Group 1

GENERAL INFORMATION

LIST OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

TABLE 1

Circuit function letters

CIRCUIT FUNCTION LETTER 'A'

Bomb fuzing and release
Bomb doors control
Bomb carrier locking and indication
Bomb jettison connectors
Emergency hydraulic power pack

CIRCUIT FUNCTION LETTER 'B'

To be issued later

CIRCUIT FUNCTION LETTER 'C'

Powered flying controls indicator
28V P.F.C. aileron controls
112V P.F.C. aileron controls
28V P.F.C. elevator controls
112V P.F.C. elevator controls
28V P.F.C. rudder controls
112V P.F.C. rudder controls
Indicators for aileron, elevator and rudder P.F.C. motors
Aileron artificial feel
Elevator artificial feel
Rudder artificial feel
Artificial feel relief
Normal trim controls
Emergency controls
Automatic pilot controls
Air brake control
Tail parachute control
Auto-stabiliser

CIRCUIT FUNCTION LETTER 'D'

Bomb door indicators
Nitrogen pressure indication
Hydraulic pressure indication
Bomb bay thermometers
Outside air and cabin thermometers
Nitrogen master valve control

CIRCUIT FUNCTION LETTER 'E'

Fuel flowmeters
Oil pressure indication
Engine tachometers
Jet pipe thermometers

CIRCUIT FUNCTION LETTER 'F'

Heated pressure heads
A.M.U. Mk. 4
G4B Compass
Artificial horizon indicators
Turn and slip indicators

CIRCUIT FUNCTION LETTER 'G'

Alighting gear control
Alighting gear indication

CIRCUIT FUNCTION LETTER 'H'

Fin anti-icing controls
Port wing anti-icing controls
Starboard wing anti-icing controls
Engine anti-icing controls
Anti-icing thermometer
Pilots' and Bomb aimer's windscreen de-icing
Pressurisation – engine master valves
Pressurisation – mass flow indication
Pressurisation – temperature and mass flow control
Pressurisation – flood flow control
Pressurisation – de-compression and warning
Pressurisation – underheat control
Pressurisation – ram air valve actuator
Pressurisation – cabin temp. selection and indication
Battery heating and ventilation
Bomb bay heating
Sextant head heater
Windscreen de-mister
Crew's ration heaters

CIRCUIT FUNCTION LETTERS 'J and K'

Engine starting and ignition

CIRCUIT FUNCTION LETTER 'L'

Cabin and general lighting
Crew's red fluorescent lighting
Pilot's red floodlamps
Console white fluorescent lighting
Navigator's instrument lighting
Ultra-violet lighting
Ground service lighting
Navigation lamps
Downward identification lamps
Combined landing and taxying lamps
Emergency lighting

CIRCUIT FUNCTION LETTER 'M'

Windscreen wipers

CIRCUIT FUNCTION LETTER 'P'

No. 1 generator controls – 112V d.c.
No. 2 generator controls – 112V d.c.
No. 3 generator controls – 112V d.c.
No. 4 generator controls – 112V d.c.
No. 1 rotary transformer, Type 1050 controls
No. 2 rotary transformer, Type 1050 controls
No. 3 rotary transformer, Type 1050 controls
Battery isolation and ground supplies
112-volt distribution and feeder protection
28-volt distribution forward of r.p.b.
28-volt distribution aft of r.p.b.
28-volt emergency supplies

CIRCUIT FUNCTION LETTER 'Q'

No. 1, 4, 5 and 7 port fuel pumps
No. 1, 4, 5 and 7 starboard fuel pumps
No. 2, 3 and 6 port fuel pumps
No. 2, 3 and 6 starboard fuel pumps
No. 1 and 7 port fuel transfer pumps
No. 1 and 7 starboard fuel transfer pumps
Secondary fuel pumps
No. 1 group – tank selection and contents
No. 2 group – tank selection and contents
No. 3 group – tank selection and contents
No. 4 group – tank selection and contents
Refuelling – No. 1 group
Refuelling – No. 2 group
Refuelling – No. 3 group
Refuelling – No. 4 group
Refuelling – No. 1, 4, 5 and 7 starboard tanks
Negative distribution
L.P. fuel cock controls
Cross-feed fuel cock controls
Fuel pressure warning

CIRCUIT FUNCTION LETTERS 'R, U, S, V and X'

Radio and radar a.c. supplies
A.c. and d.c. distribution in 11P
Type 350 inverter controls
Type 100A inverter controls
Supplies for radio altimeter and I.F.F.
A.C. supplies to flight instruments
Inverters, Type 153

CIRCUIT FUNCTION LETTER 'W'

Engine fire warning control
Engine fire extinguishers
Leading edge duct fire extinguishers
Port wing tank fire extinguishers
Starboard wing tanks fire extinguishers
No. 1 and 2 tank bay fire extinguishers
Canopy and entrance door indication

WARNING

Voltages in excess of 100 volts either a.c. or d.c., can be dangerous under certain circumstances. Personnel should therefore ensure that the electrical system is electrically safe before any servicing is attempted. Where it is essential that tests or adjustments be made with the electrical power switched on, the greatest care must be exercised.

Introduction

1. This chapter contains descriptive and servicing information for the electrical system. The chapter is divided into groups according to the mandatory code letter of each circuit or group of circuits. Each group is self-contained, including descriptive, servicing and removal information for all items of equipment dealt with therein. The use of theoretical circuit diagrams using Post Office symbols simplifies the text, and assists the reader to understand the function of the more complicated circuits.

2. Descriptive and servicing information for standard items of equipment will be found in the relevant Air Publication, to which reference will be made in the appropriate paragraphs. A general list of Air Publications will be found at the front of this book.

DESCRIPTION

AN OUTLINE OF THE SYSTEM

3. The electrical system can be divided into three main sections namely, 112-volt d.c. for the heavy duty or main consuming devices, 28-volt d.c. for the secondary or low current consuming devices, and single and three-phase, a.c. at 115-volts with frequencies of 1600 and 400 cycles per second. A good deal of the controlling equipment for the 112-volt section is supplied at 28-volts.

4. Power for the 112-volt section is generated by four 22½ k.w. engine-driven generators installed one on each engine; 28-volt power is provided by d.c. – d.c. rotary transformers which derive their input from the 112-volt section of the system. Single and three-phase a.c. supplies for radio, radar and other equipment are provided by rotary inverters driven from the 112-volt and 28-volt sections of the system.

5. A main battery consisting of four 12-cell blocks of 40 ampere-hour capacity is provided for the 112-volt section, and a separate 12-cell 40 ampere-hour battery for the 28-volt section. The negative poles are normally earthed, but provision is made for connecting the two batteries in series for emergency engine starting.

6. A single-pole wiring installation is employed which utilises the aircraft metal structure for the negative return. Pren type cables are used for most of the wiring, and connector blocks are installed at transport breaks and bulkheads. Each circuit is identified by a mandatory code letter.

7. Protective devices such as circuit breakers and fuses are installed as close to the source of supply as possible, and are disposed in groups to minimise vulnerability. The 115-volt three-phase a.c. circuits are protected in two phases. All protective devices are identified numerically.

8. Essential services can be split into two groups, i.e., those which must remain on after a crash landing in which the inertia switches have been tripped, and those which must be supplied if a failure occurs on the 28-volt bus-bar during flight. Circuits common to both groups of essential services include fire extinguisher controls and engine low pressure fuel cocks. Further details will be found in Group 2.

9. Two external supply plugs, one for the 112-volt services, the other for the 28-volt circuits, are provided for ground testing and servicing purposes. The 112-volt external supply plug is also used for engine starting. A ground supply truck provides 28-volt and 112-volt constant voltage supplies.

WIRING INSTALLATION

10. A composite wiring installation is employed in which S.B.A.C. and AVRO connector blocks provide most of the junction or connection points. Plessey plugs and sockets of the standard and pressure proof types are used at transport joints and pressure bulkhead. Although a good deal of 2-pole components are installed, the d.c. wiring installation can be regarded as single-pole with the aircraft metal structure acting as the negative return. On a.c. circuits, one wire of the single-phase and the third wire of the three-phase circuits are earthed to the aircraft structure. An AVRO identification scheme, coupled with the S.B.A.C. circuit code letter is used throughout.

PANELS AND JUNCTION BOXES

11. Each panel is an assembly of components such as fuses, circuit breakers, instruments, relays, etc. with or without connector blocks and plugs and sockets. Junction boxes are enclosed assemblies of connector blocks with or without plugs and sockets. The inlets or outlets of all panels and junction boxes are numbered clockwise. The designations of all panels and junction boxes are given in Table 2, their location is shown in fig. 1.

CONNECTOR BLOCKS

12. With the exception of a small number of earth connection or multiple distribution points where standard S.B.A.C. blocks are used, all circuits up to 12 amp. use the AVRO lightweight connector block. S.B.A.C. blocks are employed for cables above the 12 amp. size. Each connector block is given the prefix T.B. and a number, which is engraved on a plate or label and forms part of the connector block assembly group.

TABLE 2

Panels and junction boxes

Panel	Description
1P	Pilots' instrument panel
2P	Fuel contents panel
3P	Port fuse and relay panel
4P	Starboard fuse and relay panel
5P	Centre console
6P	Port console
7P	Starboard console
8P	Visual air bomber's panel
9P	Bomb control panel
10P	Generator control panel
11P	Radar a.c. control and fuse panel
12P	Navigator's and signaller's panel
13P	Nose wheel bay T.B. panel
14P	Not allocated
15P	28-volt power panel
16P	28-volt distribution panel
17P	Wing de-icing panel
18P	112-volt distribution panel
19P	112-volt distribution panel
20P	Bomb gear distribution panel
21P	Bomb bay T.B. panel – forward
22P	Bomb bay T.B. panel – aft
23P	Fin de-icing panel
24P	112-volt control panel—port
25P	112-volt control panel—starboard
26P	Rear spar distribution panel
28P	P.F.C. contactor panel
29P	28-volt fuse panel (Mod. 40)
30P	No. 1 engine T.B. panel
31P	No. 2 engine T.B. panel
32P	No. 3 engine T.B. panel
33P	No. 4 engine T.B. panel
34P	Fuel pump and fire extinguisher panel—port
35P	Fuel pump and fire extinguisher panel—starboard
36P	Refuelling panel – port
37P	Refuelling panel – starboard
38P	Alighting gear T.B. panel – port

Panel	Description
39P	Alighting gear T.B. panel – starboard
40P	Port wing T.B. panel
41P	Starboard wing T.B. panel
42P	Not allocated
43P	Bomb bay heating panel
44P	Not allocated
45P	C of G computor panel port (Mod. 38 only)
46P	C of G computer panel starboard (Mod. 38 only)
47P	Not allocated
48P	Not allocated
49P	A.R.I.5890 version only
50P	Not allocated
51P	V.H.F. relay panel
52P	Not allocated
53P	Not allocated
54P	Intercomm. panel
55P	Not allocated
56P	R.A.T.O.G. (Mod. 1 only)
57P	P.F.C. indicator relay panel (Mod. 162)
58P	Artificial feel relay panel (Mod. 289)
59P	Artificial feel distribution panel (Mod. 289)
J.B.	
1	Bomb bay port junction box
2	Bomb bay starboard junction box
3	Port wing tip junction box
4	Scanner junction box (nose)
5	Intercomm. relay junction box
6	A.R.I.18051 junction box (Mod. 10)
7	Fuel flowmeters junction box (Mod. 82)
8	A.R.I.5890 version only
9	A.R.I.5890 version only
10—26	Not allocated
27	A.R.I.5800 junction box (Mod. 66)
28	Radar reconnaisance version only
29	Auto-trim control (Mod. 233 only)
30	A.R.I.5890 version only
31	A.R.I.5890 version only

