

GROUP D.2

ELEVATOR AND AILERON POWER CONTROLS
(CODE PE AND PA)

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TABLE 1

Equipment type and Air Publication reference

Equipment Type	Air Publication
◀ Aileron electro-hydraulic valve, Type C5702Y, Mk.A, or 08808Y-B06 (Mod.996)	
Elevator electro-hydraulic valve, Type C5702Y, Mk.C, or 08808Y-B07(Mod.996)	{ A.P.1803D, Vol.1, Book 3, Sect.8
Aileron gearing ratio electro-hydraulic valve, Type 08816Y.A01	
Control switches, single-pole, change over without centre off, Type XD778, No.4 A.P.4343C, Vol.1, Book 1, Sect.1
Pressure switches, Type T.P.5566 A.P.1275A, Vol.1, Sect.11
Indicators, Type B.2 A.P.4343E, Vol.1, Book 4, Sect.18

TABLE

Table

<i>Equipment Type and Air Publication reference</i>	1
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Equipment employed

1. The major components employed in the elevator and aileron power controls circuit are listed in Table 1, together with the appropriate Air Publications to which reference should be made for a detailed description and the necessary servicing required to maintain them in an efficient condition.

DESCRIPTION

Elevator and aileron power controls

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. Electromagnetic indicators controlled by hydraulic

