Chapter 14

FIRE DETECTION RELAY BOX, TYPE D879

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LEADING PARTICULARS

Relay box, Type D879	*Ref. No.* 5CZ/5256
Length	6·8*in.*
Width	3·725*in.*
Height	2·4*in.*
Weight	1*lb.* 10*oz.*
Relay operating current (Type GD relay)	9–16*mA.*
Relay release current (Type GD relays)	2–6*mA.*
Relay operating current (Type JD relays)	13–17*mA.*
Relay release current (Type JD relays)	6–10*mA.*

Introduction

1. The Type D879 relay box is a single way unit for use with the Graviner continuous wire type of fire detection system. This chapter deals only with the relay unit and for general information on the system as a whole, reference should be made to A.P.4343, Vol. 1, Section 22, Chapter 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.

DESCRIPTION

General

2. The box shown in fig. 2, is a hermetically

sealed unit and comprises a cast light-alloy case and pressed light-alloy lid retained by ten wire-locked 2 B.A. screws. Cast integral with the box are four mounting bosses drilled and tapped to take 2 B.A. mounting screws.

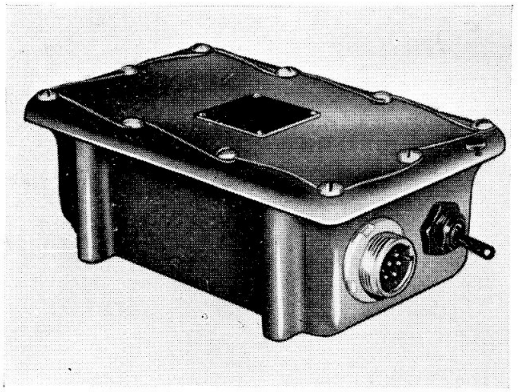

Fig. 1. Relay box, Type D879

3. A single-pole toggle-type test switch and a 6-pole plug are mounted on one end face of the relay box. The test switch is biased to rest in one position and is depressed only for test purposes. The 6-pole plug is the a.c. input plug; pins A and B being used for the 115-volts 400 c/s power supply, and pins C and B for the alternative level of 26-volts 400 c/s. The remaining pins are spare.

4. On the opposite end face of the box are mounted two plugs, a 6-pole and a 3-pole. The 24-volts d.c. supply is brought to pins A and B of the 3-pole plug whilst the other plug takes the connections from the bulkhead fittings.

5. The components in the relay box are mounted on a light-alloy chassis to facilitate easy removal and comprise: A transformer, a full-wave rectifier, a relay, a 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 relays used in the boxes are of the GD or JD Type, which are identical in operation but differ slightly in manufacturing details, and coil and contact rating. The GD relays are fitted to control units with the following serial numbers:—

3RB/1 to 329, 331 to 725, 727 to 997, 999 to 1035, and 1384 to 1408.

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. 2974 and in all subsequent units.

OPERATION

6. The circuit diagram of the relay box being used in conjunction with a sensing element is shown in fig. 3. From this diagram it will be seen that, with the test switch in its normal position, both ends of the sensing element are connected in parallel to the rectifier and thence to one side of the secondary winding of the transformer.

