

Fig.1 Normal and emergency A.C. supplies

RESTRICTED

Introduction

1. This group contains descriptive and servicing information on the aircraft's a.c. power and distribution services with Mods.353 and 395 embodied. Information on subsequent modifications, including those applicable to Mk.1A aircraft is also given.

2. Illustrations giving the location and details of the equipment are provided, together with theoretical circuit diagrams, which present the circuits in simplified form. The necessary routing charts follow the text at the end of the group. Note that the tables for all fuse distribution are contained in Group 1.

General

4. Two sources of a.c. power are provided for the various aircraft installations. For general use, a supply at 115 volts, 3-phase, 400 c/s is required, and for certain loads, a further supply at 115 volts, single-phase, 1,600 c/s is required.

5. The a.c. power is supplied by five inverters, three of which are Type 350, and the other two, Type 153 or 153A. Each inverter is allotted a specified role as follows:-

Inverter	Type	Role
No.1	350	Supplies for N.B.S. (A.R.I.5810).
No.2	350	Emergency standby.
No.3	350	Essential loads as follows:- G4B compass Artificial horizon (port) Zero reader Non-essential loads as follows:-

3. The modifications included in this group are as follows:-

Mod.353 - Introduction of zero reader flight director.

Mod.395 - Deletion of Type 100A inverter and transfer of G4B compass supplies to No.3 inverter, Type 350.

Mod.675 - Introduction of Type 153A inverters in lieu of Type 153.

Mod.755 - Introduction of 5 amp. fuse in supply line to power unit, Type 729 (H2S).

Mod.867 - Introduction of 5 amp. fuse in supply line to control unit, Type 595 (H2S).

Mod.1201- Deletion of calculator, Type 7, (N.B.C.) and associated supplies.

Mod.1253- Introduction of a rectifier in No.3 inverter control circuit to prevent malfunction during shut-down.

Mod.1453- To increase the 5 amp. fuse introduced by Mod.867 to 10 amp. (Supply to control unit, Type 595).

DESCRIPTION AND OPERATION

A.R.I.'s 23023 - 5848
- 18090 - 5816 - and
5800 (Mk.1 aircraft
only).

Note A.R.I.18107/13 Tacan installation is fitted to certain Mk.1A aircraft in place of A.R.I.5816 Gee.

No.4 153 or 153A Supplies for auto-pilot, Mk.10, and A.R.I.5844 (On Mk.1A aircraft A.R.I.5844 is deleted and supplies are used for A.R.I.5924).

No.5 153 or 153A Supplies for A.R.I.5851.

6. The outputs of the inverters are fed to main distribution points in panels 11P and 22P, fused feeders being used to connect the supplies to the consumer loads. The fuse distribution is shown in fig.12, and the associated fuse table is contained in Group 1.

7. The N.B.S. installation is screened throughout. Since the connectors to the components have to be broken at panel

11P to allow connection to be made to relays etc. within the panel, that part of the panel (lower) containing the control equipment is screened, continuity of screening being assured by employing screened plug and socket entries to the panel. Testing of the supplies can be made from two test sockets No.595 and 594, fitted one on 11P and one in the starboard side of the nose section respectively.

CONTROLS AND INDICATORS

8. The complete a.c. supply system is shown schematically in fig.1. Control of the five inverters is effected by switches on the a.c. supplies switch panel at the navigator's station, and neon lamps are fitted on the same panel to give indication of 115-volt, 3-phase, 400 c/s power failure. In addition to neon lamps, a magnetic indicator on the panel gives power failure indication for No.3 inverter. This indicator is energised either by the selection of a standby-stop-normal switch to STANDBY, or via the d.c. contacts of a

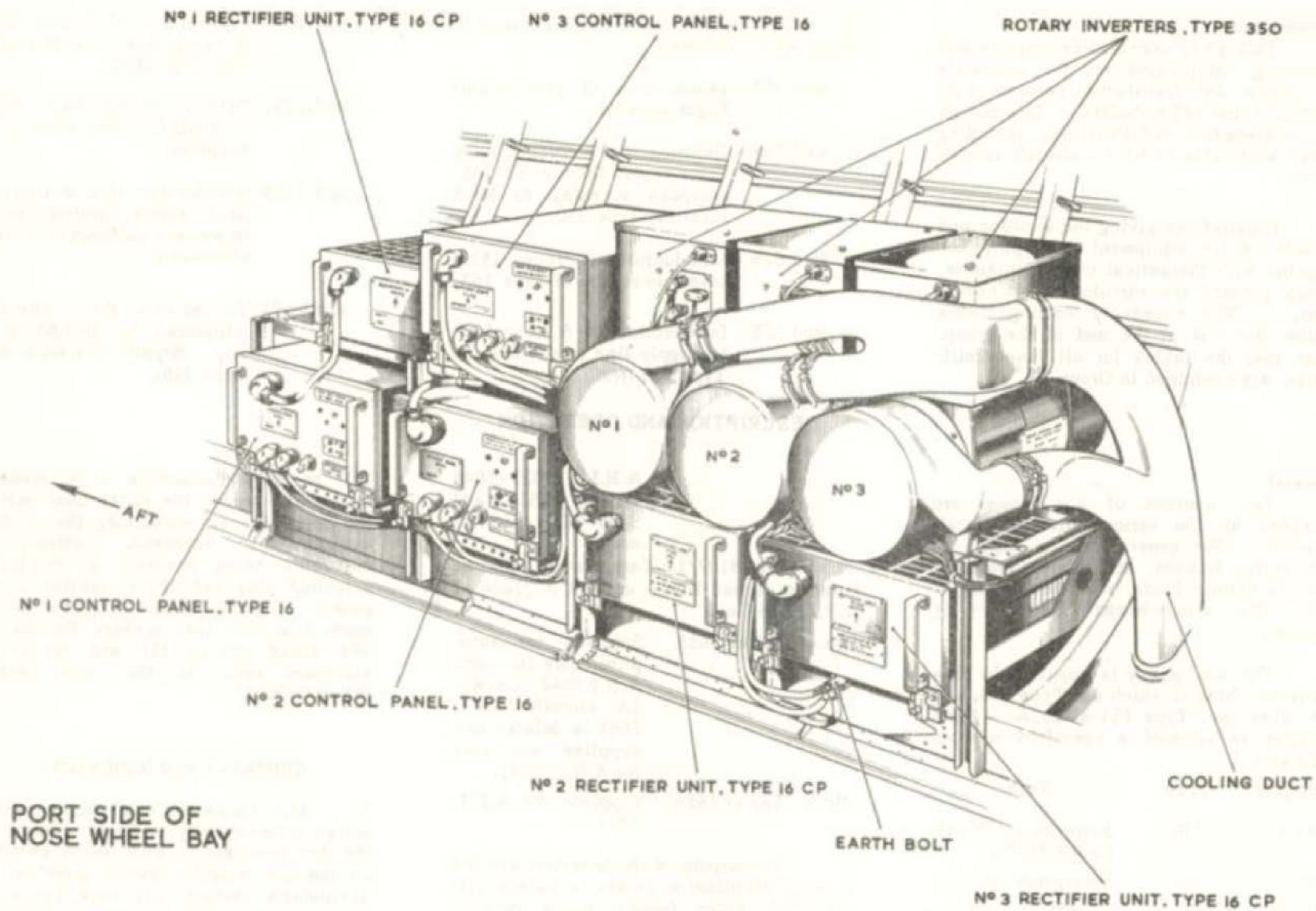


Fig.2 Location of type 350 inverters
RESTRICTED

torque switch (No.2), which in turn is operated by the 400 c/s output of No.3 inverter. The indicator shows black (energised) when normal supplies are available from No.3 inverter, and white (de-energised) when a failure of these supplies occurs.

Automatic transfer

9. In the event of failure of No.3 inverter, its essential consumer loads are automatically changed over to No.2 inverter. However, in these circumstances, should No.2 inverter also fail, the essential loads can be reverted to No.3 inverter output by selecting the standby-stop-normal switch to STANDBY. A voltmeter and a frequency meter are provided for checking the inverter outputs (see para.11).

Manual transfer

10. A manually-operated change-over switch, labelled EMERGENCY SELECTION on the a.c. supplies switch panel, provides the means of transferring the non-essential loads of Nos.1, 3 or 4 inverters to No.2 inverter. As only one manual transfer can be accommodated at any one time, this means that if more than one inverter should fail, the crew will have to decide which selection is required to serve the situation. No standby supply is provided for the consumer load of No.5 inverter, and failure of this machine will render the A.R.I.5851 inoperative.

Frequency meter and voltmeter

11. A frequency meter, Ref.No.5Q/25706, and a voltmeter, Ref.No.5Q/25704, with selective switching to the output of No.2 or 3 inverter, are fitted on a panel at the navigator's station (see para.9). This will enable the responsible crew member to decide by comparison which output can best serve the essential loads in conditions of supply failure. The selector switch, labelled MAIN-STANDBY will connect the

instruments to No.3 inverter at MAIN and to No.2 inverter at STANDBY.

Indicators on radar panel

12. In addition to the power failure neon lamps available on the a.c. supplies switch panel, two further neon lamps are positioned on the navigator's radar panel to provide indication that the 115-volt, 3-phase, 400 c/s supply from No.1 inverter is switched on. Failure of the supply will cause the indicators to go out.

TYPE 350 INVERTERS

13. The three Type 350 inverters, together with their associated control panels and rectifier units, are fitted in a compact group at the forward end, port side of the nose wheel bay. Their arrangement and method of securing is illustrated in fig.2. Designed to give outputs of 115-volt, 3-phase, 400 c/s and 115-volt, single-phase, 1,600 c/s, these units are driven by d.c. motors operating on 112 volts. The inverters are fitted with extractor fans which ensure adequate cooling whilst the aircraft is on the ground. Additional cooling to satisfy airborne conditions is provided by piped connections to a ram air intake in the structure below the inverters. To prevent damage to the inverters due to ingress of ice particles, the cooling duct is fitted with a de-icing heater, details of which will be found in Group 8 of this publication. The outputs of the inverters are fed to the main distribution points in panel 11P. A full description of the Type 350 inverter, and associated control panel and rectifier unit, is given in A.P.4343B, Vol.1.

Starting and control

WARNING. . .

It is important to ensure that the 1,600 loads are switched off before attempting to start the Type 350 inverters.

14. The starting system requires the link on each inverter to be in the normally closed position; the significance of this is enlarged upon in para.19. To satisfy the normal requirements for limiting starting current, starting relays and associated resistors are embodied in the inverter. Other relays protecting the system from variation of the inverter output in voltage or frequency are contained in the associated control panel, Type 16. The control circuit operates on 28 volts d.c. The following paragraphs, which outline the operation of the system, should be read in conjunction with fig.4 and 5.

No.1 and 2 inverter control switches

15. Two single-pole switches, one to each machine and labelled ON-OFF, are mounted on the a.c. supplies switch panel. In the on position they complete a 28-volt d.c. energising supply to the coils of their respective main contactors. The contactors are mounted on panels 18P and 19P and, in turn, connect a 112-volt d.c. supply to their respective inverters. They will continue to run as long as their 112-volt supply is connected. When the switches are returned to the off position, the contactors will be de-energised to disconnect the 112-volt supply from the inverters, and the machines will stop.

No.3 inverter control switches

16. This inverter is controlled by two single-pole switches on the a.c. supplies switch panel. One functions as a start switch, having two positions, labelled AUTO-MANUAL, and is spring returned to the auto position. The other functions as a stop and standby supplies switch (see para.9 and 18), and has three positions labelled, STANDBY-STOP-NORMAL.

