GROUP A 1

SYSTEM DETAILS

CONTENTS

TABLES

ILLUSTRATIONS

Introduction

1. This group contains a general description of the electrical system as a whole, together with wiring details and general servicing information. Tables listing the ratings and references of the fuses, circuit breakers and filament lamps are also given, together with circuit coding details and a circuit index. For detailed information on the standard items of equipment employed, reference should be made to the appropriate Air Publications, which are quoted at the beginning of each group of this chapter.

2. The system is of the 28-volt, single-pole, earth return, voltage regulated type. It is supplied by two Type 515A genera-

tors, connected in parallel and stabilized by two Varley Type J, 24-volt, 25 amp. hour batteries, which are connected in parallel and float across the output of the generators. The batteries are provided with vented protective covers and the external connections are made by self-locking, Cannon-type 2-pole plug and socket combinations. A test socket is also provided for checking the state of charge of the batteries, by voltage, as no specific gravity check is possible. A 24-volt standby supply, obtained from two 12-volt, 4 amp. hour batteries in series, is also provided for certain services should the normal supply fail.

3. The generators are mounted on, and driven by, the auxiliary gearbox situated in the engine bay. Their control equipment is mounted on a panel located on the starboard side of the radio bay in the front fuselage. The batteries are mounted on platforms also located in the radio bay. The supply from the generators and batteries to the fuse bus-bars is shown, together with the earth return points, in Group B 1 of this chapter.

4. The wiring cable assemblies in the front fuselage are contained in the Main Trunking situated below the ejection seats and run out in P V C conduits to panels and junction boxes located at points suitable for distribution to the equipment. The cable assemblies in the centre and rear fuselage, together with those in the wings run from junction boxes to terminal blocks, which are situated at points convenient for the equipment and for breaking down the aircraft. The majority of the cable assemblies are provided with fully weather-proof multi-pole plug and socket breakdown points and whenever possible the cable connections to the pins are crimped. To facilitate servicing and testing the earth return connections are restricted in number and taken to stud type earth points, which are shown on the cable assembly layout, *(Group A 3)* and also on the earth routeing charts given in Group B 1 of this chapter.

REFERENCING AND GENERAL SERVICING OF COMPONENTS

Main trunking

5. The main trunking is in the form of a shallow tray, which extends across the cabin below the ejection seats and is provided with readily detachable lids. It contains a large number of terminal blocks and cable assemblies and is the main distribution point for the electrical equipment in the front fuselage. It is bolted to the cabin floor and has been designed so that it can be removed, complete with its cable assemblies, in a comparatively short time when major servicing is required. Access to the trunking, for daily servicing or simple modifications using existing or spare wiring, may be obtained by raising the ejection seats on their guide rails. For complete removal of the trunking, the ejection seats must, however, be removed to provide access. The method of removing the trunking is described in Group A 2 of this chapter. A diagram of the wiring contained in the trunking is attached to the inside of the starboard lid.

WARNING

Before attempting to raise or remove the ejection seats, refer to the ejection seat lethal warning at the front of this volume.

Centre console

6. The centre console is in the form of a box, which is bolted to the cabin floor on the centre line of the aircraft. It extends from the instrument panels to the trunking and contains the majority of the relays for the front fuselage electrical system, together with certain controls and switches used by the pilots. It also serves as a cover to the cable trough on which it is mounted. A detachable door is provided on each side of the console for access to the equipment and the complete console may be removed, for major servicing, as described in Group A 2 of this chapter. A diagram of the internal wiring is also contained within the console.

Main fuse box

7. The main fuse box is supported on quick-release mountings on the forward face of the flying control casing in the cabin and, as its name implies, contains the majority of the circuit fuses for the aircraft's electrical equipment. The box is provided with a readily detachable lid for fuse replacement and a wiring diagram

of the contents of the box, including fuse details, is attached to the inside face of this lid.

Leg panel

8. This panel is in the form of a box, which is bolted to the cabin floor, below the instrument panels and just forward of the pupil's control column. It is provided with a detachable cover plate on the port side for access to the internal wiring and its forward face is in the form of a sloping plate, which carries the plugs for the cable assemblies to and from the panel. The rear face carries the oil pressure gauge, generator power failure warning lamps, ignition and starter selector switches, together with a number of ganged control switches. A wiring diagram of the panel is attached to the inside face of the detachable cover plate.

Junction boxes

9. These are of welded aluminium, waterproof construction, and contain terminal blocks and other equipment. Generally, they are numbered for reference, the number being preceded by the letters JB. The A.C. junction boxes are designated A.C. J.B. No.1, and A.C. J.B. No.2, and armament junction boxes as ARM. J.B.1, etc. The terminals in each box are numbered, and can be identified by referring to the wiring diagram contained in the box. On the diagram, spare terminals with wires connected to them are starred denoting that the wires are spares. Spare wires in the boxes are long enough to reach any other terminal in the box. The surplus lengths of wire from terminals in the main trunking are stored in the cable trough under the centre console. Where a cable passes through a box without connecting to a terminal the cable is wired pin to pin between its associated plugs and this is indicated on the routeing diagrams by an arched line in the column concerned. Each such wire in the main trunking and J.B.2 has a marker sleeve attached to indicate its point of origin for location and identification purposes.

10. Junction box number 1 is the major distribution point for the equipment in the centre fuselage and is mounted on the bottom rear face of the main spar frame. Junction box number 2 is mounted just forward of the instrument panels and is used as a distribution point for the equipment on these panels and in the fuselage nose. A number of fuses are contained in this box, to which access is gained from above the instrument panels after the removal of the lid from the top of the box.

11. The junction boxes are provided with readily detachable lids and have, in general, been designed for ease of re, moval, being supported on quick-release mountings; an exception is J.B.2, which necessitates removal of the instrument panel. When major servicing is necessary, it is recommended that the boxes are removed from the aircraft and replaced with fully serviced components, thus reducing the time in which the aircraft is unserviceable. The faulty boxes should then be serviced on the bench, and returned to store to be held as spares. The method of removing the boxes is described in Group A.2.

A.C. junction box No.1 and No.2

12. A.C. junction box No.1 is mounted aft of the cabin starboard shelf. It contains both d.c. and a.c. circuit fuses; the latter supplying a.c. - operated equipment, and the former supplying d.c. to equipment requiring both supplies. A.C. junction box No.2 is mounted in the nose wheel bay, and is used to distribute supplies to the Tacan equipment in the bay, and to the air data computer on frame 1.C.

Armament junction boxes

13. ARM. J.B.1 is located on the starboard fuel tank access door on the forward face of frame 19. ARM. J.B.3 and 4 are situated in the port outer wing, being mounted on the top skin of the wheel bay and the diaphragm between interspar ribs Q and R respectively. ARM. J.B.5 and 6 are located in similar positions in the starboard outer wing. Junction boxes ARM. J.B.7 and 8 are located side by side in the radio bay, being mounted on the starboard undersurface of the cross member adjacent to frame 18A. All these ARM junction boxes are used as breakdown and distribution points for the armament services and it should be noted that ARM. J.B.2, which on standard Hunter aircraft is located in the cabin, is not installed in this aircraft, its function

being carried out by the centre console.

Generator control and supply panels

14. These two panels are located together between frames 16 and 19 on the starboard side of the radio bay in the front fuselage. The supply panel, which is curved, is located outboard of the generator control panel and is attached to frames 17A and 17B. This panel carries a number of terminal blocks, fuse boxes and relays, together with plugs for the cable assemblies to and from the panel. The generator control panel, which fits over the supply panel to form a lid, is hinged at its top edge to channel members extending upwards from the supply panel and is attached to this latter panel by four Dzus fasteners along its lower edge. This panel contains all the generator control components, fuse boxes and test equipment sockets. When raised for access to the supply panel, the generator control panel may be retained in the raised position by a hook attached to a length of chain secured to local structure.

Note . . .

To prevent short circuits between the generator control panel retaining chain and the supply panel terminals, care must be taken to ensure that the chain is adequately secured after removal and replacement of the panel and when servicing in the vicinity takes place. Particular attention must be paid to the serviceability of the hook before re-attachment. A damaged hook must be renewed.

Radio relay box

15. This box is supported on a quick-release mounting located at the top of the radio bay on the rear face of frame 15 and contains the radio supply fuses and control relays, together with a number of plugs for the radio connectors to and from the box. For further details of this box, reference should be made to Sect.6, Chap.1 of this volume.

Cabin port shelf and switch panel

16. The cabin port shelf, as a whole, extends aft from the instrument panels to frame 11 and the miscellaneous switch panel is located to the rear of this shelf. The shelf is in the form of a top panel and side member, the forward portion of the shelf being readily detachable. The shelf carries various control switches, warning lamps and indicators. The equipment on the fixed parts of the shelf is fed from readily accessible terminal blocks located adjacent to the throttle control box, and that on the removable portion and the components on the switch panel are fed direct from the main trunking.

Cabin starboard shelf and a.c. circuit breaker panel

17. This shelf also extends aft from the instrument panels to frame 11 and the circuit breaker panel is located between frames 13 and 14 aft of the a.c. junction box. The shelf is in the form of a top panel and side member and carries a gyro gun sight control unit, a trim switch, indicators and a number of control switches. The a.c. circuit breaker panel incorporates the flight instrument inverter circuit breakers, together with the booster pump test switch and test socket. The equipment on the shelf is supplied via two readily accessible terminal blocks located, under a guard cover, above the shelf between frames 9 and 10. The components on the circuit breaker panel are fed from the a.c. junction box and main trunking.

Tacan a.c. supplies panel

18. This panel is mounted on the port side of the radio bay, being bolted to the aft face of frame 14. Mounted on this panel are the Tacan inverter, control panel, starting unit, Thermal delay unit, Tacan a.c. control box, Tacan fuses and various associated relays.

Servicing, main components

19. A regular examination of the junction boxes and fuse box, together with the main trunking, centre console and all the other main components should be carried out to ensure that they are correctly supported, clean and undamaged. All the equipment on and within these components should also be checked for security, and the wiring and terminals examined for damage and corrosion. The Dzus fasteners securing the removable portion of the cabin port shelf and the generator control panel should be examined to ensure that they are correctly engaged and not damaged or distorted in any way, paying particular attention to the springs. Any fasteners found to be unlocked must be re-engaged and any found defective renewed as described in A.P.1464B, Vol.1, Part 2, Sect.6, Chap.3. When major servicing is necessary to the main components, it is recommended that they are removed from the aircraft and replaced with fully serviceable units, thus reducing the time in which the aircraft is unserviceable. The faulty units should then be serviced, on the bench, and returned to store to be held as spares. The method of removing

these components is given in Group A.2 of this chapter.

Cable assemblies

20. These consist of a number of cables, held together by P.V.C. sleeving or straps to form looms, most of which are fitted at the ends with multi-pole plugs or sockets. The assemblies are referenced numerically, the number being prefixed with a letter denoting their location in the aircraft or in certain special installations, the service which they supply. Front fuselage cable assemblies are prefixed by the letter F, centre fuselage assemblies with the letter C and rear fuselage assemblies with the letter R. Cable assemblies in the port wing are prefixed by the letter P and those in the starboard wing carry the letter S. The cable assemblies of the artificial horizon, GM.4F compass and armament installations are prefixed with the letters AH, GC and A respectively. The cable assemblies in the engine bay hot zones where oil contamination is possible, consist of Nypren insulated cables. The majority of the cable assemblies in the front fuselage are contained in P.V.C. conduits.

21. A periodical examination of the cable assemblies should be made for signs of oil soakage and to ensure that they are properly supported and not chafing, cut or damaged in any way. Damaged cables must be renewed or repaired as described in A.P.4343, Vol.1, Sect.12, Chap.5 and all slack support clips retightened.

Cables

22. All individual cables in a cable assembly are identified by the cable assembly code number and end reference plus the letter of the plug pin, socket insert or equipment terminal to which

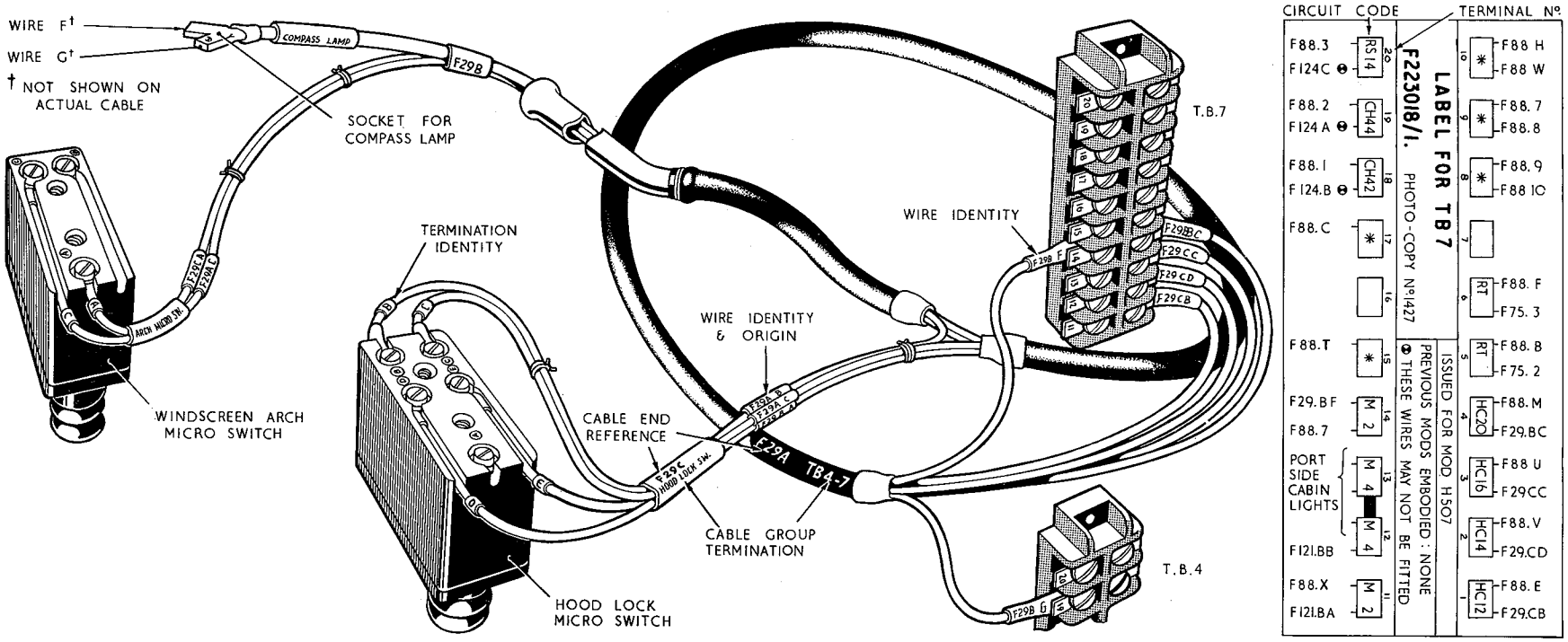


Fig.1 Typical cable assembly

they are connected. For example, consider cable assembly F.29 *(fig.1)*, which is a general services cable in the front fuselage. It connects between terminal blocks numbers 4 and 7, located together above the cabin port shelf, and the compass lamp, windscreen arch microswitch and hood lock microswitch. The end of the cable assembly connected to T.B.4 and 7 is known as F.29A; that connected to the compass lamp and windscreen arch microswitch, which is split to form two end tails, is known as F.29B and the end connected to the hood lock microswitch is known as F.29C. These cable assembly end references, together with the cable group terminations *(e.g. F.29C, hood lock microswitch)* are marked on plastic sleeves passed around each bunch of cable. The individual cables of each bunch also carry sleeves at each end, on one of which is marked its remote end and identity, and on another, its local terminations *(e.g. E. F.29B.A, at end C of the assembly and A. F.29C.A at end B)*. It can thus be seen that this length of cable extends from terminal E of the hood lock microswitch to terminal A of the windscreen arch microswitch. End A of the cable assembly is connected to T.B.4 and 7 as previously stated and on these terminal blocks will be found labels to indicate to which terminal numbers the cable cores are connected. For the type of cable employed in the various circuits, reference should be made to the routeing diagrams and to the table of cable abbreviations given in this group. The method of servicing and repairing the cables is contained in A.P.4343, Vol.1, Sect.12, and in A.P.4343C, Vol.1, Book 3, Sect.5.

