Chapter 19

BOMB DOORS CONTROL

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LIST OF ILLUSTRATIONS

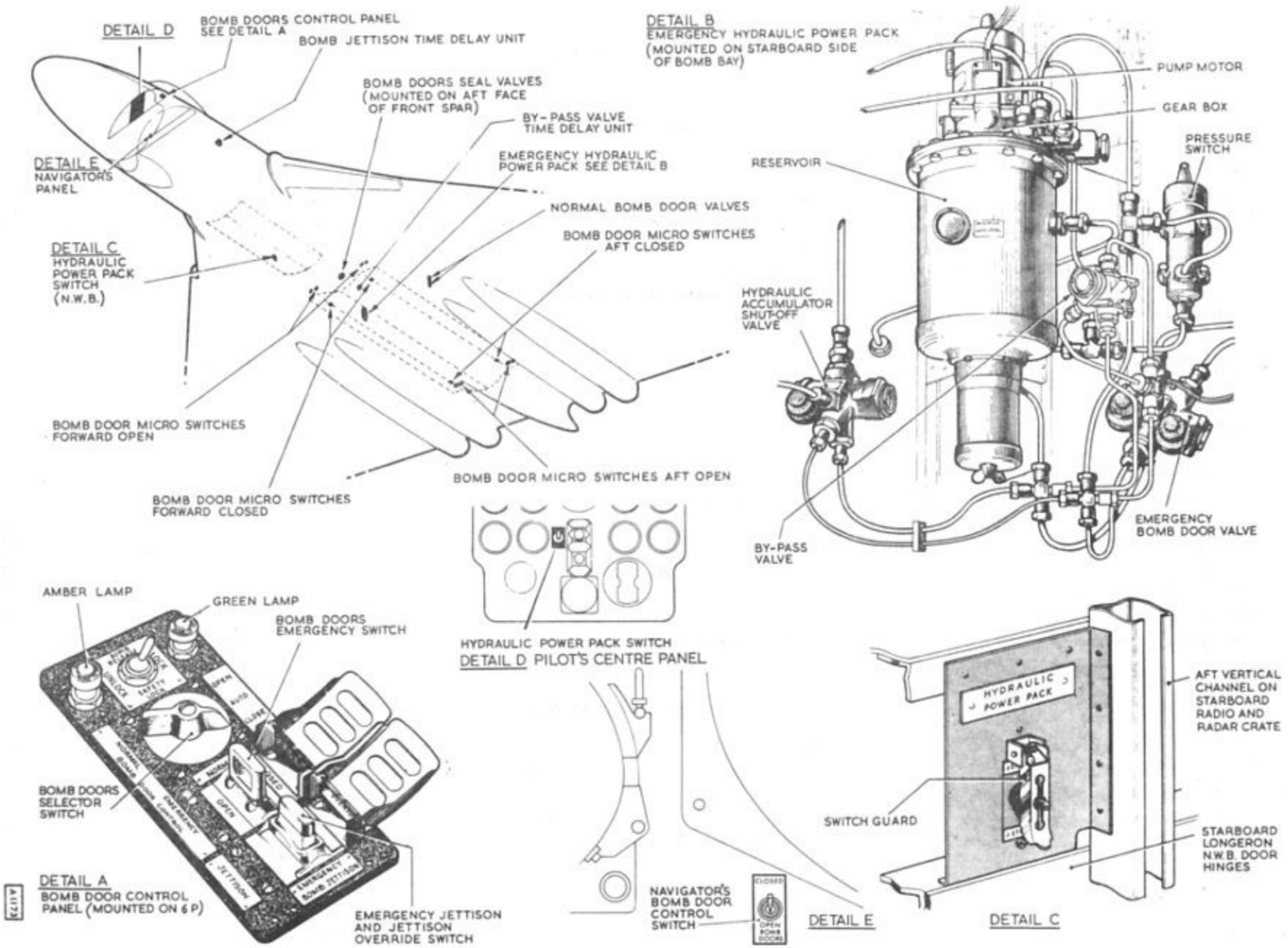


Fig. 1 Bomb doors control and equipment

Introduction

1. This chapter contains descriptive and servicing information on the control system for normal and emergency operation of the bomb doors and associated circuits, which include the emergency hydraulic power pack. An illustration showing location of equipment and theoretical circuit diagrams are provided, the respective routing charts being placed at the end of the text.

2. Modifications which affect this chapter are included as follows:-

Mod.748 Armament – To introduce fixed fittings (not covered by Mod.199) for Blue Steel.

Mod.1074 Armament – To introduce an external ground supply plug in bomb bay for store hoisting.

Mod.1204 Instruments – To introduce leader cable loop aerial, autopilot Mk.10B and auto-landing inst. on aircraft with Mod.360 embodied.

Mod.1978 Armament – To introduce bomb door opening switch at navigator plotter set operator's station.

Mod.2082 To prevent feedback from the autopilot Mk.10B to the bomb release system in the event of autopilot fault.

▶Mod.2451 Introduces T.D.U. Type 33/V9303 to hydraulic power pack circuit in lieu of Type 18/V9303. ◀

Skybolt role

3. On certain aircraft which were fitted for the Skybolt role, minor alternations were made to some of the normal aircraft circuits. In this chapter one such circuit is bomb doors indicator and jettison connectors. For those aircraft prepared for the Skybolt role therefore, the associated routing chart, fig.11, applies.

Blue Steel aircraft

3A. As all aircraft have now been reverted to the free-fall role, all text and illustrations post Mod.748 in this chapter should be disregarded.

DESCRIPTION AND OPERATION

BOMB DOORS CONTROL

General

4. Bomb door operation is controlled by a series of electrically operated selector valves in the hydraulic system. These valves control the operation of the bomb door jacks. In normal flight conditions, and when hydraulic pressure is available from a ground servicing trolley, control of the bomb doors is by two of the selector valves employed in the main hydraulic system. For emergency flight conditions and occasional ground use, control of the bomb doors is obtained by a third selector valve employed in a separate hydraulic system pressured by the emergency hydraulic power pack.

5. The forward and aft ends of the bomb bay are equipped with inflatable seals, to assist in the minimizing of heat losses from the bomb bay when the doors are closed. The seals are inflated from the pneumatic system, inflation and deflation being controlled by two electrically operated unimatic valves, one for each seal. The electrical circuit is so arranged that the seals are inflated after the bomb doors have closed, and deflated on the selection of bomb doors open. This sequence of events is effected by the bomb door microswitch circuit.

Microswitches

6. Eight microswitches, Dowty Type C.1831 Mk.1, are employed for bomb door position indication, bomb door seal inflation and deflation, bomb jettison control and signal supplies to and/or from the following installations:-

(1) Autopilot/N.B.S. (Sect.7, Chap.6)

(2) Bomb gear (Chap.20)

(3) Special stores (Chap.21)

7. Four of these switches are used to give visual indication of doors closed, and when the doors are open, provide a signal to the autopilot/N.B.S. system. They are installed at the inner hinge on the port and starboard bomb doors, two forward and two aft, the two forward ones operating the bomb doors seals unimatic valves in addition to their indication function.

8. The other four switches are used to give a signal of bomb doors fully open to the autopilot/N.B.S. system, normal, alternative and special stores circuits. Jettisoning of normal stores is controlled by all four of these switches. The two forward switches are installed at the port and starboard ends of the forward bomb door jack beam, on mountings at the forward face. The two aft switches are installed at the port and starboard ends of the aft bomb door jack beam, on mountings at the aft face.

9. Four additional doors open microswitches of the same type are installed in tandem with those detailed in para.8. These microswitches are peculiar to the special stores

installation (Chap.21). When Mod.748 is embodied the microswitches are also used to energize the bomb doors indicator (para.37).

Controls, manual

10. The bomb doors are controlled by suitable switches installed on panel 6P, the pilot's port console. The switches are:-

(1) Normal bomb door control switch. A 3-position rotary selector switch labelled OPEN-AUTO-CLOSE.

(2) Emergency bomb door control switch. A double-pole changeover switch labelled OPEN-NORMAL-CLOSED.

(3) Emergency bomb jettison switch. A single-pole 3-position switch; spring-loaded to the centre off position and labelled JETTISON-OVERRIDE.

(4) An additional control switch, introduced with Mod.1978, is positioned at the nav. plotter's station and labelled NAV. PLOT/ NAV. RAD – OPEN/CLOSED.

Controls, automatic

11. The bomb doors can be closed after a preset time, by the jettison time delay unit, located just aft of 3P in the crews' compartment.

Indication

12. One magnetic indicator, Ref. No. 5CZ/5074 gives indication of bomb doors fully closed, and inversely not closed. The indicator is situated on the pilots' panel 1P and presents a white face with doors not closed, a black face with doors fully closed.

Circuit operation

13. The following sequence of operations should be read in conjunction with the theoretical circuit diagram contained in fig.2. For normal automatic and jettison control it is assumed that the emergency bomb door control switch is in the NORMAL position.

Normal selection

14. The bomb doors circuit is shown with the bomb doors closed, and from fig.2 it will be seen that:-

(1) The bomb doors indicator on the pilots' panel is energized by a supply from fuse 480, via contacts 2-3 of the four bomb doors closed microswitches connected in series. The indicator presents a black face.

(2) The close solenoids of the normal bomb doors valves are energized by a supply from fuse 602, via normally closed contacts 162/3, 155/3 and 257/1, the return to earth being via normally closed contacts 257/5.

(3) The solenoids of the bomb door seals pneumatic valves are energized by a supply from fuse 602, via normally closed contacts 162/3, 155/3 and 257/3, and the port and starboard forward doors closed microswitch contacts 5-6.

15. On placing the bomb door 3-way selector switch to the OPEN position the following circuit action takes place:-

(1) A 28-volt supply from fuse 602 will energize the coil of relay 162, via the selector switch.

(2) Opening of contacts 162/3 will disconnect the supply from the close solenoids of the bomb doors valves and the solenoids of the bomb doors seal valves. The bomb doors seals will now deflate.

(3) Closing of contacts 162/2 will connect a supply from fuse 602 to energize the open solenoids of the normal bomb doors valves, via normally closed contacts 257/4. The bomb doors will thus commence to open.

16. As the doors commence to open, the bomb doors indicator on the pilots' panel will be de-energized by operation of the bomb doors closed microswitches to present a white face. Note that the supply circuit from fuse 480 to the autopilot/N.B.S. is so wired that should any one, two or three of the four micro-switches fail to operate, the supply will be completed via the respective contacts of the microswitches.

17. On reaching the fully open position the bomb doors will operate the open micro-switches, and a supply from fuse 481 will be fed, via the series 2-3 contacts, to the following installations:-

(1) Autopilot/N.B.S.

