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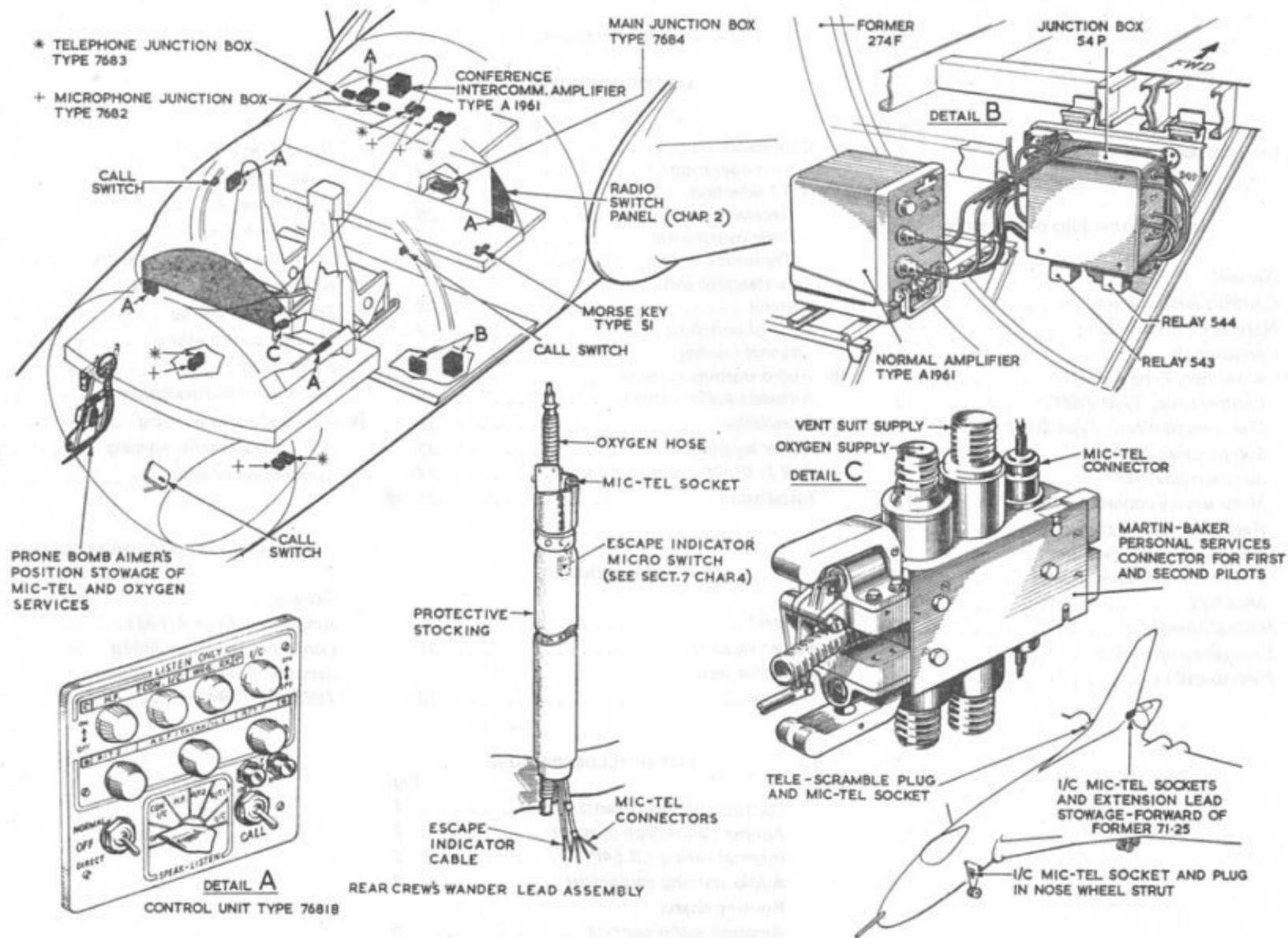


Fig. 1 Location of components A.R.I. 18089

Control unit now type 7681B

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Introduction

1. This chapter deals with the installation and general functioning of the intercommunication system (A.R.I.18089). A location illustration of the major components is provided in fig.1. Routing charts for the installation will be found at the end of the text. The system is operated from the 28-volt d.c. supplies (Sect.6, Chap.6).

