Group 3 A.C. POWER AND DISTRIBUTION

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. This group contains descriptive and servicing information for the a.c. power services on the aircraft. Theoretical circuit diagrams and location illustrations are provided in fig. 1 to 9. It should be noted that the main distribution fuse tables are contained in Group 1. The following modifications to the a.c. power and distribution circuits are included in this group:—

Mod. 220—Introduction of additional fuse panel to cater for other essential modifications.

◄ Mod. 294—E.C.U.—To introduce a jet pipe temperature limiter. ►

Mod. 295—Introduction of torque switch Type E.A.P.2340 in lieu of Type E.A.P.2312 and introduction of rectifiers across relay coils.

Mod. 298—Modification of wiring to enable No. 5 inverter, Type 153, to be started under no-load conditions.

Mod. 334—Introduction of radio altimeter Mk. 6A in lieu of Mk. 6.

◄ Mod. 370—Radar — N.B.S. Mk. 1 — To modify power switching panel wiring.

Mod. 372—To improve the waveform of Type 350 inverter for mach auto trim circuit by introduction of a suppressor.

Mod. 390—Radio — A.R.I.5810 — To make provision for and introduce control unit Type X.6223.

Mod. 697—To improve the 112-volt generating system. ►

DESCRIPTION AND OPERATION

2. Two sources of a.c. power are required for the satisfactory performance of the aircraft installation. For general use, a.c. supply at 115 volts, 3-phase, 400 c/s is required. A further a.c. supply at 115 volts, single-phase 1600 c/s is required for instrumentation and for certain special loads.

3. Six inverters are fitted. Of these, three are Type 350, two Type 153, and the sixth a Type 100A. Each is allocated a specified role, as follows:—

Inverter	*Type*	*Role*
No. 1	350	Supplies for A.R.I.5810
No. 2	350	Emergency stand-by
No. 3	350	Supplies for miscellaneous consumer loads
No. 4	153	Supplies for autopilot and A.R.I.5844
No. 5	153	Supplies for A.R.I.5851
No. 6	100A	Supplies for G.M.4.B compass and artificial horizons

4. Precautions are taken to ensure that essential consumer loads are not starved of power supplies. The G.M.4.B. compass and artificial horizons are doubly safeguarded so that should No. 6 inverter fail, these loads are automatically switched to No. 3 inverter. Should No. 3 inverter also fail, its consumer loads may be transferred to the emergency stand-by inverter, No. 2. Similarly, the loss of No. 1 inverter or of No. 4 inverter does not necessarily render unserviceable the consumer loads supplied by these inverters, since the

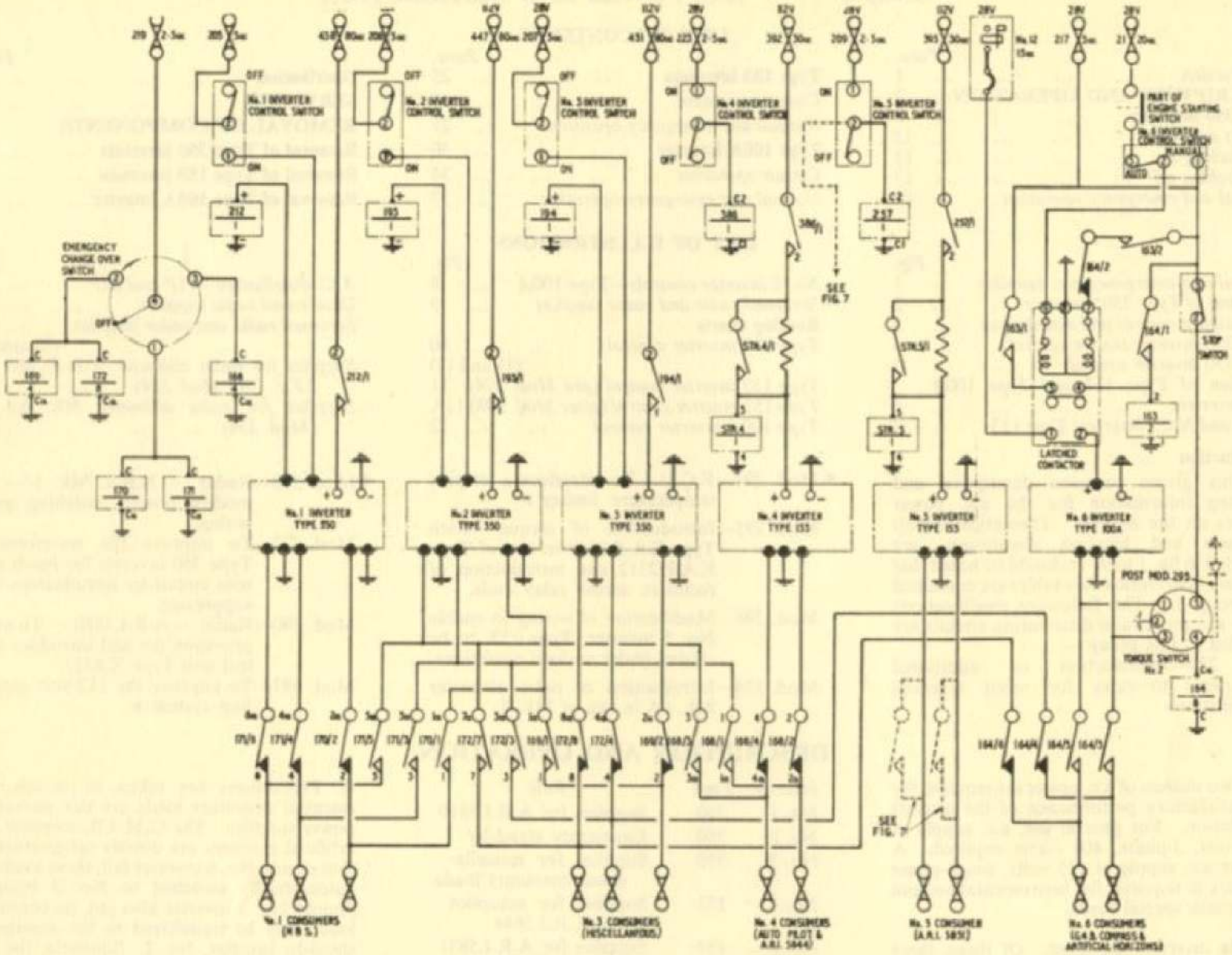


Fig. 1. Normal and emergency a.c. supplies

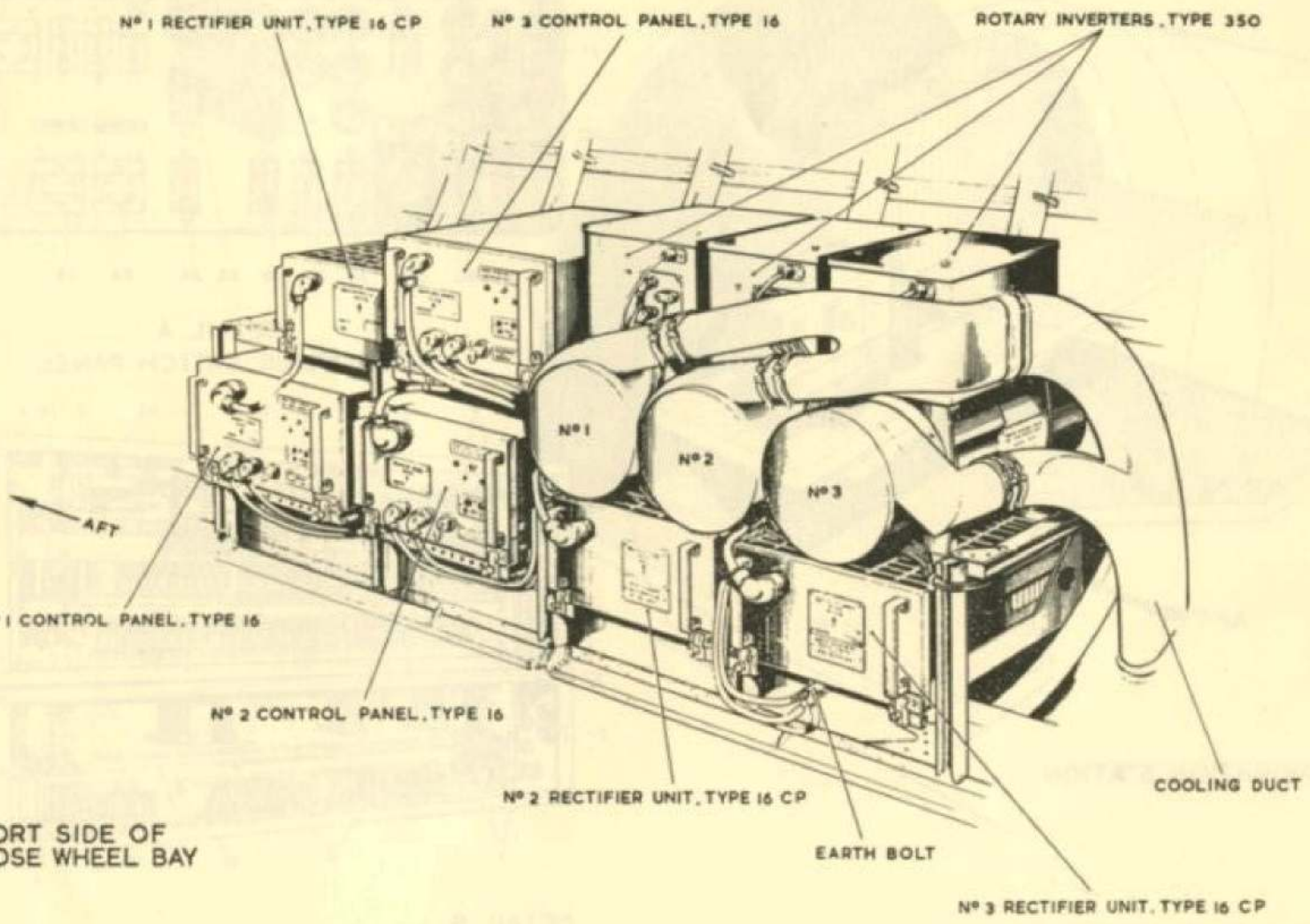
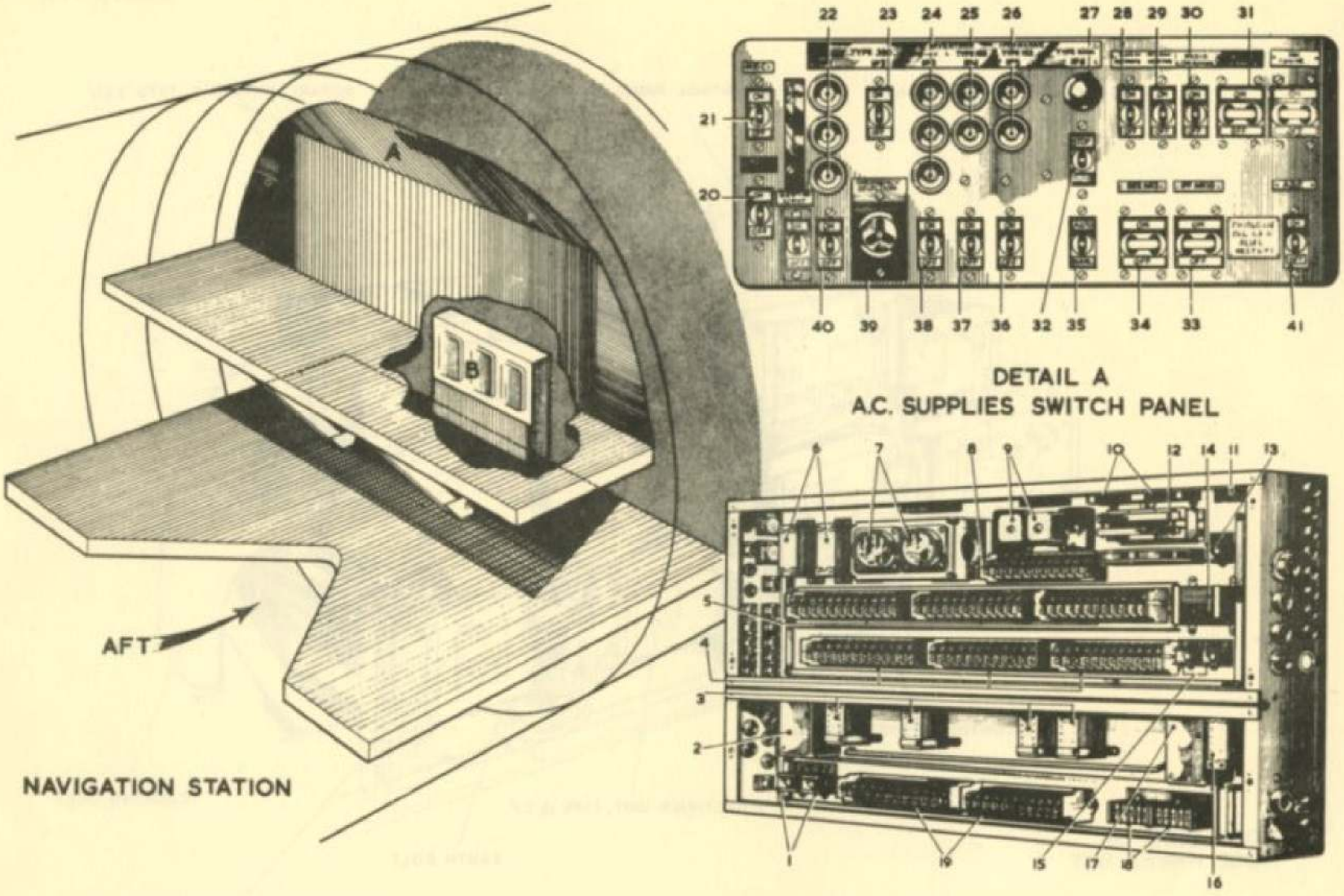


