GROUP D.2

ELEVATOR AND AILERON POWER CONTROLS (CODE PE AND PA)

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LIST OF ILLUSTRATIONS

TABLE

Introduction

1. This group contains the description and operation of the elevator and aileron power control circuit installed in this aircraft, together with information on the servicing required to maintain the equipment in an efficient condition. Routeing and theoretical circuit diagrams are included. For a general description of the aircraft electrical system, reference should be made to Groups A1, A2 and A3 of this chapter. Detailed information on the standard items of equipment used in the circuit will be found in the Air Publications listed in Table 1.

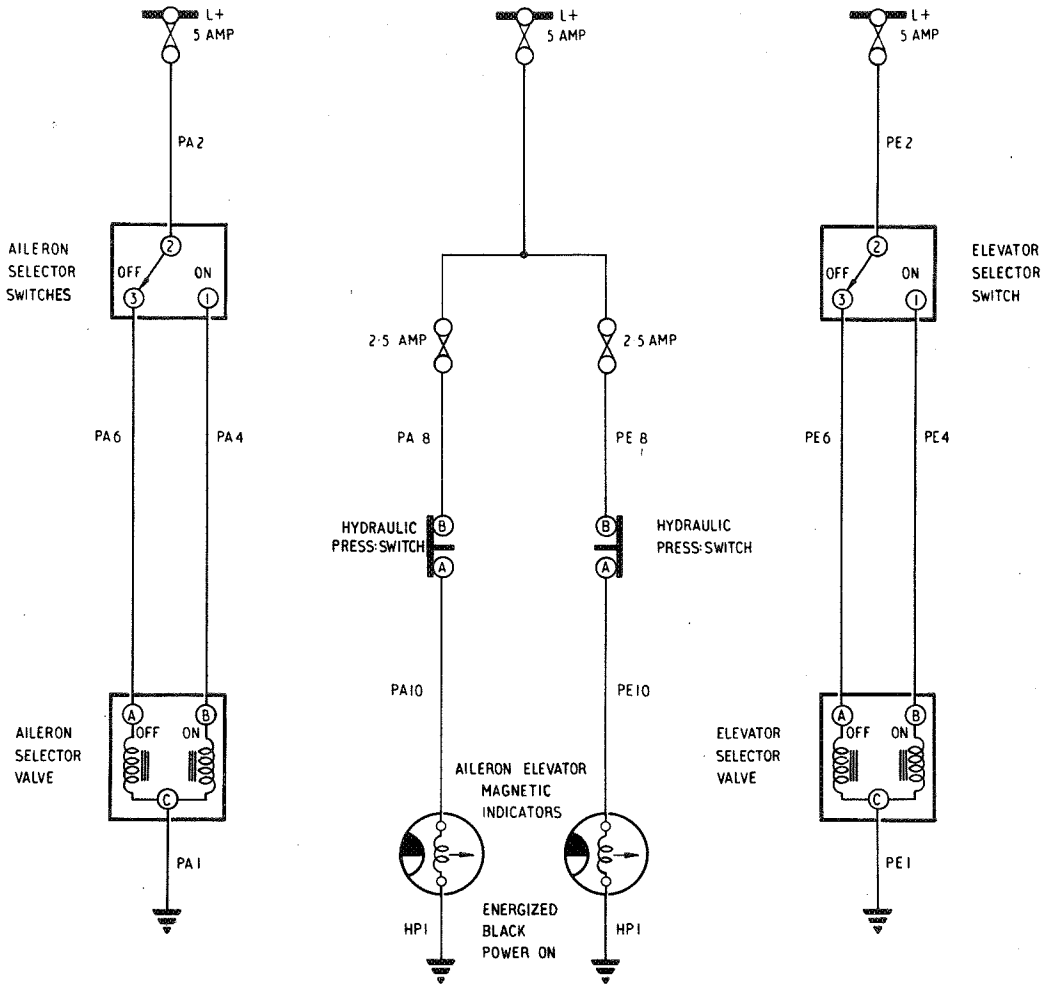

Fig. 1. Elevator and aileron power controls (theoretical)

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DESCRIPTION

Equipment details

General

2. The elevator and aileron hydraulic booster units are permanently engaged with the flying surfaces, but hydraulic power may be selected on or off, on the ground or in the air, with the control column in any position. Hydraulic power on or off is selected by the use of two switches which control electro-hydraulic selector valves in each system. Electro-magnetic indicators controlled by hydraulic pressure switches tapped into the pipe-lines feeding the booster units are provided to show when hydraulic power is applied to the booster units.

