GROUP C3

TANK PUMPS, FAILURE WARNING AND PRESSURE REFUELLING (CODE BP AND BR)

(Including Mod.1023, 1385, 1388, 1394 and 1395)

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Introduction

1. This Group contains the description and operation of the tank pump failure warning and pressure refuelling circuits and information on the servicing required to maintain the equipment in an efficient condition. Theoretical and routeing diagrams of the circuits are included and detailed information on the standard items of equipment used will be found in the Air Publications listed in Table 1.

DESCRIPTION

Tank pumps

2. The electrically-driven two-speed booster pumps, incorporated one in each front fuel tank, are supplied with current via the engine master *(Group C.1)*. The pumps are controlled by independent ON/OFF switches marked PORT and STBD, which are located on the forward end of the cabin starboard shelf and each pump is protected by a 25 amp. circuit breaker situated at the rear end of this shelf. The pumps normally operate continuously at low speed throughout flight, but either is capable, if run at high speed, of supplying the maximum fuel demand from the engine. The high or low speed operation is controlled by a pair of relays situated on the supply panel, which are energized by pressure switches tapped into the pump outlet pipes and mounted on the port side of the keel member adjacent to the pumps. The relays on the supply panel also control the operation of a pair of warning lamps, which indicate pump failure and are located one adjacent to each pump control switch on the starboard shelf. Provision is made for testing each pump, in turn, by means of a two-position test switch, marked TANK PUMPS TEST, and mounted, together with an ammeter test socket, on the rear end of the cabin starboard shelf.

Operation

3. With the engine master switch made and both pump control switches in the ON position current will flow from the main positive supply line to both tank pumps. With the pumps operating, the contacts of the pressure switches in their outlet pipes, will close, due to the fuel pressure, and energize relays H.1 and G.1. Energizing these relays will break their respective failure lamp contacts and complete a circuit across contacts 6 - 5 which brings the pump shunt coils into circuit causing the pumps to operate at their normal (low) speed and supply fuel to the engine driven pump via the flow proportioner. The flow proportioner is operated by the fuel flow and en-