FIG.2. LOCATION OF TYPE 350 INVERTERS



NOTE :- WIRING OMITTED FOR CLARITY

FIG. 3. A.C. SUPPLY CONTROL AND DISTRIBUTION

KEY TO FIG. 3

1 AVRO TYPE CONNECTOR BLOCKS, TB778 AND TB779
2 SUPPRESSOR
3 TYPE S RELAYS 165, 167, 170 AND 171
4 FUSES 229 TO 264
5 FUSES 205 TO 228 AND 265 TO 276
6 TYPE S RELAYS 160 AND 161
7 TORQUE SWITCHES
8 FUSES 199 TO 204 AND 606 TO 611
9 TYPE Q RELAYS 162 AND 163
10 TYPE S RELAYS 168 AND 169
11 S.B.A.C. CONNECTOR BLOCK
12 TRANSFORMER
13 AVRO TYPE CONNECTOR BLOCK, TB775
14 TYPE S RELAY 172
15 AVRO TYPE CONNECTOR BLOCKS, TB776 AND TB777
16 TYPE S RELAY 351
17 SUPPRESSOR
18 S.B.A.C. CONNECTOR BLOCKS, TB781 AND TB782
19 FUSES 534 TO 557
20 H.2.S. CONTROL SWITCH
21 N.B.C. CONTROL SWITCH
22 NO. 1 INVERTER NEON INDICATORS
23 NO. 2 INVERTER (TYPE 350) CONTROL SWITCH
24 NO. 3 INVERTER NEON INDICATORS
25 NO. 4 INVERTER NEON INDICATORS
26 NO. 5 INVERTER NEON INDICATORS
27 NO. 6 INVERTER MAGNETIC INDICATOR
28 A.R.I.5844 CONTROL SWITCH
29 TAIL WARNING CONTROL SWITCH
30 LOW RANGE ALTIMETER CONTROL SWITCH
31 HIGH RANGE ALTIMETER CONTROL SWITCH
32 NO. 6 INVERTER (TYPE 100A) STOP SWITCH
33 I.F.F. CONTROL SWITCH
34 GEE MK. 3 CONTROL SWITCH
35 NO. 6 INVERTER START SWITCH
36 NO. 5 INVERTER (TYPE 153) CONTROL SWITCH
37 NO. 4 INVERTER (TYPE 153) CONTROL SWITCH
38 NO. 3 INVERTER (TYPE 350) CONTROL SWITCH
39 EMERGENCY CHANGE-OVER SWITCH
40 NO. 1 INVERTER (TYPE 350) CONTROL SWITCH
◄ 41 A.R.I.23023 CONTROL SWITCH ►

F.S./3

loads may be transferred to No. 2 inverter. Only one transfer is possible at any one time, however, so that in the event of failure of more than one inverter, the crew will have to decide which consumer loads shall be supplied from No. 2 inverter.

5. The complete alternating current supply system is shown schematically in fig. 1. It is seen from this diagram that with all inverters switched on and with the emergency change-over switch in the OFF position.

(1) The N.B.S. installation will be supplied from No. 1 inverter through relay contacts 171/6, 171/4 and 170/2.

(2) The miscellaneous consumer loads will be supplied from No. 3 inverter through relay contacts 172/8, 172/4 and 169/2.

(3) The auto pilot and A.R.I.5844 installations will be supplied from No. 4 inverter through relay contacts 168/4 and 168/2.

(4) The A.R.I.5851 installation will be supplied from No. 5 inverter.

(5) The G.M.4.B. and artificial horizon installations will be supplied from No. 6 inverter through relay contacts 164/5 and 164/3, relay 164 being energised due to a supply through the d.c. contacts of the torque switch.

6. If relay 164 is de-energised, the G.M.4.B and artificial horizons will be transferred to No. 3 inverter due to closing of contacts 164/6 and 164/4. If, now, the emergency change-over switch is selected to position 2, the coils of relays 169 and 172 will be energised. The G.M.4.B and artificial horizon installations will now be supplied from No. 2 inverter through relay contacts 169/1, 172/7 and 172/3. In addition, the auto pilot and A.R.I.5844 installations will be supplied from No. 2 inverter through relay contacts 169/1, 172/7 and 172/3.

7. Control of the six inverters is by means of switches fitted on panel 12P. Neon lamps fitted on the same panel serve to give warning of power failure in the a.c. system.

TYPE 350 INVERTERS

8. 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 1600 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 the blast air system. To prevent damage to the inverters due to ingress of ice particles, the cooling duct is provided 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 main distribution points in panel 11P. ◄ On aircraft with Mod. 294 embodied inter-fuse links in 11P are rearranged and added. The index number of the R.P.B. plug connecting panels 11P and 22P also changes. ►

9. Input supplies for the Type 350 inverters are taken from panels 18P and 19P situated on the rear face of the front spar. To satisfy the normal requirements for limited starting current, starting relays embodying resistance units are employed. These are contained within the control panels.

10. Control of the Type 350 inverters is by means of three 2-way switches fitted on panel 12P. These control supplies to main contactors used for switching the 112 volt d.c. supply to the inverters. The contactors are fitted in panels 18P and 19P. The starting system requires the link on each inverter to be in the NORMALLY CLOSED position, the significance of this being enlarged upon in the description of circuit operation. The control circuit operates on 28 volts d.c.

11. Suppressors are introduced into the system to minimise radio interference. Neon type indicators fitted on panel 12P ensure visible warning of failure of a.c. power supplies. ◄ On aircraft with Mod. 372 embodied a suppressor, Avro Type V6826 is

added to improve the waveform of the 1600 c/s. output from No. 3 inverter. ▸

Circuit operation

12. The setting of the protective change-over link on the inverter in the NORMALLY CLOSED position introduces into the starting control circuit a 1600 c/s. voltage reference relay, a 1600 c/s. alternator over-volt relay, and a 400 c/s. alternator over-volt relay. Referring to fig. 4, these are designated respectively RL1, RL3, and RL4. The relay designated 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

13. When the inverter control switch is switched 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 large volt drop across the starting resistance.

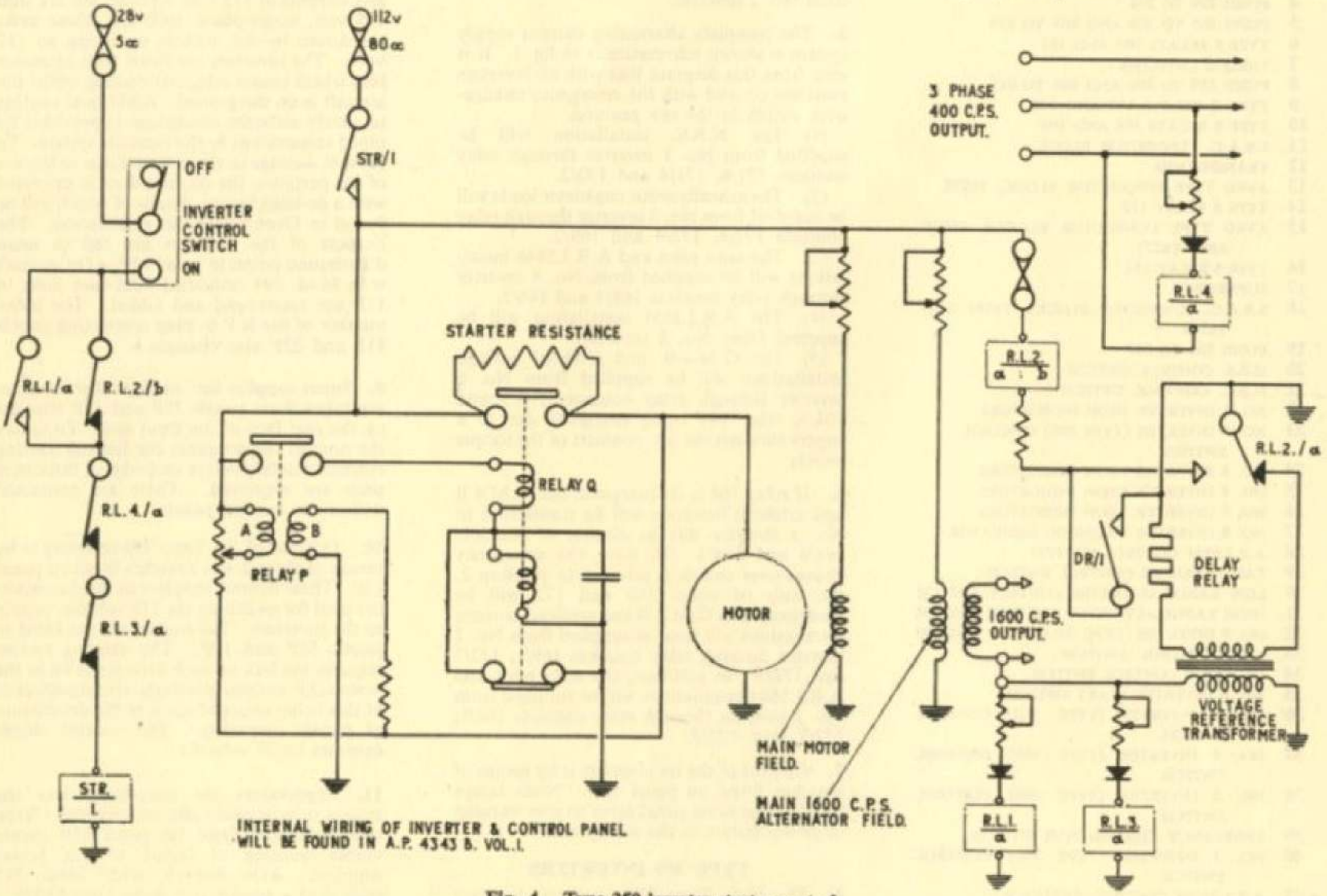


Fig. 4. Type 350 inverter starter control

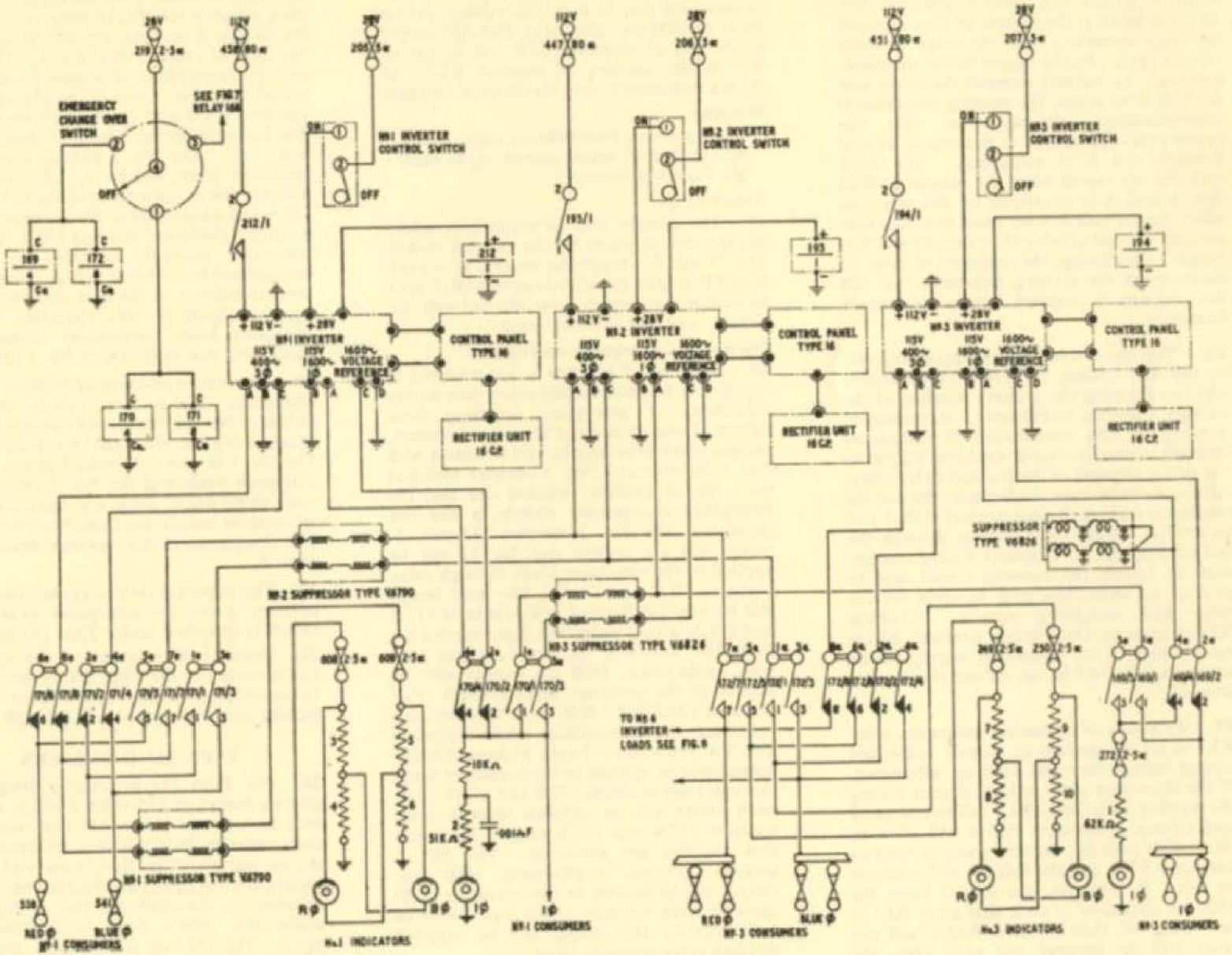


Fig. 5. Type 350 inverter control

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 volt 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 are closed when the magnetic effect due to coil A is overcome by the magnetic effect due to coil B, and these contacts now connect the coil of relay Q to the 112-volt d.c. supply. In closing, the contacts of relay Q short-circuit the starting resistance and full line voltage is applied across the motor terminals.

