

## Chapter 8

### COMBINED CONTROL UNITS, TYPES CCU 46, 48, 60, 108, 109, 110 and 126

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1. Each type of combined fuel control unit described in this chapter is attached to a gear type pump, which is fitted to the engine accessories mounting plate. The unit is employed to control the rate of fuel flow to the engine sprayers according to operational requirements.

2. All the units are basically similar in build and operation, and some of the units operate in conjunction with an altitude compensator which is described in Sect. 3, Chap. 4 of this publication. Refer to Table 1 at the end of this chapter for engine types and applicable units with their differences.

3. To identify a unit by its type number, and using the CCU 46/19BC as an example, 46 is the basic type number, /19 indicates the particular installation standard, and the letters BC show the calibration code to which the unit must be tested. On later units, a three figure number, e.g. 108, is used; this alone identifies the type, installation standard, and the calibration code.

#### Description

4. Within the unit, comprising two bodies (a main body and governor body) is a

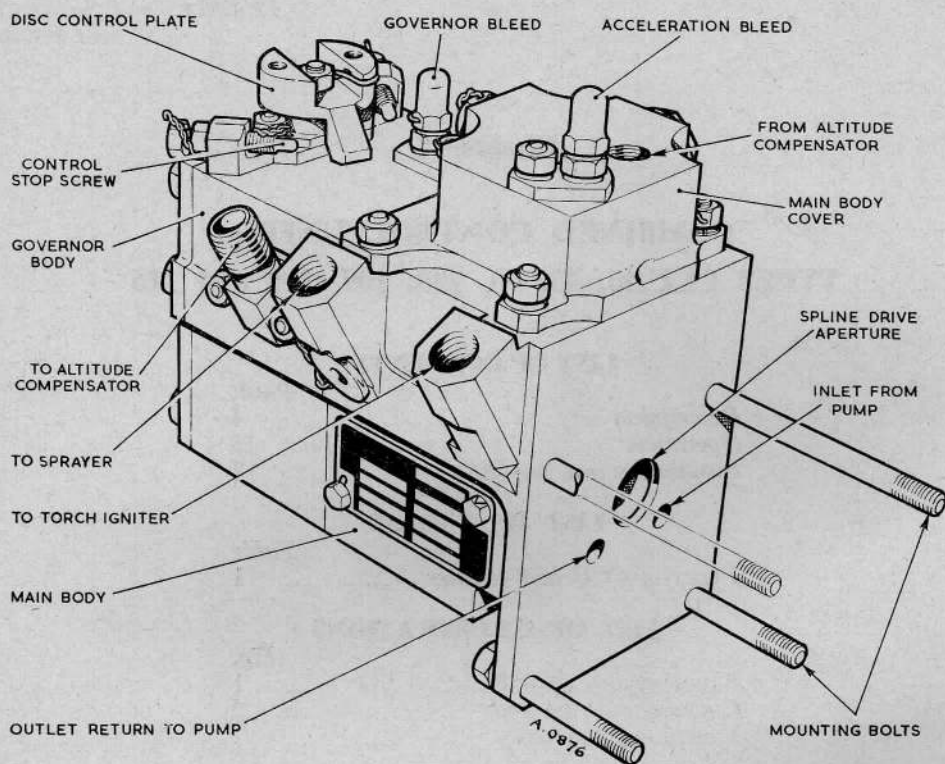
governor and a throttle valve operating within variable orifices, and a system of valves and bleeds which are adjusted basically to control starting, acceleration and fuel pressure.

#### Governor

5. The governor is of the mechanical fly-weight type, supported in a bonded carbon bush and driven via a splined coupling by the drive shaft of the fuel pump. Governed speed is controlled by a spring-loaded governor plunger which meters fuel through an orifice. The pressure of the springs is varied by a cam attached to a spindle that moves the spring carrier by means of a contacting guide rod and plate assembly. The spindle also carries a cam that operates a throttle valve plunger, thus both cams are controlled by a single lever known as the disc control plate.

6. Of the two springs in the governor, one operates at idling speed and then locks against a stop sleeve when the more heavily loaded spring takes over for a high-speed range. Pre-determined shim washers are located on the plunger and springs to provide governor setting characteristics, these

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**Fig. 1. Exterior view of unit**

being obtained on the test rig to specific test schedule requirements. An additional adjustment is provided by a vernier coupling located on the spindle between the two cams.