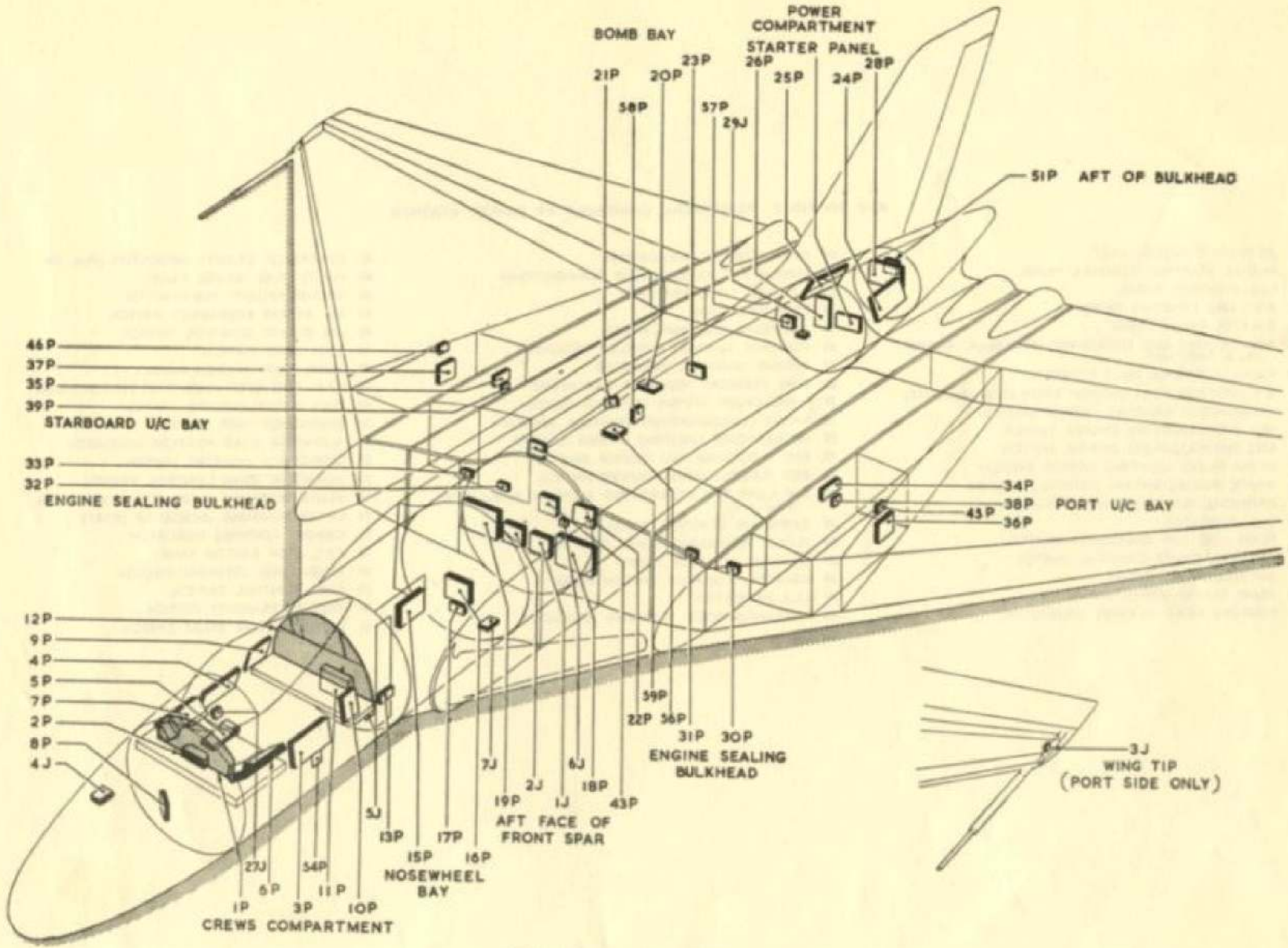


Fig. 1. Panels and junction boxes

KEY TO FIG. 2 ELECTRICAL CONTROLS AT PILOTS' STATION

1 COMPASS CONTROL UNIT
2 ENGINE STARTING CONTROL PANEL
3 I.L.S. CONTROL PANEL
4 A.R.I. 5800 CONTROL PANEL
5 V.H.F. CONTROL PANEL
6 BOMB DOORS AND EMERGENCY HYDRAULIC POWER PACK SWITCHES
7 RADIO ALTIMETER Mk. 5 CONTROL
8 U/V LAMP FOR PORT OXYGEN REGULATOR (Mod. 112)
9 ULTRA-VIOLET LIGHTING DIMMER SWITCH
10 RED FLOODLIGHTING DIMMER SWITCH
11 RED FLOODLIGHTING DIMMER SWITCH
12 ULTRA-VIOLET LIGHTING DIMMER SWITCH
13 WHITE FLOODLIGHTING CONTROL SWITCH
14 ARTIFICIAL FEEL WARNING INDICATOR
15 I.L.S. INDICATOR
16 TURN AND SLIP EMERGENCY SWITCH
17 TAIL PARACHUTE CONTROL SWITCH
18 AIR BRAKES INDICATOR
19 BOMB DOORS INDICATOR
20 PRESSURE HEAD HEATING INDICATORS
21 P.F.C. WARNING INDICATORS
22 ENGINE FIRE EXTINGUISHER PUSH-SWITCHES
23 L.P. FUEL COCK SWITCHES
24 TRIM INDICATOR
25 ARTIFICIAL FEEL INDICATORS
26 CONTROL SURFACE POSITION INDICATOR
27 ENGINE CONTROL INDICATOR
28 FUEL PRESSURE WARNING INDICATORS
29 WINDSCREEN WIPERS CONTROL SWITCH
30 WHITE FLOODLIGHTING CONTROL SWITCH
31 ULTRA-VIOLET LIGHTING DIMMER SWITCH
32 RED FLOODLIGHTING DIMMER SWITCH
33 RED FLOODLIGHTING DIMMER SWITCH
34 U/V LAMP FOR STARBOARRD OXYGEN REGULATOR (Mod. 112)
35 CABIN AIR CONTROL PANEL
36 FLIGHT REFUELLING PANEL (Mod. 38)
37 DE-ICING CONTROL PANEL
38 LIGHTING CONTROL SWITCH PANEL
39 I.L.S. INDICATOR
40 ENTRANCE DOOR WARNING INDICATOR
41 CENTRE OF GRAVITY INDICATOR (Mod. 38)
42 PILOTS' FUEL GAUGE PANEL
43 ENGINE RELIGHT PUSH-SWITCH
44 AIR BRAKES EMERGENCY SWITCH
45 AIR BRAKES CONTROL SWITCH
46 TRIM RESET SWITCH
47 AUTO PILOT SWITCH PANEL
48 P.F.C. AND AUTO MACH TRIM SWITCH PANEL
49 FUEL SYSTEM CONTROL PANEL
50 EMERGENCY TRIM SWITCH
51 ALIGHTING GEAR POSITION INDICATOR
52 EMERGENCY LIGHTING SWITCH
53 ALIGHTING GEAR CONTROL SWITCH
54 BRAKE WARNING INDICATOR (STARBOARD)
55 BRAKE WARNING INDICATOR (PORT)
56 CANOPY LOCKING INDICATOR
57 P.F.C. STOP SWITCH PANEL
58 NOSE-WHEEL STEERING SWITCH
59 TRIM CONTROL SWITCH
60 PRESS-TO-TRANSMIT SWITCH
61 ARTIFICIAL FEEL RELIEF SWITCH

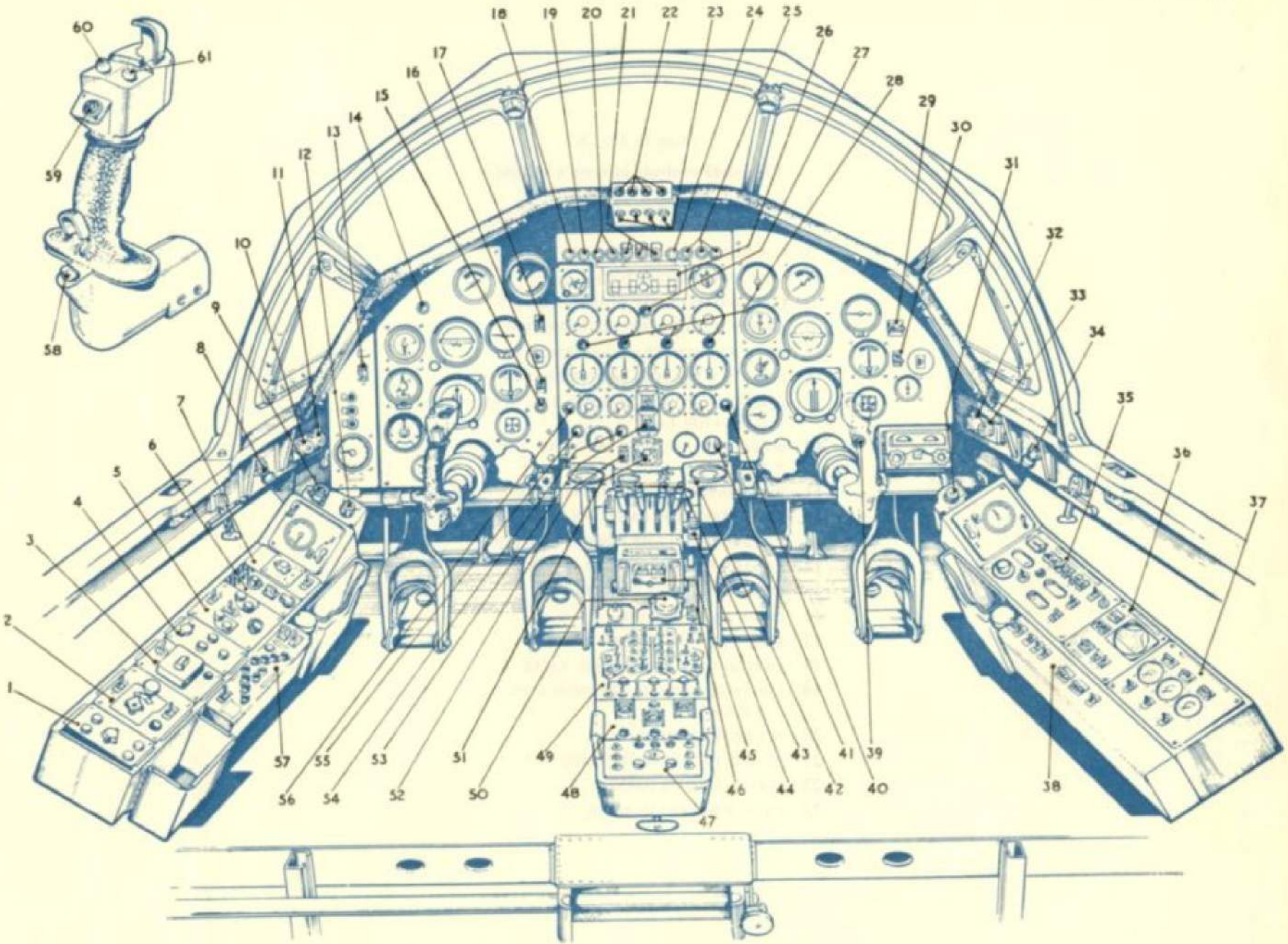


Fig. 2. Electrical controls at pilots' station

Key to Fig. 3

Electrical controls at crew's station

1 BOMBING CONTROL PANEL 9P
2 SCANNER MASTER SWITCH
3 SCANNER ROTATION SWITCH
4 N.B.S. NEON INDICATORS
5 CHARTBOARD LAMP DIMMER SWITCH
6 LOSS OF CABIN PRESSURE INDICATOR
7 BOMB BAY TEMPERATURE INDICATOR
8 BOMB BAY HEATING MASTER SWITCH
9 DIMMER SWITCH FOR BOMB BAY HEATING INDICATOR LAMP
10 BOMB BAY HEATING MANUAL CONTROL SWITCH
11 BOMB BAY TEMPERATURE SELECTOR
12 A.M.U. CONTROL PANEL MK. 4
13 CHARTBOARD LAMP DIMMER SWITCHES
14 RADAR AND A.C. SUPPLIES CONTROL PANEL
15 FUEL FLOW RESET SWITCH
16 CABIN LAMP SWITCH
17 ROOF LIGHT SWITCHES
18 SWITCH FOR LIGHT UNDER TABLE
19 CONTROL SWITCH AND INDICATOR A.R.I.18051
20 R/T SWITCH PANEL
21 GENERATOR CONTROL PANEL 10P
22 FUEL CONTENTS GAUGES
23 CREW'S RATION HEATERS