(2) Bomb gear

(3) Special stores

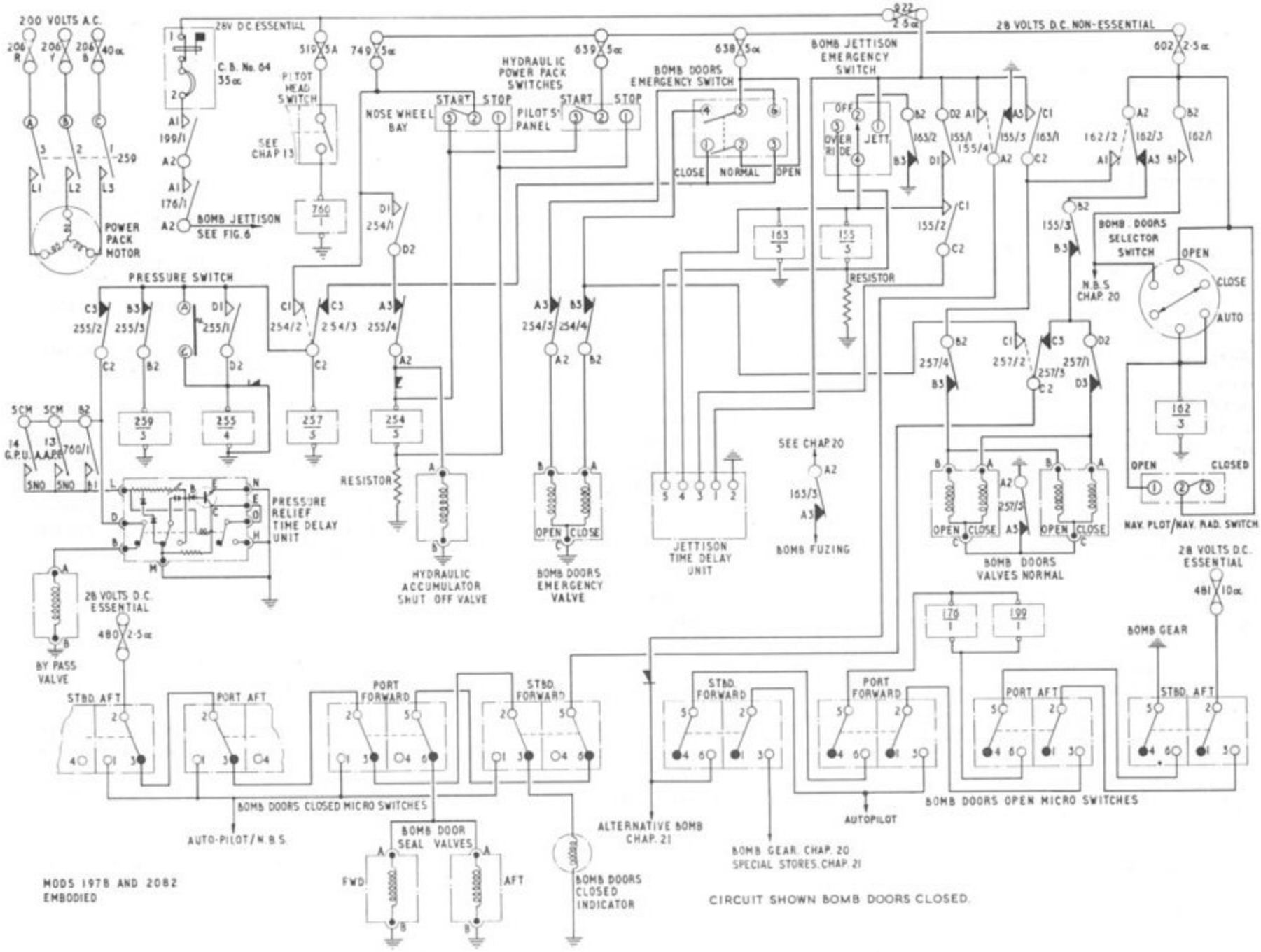


Fig. 2 Bomb doors and emergency power pack controls - pre Mod 748 and 1074

◄ Fig. No. changed ►

18. Placing the selector switch to CLOSE will de-energize the coil of relay 162, causing its contacts to revert to the original positions. This action will cause the open solenoids of the bomb doors valves to be de-energized by the changeover of contacts 162/2 to 162/3, which will now energize the close solenoids of the bomb doors valves.

19. The bomb doors will now commence to close, and the doors open microswitches will revert to their original positions, cutting the supply to the installations referred to in para.17. As the doors reach the fully closed position, the doors closed microswitches will revert to their original position and connect a supply to the solenoids of the door seal valves, causing the seals to be inflated. At the same time, the indicator on the pilots' panel will become energized to present a black face.

Automatic selection

20. With the bomb doors selector switch at the AUTO position, the bomb doors can be opened automatically by a pulse from the N.B.S. This pulse is fed via the selector switch to energize relay 162. The bomb doors will be opened as described in para.15, 16 and 17, contacts 162/1 forming a hold-in circuit for relay 162. At the conclusion of bombing operations, the bomb doors are closed by placing the selector switch to the CLOSE position, when the events will be as in para.18 and 19.

Emergency selection

21. Should a failure occur in the main hydraulic system, the bomb doors can be operated from the emergency hydraulic system. This system is powered by the emergency hydraulic power pack (para.38), and the circuit operation of the bomb doors using the power pack is given in the following paragraphs. It should be noted, however, that pressure in the emergency hydraulic line will not be available until the appropriate relay is energized (para.39). For this function, therefore, it is assumed that a 200-volt ground supply is connected and the G.P.U. relay is energized.

▶22. Reference to fig.2 will show that with◀ the emergency bomb doors control switch placed to OPEN, the following circuit action will take place:-

(1) The open solenoid of the emergency bomb doors valve will be energized by a supply from fuse 638 via contacts 5-6 of the control switch and normally closed contacts 254/5.

(2) Relay 257 will be energized from fuse 638 via contacts 2-3 of the control switch and normally closed contacts 254/3.

(3) Relay 259 will be energized via normally closed contacts 254/3 and 255/3.

(4) The by-pass valve will be energized via normally closed contacts 254/3, 255/2 and the contacts of the time delay unit (pins D-B).

(5) The time delay unit will be energized to start the timing sequence via contacts 254/3, 255/2, the G.P.U. relay contacts (para.21) and pin L of the time delay unit. The operation of the time delay unit is described in para.49.

23. Opening of relay contacts 257/1, 257/4 and 257/5 will completely isolate the normal doors valves from the circuit and earth, thereby isolating any fault in the normal hydraulic system. Changeover of contacts 257/3 to 257/2 will transfer the circuit for the bomb doors seal valves from the normal to the emergency system. As no supply is available at contacts 257/2, the seals will deflate.

24. Closing of contacts 259/1, 259/2 and 259/3 will connect the 200-volt, 3-phase supply from fuses 206R, Y, B to the hydraulic power pack motor. The by-pass valve, when energized, connects the hydraulic pressure and return lines, therefore pressure build-up on starting is low and the motor will quickly attain running speed. After 2 seconds, the delay unit's internal relay will be energized, causing the supply to be removed from pin B, and thus de-energizing, the by-pass valve. Pressure will then build up in the hydraulic system and the bomb doors will begin to open.

25. Operation of the bomb doors micro-switches is exactly the same as in normal operation, hence bomb doors indication and supplies to other systems will be as described in para.16-17.

26. When the bomb doors are fully open, the hydraulic pressure will increase, and on reaching a nominal 4 000 lb/in^2, will cause the pressure switch to close and energize relay 255. The following action will then result:-

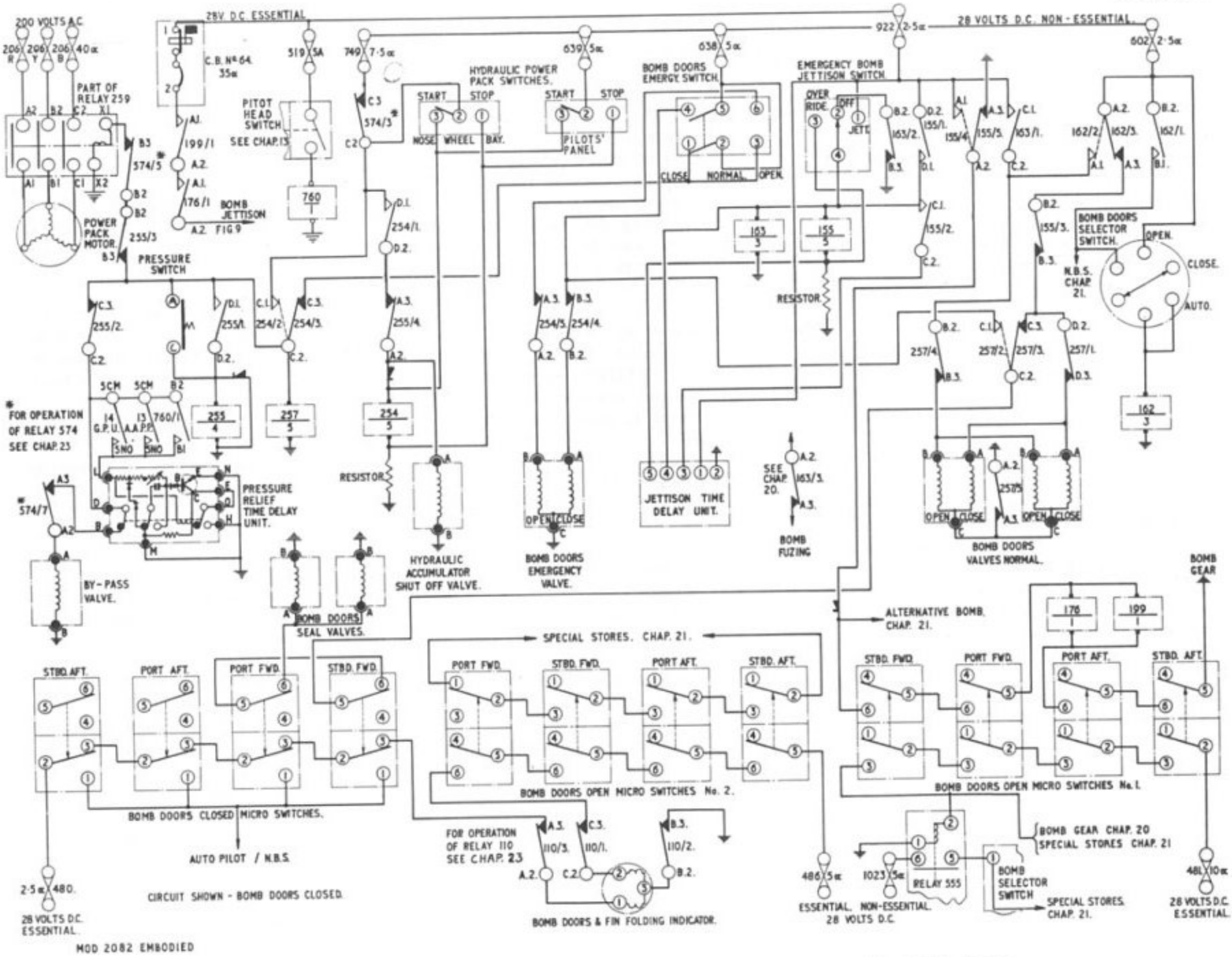


Fig. 3 Bomb doors and emergency power pack controls post Mod 748, 1074

(1) Contacts 255/1 will close to hold in relay 255.

(2) Contacts 255/2 will open to de-energize the time delay unit, which will be ready for subsequent operation on selection of doors closed.

(3) Contacts 255/3 will open to de-energize relay 259, thereby breaking the supply to the power pack motor.

(4) Contacts 255/4 will open to isolate the wheel brakes accumulator shut-off valve. This function is related to charging the hydraulic accumulators (para.47).

The current control action at this stage would be to select the control switch to the centre (normal) position. This will de-energize relay 255, thus leaving the circuit prepared for starting the power pack from other sources. A note on correct use of the control switch is contained in Sect.3, Chap.6.

27. Placing the emergency bomb doors control switch to CLOSE will cause similar circuit operation to that described for OPEN selection, except that the close solenoid of the emergency bomb doors valve will be energized from fuse 638 via contacts 5-4 of the control switch and normally closed contacts 254/4. This supply will also be available to the bomb doors seal valves via contacts 257/2. Operation of the bomb doors microswitches and indicator will be as described in para.19.

Emergency bomb jettison

28. The bomb load may be jettisoned in the event of an emergency by use of the JETTISON/OVERRIDE switch. No separate selection of the bomb doors is required, since opening of the bomb doors is automatic, being the first requirement of jettison function. The action to jettison may be overriden by use of the same switch, and providing the override action is taken before the bomb doors are fully open, jettison will not take place.

Jettison

29. Reference to fig.2 will show that when the emergency jettison switch is pressed momentarily to JETTISON, relays 155 and 163 will be energized from fuse 922 via contacts 1-4 of the switch to result in the following circuit action:-

(1) Contacts 155/1 will close to form a hold-in circuit for relay coils 155 and 163.

(2) Contacts 155/2 will close to connect the supply to the coil of the time delay unit.

(3) Contacts 155/3 will open to isolate the close solenoids of the normal bomb doors valves, and de-energize the bomb doors seal valves, causing the seals to deflate.

(4) Changeover of contacts 155/5 to 155/4 will remove the safety earth and connect the supply to the bomb doors open microswitches in preparation for jettison action.

(5) Contacts 163/1 will close to connect the supply from fuse 922 via normally closed contacts 257/4 to the open solenoids of the normal bomb doors valves.

(6) Contacts 163/2 will open to remove the safety earth from terminal 2 of the emergency jettison switch. (A supply at terminal 4 is made via contacts 155/1).

(7) Contacts 163/3 will open to break the supply to the bomb fuzing switches (Chap.20), thus ensuring safe jettison irrespective of fuzing selection.

30. When the bomb doors are fully opened, the doors open microswitches will be operated and the supply from fuse 922 (para.29, sub-para.4) will energize the jettison relays 176 and 199 via contacts 6-5 of the four micro-switches.

31. The stores will now be jettisoned by a supply from C.B.64 via the operated contacts of the jettison relays.

32. After a time interval (preselected on the time delay unit) during which the stores have been jettisoned, a 28-volt supply will be fed from terminal 5 of the time delay unit to the earth side of relay 155. Relays 155 and 163 will then be de-energized. The contacts of the relays will revert to their normal positions and the close solenoids of the normal bomb doors valve will be energized from fuse 602, the supply for the bomb doors seal valves being fed from the same source. The bomb doors will now close as in the normal selection.

Jettison override

33. If, after jettison selection, it is found that jettison action is not required, the action can be stopped by pressing the jettison/override switch to OVERRIDE. This overriding action taken before the bomb doors are fully open will cause the doors to close and no stores will be jettisoned. Where bomb jettison is already taking place, selection of OVERRIDE will stop the jettison sequence and return the bomb doors to the closed position.