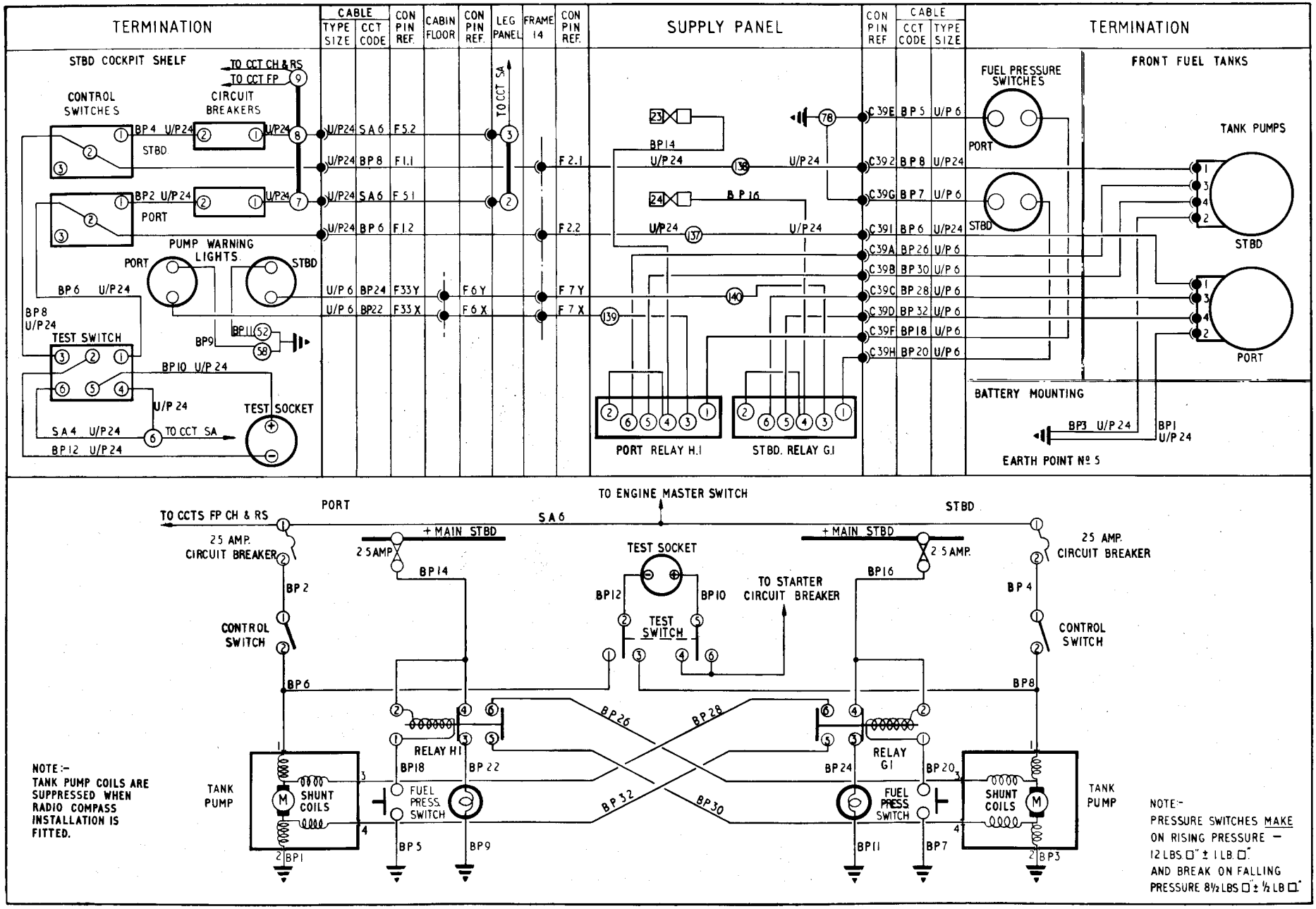

Fig. 1 Tank pumps
(Mod.1381 added)

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sures the equal amounts of fuel are supplied by both pumps. As the front tanks are emptied, fuel in the remaining tanks is transferred to the front tanks under air pressure. Thus, both sides of the fuel system should empty simultaneously.

4. Should either pump be overloaded, due, for example. to a fuel surge, the appropriate circuit breaker will operate and isolate the pump from the circuit. When this occurs, the pressure switch in the outlet pipe of the affected pump will open circuit, due to the loss of output from the pump, and de-energize its relay. With the relay de-energized, a supply will be made, via one set of contacts within the relay, to the warning lamp which will illuminate to indicate pump failure. The shunt field circuit across contacts 6 - 5 of the affected pump relay will be broken, allowing the serviceable tank pump to operate at emergency (high) speed to maintain fuel pressure to the engine. Under these conditions, the circuit breaker of the overloaded pump must be re-set. Then if the fault was temporary, the pump will re-commence running in the normal manner and the other pump will revert to low speed operation when the pressure switch closes and energizes the relay.

5. If the circuit breaker refuses to hold on this indicates that the fault is of a permanent nature and, if sufficient fuel is not available in the serviceable side of the system to complete the flight, engine speed must be reduced and the sound pump switch OFF by means of its control switch. Under this condition, the fuel will be supplied to the engine equally from both sides of the system under gravity and transfer air pressure. The sound pump should, however, be switched on again for landing.

6. The two-position test switch and ammeter socket, used to test the tank pumps for correct functioning, as described in para.12 of this group, are coupled to the engine starter circuit breaker (Group C.1) and obtain their positive supply from this source. The test switch feeds each pump, in turn, irrespective, of the position of the control switches provided that the engine master switch is OFF. For the full description of the fuel system as a whole, reference should be made to Section 4, Chapter 2 of this volume.

TABLE 1

Equipment type and Air Publication reference

Equipment Type	Air Publication
Tank pumps	
Pumps, Type 2009, Mk.4, 5, or 7 or 2009A, Mk.5 or 6	A.P.113E–0423–6
Pressure switches, Speed development Co. Ltd., T.P.5250	A.P.113D–1500 series
Control switches, Rotax, Type D.5405	A.P.113D–1100 series
Warning lamps Rotax H.2805 or Smiths 43 CFP/24	A.P.113F–0600 series
Indicators, Dowty, C.5165Y, Mk.10	
Relays, Type 9B, No.2	A.P.113D–1328–1
Circuit breakers, Type A.4	A.P.113D–0900 series
Test switch, Rotax, Type D.5503	A.P.113D–1100 series
Pressure refuelling	
Solenoid valves, Mk.17	A.P.106C–0100 series
Indicator, Flight Refuelling, Type 4506080	A.P.106D–2100 and 4700 series
Fluid level switch	
Flight Refuelling, Type D.3504147 or Hawker Pt. No. D.215808 (Front tanks)	
Smiths, Type 1696FG (Rear tanks)	
Flight refuelling, Mk.4, series 2 (Wing tanks)	
Flight Refuelling, Mk.4, series 13 or 153 (Drop tanks)	
Time switch, Venner, Type PTA/HA	A.P.113D–1400 series

