconnections so that both cams begin to move simultaneously.

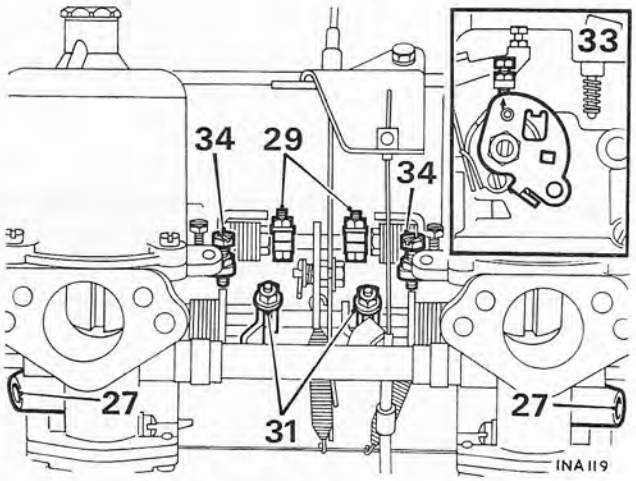
(32) With the fast idle cams against their stops check that a $\frac{1}{16}$ in. (1·5 mm.) free movement of the mixture control (choke) cable exists before the cable moves the cams.

(33) Pull out the mixture control (choke) until the arrow marked on the cam is positioned under the fast idle adjusting screw of each carburetter.

(34) Using the balancing meter to ensure equal adjustment, turn the fast idle adjusting screws to give the correct fast idle speed (see **'TUNING DATA'** and/or Vehicle Emission Control Information Label).

(35) Refit the air cleaners.



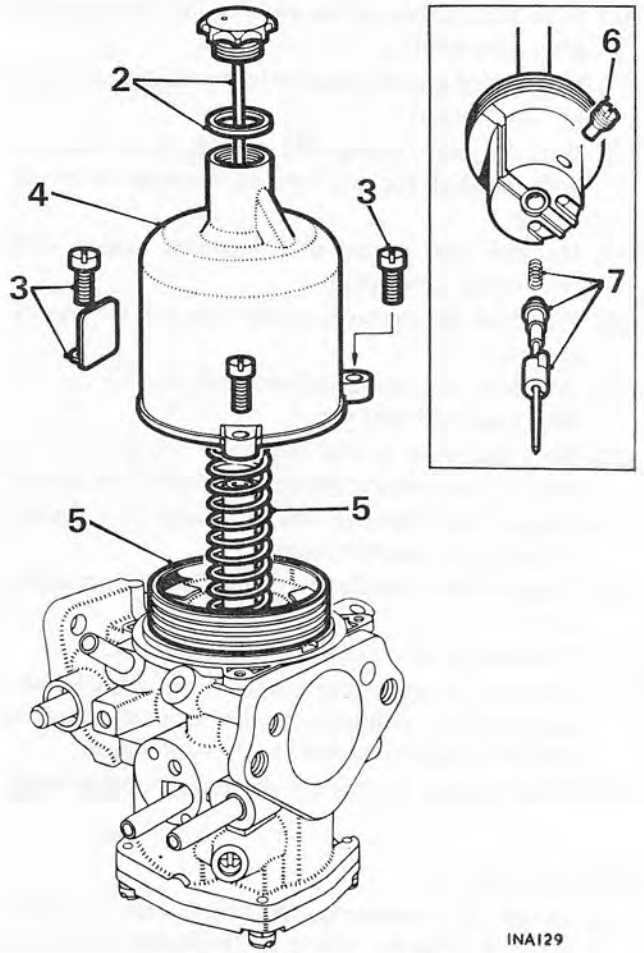


Section 4-E

TYPE HIF CARBURETTERS—OVERHAULING
(Fitted to MGB from 1972 Model Year)

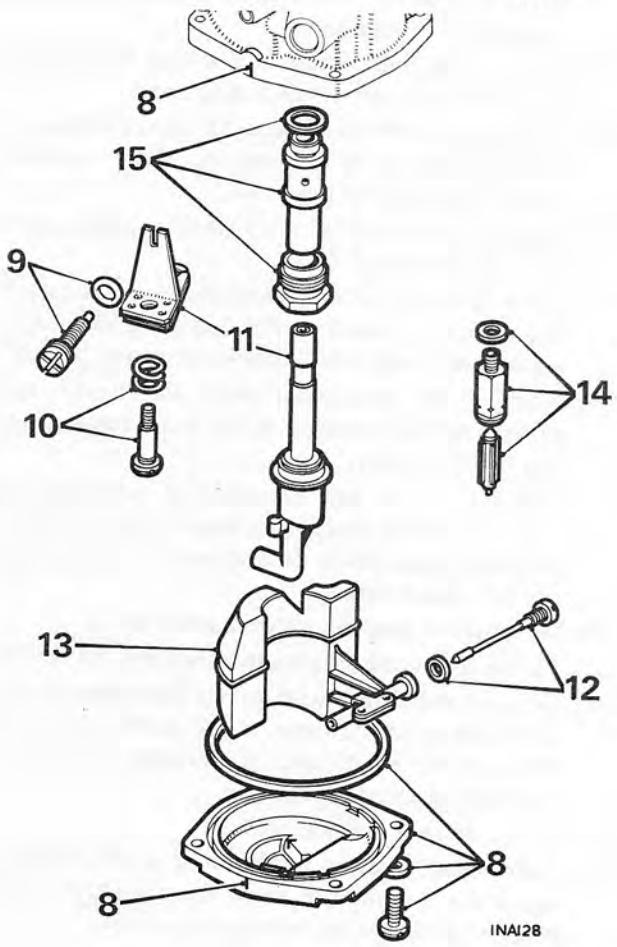
Dismantling

(1) Thoroughly clean the outside of the carburetter.
(2) Remove the piston damper and its washer.
(3) Unscrew the suction piston chamber retaining screws and remove the identity tag.
(4) Lift the chamber vertically from the body without tilting it.
(5) Remove the piston spring, lift out the piston assembly and empty the oil from the piston rod.
(6) Unscrew the needle guide locking screw.
(7) Withdraw the needle, guide and spring.



INA129

(8) Mark the bottom cover-plate and body to ensure correct reassembly, unscrew the retaining screws and remove the cover complete with sealing ring.
(9) Remove the jet adjusting screw complete with 'O' ring.
(10) Remove the jet adjusting lever retaining screw and spring.
(11) Withdraw the jet complete with adjusting lever and disengage the lever.
(12) Remove the float pivot spindle and fibre washer.
(13) Withdraw the float.
(14) Remove the needle valve and unscrew the valve seat.
(15) Unscrew the jet bearing locking nut and withdraw the bearing complete with fibre washer.