2. Descriptive and servicing details for the A.R.I. are given in A.P.116N-0105-1.

General

4. The A.R.I.18089 is a service-selecting and intercomm. system which fulfils three distinct but correlated functions as follows:-

- (1) To provide a channel for the distribution of normal and conference i/c.
- ▶ (2) To provide a means of selecting all available air radio installations (A.R.I.'s). ◀
- (3) To provide a means of mixing two or more receiver services, without one adversely affecting the other.

In addition to the foregoing, external i/c facilities are available as an aid to the ground crew during servicing, and as a means of alerting the crew for tele-scramble operations. The

3. Information on the following modifications is included:-

- Mod.1801 To introduce separate mic-tel sockets in lieu of existing combined multi-service connectors for the rear crew members.
- Mod.1696 To introduce swivel seats for rear crew members and reposition connection points for rear crew oxygen, air vent suit and mic-tel services.

DESCRIPTION AND OPERATION

Installation is divided into two systems, viz. normal i/c and conference i/c, each having its own amplifier.

Controls and supplies

5. The main control switches for the installation are fitted to a small panel located on the main panel at the A.E.O.'s station as shown on fig.1. The switches controlling the intercomm. system are as follows:-

- Normal-Emergency-Off
- External I/C - Off
- Conference I/C - Off
- Press-to-Transmit - Off

The 28-volt d.c. supply to the system is fed via fuses 526, 605, 636, 690 and 918, which are located in panels 3P, 4P and 48P.

Mod.1900 To introduce a low level high speed warning indication for the first and second pilot.

Mod.2007 To introduce a combined V.H.F./U.H.F. transmitter receiver system in lieu of existing V.H.F. installation.

▶ Mod.2441 To introduce an audio filter to eliminate interference in the intercomm. system. ◀

NORMAL I/C INSTALLATION**Components**

6. The i/c installation comprises the following major components:-

Item	No fitted
Amplifiers, Type A.1961	2
Control units, Type 7681B	5
Main junction box, Type 7684	1
Sub-junction boxes	
Microphone junction boxes	
Type 7682	5
Telephone junction boxes	
Type 7683	5
Junction box 54P (H.S.A.)	1
Multi-service connectors	2
Press-to-transmit switches	3
Press-to-call switches	3
Mic-tel sockets, Type 359	2
Mic-tel plugs, Type 3570	3
Audio filter unit	2

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Amplifier, Type A.1961

7. The normal intercomm. amplifier, Type A.1961, is fitted to an anti-vibration mounted tray, located under the crew's floor port side. The unit is a three-stage audio-frequency amplifier operating from the aircraft 28-volt d.c. supply. A rotary transformer is incorporated within the unit to give an H.T. supply of 260 volts. The L.T. supply is a stabilized 19 volts, stabilization being effected by a carbon pile regulator. Two fuses, one for L.T. and H.T. are provided, access to these being on the front panel of the amplifier.

Control units, Type 7681B

8. Control units, Type 7681B, are provided, one at each crew station, namely:-

1st pilot
2nd pilot
A.E.O.
Nav. plotter
Nav. bomber

These units provide selection to three transmitter-receiver services, two i/c and three receiver services (A.D.F., TACAN and I.L.S.). Also included is a call switch, which superimposes the caller's signal on any other service when operated. The first and second pilot have a further service which provides a warning tone to indicate a critical airspeed when flying at low level, further information is given later in the text. Selection of transmitter-receiver services is provided by a speak-listen switch, controlling the appropriate mic-tel circuits. Volume controls are provided to give a suitable signal level. The volume control, labelled A.D.F./TACAN/I.L.S., is operated in conjunction with a switch similarly

labelled on the port console. The mixing of signals from the receiver services is effected by the volume controls. To prevent re-radiation of signals between the services, an anti-cross-talk network is employed, and an amplifier, integral with each unit, restores the signals to the normal level.

9. A 28-volt d.c. supply to the control units is obtained from the aircraft busbars via the following fuses:-

690 in 48P — 1st pilot, Nav. plotter, Nav. bomber

526 in 4P — 2nd pilot, A.E.O.