14. With the inverter now running normally on full line voltage, the 1600 c/s. alternator will be supplying the primary winding of the voltage reference transformer. A secondary winding on 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 is such as to close contacts DR/1 and so provide a path for a current through the coil of relay RL2. Contacts RL2/a change-over to isolate the element circuit and to provide an alternative path to earth for the relay RL2 energising current. Contacts RL/b2 open so that, unless contacts RL1/a have closed in the meantime, supply to the contactor STA will be cut off and the inverter stopped.

15. By means of a trimmer resistance, relay RL1 is set to operate at normal controlled output voltage from the 1600 c/s. alternator. If the alternator gives normal output during the starting cycle, relay RL1 will be energised and 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 1600 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 relay is operated.

16. It is seen also that if relay RL3 is energised due to excessive voltage output from the 1600 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.

Warning . . .

It is important that 1600 *c/s loads should be switched off before attempting to start the Type* 350 *inverter.*

Switching off

17. The invertor may be stopped by selecting the OFF position on the control switch. The 28-volt d.c. supply to the coil of contactor STR is thus cut off, contacts STR/1 open to isolate the inverter from the 112-volt d.c. supply, and the inverter stops.

Normal and emergency operation

18. Since No. 2 invertor is not required to supply any consumer loads other than during conditions of emergency resulting from failure of one or more of the other inverters, normal conditions may be said to obtain with No. 1 inverter and No. 3 inverter switched ON, No. 2 invertor switched OFF and the emergency change-over switch in the OFF position. The No. 1 inverter 115-volt, 3-phase, 400 c/s. output (see fig. 5) 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, 1600 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. The No. 3 inverter 115-volt, 3-phase, 400 c/s. output will be applied to the consumer loads through relay contacts 172/8 and 172/4. The neon lamps will be supplied through relay contacts 172/4 and 172/6 to give indication that supplies are available. The No. 3 inverter 115-volt, single-phase, 1600 c/s. output will be applied to the consumer loads through relay contacts 169/2, and the neon indicators for this output will be supplied through relay contacts 169/4.

19. Now suppose No. 1 inverter to have failed. Warning of such failure will be given by the neon indicators Having first switched on No. 2 inverter, if the EMERGENCY CHANGE-OVER switch is selected to position 1, a 28-volt d.c. supply from fuse 219 will be applied to the coils of relays 170 and 171. The No. 1 inverter three-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 opening of contacts 170/2 and 170/4 and transferred to No. 2 inverter due to 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 serve to indicate to the crew that supplies are again available for the operation of those consumer loads temporarily rendered unserviceable due to failure of No. 1 inverter.

20. Alternative selection of position 2 on the emergency change-over switch, following failure of No. 3 inverter, will connect the coils of relays 169 and 172 to the 28-volt d.c. supply. The No. 3 inverter 115-volt, 3-phase, 400 c/s. consumer loads and the No. 3 inverter 115-volt, single-phase, 1600 c/s. consumer loads will now be transferred from No. 3 inverter to No. 2 inverter in the manner described in para. 6.

21. The sequence following the selection of position 3 on the emergency change-over switch is described under Type 153 inverters.

22. Detailed information on the operation and servicing of the Type 350 inverter, Type 16 control panel and the Type 16 control panel rectifier unit is contained in A.P.4343B, Vol. 1.

TYPE 153 INVERTERS

23. The Type 153 inverter is designed to give an output of 115-volts, 3-phase, 400 c/s. 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. The 112-volt d.c. supplies are taken from fuses in panel 18P. As with the Type 350 inverters, remote switching is

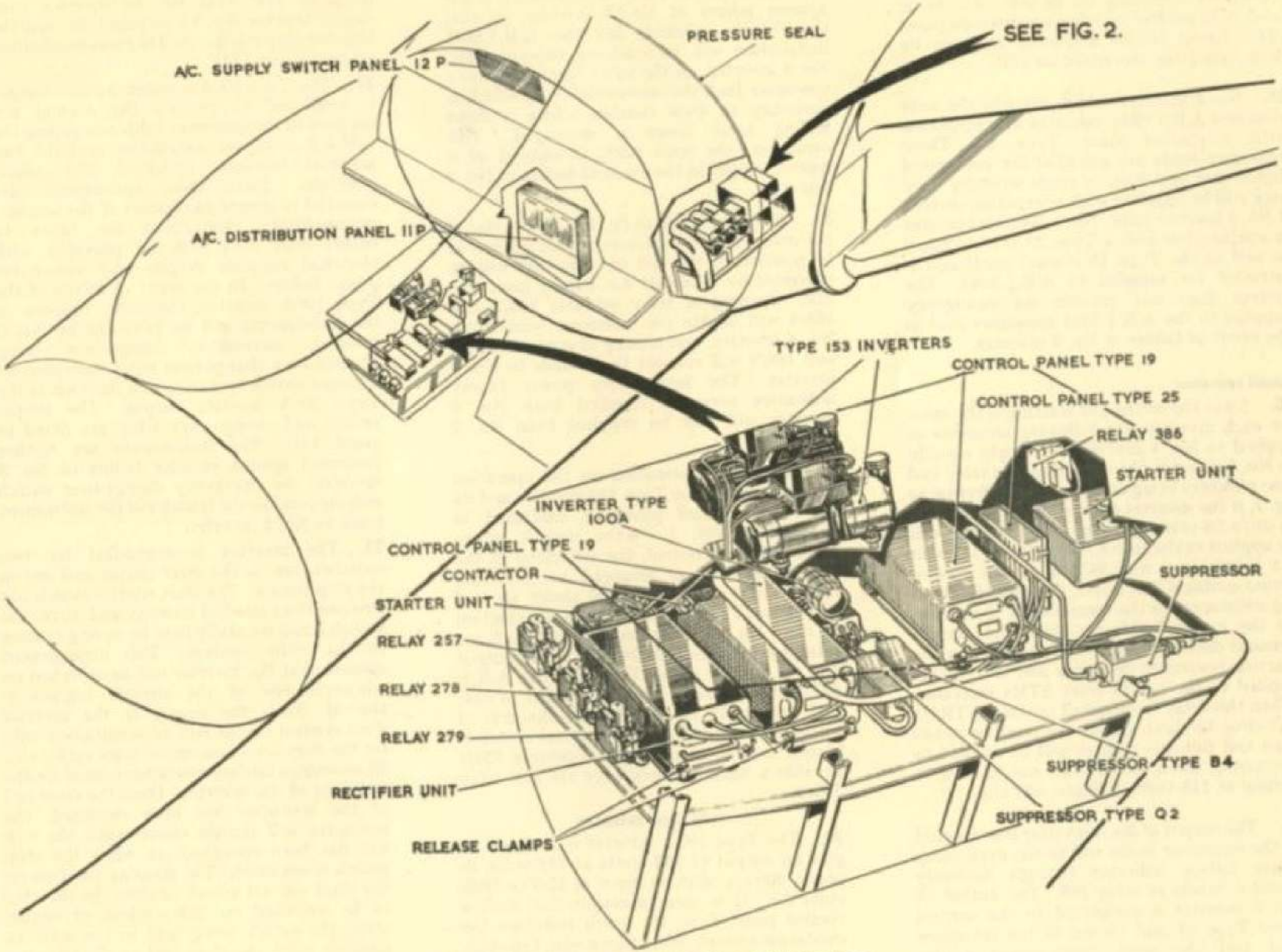


Fig. 6. Location of Type 153 and Type 100A inverters

(A.L.17, Dec. 56)

employed to connect the inverters to the 112-volt d.c. supply, control switches and contactors operating on 28-volts d.c. being used. The control switches are fitted on panel 12P. Power failure indication is given by neon indicators also fitted on 12P.

24. No. 4 inverter, which supplies the auto pilot and A.R.I.5844, operates in conjunction with a control panel, Type 19. These consumer loads are essential for protracted flights and provision is made whereby they may still be supplied with alternating current if No. 4 inverter fails. No. 5 inverter operates in conjunction with a Type 25 control panel as well as the Type 19 control panel and is intended for supplies to A.R.I.5851. The system does not provide for emergency supplies to the A.R.I.5851 consumer load in the event of failure of No. 5 inverter.

Circuit operation

25. Since the method of starting is the same for each inverter, the following sequence as applied to 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 be applied to the coil of relay 386. A 112-volt d.c. supply from fuse 392 will now be applied across contacts 386/1 and, through the starting resistance, to the terminals of the motor. As the motor builds up speed the current demand decreases, the volts drop across the starting resistance decreases and the voltage applied to the coil of relay STR4 increases. When this relay is energised contacts STR4/1 will close to short circuit the starting resistance and full line voltage will be applied to the motor, when the inverter output will be normal at 115-volts, 3-phase, 400 c/s.

26. The output of No. 4 inverter is connected to the consumer loads and to the neon lamp power failure indicator through normally closed contacts of relay 168. The output of No. 5 inverter is connected to the control panel Type 25 and thence to the consumer load and the neon lamp power failure indicator. All distribution circuits are suitably fused in panel 11P.

Normal and emergency operation

27. As already stated, no provision is made against failure of No. 5 inverter so that should this machine fail the A.R.I.5851 installation will be rendered unserviceable. No. 4 inverter, on the other hand, supplies a consumer load the serviceability of which is necessary to crew comfort where a flight lasting some hours is envisaged. This consumer, the auto pilot, is assured of a reserve supply in the event of failure of No. 4 inverter.

28. Referring again to fig. 1, it is seen that if the emergency change-over switch is selected to position 3, the coil of relay 168 will be energised by a 28-volt d.c. supply from fuse 219. Opening of relay contacts 168/2 and 168/4 will isolate the consumer loads from No. 4 inverter, and closing of contacts 168/1 and 168/3 will connect these loads to No. 2 inverter. The neon lamp power failure indicators normally supplied from No. 4 inverter will now be supplied from No. 2 inverter.

29. Detailed information on the operation and servicing of the Type 153 inverter and its associated control panels is contained in A.P.4343B, Vol. 1. ◄On aircraft where Mod. 298 is embodied, the switching of the No. 5 inverter is arranged so that the inverter can only be started under *no load* conditions. This is effected by the introduction of relay No. 532, the contacts of which are interposed between the No. 5 inverter output and the control panel, Type 25. The A.R.I. 5851 control switch is spring loaded to OFF, and no supply is available to the coil of relay 532 until the inverter control switch is placed to the ON position. Contacts 532/1 provide a 'hold-in' circuit for the coil relay 532.►

TYPE 100A INVERTER

30. The Type 100A inverter is designed to give an output of 162 watts at 115-volts, 3-phase, 400 c/s. with an input of 22·5 to 28·5-volts d.c. It is used in conjunction with a control panel Type 12, which stabilizes the excitation current, and a suppressor Type G.5, the three units being accommodated on suitable mountings under the crew's floor in the manner illustrated in fig. 6. The d.c. supply for the control circuit is taken from fuse 217 in panel 11P, that for the inverter from circuit breaker No. 12 on panel 3P, and the inverter output is directed to main distribution points in panel 11P.