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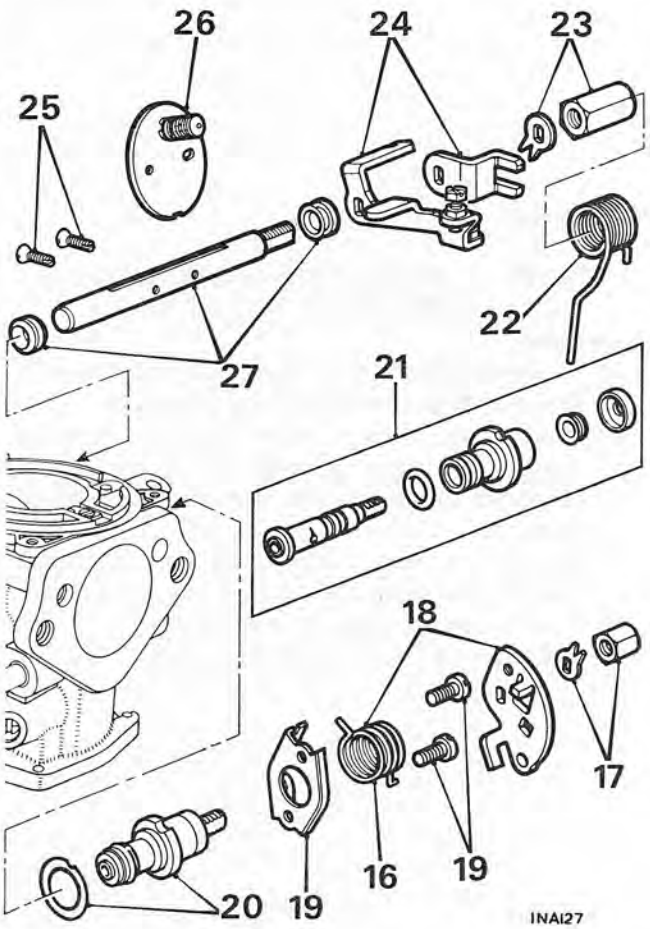
(16) Note the location of the ends of the fast idle cam lever return spring.
(17) Unlock and remove the cam lever retaining nut and locking washer.
(18) With the return spring held towards the carburetter body, prise off the cam lever and remove the return spring.
(19) Unscrew the starter unit retaining screws and remove the cover-plate.
(20) Withdraw the starter unit assembly and remove its gasket.
(21) Withdraw the valve spindle and remove the 'O' ring, seals and dust cap.
(22) Note the location and loading of the ends of the throttle lever return spring and remove the spring.
(23) Unlock and remove the nut and tab washer retaining the throttle levers.
(24) Remove the throttle lever and throttle actuating lever.
(25) Remove the throttle disc retaining screws.
(26) Open the throttle; note that the throttle disc is oval, and carefully withdraw the disc from the throttle spindle. Do not damage the over-run valve.
(27) Withdraw the throttle spindle and remove its seals.

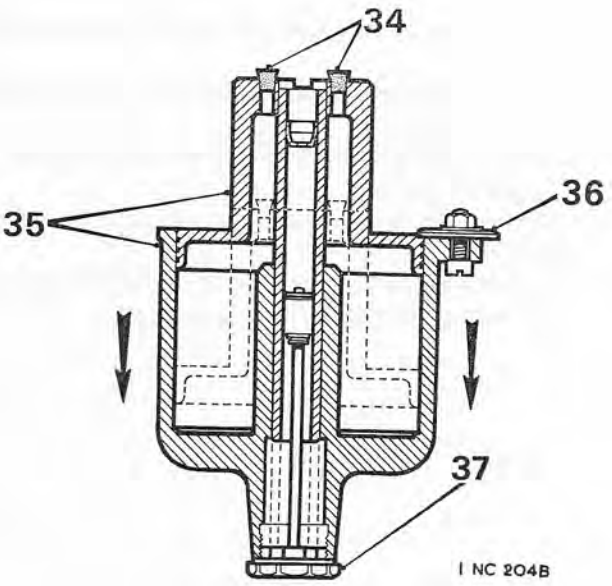


INSPECTION

(28) Examine the throttle spindle and its bearings in the carburetter body; check for excessive play, and renew parts as necessary.
(29) Examine the float needle and seating for damage and excessive wear; renew if necessary.
(30) Examine all rubber seals and 'O' rings for damage deterioration; renew as necessary. The cover-plate sealing ring must be renewed.
(31) Check condition of all fibre washers and gaskets renew as necessary.
(32) Clean the inside of the suction chamber and piston rod guide with fuel or methylated spirit (denatured alcohol) and wipe dry. Abrasives must not be used.
(33) Examine the carburetter body for cracks and damage and for security of the brass connections and the piston key.

NOTE.—It is only necessary to carry out the following timing check if the cause of the carburetter malfunction which necessitated the dismantling has not been located.

(34) Temporarily plug the piston transfer holes.
(35) Fit the piston into the chamber without its spring.
(36) Fit a nut and screw, with a large flat washer under the screw head, into one of the suction chamber fixing holes, positioning the washer so that it overlaps the chamber bore.
(37) Fit the damper and washer.
(38) Check that the piston is fully home in the chamber invert the assembly to allow the chamber to fall away until the piston contacts the washer.



(39) Check the time taken for the chamber to fall the full extent of the piston travel. For HIF carburetters $1\frac{1}{2}$ in. (38 mm.) bore the time taken should be 4 to 6 seconds; for HIF6 $1\frac{3}{4}$ in. (44·5 mm.) bore the time taken should be 5 to 7 seconds.

(40) If the times are exceeded, check the piston and chamber for cleanliness and damage. If after re-checking the time is still not within these limits, renew the chamber and piston assembly.

Reassembling

(41) Reverse the procedure in 1 to 28, noting the following:

(*a*) The throttle spindle must be fitted with the threaded end at the piston lifting pin side of the body.

(*b*) Fit the throttle disc so that the over-run valve is at the top of the bore and its spring towards the inside when the throttle is closed.

(*c*) New throttle disc retaining screws must be used when refitting the disc. Ensure that the throttle disc is correctly positioned and closes correctly before tightening and locking the retaining screw.

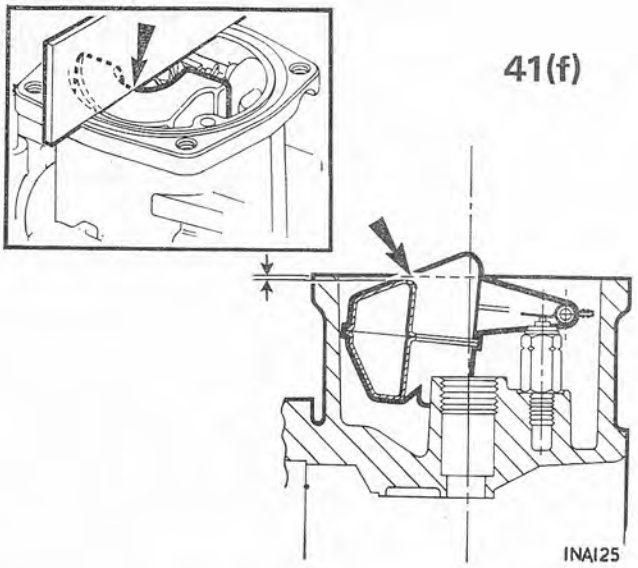
(*d*) Position the throttle spindle end seals just below the spindle housing flange.

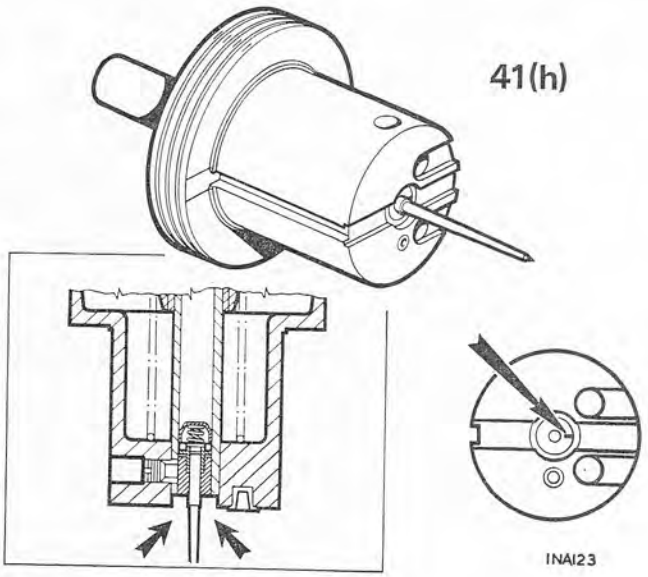
(*e*) The starter unit valve is fitted with the cut-out towards the top retaining screw hole, and its retaining plate is positioned with the slotted flange towards the throttle spindle.