17. In the auto position the auto-manual switch completes a circuit, via the coil of a starting relay (280), by means of which the inverter is automatically started on

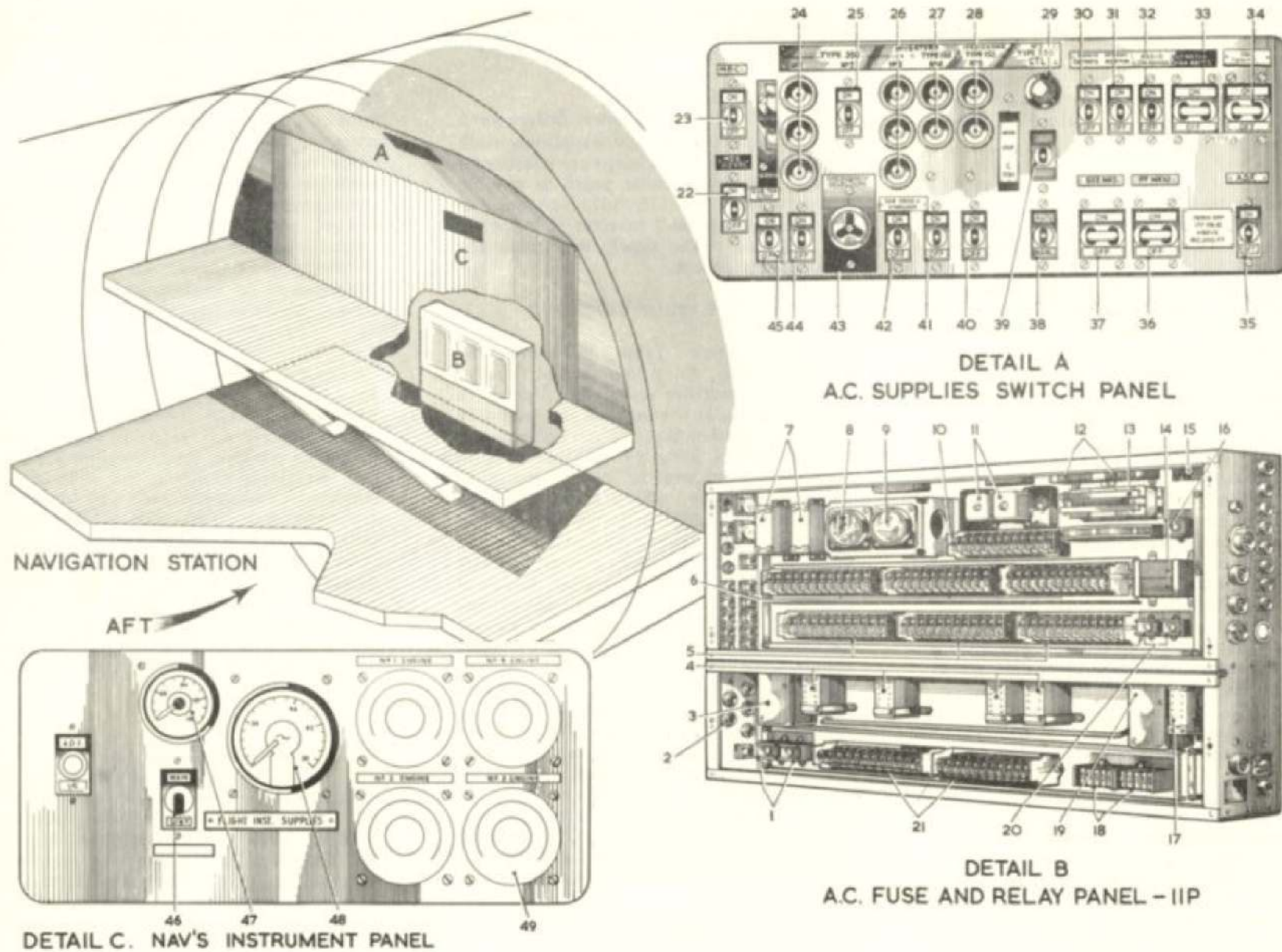
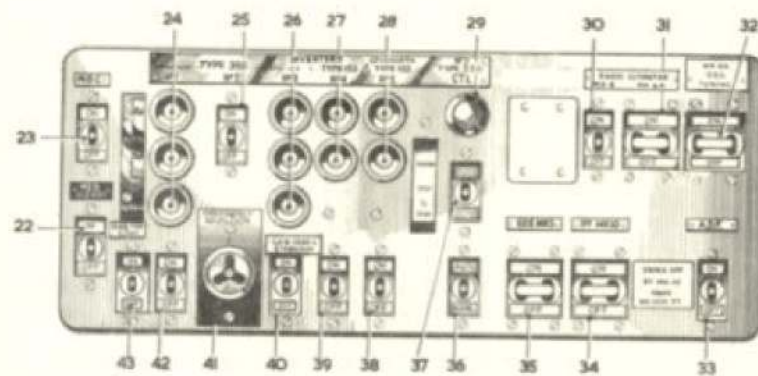
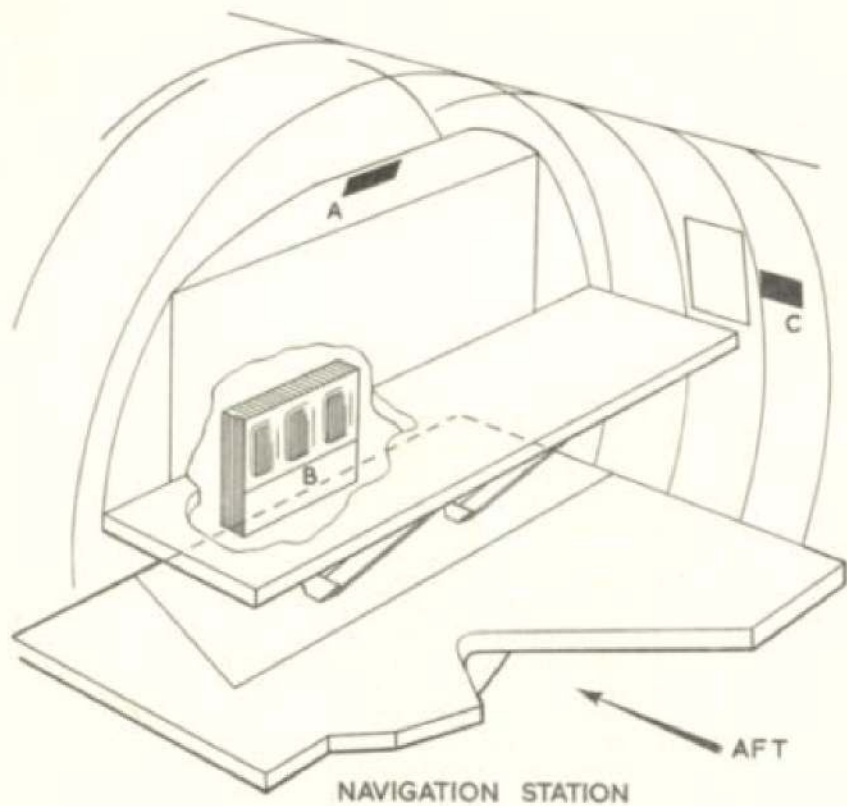


Fig.3 A.C. supply control and distribution - Mk.I aircraft only

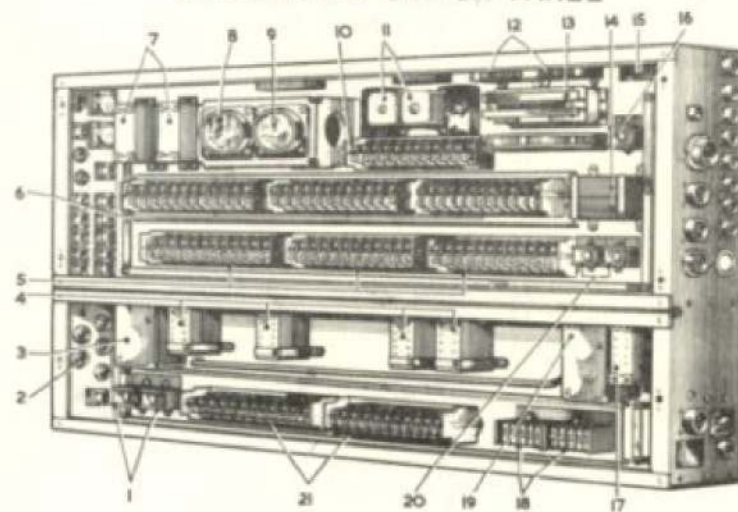
RESTRICTED

KEY TO FIG.3

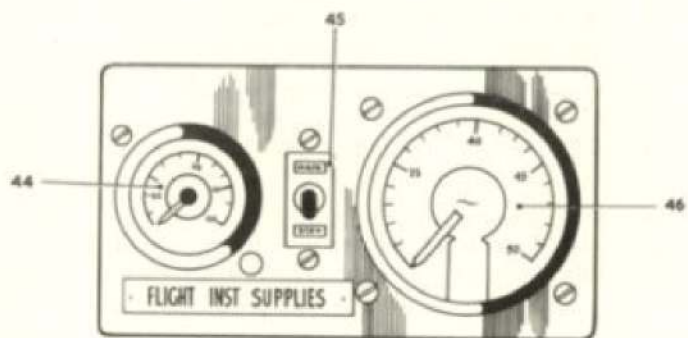
- | | | | |
|----|---|----|--|
| 1 | AVRO CONNECTOR BLOCKS, T.B.778 AND 779 | 25 | NO.2 INVERTER CONTROL SWITCH |
| 2 | TEST SOCKET 595 | 26 | NO.3 INVERTER NEON INDICATORS |
| 3 | SUPPRESSOR, AVRO PART NO.1/V6790 | 27 | NO.4 INVERTER NEON INDICATORS |
| 4 | TYPE S RELAYS 165, 167, 170 AND 171 | 28 | NO.5 INVERTER NEON INDICATORS |
| 5 | FUSES 229 TO 264 | 29 | NO.3 INVERTER MAGNETIC INDICATOR |
| 6 | FUSES 205 TO 228, AND 265 TO 276 | 30 | A.R.1.5844 CONTROL SWITCH |
| 7 | TYPE S RELAYS 160 AND 161 | 31 | A.R.1.5800 CONTROL SWITCH |
| 8 | NO.1 TORQUE SWITCH 'AUTOPILOT, MK.10) | 32 | A.R.1.5378 CONTROL SWITCH |
| 9 | NO.2 TORQUE SWITCH (NO.3 INVERTER) | 33 | A.R.1.18090 CONTROL SWITCH |
| 10 | FUSES 199 TO 204 AND 606 TO 611 | 34 | A.R.1.18090 OSCILLATOR TUNING SWITCH |
| 11 | TYPE Q RELAYS 162 AND 163 | 35 | A.R.1.23023 CONTROL SWITCH |
| 12 | TYPE S RELAYS 168 AND 169 | 36 | A.R.1.5848 CONTROL SWITCH |
| 13 | TRANSFORMER, REF.NO.SUB/5919 (OIL PRESSURE) | 37 | A.R.1.5816 CONTROL SWITCH |
| 14 | TYPE S RELAYS 172 AND 164 | 38 | NO.3 INVERTER START SWITCH |
| 15 | S.B.A.C. CONNECTOR BLOCK, T.B.780 | 39 | NO.3 INVERTER STANDBY-STOP-NORMAL SWITCH |
| 16 | AVRO CONNECTOR BLOCK, T.B.775 | 40 | NO.5 INVERTER CONTROL SWITCH |
| 17 | TYPE S RELAY 351 | 41 | NO.4 INVERTER CONTROL SWITCH |
| 18 | S.B.A.C. CONNECTOR BLOCKS, T.B.781 AND 782 | 42 | G4B COMPASS HEADING AND STABILISER SWITCH |
| 19 | SUPPRESSOR, AVRO PART NO.1/V6790 | 43 | EMERGENCY CHANGE-OVER SWITCH |
| 20 | AVRO CONNECTOR BLOCKS, T.B.776 AND 777 | 44 | NO.1 INVERTER CONTROL SWITCH |
| 21 | FUSES 534 TO 557 | 45 | G4B COMPASS TURN CUT-OUT SWITCH |
| 22 | H25 CONTROL SWITCH | 46 | VOLTMETER AND FREQUENCY METER CONTROL SWITCH |
| 23 | N.B.C. CONTROL SWITCH | 47 | VOLTMETER, REF.NO.5Q/25704 |
| 24 | NO.1 INVERTER NEON INDICATORS | 48 | FREQUENCY METER, REF.NO.5Q/25706 |
| | | 49 | NAVIGATOR'S FUEL CONTENTS GAUGES |



