Chapter 10 FUEL SYSTEM

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DESCRIPTION

General information

◀ **1.** This chapter has been amended to include the modifications listed below:-

Mod.4376 To introduce fuel pump switch A.E.I. LHA.4BG.201 in lieu of N.S.F.7662/B101.

Mod.4409 To prevent loss of fuel transfer in the event of a double fuse failure in the d.c. fuel transfer pump system.

Mod.4609 To introduce Mk.4 float switch Pt.No.3504100/288 and Pt.No.3504100/289 in lieu and by conversion of Mk.4 float switches Pt.No.3504100/255 and Pt.No.3504100/256. ▶

In each main plane tank system four pumps, and two low-pressure cocks, all electrically operated and controlled from a switch in the cockpit, control the fuel delivery to the engines. Two pumps, Type S.P.E.2437, are a.c. operated; the two others, Type P.D.C.1001, are d.c. operated. The d.c. pumps transfer fuel to the a.c. pumps which supply the engines. Solenoid-operated refuelling valves, in circuit with fuel level switches, a flow-sensing switch, and an access-panel-operated microswitch, control fuel flow when the aircraft is

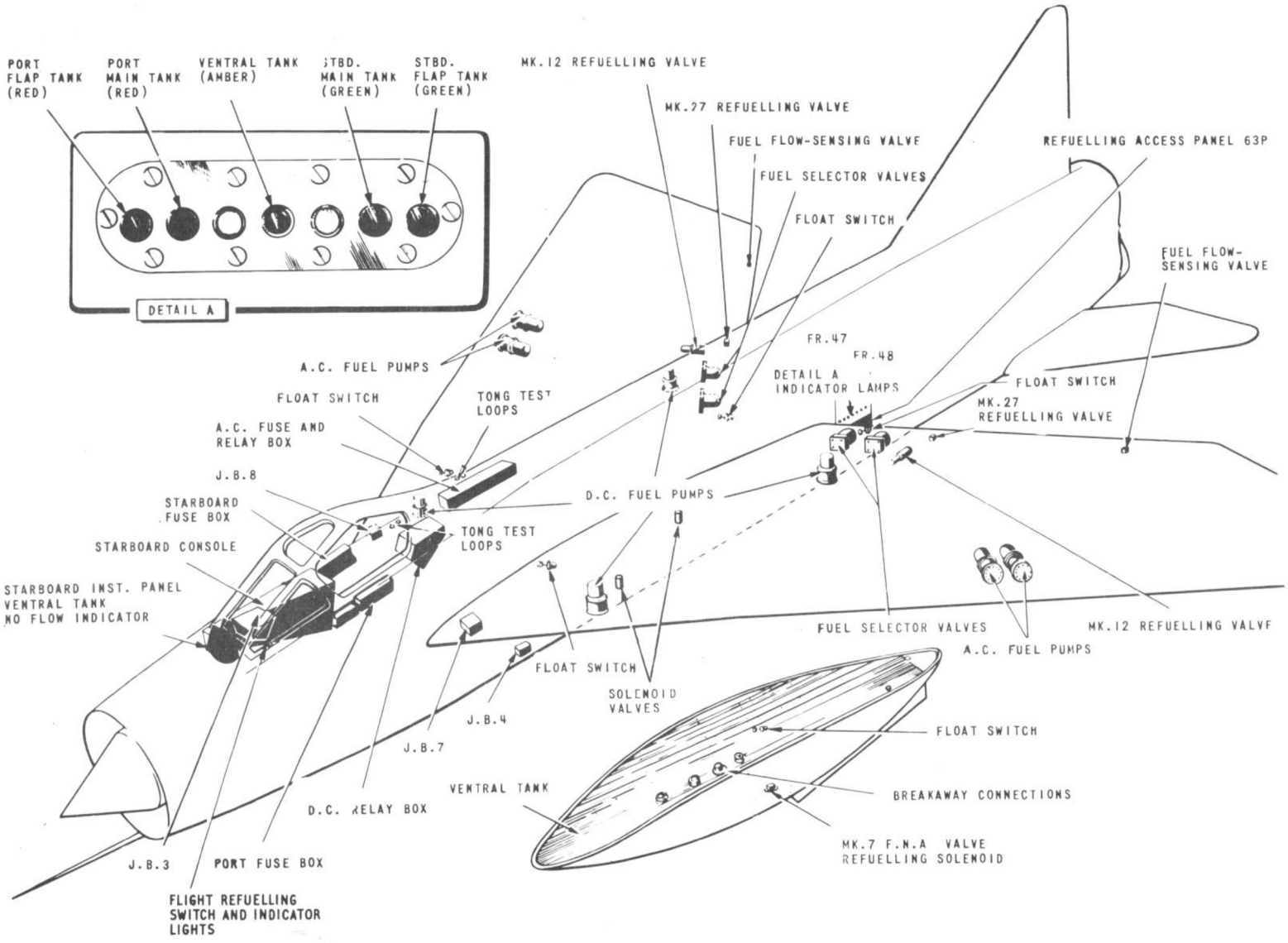

FIG.I. FUEL SYSTEM EQUIPMENT

being refuelled and when inter-tank transfer is occurring. A ventral tank no flow magnetic indicator and certain fuel gauging circuits are controlled by flow-sensing switches and the fuel level float switches also control tank full indicator lamps *(para.16)* whenever the refuelling access panel is open. Flight refuelling is controlled by a switch, in the cockpit, which completes an alternative supply to the refuelling circuit. The fuel system is described in A.P.101B-1001-1A Sect.4, Chap.2, fuel gauging in Sect.7, Chap.4, and fuel pressure warning circuits in Sect.6, Chap.12.

