

SECTION 6

RADIO INSTALLATION

LIST OF CHAPTERS

Note—A detailed list of contents appears at the beginning of each chapter

- 1 Wireless installation
- 2 Radar installation

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CHAPTER 1 — RADIO INSTALLATION

LIST OF CONTENTS

	Para.		Para.
Introduction ...	1	H. F. INSTALLATION	
DESCRIPTION ...		Introduction ...	26
Power Supplies ...	3	Transmitter receiver Type M15 ...	28
INSTRUMENT LANDING SYSTEM ...	4	Radio set control unit Type M53 ...	30
Localiser receiver, Type R.1964 ...	7	Pre-amplifier Type UA 6002 ...	32
Glidepath receiver, Type R.1965 ...	8	Tuner RF Type 490T1 ...	33
Marker receiver ...	9	TUBE and OPERATE indicator lamps ...	34
Control unit, Type 705 ...	10	H. F. master switch ...	35
Junction box, Type 157 ...	11	H. F. junction box ...	36
Voltage regulator, Type 60 ...	12	Aerial system ...	37
Junction box, Type 164 ...	13	Audio switching ...	38
Pilot's indicator, Type 7 ...	14	Power supplies ...	39
Marker warning lamp ...	15		
Marker aerial, Type 237 ...	16		
Localiser and glidepath aerals, Type 238 and 239 ...	17	RADIO ALTIMETER Mk. 7B	
RADIO COMPASS		Introduction ...	40
Introduction ...	18	Transmitter/receiver, Type 16098 ...	41
Amplifier, Type A. 8281 ...	19	Amplifier, (5841-99-954-2618) ...	42
Amplifier, Type A. 8282 ...	20	Junction box, Type 16107 ...	43
Control unit, Type 8283 ...	21	Control unit, Type 16095 ...	44
Indicators ...	22	Indicator, Type 16094 and indicator lamps ...	45
Loop aerial, Type 8280 ...	23	Aerials and delay unit ...	46
Q. E. corrector unit ...	24	Access to equipment in rear fuselage camera access hatch ...	47
Sense aerial ...	25	U/V.H.F. INSTALLATION	
		Introduction ...	48
		Transmitter/receiver, PTR 175 ...	49

RESTRICTED

	Para.		Para.
Control units, Type C1607/4/7 ...	50	I/C Panel ...	64
Muting Bias unit ...	51	Sockets ...	65
Interconnecting box ...	52	Selector switches ...	66
Aerial system ...	53	Aural warnings ...	67
V. H. F. Aerial switching ...	54	Call push switches ...	68
U/V. H. F. switching and R/T section...	55		
Press to transmit switches ...	56	SERVICING ...	69
Tone transmission switch ...	57	Visual Check ...	70
STANDBY V. H. F. INSTALLATION		TESTING	
Transmitter/receiver, Type M6 ...	58	Instrument Landing System ...	71
Power Supply... ...	59	Radio Compass ...	72
Aerial Type 11789 ...	60	H. F. ...	73
Test Socket ...	61	Radio Altimeter Mk. 7B ...	74
		U/V. H. F. Installation ...	75
INTERCOMM. SYSTEM		U. H. F. Standby Installation ...	76
Introduction ...	62	Intercomm. system ...	77
Amplifier, Type A. 1961 ...	63	Removal ...	78

LIST OF TABLES

LIST OF EQUIPMENT

Table

1

LIST OF ILLUSTRATIONS

	Fig.		Fig.
◀ Radio equipment location ▶	1A	Intercommunication (routeing)	8
◀ Radio equipment location ▶	1B	Tel/mic. switching (theoretical)	9
A. R. I. 18011 (routeing)	2	A. R. I. 18011 aerial removal	10
A. R. I. 5877 (routeing)	3	A. R. I. 5877 aerial removal	11
◀ A. R. I. 23090/9 (routeing) ▶	4	A. R. I. 23172 aerial removal	12
A. R. I. 23172 (routeing)	5	◀ A. R. I. 23090/9 aerial removal & rigging ▶	13
A. R. I. 23143/1 (routeing) (pre mod 4378)	6	A. R. I. 23143/1 U.H.F. aerial removal	14
A. R. I. 23143/1 (routeing) (post mod 4378)	6A	A. R. I. 23143/1 U.H.F. aerial removal	15
A. R. I. 23057 (routeing)	7	A. R. I. 23057 U.H.F. aerial removal	16

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KEY TO FIG. 1A

- | | |
|---|--|
| 1 RADIO COMPASS AMPLIFIER (R.F.) | 24 RADIO ALTIMETER Mk.7B AERIAL |
| TYPE A8281 | 25 I. L. S. LOCALISER AERIAL TYPE 239 |
| 2 RADIO COMPASS MASTER INDICATOR | 26 U. H. F. TERMINAL BLOCK No. 5 |
| TYPE 8720 | 27 U. H. F. TERMINAL BLOCK No. 4 |
| 3 RADIO COMPASS CONTROL UNIT TYPE 8283 | 28 U. H. F. TERMINAL BLOCK No. 3 |
| 3A ADF/TACAN RELAY UNIT | 29 U. H. F. RELAY No. 2 |
| ◀ 4 H. F. REMOTE CONTROL UNIT TYPE M53 ▶ | 30 U. H. F. RELAY No. 1 |
| 5 I/C AMPLIFIER TYPE A1961 | 31 U. H. F. TERMINAL BLOCK No. 6 |
| ◀ 6 H. F. AERIAL TUNER TYPE 490T1 ▶ | 32 SWITCH H. F. MAGNETIC TYPE 31A |
| 7 U. H. F. AND H. F. PANELS | 33 U. H. F. AERIAL XW/WTP. 8722 |
| 8 HF AERIAL MAST, PT. No. Z5017 & SPARK GAP | 34 TERMINAL BLOCK U. H. F. |
| ◀ 9 HF TRANSMITTER RECEIVER TYPE M15 ▶ | 35 U. H. F. INTERCOM. BOX |
| 10 I. L. S. GLIDEPATH AERIAL TYPE 238 | 36 T/R PTR 175 |
| 11 RADIO COMPASS Q. E. CORRECTOR UNIT | 37 I/C TERMINAL BLOCKS |
| 12 RADIO COMPASS LOOP AERIAL TYPE 8280 | 38 I. L. S. JUNCTION BOX TYPE 164 |
| 13 V. H. F. AERIAL TYPE 1014 | 39 I. L. S. VOLTAGE REGULATOR TYPE 60 |
| 14 U. H. F. RECEIVER | 40 U. H. F. STANDBY TRANSMITTER/RECEIVER |
| 15 U. H. F. AERIAL SWITCH UNIT TYPE 1741 | 41 RADIO COMPASS AMPLIFIER (IF) TYPE A. 8282 |
| 16 RADIO COMPASS SENSE AERIAL | 42 I. L. S. GLIDEPATH RECEIVER TYPE R. 1964 |
| 17 U. H. F. STANDBY AERIAL TYPE 11789 | 43 I. L. S. JUNCTION BOX TYPE 157 |
| 18 U. H. F. AERIAL XC/WTP. 8722 | 44 I. L. S. LOCALISER RECEIVER TYPE R. 1964 |
| 19 EXTERNAL I/C SOCKET | ◀ 45 H. F. JUNCTION BOX ▶ |
| 20 I. L. S. MARKER AERIAL | ◀ 46 I/C PANEL ▶ |
| 21 RADIO ALTIMETER Mk. 7B AERIAL | 47 TERMINAL BLOCKS I/C |
| 22 RADIO ALTIMETER Mk. 7B JUNCTION BOX | 48 U. H. F. STANDBY TEST SOCKET |
| TYPE 16107 | 49 U. H. F. /V. H. F. CONTROL, TYPE C1607/7 |
| 23 RADIO ALTIMETER Mk. 7B AMPLIFIER AND | 50 RADIO ALTIMETER Mk. 7B TRANSMITTER/ |
| JUNCTION BOX TYPE 16507 | RECEIVER |
| | 51 RADIO ALTIMETER Mk. 7B DELAY UNIT |

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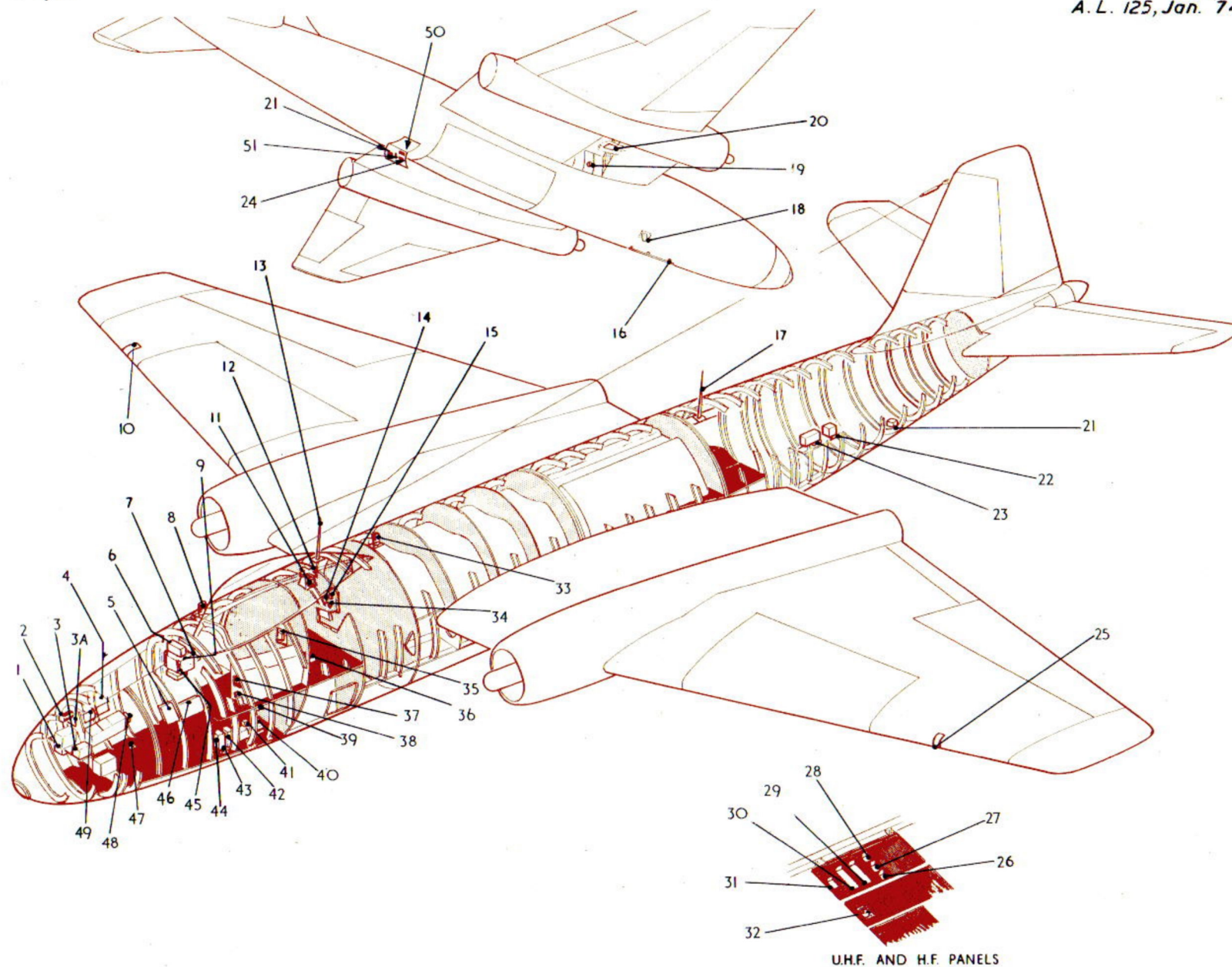


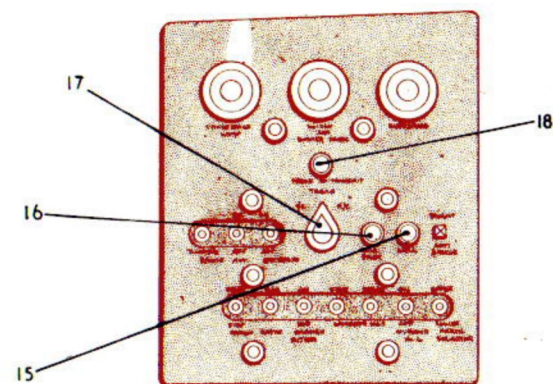
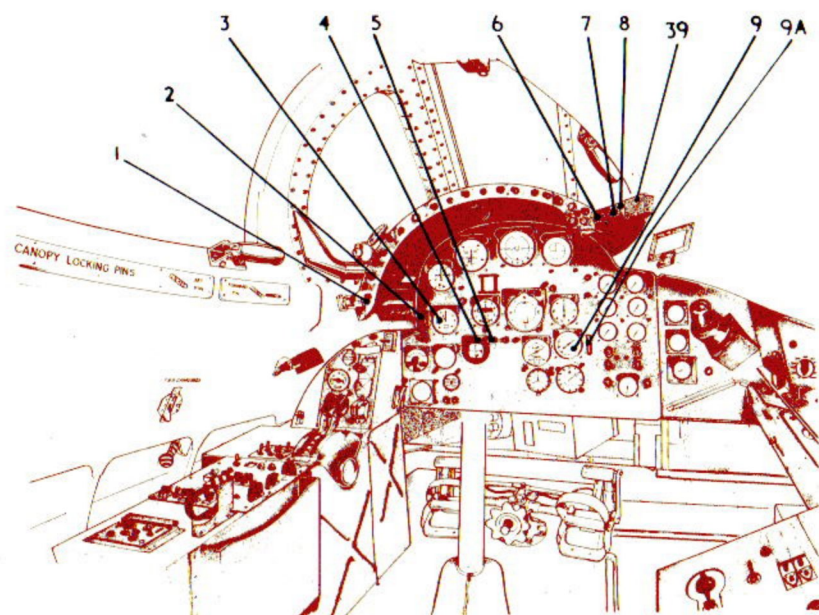
Fig. 1A Radio equipment, location

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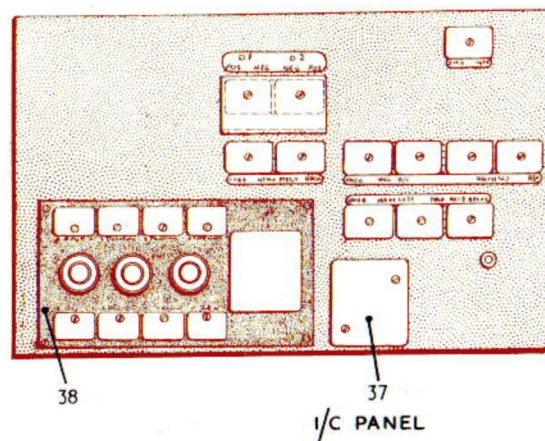
KEY TO FIG. 1B

- | | |
|---|---|
| 1 I/C CALL LAMP | 20 I. L. S. VOLUME CONTROL |
| 2 RADIO ALTIMETER Mk. 7B INDICATOR LIGHTS | 21 SELECTOR SWITCH RH. MIX. RC. |
| 3 RADIO ALTIMETER Mk. 7B INDICATOR TYPE 16094 | 22 CALL NAV. PUSH SWITCH |
| 4 I. L. S. INDICATOR TYPE 7 | 23 V. H. F. VOLUME CONTROL |
| 5 I. L. S. MARKER WARNING LAMP | 24 I/C SELECTOR SWITCH, NORMAL/ EMERGENCY |
| 6 U. H. F. STANDBY SWITCH 1 | 25 I. L. S. MASTER SWITCH |
| 7 U. H. F. STANDBY SWITCH 2 | 26 I. L. S. CONTROL UNIT TYPE 705 |
| 8 U. H. F. STANDBY SWITCH PANEL | 27 PRESS TO TRANSMIT, PUSH SWITCH |
| 9 TACAN INDICATOR TYPE 9547 | 28 U. H. F. CONTROL UNIT |
| 9A ADF/TACAN CHANGEOVER SWITCH | 29 U. H. F. /V. H. F. PRESS TO MUTE |
| 10 RADIO ALTIMETER Mk. 7B CONTROL UNIT TYPE 16095 | 30 H. F. MASTER SWITCH ON/OFF |
| | 31 |
| | 32 RADIO ALTIMETER Mk. 5 MASTER SWITCH |
| | 33 U. H. F. AERIAL SELECTOR SWITCH |
| | 34 U. H. F. TONE SWITCH |
| | 35 CHANGEOVER SWITCH H. F. UHF/VHF. UHF STANDBY |
| 15 I/C CALL LAMP | 36 U/V. H. F. CONTROL UNIT |
| 16 CALL PILOT PUSH SWITCH | 37 ATTENUATOR BOX ASSEMBLY |
| 17 SELECTOR SWITCH | 38 JUNCTION BOX TYPE 154 |
| 18 PRESS TO TRANSMIT PUSH SWITCH | 39 ILLUMINATED FREQUENCY CARD |
| 19 I/C CONTROL SWITCH, ON/OFF | |

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NAVIGATORS SWITCH AND DIMMER PANEL



I/C PANEL

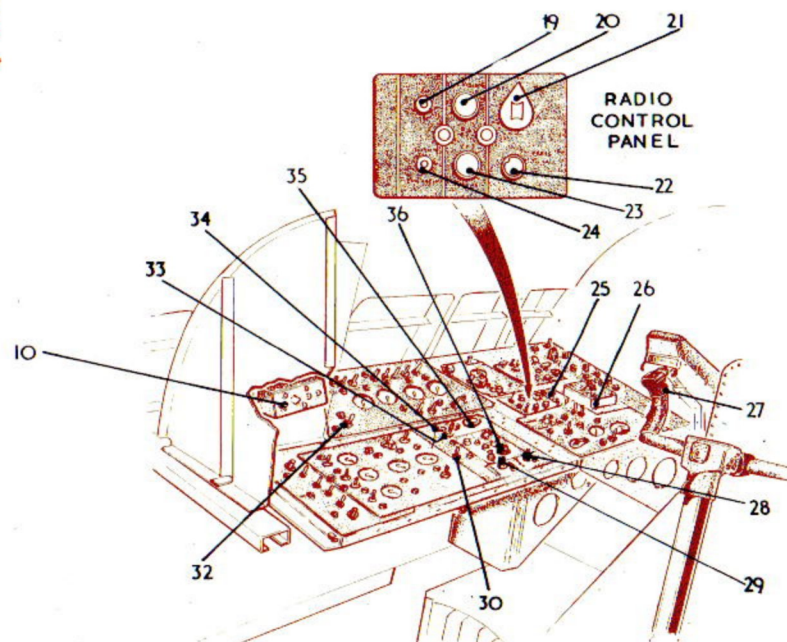


Fig. 1B Radio equipment, location

◀ (ITEMS 11, 12, 13 & 14 DELETED) ▶

INTRODUCTION

1. This chapter describes and illustrates the wireless installation of the aircraft. The location of wireless equipment is shown in figs. 1A and 1B.

2. The installations fitted to the aircraft comprise the following:-

A.R.I. 18011 - Instrument landing system.

A.R.I. 5877 - Radio compass.

◀ A.R.I. 23090/9 H.F. installation ▶

A.R.I. 23172 - Radio altimeter Mk. 7B

A.R.I. 23143/1 - U/V.H.F. installations

A.R.I. 23057 - U.H.F. Standby installation.

DESCRIPTION

Power Supplies

3. The wireless equipment is operated by direct current: details of the supply are contained in Sect. 5, Chap. 1, Group P. In addition a 115 volt, 3 phase, 400 Hz a. c. supply is required to operate the indicators in the radio compass installation; details of this supply are contained in Sect. 5, Chap. 1, Group D.

INSTRUMENT LANDING SYSTEM

4. The instrument landing system provides a radio guide along a prescribed approach path to a runway and enables the aircraft to descend to a low altitude without sight of the ground. Thus, in conditions of bad visibility, a successful approach can be made to a point at which sight of the ground or landing lights

will permit a landing to be made.

5. Three receivers are used in the airborne equipment. A localiser receiver provides indication of lateral deviation from the approach path: it shows the aircraft's position in the horizontal plane, relative to the line of the runway. A glidepath receiver provides indication of deviation from the vertical path to the runway: it shows the aircraft's position, relative to the correct angle of approach to the runway. A marker beacon receiver indicates aurally or, on a flashing lamp the approximate distance to the touchdown point at three fixed positions along the approach. Detailed information on the I. L. S. equipment is contained in A.P. 2534R.

6. The I. L. S. installation may be used in conjunction with the automatic pilot and zero reader installations. Signals produced by the localiser and glidepath receivers are fed to the autopilot coupling unit and zero reader flight computer respectively.

Localiser receiver, Type R. 1964

7. The receiver, Type R. 1964, is mounted underneath the pilot's floor: it is a double superhet operating at any one of twelve spot frequencies from 108 MHz to 118 MHz. A d. c. output, the level of which is dependent upon the aircraft's lateral deviation from the line of approach, operates the vertical pointer of the indicator Type 7. The 1000 Hz tone which appears in the output stages of the localiser receiver, is separated from the localiser tones and amplified in an audio circuit for presentation over the aircraft intercomm. system.

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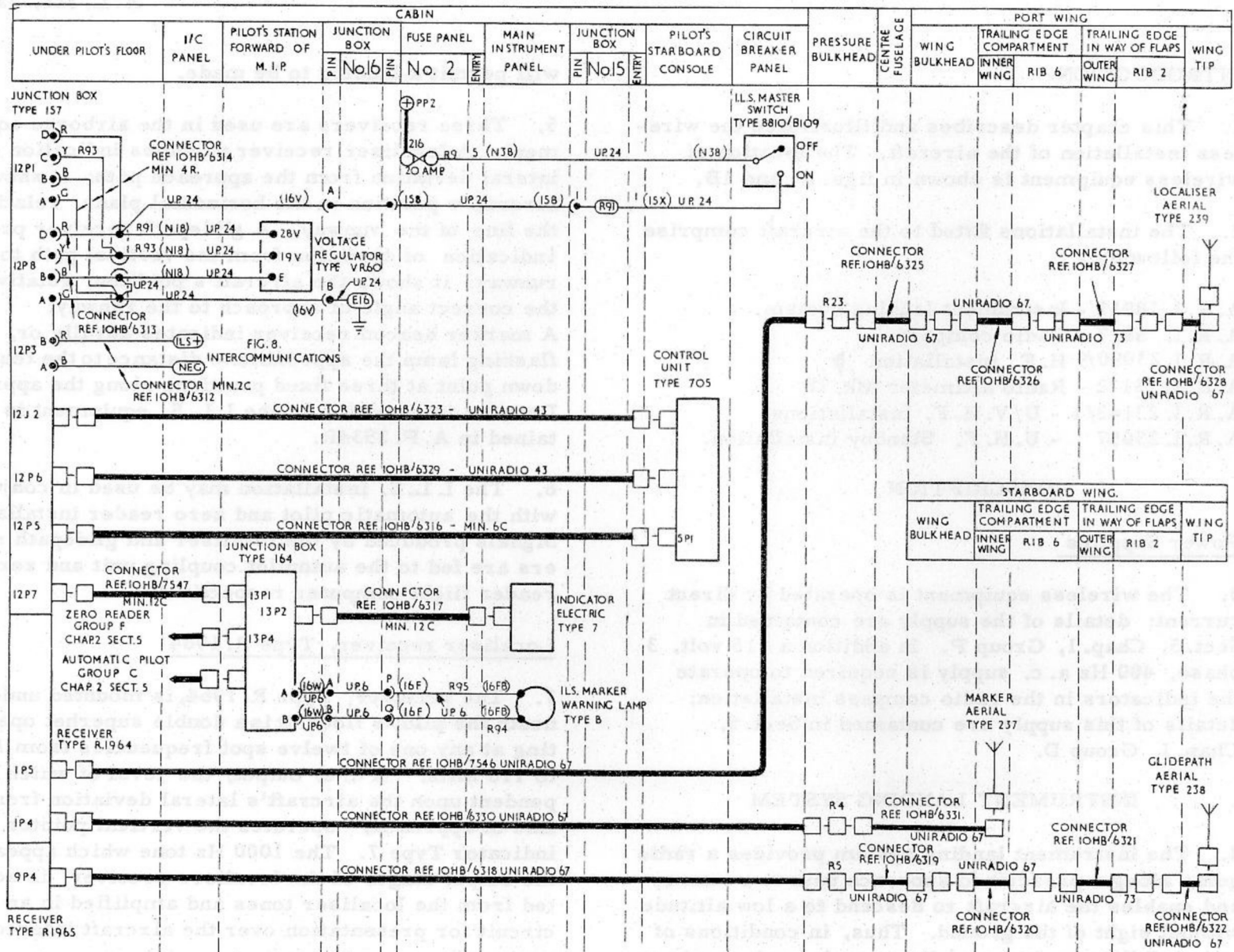


Fig. 2. A.R.I. 18011 (routing)

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Glidepath receiver, Type R.1965

8. The receiver, Type R.1965, is mounted adjacent to the localiser receiver: it is a double superhet operating at any one of twelve spot frequencies from 329 MHz to 335 MHz. The glidepath receiver is generally similar to the localiser receiver, and its output is also a d.c. potential whose value depends upon deviations from the correct path.

