

Chapter Fourteen

FUEL SYSTEM SERVICING AND MAINTENANCE

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This chapter contains instructions for adjusting, removing, and refitting the fuel system components. The general information contained in Chapter 5 should be referred to as necessary.

LOW PRESSURE FUEL FILTER, REMOVAL AND REFITTING OF COMPLETE COMPONENT

The low pressure fuel filter is mounted on a large sheet-metal bracket, to port of the air-intake, on the front of the diffuser casing.

When it is required to remove the complete low pressure fuel filter, proceed as described in the following paragraphs, but before commencing operations ensure that the L.P. fuel cock lever is in the OFF position and that the fuel tank booster pump is switched off.

Cut the locking wire and unscrew the union nut at the low pressure filter end of the distributor spill pipe, and, taking care to bend the rigid pipe as little as possible, ease the pipe clear of the filter. Unscrew the four $\frac{1}{4}$ " B.S.F. plain nuts which secure the outlet pipe to the filter, remove the spring washers, and ease the flanged end of the flexible pipe off the studs; there is a Klingerit joint washer at this joint. If the engine is installed in an aircraft, cut the wire-locking, and unscrew the union nut, to disconnect the fuel supply pipe.

It will probably be found simpler to remove the low pressure fuel filter complete with its bracket. To do this, remove the $\frac{1}{4}$ " B.S.F. plain nut and spring washer from the stud in the diffuser casing which secures the lug welded to the centre of the filter bracket. Remove the $\frac{1}{4}$ " B.S.F. plain nut and spring washer from the stud in the diffuser casing at the inboard extremity of the filter bracket, and the five 2 B.A. nuts and spring washers which secure the outboard edge of the bracket and also secure one of the deflector casings. Draw the filter and bracket off the seven studs and remove the filter complete with bracket and spacing washers; note particularly the location of each spacing washer.

If it is desired to separate the low pressure fuel filter from its bracket, remove the two $\frac{3}{8}$ " B.S.F. plain nuts, spring washers and bolts which pass through the flange on the filter and the bracket, and then remove the two nuts and spring washers from the studs in the filter which also secure it to the bracket.

Refitment of the filter to the bracket and the sub-assembly to the engine is practically a direct reversal of the removal instructions given already. Lock the distributor spill pipe union with 22 S.W.G. stainless steel lock-wire.

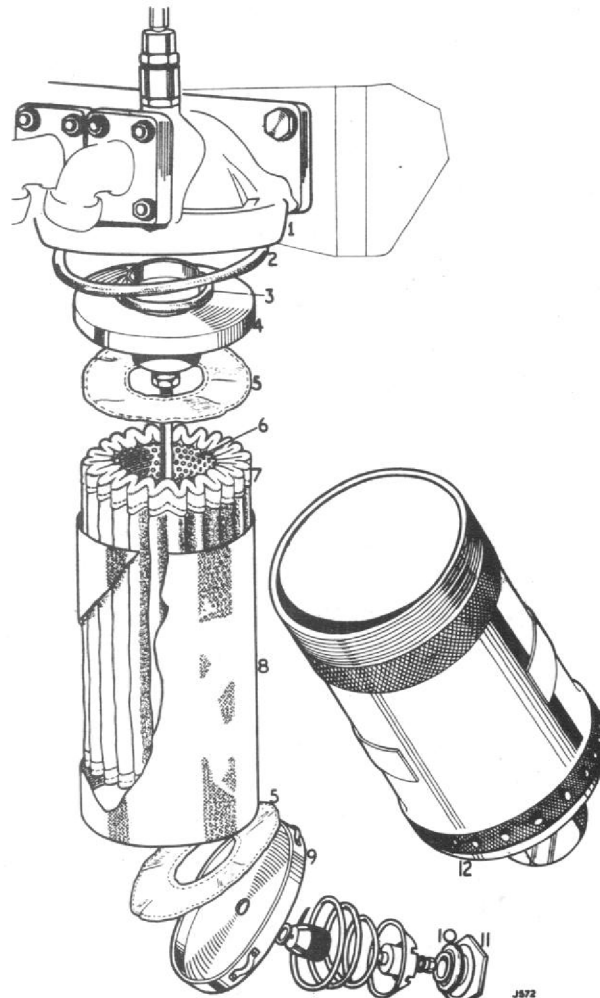
LOW PRESSURE FUEL FILTER, REMOVAL AND REFITTING OF ELEMENT (Fig. 1.)

Before commencing to remove the low pressure fuel filter case (bowl), in order to clean out any sediment or to examine or change the filter element, ensure that the L.P. fuel cock lever is in the OFF position and that the fuel tank booster pump is switched OFF. If it is desired to drain the filter case prior to its removal, place a suitable receptacle underneath the filter, cut the locking-wire, and unscrew the drain plug which is situated in the bottom of the filter case.

To remove the low pressure fuel filter case and to dismantle the filter element assembly, which is also referred to as the insert assembly, proceed as follows. Cut the locking wire and, using spanner T.73692 and tommy bar T.73693, unscrew the filter case; be prepared to support weight of the case and element assembly as the last few threads are unscrewed. Having removed the filter case from the filter head, which remains attached to the engine, the filter element assembly can be lifted out of the case. This filter element and its detail parts should be handled with care so that serviceable parts are not damaged and so rendered unserviceable. To dismantle the filter element assembly proceed thus. Using a 2 B.A. box spanner, unscrew the Phillidas self-locking nut which retains the spring cup at the base of the assembly. Remove the plain washer, spring cup, and spring. Cut the locking wire, unscrew the knurled nut, and remove the aluminium washer from the lower end of the stud which is attached to the centre of the top plate. Lift off the following parts: bottom plate, bottom nylon-covered felt pad, outer gauze covered sleeve, felt element, inner perforated tube, and top nylon-covered felt pad.

Thoroughly clean the metal parts and the filter case in clean kerosene; the gauze-covered sleeve should be cleaned by using a syringe to force the kerosene through the gauze. Move the syringe up, down, and around inside the gauze so that the kerosene is forced through every part of it, brushing any sediment off the exterior of the sleeve; ensure that the gauze is not accidentally torn or pierced. No cleaning of the felt filter element or the nylon-covered felt pads is permissible and a new filter element (Part No. C40383) and pads (Part No. AX40384) should be fitted every 150 hours.