Fuel pump and cock control *(fig.3)*

2. The PORT and STBD. FUEL PUMPS switches Type A.E.I. LHA.4BG.201, located on the starboard console, control the pumps and cocks in their associated main plane tank system. Each switch has three marked positions, No.1 ENG -OFF -No.2 ENG, and has four poles which control supplies to all fuel pumps, and the fuel cocks associated with the selection made.

3. On pre Mod.4409 aircraft with either switch selected to the No.1 or No.2 engine, one pole energizes two Type S3, relays which in closing, complete the three-phase supply to the a.c. booster pumps. Two other poles complete the circuit to the d.c. pumps and also energize two fuel cock relays. The fourth pole controls the fuel cock actuators, ensuring that selecting the switch to OFF automatically returns the cocks to the closed position.

4. On post Mod.4409 aircraft with either switch selected to No.1 or No.2 engine, one pole energizes two Type S3 relays, which in closing, complete the three phase supply to the a.c. booster pumps, and one of the two fuel cock relays. Two other poles complete the circuits to the d.c. pumps and also energize the other fuel cock relay, whilst the fourth pole controls the fuel cock actuators. The function of the fuel cock relays ensures that selecting the switch to OFF automatically returns the cocks to the closed position. This arrangement prevents the loss of fuel transfer facilities should a double fuse failure occur in the d.c. fuel transfer pump system.

5. If the supply to the S3 relays fails when the aircraft is operating in reheat thrust, reheat is cancelled automatically by the relays which, in opening, energize the temperature trip relay through cores KF28 and KF58 *(Sect.6, Chap.7)*.

Refuelling valves *(fig.1)*

6. Three types of refuelling valve are used in the system. Two Mk.12 valves, one on spar 5 in each main plane, control flow into the main tanks. Flow in or out of the flap tanks is controlled by a Mk.27 valve in the fuel pipe to each flap (access panel 124 P or S). A Mk.7 valve inside the ventral tank controls refuelling and defuelling flow to the tank. All valves are described in A.P. 106D series.

Refuelling control *(fig.3)*

Ground refuelling

7. Removing the refuelling access panel (63P) operates a microswitch which causes all refuelling valves to open for refuelling flow. Fuel flows into all tanks simultaneously and, as each tank fills, the tank full float switch closes its refuelling valve and lights an associated indicator lamp situated above the refuelling panel. Replacing the panel extinguishes all lamps and energizes the transfer circuits *(para.8)*. The two tank pressure datum vent valves also operate when the panel is removed but have no essential function during ground refuelling.

Flight refuelling

8. A switch, labelled FLIGHT REFUEL - OFF - LAMP TEST, on the port shroud extension panel, controls refuelling flow in flight. Selecting FLIGHT REFUEL simulates the removal of the refuelling access panel. *(para.7)*; tank pressurizing air is vented by the air pressure datum vent valves to allow fuel flow into the tanks. Indicator lamps below the pilot's attack sight function in a similar manner to those in the fuselage, and may be referred to on the ground for checking fuel content when the refuelling access panel is fitted. The LAMP TEST selection will cause all serviceable indicator lamps to light.

Fuel transfer control *(fig.3)*

9. The sequence of transfer is ventral tank contents followed by flap tank contents. This sequencing is under the control of the ventral tank flow sensing switch and an associated relay, Type A24NR/1. When fuel is transferring from the ventral tank the relay is energized and the Mk.27 valves are closed; when flow ceases the flow sensing switch de-energizes the relay to open the Mk.27 valves and allow the flap tanks to empty. A magnetic indicator below the starboard instrument panel is also in circuit with the flow sensing switch and shows black when energized, i.e. fuel flowing; if no ventral tank is fitted the indicator shows white. Two further flow sensing switches in the flap tank fuel pipes energize relays in the gauging circuits *(Sect.7, Chap.4)* whenever fuel is transferring from the flap tanks to the main tanks. The flow sensing switches are described in Sect.4, Chap.2.