31. The Type 100A inverter 3-phase output is employed to provide the normal a.c. supplies to the consumer loads comprising the G.M.4.B. compass installation and the two artificial horizons fitted in the pilots' positions. Since these instruments are essential to proper navigation of the aircraft, extraordinary precautions are taken to ensure that they will be provided with electrical supplies despite any reasonable power failure. In the event of failure of the Type 100A inverter, therefore, supplies to the instruments will be provided by No. 3 inverter, automatic change-over being effected by a change-over relay controlled by a torque switch operating as a function of the Type 100A inverter output. The torque switch and change-over relay are fitted in panel 11P. The instruments are further protected against possible failure of No. 3 inverter, the emergency change-over switch making possible the transfer of the instrument loads to No. 2 inverter.

32. The inverter is controlled by two switches, one in the start circuit and one in the stop circuit. The start control switch has two positions labelled MANUAL and AUTO, the switch being normally held by spring tension to the AUTO position. This arrangement ensures that the inverter will be switched on whenever one of the aircraft engines is started. Since the supply to the inverter start control circuit will be maintained only for the duration of an engine start cycle, viz., 35 seconds, a latched contactor is used for the engaging of the inverter. Once the close coil of the contactor has been energised, the contactor will remain closed until the trip coil has been energised, as when the stop switch is operated. The MANUAL position on the start control switch enables the inverter to be switched on independent of engine start, the switch being held in the MANUAL position until the close coil of the starting contactor has been energised and the inverter started, and then allowed to return under its spring control to the AUTO position.

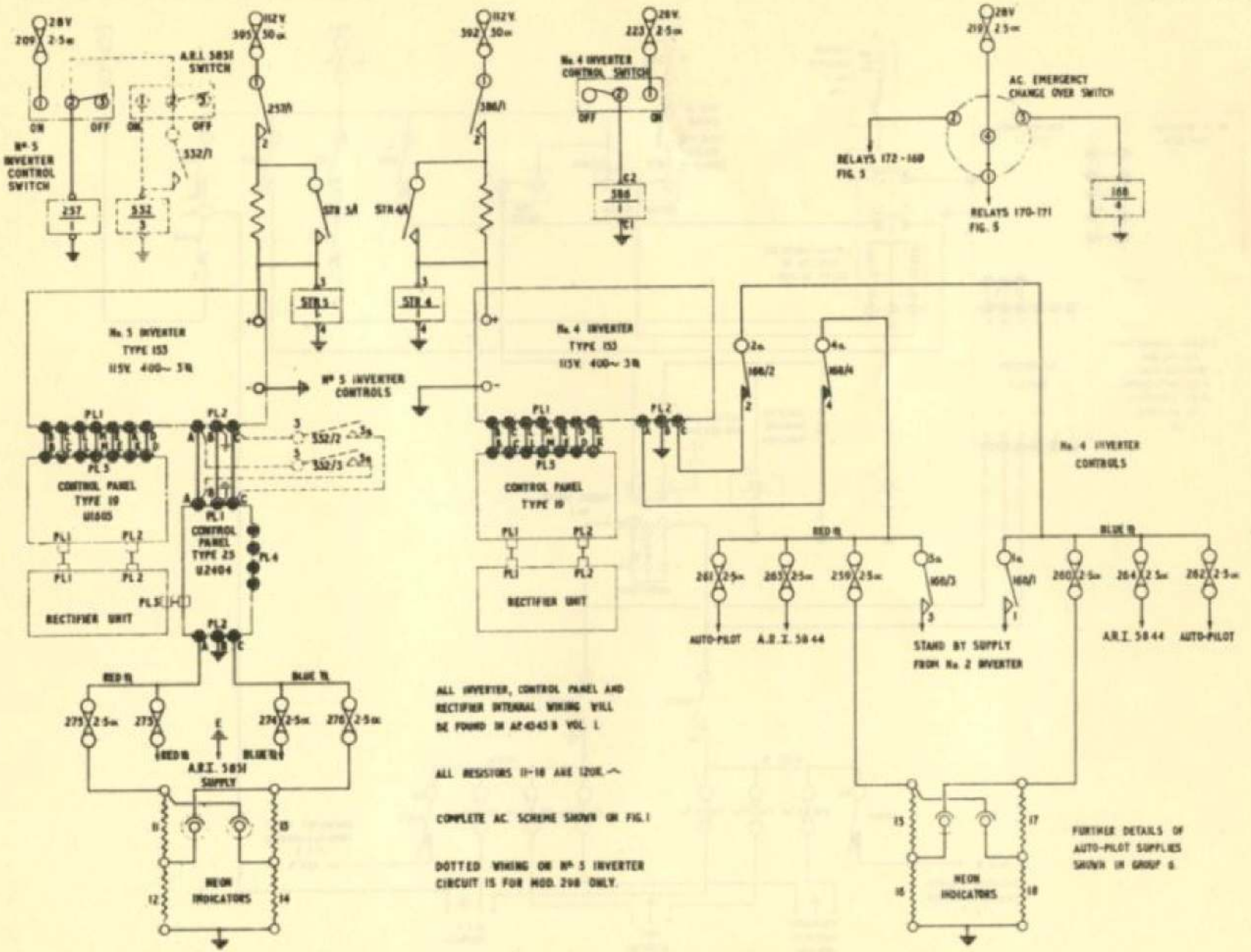


FIG. 7. No. 4 AND No. 5 INVERTERS TYPE 153

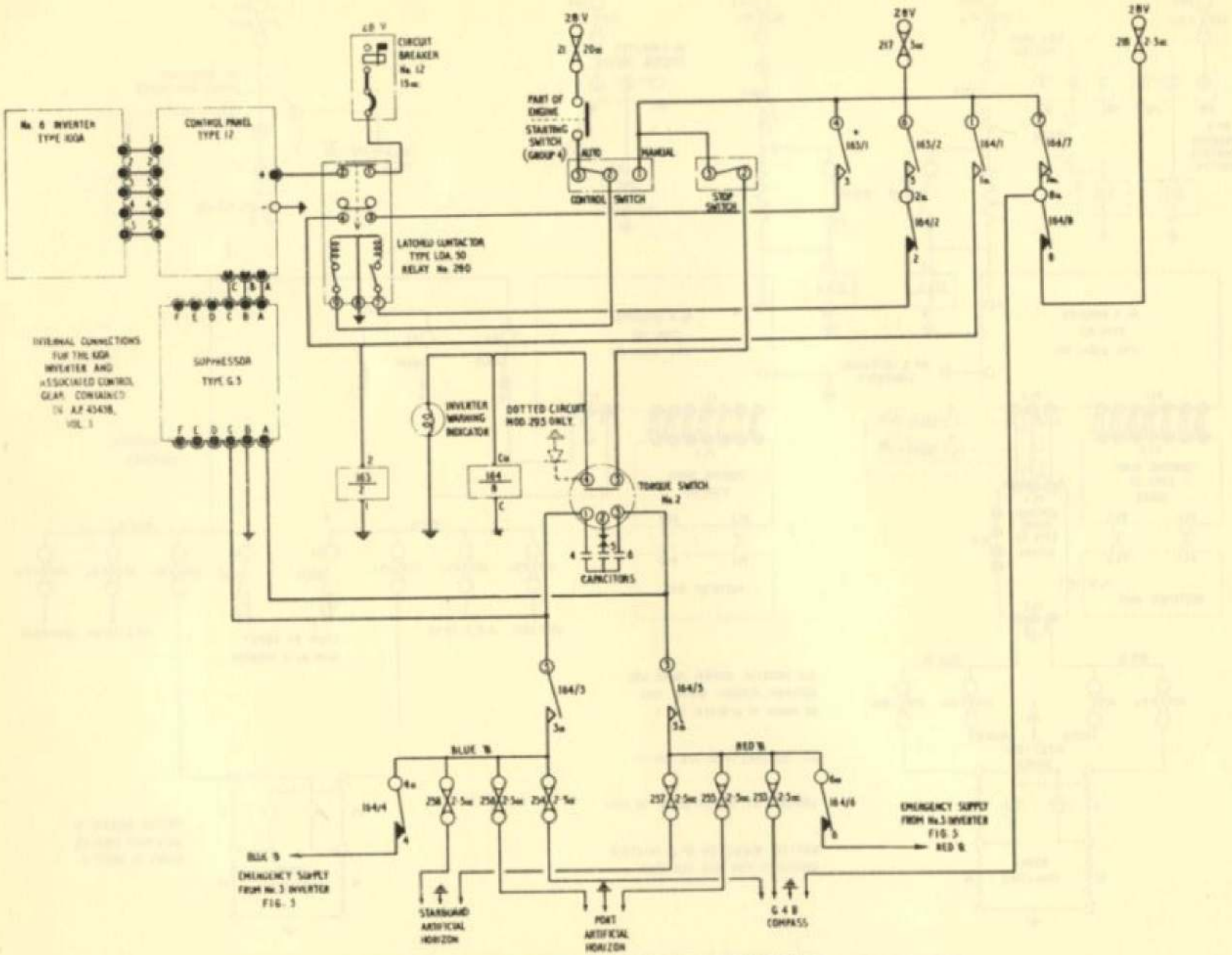


FIG. 8. No. 6 INVERTER CONTROLS - TYPE 100A.

33. A magnetic indicator fitted on panel 12P serves to give visual indication of failure of the Type 100A inverter. When the inverter is functioning normally, the indicator is supplied through the d.c. contacts of the torque switch.

Circuit operation

34. The following description of circuit operation should be read in conjunction with the theoretical circuit diagram, (fig. 8). It is seen that since the start control switch is normally spring loaded to the AUTO position, if the engine start push-switch is engaged, a 28-volt d.c. supply from fuse 21 will be applied to the close coil of the latched contactor. A 28-volt supply from circuit breaker No. 12 will now be applied across contacts 1 and 2 of the latched contactor to the motor side of the inverter, via the control panel, Type 12. When the inverter is running at normal speed the 115-volt, 3-phase, 400 c/s. output will be applied to torque switch No. 2. The d.c. contacts of the torque switch will close to apply a 28-volt d.c. supply from fuse 217 to the magnetic indicator which will register correct operation of the inverter, and, through the STOP switch, to the coil of relay 164. Contacts 164/1 now connect a 28-volt d.c. supply from fuse 217 to the coil of relay 163, the supply to the coil then being maintained through contacts 163/1 and contacts 3 and 4 of the latched contactor. Contacts 163/2, in closing, prepare the circuit for the tripping of the latched contactor.

35. Connected in series with the torque switch, the STOP switch is held under spring tension to the ON position. To stop the inverter this switch is opened. The 28-volt d.c. supply to the coil of relay 164 is thus cut off. A 28-volt d.c. supply from fuse 217 will be applied through contacts 163/2 and 164/2 to the trip coil of the latched contactor. Opening of the contacts isolates the inverter from the input and the inverter stops. At the same time, opening of contacts 3 and 4 of the latched contactor isolates the coil of relay 163 so that the circuit is now prepared for the next starting sequence.

36. It is seen from the preceding paragraph that continued running of the inverter is determined by relay 164. The d.c. contacts in the coil circuit are in series with the STOP switch and opening of these contacts will result in the same sequence of operations as already described.

Normal and emergency operation

37. In addition to its function in the control of the Type 100A inverter circuit, relay 164 serves also to determine the sources of supplies for the instruments. During normal operation of the a.c. system, the instruments are served from the Type 100A inverter through 164/3 and 164/5 and from the 28-volt d.c. supply at fuse 217 through contacts 164/7. If, for any reason, the torque switch operates, the coil of relay 164 will be isolated. The instruments will now be served with a.c. supplies from No. 3 inverter through contacts 164/4 and 164/6, and with a 28-volt d.c. supply from fuse 218 through contacts 164/8.

38. In the event of subsequent failure of No. 3 inverter, the instruments may be served from No. 2 inverter by selection of the emergency change-over switch, the sequence of operations being as previously described under Type 350 inverters.

39. Detailed information of the operation and servicing of the Type 100A inverters and Type 12 control panel is contained in A.P. 4343B, Vol. 1.

DISTRIBUTION

40. As already mentioned in para. 3, each of the six inverters is intended for the supply of alternating current to certain specified loads. 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. A table of fuses for these feeders is contained in Group 1 of this chapter.

41. The miscellaneous loads served by No. 3 inverter, and the instrument loads served by No. 6 inverter, are dealt with separately in the appropriate groups of this chapter. All other consumer loads, mainly in the form of special equipment, are supplied from inverters Nos. 1, 4 and 5, with No. 2 inverter standing by to meet conditions of emergency such as would arise should one or more of the inverters fail.

42. Detailed information on the function and operation of the special equipment is beyond the scope of this publication. It is necessary for the proper maintenance of the aircraft, however, that the operator should be aquainted with the control of supplies to the special equipment and it is with this aspect of the installation that the following notes are concerned.

43. Certain of the special equipment installations are required to be screened throughout. Since the connectors to the components have to be broken at panel 11P to allow for connections to control equipment such as relays, etc., contained within the panel, that part of the panel containing the control equipment is screened. Continuity of screening being assured by employing screened plug and socket entries to the panel.