Pressure refuelling

7. The aircraft is refuelled under pressure through a standard 1½ in. coupling situated in the port wheel bay, the operation being controlled by a pre-set time switch mounted in the port stub wing adjacent to the refuelling coupling. The time switch energises six solenoid-operated refuelling valves, located in the fuel pipe lines to the port and starboard front, rear and wing fuel tanks. These valves are controlled by fluid level switches located one, in each front, rear and outboard wing tanks and drop tanks when fitted. Filament lamps, carried in an indicator located in the stub wing, adjacent to the time switch, are wired in parallel with each refuelling valve solenoid to indicate when the valves are open during refuelling. Theoretical and routeing diagrams of the pressure refuelling circuit pre Mod.1023, 1385 and 1388 is shown at fig.2, post Mod.1023, 1385 at figs.3 and 4 and post Mod.1023, 1385, 1388 at figs.5 and 6.

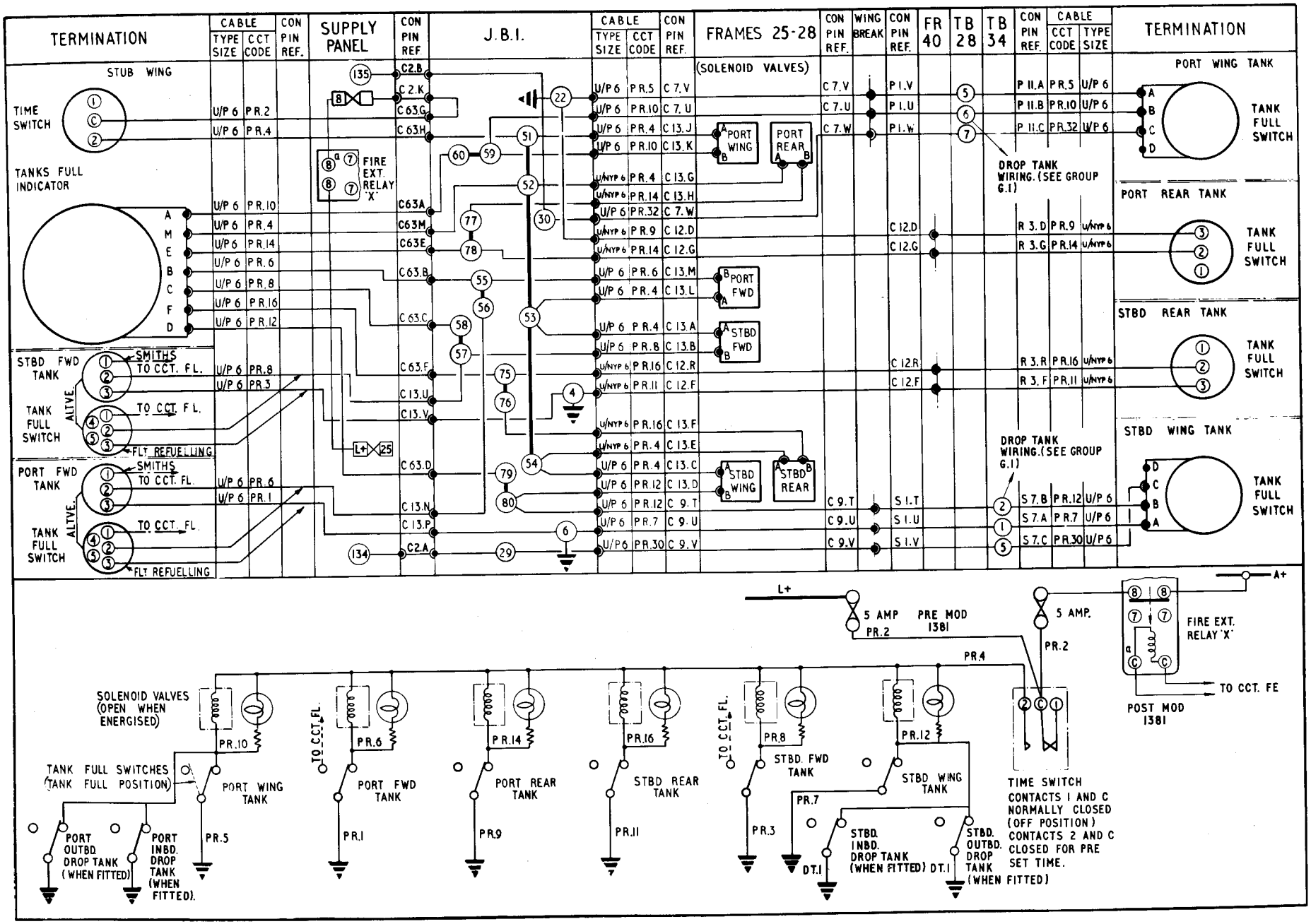

Fig. 2 Pressure refuelling
(Mod.1381 added)

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For wiring outboard of T.B.28 and 34 reference should be made to Group G.1, App.1 and App.2 of this chapter.

8. Mod.1023 introduces a DROP TANK REFUELLING selector switch marked I, II and III located adjacent to the refuelling indicator to enable drop tank refuelling selection to be made. The switch is to be selected in accordance with the refuelling instruction plate which is attached to the port cable cover plate which is located below the switch.

9. To permit the Hunter F. Mk.6A to carry 230 gallon drop tanks Mod.1385 introduces inboard pylons Part Nos. E.267586 (Port) and E.267587 (Starboard) and the necessary wiring changes to the mainplanes to achieve compatability.

10. To permit the Hunter F. Mk.6 to accept Hunter F. Mk.9 mainplanes and to operate as the Hunter F. Mk.6A Mod 1388 introduces the necessary wiring changes to the fuselage wiring in the stub wing to achieve compatability.

Operation

11. To understand the function of the pressure refuelling circuit it is necessary to trace the sequence of operations which take place whenever the aircraft is refuelled. On pre Mod.1381 aircraft the BATTERY MASTER switch is to be selected to the ON position or an external supply connected before refuelling can commence. On post Mod.1381 aircraft the supply for the refuelling valves is taken from A+ supply (Group B.1) through relay X and no switching is necessary providing the aircraft batteries are connected.