Ventral tank attachment

10. The tank is secured to the fuselage by a manual release unit which cannot be checked visually for correct cocking

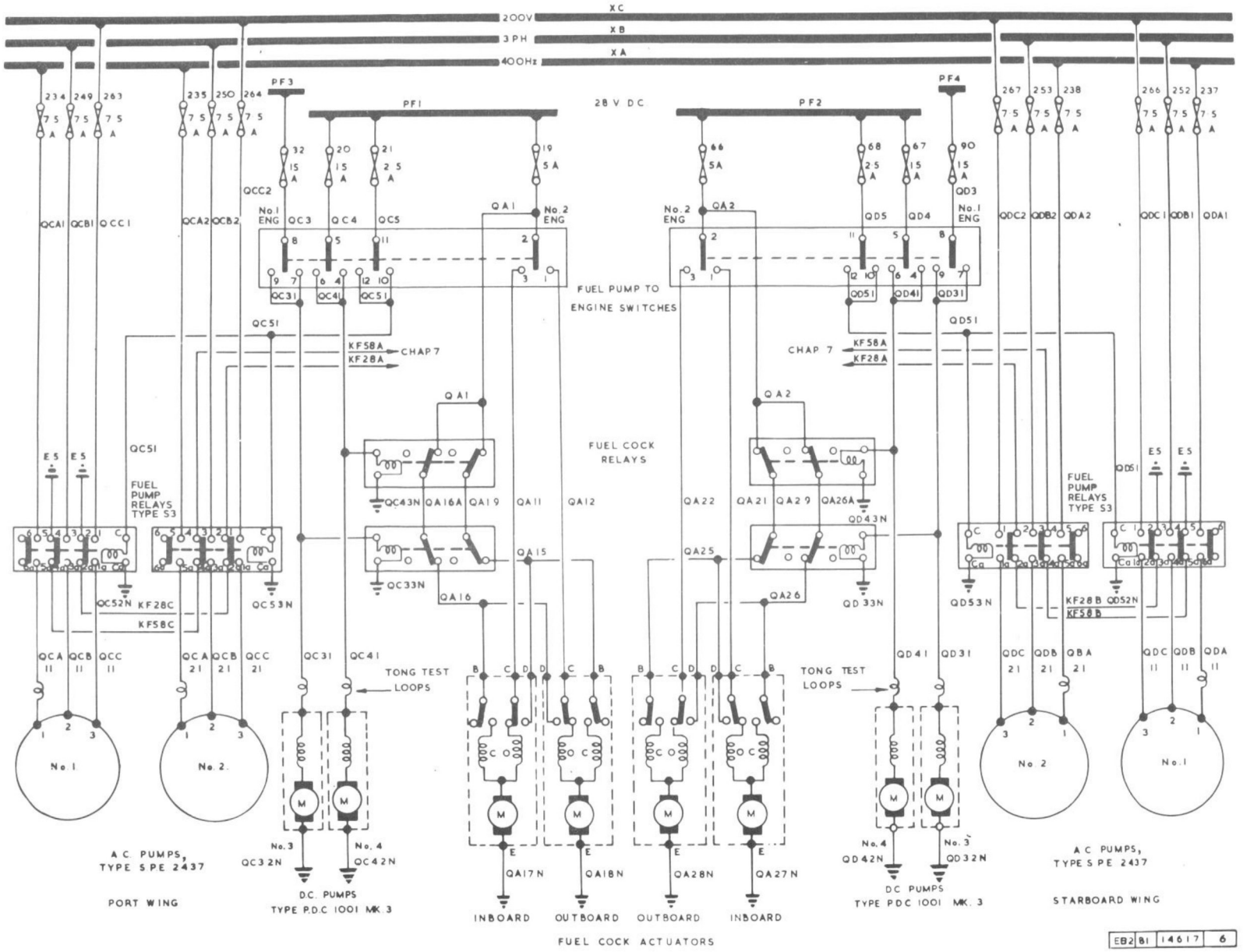

FIG. 2. FUEL PUMPS AND COCKS (PRE MOD. 4409)