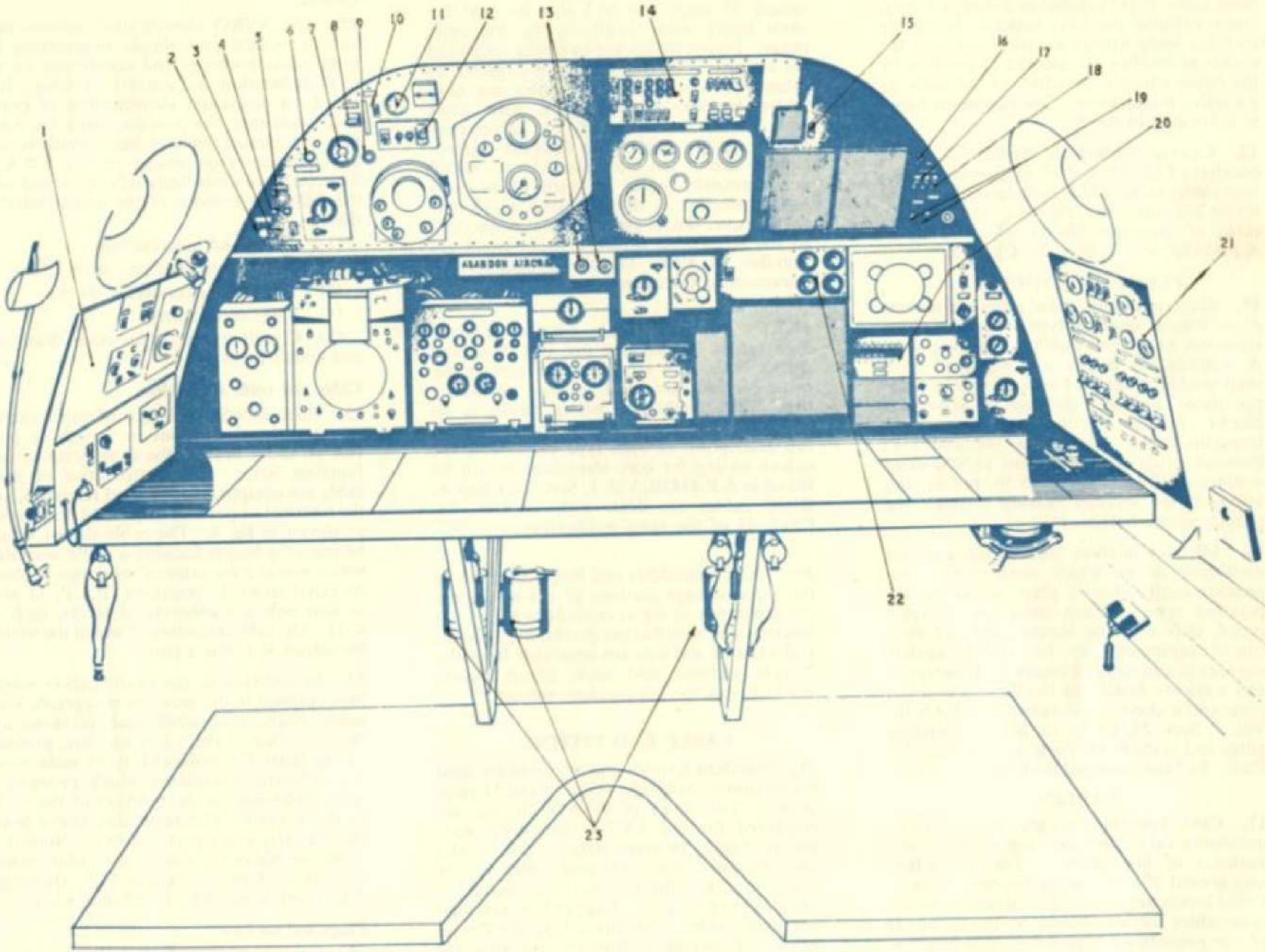


Fig. 3. Electrical controls at crew's station

13. The AVRO lightweight connector block has been designed to suit the new range of cable sizes. It is available in 5-way size only, and is designed for 3-tier sockets. No spring or other loose fittings are employed and the socket assemblies are secured in position by the cover which is attached to the body by a captive thumbscrew. The connector block is illustrated in fig. 6.

14. Connector blocks in the S.B.A.C. range consists of the 19 and 37 amp. series and a heavy duty series which is designed for cables up to 200 amp. Full details of the S.B.A.C. range of connector blocks will be found in A.P.4343B, Vol. 1, Sect. 24, Chap. 2.

PLUGS AND SOCKETS

15. Single or double-ended plugs and sockets of the Plessey standard type are employed for transport joints and bulkhead break points. A number of panels are equipped with single-ended plugs and sockets where space provisions preclude the use of connector blocks or where the box can be used as transport break point as in 34P and 35P. Pressure proof plugs designed to withstand a differential pressure of 15 lb. per sq. in., are used for services passing through the cabin pressure bulkheads.

16. Mk. 4 miniature sockets are used for multi-core cables which connect to components equipped with plugs of the corresponding type. These units are pressure proof, thus enabling instruments and electronic equipment to be sealed against changes in atmospheric pressure. Descriptive and servicing details for the Plessey series of plugs and sockets are contained in A.P.4343B, Vol. 1, Sect. 24, Chap. 1. Mk. 4 miniature plugs and sockets are dealt with in Sect. 24, Chap. 8 of the same publication.

CABLES

17. Cable assemblies are groups of single or multi-core cables bunched together for convenience of installation. The extremities may consist of a plug or socket or open tails. Cable looms are made up of single or multi-core cables for attachment to the terminals of components on a panel or in a junction box. The extremities of each loom may terminate as tails or as plugs and sockets.

18. Pren cables are normally used for all d.c. circuits where the current does not exceed 35 amp. and will also be used for some heavy duty circuits in the 200 amp. range. Prenal cables are normally employed for circuits where the current is expected to exceed 35 amp. Nypren cables are used where possible contamination with Ester base lubricants may occur, and cables connecting to the engine fire detector thermocouples are of the Unifiredet series. Glasil and Ducunvin cables are used where extra heat protection is required such as circuits passing over the jet pipes. Cables connecting to the retractable centre console panel are Prenflex to allow for the extension and retraction of the console.

19. On a number of a.c. circuits, standard Pren cables, twisted into two and three-core spirals have been introduced to replace the metal-braided screened cables previously used. This method of wiring results in an appreciable saving in weight of cable. A full description of Pren type cables and the colour coding for core identification will be found in A.P.4343B, Vol. 1, Sect. 24, Chap. 4. Glasil cables are dealt with in Sect. 24, Chap. 11 of the same publication.

20. Cable assemblies and looms for each of the three voltage sections of the sytem are run separately as far as conditions allow. At junction and distribution points, the 112-volt and 115-volt sections are separated from the 28-volt sections and each group clearly marked with the appropriate voltage.

CABLE END FITTING

21. Standard ferrules and adapters are used for all connector blocks of the 19 and 37 amp. series. Two sizes of AVRO ferrules are employed for the AVRO lightweight connector block. In every instance the ferrules are crimped to the cable core. Heavy duty cable lugs are fitted, where necessary, to cables above 37 amp. Copper lugs are used for Pren cables, aluminium lugs for Prenal cables. Crimping instructions for all cable ferrules and lugs will be found in para. 42–47.

IDENTIFICATION SCHEME

General

22. The AVRO identification scheme provides complete and simple instructions for installation purposes and constitutes an aid to fault location and general servicing. It is based on positional identification of cables and associated components, with the addition of a circuit function letter which is now a mandatory requirement of the S.B.A.C. The system of identification is concerned with the following sections of the wiring installation:—

(1) Panels and junction boxes
(2) Cable assemblies and cable looms
(3) Terminal or connected blocks
(4) Plugs and sockets
(5) Circuit protection devices such as fuses and circuit breakers.

Cable and cable assemblies

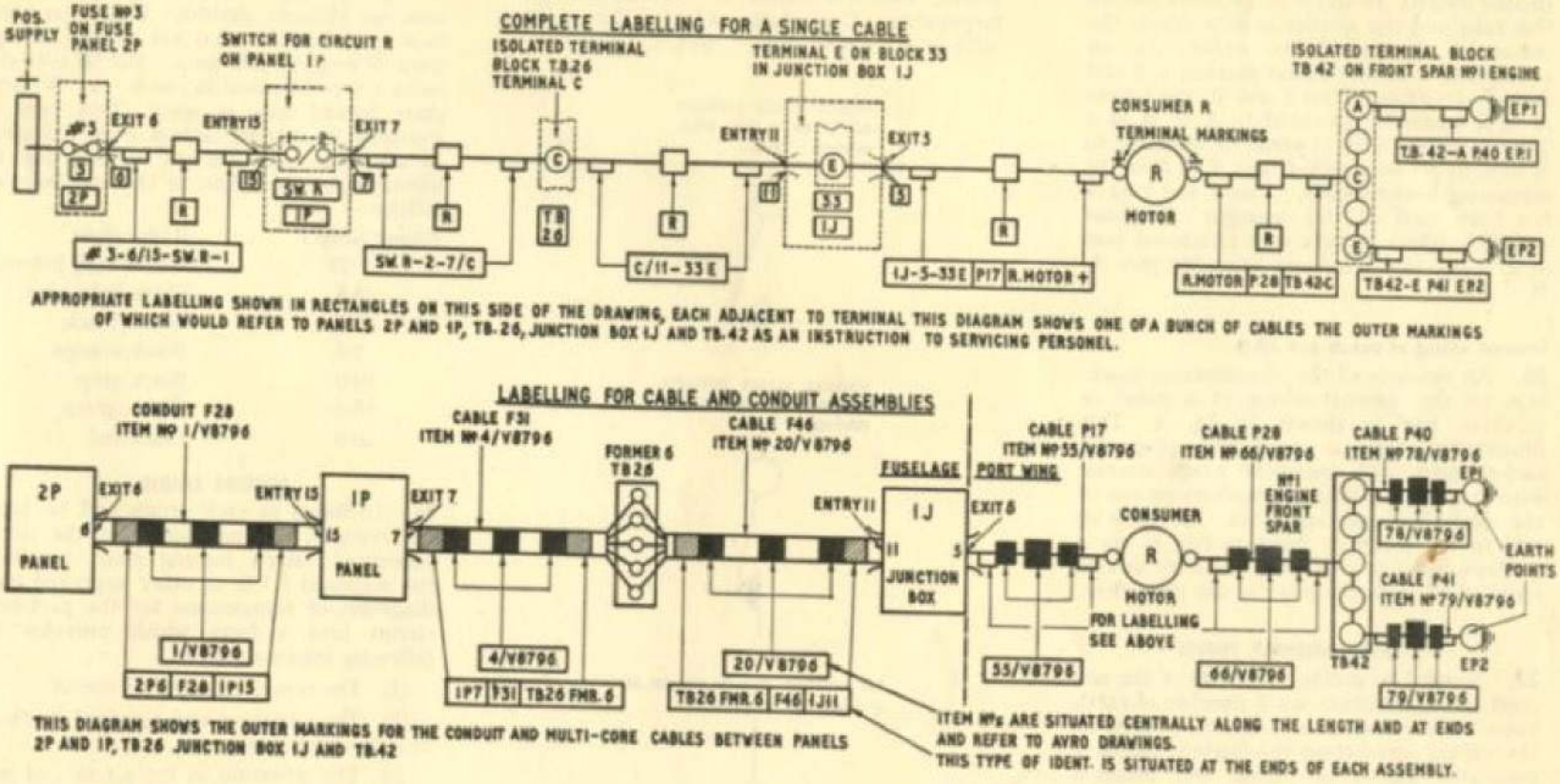
23. Each individual length of cable carries at intervals, throughout its length, a pink Helvyn sleeve bearing the appropriate circuit function letter. The extremities of each cable are equipped with a dual reference, i.e., the terminal or point of origin and destination as shown in fig. 4. The cable shown would be one of a bunch forming a cable assembly which would have external markings to show its installations to positions 1P, 2P, 1J etc., so that only the abbreviated idents, such as C/11 –33E cable assembly of which the wiring for circuit R forms a part.