12. At the commencement of the refuelling operation, the refuelling hose is connected to the aircraft refuelling coupling and the pump started with its control set to REFUEL. The DROP TANK REFUELLING selector switch (post Mod.1023) is selected to either position I, II or III dependant on which drop tanks, if any, require to be filled. With drop tanks fitted to the inboard pylons the PRACTICE/NORMAL switches (post Mod.1385) are to be selected to the NORMAL position. With drop tanks fitted to the inboard and outboard pylons the PRACTICE/NORMAL switches (post Mod.1385 and 1388) are to be selected to the NORMAL position on all four pylons. On post Mod.1394 and 1395 aircraft the inboard pylon PRACTICE/NORMAL switch is wire-locked to the NORMAL position and the outboard pylon PRACTICE/NORMAL switch is wire-locked to PRACTICE. Only drop tanks may be carried on the inboard pylons and practice bombs on the outboard pylons. The time switch is then set and contacts C and 2 are made completing the circuit to the six refuelling valves and the indicator lamps. The refuelling valves open when the solenoids are energised to allow fuel to pass into all tanks and the indicator lamps are illuminated to indicate that the valves are open. As each tank becomes full, its fluid level switch opens and de-energises the refuelling valves, which close to cut off the fuel supply to that tank. The indicator lamp will be extinquished to indicate that the valve has closed.

13. Refuelling is complete when all the refuelling valves have closed and all indicator lamps are extinguished. The time switch is then switched off, if it has not already completed its full travel, but if not switched off, after refuelling, it will automatically switch itself off after approximately 8 minutes. The time switch ensures that the refuelling circuit is disconnected from the positive supply at all times, apart from actual refuelling operations. This ensures that the refuelling valve solenoids do not become energized again, when the fluid level switches close as the fuel is consumed, as this would cause cross-transfer between the tanks, via the refuelling pipe lines. For a full description of the fuel and refuelling system, reference should be made to Section 4, Chapter 2 of this volume.

SERVICING

General

14. For general servicing of the electrical system as a whole, reference should be made to Group A of this chapter. The contacts of the pressure refuelling time switch should be kept clean and inspected for signs of pitting, which if found must be removed in the approved manner. These operations should only be carried out by competent personnel, as the switch contains a delicate clockwork mechanism. Apart from checking the filament lamps in the refuelling indicator for serviceability, keeping all the components clean and carrying out the normal routine tests of security and serviceability, as described in the appropriate Air Publications, listed in Table 1, the only other servicing required is the tank pump test, described in the following paragraph.