The gauze surrounding the outer sleeve should be examined for damage; slight damage may be repaired by soldering. Ensure that the joint faces of the top and bottom plates and of the filter case and head are clean and undamaged. Examine the joint ring (Part No. B25806) and the sealing ring (Part No. A40345) which are in the filter head, and the drain plug sealing ring (Part No. A16580); if any of these parts or the nylon-covered pads or the felt filter element are in any way unserviceable, new parts should be fitted.



1. Filter head attached to engine.
2. Joint ring.
3. Sealing ring which is fixed in groove in filter head with compound.
4. Top plate.
5. Nylon-covered felt pad.
6. Inner perforated tube.
7. Felt element.
8. Outer gauze-covered sleeve.
9. Bottom plate.
10. Drain plug sealing ring.
11. Drain plug.
12. Filter case, or bowl.

Fig. 1. Low pressure fuel filter

When fitting new joint or sealing rings in the filter head, all traces of the old ring and jointing compound must be carefully removed; the sealing ring, which is the smaller of the two rings, is fixed in its groove with compound. A new sealing ring must be fitted thus. Prime the metal surface of the inner groove in the filter head with Boscotex 5R. Mixed Boscoprene cement No. 551 should be applied sparingly to both mating surfaces and allowed to dry for about 15 minutes; the radius on the sealing ring must face the filter element assembly when the ring is in position in the head. Position the ring in the sealing ring groove in the head and apply as much pressure as possible. When assembling the joint ring to the outer groove in the filter head, both items should be smeared with mineral jelly before fitting them together.

Having ensured that all parts are clean and serviceable, reassemble and refit the filter as follows. Place one of the nylon-covered felt pads in the top plate. Position the inner perforated tube, the felt element, and the outer gauze-covered sleeve on the top plate; carefully easing the end of the outer sleeve into the recess in the top plate. Place the second nylon-covered pad in the bottom plate and place the latter over the stud at the lower end of the filter element assembly. Refit the soft aluminium washer (Part No. AX37960) and screw on the knurled nut. Position the spring and spring cup on the bottom plate and refit the plain washer and self-locking nut. Check the complete filter element assembly. Place a sealing ring on the drain plug and screw the plug into the filter case. Ensure that the inside of the filter case is perfectly clean and that its upper edge and thread are clean and free from burrs. Place the filter element assembly, spring downwards, in the filter case, and screw the case into the filter head. It is important to ensure that this filter element assembly is fitted the correct way up, failure to do this can result in a serious restriction of the fuel flow to the engine. Where mod. 754 has been embodied, there is a shroud around the element spring which ensures that the element cannot be fitted upside-down. It is advisable to lubricate the threads at the upper end of the filter case with graphite grease to reduce the likelihood of seizure; special care should be taken always to avoid crossing or damaging these fine threads. Securely tighten and wire-lock the filter case and the drain plug.

FUEL PUMPS. ADJUSTMENT OF GOVERNOR MECHANISM

Deviations of governed speed from the nominal value can occur through changes in ambient atmospheric temperature and pressure, and apparent deviations may occur because the aircraft instruments are less accurate than the stroboscope used for speed setting on the test bed. If attention is paid to deviations occurring in the first case, too frequent adjustment will be made in order to contend with day to day atmospheric changes, and in the second case, the speed will be adjusted to an incorrect setting. Generally speaking, variations between plus 30 and minus 50 r.p.m. of the nominal speed may be ignored unless they are habitual, in which case the overspeed governor mechanism should be reset to cater for the different operating conditions. Variations beyond these tolerances must be investigated on the lines indicated in the Running Defects table. As this is an engine publication, no reference is made to faulty aircraft instruments in the table of Running Defects, but the operator is strongly advised to check these instruments before making any adjustments to the governor mechanism.

The overspeed governor mechanism is integral with the fuel pumps and it is customary to set one governor to control at a higher engine speed than the other. When adjusting the governor mechanism, ensure that the throttle is fully open. To alter the governor setting of either fuel pump, slacken the lock nut at the end of the diaphragm cover and, using the special spanner T72181, turn the square-ended adjusting screw clockwise to increase the governed r.p.m., or anti-clockwise to decrease it.

The procedure for adjusting the governor mechanism is as follows:—Temporarily, decrease the governor setting of the rear fuel pump to approximately 10000 r.p.m. Move the fuel pump isolating switch to the ON position. Set the governor of the front fuel pump to govern at 10300 r.p.m.; as this speed exceeds the maximum permissible r.p.m. the engine must be run at this speed for the shortest possible time that will permit an accurate setting to be obtained. Return the fuel pump isolating switch to the OFF position. Set the governor of the rear fuel pump to govern at 10250 r.p.m.

FUEL PUMPS, SINGLE PUMP CHECK

If, when investigating a fuel system defect, it is desired to check each pump individually, proceed as described in the following paragraphs. When making this check under test bed conditions, if the maximum declared engine speed cannot be obtained on one pump alone due to low ambient temperature, the single pump delivery is established by applying a formula. Since when making this check 'in the field' the actual delivery cannot be measured, the results obtained can be checked only by comparison and, as the maximum r.p.m. obtained on each pump should be approximately the same, any wide difference indicates that one pump is faulty.

TO CHECK THE REAR FUEL PUMP

While the engine is stopped, disconnect the servo pipe between the front and rear fuel pumps at the double banjo on the front fuel pump and blank off the open end of the servo pipe; leaving the connection on the front pump open to atmosphere.

Move the fuel pump isolating switch to the ON position in order to close the solenoid valve. Start the engine, and move the fuel pump isolating switch to the OFF position, thus opening the solenoid valve in the front fuel pump and, by venting its servo system to atmosphere, rendering the front pump non-operative. Increase the engine speed and establish the maximum r.p.m. which can be attained on the rear pump alone. Stop the engine.

TO CHECK THE FRONT FUEL PUMP

Return the fuel pump isolating switch to the ON position, thus closing the solenoid valve, and remove the blank from the servo pipe, thus, by venting its servo system to atmosphere, rendering the rear pump

non-operative. Start the engine and increase the engine speed until the maximum r.p.m. which can be attained on the front pump alone is established. Stop the engine and reconnect the servo pipe to the front fuel pump.

FUEL PUMPS, REMOVAL AND REFITTING

The two fuel pumps are mounted on adapters underneath the bottom wheelcase, and each pump is secured by eight studs, spring washers, and $\frac{1}{4}$ " B.S.F. plain nuts; there is a Velumoid or special fibre sealing washer between each fuel pump flange and each adapter.