A three-position switch, labelled NORMAL-OFF-DIRECT, controls the supply and connects the user's telephone to the amplifier in the NORMAL position. In the event of amplifier failure the DIRECT position is selected; this cuts off the d.c. supply and connects the user's telephone direct to the incoming signal. It should be noted that no mixing facilities are available when the DIRECT position is selected.

Main junction box, Type 7684

10. This unit is located below the navigator's table and provides the central distribution point for the i/c system and its associated wireless services. Mounted on the top face of the unit are two control relays, designated NE/4 and O/2. Alongside the relays are thirteen multi-pole plugs and sockets, which form the main connections to the system. These plugs and sockets are equipped with a key and slot locating device, thus rendering crossovers impossible.

Sub-junction boxes

11. Two junction boxes, one Type 7682 and one Type 7683, are fitted at each station equipped with a control unit, Type 7681B. Each sub-junction box is equipped with three multi-pole plugs for inter-circuit connection, and a multi-pole socket for connection to the associated control unit. The junction box, Type 7682, carries the main microphone services; the junction box, Type 7683, carries the main telephone services. Internal connections are made by soldered spills on a tagboard, the spills are arranged according to the wireless services required. A jumper connection diagram (fig.2) shows the key and spill connections for each sub-junction box.

Junction box 54P

12. This unit is fitted below the crew's floor on the port side of the aircraft and contains relays No.543, 544 and terminal blocks 1074 to 1083 inclusive, for the interconnection of the i/c system and associated wireless services. A wiring diagram of the box is contained in fig.3.

Multi-service connectors

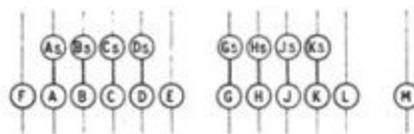
13. Two multi-service connectors are provided for the first and second pilot and provide oxygen, air suit vent and mic-tel connections on the one plug and socket assembly.

Rear crew service connectors

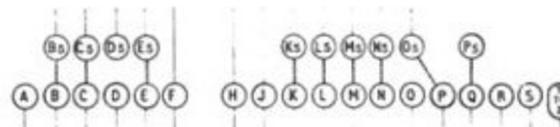
13A. The rear crew members have separate connectors for the air vent suit, oxygen and mic-tel services. The air suit and oxygen supply

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SWITCH POSITION CODE NUMBER	WHETHER POSITION ROTARY MIC-TEL SWITCH OR TELS ONLY SWITCH	SERVICE	MICROPHONE CIRCUIT IDENT. FROM CONTROL UNIT INSIDE J.B. 7682	MICROPHONE CIRCUIT. PRECEDING COLUMN TO CONNECT WITH PAIR BELOW	TRANSMITTER/RECVR. OUTLET 6-WAY MICS. TELS & PTOT ON J.B. 7684 AS PRECEDING COLUMN	IDENT. LETTERS OF PRESS TO TRANS CIRCUIT FROM C/U INSIDE J.B. 7683.	MATING LETTERS IN J.B. 7683 FOR PRESS TO TRANS CIRCUIT.	IDENT. LETTERS OF TELEPHONE + CIRCUIT FROM C/U INSIDE J.B. 7683.	MATING LETTERS IN J.B. 7683 FOR TELEPHONE + CIRCUIT.
1	MIC / TEL	OFF	---	---	---	---	---	---	---
2	MIC / TEL	ARI 18089	Bs & Ms	B & H	PL 2 B	---	---	Ls	L
3	MIC / TEL	ARI 23090	Js & Cs	J & C	PL 3 C	Cs	C	Ms	M
4	MIC / TEL	ARI 18124/2	Ks & Ds	K & D	PL 4 D	Bs	B	Ns	N
5	MIC / TEL	ARI 23143	Gs & As	G & A	PL 1 A	Es	E	Ks	K
6	MIC / TEL	ARI 18089	E & L	E & L	PL 7 K	---	---	J	J
7	TELS ONLY.	ARI 18228	---	---	---	---	---	Ps	Q
8	TELS ONLY.	ARI 23023 ARI 18011	---	---	---	---	---	Os	P



SPILL CONNECTIONS FOR JUNCTION BOX TYPE 7682.



SPILL CONNECTIONS FOR JUNCTION BOX TYPE 7683.