24. In addition to the identification markings outlined in the previous paragraph, each cable bears two additional identification sleeves. One of these is a number, prefixed by the letter F (fuselage) P (port mainplane) S (starboard mainplane) which provides a ready reference to the position of the cable in the aircraft. The remaining sleeve bears the manufacturers part number. Note that cable assemblies for wireless and radar circuits bear the reference prefixes F.R. (fuselage) P.R. (port wing) S.R. (starboard wing).

Plugs and sockets

25. Cable assemblies with similar sockets at their extremities are wired without cross-overs, i.e. pin A is wired to pin A, B to B etc.

P30172 473308/9143 5/60 125 C & P Gp 325



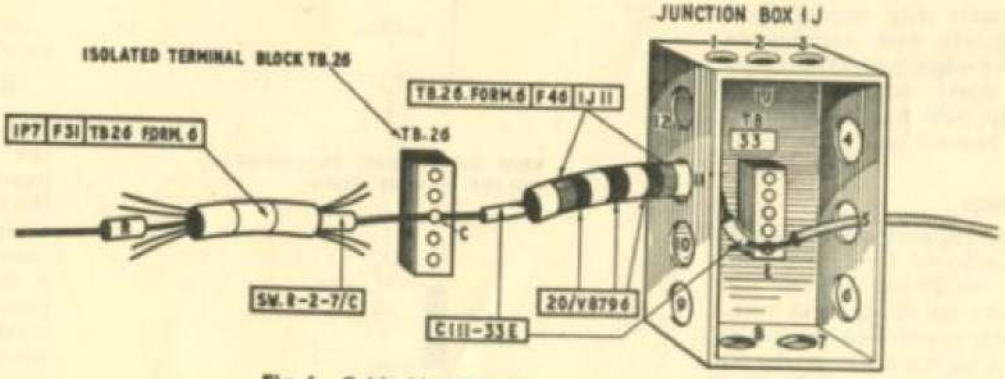


Fig. 4. Cable identification

When a large socket feeds into two or more smaller sockets the larger of the latter follows this rule, and the smaller sockets divide the remainder in consecutive order. As an example in a 26-way socket marked 1, 2 and A to Z (omitting letters I and O) the letters A to Z would be allocated to A to M of a 12-way socket; N to U would be allocated to A to G in a 7-way socket, and V to Z to the remaining 5-way socket. Pins 1 and 2 have not been used on this example. In those instances where sockets with numbered pins 1, 2, 3 etc. would connect to socket pins A, B, C etc.

Internal wiring of panels and J.B.'s

26. An example of the identification markings on the internal wiring of a panel or junction box is shown in fig. 4. This illustration shows a panel with plug and socket entry and connector block interior with typical identification markers on one of the internal connecting wires. If entry or exit to the panel or junction box is via a pressure bung or grommet, the entry or exit number will take the place of the plug ident.

EARTH ASSEMBLY POINTS

27. Secured to accessible points of the aircraft metal structure are a number of earth bolts which provide attachment points for the cables, connecting the various negative connector blocks in panels and junction boxes, to the structure. A relatively small number of components may employ local earth attachment points, while components expressly designed for single-pole installations will be earthed direct to the aircraft structure. All earth bolts can be identified by their coating of blue oil base paint.

FUSES

28. High rupturing capacity (H.R.C.) cartridge fuses are employed for circuit protection on most of the 28 and 112-volt d.c. systems. These fuses are designed to withstand a large percentage overload on circuits where high starting currents are produced, such as actuators, fuel pumps etc. The fuse element is mechanically supported throughout its length by a filling medium inside the body, and in addition it is hermetically sealed, thus oxidization of the element is impossible. These fuses will be fully dealt with in A.P.4343C, Vol. 1, Sect. 5.

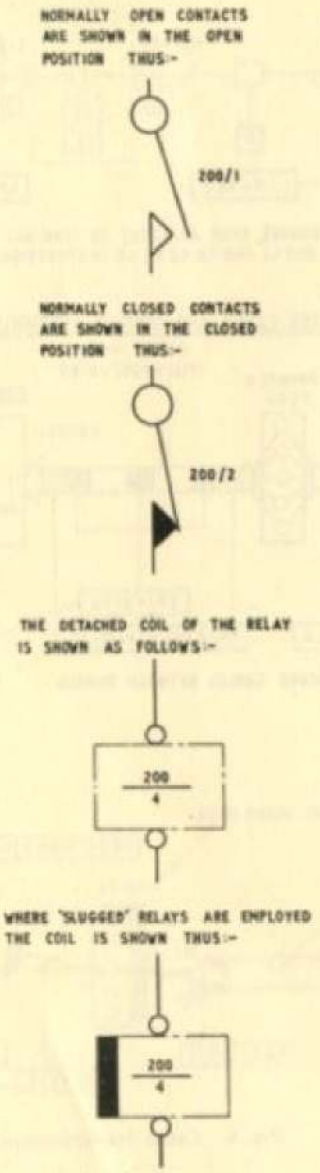


Fig. 5. Relay symbols

29. Two types of H.R.C. fuses are employed. A "prong type" Admiralty pattern is used on 112-volt circuits. This type bolts to a special holder, and has current ratings from ·5 amp. to 300 amp. For 28-volt circuits, a type identical in size to the "S" type glass bodied fuse is used. This type is available in current ratings from ·75 amp. to 20 amp., and current ratings can be identified by the colour of the fuse body as follows:—

Rating (amp.)	*Body colour*
·75	White/dark brown
2·5	Black/light blue
5·0	White/black
7·5	Black/orange
10·0	Black/grey
15·0	White/green
20·0	Black/red

ROUTING CHARTS

30. Included in each group will be found the relevant routing charts for the circuit concerned. Each routing chart translates the standard S.I.S. or other approved basic diagrams of connections for the particular circuit into a form which provides the following information:—

(1) The complete electrical circuit

(2) The situation and terminal markings of each component.

(3) The situation in the aircraft of each section of wiring and its terminal markings.

(4) The mandatory code letter of the circuit.

(5) The capacity or size of each cable used.

31. These charts are in tabular form with the vertical columns denoting the panel, junction box or items of equipment where the break points or connections occur in the circuit. It should be noted that although connection points are given for each circuit, it does not follow that cables shown diagrammatically as passing through a panel or similar column do so physically unless they have a junction or connection point in that column. Columns headed "Con. Ref." contain the cable assembly reference and/or plug and socket pin reference.

THEORETICAL CIRCUIT DIAGRAMS

32. Theoretical circuit diagrams are provided to assist the reader to understand the function of the more complex circuits. To simplify the arrangement of the circuit diagrams where relays are employed, the detached contact system is used (similar to the Post Office system). Under this system, a relay is designated by a fractional number e.g. $\frac{200.}{4}$ The numerator identifies the relay, and the denominator shows the number of contact units used. The contact units are then indicated thus:—

200/1, 200/2, 200/3, 200/4.

Contact positions are shown in fig. 5.

33. It should be noted that the theoretical circuit diagrams are provided only for circuit description. For fault finding and circuit testing, reference must be made to the routing charts contained in each group.

SERVICING

GENERAL

34. Detailed servicing of cables, wiring and accessories is governed by the procedure laid down in A.P.4343B, Vol. 1, Sect. 24. Servicing notes of a more general nature, and a brief introduction to fault location methods, are contained in the following paragraphs.

35. Strain on joints due to insufficient anchorage of cables, loose connections, tight cleats, abrasion and excessive pressure on the insulation of conductors are all possible causes of failure, and are points to be borne in mind and looked for during inspection periods. The presence of moisture in any item of equipment may cause corrosion, and where this is evident the equipment should be thoroughly cleaned, dried out and treated in accordance with the instructions given in A.P.4343, Vol. 1, Sect. 12, Chap. 2.

36. All connector blocks in junction boxes, panels, and on the aircraft structure should be examined at regular intervals for security of assembly and individual connections. This will reduce the development of high resistance conditions to a minimum. Junction boxes and panels should be checked to ensure that they do not contain any loose wires, swarf or other foreign matter likely to cause short circuits.

FAULT LOCATION

37. The first step to speedy fault location is to obtain from the routing chart a thorough knowledge of the nature of the defective circuit. The most common wiring faults fall under two headings, namely open circuits and earth faults. It cannot be over-emphasised that the efficient inspection of connector blocks for cleanliness and security of connections should reduce open circuits and high resistance faults to a minimum.

38. When carrying out fault location tests, the following points should be observed.

(1) Do not pull cables unnecessarily

(2) Do not disconnect cables at connecting points without a definite objective.

(3) When testing for open circuits, use an external supply and low wattage test lamp.

WARNING

If components are disconnected for any reason, the relevant routing chart should be consulted before any reconnecting is attempted. Many components are connected to two or even three different supply voltages.

WIRING FAULTS

39. The recommended procedure for tracing open circuits and wiring faults is as follows:—

Open circuits

(1) Carry out a systematic point-to-point test of the wiring commencing at the supply fuse, where a test should be made by connecting a test lamp of the correct voltage between each side of the fuse in turn, and the nearest earth terminal.

(2) When power supply and fuse continuity are proved, apply the test to each junction box or breakdown point in the circuit until the fault is located.

(3) In the event of an individual lamp failure the filament in question should be tested before proceeding with wiring tests.

Earth faults

(4) The method of tracing low resistance earth faults will vary according to the nature of the fault. Due to the earth return system being used, a fuse will 'blow' immediately an earth develops on the positive side of the equipment. In one instance this may have happened without the controlling switch being operated, denoting that the fault lies between the supply fuse and the switch. In another instance, the fuse may have 'blown' when the controlling switch was operated, denoting that the fault lies between the switch and the consuming equipment. The earth fault can be located by normal line test procedure with a lamp and battery connected between the faulty circuit and earth with the aircraft batteries disconnected.

FUSE TESTING

40. To facilitate fuse testing during ground servicing periods, panels 3P and 4P in the crew's compartment are each fitted with a test lamp and probe. One side of each test lamp is connected to a test probe, via a suitable length of Pren cable. When the probe is not in use, it should be stowed in the clip provided.

EARTH ASSEMBLY POINTS

41. It is essential that earth contacts of low resistance be maintained. All contact surfaces of connectors, washers, and metal structure at the earth assembly points must be thoroughly clean. When the earth bolts are re-assembled they must be scraped clean at the point of contact, and after the cables

have been secured, the whole assembly is to be painted with blue oil-base paint Specification D.T.D.260B.

FERRULE CRIMPING

42. Crimping details for the S.B.A.C. range of ferrules and connectors are contained in A.P.4343C, Vol. 1, Sect. 25. Details for crimping of the AVRO ferrules are outlined in the following paragraphs.

43. Two sizes of AVRO ferrules are available specifically for use with the AVRO lightweight connector blocks, namely:—

Ferrule 5X/6620 for 12 amp. cables (identified by a square shoulder)

Ferrule 5X/6621 for 6 amp. cables (identified by a bevelled shoulder).

It will be seen from fig. 7 that both ferrules have the same outside diameter, but differ internally in the size of the bore and cable bucket. Each ferrule is designed to form a close fit on the associated cable, the ferrule body being crimped to the cable conductor and the bucket to the cable insulation.