Marker receiver

9. This is a T.R.F. receiver fixed tuned to 75 MHz. The detected signal, consisting of keyed tones coded to identify the station, is amplified and fed through two output circuits for aural and visual presentation. The aural channel is fed into the aircraft intercommunication system and the visual channel to the marker identification lamp. For reliable operation the maximum altitude is 3 000 ft. ▶

Control unit, Type 705

10. The control unit Type 705, is mounted on the pilot's starboard console. The unit contains 24 crystals and a twelve channel selector switch identified A to L. A small red lamp is fitted to the front face of the unit to indicate that the I.L.S. equipment is switched on.

Junction box, Type 157

11. The junction box is mounted under the pilot's floor and forms a backplate for the localiser and glidepath receivers. The unit carries the power supplies to the receivers and the audio signals to the intercomm. system via the crew microphone terminals on the V.H.F. and I/C panel.

Voltage regulator, Type 60

12. A voltage regulator, Type 60, located under the pilot's floor controls the input voltage to the installation.

Junction box, Type 164

13. The junction box, Type 164, mounted on the port side of the aircraft, forward of the port console, acts as a distribution point for the output signals to the pilot's indicator and warning lamp and to the automatic pilot and zero reader equipment.

Pilot's indicator, Type 7

14. The pilot's indicator Type 7 is mounted on the main instrument panel.

Marker warning lamp

15. An amber warning lamp labelled I.L.S. MARKER is mounted adjacent to the indicator Type 7. As the aircraft passes over the marker beacons in the latter stages of a landing approach, the lamp is blinked in accordance with the keyed coding of the individual beacons.

Marker aerial, Type 237

16. The marker aerial Type 237, is mounted recessed in the underside of the starboard inner wing: it consists of a shaped strip of silvered metal, nine inches long fitted into a shallow dish. Over the aperture is fitted a glass cloth cover, in which is a hole fitted with a rubber grommet to provide access to the

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load capacitance trimmer. The aerial can be tuned by means of this preset trimmer to resonate at a frequency of 75 MHz.

Localiser and glidepath aerials, Types 238 & 239

17. The localiser and glidepath aerials are recessed into the leading edges of the port and starboard wings; both aerials are similarly constructed and fitted with a glass cloth cover.

RADIO COMPASS

Introduction

18. The radio compass is an automatic direction finding instrument installation providing homing position fixing and communication facilities throughout the frequency range 200 KHz to 1700 KHz. Detailed information is contained in A.P. 2530M, Vol. 1.

Amplifier Type A.8281

19. The amplifier Type A.8281 is mounted in the nose of the aircraft, in a special suspension rack underneath the navigator's starboard instrument panel. Connections to other items of equipment are made via two sockets and a torsional drive cable mounted on the rack backplate.

Amplifier Type A.8282

20. The amplifier Type A.8282 is mounted underneath the pilot's floor on the port side of the aircraft. The unit is installed in a special mounting tray and backplate assembly which has a single plug and socket connection to the remainder of the equipment.

Control unit, Type 8283

21. All controls for radio reception and D.F. operation are located on the front panel of the remote control unit Type 8283. The unit is mounted in the nose

of the aircraft just below the navigator's port instrument panel.

Indicator Type 8720

22. The A.D.F. bearing information is presented visually on an indicator mounted on the navigator's starboard instrument panel. This information may also be switched to the TACAN indicator on the pilot's instrument panel by means of the adjacently mounted ADF/TACAN changeover switch. When this switch is set at ADF it energizes five relays to transfer the pilot's indicator from the TACAN system to ADF (Radio compass). The relays are housed in the relay unit mounted between frames 4 and 5 on the starboard side.

NOTE: As the changeover relays are energized when the changeover switch is at ADF, it is essential that the switch is only set at ADF when that system is in use. At all other times it must remain at TACAN as there is no other method of breaking the relay supply.

Loop aerial, Type 8280

23. The loop aerial, Type 8280, is a ferrite cored crossed-loop assembly, resin bonded inside a shallow casing. The assembly is bolted to a mounting on the upper fuselage skin, under the cockpit canopy, aft of the pilot's position.

Q.E. corrector unit

24. This unit serves to compensate for quadrantal error induced in the loop aerial; it is bolted to the port side of the loop aerial mounting.

Sense aerial

25. The sense aerial which is of the omni-directional type is mounted on three insulators on the underside of the front fuselage.

A. L. 121, Jan. '73

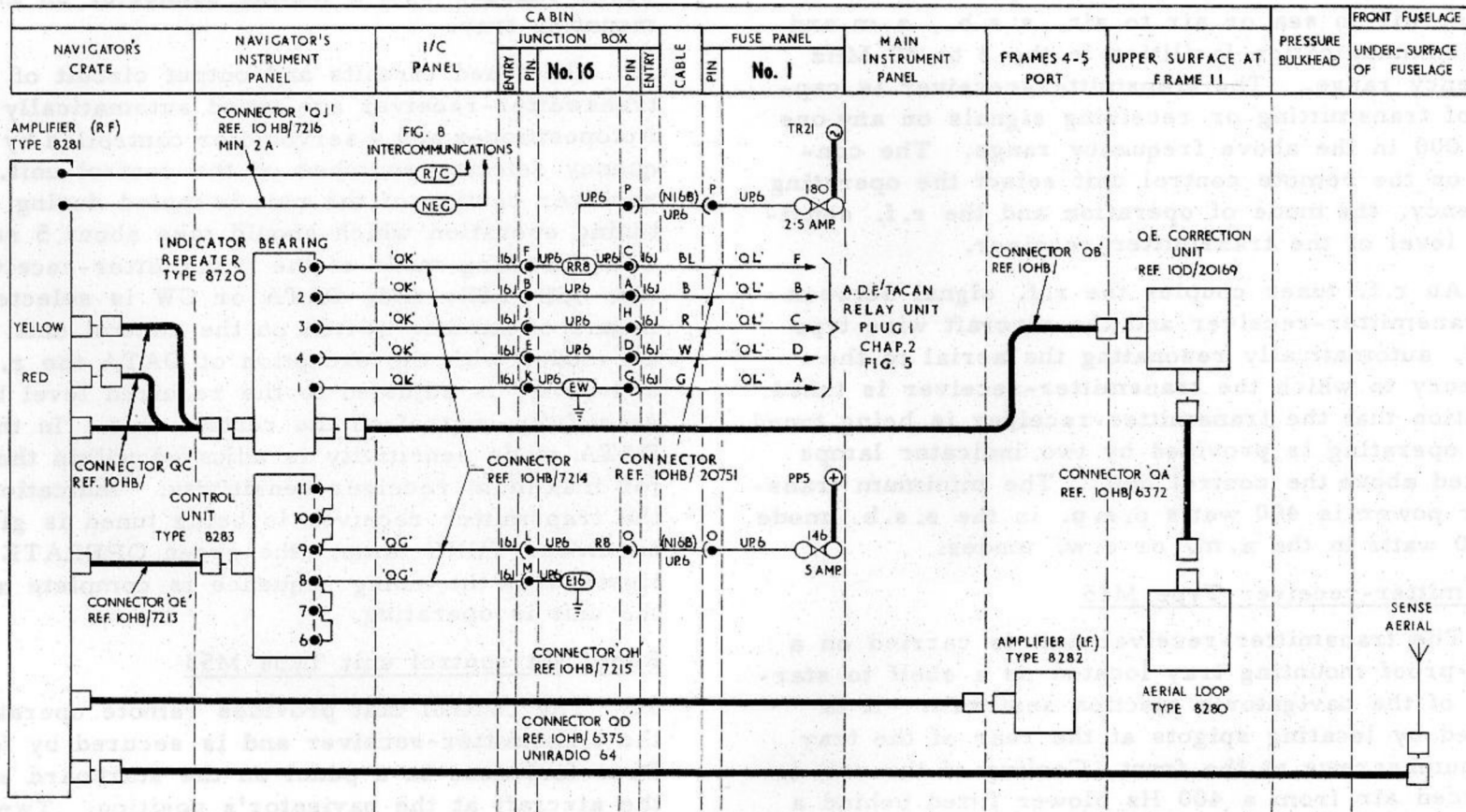


Fig. 3 A.R.I. 5877 (routing)

H.F. INSTALLATION

◀ Introduction

26. The A.R.I. 23090/9 (Collins 618T installation) is a communications system which provides air to ground, air to sea or air to air, s.s.b., a.m. and c.w. communication facilities in the 2 to 30 MHz frequency range. The transmitter-receiver is capable of transmitting or receiving signals on any one of 28 000 in the above frequency range. The controls on the remote control unit select the operating frequency, the mode of operation and the r.f. sensitivity level of the transmitter-receiver.

27. An r.f. tuner couples the r.f. signal between the transmitter-receiver and the aircraft wire type aerial, automatically resonating the aerial to the frequency to which the transmitter-receiver is tuned. Indication that the transmitter-receiver is being tuned or is operating is provided by two indicator lamps mounted above the control unit. The minimum transmitter power is 400 watts p.e.p. in the s.s.b. mode or 100 watts in the a.m. or c.w. modes.

Transmitter-receiver Type M15

28. The transmitter-receiver unit is carried on a shock-proof mounting tray located on a shelf to starboard of the navigator's ejection seat rail. It is secured by locating spigots at the rear of the tray and thumbscrews at the front. Cooling of the unit is by forced air from a 400 Hz blower fitted behind a filter on the front panel. For testing purposes a panel on the front of the unit provides a PHONE jack, a MIC jack a meter and a meter selector switch. Three positions of the meter selector switch check the internal power supply voltages. The fourth position of the switch monitors the power amplifier anode current, while the fifth position, CAL TONE compares the operating frequency of the transmitter

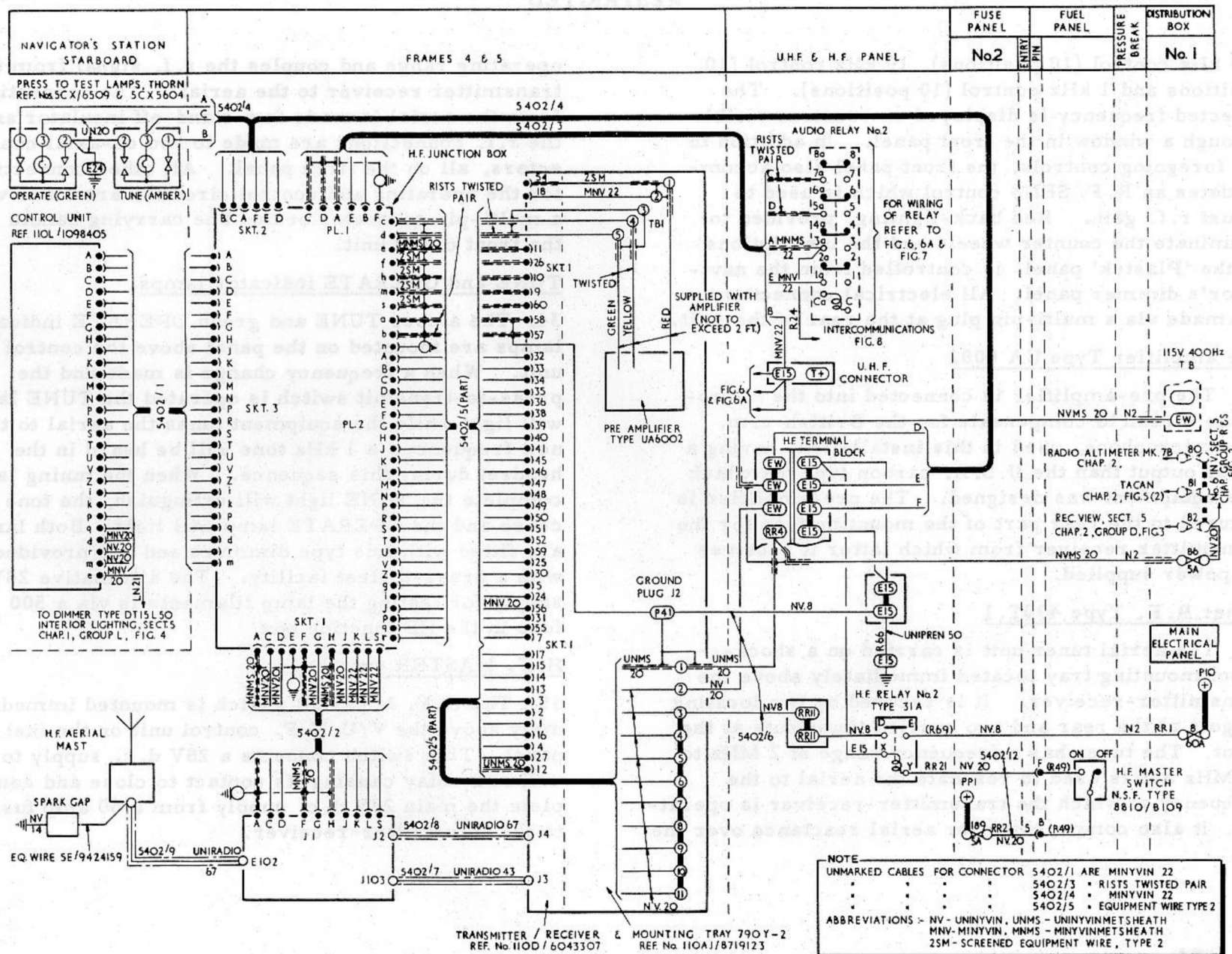
receiver with a WWV station. Aerial connections are made to two connectors on the front of the unit. All other electrical connections are made via a 60 pin connector, at the rear of the unit, which engages with a mating connector on the mounting tray.

29. The tuned circuits and output circuit of the transmitter-receiver are tuned automatically by an Autopositioner and a servomotor controlled by frequency selector switches on the control unit. The receiver portion of the unit is muted during the tuning operation which should take about 5 sec. The operating mode of the transmitter-receiver viz. USB, LSB, AM, DATA or CW is selected by means of another switch on the control unit. In all modes with the exception of DATA the r.f. sensitivity is adjusted to the required level by the sensitivity control on the control unit. In the DATA mode sensitivity is adjusted within the unit for maximum receiver sensitivity. Indication that the transmitter receiver is being tuned is given by an amber TUNE lamp; the green OPERATE lamp lights when the tuning sequence is complete and the unit is operating.

Radio set control unit Type M53

30. The control unit provides remote operation of the transmitter-receiver and is secured by four Dzus fasteners to a panel on the starboard side of the aircraft at the navigator's position. Twenty-eight thousand frequency channels in the 2 to 30 MHz range may be selected in 1 kHz increments, using wire saving circuits. Single side band, upper (USB) or lower (LSB), AM, DATA or CW may be selected on a mode selector switch on the front panel.

31. Frequency selection is controlled by four knobs on the front of the panel; Hz control (28 positions),



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100 kHz control (10 positions), 10 kHz control (10 positions and 1 kHz control (10 positions). The selected frequency is displayed on counters visible through a window in the front panel. In addition to the foregoing controls, the front panel also accommodates an R.F. SENS control which is used to adjust r.f. gain. Red back-lighting, provided to illuminate the counter wheels and the inscriptions on the 'Plastek' panel, is controlled from the navigator's dimmer panel. All electrical connections are made via a multi-pin plug at the rear of the unit.

Pre amplifier Type UA 6002

32. The pre-amplifier is connected into the microphone circuit to compensate for the British e.m. type microphone, used in this installation, having a lower output than the U.S.A. carbon type for which this equipment was designed. The pre-amplifier is secured to the rear part of the mounting tray for the transmitter receiver from which latter it receives its power supplied.

Tuner R.F. Type 490T.1

33. The aerial tuner unit is carried on a shock-proof mounting tray located immediately above the transmitter-receiver. It is secured by two locating spigots at the rear and two knurled thumbnuts at the front. The tuner has a frequency range of 2 MHz to 30 MHz and is used to resonate the aerial to the frequency at which the transmitter-receiver is operating. It also compensates for aerial reactance over the

operating range and couples the r.f. signal from the transmitter receiver to the aerial. The connection from the aerial is made to a stand-off insulator and the r.f. connections are made to two co-axial connectors, all on the front panel. All other connections, for the operating and control circuits, are made via a multi-pin connector behind the carrying handle on the front of the unit.

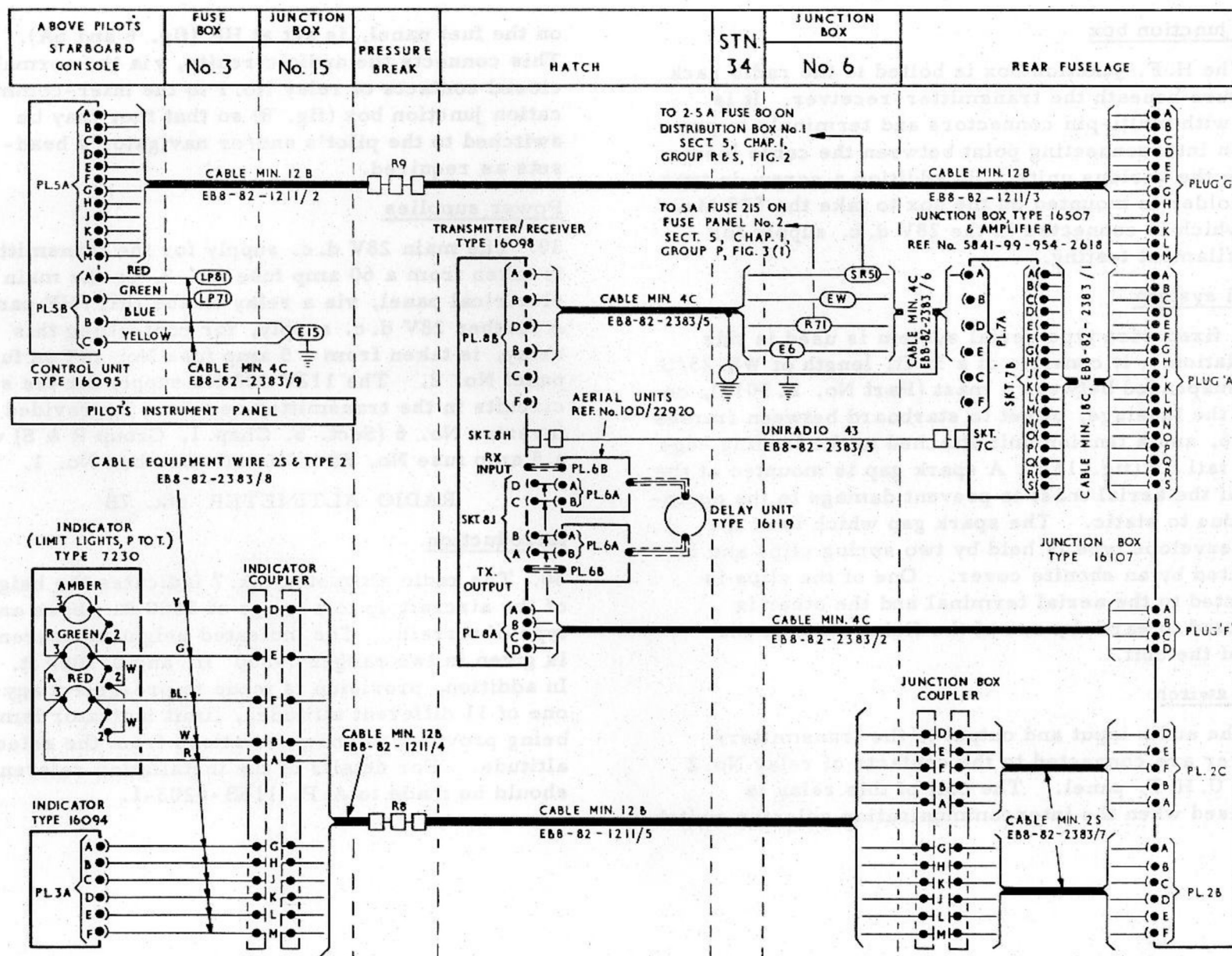
TUNE and OPERATE indicator lamps.

34. The amber TUNE and green OPERATE indicator lamps are mounted on the panel above the control unit. When a frequency change is made and the press-to-transmit switch is operated the TUNE lamp will light while the equipment tunes the aerial to the new frequency; a 1 kHz tone will be heard in the headset during this sequence. When the tuning is complete the TUNE light will extinguish, the tone will cease and the OPERATE lamp will light. Both lamps are fitted with iris type dimmers and are provided with a press-to-test facility. The alternative 28V d.c. supply for testing the lamp filaments is via a 500 Ma. fuse in the HF junction box.

H.F. MASTER switch

35. The H.F. MASTER switch is mounted immediately above the V/U.H.F. control unit on the fuel panel. This switch connects a 28V d.c. supply to the coil of a relay causing its contact to close and complete the main 28V d.c. supply from a 60 amp fuse to the transmitter-receiver.

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62/2382/1

Fig.5 A.R.I. 23172 (routing)

H. F. junction box

36. The H. F. junction box is bolted to the radio rack structure beneath the transmitter-receiver. It is fitted with multi-pin connectors and terminals to provide an interconnecting point between the cable looms linking the various units. In addition a screw-in type fuse holder is mounted on the box to take the 500 Ma. fuse which is connected in the 28V d. c. supply for lamp filament testing.

Aerial system

37. A fixed wire type aerial system is used in this installation. It consists of a 55 ft. length of WS.25/U wire suspended between a mast (Part No. Z.5017), on top of the fuselage, offset to starboard between frames 5 and 6, and a tension unit attached to the leading edge of the tail fin (fig. 13). A spark gap is mounted at the base of the aerial mast to prevent damage to the equipment due to static. The spark gap which is of the glass envelope type is held by two spring clips and is protected by an ebonite cover. One of the clips is connected to the aerial terminal and the other is connected to earth by one of the fixing bolts at the base of the unit.

Audio switch

38. The audio input and output to the transmitter/receiver are connected to the contacts of relay No. 2 on the U. H. F. panel. The coil of this relay is energised when the intercommunication selector switch,

on the fuel panel, is set at HF (fig. 6 and 6A).

This connects the audio circuits, via the normally closed contacts of relay No. 1 to the inter-communication junction box (fig. 8) so that they may be switched to the pilot's and/or navigator's headsets as required.