TABLE 1

Equipment type and Air Publication refererence

Equipment	Air Publication
Aileron electro-hydraulic valve, Type 08808Y.B02 Elevator electro-hydraulic valve, Type 08808Y.A07	A.P.1803D, Vol.1, Book 3, Sect.8
Tumbler switch, S.P/C.O. Type XD.780 No.4 *(Audio cut out)* Tumbler switch D.P./C.O., Type XD789 No.4 *(Power control)*	A.P.4343C, Vol.1, Book 1, Sect.1
Pressure switch, Type T.P.5566. *(H.P. failure)* Pressure switch, Type T.P.5555 *(Power ON-OFF)*	A.P.1275A, Vol.1, Sect.11
Magnetic indicators, Type B.2 *(Power ON-OFF)* Warning lamp, Type B	A.P.4343E, Vol.1, Sect.18
Relay, Type 9B, No.2 *(Audio warning)*	A.P.4343C, Vol.1, Book 2, Sect.3

Control switches

3. The hydraulic power supply to the elevator and aileron booster units is controlled by two 2-position ON-OFF change-over selector switches. One of these is mounted on the centre instrument panel to control the elevator electro-hydraulic selector valve and the other is located on the port instrument panel to control the aileron selector valve.

Electro-hydraulic valves

4. The elevator electro-hydraulic selector valve is located between frames 54 and 55 in the rear fuselage lower fin structure and the aileron selector valve is mounted on the front spar in the starboard wheel bay. These valves control the supply of hydraulic power to the elevator and aileron booster units. The elevator booster unit is located between frames 52 and 55 in the rear fuselage lower fin structure and the aileron booster units are situated one in each outer wing.

Indicators

5. Two electro-magnetic indicators, located one on the port instrument panel and the other on the centre instrument panel, are provided to indicate when hydraulic pressure is applied to the booster units. These indicators, which are separately fused, are controlled by hydraulic pressure switches. The indicators show BLACK when the hydraulic pressure supplied to the booster units is greater than 600 lb./sq.in., and WHITE when the pressure drops below this figure.