44. An earlier type of 6 amp. ferrule had a bucket internal diameter of 0·128 in., i.e. the same size as the 12 amp. ferrule bucket. Hence to ensure positive crimping of the 6 amp. insulation, a P.V.C. sleeve was fitted over the cable to increase the overall diameter of the insulation in the bucket. This condition is now obviated by the introduction of a later type of ferrule.

Crimping tools

45. Crimping of the ferrules to the cables is effected by an AVRO die (Stores Ref. 26DC/95162), which is accommodated in a hand crimping tool (Stores Ref. 26DC/95161). An ejector spindle is fitted to the die and is used to eject the ferrule and cable when the crimping operation is completed. The crimping tool is a modified version of the standard S.B.A.C. tool (Stores Ref. 5H/96). The modification takes the form of an enlargement of the slot in the base of the standard tool in order to accommodate the ejector spindle of the AVRO die. The tool can be used for the crimping of both AVRO and S.B.A.C. ferrules, provided that the appropriate die is fitted.

46. Alternatively, the AVRO ferrules may be crimped by using the die in a pressure-operated die-holder (AVRO Part No. T255676). An adaptor (AVRO Part No. T.D.E. 68) is fitted to the die-holder and the assembly is connected to an air intensifier (AVRO Part No. T.D.E. 74). Both the hand and pressure-operated crimping tools are illustrated in fig. 6; crimping instructions and the correlation of ferrules and cable sizes are provided in fig. 7.

LUG CRIMPING

47. Standard tools of Plessey manufacture are available for the hexagonal crimping of copper and aluminium lugs to pren and prenal cables. A hand-crimping tool (Stores Ref. 5X/6462) which is supplied complete in a case with a set of dies and keys is capable of crimping copper lugs up to 50 amp. carrying capacity and aluminium lugs up to 35 amp.

48. For lugs above the range of the hand tool, a hydraulic crimping press unit (Stores Ref. 3A/3304) is used. This unit is portable and foot-operated, thus leaving the hands free for manipulation of the cable and positioning of the lug. Full instructions for the crimping of hexagonal lugs, including certain precautions to be observed will be found in A.P.4343C, Vol. 1, Sect. 5. The Plessey crimping tools are dealt with in the same Section.

General

49. The electrical installation of the aircraft provides, as far as practicability allows, for easy and speedy removal of the various electrical panels, fittings and equipment. Where equipment is situated within the structure, particularly in the main planes, removable access panels are fitted. A typical example of these access panels is given in Group 9.

REMOVAL OF EQUIPMENT

50. In order to prevent the occurrence of electrical fires, and possible damage to the aircraft due to the live connections coming into contact with the metal structure, it is important that the following precautions be taken prior to the removal of equipment:—

(1) Ensure that all power supplies are OFF, and that the fuse or circuit breaker controlling the item being removed has been rendered inoperative.

(2) Insulate and stow all disconnected leads and connectors.

51. Removal instructions for those items of electrical equipment which will require periodical servicing will be found in the respective Group for the equipment concerned; major items of equipment such as main panels and junction boxes will not normally require removal at inspection periods.

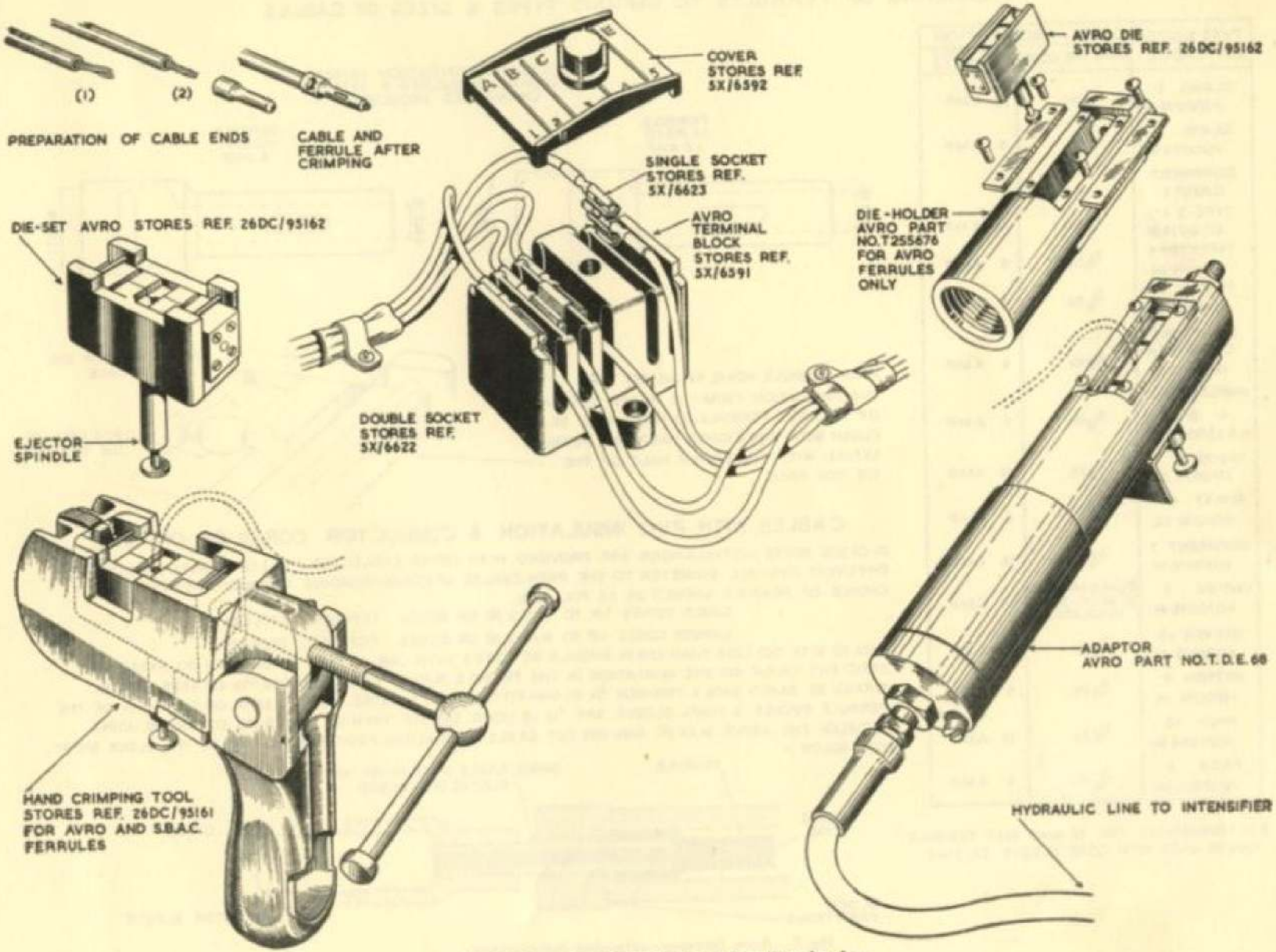


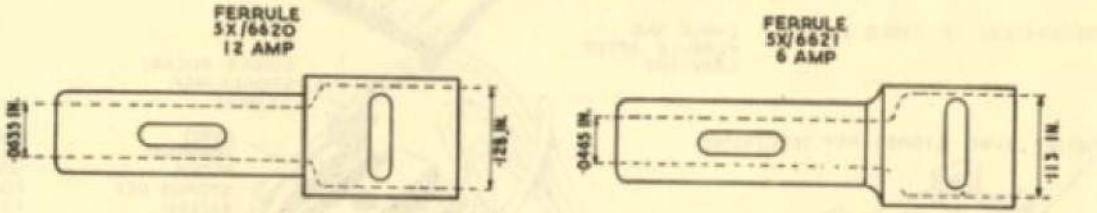
Fig. 6. Avro terminal block and ferrule crimping

CRIMPING OF FERRULES TO VARIOUS TYPES & SIZES OF CABLES

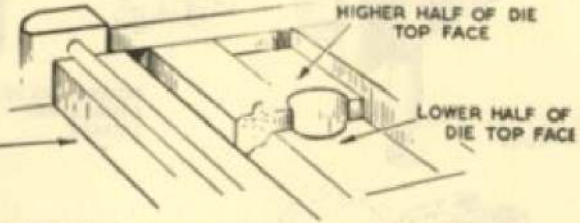
TYPE & SIZE OF CABLE	CABLE PREPARATION	
	BARE THE CORE	FIT AVRO FERRULES
GLASIL 9 40/0076 IN.	3/8 IN	12 AMP
GLASIL 4 19/0076 IN.	3/8 IN.	6 AMP
EQUIPMENT CABLES		
TYPE 3 12 40/0076 IN.	3/8 IN.	12 AMP
TYPES 2&3 4 14/0076 IN.	3/8 IN.	6 AMP
TYPE 2 6 23/0076 IN.	3/8 IN.	6 AMP
MINIATURE CABLES 'C' 4 14/0076 IN.	3/8 IN.	6 AMP
UNIFLEXPREN 6 @ 16 X 3/0048 IN.	3/8 IN.	6 AMP
UNI-EF 9 37/0076 IN.	3/8 IN.	12 AMP
UNI-EF 4 19/0076 IN.	3/8 IN.	6 AMP
UNIFIREDET 7 40/0076 IN.	3/8 IN.	12 AMP
UNIFIRE 7 40/0076 IN.	3/8 IN. & REMOVE 1/2 IN. OF TOP INSULATION	12 AMP
NYPREN 12 40/0076 IN.	3/8 IN.	12 AMP
NYPREN 6 19/0076 IN.	3/8 IN.	6 AMP
PREN 12 40/0076 IN.	3/8 IN.	12 AMP
PREN 6 19/0076 IN.	3/8 IN.	6 AMP

@ ALTERNATIVELY THE 12 AMP SIZE FERRULE CAN BE USED WITH CORE SLEEVE 5X/3149

TO ASSIST IDENTIFICATION 5X/6620 HAS SQUARE SHOULDER & 5X/6621 CHAMFERED SHOULDER



PUSH FERRULE HOME IN DIE SO THAT THE INSULATION CRIMP IS IN MID POSITION OF BUCKET. FERRULE 5X/6620 WILL BE FLUSH WITH THE HIGHER HALF, AND FERRULE 5X/6621 WITH THE LOWER HALF OF THE DIE TOP FACE



CABLES WITH PVC INSULATION & CONDUCTOR CORES OF ·012 WIRE

IN CASES WHERE INSTALLATIONS ARE PROVIDED WITH OTHER CABLES (EG P.V.C) OF SUBSTANTIALLY DIFFERENT OVERALL DIAMETER TO THE PREN CABLES OF CORRESPONDING CONDUCTOR CORES THE CHOICE OF FERRULE SHOULD BE AS FOLLOWS

CABLE CORES UP TO 9/012 IN OR EQUAL FERRULE 5X/6621

LARGER CORES UP TO 16/012 IN OR EQUAL FERRULE 5X/6620

CABLES WITH O/D LESS THAN ·128 IN. SHOULD BE FITTED WITH ONE OR TWO PI SLEEVES TO ATTAIN AN EFFICIENT CRIMP ON THE INSULATION IN THE FERRULE BUCKET CABLES WHOSE O/D EXCEEDS ·128 IN. SHOULD BE BARED BACK A FURTHER 3/4 IN. AND FITTED WITH SLEEVES TO FIT ·128 IN. OR ·113 IN I/D OF THE FERRULE BUCKET. A FINAL SLEEVE SAY 1/2 IN. LONG SHOULD THEN BE FITTED TO COVER THE JOINT BETWEEN THE ABOVE SLEEVE AND THE CUT CABLE INSULATION POSITIONED CLEAR OF THE BLOCK ENTRY SEE BELOW :-