Fig. 2 Jumper connection diagram

points are fully described in Sect. 3, Chap. 8 and 11 respectively of this publication. The mic-tel interconnections are made via a normal jack plug and socket and mic-tel leads (strapped to the oxygen wander leads as shown in fig. 1) sufficient in length to allow unrestricted access to the port and starboard perisextant stations. The prone bomb aimer's position is equipped with its own oxygen/mic-tel wander lead and stowage position. The port and starboard perisextant stations and prone bomb aimer's station are each provided with a call switch. The rear crew on leaving the aircraft uncouple the oxygen/mic-tel wander leads from their flying helmets and re-connect the oxygen connectors to special stowage brackets situated

on the roof directly above the rear crew seating positions.

Press-to-transmit facilities

14. Three press-to-transmit switches are provided, one on the 1st and 2nd pilots' control columns and one on the R/T panel at the A.E.O.'s station.

External intercomm. points

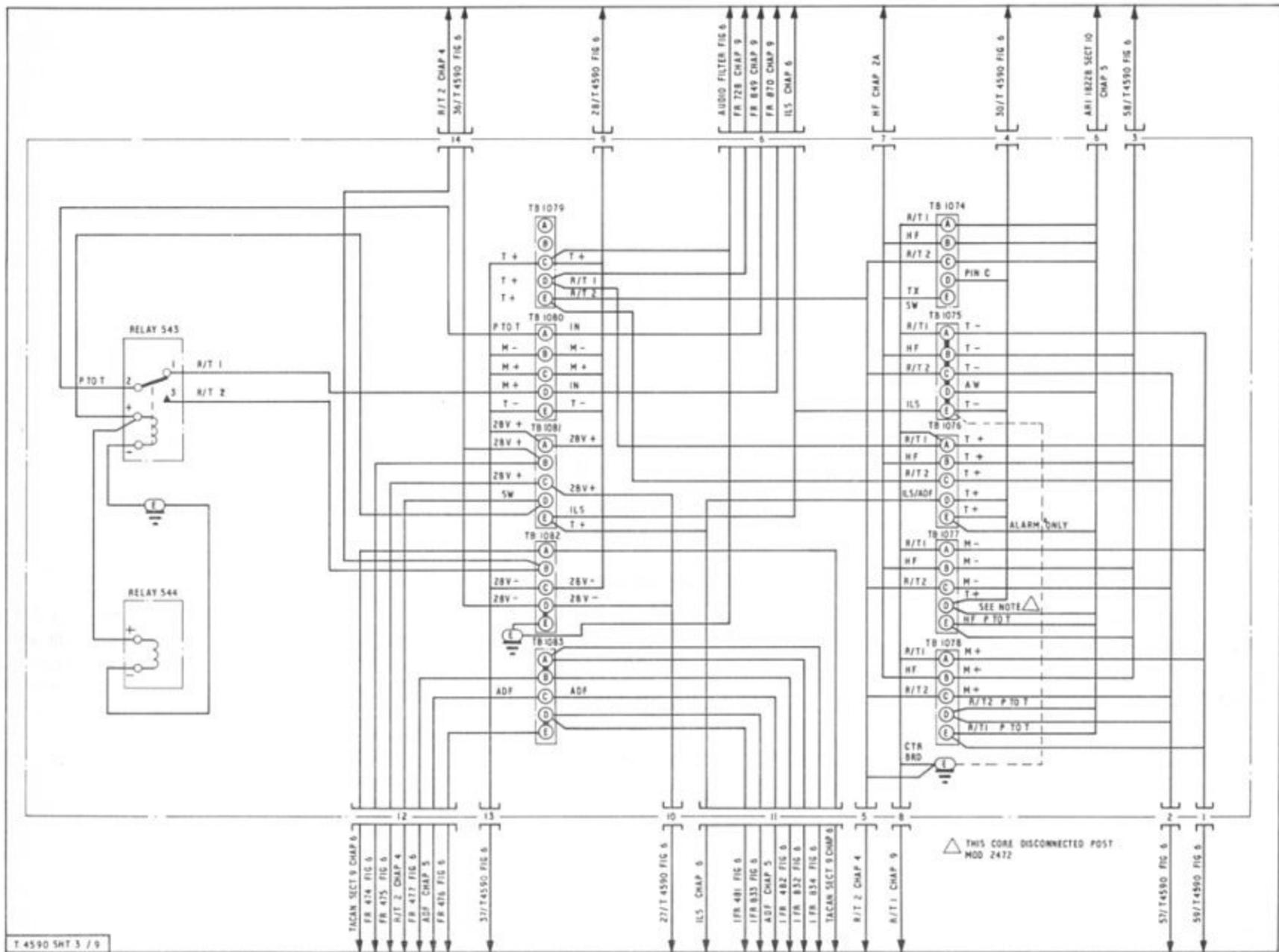
15. External intercomm. points for use during ground servicing periods and towing operations are provided by a mic-tel plug, Type 3570, fitted on the lower part of the nose