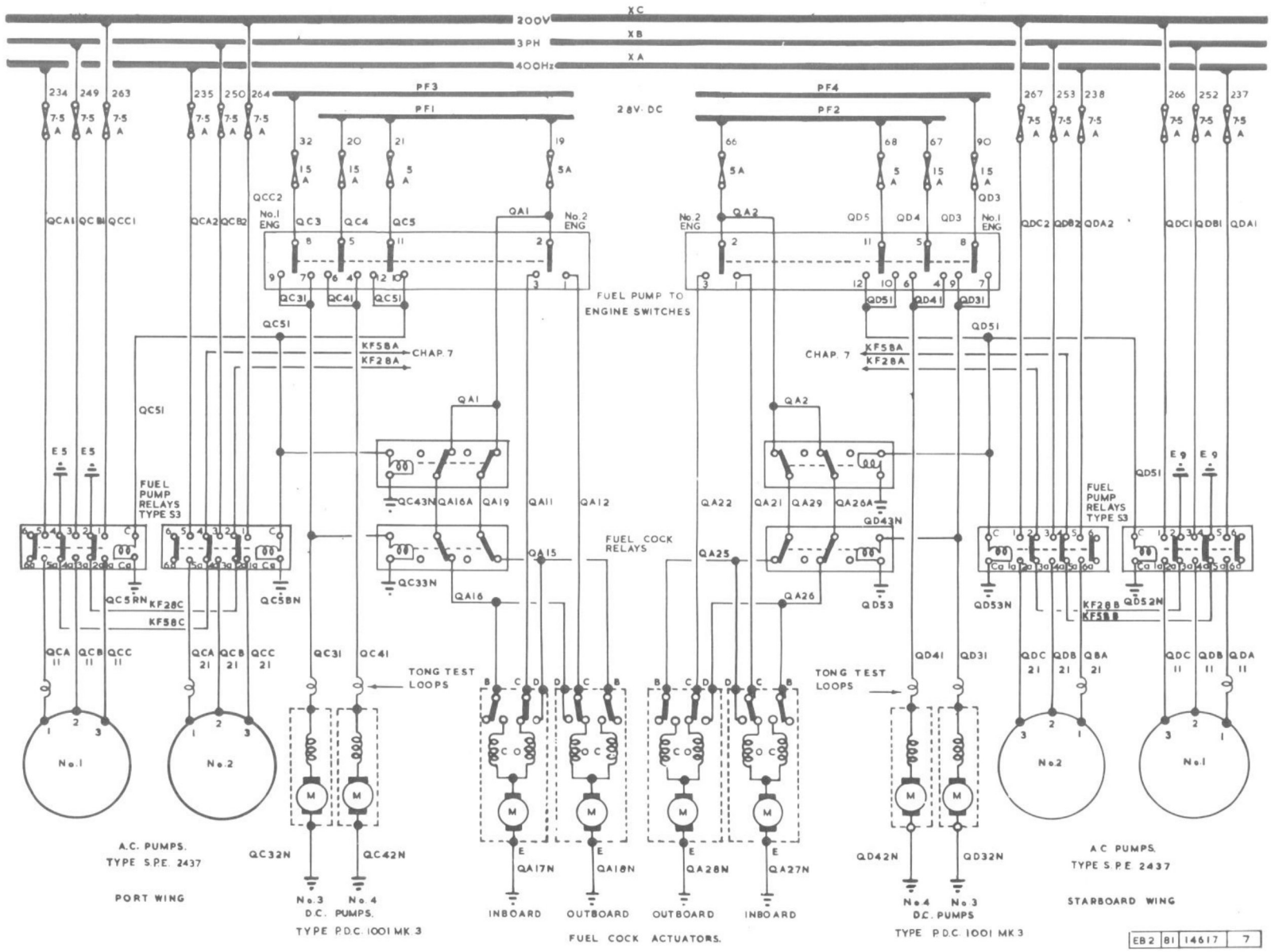

FIG. 2A FUEL PUMPS AND COCKS (POST MOD 4409)

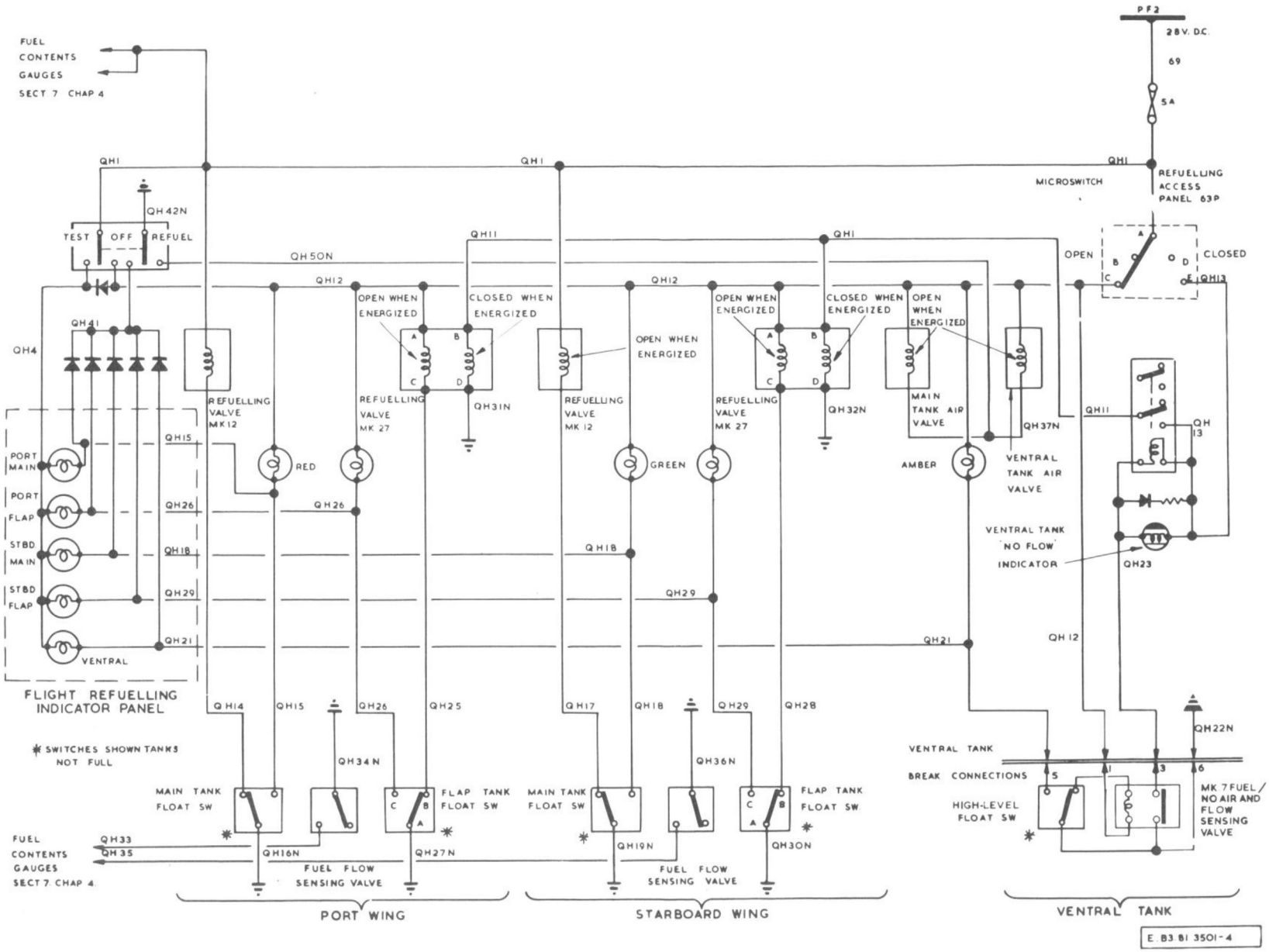

FIG. 3. REFUELLING SYSTEM

◀ MINOR AMENDMENTS ▶

when the tank is fitted. To overcome this, an electrical checking circuit is incorporated, *(fig.5A and para.14)*. The electrical connection to the refuelling and transfer circuits is completed by the spring-loaded pins of a butt connector. For details of internal electrical components refer to Sect.4, Chap.2.

Fuel pressure warning

11. Warning of low fuel pressure in the engine fuel delivery lines is given by two lamps on the auxiliary warnings indicator panel *(Sect.6, Chap.12)*. These lamps are controlled by pressure switches fitted in the engine bays *(Sect.7, Chap.4)*.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cockpit or performing any operations upon the aircraft.