34. When the switch is pressed to OVERRIDE, a supply from fuse 922 will be fed via contacts 155/1 and terminals 4-3 of the switch to the earth side of relay 155. Relays 155 and 163 will be de-energized, thus cancelling the jettison action, and the bomb doors will close.

Mod.1074

Bomb doors control

35. No change is made to the bomb doors circuit by the introduction of Mod.1074. The routing chart for the circuit however, (fig.8) shows some additional wiring for Blue Steel, and is now drawn entirely separate from the hydraulic power pack routing chart (fig.10). A theoretical circuit diagram is contained in fig.3.

Mod.1978

Bomb doors control

36. With the introduction of this modification an additional control switch is fitted at the navigator plotter station. Movement of the switch toggle to the OPEN position will complete an alternative supply to energize and changeover the contacts of relay 162. Contacts 162/3 open the circuit to the solenoid valve 'close' coil, and contacts 162/2, complete the circuit to the solenoid valve 'open' coil, via contacts 257/4. Placing the control switch in the CLOSED position will de-energize relay 162. This action will remove the supply to the open coil of the solenoid valve and transfer it to the close coil, thereby closing the bomb doors. Indication of bomb door position will be the same (para.14 and 15).

Mod.748

Indication

37. With the introduction of Mod.748, the pilots' indicator is replaced by a Dowty 3-position indicator, No. C5175Y Mk.15, which shows black for doors closed and white for doors open as before. In the off position, black and white diagonal stripes are displayed, With Mod.200 embodied, the indicator is changed to Type C5175Y, Mk.154 for fin folding indication.

38. Reference to fig.3 will show that the indicator is energized black by a supply from fuse 480 via contacts 2-3 of the doors closed microswitches and relay contacts 110/3. In the white position, the indicator is energized from fuse 486 via contacts 5-6 of the doors open additional microswitches (Chap.21) and contacts 110/1. The earth side of the indicator is completed via contacts 110/2. The bomb jettison connectors circuit is shown on the routing chart, fig.9.

EMERGENCY HYDRAULIC POWER PACK

General

39. The emergency hydraulic power pack, driven by a 3-phase, 4-pole induction motor, Type 1401, is installed on the starboard side of the bomb bay (fig.1). The unit consists of a high pressure radial pump built into a cylindrical casing, to which the electric motor and a filter assembly are mounted. The motor is operated from the 200-volt, 3-phase a.c. supply via a heavy duty relay near the pack. The operating pressure, nominally 4 000 lb/in^2, is regulated by a pressure switch in the electrical control circuit.

Operation and controls

40. The power pack is provided for ground and emergency bomb doors operation, and for recharging the wheel brakes accumulators prior to the aircraft being towed. The circuit incorporates a time delay unit, which operates in conjunction with a by-pass valve connected in the hydraulic circuit, and allows the power pack motor to attain running speed off load (para.42). Reference to fig.2 will show that the supply to energize the time delay unit (via pin L) is connected through normally open contacts B2-B1 of relay 760 and normally open contacts 5CM-5NO of relay 14 (G.P.U.) and 13 (A.A.P.P.). This ensures that the hydraulic pressure circuit will not function until either:-

(1) The pitot head is switched on (relay 760 energized) or,

(2) A 200-volt ground supply is connected (G.P.U. relay energized) or,

(3) The A.A.P.P. supply is connected (A.A.P.P. relay energized).

41. The power pack is controlled from three positions as follows:-

(1) The EMERGENCY bomb doors selector switch on the 1st pilot's port console 6P.

(2) The hydraulic power pack START-STOP switch on the pilots' centre instrument panel.

(3) The hydraulic power pack START-STOP switch adjacent to 16P on the starboard aft side of the nose wheel bay.

By-pass valve

42. The by-pass valve is located aft of the hydraulic power pack and is controlled by a transistorised time delay unit, B.Ae. Part No. 18/V9303 (Pre Mod.2451) or 33/V9303 (Post Mod.2451). The time delay unit is attached to the forward face of bomb arch 108 on the starboard side.

43. The valve, when operated, provides relief of full pressure, hence relief of full load on the power pack motor on the instant of starting. When energized, the valve opens and couples the hydraulic pressure and return lines, therefore pressure build-up on starting is low and the motor quickly attains running speed. After 2 seconds, the delay unit's internal relay will be energized breaking the supply to the valve, which will close and allow pressure to build-up in the hydraulic system.

WARNING . . .
Prior to connecting 200-volt a.c. supplies to the aircraft a check should be made to ensure that the circuit is de-energized by observing the precautions outlined in the servicing part of this chapter.

Circuit operation

44. The following sequence of operations should be read in conjunction with the theoretical circuit diagram fig.2. Details of the hydraulic circuit functions are given in Sect.3, Chap.6.

Start-stop switches

45. Pressing any one of the two start-stop switches momentarily to START will energize relay 254, the pilots' switch being fed from fuse 639, and the nose wheel bay switch from fuse 749.

46. The following action will then result:-

(1) Contacts 254/1 will close to form a hold-in circuit for relay 254, fed from fuse 749 via normally closed contacts 255/4. This supply will also energize the solenoid of the accumulator shut-off valve.

(2) Changeover of contacts 254/3 to 254/2 will (a) energize relay 257, (b) energize relay 259 via contacts 255/3, (c) energize the by-pass valve via contacts 255/2 and normally closed contacts (pins D-B) of the time delay unit, and (d) energize the time delay unit via contacts 255/2, the G.P.U. contacts (see para.21), and pin L of the time delay unit.

(3) Contacts 254/4 and 254/5 will open to isolate the bomb doors emergency valve.

(4) Contacts 257/1, 257/4 and 257/5 will open to isolate the normal bomb doors valves.

(5) Changeover of contacts 257/3 to 257/2 will deflate the bomb doors seals, but has no real function in this application of the power pack.

(6) Contacts 259/1, 259/2 and 259/3 will close to connect the 200-volt a.c. supply from fuses 206R, Y, B to the power pack motor.

47. As there is relatively little pressure build-up due to the by-pass valve being open, the power pack motor will attain running speed almost instantaneously. After the 2 seconds time lapse of the time delay unit, the by-pass valve will be de-energized, which will allow pressure to build-up in the hydraulic circuit.

48. When the hydraulic pressure reaches a nominal 4 000 lb/in^2 the pressure switch will close and energize relay 255. The following circuit action will then occur:-

(1) Contacts 255/1 will close to hold in relay 255.

(2) Contacts 255/2 will open to de-energize the time delay unit and prepare it for subsequent use.

(3) Contacts 255/3 will open to de-energize relay 259, thereby breaking the supply to the power pack motor.

(4) Contacts 255/4 will open to break the hold-in supply for relay 254, and also de-energize the accumulator shut-off valve.

(5) Contacts 254/4 and 254/5 will close to reconnect the emergency bomb doors valve in the circuit.

(6) Contacts 254/1 will open to isolate relay 254.

(7) Changeover of contacts 254/2 to 254/3 will de-energize relay 257, which will reconnect the normal bomb doors valves and seal valves in the circuit.

(8) Changeover of contacts 254/2 to 254/3 will also de-energize relay 255, which will return the circuit to normal, i.e. to conditions prior to selection.

49. The system can also be switched off by pressing any one of the start-stop switches to STOP. This will connect a supply from the respective fuse to the earth side of relay 254, thus de-energizing the relay to cause the following action:-

(1) Contacts 254/1 will open to break the hold-in supply for relay 254, and also de-energize the accumulator shut-off valve.

(2) Contacts 254/4 and 245/5 will close to reconnect the emergency bomb doors valve in the circuit.

(3) Changeover of contacts 254/2 to 254/3 will de-energize relays 257 and 259, which will reconnect the normal bomb doors valves in circuit and stop power pack motor.

Function of by-pass valve time delay unit

▶ 50. Reference to fig.2 will show that pins H, N and M are at earth potential, and that pins L and D are linked via the contacts of the appropriate relay when energized (para.39). A 28-volt d.c. +ve supply applied to pin D will pass across the respective normally closed contacts of the relay to pin B to energize the by-pass valve. The same potential is applied via pin L to the relay coil, and a lower potential to the capacitor through the fixed and variable resistors. Initially the path from pin L through the coil and transistor C-E to earth will be non-conductive due to the low potential at transistor B. As the capacitor becomes charged, however, the potential at transistor B will increase and transistor C-E will start to conduct, until at a time determined by the variable resistor, sufficient current will flow to energize the relay. Operation of the relay contacts will then:- ◀

(1) Provide a full earth for the relay coil via pins E-O (linked), the relay contacts and pin H, to lock in the relay.

(2) Short out the capacitor, thus discharging it and preparing for subsequent operation.

(3) Cut off the supply to the by-pass valve.

Mod.1074

Hydraulic power pack

51. With the introduction of Mod.1074, a ground supply plug is provided in the bomb bay for hoisting and lowering the new store (Chap. 23). This necessitates an additional relay, No.574, being fitted and the substitution of relay 259, Type D6704, for a changeover relay, Type LDK 35Y1/1. As previously mentioned in para.35, the routing chart (fig.10) is now drawn separate from the bomb doors circuit.

52. The changeover relay 259 contains two separately energized sections, which receive alternatively (a) a 200-volt, 3-phase supply from the aircraft busbar for normal operation of the hydraulic power pack, or (b) a similar supply from the bomb bay ground supply plug for operation of the pack when store hoisting or lowering is being carried out. For descriptive purposes the two sections of the relay are referred to as 259A where the aircraft supply is connected, and 259G where the ground supply is connected.

▶ 53. It will be seen from fig.3 that no change ◀ is made to the normal operation of the power pack, except that the power pack motor is connected to the aircraft busbar via relay 259A, which is energized via normally closed relay contacts 574/5. Note also that the supply from fuse 749 to the nose wheel start-stop switch is taken via normally closed contacts 574/3, and that the by-pass valve is fed via normally closed contacts 574/7. For connection of the ground supplies via relay 259G and for operation of relay 574, reference should be made to Chap. 23.

WARNING . . .
If for any reason the emergency bomb doors switch is selected to OPEN or CLOSE, or any one of the two hydraulic power pack switches is selected to START with a 28-volt d.c. supply connected but WITHOUT a 200-volt a.c. supply connected, the later application of the 200-volt a.c. supply will cause the bomb doors to move almost instantly. Also pre Mod.1363, the hydraulic power pack will be started under full load with consequent fatiguing or rupturing of fuses 237 (pre Mod.1552) or fuses 206 (post Mod.1552). To obviate the possibility, therefore, that the above switches have been operated with a 28-volt d.c. supply only on the aircraft, the following drill is recommended prior to connecting a 200-volt a.c. supply:-

(1) Ascertain that the emergency bomb doors selector switch is in the NORMAL position.

(2) Operate any one of the two hydraulic power pack switches to STOP.

(3) Pitot head heater switch in OFF position.

General

54. In accordance with A.P.101B-1902-4 a periodic examination of the terminal points for security and cleanliness is to be carried out. A regular check of the microswitches for external damage and torn bellows and grommets is recommended. Very little servicing of the installation is necessary.

55. In view of the dual functioning of the electro-hydraulic valves used in this installation, it is essential that the closest co-operation be maintained between the electrical and airframe tradesmen in order to ensure a high degree of serviceability. This applies to operational tests on the aircraft and bench testing of components.

56. Electrical testing is dealt with in the following paragraphs, system testing of the hydraulics in the bomb doors installation is contained in Sect.3, Chap.6. Component testing of electro-hydraulic valves is contained in A.P.1803D.

By-pass valve time delay unit

57 No servicing is possible on this item, apart from checking the time delay stamped on the nameplate which should be 2 seconds plus or minus 0.25 seconds. A faulty item should be returned to the appropriate repair depot or maintenance unit.

Functional test

58. A functional test of the bomb doors control should be carried out at the time required by A.P.101B-1902-4, the tests being carried out as outlined in Sect.3, Chap.6.

Continuity test

59. A suitable test-box, containing the test lamps described in para.60 sub-para.(2) and (3) and equipped with suitable leads and terminations may be manufactured locally.

60. A continuity test of the bomb doors control circuit wiring which will also prove the operation of the microswitches, should be carried out at inspection periods. The recommended procedure is contained in the following paragraphs.

Control circuit testing

61. In co-operation with the airframe tradesmen, by use of the hydraulic ground servicing trolley or by means of the emergency hydraulic power pack, (Sect.3, Chap.6) operate the bomb doors to a position where all the microswitches are free to be operated manually. To prove the serviceability of the circuits the following procedure should now be adopted:-

(1) Isolate the installation from all supplies.

(2) Disconnect the supply cables from each of the following control valves, and connect suitable low wattage test lamps across each of the disconnected cables thus:-

(a) Normal bomb doors selector valve port side, lamp across pins A and C, lamp across pins B and C.

(b) Normal bomb doors selector valve starboard, lamp across pins A and C, lamp across pins B and C.

(c) Emergency bomb doors selector valve, lamp across pins A and C, lamp across pins B and C.

