TRIUMPH

SPITFIRE MK. 3 AND TR4A

INCORPORATING EMISSION CONTROL EQUIPMENT

Workshop Manual Supplement

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TRIUMPH

SPITFIRE Mk III
and
TR 4A

WORKSHOP MANUAL
SUPPLEMENT

CONTENTS

EMISSION CONTROL SYSTEM

Relating to Triumph Vehicles

Fitted with S.U. Carburettors (Specifications AUD284 and 285)

INTRODUCTION –

The information contained in this supplement applies specifically to the emission control systems of the Spitfire Mk 3 and the TR. 4A. All other information required for servicing these vehicles is contained in the Spitfire Workshop Manual, Part Number 511243, and the TR. 4A Workshop Manual, Part Number 510322.

General Requirements

All 1968 vehicles entering the United States of America will be required to comply with Federation Regulations (31 C.F.R., Part 85) governing the emission of Hydrocarbons and Carbon Monoxide from exhaust systems.

The Federal limit for exhaust emissions are as follows:

1. Vehicles with an engine displacement of 50 cubic inches or more but not in excess of 100 cubic inches:
   (i) Hydrocarbons –410 parts per million.
   (ii) Carbon Monoxide – 2.3 percent by volume.

2. Vehicles with an engine displacement in excess of 100 cubic inches but not more than 140 cubic inches:
   (i) Hydrocarbons – 350 parts per million.
   (ii) Carbon Monoxide – 2.0 percent by volume.

3. Vehicles with an engine displacement in excess of 140 cubic inches:
   (i) Hydrocarbons – 275 parts per million.
   (ii) Carbon Monoxide – 1.5 percent by volume.

In addition to the above requirements, existing regulations concerning the Crankcase emission will also apply. The respective category of both models mentioned below, are as follows :

Model Designation	Engine Cubic Capacity	Category
Spitfire III	79.2 cubic inches	50–100 C.I.D.
TR4A	130.5 cubic inches	100–140 C.I.D.

The instructions given on the following pages relate specifically to emission control of the Triumph Spitfire III and TR4A and are supplementary to the basic information given in the respective Workshop Manuals.

ENGINE MODIFICATIONS - SPITFIRE III

Conformity with regulations imposed by the U.S.A. for controlling the engine emission of free Hydrocarbon and Carbon Monoxide is achieved by alterations to the carburation and combustion characteristics. Brief details of modifications incorporated are as follows:

1. **Exhaust Valves**
   Stellite faced exhaust valves are fitted to maintain effective valve seating between servicing intervals.

2. **Cylinder Head**
   A modified cylinder head is fitted, giving a compression ratio of 8.5 : 1 which, together with a new camshaft, significantly reduces emissions.

3. **Camshaft**
   A new camshaft with 10 – 10 – 50 – 50 timing is fitted to give better control of emissions during idling and low speed cruising.

4. **Ignition Distributor**
   The system includes a special distributor which, has an extended operation range to permit a retarded static setting whilst maintaining the normal advance characteristics at higher engine speeds.

5. **Crankcase Emission Control Valve**
   The emission control valve as fitted to the system is essentially a depression control device; the inlet pipe being connected to the engine crankcase and the outlet to the induction manifold. Manifold depression is used to remove the blow-by gases yet facilitate satisfactory idling.

6. **Spark Plugs**
   Champion UN 12Y sparking plugs are designed to give improved combustion.

7. **Carburettors**
   Twin S.U. (Emission) Carburettors are fitted. These instruments incorporate the following special features:

   (a) **Throttle disc poppet valve** – This is a small spring loaded poppet valve set in the carburettor throttle disc. At high manifold depression, that is during overrun with throttle closed, the valve opens to supplement the volume of fuel/air mixture which, together with a retarded ignition setting, maintains correct combustion.

   (b) **Jet adjustment restrictors** – This is a locking device fitted to each carburettor for restricitng the adjustment of mixture strength. Once the correct mixture has been achieved at the factory, the restrictor is locked to prevent further enrichment of the mixture. Subsequent re-adjustment within the range of the restrictor can only weaken the mixture.

   (c) **Needle** – A new needle is fitted to provide a weaker mixture.

   (d) **Piston Damper** – The piston damper is modified to restrict movement of the barrel. This provides a more immediate effect on the piston to give maximum acceleration with the weaker needle.

ENGINE MODIFICATIONS - TR4A

The specification of the TR4A remains unaltered except for the following details:

1. **Carburettor**
   To conform with emission requirements the twin S.U. carburettors incorporate the following:
   (a) **Needle** – A new needle is fitted to provide a weaker mixture.

   (b) **Main Jet** – A new main jet is fitted to suit the revised needle.

   (c) **Piston Damper** – The piston damper is modified to restrict movement of the barrel. This provides a more immediate effect on the piston to give maximum acceleration with the weaker needle and jet settings.

   (d) **Throttle Disc Poppet Valve** – This is a small spring loaded poppet valve set in the carburettor throttle disc. At high manifold depression, that is during overrun with throttle closed, the valve opens to supplement the volume of fuel/air mixture which, together with a retarded ignition setting, maintains correct combustion.

2. **Ignition Distributor**
   The system includes a special distributor which has an extended operating range to permit a retarded static setting whilst maintaining the normal advance characteristics at higher engine speeds.

GENERAL SERVICING PROCEDURE

Because of the extreme improbability of analytical equipment being available generally, checks using the "Sun" recognised equipment or other similar equipment, will prove adequate for dealing with a stable system that has proper testing and monitoring when the vehicle is first built. Durability testing on development vehicles indicates that once the system has been set correctly it will remain so, and may well improve, until severe deterioration in performance or misfiring indicate the need for attention. Routine servicing, carried out at the specific mileage intervals quoted in the publications provided with each new vehicle, should rectify or lessen this deterioration.

