# Chapter 49

# SWITCH, MAGNETIC, TYPE 2Y (ROTAX D 6801/3)

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## LIST OF ILLUSTRATIONS



## LEADING PARTICULARS

| | |
|---|---|
| Switch, magnetic, Type 2Y ... ... ... | Stores Ref. 5CW/4777 |
| Main contact voltage ... ... ... | 208–V. three-phase a.c. |
| Coil voltage ... ... ... ... ... ... ... | 28–V. d.c. |
| Auxiliary contact voltage ... ... ... ... ... | 28–V. d.c. |
| Main contact rating ... ... ... ... | 30 KVA (400 c.p.s.) |
| Auxiliary contact rating ... ... ... ... ... | 5 amperes |
| Pull-in coil resistance (at 20 deg. C.) ... | 2·6 ohm ±7 per cent |
| Hold-in coil resistance (at 20 deg. C.) ... | 65 ohm ±10 per cent |
| Operational temperature range ... | —70 deg. C. to + 70 deg. C. |
| Operational ceiling ... ... ... ... ... ... | 50,000 ft. |
| Length ... ... ... ... ... ... ... ... | 8·359 in. |
| Width ... ... ... ... ... ... ... ... | 5·187 in. |
| Height (from mounting base) ... ... ... ... | 4·890 in. |
| Weight ... ... ... ... ... ... ... ... | 9 lb. |

### Introduction

**1.** The Type 2Y magnetic switch is a 208-V. three-phase a.c. change-over contactor, operated (and magnetically held) by a 28-V. d.c. coil. The switch has four pairs of auxiliary contacts, two pairs normally open and two normally closed.

### DESCRIPTION

**2.** The switch is mounted on a moulded base and is enclosed by a metal cover having flame-trap ventilation. The nine main terminals and twelve auxiliary terminals are situated underneath the base. The three terminals of the main contacts (L1, L2, L3) project from the moulded terminal blocks which house the remaining terminals. Terminals A, B, C (which are normally connected to L1, L2, L3 respectively) are enclosed within a terminal moulding with a screw retained cover, through which the exposed terminals project. Terminals D, E, F are contained in a similar moulding at the opposite end of the base. The auxiliary terminals are set in two terminal blocks between the outer terminal boxes.