DETAIL A
A.C. SUPPLIES SWITCH PANEL



DETAIL B
A.C. FUSE AND RELAY PANEL - IIP



DETAIL C FREQUENCY & VOLTMETER PANEL

Fig. 3A A.C. supply control and distribution - Mk.IA aircraft only

RESTRICTED

KEY TO FIG.3A

1	AVRO CONNECTOR BLOCKS, T.B.778 AND 779	24	NO.1 INVERTER NEON INDICATORS
2	TEST SOCKET 595	25	NO.2 INVERTER CONTROL SWITCH
3	SUPPRESSOR, AVRO PART NO.1/V6790	26	NO.3 INVERTER NEON INDICATORS
4	TYPE S RELAYS 165, 167, 170 AND 171	27	NO.4 INVERTER NEON INDICATORS
5	FUSES 229 TO 264	28	NO.5 INVERTER NEON INDICATORS
6	FUSES 205 TO 228, AND 265 TO 276	29	NO.3 INVERTER MAGNETIC INDICATOR
7	TYPE S RELAYS 160 AND 161	30	A.R.I.5378 CONTROL SWITCH
8	NO.1 TORQUE SWITCH (AUTOPILOT, MK.10)	31	A.R.I.18090 CONTROL SWITCH
9	NO.2 TORQUE SWITCH (NO.3 INVERTER)	32	A.R.I.18090 OSCILLATOR TUNING SWITCH
10	FUSES 199 TO 204 AND 606 TO 611	33	A.R.I.23023 CONTROL SWITCH
11	TYPE Q RELAYS 162 AND 163	34	A.R.I.5848 CONTROL SWITCH
12	TYPE S RELAYS 168 AND 169	35	A.R.I.5876 CONTROL SWITCH
13	TRANSFORMER, REF.NO.SUB/5919 (OIL PRESSURE)	36	NO.3 INVERTER START SWITCH
14	TYPE S RELAYS 172 AND 164	37	NO.3 INVERTER STANDBY-STOP-NORMAL SWITCH
15	S.B.A.C. CONNECTOR BLOCK, T.B.780	38	NO.5 INVERTER CONTROL SWITCH
16	AVRO CONNECTOR BLOCK, T.B.775	39	NO.4 INVERTER CONTROL SWITCH
17	TYPE S RELAY 351	40	G4B COMPASS HEADING AND STABILISER SWITCH
18	S.B.A.C. CONNECTOR BLOCKS, T.B.781 AND 782	41	EMERGENCY CHANGE-OVER SWITCH
19	SUPPRESSOR, AVRO PART NO.1/V6790	42	NO.1 INVERTER CONTROL SWITCH
20	AVRO CONNECTOR BLOCKS, T.B.776 AND 777	43	G4B COMPASS TURN CUT-OUT SWITCH
21	FUSES 534 TO 557	44	VOLTMETER, REF.NO.5Q/25704
22	H25 CONTROL SWITCH	45	VOLTMETER AND FREQUENCY METER CONTROL SWITCH
23	N.B.C. CONTROL SWITCH	46	FREQUENCY METER, REF.NO.5Q/25706

operation of the engine starting switch. As the engine starting switch will not normally be retained pressed for more than 35 seconds (engine starting cycle), a hold-in supply is applied to the coil of the starting relay. In the manual position, the switch causes the inverter to start independently of the engine starting switch.

18. The standby-stop-normal switch, in the normal position, is in series with the essential supplies change-over relay 164 and the contacts of the No.2 torque switch. In the standby position, the switch energises relay 164, by-passing the torque switch contacts. When the switch is placed in the stop position, relay 164 is de-energised and a 28-volt d.c. supply is connected to the earthy end of relay 280; this cancels the hold-in supply for relay 280, which is de-energised.

Circuit operation

19. The setting of the protective change-over link on the inverters in the normally closed position, introduces into the starting control circuit a 1,600 c/s voltage reference relay, a 1,600 c/s over-volt relay, and a 400 c/s over-volt relay. Referring to fig.4, these are numbered RL1, RL3 and RL4 respectively. Relay RL2 is a thermal delay relay which allows the normally open contacts RL1/a to be short-circuited for a period sufficient to complete the starting cycle.

Switching on

20. When the control switch is placed to ON, a 28-volt d.c. supply is connected through contacts RL2/b, RL4/a and RL3/a to the coil of the starting contactor STR. The 112-volt d.c. supply is now connected through the starting resistance to the motor. Since the initial current is heavy, there will be a considerable voltage drop across the starting resistance. Coil A of relay P is connected across the starting resistance and will carry a large current,

whereas coil B, connected across the motor armature, will carry a small current. This condition is the reverse of that required for relay operation, and the relay contacts remain open. As the motor builds up speed, however, the current demand decreases and the voltage drop across the starting resistance is correspondingly decreased, so that the current through coil A is decreasing as that through coil B is increasing. The relay contacts close when the magnetic effect of coil A is overcome by the magnetic effect of coil B, with the result that relay Q is now energised from the 112-volt supply. The contacts of relay Q, in closing, short-circuit the starting resistance and full line voltage is applied across the motor terminals.

21. With the inverter now running normally on full line voltage, the 1,600 c/s alternator will be supplying the primary winding of the voltage reference transformer. A secondary winding of the transformer is connected through normally closed contacts RL2/a to the heater element of the thermal delay relay. After a short interval, the thermal effect of the element will close contacts DR/1 and so provide a path for current through the coil of relay RL2. Contacts RL2/a will then change over to isolate the element from the voltage reference transformer, and to provide an alternative path to earth for the energising current of relay RL2. In addition contacts RL2/b will open so that, unless contacts RL1/a have closed meanwhile, supply to the contactor STR will be cut off and the inverter stopped.

22. By means of a trimmer resistance, relay RL1 is set to operate at normal controlled output voltage from the 1,600 c/s alternator. If the alternator gives normal output during the starting cycle, relay RL1 will be energised and the closing of contacts RL1/a will offer an alternative path for the energising current to contactor STR, and the inverter will

continue to run. If, however, the output from the 1,600 c/s alternator is such that relay RL1 is not energised, then contacts RL1/a will not close and the inverter will stop when the thermal delay relay is operated.

23. It will be seen also, that if relay RL3 is energised due to excessive voltage output from the 1,600 c/s alternator, or if relay RL4 is energised due to excessive voltage output from the 400 c/s alternator, then the supply to the coil of contactor STR will be cut off due to the opening of contacts RL3/a or RL4/a respectively, and the inverter stopped.

Switching off

24. The inverter may be stopped by placing the control switches of No.1 and 2 to OFF and the standby-stop-normal switch of No.3 to STOP. In each case the 28-volt d.c. supply to the coil of contactor STR is then disconnected and contacts STR/1 open to isolate the inverter from the 112 volt supply.

25. In the case of No.3 inverter, relays 164, 280 and 163 (fig.5) are de-energised in turn prior to the starting contactor 194. Automatic switching off of No.3 inverter in the event of its failure is described in para.31.

Mod.1253

26. When Mod.1253 is embodied, a rectifier, Type GJ-3M, is connected in the No.3 inverter circuit between the coils of relay 280 and contactor 194. This has the effect of blocking the feed via relay contacts 163/2, 164/2, and the coils of relay 280 and contactor 194 in series during shut-down, which would otherwise temporarily energise contactor 194 and prolong the running of the inverter.

Supply indicators

27. Referring to fig.5. since No.2 inverter

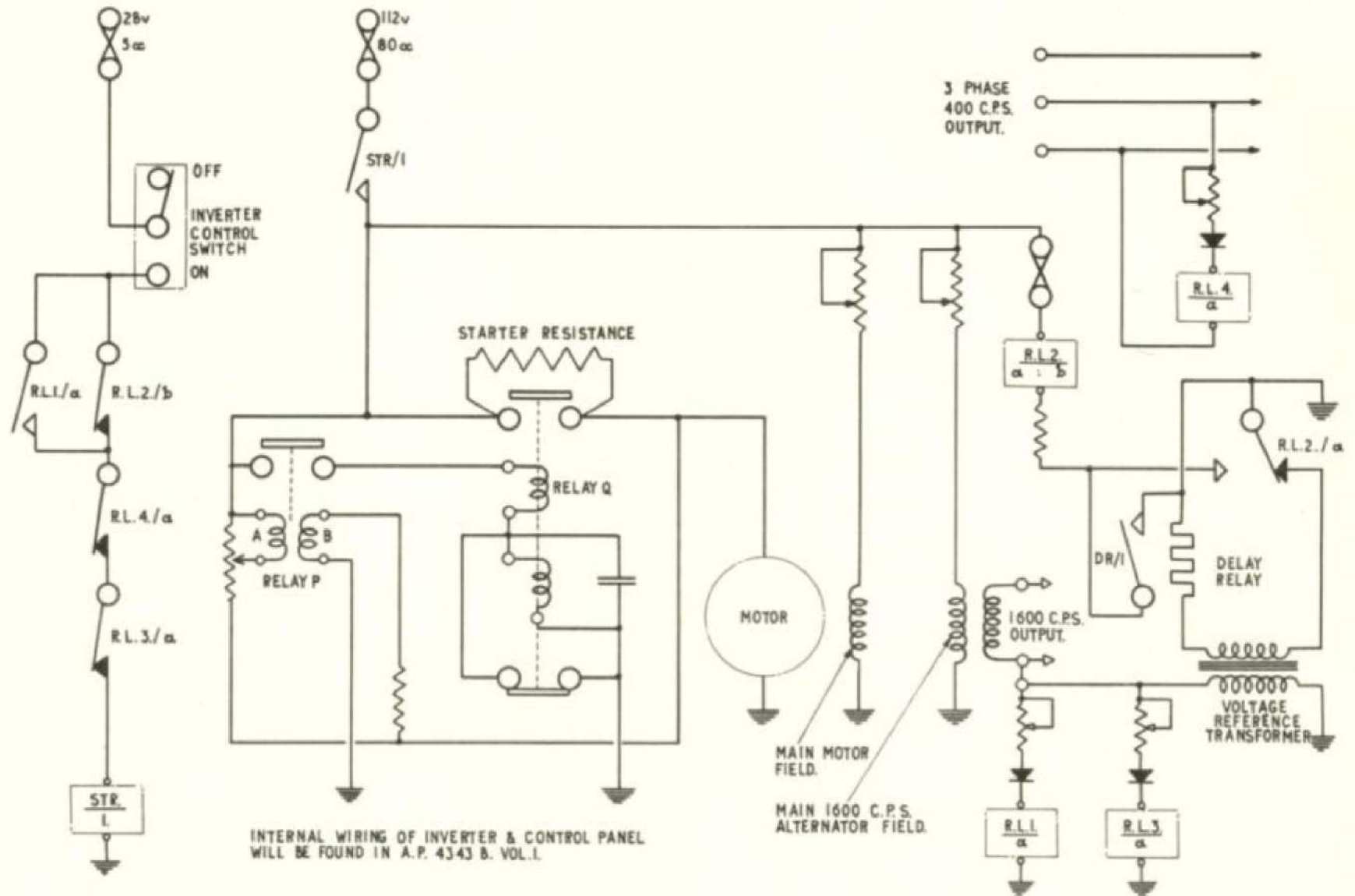


Fig.4 Type 350 inverter starter control

RESTRICTED

is not required to supply any consumer loads other than during conditions of emergency due to failure of one or more of the other inverters, normal conditions will exist with Nos. 1, 2 and 3 inverters switched on, and the emergency change-over switch in the off position. The No.1 inverter 115-volt, 3-phase, 400 c/s output will be applied to the consumer loads through relay contacts 171/4 and 171/6. The neon lamps will be supplied through relay contacts 171/2 and 171/8, giving indication that supplies are available. Similarly, the No.1 inverter 115-volt, single-phase, 1,600 c/s output will be applied to the consumer loads through relay contacts 170/2 and 170/4, these contacts also supplying the single-phase neon indicator.