Multi-pole plugs and sockets

23. Plessey standard and pressure-proof plugs and sockets, together with the Mk.4 miniature types, are used on the cable assemblies, junction boxes, panels, etc. These are described in A.P.4343C, Vol.1, Book 3, Sect.5, and consist of internal mouldings, holding the plug pins and socket inserts, which float in fully weather-proof metal housings. The plug pins and socket inserts are each identified by a letter or number on the internal moulding and are arranged in a pattern so as to prevent incorrect assembly with their associated component, thus preventing cross-connection or short-circuiting. Those plugs and sockets in the centre fuselage, rear fuselage and wings which are fitted to cable assemblies outside junction boxes, panels, etc., are provided with rubber sleeves and bungs, which seal the cable entry to prevent the ingress of moisture. The sleeves and bungs are retained in position by inner and outer ferrules locked by a coupling nut. The P.V.C. conduits of the cable assemblies in the front fuselage extend right up to the plugs and sockets, being retained in position by inner ferrules and metal clamps. At frames 6 and 14, quick-release waterproof pressurized cable entries are used on the plugs and sockets. Each socket may be identified by the cable assembly to which it is attached, the reference being printed on the rubber sleeve or P.V.C. conduit. Each plug is also identified by its associated cable assembly reference or colour which is painted on the junction box or panel to which the plug is attached. Where two or more identical plugs or sockets are situated together, they are coloured for easy identification.

24. Before an attempt is made to remove a Plessey standard or pressure-proof socket from its associated plug, the coupling nut retaining the sleeve and bung, or ferrule and P.V.C. assembly to the socket, must be slackened. This is necessary as the coupling nut also serves to lock the socket when it is mating with its plug. It should also be noted that this nut should be slackened before fitting the socket, and the socket screwed in by hand, being assisted home by pushing on the back. A spanner or undue force must NOT be used, or damage will result.

25. The plugs and sockets should be examined periodically for signs of corrosion which, if found, must be removed without delay. When removing corrosion, care must be taken not to damage the plated surface of the plug pins and socket inserts or early re-corrosion will result. The importance of cleanliness and the need for regular lubrication of the plug and socket screw threads cannot be over-emphasized if seizing of these threads is to be avoided. Low temperature grease

MS-4 *(Ref.33H/9424829)* is to be used and all excess wiped off. On no account should a lubricant with a graphite base be employed. When it is required to examine or service the cable connections to plugs and sockets incorporating rubber sleeves and bungs, access may be gained by releasing the sleeve at the coupling nut and rolling it back until clear of the connections.

Fuses

26. The majority of the circuit fuses are contained in quick-release fuse blocks located within the main fuse box and junction box number 2. Others will also be found in the various junction boxes and on the panels carrying the electrical equipment. There is a bomb circuit fuse in the centre console. Fuses are referenced numerically, each box and panel having its own set of numbers. In most instances, these numbers, together with the fuse amperage and the code letters of the circuit it serves, appear on the associated wiring diagram in the box concerned. In certain instances this information is given on a photographic label attached to the appropriate fuse block. The majority of the fuses are of the Type S series, reference should be made to Table 1 for the References, ratings and fuse numbers. The fuses should be examined periodically to ensure that they are serviceable and of the correct value.

TABLE 1 Fuses

Location	Fuse No.	Size (Amp.)	Service
Main fuse box	1	5	Engine starter
"	2	5	Hood control
"	3	2.5	Alighting gear control
"	4	10	Anti-collision lamps (Mod 1380)
"	5	2.5	Standby compass lamp (emergency)
"	6	2.5	Turn and slip indicator
"	7	2.5	A.C. supplies
"	8	2.5	A.C. supplies
"	9	2.5	Fuel pressure
"	10	5	Emergency fuel pump
"	11	10	Engine starter
"	12	5	Altimeter inverter control
"	13	5	Auto-tone
"	14	5	Engine anti-icing
"	15	2.5	Aileron trim controls
"	16	2.5	Turn and slip indicator main port
Main fuse box	17	2.5	Turn and slip indicator standby port
"	18	2.5	Oxygen flow indicator
"	19	2.5	Alighting gear indicator
"	20	2.5	Turn and slip indicator standby starboard
"	21	10	Pressure head heater
"	22	–	Spare
"	23	2.5	Hydraulic pressure indicator
"	24	–	Spare
"	25	5	Cabin pressurization control
"	26	5	Cabin pressurization control
"	27	5	Cabin pressurization control
"	28	5	Tail plane control
"	29	20	Tail plane control
"	30	5	Tail plane control
"	31	2.5	Cabin lamps

TABLE 1 Fuses (Continued)

Location	Fuse No.	Size (Amp.)	Service
Main fuse box	32	2.5	Cabin lamps
"	33	2.5	Cabin lamps
"	34	2.5	Standby compass lamp
"	35	5	Hood control
"	36	5	Power elevator control
"	37	–	Spare
"	38	–	Spare
"	39	5	Arresting hook indicator
"	40 to 42	-	Spare
"	43	5	Radar altimeter Tx/Rx
"	44	2.5	Radar altimeter tone generator and amplifier
"	45	-	Spare
"	46	5	Power aileron control
"	47	2.5	Turn and slip indicator main starboard
	48 to 60	-	Spare
Centre console	–	3	Bomb fuse - tail
Junction box 2	1	–	Spare
"	2	–	Spare
"	3	5	Engine top temperature control
"	4	5	Dummy (Mod 1430)
"	5	5	Airbrake control
"	6	5	Alighting gear control
"	7	5	Alighting gear control
"	8	20	Tail parachute control
"	9	2.5	Service lamp (nose)
"	10	5	Flap control
"	11	10	Fire extinguisher
"	12	2.5	Oxygen flow indicator
"	13	5	Navigation lamps
"	14	2.5	Fuel contents indicator (port)
"	15	2.5	Fuel contents indicator (starboard)
"	16	–	Spare
"	17	2.5	Flying instrument panel lamps (port)
"	18	2.5	Flying instrument panel lamps (starboard)
Junction box 2	19	2.5	Centre instrument panel lamps (port)
"	20	2.5	Centre instrument panel lamps (starboard)
"	21	2.5	Starboard instrument panel lamps
"	22	5	Arresting hook control
"	23	–	Spare
"	24	–	Spare
"	25	2.5	Cabin lamps (emergency)
"	26	2.5	Turn and slip (emergency)
"	27	2.5	Aileron power indicator
"	28	2.5	Elevator power indicator
A.C. junction box	1	2.5	G.4FT compass blue phase
"	2	2.5	Engine top temperature control blue phase
"	3	2.5	Radar altimeter
"	4	2.5	Autostabilizer blue phase
"	5	2.5	Artificial horizon blue phase (port)
"	6	2.5	Artificial horizon blue phase (starboard)
"	7	2.5	Oil pressure gauge blue phase
"	8	–	Spare
"	9	2.5	Cabin temperature control blue phase
"	10	–	Spare
"	11	–	Spare
"	12	–	Spare
"	13	–	Spare
"	14	–	Spare
"	15	–	Spare
"	16	–	Spare
"	17	2.5	G.4FT compass red phase
"	18	2.5	Engine top temperature control red phase

TABLE 1 Fuses (Continued)

Location	Fuse No.	Size (Amp.)	Service
"	19	-	Spare
"	20	2.5	Autostabilizer red phase
"	21	2.5	Artificial horizon red phase (port)
"	22	2.5	Artificial horizon red phase (starboard)
"	23	2.5	Oil pressure gauge red phase
"	24	–	Spare
"	25	2.5	Cabin temperature control red phase
"	26 to 32		Spare
"	33	2.5	Port indicator standby d.c.
"	34	2.5	Port indicator main d.c.
"	35	2.5	Starboard indicator standby d.c.
"	36	5	Compass standby d.c.
"	37	2.5	Starboard indicator main d.c.
"	38	5	Compass main d.c.
"	39	–	Spare
"	40	–	Spare
Generator control panel	1	5	Generator test socket No.2 + ve
	2	5	Amp.1 test socket No.2 - ve
"	3	5	Amp.1 test socket No.1 - ve
"	4	5	Generator test socket No.1 + ve
"	5	5	Power failure indicator No.2
"	6	5	Power failure indicator No.1
"	7	10	A.C. supplies control No.2 Group
"	8	5	A.C. supplies control No.1 Group
"	9	125	TACAN inverter
Supply panel	1	2.5	Fuel contents (port)
"	2	2.5	Fuel contents (starboard)
"	3	2.5	Fuel pressure (port)
"	4	2.5	Fuel pressure (starboard)
"	5	2.5	Tank pump failure (port)
"	6	2.5	Tank pump failure (starboard)
Supply panel	7	5	Pressure refuelling
"	8	2.5	Nose lamp (Grimes)
"	9	20	Altimeter vibrator
"	10	2·5	IFF/SSR (Mod 1372)
▶ "	11	5	Fuel filter de-icing valve } Dummy
"	12	10	Fuel filter de-icing pump } STI/427 ◀
"	13	10	Ignition (port)
"	14	10	Ignition (starboard)
"	15	5	Fire warning
"	16	2.5	Tail plane position indicator
"	17	2.5	Flap position indicator
"	18	2.5	Aileron trim tab position indicator
"	19	2.5	Rudder trim tab position indicator
"	20	2.5	Service lamp (radio bay)
"	21	2.5	Service lamp (starter bay)
"	22	2.5	Drop tank empty indicator
"	23	2·5	IFF/SSR (Mod 1372)
"	24	5	Autostabilizer
"	25	10	Gun firing
"	26	5	Pylon jettison gun
"	27	10	Bomb jettison and fuzing
"	28	5	Dummy (post-Mod 1441)
"	29	5	IFF/SSR test set supply
"	30	10	Tacan a.c. supply control
"	31	–	Spare
"	32	–	Spare
"	33	20	Fire extinguisher
"	34	10	Battery master switch
"	35	2.5	Battery voltage test socket
"	36	10	Tele-briefing relay
"	37	5	Generator No.1 crash switch
"	38	5	Generator No.2 crash switch
"	39 to 47		Spare
"	48	5	VHF (Mod 1430)

TABLE 1 Fuses (Continued)

Location	Fuse No.	Size (Amp.)	Service
Radio relay box	1	10*	Standby battery
"	2	5	Tele-briefing
"	3	2.5	Emergency press-to-talk
"	4	10*	Test set supply
"	5	5*	Amplifier A.1961
"	6	2.5	Audio warning
"	7	2.5	Main press-to talk
"	8	–	Spare
"	9	10	Standby set supply
Radio relay box	10	5*	Aerial relay
"	11	–	Spare
"	12	2.5	Main/Standby selection
A.C. J.B.2.	–	3	Altimeter
"	–	3	Test Skt.
"	–	7	TACAN a.c.
TACAN a.c. supplies panel	–	7	Inverter Type 108
	–	7	TACAN d.c.

* H.R.C. Type fuse.

27. Dummy fuses are fitted in NOT IN USE circuits to prevent inadvertent operation of the circuit. These fuses, in red plastic, are identifiable by feel by their square section centre and corrugated sides. One side is embossed "NOT IN USE". Whenever a live fuse is removed while servicing it is to be temporarily replaced by a dummy fuse fitted with a 9 inch by 1 inch streamer. Dummy fuses are referenced:–

2 amp. size fuse dummy	10H/21790
2.5 amp. size fuse dummy	10H/21791
5 amp. size fuse dummy	
10 amp. size fuse dummy	10H/21792
40 amp. size fuse dummy	10H/21793

Circuit breakers

28. All the circuit breakers, apart from those on and below the generator control panel and those forward of the supply panel, which are located in the radio bay, are accessible from the cabin. They are not referenced, but may be identified by the name of the circuit that they protect, this being given adjacent to each breaker. The interior of the circuit breakers is inaccessible and servicing is therefore restricted to the functional and insulation tests given in the relevant equipment servicing A.P. Table 2 lists the circuit breakers, together with their ratings and References.

Relays

29. The majority of the relays are contained within the centre console and others will be found in the various junction boxes and on the panels carrying the electrical equipment. They are referenced alphabetically in each assembly, the letters being given adjacent to each unit and on the wiring diagrams. The relays should be inspected at regular intervals to ensure that the contacts are kept clean and that the units are undamaged and secure. They should also be subjected periodically to the functional tests given in the relevant equipment servicing A.P.

Note . . .

Relays that are operating correctly are best left alone and it is, therefore, not recommended that the covers are removed or the contacts cleaned unless absolutely necessary.

Switches

30. The switches employed in this aircraft are sealed units and cannot be readily dismantled for servicing. They should, however, be examined for cracks and signs of strain, paying particular attention to the switch dolly.

Terminal blocks

31. In addition to those terminal blocks installed inside junction boxes and on the panels carrying electrical equipment, terminal blocks are also used as distribution and breakdown points throughout the aircraft. These are of the Plessey quick-release 2, 3, 5, 10 and 20 way types, together with a few Air Ministry 2 and 3 way types. The blocks are referenced numerically, the numbers being preceded by the letters T.B. Each terminal carries a coding plate on which is marked the terminal number, as given in the wiring diagrams. The terminal blocks may be located by reference to the cable assembly layout and location diagrams contained in Group A.3 of this chapter.

Note . . .

Terminal Blocks 11, 12, 22, 24, 32, 42, 43, 44, 45, 46, 47, 48, 56, 73, 79, 87, 97, & 98 should not be fitted with perspex covers (introduced by STIs 182A and 262).

31A. Where cable terminations take place at terminal blocks, microswitches and components, situated in exposed external areas, they are to be treated with grease MS-4 (Ref.33H-9424829) to prevent ingress of water.

Filament lamps

32. When renewing filament lamps, reference should be made to Table 3 to ensure that the correct type is used.

Earth points

33. Apart from the guns, engine starter, inverters, suppressors, panel lamps and the U.H.F. main and standby radio sets, which are earthed internally or adjacent to their mountings, all the other earth leads are grouped, for ease of servicing and insulation resistance testing, and connected to the aircraft structure at a number of stud-type main earth points. All the main earth points are numbered and may be located by reference to the cable assembly layout in Group A 3 and to the earth routeing chart given in Group B 1 of this chapter. When refitting earth leads, care must be taken to ensure that the surfaces in contact are perfectly clean and in particular, free from grease and paint. Completed assemblies should be protected against corrosion by applying one coat of blue oil-base paint to Spec.827.