Tank pump test

15. To test the pumps for correct functioning, connect an ammeter to the test socket located on the cabin starboard shelf. Ensure that the battery master switch is in the ON position, or that an external supply is connected and check that the engine starter circuit breaker is CLOSED. Trip each pump circuit breaker or ensure that the engine master switch is OFF and select each pump in turn by operating the test switch located adjacent to the ammeter test socket. With the pump under test operating at high speed, i.e., the other pump indicator showing OFF, the ammeter should show a reading of less than 25 amp., but if the other pump indicator is showing ON the pump under test will be operating at low speed and a reading of less than 18 amp. should be indicated on the ammeter. If the readings are above these values, the cause must be investigated and rectified before the next flight. After test, reset the circuit breakers, if tripped during test.

Note . . .

The reason for quoting the low speed test current is that, immediately, after refuelling, the fuel pressure switches in the pump outlet pipes may be closed by the refuelling pressure and the pumps will therefore operate at low speed, as described in para.3.

REMOVAL AND ASSEMBLY

General

16. The removal of the tank pumps, refuelling valves and fluid level switches is fully described and illustrated in Section 4, Chapter 2 of this volume. Once access has been obtained, the removal of the remaining components forming the tank pumps and pressure refuelling circuits, should present no unusual difficulties. The removal of the cabin starboard shelf, which carries the control switches and circuit breakers of the tank pumps circuit is fully described in Group A.2 of this chapter, while the location and access to all the components is indicated in Group A.3 also of this chapter.