28. The No.3 inverter 115-volt, 3-phase, 400 c/s output will be applied to the non-essential loads via relay contacts 172/8 and 172/4. The neon lamps will be supplied via relay contacts 172/2 and 172/6. The No.3 inverter 115-volt, single-phase, 1,600 c/s output will be applied to the consumer loads via relay contacts 169/2, and the neon indicator for this output will be supplied through relay contacts 169/4.

Manual transfer

29. Should the failure of No.1 inverter occur, warning of such failure will be given by the associated neon indicators. If position 1 is selected on the emergency change-over switch, a 28-volt d.c. supply from fuse 219 will energise relays 170 and 171. The No.1 inverter 3-phase consumer loads will be cut off from No.1 inverter by the opening of contacts 171/4 and 171/6 and transferred to No.2 inverter by the closing of contacts 171/3 and 171/5. The No.1 inverter single-phase consumer loads will be cut off from No.1 inverter due to the opening of contacts 170/2 and 170/4, and transferred to No.2 inverter by the closing of contacts 170/1 and 170/3. The neon indicators normally supplied by No.1 inverter will be switched to No.2 inverter

and will thus indicate to the crew that supplies are again available for the operation of those consumer loads normally fed from No.1 inverter.

30. In the event of No.3 inverter failing, automatic transfer to standby supplies for the essential loads is carried out as described in para.31. The non-essential loads, however, are transferred manually, by selection of position 3 on the emergency change-over switch, when the following action occurs. Relays 169 and 172 are energised, and the 3-phase loads are transferred from relay contacts 172/4 and 172/8 fed from No.3 inverter, to relay contacts 172/3 and 172/7 fed from No.2 inverter. Neon indication of supplies is transferred from relay contacts 172/2 and 172/6 to 172/1 and 172/5. The single-phase 1,600 c/s loads are transferred from relay contacts 169/2 to 169/1 and neon indication from 169/4 to 169/3.

Automatic transfer - No.3 inverter

31. The transfer of essential loads to No.2 inverter is effected by the change-over relay 164. This relay is energised by a 28-volt d.c. supply via the contacts of No.2 torque switch, which is operated by the output of No.3 inverter. Should this output fail, the torque switch contacts will open to disconnect the d.c. supply and de-energise the relay. The following action will then occur:-

- (1) The magnetic indicator on the a.c. supplies switch panel will be de-energised to show white. This will denote a supply failure in addition to the normal neon failure indication.
- (2) Opening of relay contacts 164/3 and 164/5 will disconnect the essential loads from No.3 inverter output.
- (3) Closing of relay contacts 164/2 will complete a 28-volt d.c. supply from

fuse 217, via relay contacts 163/2 to the earthy end of the coil of relay 280. This will cancel the hold-in supply to the coil and the relay will be de-energised. The resultant opening of relay contacts 280/1 will de-energise contactor 194, which will open to isolate the No.3 inverter from the 112-volt d.c. supply and stop the machine. It will be seen also that the opening of relay contacts 280/2 will de-energise relay 163 to open contacts 163/2 and isolate the supply from fuse 217.

NOTE . . .

Although the essential loads will be transferred and supplied automatically, the neon indicators of No.3 inverter will only be energised by No.2 inverter output on the manual operation of the emergency change-over switch to transfer the non-essential loads.

32. If, after automatic change-over of essential loads from No.3 inverter, No.2 inverter should subsequently fail, the essential loads can be reverted to No.3 inverter by selection of the standby-stop-normal switch to STANDBY. A supply from fuse 217 will then bypass the torque switch contacts to energise relay 164, and the essential loads will be reconnected to No.3 inverter via contacts 164/3 and 164/5.

TYPE 153 INVERTERS

33. The Type 153 inverter is designed to give an output of 115 volts, 3-phase, 400 c/s a.c., with an input of 110 to 116 volts d.c. Two such inverters, Nos.4 and 5, are fitted under the navigator's chair, their associated starter panels, control panels and rectifier units being installed on the starboard side of the cabin under the crew's floor as illustrated in fig.6.

Mod.675

34. When Mod.675 is embodied, the

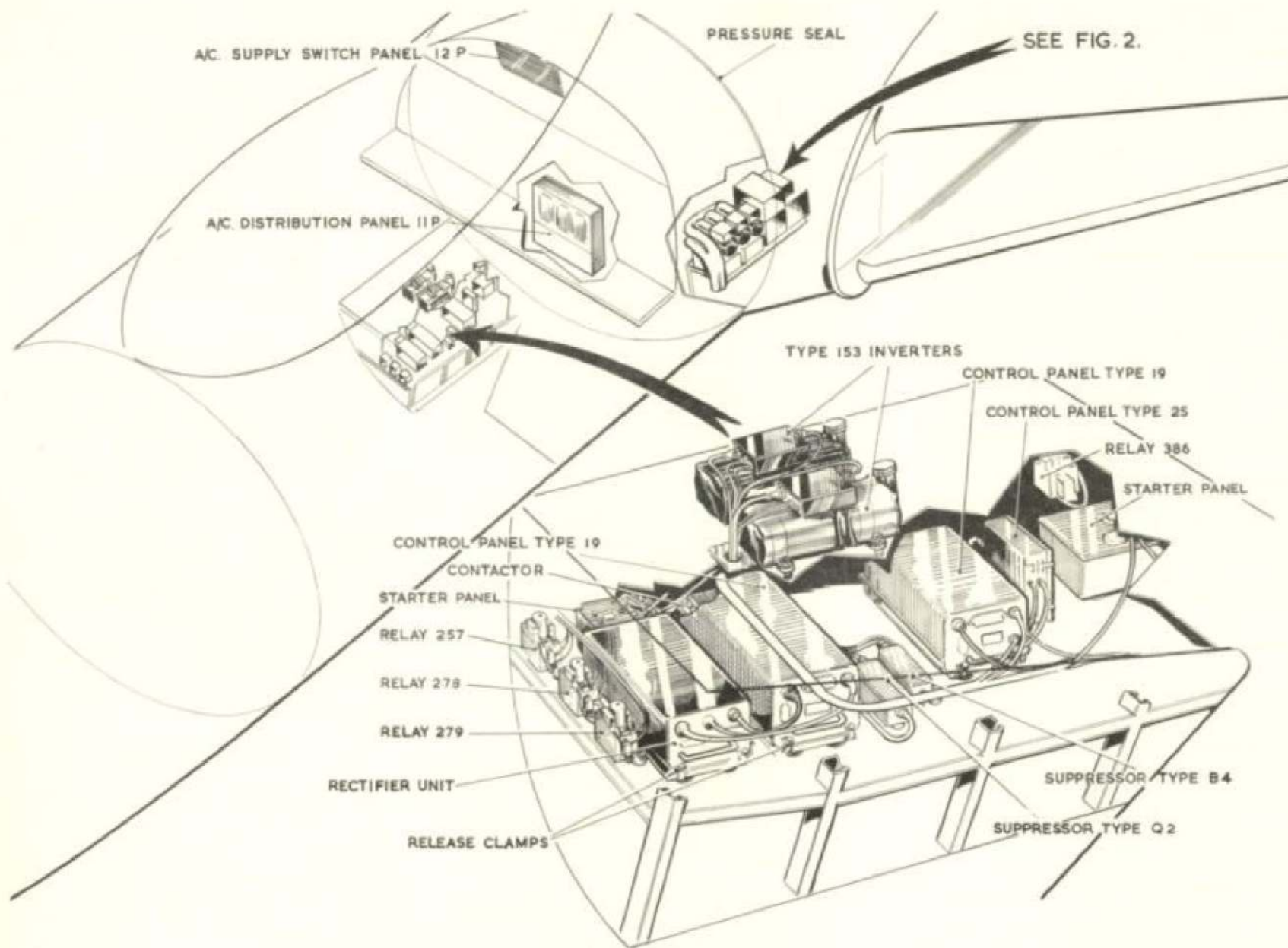


Fig. 6 Location of Type 153 inverters

RESTRICTED

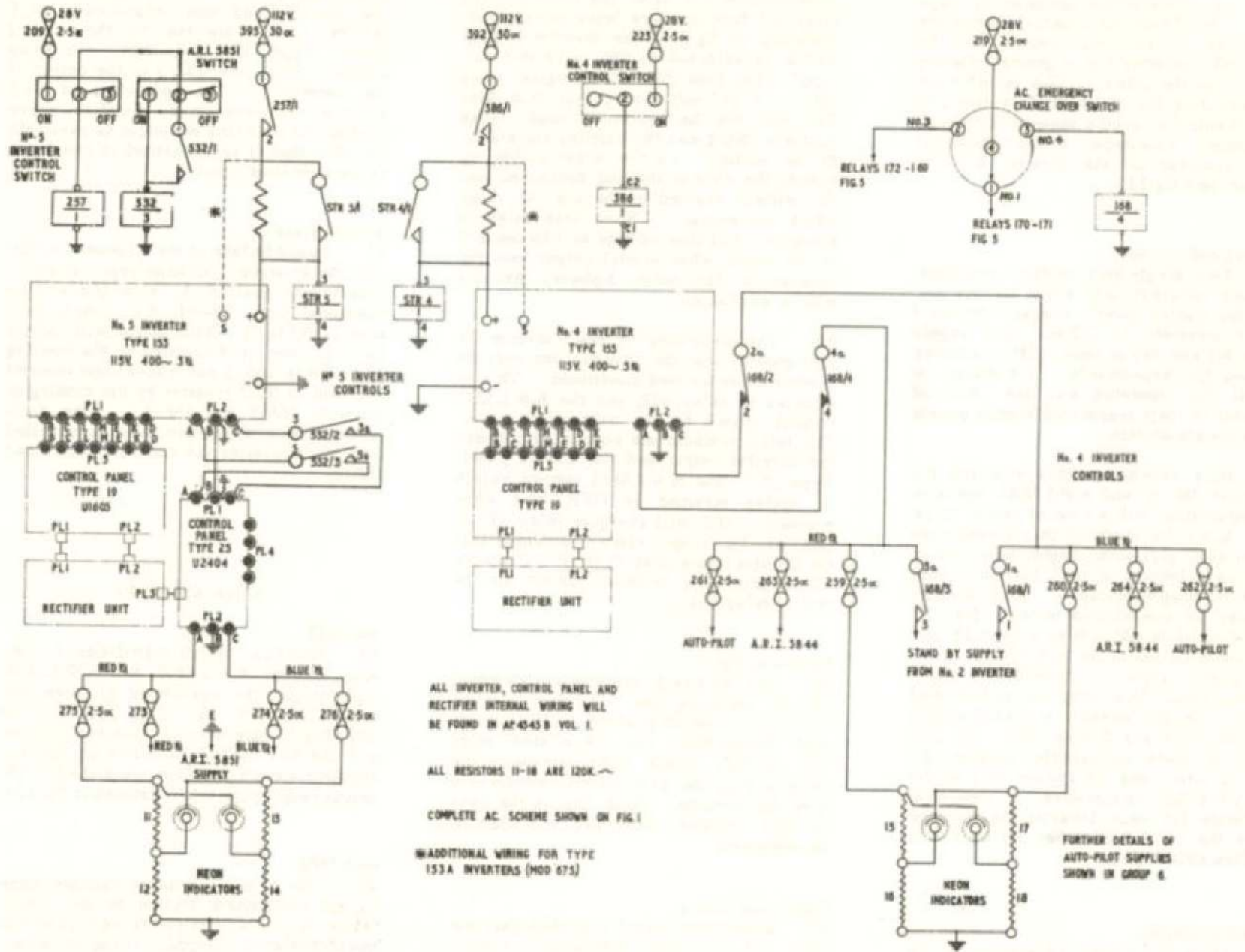


Fig. 7 Type 153 inverters control

RESTRICTED

Type 153 inverters are replaced by Type 153A. No difference exists between the two types of machines, except that the Type 153A inverter has a greater starting torque than the other. This is achieved by connecting the shunt winding direct to the 112-volt d.c. supply instead of through the starter resistance, a shunt terminal being provided on the inverter for this purpose (see fig.11).

Starting and control

35. Two single-pole control switches, labelled ON-OFF, and fitted on the a.c. supplies switch panel, connect the No.4 and 5 inverters to 112-volt d.c. supply fuses 392 and 395 in panel 18P, via relays 386 and 257 respectively. The relays are 28-volt d.c. operated, and are mounted adjacent to their respective starter panels at the crew's station.