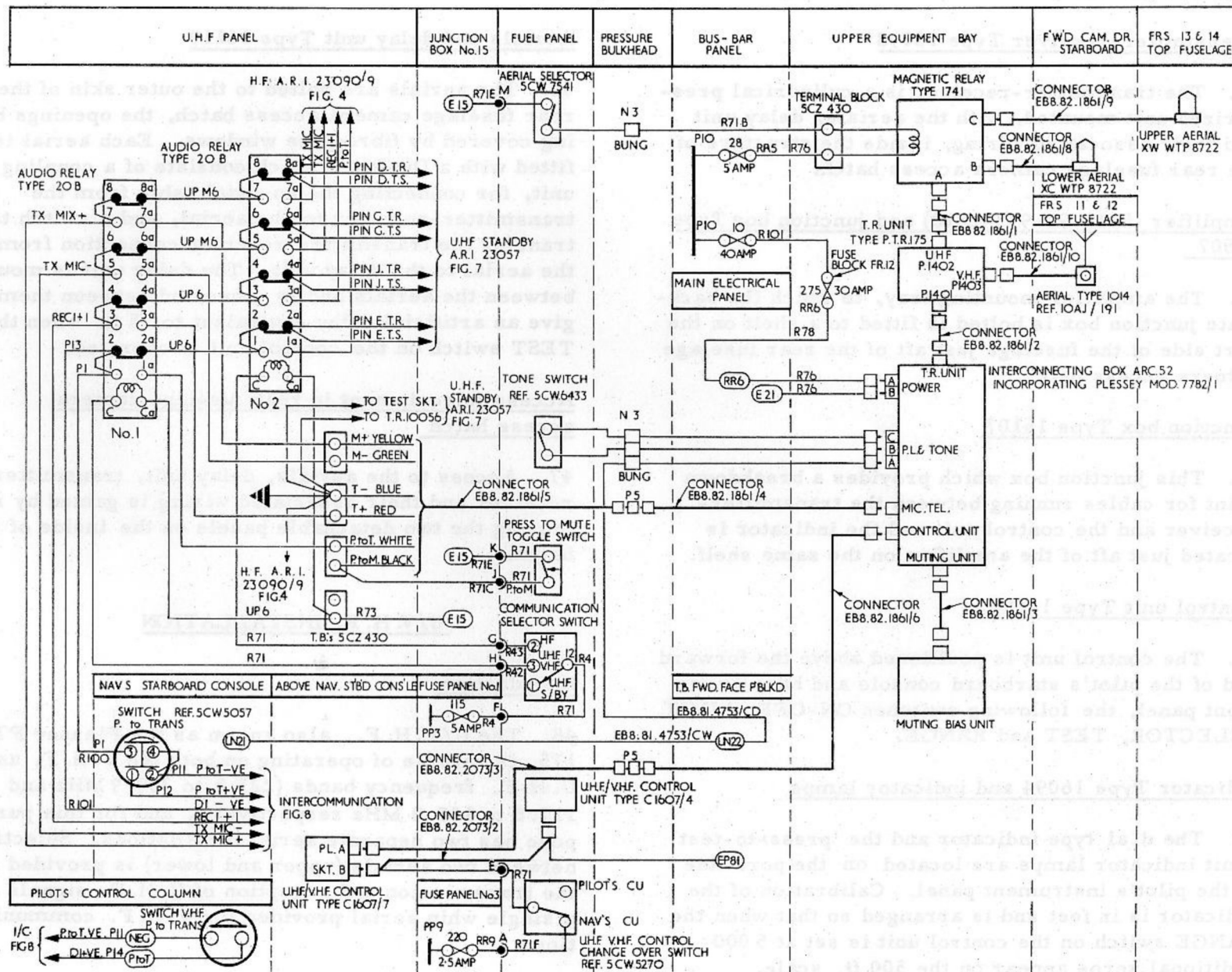
Power supplies

39. The main 28V d. c. supply for the transmitter is taken from a 60 amp fuse No. 8, on the main electrical panel, via a relay on the UHF/HF panel. A further 28V d. c. supply, for controlling this relay, is taken from a 5 amp fuse No. 189 on fuse panel No. 2. The 112V 300 Hz supply for the servo circuits in the transmitter receiver is provided by inverter No. 6 (Sect. 6, Chap. 1, Group R & S) via a 5 amp fuse No. 86 in distribution box No. 1. ▶

RADIO ALTIMETER Mk. 7B

Introduction

40. The radio altimeter Mk. 7 indicates the height of the aircraft up to a range of 5000 ft. above any type of terrain. The indicated height measurement is given in two ranges 0-500 ft. and 0-5000 ft. In addition, provision is made to pre-select any one of 11 different altitudes, limit indicator lamps being provided to show deviations from the selected altitude. For details of the installation reference should be made to A. P. 116B-0203-1.



RESTRICTED

Transmitter-receiver Type 16098

41. The transmitter-receiver is a cylindrical pressurized unit mounted, with the aerials, delay unit and their associated wiring, inside the structure of the rear fuselage camera access hatch.

Amplifier (5841-99-945-2618) and junction box Type 16507

42. The amplifier mounting tray, to which the back-plate junction box is bolted is fitted to a shelf on the port side of the fuselage just aft of the rear fuselage camera access hatch.

Junction box Type 16107

43. This junction box which provides a breakdown point for cables running between the transmitter-receiver and the control unit and the indicator is located just aft of the amplifier on the same shelf.

Control unit Type 16095

44. The control unit is positioned above the forward end of the pilot's starboard console and has, on its front panel, the following switches ON-OFF, LIMIT SELECTOR, TEST and RANGE.

Indicator Type 16094 and indicator lamps

45. The dial type indicator and the 'press-to-test' limit indicator lamps are located on the port side of the pilot's instrument panel. Calibration of the indicator is in feet and is arranged so that when the RANGE switch on the control unit is set at 5 000 additional zeros appear on the 500 ft. scale.

Aerials and delay unit Type 16119

46. The aerials are bolted to the outer skin of the rear fuselage camera access hatch, the openings being covered by fibreglass windows. Each aerial is fitted with a Duplexer which consists of a coupling unit, for connecting the co-axial cable from the transmitter-receiver to the aerial, and a switch to transfer the transmitter-receiver connection from the aerial to the delay unit. The delay unit is mounted between the aerials and is connected between them to give an artificial delay equivalent to 75 ft. when the TEST switch on the control unit is operated.

Access to equipment in rear fuselage camera access hatch

47. Access to the aerials, delay unit, transmitter-receiver and their associated wiring is gained by removing the two detachable panels on the inside of the hatch.

U/V. H. F. INSTALLATION

Introduction

48. The U/V. H. F., also known as the Plessey PTR 175, is capable of operating on both the V. H. F. and U. H. F. frequency bands (225.0 to 399.9 MHz and 117.5 to 135.9 MHz respectively), and for this purpose has two separate aerial installations. Selection between two aerials (upper and lower) is provided for the transmission and reception of U. H. F. signals and a single whip aerial provides for V. H. F. communications.

F.S./10A

RESTRICTED

A.P. 101B - 0409-1, Sect. 6, Chap. 1

A.L. 121, Jan. '73

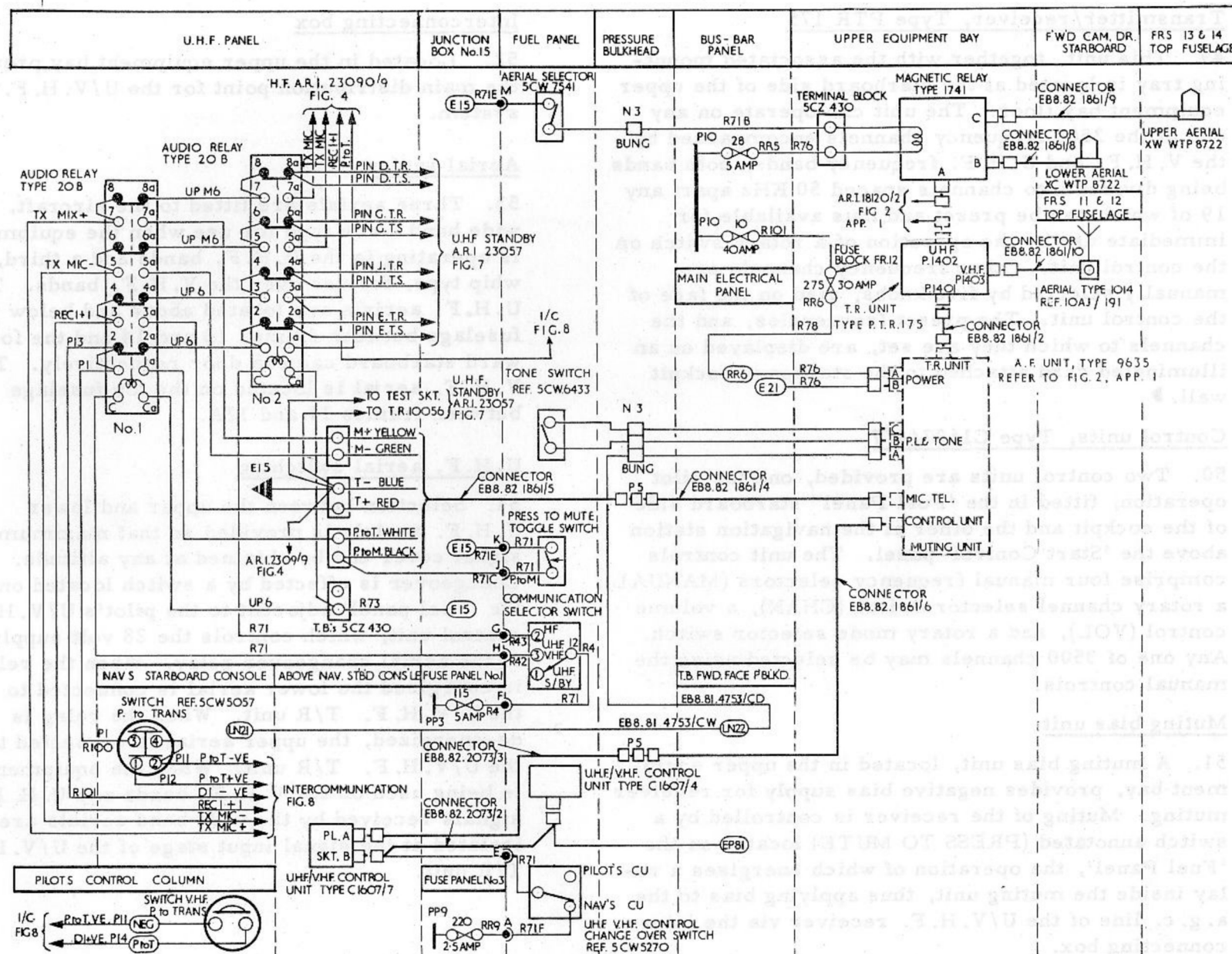


Fig.6 A.A.R.I. 23143/1 (routing) - (Post mod. 4378)

< (CROSS REFS. ADDED) >

RESTRICTED

Transmitter/receiver, Type PTR 175

49. This unit, together with the associated mounting tray is located at the starboard side of the upper equipment bay floor. The unit can operate on any one of the 3500 frequency channels encompassed by the V. H. F. and U. H. F. frequency bands, both bands being divided into channels spaced 50 KHz apart any 19 of which can be preset and thus available for immediate use by the operation of a rotary switch on the control unit. Other frequency channels are manually selected by five knobs, also on the face of the control unit. The preset frequencies, and the channels to which they are set, are displayed on an illuminated card attached to the starboard cockpit wall. ▶

Control units, Type C1607/4/7

50. Two control units are provided, one for pilot operation, fitted in the 'Fuel Panel' starboard side of the cockpit and the other at the navigation station above the 'Start Control' panel. The unit controls comprise four manual frequency selectors (MANUAL), a rotary channel selector switch (CHAN), a volume control (VOL), and a rotary mode selector switch. Any one of 3500 channels may be selected using the manual controls.

Muting bias unit

51. A muting bias unit, located in the upper equipment bay, provides negative bias supply for receiver muting. Muting of the receiver is controlled by a switch annotated (PRESS TO MUTE) located on the 'Fuel Panel', the operation of which energises a relay inside the muting unit, thus applying bias to the a. g. c. line of the U/V. H. F. receiver via the interconnecting box.

Interconnecting box

52. Located in the upper equipment bay provides the main distribution point for the U/V. H. F. system.

Aerial system

53. Three aerials are fitted to the aircraft, two wide band blade type for use when the equipment is operating in the U. H. F. bands and a third, whip type, for use over the V. H. F. bands. The U. H. F. aeriaks are located above and below the fuselage between frames 13 and 14 and the forward starboard camera door respectively. The V. H. F. aerial is located on the top fuselage between frames 11 and 12A.

U. H. F. aerial switching

54. Selection between the upper and lower U. H. F. aeriaks is provided so that maximum signal cover can be obtained at any altitude. Changeover is effected by a switch located on the 'Fuel panel' adjacent to the pilot's U/V. H. F. control unit, which controls the 28 volt supply to the aerial changeover relay. When the relay is energized the lower aerial is connected to the U/V. H. F. T/R unit. When the relay is de-energized, the upper aerial is connected to the U/V. H. F. T/R unit. When the equipment is being used on the V. H. F. bands any U. H. F. signals received by the wide band aeriaks are isolated at the signal input stage of the U/V. H. F. T/R unit.

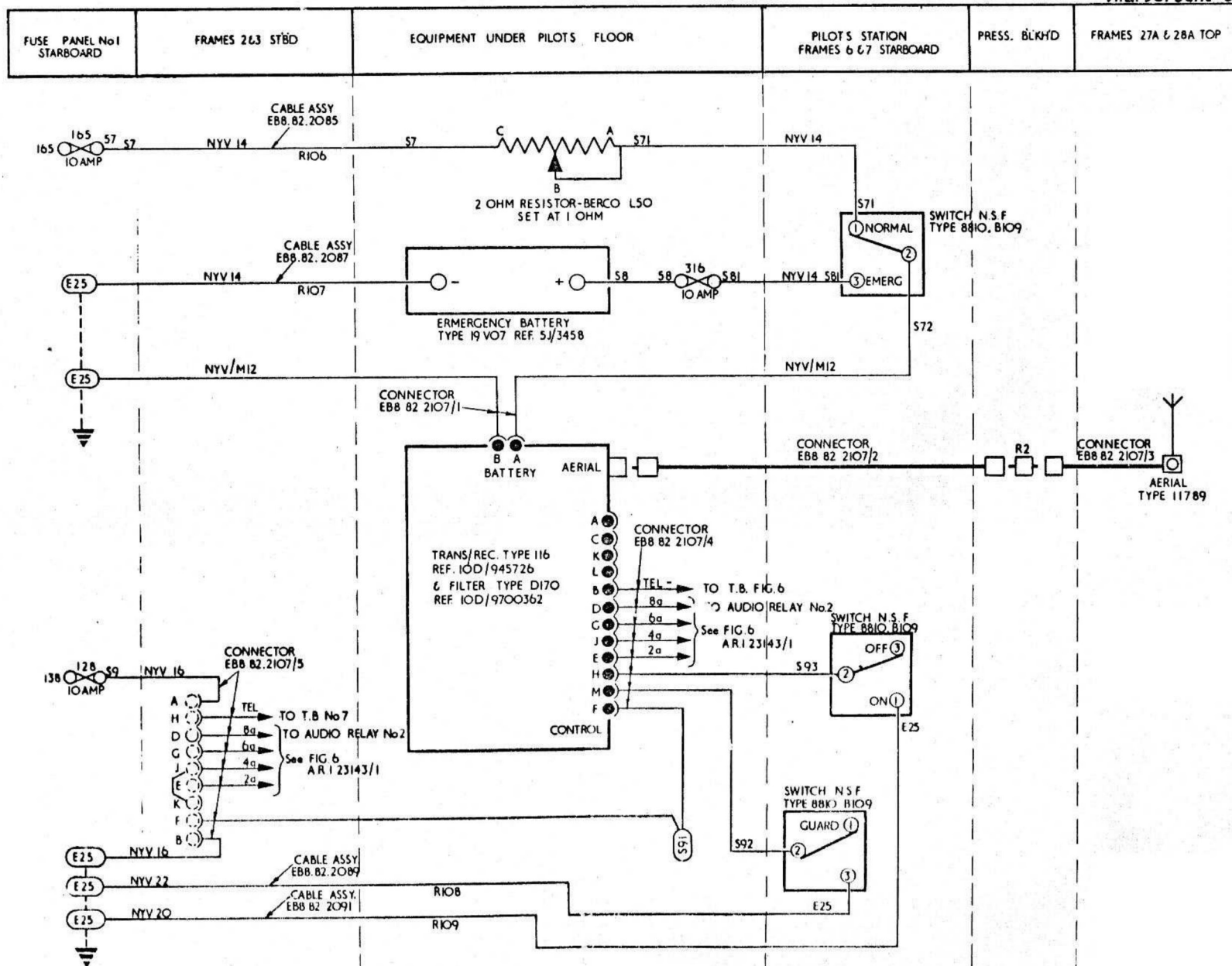


Fig. 7 A.R.I. 23057 (routing)

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U/V. H. F. switching and R/T selection

55. The pilot is provided with a rotary changeover switch, labelled 'V. H. F. - STANDBY/HF/U. H. F. V. H. F.' mounted on the fuel panel on the starboard console. With the switch in the U. H. F. - V. H. F. position, the audio relay No. 1 (on the U. H. F. panel) is energized and the transmitting and mic/tel. circuits are connected to the U/V. H. F., T/R unit. With the switch in the U. H. F. STANDBY position, the audio relays Nos. 1 and 2 are de-energized and the transmitting and mic/tel. circuits are connected to the standby T/R units. When H. F. is selected, audio relay No. 2 is energized and audio relay No. 1 de-energized to connect the transmitting and mic/tel. circuits to the H. F. T/R unit.

Press to transmit switches

56. Press to transmit switches are mounted, one on the navigator's switch of dimmer panel, and one on the right hand grip of the pilot's control column. When either of the switches is depressed, the transmit relay in the junction box Type 154 is energized permitting transmission on U/V. H. F., STANDBY V. H. F. or H. F. depending on the position of the pilot's selector switch.

Tone transmission switch

57. A switch annotated 'U. H. F. /V. H. F. TONE' is mounted on the fuel panel; it controls the tone-transmission facility.

STANDBY V. H. F. INSTALLATION

Transmitter/receiver, Type M6

58. The transmitter/receiver with its associated mounting tray is located in the equipment bay under the pilot's floor. The unit can operate on the guard frequency channel and another frequency known as Channel 'A', both these frequencies are in the range of between 238 to 248 MHz and are spaced at not more than 1 MHz apart. A switch annotated GUARD-CHAN A, situated on the U. H. F. standby panel, located on the starboard side of the cockpit provides selection of the required frequency by energizing a relay within the T/R unit.

Power supply

59. The unit requires a power supply of 24 volt d. c. This is normally obtained from the A/C's 28 volt d. c. system, at fuse panel No. 1, the reduction in voltage being obtained by a 2 ohm series resistor set at 1 ohm, located under the pilot's floor. A filter unit which plugs into the front of the T/R unit, provides protection against transient supply conditions. In the case of emergency, when either the main U/V. H. F. system has failed or a failure in the nominal d. c. supply exists, the standby T/R unit can be operated from a 24 volt supply obtained from the emergency battery located under the pilot's floor. The changeover being effected by a toggle switch on the U. H. F. standby panel annotated 'POWER SWITCH - NORMAL EMERGENCY'.

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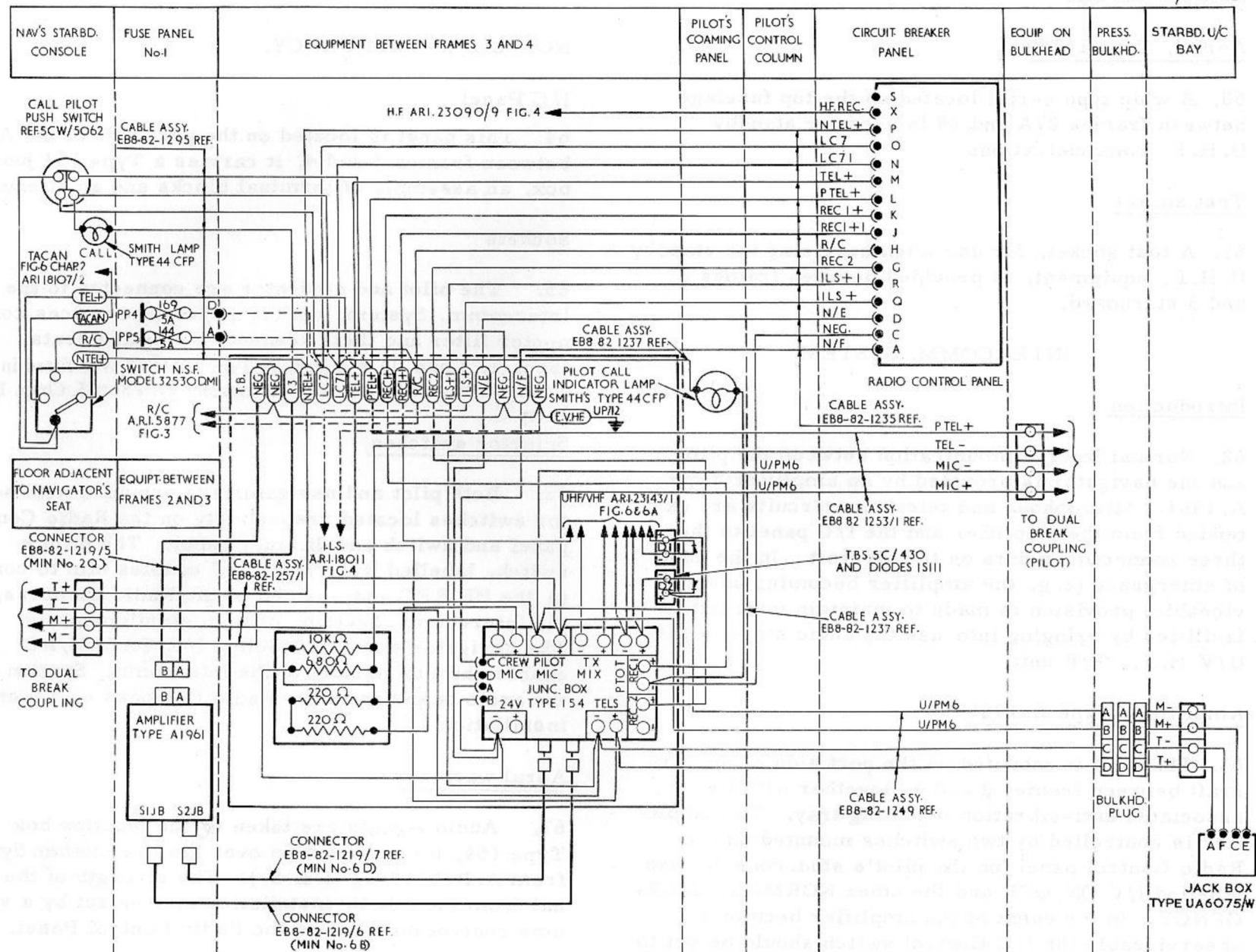


Fig. 8 Intercommunication (routing)

(MOD 4990)

Aerial, Type 11789

60. A whip type aerial located on the top fuselage between frames 27A and 28 is used for standby U.H.F. communications.

Test socket

61. A test socket, for use when servicing the standby U.H.F. equipment, is provided between frames 2 and 3 starboard.

INTERCOMM. SYSTEM

Introduction

62. Normal intercommunication between the pilot and the navigator is provided by an amplifier Type A. 1961. Microphone and telephone circuits are extended from the amplifier and the I/C panel to the three connecting points on the aircraft. In the case of emergency (e. g. the amplifier becoming unserviceable) provision is made to maintain intercomm. facilities by bringing into use the audio stage of the U/V. H. F. T/R unit.

