Group D.6

CABIN PRESSURIZATION AND TEMPERATURE CONTROL (CODE CP)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

TABLE

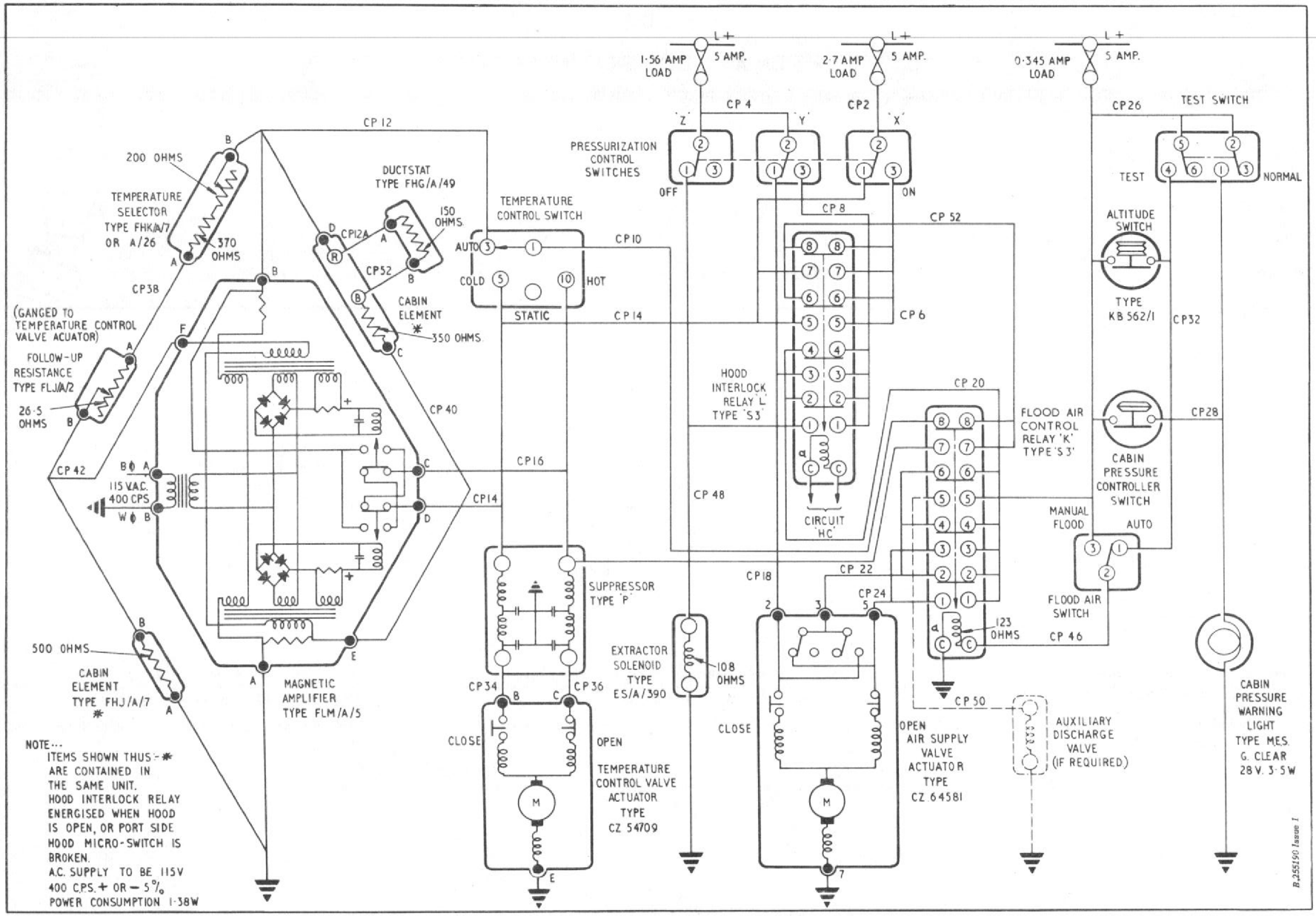

Fig. 1. Cabin pressurization and temperature control (theoretical)

RESTRICTED

Introduction

1. This Group contains the description and operation of the cabin pressurization and temperature control circuit, together with the information necessary to maintain the equipment in an efficient condition. Routeing and theoretical circuit diagrams are also included. For a general description of the aircraft's electrical system, reference should be made to Groups A.1, A.2 and A.3. Detailed information on the standard items of equipment used in the circuit will be found in the Air Publications listed in Table 1.