36. No.4 inverter, which supplies the autopilot, Mk.10, and A.R.I.5844, operates in conjunction with a control panel, Type 19. Since the loads of this inverter are essential to protracted flight, provision is made for selection to No.2 inverter in the event of supply failure. No.5 inverter operates in conjunction with a Type 25 control panel in addition to a Type 19, and provides supplies to the A.R.I.5851. Control panel, Type 25, provides a pulse supply direct from plug 4, and control panel, Type 19, provides a normal supply via fuses 273 and 274 in 11P. No provision is made for standby supplies for No.5 inverter, and its failure will render the A.R.I.5851 inoperative. Two neon indicators for each inverter are located above the control switches on the a.c. supplies switch panel.

Circuit operation

37. Since the method of starting is the same for each inverter, the following sequence for No.4 inverter will apply

equally to No.5 inverter, the corresponding relay and fuse numbers being substituted. Referring to fig.7, if the inverter control switch is selected to ON, a 28-volt d.c. supply from fuse 223 will energise relay 386. A 112-volt d.c. supply from fuse 392 will now be applied through relay contacts 386/1 and the starting resistance to the motor. As the motor builds up speed, the current demand decreases and the voltage applied to the coil of relay STR4 increases. When this relay is energised, full line voltage will be applied to the motor, when normal output from the inverter at 115 volts, 3-phase, 400 c/s will be available.

38. The switching of No.5 inverter is arranged so that the inverter can only be started under no load conditions. This is effected by relay 532, and the A.R.I.5851 control switch on the navigator's panel. The relay contacts are connected between the inverter output and the control panel, Type 25. The A.R.I.5851 control switch is spring returned to OFF, and when pressed to ON, will energise relay 532 to complete the supply circuit, provided that the inverter control switch is ON. Contacts 532/1 provide a 'hold-in' circuit for the coil of relay 532.

Switching off

39. The No.4 or 5 inverters are switched off by returning the respective control switches to the off position. This action will de-energise the associated relay 386 or 257, which will disconnect the inverter from the 112-volt d.c. supply and stop the machine. Note, that in the case of No.5 inverter, relay 532 will also be de-energised.

Supply indicators

40. Reference to fig.7 will show that the load and the neon indicators of No.4 inverter are connected to the output of that machine via normally closed relay contacts

168/2 and 168/4. It will also be seen that the load and neon indicators of No.5 inverter are connected to the control panel, Type 25, and then, via relay contacts 532/2 and 532/3 to the output of the inverter. The indicators of No.5 inverter when energised, therefore, serve to show not only that an output is available but also that it is connected to the fuses of the consumer circuit.

Manual transfer

41. Should failure of No.4 inverter occur, and the emergency change-over switch is selected to position 4, relay 168 will be energised by a 28-volt d.c. supply from fuse 219 (Fig.7). This action will isolate the load from No.4 inverter by the opening of contacts 168/2 and 168/4, and connect the load to No.2 inverter by the closing of contacts 168/1 and 168/3. Also, No.4 inverter neon indicators will be supplied from No.2 inverter via contacts 168/1 and 168/3.

MK.1A AIRCRAFT

Mod.613

42. Mod.613, which introduces E.C.M., also deletes A.R.I.5800 and A.R.I.5844. Accordingly, the associated supplies from fuses 210, 215, 263, 264, 231, 232 and 270 (Fig.13) are deleted, (but see para.44) and the two control switches on the a.c. supplies switch panel are blanked off. The revised supply circuits are shown in fig.13A.

Mod.1186

43. Due to the necessary changes made at the navigator's station by the installation of E.C.M. equipment, Mod.1186 has been introduced to reposition the voltmeter, frequency meter and associated main-standby switch from the navigator's fuel

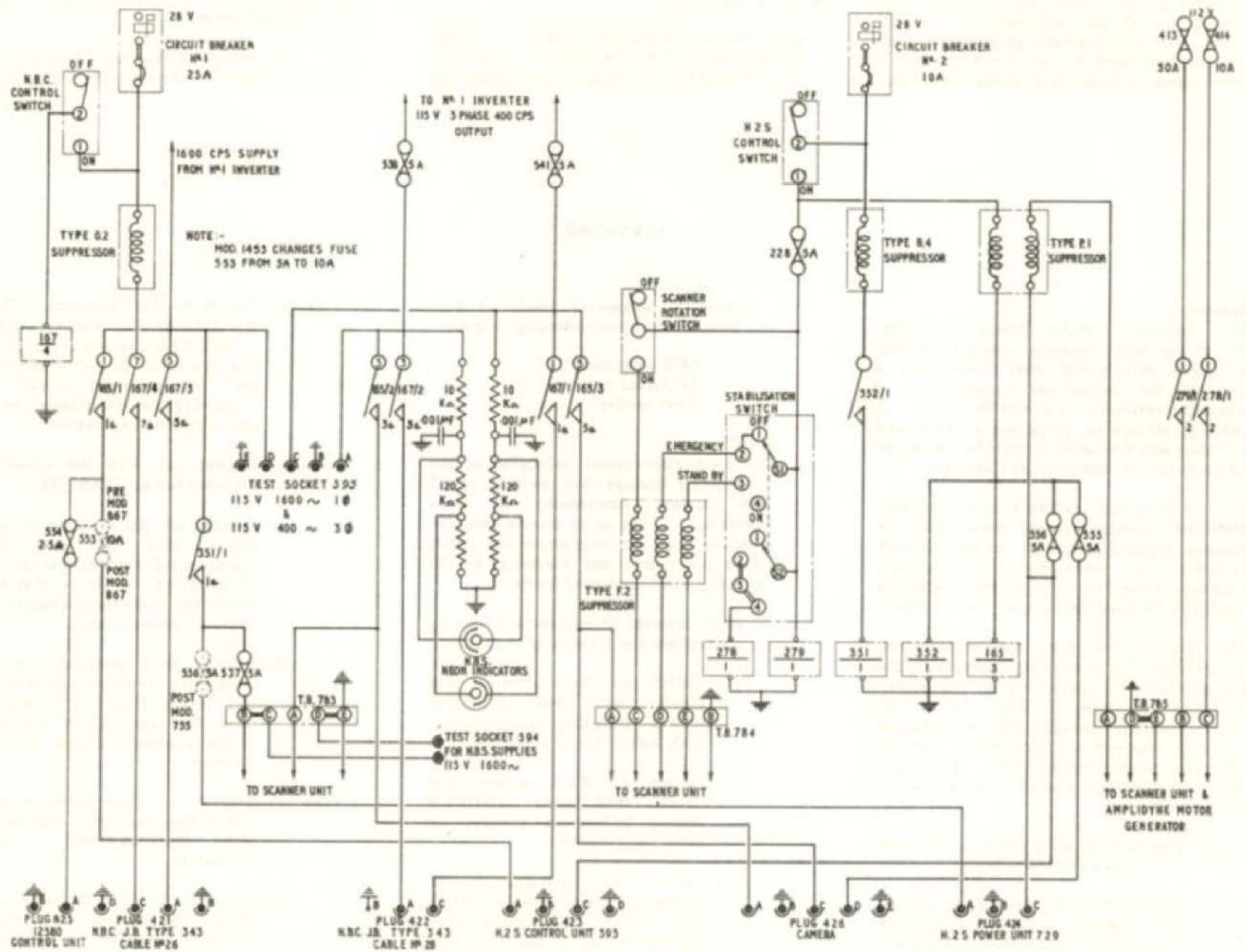


Fig 8 Screened radio and radar supplies
 (4 Fuse 414 changed to 10A)

RESTRICTED

contents gauge panel (fig.3) to the port side of the aircraft adjacent to 10P (fig. 3A). The fuel contents gauges have also been repositioned to the lower portion of the navigator's panel just above the table.

General

46. Periodic checks should be carried out on the five inverters, control panels, rectifiers, relays and other components in line with the instructions contained in the relevant sections of A.P.4343B, Vol.1. In addition, all cables, plugs and sockets, and switches and indicators should be inspected for cleanliness, security and damage.

47. Functional testing of the inverters when the aircraft is on the ground with the engines stopped should be carried out with 112-volt d.c. and 28-volt d.c. ground supplies connected. The internal batteries must NOT be used for running the inverters.

48. Before switching on the inverters, ensure that the necessary power supplies are available by switching on the battery isolation switches. The 112-volt and 28-volt bus-bar voltages will be indicated on the respective voltmeters on the generator control panel 10P. Testing of the five inverters should now be carried out as follows:-

- (1) Ensure that all 1,600 c/s consumer loads are switched off.
- (2) Ensure that the emergency change-over switch on the a.c. supplies switch panel is in the off position.
- (3) Switch on No.2 inverter and check

◀ S.O.O. Mod.1630

44. On certain Mk.1A aircraft A.R.I.5816 is replaced by A.R.I.18107/13. Details of the A.R.I.18107/13 Tacan installation can

SERVICING

that the essential loads of No.3 inverter function correctly, viz:-

G4B compass
Artificial horizon
Zero reader

NOTE . . .

At each subsequent selection of the emergency change-over switch, check the correct functioning of these systems. This is to ensure that the transfer of the non-essential loads does not cause any variation in the supply to the essential loads.

- (4) No.2 inverter should remain running throughout the following checks:-
 - (a) Switch on No.1 inverter and check that neon indication shows supplies available at both 400 c/s and 1,600 c/s.
 - (b) Switch off No.1 inverter and check that neon indication shows failure of supply on both frequencies.
 - (c) Select No.1 position on the emergency change-over switch and check that No.1 neon indicators show that standby supplies on both frequencies are available.

be found in Book 3, Sect.6, Chap.2, App.2 of this publication.

45. The supplies for the Tacan installation are shown in the routing chart fig.17. ▶

- (5) (a) Switch on No.3 inverter. With the standby-stop-normal switch at NORMAL check that supplies are available to both essential and non-essential loads by observing the associated neon and magnetic indicators.
 - (b) Repeat (a) with the standby-stop-switch at STANDBY.
 - (c) Switch off No.3 inverter, and check that the neon and magnetic indicators show failure of supplies. Check that the essential loads have transferred to No.2 inverter output.
 - (d) Select No.3 position on the emergency change-over switch and check that No.3 inverter neon indicators show transfer of non-essential loads to No.2 inverter.
- (6) (a) Switch on No.4 inverter and check that the neon indicators show that supplies are available.
 - (b) Switch off No.4 inverter and check that the indicators show failure of supplies.
 - (c) Select position 4 on the emerg-

RESTRICTED

ency change-over switch, and check that No.4 inverter neon indicators show that standby supplies are available.

- (7) Return the emergency change-over switch to the off position.
- (8) Switch off No.2 inverter.
- (9) Switch on No.5 inverter and check that the neon indicators show that supplies are available. Switch off the inverter.

General

52. Where it is necessary to remove major components from the aircraft, it is essential that use be made of proper ground equipment if damage to components is to be avoided. Where more than one man is necessary for a particular removal, no attempt should be made to carry out the task single-handed.

Type 350 inverters and equipment

53. The removal of these inverters requires two men and the use of a 'Safety Raiser', or similar adjustable trestle. The procedure is as follows:-

- (1) Position the 'Safety Raiser' in the nose wheel bay under the inverters.
- (2) Raise the platform to a convenient level for removing the equipment.
- (3) Disconnect the inverters, and remove the securing bolts from the rack in each case.

Supply checks

49. Checks for the correct voltage and frequency outputs of No.1 inverter can be made from test socket 595 on 11P. An additional check on the 1,600 c/s supply to the H2S equipment can be made from test socket 594 in the starboard side of the nose section, but in this case No.2 circuit breaker on 3P must be closed and the H2S control switch on the navigator's radar panel must be on, in order to switch on the supply.

50. Similar checks on the outputs of the other inverters should be made between

the appropriate fuse and earth in 11P.

