Chapter 22

E.C.M. POWER SUPPLIES AND COOLING

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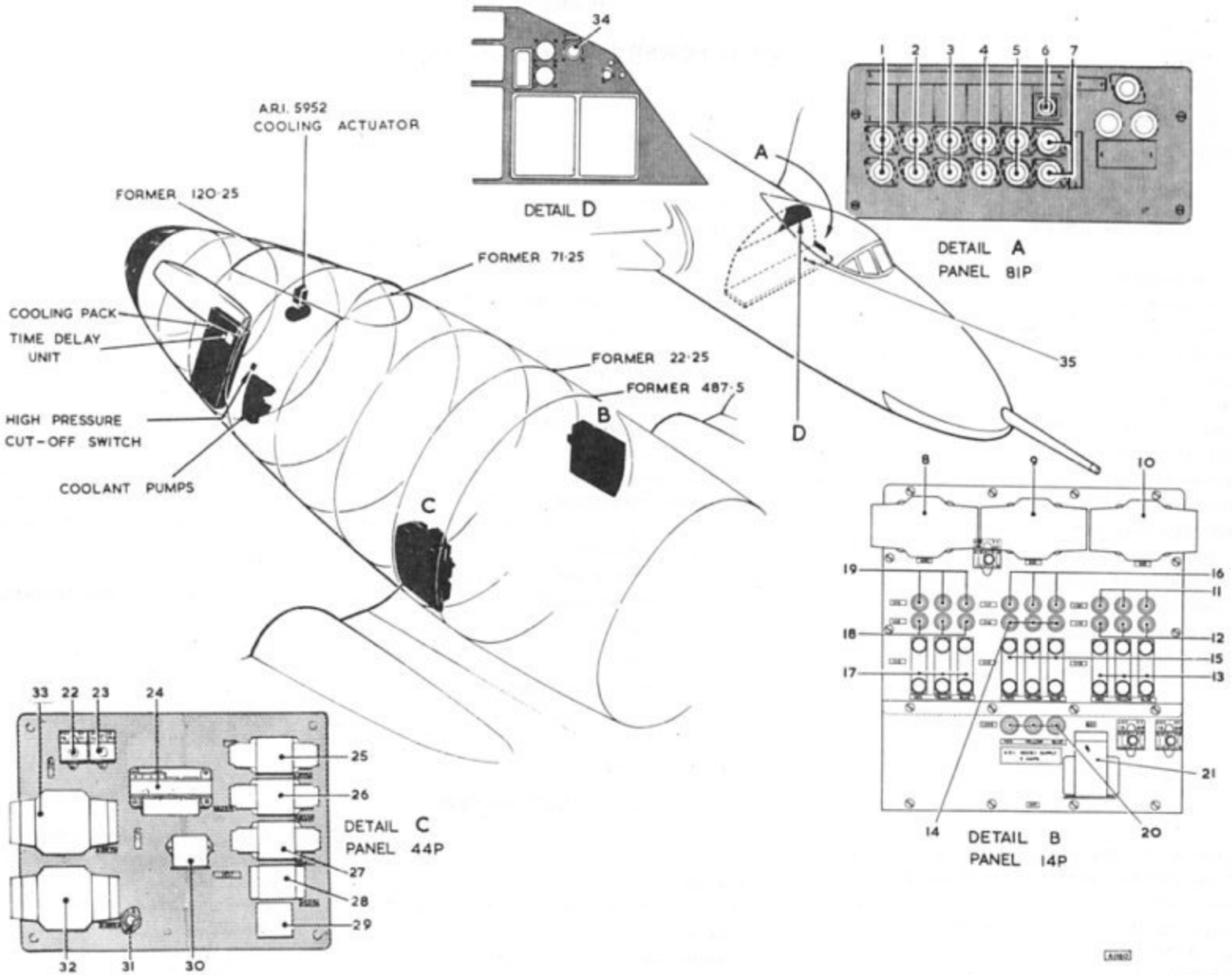

Fig. 1 Location of equipment

► *Mod. 2496* ◄

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Introduction

1. This chapter contains details of the power supplies to the equipment and cooling systems fitted in the E.C.M. compartment and the equipment fitted in the rudder powered flying control (P.F.C.) bay. Control of the cooling air to the A.R.I.5952 scanner is also described.

2. Location of the controls and equipment together with theoretical circuit diagrams are included. A fuse distribution Table and routing charts will be found at the end of the chapter. The following modifications are incorporated:-

Mod.1071 - Introduction of test switch for de-icing heater element in Freon condenser air intakes.

Mod.1451 - Introduction of water/glycol temperature gauge, Ref. No. 6A/3682.

Mod.1481 - Introduction of motor compressor, Type ACM 8/200, Mk.3 in lieu of ACM 8/200 Mk.2.

Mod.1617 - Introduction of motor overload protection unit B.Ae., Pt. No. 62V/11313.

Mod.2017 - Introduction of A.R.I.5952 in lieu of A.R.I.5919.

Mod.2024 - Introduction of A.R.I.18146

Mod.2125 - Introduction of motor overload protection unit B.Ae Pt. No 68V/11313 in lieu of B.Ae. Pt. No. 62V/11313.

Mod.2304 - Introduction of A.R.I.18228/1 in lieu of A.R.I.18105.

Mod.2431 - Introduction of motor overload protection unit B.Ae. Pt. No. V18555-68 as an alternative to B.Ae. Pt. No. 68/V11313.

Mod.2496 - Introduces A R.I.18235 (SRIM 3965).

Mod.2501 - Introduction of ballast 10ZZ/ 470411 in lieu of A.R.I.18075 (SEM/VUL/038).

KEY TO FIG.1

Location of equipment

1. A.R.I.5952, ON AND OFF PUSH-SWITCHES
2. A.R.I.18076 (No.1) AND A.R.I.18074 (PRE MOD.2024) OR A.R.I.18076 No.1 AND A.R.I.18146 (POST MOD.2024)
3. A.R.I.18076 (No.2) ON AND OFF PUSH-SWITCHES
4. ARI.18076 (No.3) ON AND OFF PUSH-SWITCHES
5. A.R.I.18228/1 AND A.R.I.18235 ON AND OFF PUSH-SWITCHES.
6. MAGNETIC INDICATOR, OFF-LOW-ON
7. COOLING SYSTEM ON AND OFF PUSH-SWITCHES
8. CONTACTOR No.620
9. CONTACTOR No.621
10. CONTACTOR No.622
11. END ON FUSES 1120 R, Y, B
12. END ON FUSES 1119 R, Y, B
13. FUSES 1118 R, Y, B
14. END ON FUSES 1116 R, Y, B
15. FUSES 1115 R, Y, B
16. END ON FUSES 1117 R, Y, B
17. FUSES 1112 R, Y, B
18. END ON FUSES 1113 R, Y, B
19. END ON FUSES 1114 R, Y, B
20. END ON FUSES 1399 R, Y, B
21. RELAY No.831
22. T.B.1321
23. T.B.1323
24. MOTOR OVERLOAD PROTECTION UNIT
25. CONTACTOR No.623
26. CONTACTOR No.624
27. CONTACTOR No.625
28. RELAY No.626
29. RELAY No.635
30. RELAY No.710
31. DE-ICING TEST SWITCH
32. CONTACTOR No.630
33. CONTACTOR No.627
34. COOLANT TEMPERATURE GAUGE
35. RELAY No.844

DESCRIPTION AND OPERATION

E.C.M. EQUIPMENT

Power supplies

3. Power supplies to the following E.C.M. equipment are covered in this chapter:-

A.R.I.5952
A.R.I.18074 (pre Mod.2024)
A.R.I.18076
A.R.I.18146 (post Mod.2024)
A.R.I.18288/1
A.R.I.18235

4. The 200-volt 3-phase 400 Hz a.c. supplies for the equipment are fed from fuses in panels 58P, 59P, 60P and 61P whilst the 28-volt d.c. supplies are fed via fuses in panels 26P and 48P. Intermediate fuses are located in panel 14P. Provision is made to isolate the equipment in the event of failure of the power supplies.

Supply switching

5. The switching of the supplies are controlled by a series of ON and OFF pushswitches (Ten in number) arranged in pairs on panel 81P at the A.E.O.'s station (fig.1). Each pair of switches are identified according to the A.R.I. equipment.