Adjustment of the fuel pump governor mechanism has been described already and no other adjustment is permitted. No servicing is required, apart from the normal regular inspection for leakage at the pipe connections and joints, and any fuel pump defect, which cannot be remedied by normal readjustment of the governor mechanism or remaking a fuel pipe connection, necessitates the removal of the pump from the engine and the fitment of a serviceable unit.

The majority of the fuel pipes connected to both fuel pumps must be disconnected before either pump can be removed; the exceptions are indicated in the following paragraphs. Wherever it is considered desirable to remove a flexible pipe completely this should be done as it is most undesirable to flex these pipes more than is absolutely essential. Each pipe union will be wire-locked and the locking-wire must be cut before attempting to unscrew the union nuts.

Unscrew the union nut at each end of the small flexible servo pipe, which connects the servo systems of the two pumps together, and remove this pipe completely.

Unscrew the union nut which connects the small flexible B.P.C. servo pipe to the front fuel pump and gently ease the pipe clear of the pump - only when removing front pump.

Unscrew the union nut which connects the B.P.C. high pressure pipe to the banjo on the front fuel pump - only when removing front pump.

Unscrew the union nut at the lower end of the large flexible pipe which connects the low pressure fuel filter to the connection between the two fuel pumps and gently ease the pipe clear of the pumps.

Unscrew the union nut which connects the pump-to-H.P.-filter pipe to the banjo on the rear pump, and gently ease the pipe clear of the pumps - only when removing the rear pump.

Remove the two cap nuts which fasten the high pressure pipe between the two pumps, to the pumps and remove this pipe completely.

Unscrew the union nut and disconnect the fuel control valve and B.P.C. spill pipe from the pumps.

Remove the four nuts and washers which secure the flanged ends of the pump-to-pump connection and draw the connection off the studs in the two pumps.

Unscrew the union nuts at each end of the rigid seal-drain pipe which connects the two pumps together and remove the pipe completely.

Unscrew the union nuts at each end of the rigid seal-drain pipe which connects the rear pump to the drain box and remove the pipe completely - only when removing the rear pump.

Remove the two $\frac{1}{4}$ " B.S.F. plain nuts, spring washers, and bolts which secure the relevant bleed valve pipe to the bracket below the port air-intake; repeat to release the second bleed valve pipe if both pumps are to be removed.

If the engine is installed in an aircraft, disconnect the electric wiring from the solenoid valve on the front fuel pump - only when removing the front fuel pump.

Having ensured that all the connections have been disconnected and that there is nothing to hinder the withdrawal of the pump, remove the eight $\frac{1}{4}$ " B.S.F. plain nuts and spring washers from the studs in the bottom wheelcase and carefully draw the pump down until its flange is clear of the studs and the drive is disengaged. Repeat to remove the second pump.

Refitment of either fuel pump to the engine is practically a direct reversal of the removal instructions given already but the following additional points should be borne in mind.

Check that the replacement fuel pump is of the correct type for the installation and for its position on the bottom wheelcase - the front and rear pumps are not interchangeable - and that it has not been damaged whilst in store or in transit. Ensure that the fuel pump drive quill, and splined sleeve are correctly assembled into the fuel pump drive gear in the bottom wheelcase, that the small circlip within the sleeve and the larger circlip which retains the sleeve and quill in the gear are correctly positioned and secure. New sealing washers (Part No. 48793) and pump-to-pump connection sealing rings (Part No. N.5182) should be fitted if there is any doubt about the serviceability of these parts. All union nuts must be wire-locked with 22 S.W.G. stainless steel lock-wire. Finally when refitment is complete, bleed the fuel system as described elsewhere.

HIGH PRESSURE FUEL FILTER, REMOVAL AND REFITTING OF COMPLETE COMPONENT

The high pressure fuel filter is carried below a sheet-metal bracket, which is attached to the diffuser casing at the rear and the air-intake/bottom wheelcase joint flange at the front, and is situated on the port side of the oil sump.

When it is required to remove the complete high pressure fuel filter, proceed as described in the next paragraph but before commencing operations ensure that the L.P. fuel cock lever is in the OFF position and that the fuel tank booster pump is switched OFF.

Cut the locking-wire and unscrew the two union nuts which connect the flexible pipes to the filter. Unscrew the two $\frac{1}{4}$ " B.S.F. plain nuts and remove the spring washers from the vertical studs in the filter head, which project through the large sheet-metal bracket. Remove the two $\frac{1}{2}$ " B.S.F. plain nuts, spring washers, and bolts, which secure the smaller sheet-metal bracket to the larger bracket; during this operation the filter must be supported as it will be free to fall as soon as both nuts have been removed. Remove the high pressure fuel filter with the smaller bracket attached to it. To separate this bracket from the filter, remove the two nuts and spring washers from the horizontal studs in the filter head.

Refitment of the smaller bracket to the filter and of the filter, complete with bracket, to the larger bracket on the engine is practically a direct reversal of the removal instructions given already. Lock both union nuts with 22 S.W.G. stainless steel lock-wire.

HIGH PRESSURE FUEL FILTER, REMOVAL AND REFITTING OF ELEMENT (Fig.2.)