Amplifier, Type A. 1961

63. This unit is mounted on the port side of the aircraft between frames 2 and 3, together with its associated anti-vibration mounting tray. The amplifier is controlled by two switches mounted on the Radio Control panel (on the pilot's stbd. console) one labelled I/C ON/OFF and the other NORMAL/EMERGENCY. In the event of the amplifier becoming unserviceable the I/C Control switch should be set to 'OFF' and the changeover switch transferred from

NORMAL to EMERGENCY.

I/C Panel

64. This panel is located on the port side of the A/C between frames 3 and 4, it carries a Type 154 junction box, an assembly of terminal blocks and an attenuator.

Sockets

65. The pilot and navigator are connected to the Intercomm. System, via the personal services connector filter and their respective ejection seats. (Sect. 1, Chap. 1). A jackbox Type UA6075/W is fitted in the starbd. wheel well for use with the transfer gyro Sect. 5, Chap. 1, Group G.

Selector switches

66. Both pilot and navigator are provided with selector switches located respectively on the Radio Control panel and switch and dimmer panel. The pilot's switch, labelled R/C/MIX/R/T enables him to connect to the HF REC audio output of the Radio Compass, the Intercomm. System, or both simultaneously. The navigator's switch labelled I/C/TACAN/RC enables him to connect to the Intercomm. System or the audio output from the Radio Compass or Tacan installation.

Aural warnings

67. Audio signals are taken to the junction box Type 154, for distribution over the Intercomm. System from A. R. I. 18011 (I. L. S.). The strength of the signal from the I. L. S. installation may be set by a volume control mounted on the Radio Control Panel.

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A.P. 101B-0409-1, Sect. 6, Chap. 1

A. L. 121, Jan. '73

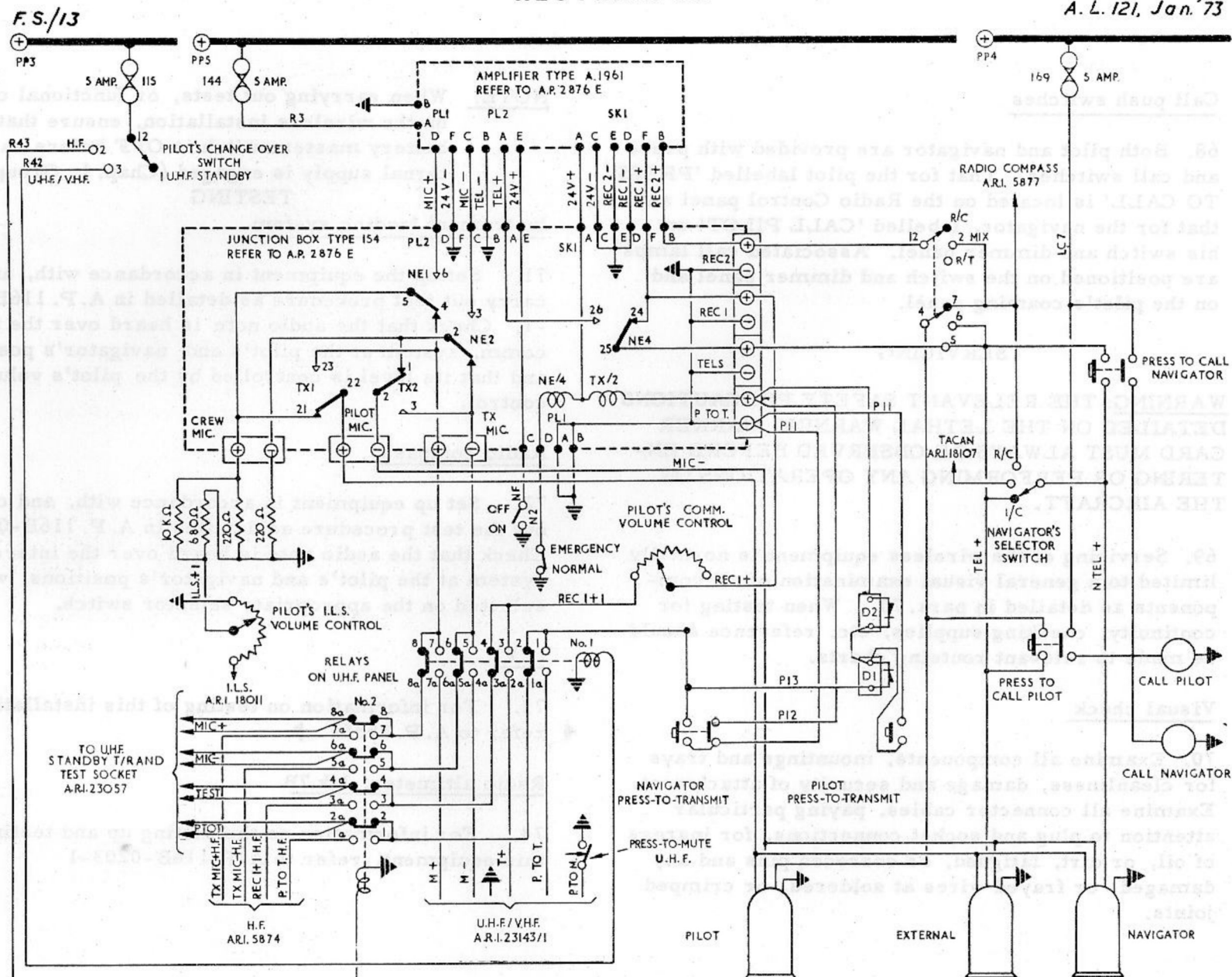


Fig. 9 Tel/mic switching (theoretical)

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Call push switches

68. Both pilot and navigator are provided with press and call switches. That for the pilot labelled 'PRESS TO CALL' is located on the Radio Control panel and that for the navigator, labelled 'CALL PILOT' on his switch and dimmer panel. Associated call lamps are positioned on the switch and dimmer panel and on the pilot's coaming panel.

SERVICING

WARNING: THE RELEVANT SAFETY PRECAUTIONS DETAILED ON THE LETHAL WARNING MARKER CARD MUST ALWAYS BE OBSERVED BEFORE ENTERING OR PERFORMING ANY OPERATIONS ON THE AIRCRAFT.

69. Servicing of the wireless equipment is normally limited to a general visual examination of all components as detailed in para. 70. When testing for continuity, checking supplies, etc. reference should be made to relevant routeing charts.

Visual check

70. Examine all components, mountings and trays for cleanliness, damage and security of attachment. Examine all connector cables, paying particular attention to plug and socket connections, for ingress of oil, or dirt, fatigued, or corroded pins and any damaged, or frayed wires at soldered, or crimped joints.

NOTE: When carrying out tests, or functional checks on the wireless installation, ensure that the battery master switch is OFF before an external supply is engaged (Chap. 1, Group P.)

TESTING

Instrument landing system

71. Set up the equipment in accordance with, and carry out test procedure as detailed in A.P. 116B-0408 -1. Check that the audio note is heard over the intercomm. system at the pilot's and navigator's positions, and that its level is controlled by the pilot's volume control.

Radio compass

72. Set up equipment in accordance with, and carry out the test procedure as detailed in A.P. 116B-0102-1. Check that the audio note is heard over the intercomm. system at the pilot's and navigator's positions, when selected on the appropriate selector switch.

H. F.

73. For information on testing of this installation, refer to A.P. 2535F. ▶

Radio altimeter, Mk.7B

74. For information on the setting up and testing of this equipment, refer to A.P. 116B-0203-1

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U/V.H.F. Installation

75. For information on the testing of this installation refer to A.P. 116D-0113-1.

U.H.F. standby installation

76. For information on the testing of this installation refer to A.P. 116D-0110-16.

Intercomm. system

77. The operation of the intercommunication facilities may be checked as follows:-

- (1) Select I/C control and selector switches to ON and NORMAL respectively.
- (2) Select pilot's selector switch to R/T or MIX and navigator's selector switch to I/C. Check that communication between pilot and navigator and external position is available.
- (3) Select pilot's switch to R/C. Check that communication between pilot and navigator and external position is not available.
- (4) Press navigator's press-to-call switch. Check that both navigator's and pilot's call lamps are lit and that communication between pilot and navigator is available as long as the switch is depressed.

- (5) Select pilot's switch to R/T or Mix and navigator's switch to R/C. Check that communication between pilot and navigator and between navigator and external position is not available.
- (6) Press pilot's press-to-call switch. Check that both pilot's and navigator's call lamps are lit and that communication between pilot and navigator is available as long as the switch is depressed.
- (7) Select I/C control and selector switches to OFF and EMERGENCY respectively.
- (8) Select changeover switch to U.H.F. Repeat operations detailed in sub-para.(2).
- (9) Select I/C selector switch to NORMAL.

NOTE: Ensure in all the above checks that background noise is not excessive.

- (10) For detailed information on the A.1961 amplifier, refer to A.P. 2867E.

REMOVAL

78. The bulk of the Radio Equipment is fitted in standard racking in an unobstructed position to allow for easy access and removal; consequently no additional information is required. When replacing cable connectors, great care must be taken to ensure that they are correctly mated and locked.

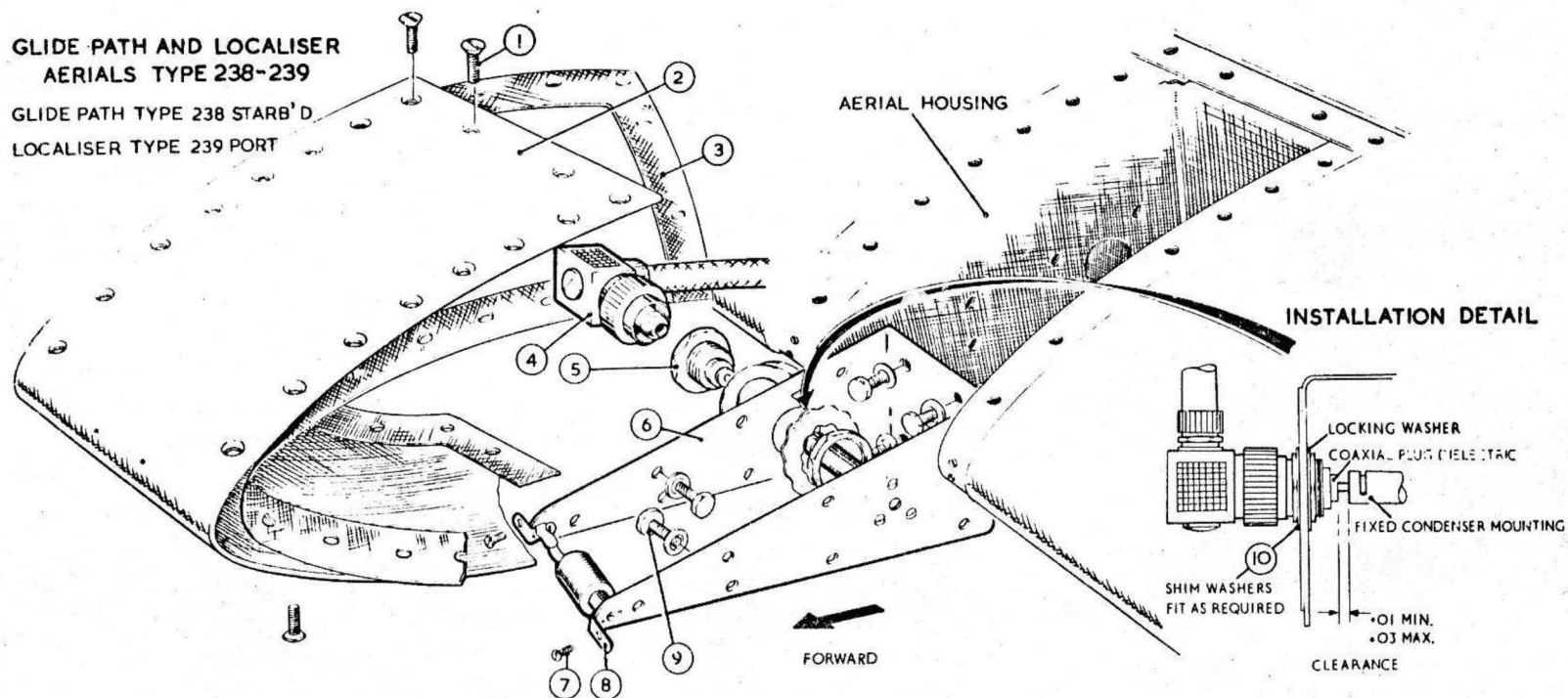
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79. The method of removing the aerials for the I. L. S. installation, Radio Compass, Radio Altimeter Mk.7B,HF, U/V. H. F. and Standby U. H. F. installation is indicated on figs. 10, 11, 12, 13, 14, 15 and 16 respectively.

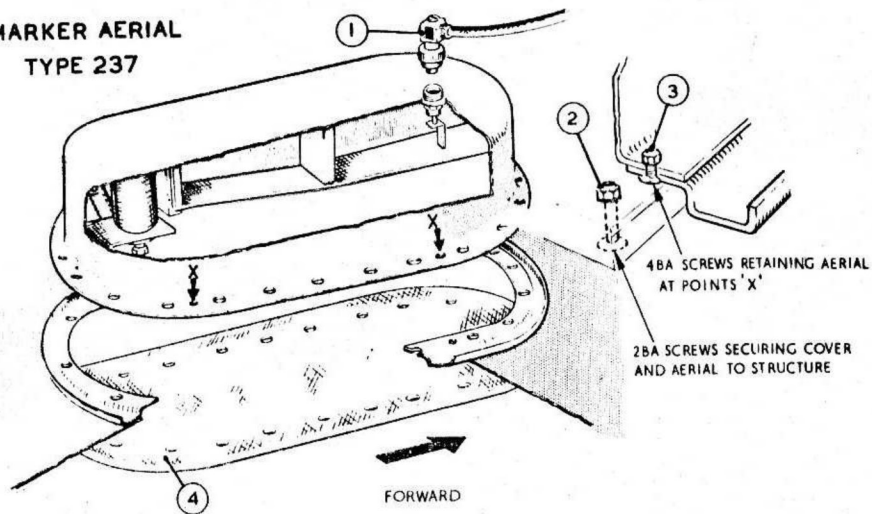
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GLIDE PATH AND LOCALISER AERIALS TYPE 238-239

GLIDE PATH TYPE 238 STARB'D
LOCALISER TYPE 239 PORT



MARKER AERIAL TYPE 237



AERIALS TYPE 238-239 REMOVAL

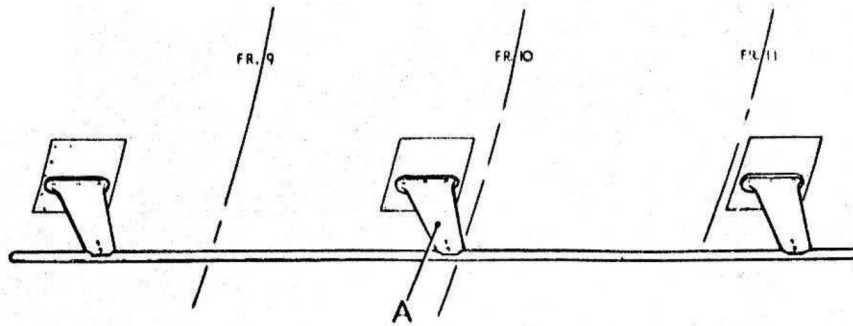
- 1 UNSCREW THE THIRTY EIGHT 2BA SCREWS (1) (TWENTY ON STARBOARD WING) AND DETACH THE GLASSCLOTH COVER (2) AND NEOPRENE SEALING RING (3)
- 2 DISCONNECT THE COAXIAL CABLE CONNECTOR (4) AND COAXIAL PLUG (5) FROM THE AERIAL (6) (ACCESS IN WING LOWER SURFACE Sect. 2, Chap. 4, Fig. 2)
- 3 REMOVE THE 6BA SCREWS (7) FROM THE BONDING STRIPS (8)
- 4 UNSCREW THE EIGHTEEN 2BA BOLTS (9) (TEN BOLTS STARBOARD) AND REMOVE THE AERIAL (6) FROM THE HOUSING
WHEN INSTALLING THE AERIALS DUST THE NEOPRENE RINGS WITH FRENCH CHALK BEFORE FITTING. WHEN REFITTING THE COAXIAL PLUG (5) THROUGH THE HOUSING AND AERIAL (6) USE SHIM WASHERS (10) TO ENSURE THE REQUIRED CLEARANCE (SEE INSTALLATION DETAIL)

AERIAL TYPE 237 REMOVAL

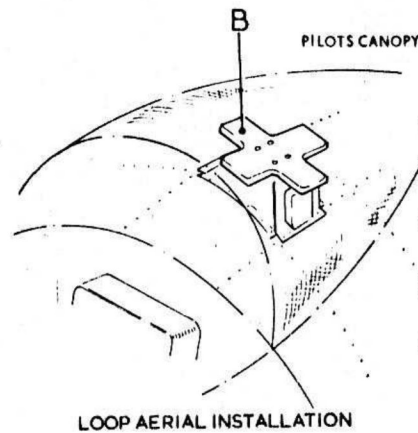
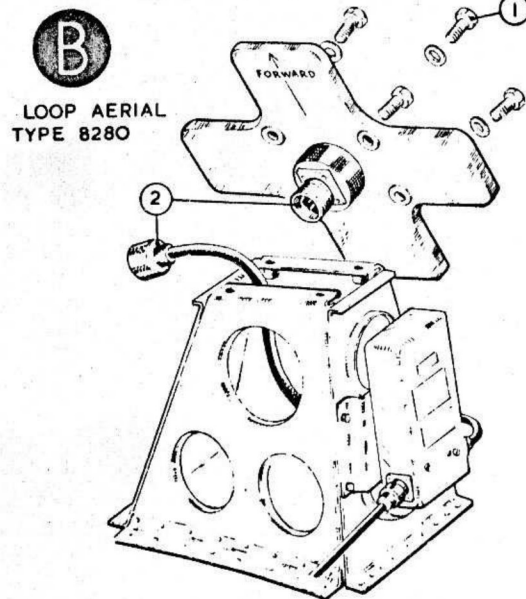
- 1 DISCONNECT THE COAXIAL CABLE CONNECTOR (1) (ACCESS FROM MAIN WHEEL BAY)
- 2 UNSCREW THE TWENTY EIGHT 2BA SCREWS AND DETACH THE GLASSCLOTH COVER (2) (4)
- 3 UNSCREW THE FOUR 4BA SCREWS (3) AND DETACH THE AERIAL

Fig. 10 A.R.I. 18011 aerial removal

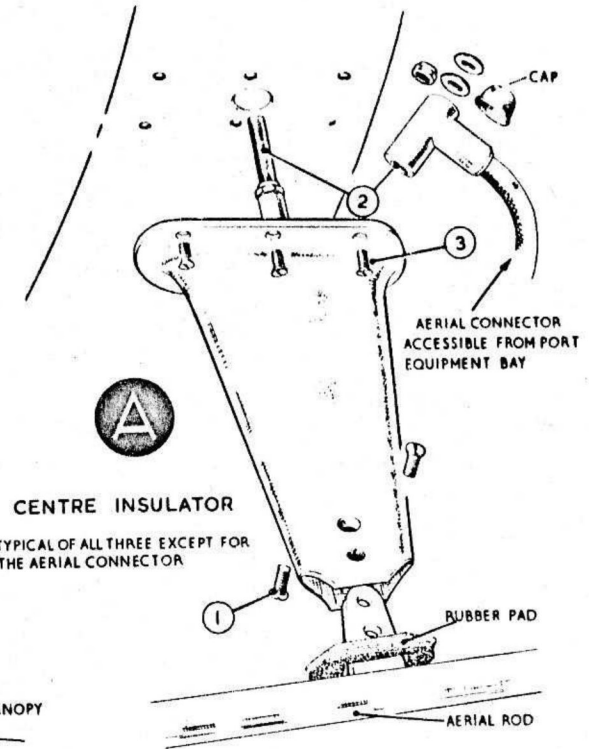
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SENSE AERIAL INSTALLATION



LOOP AERIAL INSTALLATION



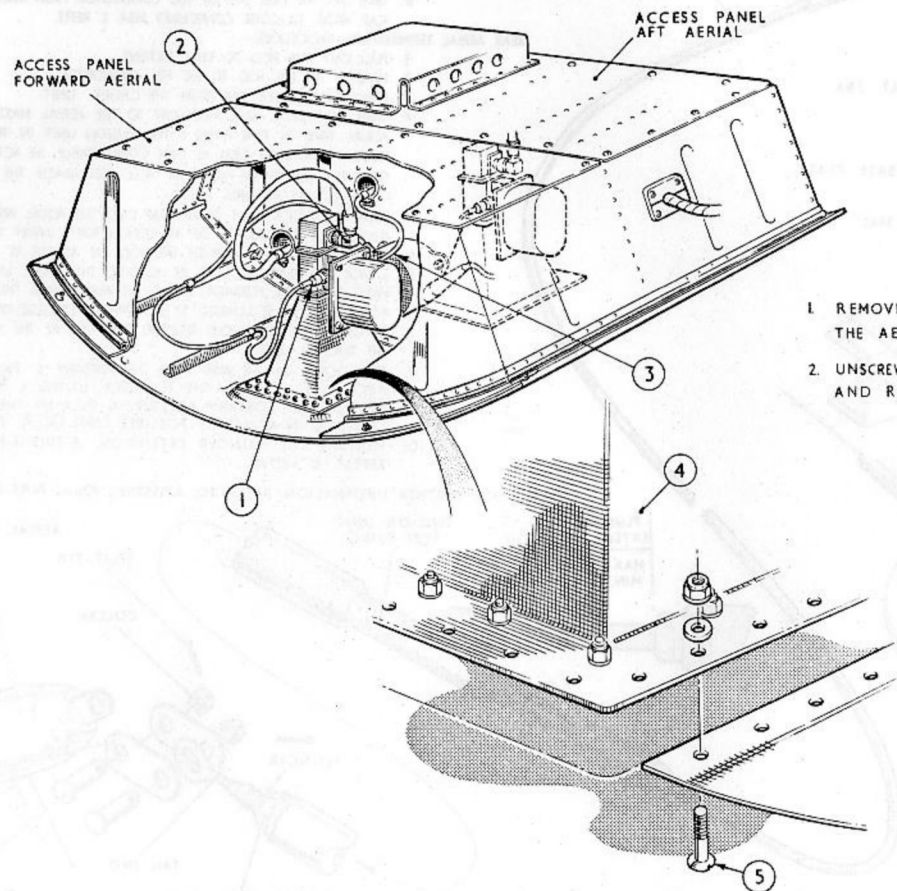
CENTRE INSULATOR
TYPICAL OF ALL THREE EXCEPT FOR
THE AERIAL CONNECTOR

- SENSE AERIAL REMOVAL**
- 1 REMOVE THE TWO 2BA SCREWS DETAIL A (1) FROM EACH OF THE THREE INSULATORS AND DETACH THE AERIAL ROD
 - 2 DISCONNECT THE AERIAL LEAD FROM THE CENTRE INSULATOR DETAIL A (2)
 - 3 REMOVE THE SIX 4BA SCREWS DETAIL A (3) FROM THE FLANGE OF EACH INSULATOR AND DETACH THE INSULATORS

- AERIAL TYPE 8280 REMOVAL**
- 1 UNSCREW THE FOUR 2BA BOLTS DETAIL B (1) AND DETACH THE AERIAL FROM ITS MOUNTING
 - 2 UNSCREW AND DISCONNECT THE AERIAL LEAD DETAIL B (2)