The procedures listed below and described in greater detail on the following pages relates to those items which affect emission control. This work must not be attempted by the owner but should be entrusted only to an authorised Triumph Dealer.

Cylinder Compressions
Ignition distributor
- Maintenance
- Performance checks
- Timing marks
- Ignition timing.

Carburettors
- General requirements
- Maintenance
- Basic tuning
- Reconditioning
- Complete tuning

Emission control valve

CYLINDER COMPRESSIONS (Fig. 1)

To maintain the quality of engine emission within the prescribed limits, given on Page 1, it is extremely important that the valve seatings and combustion chambers continue to remain gas-tight. The general condition of these items can be assessed by measuring and comparing the compression pressures of all cylinders, at 6,000 mile intervals, in the following manner.

(a) Immediately after a run, that is whilst the engine is at normal running temperature and the battery is fully charged, stop the engine apply the handbrake, engage neutral and remove all sparking plugs.

(b) Assemble the correct adaptor to the compression tester and insert the adaptor into No. 1 plug hole in the cylinder head.

(c) Press the solenoid starter button and hold it for 2 – 3 seconds before reading and noting the pressure indicated on the gauge. Repeat the procedure with each of the remaining cylinders. The readings should be within 5 p.s.i. of each other.

As this service coincides with sparking plug servicing, clean, reset the gaps and test (at 6,000 miles), and renew the plugs (at 12,000 miles) before refitting them to the cylinder head.

IGNITION DISTRIBUTOR

Emission Distributors fitted to Spitfire III and TR4A engines have an extended operating range to permit a retarded static setting whilst maintaining the normal advance characteristics at higher engine speeds. Adjustment, servicing and overhaul procedures for these distributors are identical to those given in the respective Workshop Manuals.

1. Maintenance

(a) **At the First 1,000 miles (Free Service)**

(i) Check the contact breaker gap and re-adjust to 0.014″ – 0.016″ if required.

(ii) Using a strobescope, check the ignition timing at the correct idling speed: See Sheet D1.

(b) **Every 6,000 miles**

Lubricate the distributor and re-adjust or renew the contact breaker points in accordance with instructions given in the current Workshop Manuals.

(c) **Every 12,000 miles**

In addition to the 6,000 miles service, check the ignition timing at idling.

2. Performance Checks (Fig. 2)

Should the distribution performance be suspect, or if the unit has been dismantled for the purpose of fitting new components to the automatic advance or retard mechanism, check the distributor by using proper equipment, to ensure that it performs within the limits quoted on pages 23 and 24.

3. **Timing Marks** (Fig. 3)

(a) **Spitfire III** – When No. 1 piston is at T.D.C., a hole on the inside face of the crankshaft pulley, near the periphery, aligns with edge of a pointer attached to the timing cover. A mark is also scored across the periphery of the pulley at two degrees in retard of the T.D.C. position. This is the idling timing mark.
To establish the static setting of 6° A.T.D.C., use a pair of dividers to make an additional mark $\frac{5}{32}$" in retard of the idling mark.

(b) **TR4A** – When No. 1 piston is at T.D.C., a hole on the inside face of the crankshaft, near the periphery, aligns with a pointer attached to the timing cover.

Model	Idle Speed	Ignition Static	Ignition at Idle
	(R.P.M.)	Crankshaft Degrees	Crankshaft Degrees
Spitfire III TR4A	800/850 850/900	6° A.T.D.C. T.D.C.	2° A.T.D.C. T.D.C.

4. **Ignition Timing**

If the distributor has been removed from the engine, use the static timing only for starting the engine. As this method cannot achieve the extreme accuracy required for the proper functioning of the emission control system, it is vitally important that the final ignition setting is made dynamically as follows:

(a) Prepare the timing marks of the Spitfire III by filling in the idling timing mark with white paint or chalk and similarly treating the straight edge of the pointer to make them visible when using a stroboscopic lamp. In the case of the TR4A, make a white mark on the periphery of the pulley in line with the T.D.C. hole.

(b) Connect a stroboscopic timing lamp and tachometer to the engine in accordance with instructions provided by the manufacturer of the equipment in use.

(c) Start the engine and when normal running temperature is reached, check and if necessary set the idling speed in accordance with the above table by turning both carburettor throttle stop screws an equal amount to achieve this speed.

(d) Set the vernier adjuster to the mid-point of its range. Slacken the distributor damping plate bolt (Fig.6) and rotate the distributor body until the idling mark on the crankshaft pulley aligns with the timing pointer under the beam of the stroboscopic lamp. This may necessitate re-adjustment of the throttle stop screws to maintain the correct idle speed.

(e) Re-tighten the distributor clamp bolt securely, recheck the timing and if satisfactory, remove the stroboscopic lamp and tachometer.

S.U. (EMISSION) CARBURETTORS

Servicing Procedure

General

S.U. Emission carburettors (N.A.D.A. Specification AUD 285) are produced to a special anti-pollution standard, and must not under any circumstances be interchanged with carburettors not to this specification. Servicing requirements are restricted to the operations given under "Periodic Servicing" or, if necessary, to those described under "Carburettor Reconditioning".

Periodic tuning must be carried out according to "Basic Tuning Procedure" pages 6 and 7 or, if reconditioning has been carried out, to "Complete Tuning Procedure" given on pages 12 and 13.