Line checks

51. Line checks should be carried out on distribution circuits either by functional testing of the associated equipment, or by connecting suitable test lamps at terminal plugs or terminal blocks and switching on the control switches, having first switched on the battery isolation switches. The servicing of individual systems should be carried out in accordance with the instructions contained in the relevant groups of this publication.

REMOVAL AND ASSEMBLY

- (4) Loosen the hose clip securing the cooling manifold to the front of each inverter, and ease the manifold clear of the inverters.
- (5) Disconnect and remove the three rectifier units. These are held in position on the rack by quick release clamps as illustrated in fig.2.
- (6) Disconnect and remove the three control panels. These are secured to the rack in similar manner to the rectifier units.
- (7) Slide No.1 inverter inboard, one man taking the weight as it clears the rack. Lower the inverter on to the platform. Repeat with Nos.2 and 3 inverters in turn.
- (8) Lower the 'Safety Raiser' and transfer the equipment to a suitable trolley for transportation.

54. Where it is necessary to remove only one inverter, note that great care should be exercised in removing the inverter from the rack on to the platform, in view of the restricted working space.

Type 153 inverters and equipment

55. Precautions similar to those outlined for the Type 350 inverters should be taken, a suitable platform being placed adjacent to the entrance door to receive the components once they have been removed from their mountings. The inverters, which are positioned under the navigator's seat, should first be disconnected, then freed by removing the securing bolts, and lowered to the second man to be placed safely on the platform.

56. The control panels, rectifier units and starter panels are secured to the rack under the crew's floor and their removal is straightforward (see fig.6 for positions of components). Having lowered the platform, the equipment may be safely transferred to a suitable trolley.

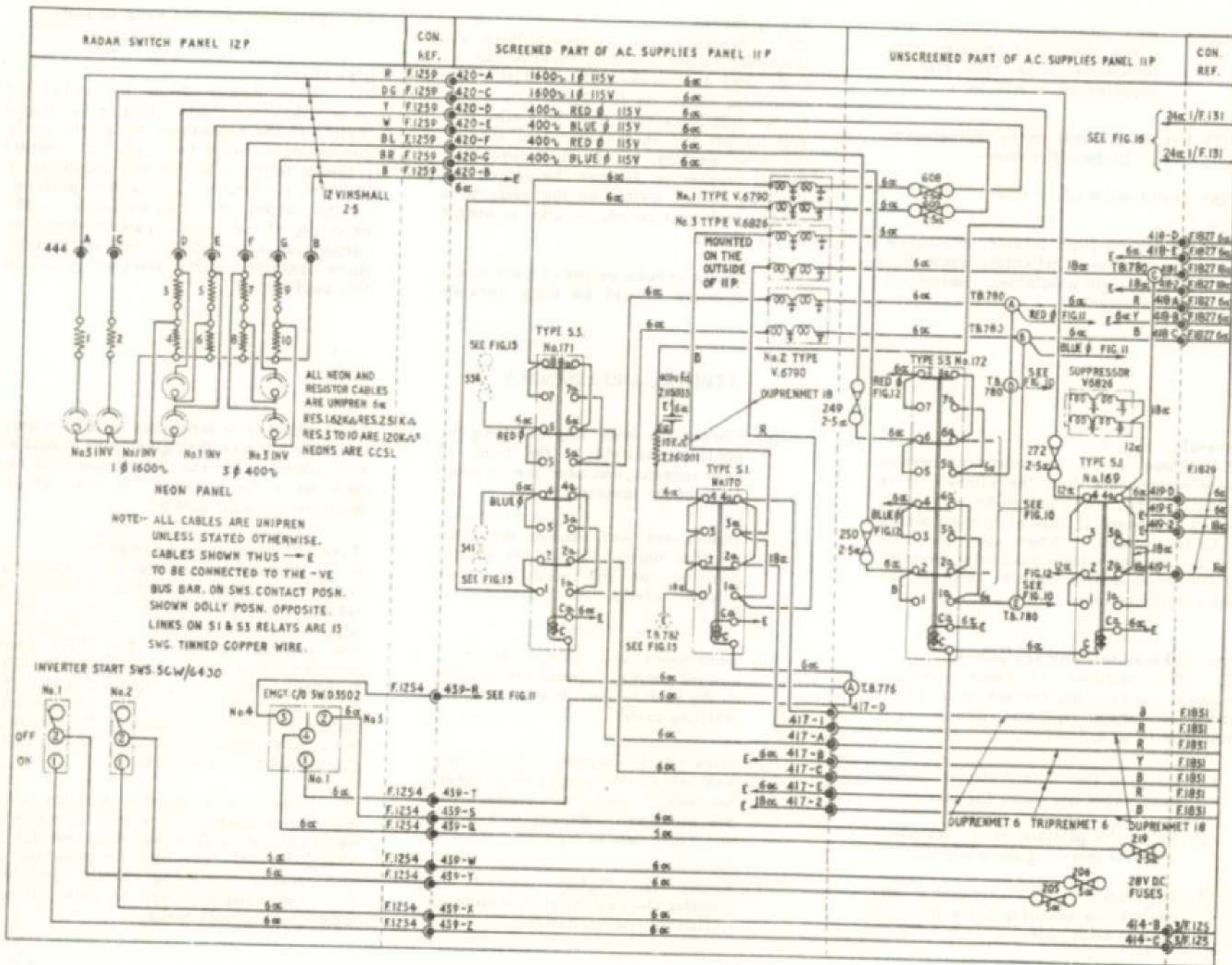


Fig. 9 (1) No 1 and 2 inverter control
 (4 Con. ref. F.1029 was 1/F.1029)
RESTRICTED

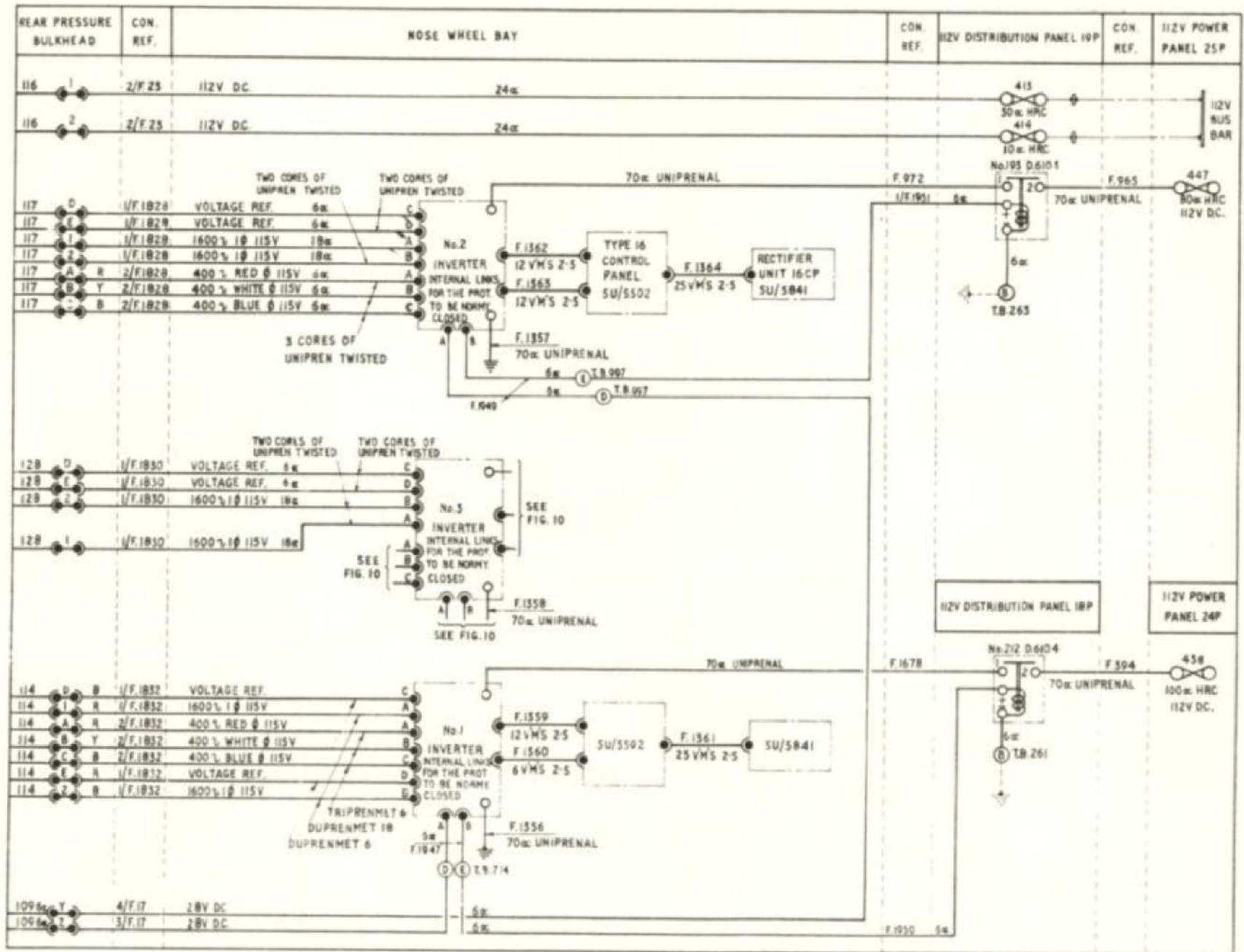


Fig. 9 (2) No 1 and 2 inverter control

RESTRICTED

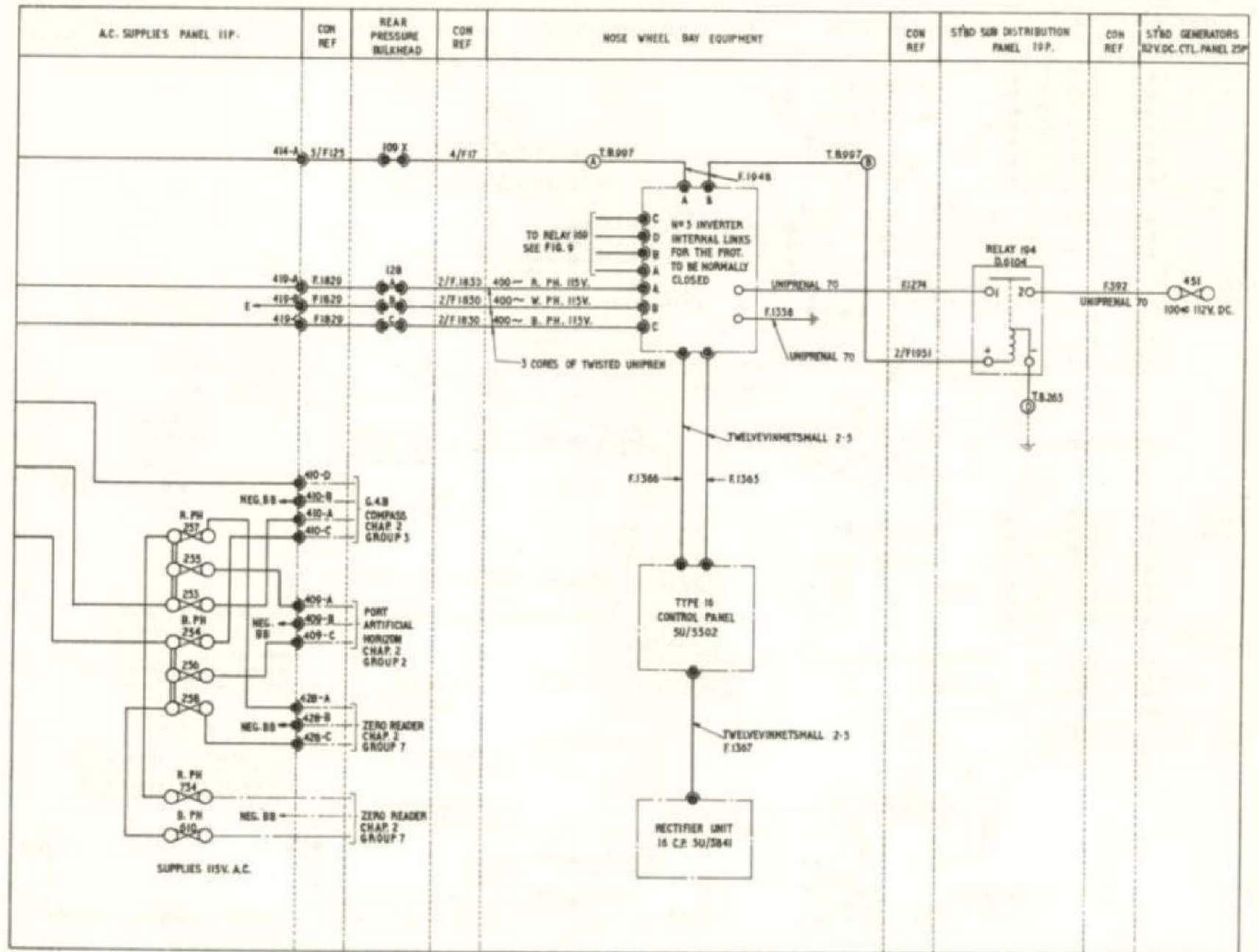


Fig 10 (2) No 3 inverter control and essential supplies

(4 Con. ref. F.1829 was 1/F1829)