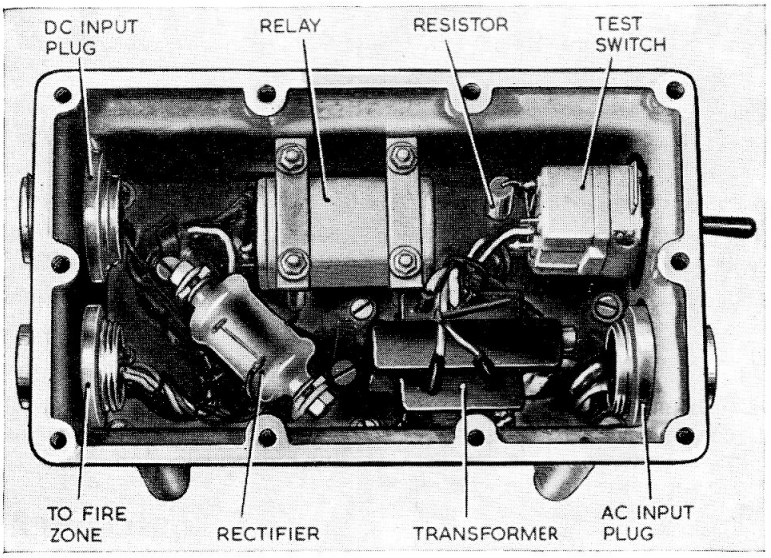

Fig. 2. Contents of relay box

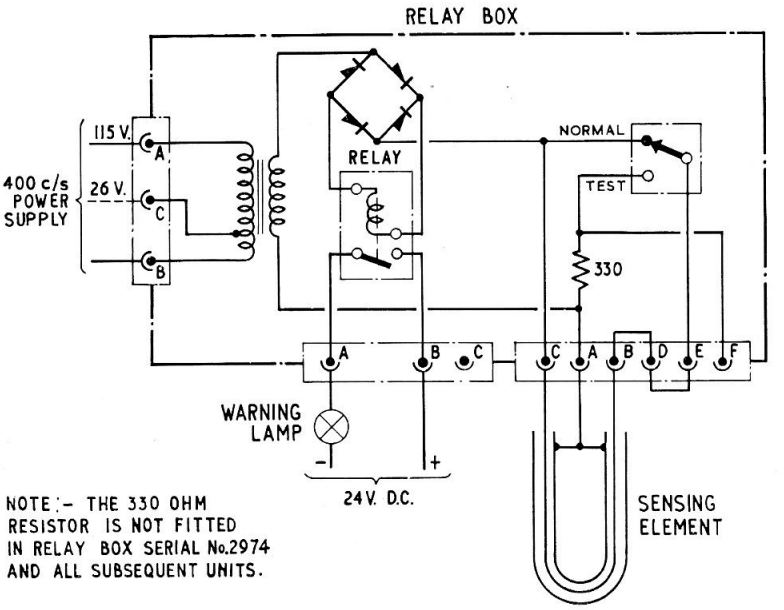

Fig. 3. Circuit diagram

7. Under normal ambient conditions the resistance of the filling material is such that a current of the order of 1 mA will flow between the inner and the outer electrodes of the element. The resultant rectified current which flows through the relay coil will be insufficient to operate the relay. Should the temperature in the fire zone rise, however, the resistance between the electrodes of the sensing element will fall, causing an increase in the rectified current through the relay coil. When the temperature in the fire zone has risen to such a value that the relay current is in the range of 13–17mA (9–16mA for Type GD relays) the relay will operate to complete the 24V d.c. circuit, and illuminate the warning lamp.

8. Should the fire zone temperature subsequently fall, the resistance of the sensing element will increase causing the relay current to decrease. When the current falls to within the range 6–10mA (2–6mA for Type GD relays) the relay will drop out and break the warning circuit. In early boxes this changeover also inserts a 330 ohm resistor in series with the central electrode to compensate for the reduced impedance of the element circuit.

Test switch

9. When the test switch is depressed the a.c. circuit is completed through the loop of the central electrode instead of through the filling material of the element. This change over also inserts the 330 ohm resistor in series to compensate for the reduced impedance of the element circuit. Provided continuity exists in the central electrode, the current will operate the relay and the warning lamp will be illuminated. If a break exists the lamp will not light up, but it should be borne in mind that a fault in the relay box would also prevent illumination of the lamp.

SERVICING

General

10. The servicing of the relay box should be confined to an examination to ensure that the unit is mechanically sound and undamaged. It should be noted that no dismantling of the relay box is permissible.

Testing

◀11. The relay box may be functionally tested using the procedure and test circuit given in the Standard Serviceability Test, Appendix A (R.N.) and Appendix B (R.A.F.).▶

Appendix A

STANDARD SERVICEABILITY TEST
for
FIRE DETECTION RELAY BOX, TYPE D879 (R.N.)

Introduction

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

TEST EQUIPMENT

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

(1) A single-pole changeover switch with centre-off position, Ref. No. 5CW/6431, and a single-pole ON/OFF switch, Ref. No. 5CW/6430.

(2) A decade resistance box 0–111110 ohms, Ref. No. 10S/16237.

(3) A 28V d.c. supply and a 26/115V 400 c/s a.c. supply.

(4) A 250V insulation resistance tester Ref. No. 0557/AP.5047.

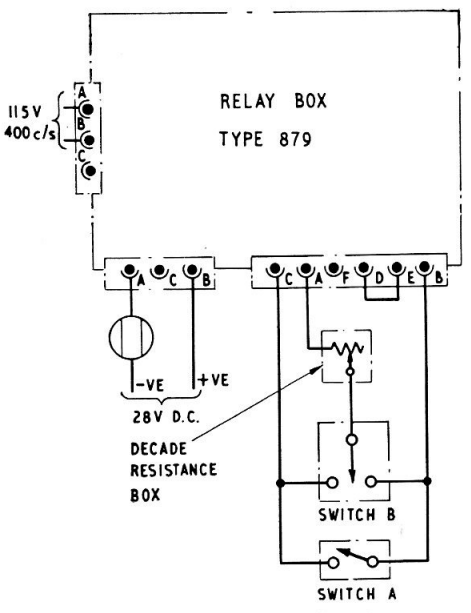

Fig. 1. Test circuit diagram

TEST PROCEDURE

Note . . .