Periodic Servicing

1. **At the first 1,000 miles (Free Service)**
   (a) Top up damper reservoirs with 20 S.A.E. or engine oil (see Handbook) to $\frac{1}{2}$" above piston rod.
   (b) Check, and if required, set slow running according to basic tuning instructions given on page 7.

2. **At 6,000 Miles Interval**
   At these periods perform the operations 1 (a) and 1 (b) listed under 1,000 miles free service.

3. **50,000 Miles Service**
   At this stage it is recommended that the old carburettors are removed, rebuilt (according to "Reconditioning" pages 8 – 11) and/or substituted by complete new exchange units. To conform with the mileage interval pattern of the vehicle general regular maintenance procedures, it is suggested for convenience that this be performed at 48,000 miles routine vehicle service.

BASIC TUNING

1. **Tuning Conditions**

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

(a) Connect a tachometer as instructed by the instrument manufacturer.
(b) Run the engine at fast idle speed until normal operating temperature is reached – preferably with the car standing in an ambient temperature of between 60° and 80°F (16° to 27°C). Continue to run engine for at least five minutes after the thermostat has opened; the thermostat opening point can be detected by a sudden rise in the temperature of the radiator header tank.
(c) Set the engine speed at 2500 r.p.m. at no load, and run for one half minute.
(d) Tuning operations may now be commenced and must be carried out in the shortest possible time. At the end of each tuning period of three minutes open the throttle and run the engine at 2500 r.p.m. for half a minute then resume tuning. Repeat this clearing operation every three minutes until tuning is completed.

2. Tuning Procedure

Mixture adjustment is permissible only within the limits of the restrictors, which, at this stage, must not be removed or re-positioned.

(a) Remove the air cleaners and gaskets.
(b) Perform maintenance operation 1 (a) (See page 6).
(c) Using a suitable instrument to measure the air intake of both carburettors, check the carburettors for balance. See Fig. 9. If the carburettors are in balance and the idling speed is correct to that given below and engine is running even and smoothly, carry out the checks 2 (f), (i) to (vii), (See page 22).
(d) If the carburettors are out of balance refer to "Carburettor Complete Tuning" operations 1 (a) to 1 (f), 3 (a) to 3 (d) and 5 (a) to 5 (e). See pages 12 and 13.
(e) If satisfactory idling at the required speeds cannot be achieved, after balancing, adjust the mixture as follows:
  (i) Turn the jet adjusting nut (28) Fig 11, on both carburettors by the same amount within the limits of the restrictor. Achieve the maximum speed consistent with smooth running.
  (ii) Re-check the idling speed and adjust if necessary by altering both idling screws (60), Fig. 13, by the same amount. Re-check with the air balance meter.

If consistent idle at the correct speed cannot be attained by this procedure, refer to "Carburettor Reconditioning" Sheets 8 – 11.

(f) (i) Check the actuating pins of the inter-connecting clamping levers are set 0.015" from the lower edge of the fork (see Fig. 16), and that there is a total of $\frac{1}{32}$" end play between the inter-connecting clamping levers and the throttle nuts.
  (ii) Check that when the mixture control is operated both jets commence to move simultaneously.
  (iii) With a balancing meter check that the carburettors are in balance at an engine speed of 1500 r.p.m.
  (iv) Ensure there is $\frac{1}{16}$" free movement of the mixture control wire before it starts to actuate the jet levers.
  (v) Check that with the mixture control pulled out to a position where the jets are just about to drop, the correct fast idle speed is obtained. (See page 21).
  (vi) If any of the above points require attention refer to Final Adjustment, page 13.
  (vii) Top up damper, etc. (page 6).

S.U. (EMISSION) CARBURETTORS

DISMANTLING

1. **Suction Chamber** (Fig. 10).
   (a) Unclip the baffle plate (9) from the inlet nozzle and thoroughly clean the outside of the carburettor.
   (b) Mark the relative positions of the suction chamber and the carburettor body to facilitate reassembly (see "Y").
   (c) Remove the damper (1) and its washer (2). Empty the damper oil from the piston.
   (d) Unscrew retaining screws (4) and lift off the chamber (3) without tilting it.
   (e) Remove the piston spring (5) and carefully lift out the piston assembly (6).
   (f) Remove the needle locking screw (7) and withdraw the needle (8). If it cannot be easily removed, tap the needle inwards first and then pull outwards. Do not bend or scratch the needle.
   (g) Remove the retaining circlip (10) and spring (11), then push the lifting pin (12) upwards to remove it from its guide.

2. **Jet Linkage and Assembly** (Fig. 11)
   The following procedure refers specifically to the Spitfire III jet linkage. The slight differences incorporated on the TR4A linkage are shown on Fig. 11 inset.
   (a) Support the moulded base of the jet assembly (31) and slacken the screw (24) retaining the jet pick-up link (22).
   (b) Relieve the tension of the pick-up lever return spring (13) from the screw and remove screw (24) and brass bush (23), if fitted.
   (c) Unscrew the brass sleeve nut (34) retaining the flexible jet tube (32) to the float-chamber and withdraw the jet assembly from the carburettor body. Note the gland (36), washer (35) and ferrule (33) at the end of the jet tube.
   (d) Remove the jet adjusting nut (28), jet adjustment restrictor (27) and spring (26). Unscrew the jet locking nut (25) and detach the nut and jet bearing (29). Withdraw the bearing from the nut, noting the steel locking washer (30) under the shoulder of the bearing.
   (e) Noting the location points of the two ends of the pick-up lever return spring, unscrew the lever pivot bolt (18) together with its double coil spring washer (17). Detach the lever assembly (14) and return spring (13).
   (f) Noting the location of the two ends of the cam lever spring (16), push out the pivot bolt tube (19), taking care not to lose the spring. Lift off the cam lever (20) and take out the skid washer (21) from between the two levers.