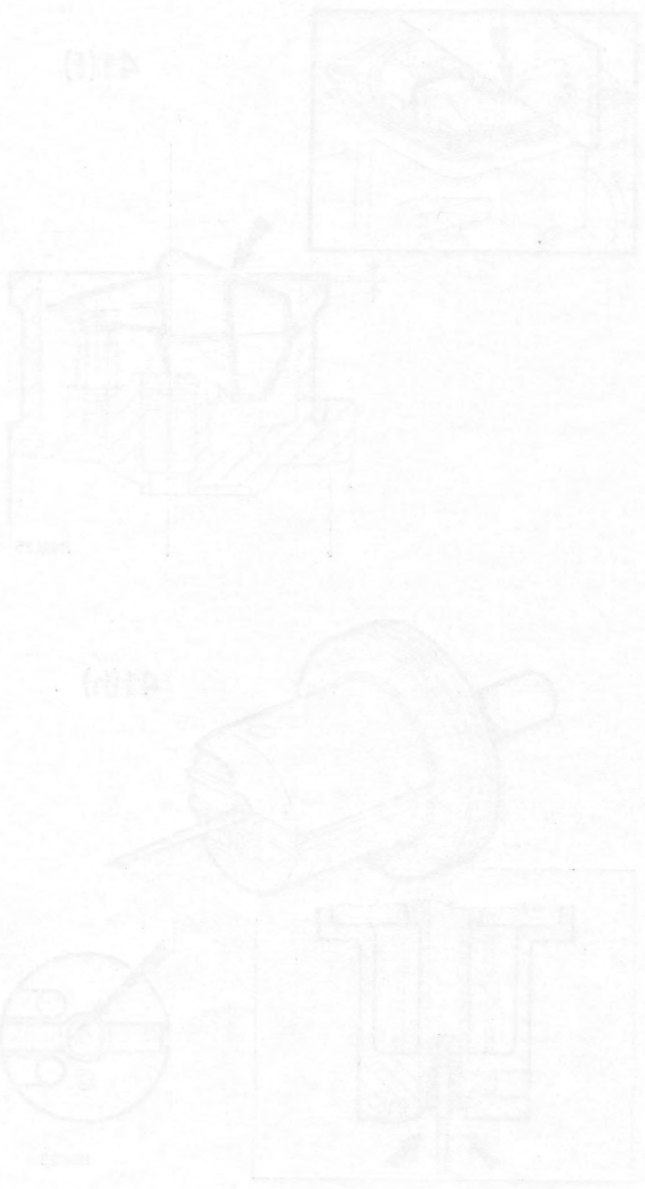
(*f*) After fitting the float and valve, invert the carburetter so that the needle valve is held in the shut position by the weight of the float only. Check that the point indicated on the float (see illustration) is 0·04±0·02 in. (1·0 ±·5 mm.) below the level of the float chamber face. Adjust the float position by carefully bending the arm.

(*g*) Check that the small diameter of the jet adjusting screw engages the slot in the adjusting lever and set the jet flush with the bridge of the body.

(*h*) Use a new retaining screw when refitting the needle and ensure that the needle guide etch mark aligns correctly with the piston transfer holes (see illustration). After fitting the needle assembly, check that the shoulder of the needle aligns the full face of the piston.







SECTION 5

EVAPORATIVE LOSS CONTROL

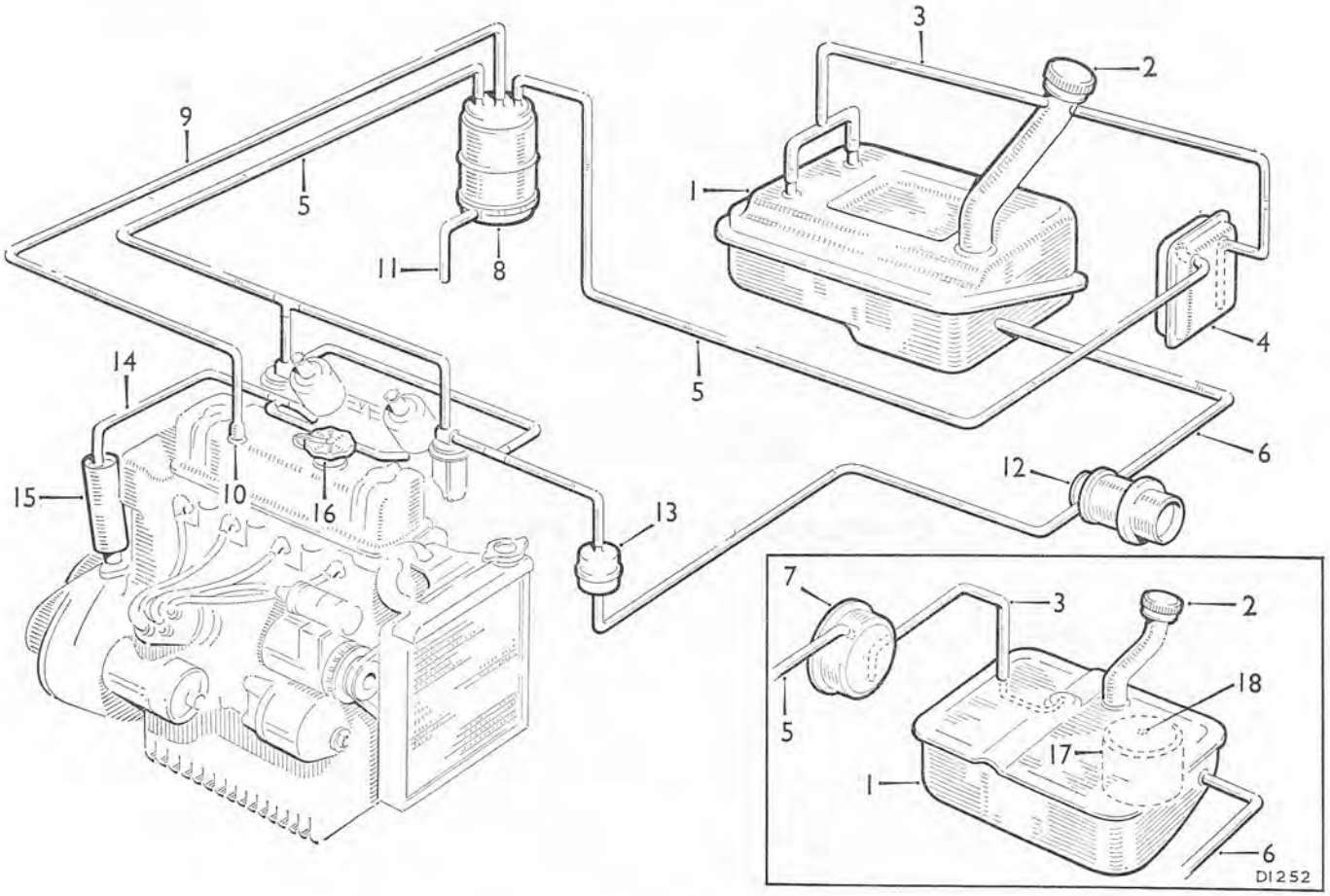


Fig. 1

A typical evaporative loss control system, with inset showing the arrangement of a separation tank and capacity-limiting fuel tank

1. Fuel tank.
2. Sealed fuel filler cap.
3. Expansion/vapour line.
4. Expansion tank.
5. Vapour pipe.
6. Fuel pipe.
7. Separation tank.
8. Adsorption canister.
9. Purge line.
10. Restricted connection.
11. Air vent.
12. Fuel pump.
13. Fuel line filter.
14. Breather pipe.
15. Oil separator.
16. Sealed oil filler cap.
17. Capacity limiting tank.
18. Air lock bleed.

Section 5-A

GENERAL DESCRIPTION

The system is designed to collect fuel vapour evaporated from the fuel in the fuel tank, and on some twin carburetter cars from the fuel in the carburetter float-chambers. The vapour is stored in an adsorption canister while the engine is stopped, and then after the engine is restarted, passed through the crankcase emission control system to the combustion chambers. While the car is being driven the vapours are drawn directly to the crankcase emission control system.

Ventilation tubes on the fuel tank ensure that vapours are vented through the control system when the car is parked on other than a level surface.

To prevent spillage of fuel by displacement due to expansion, sufficient capacity is provided in the expansion tank to accommodate the amount of fuel from a full tank which would be displaced by a high temperature rise.