TABLE 1

Equipment type and Air Publication reference

Equipment Type	Air Publication
Control switches, changeover, no centre off, C.W.C. Type XD.778, No.4 Flood switch, changeover, no centre off, C.W.C. Type XD.778, No.4 Temperature control switch, Type C.1223Y, Mk.12 Pressure warning test switch, on/off, spring-return to centre off, C.W.C. Type XD.786, No.4.	A.P.4343C, Vol.1, Book 1, Sect. 1
Temperature selector, Type FHK/A/7 or 26 Cabin element, Type FHJ/A/7 Ductstat, Type FHG/A/49	A.P.1275A, Vol.1, Sect.20
Air supply valve actuator, Type CZ.64581/A Temperature control valve actuator, Type CZ.54709/10/A	A.P.4343D, Vol.1, Book 5, Sect. 16
Air extractor valve solenoid, Type ES/A/390	A.P.4343E, Vol.1, Book 1, Sect.2
Relays, Type S, No.3	A.P.4343C, Vol.1, Book 2, Sect.3
Altitude switch, Type KB.562/01	A.P.1275A, Vol.1, Sect.24
Suppressor, Type P, No.1	A.P.4343C, Vol.1, Book 3, Sect.5
Magnetic amplifier, Type FLM/A/5	A.P.1469E, Vol.1, Sect.1
Follow-up resistor, Type FLJ/A/2	A.P.4343E, Vol.1, Book 4, Sect.22
Warning lamp, Type B	A.P.4343E, Vol.1, Book 4, Sect.18

DESCRIPTION

Cabin pressurization and temperature control

Control switches

2. The cabin pressurization and temperature control installation of this aircraft is controlled by:-

(1) A cabin pressurization control switch unit consisting of three ganged ON/OFF power supply switches.

(2) A flood switch marked AUTO and MANUAL.

(3) A four position temperature control switch, which is marked AUTO, COLDER, EMERGENCY and HOTTER.

(4) A temperature selector marked COOL, NORMAL and WARM.

All these switches are situated on the cabin pressurization control panel at the aft end of the cabin port shelf.

Actuators

3. The pressurization control switch unit controls:-

(1) The air supply valve actuator, located at the top of the centre fuselage aft of the rear spar frame.

(2) The air extractor valve solenoid situated on the forward face of the diaphragm aft of the hood.