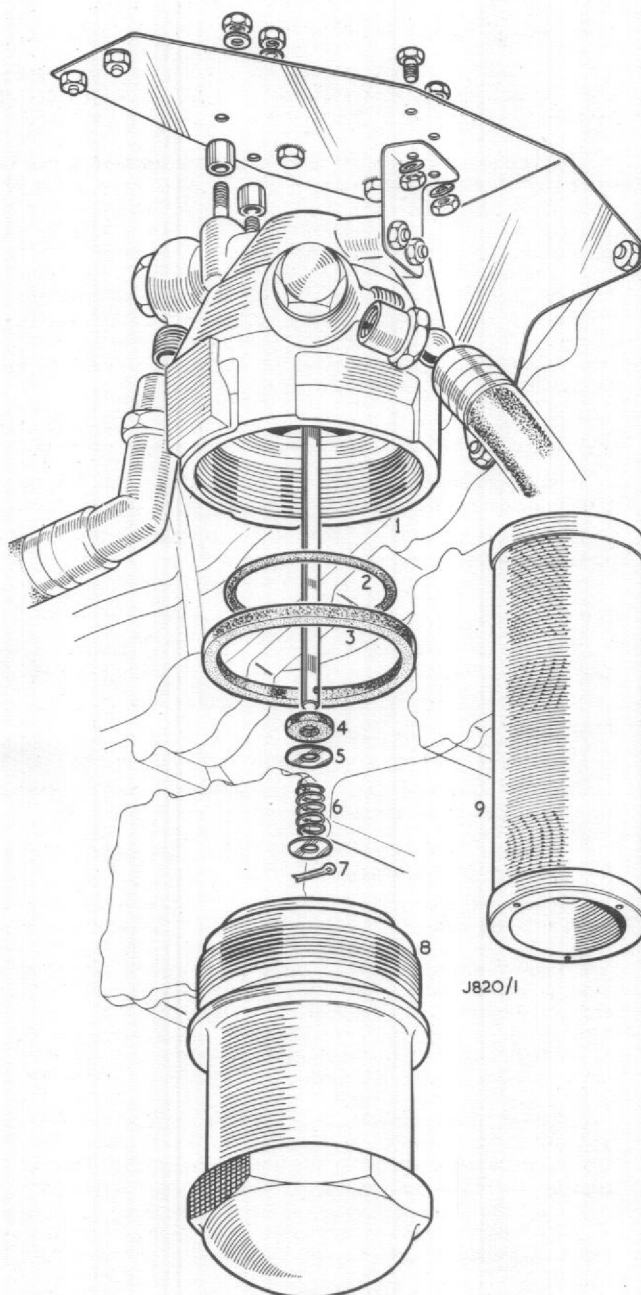
Before commencing any servicing or maintenance operations on the high pressure fuel filter ensure that the L.P. fuel cock lever is in the OFF position, and that the fuel tank booster pump is switched OFF.

To remove the high pressure fuel filter bowl and element, in order to clean out any sediment and to examine and clean the element, proceed as follows. Cut the locking wire, and, using spanner T 73692 and tommy bar T 73693 or a $2\frac{1}{4}$ in. Whitworth ring spanner (3.535/3.550 in. across the flats), unscrew the filter bowl; be prepared to take the weight of the bowl as the last few threads are unscrewed. Empty any fuel out of the bowl. Extract the split pin from the lower end of the filter element support rod, and remove the plain washer, spring, second plain washer, and the rubber washer. The wire-wound filter element can then be withdrawn from the filter head; as the upper end of the element is a close fit in the counterbore in the head a definite pull may be required to withdraw it.

Thoroughly clean the detail parts in clean kerosene. Use a syringe to force the kerosene through the filter element, moving the syringe up, down, and around inside the element so that the kerosene is forced through every part of it; gently brush any sediment off the exterior of the element.

Carefully examine the element for signs of damage. Ensure that the threaded and jointing surfaces of the filter bowl and head are clean and undamaged, and that the synthetic rubber seals are serviceable. If either of the seals (filter element seal in head MPA 30444 and bowl-to-head seal MPA 30254) or the rubber washer (Part. No. MPA 30308) is in any way unserviceable, a new one should be fitted.

Having ensured that all parts are clean and serviceable, reassemble the parts by reversing the dismantling instructions, taking great care that the filter element seal in the filter head is not displaced and damaged. Use a new split



- | | |
|------------------------------------|-------------------------------|
| 1. Filter head attached to engine. | 6. Spring. |
| 2. Filter element seal | 7. Split pin |
| 3. Bowl-to-head seal. | 8. Filter bowl. |
| 4. Rubber washer. | 9. Wire-wound filter element. |
| 5. Plain washer. | |

Fig. 2. High pressure fuel filter

pin (Part No. AGS784/50) and lubricate the threads with a mineral oil such as D.T.D. 44D. Securely tighten and wire-lock the filter bowl.

SLOW-RUNNING ADJUSTMENT - FUEL CONTROL VALVE ASSEMBLY

A tolerance of plus or minus 200 r.p.m. is permitted on the nominal slow-running speed and it should be understood that the slow-running speed is influenced by atmospheric pressure. Do not alter the setting of the slow-running control needle unless readjustment is essential. When making any adjustment to the slow-running control needle ensure that the throttle valve is in the 'fully closed' position.

If it is required to adjust the slow-running speed, proceed thus. Unscrew the two 2 B.A. plain nuts which secure the slow-running control blanking cap, and remove the two spring and plain washers, and the blanking cap. Using the combined box spanner and screwdriver T75864, release the lock nut and screw out (turn anti-clockwise) the slow-running needle to increase the slow-running r.p.m., and vice versa. When a satisfactory slow-running speed has been obtained, lock the setting by retightening the lock nut; ensure that the setting is correct after the lock nut has been tightened fully. Refit the blanking cap, plain and spring washers, and the two nuts.

FUEL CONTROL VALVE ASSEMBLY, REMOVAL AND REFITTING

The fuel control valve assembly is mounted on the back of the oil sump adjacent to the oil sump drain plug. In order to remove the complete assembly from the engine proceed as follows.

Extract the split pin, unscrew the 2 B.A. slotted nut, and withdraw the bolt which couples the throttle rod end to the throttle lever on the control valve assembly; do not loose the two steel washers which are fitted either side of the rod end bearing. Swing the control rod clear of the lever and temporarily reassemble the bolt, washers and slotted nut in the rod end. Disconnect the cut-off valve control in a similar manner.

Cut the locking wire and unscrew the union nut which secures the air-fuel ratio control spill pipe to the union in the top of the control valve assembly. Disconnect the B.P.C. spill pipe from the union, which is just above the slow-running blanking cap, and the H.P. filter to control valve pipe from the banjo at the bottom of the control valve, in a similar manner.

Remove the four $\frac{1}{4}$ " B.S.F. plain nuts and spring washers which secure the flange at the end of the control valve to distributor pipe to the inboard face of the control valve assembly; the high pressure pipe to the air-fuel ratio control is connected to this point also. Ease the flanged connection off the studs in the control valve assembly.

Unscrew the four $\frac{1}{4}$ " B.S.F. mounting bolts until they are free from the ferrules in the oil sump; as the last bolt is unscrewed, the weight of the control valve assembly must be supported with one hand. The control valve assembly will now be free of the engine.

If a new control valve assembly is to be fitted, it will first be necessary to transfer the rod end bearings, bolts, steel washers, and slotted nuts from the new control valve assembly to the one which has been removed.

Before commencing to refit the control valve assembly to the engine, ensure that the pipe unions and the flanged connection face are perfectly clean and free from any burrs or damage which might prevent fuel-tight joints being made. Examine the outlet seal ring which fits in a groove machined in the outlet face on the inboard side of the control valve assembly; if there is any doubt of its serviceability, a new seal ring (Part No. N4279) should be fitted.