44. The screened supplies are those affecting the A.R.I.5810 installation comprising the H2S and N.B.C. equipment. This equipment requires alternating current supplies at 115-volts, 3-phase, 400 c/s. and at 115-volts, single-phase, 1600 c/s., and direct current supplies at 28- and 112-volts. All a.c. supplies for normal operation of the installations are provided by No. 1 inverter. ◄ On aircraft with Mod. 390 embodied, plug No. 825 is added at panel 11P to provide for the introduction of a control unit Type X6223 in the circuit of A.R.I.5810. ►

45. Neon lamps on 12P give visual indication of a.c. power supplies in the A.R.I.5810 installation and a test socket on panel 11P provides a means whereby such supplies may be checked. A further test socket in the nose section enables the 1600 c/s. supply to be checked at a point local to the consumer equipment.

46. The N.B.C. installation is controlled by a switch fitted on panel 12P and operating on

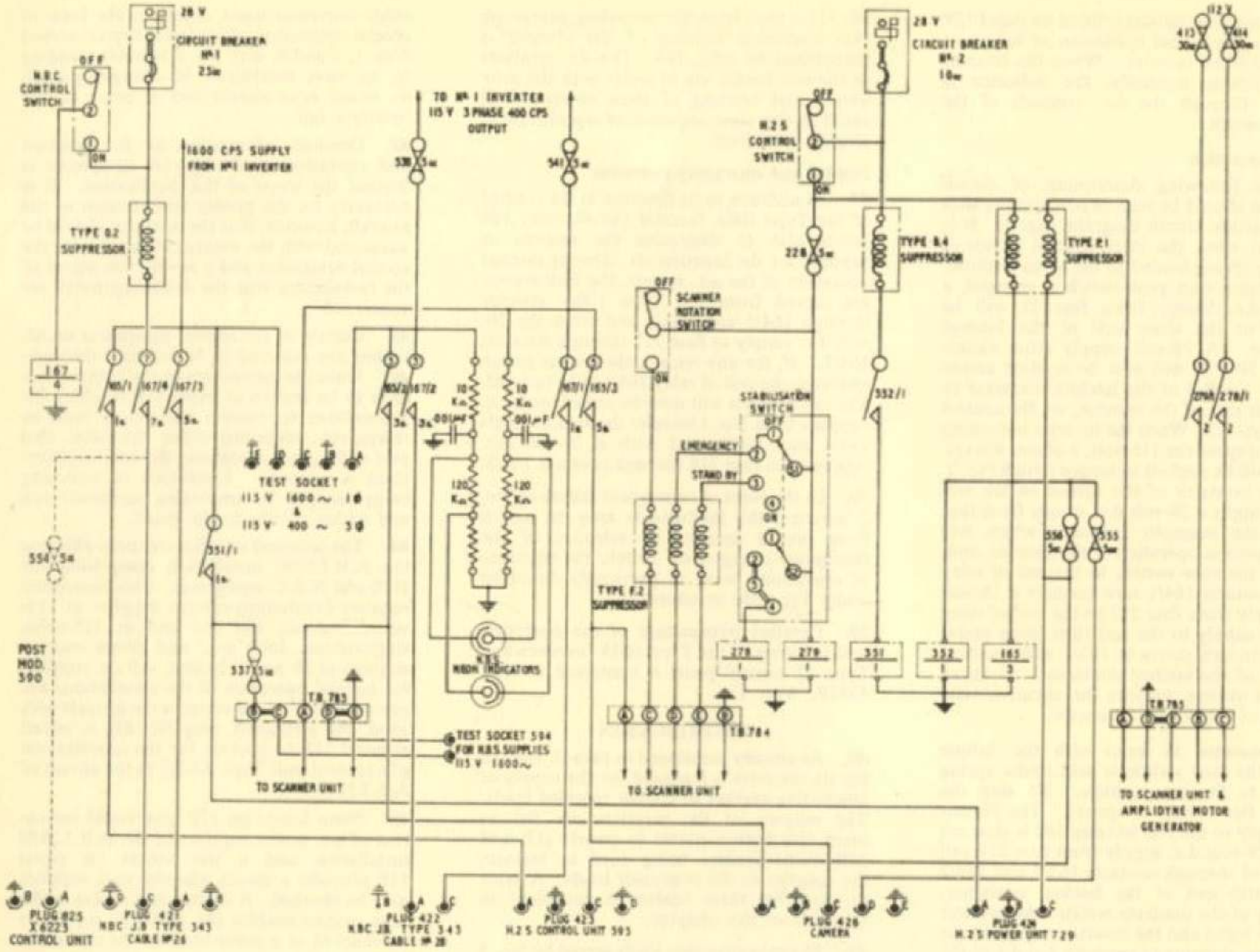


Fig. 9. Screened radio and radar supplies

28-volts d.c. The H2S is similarly controlled by its own switch, also fitted on panel 12P. In each case, the single switch operation connects all necessary supplies to the installation. A theoretical wiring diagram of the screened radio and radar supplies is shown in ◄ fig. 9. On aircraft with Mod. 370 embodied, a link is added between the No. 1 and No. 2 terminals at the S.1 portion of the stabilisation switch. This serves to maintain the supply with the switch in the off position. ►

SERVICING

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

48. Functional tests may be carried out on the inverters whilst the aircraft is on the ground. If such tests are carried out with the engines stopped, external supplies will have to be plugged in to the 112-volt d.c. and the 28-volt d.c. ground supply plugs. ◄ The internal batteries must not be used for this purpose. ►

49. 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 d.c. control panel, 10P. Checking of the six inverters may now proceed in the following manner:—

(1) Switch on No. 1 inverter. The No. 1 inverter neon lamps will indicate correct operation of the 400 c/s. and of the 1600 c/s. sections of the inverter. If it is required to check the output voltage and frequencies, this may be done by plugging suitable test equipment into the test socket provided on panel 12P.

(2) Switch on No. 2 inverter and switch off No. 1 inverter. The neon lamps now indicate the absence of power supplies. Switch the emergency change-over switch to position 1 and check that the neon lamps again indicate availability of power supplies, thus proving the outputs of No. 2 inverter and correct change-over operation.

(3) Switch on No. 3 inverter and observe the No. 3 inverter neon lamps to prove the outputs. Switch off No. 3 inverter and check that the neon lamps indicate the absence of power supplies. Switch the emergency change-over switch to position 2, when the neon lamps will again glow to indicate supplies from No. 2 inverter, thus proving correct change-over. DURING THESE TESTS, ENSURE THAT THE ARTIFICIAL HORIZONS AND G.M.4.B COMPASS ARE FUNCTIONING.

(4) Switch on No. 6 inverter by holding the control switch to the MANUAL position until the magnetic indicator registers the change-over due to the action of the torque switch, thus proving the correct functioning of the inverter and of the change-over relay. As a further check, ensure that the instrument gyros continue to rotate. Switch off No. 6 inverter.

(5) Switch on No. 4 inverter, checking on the neon lamps for availability of the 400 c/s. output. Switch off No. 4 inverter, when the neon lamps will indicate the absence of power supplies. Now switch the emergency change-over switch to position 3 and check that No. 4 inverter neon lamps glow due to supplies from No. 2 inverter, thus proving correct change-over. Switch off No. 2 inverter and return the emergency change-over switch to the OFF position.

(6) Switch on No. 5 inverter and check that the neon lamps indicate that the 400 c/s. output is available. Switch off No. 5 inverter.

(7) Switch off the battery isolation switches.

50. Line checks should be carried out on distribution circuits either by functional testing of the equipment served, or 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 instructions contained in the relevant groups of this publication.

REMOVAL OF COMPONENTS

51. 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.

REMOVAL OF TYPE 350 INVERTERS

52. This is a task requiring two men and ground equipment taking the form of a "Safety Raiser" or similar adjustable trestle. The procedure is as follows:—

(1) Position "Safety Raiser" below nose-wheel bay.

(2) Raise platform as high as possible to clear aircraft structure.

(3) Both men climb on to the platform to gain access to the inverters and control gear in the nose-wheel bay.

(4) Disconnect the inverters and remove the

four bolts securing each inverter to the rack.

(5) Loosen the hose clip securing the cooling manifold to the front of each inverter and ease the manifold clear of the inverters.

(6) Disconnect and remove the three rectifier units. These are held in position on the rack by quick release clamps as illustrated on fig. 2.

(7) Disconnect and remove the three control panels. These are secured to the rack in a similar manner to the rectifier units.

(8) Slide No. 1 inverter inboard, one man taking the weight as it clears the rack. Lower the inverter on to the platform. Repeat with No. 2 inverter followed by No. 3 inverter.

(9) Lower the safety raiser and transfer the inverters to a flat trolley.

53. Where it is necessary to remove only one inverter, the procedure is similar but, in view of the restricted working space, greater care will have to be exercised in removing the inverter from the rack on to the platform.

REMOVAL OF TYPE 153 INVERTERS

54. Precautions similar to those outlined above 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 be disconnected, freed by removing the securing bolts, and lowered to the second man who will place them safely on the platform. The control panels are secured to the racks under the crew's floor by quick release clamps, and their removal should be carried out in a similar manner to the removal of Type 350 inverter control gear. Having lowered the platform the components may safely be transferred on to a flat trolley. The positions of the components and the manner of their attachment to their mounting are illustrated in fig. 6.

REMOVAL OF TYPE 100A INVERTER

55. Reference to fig. 6 will show that the Type 100A inverter, fitted under the crew's floor, is readily detachable from the mounting rack. The machine and its control equipment are of light weight and may be removed single-handed, having first disconnected the electrical connections and removed the securing bolts.