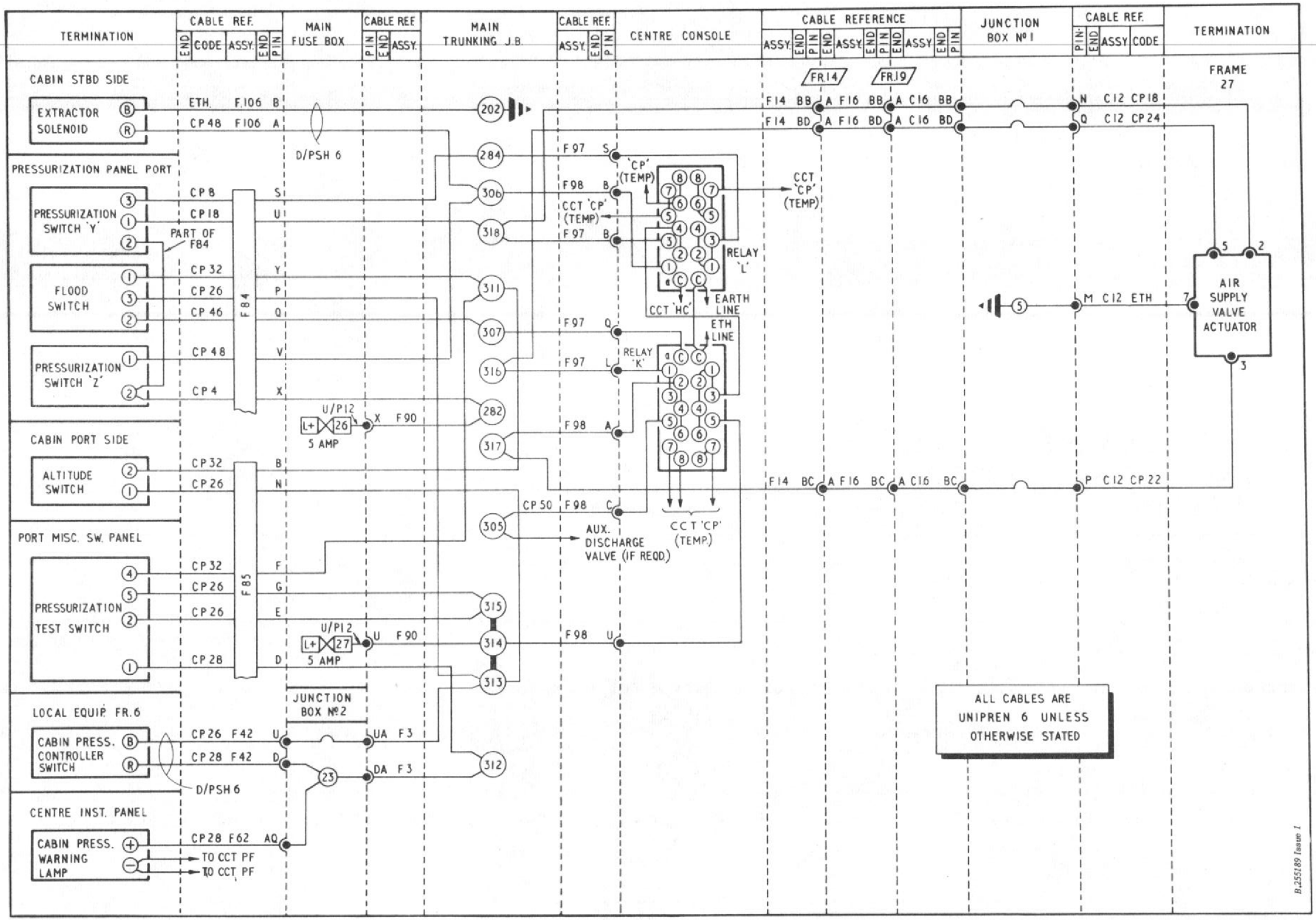

Fig.2. Cabin pressurization and temperature control – pressure section (routeing)

(3) The temperature control valve actuator located in the hood fairing.

This control is via contacts of the hood interlock and flood air control relays L and K which are both mounted in the centre console.

Pressurization and hood, interlock

4. The hood interlock relay L is linked with the hood control circuit *(Group D.5)*, and is energized as the hood opens. It then overrides the pressurization control switches to close the air supply valve, and energizes the air extractor valve solenoid to open this valve. At the same time, the supply to the temperature control switch is cut off and the temperature control valve actuator is energized to close the hot air by-pass.

5. The flood air control relay K is controlled automatically, by an altitude switch, located just forward of frame 12 on the port side of the cabin, or manually by the flood switch. When energized this relay causes the air supply valve actuator to open to the flood position, the temperature control valve actuator to open the hot by-pass and the auxiliary air discharge valve, which is located on frame 14, to open to vent the cabin.

Temperature valve actuator

6. To minimise radio interference, the supply to the temperature control valve actuator is taken through a suppressor, mounted in the hood fairing. This actuator is controlled manually when the temperature control switch is in the COLDER, EMERGENCY and HOTTER position, or automatically when AUTO is selected. In this latter position, the cabin temperature is selected at the temperature selector and the selected temperature is then automatically maintained by a magnetic amplifier. The amplifier controls the operation of the temperature control valve actuator in accordance with a temperature sensing cabin element, a ductstat and follow-up resistor. The magnetic amplifier and cabin element are located in the cabin. The follow-up resistor is situated adjacent to and operated by the temperature control valve actuator in the hood fairing. The ductstat is fitted in a pressurizing pipe located just forward of frame 14 on the starboard side of the cabin.

Cabin pressure warning

7. Visual warning of loss of cabin pressure is given by a lamp located on the centre instrument panel. The warning lamp is controlled by a switch in the cabin pressure control valve Type A, which is mounted on the rear face of frame 6. The warning system, together with the operation of the flood air supply valve actuator, may be tested on the ground by the pressure warning and flood control test switch located on the port miscellaneous switch panel, aft of the cabin shelf.

Operation

Pressurization and hood, interlock

8. The cabin pressurization and temperature control circuit is interconnected with the hood control circuit *(Group D.5)* either directly, as in the case of the hood seal valve solenoid, or via the hood interlock relay, which is energized when the hood is open. This interconnection prevents the supply of pressurizing air to the cabin, hood seal and air extractor valve, until the hood is closed. Further, the interlock relay ensures the return of the various valves to the neutral or closed position on selecting hood open, irrespective of the pressurization control switch position.

9. With the hood open, the interlock relay is energized. A supply is then made via contacts 3-3a, to the close field windings of the air supply valve actuator to close this valve, and via contacts 1-1a, to energize the air extractor valve solenoid and open the extractor valve. The supply to the temperature control switch, via the flood air control relay, is also cut off at contacts 6-6a and 8-8a of the hood interlock relay and the close field windings of the temperature control valve actuator are energized, via contacts 5-5a, to close the hot by-pass.