TABLE 2
Circuit breakers

Circuit	Rating (amp.)	Ref.
Parachute brake	6	-
No.1 Generator, field	10	5CY/955083
No.2 Generator, field	10	5CY/955083
Stores release	10	5CY/955083
AC supplies		
No.1 inverter	15	5CY/4376383
No.2 inverter	15	5CY/4376383
No.3 inverter	15	5CY/4376383
No.4 inverter	15	5CY/4376383
Tank pumps		
Port	25	5CY/9992777
Starboard	25	5CY/9992777
UHF main supply	25	5CY/9992777
ARC 52 (pre Mod. 1481)		
PTR 1751 (Mod 1481)	7.5	5CY/6429790
Tail plane, normal	24	5CY/5321
Tail plane, override	45	5CY/4376060
Engine starting	45	5CY/4376060
L + distribution (6 off)	45	5CY/4376060
UHF services	45	5CY/4376060
No.1 Generator, main	200	5CY/4376491
No.2 Generator, main	200	5CY/4376491

Circuit coding and group references

34. Each circuit of this aircraft is coded by means of a letter or letters, which normally consist of the initials of the circuit title, e.g. the fire warning circuit is coded FW. It must be noted that these code letters are for reference only and will not be found on the cables in the aircraft by means of a label or wiring diagram. The code letters will also be found on the theoretical and routeing diagrams in the various groups of this chapter, because each section of a particular circuit is also referenced by a number preceded by the circuit code letters, e.g. FW2, FW4, etc. A list of the various circuits employed in this aircraft, together with their code letters and the chapter and group references of this Section is given in Table 4.

GENERAL SERVICING OF SYSTEM

External supply socket

35. This is mounted in the radio bay on the port underside of the cross member adjacent to frame 18A; access is gained by removing a small access door from the radio access panel. It is used to connect an external supply to the aircraft services by means of a standard plug and it is most important that, when servicing, the external supply is used to prevent the aircraft batteries from being discharged. When the external supply is in use, the generators are automatically isolated to prevent a reverse feed *(Group B 1)* and it is recommended that the battery master switch, located on the leg panel, is placed in the OFF position to prevent discharge of the aircraft batteries should the external supply voltage fall below that of the batteries.

Note . . .

If necessary, in an emergency, the aircraft batteries may be charged in-situ

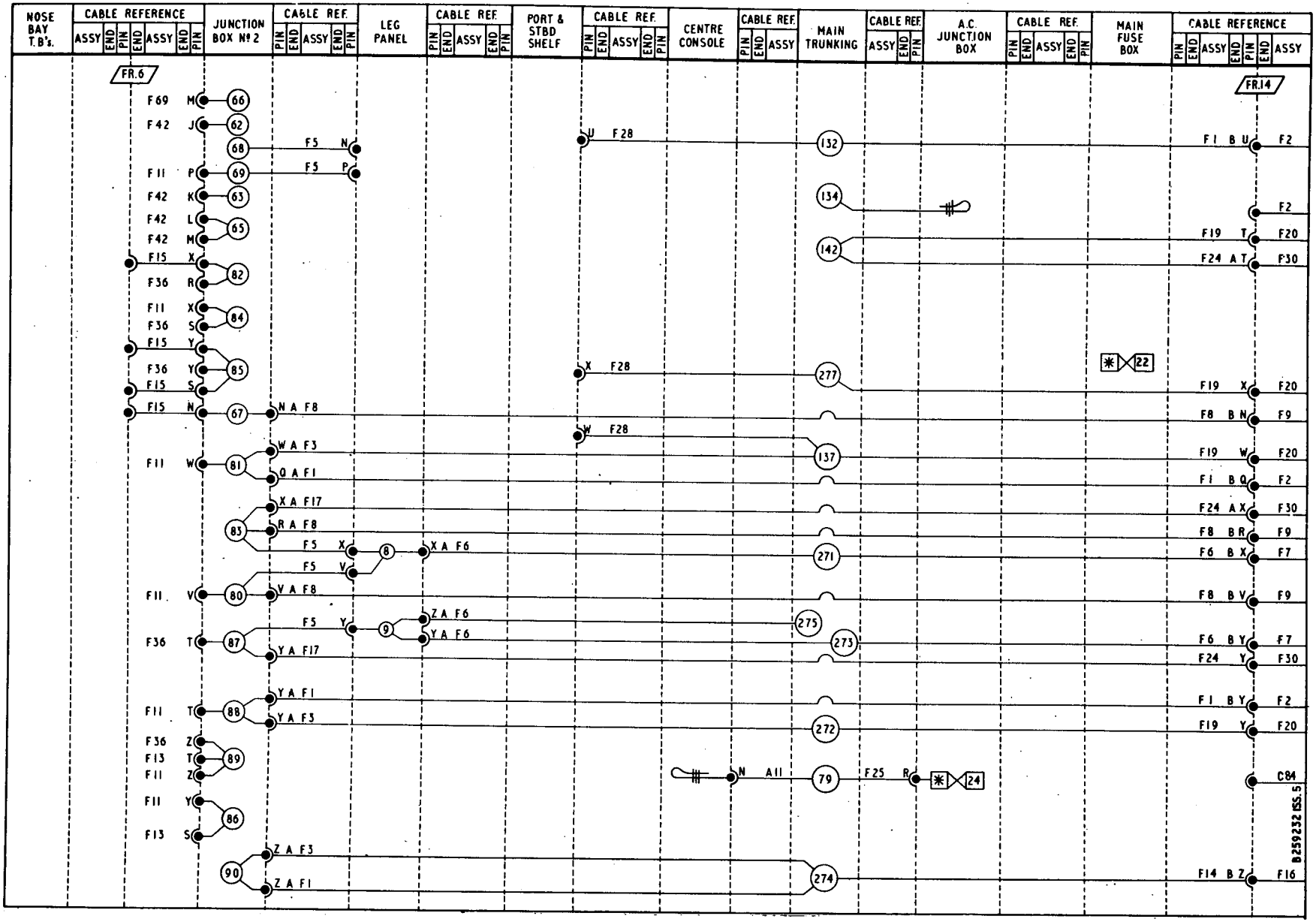
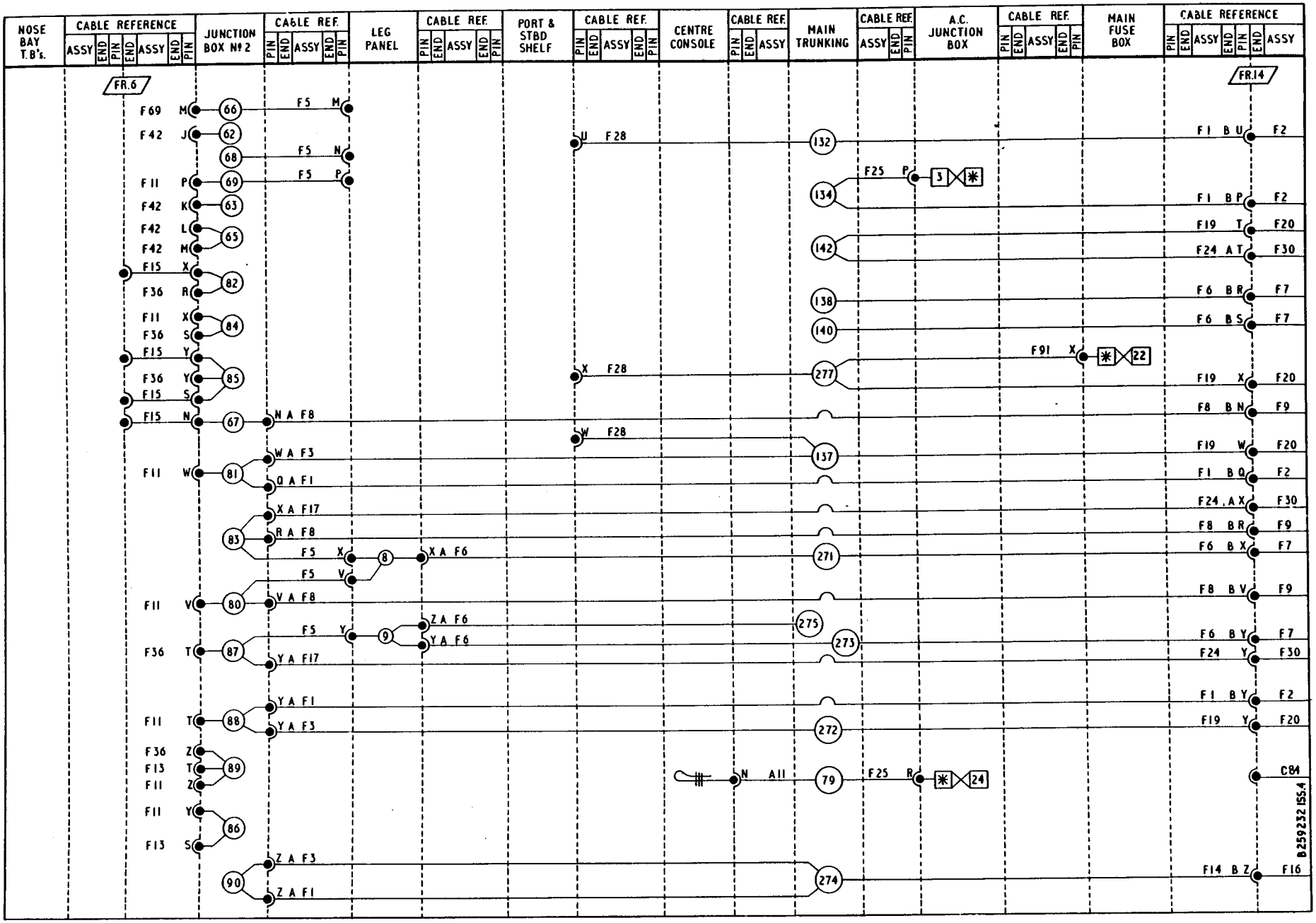


Fig. 2 Available spare wiring - Sheet 1
(Mod 1467 added)



▶ Fig.2A Available spare wiring – sheet 1 – pre-Mod 1380 ◀

TABLE 3
Filament lamps

Lamp	Circuit	No.off	Voltage	Wattage	Ref.
Parachute indicator	Parachute brake	2	28	3.5	5L/9951273
Power failure warning	Generators and batteries	2	28	3.5	5L/9951273
Fuel low pressure warning	Fuel pressure	1	28	3.5	5L/9951273
Cabin pressure warning	Cabin pressurization and temperature control	1	28	3.5	5L/9951273
Alighting gear warning	Alighting gear indicator	1	28	3.5	5L/9951273
Alighting gear indicator	Alighting gear indicator	9	28	2.5	5L/9951286
Hook warning	Arresting hook control	1	28	3.5	5L/9951273
Wing tip navigation	Navigation lamps	2	28	20	5L/9952431
Tail navigation	Navigation lamps	1	24	10	5L/9952276
Service lamps	Service lamps	3	24	6	5L/9952254
Hydraulic pressure	Hydraulic pressure indicator	1	28	3.5	5L/9951273
U H F Control	U H F	2	28	1.1	5L/9951122
Tele-briefing	U H F	1	28	3.5	5L/9951273
Tacan control	Cabin lighting	2	28	1.12	5L/9959118
Fire warning	Fire warning and extinguisher	1	28	3.5	5L/9951273
Emergency fuel pump	Emergency fuel pump	1	28	3.5	5L/9951273
Hood lock	Hood control	1	28	3.5	5L/9951273
Tank pump failure	Tank pumps	2	24	2.4	5L/9959215
Gun sights	Gun sight	4 plus 4 spare	22	12	5L/9951260
Cabin lamps					
Side lamps	Cabin lighting	7	28	3.5	5L/9951273
Pillar lamps	Cabin lighting	3	28	1.12	5L/9959118
Bridge lamps	Cabin lighting	35	28	1.12	5L/9959118
Emergency lamps	Cabin lighting	2	28	3.5	5L/9951273
Standby compass lamp	Cabin lighting	1	28	1.12	5L/9959118
Failure warning	IFF/SSR (Mod 1372)	1	28	3.5	5L/9951273

by connecting a suitable supply to the external supply socket and placing the battery master switch to the ON position.

Rendering aircraft electrically safe

36. During any servicing operations not requiring the electrical supply, the aircraft must be rendered electrically safe to eliminate the possibility of a short-circuit resulting in the possible operation of the guns, hydraulic units, etc., with consequent damage to the aircraft or injury to personnel. When electrical power is required during servicing, an external supply should be used. To render the aircraft safe, the battery leads must be disconnected, because operation of the battery master switch will not render the system completely safe; also ensure that the external supply is disconnected.

Use of spare cables for emergency servicing

37. Routeing diagrams of the available spare cables incorporated in the cable assemblies are given in this group. These are provided for future modifications and additions to the existing system, but may also be used, in an emergency to replace a defective cable should a circuit fail for this reason. Under this condition, having found the defective portion of cable, refer to the spares routeing charts to find a similar cable which can be used, At suitable points, modify the existing cable run to use the spare cable and isolate the defective cable. Amend the junction box and panel wiring diagrams to agree and note the fact of this change in the aircraft