3. **Float Chamber Assembly** (Fig. 12)
   (a) Slacken and remove the bolt (51) retaining the float-chamber to the carburettor body. Note the component sequence with flexibly mounted chambers.
   (b) Mark the location of the float-chamber lid (37). Unscrew the lid retaining screws (39) and detach the lid (38) and its gasket (42), complete with float assembly.
   (c) Push out the float hinge pin (45) from the end opposite its serrations and detach the float (46).
   (d) Extract the float needle (44) from its seating and unscrew the seating (43) from the lid, using a box spanner .338in. (8.85mm) across the flats. Do not distort the seating.

DISMANTLING - Cont.

4. **Throttle Disc Assembly** (Fig. 13)
   (a) Close the throttle and mark the relative positions of the throttle disc (59) and the carburettor flange. Do not mark the throttle disc in the vicinity of the over-run valve.

   (b) Unscrew the two disc retaining screws (58). Open the throttle and ease out the disc (57) from its slot in the throttle spindle (52). The disc is oval and will jam if care is not taken. Store the disc in a safe place until required for reassembly.

   (c) Tap back the tab washer (55) securing the spindle nut. Note the location of the lever arm in relation to the spindle and carburettor body; remove the nut (56), detach the tab washer (55), fork lever (54), lever (53) and withdraw the spindle (52).

REBUILD

1. **Throttle Disc Assembly** (Fig. 13)
   (a) Examine the throttle spindle (52) and its bearings in the carburettor body. Check for excessive play and renew parts as necessary.

   (b) Refit the spindle to the body. Assemble the operating levers (53) (54) with tab washer (55) and spindle nut (56) to the spindle. Ensure that when the stop on the throttle lever is against the abutment on the carburettor 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.

   (c) Re-insert the throttle disc (57) to its original position in the slot of the spindle as marked (59). Manoeuvre the disc in its slot until the throttle can be closed, taking care not to damage the throttle over-run valve. When assembled, the valve should be positioned below the throttle spindle and the head of the valve should face the engine. Fit two new retaining screws (58) but do not fully tighten. Check visually that the disc closes fully, and adjust its position as necessary. With the throttle closed there must be clearance between the throttle lever and the carburettor body. Tighten the screws fully and spread their split ends just enough to prevent turning.

2. **Float Chamber Assembly** (Fig. 12)
   (a) Examine the float needle (44) and seating (43) for damage. Check that the spring-loaded plunger in the end of the plastic-bodied needle operates freely.

   (b) Screw the seating carefully into the float-chamber lid (38). Do not overtighten. Replace the needle in the seating, coned end first. Test the assembly for leakage with air pressure at $1\frac{1}{2}$ to 2 p.s.i.

   (c) Refit the float and lever (46) to the lid, insert the hinge pin (45) 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 $\frac{3}{16}$" (4.8mm) gap between the float lever and the rim of the float chamber lid. (See Fig. 15).

   (d) Examine the lid gasket (42) for re-use. If satisfactory, assemble the gasket to the lid and refit the lid to the float chamber in the position marked during dismantling. Tighten the securing screws evenly.

   (e) Refit the float chamber assembly to the carburettor body and fully tighten the retaining bolt (51), making sure that the rubber mounting details and backing washer, items (50), (49) and (48), are assembled in the correct order and engage with the register on the body. Do not inter-mix the rubbers of a pair of carburettors.

REBUILD - Cont.

3. Suction Chamber (Fig. 10)

(a) Refit the piston lifting pin (12), spring (11) and circlip (10).

(b) Using gasolene or denatured alcohol as a cleaning agent, scrupulously clean and examine the surfaces of the piston and piston rod for damage. Wipe dry using a clean cloth. Do not use abrasive.

(c) Similarly clean the inside of the suction chamber and piston rod guide. Refit the damper assembly (1) and washer (2). Seal the transfer holes in the piston assembly with rubber plugs or corks and fit the assembly to the suction chamber as shown on Fig. 17. Invert the complete assembly and allow the suction chamber to fall away from the piston. This should take 3 to 5 seconds for Spitfire carburettors of 1¼in. (31.75mm) bore, or 5 to 7 seconds for TR4A carburettors.

(d) Refit the needle (8) to the piston assembly, ensuring that the lower edge of the needle shank is level with the bottom of the piston rod as shown on Fig. 14 inset. Fit a new needle locking screw (7) and tighten. Invert the suction chamber and spin the piston assembly inside it to check for needle concentricity.

(e) Check the piston key for security in the carburettor body. Refit the piston assembly to the body and replace the piston spring (5) over the piston rod. Fit the suction chamber (3) and retaining screws (4), taking care not to "wind up" the piston spring during assembly. Tighten the screws evenly.

4. Jet Assembly (Fig. 11)

(a) Refit the jet bearing (29), a new locking washer (30), and the locking nut (25). Do not tighten the nut. Ensuring that the bore of the jet bearing is clean and dry.

(b) Centralise the jet as follows:

(i) Enter the end of the nylon feed tube (32) into the base of the float chamber, without the gland (36) or washer (35) fitted, and loosely secure with the retaining nut (34).

(ii) Feed the jet (31) into the jet bearing (29). Do not fit the spring (26), jet adjustment restrictor (27), or adjusting nut (28) at this stage.