Fig II A.R.I. 5877 aerial removal

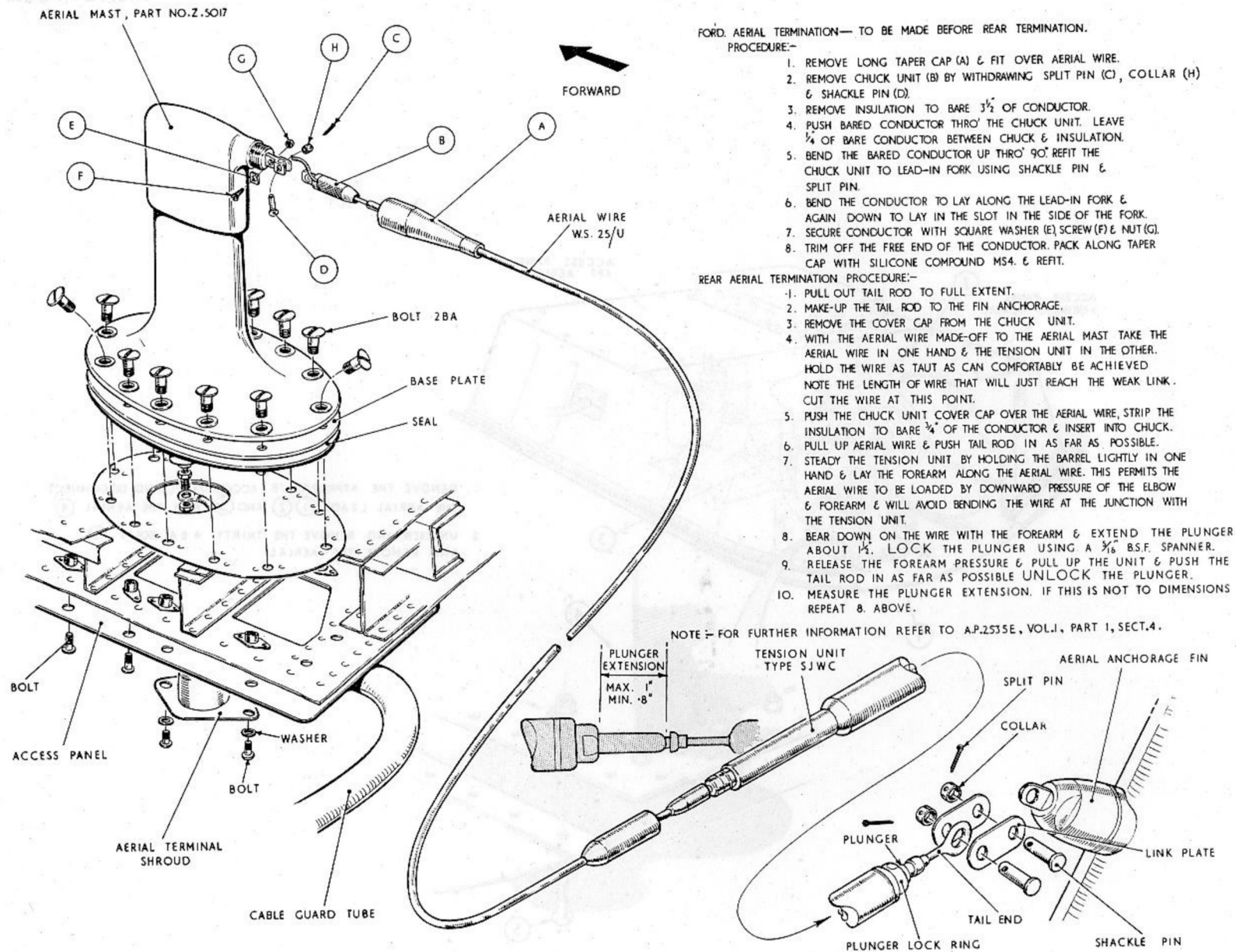
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- 1 REMOVE THE APPROPRIATE ACCESS PANEL AND DISCONNECT THE AERIAL LEADS (1) (2) AND (3) FROM THE AERIAL (4)
- 2 UNSCREW AND REMOVE THE THIRTY 4 BA BOLTS (5) AND REMOVE THE AERIAL.

Fig. 12 A.R.I. 23172 Aerial removal

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◀ Fig. I3.ARL230909 aerial removal and rigging ▶

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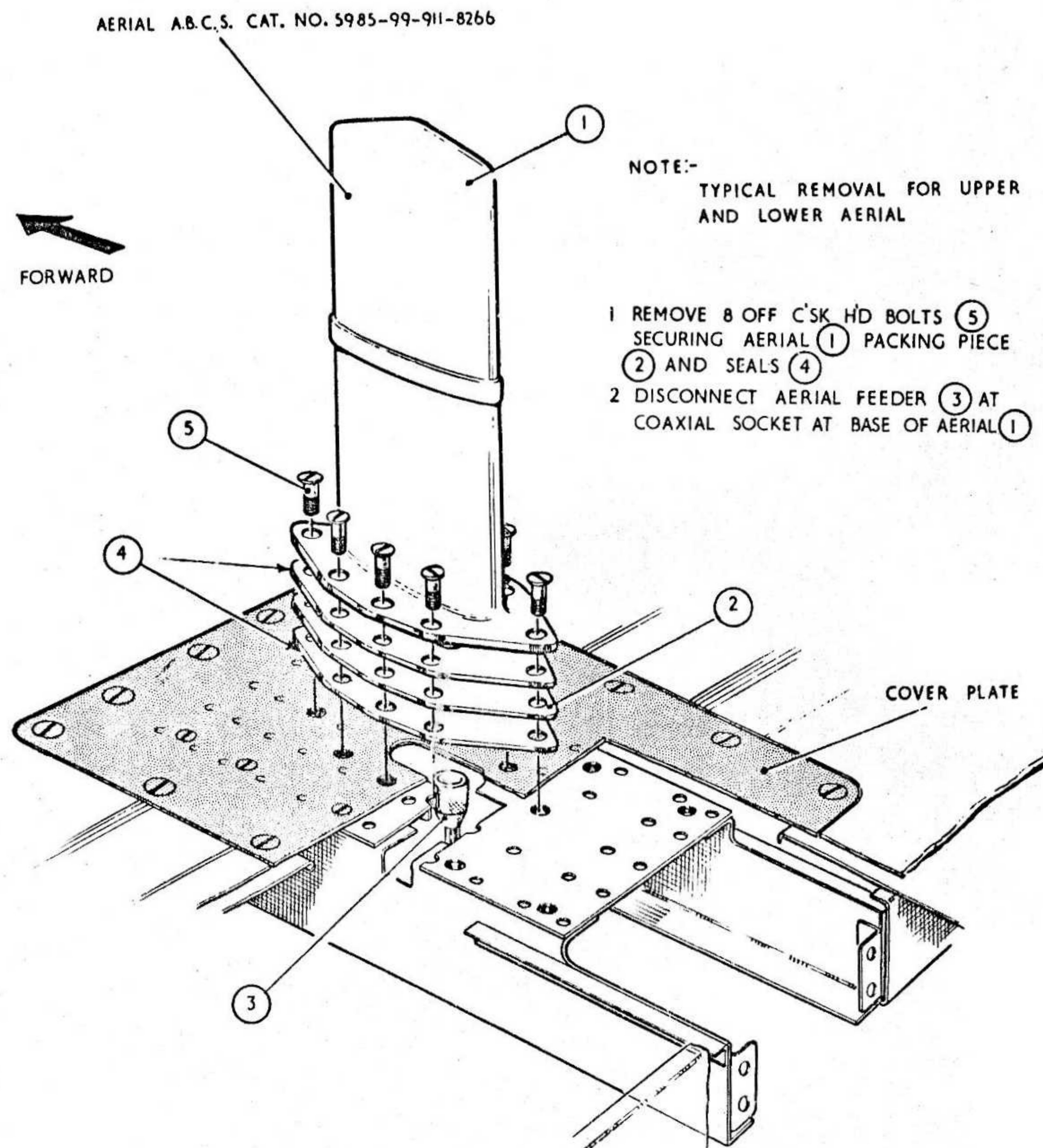


Fig. 14. A.R.I. 23143/1 U.H.F. Aerial removal

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1. REMOVE THE 4 OFF COVER RETAINING SCREWS (5) AND REMOVE THE COVER (7) FROM THE WHIP AERIAL.
 2. DISCONNECT THE AERIAL LEAD (2) AND MATCHING STUB (9) BY REMOVING THE 4 OFF RETAINING SCREWS (3) FROM THE CLAMPS (1) AND UNSCREWING THE FEEDER SECURING NUT (4).
 3. REMOVE THE MOUNTING (15) BY UNSCREWING THE 8 OFF 2 B.A. BOLTS (8) AND (14).
 4. CAREFULLY WITHDRAW AERIAL ROD (11) FROM GROMMET (10). DUST AERIAL WITH FRENCH CHALK IF NECESSARY.
 5. REMOVE 4 OFF 2 B.A. SCREW ASS'YS (12) (13) (16) SECURING AERIAL (6) TO BRACKET (15).
- N.B. ALL SPACES IN AERIAL BOLLARD TO BE FILLED WITH INSULATING COMPOUND SPEC. 998

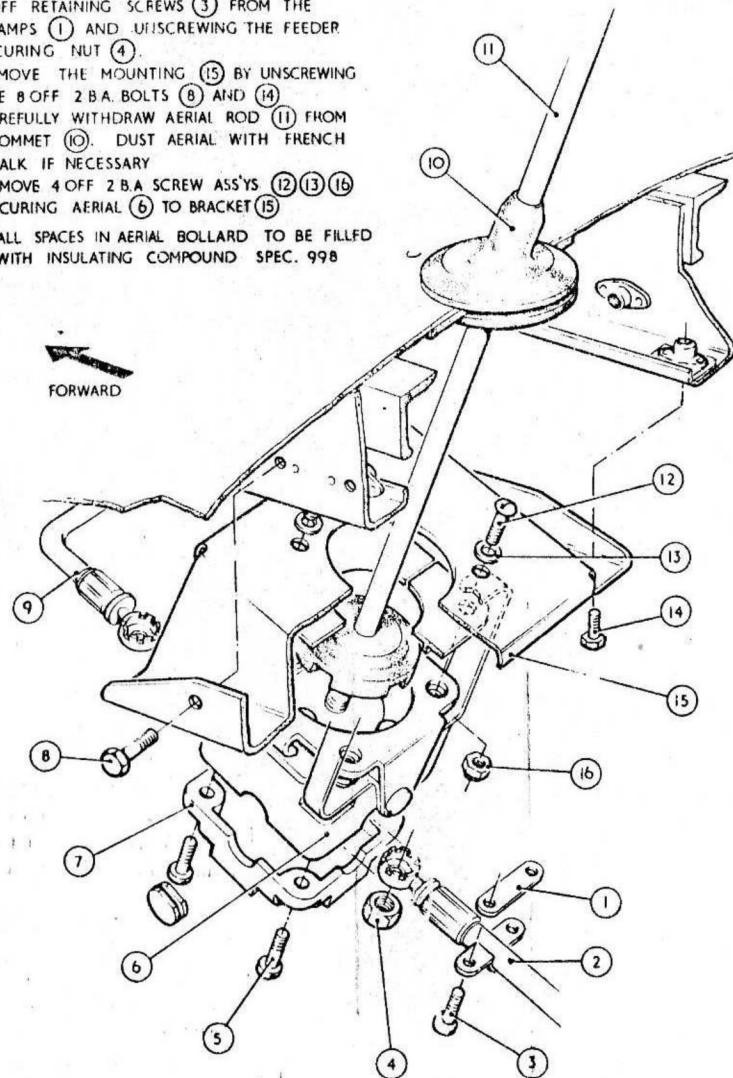


Fig.15. A.R.I. 23143/1 V.H.F. Aerial removal

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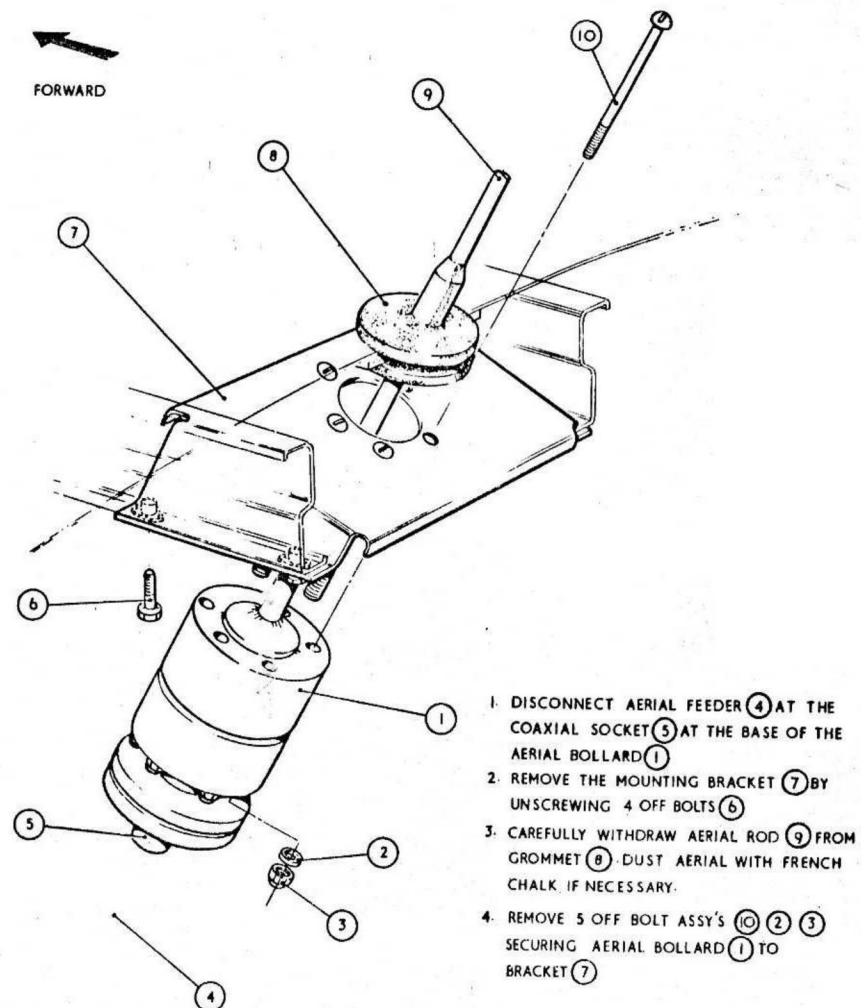


Fig. 16. A.R.I. 23057 U.H.F Aerial removal

TABLE 1
List of Equipment

EQUIPMENT	No. OFF	A.P.No.	VOL	BOOK	SECT.	CHAP.
INSTRUMENT LANDING SYSTEM						
Junction box, Type 157	1)					
Receiver, localiser marker, Type R.1964	1)					
Receiver, glidepath, Type R.1965	1)					
Junction box, Type 164	1)					
Indicator, Type 7	1)	116B-0408-1				
Control unit, Type 705	1)	(Previously 2534E)				
Aerial, glidepath, Type 238	1)					
Aerial localiser, Type 239	1)					
Aerial marker, Type 237	1)					
Voltage regulator, Type 60		4343B	1	1	1	22
Switch N.S.F. Type 8810/B109		4343C	2	1	1	51
Warning lamp, amber, Type 43 C.F.P.		4343E	1	-	18	10
RADIO COMPASS						
Amplifier, R.F. Type 8281	1)					
Amplifier, I.F. Type 8282	1)					
	1)					
Electrical indicator, Type 8720	1)	116B-0102-1				
Control unit, Type 8283	1)	(Previously 2530M)				
Q.E. corrector unit, Ref.No. 10D/20169	1)					
Aerial loop, Type 8280	1)					
Sense aerial	1					

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TABLE 1
List of Equipment (Contd)

EQUIPMENT	No. OFF	A. P. No.	VOL.	BOOK	SECT.	CHAP.
H. F. INSTALLATION						
Transmitter receiver Type M15 (Ref. 110D/ 6043307)	1)	2535F	1			
Radio set control unit Type M53 (Ref. 110L/ 1098405)	1)					
Tuner R.F. Type 490T1 (Ref. 110B/9541665)	1)					
Pre amplifier Type UA 6002	1					
TUNE indicator lamp (Ref. 5CX/5604)	1					
OPERATE indicator lamp (Ref. 5CX/6509)	1					
Switch N. S. F. Type 8810/B109	1	4343C	1	1	1	57
Magnetic switch Type 31A	1	4343C	1	2	4	47
Aerial mast Part No. Z5017	1	2535E	1	1	4	2
Tension unit Type SJWC	1	2535E	1	1	4	3
RADIO ALTIMETER, Mk. 7B						
Transmitter-receiver Type 16098(5841-99- 954-2617)	1)					
Amplifier (5841-99-954-2618)	1)					
Junction box Type 16507 (Ref. 10D/22437)	1)					
Junction box Type 16107 (Ref. 10D/21798)	1)	116B-0203-1				
Control unit Type 16095 (Ref. 10L/16720)	1)	(Previously 2533J)				
Indicator Type 16094 (Ref. 10Q/16459)	1)					
Aerials (Ref. 10D/22920)	2)					
DUPLEXER 5826-99-104-6011)					
Delay unit Type 16119 (Ref. 10D/21798)	1)					
Indicator lamp Red (Ref. 5CX/5950)	1					
Green (Ref. 5CX/5988)	1					
Amber(Ref. 5CX/6260)	1					

RESTRICTED

TABLE 1
List of Equipment (Contd)

EQUIPMENT	No. OFF	A. P. No.	VOL.	BOOK	SECT.	CHAP.
U/V. H. F. INSTALLATION						
Transmitter/Receiver Unit, Type PTR 175	1)	116D-0105-1				
Control unit, Type C1607/4	1)					
Control unit, Type C1607/7	1)					
Interconnecting box ABCS. CAT No. 10AD/9326361	1					
Aerial Upper ABCS. CAT No. 5985-99- 911-8266	1					
Aerial Lower ABCS. CAT No. 5985-99- 911-8266						
Aerial (V. H. F.) Type 1014	1					
Element Antenna Ref. No. 5985-99- 951-3782						
Muting Bias Unit ABCS. CAT No. 5821-99- 943-3247	1					
Aerial Switch Unit Type 1741	1					
Audio Relay, Type 20B No. 1	2	4343C	1	2	3	54
Switch - Tone Ref. 5CW/6433	1					
Switch - Press to Mute Ref. Z. 510503	1					
Switch - Aerial Changeover Ref. 5CW/6430	1					
Switch - Control Changeover Ref. 5CW/5270	1					
Switch - Oak NSF Model 32530 OM1	1	4343C	1	1	1	90

TABLE 1
List of Equipment (Contd)

EQUIPMENT	No. OFF	A. P. No.	VOL.	BOOK	SECT.	CHAP.
U. H. F. STANDBY INSTALLATION						
Transmitter/Receiver Type M6	1)					
Aerial Type 11789	1)					
Battery Type 19/VO/7	1)	116D-0110-1				
Filter Type D170	1)					
Socket Test Type Mk. 4	1					
Switch NSF Type 8810/3109	3	4343C	2	1	1	51
INTERCOMMUNICATION						
Amplifier Type A1961	1	2876E				
Junction Box Type 154	1	2876E	1	Pt. 2		2
Socket Mic/Tel Type 3510	1					
Switch - Push Ref. 5CW/5062	2	4343C				
Lamp - Indicator, Smiths 44CFP	2	4343C	1		18	10
Diode Ref. 1S111	2					
Resistor - 10K OHM Ref. Z212234	1					
Resistor - 220 OHM Ref. Z211242	2					
Resistor - 680 OHM Ref. Z211248	1					

APPENDIX 1 - U.H.F. HOMER INSTALLATION (MOD 4378)

LIST OF CONTENTS

	Para.		Para.
INTRODUCTION ...	1	Meter sensitivity and changeover switch	9
R.F. unit Type 11037 ...	2	Indicator Type 7 ...	10
A.F. unit Type 9635 ...	5	Aerials Type 11421 ...	11
Junction box Type 9636 ...	7	Power supplies ...	12
Junction box Type 7372 and ILS/VP		SERVICING ...	13
junction box ...	8		

LIST OF TABLES

	Table
List of equipment ...	1

LIST OF ILLUSTRATIONS

	Fig.
A.R.I. 18120/2 Equipment location ...	1
A.R.I. 18120/2 (Routeing) ...	2
A.R.I. 18120/2 Aerial removal ...	3

INTRODUCTION

1. This installation, when fitted, is used in conjunction with ARI 23143/1 to provide homing indications at the pilot's and navigator's positions. These indications can be obtained from any c.w., m.c.w. or R/T transmission in the 225-400 MHz (U.H.F.) band to which the transmitter is tuned. The homing indication is in azimuth only and is derived from the phase difference between the signals produced in two separate aerials by the selected transmission.

2. The equipment used in this installation consists of two identical aerials, an R.F. unit, an A.F. unit, a pair of junction boxes Types 9636 and 7372, an indicator Type 7, and a meter sensitivity switch. In addition, an ILS/VP meter junction box and a meter changeover switch are provided to allow the homing information to be switched to the pilot's I.L.S. indicator.