Fuel pump current consumption test

12. To check the current consumption of the a.c. and d.c. fuel pumps:-

(1) Connect a suitable a.c. and d.c. ground supply to the aircraft.

(2) Ensure that all fuel system fuses are fitted and intact.

(3) Operate the PORT fuel pumps switch to the NO.1 ENG position.

(4) Using a suitable range tong test ammeter Ref.No.5Q/38 in the test loops on the a.c. fuse and relay box, check the current consumption of the port wing No.1 and No.2 a.c. fuel pumps. The reading in each case should be 7-9 amp.

(5) Repeat (4) in the d.c. test loops, located inside the cable cover on the starboard side of the rear pressure bulkhead, for No.3 and No.4 d.c. pumps. The reading in each case should not exceed 8 amp.

(6) Operate the PORT fuel pump switch to OFF, and the STARBOARD switch to NO.1 ENG.

(7) Repeat (4) and (5) for the fuel pumps in the starboard main plane.

(8) Operate the STARBOARD fuel pump switch to OFF.

Fuel cock functional check

13. Operate the PORT fuel pump switch to the NO.1 ENG position, and then to the NO.2 ENG position, and note that the appropriate fuel pressure warning light is extinguished in each position. Repeat the procedure with the STARBOARD fuel pump switch, and again note that the appropriate warning light is extinguished.

Ventral tank attachment check

14. A test point, behind access panel 63P, enables the attachment of the ventral tank to the aircraft to be checked. The two pins of the test point plug are in series with a pair of contacts in the tank release unit, sothat, when the release unit is correctly cocked, continuity can be checked using an external test lamp and battery.

REMOVAL AND ASSEMBLY

Fuel pumps

15. Removal and assembly of the fuel pumps is detailed in Sect.4, Chap.2. Care must be taken to remove the appropriate fuses before work commences.

Indicator lamps

16. To remove an unserviceable ground refuelling indicator lamp, access panel 61P must first be removed, and then the domed cover of the lamp holder unscrewed. The lamp filaments Ref.No.5L/9959122 are rated at 28V, 2W.

17. To remove an unserviceable flight refuelling indicator lamp, the indicator panel support bracket must first be removed from below the gunsight, and then the two parts of the indicator panel be separated by removing the screws securing the assembly to the support bracket. The lamp filaments Ref.No.5L/9959118 are rated at 28V, 0.04 amp.

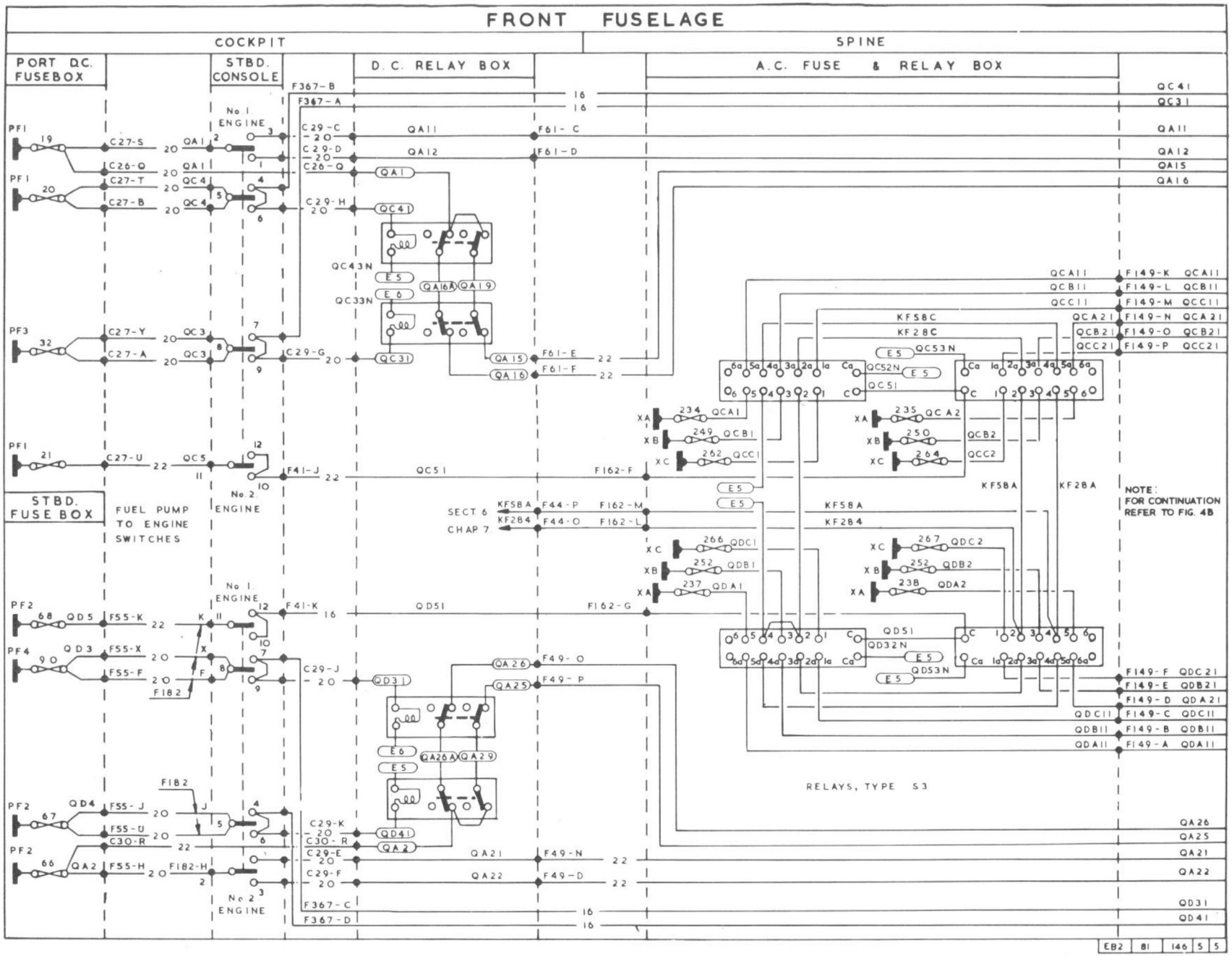

FIG. 4. FUEL PUMPS AND COCKS (PRE MOD. 4409)