(iii) With the carburettor positioned with its inlet flange downwards, and referring to Fig. 18, insert the piston loading tool into the 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 carburettor.
The tool and carburettor must remain in this position throughout the centring operation.

(iv) With the piston at the bottom of its travel, that is resting on the bridge, and the jet hard up against the bearing, slowly tighten the jet locking nut. During the tightening process ensure that the jet does not bind within the bearing when the jet is drawn in and out. If tightness is detected, slacken the jet locking nut and repeat the process. Upon completion of this operation, check that the locking nut is fully tightened.

(v) Remove the jet loading tool.

(c) Withdraw the jet and tube; refit the spring (26), restrictor (27) and adjusting nut (28). Fit the gland (36) and washer (35) to the flexible tube (32), check that the internal ferrule (33) is positioned in the end of the tube. The end of the tube should project a minimum of $\frac{3}{16}$" (4.8mm) beyond the gland. Refit the jet and tube. Tighten the sleeve nut (34) until the neoprene gland is compressed. Overtightening can cause leakage.

(d) Refit the damper (1) and washer (2).

REBUILD - Cont.

5. Jet Linkage Assembly (Fig. 11)

(a) Re-assemble the pick-up lever (14), (22), cam lever (20), cam lever spring (16), skid washer (21) and pivot bolt tube (19) in the positions noted on dismantling.

(b) Place the pick-up lever return spring (13) in position over its boss and secure the lever assembly to the carburettor body with the pivot bolt (18). Ensure that the double-coil spring washer (17) fits over the projecting end of the pivot bolt tube (19).

(c) 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 of the carburettor body.

(d) Fit the brass ferrule (23) to the hole in the end of the pick-up link (22). Relieve the tension of the return spring (13) and fit the link to the jet (31) with its retaining screws (24). When finally tightening the screw, support the moulded end of the jet.

(e) Refit the baffle plate (9) to the float chamber lid nozzle.

6. Datum Settings

These settings should be carried out immediately upon completion of servicing procedure before carburettor is refitted to the engine.

NOTE: The following settings are merely a starting point with which to commence "Carburettor Tuning Complete", see pages 12 and 13). They must not be regarded as a final setting.

(a) Without removing suction chamber, turn the jet adjusting nut up to its highest (i.e. weakest) position, and then turn the nut down until the jet is flush with the bridge (i.e. the platform on which the jet is positioned) of the carburettor. For both the Triumph TR4A and the Triumph Spitfire Mk III turn down the jet nut by ten flats.

(b) Refit the carburettors and linkage to the inlet manifold using new flange gaskets.

(c) Tune the carburettors in accordance with the instructions given in "Carburettor Tuning Complete" (see pages 12 and 13).

CARBURETTOR COMPLETE TUNING

NOTE: This complete tuning procedure can only be undertaken when the carburettors being used are either new ex-factory units or have been stripped and rebuilt according to "Carburettor Reconditioning" (see pages 8 – 11).

1. Preparation

(a) Slacken both clamping bolts on the throttle spindle inter-connections.

(b) Unscrew the fast idle screw on each carburettor until both screws are well clear of the cam.

(c) Disconnect the jet control inter-connection by slackening the clamping bolts

(d) Disconnect the mixture control wire.

(e) Unscrew the throttle adjusting screw on each carburettor until both screws are just clear of their stops and the throttles are closed.

(f) Set each throttle adjustment screw a half turn open.

(g) Top up damper

2. Tuning Conditions

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

(a) Connect a tachometer as directed by the instrument manufacturer.

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

(c) Set the engine speed at 2500 r.p.m. at no load, and run for one half minute.

(d) Tuning operation may now be commenced and must be carried out in the shortest possible time. If the time for setting exceeds a three minute period, open the throttle and run the engine at 2500 r.p.m. for a half minute, then resume tuning. Repeat this clearing operation if further periods of three minutes are exceeded.

3. Balancing

(a) Start the engine and warm up in accordance with "Tuning Conditions" (see 2 (b) above).

(b) Adjust each throttle screw by the same amount to attain the idling speed given on page 22.

(c) Using a suitable instrument to measure the air intake of each carburettor, balance the carburettors in accordance with the instrument manufacturer's instructions, and maintain the correct idle speed by altering the throttle adjusting screws.

(d) If correct balance cannot be attained, check the intake system for leaks (i.e. brake servo system, crankcase emission control equipment, inlet manifold, etc.). If unable to trace the cause of unsatisfactory balance, refer to "Carburettor Reconditioning" (pages 8 – 11).

4. Mixture Setting

Each time the jet adjusting nut is altered during the following procedure, gently tap the neck of the suction chamber with a light non-metallic instrument (e.g. screwdriver handle).

(a) Turn each jet adjusting nut by the same amount, up to weaken, down to enrich, 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 half flat down (enrich).

(b) Check the idling speed against the figure given on page 22 and adjust, if necessary, by altering both throttle adjusting screws, each by the same amount.
Using the balancing meter, check to ensure that the carburettors remain balanced.

(c) Using the exhaust gas analyser (either CO meter or air/fuel ratio meter), check the percentage CO reading or air/fuel ratio is within the limits given on page 22. If the reading falls outside the limits given, reset both adjusting nuts by the minimum amount necessary to bring the reading just within the limits.

(d) Hold the jet adjusting nut on each carburettor to prevent it from turning, and rotate the adjustment restrictor (27) (Fig. 11) around the nut until the vertical tag contacts the carburettor body on the left-hand side when viewed from the air cleaner flange (see Fig. 19).
In this position, bend down the small tag on the adjustment restrictor so that the restrictor locks to the nut and will follow its movement.

