Chapter 3

DETECTOR UNITS, E.188, E.680, E.782 AND E.783 (GRAVINER EXPLOSION PROTECTION SYSTEM)

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LEADING PARTICULARS

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*Detector unit, Type E.*782	*Ref. No.* 27*N*/217
*Detector unit, Type E.*783	*Ref. No.* 27*N*/218

Introduction

1. This unit is a component of the Graviner explosion protection system and as such detects the presence of a flame within the aircraft fuel tank. Having detected the flame it operates to fire a detonator which causes a suppressant to be dispersed within the tank, thus arresting an explosion.

2. The four detector units described in this chapter are outwardly identical, differing only in the type of cold cathode trigger tube employed and slight circuit variations. The E.782 and E.783 units are merely later versions of the E.188 and E.680 units, respectively.

3. The detector units only are described in this chapter. For information relating to the explosion protection system as a whole, reference should be made to A.P.4343, Vol. 1, Sect. 22, Chap. 4.

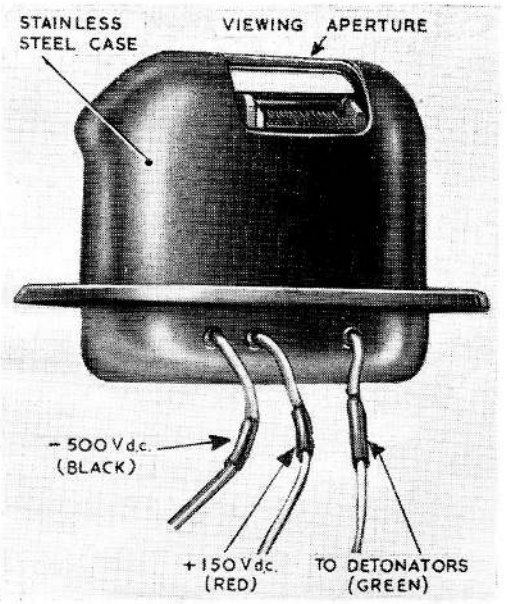

Fig. 1. Detector unit

DESCRIPTION

4. The detector unit consists, essentially, of a highly sensitive photo-electric cell combined with a firing circuit. The firing circuit incorporates a single cold cathode triode valve, capacitors and resistors and is designed to " fail safe " if external wiring is open or short circuited.

5. The active components are enclosed in a pressed, stainless steel case, windowed at the top to allow the photocell to " view " the tank interior. A resin compound encapsulates all components thus insulating the unit both electrically and mechanically.

6. Three fly leads emerging from the base of the unit provide the electrical connections necessary. Two of these leads are grouped together at one end and these accept the —500V d.c. and +142V d.c. inputs, the outer one being for the —500V d.c. The remaining lead carries the detector output for firing the detonators in the suppressors. These leads carry coloured identification sleeves as follows:—

—500V d.c.—Black
+142V d.c.—Red
Detector output—Green

7. As indicated in Leading Particulars, there exist four types of detector unit. Although outwardly identical they are different in certain respects; these differences are shown in Table 1.

Table 1
Details of detector units

Type	Cold cathode valve incorporated	Value of resistor R1 (fig. 2)	Value of resistor in —500V d.c. line
E.188	GK45	7·5M ohm	220K ohm
E.782	GK45	7·5M ohm	750K ohm
E.680	G1/236G	Two 3M ohm in series	220K ohm
E.783	G1/236G	Two 3M ohm in series	750K ohm

8. The GK45 cold cathode valve is less stable with rise in temperature than the G1/236G although its current carrying capacity is superior. The G1/236G is, therefore, employed when only one column of suppressors is fitted, advantage being taken of its greater stability. Where more than one column of suppressors is fitted the units employing GK45 cold cathode valves are used.

9. The striking voltages of the cold cathode valves GK45 and G1/236G are 79 to 84 volts and 69-86 volts, respectively. This means that the value of resistor R1 (*fig.* 2) depends upon the type of cold cathode valve employed, since this resistor sets the standing bias voltage on the trigger electrode.

OPERATION

10. When no light is present in the tank, the current through the photo-cell is minute and, therefore, the voltage drops across resistor R4 is negligible. In this condition, the potential of the trigger electrode of the cold cathode triode valve is determined by the potentiometer chain effectively formed by resistors R3, R1 and R2. This potential is not high enough to cause the valve to strike.

11. When light enters the tank, the current through the photocell increases thus increasing the voltage drop across R4. This voltage is effectively in series with that across R1 and R2 and the combined voltage is sufficient to trigger the cold cathode valve which then starts to conduct.

12. With the cold cathode valve conducting, the voltage across the valve is in the region of 75 volts leaving the balance available across the detonators within the suppressor units. Thus, ample voltage and current is available to fire the detonators.

13. To prevent a surge of current through the power pack when the cold cathode valve conducts, two 10μF capacitors, in parallel, store up a charge sufficient to fire the detonators without imposing a sudden load on the power pack.

SERVICING

14. No servicing of this unit is possible since all components are encapsulated in a resin compound.

TESTING

15. Two test kits are available for testing explosion protection equipment, namely, the Minor Test Kit (Ref. No. 5G/3199) and the Major Test Kit (Ref. No. 5G/3200). The minor test kit is suitable only for functionally testing the complete system when installed in the aircraft, but the Major test kit is suitable for the testing of each component individually, both in situ and on the bench, in addition to complete system checks. Information on the two test kits and their method of use will be found in A.P.4343S, Vol. 1, Sect. 17.

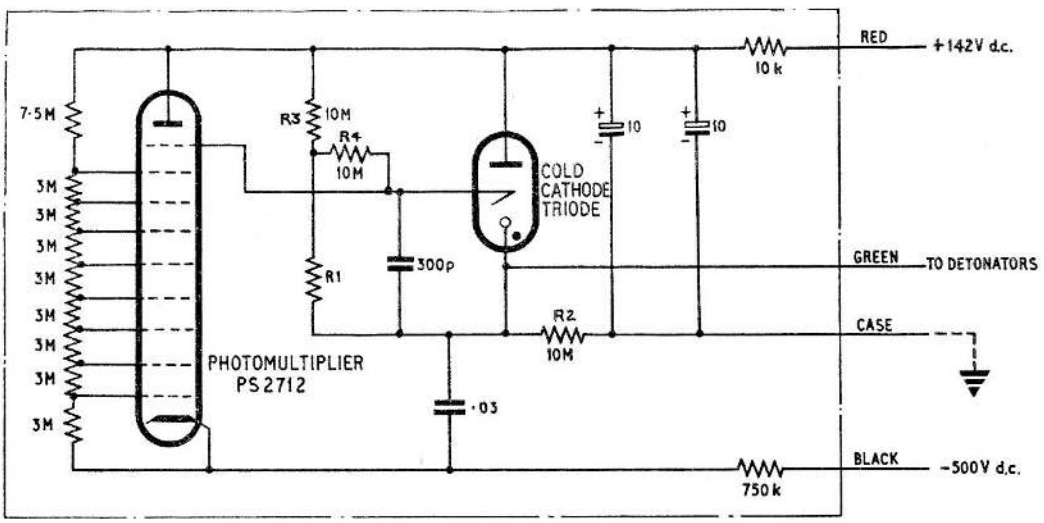

Fig. 2. Circuit diagram

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