

Chapter 16

FIRE DETECTION RELAY BOX, TYPE D1750

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LEADING PARTICULARS

Relay box, Type D1750	Ref. No. 5CZ/5450
<i>Length</i>	6.8 in.
<i>Width</i>	3.725 in.
<i>Height</i>	2.4 in.
<i>Weight</i>	1 lb. 10 oz.
<i>Relay operating current (Type JD relays)</i>	13-17mA
<i>Relay release current (Type JD relays)</i>	6-10mA

Introduction

1. The Type D1750 relay box is a single way unit for use with the Gravinier continuous wire type of fire detection system. This par-

ticular type of unit is used in aircraft fuel tank bay protection and has provision for automatic firing of extinguishers. Only the relay box is dealt with in this chapter and for

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general information on the Firewire system reference should be made to A.P.4343, Vol. 1, Sect. 22, Chap. 2, and for details of the sensing elements and accessories to Chapter 2 of this section. For information on the installation as a whole reference may be made to A.P.957C, Vol. 1, Part 1, Section 3, Chapter 1.

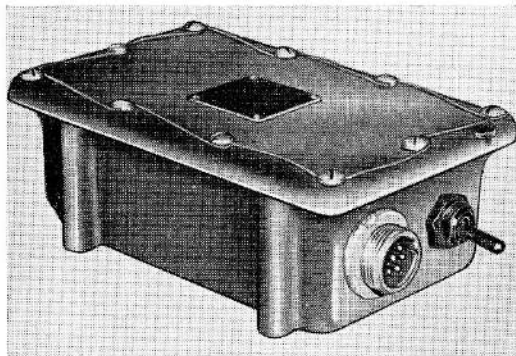


Fig. 1. Relay box, Type D1750

DESCRIPTION

General

2. The relay box, shown in fig. 1, is a hermetically sealed unit of light-alloy and comprises a case with a pressed lid retained by ten wire-locked 2 B.A. screws. Cast integral with the case are four mounting bosses which are drilled and tapped to take 2 B.A. mounting screws.

3. Mounted on one endface of the case is a double-pole change-over test switch and a 6-pole plug. The test switch is biased to rest

in one position and is depressed only for test purposes. The 6-pole plug accepts the 400 c/s a.c. supply; pins A and B being used for 115V, and pins B and C for the alternative level of 26V. The remaining pins of the plug are spare.

4. A 3-pole and a 6-pole plug are mounted on the other endface of the relay box. The 3-pole plug is used for the warning lamp and extinguisher circuits, pin B receives the positive supply, and pins A and C provide the positive supply to the warning lamp and extinguishers respectively when the relay is closed. The 6-pole plug takes the connections from the bulkhead fittings.

5. The components of the relay box, which are shown in fig. 2, are mounted on a light-alloy chassis and consist of; a transformer, a full-wave rectifier, a relay, a double-pole change-over test switch, and in early boxes a 330 ohm resistor. The transformer is a step-down transformer with a tapped primary winding for use on 115V or 26V, 400 c/s a.c. supply. The 330 ohm resistor which was intended to compensate for the reduced circuit impedance on operation of the test switch is deleted on relay box Serial No. 3494 and all subsequent units.

OPERATION

6. A typical circuit diagram of the relay box connected to a sensing element and extinguisher is shown in fig. 3. From this diagram it will be seen that with the test switch in the normal position, the transformer secondary circuit is completed through the filling material of the element.

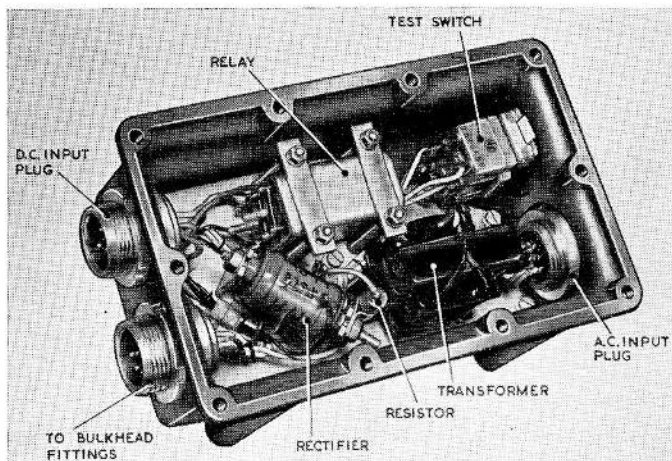


Fig. 2. Contents of relay box

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7. At normal temperature the resistance of the filling material is such that a current in the order of 1mA will flow through the secondary circuit. Under these conditions the rectified current flowing through the relay coil will be insufficient to operate the relay.

8. A rise in temperature in the potential fire zone will cause a decrease in the resistance of the filling material. This will allow an increased current to flow through the rectifier and thence through the relay coil, when this current reaches a value within the range of 13-17mA the relay will close, completing the circuit to the fire warning lamp and the extinguishers. A subsequent fall in temperature will cause the current through the relay coil to fall and when the current has fallen to within the range 6-10mA the relay will open thus resetting the system.