(d) Hydraulic accumulator shut-off valve, lamp across pins A and B.

(e) By-pass valve, lamp across pins A and B.

(f) Bomb door seal valves, lamps across pins A and B.

(3) Connect suitable low wattage test lamps between the following points and earth:-

(a) Terminal block 171-A in panel 4P.

(b) Terminal block 171-C in panel 4P.

(c) Terminal block 900-C in panel 65P.

(d) Terminal block 901-A in panel 65P.

(4) Select the maximum time delay at the jettison time delay unit.

(5) Remove fuses 206 red, yellow and blue from panel 27P, and connect two battery test lamps to the OUT-GOING fuse pillars. One test lamp between red and yellow pillars, one test lamp between blue and yellow pillars, care being taken to ensure that the polarity of the connections to the yellow pillar are either both positive or both negative, never positive and negative.

(6) Select NORMAL at the emergency bomb doors selector switch.

Normal and automatic selection

62.

(1) With 28-volts d.c. available and all d.c. fuses fitted, the test lamp at terminal block 171-A in 4P should light. Pressing of all four bomb doors closed microswitches individually will not extinguish the light, but pressing all four simultaneously will, at the same time causing the indicator on the pilots' panel to present a black face. Release all four micro-switches. Remove the test lamp from terminal block 171-A.

(2) Select CLOSE at the normal bomb doors selector switch and the following test lamps should light:-

(a) Normal bomb doors selector valve port, pins A-C.

(b) Normal bomb doors selector valve starboard, pins A-C.

(3) Press the plungers of BOTH port and starboard forward bomb doors closed microswitches, and both test lamps at the bomb doors seals valves should light. Leave both these microswitches pressed.

(4) Select OPEN at the normal bomb doors selector switch, and the test lamps at pins A and C of the normal bomb doors selector valves should be out, whilst the test lamps across pins B and C should light. The test lamps at the bomb door seal valves should now be out.

(5) Select AUTO at the normal bomb doors selector switch, and conditions should be as for the 'CLOSE' selection in sub-para.(2) and (3). Apply a transient 28-volt positive to terminal block 191-E in 4P, and conditions should be as for the OPEN selection in sub-para.(4).

(6) Select CLOSE at the normal bomb doors selector switch, and conditions should be as in sub-para.(2) and (3).

(7) Select first CLOSED and then OPEN at the navigator plotter set operator's bomb door switch and repeat the operations in (2), (3) and (4) above.

Mod.748

63. When Mod.748 is fitted, the bomb doors indicator will be energized to show white when all four doors open additional microswitches (Chap.21) are pressed.

Emergency selection and hydraulic power pack

64.

(1) Remove fuse 522 from 4P to isolate the starboard pitot head heater.

(2) Disconnect the port pitot head heater at terminal block 1519 (Chap.13) and temporarily stow the leads.

(3) Select the pitot head switch on 7P to ON to energize relay 760. Ensure that the pitot head heaters do NOT heat up.

(4) Select OPEN at the emergency bomb doors selector switch, and the following should result:-

(a) The test lamp at the by-pass valve lights for 2 seconds and then goes out.

(b) All lights go out at the normal bomb doors selector valves.

(c) Lights out at the bomb doors seal valves.

(d) The test lamp lights at the emergency bomb doors selector valve, pins B and C.

(e) The battery test lamps light at fuses 206.

(5) Select NORMAL at the emergency bomb doors selector switch, and OPEN at the normal bomb doors selector switch, and conditions should be as in para.61, sub-para. (4).

(6) Select CLOSE at the emergency bomb doors selector switch, and the following should result:-

(a) The test lamp at the by-pass valve lights for 2 seconds and then goes out.

(b) All lights go out at the normal bomb doors selector valves.

(c) The test lamps light at the bomb doors seal valves.

(d) The test lamp lights at the emergency bomb doors valve, pins A-C.

(e) The battery test lamps light at fuses 206.

(7) Select NORMAL at the emergency bomb doors selector switch and conditions should be as in para. 61, sub-para.(4).

(8) Select START at the pilots' hydraulic power pack switch, and the following should result:-

(a) The test lamp at the by-pass valve lights for 2 seconds and then goes out.

(b) The test lamp lights at the accumulator shut-off valve.

(c) All lights go out at the normal bomb doors selector valves.

(d) The battery test lamps light at fuses 206.

(9) Select OPEN and then CLOSE at the emergency bomb doors selector switch and ensure that the lights are out at the emergency bomb doors valve. Place the emergency bomb doors selector switch to NORMAL.

(10) Apply a transient short-circuit to pins A-C of the hydraulic pressure switch socket, and the following should result:-

(a) The test lamp goes out at the accumulator shut-off valve.

(b) The battery test lamps at fuses 206 go out.

(c) The test lamps light at pins A-B of the normal bomb doors selector valves.

(11) Select START at the pilots' hydraulic power pack switch, and conditions should obtain as contained in sub-para.(5). Select STOP at the same switch, and conditions should obtain as contained in sub-para.(7).

(12) Select START at the nose wheel bay hydraulic power pack switch, and conditions should obtain as contained in sub-para.(5). Select STOP at the same switch, and conditions should obtain as contained in sub-para.(7).

Emergency bomb jettison

65.

(1) Select CLOSE at the normal bomb doors selector switch, and the following test lamps should light:-

(a) Normal bomb door selector valve port, pins A-C.

(b) Normal bomb door selector valve starboard, pins A-C.

(c) Bomb door seal valves.

(2) Select JETTISON at the emergency bomb jettison switch, and the following events should occur:-

(a) The test lamps at pins A-C of the normal bomb doors selector valves go out, whilst the test lamps across pins B-C light.

(b) The test lamps at the bomb door seal valves go out.

(c) The test lamp lights at terminal block 900-C in 65P.

(3) Press all four bomb doors open microswitches, and lights should be obtained at the test lamp at terminal block 171-C in 4P, and the test lamp at terminal block 901-A in 65P. Leave all four micro-switches pressed.

(4) After the time has expired as set at the jettison time delay unit, the following events should occur:-

(a) The test lamps at pins B-C of the normal bomb doors selector valves go out, whilst the test lamps across pins A-C light.

(b) The test lamps light at the bomb door seal valves.

(c) The test lamps at terminal blocks 900-C and 901-A in 65P go out.

(5) Select JETTISON at the emergency bomb jettison switch, and the following events should occur:-

(a) The test lamps at pins A-C of the normal bomb doors selector valves go out, whilst the test lamps across pins B-C light.

(b) The test lamps at the bomb door seal valves go out.

(c) The test lamps light at terminal blocks 900-C and 901-A in 65P.

Ascertain that the individual release of each one of the bomb doors open microswitches, whilst the other three are pressed, cancels the lights at terminal blocks 171-C, and 901-A. Due to the action of the time delay unit, the selection to JETTISON may have to be repeated to gain time for carrying out the foregoing. Leave all four switches pressed.

(6) Select JETTISON at the emergency bomb jettison switch, and conditions should obtain as contained in sub-para.(5) (a), (b) and (c). Select OVERRIDE at the same switch, and conditions should obtain as contained in sub-para.(4).

66. By means of a suitable medium-range resistance meter, ascertain that terminal block 279-D in 3P and terminal block 894-B in 65P are at earth potential. A small resistance reading may be obtained because of the length of cable between these T.B.'s and their earth point.

67. On completion of test disconnect supplies and remove all test lamps. Reconnect all sockets and T.B.'s to equipment, and replace all fuses removed in preparation. Return all switches to their off or normal position.

68. In co-operation with the airframe tradesman, by use of the hydraulic ground servicing trolley or by means of the emergency hydraulic power pack, operate the bomb doors to either the fully open or the fully closed position as appropriate to aircraft servicing stages.

REMOVAL AND INSTALLATION

Precautions

69. Removal and assembly of the various items of equipment used in this installation is described in the following paragraphs. Important points to be borne in mind are:-

(1) Prior to the removal of any electrical equipment, ensure that the relevant supplies are isolated from the system.

(2) Always insulate and stow any disconnected cables.

(3) Before re-connecting cables to equipment, check with the

appropriate routing chart for correct terminal numbers and cable references.

(4) When it is necessary to remove any of the electro-hydraulic valve units, the task should be undertaken in conjunction with the airframe tradesman.

Manual controls

70. The removable panel at 6P, bearing all the control switches except the nose wheel bay hydraulic power pack switch, can be easily removed for bay servicing by disconnecting the socket from the rear of the panel and removing the four 4BA retaining bolts. The nose wheel bay hydraulic power pack switch is reasonably accessible.

By-pass valve time delay unit

71. No difficulty should be experienced in the removal and assembly of this unit.

Bomb jettison time delay unit

72. No difficulty should be experienced in the removal or assembly of this unit, but the following should be noted. It is easier to detach the unit from the aircraft structure before disconnecting the wiring, and inversely it is easier to connect the wiring to the unit prior to assembly to the aircraft.

Magnetic indicator

73. No difficulty should be experienced in the removal and assembly of the indicator. The pilots' centre instrument panel is secured at each side to the pilots' flight instrument panels. Access to the rear of the panel is gained by unscrewing the two retaining studs and allowing the panel to hinge towards the throttle box, care being taken that the throttle handles do not impinge on any instrument glasses.

Microswitches

74. No removal instructions are required for the microswitches employed in this installation. Most of the switches accessible. On renewal or assembly care must be taken to replace any cable securing clips mounted on the microswitch retaining bolts, and sufficient attention paid to cable lengths to obviate chafing and pulling, when the bomb doors are operated. Details for connecting a new microswitch are given in para.74. For microswitch settings, reference should be made to Sect.3, Chap.1.

Connecting a microswitch

75. Remove the synthetic rubber grommet, nip the extreme tips of a sufficient number of sleeves and feed the cables through, causing the sleeves to invert. Pull the conductors back to re-invert the sleeves. Slacken off the central screw and push the cable ferrules fully home into the requisite sockets. Fit cable ferrules Ref.No. 5H/24 or 5H/25 into the vacant sockets, and finally tighten the central screw to lock all the connections.