By the positioning of the expansion tank connections, or by the inclusion of a small separation tank in the vapour line, liquid fuel is prevented from being carried with the vapour to the storage canister.

IMPORTANT. The fuel and oil filler caps seal the system, and it is essential for its efficient function that they are correctly refitted after removal.

Adsorption canister

The adsorption or vapour storage canister mounted in the engine compartment contains activated charcoal (carbon) granules. Filter pads are fitted at both sides of the charcoal to filter incoming ventilating air and to prevent the granules from leaving the canister through the purge line. The ventilation air filter pads on canisters fitted prior to 1973 models, required renewing every 12,000 miles, the later sealed type canisters are renewed complete every 24,000 miles. Vapour tubes from the fuel

tank and carburetter float-chambers and the purge line from the engine breather system are connected to the ports on the top of the canister. The port on the bottom section provides a connection for the ventilating air tube.

Fuel vapour entering the canister through the vapour tubes is adsorbed and held by the charcoal. When the engine is started, air is drawn by the crankcase emission control system, through the ventilation tube and into the canister. As the air passes over the charcoal granules the vapours are given up and are carried with the air through the crankcase emission system to the combustion chambers.

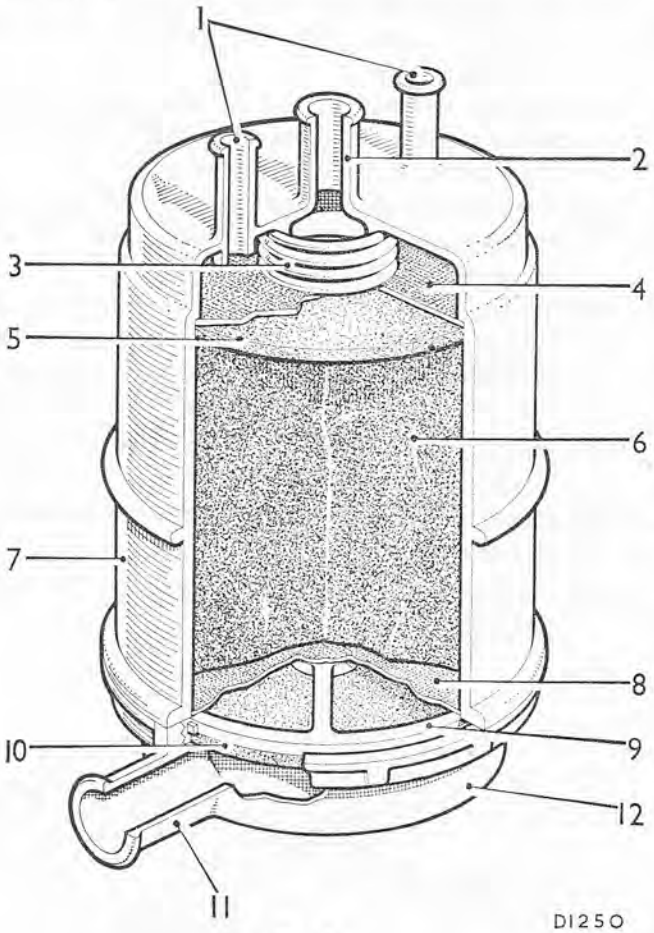


Fig. 3

The adsorption canister

1. Vapour pipe connections.
2. Purge pipe connection.
3. Spring.
4. Gauze.
5. Filter pad.
6. Charcoal granules.
7. Canister.
8. Gauze.
9. Retainer.
10. Filter pad.
11. Air vent connection.
12. End cap.

Fuel expansion

Two methods are used to ensure that sufficient space is available to accommodate fuel displaced by expansion due to high ambient temperatures. The method used on the Austin America is by fitting an additional tank into which the displaced fuel flows when the volume of the fuel exceeds that of the fuel tank. The MGB and MG Midget use an air lock chamber in the fuel tank which prevents the tank being completely filled with fuel, thereby ensuring that sufficient space is always available for expansion.

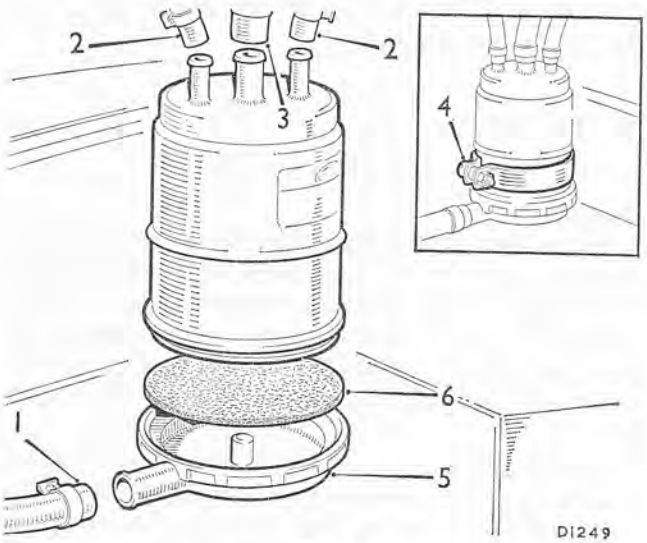


Fig. 2

The early type adsorption canister air filter pad

1. Air vent tube.
2. Vapour pipes.
3. Purge pipe.
4. Canister securing clip.
5. End cap.
6. Air filter pad.

Fuel line filter

On some models an additional renewable filter is fitted in the main fuel line as an added safeguard against foreign matter causing the setting of the carburetter float-chamber level to be exceeded.

Mixture temperature compensator

On some applications a small temperature-sensitive valve is fitted adjacent to the carburetter. The valve is connected between the air cleaner and the controlled depression chamber of the carburetter.

Under conditions where fuel is entering the carburetter at high temperature, i.e. prolonged idling in high ambient temperatures, the valve opens and allows a small quantity of air to pass into the carburetter, bypassing the jet. The air leans off the mixture which has been enriched by vapours from the evaporative loss control system and by

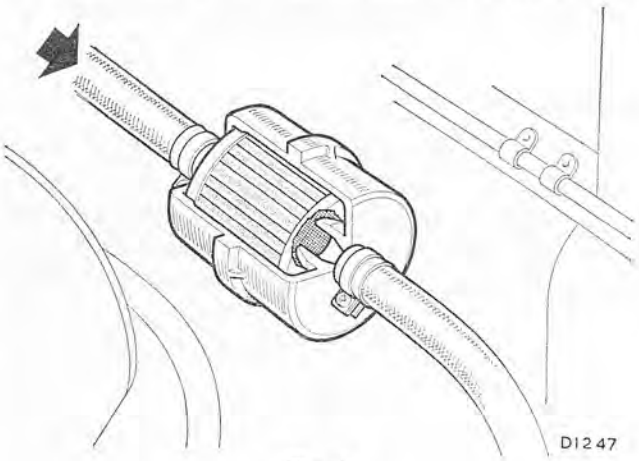


Fig. 4

The fuel line filter

the increase in fuel flow through the carburetter due to the high fuel temperature.

Section 5-B

ADSORPTION CANISTER

Renewing

The air filter fitted in the bottom section of the canister must be renewed every 12,000 miles (20000 km.) or more frequently in dusty operating conditions (early models prior to 1973 only). The complete canister must be renewed every 24,000 miles (40,000 km.) or if at any time it should inadvertently become saturated with liquid fuel.

WARNING. Do not attempt to recover a saturated canister by passing compressed air through the charcoal.

(1) Disconnect the air vent tube from the bottom of the canister.
(2) Disconnect the vapour and purge pipes from the top of the canister.
(3) Unscrew the securing clip screw and lift out the canister.
(4) If the air filter pad only is being renewed:
  (*a*) Unscrew the lower end cap of the canister.
  (*b*) Remove and discard the filter pad.
  (*c*) Clean any dirt from the cap.
  (*d*) Fit the new filter pad and refit the cap.
(5) Fit the canister ensuring that the purge pipe (from the engine rocker cover) is connected to the large centre connection on the top of the canister.