5. Final Adjustments

(a) Set the throttle inter-connection clamping levers so that the actuating pins are 0.015″ away from the lower edge of the fork (see Fig. 16). Ensure that there is a total of $\frac{1}{32}$ end-play between the inter-connecting claming levers and the throttle nuts.

(b) With both jet levers pressed down to their lowest position set the jet inter-connection lever clamping bolts so that both jets commence to move simultaneously.

(c) Re-start the engine and run at 1500 r.p.m. Using the balancing meter, check that the carburettors are in balance.

(d) Reconnect the mixture control wire with approximately $\frac{1}{16}$″ free movement before it starts to actuate the jet levers.

(e) Pull the mixture control until the linkage is about to cause the carburettor jets to drop. With the cams in this position and using the balancing meter to ensure equal adjustment, turn the fast idle screws to give the correct fast idling speed when hot. (See page 22).

CRANKCASE EMISSION CONTROL VALVE

Servicing Procedure

General Details (Fig. 20)

The valve pin and pressure plate assembly (1), which bears on the diaphragm (3), is positioned relative to the controlling orifice by the spring (2). The valve pin is located on the orifice plate (4) by guides which permit clearance between the pin and the orifice to prevent sticking and allow a limited flow through the valve at engine idle. The plate valve (5) on the outlet side is controlled by a light spring (6).

When the vacuum is applied, the lightly loaded plate valve (5) is sucked off its seat and a depression is created beneath the diaphragm (3). When this depression exceeds the diaphragm spring force, the valve (1) moves to reduce the controlling orifice until the spring and diaphragm forces are balanced. The value of the diaphragm spring force is such, that, when operating, a reasonable depression is maintained in the crankcase. The plate valve (5) acts as a non-return valve against a back-fire within the carburettor intake manifold by isolating the crankcase and it also limits flow at cold starting.

The same valve is used in the following models:

Spitfire III and TR4A

The ventilation air is drawn into the crankcase through an orifice and air filter in the oil filler cap. This air together with blow-by gas is drawn, via the emission valve, into the engine combustion chamber. In the unlikely event of blow-by exceeding the valve capacity, the excess emission reverses the cycle and escapes through the fresh air intake.

Service Procedure

Every 12,000 miles, service the valve as follows:

(a) Remove all connecting pipes.

(b) Remove the spring clip and cover plate.

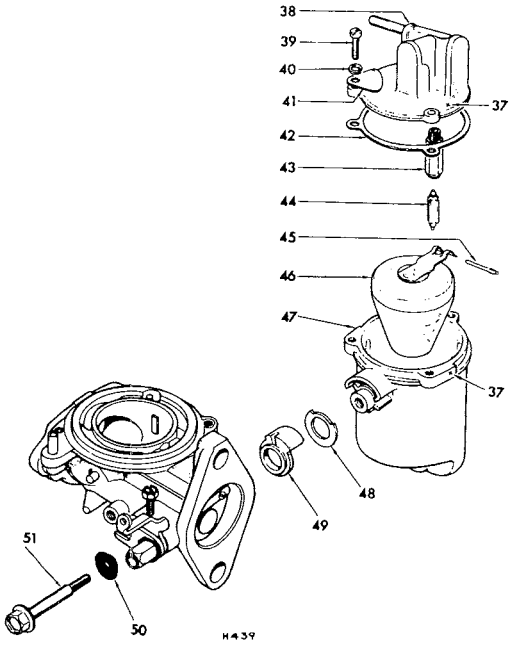
(c) Take out the rubber diaphragm (3), noting the correct fitted position of its top face.

(d) Remove the valve plate (1) and spring (2).

(e) Clean the body, pipes and all remaining components in clean gasolene, taking particular care to ensure that the diaphragm is kept perfectly clean.

(f) Check to ensure that the valve plate (1) is free to move and is maintained in its upward position by the spring underneath it.

(g) Renew defective items and reassemble by reversing the foregoing, taking care to correctly locate the plunger in the centre of the guides in the orifice plate (4).



37. Marks for refitting.
38. Float chamber lid.
39. Lid retaining screws.
40. Spring washers.
41. Identification plate.
42. Lid gasket.
43. Needle seating.
44. Float needle.
45. Float hinge pin.
46. Float assembly.
47. Float chamber.
48. Backing washer (steel).
49. Rubber mounting.
50. Rubber washer.
51. Retaining bolt.

Fig. 12. Carburettor float chamber.

52. Throttle spindle.
53. Throttle lever.
54. Fork lever.
55. Tab washer.
56. Lever retaining nut.
57. Throttle disc assembly.
58. Throttle disc screws.
59. Marks for reassembly.
60. Throttle adjusting screw.

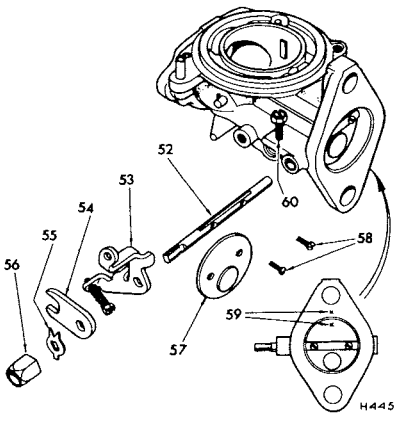


Fig. 13. Carburettor throttle disc and lever assembly.