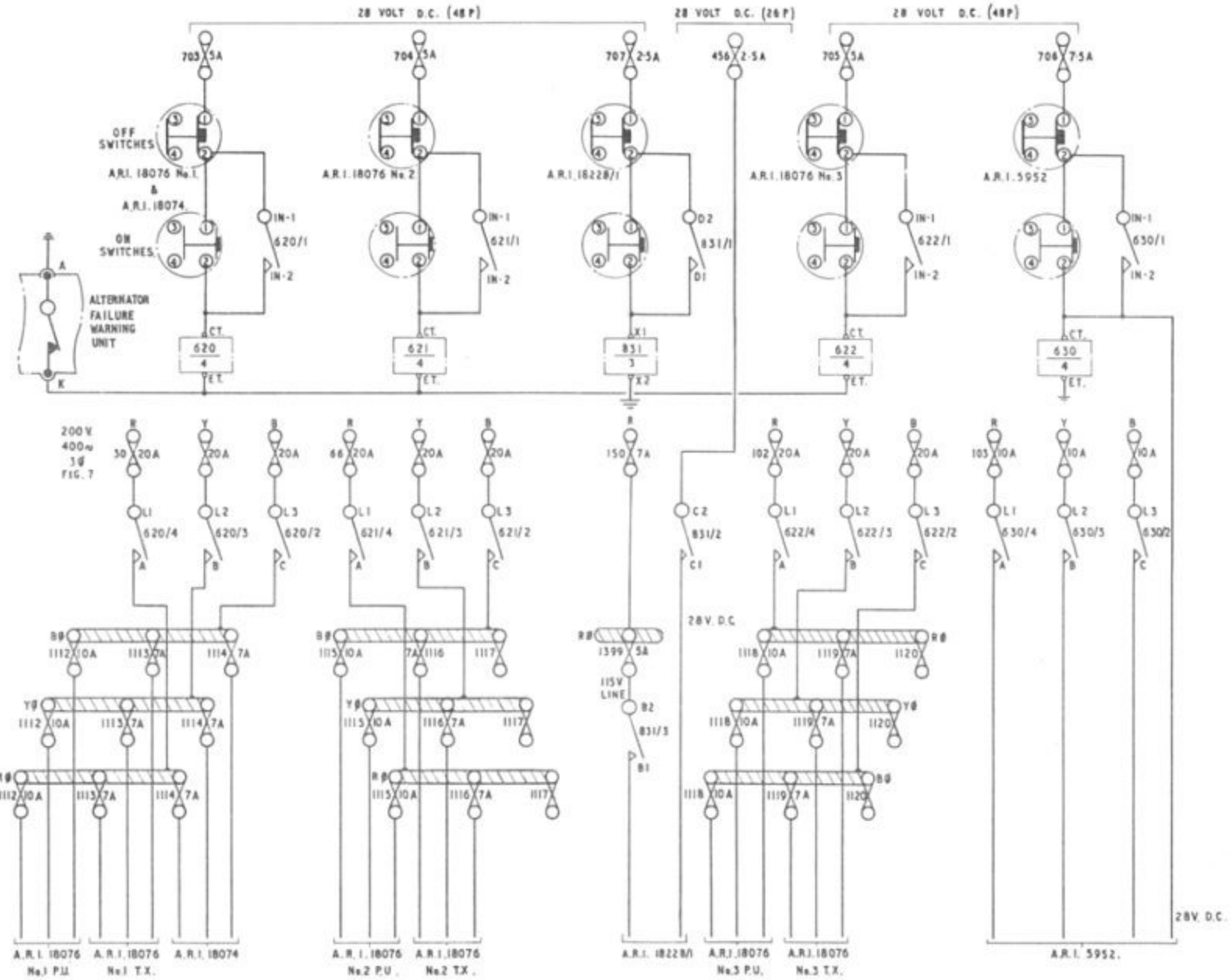


Fig. 2 Power distribution circuit, pre Mod 2024, and 2496

▶ *Mod 2501* ◀

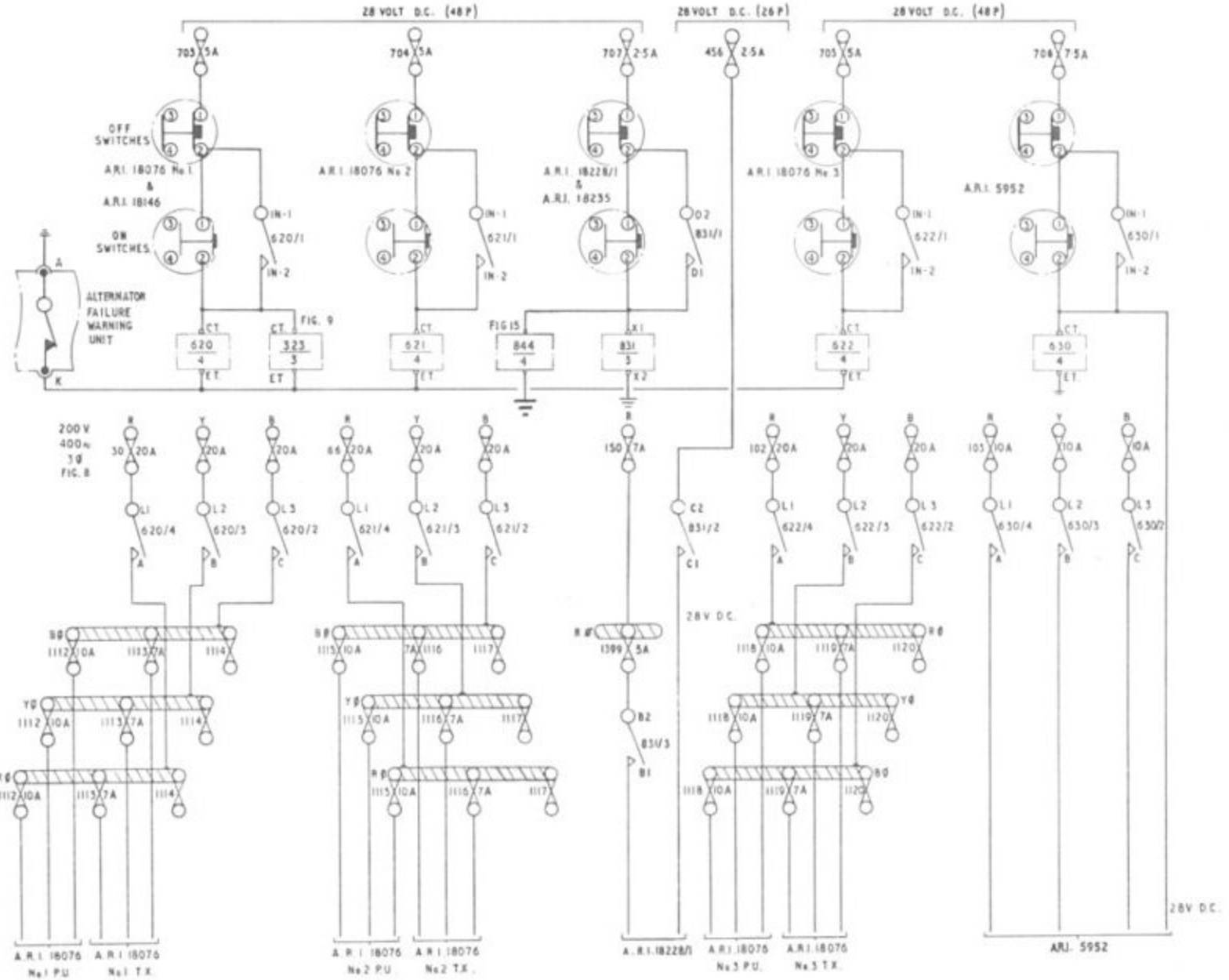


Fig. 3 Power distribution circuit, post Mod 2024 and 2496 ▶Mod 2501◀

Circuit operation

6. Only the switching of the supplies to A.R.I.18074 (Pre Mod 2024) or A.R.I. 18146 (Post Mod 2024) and A.R.I. 18076 will be described. The remaining circuits are similar in control.

A.R.I.'s 18076 and 18074 - Pre Mod 2024

7. Reference to fig.2 will show that when the appropriate ON push-switch is pressed, a 28-volt d.c. supply from fuse 703 is fed via the normally closed OFF push-switch (contacts 1-2) the now closed ON push-switch (contacts 1-2) to energize contactor 620. Contacts 620/1 close providing a hold-on circuit for contactor 620, and contacts 620/2, 3 and 4 close connecting the 200-volt 3 phase a.c. supply from fuses 30 R, Y, B, to fuses 1112, 1113 and 1114 R, Y and B in panel 14P. The supplies are fed to the A.R.I. 18076 equipment via fuses 1112 and 1113 R, Y and B and to the A.R.I. 18074 equipment via fuses 1114 R, Y and B.

A.R.I. 18146 and 18074 - Post Mod 2024

8. Reference to fig.3 will show that when the appropriate ON push-switch is pressed a 28-volt d.c. supply from fuse 703 is fed via the normally closed OFF push-switch (contacts 1-2), the now closed ON push-switch (contacts 1-2) to energize contactor 620 and 323. Contacts 620/1 close to provide a hold-on supply for contactors 620 and 323. Contacts 620/2, 3 and 4 close, connecting the 200-volt, 3 phase a.c. supply from fuses 30 R, Y and B to the A.R.I. 18076 equipment via fuses 1112 and 1113 R, Y and B. Contacts 323/1, 2 and 3 close (fig.9) connecting a 200-volt, 3 phase a.c. supply from fuses 117 R, Y and B in panel 60P to the A.R.I. 18146 equipment, via fuses 1387 to 1391 R, Y and B in panel 109P.

COOLING SYSTEM

9. The cooling system is designed to control the temperature at which the E.C.M. units operate, under all aircraft operating conditions. A full description of the mechanical aspects of the system is given in Sect.3, Chap.16.

10. The cooling system is in effect in two stages, one being the water/glycol mixture, which is circulated through heat exchangers inside canisters containing the E.C.M. units and the second stage, the vapour cycle cooling pack, which regulates (not necessary cooling) the temperature of the water glycol mixture. In view of this, the description of the system will be split into two parts.

Supply switching

11. The cooling system supplies are controlled by a pair of push-switches labelled COOLING SYSTEM ON/OFF mounted adjacent to the E.C.M. equipment push-switches on panel 81P (fig.1). It should be noted that the same push-switches control both the supplies to the water/glycol system and the vapour cycle cooling system.

12. The associated relays and contactors used in the control circuits of the combined cooling systems are mounted on panel 44P (fig.1, Detail C).

Water/glycol system

Circulating pumps

13. Two electrically-driven pumps are used to circulate the water/glycol mixture. With Mod. 2024 embodied a third pump is fitted to assist delivery. The pump circuits are so arranged that if any one pump fails the remaining pump(s) will continue to circulate the mixture, but at a reduced rate.

High pressure cut-out switch

14. A high presssure cut-out switch is fitted in the water/glycol delivery line from the pumps to prevent a high pressure overload on the pumps. This high pressure can occur when the water glycol mixture is at a low temperature.

Circuit operation (fig.4)

15. When the cooling system ON push-switch is pressed, a 28-volt d.c. supply is fed from fuse 702 is panel 48P via the now closed ON push-switch (contacts 3-4) to energize relay 626. (the earth return being via the normally closed contacts M-E of the alternator failure unit, Chap.2). Contacts 626/1 close, providing a hold-on circuit via the normally closed contacts 3-4 of the OFF push-switch. Contacts 626/3 close to prepare a circuit for the ram air intake de-icing heaters (para.56). Contacts 626/2 close connecting the d.c. supply via the normally closed high pressure cut-out switch contacts B-A, to energize contactors 625 and 623 (Pre Mod 2024) and contactor 322 (Post Mod 2024). The following circuits are provided:-

(1) Contacts 625/1, 2 and 3 close connecting the a.c. supply from fuses 75 R, Y and B to the No.1 water glycol pump motor.

(2) Contacts 623/1, 2 and 3 close connecting the a.c. supply from fuses 73 R, Y, and B to the No.2 water glycol pump motor.

(3) Post Mod 2024: contacts 322/1, 2 and 3 close connecting the a.c. supply from fuses 76 R, Y and B to the No.3 pump motor.

16. If the delivery pressure of the pumps rises, the high pressure cut-out switch will open, breaking the supply to contactors 623 and 625 (and 322 Post Mod. 2024) thus stopping the pumps. When the pressure falls the high pressure switch contacts will close resulting in the contactors being re-energized to re-start the pumps; this cycle will be repeated until an input of heat reduces the viscosity of the water/glycol mixture, so reducing the build up of pressure.

Vapour cycle cooling system

17. The vapour cycle cooling system pack (27UA/1716) controls the temperature of the water/glycol mixture circulating in the E.C.M. canisters. The following components are incorporated in the system.

(1) Compressor motor

(2) High pressure switch

(3) High temperature switch

(4) Time delay unit

(5) Motor overload protection unit

(6) Magnetic indicator

(7) Low temperature switch

(8) Temperature gauge

Vapour cycle cooling pack

General

18. The compressor motor, high pressure switch, high temperature switch and the time delay unit are contained within a vapour cycle cooling pack (Freon unit Type VCP - 1) mounted on the starboard side of the aft rear fuselage structure (fig.1).

Compressor motor

19. The combined compressor and motor unit, Type ACM 8200/Mk.3, is controlled by the cooling system push-switches on panel 81P. As stated in para.11, the same push-switch controls are used for the water/glycol pump motors and for the vapour cycle cooling pack.

High pressure switch

20. If the pressure of the vapour in the cooling pack becomes excessive, a high pressure switch fitted in the vapour line will operate resulting in the supply to the compressor motor being open circuited; to stop the compressor motor.

High temperature switch

21. If the temperature of the system becomes excessive, a high temperature switch situated adjacent to the coil vapour separator within the cooling pack will operate causing the compressor motor supplies to be open circuited; to stop the motor.

Time delay unit

22. A time delay unit ensures that, when the compressor motor is switched off, either from the push-switch controls at panel 81P or by the operation of either the high pressure or temperature switches, a re-start cannot be made until a period of one to two minutes has elapsed.

23. The time delay unit consists of three N.P.N. silicon transistors, three capacitors, ten resistors and a relay designated M.

Circuit operation

Vapour cycle cooling pack (fig.4)

24. When the ON push-switch is pressed (approx 5 seconds), a 28-volt d.c. supply from fuse 701 is fed via the now closed ON push-switch (contacts 1-2) and the normally closed contacts 710/1 to energize trigger relay T.

25. The trigger contacts change-over, connecting the supply from fuse 701 via the normally closed, high pressure switch contacts, high temperature switch contacts and relay contacts 710/2, to energize contactor 627.

26. Contacts 627/2, 3 and 4 close, to complete the a.c. supplies from fuses 67 R, Y and B in panel 59P to the compressor motor via the motor overload protection unit. Contacts 627/1 close providing a hold-on supply for trigger relay T via the normally closed OFF push-switch (contacts 1-2) and the normally closed contacts 710/1. With the trigger relay held energized, contactor 627 is maintained in the energized condition as described in para. 24 and 25.