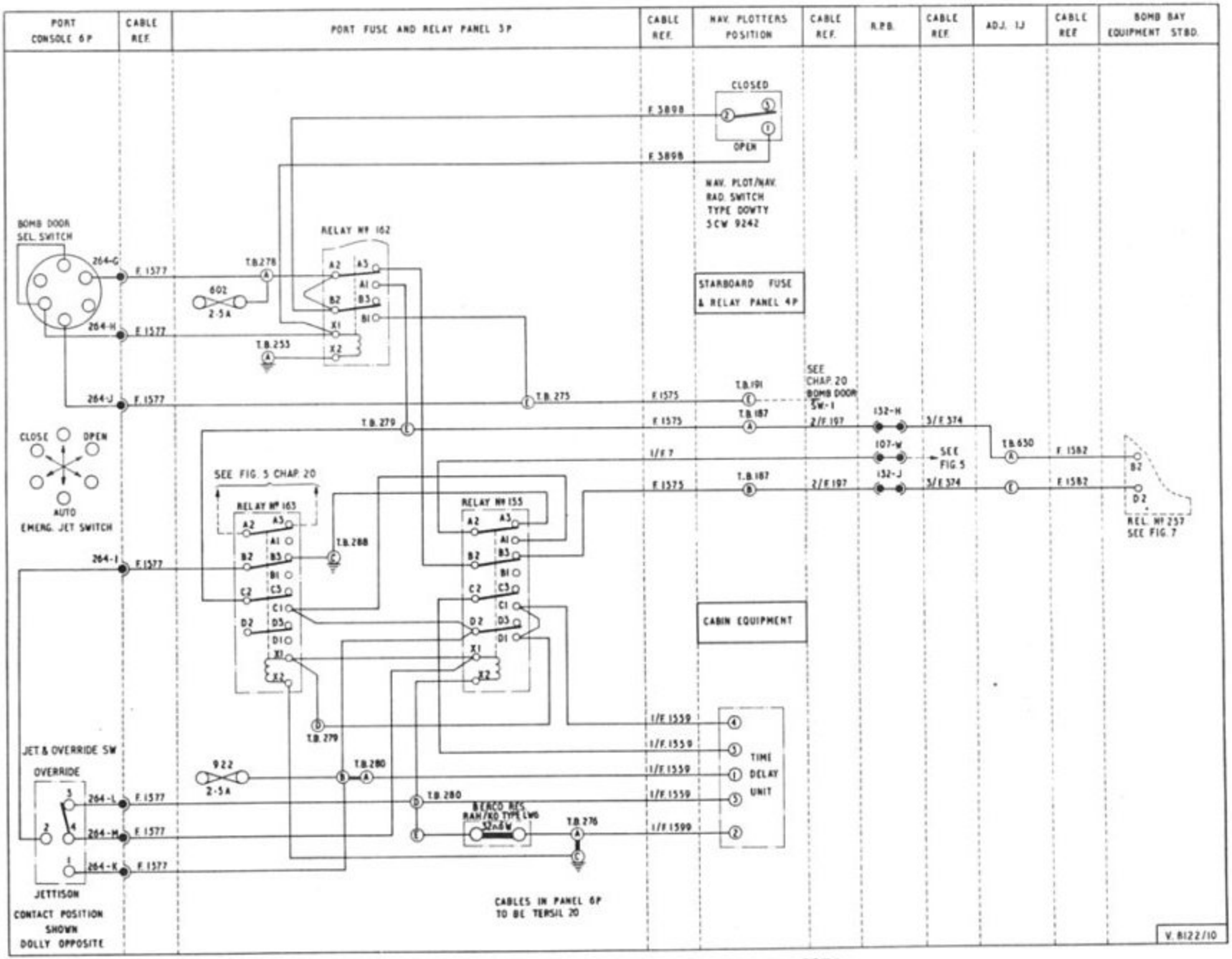


Fig.4 Normal bomb doors selection - Pre Mod. 1074

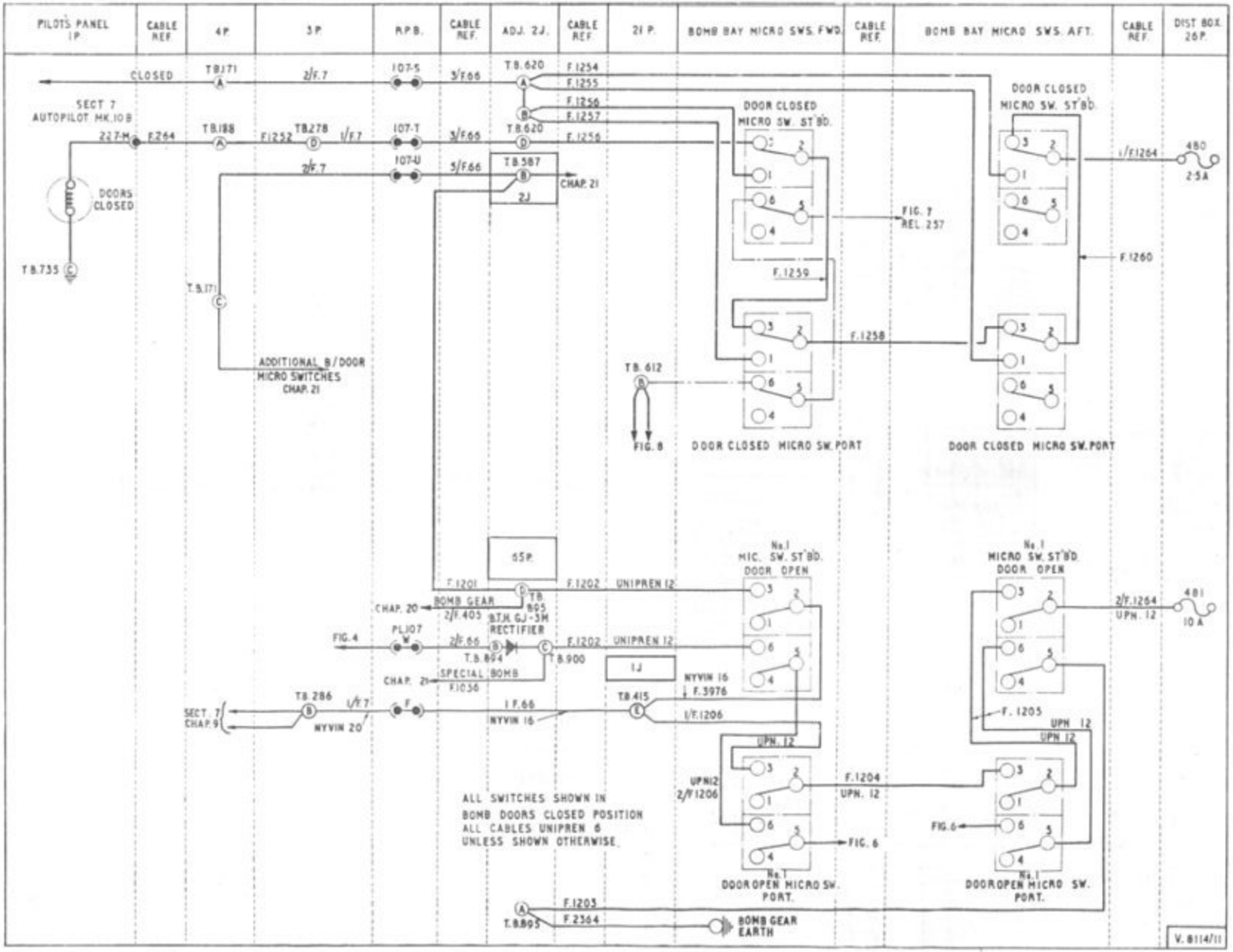
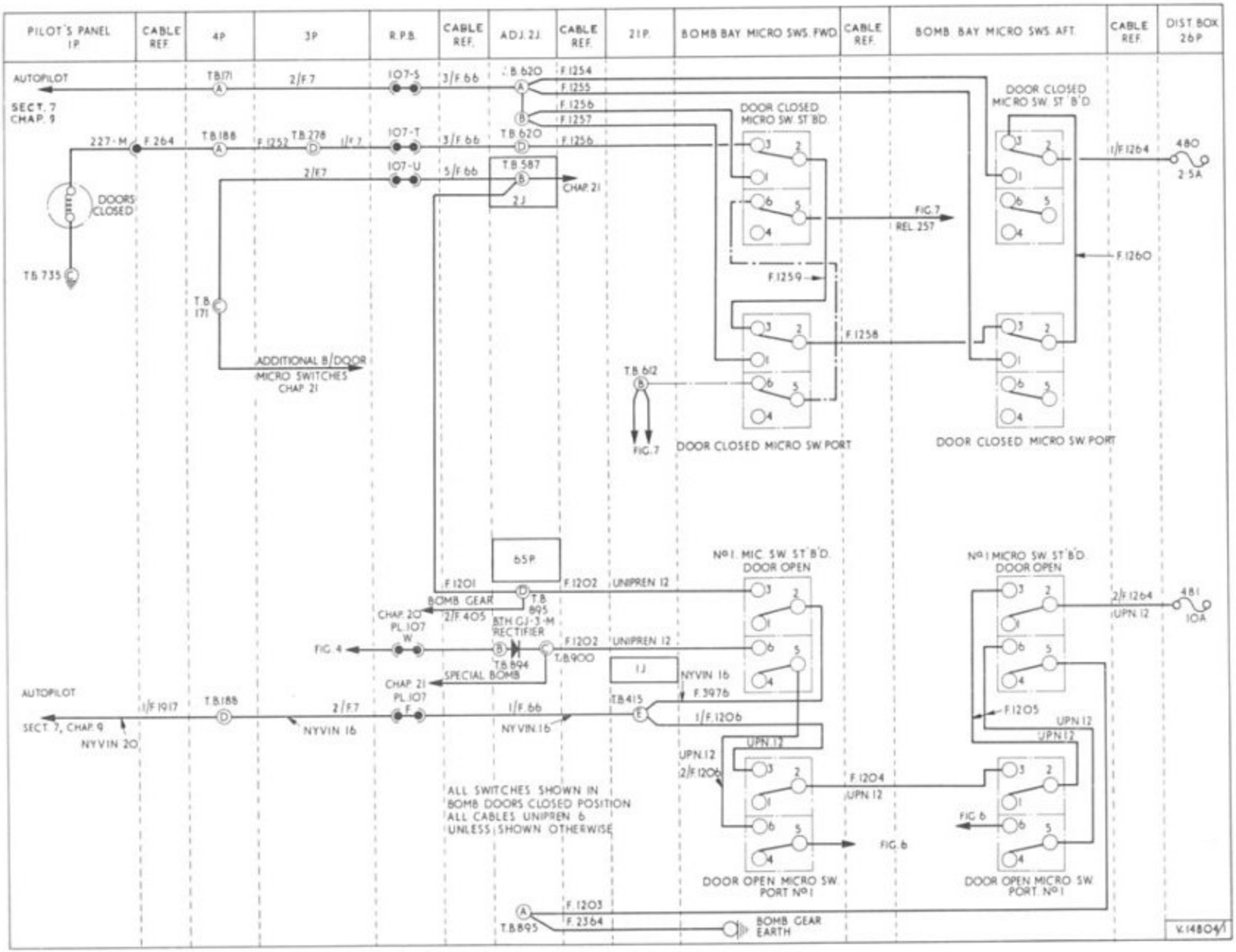


Fig. 5 Bomb doors indicator pre Mod. 748 post Mod. 1204 and 2082

«Minor corrections»