Mounting and reconnecting the control valve assembly is a direct reversal of the instructions given already. The union nuts should be wire-locked with 22 S.W.G. locking wire and new split pins (Part No. AGS784-1) must be used to lock the slotted nuts on the levers.

FUEL CONTROL VALVE ASSEMBLY, RECTIFICATION OF LEAKAGE

Complete dismantling and subsequent reassembly of the fuel control valve assembly is not permissible unless the reassembled control valve assembly can be properly tested on a suitable test rig. Leakage from the slow-running control needle, or from the crank or valve bore blanking caps can, however, be rectified without extensive dismantling.

If leakage around the slow-running control needle cannot be remedied by tightening the locking nut, the seal may be changed thus. Unscrew the two 2 B.A. plain nuts which secure the slow-running control blanking cap. Remove the two spring and plain washers, and the blanking cap. Remove the locking nut and unscrew the slow-running needle until the slow-running needle seal is exposed; note the number of complete turns the needle is unscrewed - if it is subsequently screwed in the same number of turns, readjustment of the slow-running speed will be simplified. Remove the seal and examine the exposed surface of the needle for signs of scoring which might be the cause of the leak. If the needle is considered satisfactory, fit a new seal (Part No. 19766), ensuring that the distance piece is correctly positioned on the needle. Refit the locking nut. If the needle is rejected on examination, a new needle must be fitted also. Screw in the needle and readjust the slow-running speed as described elsewhere.

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Leakage around the crank or valve bore blanking caps may be due to failure of the sealing ring which is under each cap and this sealing ring may be changed. The procedure is identical in each instance with the following exception. When it is required to remove the top blanking cap from the cut-off valve bore, it is necessary to cut the locking wire and unscrew the union nut at the lower end of the air-fuel ratio control spill pipe, and to ease the pipe clear of the union in the blanking cap. Unscrew the four 2 B.A. plain nuts. Remove the spring and plain washers and the blanking cap. Extract the sealing ring from the recess in the control valve body or remove it from the spigot on the blanking cap. Ensure that each detail part is perfectly clean and free from damage which might prevent a fuel-tight joint being obtained. Take particular care that no dirt of any description enters the control valve assembly whilst the cap is off. Fit a new sealing ring. (Part No. N4281 for the valve bores, and N4282 for the crank bores) and refit the blanking cap. In the case of the top cut-off valve blanking cap, reconnect and wire-lock the air-fuel ratio control spill pipe.

Leakage around the exposed end of either control shaft may be due to failure of the control shaft seal which is housed in a counterbore just behind the lever which is attached to the end of the shaft. If it is required to change either of these seal rings, proceed as follows. Extract the split pin, unscrew the 2 B.A. slotted nut, and withdraw the bolt which couples the control rod end to the lever on the control valve assembly; do not loose the two steel washers which are fitted either side of the rod end bearing. Swing the control rod clear of the lever and temporarily reassemble the bolt, washers, and slotted nut on the rod end. Mark the end of the control shaft and the lever so that the lever can be refitted in the same relative position as it was before its removal. Loosen the 2 B.A. plain nut on the bolt which clamps the lever to the shaft. Carefully ease the lever off the serrated end of the shaft. Prise out the circlip washer and damaged seal from the counterbore in the control valve body. Ensure that the distance piece is correctly located within the counterbore around the shaft and that both counterbore and shaft are perfectly clean and undamaged; if the shaft is badly scored it is unlikely that the fitment of a new seal will rectify the leakage. Having ensured that all the parts concerned are perfectly clean and serviceable, carefully coax a new control shaft seal (Part No. 40199) over the serrated end of the shaft and into the counterbore. Refit the washer and secure it by refitting the circlip; if there is any doubt about the serviceability of the circlip, a new one (Part No. N4244) must be fitted. By reference to the marks previously made on the shaft and lever refit the lever and secure it by tightening the nut on the clamping bolt. Reconnect the control rod to the lever.

FUEL FLOW DISTRIBUTOR, REMOVAL AND REFITTING

When mod. 35 has been embodied, the fuel flow distributor is mounted on four studs screwed into bosses in the diffuser casing a few degrees to port of twelve o'clock. When mod. 35 has not been embodied, the distributor is mounted in the same position on a sheet-metal bracket and is secured by three bolts welded to the bracket and one stud screwed into the diffuser casing and passing through the bracket. In either case the method of removal is similar. Once the unit is installed on the engine, no adjustment is permitted and no servicing is required, apart from the normal regular inspection for leakage at the pipe connections and joints. Any defect in this unit, other than leakage at the pipe connections which can be remedied in the usual way, necessitates its removal from the engine and the fitment of a serviceable unit.

To remove the fuel flow distributor proceed as follows. Cut the locking wire, and unscrew the union nut at the distributor end of each of the ten rigid burner pipes, and of the distributor spill pipe. Each of these eleven rigid pipes should be eased gently clear of the distributor, bending each pipe as little as possible. Cut the locking wire, unscrew the union nut and ease the large flexible pipe clear of the distributor. Remove the four plain $\frac{1}{4}$ " B.S.F. nuts, and spring and plain washers which secure the distributor to the bracket. Carefully draw the distributor off the studs and clear of the engine.

Refitment of the fuel flow distributor is practically a direct reversal of the removal instructions given already. Lock all the union nuts with 22 S.W.G. stainless steel lock-wire.

BURNERS

Burners, combustion chambers, etc., are numbered in a clockwise direction when the engine is viewed from the front. The number of the combustion chamber is cast on the diffuser casing, and is stamped on the burner holder or block adjacent to the part number. Although each of the burners is nominally identical and has the same part number it is advisable to refit each in its original combustion chamber with the original set of adjusting washers between the burner diaphragm and the face on the expansion chamber; this will retain the original burner protrusion.

To remove one of the burners proceed thus. Cut the locking wire, unscrew the union nut and disconnect the flexible burner feed pipe from the burner. Holding the burner diaphragm cover and the burner in position in the expansion chamber; remove the four $\frac{1}{4}$ " B.S.F. set-bolts and spring washers, and the lockwire tab. Carefully draw the burner assembly out of the combustion chamber; securely attach the adjusting washer/s to its individual burner assembly. Place a standard metal dust cap on the inlet union and one of the special rubber protecting caps (Part No. 217091/43) over the atomiser end of the burner. Place the burner in a suitable transport box to protect it from accidental damage.