Section 5-C

FUEL LINE FILTER

Renewing

The fuel line filter must be renewed every 12,000 miles (20000 km.).

(1) Check that the ignition is switched off.
(2) Disconnect and discard the filter.
(3) Connect the new filter.
(4) Switch on the ignition and check the filter connections for fuel leakage.
(5) Start the engine and recheck for fuel leakage.

Section 5-D

LEAK TESTING

NOTE. As a preliminary check for leaks on the induction and evaporative loss control systems on cars fitted with running on control valves, temporarily block the air vent pipe of the valve while the engine is idling. If no air leaks exist in the systems the engine will stop almost immediately; if the engine continues to run an air leak is indicated.

If a fault in the operation is suspected or components of the system other than the filters or canister have been removed and refitted, the evaporative loss control system must be pressure-tested for leaks as follows:

(1) Check that there is at least one gallon of fuel in the fuel tank.
(2) Switch on the ignition for one minute to prime the fuel system.
(3) Switch off the ignition and disconnect the fuel tank ventilation pipe from its connection on the adsorption canister.
(4) Connect a 0 to 10 lb./sq. in. pressure gauge, a Schrader valve, and a low-pressure air supply (i.e. a tyre pump) to the disconnected pipe.
(5) Pressurize the system until 1 lb./sq. in. is registered on the gauge. **DO NOT EXCEED THIS PRESSURE AT ANY TIME.**
(6) Check that the gauge reading is maintained for 10 seconds without falling more than ·5 lb./sq. in. If the reading is not maintained, check the system for leaks commencing with the fuel filler cap and seal.
(7) Make a visual check for fuel leakage from the tank and its connections.
(8) Remove the fuel filler cap and check that the gauge falls to zero.
(9) Remove the test equipment and re-make the connections.

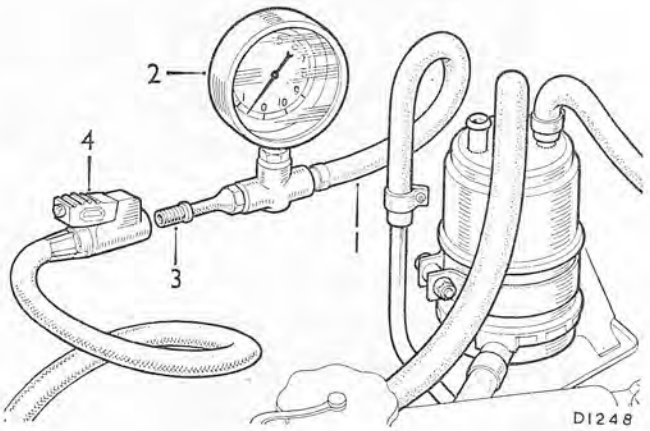


Fig. 5

Leak-testing the control system

1. Fuel tank ventilation pipe.
2. Pressure gauge.
3. Schrader valve.
4. Low-pressure air supply.

SECTION 6

TUNING DATA

MODEL: AUSTIN AMERICA

ENGINE		
Type	12H157, 12H185, 12H393, and 12H394	
Firing order	1, 3, 4, 2	
Capacity	1274·86 c.c. (77·8 cu. in.)	
Compression ratio	8·8 : 1	
Compression pressure	120 lb./sq. in. (8·44 kg./cm.²)	
Idle speed	850 r.p.m.	
Fast idle speed	1,050 r.p.m. maximum	
Valve rocker clearance	·012 in. (·305 mm.) set cold	
Stroboscopic ignition timing	3° B.T.D.C. at 1,000 r.p.m. (vacuum pipe disconnected)	
Static ignition timing	T.D.C.	
Timing mark location	Marks on flywheel, pointer on flywheel housing beneath inspection cover	
DISTRIBUTOR		
Make	Lucas	
Type	25D4	
Serial number	41220 or 41264	
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)	
Rotation of rotor	Anti-clockwise	
Dwell angle	57° to 63°	
Condenser capacity	·18 to ·24 mF	
Centrifugal advance		
Crankshaft degrees (vacuum pipe disconnected)	0° at 700 to 900 r.p.m. 12° at 1,500 to 1,700 r.p.m. 30° ± 2° at 4,500 r.p.m.	
Vacuum advance		
Starts	5 in. Hg	
Finishes	11 in. Hg	
Total crankshaft degrees	16° ± 2°	
SPARKING PLUGS		
Make	Champion	
Type	N-9Y	
Gap	·024 to ·026 in. (·62 to ·66 mm.)	
IGNITION COIL		
Make	Lucas	
Type	LA12 (early cars)	BA7 (later cars) with ballast resistor
Resistance—primary at 20° C. (68° F.)	3·2 to 3·4 ohms	1·43 to 1·58 ohms.
Consumption		
Ignition on—standing	3 to 4 amps.	4·15 amps.
at 2,000 r.p.m.	1 amp.	1·9 amps.
CARBURETTER(S)		
Make	S.U.	
Type	Single HS4	
Specification—(manual transmission)	AUD 281 (fixed needle type) AUD 379 (spring-loaded needle type) or AUD 345	
—(automatic transmission)	AUD 296 (fixed needle type) AUD 380 (spring-loaded needle type) or AUD 346	
Choke diameter	1½ in. (38·1 mm.)	
Jet size	·090 in. (2·28 mm.)	
Needle—fixed type	DZ	
—spring-loaded type	AAG	
Piston spring	Red	
Initial jet adjustment	13 flats from bridge	
Throttle damper setting	·10 in. (2·54 mm.)	
EXHAUST EMISSION		
Exhaust gas analyser reading:		
At engine idle speed	3·5% CO (maximum)	
Air pump test speed	1,200 r.p.m. (engine)	

MODEL: MGC

ENGINE

Type	29GA
Firing order	1, 5, 3, 6, 2, 4
Capacity	2912 c.c. (177·7 cu. in.)
Compression ratio	9 : 1
Compression pressure	155 lb./sq. in. (10·9 kg./cm.²)
Idle speed (manual transmission)	850 r.p.m.
Fast idle speed (manual transmission)	1,300 to 1,400 r.p.m.
Valve rocker clearance	·015 in. (·38 mm.) set cold
Stroboscopic ignition timing	4° B.T.D.C. at 1,000 r.p.m. (vacuum pipe disconnected)
Static ignition timing	T.D.C.
Timing mark location	Marks on front cover, notch on crankshaft pulley

DISTRIBUTOR

Make	Lucas
Type	25D6
Serial number	41224
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)
Rotation of rotor	Anti-clockwise
Dwell angle	34° to 37°
Condenser capacity	·18 to ·24 mF
Centrifugal advance	
Crankshaft degrees (vacuum pipe disconnected)	0° at 700 to 900 r.p.m. 16° at 1,500 to 1,700 r.p.m. 30° ± 2° at 4,000 r.p.m.
Vacuum advance	
Starts	5 in. Hg
Finishes	8 in. Hg
Total crankshaft degrees	6° ± 2°

SPARKING PLUGS

Make	Champion
Type	N-9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)

IGNITION COIL

Make	Lucas
Type	HA12
Resistance—primary	3·1 to 3·5 ohms at 20° C. (68° F.)
Consumption	
Ignition on—standing	3·9 amps.
at 2,000 r.p.m.	1·4 amps.