R.F. unit Type 11037

3. The R.F. unit is connected directly to the

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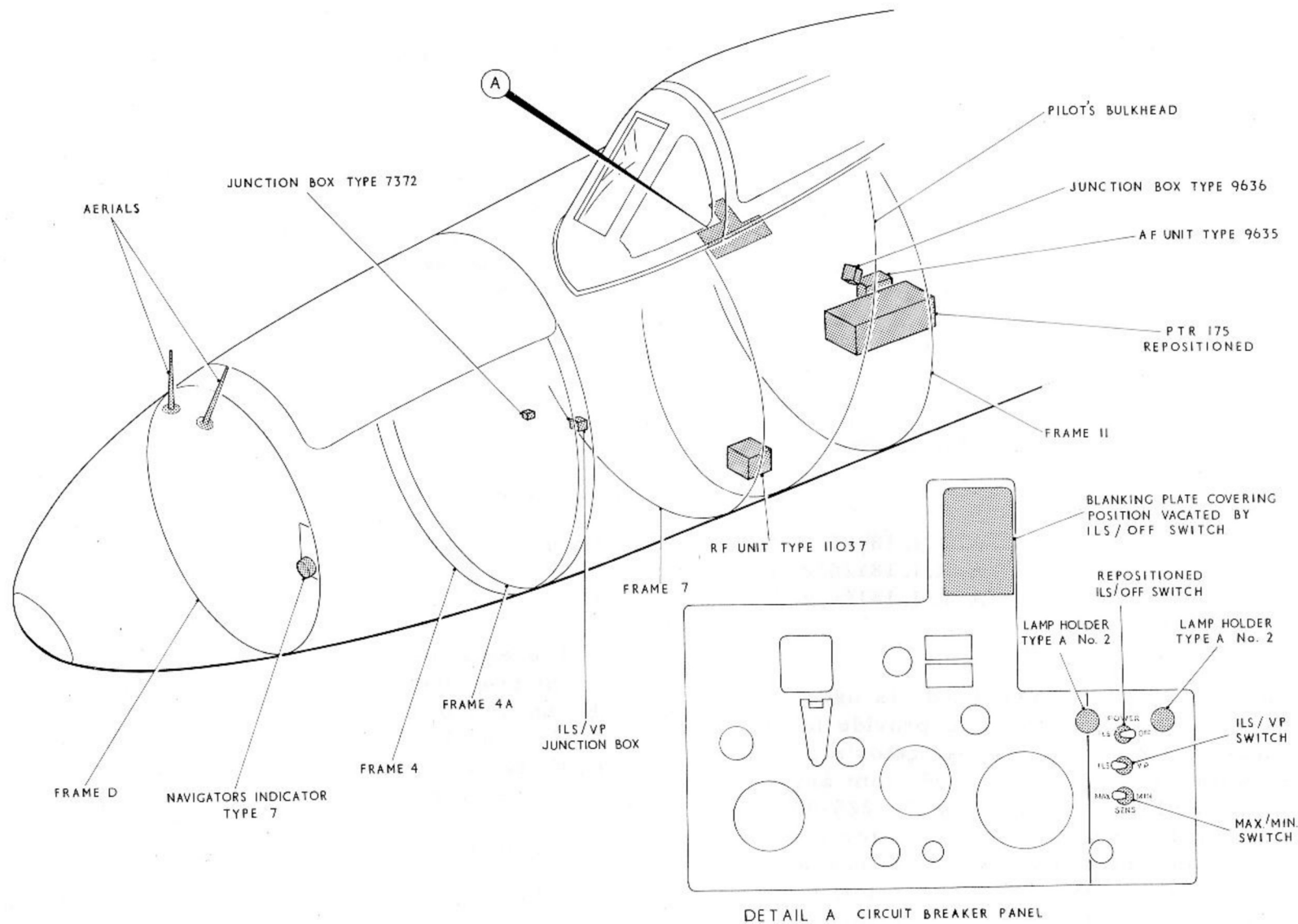


Fig.1. A.R.I. 18120/2 — location

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F/S. 2

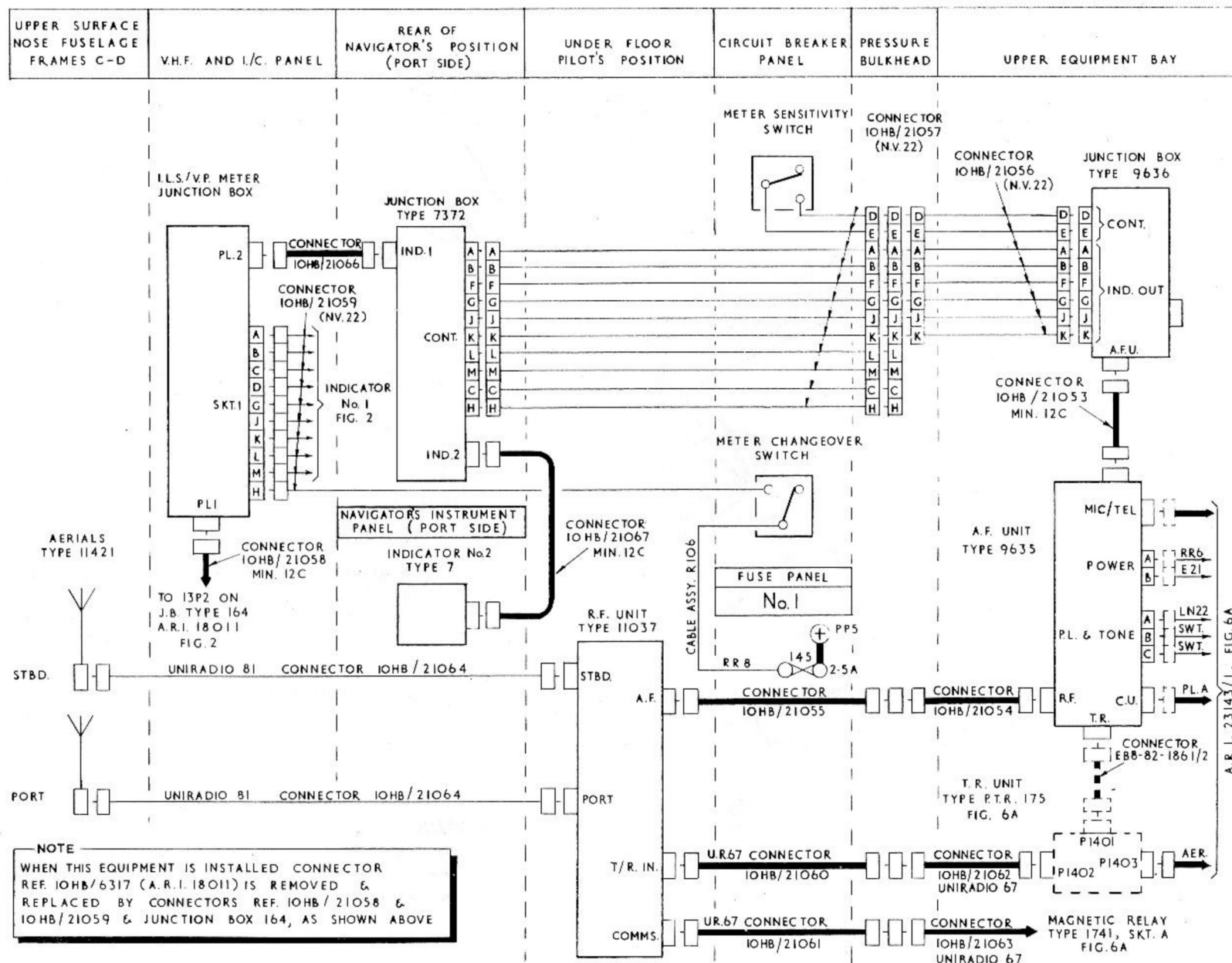
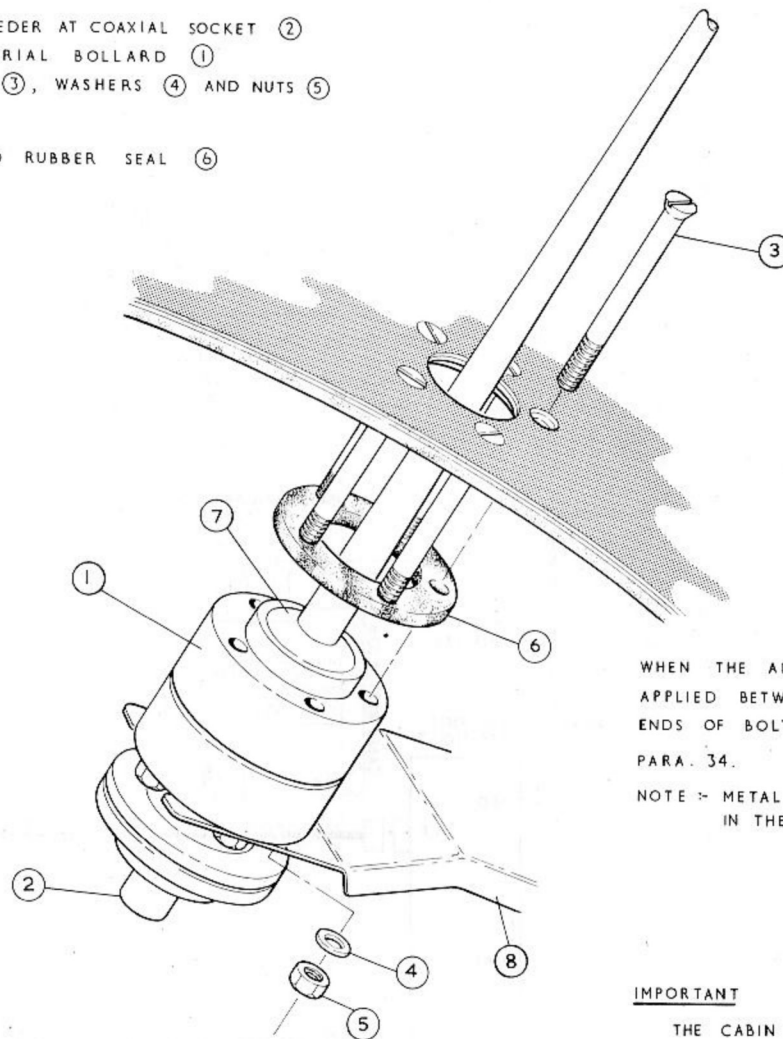


Fig. 2. A.R.I. 18120/2 (routing)

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REMOVAL/ INSTALLATION

1. DISCONNECT AERIAL FEEDER AT COAXIAL SOCKET ②
AT THE BASE OF THE AERIAL BOLLARD ①
2. REMOVE 5 OFF BOLTS ③, WASHERS ④ AND NUTS ⑤
3. DETACH BRACKET ⑧
4. WITHDRAW AERIAL AND RUBBER SEAL ⑥



WHEN THE AERIAL IS REPLACED THE SEALANT IS TO BE APPLIED BETWEEN THE AERIAL SEATING ⑦ AND AT THE ENDS OF BOLTS ③ AS DESCRIBED IN SECT. 3 CHAP. 8 PARA. 34.

NOTE - METAL TO METAL CONTACT MUST BE MAINTAINED IN THE COUNTERSINKS OF ③

IMPORTANT

THE CABIN PRESSURE TEST DESCRIBED IN SECT. 3 CHAP. 8 PARA. 31 MUST BE CARRIED OUT WHENEVER AN AERIAL IS FITTED.

Fig.3. A.R.1.18120/2 Aerial removal/installation

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two homing aerials and contains the delay, modulation and amplification circuitry for processing the received signals before feeding them to the transmitter/receiver (P.T.R. 175) for detection and amplification. The U.H.F. communications aerial connection is disconnected from the transmitter/receiver and routed through the R.F. unit. In this unit an aerial changeover relay disconnects the communications aerial and connects, in lieu, the modulated output from the R.F. to the transmitter/receiver when the function switch on the control unit is turned to A.D.F.

4. The R.F. unit is located under the pilot's floor and is carried on an anti-vibration mounting tray. It is removed from the tray by first loosening the two hollow knurled nuts at the front of the unit and pulling forward to disengage the two spigots from their locating holes at the rear. All connections to the unit are via co-axial connectors and a multi-pin plug on the front panel. Also on the front panel is a valve, for pressurizing the unit, and a silica-gel dessicator cartridge with a window through which the crystals are visible. When in good condition the crystals are light blue, the same colour as the window surround. The cartridge should be changed when the crystals become pink in colour.

A.F. unit Type 9635

5. The demodulated signal from the transmitter/receiver is fed into the A.F. unit which contains the circuitry for converting it into a form suitable to operate the indicator pointers. When the A.F. unit is installed it replaces the ARI.23143/1

interconnecting box Type ARC 52 and the muting bias unit.

6. The A.F. unit is fitted in an anti-vibration mounting tray and is located in the upper equipment bay. It is removed from the tray after first loosening the single hollow knurled nut at the front of the unit and pulling forward to disengage the spigots from the locating holes at the rear. Connections to the unit are via multi-pin plugs and sockets on the front panel. Also on this panel are the test socket, L-R (left-right) CHECK buttons and the PHASE LINK plate. This plate is reversible to indicate IN or OUT and is secured by a single screw. As this installation is used with U.H.F./V.H.F. equipment the link plate should indicate IN.

Junction box Type 9636

7. This junction box is located in the upper equipment bay and is secured by four fixing bolts. It is connected in the indicator output circuit from the A.F. unit to provide a connection point for the meter sensitivity switch and a test point for the indicator display.

Junction box Type 7372 and ILS/VP junction box

8. The indicator output from the previous junction box is connected to junction box Type 7372 which is bolted to the structure at the rear of the navigator's position on the port side. From this box two indicator outputs are taken, one to the navigator's indicator direct and the other, via the ILS/VP

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junction box on the VHF and intercommunication panel, to the pilot's ILS indicator. The ILS/VP junction box replaces the connector between the pilot's indicator and junction box Type 164 in the I. L. S. system when this equipment is installed.

Meter sensitivity and changeover switches

9. These switches are mounted on the circuit breaker panel. The meter sensitivity (MIN/MAX) switch is used to reduce the output from the A.F. unit to the indicators as the aircraft approaches the selected station. When the switch is set to MIN the meter sensitivity is reduced by a ratio of 3 : 1. Operation of the meter changeover switch connects the pilot's indicator to either this system or the I. L. S.

Indicator Type 7

10. This indicator is mounted on the port side of the navigator's instrument panel and is of the same type as the pilot's I. L. S. indicator. The indicator Type 7 is a crossed pointer instrument in which the vertical pointer gives indications in azimuth and the horizontal pointer in elevation. Two flag movements are embodied in the indicator to identify the service in use. Each flag disappears from the appropriate pointer when the received signal is of sufficient strength to give a valid indication. For this installation, only the vertical pointers are used, the horizontal pointer on the pilot's indicator being used for I. L. S. glideslope indications only.

Aerials Type 11421

11. The two aerials are mounted on the top surface of the nose fuselage between frames C and D. Each aerial consists of a rod element 9 in. long moulded into a p.t.f.e. insulator which is, in turn, bonded into a metal base. Moulded into the base is a short-circuiting stub to provide matching into the feeder, connection to which is by means of a coaxial socket.

Power supplies

12. When this equipment is installed and the A.F. unit replaces the interconnecting box Type ARC 52 the A.R.I.23143/1 power supplies are plugged into the A.F. unit so that they are shared by both installations. A separate 28V d.c. power supply controlled by the meter changeover switch is taken from a 2.5 amp fuse (No.145) in fuse panel No.1 to operate the meter changeover relay.

SERVICING

13. The general instructions given in Chap.1 for servicing the wireless installation should be observed when servicing this equipment. As the operation of this equipment is dependent on the correct functioning the U/VHF system it is necessary that the ARI 23143/1 is functionally tested as described in A.P.116D-0113-1 before commencing functional tests on the ARI 18120/2. Testing and fault finding procedures for the ARI 18120/2 installations as given in A.P.116B-0301-1.

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Table 1

List of Equipment

Equipment	No. off	A.P.No.	Part	Chap.
R.F. unit Type 11037)	1			
A.F. unit Type 0635)	1			
Junction box Type 9336)	1	116B-	1	
Junction box Type 9672)	1	0301-1		
Aerial Type 11421)	2			
ILS/VP junction box				
Switch (NSF) Type SPST				

LIST OF CONTENTS

	Para		Para
Introduction	1	TACAN	
DESCRIPTION		General	25
General	2	Transmitter-receiver, Type 9171	26
Power supplies	3	Coupling unit, Type 9546 or 11920	27
DOPPLER 72		Control unit, Type 9273 or 7750	28
General	4	Indicator, Type 9547	29
Transmitter/receiver and antenna assembly	5	Aerial	30
Groundspeed and drift indicator	7	SERVICING	31
Controls	8	Visual check	33
RADIO ALTIMETER, Mk.6A		TESTING	
General	9	Doppler 72	34
Transmitter-receiver, Type 7923	11	Radio altimeter Mk.6A	35
Indicator, Type 7921	12	I.F.F./SSR	36
Tuning switch	13	Tacan	37
Aerials, Type 7165	14	REMOVAL	38
I.F.F./SSR			
General	15		
Transponder	16		
Control unit	17		
I.F.F. FAIL lamp	19		
Aerial switching unit	20		
Aerial test switch	21		
Aerials	22		
Power supplies	23		
Operation	24		

LIST OF TABLES

	Table
List of equipment ...	1

LIST OF ILLUSTRATIONS

	Fig.		Fig.
Radio equipment, location ...	1	ADF/TACAN relay unit - wiring diagram	6
1 R.I. 5972/3 (routeing) ...	2	A.R.I. 5972/3 aerial removal ...	7
A.R.I. 18090 (routeing) ...	3	A.R.I. 18090 aerial removal ...	8
A.R.I. 23134 (routeing) ...	4	A.R.I. 23134 and A.R.I. 18107/2 aerial removals	9
A.R.I. 18107/2 (routeing) ..	5		

Introduction

1. This chapter describes the various radar installations and provides in situ servicing and testing information together with instructions (where not obvious) for the removal of equipment from the aircraft. The location of the radar equipment is shown in fig. 1.

DESCRIPTION*General*

2. The installations fitted in the aircraft consist of the following:-

A.R.I. 5972/3	-	Doppler 72
A.R.I. 18090	-	Radio altimeter Mk. 6A
A.R.I. 23134	-	I.F.F./ S.S.R
A.R.I. 18107/2	-	Tacan

Power supplies

3. The d.c. supplies for the radar installations are taken from the aircraft distribution system as described in Sect.5, Chap.1, Group P. The single phase 115V, 400Hz supply for A.R.I. 5972/3 is taken from phase A of the three-phase inverter No. 3. Single-phase inverters No. 5 & 6 provide a 115V, 1600Hz supply for A.R.I. 18090 and a 115V, 400Hz supply for A.R.I. 18107/2 respectively. Details of these a.c. supplies are given in Sect.5, Chap.1, Group R & S. A.R.I. 23124 derives its d.c. supply from bus-bar P10 (Sect.5, Chap.1, Group P) and its a.c. from its own 115V 400Hz inverter as described in para 23.

DOPPLER 72*General*

4. A.R.I. 5972/3 is an airborne navigation equipment operating

in the J Band (13,320MHz). The Doppler principle is used to provide signals to the Master Reference Gyro Mk. 3 and the TANS computer (Sect.5, Chap.2, Group G) which represent aircraft velocity along, across and vertical which respect to aircraft axes. This information is also displayed on the groundspeed and drift indicator.

Transmitter/receiver and antenna assembly

5. This unit contains the electronic circuitry and the fixed antenna systems; the circuitry being mounted on top of the separate transmission and reception slotted wave guide antennae. The antennae are separated by a metal septum plate and have individual radomes which enable the whole unit to be flush mounted (by 22 countersunk screws) in the port underwing skin. Two locating dowels are provided on the unit mounting flange to prevent the incorrect insertion of the equipment and to eliminate the necessity for re-alignment upon removal and replacement of the unit. Cable connection is via a single 61-way plug situated on the star-board rear corner of the unit.

6. The outputs from the transmitter/receiver and antenna assembly are as follows:-

(a) Velocity along the heading	(g) Resolver across
(b) Velocity across the heading	(h) Along drive
(c) Sense across	(i) Drift drive
(d) Velocity up	(j) G/S feedback
(e) Velocity down	(k) Drift feedback
(f) Resolver along	(l) Memory signal

Outputs (a) to (e) are coupled with the TANS computer and outputs (f) to (l) are provided to drive the groundspeed and drift indicator.

Groundspeed and drift indicator

7. This instrument which is mounted on the navigators instrument

Key to fig 1 - Radar equipment - location

1. Tacan indicator Type 9547.
2. Tacan repeater indicator.
3. Radio altimeter aerials Mk.6A Type 7165.
4. IFF/SSR upper aerial Type 100B.
5. IFF/SSR static inverter Type E182, relay and fuse block.
6. Tacan transmitter - receiver Type 220C and coupling unit Type 9546 or 11920.
7. IFF/SSR aerial switch unit Type T16941.
8. IFF/SSR transmitter - receiver Type 16928.
9. Radio altimeter junction box.
10. IFF/SSR lower aerial Type 100B.
13. Doppler transmitter - receiver and antenna assembly Type 5841-99-0859.
14. Tacan aerial Type 100B.
15. IFF/SSR control unit Type 16929.
16. Radio altimeter indicating unit CRT Type 7921.
17. Doppler ON-OFF switch.
18. Doppler NORMAL-TEST switch.
19. Groundspeed and drift indicator Type 5841-99-639-1163.
20. Radio altimeter tuning switch.
21. Radio altimeter master switch.
22. IFF/SSR failure warning switch.
23. Selector switch Q.C. - TACAN - R.C.

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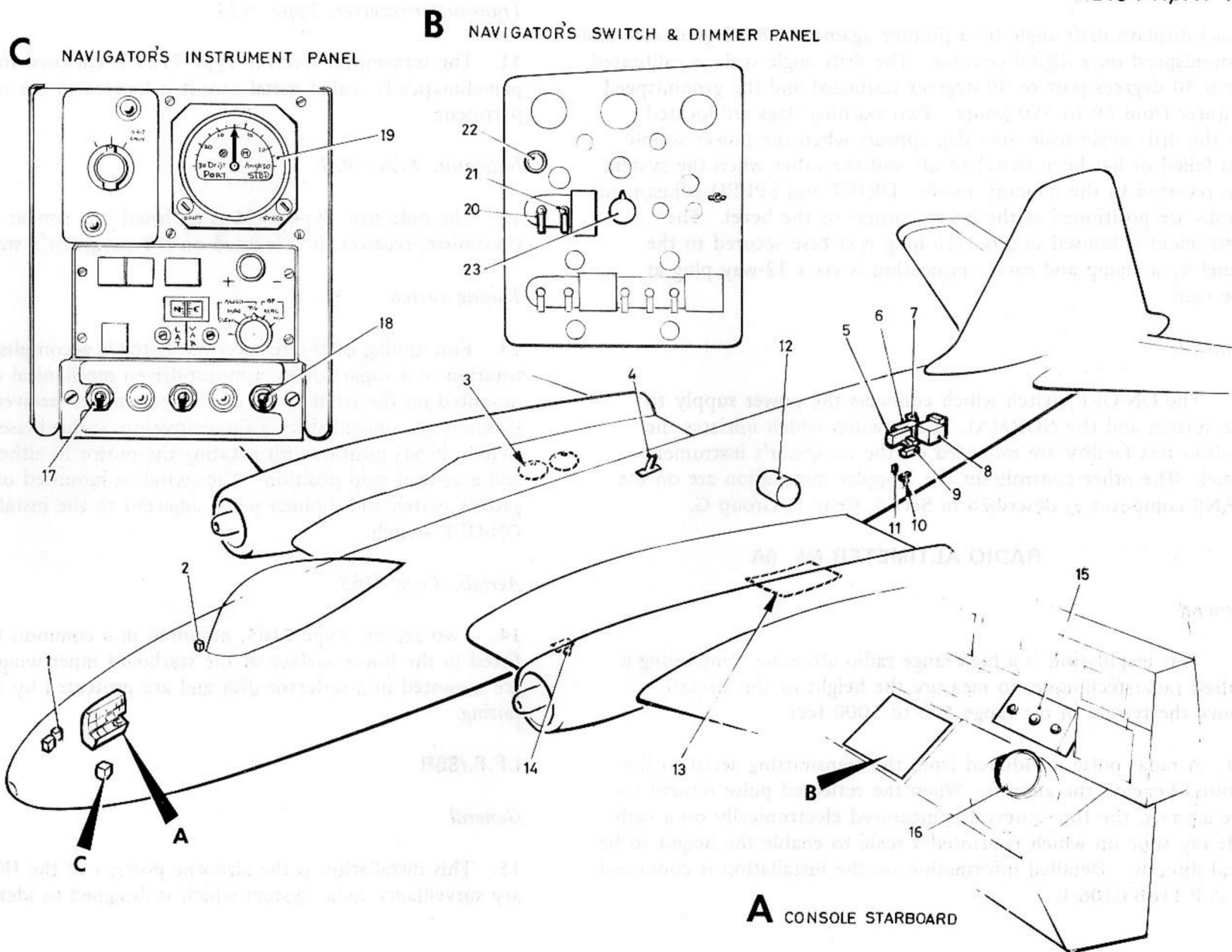


Fig.I. Radar equipment location.

(MDD 49901)

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panel displays drift angle by a pointer against a 180 degree scale and groundspeed on a digital counter. The drift angle scale is calibrated from 30 degrees port to 30 degrees starboard and the groundspeed counter from 80 to 550 knots. Two warning flags are located on the drift angle scale, one flag appears when the power supply has failed or has been switched off and the other when the system has reverted to the memory mode. DRIFT and SPEED adjustment knobs are positioned at the lower corners of the bezel. The instrument is housed in a 6 3/10 long ATI case secured to the panel by a clamp and cable connection is via a 32-way plug at the rear.

Controls

8. The ON-OFF switch which connects the power supply to the system and the NORMAL-TEST switch which initiates the built-in test facility are mounted on the navigator's instrument panel. The other controls for the Doppler installation are on the TANS computer as described in Sect.5, Chap.2, Group G.

RADIO ALTIMETER Mk. 6A

General

9. This installation is a high-range radio altimeter, employing a pulsed radar technique, to measure the height of the aircraft above the terrain in the range 500 to 5000 feet.