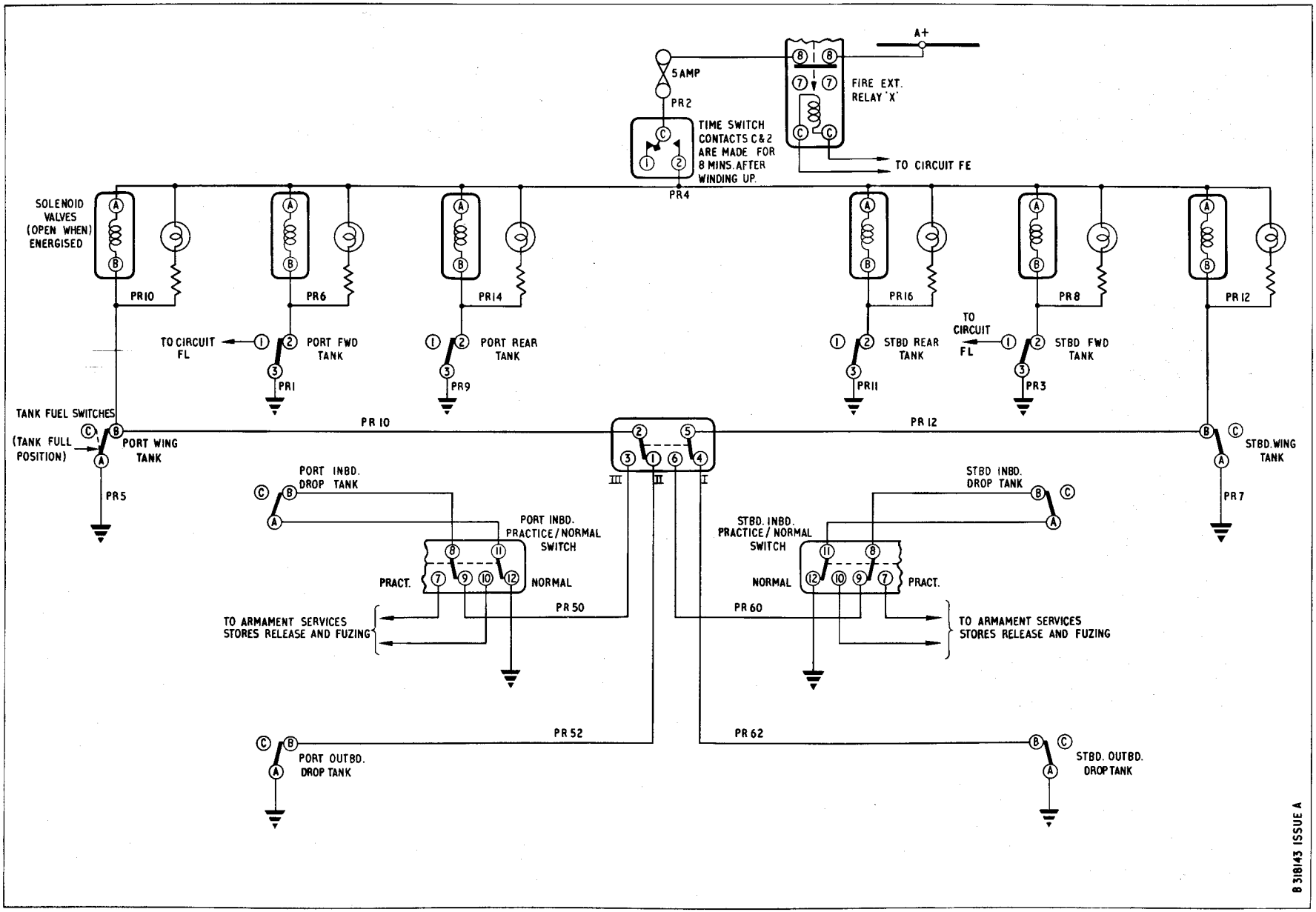

Fig.3 Pressure refuelling Mk.6A – post Mod.1023 and 1385 (theoretical)