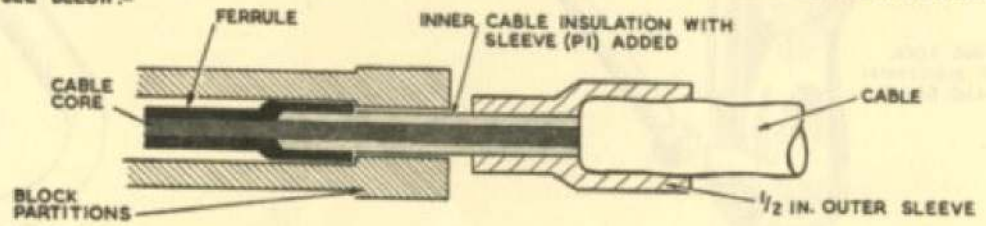


Fig. 7. Avro ferrules—crimping instructions

TABLE 3
112-volt power distribution fuses

Fuse No.	Rating (amps)	Service
		96-volt battery bus-bar
	Panel 24P	
430	200	Feeder to 112 volt bus-bar in panel 18P
431	150	Feeder to No.3 generator bus-bar
432	150	Feeder to No.4 generator bus-bar
433	80	Aileron P.F.C. motor - starboard outboard
434	80	Rudder P.F.C. motor - main
435	80	Elevator P.F.C. motor - starboard outboard
436	80	Elevator P.F.C. motor - port outboard
437	80	Aileron P.F.C. motor - port outboard
442	0.5	Live bus-bar indication and 112V Voltmeter
443	0.5	Pilot's generator failure warning
444	10	Battery heating
591	100	Feeder to 112 volt bus-bar in panel 18P
592		Spare
818	5	No.4 generator fail indicator
819	5	No.3 generator fail indicator
847	0.5	No.1 generator fail indicator
848	0.5	No.2 generator fail indicator
	Panel 18P	
377	10	No.3 secondary fuel pump - port
378	10	No.2 fuel pump - port
379	10	No.3 fuel pump - port
380	10	No.6 fuel pump - port
381	10	No.1 Transfer fuel pump - port
382	20	Inverter intake de-icing
383	100	Air brake actuation - port
384		Spare
385	10	No.6 Secondary fuel pump - port
386	10	Flight refuelling booster pump - port (tanker only)
387	10	No.4 fuel pump - port
388	10	No.7 fuel pump - port
389	10	No.5 fuel pump - port
390	10	No.7 transfer fuel pump - port
391	10	Windscreen demister
392	30	No.4 inverter (Type 153)
393		Spare
394		Spare
395	30	No.5 inverter (Type 153)
397	0.25	Live bus-bar indication
581	10	No.1 fuel pump - port
582	10	No.4 secondary fuel pump - port
583	10	No.5 secondary fuel pump - port
584	10	Flight refuelling booster pump - starboard (Tanker only)
585	10	No.7 secondary fuel pump - port
		Power compartment (below 25P)
1136	150	Feeder to No.4 generator bus-bar
1137	150	Feeder to No.3 generator bus-bar
		No. 1 and 2 generators bus-bar
	Panel 24P	
438	100	No.1 inverter (Type 350)
593	80	No.1 rotary transformer (Type 1050A)
		No. 3 generator bus-bar
	Panel 25P	
446	200	Feeder to 112-volt bus-bar in panel 19P
447	100	No.2 inverter (Type 350)
448	80	Elevator P.F.C. motor - starboard inboard
449	80	Aileron P.F.C. motor - port inboard
458	0.25	Live bus-bar indicator
594	80	No.2 rotary transformer (Type 1050A)

TABLE 3 - (continued)

Fuse No.	Rating (amps)	Service
	Panel 19P	
403		Spare
404	10	No.1 transfer fuel pump - starboard
405		Spare
406	100	Air brake actuation - starboard
407		Spare
408	10	No.6 fuel pump - starboard
409	10	No.2 fuel pump -starboard
410	10	No.3 fuel pump - starboard
411	10	No.3 secondary fuel pump - starboard
412	10	No.6 secondary fuel pump - starboard
413	30	H.2.S. Amplidyne - power unit
414	10	H.2.S. Amplidyne - control unit
423	0.25	Live bus-bar indication
		No.4 generator bus-bar
	Panel 25P	
451	100	No.3 inverter (Type 350)
452	80	No.3 rotary transformer (Type 1050A)
453	80	Rudder P.F.C. motor - auxiliary
454	80	Aileron P.F.C. motor - starboard inner
595	100	Feeder to 112-volt bus-bar in panel 19P
596	80	Elevator P.F.C. motor - port inboard
	Panel 29P	
612	30	Flight refuelling - No.2 retraction unit
613	200	Flight refuelling - contactor unit
644	30	Flight refuelling - No.1 retraction unit
	Panel 19P	
415		Spare
416	60	Emergency hydraulic power pack
417	30	Vent suit heaters
418		Spare
419	10	No.4 fuel pump - starboard
420	10	No.7 fuel pump - starboard
421	10	No.5 fuel pump - starboard
422	10	No.7 transfer fuel pump - starboard
586	10	No.1 fuel pump - starboard
587	10	No.4 secondary fuel pump - starboard
588	10	No.5 secondary fuel pump - starboard
589		Spare
590	10	No.7 secondary fuel pump - starboard
		Control fuses
	Panel 24P	
-	300	No.1 generator main fuse
-	300	No.2 generator main fuse
440	10	No.1 generator control and protection
441	10	No.2 generator control and protection
		112-volt ground supply bus-bar
509	5	112-volt ground supply pick-up
510		Spare
511		Spare
512		Spare
513		Spare
	Panel 25P	
-	300	No.3 generator main fuse
-	300	No.4 generator main fuse
456	10	No.3 generator control and protection
457	10	No.4 generator control and protection
		96-volt emergency fuses
601	10	No.1 generator control and protection
602	10	No.2 generator control and protection
603	10	No.3 generator control and protection
604	10	No.4 generator control and protection
605		Spare

TABLE 4

28-volt distribution circuit breakers Type A
(Post Mod. 340. 353 and 544)

C.B. No.	Rating (amp.)	Service
		Circuit Breakers on 3P (Port)
1	25	N.B.C.
2	10	H2S
3	5	Spare
4	5	Spare
5	25	Resistance unit—windscreen wiper—starboard
6	25	Resistance unit—windscreen wiper—port
7	15	Spare
8	10	I.L.S.
9	5	A.1961 amplifier
10	15	Alternative bombing
11	35	Spare
12	15	Spare
13	35	Windscreen de-mister
14	5	Bomb bay heating
65	5	Spare
		Circuit Breakers on 4P (starboard)
15	5	Fin de-icing
16	5	Bomb bay heating
17	5	Art. feel relief—rudder
18	5	Art. feel relief—elevator
19	25	External lights
20	5	No. 1 engine isolation cock
21	5	No. 2 engine isolation cock
22	5	No. 3 engine isolation cock
23	5	No. 4 engine isolation cock
24	5	Spare
25	5	Spare
70	5	Spare
71	5	Art. feel failure
72	5	Ram air valve
73	10	Radio altimeter Mk. 6A
74	5	Spare
75	5	Flow control valve—starboard
76	5	Flow control valve—port
77	10	Flow rate control
78	5	Temperature control valve
79	5	Spare

Fuse No.	Rating (amp.)	Service
		Circuit Breaker on Navigator's Panel
83	45	Radio services, H.F. installation
		Circuit Breakers Adjacent to 15P
30	25	Landing lamp
31	25	Landing lamp
32	5	Port wing de-icing
33	5	Starboard wing de-icing
34	25	Feeder to wing de-icing panel 17P
35	45	Feeders to circuit breakers
36	45	No. 71 to 79 in 4P
37	45	Feeders to circuit breakers
38	45	No. 7 to 13 in 3P
39	5	Rudder art. feel
40	5	Elevator art. feel
41	5	Aileron art. feel
		Circuit Breakers on 16P
42	35	Bomb gear
43	45	Feeders to fuses No. 461 to 464, 470 to
44	45	484, 487 to 496 in 16P
45	45	Feeders to circuit breaker No. 83 navigator's
46	45	panel, Fuses No. 8, 25 to 36, 61 to 72, 97 to 108 in 3P
47	45	Feeders to fuses No. 9, 39 to 48, 49 to 60,
48	45	85 to 96 in 3P
49	45	Feeders to circuit breakers No. 1 to 6,
50	45	14 and 65, fuses No. 73 to 79 in 3P
51	45	Alternative bombing
52	45	Feeders to fuses No. 205 to 227, 733 and
53	45	735 in 11P
54	45	Feeders to fuses No. 169 to 192, 145 to
55	45	152 in 4P
56	45	Feeders to circuit breakers No. 15 to 25 and
57	45	fuses No. 193, 194 and 195 in 4P
58	45	Feeders to fuses No. 121 to 168,
59	45	1041 to 1046 in 4P.
		Circuit Breakers in Power Compartment
80	5	Battery ventilation

TABLE 5

28-volt distribution fuses

Fuse No.	Rating (amp.)	Service
		Panel 3P
8	5	No. 2 D.C. rotary transformer
9	5	No. 3 D.C. rotary transformer
25	2·5	Emergency lights and turn and slip
26	2·5	Fuel pressure warning No. 1 engine
27	2·5	G4B compass
28	2·5	Sextant lamp—port
29	2·5	Cross-feed cock—port wing
30	2·5	Cross-feed cock—fuselage
31	5	Parachute stream and jettison control
32	2·5	Fuel pressure warning No. 2 engine
33	2·5	U/C indication
34	2·5	N/W steering, art. feel relief P-to-T 1st Pilot
35	2·5	N/W steering, art. feel relief P-to-T 2nd Pilot
36	5	U/C actuation
37	—	Spare
38	—	Spare
39	—	Spare
40	20	Bomb fuzing and release
41	—	Spare
42	—	Spare
43	5	Engine speed governors—Mod. 294
44	5	Pitch damper control—auto stabiliser Mod. 458
45	5	P.F.C. motors 'start and stop' switch
46	—	Spare
47	2·5	Fuel contents No. 1 group
48	2·5	No. 1 fuel pump control—port
50	2·5	No. 2 fuel pump control—port
51	2·5	No. 3 fuel pump control—port
52	2·5	No. 4 fuel pump control—port
53	2·5	No. 5 fuel pump control—port
54	2·5	No. 6 fuel pump control—port
55	2·5	No. 7 fuel pump control—port
56	2·5	Fuel sequence timer control—port
57	2·5	Fuel sequence timer control—port
58	2·5	Fuel contents No. 1 group
59	2·5	Fuel contents No. 2 group
60	5	Fuel flowmeters selector switch
61	5	H2S air valve
62	2·5	E2B compass lamp Mod. 383
63	—	Spare
64	5	Hydraulic pressure indicator No. 2
65	2·5	U/V lighting for oxygen panels
66	—	Spare
67	—	Spare
68	2·5	Anti-dazzle high intensity lamp Mod. 186
69	—	Spare
70	7·5	Ration heater—signaller and pilot
71	5	Ration heater—navigator
72	7·5	Ration heater—air bomber and 2nd pilot
73	5	Engine speed governors No. 2 and 3 engines Mod. 294
74	2·5	Abandon aircraft warning sign
75	2·5	Anti-dazzle high intensity lamp Mod. 186
76	5	Hydraulic power pack
77	—	Spare
78	5	R.A.T.O.G. jettison
79	20	R.A.T.O.G. master switch
80	2·5	R.A.T.O.G. port indicator 'C'
81	2·5	R.A.T.O.G. starboard indicator 'C'
82	10	R.A.T.O.G. idle and full power
83	10	R.A.T.O.G. off
84	5	R.A.T.O.G. selector switch
85	2·5	Service oxygen regulators Mod. 440
86	—	Spare
87	—	Spare
88	5	Spare
89	—	Spare
90	2·5	Service oxygen regulator Mod. 440
91	—	Spare
92	—	Spare
93	2·5	R.A.T.O.G. port indicator 'B'
94	2·5	R.A.T.O.G. starboard indicator 'B'
95	2·5	Hydraulic pressure indicator
96	—	Spare
97	2·5	Air brakes actuation
98	5	H.F. (I/Comm. V.H.F.) 1st pilot's call

April, 1958

AIR MINISTRY

Air Publication 4505A
Volume 1, Book 2

VULCAN B MK.1 (AND ASSOCIATED RCLS) AIRCRAFT

ADVANCE INFORMATION LEAFLET NO.1/58

Insert this leaflet in A.P.4505A, Vol.1, Book 2, Sect.5, Chap.1, Group 1, to face Table 5

TABLE 5
Panel 16P
Fuse 347 2·5 amp. Explosion suppression (Mod.171)

This fuse is to be removed until further notice.