940054 570 3.74 H.S.A.1354

Fig. 5A Bomb doors indicator – pre Mod. 748 and 1204, post Mod. 2082

◂ Minor alterations ▸

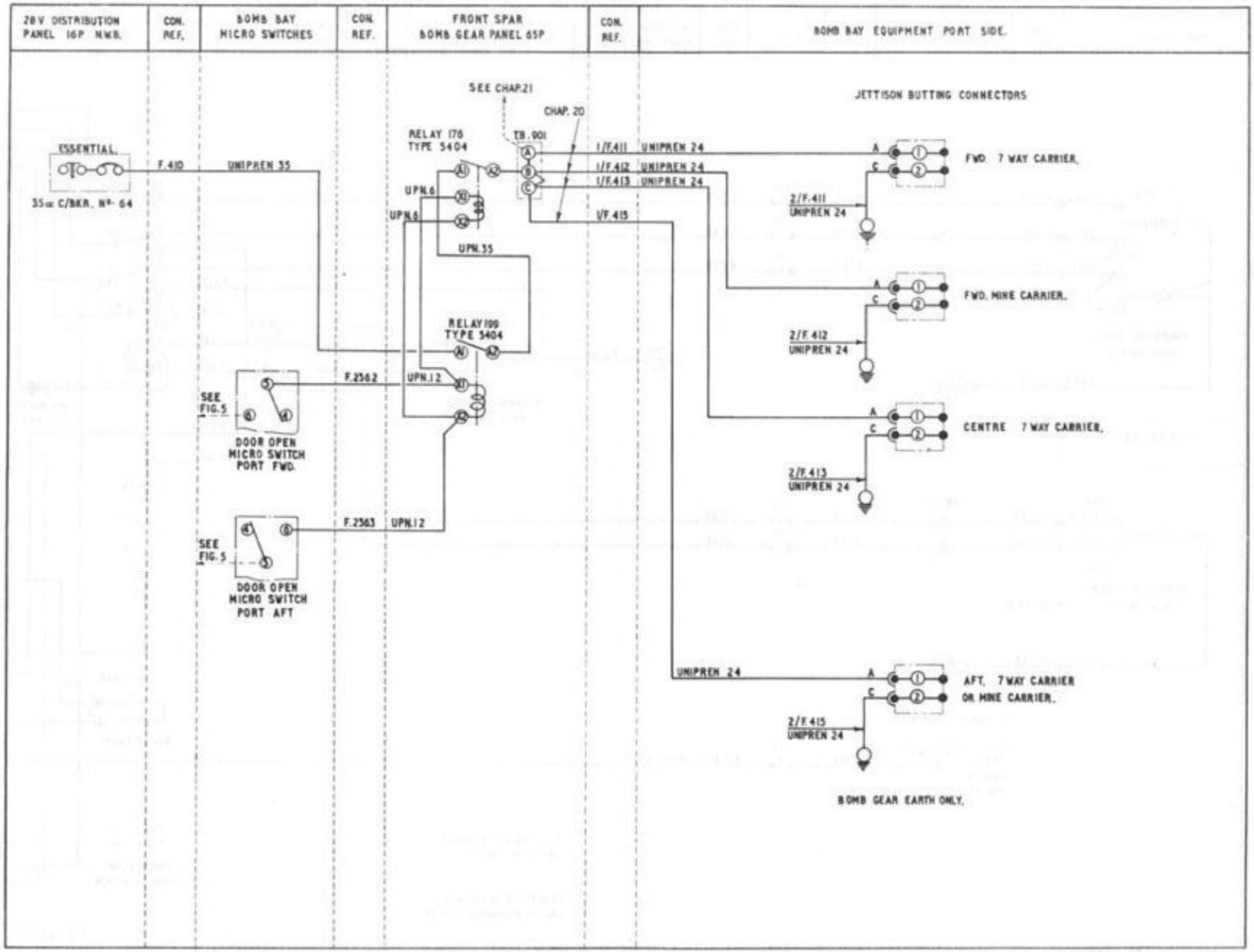


Fig.6 Bomb jettison connectors - Pre Mod.748

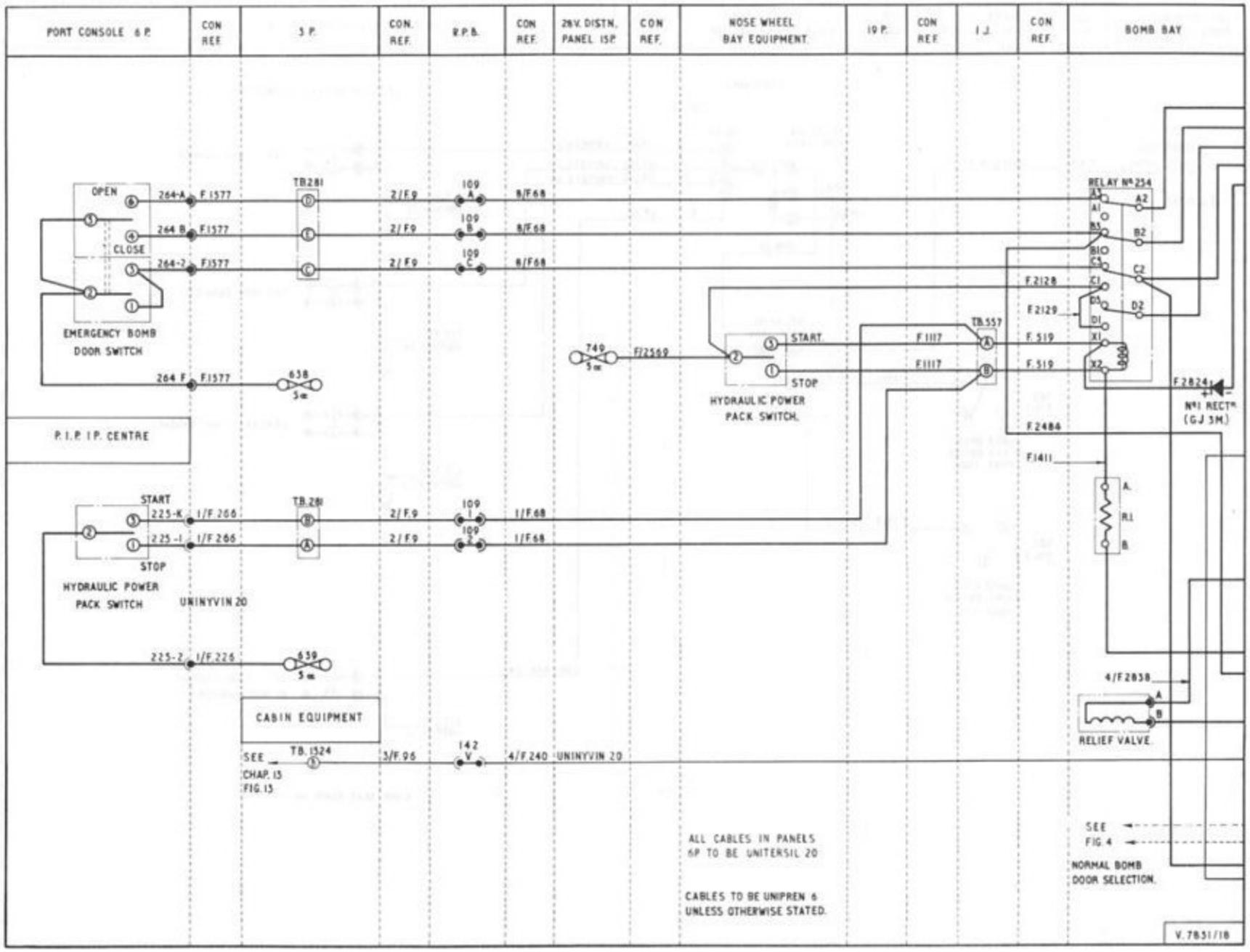


Fig.7(1) Hydraulic power pack and emergency bomb doors selection - Pre Mod.1074

◀ *(T.B.1524 identified)* ▶

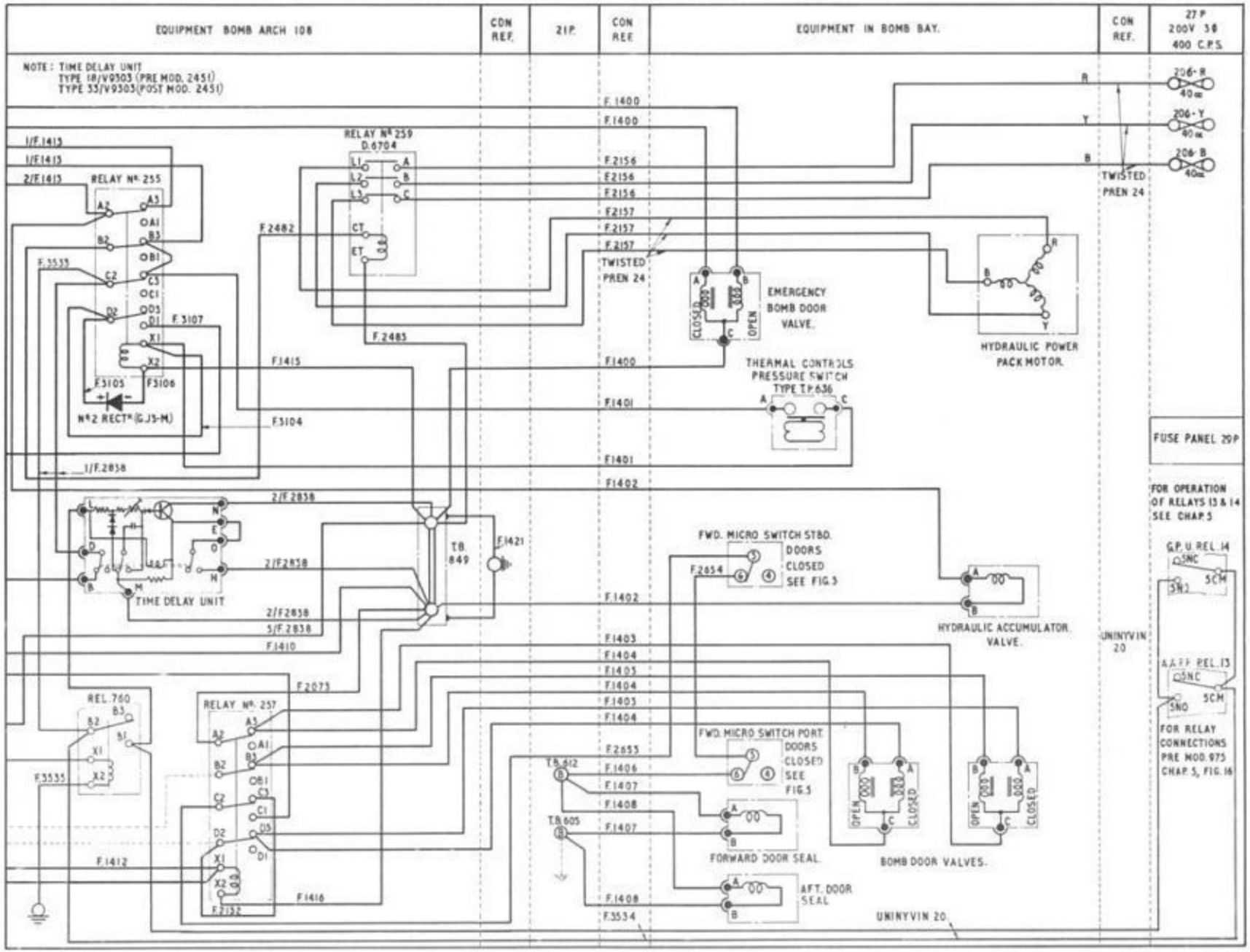


Fig 7 (2) Hydraulic power pack and emergency bomb doors selection - Pre Mod. 1074
► Mod. 2451 ◄