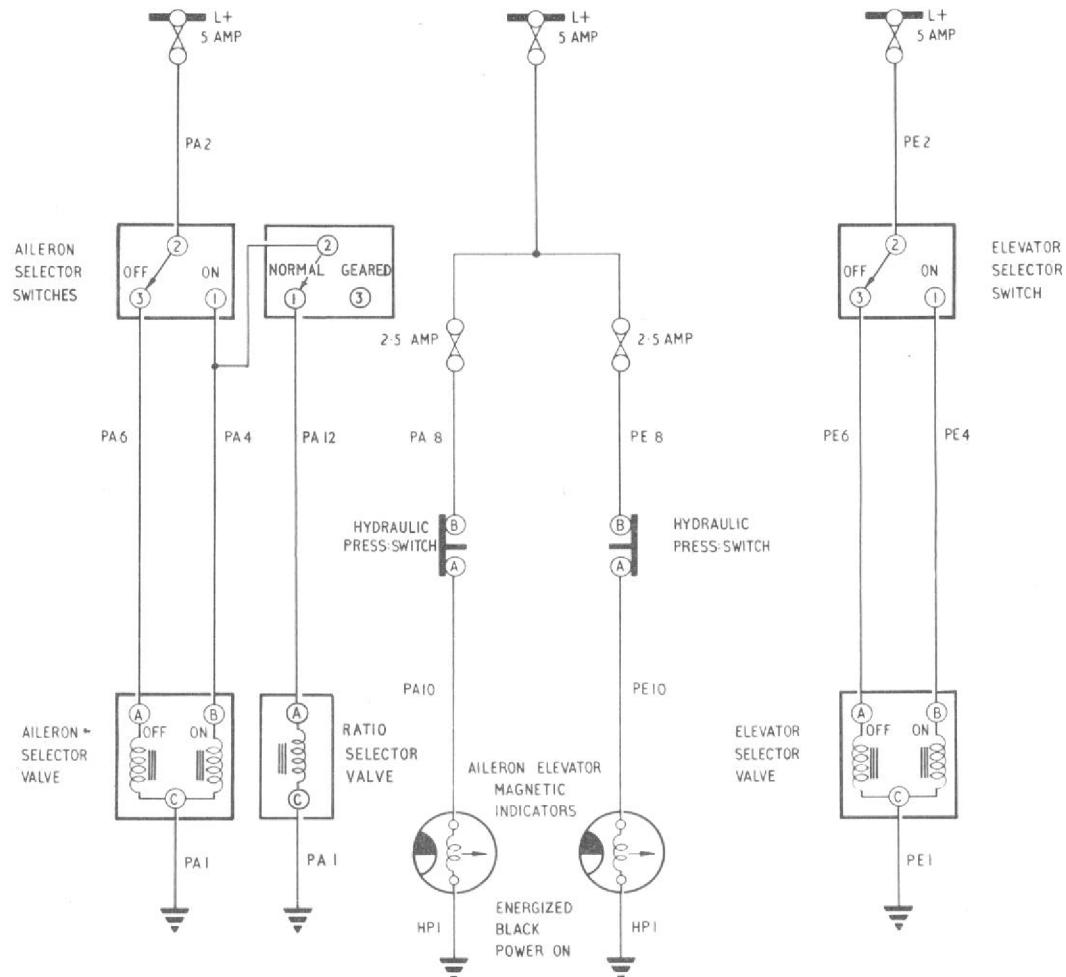


Fig.1. Elevator and aileron power controls (theoretical)

RESTRICTED

pressure switches tapped into the pipelines feeding the booster units are provided to show when hydraulic power is applied to the booster units.

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.

4. To enable the high or low aileron gear ratio to be selected at will, with the controls in power, a two-position selector switch marked NORMAL and GEARED is mounted on the port instrument panel adjacent to the aileron power control switch. With the ailerons in power and the switch in the NORMAL position, the high gear ratio is selected, i.e. the two position aileron jack is extended for normal power operation (Sect.3, Chap.4). If a hydraulic failure occurs, the two-position aileron jack will automatically retract thus setting the ailerons to low gear. With the ailerons in power, the two-position aileron jack may be retracted, at will, by setting the selector switch to the GEARED position. This facility may be used, to prevent fatigue, when it is required to maintain level flight over a long period.

Electro-hydraulic valves

5. 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. The electro-hydraulic selector valve which controls the flow of hydraulic fluid to the two position aileron jack to give either high or low aileron gearing is mounted between frames 15 and 16 on the port side of the front fuselage.

Indicators

6. 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. per sq.in. and WHITE when the pressure drops below this figure.

Hydraulic pressure switches

7. 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's 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 that quoted in paragraph 6.

Hydraulic failure

8. 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 low gear 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

9. The operation of the elevator and aileron power control electrical circuits are similar apart from the aileron gearing selector switch and ratio selector valve included in the aileron circuit, thus only