27. If the pressure of the vapour in the cooling pack is excessive, a spring-loaded

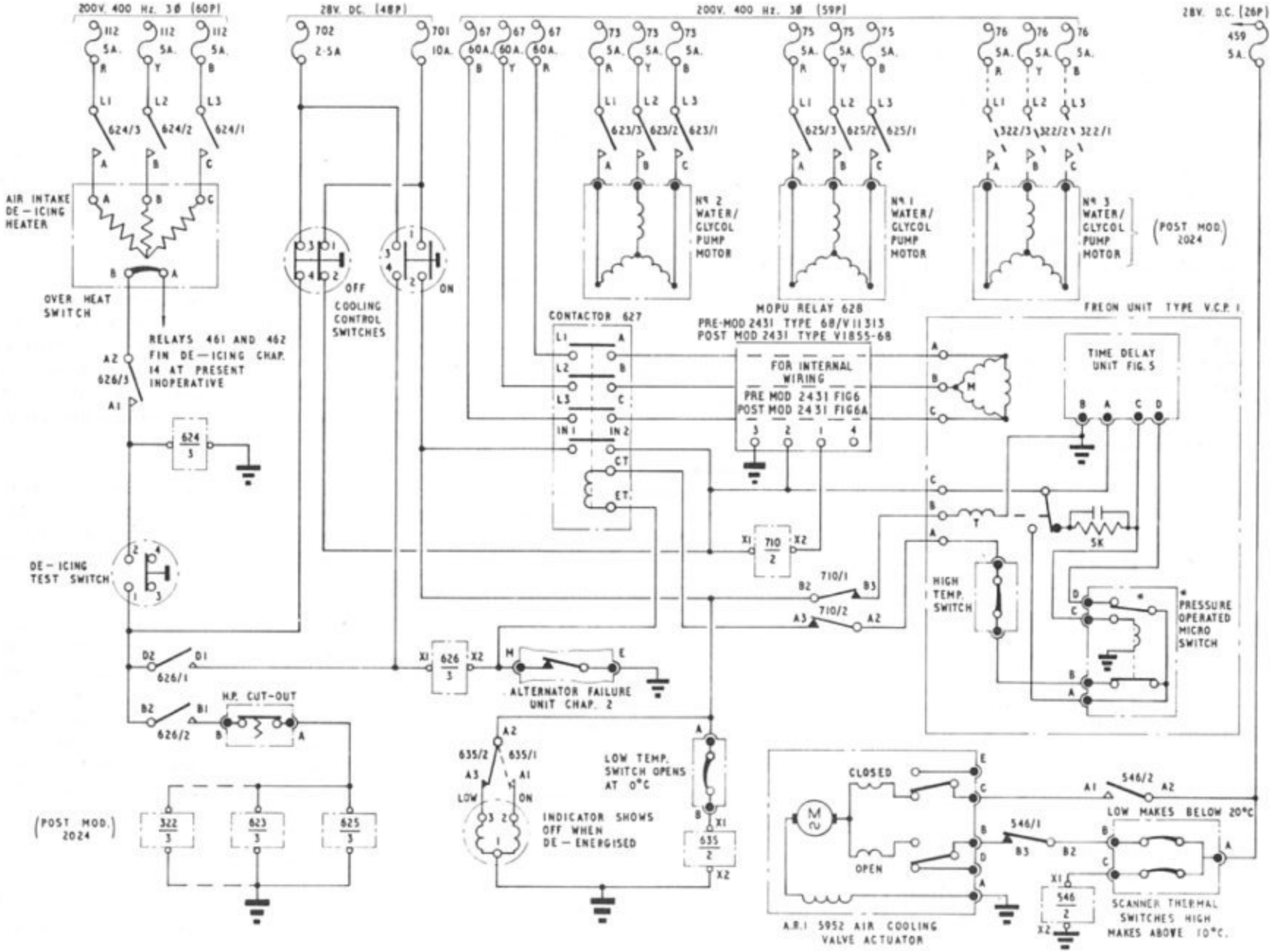


Fig. 4 Cooling system controls pre and post Mod 2431

◄ Mod 2431 ►

plunger operates a microswitch (incorporated within the high pressure switch). A supply is fed via the now closed microswitch contacts, to energize the pressure switch relay. The high pressure switch contacts open to break the supply to the coil of contactor 627. Contacts 627/1 open, to break the hold-on supply to trigger relay T and contacts 627/2, 3 and 4 open thus isolating the supplies to the compressor motor.

28. If the temperature of the system rises above a predetermined value, the high temperature switch contacts open to break the supply to the coil of contactor 627. Contacts 627/1 open to break the hold-on supply to trigger relay T and contacts 627/2, 3 and 4 open to isolate the supplies to the compressor motor.

Time delay unit

29. Prior to the operation of the ON push-switch, a 28-volt d.c. supply is already available at pole A of the time delay unit, fed from fuse 701 via the OFF push-switch (contacts 1-2). For the time delay unit to operate, in addition to the supply at pole A there must also be a supply at pole C. Any of the following conditions make this supply available.

(1) The operation of the OFF push-switch breaks the hold-on supply from fuse 701 to trigger relay T, via contacts 627/1 and 710/1. When the OFF push-switch is released, the supply from fuse 701 is fed via the now closed OFF push-switch (contacts 1-2) and a 5K dropper resistor to pole C of the time delay unit, via the de-energized contacts of trigger relay T.

(2) The operation of the motor overload protection unit (para.41) which energizes relay 710. Contacts 710/1 open to break the supply to trigger relay T, with the effect detailed in (1).

(3) The opening of either the high pressure switch or the high temperature switch contacts which breaks the supply to contactor 627 (para.27 and 28). Contacts 627/1 open to break the hold-on supply to trigger relay T with the effect detailed in (1).

30. With the supplies available at poles A and C, reference to fig.4 shows that the supply at pole C is fed via resistors R9 and R1 to the base of transistor T1, which will conduct. T1, T2 and T3, are connected in cascade such that when T1 conducts T3 bottoms resulting in relay M being energized. Contacts M2 close connecting pole C with the 28-volt supply at pole A, and provides a 28-volt supply to T1 base, holding T1 in conduction. Contacts M1 open allowing capacitors C1 and C2 to be charged through T1.

31. The 28-volt supply now at pole C is fed to the coil of the high pressure switch relay. The pressure switch relay contacts open, isolating the supplies to the compressor supply contactor 627. As long as the pressure switch contacts are open, the compressor motor cannot be started.

32. As C1 and C2 charge, the potential at T1 collector will go more negative, reducing the current flow through T1. After a period of between one to two minutes the -ve potential will be such that T1 is cut-off. This in turn cuts off T2 and T3 and relay M is de-energized. Contacts M2 open, de-energizing the pressure switch relay. The energizing circuit for contactor 627 is now available and the compressor motor may be re-started.

33. Although the triggering +ve supply may still be at pole C, the time delay will not commence due to the charged state of capacitors C1 and C2. When the compressor motor is re-started, C1 and C2 will discharge through a shorting circuit formed by resistor R7, the closed contacts M1 the pressure micro-switch closed contacts and the operated contacts of trigger relay T.

▶ Motor overload protection unit post Mod.2125

34. A motor overload protection unit, 68/V11313 protects the compressor motor against damage in the event of high current conditions. It consists of a sub-assembly 101/V11313 and plug-in unit, 138/V13313. A pre-determined time lag prevents the operation of the unit where a heavy current is being drawn during the starting of the compressor motor.

Circuit operation

35. In the following circuit operation it is presumed that the compressor motor has been started.

36. Reference to fig.4 and 6 will show that two of three a.c. supply lines from contactor 627 to the compressor motor pass through two current transformers. The current induced in the transformer windings develop voltages across resistors R3 and R7 proportional to the current in the supply lines. The output voltages are rectified, smoothed and applied to a potentiometer network formed by resistors R1 and R2. The voltage at R1 and R2 will ◀

follow the higher of the two voltages developed across R3 and R7 and will charge capacitor C1 at a voltage proportional to the higher of the two currents in the a.c. lines being monitored. Under normal conditions the voltage across C1 is insufficient to exceed the breakdown voltage of a four-layer diode connected in the circuit. With an excessive increase in the motor current, and a consequent rise in the voltage at C1, the four layer diode will break down and C1 will discharge through the diode and a resistance network formed by R8, R9 and R10 to trigger the SCR. The triggering of the SCR completes the earth return for relay 710. Relay 710 is energized by a supply from fuse 701 via the normally closed OFF push-switch (contacts 1-2). Contacts 710/1 open to break the hold-on circuit for trigger relay T, causing trigger relay T contacts to open and break the hold-on supply for contactor 627. Contacts 710/2 open to de-energize contactor 627 thus isolating the supplies to the compressor motor.

37. With no supplies to the compressor motor, capacitor C1 will cease to charge and the four layer diode will not conduct. The SCR will continue to conduct until an open circuit is created in the line to either the cathode or the anode. This is achieved by pressing the cooling control OFF push-switch which breaks the supply to relay 710 and open circuits the SCR. Further details and standard serviceability tests are described in A.P.113D-07121-1.

Motor overload protection unit post Mod.2431

38. When Mod.2431 is embodied, the motor overload protection unit Part No.68/V11313 is replaced by Part No.V18555-68, the two units being interchangeable. Part No.V18555-68 consists of a sub-assembly 3V/18555 and a printed circuit assembly 1/V18552.

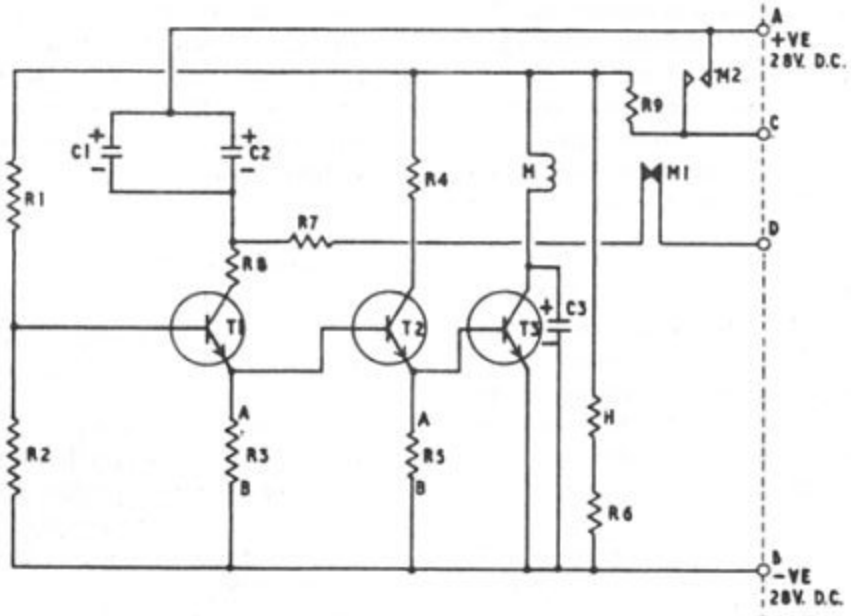


Fig.5 Time delay unit circuit

Circuit operation

39. Reference to fig.4 and 6A will show that two of the three a.c. supply lines from contactor 627 to the compressor motor pass through two current transformers CT1 and CT2. The current induced in the transformer windings develop voltages across resistors R5 and R6 proportional to the current in the supply lines. The outputs are rectified, smoothed and fed into an amplifier (A1) via a potentiometer network formed by resistors R1, RV1 and RV2. Simultaneously a reference voltage is fed to the amplifier via resistor R2 and a voltage regulator V1. The supply to the amplifier (via resistor R2) is stabilized at +15V by a zener diode MR1.

40. When the current drawn by the compressor motor becomes excessively high, the outputs from the bridge rectifiers (BR1 and BR2) to the amplifier will increase until they exceed the reference voltage sufficiently to give an output from the amplifier, across resistor R3, in excess of the breakdown voltage of zener diode MR2. MR2 will now conduct via MR3 to trigger the SCR.

41. The triggering of the SCR completes the earth return for relay 710. Relay 710 is energized by a supply from fuse 701 via the normally closed OFF push-switch (contacts 1-2). Contacts 710/1 open to break the hold-on circuit for trigger relay T, causing trigger relay T contacts to open and break the hold-on supply for contactor 627. Contacts 710/2 open to de-energize contactor 627 thus isolating the

▶ supplies to the compressor motor. With no supplies to the compressor motor the output from the amplifier will fall and zener diode MR2 will cease to conduct The SCR will continue to conduct until an open circuit is created in the line to either the cathode or the anode This is achieved by pressing the cooling control OFF push-switch which breaks the supply to relay 710 and open circuits the SCR.

42. A test microswitch is fitted in the sub-assembly to simulate overload conditions without the compressor motor running. When the microswitch is pressed a +28V supply is fed to the amplifier via the potentiometer network, creating an output from the amplifier sufficient to trigger the SCR as previously described ◀

Low temperature conditions

General

43. The E.C.M. units should not be operated when the temperature of the coolant in the E.C.M. canisters is below 0 deg.C.