CARBURETTER(S)

Make	S.U.
Type	Twin HS6
Specification—fixed needle type	AUD 287
—spring-loaded needle type	AUD 342
Choke diameter	1¾ in. (44·4 mm.)
Jet size	·100 in. (2·54 mm.)
Needle—fixed type	KM
—spring-loaded type	BAD
Piston spring	Yellow
Initial jet adjustment	8 flats from bridge

EXHAUST EMISSION

Exhaust gas analyser reading:	
At engine idle speed	3% CO (maximum)
Air pump test speed	1,000 r.p.m. (engine)

MODEL: AUSTIN/MORRIS—1800 Mk. II

ENGINE

Type	18H359B, 18H360B, 18H361B, 18H362B, 18H363B, 18H364B
Firing order	1, 3, 4, 2
Capacity	1798 c.c. (109·8 cu. in.)
Compression ratio	9 : 1
Compression pressure	160 lb./sq. in. (11·25 kg./cm.²)
Idle speed	800 r.p.m.
Fast idle speed	1,100 to 1,200 r.p.m.
Valve rocker clearance	·015 in. (·38 mm.) set cold
Stroboscopic ignition timing	14° B.T.D.C. at 1,000 r.p.m. (vacuum pipe disconnected)
Timing mark location	Pointer on timing case, notch on crankshaft pulley

DISTRIBUTOR

Make	Lucas
Type	25D4
Serial number	41234
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)
Rotation of rotor	Anti-clockwise
Dwell angle	57° to 63°
Condenser capacity	·18 to ·24 mF
Centrifugal advance	
Crankshaft degrees (vacuum pipe disconnected)	14° at 800 to 1,000 r.p.m. 19° at 1,400 to 1,600 r.p.m. 42°±1° at 6,000 r.p.m.
Vacuum advance	
Starts	4 in. Hg
Finishes	12 in. Hg
Total crankshaft degrees	16°±2°

SPARKING PLUGS

Make	Champion
Type	N-9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)

IGNITION COIL

Make	Lucas
Type	HA12
Resistance—primary	3·1 to 3·5 ohms at 20° C. (68° F.)
Consumption	
Ignition on—standing	3·9 amps.
at 2,000 r.p.m.	1·4 amps.

CARBURETTER(S)

Make	S.U.
Type/Specification	HS6/AUD 314 (manual); AUD 315 (automatic)
Choke diameter	1¾ in. (44·4 mm.)
Jet size	·100 in. (2·54 mm.)
Needle	BAJ
Piston spring	Yellow
Initial jet adjustment	12 flats from bridge

EXHAUST EMISSION

Exhaust gas analyser reading:	
At engine idle speed	3% CO (maximum)
Air pump test speed	1,000 r.p.m. (engine)

MODEL: AUSTIN/MORRIS—MINI 998 c.c.

ENGINE

Type	99H292E, 99H291J, 99H354V, 99H286U
Firing order	1, 3, 4, 2
Capacity	998 c.c. (60·96 cu. in.)
Compression ratio	8·9 : 1
Compression pressure	120 lb./sq. in. (8·44 kg./cm.²)
Idle speed	800 r.p.m.
Fast idle speed	1,200 to 1,300 r.p.m.
Valve rocker clearance	·012 in. (·305 mm.) set cold
Stroboscopic ignition timing	9° B.T.D.C at 1,000 r.p.m. (vacuum pipe disconnected)
Static ignition timing	1° B.T.D.C.. to 1971; 2° B.T.D.C. from 1972 on
Timing mark location	Pointer on converter housing beneath inspection cover, marks on converter

DISTRIBUTOR

Make	Lucas
Type	25D4
Serial number	41134A to 1971; 41395 from 1972 on
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)
Rotation of rotor	Anti-clockwise
Dwell angle	57° to 63°
Condenser capacity	·18 to ·24 mF
Centrifugal advance	
Crankshaft degrees (vacuum pipe disconnected)	4° at 600 to 800 r.p.m. 16° at 1,400 to 1,600 r.p.m. 24°±2° at 3,000 r.p.m.

Vacuum advance	*To* 1971	*From* 1972 *on*
Starts	3 in. Hg	5 in. Hg
Finishes	15 in. Hg	8 in. Hg
Total crankshaft degrees	18°±2°	6°±2°

SPARKING PLUGS

Make	Champion
Type	N-9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)

IGNITION COIL

Make	Lucas
Type	LA 12
Resistance—primary	3·2 to 3·4 ohms at 20° C (68° F.)
Consumption	
Ignition on—standing	3 to 4 amps.
at 2,000 r.p.m.	1 amp.

CARBURETTER(S)

Make	S.U.
Type/Specification	HS4/AUD 398 to 1971; AUD 548 from 1972 on
Choke diameter	1½ in. (38·1 mm.)
Jet size	·090 in. (2·28 mm.)
Needle	AAG
Piston spring	Red
Initial jet adjustment	11 flats from bridge
Throttle damper setting	·080 in. (2·03 mm.)

EXHAUST EMISSION

Exhaust gas analyser reading:	
At engine idle speed	4·5% CO (maximum)

MODEL: AUSTIN/MORRIS—MINI 998 c.c.—1973 Models

ENGINE

Type	99H
Firing order	1, 3, 4, 2
Capacity	998 c.c. (60·96 cu. in.)
Compression ratio	8·9 : 1
Compression pressure	120 lb./sq. in. (84·4 kg./cm.²)
Idle speed	850 r.p.m.
Fast idle speed	1,200 to 1,300 r.p.m.
Valve rocker clearance	·012 in. (·305 mm.) set cold
Stroboscopic ignition timing	8° B.T.D.C. at 1,500 r.p.m. (vacuum pipe disconnected)
Static ignition timing	6° B.T.D.C.
Timing mark location	Pointer on converter housing beneath inspection cover, marks on converter

DISTRIBUTOR

Make	Lucas
Type	25D4
Serial number	41532
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)
Rotation of rotor	Anti-clockwise
Dwell angle	57° to 63°
Condenser capacity	·18 to ·24 mF
Centrifugal advance	
Crankshaft degrees (vacuum pipe disconnected)	8° at 1,500 to 2,100 r.p.m. 18° at 2,800 to 3,400 r.p.m. 24°±2° at 5,200 r.p.m.
Vacuum advance	
Starts	10 in. Hg
Finishes	15 in. Hg
Total crankshaft degrees	10°±2°

SPARKING PLUGS

Make	Champion
Type	N-9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)

IGNITION COIL

Make	Lucas
Type	LA 12
Resistance—primary	3·2 to 3·4 ohms at 20° C. (68° F.)
Consumption	
Ignition on—standing	3 to 4 amps.
at 2,000 r.p.m.	1 amp.

CARBURETTER(S)

Make	S.U.
Type/Specification	HS4/AUD 618
Choke diameter	1½ in. (38·1 mm.)
Jet size	·090 in. (2·28 mm.)
Needle	ABJ
Piston spring	Red
Initial jet adjustment	11 flats from bridge
Throttle damper setting	·080 in. (2·03 mm.)

EXHAUST EMISSION

Exhaust gas analyser reading:	
At engine idle speed	4·5% CO (maximum)

MODEL: SPRITE (Mk. IV)/MIDGET (Mk. III) Up to 1972

ENGINE

Type	12CD or 12CJ
Firing order	1, 3, 4, 2
Capacity	1274·86 c.c. (77·8 cu. in.)
Compression ratio	8·8 : 1
Compression pressure	120 lb./sq. in. (8·44 kg./cm.²)
Idle speed	1,000 r.p.m.
Fast idle speed	1,100 r.p.m. to 1,200 r.p.m.
Valve rocker clearance	·012 in. (·305 mm.) set cold
Stroboscopic ignition timing*	10° B.T.D.C. at 1,000 r.p.m.
Static ignition timing	4° B.T.D.C.
Timing mark location	Pointer on timing case, notch on crankshaft pulley

DISTRIBUTOR

Make	Lucas
Type	25D4
Serial number	41229 to 1971; 41271 from 1971 on
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)
Rotation of rotor	Anti-clockwise
Dwell angle	57° to 63°
Condenser capacity	·18 to ·24 mF
Centrifugal advance	
Crankshaft degrees*	4° at 500 to 700 r.p.m. 19° at 2,300 to 2,500 r.p.m. 30° ± 2° at 4,300 r.p.m.
Vacuum advance	
Starts	5 in. Hg
Finishes	8 in. Hg
Total crankshaft degrees	6° ± 2°

SPARKING PLUGS

Make	Champion
Type	N-9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)

IGNITION COIL

Make	Lucas
Type	11C12
Resistance—primary	3 to 3·4 ohms at 20° C. (68° F.)
Consumption	
Ignition on—standing	3·5 to 4 amps.
at 2,000 r.p.m.	1 amp.