10. With the hood closed, the interlock relay is de-energized. When the pressurization control switches are placed in the ON position, a supply will be made to the open field windings of the air supply valve actuator, via contacts 4-4a and 2-2a of the interlock relay and contacts 2,4 and 6 of the flood air control relay. This valve will

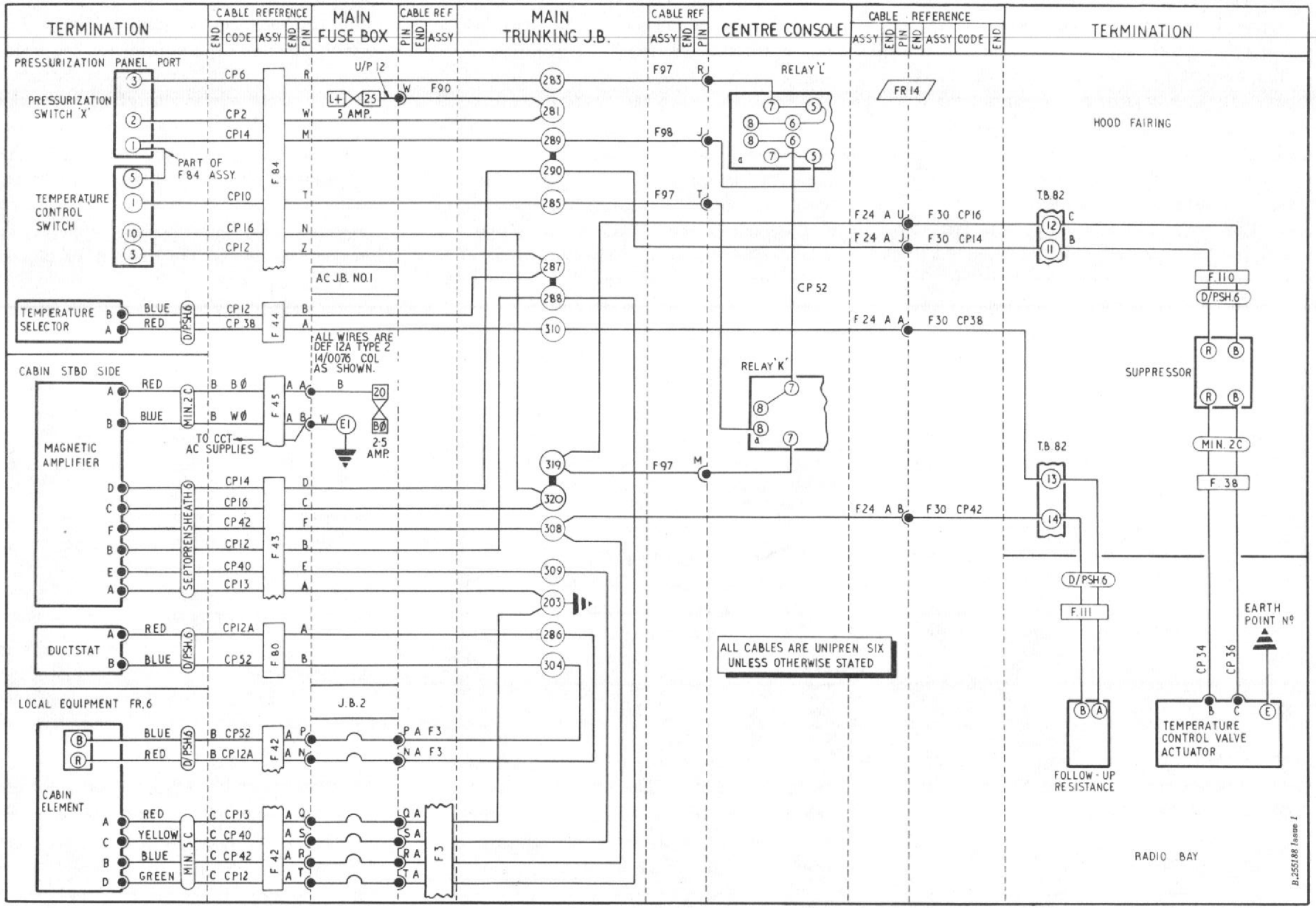

Fig.3. Cabin pressurization and temperature control – temperature section (routeing)

RESTRICTED

move to the normal open position to supply pressurizing air to the cabin. The air extractor valve is closed under this condition. The pressurization control switches will also supply the temperature control switch, via contacts 6-6a and 8-8a of the interlock relay and contents 8-8a of the flood air control relay.