Magnetic indicator

44. Warning of low temperature conditions is given by a three-position magnetic indicator showing LOW-ON or OFF indications, fitted on panel 81P at the A.E.O.'s station (fig.1). The indicator is controlled by a low temperature switch.

Low temperature switch

45. The low temperature switch, fitted in the water/glycol return line between the canisters and the vapour cycle cooling pack, opens when the coolant temperature falls to 0 deg.C.

Circuit operation (fig.4)

46. A 28-volt d.c. supply from fuse 701 is available at the low temperature switch initially via the ON push-switch (contacts 1-2) and then via the OFF push-switch (contacts 1-2) and the closed hold-on contacts 627/1.

47. When the mixture temperature is normal, relay 635 is energized via the closed contacts of the low temperature switch. Contacts 635/1

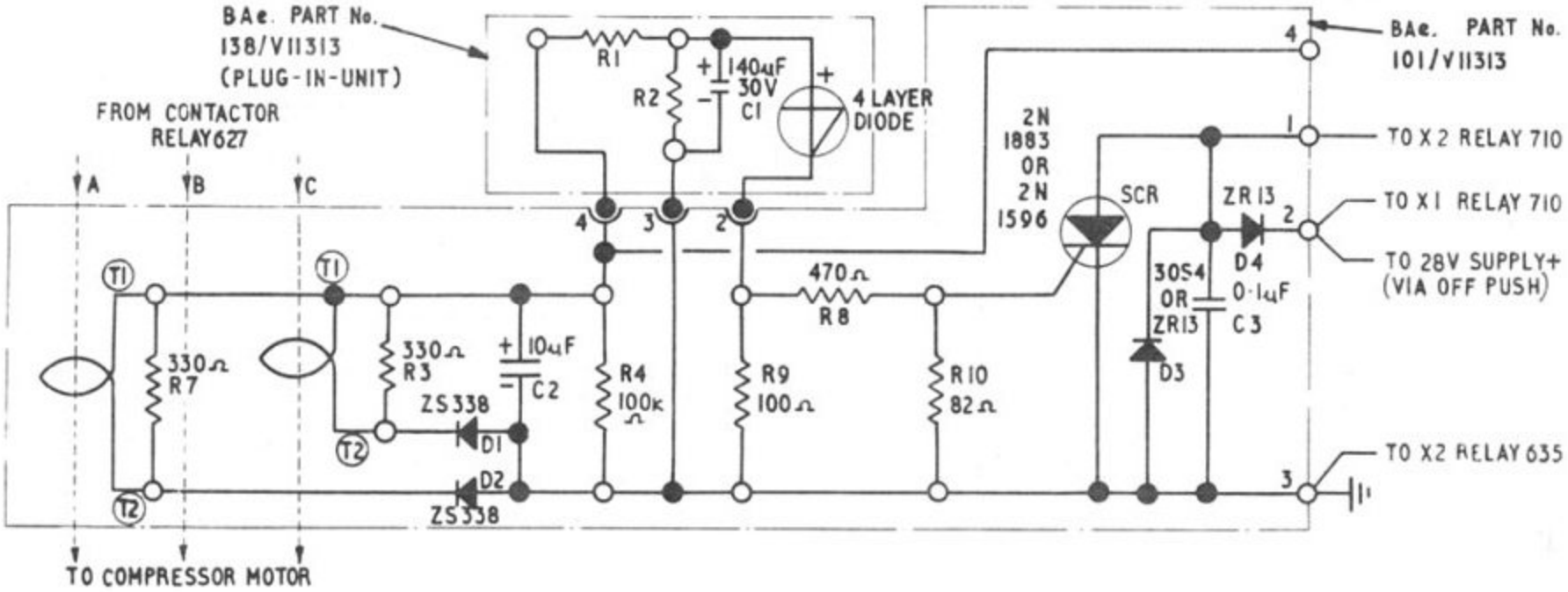


Fig.6 Motor overload protection unit pre Mod.2431

▶ *Minor corrections* ◀

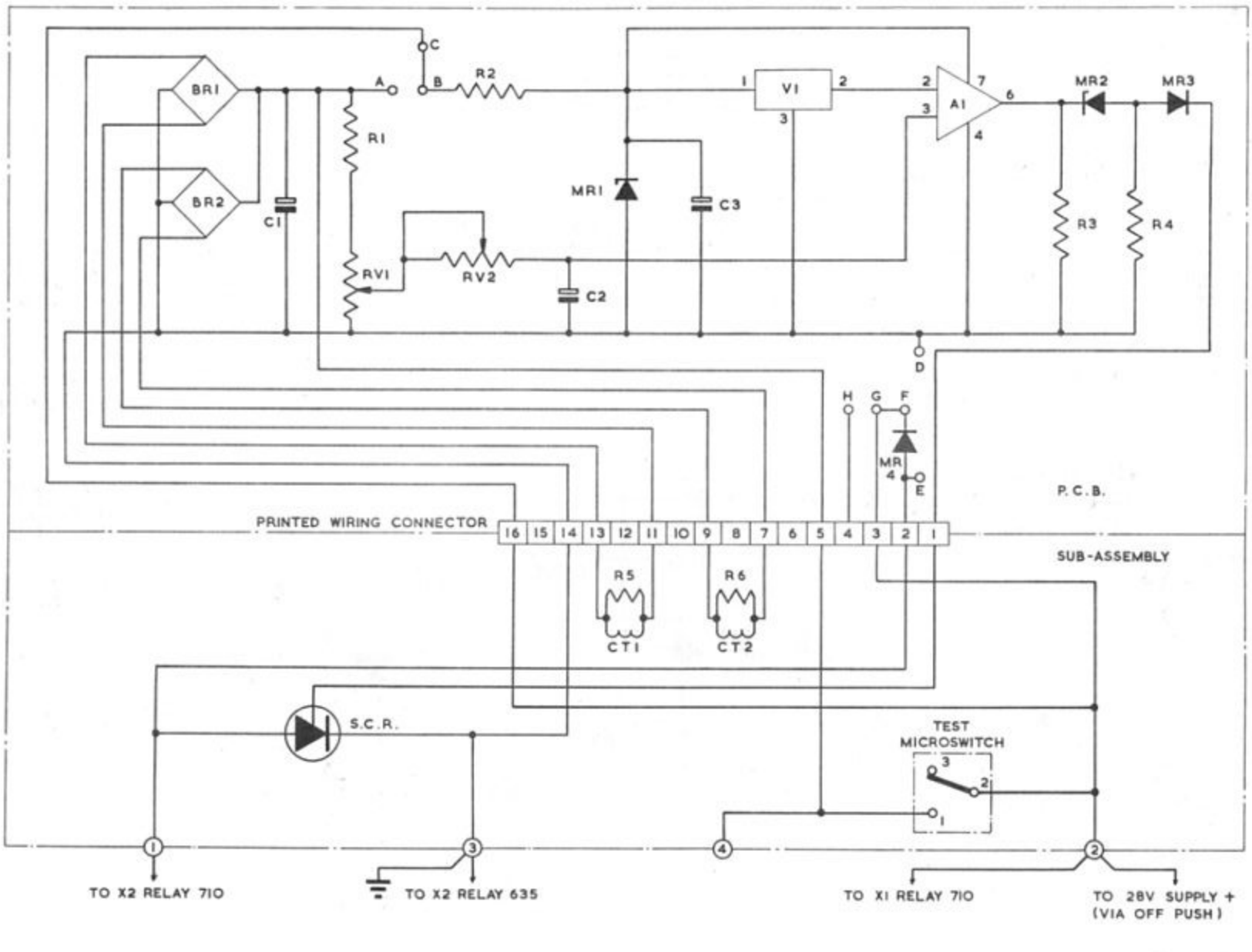


Fig. 6A Motor overload protection unit post Mod. 2431

▶New drg.◀

close connecting the supply to pole 2 of the magnetic indicator. The indicator will show ON.

48. When the temperature of the mixture falls to 0 deg.C the low temperature switch contacts open, de-energizing relay 635. Contacts 635/2 close connecting the supply to pole 3 of the magnetic indicator. The indicator will show LOW.

49. The indicator will be de-energized to show OFF whenever the vapour cycle cooling system is switched off. Under these conditions contactor 627 will be de-energized and contacts 627/1 open, isolating the supply to the indicator.

50. Contactor 627 will be de-energized and the indicator will show OFF whenever the following switches and units operate.

(1) OFF push-switch.

(2) High pressure or high temperature switch (para.27 and 28).

(3) Time delay unit (para.29).

(4) Motor overload protection unit (para.41).

Temperature gauge

51. A further indication of the water/glycol temperature is given by a temperature gauge (Ref.No. 6A/3682) mounted at the navigator's panel (fig.1 detail D). This gauge calibrated from -80 deg.C to +80 deg.C is operated by a temperature sensing bulb (Ref.No. 6A/3684) inserted into the water/glycol mixture outlet from the cooling pack. For further details refer to A.P.1275A, Vol.1, Sect.17. The 28-volt d.c. supply for the gauge is fed from fuse 717 in panel 48P (fig.13).

A.R.I.5952 cooling

General

52. The A.R.I.5952 scanner unit, (Sect.9, Chap.8) mounted at the extreme end of the rear fuselage is cooled by ram air admitted by an actuator operated butterfly valve, mounted at former 141.25 (fig.1). The actuator is controlled by two thermal switches, fitted in the scanner unit, and a relay 546 fitted at former 141.5 (Port).

Circuit operation (fig.4)

53. The d.c. supply to the thermal switches is fed from fuse 459 in panel 26P. When the temperature of the scanner rises to + deg.C, the high temperature thermal switches closes, connecting the supply from fuse 459, via the normally closed contacts 546/1 to the 'open' coil of the actuator. The actuator will operate to open the butterfly valve; to provide cooling.

54. When the temperature falls to -20 deg.C, the low temperature thermal switch closes connecting a supply from fuse 459 to energize relay 546. Contacts 546/1 open, isolating the supply to the 'open' coil of the actuator and contacts 546/2 close connecting the supply to the 'close' coil of the actuator. The actuator will operate to close the butterfly valve.

A.R.I.18228/1 cooling

55. Cooling for this equipment is provided by motor driven fans, fitted in both the receiver and power units. The fans draw air through wire mesh grilles fitted at the forward end of each unit.

Ram air de-icing

56. The nose portion of the ram air intake, containing the vapour cycle condenser, embodies an electrical heater for de-icing purposes, controlled via the aircraft fin de-icing circuit. A DE-ICING TEST SWITCH mounted on panel 44P provides for ground testing the heater without the necessity of operating the aircraft fin de-icing circuit.

Circuit operation

57. Due to the fin de-icing system being inoperative (fuses 257 in 25P and 586 in 4P removed, Chap.14) no supplies are available to energize the air intake heater supply contactor 624 via the fin de-icing circuit (System inoperative).

SERVICING

Precautions

58. Servicing personnel in particular are warned that a.c. and d.c. voltages in excess of 100-volt can be dangerous to the extent of causing personal injury fatal or otherwise. It is essential that the utmost attention be given to servicing instructions where matters of safety are concerned and that maximum co-operation be maintained between trades mutually concerned in servicing operations. The notes contained in Chap.1 of this section should be read for general servicing information. For ▶detailed information and fault diagnosis of vapour cycle cooling pack refer to A.P.107B-0103-1.◀

Relays and contactors

59. In accordance with Vol.4 of this publication, a periodic examination of all relays, contactors and associated wiring should be carried out. Pay particular attention to the contacts of the relays and contactors for signs of pitting and burning. Examine mouldings for evidence of cracks or other damage. Relays or contactors suspected of malfunctioning should be removed for further checks and serviceable replacements fitted.

Water/glycol pumps

60. The water/glycol pumps should be examined in accordance with the instructions contained in Vol.4 of this publication. Check that the associated wiring is secure and free from damage. Testing of the pumps and the high pressure cut-out switch is detailed in Sect.3, Chap.16.