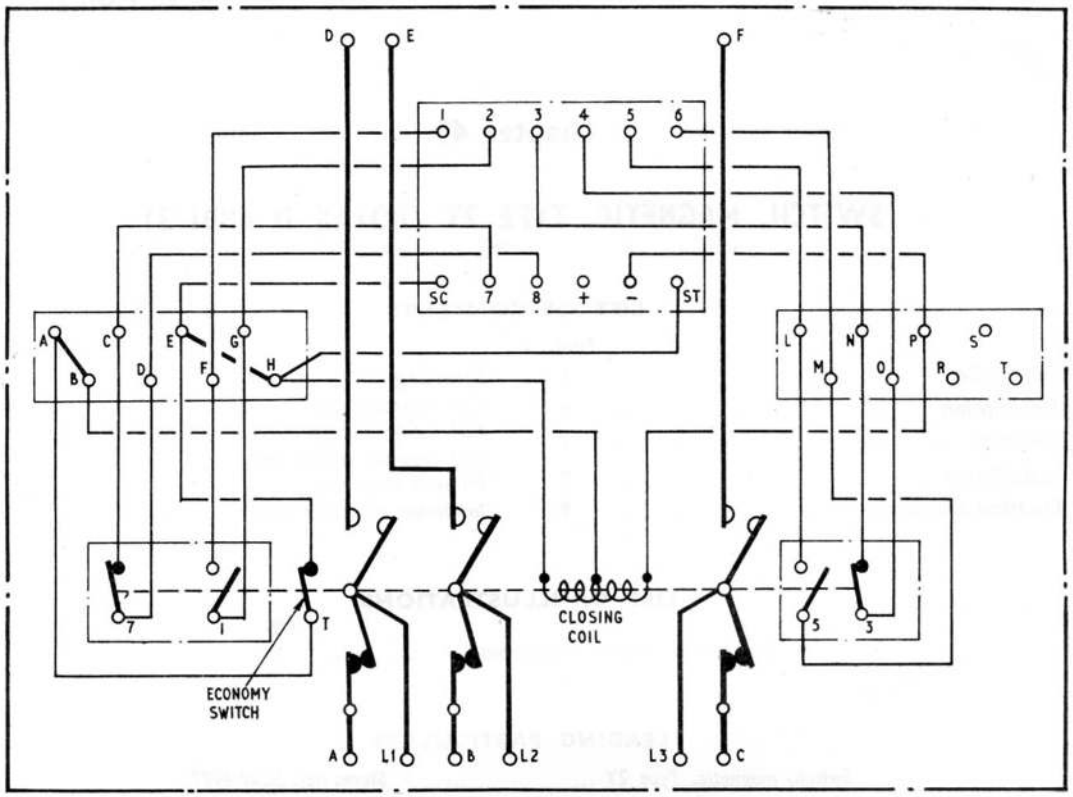


**Fig. 1. Diagram of internal connections**

**3.** A moving contact carrier is pivoted between the vertical side plates of a switch frame which is screwed to the base. The contact carrier is connected by a toggle linkage to the plunger of the operating coil, which is mounted on the switch frame. The contact carrier has two sets of three contacts which mate with corresponding fixed contacts mounted on the base. The two sets of contacts project one at each end of the contact carrier and the corresponding members of the sets are commoned (to form three pairs). The terminals L1, L2, L3 are connected to the pairs of moving contacts by flexible braid. Each mating pair of contacts operates within a separate compartment formed by moulded phase barriers. Each moving contact is spring loaded to permit follow through when the contact makes. The normally open contacts have arcing fingers to protect the contact faces from arcing.

**4.** The four pairs of auxiliary contacts are mounted in two moulded contact housings, one housing being fixed to each side of the switch frame. The contacts are operated by pins fitted to the main contact carrier and projecting through the side plates of the switch frame. The coil economy switch is fitted to one of the side frames and is operated by a moulded sleeve on an extension of the centre toggle pin. The economy switch has a latch mechanism to time its operation; it opens at the end of the plunger "in" stroke and closes at the end of the plunger "drop-out" stroke.

#### Operation

**5.** When the coil is energized, the plunger pulls the toggle linkage over centre, and the main contact carrier pivots so that the three normally open pairs of contacts close and the three normally closed pairs of contacts open. Connection is therefore made between terminals D and L1, E and L2, F and L3 and broken between terminals A and L1, B and L2, C and L3 respectively. The auxiliary contacts are operated by the contact carrier pins, and at the end of the plunger stroke the economy switch opens, bringing the "hold-in" winding in circuit with the low resistance

"pull-in" winding in order to limit the continuous hold-in coil current to a safe value.

**6.** When the coil is de-energized, torsion return springs, fitted to the centre toggle pins and the contact carrier hinge-pin, return the contacts and linkage to normal.

## INSTALLATION

**7.** The switch may be mounted in any convenient attitude. For mounting, four bushes are set in the moulded base and provided with 0·257 in. diameter clearance holes. The fixing centres of the four holes form a rectangle 6·156 in. by 4·187 in.

**8.** In order to mount the switch, it is necessary to remove the main cover, which is retained by three screws. The fixing hole adjacent to terminal "A" may require a longer bolt in order to accommodate the earthing strip which connects the switch frame to aircraft frame.

### Electrical connections

**9.** The nine main terminals are standard 68 ampere S.B.A.C. sockets whilst the twelve auxiliary terminals are 7 ampere S.B.A.C. sockets.

## SERVICING

**10.** Make a general inspection of the switch to ensure that it is in good condition and that it has not sustained damage. The electrical connections should be secure and clean and the switch should be secure on its mounting.

**11.** Remove the cover and examine the main contacts for excessive burning and pitting; also ensure that the three pairs of arcing fingers are fit to give further service.

### Coil resistance tests

**12.** The resistance of the "pull-in" coil, measured between terminals "SC" and "—" (contacts normal) should be between 2·4 and 2·8 ohm. The resistance of the total winding, measured between terminals "ST" and "—" should be between 58·5 and 71·5 ohm. These values apply at 20 deg. C. ambient temperature and the readings obtained should be corrected to this temperature.