RESTRICTED

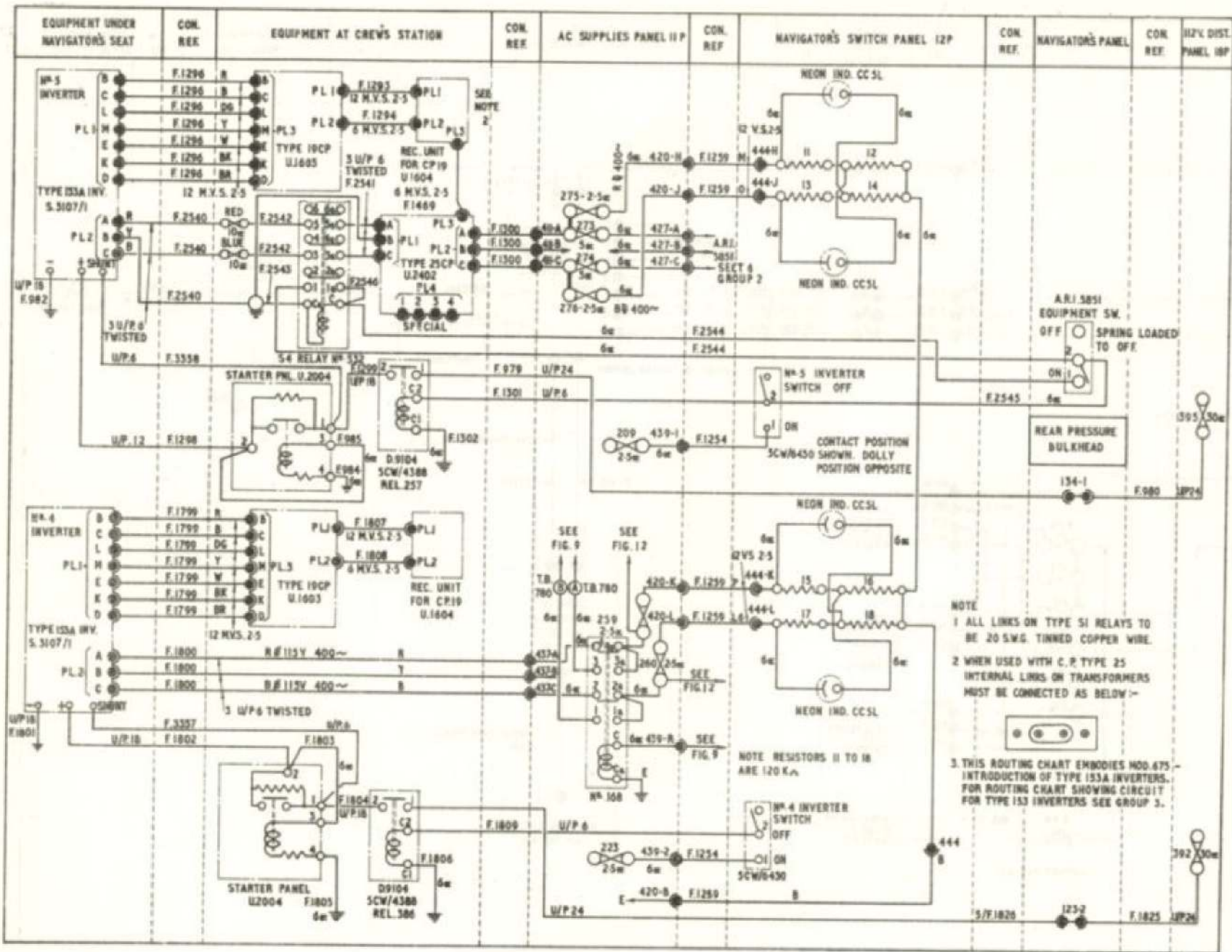


Fig. II N# 4 and 5 Inverter control

RESTRICTED

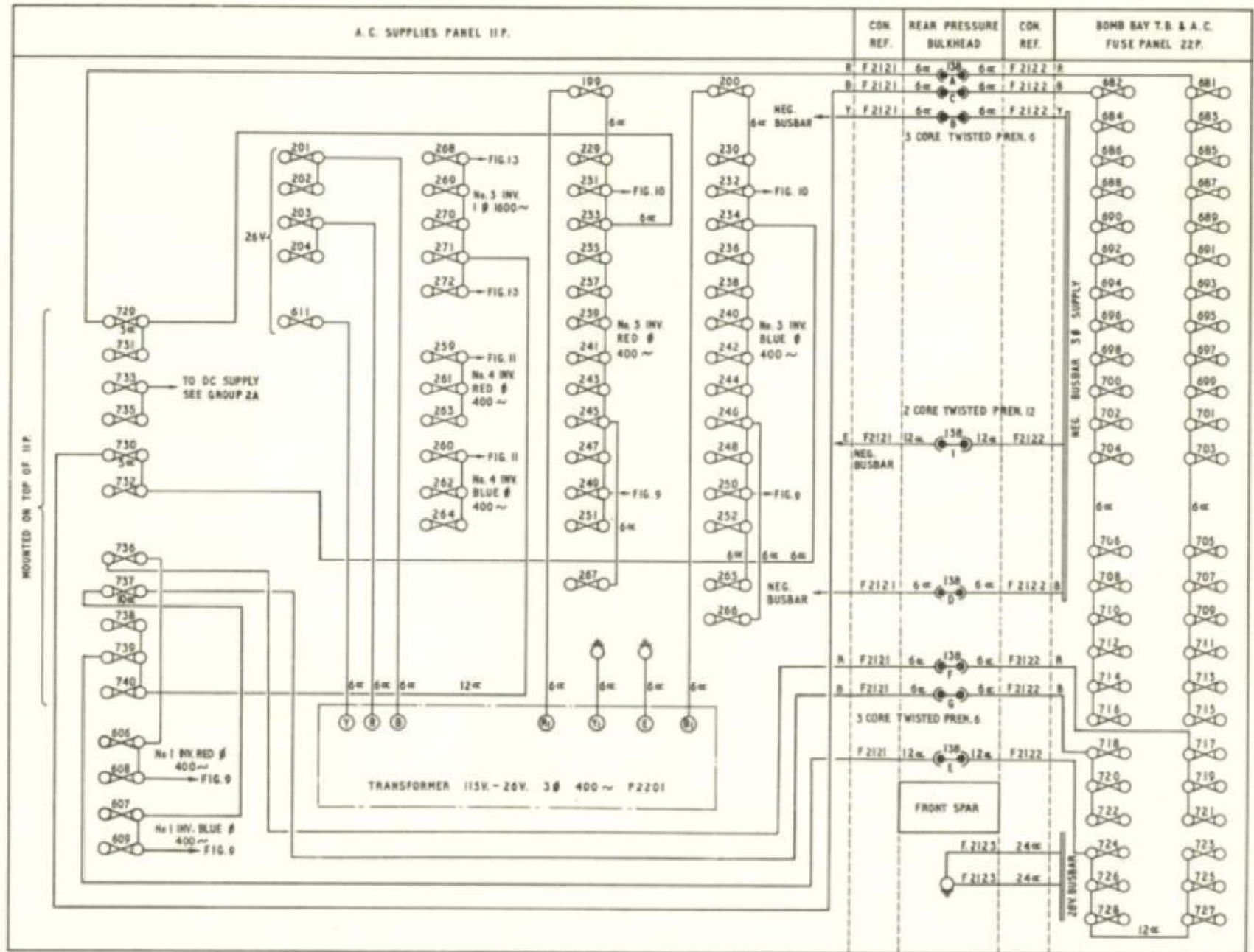


Fig.12 A.C. Distribution - 11P and 22P

RESTRICTED

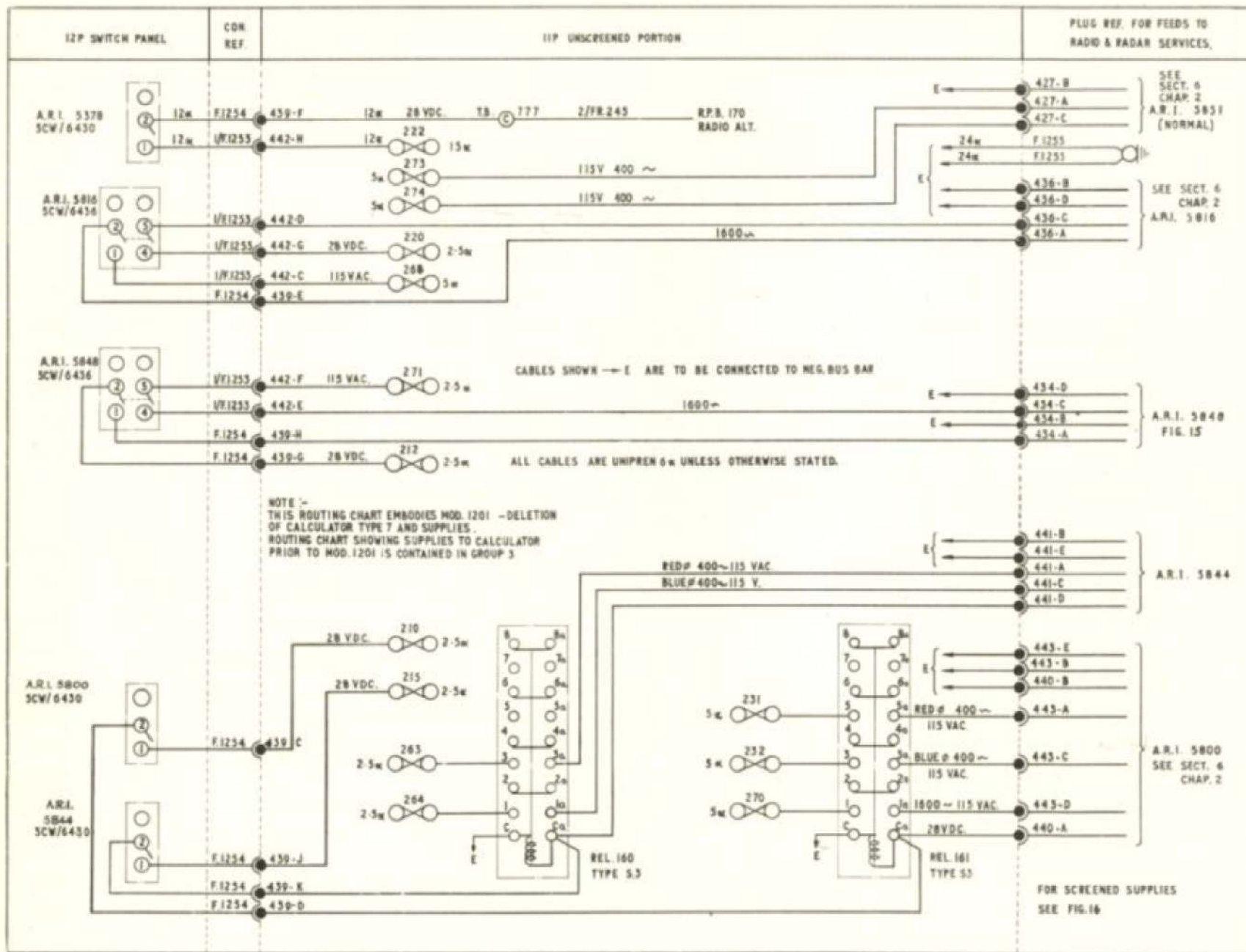


Fig. 13 Unscreened radio supplies - Mk.1 aircraft only

RESTRICTED

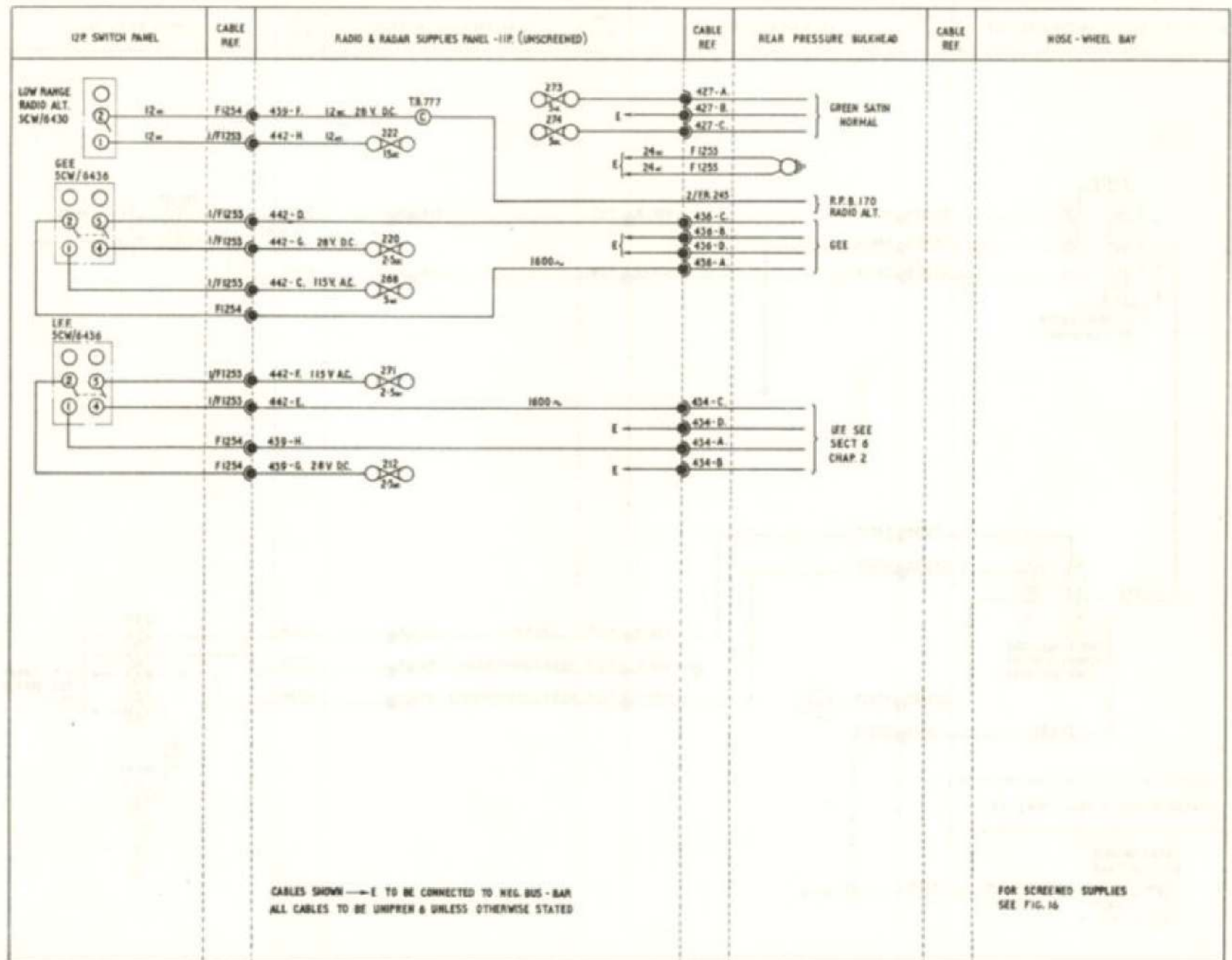