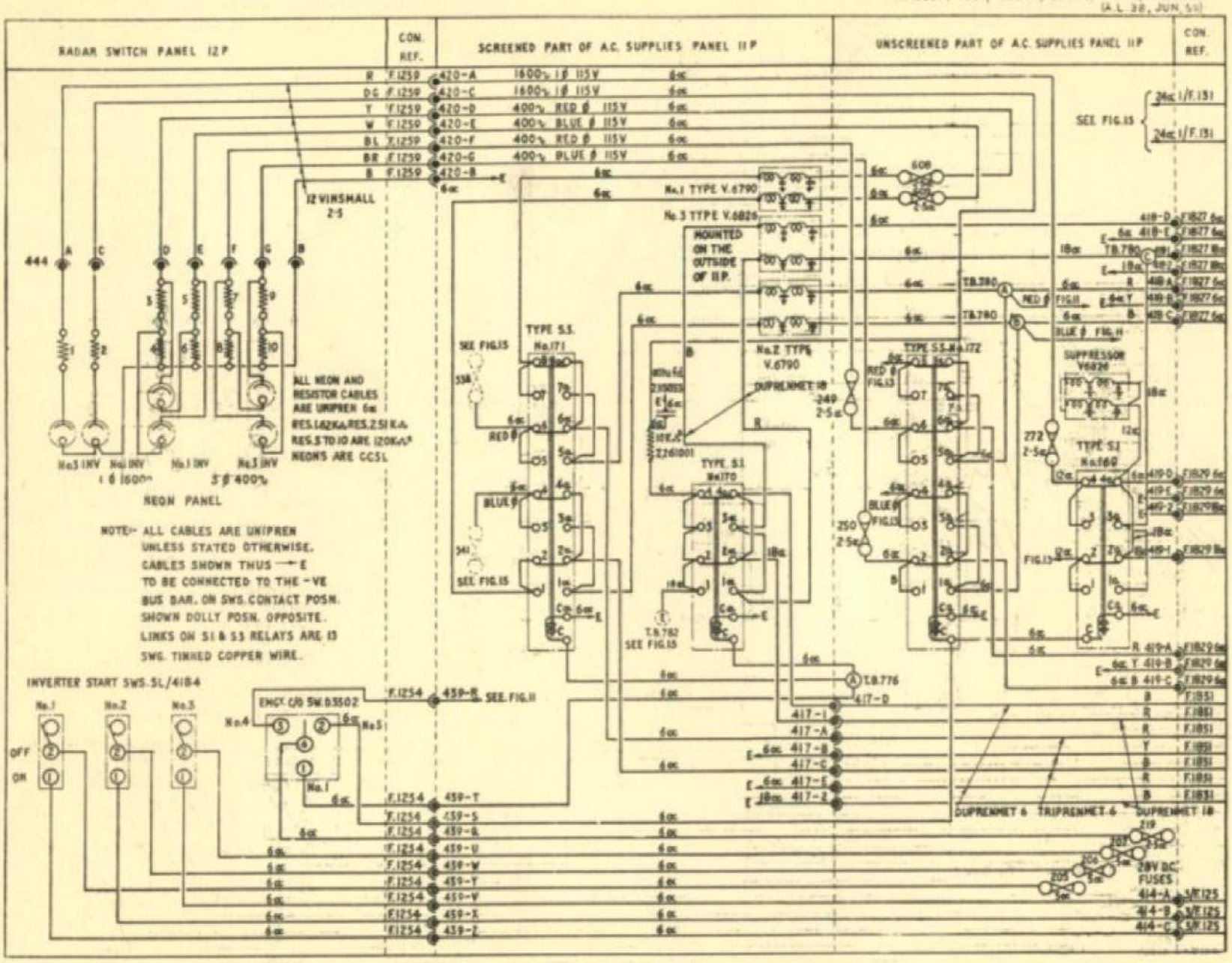


FIG. 10 (1). TYPE 350 INVERTER CONTROL

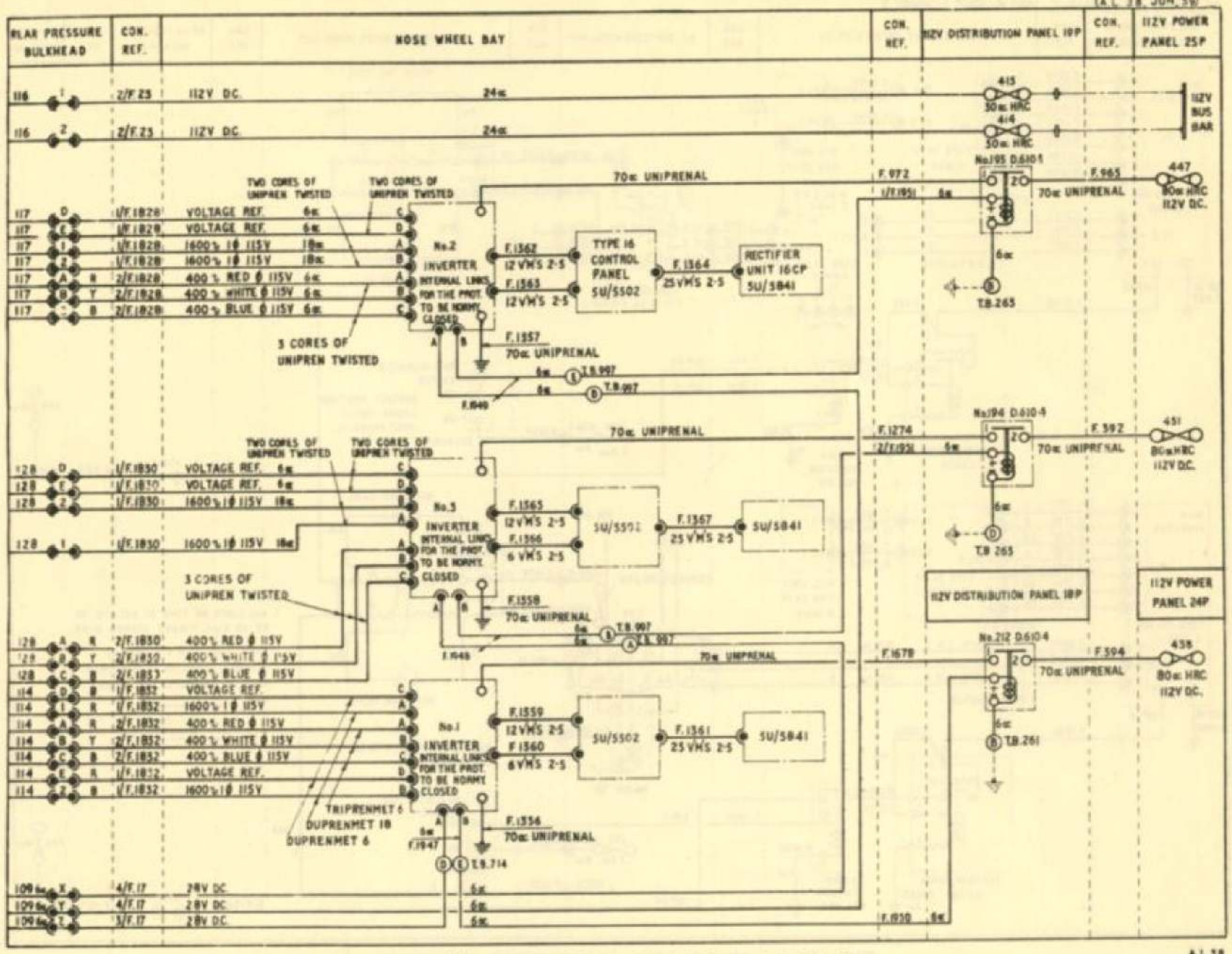


FIG. 10(2) TYPE 350 INVERTER CONTROL

A.L.38

RESTRICTED

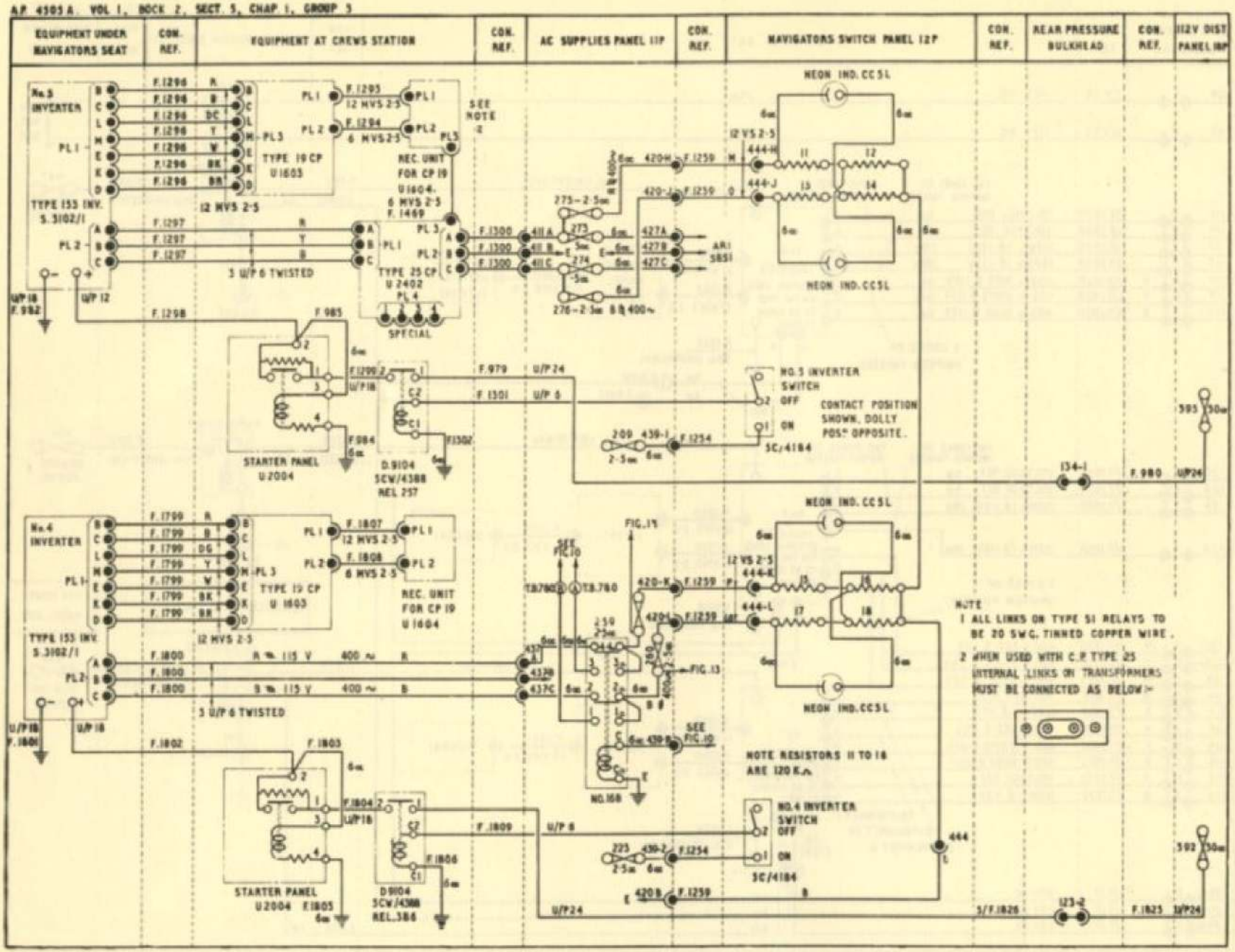


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FIG 11 - TYPE 153 INVERTER CONTROL (PRE MOD. 298)

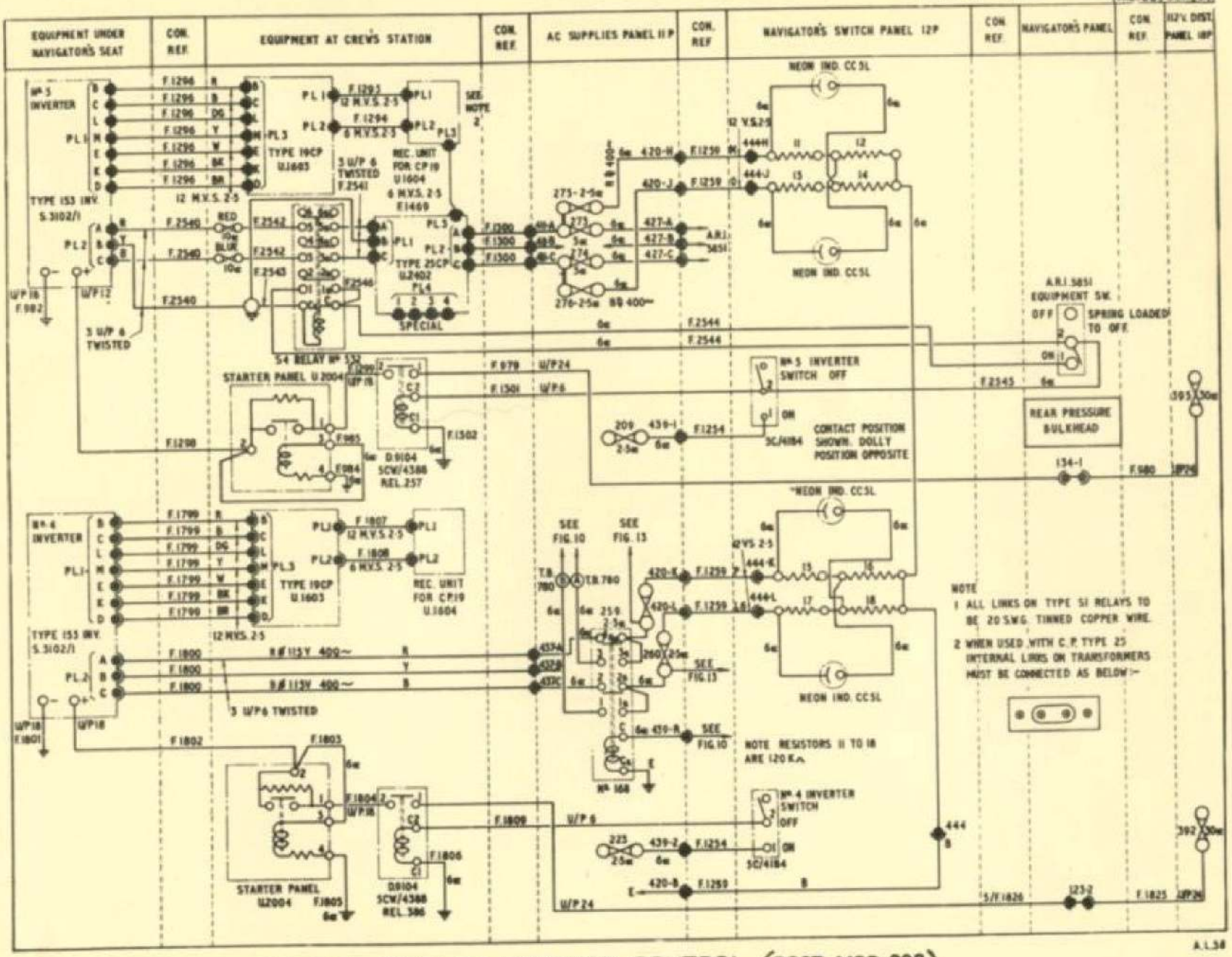


FIG. 11 A TYPE 153 INVERTER CONTROL (POST MOD. 298)