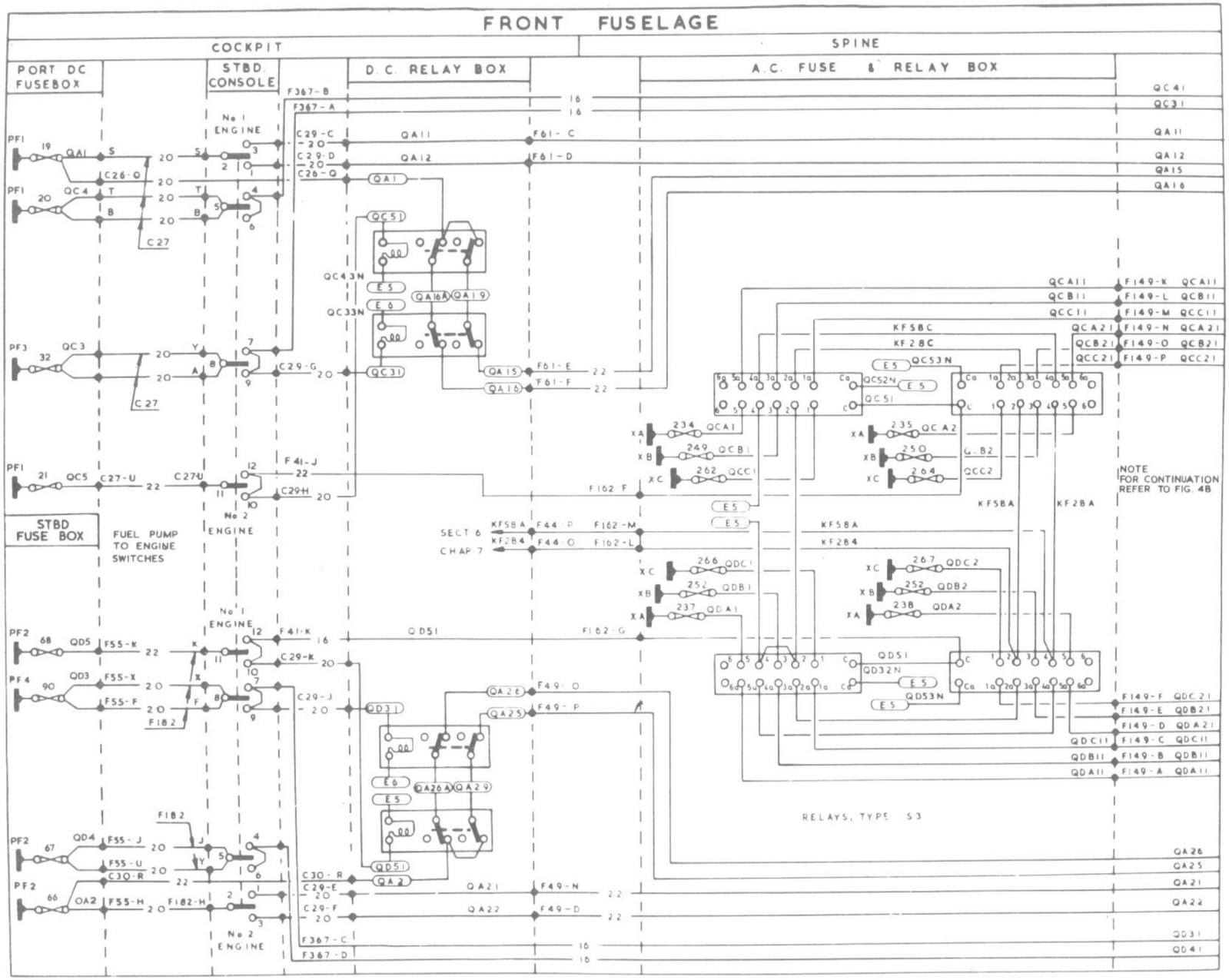

FIG. 4A FUEL PUMPS AND COCKS (POST MOD 4409)