#### *Throttle valve*

7. The throttle valve is a profiled spring-loaded plunger operating through a fixed sleeve. The position of the plunger is determined by its cam on a spindle which also carries the governor cam. Laminated and/or plain shim washers located between the cam follower and the end flange of the plunger provide adjustment enabling the required fuel flow to be obtained.

#### *Governor bleed*

8. The governor bleed comprises an orifice body and tapered bleed screw positioned in a by-pass line and ensures an adequate flow of fuel to maintain combustion during governor operation.

#### *Acceleration bleed*

9. Similar in construction to the governor bleed, the acceleration bleed is a trimming

device situated upstream of the throttle valve.

#### *Pressurising valve*

10. The pressurising valve is a spring-loaded assembly situated downstream of the torch igniter connection between the main body and cover. This ensures that the fuel passing to the torch igniter is at a pressure sufficient for starting purposes, and that a minimum sprayer pressure is maintained under normal operating conditions. The valve is shimmed to open at a pre-determined setting.

#### *Relief valve*

11. The relief valve is a similar spring-loaded assembly situated adjacent to the pressurising valve and upstream of the governor. The valve operates in conjunction with the governor, in that as the flow area is decreased by movement of the governor plunger through its orifice, the line pressure increases, so operating the relief valve which spills surplus fuel back to the pump return line. The valve setting is determined according to calibration requirements and is adjusted on the test rig by suitable shimming.

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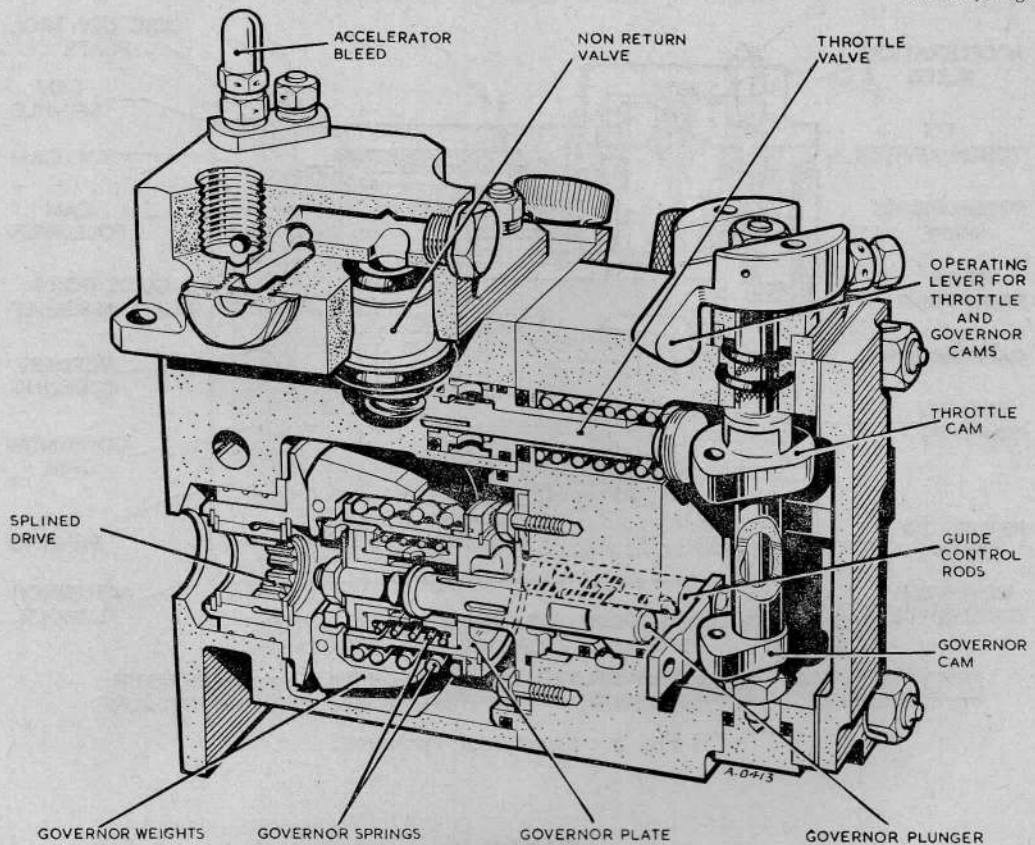


Fig. 2. Cutaway view of unit

#### *Nor-return valve*

12. The non-return valve is a pre-set, spring-loaded assembly located in the main body, downstream of the acceleration bleed and upstream of the governor. It prevents a reverse flow to the combustion chamber prior to ignition and during priming.