Time delay unit

61. Functioning of the time delay unit should be carried out in conjunction with the appropriate fitter trades, at the times laid down in Vol.4 of this publication. If a check of a suspected unit is to be carried out, the following notes may help. A stop watch will be required.

(1) Connect ground power supplies to the aircraft.

(2) Connect a ground cooling trolley Ref.No. 4F/2584 or 2396 to the condenser (Sect.3, Chap.16).

(3) Remove fuse 702 (48P) and fit dummy fuse. This will isolate the water/glycol pumps if these are not to be run.

(4) On panel 81P, select and press the ON cooling switch. (The switch must be pressed for at least 5 sec.). Check that the magnetic indicator shows ON.

(5) Allow a period of time for the compressor motor to run up to speed.

(6) On panel 81P, press the OFF cooling switch and start the stop watch. Check that the magnetic indicator shows OFF.

(7) Press the ON cooling switch again, keeping the switch pressed for 5 seconds and then releasing. The magnetic indicator will flick from ON to OFF.

(8) Repeat as (7) until the magnetic indicator remains at ON. At this indication stop the watch and check that the time interval is between one and two minutes.

(9) Remove dummy fuse and replace fuse 702 (48P) if removed (3).

A.R.I. cooling actuator

62. The actuator which opens or closes the ram air intake valve should be examined at the times and periods laid down in Vol.4 of this publication. Check for security and signs of damage. Examine associated wiring for serviceability.

63. In order to ensure that the actuator moves to the fully open or closed position, remove the cable and socket assembly F3393 connected to PL.H on the thermostat assembly fitted to the heat exchanger (part of the radar head).

64. With poles A and B on the detached socket shorted together with a suitable link and a d.c. supply to fuse 459 on panel 26P, the actuator should run to the fully open position. Similarly with poles A and C shorted, relay 546 should be energized and the actuator will move to the fully closed position. After satisfactory tests are completed refit cable and socket assembly to PL.H.

Ram air de-icing

65. If required, the ram air de-icing heaters can be checked by pressing the DE-ICING TEST SWITCH on panel 44P.

NOTE . . .
It must be emphasised that the testing of the heater elements must be restricted to the minimum period required in order to establish that the elements are serviceable.

66. When the de-icing test push-switch is pressed (for a maximum period of 60 seconds) a d.c. supply from fuse 702 is fed via the normally closed cooling control OFF push-switch (contacts 3-4), the now closed de-icing test push-switch (contacts 1-2) to energize contactor 624 (fig.4). Contacts 624/1, 2 and 3 close connecting a 200-volt 3 phase a.c. supply from fuses 112R, Y and B to the intake de-icing heater element.

REMOVAL AND INSTALLATION

General

67. Access to the equipment is fairly straightforward, therefore removal instructions are not considered necessary. When it becomes necessary to remove any item of equipment for servicing or replacement ensure that the power supplies to the equipment concerned are switched OFF and all detached cables and connectors suitably protected and stowed.

68. When removing any item of electrical equipment connected into the water/glycol or vapour cycle cooling systems, the co-operation of the fitter trades must be obtained in removing any pipes or pressure operated equipment. Details will be found in Sect.3, Chap.16.

TABLE 1

Distribution fuses

No.	Rating (Amps)	Type	Service
200-volt 3-phase			
Panel 58P			
30 R. Y. B.	20	H	Feeders for fuses 1112, 1113 and 1114
Panel 59P			
66 R. Y. B.	20	H	Feeders for fuses 1115, 1116 and 1117
67 R. Y. B.	60	H	Freon unit motor
73 R. Y. B.	5	EO	No.2 water/glycol pump
75 R. Y. B.	5	EO	No.1 water/glycol pump
76 R. Y. B.	5	EO	No.3 water/glycol pump (post Mod.2024)
Panel 60P			
102 R. Y. B.	20	H	Feeders for fuses 1118, 1119 and 1120
103 R. Y. B.	10	H	Supply for A.R.I.5952
112 R. Y. B.	5	EO	Supply for de-icing heater
117 R. Y. B.	20	H2	Supply for A.R.I.18146 (post Mod.2024)
Panel 61P			
150 R.	7	EO	Feeder for fuse 1399
Panel 14P			
1112 R. Y. B.	10	H	No.1 A.R.I.18076 P.U.
1113 R. Y. B.	7	EO	No.1 A.R.I.18076 T.X.
1114 R. Y. B.	7	EO	A.R.I.18074 (not used post Mod.2024)
1115 R. Y. B.	10	H	No.2 A.R.I.18076 P.U.
1116 R. Y. B.	7	EO	No.2 A.R.I.18076 T.X.
1117 R. Y. B.			Not used
1118 R. Y. B.	10	H	No.3 A.R.I.18076 P.U.
1119 R. Y. B.	7	EO	No.3 A.R.I.18076 T.X.
1120 R. Y. B.			Not used
1399 R	5	EO	A.R.I.18228/1 P.S.U.
Panel 75P			
736 R. Y. B.	3	S	A.R.I.18235 (Post Mod.2496)
28-volt d.c.			
Panel 3P			
655	5	S	E.C.M. control unit lighting and A.R.I.18228/1 (relay module)
Panel 4P			
548	5	S	E.C.M. control unit lighting and A.R.I.18228/1 (relay module)
Panel 26P			
459	5	S	Air cooling control A.R.I.5952 scanner
456	2.5	S	A.R.I.18228/1 P.S.U.
Panel 48P			
700	2.5	S	A.R.I.18235 (Post Mod 2496)
701	10	S	Cooling control for Freon unit
702	2.5	S	Cooling pumps and intake de-icing control
703	5	S	No.1 A.R.I 18076 and 18074 control
704	5	S	No.2 A.R.I.18076
705	5	S	No.3 A R.I.18076
706	7.5	S	A.R.I 5952 control
707	2.5	S	A.R.I.18228/1 and A.R.I.18235 (Post Mod.2496) control

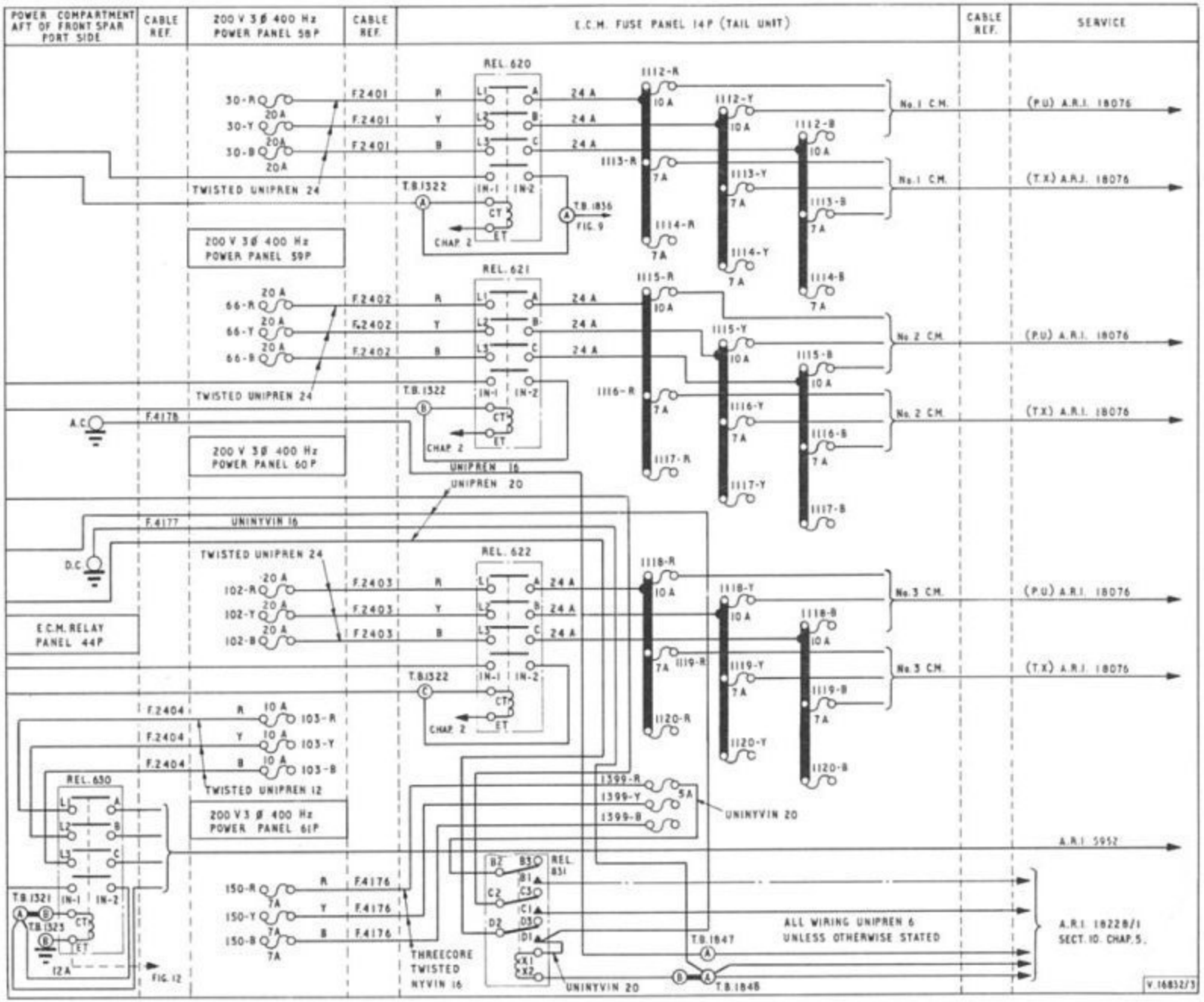


FIG. 8(2) Power distribution. (post Mods. 2024 and 2496)