RESTRICTED

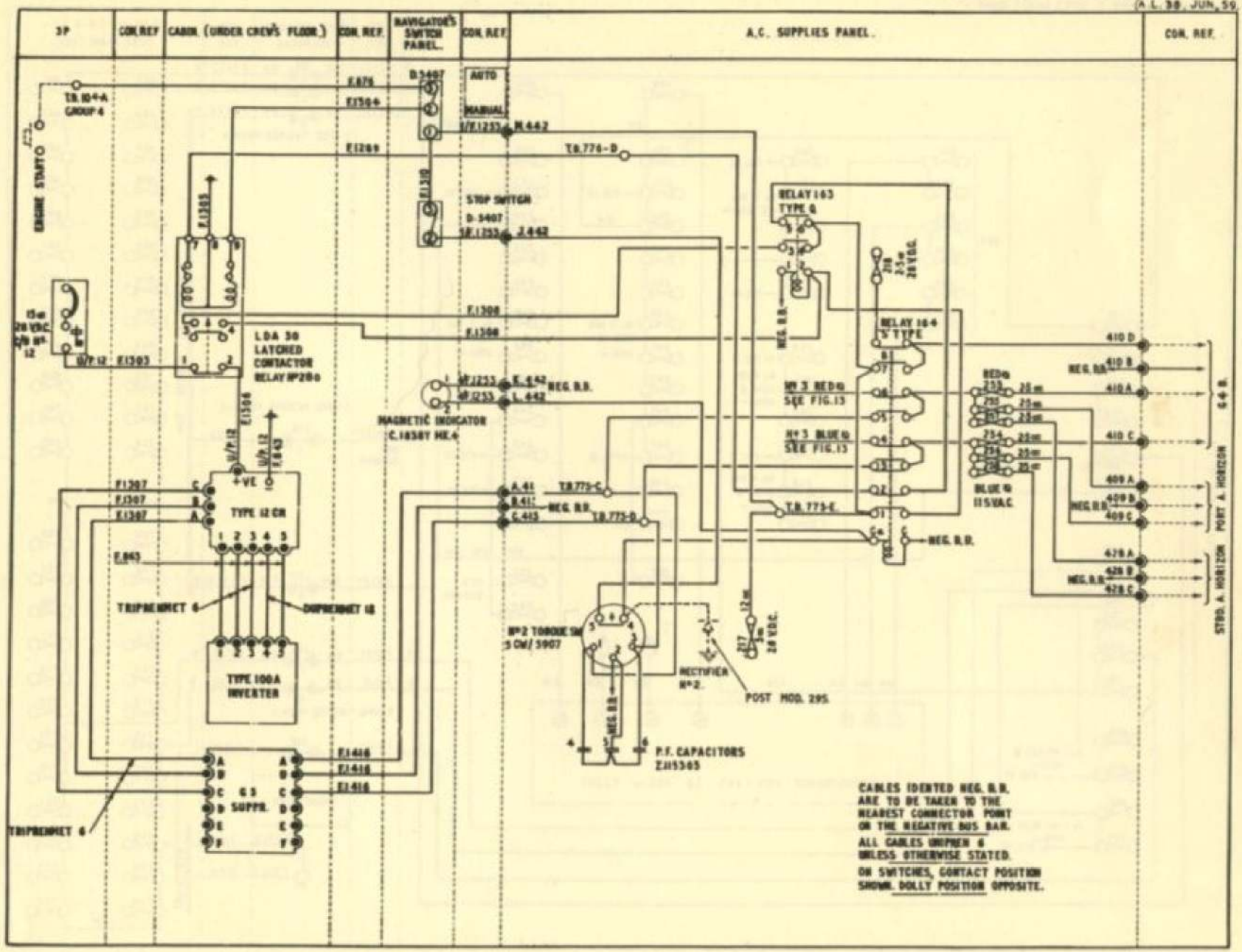
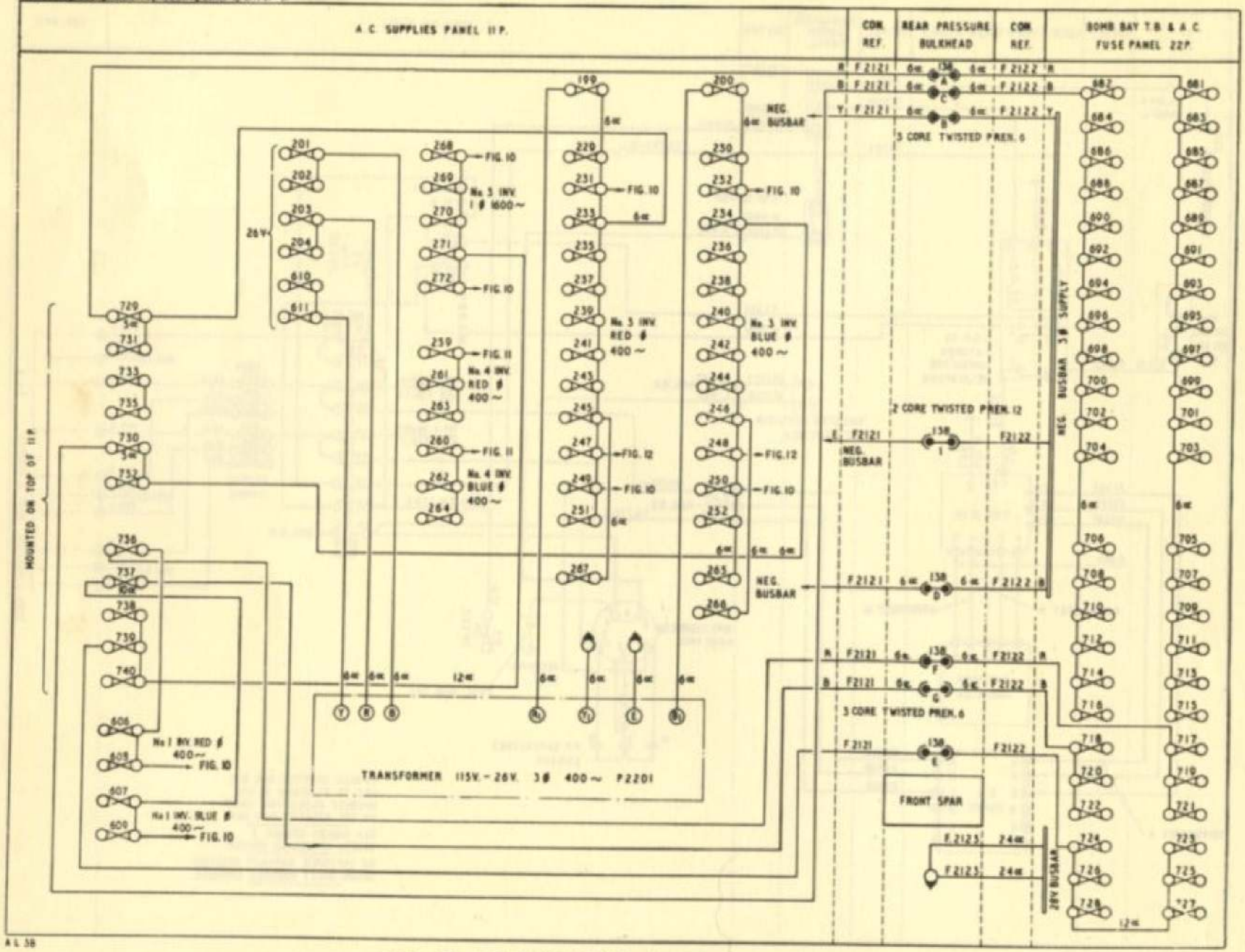


FIG. 12. TYPE 100A INVERTER CONTROL



A.L. 58

FIG. 13 A.C. DISTRIBUTION - 11P AND 22P

RESTRICTED

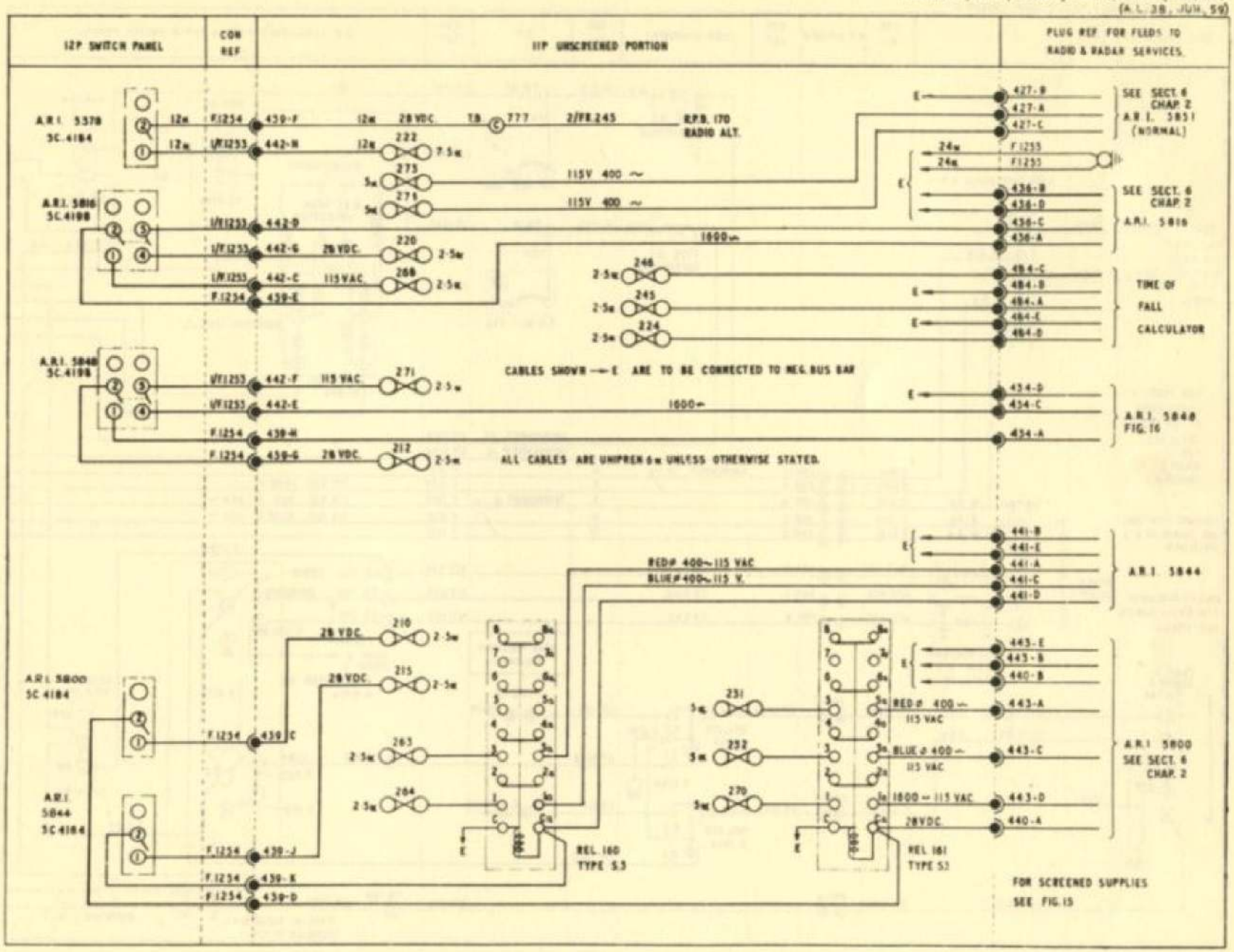


FIG. 14 UNSCREENED RADIO SUPPLIES

A.L. 28

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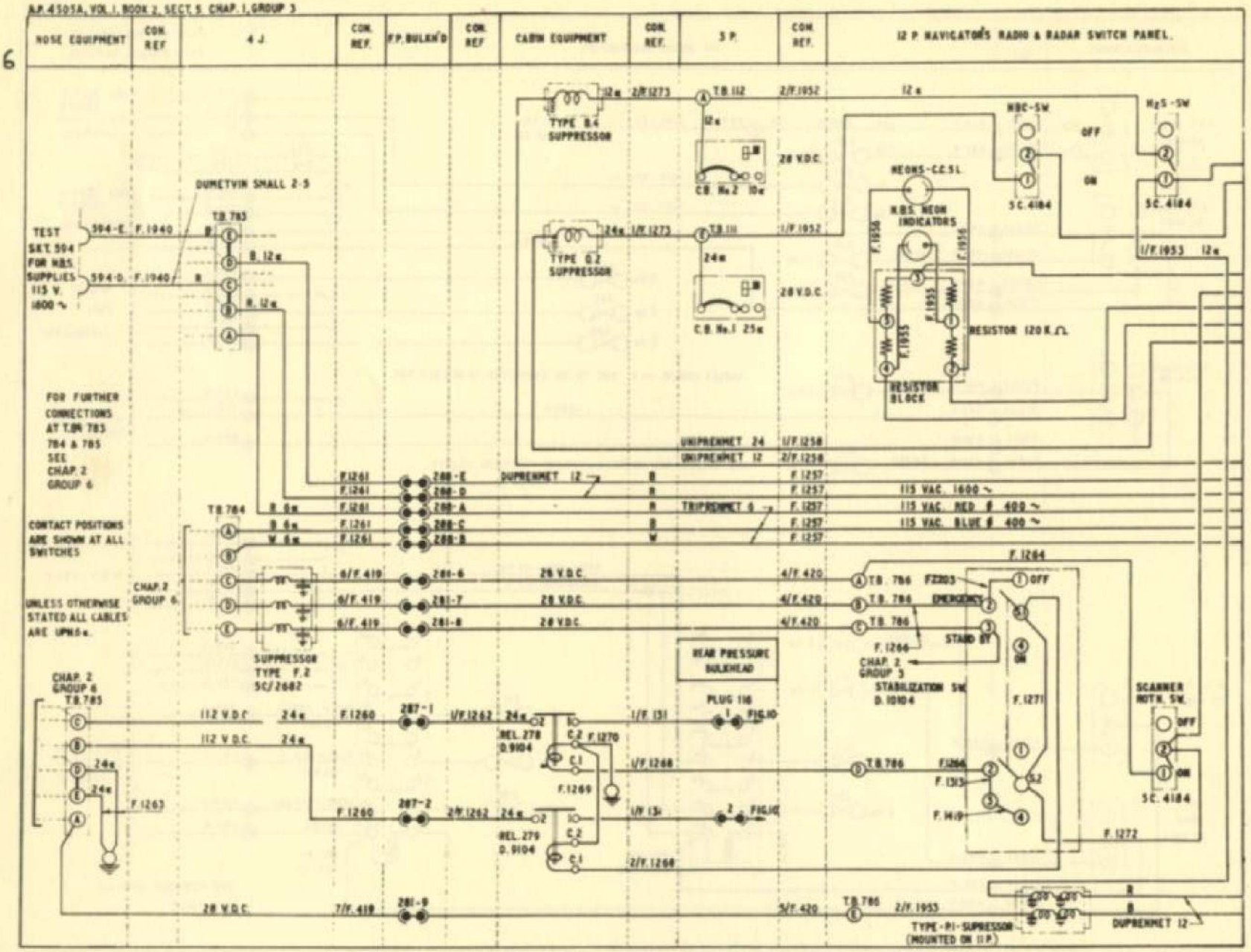