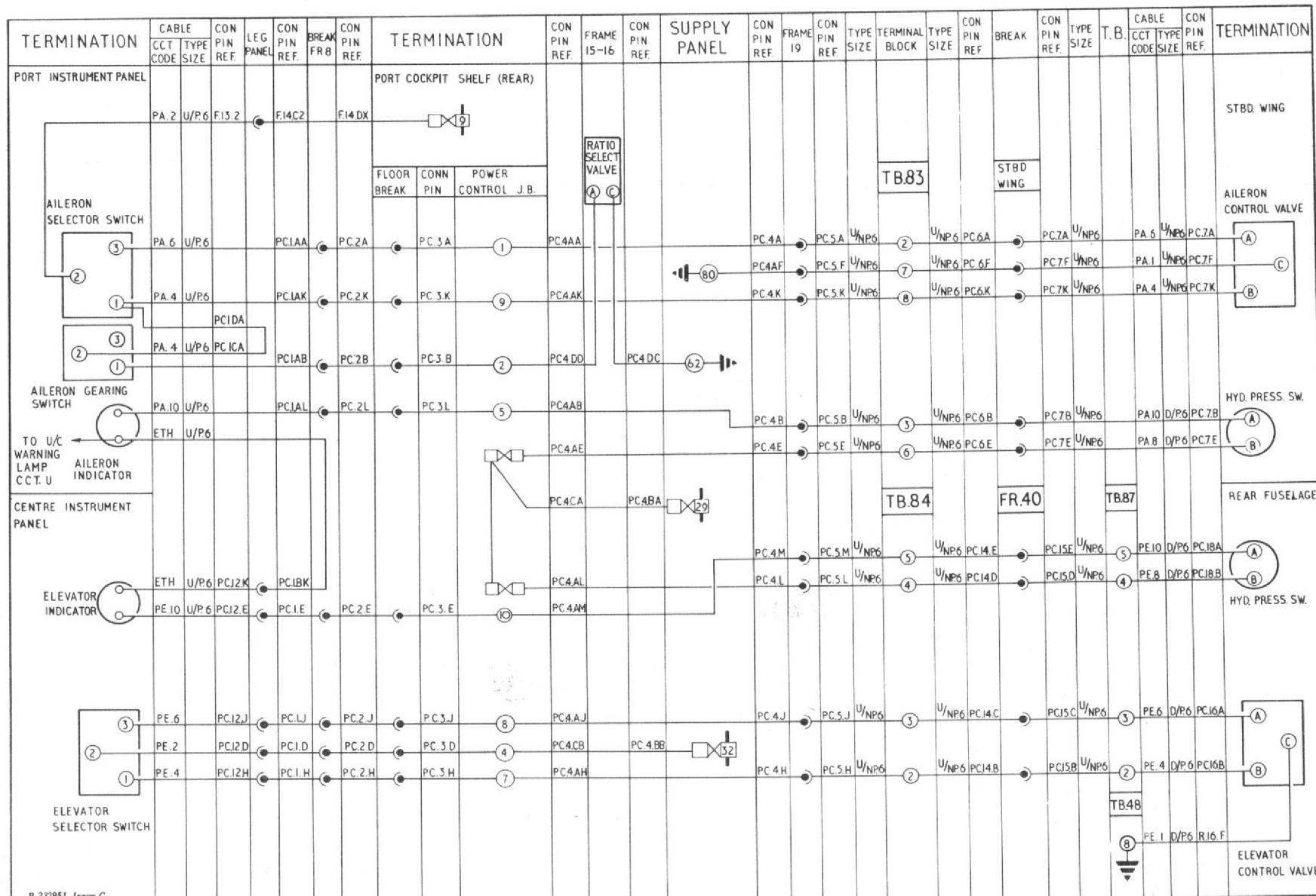


Fig.2. Elevator and aileron power controls (routeing)

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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.

10. 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.

Aileron gearing

11. The supply from the aileron selector switch to the aileron electro-hydraulic selector valve also feeds the aileron

gearing selector switch. When this switch is in the NORMAL position, current is fed through the switch to the solenoid of the electro-hydraulic aileron ratio selector valve. With this solenoid energized, hydraulic pressure is directed to the two-position aileron jack which is thus extended to give a high aileron gear ratio. If the aileron gearing selector switch is placed in the GEARED position, the supply to the ratio selector valve solenoid is broken, thus de-energizing the solenoid to release the hydraulic pressure from the two-position aileron jack. With the hydraulic pressure released, the aileron jack will retract to give a low aileron gear.

Power off

12. 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.

13. 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.

14. Placing the aileron selector switch to the OFF position will also isolate the supply to the aileron gearing selector switch, thus automatically de-energizing the solenoid of the aileron gearing ratio selector valve. With the solenoid de-energized, the hydraulic pressure is released from the two-position aileron jack, and the jack retracts to give a low aileron gear ratio for manual operation.

◀ Manual reversion on ground (Post Mod.895)

15. On aircraft (Post Mods 686 and 687) the controls are normally left in power operation after shutdown. 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 push button incorporated in each of the elevator and aileron electro-hydraulic valves while using the handpump.

SERVICING

General

16. For general servicing of the 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 other servicing

necessary is the electrical tests of the electro-hydraulic selector valves as described in the appropriate Air Publications quoted in paragraph 1.

REMOVAL AND ASSEMBLY

General

17. 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.

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