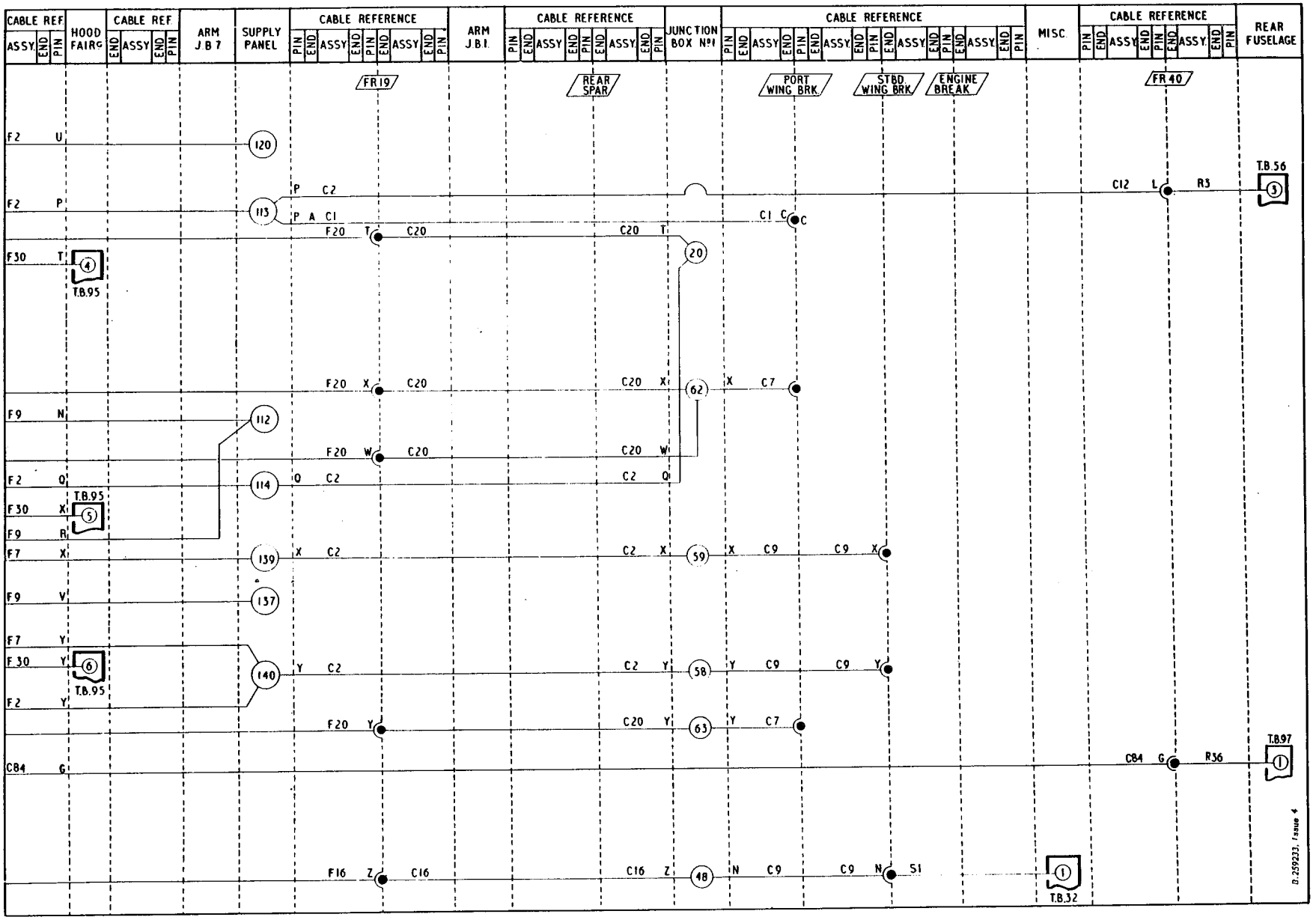
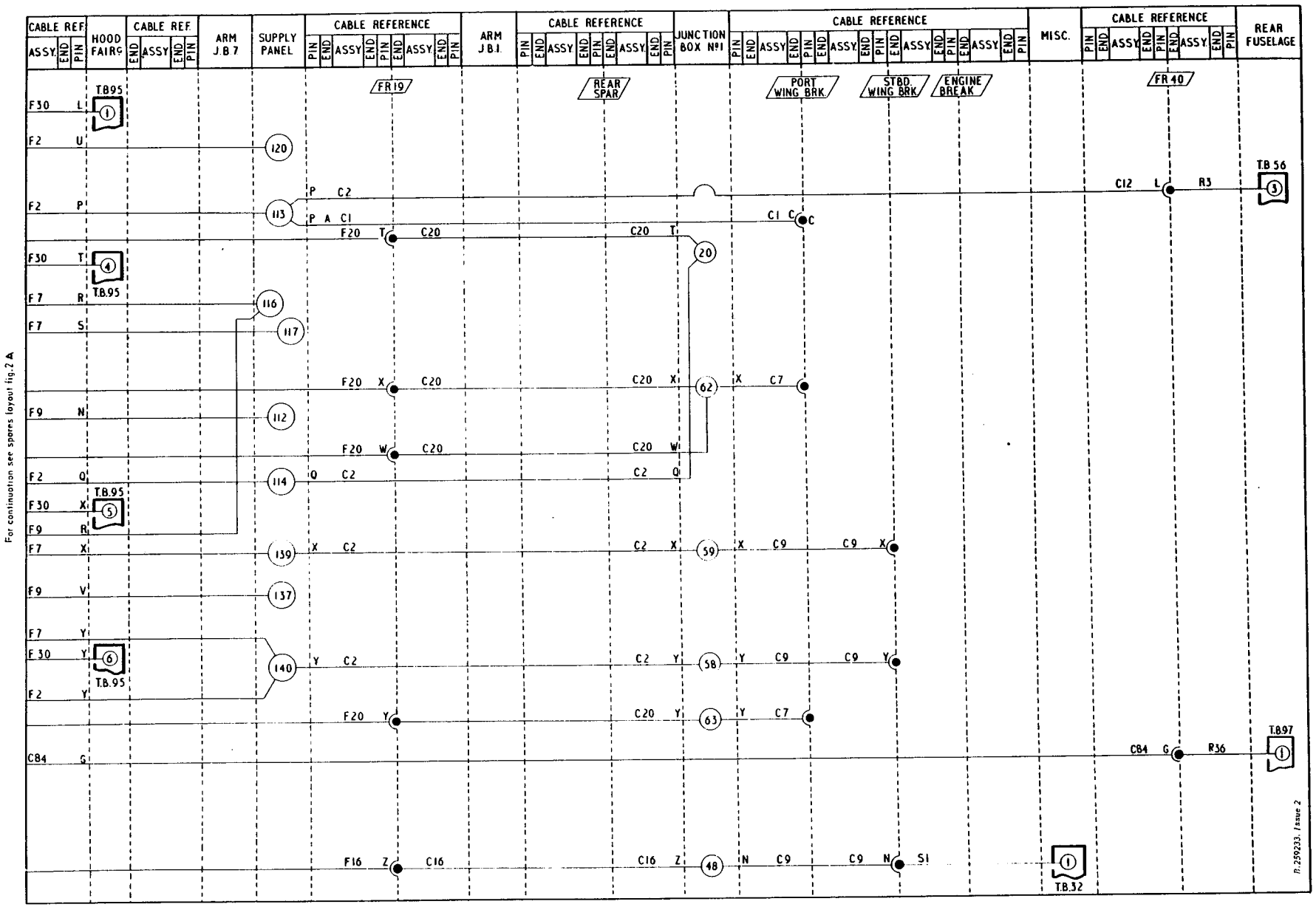


Fig.3 Available spare wiring — sheet 2

▶ **(Mod 1380 added)** ◀



▶ **Fig.3A Available spare wiring — sheet 2 — pre-Mod 1380** ◀

log book, with the instruction that the cable assembly containing the defective cable must be changed or repaired at the next available opportunity.

Note...

The above procedure is only to be adopted as an emergency measure to keep the aircraft flying and the fault must be rectified at the first opportunity, as later modifications may depend upon the use of such spare wiring being available.

TABLE 4

Circuit codes and group references

Circuit	Code	Chapter	Group	Circuit	Code	Chapter	Group
A.C. supplies	CH	1	E 1	Engine starting	SA	1	C 1
Aileron trim controls	A	1	D 1	Elevator power controls	PE	1	D 2
Aileron trim indicators	AD	2	3 B	Exhaust gas thermometer and top temperature control	ET	2	2 B
Aileron power controls	PA	1	D 2	Fire warning	FW	1	C 2
Alighting gear control	UC	1	D 7	Fire extinguisher	FE	1	C 2
Alighting gear indicator	U	2	5 A	Flap control	F	1	D 4
Air brake control	AB	1	D 7	Flap position indicator	FD	2	3 B
Artificial horizon	AH	2	3 B	Fuel content gauges	FG	2	2 A
Autostabilizer	AS	1	D 9	Fuel filter de-icing	EFD	1	C 5
Airstream direction detector	ADD	2	3 B	Fuel transfer pressure warning	FP	2	2 A
Altimeter	AL	2	3 B	Generators and batteries	GA	1	B 1
Arresting gear control	AG	1	D 10	Gyro compass	GC	2	3 B
Bomb fusing and SSD control	BF	1	G 1	Gyro gun sight and camera recorder	GS	2	4 A
Bomb jettison and drop tank jettison	BJ	1	G 1	Gun firing	GF	1	G 1
Bomb release and rocket battery	BR	1	G 1	Hood control	HC	1	D 5
B+ distribution	B+	1	B 1	Hydraulic pressure warning	HP	2	5 A
Cabin lighting	M	1	F 1	IFF/SSR (Mod 1372)	IF	1	H 1
Cabin pressurization and temperature control	CP	1	D 6	Parachute brake	TC	1	D 8
Drop tank empty warning	DE	2	2 A	L+ distribution	L+	1	B 1
Drop tank jettison	BJ	1	G 1	Navigation and anti-collision lamps	N	1	F 2
Ejector release	JG	1	G 1	Oil pressure gauge	OP	2	2 C
Emergency fuel pump	EF	1	C 6	TACAN	TK	1	H 1
Engine anti-icing	EA	1	C 4				

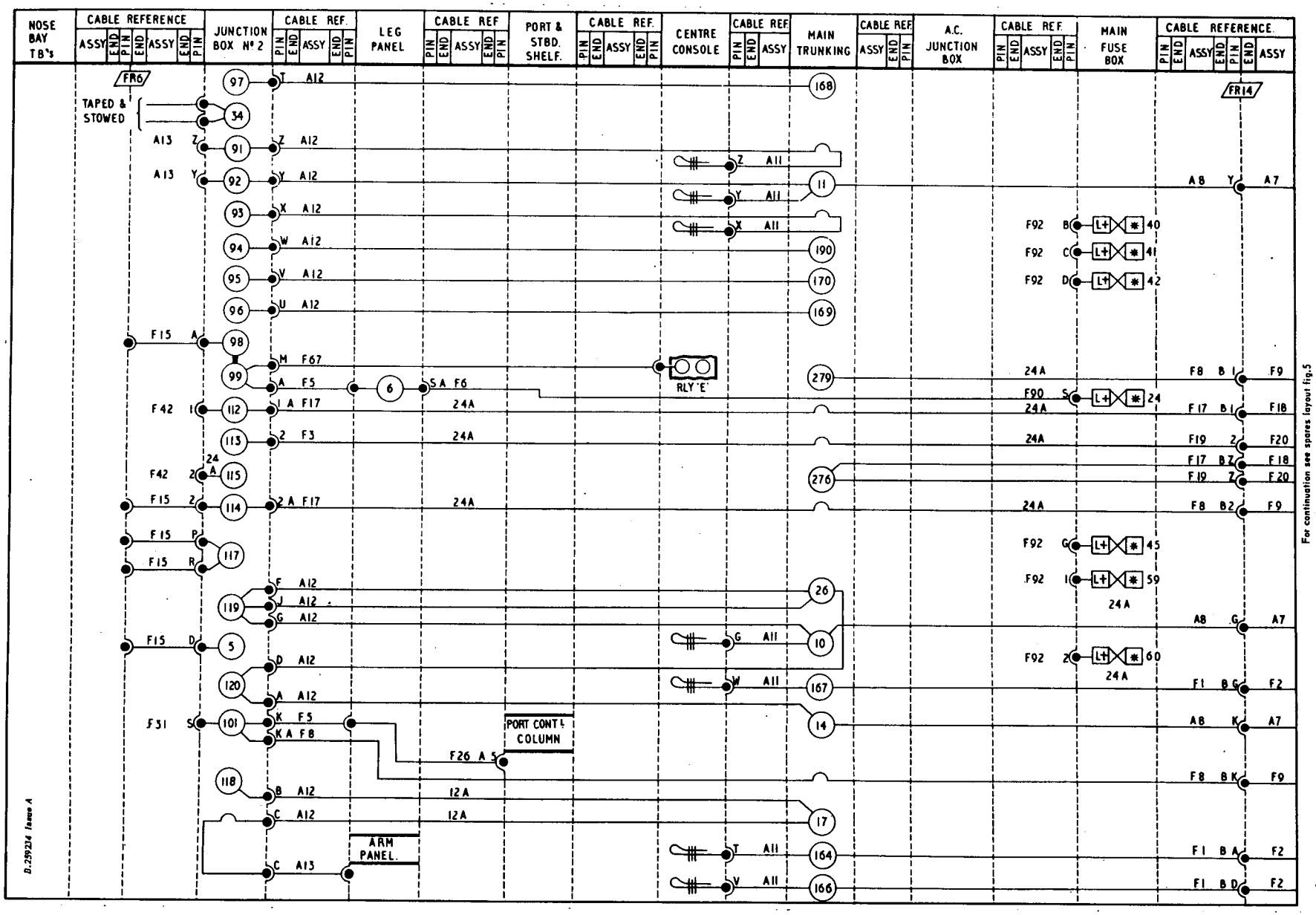


Fig. 4 Available spare wiring - sheet 3
(Mod 1467 added)

Table 4 (Continued)

Circuit	Code	Chapter	Group
Oxygen flow indicator	OX	2	5 A
Pressure head heater	P	2	3 A
Pressure refuelling	PR	1	C 3
Rocket battery	BR & RP	1	G 1
R.P. firing	RP	1	G 1
Rudder trim controls	R	1	D 1
Rudder trim indicators	RD	2	3 B
Service lamps	L	1	F 3
Spare wiring	*	1	A 1
Tachometer	RA	2	2 C
Tail plane control	T	1	D 3
Tail plane position indicator	TD	2	3 B
Tank pumps	BP	1	C 3
Tank pump failure warning	PF	1	C 3
Turn and slip indicator	TS	2	3 B
▶ UHF and VHF radio ◀	RT	1	H 1

Insulation resistance testing

38. As an interim measure, pending the introduction of a full insulation resistance test, the following procedure, which only covers the minimum requirements should be carried out. Reference should also be made to the aircraft servicing schedule.

(1) Remove all lamps.

(2) Disconnect the inverters.

(3) Disconnect all the main earth points.

(4) Disconnect cable assemblies GC.11, RR.1 and AH.1 from a.c. junction box No.1.

(5) Remove the plug from the fire extinguisher.

(6) Remove the supply plug from the fuel contents gauge amplifiers.

(7) Remove the voltmeter, if this has been fitted.

(8) Disconnect all the suppressors.

(9) Remove the engine plugs.

(10) Place all switches to the ON position.

(11) Connect a 250 volt insulation resistance tester to positive terminal and to an earth point of the aircraft.

Note ...

It is not necessary to disconnect the suppressors if an insulation resistance tester Type C (Stores Ref. 5G/2282) is in use.

Bonding check

39. It is not required to carry out bonding checks on those parts of the airframe, or airframe systems which are capable of movement, or of being moved over an electrically conductive bearing *(e.g. control columns, rudder bars, etc.)*, physical examination that these items are correctly bonded being sufficient. The following items should, however, be checked using a Safety Ohmmeter Ref. 5G/1006388 or other suitable Safety Ohmmeter:-

(1) Metal frames of radio and radar equipment.

(2) Aerial mounting brackets.

(3) Electrical control and distribution panels.

(4) Fuel pipelines.

(5) Hydraulic pipelines.

(6) Engine.

(7) Jet pipe.

With the battery master switch OFF and the external supply disconnected, check each item from an aircraft main earth point. The maximum permissible resistance is 4.5 ohms.

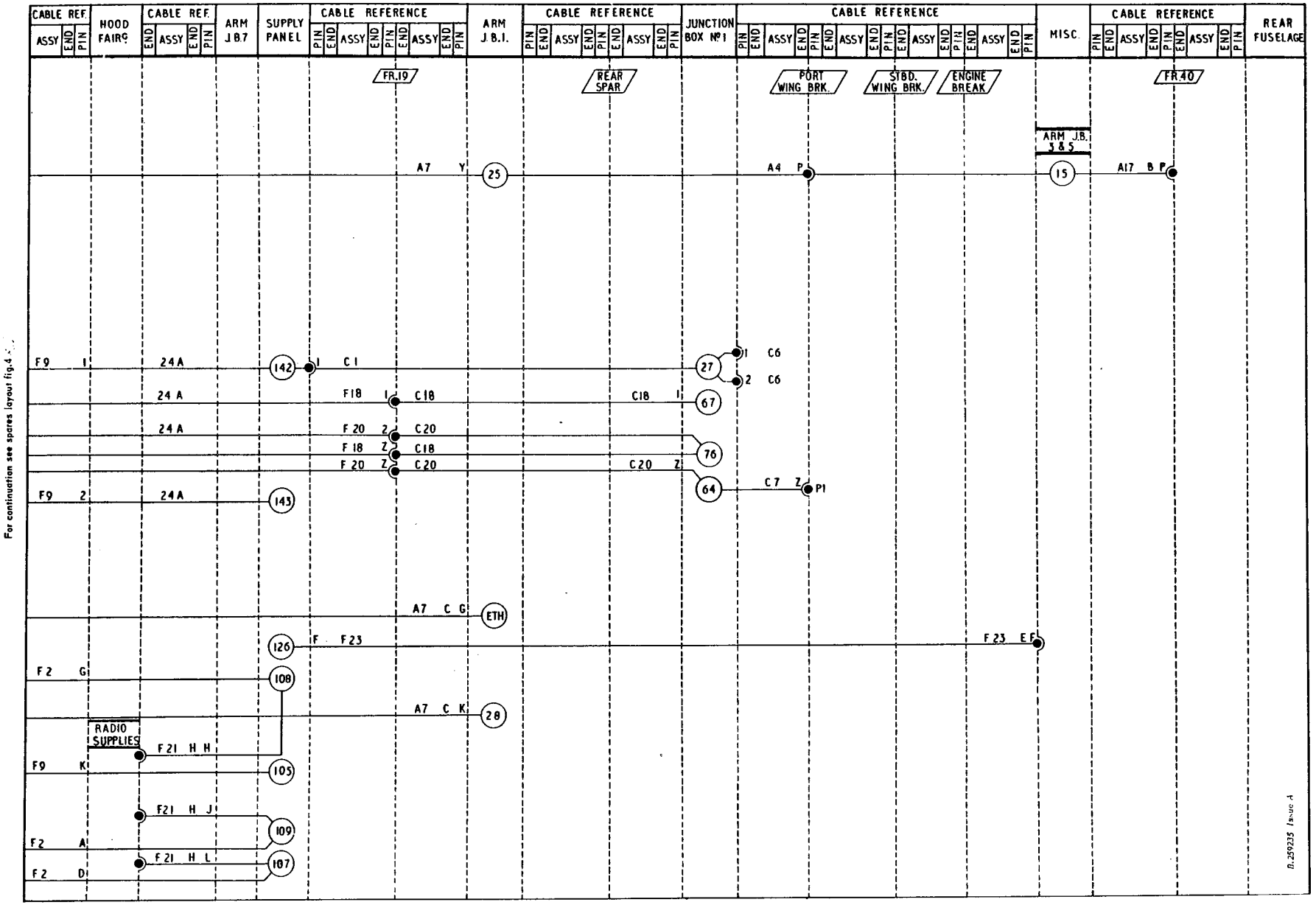


Fig.5 Available spare wiring — sheet 4

Main undercarriage electrical cables replacement

40. When replacing the electrical cable looms from the compression microswitches on each main undercarriage leg, as called for during Major Servicing, the following points must be observed.