FIG. 15(1) SCREENED RADIO AND RADAR SUPPLIES (PRE & POST MOD. 390)

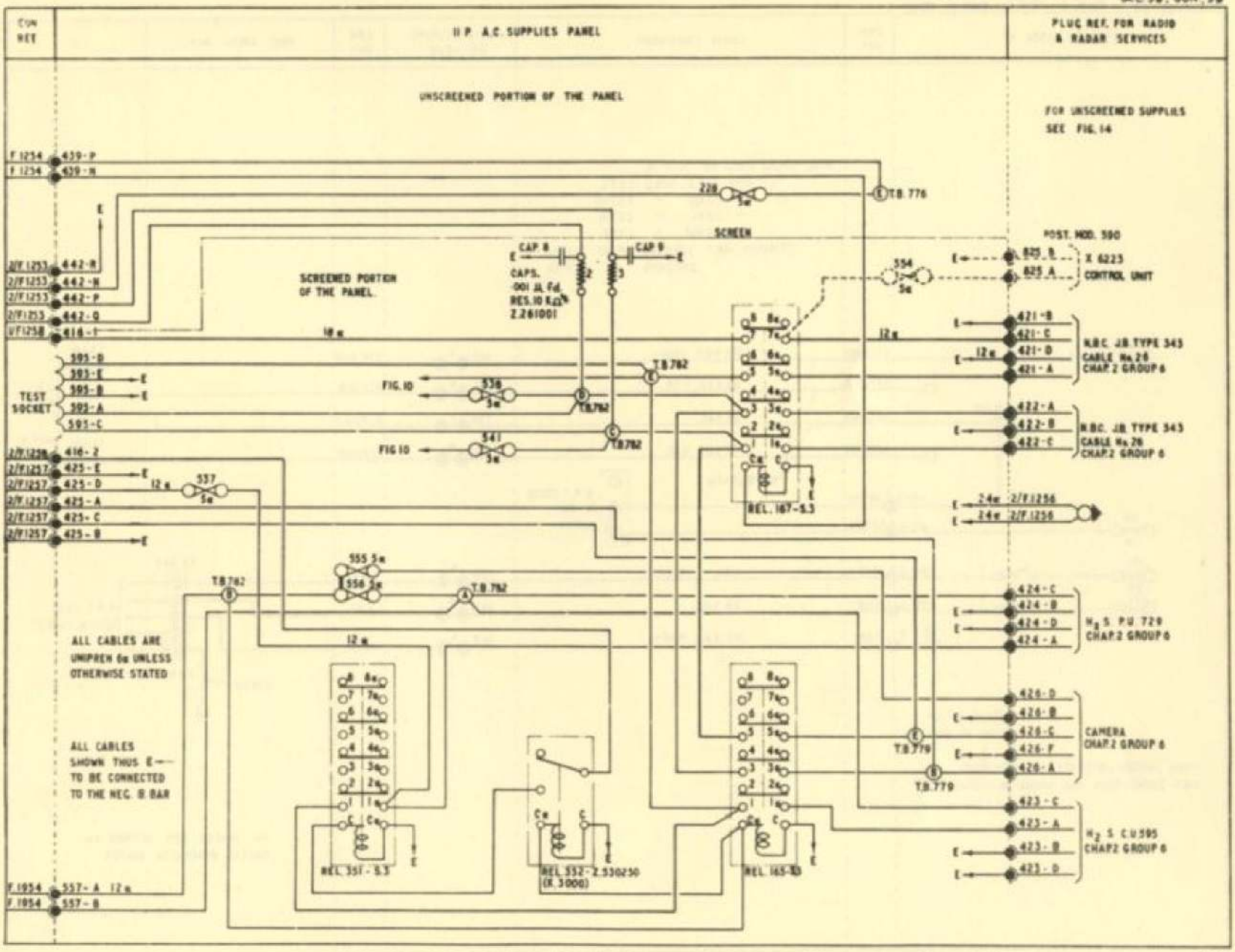
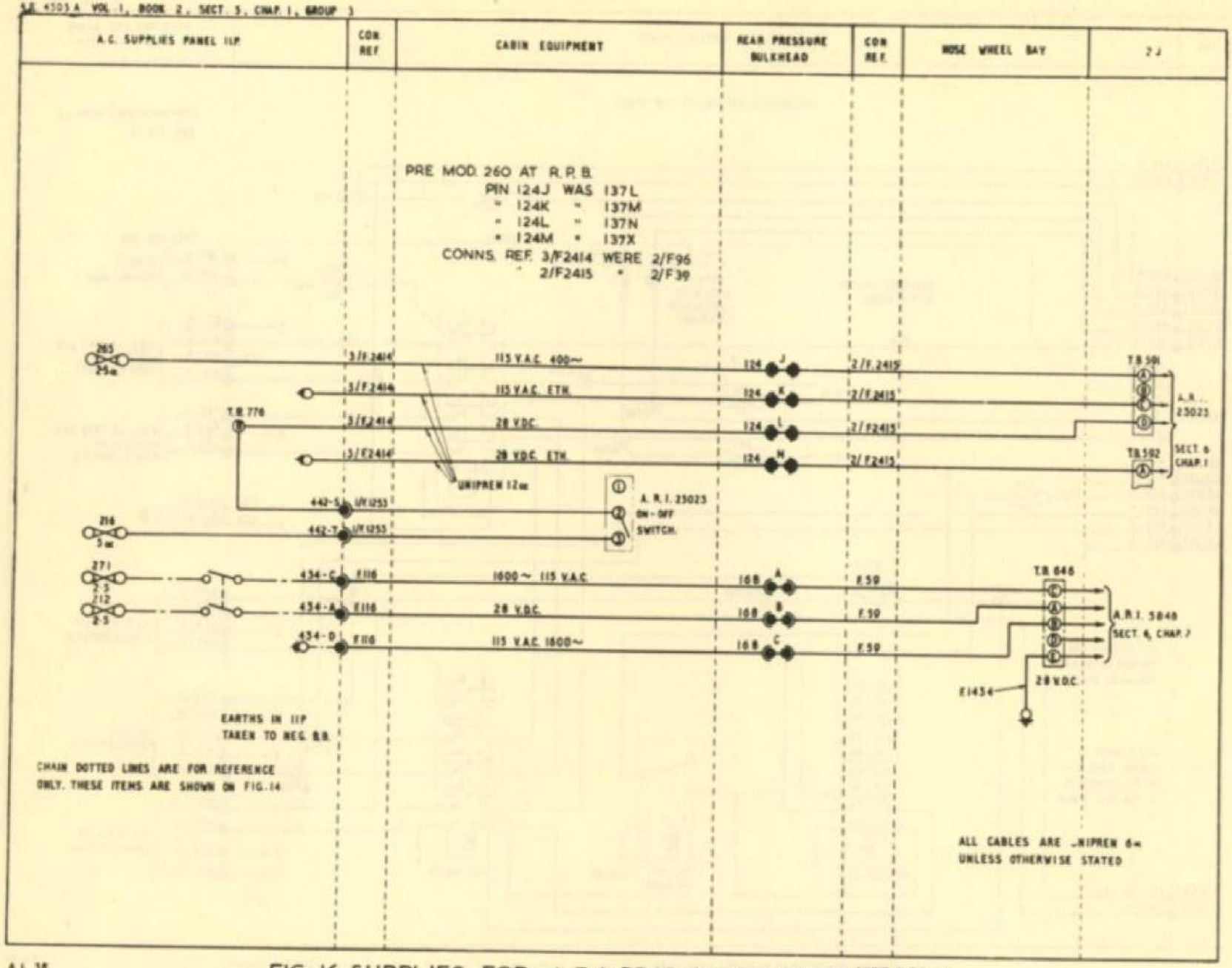


FIG. 15(2) SCREENED RADIO AND RADAR SUPPLIES (PRE & POST MOD. 390)



A.L. 38

FIG. 16 SUPPLIES FOR A.R.I. 5848 & A.R.I. 23023 (PRE & POST MOD. 260)

RESTRICTED

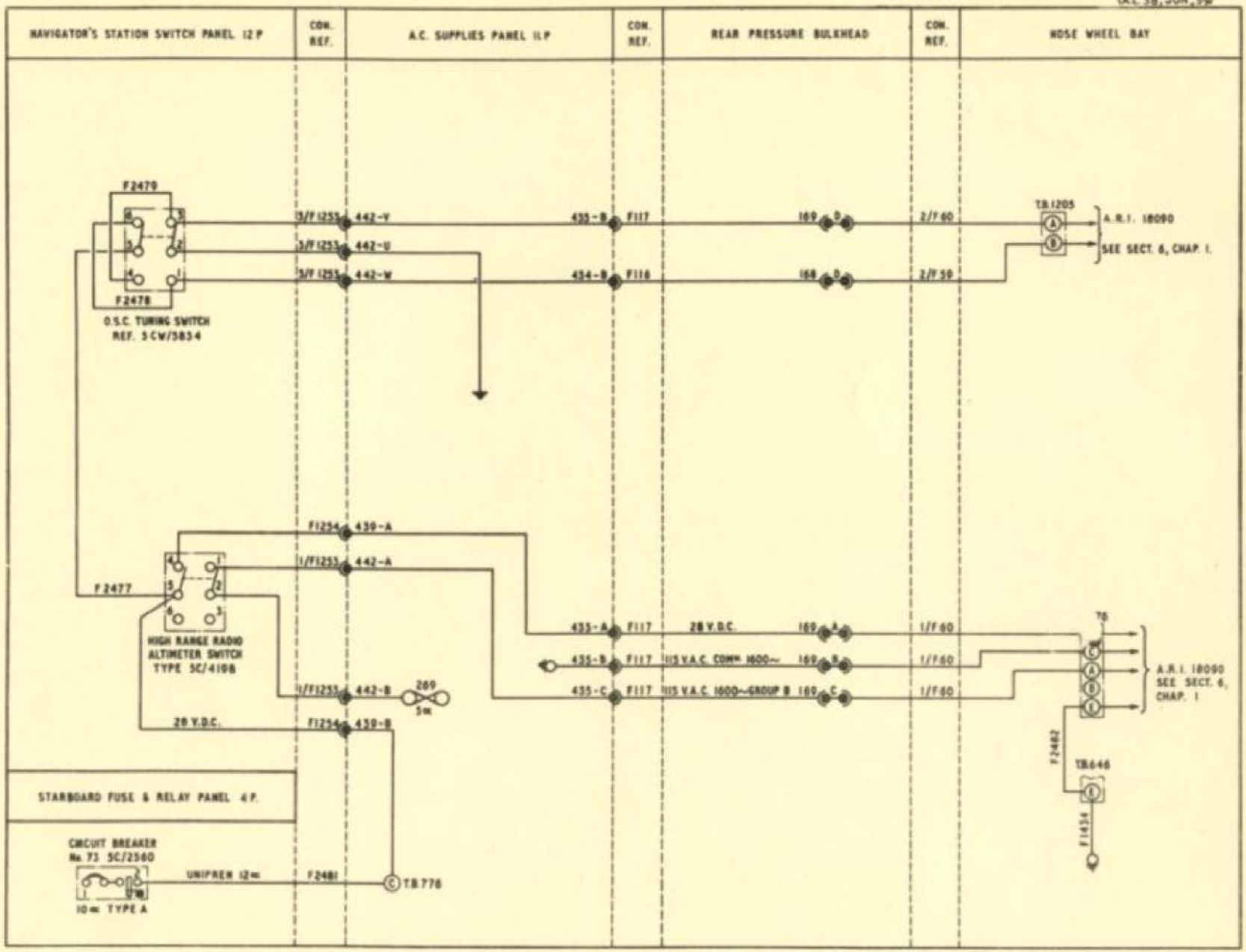


FIG. 17 SUPPLIES FOR A. R. I. 18090