(Authority: Air Ministry Memorandum Ref: A261363/56/Air.Eng.3B, dated 20.1.58).

Notes

(1) The information contained in this leaflet will be incorporated by normal amendment list action in due course.

(2) If, after receipt of this leaflet, an amendment list with a prior date and conflicting information is received, the information in the leaflet is to take precedence.

ENGINEER

TABLE 5—*continued*

28-volt distribution fuses

Fuse No.	Rating (amp.)	Service
99	2·5	Explosion suppression relay box Mod. 606
100	2·5	Sextant head heater—port
101	2·5	Bomb doors selection—normal
102	2·5	Bomb doors selection—emergency
103	2·5	Red flood lights—port coaming
104	2·5	Red floodlights—port console
105	2·5	Hydraulic pressure indicator No. 1
106	2·5	Instrument lights—navigator's panel
107	2·5	Windscreen wiper control
108	5	V.H.F. C/O
		Panel 4P
121	2·5	Service oxygen regulator Mod. 440
122	2·5	Service oxygen regulator Mod. 440
123	2·5	Service oxygen regulator Mod. 440
124	2·5	Service oxygen regulator Mod. 440
125	2·5	E2B compass lamp Mod. 383
126	2·5	Sextant lamp—starboard
127	2·5	Fuel contents—No. 3 group
128	2·5	Fuel contents—No. 4 group
129	2·5	Fuel contents—No. 4 group
130	2·5	Fuel contents—No. 3 group
131	2·5	Windscreen de-mister
132	2·5	Cabin service lamps
133	2·5	Cross-feed cock—starboard wind
134	5	Cabin service lamps
135	5	Bomb fuzing and release
136	2·5	Bomb bay temperature
137	5	Special bomb
138	2·5	Port wing anti-icing temperature
139	2·5	Stbd. wing anti-icing temperature
140	2·5	Fin anti-icing temperature
141	5	Heated pressure head—port
142	5	Heated pressure head—starboard
143	2·5	Emergency lights and turn and slip
144	5	Elevator trim actuation
145	2·5	Air bomber's windscreen de-icing
146	2·5	Pilot's windscreen de-icing
147	2·5	Fire extinguisher test switch
148	5	Special bomb
149	2·5	Canopy micro-switch
150	5	Emergency elevator trim actuation
151	5	Emergency rudder trim actuation
152	5	Emergency aileron trim actuation
153	5	Downward ident. lamp
154	5	Navigation lamps
155	5	Landing lamp—port
156	5	Landing lamp—starboard
157	2·5	Red floodlights, starboard coaming and wander
158	2·5	Red floodlights, 5P, 7P and throttle box
159	2·5	Emergency and normal bomb door selection
160	5	Normal trim actuation—rudder
161	5	Ventilated suits—air supply control Mod. 171
162	2·5	Special store Nos. 1 & 2 Mod. 532
163	2·5	Fuel pressure warning No. 3 engine
164	2·5	Fuel pressure warning No. 4 engine
165	5	Bomb fuzing and release
166	5	Nitrogen actuator valve Pre-Mod. 171
—	5	Special store Nos. 1 & 2 Mod. 532
167	2·5	Tank pressurisation—air release valves
168	5	Inter-comm. second pilot's CALL/H.F. switch
169	5	Normal trim actuation—aileron
170	2·5	No. 2 fuel pump—No. 3 group
171	2·5	No. 3 fuel pump—No. 3 group
172	2·5	No. 4 fuel pump—No. 4 group
173	2·5	No. 5 fuel pump—No. 4 group
174	2·5	No. 6 fuel pump—No. 3 group
175	2·5	No. 7 fuel pump—No. 4 group
176	2·5	Fuel sequence timer control—stbd.
177	2·5	Fuel sequence timer control—stbd.
178	—	Spare

TABLE 5—*continued*

12-volt distribution fuses

Fuse No.	Rating (amp.)	Service
179	2·5	Outside air temperature
180	2·5	No. 1 fuel pump—No. 4 group
181	2·5	Air brakes actuation
182	—	Spare
183	2·5	Artificial fuel relief
184	20	Special store No. 1 & 2 Mod. 532
185	2·5	Trim re-set switch
186	2·5	Cabin temperature and flood flow
187	2·5	Emergency trim control
188	2·5	Main entrance door switch
189	2·5	Emergency decompression
190	2·5	Pressure controller
191	2·5	Decompression warning horn
192	2·5	Sextant heater—starboard
193	10	Fuel C of G control
194	5	Fuel tank nitrogen purge
195	5	Fuel probe de-icing
		Panel 11P Pre-Mod. 353
205	5	No. 1 inverter Type 350
206	5	No. 2 inverter Type 350
207	5	No. 3 inverter Type 350
208	5	A.M.U. and A.M.I.
209	5	No. 5 inverter Type 153
210	5	A.R.I. 5800
211	2·5	A.R.I. 5380
212	2·5	I.F.F. Mk. 10
213	2·5	Auto pilot controls
214	—	Spare
215	2·5	A.R.I. 5844
216	5	A.D.F. ON/OFF switch
217	10	No. 6 inverter Type 100A
218	2·5	G4B compass
219	2·5	Type 350 inverters emergency c/o
220	2·5	A.R.I. 5816
221	5	Yaw damper
222	15	A.R.I. 5378
223	2·5	No. 4 inverter Type 153
224	2·5	N.B.S. calculator Type 7
225	2·5	A.R.I. 18051 stbd. control
226	2·5	A.R.I. 18051 port control
227	2·5	A.R.I. 18051 aft door
228	5	H2S master switch (Note: This fuse is fed from circuit breaker No. 2 via the H2S switch)
555	5	Camera
556	5	H2S P.U. 729
733	2·5	Artificial horizon
735	2·5	Artificial horizon
		Panel 11P Post-Mod. 353
205	5	No. 1 inverter Type 350
206	5	No. 2 inverter Type 350
207	5	No. 3 inverter Type 350
208	5	A.M.U. and A.M.I.
209	5	No. 5 inverter Type 153
210	5	A.R.I. 5800
211	2·5	A.R.I. 5380
212	2·5	I.F.F. Mk. 10
213	2·5	Auto pilot controls
214	—	Spare
215	2·5	A.R.I. 5844
216	7·5	A.D.F. ON/OFF switch
217	10	Zero reader
218	2·5	Zero reader
219	2·5	Type 350 inverters emergency c/o
220	2·5	A.R.I. 5816
221	5	Yaw damper
222	15	A.R.I. 5378
223	2·5	No. 4 inverter Type 153
224	2·5	N.B.S. calculator Type 7
225	2·5	A.R.I. 18051 stbd. control
226	2·5	A.R.I. 18051 port control
227	2·5	A.R.I. 18051 aft door
228	5	H2S master switch (Note: This fuse is fed from circuit breaker No. 2 via the H2S switch)

TABLE 5—*continued*

12-volt distribution fuzes

Fuse No.	Rating (amp.)	Service
555	5	Camera
556	5	H2S P.U. 729
733	2·5	Zero reader
735	2·5	Zero reader
		28-volt fuses introduced by Mod. 544
1041	2·5	Jet pipe temp. limiter override 1 & 4 engines
1042	2·5	Jet pipe temp. limiter override 2 & 3 engines
1043	—	Spare
1044	—	Spare
1045	—	Spare
1046	—	Spare
		Panel 15P
286	2·5	No. 1 D.C. rotary transformer test socket
287	2·5	No. 2 D.C. rotary transformer test socket
288	2·5	No. 3 D.C. rotary transformer test socket
289	100	Feeder protection for circuit breakers on 15P
849	60	Bomb gear Mod. 532
850	60	Bomb gear Mod. 532
		Panel 16P
304	10	Bomb fuzing and release Mod. 532
305	2·5	Nitrogen pressure indication Pre-Mod. 171
—	2·5	Fatigue meter introduced by Mod. 374
306	2·5	Nitrogen pressure indication
307	2·5	Tanker version only
308	5	Bomb fuzing and release
309	5	Bomb fuzing and release
310	5	Bomb fuzing and release
311	10	Alternative bombing
312	2·5	Cabin temperature selection
313	2·5	Under heat control
314	2·5	Mass flow indicator
315	2·5	Mass flow indicator
316	2·5	Temperature and mass flow
317	5	Refuelling—No. 4 group
318	5	Refuelling—No. 1 group
319	2·5	No. 6 tank amplifier—port
320	2·5	No. 2 tank amplifier—port
321	2·5	No. 3 tank amplifier—port
322	2·5	Refuelling—No. 1 group
323	2·5	Refuelling—No. 1 group
324	—	Spare
325	2·5	No. 7 tank amplifier—port
326	2·5	No. 1 tank amplifier—port
327	2·5	No. 4 tank amplifier—port
328	5	Emergency hydraulic power pack
329	2·5	Under heat control
330	2·5	Ram air valve indicator
331	10	Alternative bombing
332	10	Alternative bombing
333	10	Alternative bombing
334	2·5	Bomb bay inspection lamp sockets
335	10	Engine fire warning No. 1 and 2 engines
336	10	Engine fire warning No. 3 and 4 engines
337	10	Alternative bombing
338	5	No. 1 rotary transformer Type 1050
339	5	No. 2 rotary transformer Type 1050
340	5	No. 3 rotary transformer Type 1050
341	5	Cabin temperature and mass flow
342	—	Spare
343	2·5	Brake pressure warning indicator
344	2·5	Brake pressure warning indicator
345	2·5	Pitch stabiliser
346	2·5	Pitch stabiliser
347	—	Spare Mod. 606
348	5	Mach trim Mod. 377
349	2·5	Auto stabiliser Mod. 458
350	5	Mach trim Mod. 377
351	—	Spare
352	5	Refuelling—No. 3 group
353	5	Refuelling—No. 2 group
354	2·5	No. 5 tank amplifier port
355	5	Refuelling—No. 4 group
356	5	Refuelling—No. 4 group
357	2·5	No. 7 tank amplifier—starboard
358	2·5	No. 1 tank amplifier—starboard
359	2·5	No. 4 tank amplifier—starboard
360	2·5	No. 5 tank amplifier—starboard

TABLE 5—*continued*

12-volt distribution fuzes

Fuse No.	Rating (amp.)	Service
361	2·5	No. 6 tank amplifier—starboard
362	2·5	No. 3 tank amplifier—starboard
363	2·5	No. 2 tank amplifier—starboard
364	2·5	28-volt d.c. voltmeter
		Panel 17P
371	5	No. 1 engine de-icing
372	5	No. 2 engine de-icing
373	5	No. 3 engine de-icing
374	5	No. 4 engine de-icing
375	—	Spare
376	—	Spare
		Panel 26P
461	—	Spare
462	—	Spare
463	—	Spare
464	—	Spare
470	2·5	P.F.C. aileron indicator
471	2·5	P.F.C. elevator indicator
472	2·5	P.F.C. rudder indicator
473	10	P.F.C. aileron motor controls
474	10	P.F.C. elevator motor controls
475	10	P.F.C. rudder motor controls
476	2·5	P.F.C. indicator P.O. aileron
477	2·5	P.F.C. indicator P.I. aileron
478	2·5	P.F.C. indicator P.O. elevator
479	2·5	P.F.C. indicator P.I. elevator
480	2·5	P.F.C. indicator rudder
481	2·5	P.F.C. indicator S.I. elevator
482	2·5	P.F.C. indicator S.O. elevator
483	2·5	P.F.C. indicator S.I. aileron
484	2·5	P.F.C. indicator S.O. aileron
485	15	Ground service lighting } Fed by 28-volt
486	2·5	Power compartment light } ground supply
487	20	V.H.F. No. 2 supply
488	20	V.H.F. No. 1 supply
489	—	Spare
490	5	Tail parachute
491	20	Radio compass
492	—	Spare
493	2·5	Power compartment lights
494	2·5	Bomb doors indication