(1) The run and strapping of the cables is to be in accordance with fig.15.

(2) Uninyvin 20 cable must *not* be used in this connection, because of its lack of flexibility. Unitersil 20 cable should be used.

(3) Hellerman Twin Grip Ring Tags *(Ref. 5X/7553)* should be fitted to the cable terminations at the microswitches when the cable looms are changed.

INTERPRETATION OF DIAGRAMS

General

41. The wiring of all the circuits in this aircraft is shown by means of theoretical and routeing diagrams. In the theoretical diagrams, the equipment is shown by symbols complete with internal wiring. Each symbol is annotated and designed to make the operation of the circuit readily understandable; brief explanatory notes are also given where necessary. As the diagrams are drawn for ease of reading, the symbols are not given in their correct physical relationship, but are positioned to give a straightforward presentation, the connections being arranged to assist in this direction. The fuse rating is given adjacent to each fuse and this information is followed by the loading of the circuit normally found at this point. Each section of the circuit is also referenced at suitable points with the circuit code. It must be noted that these circuit codes are for references only and will not be found on the cables in the aircraft, but are shown on every terminal connection through which the circuit may pass, by means of a label or wiring diagrams. It will assist when reading theoretical and routeing diagrams to refer to the cable assembly layout given in Group A 3 of this chapter and to note that all positive cables are given an even reference number until a current consuming device is encountered, after which the code becomes an odd number or the letters ETH to represent earth. In those circuits, where it is considered unnecessary to give a separate theoretical diagram, the theoretical symbol for the internal wiring of the units is given on the routeing diagram.

42. The routeing diagrams show the complete wiring for each individual circuit and the physical relationship between the electrical components. The diagrams are divided into a number of columns which bear the names of the junction box and equipment panels through which the wiring passes and also the circuit code, connection pin references, and cable type, together with all break points and terminations. A plug and socket connection is shown by a small semi-circle embracing a black dot, the semi-circle denotes the socket insert and the black dot the plug pin. Terminals in the junction boxes and on equipment panels are represented by small circles with their reference numbers enclosed. Fuses are numbered and, in most instances, are shown in the equipment panel columns. These numbers refer only to the fuses in the box or on the panel concerned, each unit having its own series of numbers, as shown on the diagrams.

43. Unless indicated otherwise, all the theoretical and routeing diagrams are drawn with the circuits in the condition found when the aircraft is at rest on the ground with its alighting gear down, the throttle closed, the engine stopped and electrical power off.

Method of reading a theoretical diagram

44. Reading theoretical diagrams is a straightforward matter if a start is made at the fuse or circuit breaker, given at the top of each circuit, and the diagram followed through to the earth point at the bottom. As an example, consider the port tank pump failure warning circuit given in Group C 3 of this chapter. From the 2.5 amp. fuse, the positive supply, referenced PF.2, is taken to the pressure switch, which is of the type that closes its contacts when the pressure falls. From the switch, the positive supply now referenced