Differences in test figures for relay boxes fitted with a 330 ohm resistor (Serial Nos. prior to 2974) are shown in brackets.

3. (1) Connect the relay box to a test circuit, as shown in fig. 1, using suitable 6-pole and 3-pole sockets.

(2) Set both switches to OFF and set the decade resistance box to 2350 (2000) ohms for units fitted with Type GD relays, or to 1250 (900) ohms for those fitted with Type JD relays.

(3) Place switch B to position 1 and ensure that the warning lamp remains out.

(4) Return switch B to OFF and set the decade resistance box to 500 (200) ohms.

(5) Close switch B to position 1 and ensure that the warning lamp is now illuminated.

(6) Slowly increase the decade resistance until the warning lamp goes out. This must occur when the value of the decade resistance is between 3000 (2700) and 12350 (12000) ohms for units fitted with GD relays and between 1300 (1000) and 5350 (5000) ohms for those fitted with JD relays.

(7) Repeat the tests given in (2)–(6) with switch B in position 2.

(8) Set switch B to OFF and switch A to ON and operate the test switch on the side of the relay box, the warning lamp should be illuminated.

(9) Set all switches OFF and disconnect the supplies.

Insulation resistance test

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

Appendix B

STANDARD SERVICEABILITY TEST

for

FIRE DETECTION RELAY BOX, TYPE D879 (R.A.F.)

Introduction

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

TEST EQUIPMENT

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

(1) The Graviner Firewire test set, Ref. No. 5G/3487.

(2) A 250V 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 the test set switches SA, SB and SC to position 1 and the resistance controls RV1 and RV2 fully counter-clockwise. Connect the test set to the relay box and supplies as follows:—

(1) Connect cable No. 1 to socket A on the test set and to the 6-pole socket mounted adjacent to the test switch at one end of the relay unit.

(2) Connect cable No. 5a to socket B on the test set and to the right-hand socket of the two 6-pole sockets mounted together on the end of the relay unit.

(3) Connect the cable No. 4b to socket E on the test set and to the left-hand socket of the two 6-pole sockets on the relay unit.

(4) Connect cable No. 7 to plug A of the test set and the free end of this cable to the output terminals of the 115V, 400c/s a.c. supply.

(5) Connect cable No. 6 to plug B on the test set and the free end of this cable to the 28V d.c. supply.

Test circuit functional test

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.

4. (1) Switch on the a.c. and d.c. supplies and ensure that power on is indicated by the illumination of lamps LP1 and LP4 respectively.

(2) Set switch SA to position 3.

(3) Operate the test switch on the relay box and ensure that lamp LP2 is illuminated.

(4) Release the relay unit test switch and ensure that lamp LP2 is extinguished.

Input current consumption test

5. (1) Set switch SB to position 2, lamp LP2 extinguished.

(2) The standby input current now shown on meter M1 on the 0–20mA scale should be not more than 10mA.

(3) Set switch SB to position 3. Lamp LP2 should now be illuminated.

(4) The operating input current now shown on meter M1 on the 0–20mA scale should be not more than 15mA.

Relay current test

Note . . .

Differences in test figures for relay units fitted with Type GD warning relays (Serial Nos. 3RB/1 to 329, 331 to 725, 727 to 997, 999 to 1035, 1384 to 1408) are shown in brackets.

6. (1) Set switch SB to position 4 and slowly rotate the resistance control RV1 clockwise to decrease the resistance until lamp LP2 is illuminated.

(2) The relay operating current now indicated on meter M1 on the 0–20mA scale should be between 13–17mA (9–16mA).

(3) Slowly increase the resistance of RV1 until lamp LP2 is extinguished.

(4) The relay release current now shown on meter M1 on the 0–20mA scale should be between 6–10mA (2–6mA).

(5) Set the resistance control RV1 fully counter-clockwise and set switch B to position 5.

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

(7) Switch off the a.c. and d.c. supplies and return switches SA, SB and SC to position 1. Disconnect the relay unit connections and then remove the connectors from the test set.

Insulation resistance test

7. The insulation resistance of the relay unit may be tested using a 250V insulation resistance tester. The reading obtained when measuring between each pin of the three 6-pole sockets and the case should be not less than 20 megohms.

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