wheel unit, and a ground i/c panel fitted in the starboard side of the tail section. The ground i/c panel contains a mic-tel plug, Type 3570, and a mic-tel socket, Type 359; an extension lead for the socket is stowed inside a satchel on the panel. Access to the panel is provided by a small hinged panel on the aircraft skin. Additional external i/c points are introduced by Mod. 984 and the tele-scramble installation (see appropriate paragraphs).

Mod. 984

16. When Mod. 984 is embodied, a mic-tel socket, Type 359, is fitted on the lower part of the nose-wheel unit adjacent to the existing

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Fig 3 Internal wiring J.B. 54 P

► Corrections to clarify circuit ◀

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mic-tel plug, Type 3570. The socket is introduced to provide the servicing crew chief with i/c facilities during towing operations.

Normal operation

17. Reference to fig.6 and A.P.116N-0105-1 will show that the i/c system is ready for use when the normal-emergency-off switch is selected to NORMAL. A supply will be fed from fuse 636, via junction box. 54P and plug 1 pin A of the amplifier, Type A.1961, to energize relay P2 which is located inside the amplifier. The earth return for relay P2 is connected via plug 2 pin E of the amplifier, junction box 54P, plug K pin E and socket J pin C of the main junction box, then through terminals 4-5 of the normal-emergency-off switch to earth. With relay P2 energized, its contacts will close and connect the supply to the rotary transformer and voltage regulator in the amplifier.

18. At the same time, relay NE/4 inside the main junction box will be energized by a supply fed from fuse 918 via junction box 54P and plug H pin A of the main junction box. The earth return for relay NE/4 is connected via socket J pin D of the junction box and terminals 1-2 of the normal-emergency-off switch to earth. The contacts of relay NE/4 will close to connect the amplifier to the mic-tel circuits via plugs K-N and sockets F-M of the main junction box.

19. The amplifiers in the control units are supplied from fuses 526 and 690, via junction box 54P, plug B pin C of each junction box, Type 7683 (J.B. TEL), plug B pin Q of each control unit and the normal-off-direct switch. The crew members' telephones are connected into the amplifiers via the normal-off-direct

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switch and plug B pin R of the control units. The microphones are connected to the speak-listen switch from plug A, pins F and M, then out through pins E and L to the junction boxes Type 7682 (J.B. MIC.). Thus with the normal-off-direct switches selected to NORMAL and the speak-listen switch selected to I/C, intercomm. facilities are available at all crew stations.

Emergency operation

20. Should a failure of the normal amplifier occur, the normal-emergency-off switch must be selected to EMERGENCY. Relay NE/4 in the main junction box will be de-energised; the mic-tel circuits will now utilize the audio stages of the R/T1 transmitter receiver (PTR 175) as an emergency amplifier (R/T1 switched ON).

Press-to-call switch

21. When any call switch on control units, Type 7681B, is depressed, relay O/2 in the main junction box will be energized, and a call telephone channel will then be available and will be super-imposed on any service selected on the control units, until the call switch is released.

Conference i/c

22. Conference intercomm. provides an additional i/c channel for use between crew members when isolation from the normal i/c channel is desired. For this purpose an additional amplifier, Type A.1961 is provided and is fitted behind the navigator's panel. Supply to the amplifier is fed from fuse 605 and is remotely controlled by a single-pole switch on the front of the panel at the A.E.O.'s station. Selection to the conference i/c channel is made from the speak-listen switch and the listen only volume controls on the control units, Type 7681B.