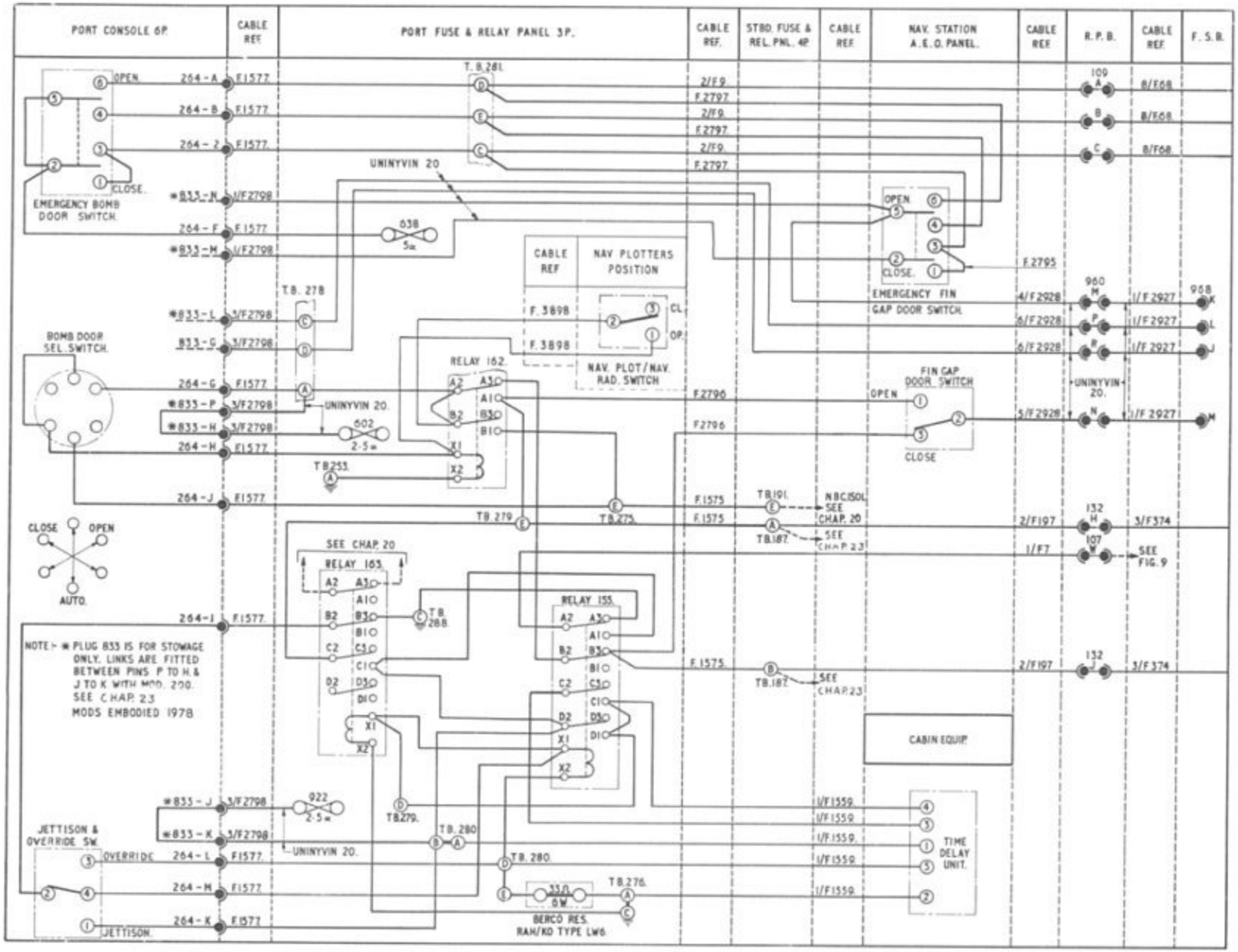


Fig.8(1) Normal and emergency bomb doors selection — post Mod 1074

► *Mod. 1978* ◄

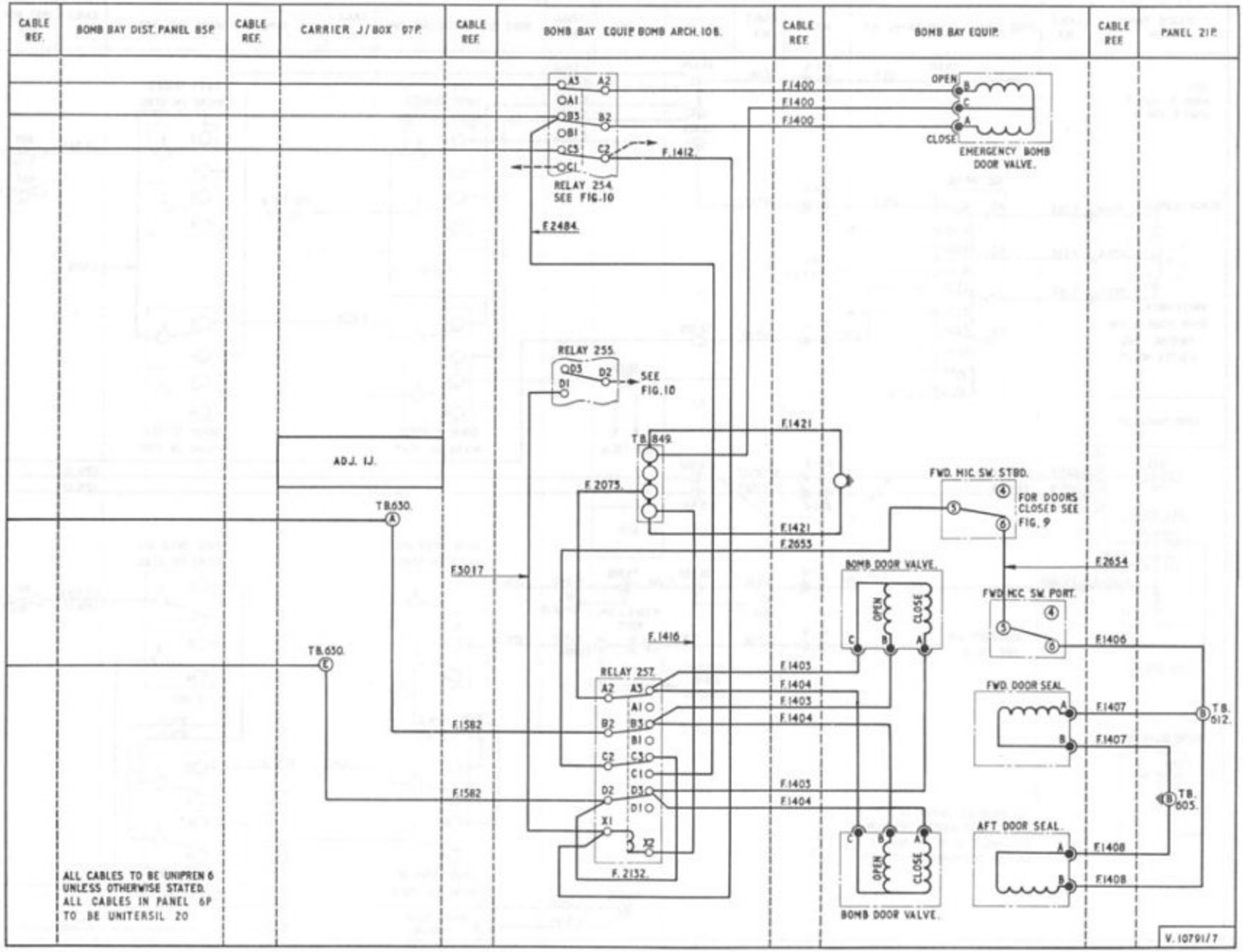


Fig.8(2) Normal and emergency bomb doors selection - Post Mod.1074

◀ *(T.B.630(B) now (E))* ▶

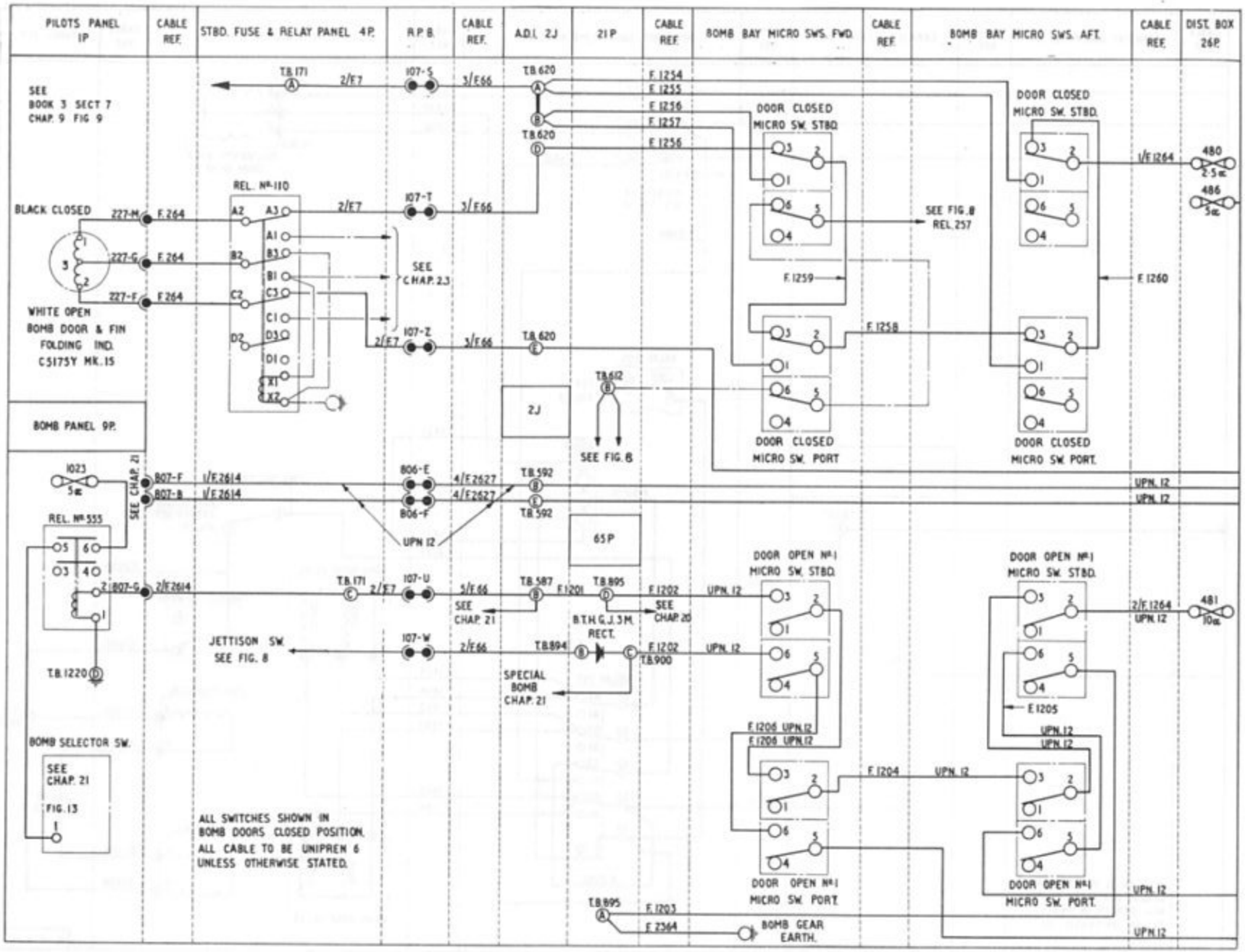


Fig.9(1) Bomb doors indicator and jettison connectors - Post Mod.748

(Mod.2082 incorporated)