### Coil pull-in voltage test

**13.** Connect a variable supply (with a suitable ammeter in circuit) to terminals "SC" and "—". Commencing at zero current, slowly increase the current flowing until the plunger pulls in, closing the normally open contacts. The current reading at this point should be between 4·3 and 6·6 amperes. The product of the current reading obtained and the actual resistance of the "pull-in" coil, at 20 deg. C. (*para.* 12) should be between 12 and 16 volt. Ensure that the current reading drops to approximately 0·2 ampere immediately the plunger pulls in, indicating that the coil economy switch has operated.

### Coil drop-out voltage test

**14.** Commence this test with the contactor normal. Apply 29-V. to pull in the plunger and then slowly reduce the current flowing in the coil until the plunger drops out. The product of the current reading at this moment and the actual resistance of the total winding at 20 deg. C. (*para.* 12) should be between 5 and 10 volt.

**Note . . .**

*While applying the tests given in para. 13 and 14, ensure that any movement of the main contact carrier to the extent of making contacts produces a full follow-through at all the contacts made. The main contact follow-through is 0·040 in.±0·010 in.*

### Millivolt drop tests

**15.** Allow the rated current (d.c.), i.e. 100 amperes, to flow through each pair of main contacts in turn and measure the potential drop across each appropriate pair of main terminals. A reading of not more than 100 millivolt should be obtained in each test involving normally closed contacts and a reading of not more than 140 millivolt should be obtained in each test involving normally open contacts.

**Note . . .**

*Care should be taken not to break main contacts when d.c. is flowing.*

**16.** The millivolt drop across each pair of auxiliary contacts should be measured with 5 amperes d.c. flowing. A reading of not more than 40 millivolt should be obtained in each test.

### Insulation resistance tests

**17.** Measure the insulation resistance between the following points, using a 500-V.

insulation resistance tester. A reading of at least 50,000 ohm should be obtained in each test.

(1) Main contacts normal
- (*a*) Terminal "—" and terminals A, B, C, D, E, F
- (*b*) Terminal 3 and terminals A, B, C, D, E, F
- (*c*) Terminal 7 and terminals A, B, C, D, E, F
- (*d*) Terminal A and terminals B, C, D, E, F
- (*e*) Terminal B and terminals C, D, E, F
- (*f*) Terminal C and terminals D, E, F
- (*g*) Terminal D and terminals E, F
- (*h*) Terminal E and terminal F
- (*i*) Terminals A, B, C, D, E, F and frame

(2) Main contacts in operated position
- (*a*) Terminal A and terminals B, C, D, E, F
- (*b*) Terminal B and terminals C, D, E, F
- (*c*) Terminal C and terminals D, E, F
- (*d*) Terminal D and terminals E, F
- (*e*) Terminal E and terminal F
- (*f*) Terminal 1 and terminals A, B, C, D, E, F
- (*g*) Terminal 5 and terminals A, B, C, D, E, F

**18.** Measure the insulation resistance between the following points, using a 250-V. insulation resistance tester. A reading of at least 50,000 ohm should be obtained in each test.

(1) Main contacts normal
- (*a*) Terminal "—" and terminals 3, 7
- (*b*) Terminal 1 and terminal 2
- (*c*) Terminal 3 and terminals 5, 7
- (*d*) Terminal 5 and terminal 6
- (*e*) Terminals "—", 3, 7 and frame

(2) Main contacts in operated position
- (*a*) Terminal "—" and terminals 1, 5
- (*b*) Terminal 1 and terminals 3, 4, 5, 7, 8
- (*c*) Terminal 3 and terminal 4
- (*d*) Terminal 5 and terminals 7, 8
- (*e*) Terminal 7 and terminal 8
- (*f*) Terminals 1, 5 and frame

**Note . . .**

*The value of insulation resistance given in paras. 17 and 18 applies to switches being tested under normal workshop conditions. Due allowance should be made for the climatic conditions of the locality and those of the aircraft servicing area or dispersal point where the tests are being applied. In particularly damp climates, the readings obtained may be low enough to give apparently sufficient reason for rejection and, in these instances, discretion should be exercised.*