CARBURETTER(S)

Make	S.U.
Type	Twin HS2
Specification—fixed needle type	AUD 266
—spring-loaded needle type	AUD 328 to 1971; AUD 404 from 1971 on
Choke diameter	1¼ in. (31·75 mm.)
Jet size	·090 in. (2·28 mm.)
Needle—fixed type	AN
—spring-loaded type	AAC
Piston spring	Blue
Initial jet adjustment	11 flats from bridge

EXHAUST EMISSION

Exhaust gas analyser reading:	
At engine idle speed	2·5% CO (maximum)
Air pump test speed	1,200 r.p.m. (engine)

* Vacuum pipe disconnected.

MODEL: M.G. MIDGET (Mk. III) from 1972 on

ENGINE

Type	12V
Firing order	1, 3, 4, 2
Capacity	1274·86 c.c. (77·8 cu. in.)
Compression ratio	8 : 1
Compression pressure	120 lb./sq. in. (8·44 kg./cm.²)
Idle speed	1,000 r.p.m.
Fast idle speed	1,100 r.p.m. to 1,200 r.p.m.
Valve rocker clearance	·012 in. (·305 mm.) set cold
Stroboscopic ignition timing*	9° B.T.D.C. at 1,500 r.p.m.
Static ignition timing	T.D.C.
Timing mark location	Pointer on timing case, notch on crankshaft pulley

DISTRIBUTOR

Make	Lucas	
Type	25D4	
Serial number	1972—41369; from 1973—41400	
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)	
Rotation of rotor	Anti-clockwise	
Dwell angle	57° to 63°	
Condenser capacity	·18 to ·24 mF	
Centrifugal advance		
Crankshaft degrees*	15° at 1,800 to 2,000 r.p.m. 24° at 2,700 to 3,100 r.p.m. 36°±2° at 4,200 r.p.m.	
	Serial No.	*Serial No.*
Vacuum advance	41369 (1972)	41400 (1973)
Starts	4 in. Hg	10 in. Hg
Finishes	9 in. Hg	15 in. Hg
Total crankshaft degrees	16°±2°	10°±2°

SPARKING PLUGS

Make	Champion
Type	N-9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)

IGNITION COIL

Make	Lucas
Type	11C12
Resistance—primary	3 to 3·4 ohms at 20° C. (68° F.)
Consumption	
Ignition on—standing	3·5 to 4 amps.
at 2,000 r.p.m.	1 amp.

CARBURETTER(S)

Make	S.U.
Type	Twin HS2
Specification	1972—AUD 502; from 1973—AUD 549
Choke diameter	1¼ in. (31·75 mm.)
Jet size	·090 in. (2·28 mm.)
Needle	1972—AAT; from 1973—ABC
Piston spring	Blue
Initial jet adjustment	11 flats from bridge

EXHAUST EMISSION

Exhaust gas analyser reading:	
At engine idle speed	1972—3% CO (maximum); from 1973, 2·5% CO (maximum)
Air pump test speed	1,200 r.p.m. (engine)

* Vacuum pipe disconnected.

MODEL: MGB

	To 1971	1971
ENGINE		
Type	18GF, 18GH, or 18GJ	18GK
Firing order	1, 3, 4, 2,	1, 3, 4, 2
Capacity	1800 c.c. (110 cu. in.)	1800 c.c. (110 cu. in.)
Compression ratio	8·8 : 1	8·8 : 1
Compression pressure	160 lb./sq. in. (11·25 kg./cm.²)	160 lb./sq. in. (11·25 kg./cm.²)
Idle speed	900 r.p.m.	900 r.p.m.
Fast idle speed	1,300 to 1,400 r,p.m.	1,300 to 1,400 r.p.m.
Valve rocker clearance	·015 in. (·38 mm.) set cold	·015 in. (·38 mm.) set cold
Stroboscopic ignition timing*	20° B.T.D.C. at 1,000 r.p.m.	15° B.T.D.C. at 1,500 r.p.m.
Static ignition timing	10° B.T.D.C.	10° B.T.D.C.
Timing mark location	Pointer on timing case, notch on crankshaft pulley	Pointer on timing case, notch on crankshaft pulley
DISTRIBUTOR		
Make	Lucas	Lucas
Type	25D4	25D4
Serial number	40897 or 41155	41339
Contact breaker gap	·014 to ·016 in. (·35 to ·40 mm.)	·014 to ·016 in. (·35 to ·40 mm.)
Rotation of rotor	Anti-clockwise	Anti-clockwise
Dwell angle	57° to 63°	57° to 63°
Condenser capacity	·18 to ·24 mF	·18 to ·24 mF
Centrifugal advance		
Crankshaft degrees*	10° at 400 to 600 r.p.m. 24° at 1,500 to 1,750 r.p.m. 30°±2° at 3,000 r.p.m.	10° at 900 to 1,100 r.p.m. 24° at 2,700 to 2,900 r.p.m. 30°±2° at 4,600 r.p.m.
Vacuum advance		
Starts	5 in. Hg	7 in. Hg
Finishes	13 in. Hg	13 in. Hg
Total crankshaft degrees	20°±2°	10°±2°
SPARKING PLUGS		
Make	Champion	Champion
Type	N–9Y	N–9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)	·024 to ·026 in. (·625 to ·660 mm.)
IGNITION COIL		
Make	Lucas	Lucas
Type	HA12	HA12
Resistance—primary	3·1 to 3·5 ohms at 20° C. (68° F.)	3·1 to 3·5 ohms at 20° C. (68° F.)
Consumption		
Ignition on—standing	3·9 amps.	3·9 amps.
at 2,000 r.p.m.	1·4 amps.	1·4 amps.
CARBURETTER(S)		
Make	S.U.	S.U.
Type	Twin HS4	Twin HS4
Specification—fixed needle type	AUD 265	—
—spring-loaded needle type	AUD 326	AUD 465
Choke diameter	1½ in. (38·1 mm.)	1½ in. (38·1 mm.)
Jet size	·090 in. (2·2 mm.)	·090 in. (2·2 mm.)
Needle—fixed type	FX	—
spring-loaded type	AAE	AAL
Piston spring	Red	Red
Initial jet adjustment	14 flats from bridge	12 flats from bridge
EXHAUST EMISSION		
Exhaust gas analyser reading:		
At engine idle speed	4·5% CO (maximum)	4·5% CO (maximum)
Air pump test speed	1,000 r.p.m. (engine)	1,000 r.p.m. (engine)

* Vacuum pipe disconnected.

MODEL: MGB from 1972 on

ENGINE

Type	18V
Firing order	1, 3, 4, 2,
Capacity	1800 c.c. (110 cu. in.)
Compression ratio	8·0 : 1
Compression pressure	160 lb./sq. in. (11·25 kg./cm.²)
Idle speed	850 r.p.m.
Fast idle speed	1,300 to 1,400 r.p.m.
Valve rocker clearance	·015 in. (·38 mm.) set cold
Stroboscopic ignition timing*	1972—16° B.T.D.C. at 1,500 r.p.m.; from 1973—11° B.T.D.C. at 1,500 r.p.m.
Static ignition timing	1972—10° B.T.D.C.; from 1973—6° B.T.D.C.
Timing mark location	Pointer on timing case, notch on crankshaft pulley

DISTRIBUTOR

Make	Lucas	
Type	25D4	
Serial number	1972—41370; from 1973—41491	
Contact breaker gap	·014 to ·016 in. (·36 to ·41 mm.)	
Rotation of rotor	Anti-clockwise	
Dwell angle	57° to 63°	
Condenser capacity	·18 to ·24 mF	
Centrifugal advance	*Serial No.* 41370 (1972)	*Serial No.* 41491 (1973)
Crankshaft degrees*	20° at 1,700 to 2,000 r.p.m.	16° at 1,800 to 2,250 r.p.m.
	35° at 3,300 to 3,900 r.p.m.	32° at 3,600 to 4,050 r.p.m.
	41°±2° at 4,800 r.p.m.	39°±2° at 4,800 r.p.m.
Vacuum advance		
Starts	7 in. Hg	10 in. Hg
Finishes	13 in. Hg	15 in. Hg
Total crankshaft degrees	6°±2°	10°±2°

SPARKING PLUGS

Make	Champion
Type	N-9Y
Gap	·024 to ·026 in. (·625 to ·660 mm.)