Circuit operation

23. Reference to fig.6 will show that the supply to the conference i/c amplifier, Type A.1961, is obtained from fuse 605. When the i/c conference switch is closed, the supply will be made through the coil of relay P2 inside the amplifier to earth. The relay will then be energized to complete the supply to the rotary transformer and regulator. Connection of the mic-tel circuits to the amplifier is made via pins A, B (earth), C and D of plug B in the main junction box. The telephone circuit is connected from plug B via pin L of socket M to the junction boxes, Type 7683; the microphone circuit is connected via pins B and H of plug N to the junction boxes Type 7682.

R/T1 Selection

24. Should the first pilot require R/T1 facilities, the following sequence of switching and circuit operation will take place. With the control unit, Type C.1607/4, situated at the A.E.O.'s position, switched on and the required channel selected, on the pilot's i/c control unit, Type 7681B, select R/T1 on the speak-listen switch, rotate the R/T1 volume on the listen only panel and place the normal-off-direct switch in the NORMAL position. The R/T1 reception will now be available to the pilot and also to the crew via the crew members i/c control units.

Receiver

25. Reception of the incoming signals will be heard by the first pilot, and by any other crew member (para.8) via the following circuit. From the R/T1 set via the main junction box (pin A plug K to pin K socket M), junction box, Type 7683, (pin K plug C) spill connection K, to the control unit (pin K plug B) and with the switch in the NORMAL position, to the headset telephone.

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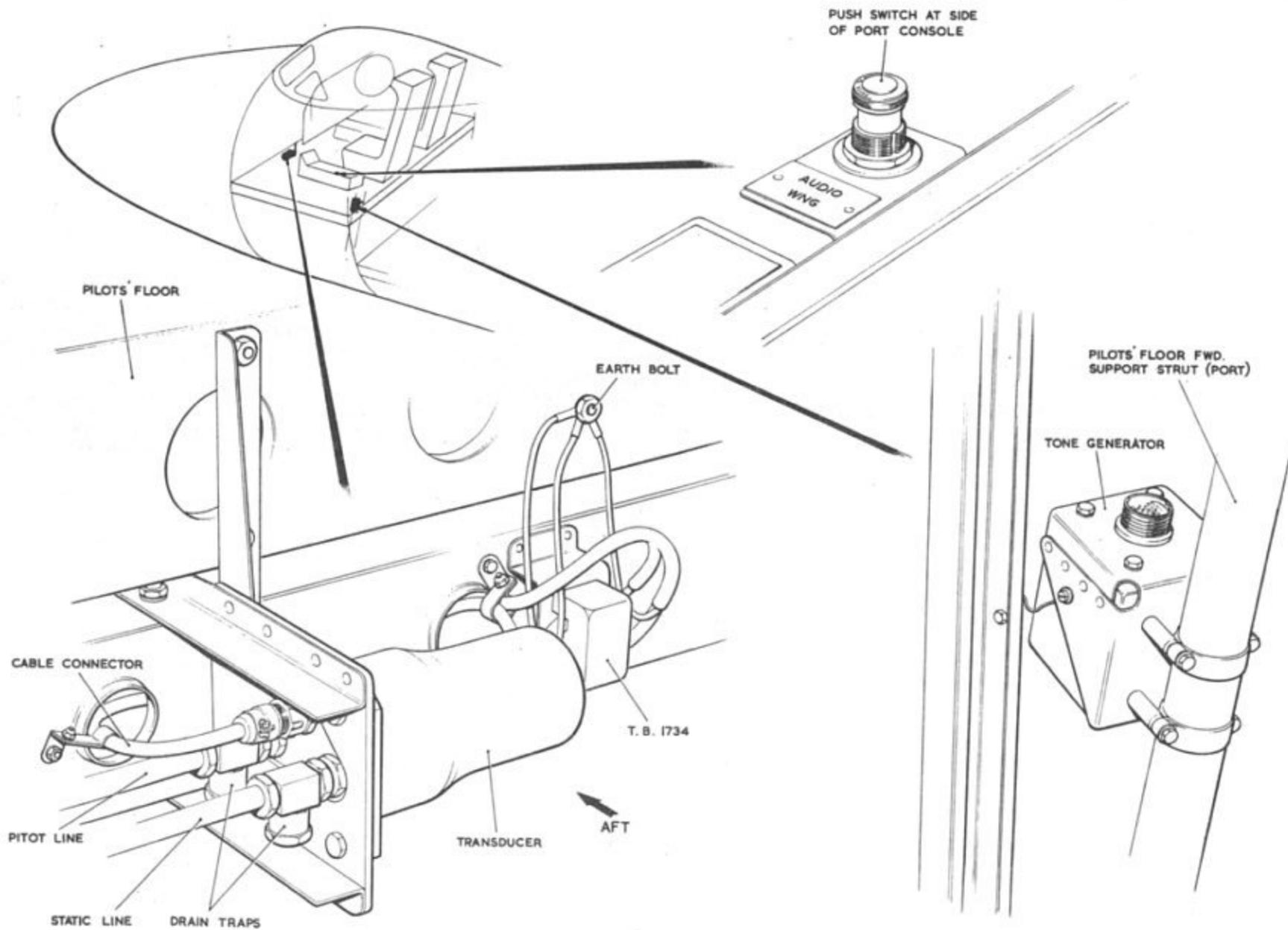