If the burners are not being refitted to the engine immediately, or being dismantled for overhaul within a week, and will, therefore, remain in store, or in transit, for a period exceeding seven days, they must be protected against internal corrosion as follows. Drain off all surplus fuel immediately on removal of each burner from the engine. Flush through with clean oil to specification D.T.D. 44D and blank off all orifices with air-tight blanks. Protection against external corrosion will in most cases have been taken care of during manufacture, by the application of approved processes, but all bright steel parts and untreated surfaces must be coated with temporary rust preventative to specification D.T.D. 121 (latest issue). Before refitting a new, or overhauled burner to an engine, it is important to ensure that all surplus inhibiting oil is drained off.

Carefully examine the complete burner assembly and remove any excessive accumulation of carbon from shroud nut and the end face, taking great care neither to scratch nor damage the burner, nor to block any of the openings in it. Under no conditions whatever may the atomiser orifice be cleaned with a piece of wire or similar object. If the shroud nut is loose or has slackened off and the orifice plate appears loose, or if any part of the burner is loose or appears to be damaged in any way, the whole burner must be changed for a serviceable burner as the burner must not be separated from the burner holder or dismantled in anyway unless it is possible to rig test the reassembled burner as described in the chapter dealing specifically with these burners.

When fitted in the engine, the burner must protrude beyond the swirl vanes in the combustion chamber as tabulated below. Setting fixture T72789 and distance gauge T72788 should be used to ascertain the thickness of adjusting washers that is required to ensure the correct relationship between the burner shroud and the swirl vanes. Burner setting fixture T.76459 introduced by mod. 601 is a modified version of T.72789 and embodies a gauge plate to provide the reduced burner protrusion required for type 5 combustion chambers. Whilst reading the following instructions, reference should be made to Fig. 3 and 4. Place the head of the distance gauge against the burner face on the expansion chamber and adjust the caliper bar until its foot contacts the rear face of the swirl vanes in the combustion chamber. Using the setting gauge, set the inner sliding block of the setting fixture and secure it in position with the thumb screw. Place the appropriate burner complete with diaphragm, in the setting fixture, and hold the burner diaphragm firmly against the fixed end of the fixture. Set the outer sliding block to the atomiser end of the burner. Select the required number of adjusting washers (Part No. 26307 Pre-mod. 983 or 603368 Mod. 983) to take up the gap between the two sliding blocks. A foul can occur between the adjusting washers(s) for the burner in No. 8 combustion chamber and the aircraft main rear fuel feed pipe which runs along No. 1 rib, with the result that the protruding sharp corner of the washer(s) causes three-cornered indentations in the pipe. Therefore, the corner of the washer(s) which has been radiused to obviate the foul, must be refitted in the correct position. Similarly, if a new combustion chamber or burner is fitted at No. 8 position, or any new adjusting washer(s) are used, the protruding sharp corner of the new washer(s) must be radiused or chamfered. Adjusting washers, Part No. 603368, introduced by Mod. No. 983, are manufactured with a 0.400 in. by 45 deg. chamfer on each corner and do not require to be radiused or chamfered.

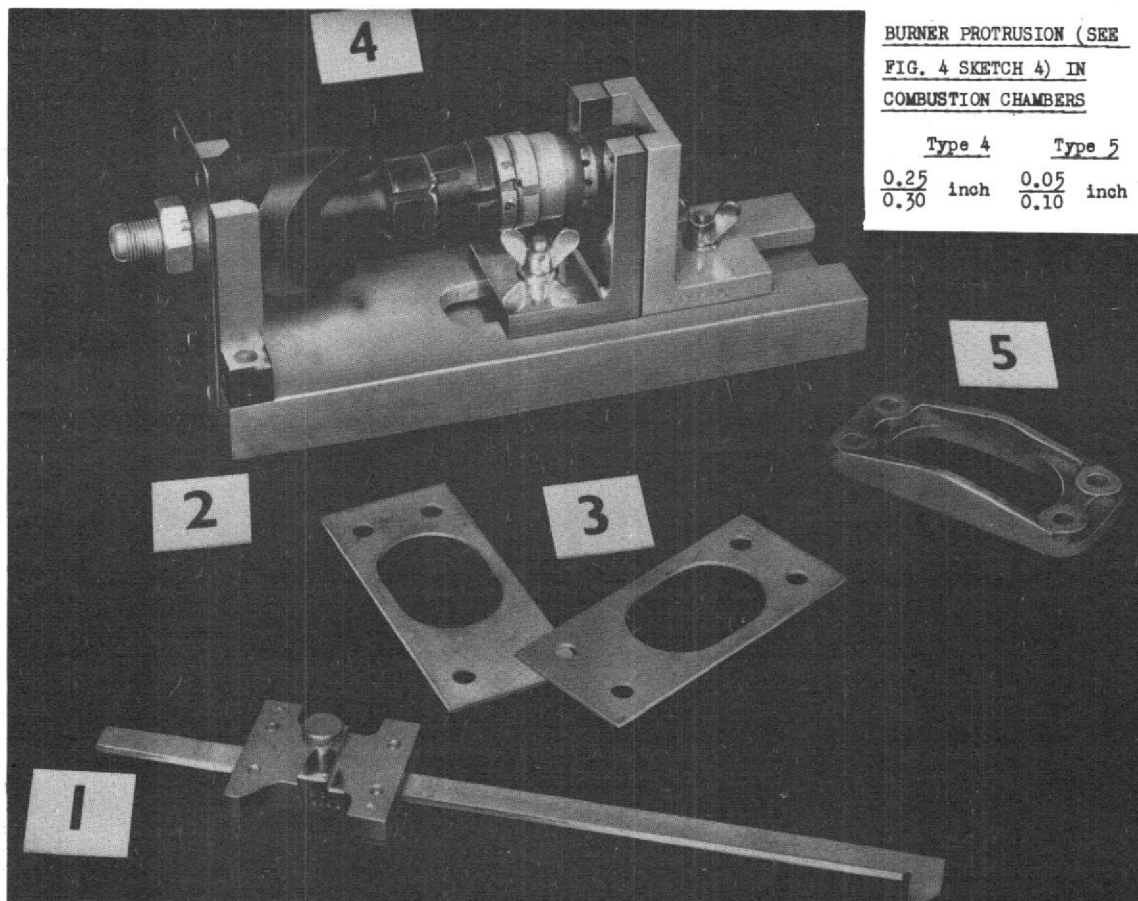


Fig. 3. Burner protrusion setting equipment.