IGNITION COIL

Make	Lucas
Type	HA12
Resistance—primary	3·1 to 3·5 ohms at 20° C. (68° F.)
Consumption	
Ignition on—standing	3·9 amps.
at 2,000 r.p.m.	1·4 amps.

CARBURETTER(S)

Make	S.U.
Type	Twin HIF4
Specification	1972—AUD 493; from 1973—AUD 550
Choke diameter	1½ in. (38·1 mm.)
Jet size	·090 in. (2·2 mm.)
Needle	1972—AAU; from 1973—ABD
Piston spring	Red
Initial jet adjustment	2 turns down from bridge

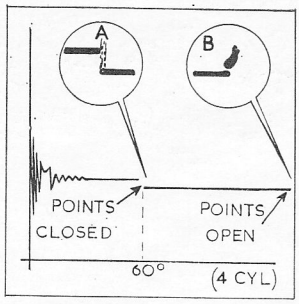
EXHAUST EMISSION

Exhaust gas analyser reading:	
At engine idle speed	1972—3·5% CO (maximum); 1973—2·5% CO (maximum)
Air pump test speed	1,000 r.p.m. (engine)

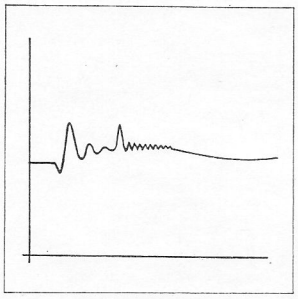
* Vacuum pipe disconnected.

SPEED ENGINE	TEST	COMPONENT CONDITION	READ/OBSERVE
START (cranking)	Cranking voltage	Battery; starting system	Voltmeter
	Cranking coil output	Coil and ignition circuit	Scope trace
	Positive crankcase ventilation/ cranking vacuum	Crankcase emission equipment	Vacuum gauge
IDLING (see 'TUNING DATA')	Idle speed	Carburetter idle setting	Tachometer
	Dwell	Distributor/drive; points	Dwell meter; scope
	Initial timing	Spark timing setting	Timing light
	Fuel mixture	Carburetter setting	Exhaust gas analyser
	Manifold vacuum	Engine idle efficiency	Vacuum gauge
FAST IDLE (see 'TUNING DATA')	Dwell variation	Distributor mechanical	Dwell meter
	Coil polarity	Ignition circuit polarity	Scope trace
	Cam lobe accuracy	Distributor cam	Scope trace
	Secondary circuit	Plugs; leads; cap; rotor	Scope trace
	Coil and condenser condition	Coil windings; condenser	Scope trace
	Breaker point condition	Points closing/opening/bounce	Scope trace
	Spark plug firing voltage	Fuel mixture; compression; plug/ rotor gaps	Scope trace
ACCELERATE— DECELERATE	Spark plugs under load	Spark plugs	Scope trace
	Carburetter open/close action	Carburetter	Exhaust gas analyser and vacuum gauge
TURNPIKE (Maximum ignition advance speed see 'TUNING DATA')	Timing advance	Distributor mech./vacuum advance	Timing light/advance meter
	Maximum coil output	Coil; condenser; ignition primary	Scope trace
	Secondary circuit insulation	H.T. cables, cap, rotor	Scope trace
	Charging voltage	Regulator; cut-out	Voltmeter
	Fuel mixture	Air cleaner, carburetter	Exhaust gas analyser
	Exhaust restriction	Exhaust system	Vacuum gauge

READINGS	CHECK SEQUENCE—FAULT LOCATION
9·6 volts minimum at the battery	Battery—connections/cables—starter motor—dynamo/alternator—regulator
17 KV. minimum	Ignition coil
6—10 in. Hg (crankcase ventilation operating) 8—15 in. Hg (crankcase ventilation blanked)	Hoses and connections—Oil filler cap—Valve rocker clearance—Emission valve—Gulp valve—Oil separator—Servo (if fitted)—Inlet manifold leaks—Valves or seats—Piston rings—Any air leak to crankcase
See **'TUNING DATA'**	Carburetter adjustment—Hoses and connections—Gulp valve—Servo (if fitted)—Carburetter limit valve or mechanical condition
4-cyl. : 57 to 63°; 6-cyl. : 34 to 37°. See Pattern 1 (see inset A)	Breaker points—Distributor and drive mechanical condition
See **'TUNING DATA'**	Distributor adjustment
See **'TUNING DATA'**	Carburetter adjustment—Hoses and connections—Gulp valve—Crankcase emission valve—Servo (if fitted)—Carburetter limit valve or mechanical condition—Air pump—Check valve—Spark plugs
12 in. Hg minimum (engine fully run in)	Hoses and connections—Gulp valve—Inlet manifold leaks—carburetter limit valve—Valves or seats—Piston rings
Variation of 2° maximum	Distributor and drive mechanical condition
See Pattern 2 (Trace inverted)	Ignition circuit connections—Ignition coil
3° max. variation. See Pattern 3 (inset A correct; inset B—overlap indicates cam error)	Distributor mechanical condition (cam)
Standard pattern	Spark plugs and leads—Breaker points—Carburetter adjustment—Hoses and connections—Gulp valve—Servo (if fitted)
See Pattern 4 (lack of oscillations indicate fault)	Ignition coil—Condenser
See Pattern 1 (inset B)	Breaker points—Condenser
See Pattern 5; voltage 6—9 kV	Spark plugs and leads—Distributor cap and rotor—Carburetter adjustment (multi-carburetters)
See Pattern 6; acceptable voltage rise 6 to 10 kV	Spark plugs and leads
Initial rich, lean off at throttle closure	Carburetter limit valve and mechanical condition—Hoses and connections—Gulp valve—Air pump
See **'TUNING DATA'**	Distributor mechanical condition, vacuum unit, centrifugal weights and springs
Standard pattern; minimum reserve $\frac{2}{3}$ more than requirement	Ignition coil—H.T. circuit insulation
Standard pattern	H.T. leads—Distributor cap and rotor
14·5 volts; steady reading	Cut-out—Voltage regulator—Dynamo/Alternator
Leaning off following peak when test speed is reached	Hoses and connections—Carburetter adjustment—Air cleaners—Gulp valve—Air pump—Check valve—Injectors
No variation in reading at constant speed for 10 sec.	Exhaust system



Pattern 1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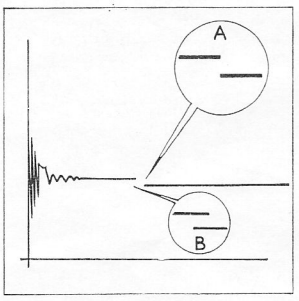
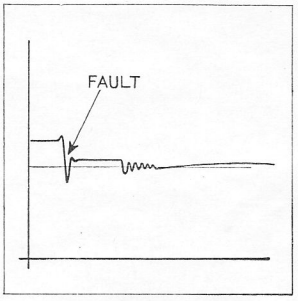
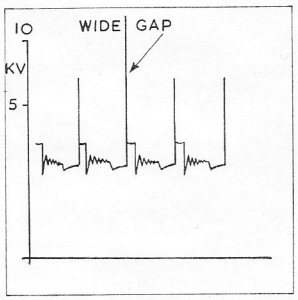


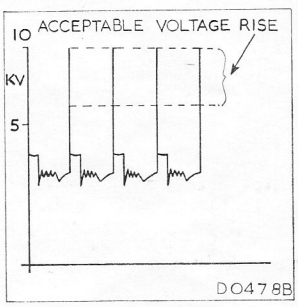
Pattern 3



Pattern 4



Pattern 5



Pattern 6