Test switch

9. Operation of the test switch will complete the transformer secondary circuit through the loop of the central electrode of the sensing element, instead of through the filling material. In early relay boxes this changeover also inserts a 330 ohm resistor in series with the central electrode to compensate for the reduced impedance in the

element circuit. Providing there is continuity in the central electrode the increased current flowing through the relay coil will operate the relay and light the warning lamp. To avoid inadvertently operating the extinguishers when testing the circuit, the supply to the extinguishers is broken when the test switch is depressed.

SERVICING

General

10. The relay box, being a hermetically sealed unit, should not be dismantled. Servicing should be restricted to examination for freedom from mechanical damage and corrosion.

Testing

11. The relay box should be functionally tested using a Graviner Firewire test set and the procedure given in the Standard Serviceability Test, Appendix A to this chapter. Additionally the millivolt drop through the contacts of the warning relay and the test switch may be measured using the test circuit given in fig. 4 which may also be used for functional tests where a test set is not available.

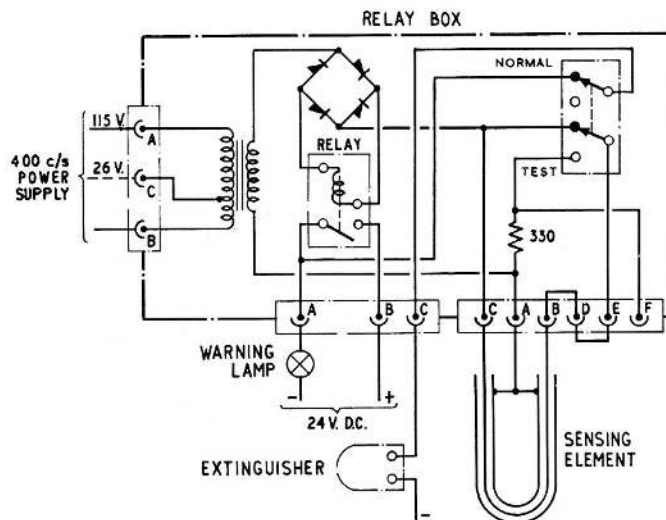


Fig. 3. Circuit diagram

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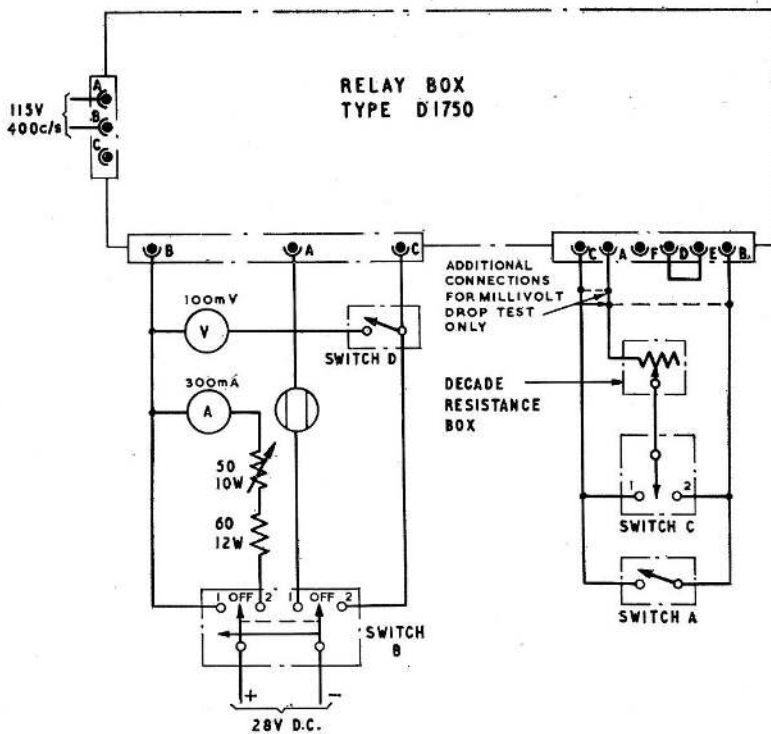


Fig. 4. Test circuit diagram

Functional testing without test set

12. Connect the relay box to a test circuit as shown, using suitable 6-pole and 3-pole sockets, switches and a decade resistance box, 0-11110 ohm, Ref. No. 10S/16239. Ensure that switch B is correctly connected to be spring loaded from position 2 to centre OFF.

Note . . .

Differences in test figures for relay boxes fitted with a 330 ohm resistor (Serial Nos. 3493 and below) are shown in brackets.

- (1) Set all switches to OFF and the decade resistance box to 1250 (900) ohms.
- (2) Switch on the supplies and set switches B and C to position 1, ensure that the warning lamp remains out.
- (3) Place switch C to OFF and set the decade resistance box to 500 (200) ohms.
- (4) Close switch C to position 1 and ensure that the warning lamp is illuminated.
- (5) Without breaking any circuits slowly increase the decade resistance until the warning lamp goes out, and ensure that

the decade resistance is within the limits of 1300 (1000) and 5350 (5000) ohms.