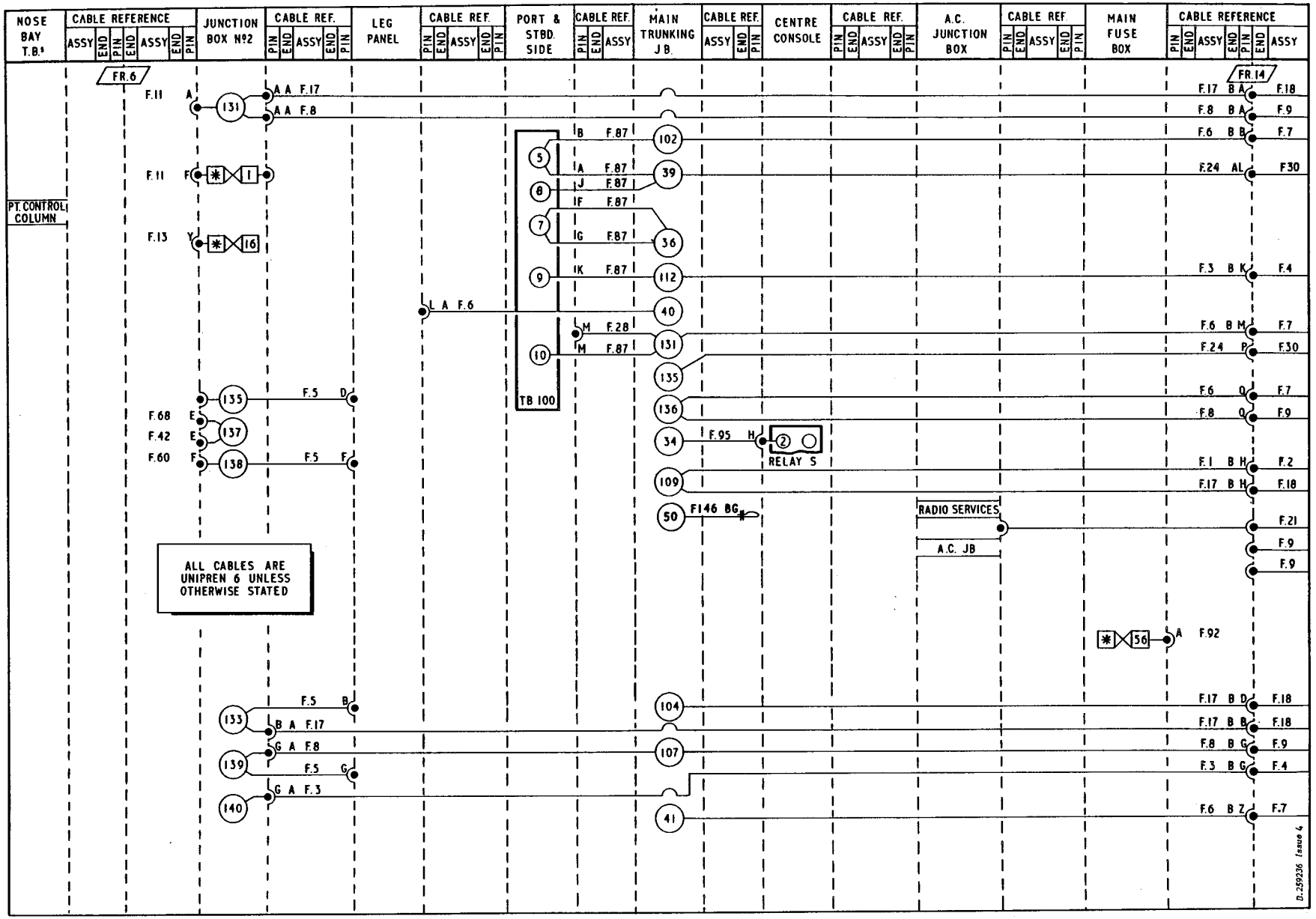


Fig.6 Available spare wiring — sheet 5

▶ **(Mod 1430 added)** ◀

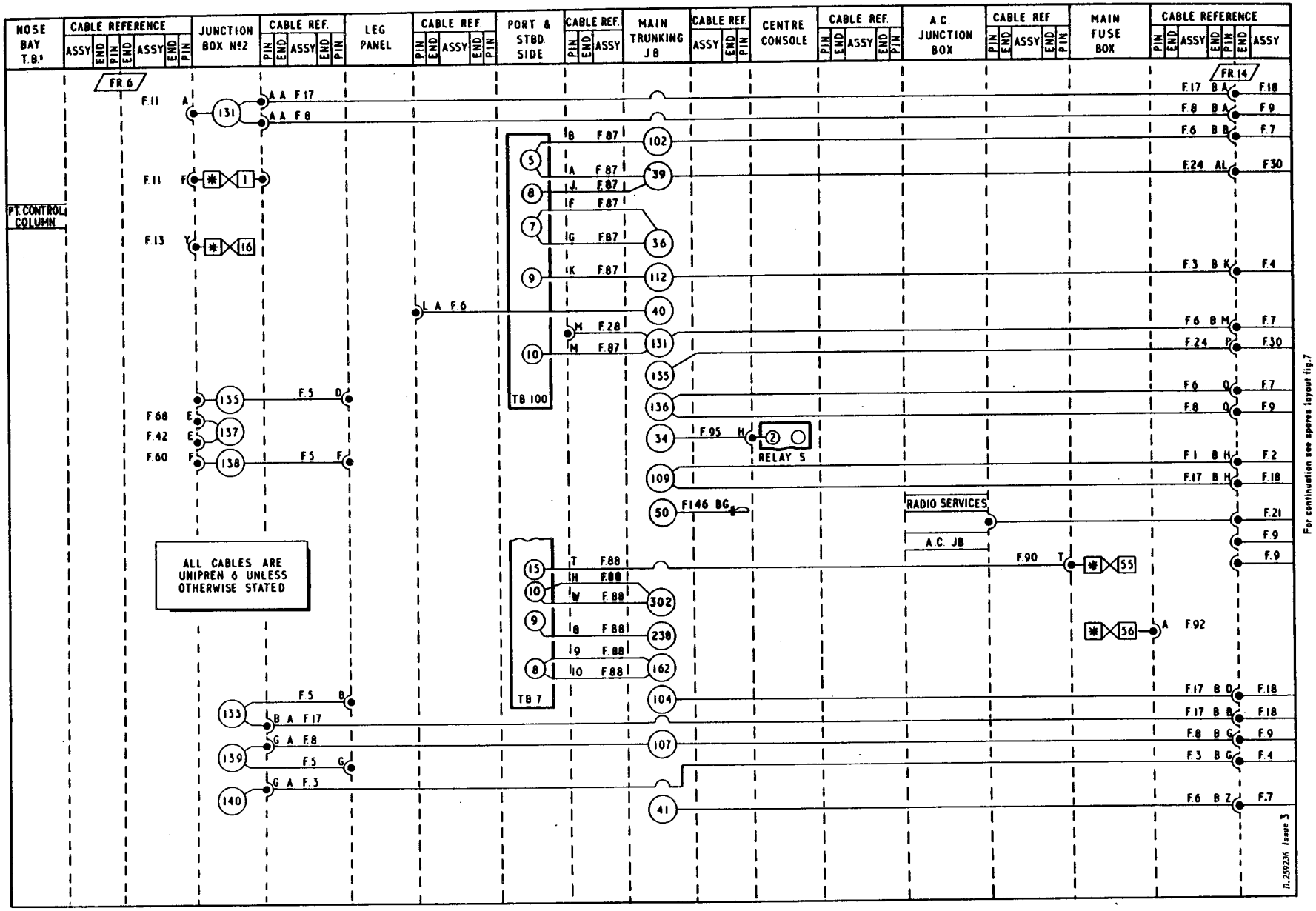


Fig.6A Available spare wiring – sheet 5 – pre-Mod 1430

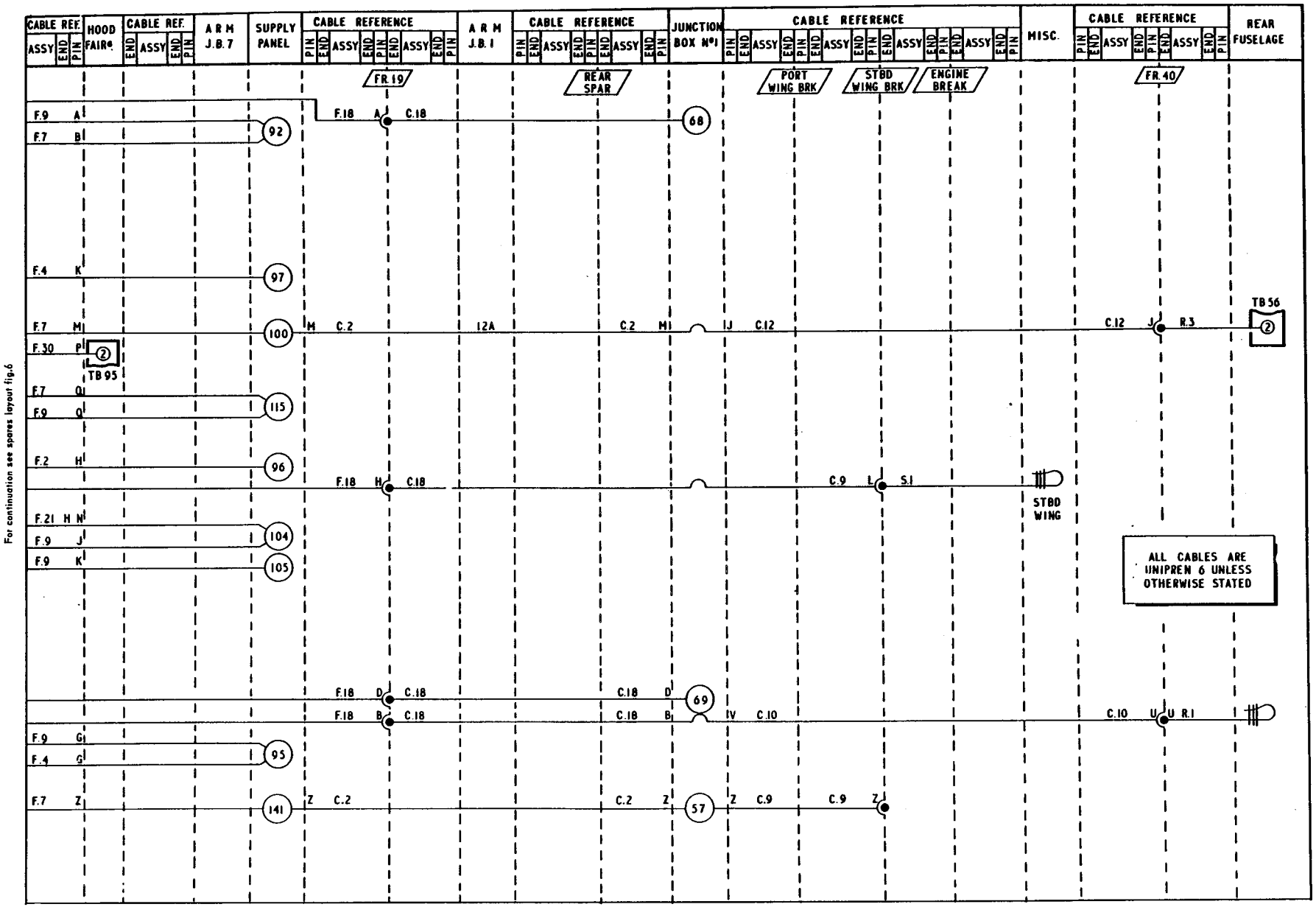


Fig.7 Available spare wiring — sheet 6

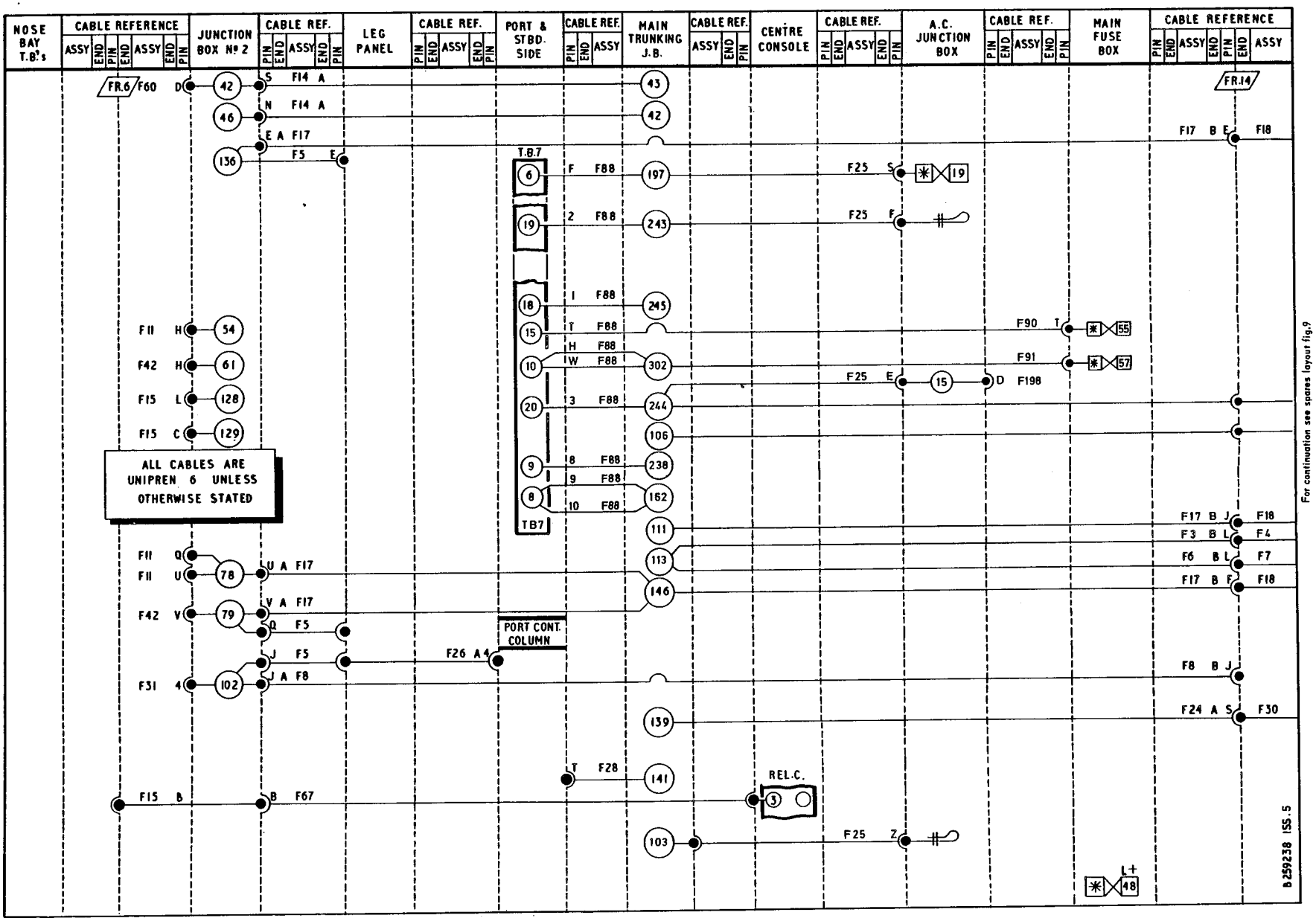
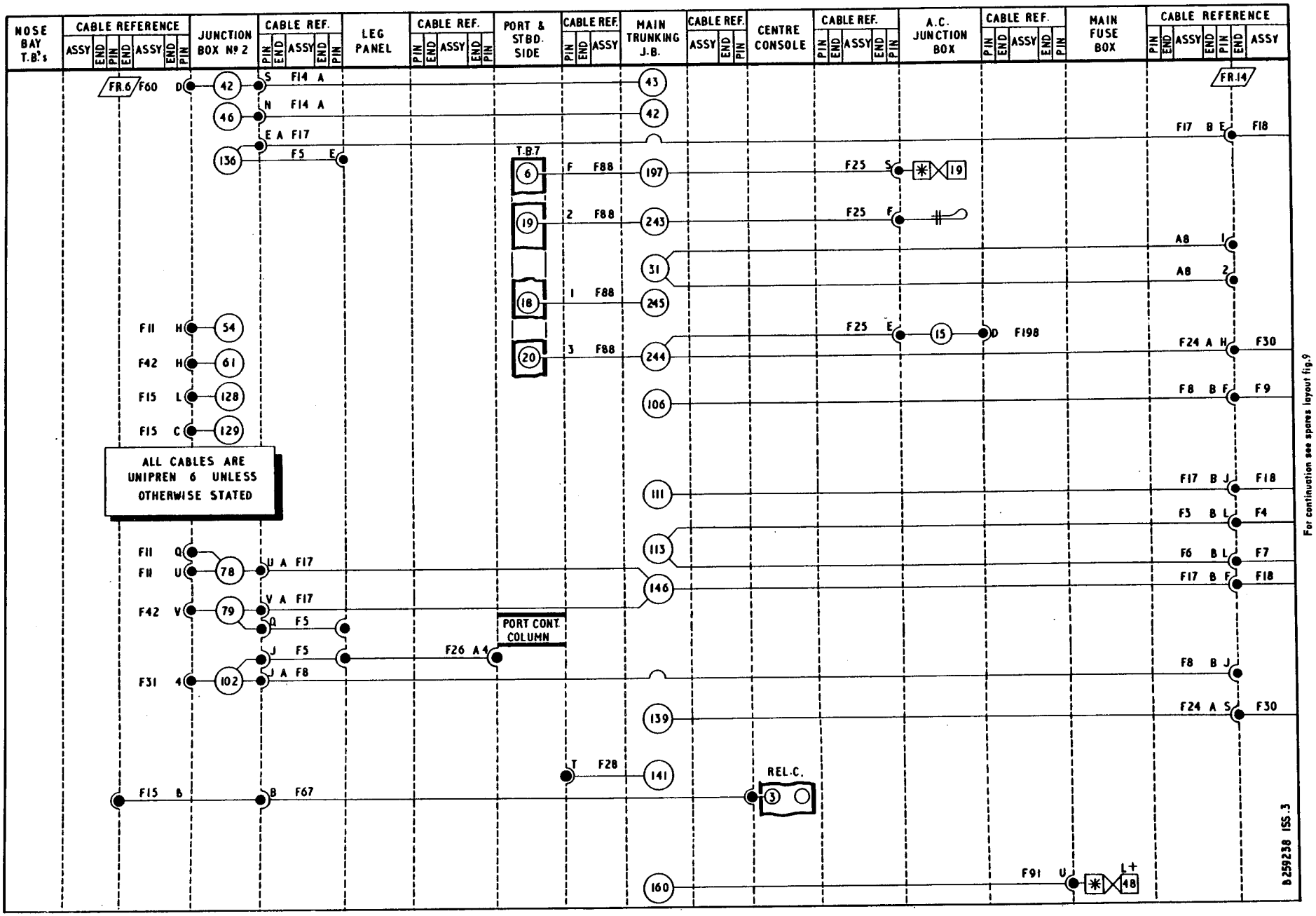
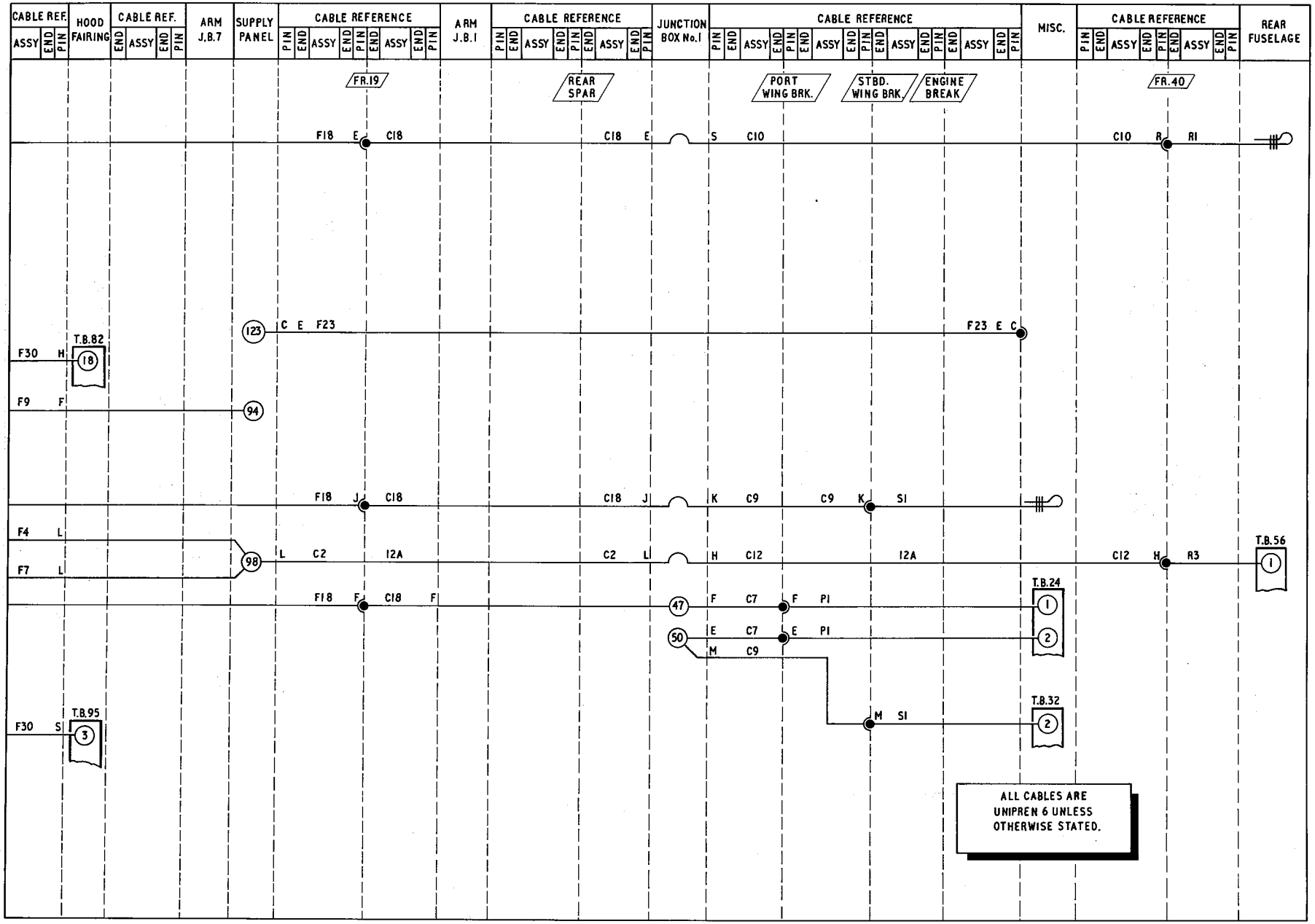