Fig. 4 Airspeed audio warning equipment

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Press-to-transmit

26. Closing of the press-to-transmit switch provides an earth via pin A plug B through the speak-listen switch to pin E plug B on the control unit; this closes the transmit relay K901 in the R/T1 transmitter-receiver.

Transmit

27. From the headset microphone a M.C.W. is transmitted, as follows:-

Mic. pos. routing

- (1) From the microphone to the control unit (pin F plug A, through speak listen switch to pin A plug A) via spill connection A, junction box, Type 7682, (pin A plug C) and main junction box, (pin A plug N, pin D plug A) to the R/T1 set.

Mic. neg. routing

- (2) From the microphone to the control unit (pin M plug A, through speak listen switch to pin G plug A) via spill connection G, junction box, Type 7682, (pin G plug C) and main junction box (pin G plug N, pin C plug A) to the R/T1 set.

TELE-SCRAMBLE INSTALLATION**General**

28. Tele-scramble instructions to the crew are fed into the I/C via a mic-tel plug, Type 3570. This plug, together with a mic-tel socket Type 359, for ground servicing, is mounted on a panel on the starboard side of the power compartment. The panel, which is fitted with a

spring-loaded cover, is positioned with the connectors facing aft for quick disconnection during rapid take-off (Chap.6, fig.4A). It should be noted that the tele-scramble channel provides one-way communication only, i.e. from ground control to the aircraft. Thus the aircraft crew members have no talk-back facility. A further mic-tel socket, Type 359, for ground servicing is included in the installation and is located in the bomb bay on the starboard aft face of bomb arch 201.367.

Control switching

29. Each crew member will be connected to the tele-scramble channel when he is on normal I/C selection, i.e. with the normal-off-direct switch selected to NORMAL and the speak-listen switch selected to I/C on his control unit.

Channel routing

30. Reference to fig.6 will show that the tele-scramble channel is connected into the intercomm. system as follows:-

Mic. pos.

- (1) From the tele-scramble plug, via T.B.1726 terminal C (1726-C), 1055-C, 1096-D, 381-C, plug 171-C, T.B.372-D, the external intercomm. switch terminals 1-2 and T.B.373-D, to pin D plug F of the main junction box.

Mic. neg.

- (2) From the tele-scramble plug, via T.B.1726 terminal D (1726-D), 1055-D, 1096-E, 381-D, plug 171-D, T.B.372-E, the external intercomm. switch, terminals 1-2 and T.B.373-E, to pin C plug F of the main junction box.

From the main junction box the channel will be connected via plug M to the junction boxes Type 7683, thence to the control units Type 7681B through to the headsets. Thus with the external i/c switch selected to ON and NORMAL i/c selected at the control units, each crew member can monitor the tele-scramble channel.

AUDIO WARNING SYSTEMS**Airspeed audio warning**

31. The high airspeed audio warning system has been introduced by Mod.1900 and its purpose is to give an audio warning to the first and second pilots when the aircraft airspeed has reached a critical value during low level flight. The main items of equipment comprise a transducer, Ref.No. 6A/9467, and a tone generator, Ref.No. 6A/9466. A push-to-test switch is fitted on the pilots console 6P. A location diagram and a routing chart are contained in fig.4 and 5 respectively.