▶ Mod. 2501 ◀

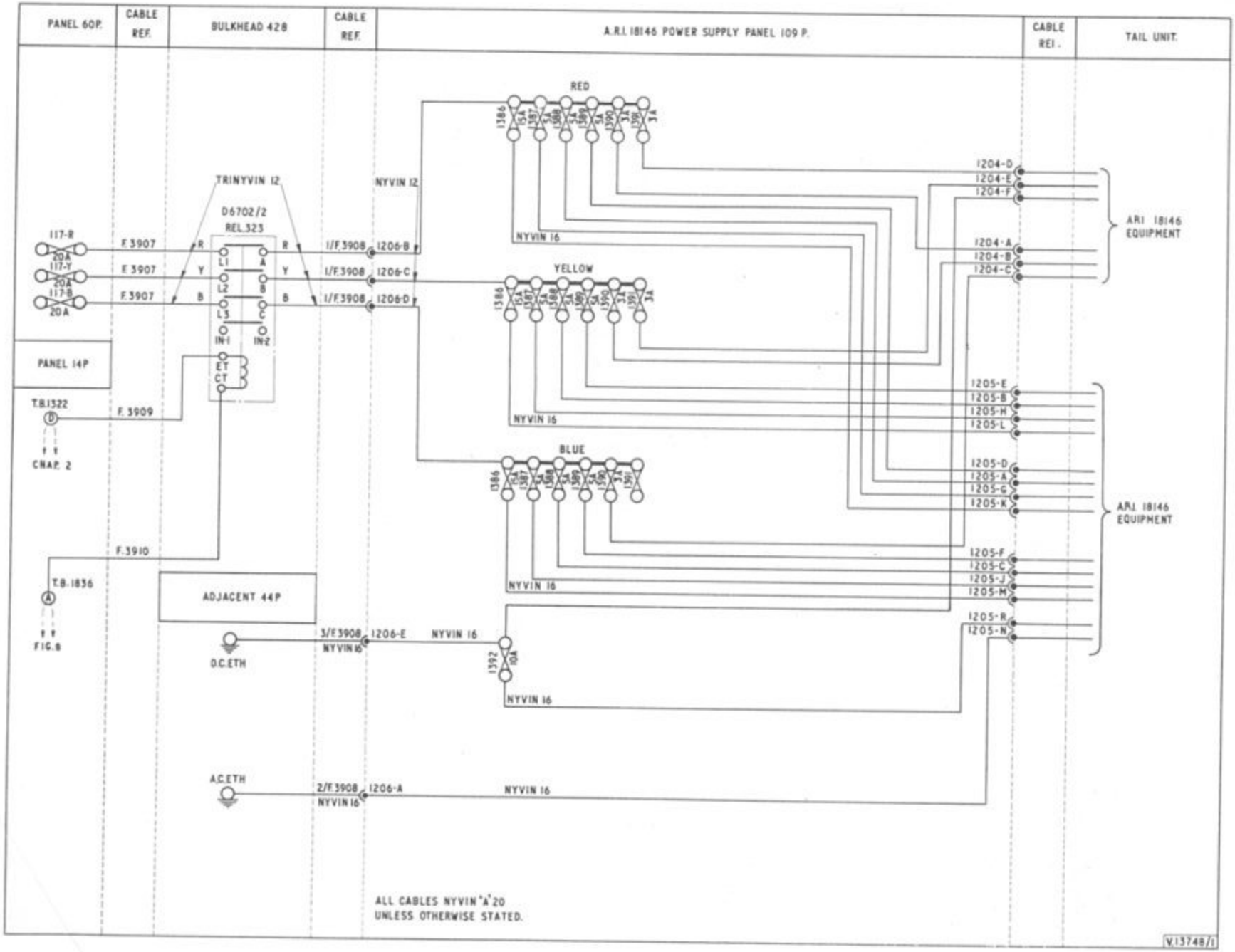


Fig. 9 A.R.I. 18146 supplies

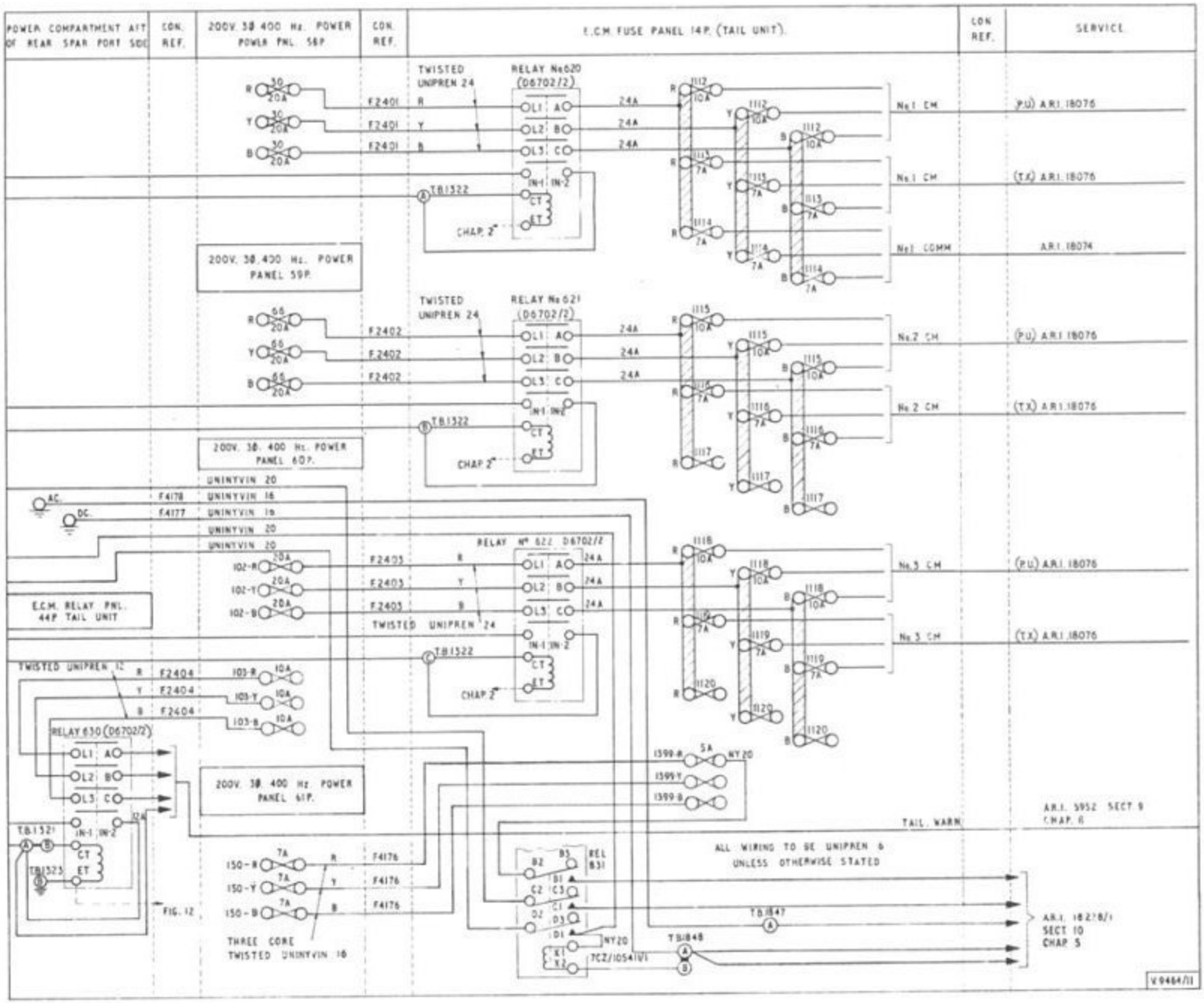


Fig 7 (2) Power distribution (Pre Mods 2024 and 2496)

▶ Mod 2501 ◀

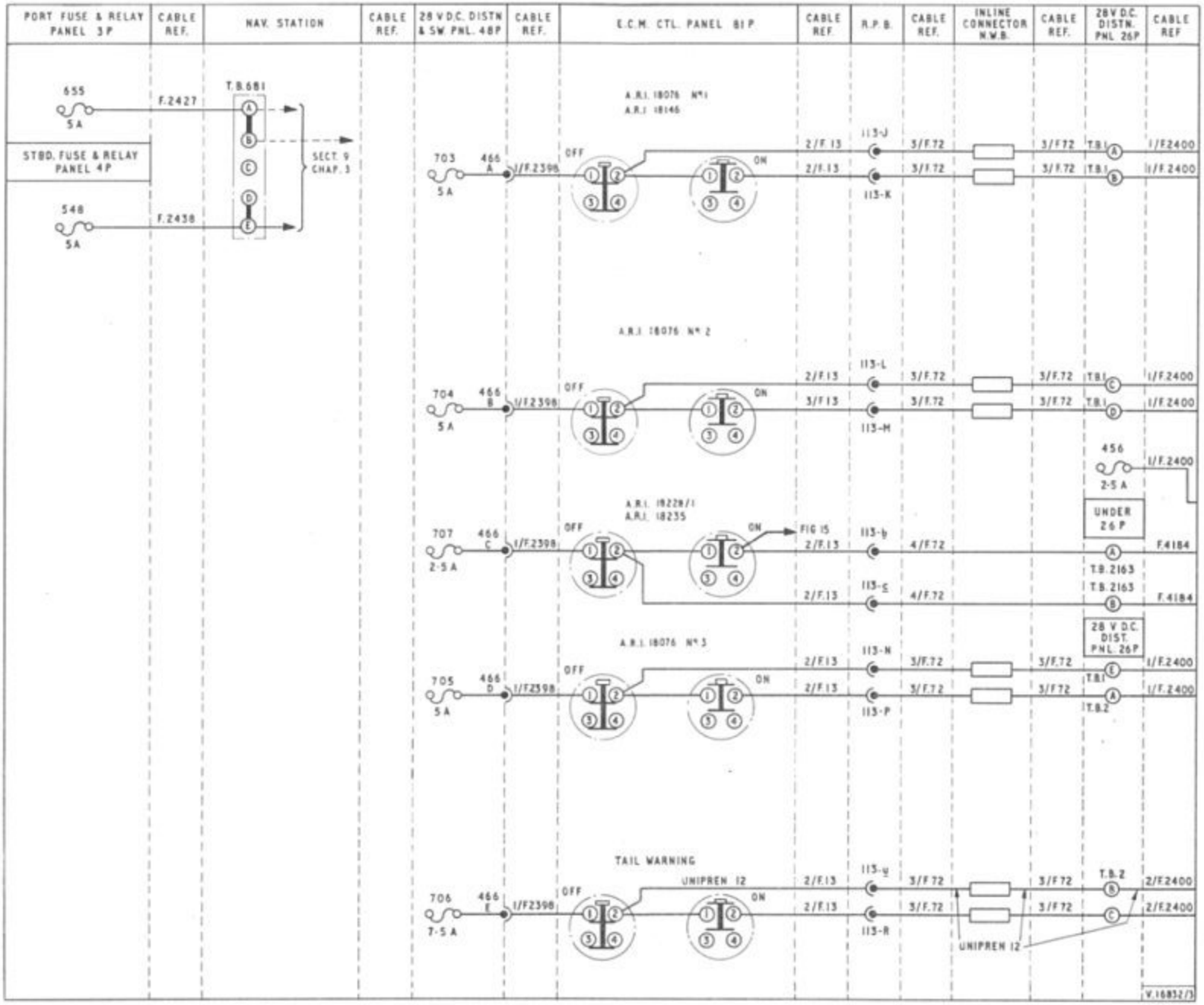


FIG. 8(1) Power distribution, (post Mods. 2024 and 2496)