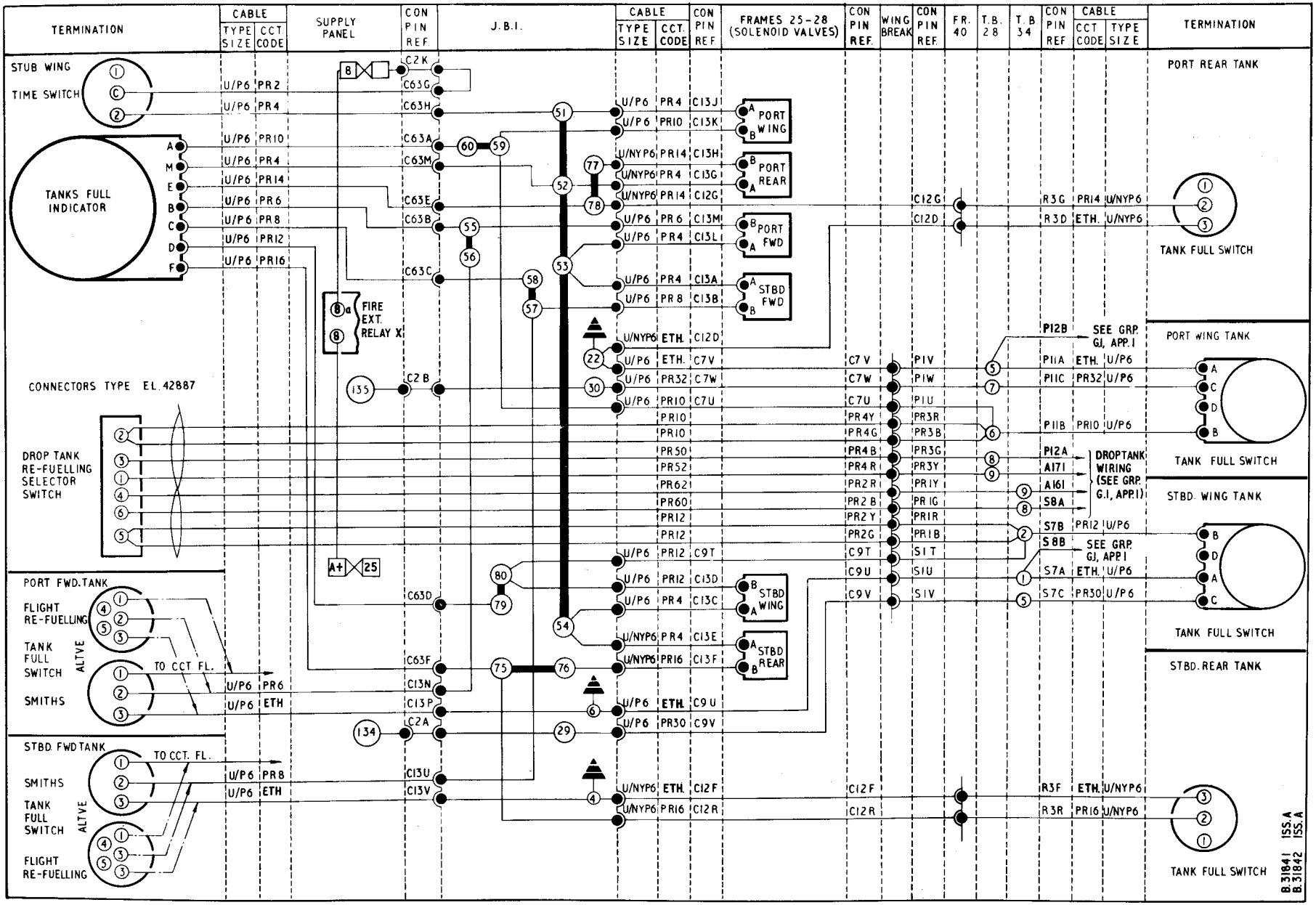

Fig.4 Pressure refuelling Mk.6A – post Mod.1023 and 1385 (routeing)

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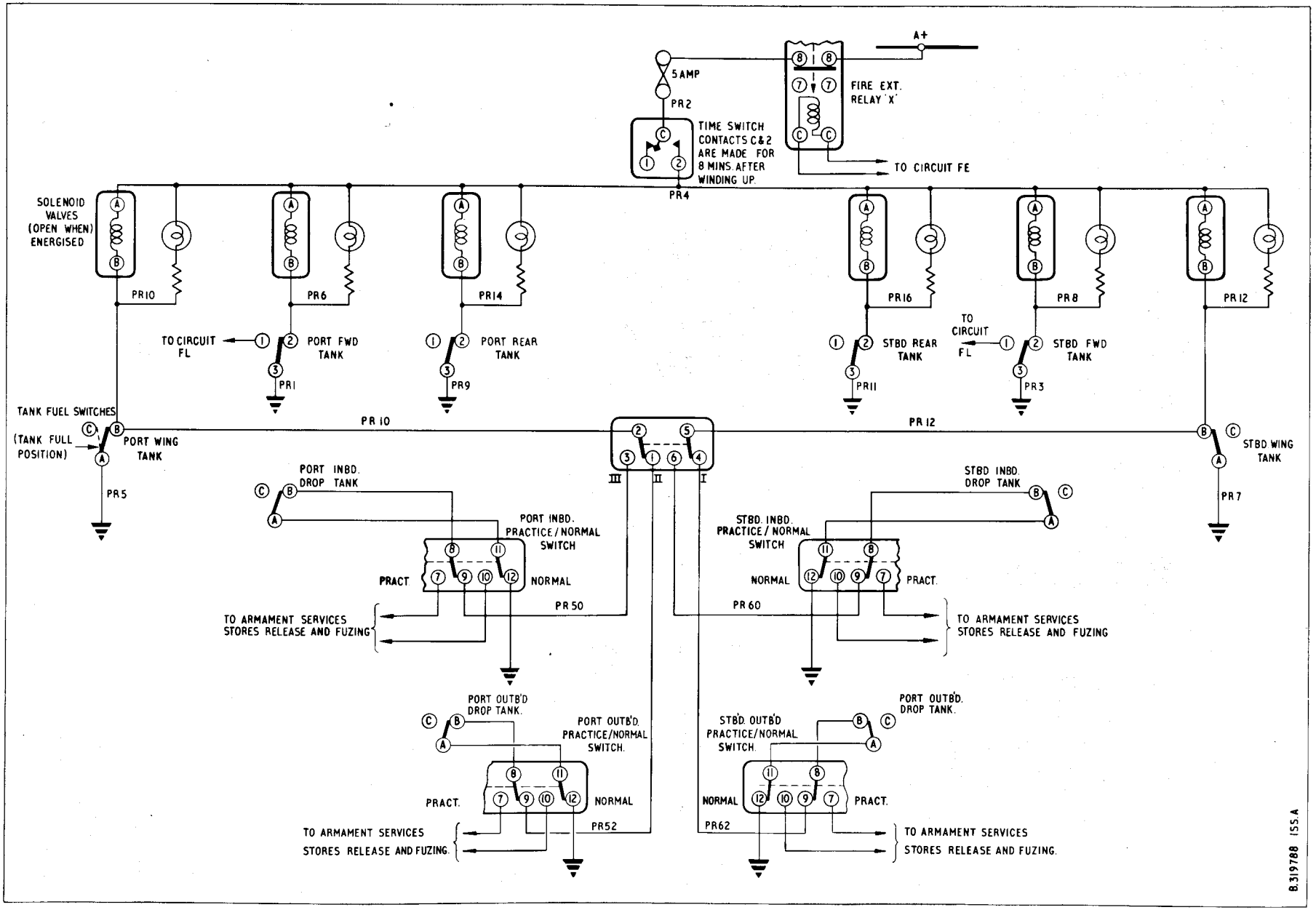