10. A radar pulse is radiated from the transmitting aerial to the ground beneath the aircraft. When the reflected pulse returns to the aircraft, the time interval is measured electronically on a cathode ray tube on which is printed a scale to enable the height to be read directly. Detailed information on the installation is contained in A.P.116B-0206-1.

Transmitter-receiver, Type 7923

11. The transmitter-receiver Type 7923 is enclosed in an airtight pan-climatically sealed metal can; it is located in the radar compartment.

Indicator, Type 7921

12. The indicator Type 7921 is enclosed in a similar case to the transmitter-receiver; it is located on the navigator's starboard console.

Tuning switch

13. Fine tuning of the receiver oscillator is accomplished by the rotation of a capacitor by a motor-driven mechanical drive unit mounted on the front cover of the transmitter-receiver. The motor is remotely controlled by a three-position, spring-biased to off switch; it has positions for rotating the motor in either direction and a central stop position. The switch is mounted on the navigator's switch and dimmer panel adjacent to the installation master ON-OFF switch.

Aerials, Type 7165

14. Two aerials, Type 7165, mounted in a common bracket are fitted in the lower surface of the starboard inner wing. The aerials are mounted in a reflector dish and are protected by a glass-fibre fairing.

I.F.F./SSR

General

15. This installation is the airborne portion of the IFF/SSR secondary surveillance radar system which is designed to identify as friendly

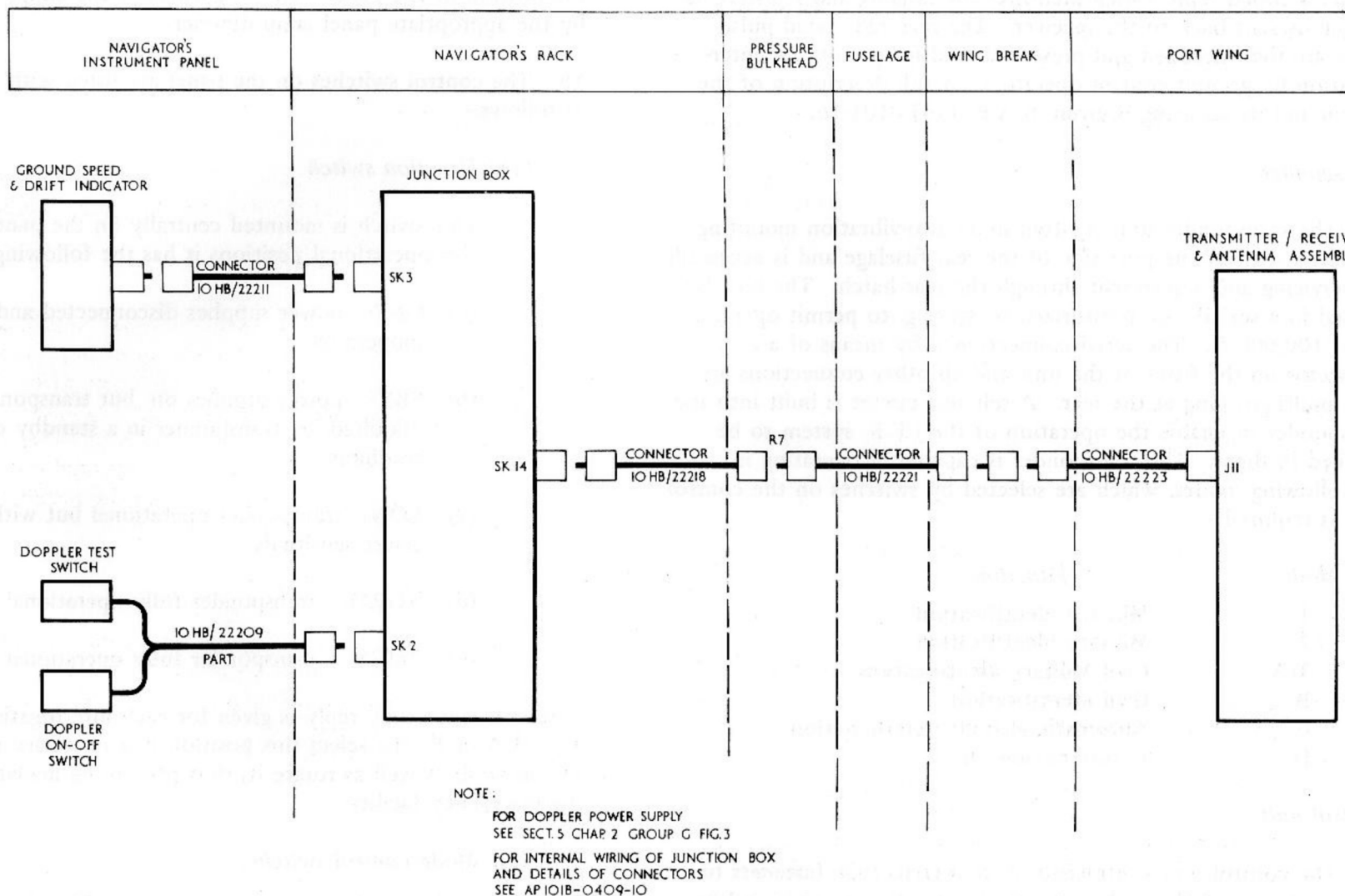


Fig 2. A.R.I. 5972/3

◀ (MOD 4990) ▶

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or enemy aircraft those targets detected by the interrogating radar. The system employs a ground based pulse transmitter which interrogates the target. If the target is fitted with the appropriate transponder a coded reply which identifies the aircraft and registers its altitude is sent back to the receiver. The received coded pulse trains are then decoded and presented to display units for interpretation by ground control operators. A full description of the system and its servicing is given in A.P. 114J-0101-16.

Transponder

16 The transponder unit is fitted in an anti-vibration mounting tray on a shelf at the port side of the rear fuselage and is accessible for servicing and adjustment through the rear hatch. The unit is housed in a sealed case pressurized to 4p.s.i.g. to permit operation up to 100,000 ft. The aerial connection is by means of a co-axial connector on the front of the unit and all other connections are via a multi-pin plug at the rear. A self test circuit is built into the transponder to enable the operation of the I.F.F. system to be checked in flight. The transponder is capable of operating in the following modes, which are selected by switches on the control unit as required:-

<i>Mode</i>	<i>Function</i>
1	Military identification
2	Military identification
3/A	Civil/Military identification
B	Civil identification
C	Automatic altitude determination
D	Future expansion

Control unit

17 The control unit is attached by four Dzus type fasteners to a mounting bracket above the navigator's starboard console and has, mounted on it, the switches control the general operation of the

transponder. All connections to the unit are via the 55-way connector at the rear. Panel lighting is two lamps for general edge lighting and eight lamps illuminating the code selector switches at the bottom of the panel. The brightness of the lamps is controlled by the appropriate panel lamp dimmer.

18. The control switches on the panel are listed with their functions as follows:-

(1) Function switch

This switch is mounted centrally on the panel and in its five operational positions it has the following functions:-

- (a) OFF: power supplies disconnected and transponder inoperative.
- (b) SBY: power supplies on, but transponder replies inhibited i.e. transponder in a standby condition of readiness.
- (c) LOW: transponder operational but with reduced receiver sensitivity.
- (d) NORM: transponder fully operational on all modes.
- (e) EMGY: transponder fully operational on all modes.

A special emergency reply is given for each interrogation on modes 1, 2, 3/A or B. To select this position it is necessary to push the switch knob as well as rotate it; thus preventing inadvertant use of the emergency facility.

(2) Mode control switches

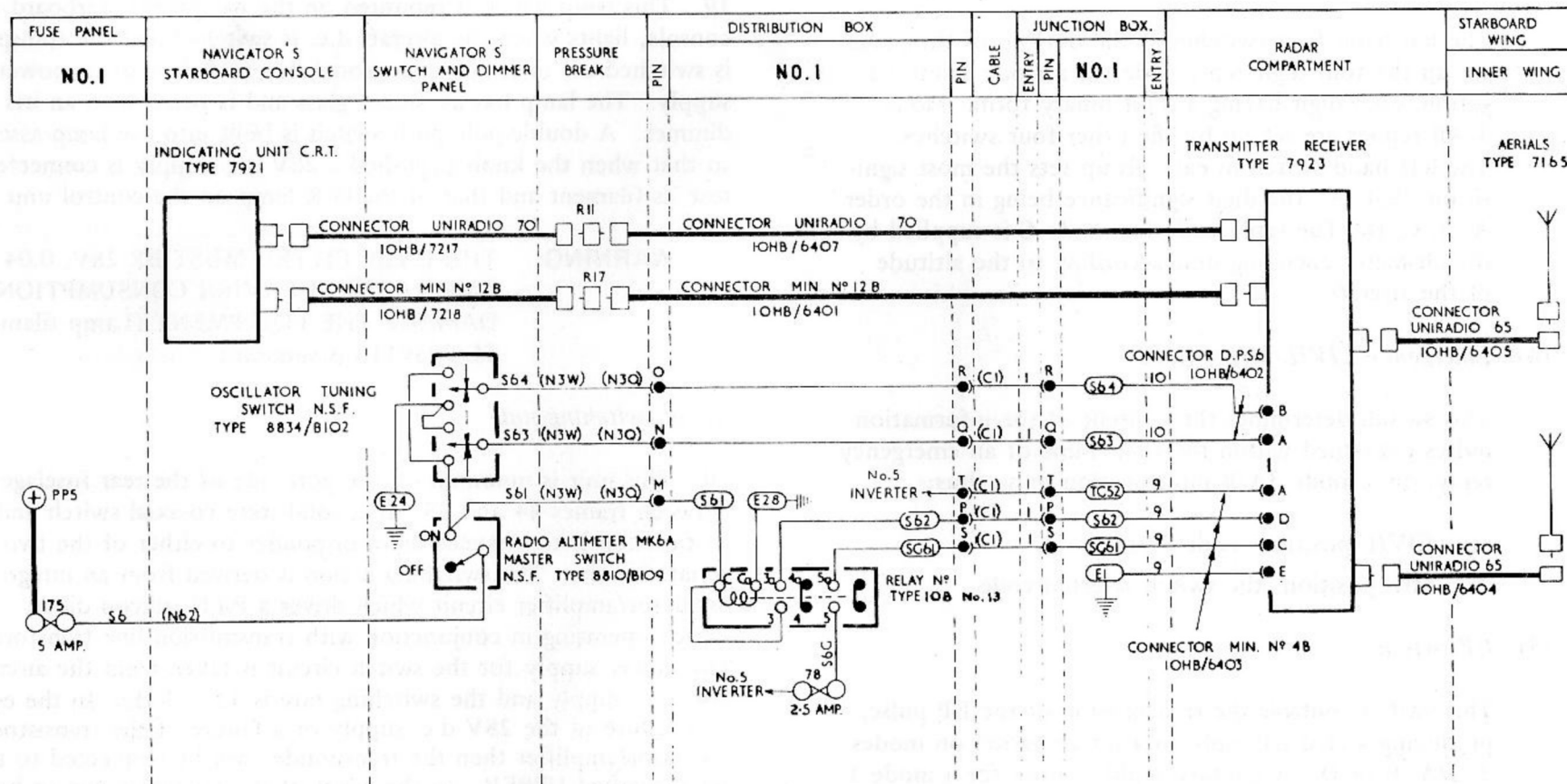
These switches (four toggle and one rotary) control the

F.S./S

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A.P. 101 B-0409-1, Sect. 6, Chap. 2

AL134 April 78



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FIG. 3 A. R. I. 18090 (routing)

RESTRICTED

operation of the memory bistables in the transponder. Any one of the switches can be operated allowing an incoming interrogation on the corresponding mode (listed in para. 16) to produce a transponder reply).

(3) *Code selection switches*

The left-hand four switches at the bottom of the panel set up the four digit reply code for a mode 1 interrogation, each digit having a 3-bit binary form. Mode 3/AB replies are set up by the other four switches. The left hand switch in each group sets the most significant digit 'A', the digit significance being in the order A, B, C, D. The reply code for mode C is supplied by the altimeter encoding unit according to the altitude of the aircraft.

(4) *Emergency CIVIL/MIL switch*

This switch determines the content of the information pulses contained within the first frame of an emergency reply, on a mode 3A/B interrogation only, thus:-

- (a) CIVIL position: code 7700
- (b) MIL position: the switch selected code

(5) *I/P switch*

This switch controls the transmission of the I/P pulse, producing a civil I/P reply to a interrogation on modes 2, 3/A, B or D. A military reply is given for a mode 1 interrogation.

(6) *PRESS TO TEST switch and lamp*

This is a combined push switch and indicator lamp,

usually referred to as the 'self-test' push button and O K lamp. If, when the button is pressed, the transponder operation is satisfactory the lamp will light.

I.F.F. FAIL lamp

19. This lamp which is mounted on the navigator's starboard on console, lights when the aircraft d.c. is switched and the transponder is switched off or is not operational due to failure of its power supply. The lamp has an amber glass and is fitted with an iris type dimmer. A double-pole push switch is built into the lamp assembly so that when the knob is pushed a 28V d.c. supply is connected to test its filament and that of the O K lamp on the control unit.

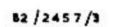
WARNING: THE LAMP FITTED MUST BE 28V, 0.04 AMP RATING..HEAVIER CONSUMPTION WILL DAMAGE THE EQUIPMENT (Lamp filament 5L/9959118 is suitable).

Aerial switching unit

20. This unit is mounted on the port side of the rear fuselage between frames 34 and 35. It is solid-state co-axial switch and its function is to connect the transponder to either of the two aerals in turn. The switching action is derived from an integral oscillator/amplifier circuit which drives a P.I.N. silicon diode switch operating in conjunction with transmission line transformers. The power supply for the switch circuit is taken from the aircraft 28V d.c. supply and the switching rate is 42 ± 3 Hz. In the event of a failure of the 28V d.c. supply or a failure of the transistor oscillator/amplifier then the transponder will be connected to the aerial marked UPPER. In the event of the failure of one or both of the switching diodes, then the transponder will be connected to the aerial socket marked LOWER.

Aerial test switch

21. A three position switch is mounted with a 28V d.c. test



socket on the port side of the rear fuselage between frames 33 and 34. The switch is provided with a guard to lock it in the centre LIGHT position. When the guard is lifted the toggle may be moved to UPPER or LOWER to test the operation on either aerial.

Aerials

22. Two omni type aerials are fitted so that they protrude through the skin sheeting, one attached to the upper surface of the centre section between frames 23 and 24 and the other to undersurface of the rear fuselage between frames 35 and 36.

Power supplies

23. The 28V d.c. power supplies for the equipment are taken from the essential services bus-bar P.10. The 115V, 400 Hz supply is provided by a static inverter Type E 182 mounted in the rear fuselage with the transponder unit. The a.c. output from the inverter energizes a relay Type BRACIB-1C-1 to connect it to the transponder. Failure of the inverter will de-energize the relay causing it to connect the transponder to an alternative 115V, 400 Hz supply from No. 6 inverter (Sect. 5, Chap. 1, Group R and S).

Operation

24. When the mode control and code selection switches have been set up as necessary to meet operational requirements the equipment is operated as follows:

- (1) Set function switch to SBY
- (2) Press TEST button on control unit and check that I.F.F. FAIL lamp flashes.

- (3) After a warming-up period of not less than one minute set function switch to NORM.
- (4) Press TEST button and check that I.F.F. FAIL lamp goes out and green lamp in TEST button lights.
- (5) Turn function switch to OFF and check that the I.F.F. FAIL lamp remains lit.

The system is then ready for use and the function switch is turned to the required setting.

TACAN

General

25. The TACAN navigational system provides the navigator with distance and bearing information, indicating the position of the aircraft with respect to the surface beacon to which his equipment has been tuned. Presentation of the information is continuous and both bearing and distance indications are given on a single indicator. Detailed information on the installation is given in A.P.116B-0304-1.

Transmitter-receiver, Type 9171

26. The transmitter-receiver is secured to a supporting structure on the floor in the rear fuselage.

Coupling unit, Type 9546 or 11920

27. The coupling unit is mounted in the rear fuselage, adjacent to the transmitter-receiver. The unit comprises a case containing two complete servo links and their associated gear trains to operate the indicator. One servo link is used to provide bearing data, while the other provides distance information.

Control unit, Type 9273 or 7750

28. The control unit is mounted on the navigator's starboard console. The volume control incorporated with the unit is used to adjust the level of the identity tone in the navigator's headset.

Indicator, Type 9547

29. Visual presentation of the TACAN bearing and distance information is by means of two similar indicators, one mounted on the navigator's starboard instrument panel and the other on the pilot's instrument panel. The pilot's indicator may also be connected to the radio compass system, by means of a changeover switch, to allow ADF bearing information to be applied to it as an alternative. For further information on the changeover circuit, reference should be made to Chap.1 para.2.

Aerial

30. An aerial, omni Type 100B is used on this installation; it is mounted protruding through the aircraft skin on the lower surface of the centre fuselage.

SERVICING

WARNING: REFERENCE SHOULD BE MADE TO THE LETHAL WARNING CARD AT THE BEGINNING OF THIS VOLUME PRIOR TO SERVICING OPERATIONS INVOLVING RADAR EQUIPMENT.

31. Servicing of the radar equipment is normally limited to a general visual examination of all components as detailed in para.38.

32. When testing for continuity, checking supplies, etc., reference should be made to the relevant routing charts.

Visual check

33. Examine all components, mounting and trays for cleanliness, damage and security of attachment. Examine all connector cables, paying particular attention to plug and socket connections for ingress of oil or dirt, fatigued or corroded pins and any damage or frayed wires at soldered or crimped joints.

TESTING*Doppler 72*

34. This installation is normally tested in conjunction with the Navigation and Target Acquisition System as described in Sect.5, Chap.2, Group G. It may, however, be tested separately as follows.

- (1) Attach a radar absorbent screen Type 9877 to the septum plate of the transmitter/receiver and antenna assembly.

Note...

If this screen is not used there is a possibility that the T/R test may not give correct indications.

- (2) Operate the appropriate dimmer switch to ensure that there is adequate illumination of the groundspeed and drift indicator dial. Set the LAND-SEA switch on the TANS computer to LAND.
- (3) Set the Doppler ON-OFF switch (on the navigator's instrument panel) to ON and check that the striped flag on the ground speed and drift indicator has disappeared and has been replaced by a plain black disc.
- (4) Depress the system NORMAL-TEST switch (on the

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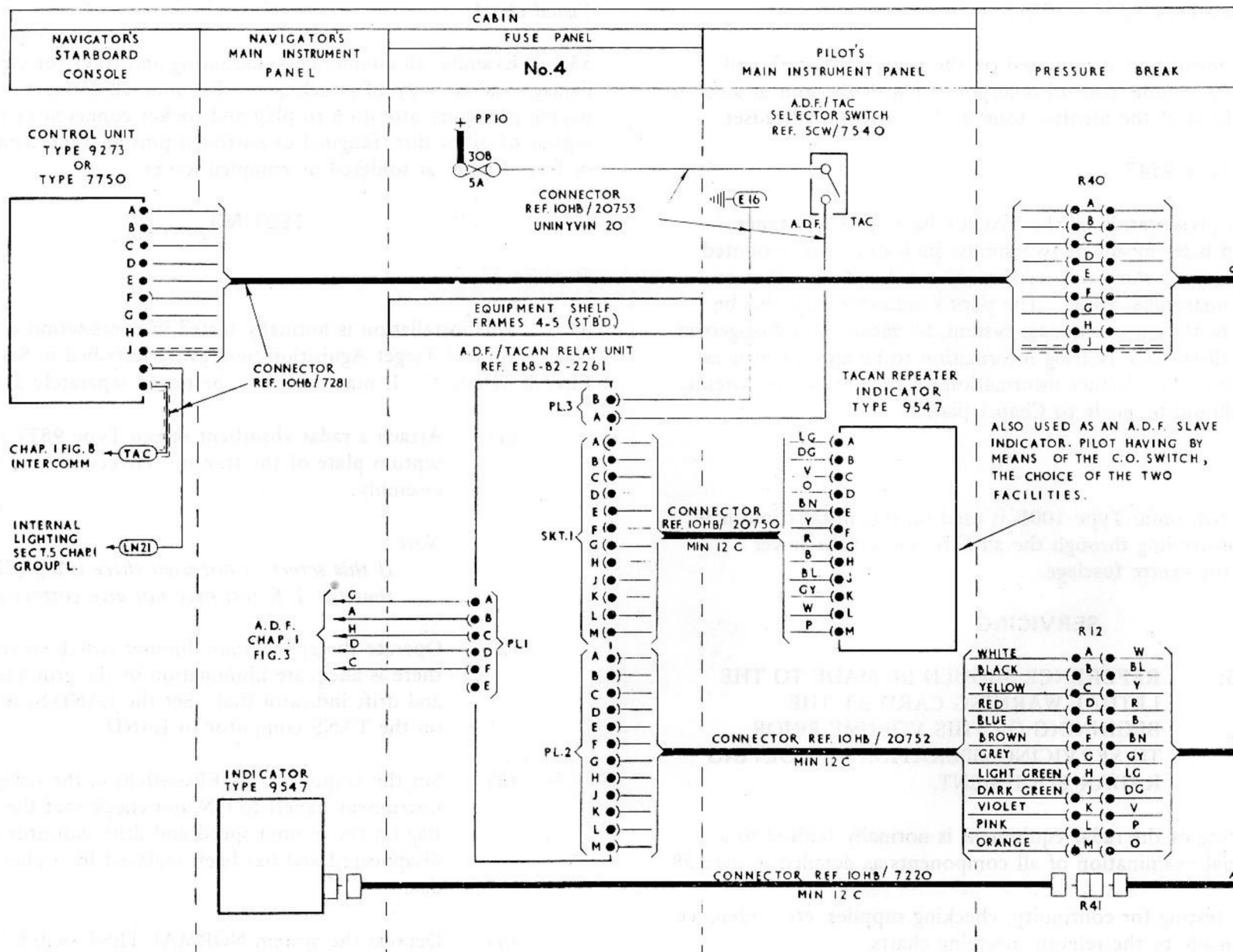


Fig. 5 (I). A.R.I. 18107/2 (routeing)