- | | | |
|------------------------------------|----------------------------|-----------------------|
| 1. Distance gauge. | 2. Setting fixture. | 3. Adjusting washers. |
| 4. Burner complete with diaphragm. | 5. Burner diaphragm cover. | |

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Alternatively if the combustion chamber has been removed from the engine and dismantled, the burner protrusion can be checked in the following manner. Position the burner in the expansion chamber and press the burner right home; it may be found convenient to commence with one adjusting washer between the burner diaphragm and the expansion chamber. Mount a dial test indicator on one of the expansion chamber flanges so that the stylus of the indicator is in contact with the burner. Set the indicator to zero. Using a suitable flat plate or short straight-edge -- a disc about $2\frac{3}{4}$ inches in diameter, or the short edge of one of the adjusting washers -- inserted from the rear of the expansion chamber, push the burner forwards until the atomiser end is level with the rear face of the swirl vanes in the expansion chamber (Fig.5). The distance which the burner protruded beyond the swirl vanes will be indicated on the dial test indicator, and adjusting washers must be selected to give a total thickness equal to the dimension thus measured less the required burner protrusion, specified in the previous paragraph; if operations were commenced with an adjusting washer between the burner diaphragm and the expansion chamber this washer must be added to the selected washers when the burner is finally assembled to the combustion chamber.

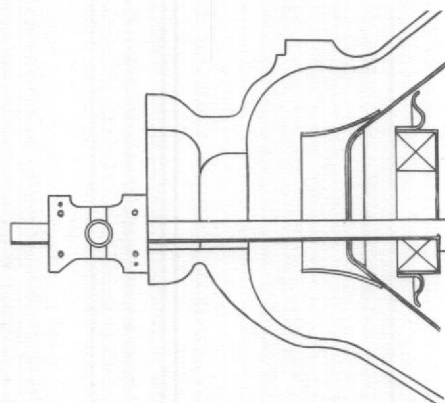
If more than four adjusting washers are fitted to any one burner, ensure that sufficient thread on the set-bolts, which secure that burner, is engaged in the expansion chamber when the burner is fitted.

Having selected the required thickness of adjusting washers and ensured that each part is clean and serviceable, refit the burner to its combustion chamber thus. Place the selected, or original, adjusting washers on the atomiser side of the burner diaphragm. Push the burner into the expansion head until the adjusting washers and diaphragm are positioned on the mounting face. Place the diaphragm cover in position. Ensure that there is a spring washer on each set-bolt and a lockwire tab on one of them, and secure the diaphragm cover, burner, and adjusting washers by refitting the four set bolts. Reconnect the flexible burner feed pipe and wire-lock the union nut to the lockwire tab with 22 S.W.G. locking wire.

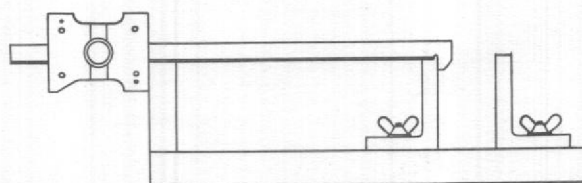
BAROMETRIC PRESSURE CONTROL, REMOVAL AND REFITTING

The barometric pressure control is mounted on the front of the oil sump. Once the unit is installed on the engine, no adjustment is permitted and no servicing is required, apart from the normal regular inspection for leakage at the pipe connections and joints. Any defect in this unit, other than leakage at the pipe connections which can be remedied in the usual way, necessitates its removal from the engine and the fitment of a serviceable unit.

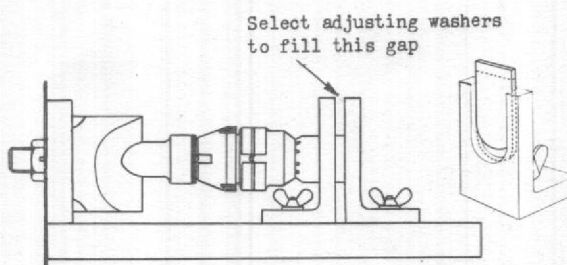
To remove the barometric pressure control proceed as follows. Cut the locking-wire and unscrew the union nuts



Measuring relationship of swirl vanes to burner mounting face with distance gauge.



Using distance gauge to set inner sliding block of setting fixture.

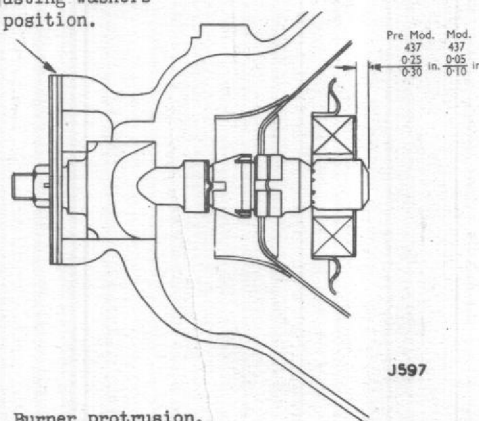


Select adjusting washers to fill this gap

When mod. 437 is embodied (type 5D combustion chambers fitted) insert the piece of gauge plate, which is attached to later type setting fixtures, into the recess which is in the outer sliding block so as to obtain the required burner protrusion; which is 0.050-0.100 inch. Where the later type setting fixture is not available, a piece of 6 S.W.G. plate inserted into the recess in the outer sliding block will give the required protrusion.

Using setting fixture to measure thickness of adjusting washers required to give correct burner protrusion.

Adjusting washers in position.



Burner protrusion.

Fig. 4. Method of using burner protrusion setting equipment.