Fig. 13A Unscreened radio supplies - Mk. IA aircraft only
 (4 A.R.I. 5924 supplies deleted)

RESTRICTED

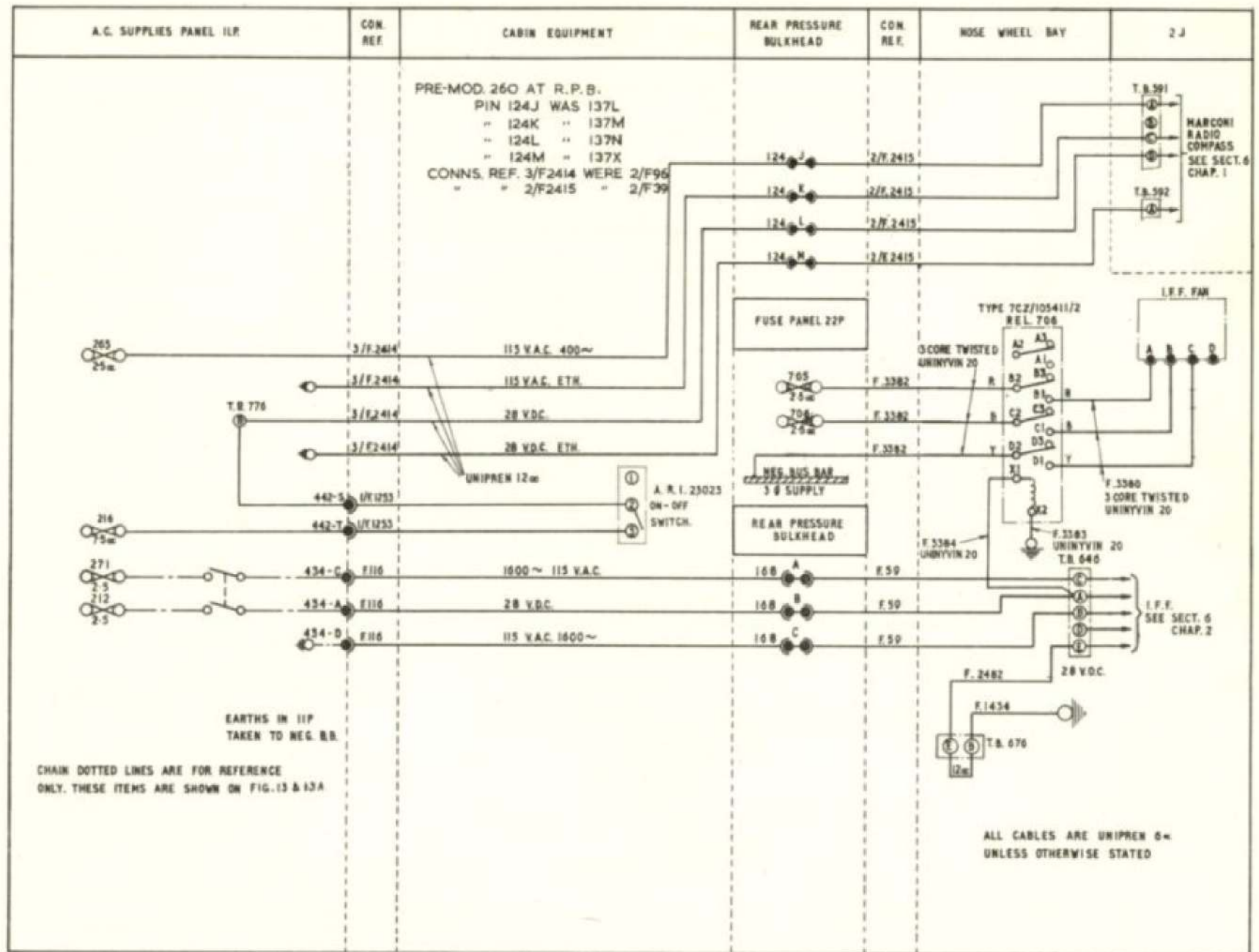


Fig.15 Supplies for A.R.I. 5848 and A.R.I. 23023 (Pre and Post Mod 260)

RESTRICTED

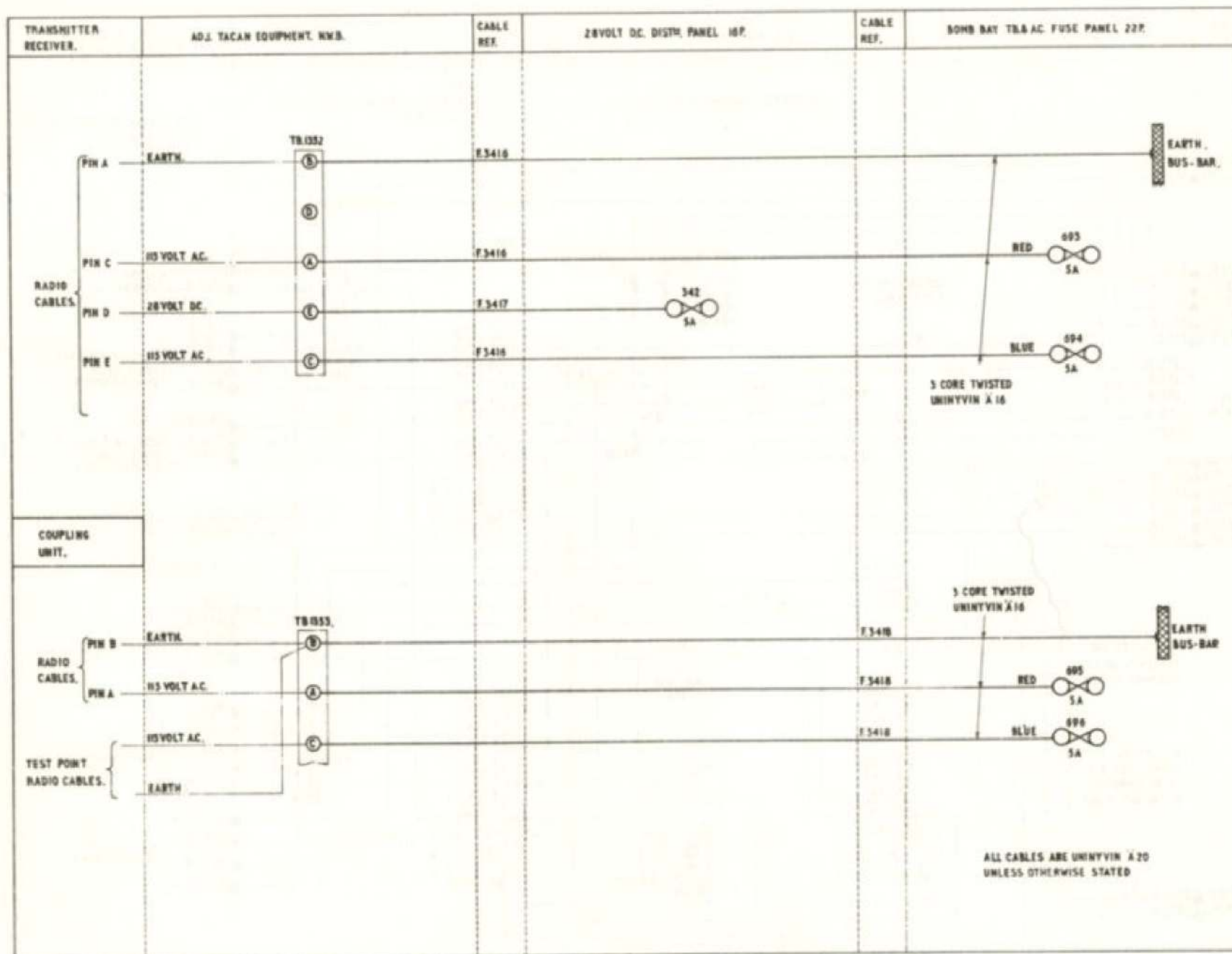


Fig.17 Supplies for A.R.I. 18107/13

This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.