#### **Operation**

13. When starting, fuel is supplied from the pump into the control unit and is directed to the torch igniter. At this juncture, the fuel pressure builds up sufficiently to open the pressurising valve thereby permitting fuel to pass through the unit to the sprayer.

14. The governor employs flyweights driven off the pump and is arranged to move the plunger to vary the orifice area and hence the quantity of fuel supplied to the sprayer. By having two springs, the loading of which is varied by the cam, it is possible to obtain the two governor ranges. The one spring controls operation at a small lever angle, and

the larger one progressively takes over to control the high-speed range.

15. Over the high-speed range where relatively large flows obtain, a small reduction in area of the governor orifice will provide a large change in the fuel flow, thus providing a small governor rate.

16. The control unit is connected to an altitude compensator which is a spill flow device compensating for increases in altitude by increasing the spill from the fuel delivery line to the governor and returning it to the inlet side of the pump.

#### **Installation and servicing**

17. The unit must be installed as detailed in the engine Air Publication; this publication must be referred to also for any permitted adjustments.

18. For inhibiting instructions refer to A.P.4471A.

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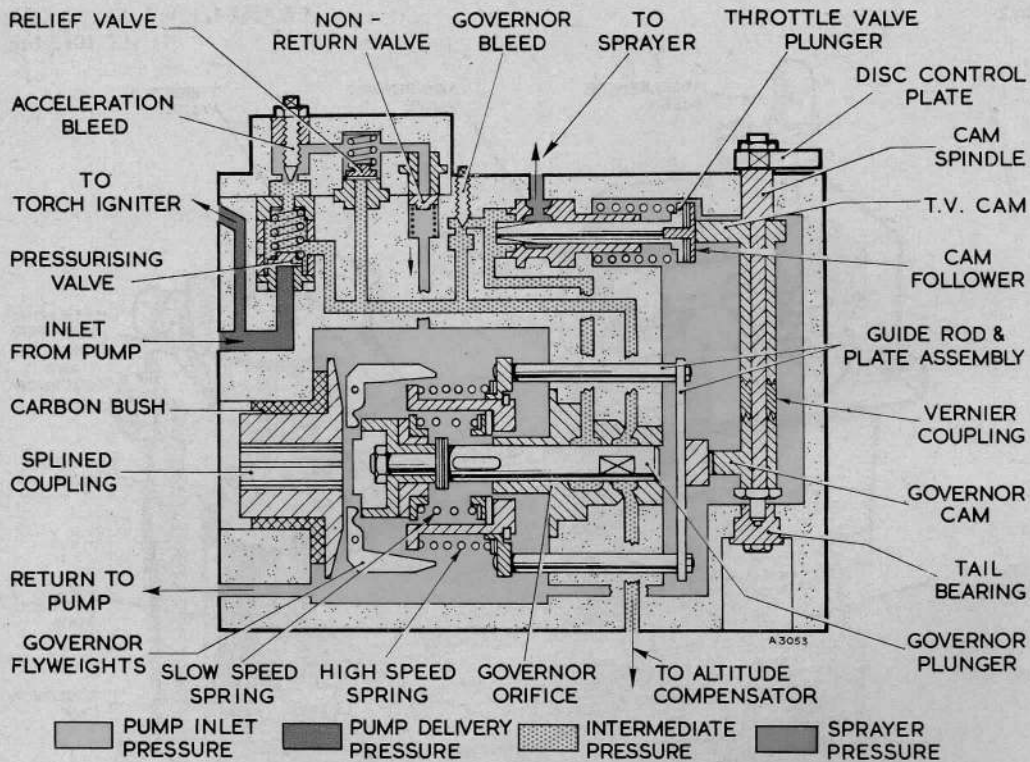


Fig. 3. Functional diagram

TABLE 1

Types of CCU and engines

CCU type	Engine type	Remarks
CCU 48/19BH	Artouste	Basic CCU as described.
CCU 60/19BH	Artouste	As CCU 48 with revised clearances.
CCU 109	Artouste	As CCU 60 with modified governor cams, modified governor plunger, and increased running clearances between governor carriage and carbon bearing.
CCU 46/19BC	Palouste	Basic CCU as described.
CCU 60/19BC	Palouste	As CCU 46 with revised clearances.
CCU 108	Palouste	As CCU 60 with modified governor cams, modified governor plunger, and increased running clearances between governor carriage and carbon bearing.
CCU 110	Nimbus	As CCU 108 with different calibration details, natural finish on body.
CCU 126	Nimbus	As CCU 110. With grey enamel finish on body and chromate treated fittings.

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