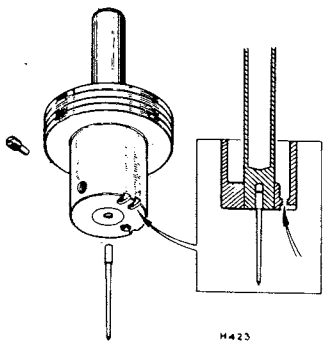


Fig. 14. Carburettor piston/needle assembly.

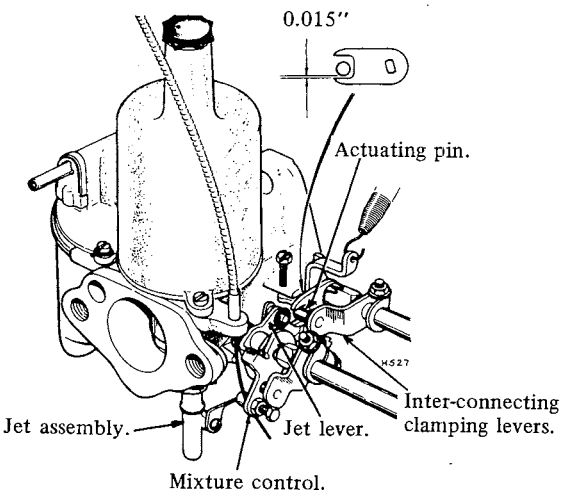


Fig. 16. Carburettor fork lever adjustment.

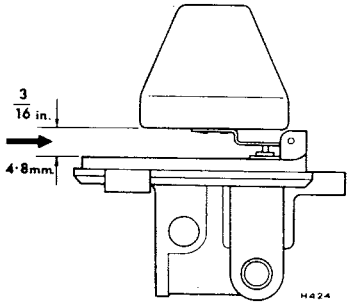


Fig. 15. Carburettor float height.

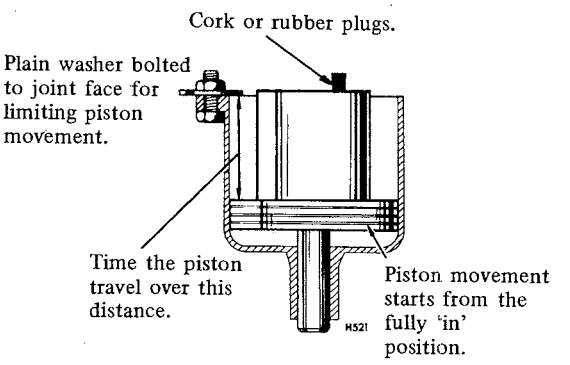


Fig. 17. Checking piston drop.

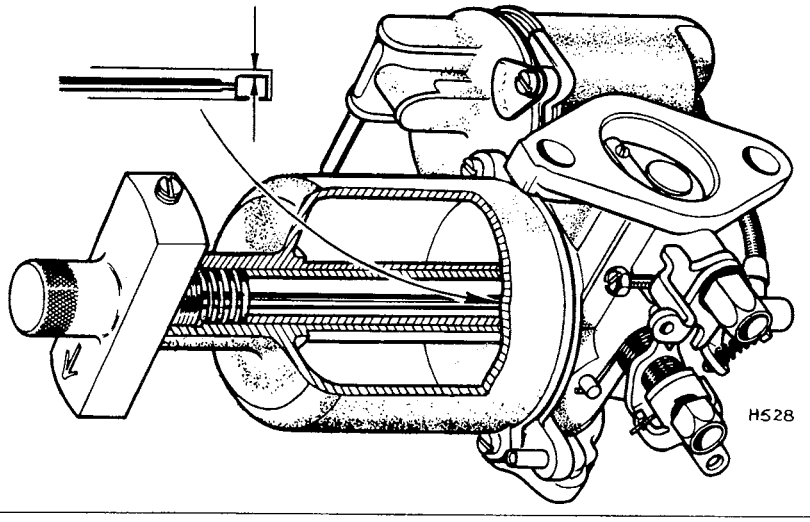


Fig. 18. Jet biasing.