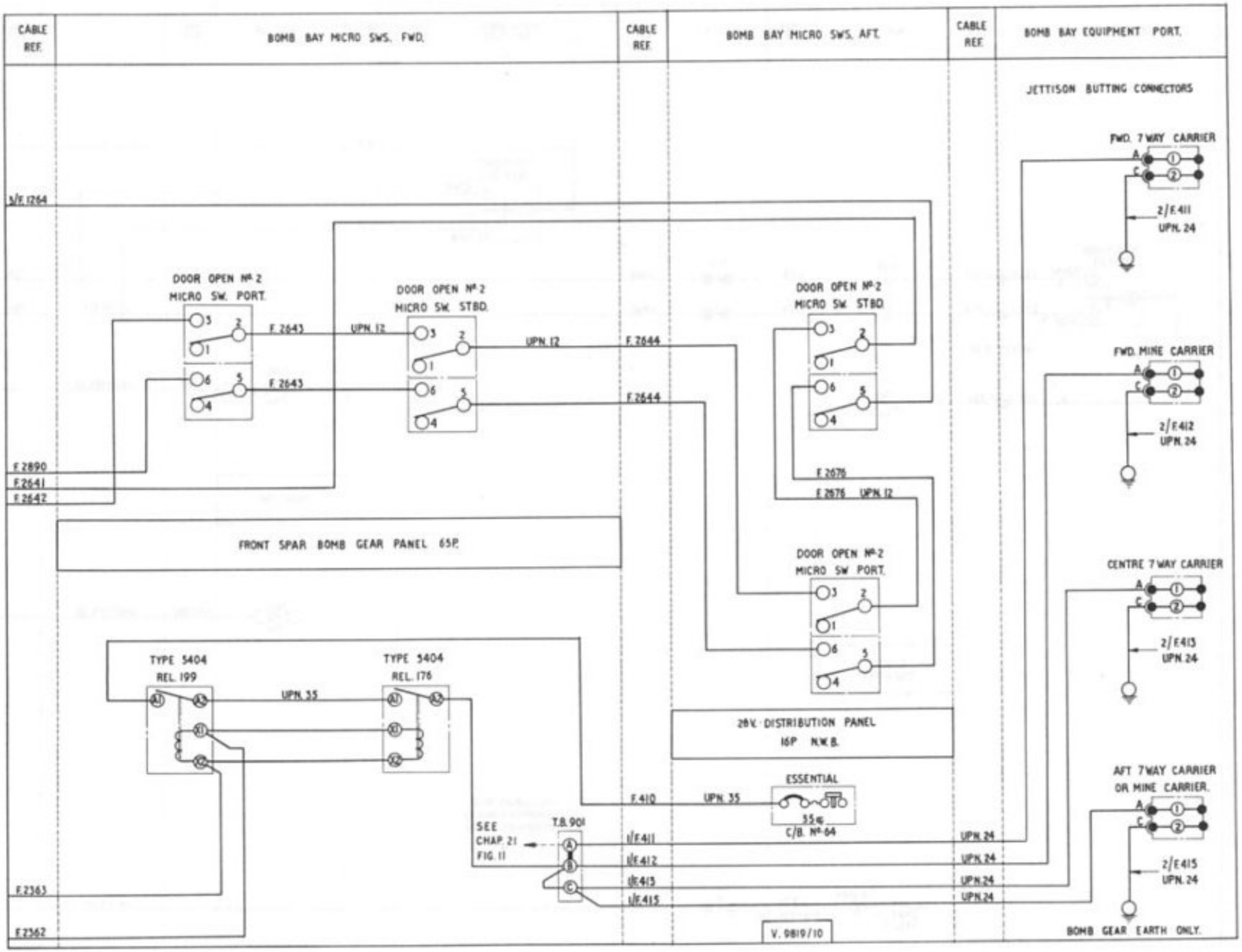


Fig.9(2) Bomb doors indicator and jettison connectors - Post Mod.748

◀ *(Cross reference at T.B.901 added)* ▶

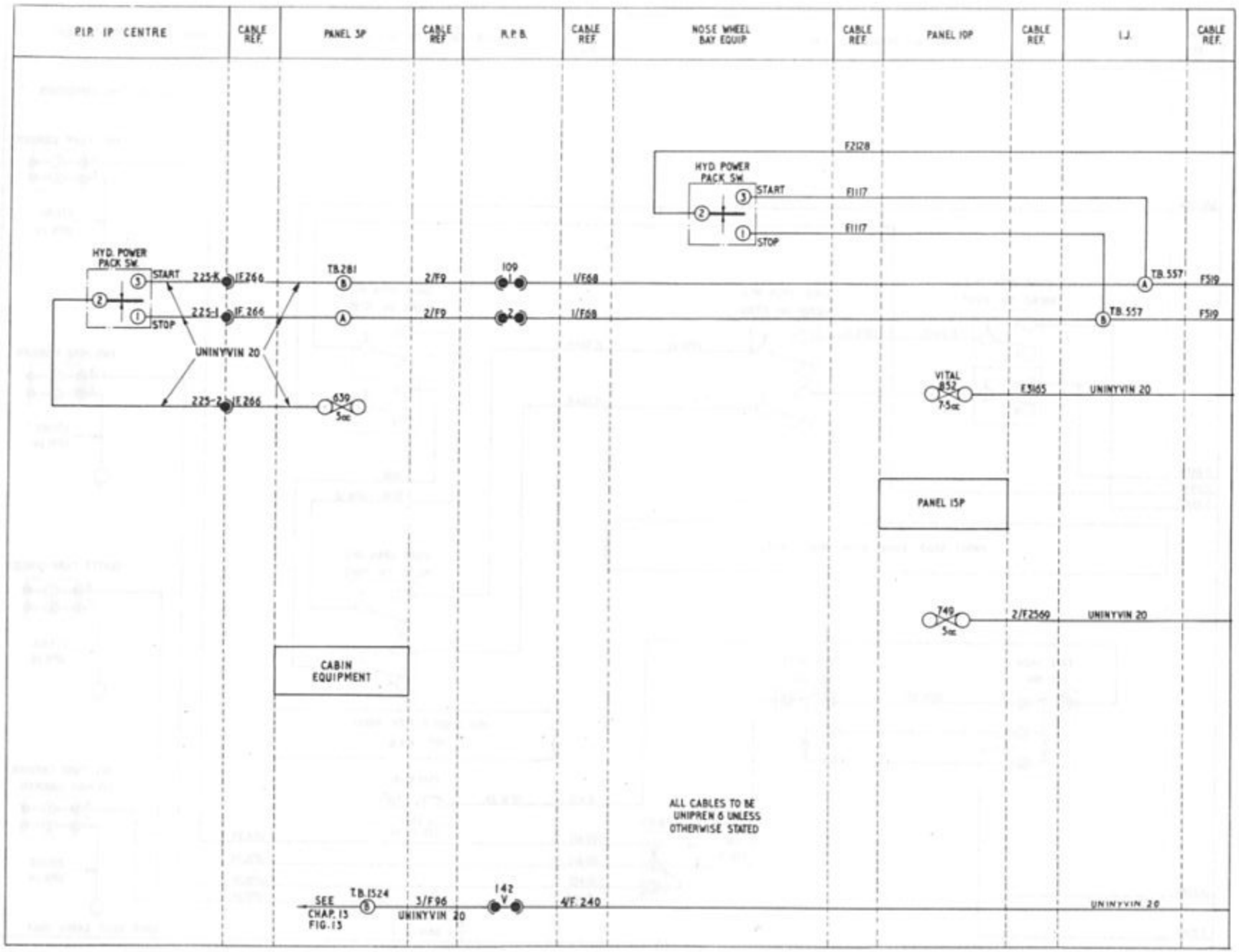


Fig.10(1) Hydraulic power pack - Post Mod.1074

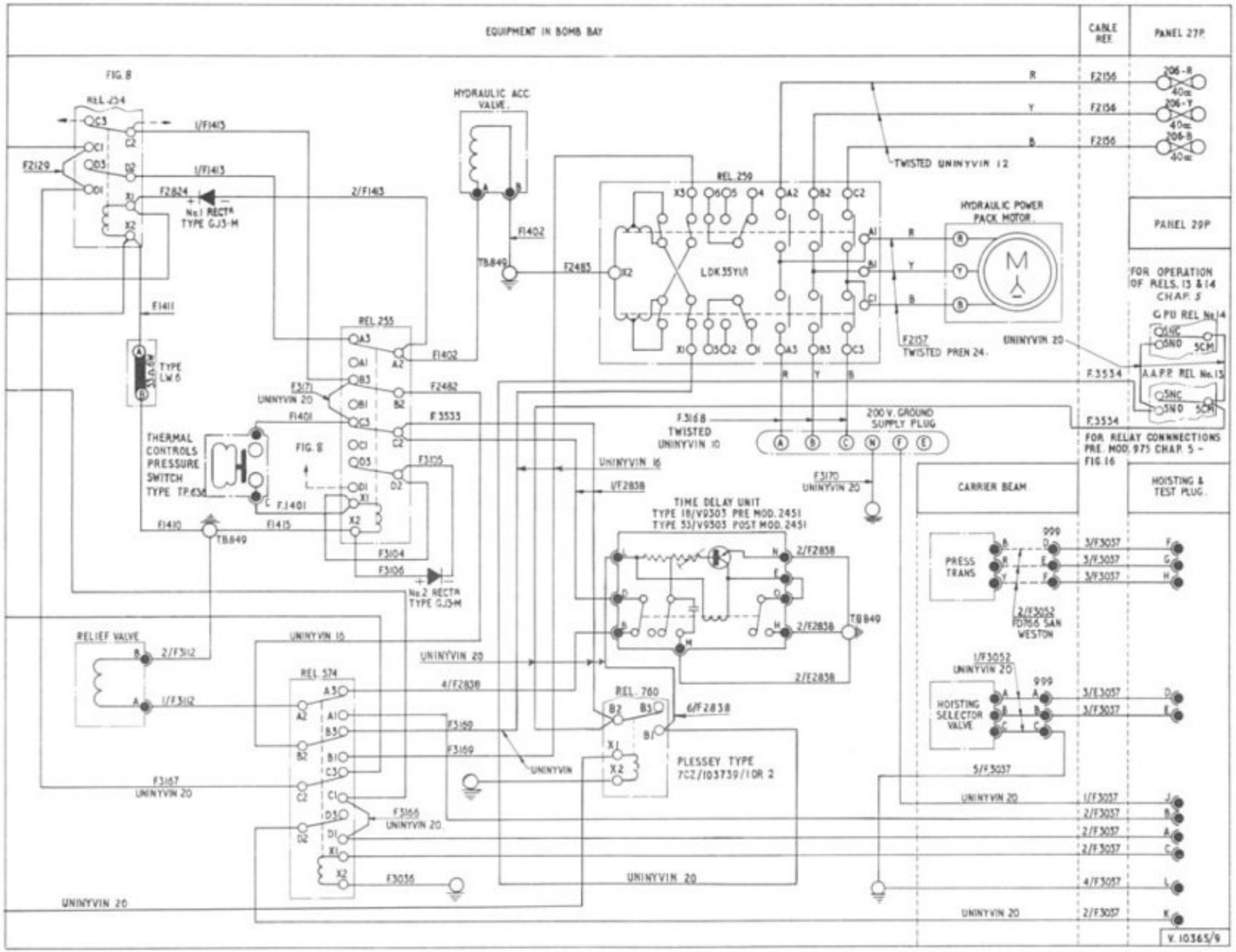


Fig. 10 (2) Hydraulic power pack - Post. Mod. 1074

► Mod. 2451 ◄

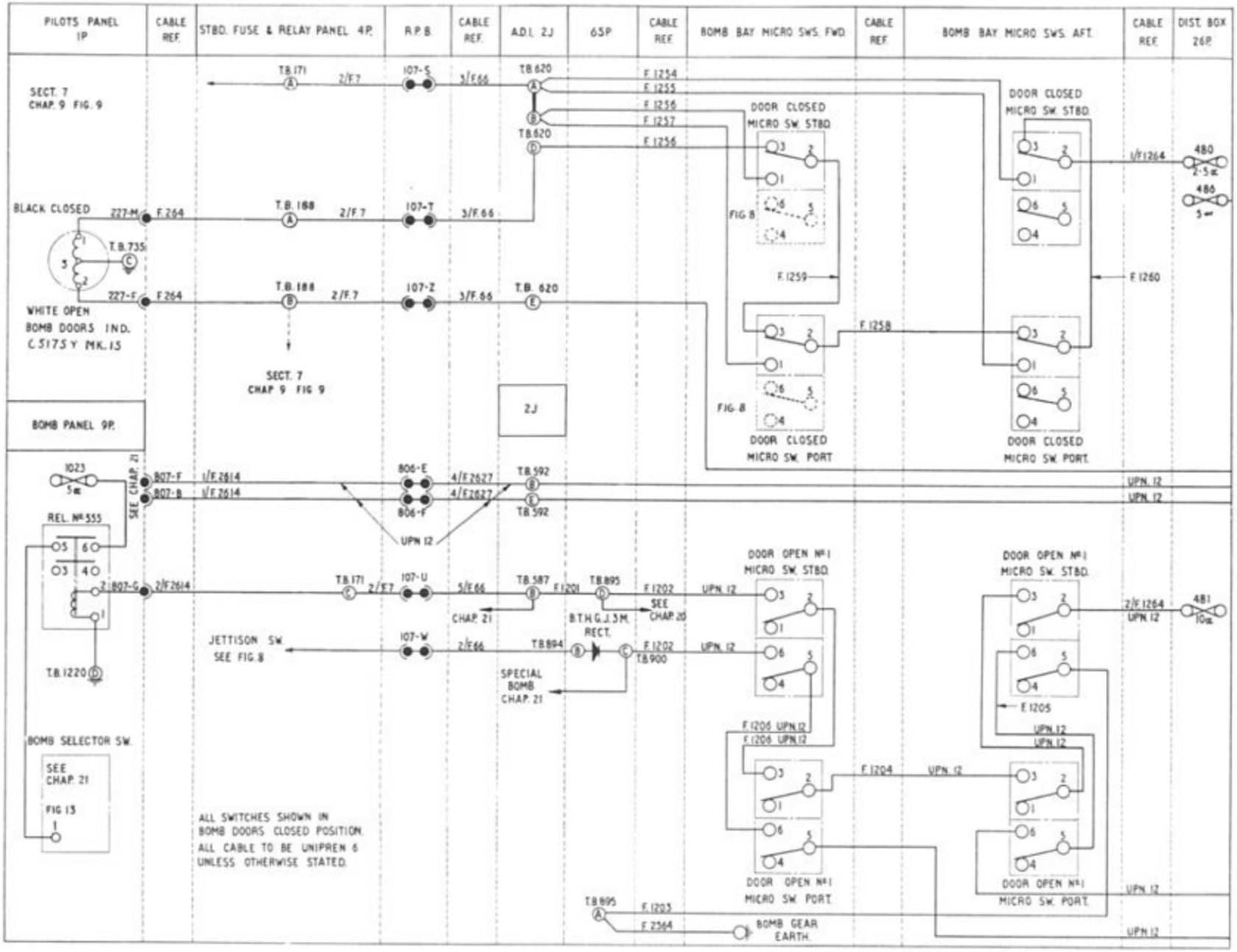


Fig. 11 (1) Bomb doors indicator and jettison connectors — post Mod. 1173. and 2082

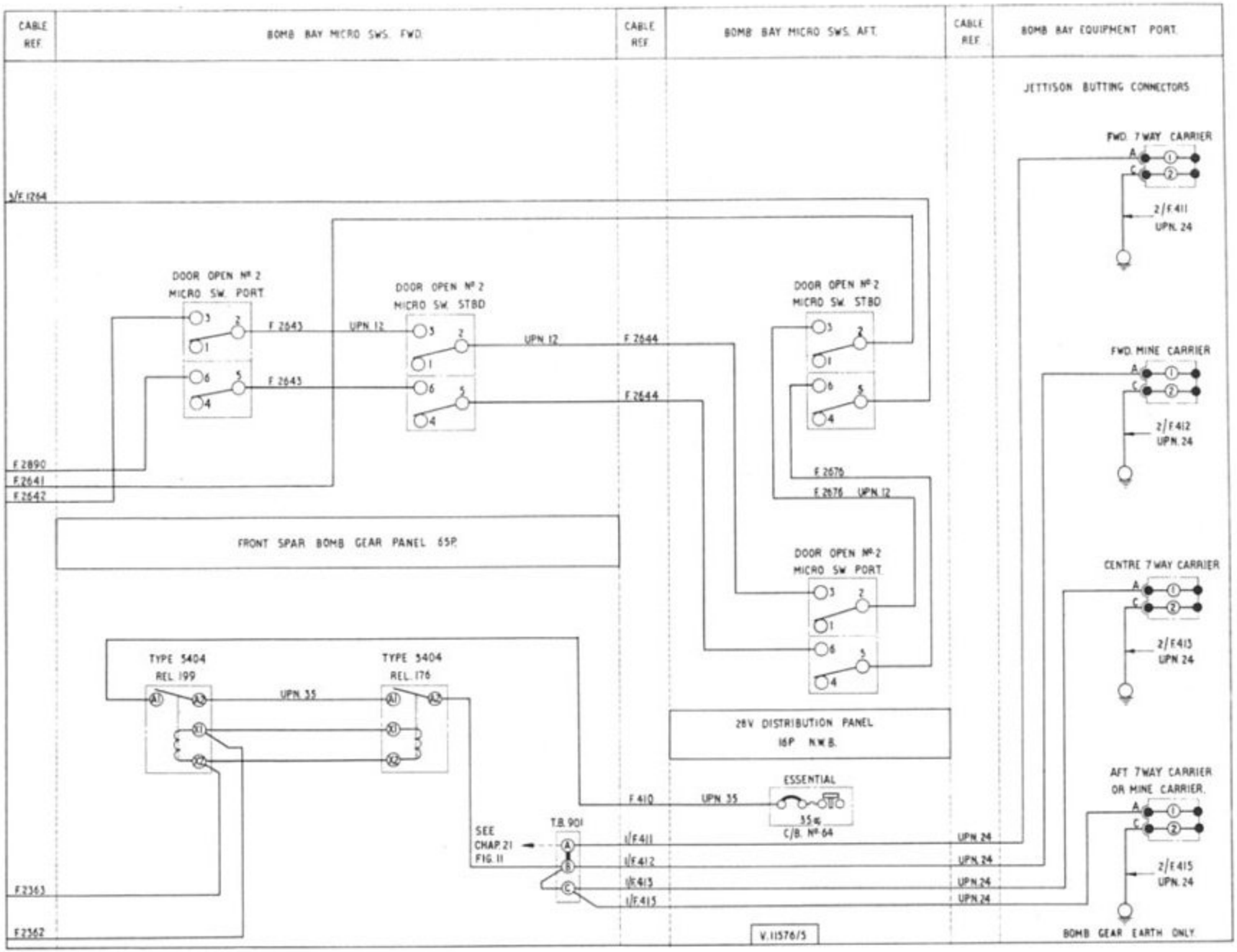


Fig.11(2) Bomb doors indicator and jettison connectors - Post Mod.1173

(cross reference at T.B.901 added)