Fig.8 Available spare wiring — sheet 7

▶ (Mod 1430 added) ◀



▶ Fig.8A Available spare wiring — sheet 7 — pre-Mod 1430 ◀



T.P.(E)24514

Fig.9 Available spare wiring – sheet 8

◀ Mod.1378 added ▶

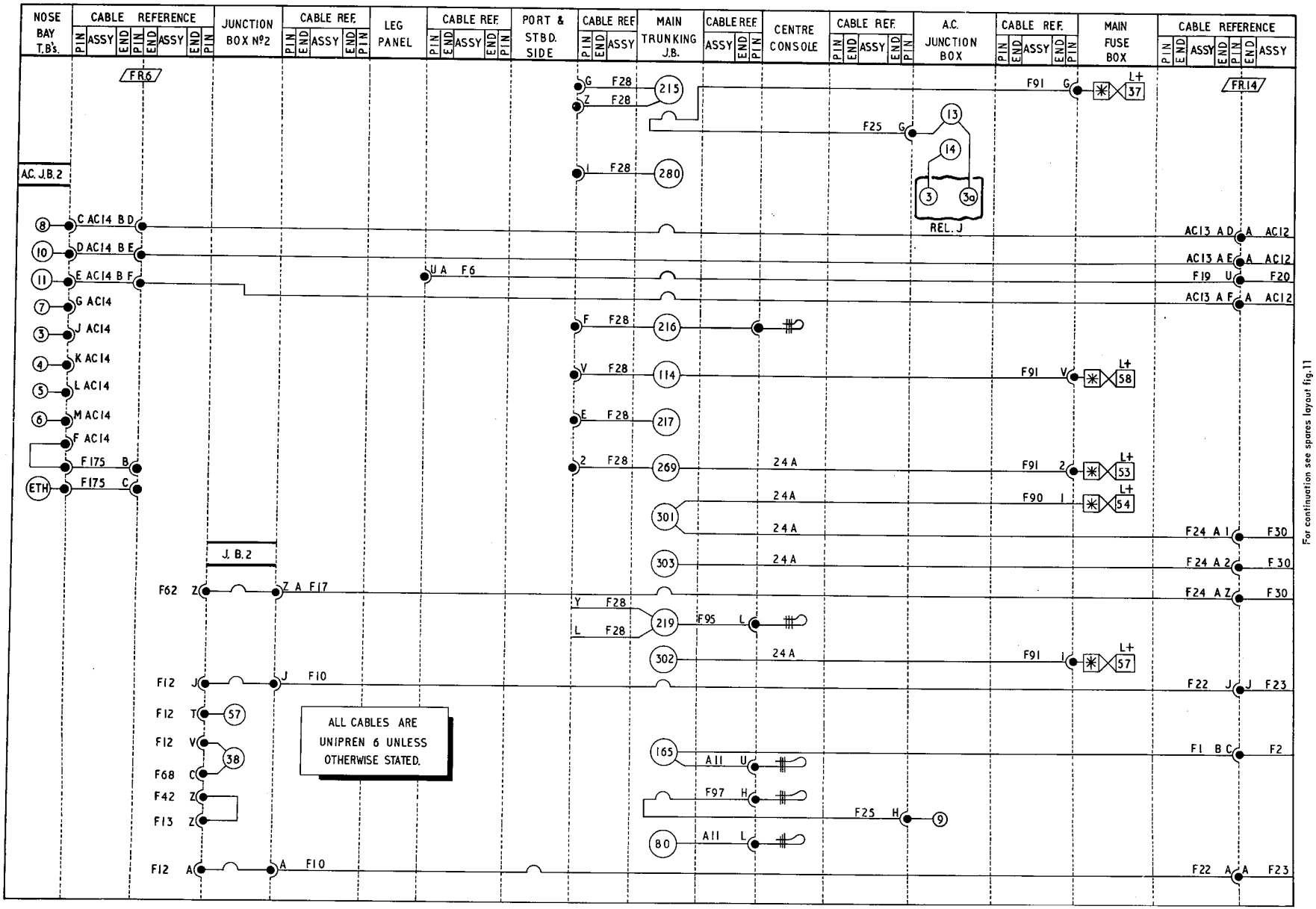


Fig-10. Available spare wiring - Sheet 9

RESTRICTED

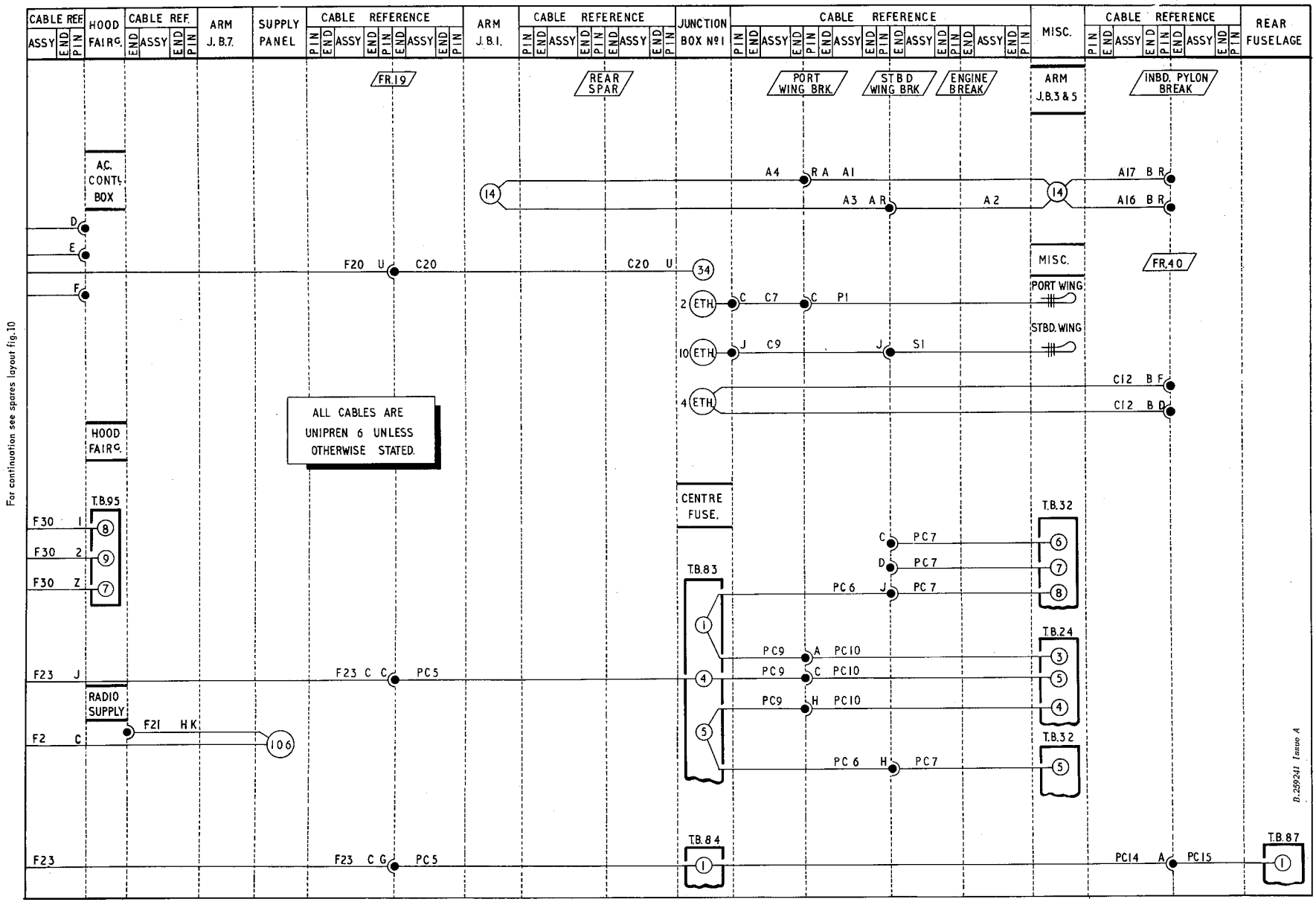


Fig.11 Available spare wiring - Sheet 10

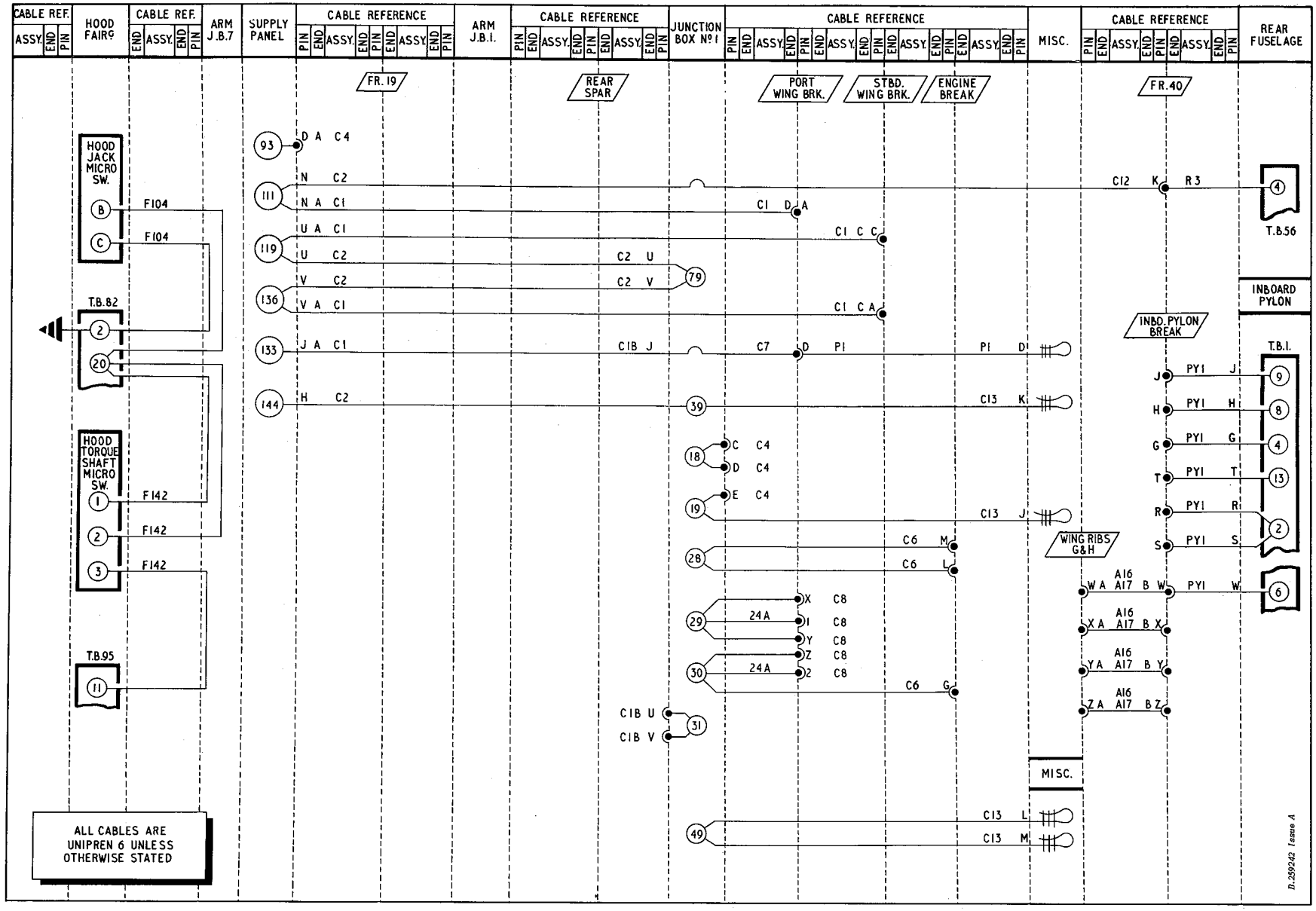


Fig.12 Available spare wiring - Sheet 11

RESTRICTED

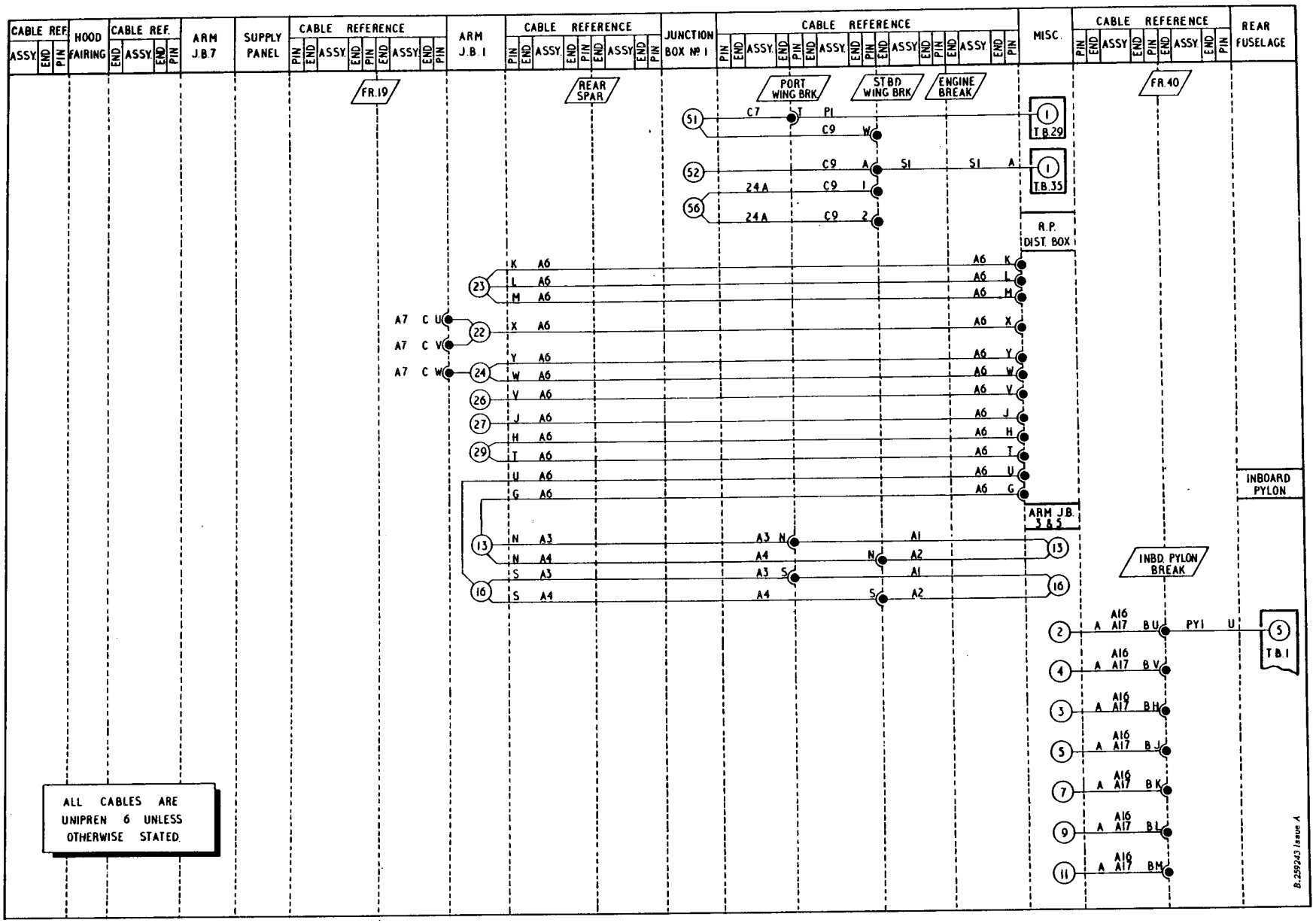


Fig.13 Available spare wiring — sheet 12

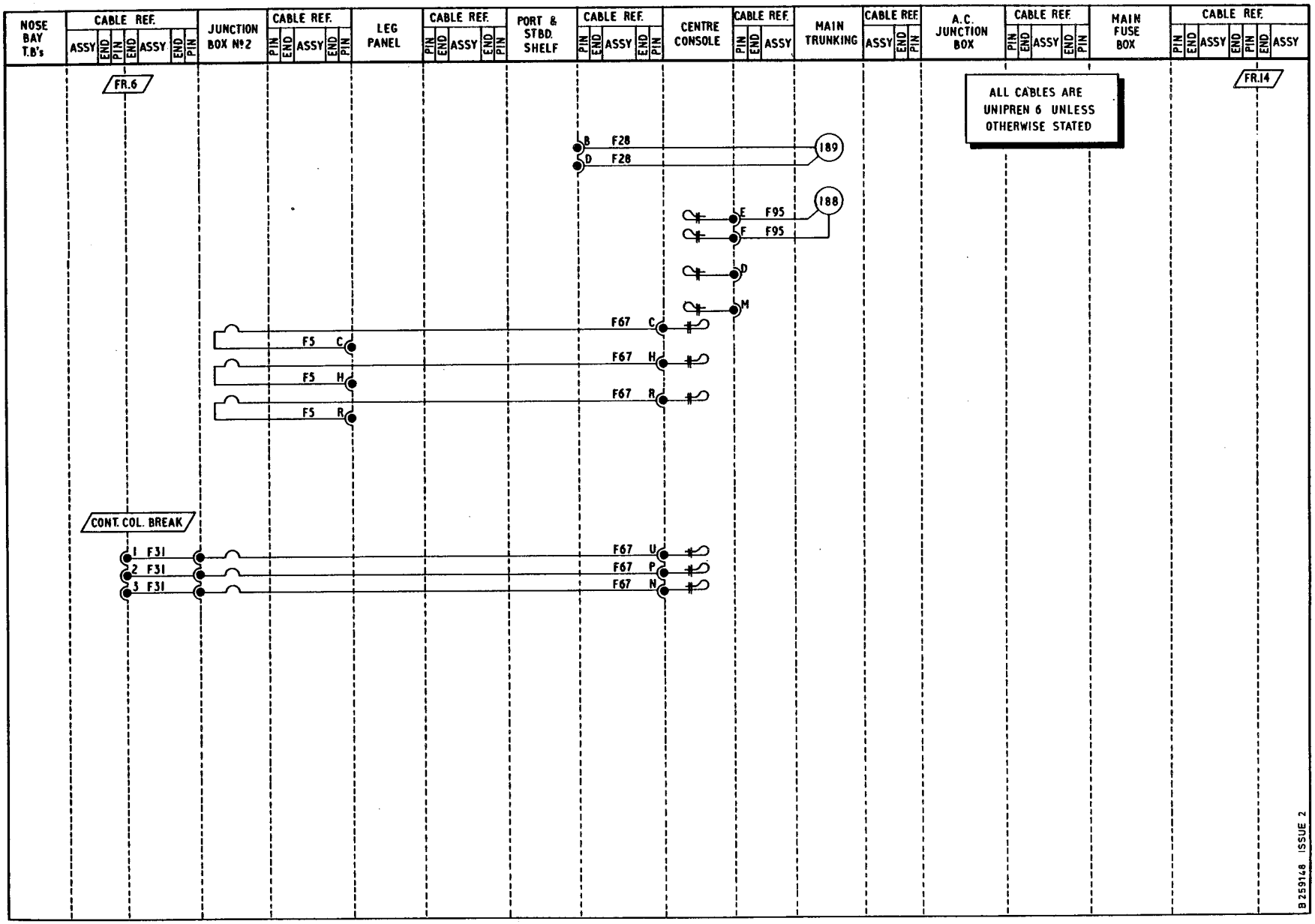
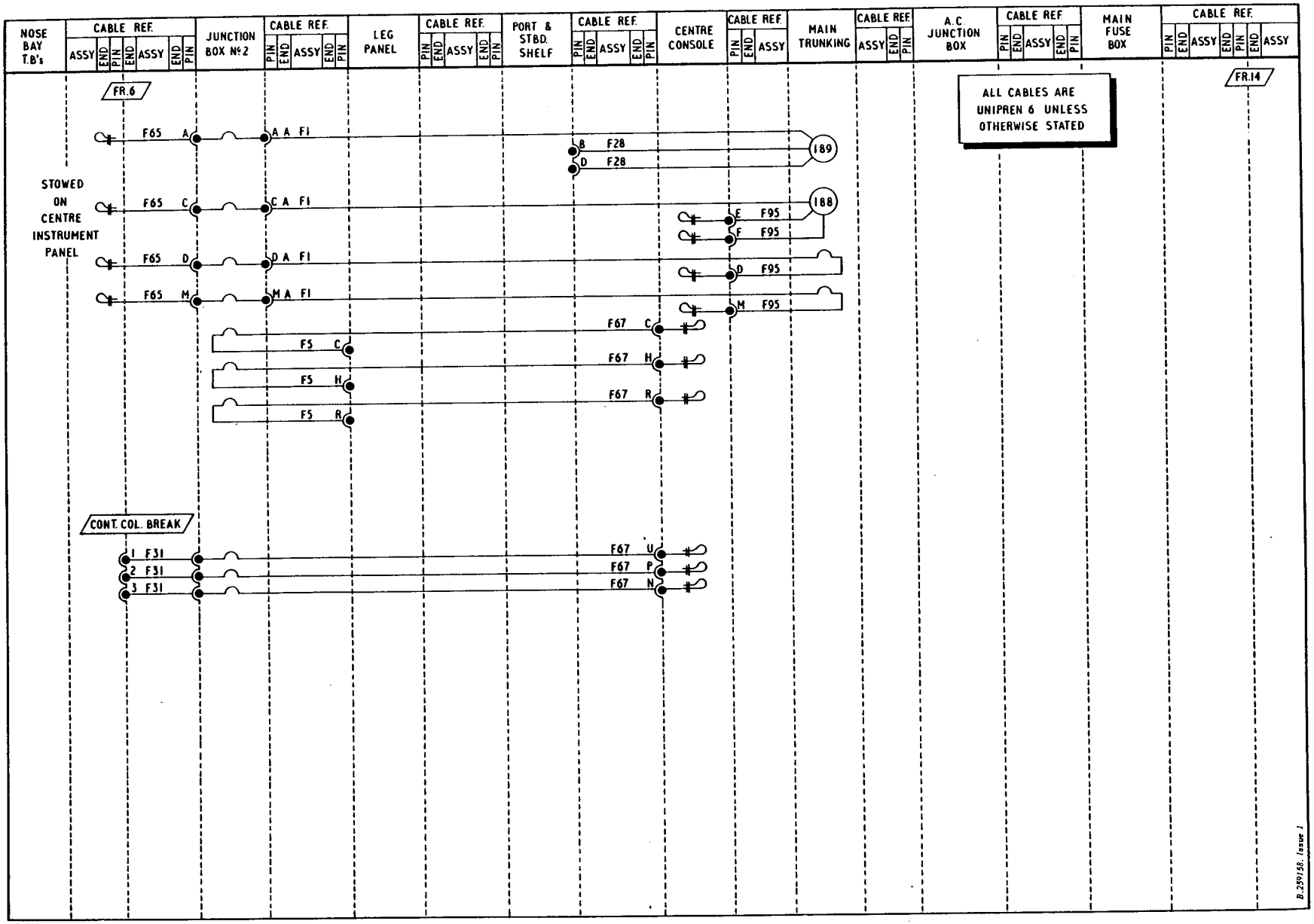


Fig.14 Available spare wiring — sheet 13

▶ (Mod 1430 added) ◀



▶ **Fig.14A Available spare wiring – sheet 13 – pre-Mod 1430** ◀

PF.6, due to the fact that it has passed through the switch, passes on to the pump warning lamp. The negative return from the lamp, which is referenced ETH, is connected to earth.

45. From the above example and a study of the diagram, it will be seen that, when the switch is closed as the pressure falls, the lamp will be supplied with current and will light to give warning of pump failure.

Method of reading a routeing chart

46. Routeing charts are divided into a number of columns as previously described, and all circuits commence from the fuse or circuit breaker shown in one of the fuse box, junction box, panel or termination columns. As an example of how to read a routeing chart, consider the port tank pump failure warning circuit in Group C.3 of this chapter. From fuse 5, on the supply panel, the positive supply is conducted by a length of cable to pin Z of plug C.4 attached to the panel. End A of cable assembly C.4 mates with this plug and a further length of cable, referenced PF.2, connects from pin Z of the socket on this cable assembly to the pressure switch located adjacent to frames 21 and 22 in the centre fuselage. From the other terminal of the pressure switch, another length of cable contained in cable assembly C.4 and referenced PF.6 is run forward to pin X of the plug and socket connection on the supply panel. From pin X of plug C.4 on the supply panel, a further length of cable connects to terminal 19 on the panel and from this terminal the supply is conducted, in cable assembly F.2, to the plug and socket break at frame 14. A cable connected to pin R of the socket at end B of cable assembly F.1, mates with cable assembly F.2 at frame 14 and cable assembly F.1 runs straight through the main trunking to junction box number 2 where