Fig.5 Pressure refuelling Mk.6A – post Mod.1023, 1385 and 1388 (theoretical)

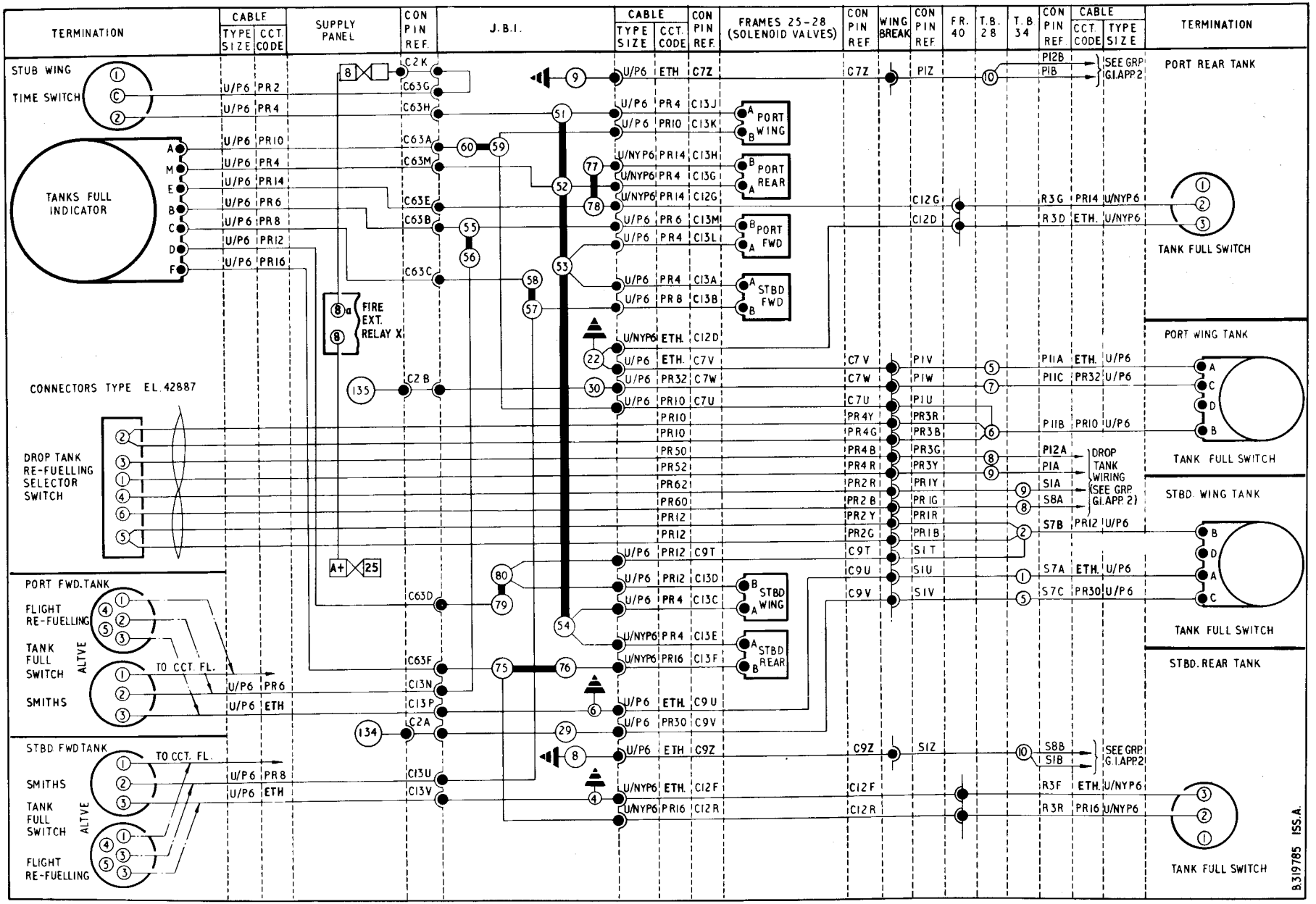

Fig.6 Pressure refuelling Mk.6A — post Mod.1023, 1385 and 1388 (routeing)

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