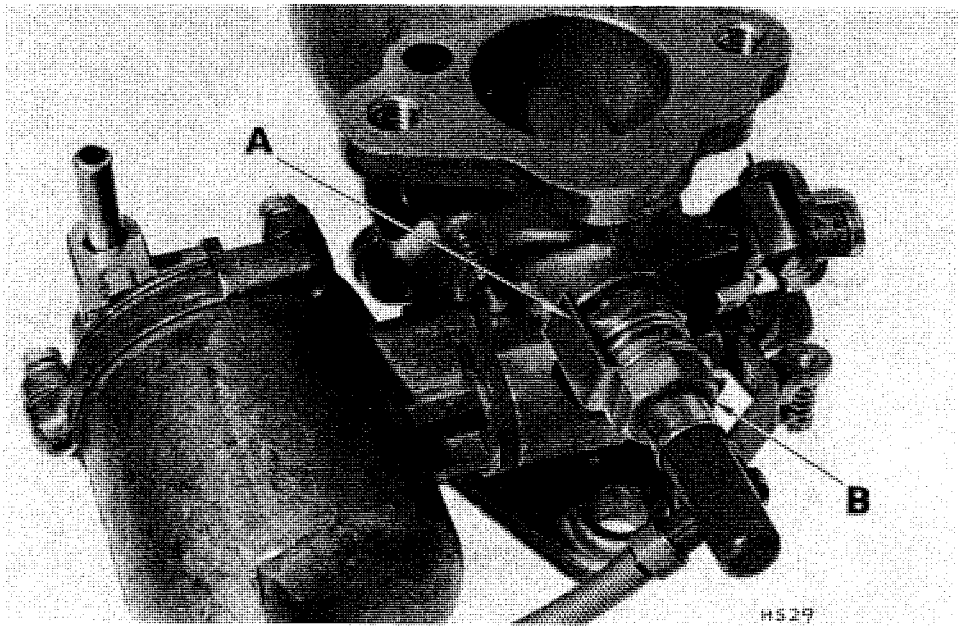
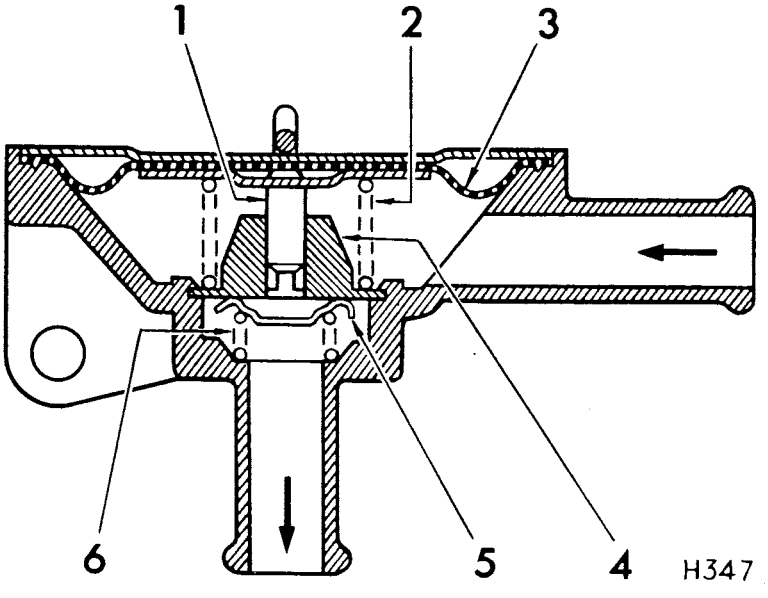


Fig. 19. Jet restrictor

A–Restrietor device
B–Jet adjusting nut



1. Valve pin
2. Spring
3. Diaphragm
4. Orifice plate
5. Plate valve
6. Spring

Fig. 20. Crankcase emission control valve

EMISSION CONTROL SYSTEM

IGNITION AND CARBURETTOR SETTINGS

General Data

	Spitfire Mk. 3	T.R.4.A.
Idle speed (r.p.m.)	800/850	850/900
Fast idle speed (r.p.m.)	1100	1100
Ignition static	6^{o} A.T.D.C.	T.D.C.
Ignition at idle	2^{o} A.T.D.C.	T.D.C.
Distributor Part Number ...	214799	214805
Carburettor settings	11 - 12 flats from bridge	10 - 11 flats from bridge
Needle	DD	QW
Jet	0·090"	0·090"
Damper	AUC 8103	AUC 8103
Throttle plate and damper	AUD 9876	AUD 9809
Idle C.O. level engine warm ...	3.5% - 4.5%	3.5% - 4.5%
Equivalent air/fuel ratio at idle (approx).	13 : 1	13 : 1

TRIUMPH SPITFIRE Mk 3

Ignition Distributor Data

Contact gap	0.015 in.
Rotation - viewed on rotor	Anti clockwise
Firing angles	90 degs.
Dwell angle	40 - 42 degs.
Open angle	48 - 50 degs.
Moving contact spring tension	22 - 26 ozs.
Condenser capacity	0.18 - 0.23 mfd.
Engine firing order	1 - 3 - 4 - 2

Centrifugal advance

Distributor r.p.m.	Degs. distributor advance		Crankshaft r.p.m.	Degs. crankshaft advance	
	Minimum	Maximum		Minimum	Maximum
350	0	2.0	700	0	4
750	9.5	11.5	1500	19	23
1200	11.0	13.0	2400	22	26
1700	12.5	14.5	3400	25	29
2100	14.0	16.0	4200	28	32

Vacuum advance

Ins. of mercury vacuum	Degs. distributor advance		Degs. crankshaft advance	
	Minimum	Maximum	Minimum	Maximum
Below 4	No advance to occur			
6	0	3·0	0	6
8	2·3	6·0	4·6	12
10	4·5	7·5	9·0	15
11	5·5	7·5	11·0	15
20	5·5	7·5	11·0	15

TRIUMPH TR 4A

Ignition Distributor Data

Contact gap	0.014 - 0.016 in.
Rotation - viewed on rotor	Anti clockwise
Firing angles	90 ± 1 degs.
Dwell angle	60 ± 3 degs.
Open angle	30 ± 3 degs.
Moving contact spring tension	18 - 24 ozs.
Capacitor capacity	0.20 mfd.
Engine firing order	1 - 3 - 4 - 2

Centrifugal advance

Check at decelerating speeds

Distributor r.p.m.	Degs. distributor advance		Crankshaft r.p.m.	Degs. crankshaft advance	
	Minimum	Maximum		Minimum	Maximum
Below 400	No advance to occur		Below 800	No advance to occur	
500	0	3·5	1000	0	7
700	7	10·5	1400	14	21
900	11	13·0	1800	22	26
2500	11	13·0	5000	22	26

Vacuum advance

Ins. of mercury vacuum	Degs. distributor advance		Degs. crankshaft advance	
	Minimum	Maximum	Minimum	Maximum
Below 2	No advance to occur			
3	0	1·0	0	2·0
4	0	2·7	0	5·4
6	2·5	5·5	5·0	11·0
8	4·8	7·8	9·6	15·6
10	6·5	8·9	·13·0	17·8
11	7·0	8·9	14·0	17·8
20	7·0	8·9	14·0	17·8