it connects with pin R of plug F.1 attached to the junction box. The cable passes through the box without connecting with a terminal, as indicated by the arched line in the junction box column, and leaves the box, still referenced PF.6, via pin R of plug F.62 attached to the box. End A of cable assembly F.62 mates with this plug and runs to the centre instrument panel, where end B is connected to the positive terminal of the port tank warning lamp. The negative return from the lamp is connected to the centre instrument panel earth line and so to earth as shown on the earth routeing chart.

Cable abbreviations

47. The following table should be used in conjunction with the cable type and size references given on the routeing charts to define the type of cable employed in the various circuits of this aircraft.

Loading chart

48. Details of the aircraft's electrical loading, together with the generator and battery characteristic curves and graphs showing the power used during a typical flight are given in Group A.4 of this chapter.

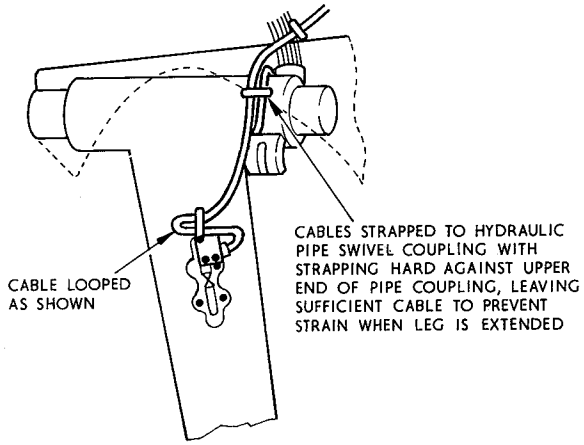
Junction box and panel wiring diagrams

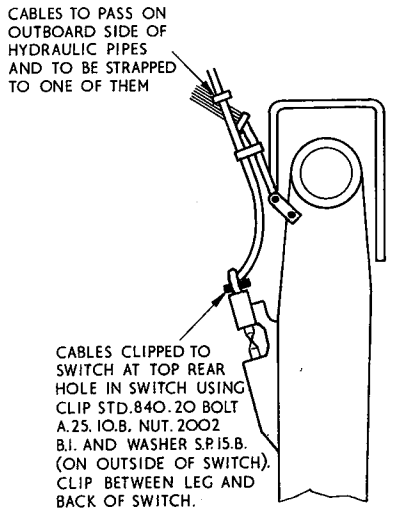
49. To facilitate servicing, each junction box and equipment panel of this aircraft contains a diagram of its electrical wiring. These diagrams give the cable size, terminal numbers and plug references, together with the fuse numbers, ratings and the services that they serve. A record of the modification state of the box or panel is also included on the diagram.

TABLE 5

Cable abbreviations

Abbreviation	Definition
U/P	Unipren
D/P SHEATH	Duprensheath
T/P SHEATH	Tripensheath
Q/P SHEATH	Quinprensheath
U/PM	Uniprenmet
U/NYP	Uninypren
U/FIRE	Unifire
D/CS	Ducralsil
D/CV	Ducralvin
MIN.2C etc.	Miniature cable 2C etc.





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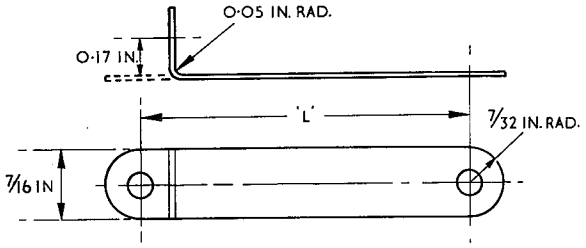
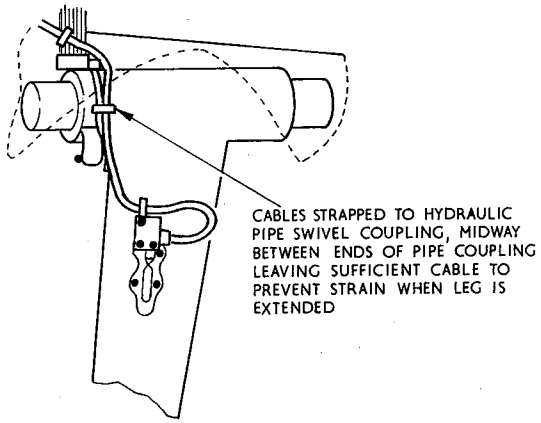
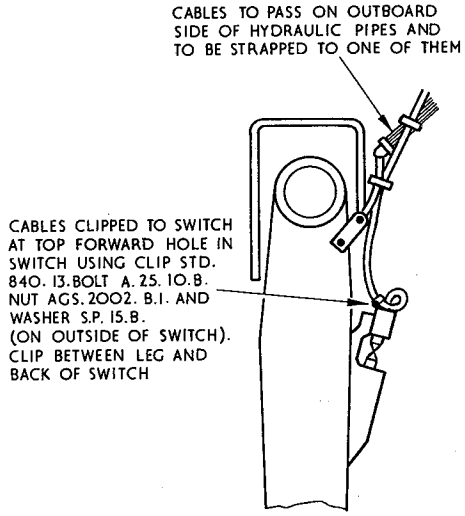


DETAIL OF STD. 840 CLIP
MAKE FROM 22 G. L.A.

STD. 840.13 'L'=1·31N.
STD. 840.20 'L' 2·0 IN.
HOLES MORSE No.10

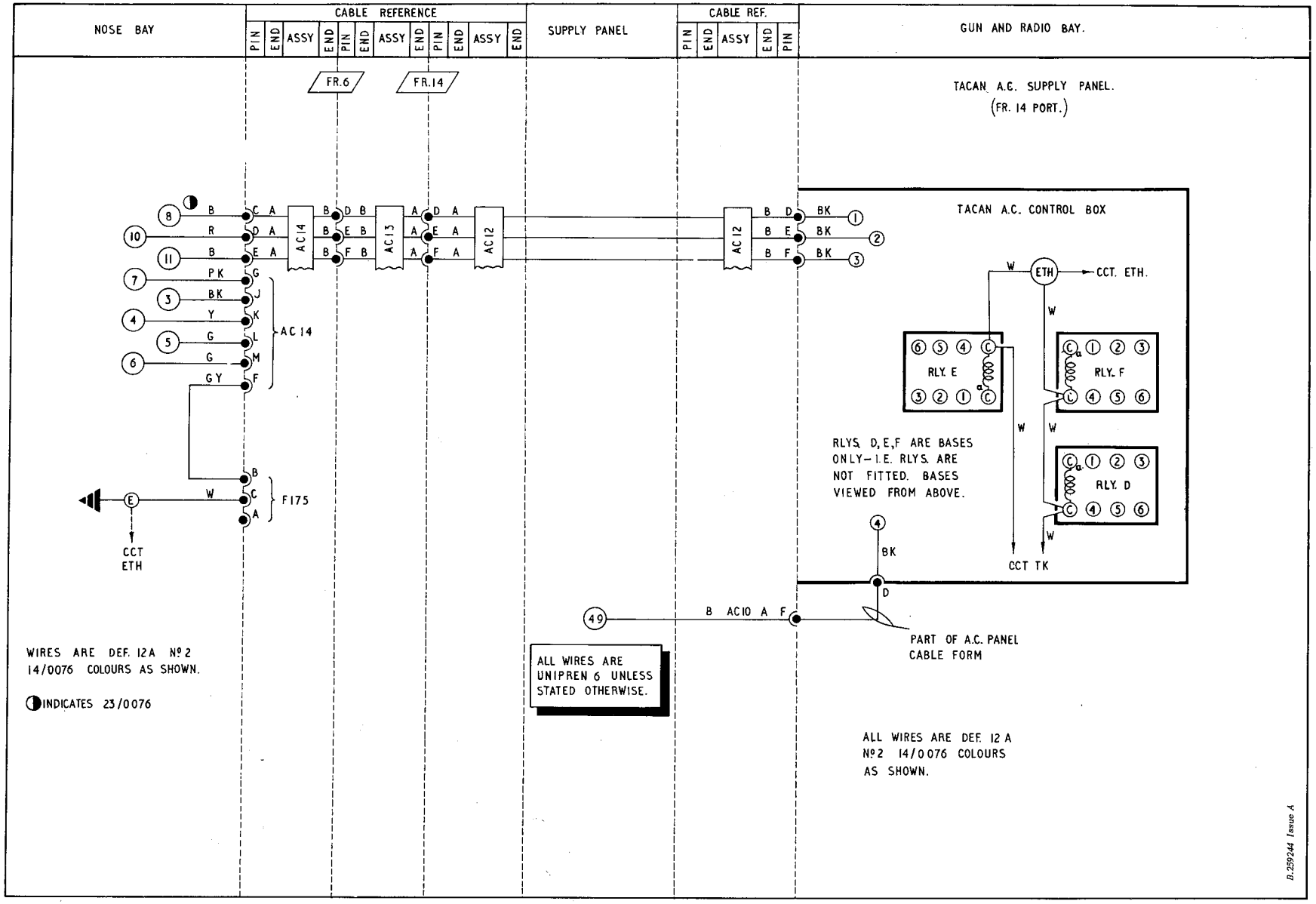




STARBOARD LEG

CABLES STRAPPED WHERE SHOWN WITH HELLERMAN STRAPS AND STUDS, HV.3341 (1/2 IN. WIDE) AND HV.3342 ON POST MOD. 178 OR MOD. 197 AIRCRAFT.
ON PRE MOD. AIRCRAFT CABLES CLIPPED TO SWITCH AS SHOWN BUT STRAPPED TO FLEXIBLE HYDRAULIC PIPES AS BEFORE

Fig. 15 Clipping of cables from undercarriage compression switch



T.P.(E) 8350

Fig.16 Available spare wiring - Tacan

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