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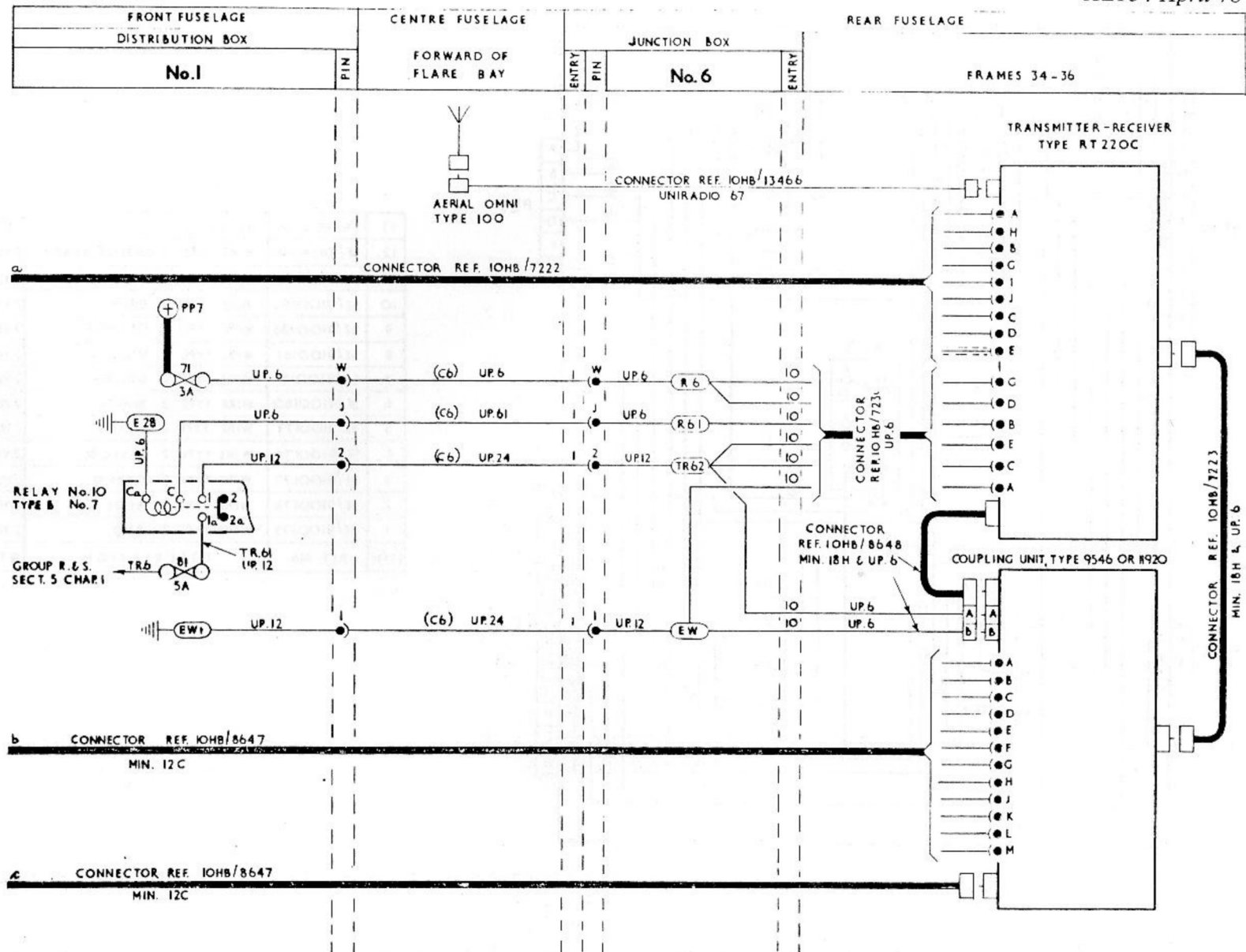
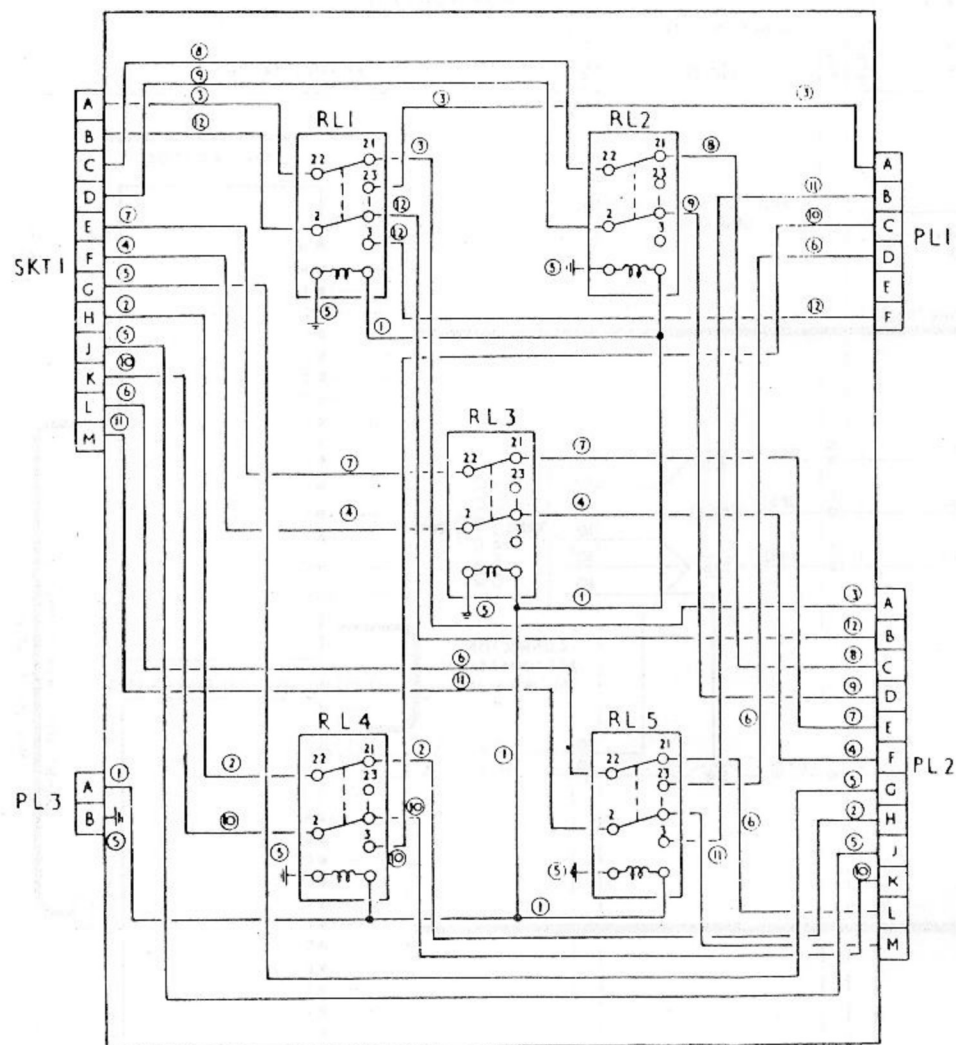


Fig. 5 (2). A.R.I. 18107/2 (routing)

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ITEM	REF No	DESCRIPTION	QTY
13	5K/9107065	SLEEVES	67
12	5E/9424076	WIRE TYPE 2 GREEN/ BLACK	2YDS.
11	5E/9100185	WIRE TYPE 2 PINK	2YDS.
10	5E/9100184	WIRE TYPE 2 GREY	2YDS.
9	5E/9100183	WIRE TYPE 2 ORANGE	2YDS.
8	5E/9100182	WIRE TYPE 2 VIOLET	2YDS.
7	5E/9100181	WIRE TYPE 2 BROWN	2YDS.
6	5E/9100180	WIRE TYPE 2 WHITE	2YDS.
5	5E/9100179	WIRE TYPE 2 BLACK	2YDS.
4	5E/9100178	WIRE TYPE 2 YELLOW	2YDS.
3	5E/9100177	WIRE TYPE 2 GREEN	2YDS.
2	5E/9100176	WIRE TYPE 2 BLUE	2YDS.
1	5E/9100175	WIRE TYPE 2 RED	2YDS.

Fig 6 ADF/TACAN relay unit — (wiring diagram)

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navigator's instrument panel) and observe the ground speed and drift indicator. Within 20 seconds the memory M flag should have disappeared to be replaced by a plain black disc.

- (5) With the NORMAL-TEST switch operation maintained, within a further 60 seconds the ground speed counters on the groundspeed and drift indicator should indicate 704 ± 5 knots, and the drift pointer should indicate 00 ± 10 .
- (6) Keeping the NORMAL-TEST switch depressed set the LAND/SEA switch to SEA. The groundspeed reading should increase by 14 ± 3 knots.
- (7) Still in the TEST mode, reset the LAND/SEA switch to LAND and note that the ground speed returns to its original reading. Release the NORMAL-TEST switch and return the ON-OFF switch to OFF.

Radio altimeter, Mk. 6A.

35. This installation should be tested in accordance with the procedure detailed in A.P.116B-0206-1.

I.F.F./SSR(ARI 23134)

36. This installation is to be set up and tested in accordance with the instructions contained in A.P.114J-0101-16 Vol.1, Pt.2 for overall checking of the primary power supplies and equipment functioning.

Note...

For information on height encoding circuits refer to Sect. 5, Chap. 2 Group F.

Tacan

37. Information regarding the setting up and testing of this installation will appear in A.P.116B-0304-1

REMOVAL

38. The bulk of the radar equipment is fitted in standard racking in an unobstructed position to allow for easy access and removal, consequently no additional information is required. When replacing cable connectors, great care must be taken to ensure that they are correctly mated and locked.

39. The method of removing the aerials for the Doppler installation, radio altimeter Mk.6A, I.F.F./SSR and TACAN installation, is indicated on figs. 7, 8 and 10 respectively.

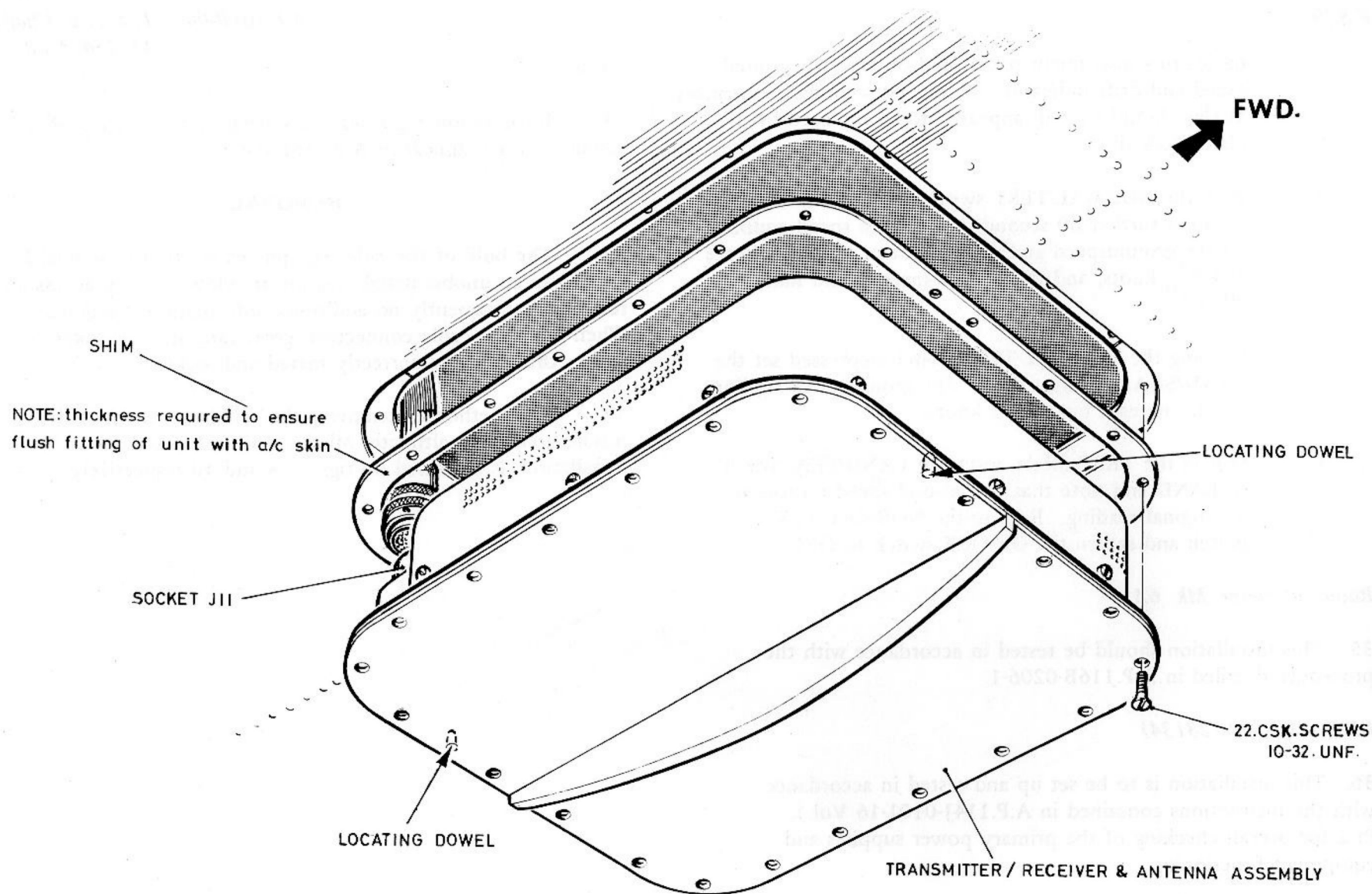


Fig.7.ARI.5972/3. Aerial removal.
 (MOD 4990)
RESTRICTED

- 1 DISCONNECT THE AERIAL LEADS (1) FROM THE AERIALS (2)
(ACCESS IN WING UPPER SURFACE)
- 2 REMOVE THE ONE HUNDRED EIGHT 1/8 BSF BOLTS (3) AND
DETACH THE DIELECTRIC PANEL (POINTS 'B')
- 3 REMOVE THE TWENTY TWO 2BA BOLTS (4) FROM THE AERIAL
MOUNTING ATTACHMENTS (POINTS 'A') AND LOWER THE COMPLETE ASSEMBLY
- 4 REMOVE THE TWENTY FOUR 4BA BOLTS (5) FROM THE AERIAL
REFLECTORS AND DETACH THE AERIALS FROM THE BRACKET

NOTE
THE AERIAL ELEMENTS ARE TO
BE SET TO POSITION 5 ON
ASSEMBLY FOR INSTALLATION

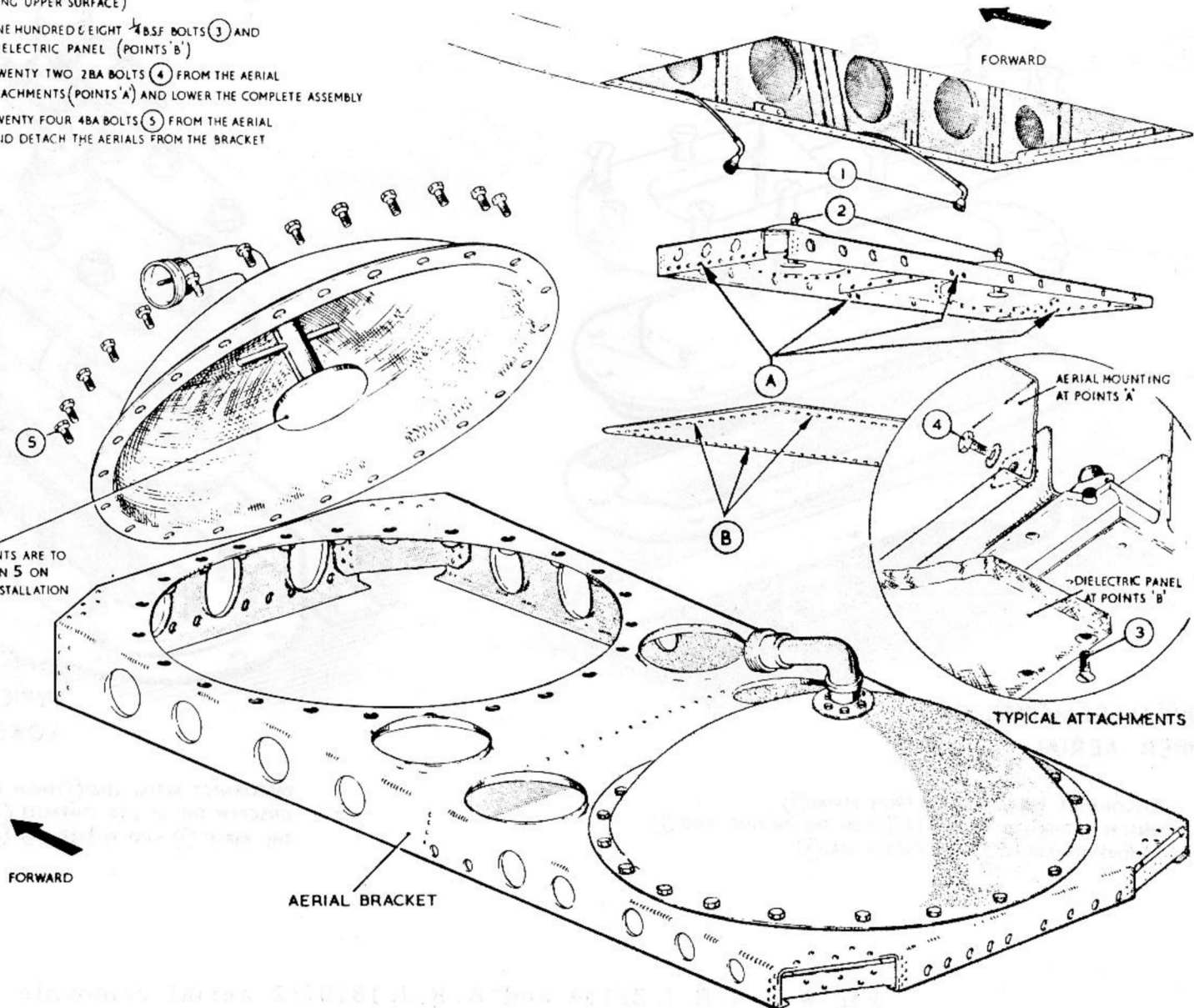
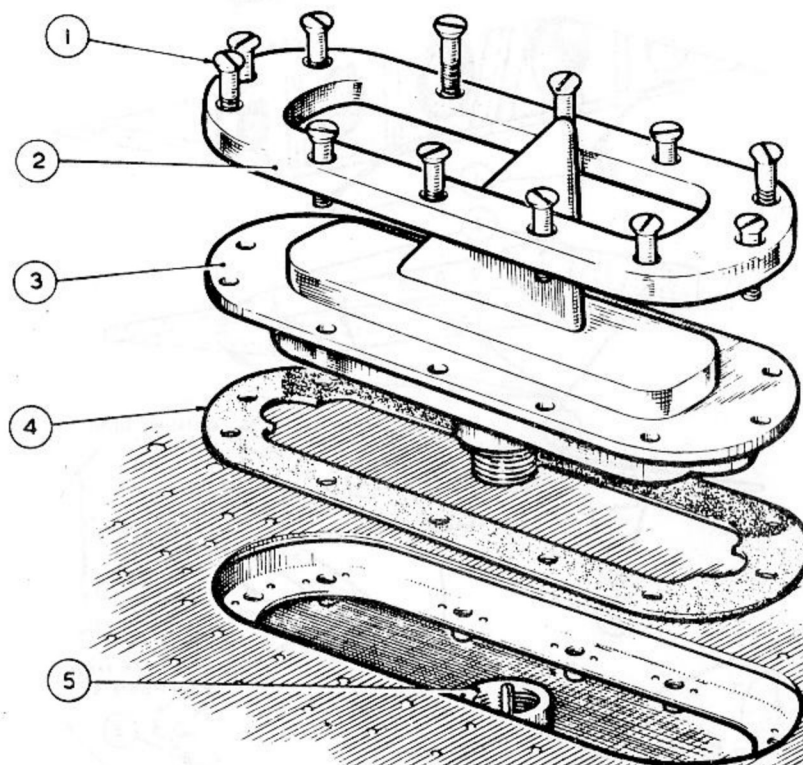


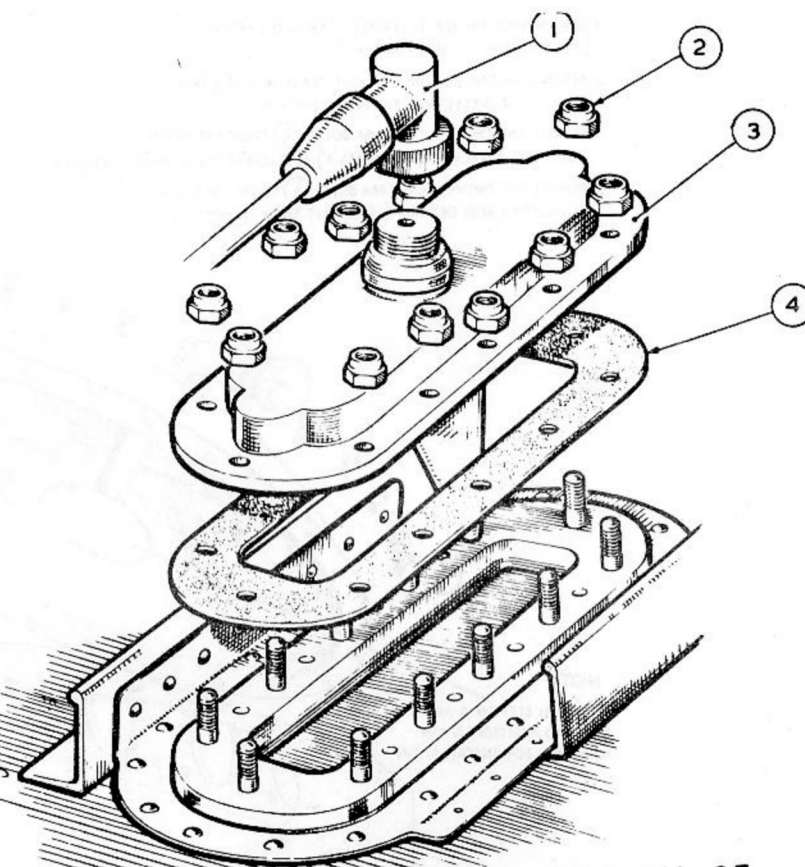
Fig. 8 A.R.I. 18090 aerial removal

RESTRICTED



TYPICAL REMOVAL OF
UPPER AERIAL

- 1 DISCONNECT AERIAL LEAD (5) FROM AERIAL (3)
- 2 UNSCREW THE 12 2 BA BOLTS (1) FROM THE PACKING RING (2)
- 3 REMOVE THE AERIAL (3) AND RUBBER SEAL (4)



TYPICAL REMOVAL OF
LOWER AERIAL

- 1 DISCONNECT AERIAL LEAD (6) FROM AERIAL (4)
- 2 UNSCREW THE 12 2 BA STIFFNUTS (2) AND REMOVE THE AERIAL (4) AND RUBBER SEAL (5)

Fig. 9 A.R.I. 23134 and A.R.I. 18107/2 aerial removals

RESTRICTED

TABLE 1
List of Equipment

EQUIPMENT	No.OFF	A.P.No.	VOL.	BOOK	SECT.	CHAP.
DOPPLER 72						
Transmitter/receiver and antenna assembly 5841-99-639-0859	1	114E-1600-16				
Groundspeed and drift indicator 5841-99-639-1163	1	114E-1600-16				
RADIO ALTIMETER, Mk.6A						
Switch, N.S.F.Type 8834/B102	1)	4343C	1	1	1	51
Switch, N.S.F. Type 8810/B109	1)					
Relay, Type 10B No.13	1	4343C	1	2	3	8
Transmitter-receiver, Type 7923	1	A.P.11B-				
Indicator, Type 7921	1	0206-1				
Aerial, Type 7165	1	(previously 2533G)				
I.F.F./SSR						
Transmitter-receiver Type 16928	1)					
Mounting tray 16949	1)	A.P.114J-0101-16	1	Part 2		
Control Unit Type 16929	1)					
I.F.F. FAILURE warning and test lamp (Page) 5CW/9743	1					
Aerial Omni Type 100B	2)	A.P.114J-	1	Part 2		
Switch Unit (aerials) Type 16941	1)	0101-16				
Switch (aerial test) 5930-99-104-)					
and socket 7694	1)					
Inverter Type E182	1					
Mounting tray 8401	1					

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TABLE 1

List of Equipment

EQUIPMENT	No.OFF	A.P. No.	VOL.	BOOK	SECT.	CHAP.
I.F.F./SSR (contd)						
Relay T20B No.3, 5CX/10678	1					
Fuse block four-way 5X/3271	1					
Fuse block six-way 5X/9026	1					
Relay DIAMOND 'H' Type BRAC1B-1C-1	1					
TACAN						
Relay Type 101B, No. 7	1	4343C	1	2	3	54
Control unit, Type 9273 or 7750	1					
Indicator, Type 9547	2					
Coupling unit, Type 11920 or 9546	1	A.P.116B-				
Transmitter-receiver, Type 9171	1	0304-1				
Aerial omni, Type 100B	1	(previously 2534W)				
Switch, Ref. No. 5CW/7540	1					

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