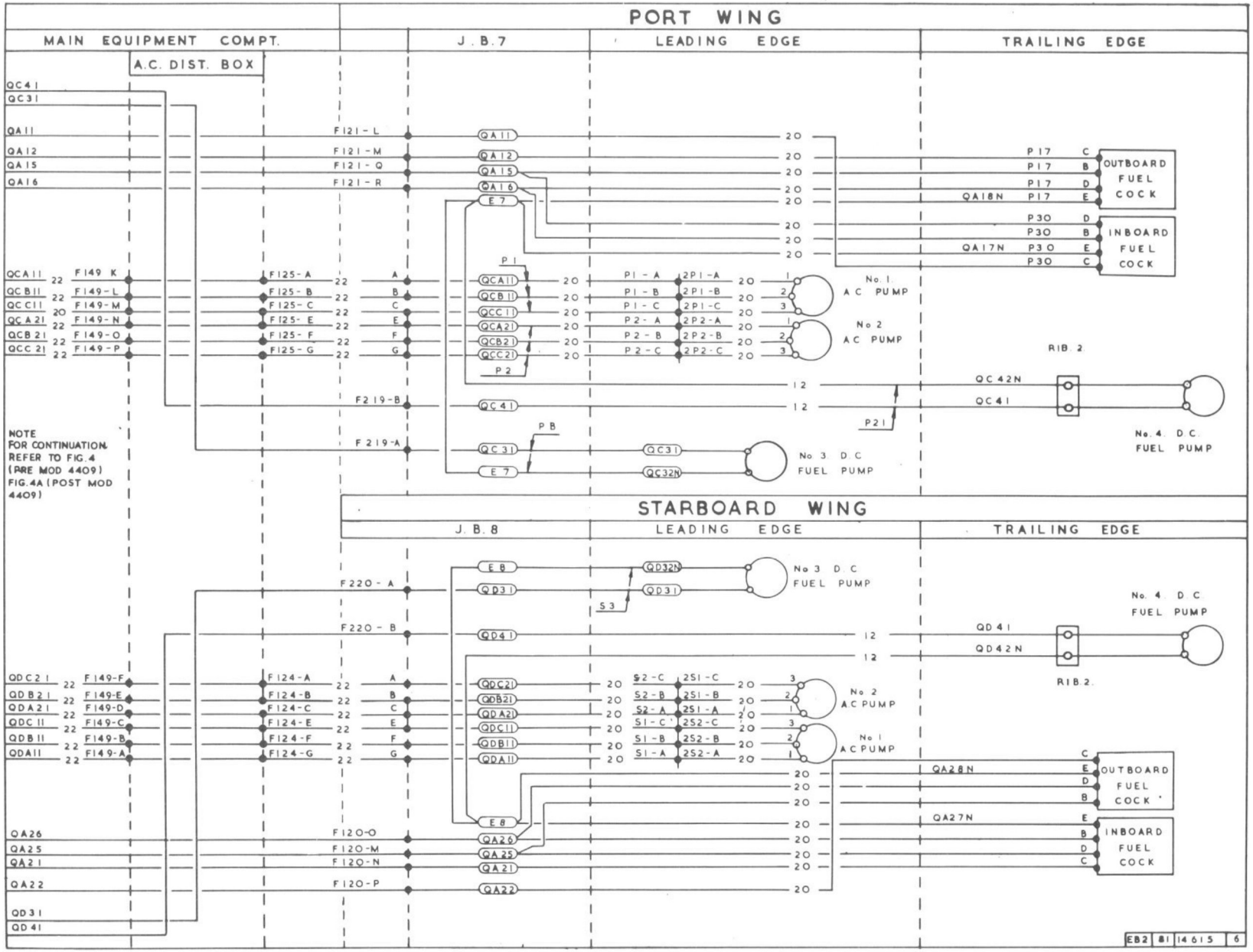

FIG. 4B. FUEL PUMPS AND COCKS

◀ MINOR AMENDMENTS ▶

FIG.5. REFUELLING SYSTEM

(illustration overleaf)