▶ Mod 2501 ◀

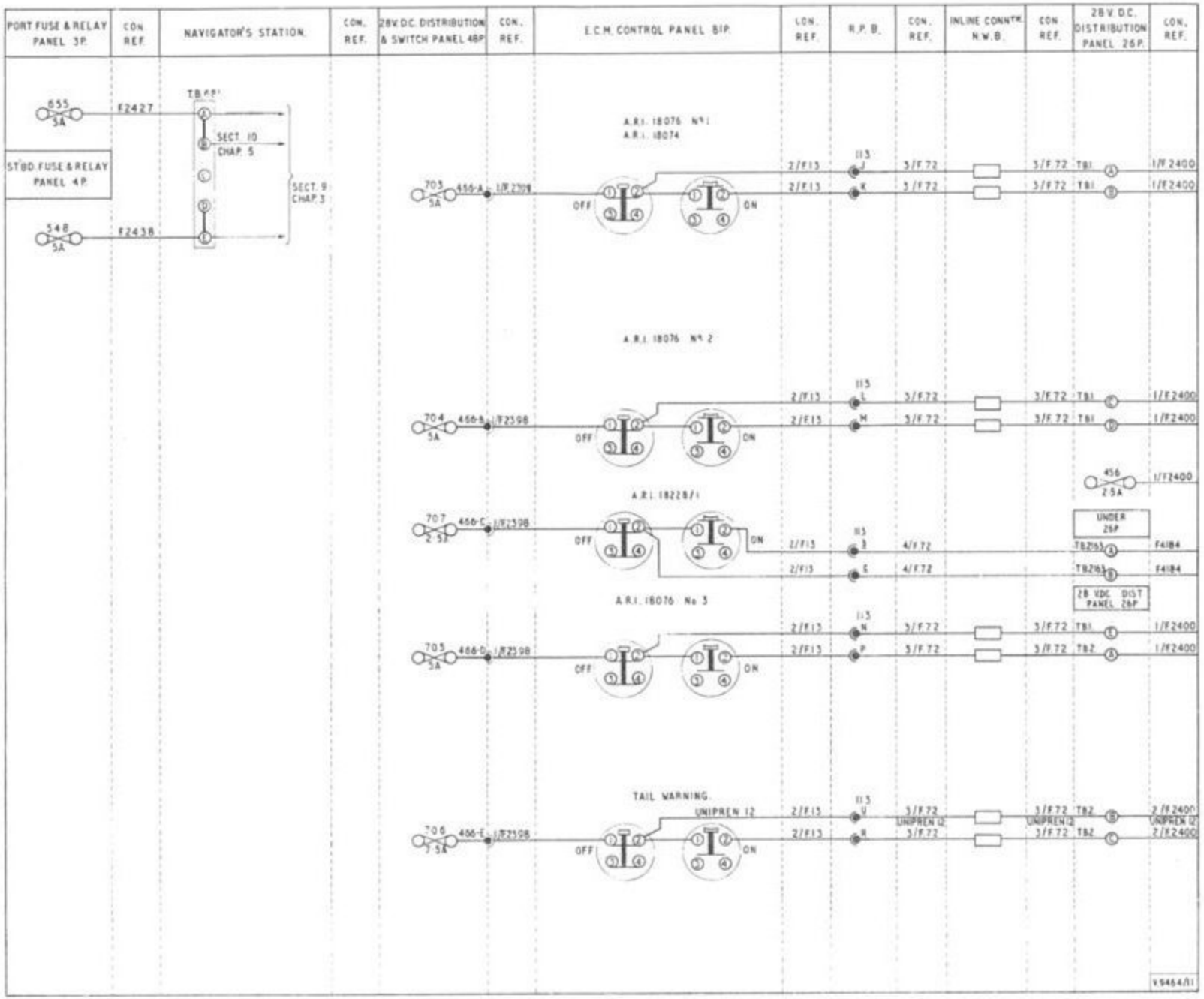


Fig 7 (1) Power distribution (Pre Mods 2024 and 2496)
▶ Mod 2501 ◀

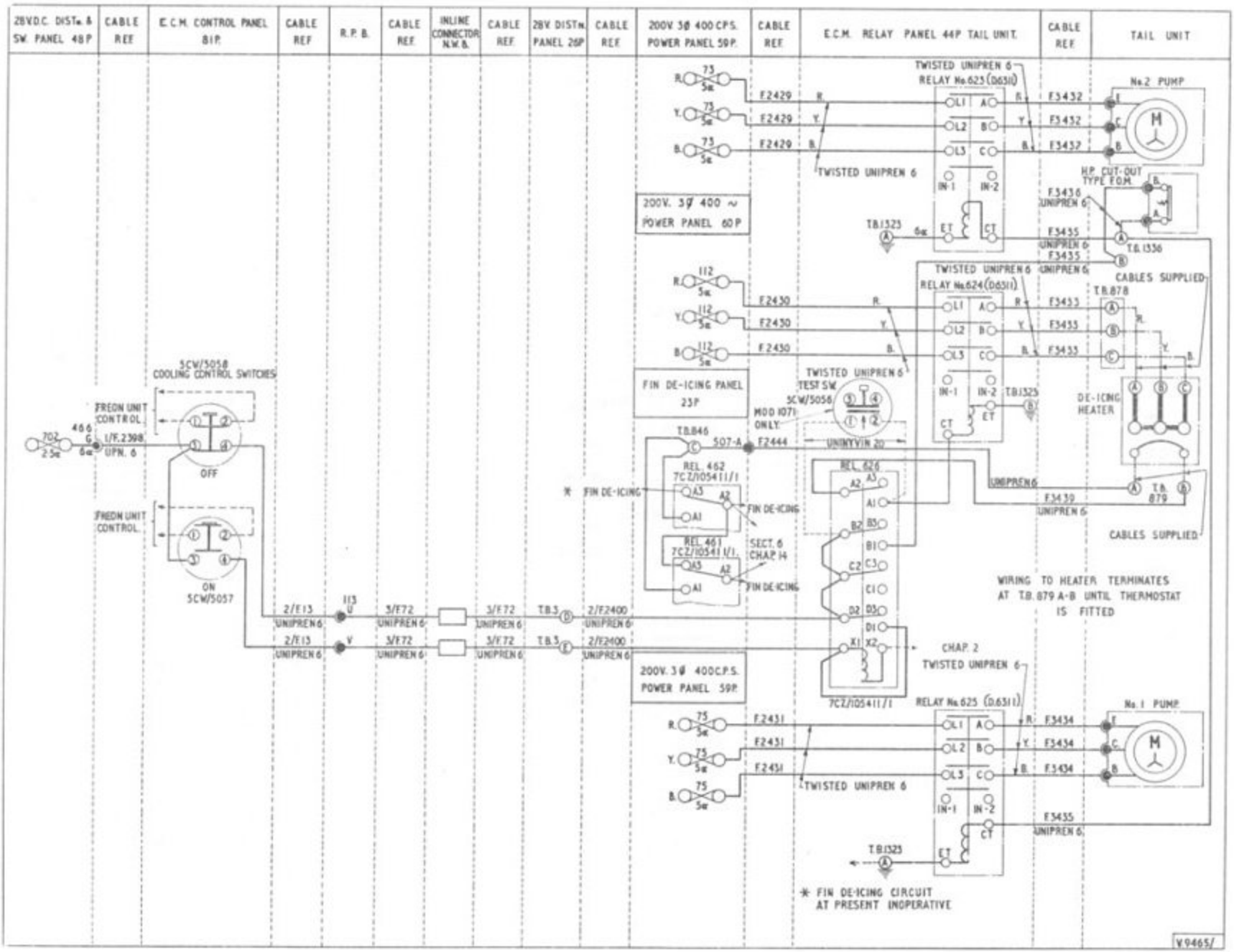
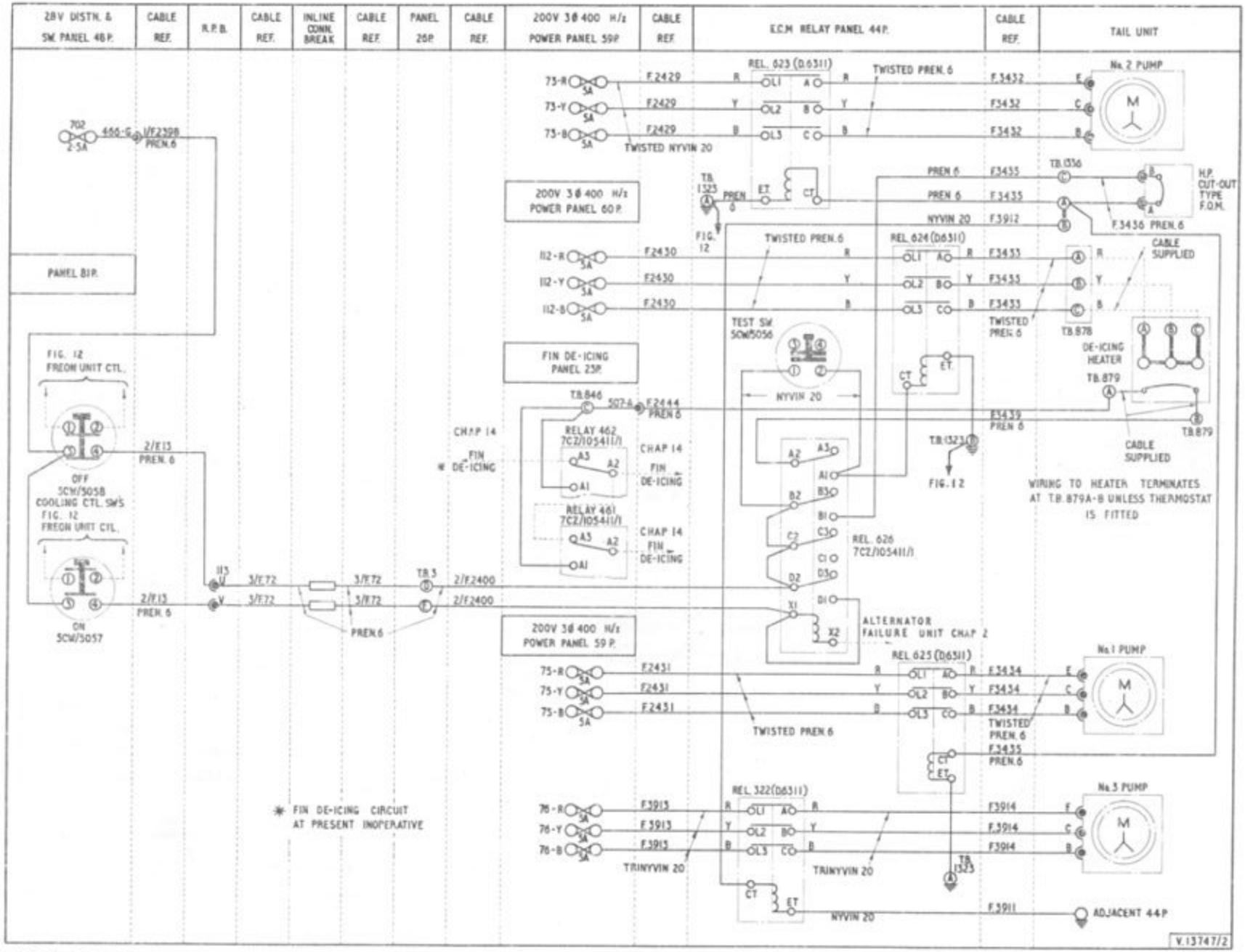


Fig.10 Cooling pumps and intake de-icing, pre Mod.2024



176809 5 70 7,75 H.S.A. 1354

Fig. 11 Cooling pumps and intake de-icing (post Mod. 2024)