- (6) Repeat the tests in sub-para. (1)-(5) with switch C in position 2.
- (7) With switch C in the OFF position and switch B in position 1, close switch A and then operate the test switch on the relay box and ensure that the warning lamp is illuminated.
- (8) Set all switches to OFF and switch off all supplies.

Relay and test switch millivolt drop test

13. The millivolt drop across the contacts of the relay and the test switch may be determined by connecting shorting links or suitable switches, shown by broken line in fig. 4, across terminals A, B and C of the 6-pole plug.

Caution . . .

Extreme care must be taken to ensure that the following procedure is carried out in the specified sequence and that the test switch of the relay box is not depressed during these tests. Failure to observe

these requirements will result in 28V d.c. being applied directly to the millivolt-meter.

- (1) Set the variable 50 ohm resistor all-in and switch on the a.c. and d.c. supplies.
- (2) Make and hold switch B to position 2 and adjust the variable resistor to give a current through the relay and switch contacts of 250mA.
- (3) Close switch D, the millivolt drop the relay and switch contacts is shown on the millivolt meter and should be not more than 50mV.

- (4) Set switch D to OFF, release switch B and switch off all supplies. Disconnect the relay box from the test circuit. ▶

Insulation resistance test

- 14.** The insulation resistance of the relay box when measured with a 250V standard insulation resistance tester between each pin of the three plugs and the case should be not less than 20 megohms.
- 15.** As no servicing of the relay box is permitted, units which fail any of the above tests should be returned to depot in accordance with current procedure.

Appendix A

STANDARD SERVICEABILITY TEST

for

FIRE DETECTION RELAY BOX, TYPE D1750 (R.A.F.)

Introduction

1. The following tests may be carried out to ascertain the serviceability of a relay unit, or prior to its installation in an aircraft.

TEST EQUIPMENT

2. The following test equipment, or suitable equivalents, will be required:—

- (1) A Gravinier Firewire test set, Ref. No. 5G/3487.
- (2) An insulation resistance tester, Ref. No. 5G/152.
- (3) A 28V d.c. supply and a 115V, 400c/s a.c. supply.

TEST PROCEDURE

3. Set switches SA, SB and SC to position 1 and the resistance controls RV1 and RV2 fully counter-clockwise. Connect cable No. 1 to socket A on the test set and also to the 6-pole socket adjacent to the test switch on the relay box. Connect cable No. 5a to socket B on the test set and also to the six-pole on the relay box at the reverse end to the test switch. Connect cable No. 4b to socket E on the test set and also to the 3-pole socket on the relay unit.

4. Connect cable No. 7 to plug A on the test set and the free end of this cable to the output terminals of the 115V, 400c/s a.c. supply. Connect cable No. 6 to plug B on the test set and the free end of this cable to the output terminals of the 24V d.c. supply ensuring, correct polarity, positive to pin A and negative to pin B.

Note . . .

Switch SD is a scale change switch in the circuits of meters M1 and M2 and should not be operated during unit testing except where detailed. Operation of the switch gives readings on the 0–5mA scale of meter M1 and on the 0–40mA scale of meter M2.

Functional test

5. (1) Set switch SA to position 3 and switches SB and SC to position 1.
- (2) Switch on the a.c. and d.c. supplies.
- (3) Operate the test switch on the relay box under test and ensure that lamp LP2 is illuminated.
- (4) Release the test switch and ensure that lamp LP2 is extinguished.
- (5) Depress switch SF on the test set and ensure that lamps LP2 and LP3 are illuminated. Holding switch SF depressed operate the test switch on the relay unit and ensure that lamp LP3 is extinguished.
- (6) Release the relay unit test switch and switch SF.

Input current consumption test

6. (1) Set switch SB to position 2.
- (2) The standby input current now indicated on meter M1 on the 0–20mA scale should be not more than 10mA.
- (3) Set switch SB to position 3 and ensure that LP2 and LP3 are illuminated.
- (4) The operating input current now indicated on meter M1 on the 0–20mA scale should be not more than 15mA.

Relay current test

7. (1) Set switch SB to position 4.
- (2) Slowly rotate the resistance control RV1 clockwise to decrease the resistance until lamps LP2 and LP3 are illuminated.
- (3) The relay operating current now indicated on meter M1 on the 0–20mA scale should be between 13–17mA.
- (4) Slowly rotate the resistance control RV1 counter-clockwise until lamps LP2 and LP3 are extinguished.
- (5) The relay release current now indicated on meter M1 on the 0–20mA scale should be between 6–10mA.

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(6) Rotate resistance control RV1 fully-counter-clockwise.

(7) Set switch SB to position 5 and ensure that lamps LP2 and LP3 are illuminated.

(8) The maximum relay current (short circuit detector) now indicated on meter M2 on the 0-40mA scale, depress switch SB, should be between 25-35mA.

8. Set switches SA and SB to position 1 switch off the a.c. and d.c. supplies. Disconnect the relay unit and then remove the connectors from the test set.

Insulation resistance test

9. The insulation resistance of the relay box may be measured using a 250V insulation resistance tester. The insulation resistance measured between each pin of the three plugs and the relay case should be not less than 20 megohms.

10. Relay units which fail any of the above tests should be returned for repair in accordance with current authorised procedure.

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