Fuse No.	Rating (amp.)	Service
495	10	Bomb doors control
496	—	Spare
		Aft power compartment
514	5	Alternative bombing (28-volt ground supply)
		Note . . . *Fuse* 514 *is alive only when a* 28*-volt ground supply is connected to the aircraft.*
		Panel 29P (Mod. 10 and Mod. 40)
614	30	A.R.I. 18051
615	30	A.R.I. 18051
616	30	A.R.I. 18051
617	30	A.R.I. 18051
618	40	Tanker version normal supply fuse (Mod. 40)
619	—	Spare
620	10	Tanker version—refuelling unit package assembly (Mod. 40)
621	10	
622	5	
623	10	
624	10	
625	10	
626	5	Tanker version master switch (Mod. 40)
627	—	Spare
628	—	Spare
629	—	Spare
630	7·5	A.R.I. 18051 Mod. 10
631	2·5	A.R.I. 18051
632	—	Spare
633	—	Spare
634	—	Spare
635	—	Spare
636	—	Spare
637	—	Spare
638	—	Spare
639	—	Spare
640	—	Spare
641	—	Spare
642	—	Spare
643	—	Spare

TABLE 6

28-volt emergency services distribution (Pre-Mod 340)

Fuse No.	Rating (amp.)	Service
		28-Volt Fuses in 3P
1	—	Spare
2	—	Spare
3	2·5	Engine relight
4	5	Engine relight
5	5	Fire extinguisher crash switch
6	2·5	Battery isolation
7	5	No. 1 D.C. rotary transformer
8	5	No. 2 D.C. rotary transformer. This fuse deleted by Mod. 320
9	5	No. 3 D.C. rotary transformer. This fuse deleted by Mod. 320
10	—	Spare
11	—	Spare
12	—	Spare
13	—	Spare
14	—	Spare
15	—	Spare
16	—	Spare
17	5	L.P. cocks
18	5	L.P. cocks
19	—	Spare
20	—	Spare
21	20	Engine start
22	10	No. 1 engine fire extinguisher
23	10	No. 2 engine fire extinguisher
24	—	Spare
		28-Volt Fuses in 4P
121	10	No. 3 engine fire extinguisher
122	10	No. 4 engine fire extinguisher
123	—	Spare
124	2·5	L.P. cocks
125	2·5	L.P. cocks
126	—	Spare
		28-Volt Fuses in 16P
294	—	Spare
295	10	Fire extinguisher
296	10	Fire extinguisher
297	10	Fire extinguisher
298	10	Fire extinguisher
299	10	Fire extinguisher
300	10	Fire extinguisher
301	10	Fire extinguisher
302	10	Fire extinguisher
303	10	Fire extinguisher
304	10	Fire extinguisher
		28-Volt Fuses in 26P
465	7·5	Battery isolation
466	7·5	Battery isolation
467	15	Battery isolation
468	15	Battery isolation
469	—	Spare
		28-Volt Fuses in Power Compartment (To the rear of 24P, on former 384·5)
515	40	Feeder to fuses No. 121—126, 294 to 304, 468 and 469.
516	40	Feeder to fuses No. 1 to 24, 265, 466 and 467
815	20	Flight refuelling Mod. 40 only

TABLE 6A

28-volt emergency services distribution
(Post Mod. 340)

Fuse No.	Rating (amp.)	Service
		28-Volt Fuses in 3P
1	5	No. 1 L.P. cock
2	10	No. 1 engine fire extinguisher
3	10	No. 1 engine relight
4	5	Fire extinguisher crash switch
5	—	Spare
6	2·5	Battery isolation
7	5	No. 1 D.C. rotary transformer
10	10	No. 2 engine relight
11	10	No. 2 engine fire extinguisher
12	2·5	No. 2 L.P. cock
13	2·5	Service oxygen regulator Mod. 440
14	10	No. 3 engine fire extinguisher
15	10	No. 3 engine relight
16	—	Spare
17	5	No. 3 L.P. cock
18	—	Spare
19	10	No. 4 engine fire extinguisher
20	10	No. 4 engine relight
21	20	Engine start master switch
22	—	Spare
23	—	Spare
24	2·5	No. 4 L.P. cock
		28-Volt Fuses in 16P
293	10	Fire extinguishers—port wing tanks
294	10	Fire extinguishers—port wing tanks
295	10	Fire extinguishers—1 and 2 tank bays
296	10	Fire extinguishers—starboard wing tanks
297	10	Fire extinguishers—1 and 2 tank bays
298	10	Fire extinguishers—starboard wing tanks
299	5	Crash switch—No. 6 crash switch
300	10	Fire extinguishers—starboard wing tanks
301	10	Fire extinguishers—starboard wing tanks
302	10	Fire extinguishers—port wing tanks
303	10	Fire extinguishers—port wing tanks
		28-Volt Fuses in 26P
465	2·5	Battery isolation
466	10	Battery isolation
467	20	Battery isolation
468	15	Battery isolation
469	—	Spare
		28-Volt Fuses in Power Compartment (To the rear of 24P on former 384·5)
515	20	Feeder to fuses No. 4, 7, 10, 11, 12 and 13 in 3P, 299, 300 and 301 in 16P, 468 and 469 in 26P.
516	20	Feeder to fuses No. 1, 2, 3, 5 and 6 in 3P, 293, 294 and 295 in 16P, 465, 466 and 467 in 26P
816	20	Feeder to fuses No. 14 to 18 in 3P, 302, 303 and 304 in 16P.
817	20	Feeder to fuses No. 19 to 24 in 3P, 296, 297 and 298 in 16P.

TABLE 7

A.C. distribution fuses

Fuse No.	Rating (amp.)	Service
		Panel 11P
199	2·5	Oil pressure transformer
200	2·5	Oil pressure transformer
201	2·5	Oil pressure indication, No. 3 eng. (26 volts a.c.)
202	2·5	Fuel flowmeters (26 volts a.c.)
203	2·5	Oil pressure indication, No. 4 eng. (26 volts a.c.)
204	2·5	Oil pressure indication, No. 1 eng. (26 volts a.c.)
229	5	Bomb fuzing and release
230	5	Bomb fuzing and release
231	2·5	A.R.I. 5800
232	2·5	A.R.I. 5800
233	2·5	Bomb bay heating
234	5	Bomb fuzing and release
235	2·5	Fuel sequence timer—port
236	2·5	Fuel sequence timer—port
237	2·5	Fuel sequence timer—starboard
238	2·5	Fuel sequence timer—starboard
239	2·5	Fin de-icing
240	2·5	Fin de-icing
241	2·5	Port wing de-icing
242	2·5	Starboard wing de-icing
243	2·5	Ultra-violet lighting
244	2·5	Ultra-violet lighting
245	2·5	N.B.S. calculator, Type 7
246	2·5	N.B.S. calculator, Type 7
247	2·5	Yaw damper Mod. 46
248	2·5	Yaw damper Mod. 46
249	2·5	No. 3 inverter neon
250	2·5	No. 3 inverter neon
251	2·5	Red fluorescent lighting
252	2·5	Red fluorescent lighting
253	2·5	G4B compass
254	2·5	G4B compass
255	2·5	Artificial horizon—port
256	2·5	Artificial horizon—port
257	2·5	Artificial horizon—starboard Pre-Mod 353
258	2·5	Artificial horizon—starboard Pre-Mod. 353
257	2·5	Zero reader Post Mod. 353
258	2·5	Zero reader Post Mod. 353
259	2·5	No. 4 inverter neon
260	2·5	No. 4 inverter neon
261	5	Auto pilot Mk. 10
262	5	Auto pilot Mk. 10
263	2·5	A.R.I. 5844
264	2·5	A.F.I. 5844
265	5	Radio compass
266	2·5	Cabin temperature control
267	2·5	Fuel flowmeters
268	5	A.R.I. 5816
269	5	A.R.I. 5380
270	5	A.R.I. 5800
271	2·5	A.R.I. 5848
272	2·5	No. 3 inverter neon
273	5	A.R.I. 5851
274	5	A.R.I. 5851
275	2·5	No. 5 inverter neon
276	2·5	No. 5 inverter neon
534	—	Spare
535	—	Spare
536	—	Spare
537	5	H2S P.U.729
538	5	N.B.S. neon
539	—	Spare
540	—	Spare
541	5	N.B.S. neon
542	—	Spare
543	—	Spare
544	—	Spare
545	—	Spare
546	—	Spare
547	—	Spare
548	—	Spare
549	—	Spare
550	—	Spare
551	—	Spare
552	—	Spare
553	—	Spare
554	—	Spare
557	—	Spare
606	5	Windscreen de-mister
607	5	Windscreen de-mister
608	2·5	No. 1 inverter neon
609	2·5	No. 1 inverter neon
610	2·5	Zero reader Mod. 353

TABLE 7—*continued*

A.C. distribution fuses

Fuse No.	Rating (amp.)	Service
611	2·5	Oil pressure indicator—No. 2 eng. 26 volts a.c.
729	5	A.C. distribution to 22P
730	5	A.C. distribution to 22P
731	—	Spare
732	—	Spare
734	—	Spare
735	—	Spare
736	5	A.C. distribution to 22P
737	10	A.C. distribution to 22P
738	—	Spare
739	10	A.C. distribution to 22P
740	2·5	Periscope heating Mod. 97
		Fuses introduced by Mod. 353
835	5	No. 1 and 2 special store
836	—	Spare
837	—	Spare
838	5	No. 1 and 2 special store
839	—	Spare
840	—	Spare
841	—	Spare
842	—	Spare
843	5	No. 1 and 2 special store
844	—	Spare
845	—	Spare
846	5	No. 1 and 2 special store
		Panel 22P
		Red and blue phases at 400 c.p.s.
681	2·5	Pitch damper—port Mod. 232
682	2·5	Pitch damper—port Mod. 232
683	2·5	Pitch damper—stabroard Mod. 232
684	2·5	Pitch damper—starboard Mod. 232
685	2·5	Mach trim amplifier No. 1 Mod. 377
686	2·5	Explosion suppression power pack Port Mod. 171
687	2·5	Explosion suppression power pack Starboard Mod. 171
688	—	Spare
689	2·5	Flight refuelling Mod. 40
690	—	Spare

Fuse No.	Rating (amp.)	Service
691	—	Spare
692	—	Spare
693	—	Spare
694	—	Spare
695	—	Spare
696	—	Spare
697	—	Spare
698	—	Spare
699	—	Spare
700	—	Spare
701	—	Spare
702	—	Spare
703	—	Spare
704	—	Spare
705	—	Spare
706	—	Spare
707	—	Spare
708	—	Spare
709	—	Spare
710	—	Spare
711	—	Spare
712	—	Spare
713	2·5	Jet pipe temp. limiter amplifier No. 2 and 3. Mod. 294
714	2·5	Jet pipe temp. limiter amplifier No. 2 and 3. Mod. 294
715	2·5	Jet pipe temp. Mod. 294
716	2·5	Jet pipe temp. Mod. 294
717	2·5	Jet pipe temp. Mod. 294
718	2·5	Jet pipe temp. limiter amplifier No. 1 and 4. Mod. 294
719	2·5	Jet pipe temp. limiter amplifier No. 1 and 4. Mod. 294
720	2·5	Jet pipe temp. Mod. 294
721	2·5	Jet pipe temp. Mod. 294
722	—	Spare
		Single phase at 1600 c.p.s.
723	2·5	Mach trim amplifier No. 2 Mod. 377
724	—	Spare
725	—	Spare
726	—	Spare
727	—	Spare
728	—	Spare