Cabin altitude control of pressurization

11. When the cabin altitude exceeds 38,000 feet, the contacts of the altitude switch close and energize the flood air control relay. This in turn, will energize the auxiliary discharge valve and will change over the supply to the air supply valve actuator via contacts 1-1a and 3-3a, causing the valve to open to the flood air position, so preventing low cabin pressure occurring at this altitude. The flood air control relay also completes a supply to the open field coil of the temperature control valve actuator, via contacts 7-7a to override the temperature control switch and open the hot by-pass. The supply to the temperature control switch, via the contacts of the hood interlock relay *(para.9)* is also isolated at the open contacts 8-8a of the flood air control relay.

Hood de-misting

12. To de-mist the cabin hood in flight, flood air operation may be obtained independent of the altitude switch, by placing the flood switch in the MANUAL position. Under these conditions, the flood air conditions, the flood air control relay is energized, the auxiliary discharge valve is opened, the air supply valve actuator operated to open the valve to the flood position and the hot by-pass opened, as during flood operation, described in para. 11.

Pressure failure, warning and test

13. Should the cabin differential pressure drop, by ½ to 1 lb/sq.in., below normal, the capsule operated switch in the cabin pressure control valve will close and illuminate the warning lamp to indicate failure. The pressure warning and flood control test switch, in the TEST position operates the warning lamp and the flood air control relay, in a manner similar to that of the cabin pressure control valve and altitude switches.

Temperature control, manual

14. The function of the temperature control switch is such that, when in either the COLDER or HOTTER position, the temperature control valve actuator is energized to close or open the valve respectively, permitting manual control of the cabin temperature; the intermediate EMERGENCY position, is used to stop the actuator in order to maintain the valve in any chosen condition.

Temperature control automatic

15. In the AUTO position of the temperature control switch, the temperature control valve actuator is controlled automatically by the operation of the magnetic amplifier, cabin element and follow-up resistor to maintain the cabin temperature in accordance with the setting of the temperature selector.

16. The magnetic amplifier consists of a Wheatstone bridge network wherein the selected temperature *(i.e. equivalent resistance)* and the actual cabin temperature are compared. The error signal current arising from their difference is amplified by means of a pair of transductors *(saturated transformers)* and this amplified and rectified a.c. output is then made to actuate one of a pair of electrically interlocked relays, according to the direction of bridge unbalance.

17. The operated relay in the amplifier passes d.c. to the appropriate side of the alternative field, series motor actuator operating the temperature control valve. The actuator operates, carrying with it the sliding contact of the follow-up, resistor, until the bridge network is reset at the new equilibrium, when the error current is cancelled and the relay contacts open. In this way, progressive alterations in the control valve opening are timed to damp out or suppress deviations from the selected setting of cabin temperature.

Control switches, OFF

18. Placing the pressurization control switches to the OFF position, energizes:-

(1) The close field coil of the temperature control valve actuator.

(2) The close field coil of the air supply actuator.

(3) The extractor valve solenoid.

The hot by-pass is then closed by the temperature control valve actuator, the pressurization air supply is cut off by the air supply valve actuator and the extractor valve opened to vent the cabin to atmosphere.

SERVICING

General

19. For general servicing of the aircraft electrical system, reference should be made to Group A.1. All the components should be kept clean and inspected periodically for signs of damage and to ensure that they are securely mounted. Apart from the routine functional testing of the components as described in the Air Publications listed in Table 1, no other servicing should be necessary, but should a fault be reported the cause must be investigated and rectified before the next flight. Should the fault be found to be in any component of the temperature control equipment or in the valve actuators, the faulty component must be removed from the aircraft and replaced with a fully serviceable component, as no attempt must be made to service these units in-situ.

Air supply valve and actuator assembly

20. The rotary actuator CZ.64581/A fitted to the air supply valve belongs to the Plessey Panther series and has angular settings of 0 deg. - 83 deg. - 166 deg. The actuator, apart from its angular travel, is similar to the Type CZ.64581 described in A.P.4343D, Vol.1, Book 5, Sect.16. Should a fault be found in the valve or actuator, the complete assembly must be removed from the aircraft and replaced with a fully serviceable air valve and actuator assembly to Part No.B.220926.

REMOVAL AND ASSEMBLY

General

21. Once access has been obtained, the removal and assembly of the electrical components forming the cabin pressurization and temperature control circuit should present no difficulties. The location and access to all the components is indicated in Group A.3.