◀ Mod 2304 ▶

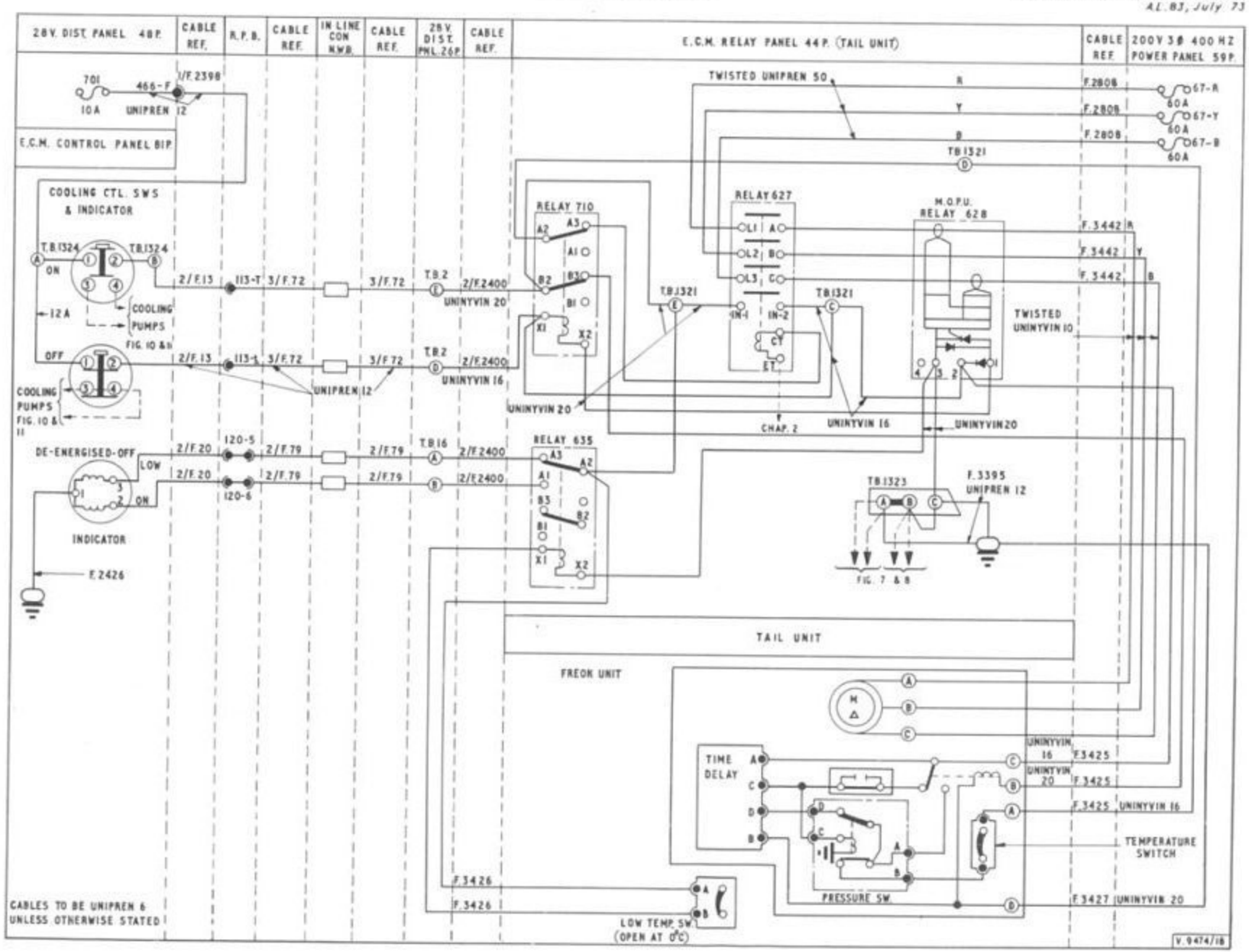


FIG. 12 Control of cooling unit

Mod. 2304 incorporated

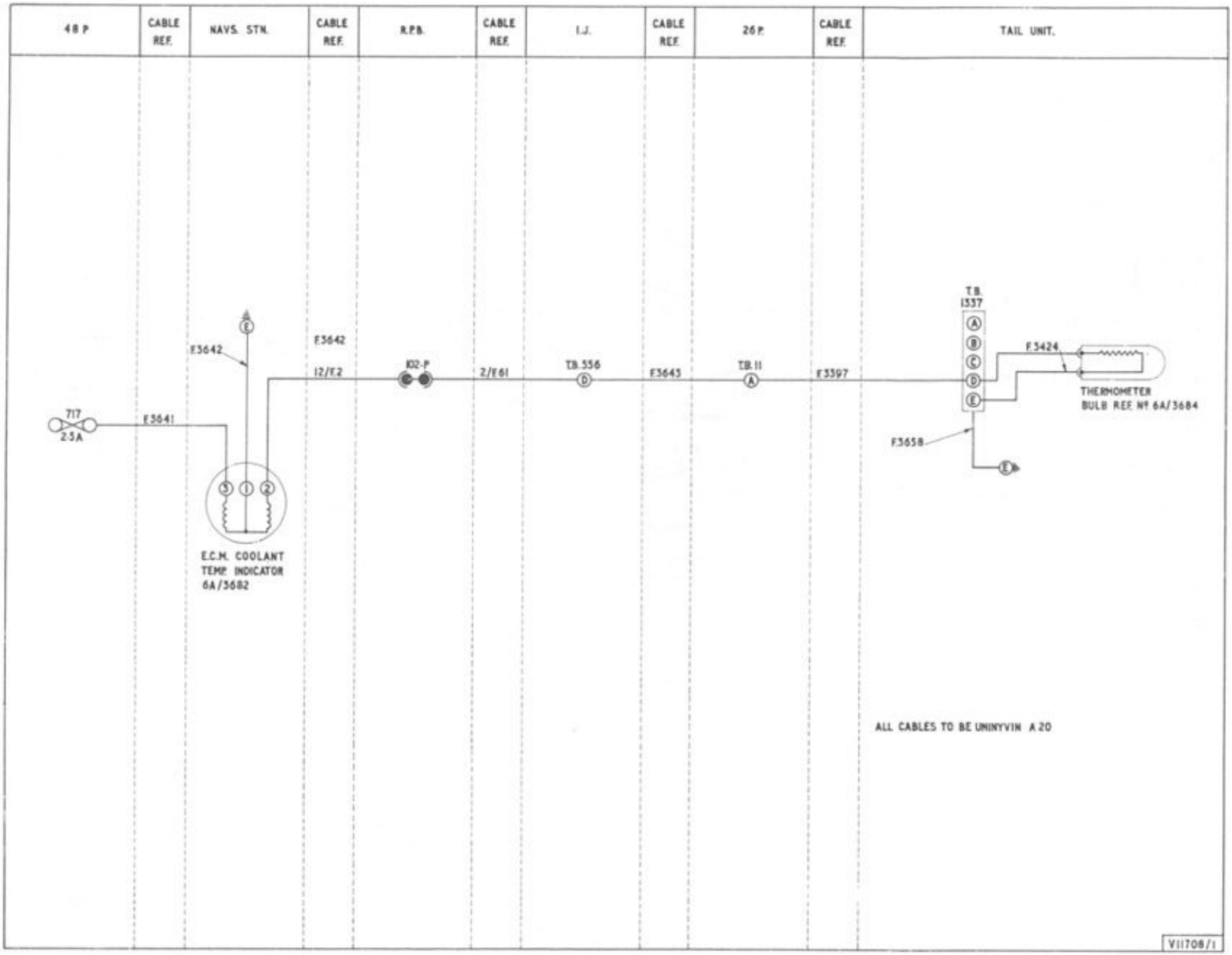


Fig. 13 Temperature indication – E.C.M. cooling system

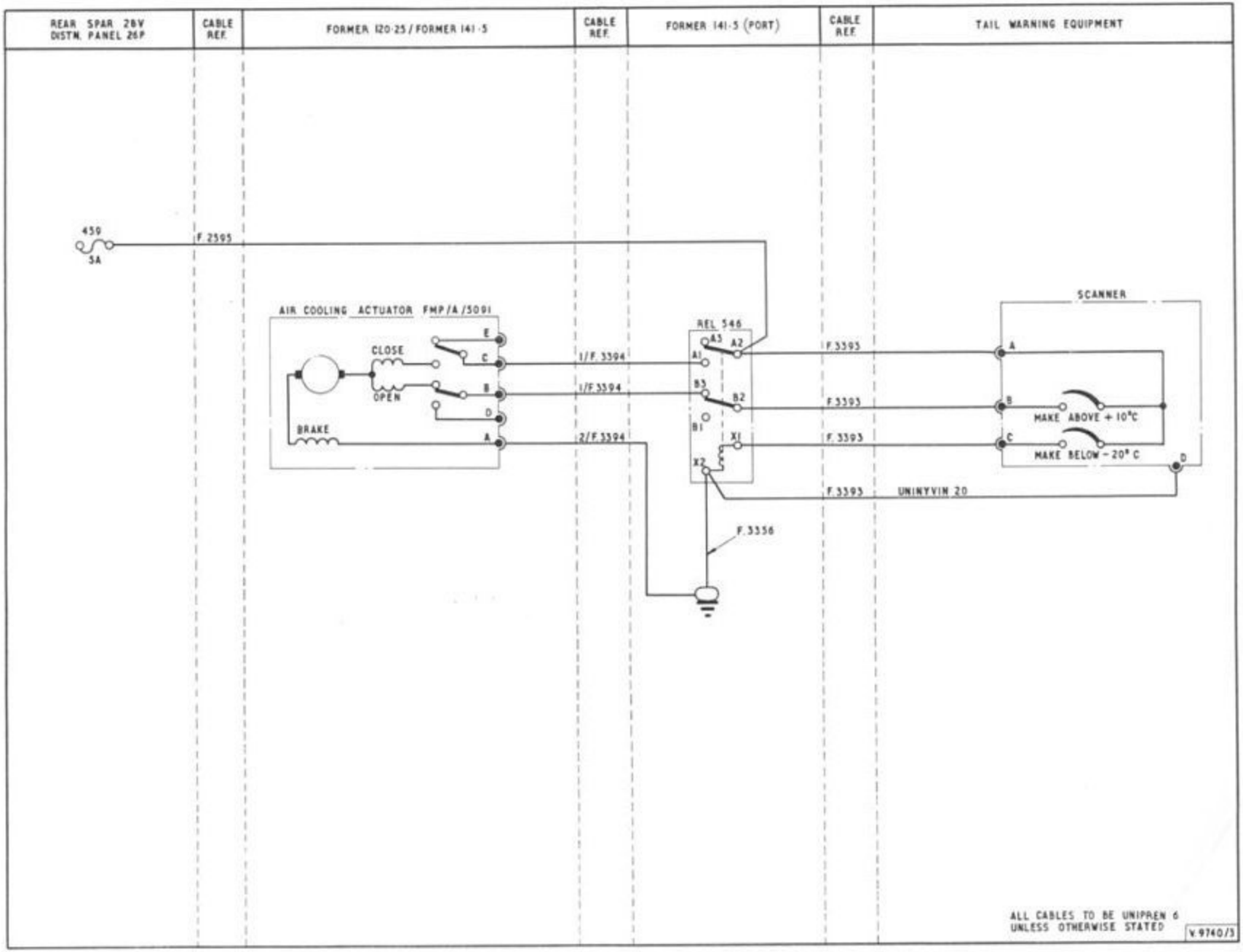
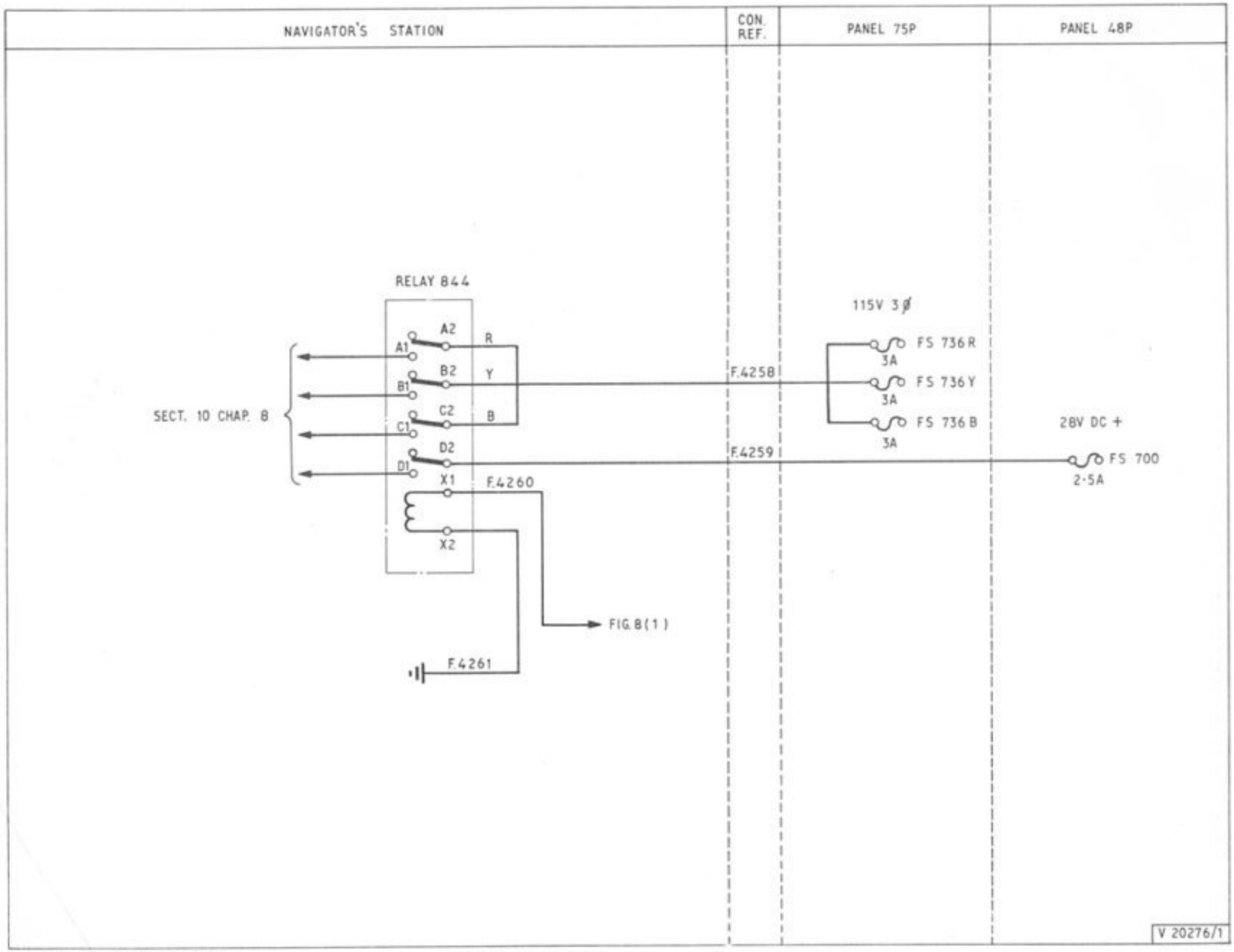


FIG. 14 A.R.I 5952 scanner cooling



8233471 453 8.81. B.A.e 1354

Fig. 15 ARI 18235 power supplies