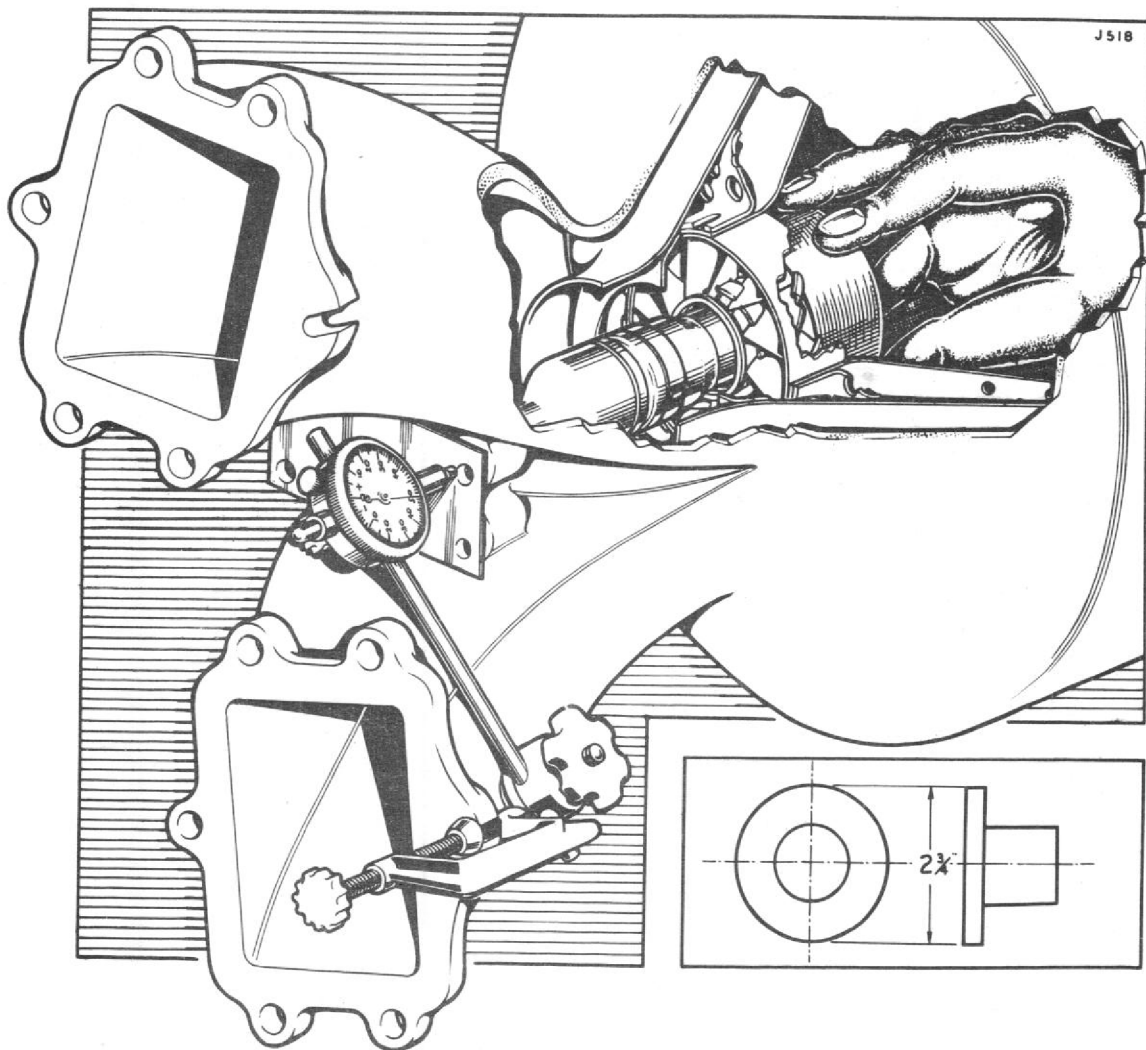


Fig. 5 Alternative method of measuring burner protrusion using a dial test indicator, with inset showing a tool which could be improvised.

which connect the following pipes to barometric pressure control:-

Spill pipe from fuel control valve to B.P.C. and to fuel pump inlet.

High pressure pipe from fuel pump to B.P.C.

Servo pipe from fuel pump to B.P.C.

Servo pipe from B.P.C. to air-fuel ratio control.

If the engine is installed in an aircraft, slacken off the hose clip which secures the air pressure pipe to the banjo on the top of the B.P.C., gently ease all pipes clear of the B.P.C., remove the four $\frac{1}{4}$ " B.S.F. plain nuts, and spring and plain washers from the studs in the oil sump on which the B.P.C. is mounted, and carefully draw the B.P.C. clear of the engine.

Refitment of the B.P.C. to the engine is practically a direct reversal of the removal instructions given already. Lock all pipe connections with 22 S.W.G. stainless steel lock-wire.

AIR-FUEL RATIO CONTROL, REMOVAL AND REFITTING

The air-fuel ratio control is mounted between two sheet-metal brackets at nine o'clock on the front of the diffuser casing. Once the unit is installed on the engine, no adjustment is permitted and no servicing is required, apart from the normal regular inspection for leakage at the pipe connections and joints. Any defect in this unit, other than leakage at the pipe connections which can be remedied in the usual way, necessitates its removal from the engine and the fitment of a serviceable unit.

To remove the air-fuel ratio control proceed as follows. Cut the locking-wire, unscrew the union nut at each end of the $\frac{1}{4}$ " rigid pipe between the air-fuel ratio control and No. 16 diffuser bolt, and remove the pipe completely. Cut the locking-wire and unscrew the union nuts which secure the high pressure and servo flexible pipes to the air-fuel ratio control, and ease the pipes clear of the unit. Cut the locking-wire and remove the cap nut from the air-fuel ratio control spill connection, and ease the banjo union at the end of the flexible spill pipe off the banjo pillar; retain the cap nut and two joint washers for use upon reassembly. Remove the 2 B.A. nut and spring washer which clamps the bridge pieces to the air-intake oil feed and starboard drain pipes and remove the two bridge pieces. Unscrew the three $\frac{5}{16}$ " B.S.F. plain nuts from the three diffuser casing/air-intake studs which also secure the pipe bridge bracket and the inboard air-fuel ratio control bracket. Remove the pipe bridge bracket. Unscrew the three plain $\frac{1}{4}$ " B.S.F. nuts from the studs immediately above No. 16 diffuser bolt, take off the three spring washers and the two plain washers from the three studs, and gently ease the burner and fire extinguisher pipe clips off the studs and clear of the air-fuel ratio control bracket. Carefully draw the air-fuel ratio control complete with its two brackets clear of the engine.

If necessary, remove the eight $\frac{1}{4}$ " B.S.F. plain nuts and spring washers from the studs in the air-fuel ratio control unit and transfer the brackets to the new air-fuel ratio control; securing them with the spring washers and nuts just removed.

Refitment of the air-fuel ratio control to the engine is practically a direct reversal of the removal instructions given already. Lock the banjo cap nut and pipe union nuts with 22 S.W.G. stainless steel lock-wire.

PRIMING THE FUEL SYSTEM

The fuel system should be primed on each occasion that the low pressure fuel filter is removed for examination or when the system has been disconnected for any servicing or maintenance operation. Instructions for priming the fuel system are contained in Chapter 8 of this Handbook.

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