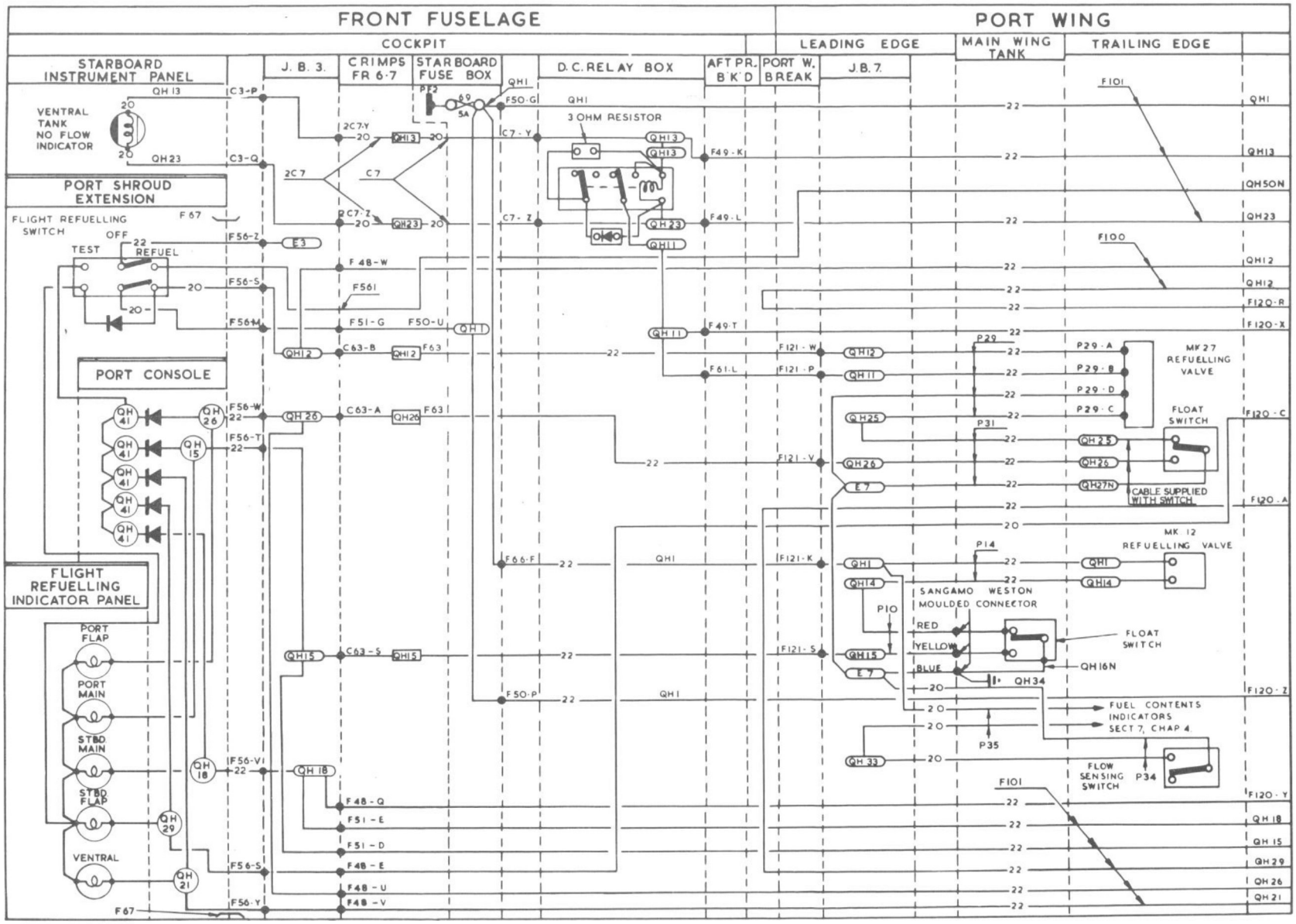

FIG. 5. REFUELLING SYSTEM

◀MOD. 4609 EMBODIED▶

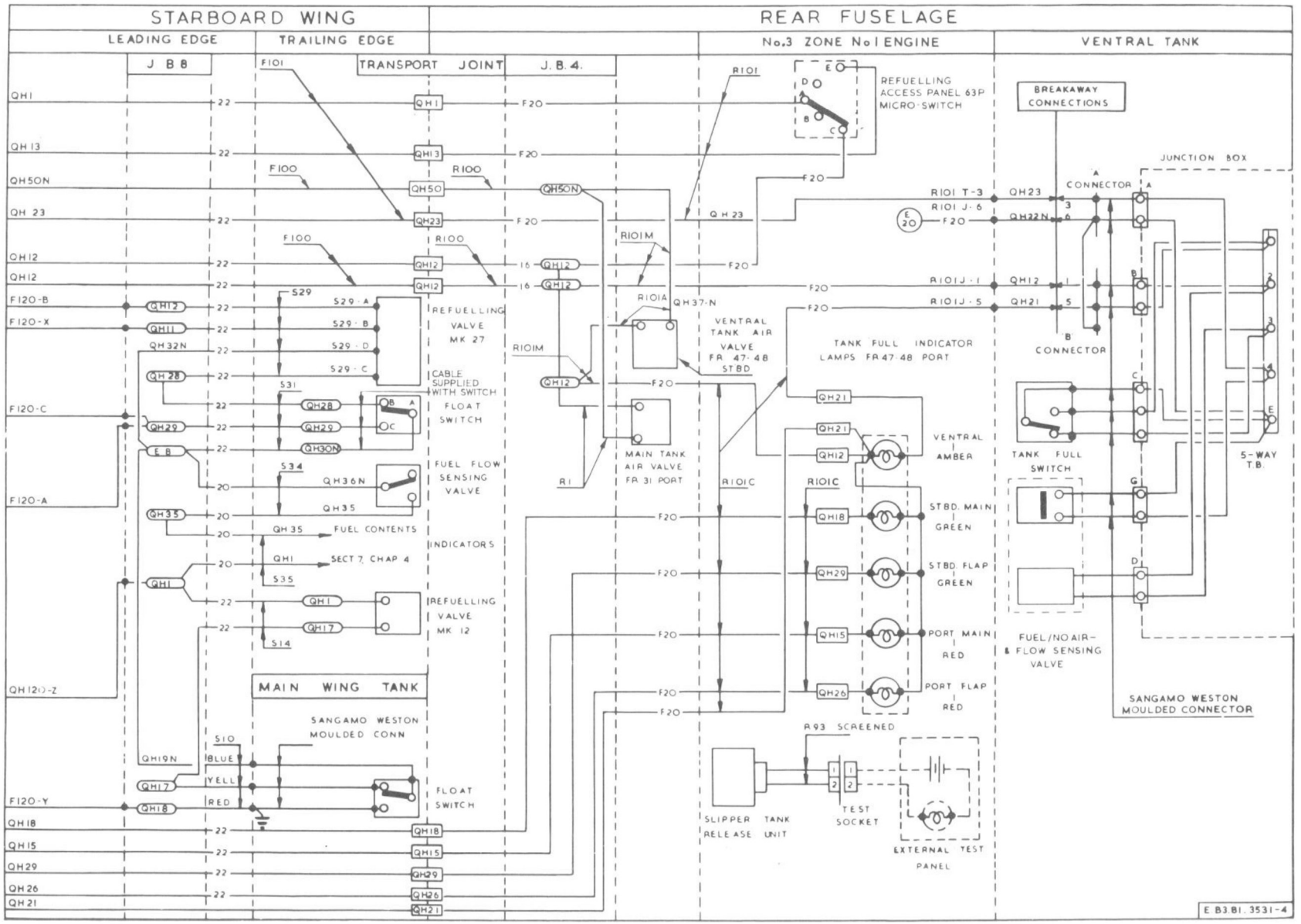

FIG. 5A. REFUELLING SYSTEM

◀ MOD. 4609 EMBODIED ▶