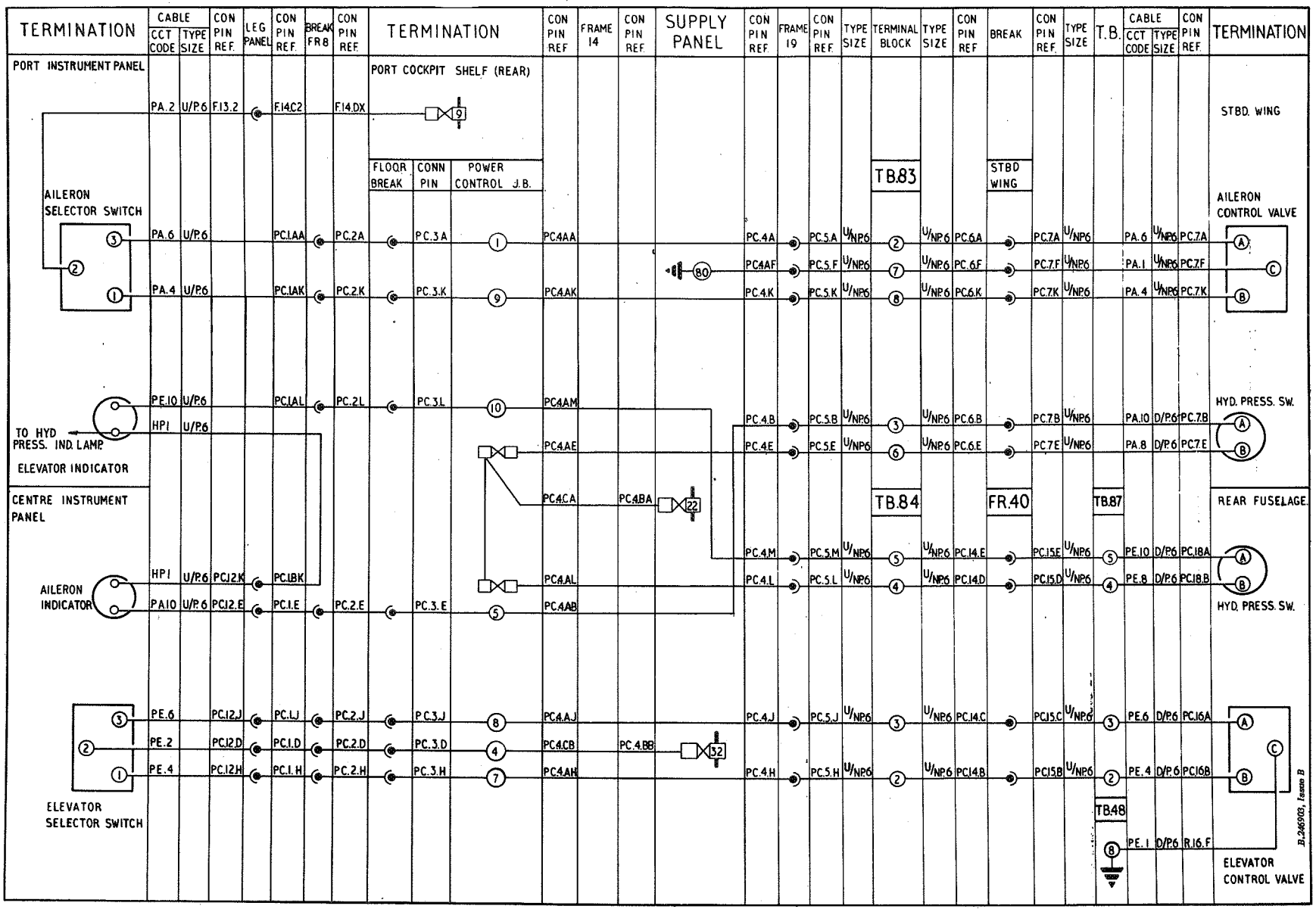

Fig.2. Elevator and aileron power controls (routeing)

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Hydraulic pressure switches

6. The hydraulic pressure switch controlling the indicator for the elevator booster unit is situated just forward of frame 54 below the tail plane in the fin structure and that controlling the aileron booster unit indicator is located between interspar ribs E and F in the starboard wing. These pressure switches are connected into the hydraulic supply lines feeding the booster units and open their contacts to de-energize the indicators when the hydraulic pressure falls below 600 lb./sq.in.

Hydraulic failure

7. In the event of an hydraulic failure, the hydraulic pressure indicator lamp will illuminate and the audio warning system operate, as described in Section 5, Chapter 2, Group 5.A, to indicate that only a limited number of power operations of the controls are available from hydraulic accumulators in the system. When the accumulators are exhausted, the elevator and aileron power control system will automatically revert to manual operation and the magnetic indicators will show WHITE to indicate this condition. During manual operation the booster units function as normal control tubes.

Operation

Power on

8. The operation of the elevator and aileron power control electrical circuits are similar, therefore only the function of the aileron circuit will be described. When the aileron selector switch is placed in the ON position, current will be fed through the switch and energize the ON solenoid of the aileron electro-hydraulic selector valve. When this solenoid is energized, it allows the hydraulic supply pressure to move the slide valve within the selector in such a direction as to supply hydraulic pressure to the servo valves of the aileron booster units.

9. When hydraulic pressure is applied to the booster units, the hydraulic pressure switch in the supply line will close its contacts and current will be fed from the circuit fuse to energize the aileron electro-magnetic indicator which will show BLACK to indicate that power is available at the booster units. Movement of the control column will operate the servo valve mechanism to open one of two orifices depending upon the direction in which the control column is moved and hydraulic pressure will then be directed to one side of the ram in each booster unit. This pressure will move the booster unit bodies, which being connected to the ailerons will move the ailerons in the required direction.

Power off

10. When the aileron selector switch is placed in the OFF position, current will be fed through the switch and energize the OFF solenoid of the aileron electro-hydraulic selector valve. When the OFF solenoid is energized, it allows the hydraulic supply pressure to move the slide within the selector in such a direction as to cut off the hydraulic pressure to the booster unit servo valves. The slide valve movement also allows the pressure in these units to flow back into the return line.

11. As the hydraulic pressure discharges into the return line, the hydraulic pressure switch opens its contacts to de-energize the aileron electro-magnetic indicator, which then shows WHITE to indicate that hydraulic power is no longer available at the booster units. The booster units now operate as normal control tubes and manual effort alone must be used to move the ailerons.

Manual operation on ground

12. The controls are normally left in power operation after shut down. If the oil pressure in the accumulator is sufficient, reversion to manual control can be achieved by use of the handpump. If the oil pressure in the accumulator is insufficient, reversion to manual operation can be achieved by operating the pushbutton incorporated in each of the aileron and elevator electro-hydraulic valves while using the handpump.

SERVICING

General

13. For general servicing of the aircraft electrical system, reference should be made to Group A.1. Apart from keeping all the components clean and carrying out the normal routine tests of security and serviceability, the only servicing necessary

is the electrical testing of the electro-hydraulic selector valves as described in the appropriate Air Publications listed in Table 1.

REMOVAL AND ASSEMBLY

General

14. Once access has been obtained, the removal of the electrical components forming the elevator and aileron power control circuits, should present no difficulties. The location and access to all the components is indicated in Group A.3.