Installation

32. The transducer and tone generator are mounted under the pilots' floor as shown in fig.4. The transducer is connected to the pitot-static pressure system and when the airspeed of the aircraft reaches 370 to 380 knots the transducer switches the tone generator on, the output tone being directly connected to the first and second pilots' headsets via T.B.1043 and T.B.1044 respectively. When the push-to-test switch on console 6P is depressed the earth return to the transducer is broken and the tone generator in turn is switched on, thus injecting the warning tone into the first and second pilots' headsets.

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► Power supplies

33. The system is operated from the aircraft 28-volt d.c. supply via fuse 719 in distribution panel 48P.

► A.R.I.18228 audio warning

34. When activated, the A.R.I. 18228 audio warning system supplies a warning tone to all five crew stations.

► Installation

35. The installation of the A.R.I. 18228 audio warning system is covered by A.P.101B-1902-1C. Cover 2, Sect. 10, Chap.5.

WARNING . . .

Voltages in excess of 30 volts a.c. (r.m.s.) or 50 volts d.c. can be dangerous under certain conditions. Personnel must therefore ensure that the electrical system is electrically safe before any servicing is attempted. Where it is essential that tests or adjustments be made with the electrical power switched ON the greatest care must be exercised.

Functional tests

Controls

38. At the A.E.O.'s station the control switches should be selected as follows:-

Normal-emergency switch	to NORMAL
External i/c switch	to ON
R/T1 control unit	to T/R

A functional test on the system can then be carried out by two men (man A and man B) in the following manner. At the R/T1 control unit at the A.E.O.'s position, man A selects the appropriate preset channel. At the second pilot's station, man B selects on the i/c control unit, Type 7681B, the normal-off-direct switch to NORMAL.

Normal i/c

39. When men A and B, in the first and second pilot's stations respectively connect their headsets to the personal equipment connectors, transmission and reception of speech will be available with the normal-off-direct switch at NORMAL, and the speak-listen switch on control units Type 7681, at I/C. ◀

Listen only

40. With the settings of the switches controlled by man A remaining in the normal i/c position (para.39), man B selects the speak-listen switch to OFF and listen-only volume control to I/C transmission of speech by man A is now received by man B. The procedure is then reversed.

Conference i/c

41. With the speak-listen switch, and listen-only switch (volume control post Mod.2304) selected to CON.I/C. repeat tests in para.39 and 40.

Call switch

42. With man A remaining on normal i/c (para.39), man B selects the speak-listen and listen-only volume controls to OFF. Man A then depresses his call switch and transmission of speech will be received by man B. The procedure is then reversed.

Control unit amplifier failure

43. To simulate a control unit amplifier failure, man A remaining on normal i/c (para.39), man B will select the normal-off-direct switch to DIRECT and the speak-listen switch to I/C. Transmission and reception of speech will now be available, but no mixing facilities.

Normal amplifier failure

44. To simulate a normal amplifier failure at the air electronics officer's station, select the ◀

General

36. The servicing of the system consists of regular testing of the circuits and components at the periods stated in A.P.101B-1902-4. All components should be frequently checked for security, and plug sockets, terminal blocks, multi-service connectors and strain cords should be examined for damage and ingress of dirt and moisture.

Power supplies

37. All ground i/c testing must be carried out with a ground electrical power supply trolley, supplying the normal aircraft d.c. system with 28 volts. The aircraft batteries must not be used. ◀

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▶ normal-emergency-off switch to EMERGENCY. At the control units, Type 7681B, select the normal-off-direct switch to NORMAL, the speak-listen switch to R/T1 and rotate the R/T1 volume control clockwise for the duration of the test only (LISTEN ONLY panel). Transmission and reception of speech between first and second pilot's stations will now be available.

Sequence of testing

45. Tests as carried out in para.39 to 44 inclusive, between first and second pilot's stations, should be repeated from these two stations to all other crew stations fitted with control unit, Type 7681B.

Isolated crew stations

46. The following isolated crew stations have no control unit, Type 7681, only a call switch and in the case of the prone bomb aimer a mic-tel lead and A.S.V. and oxygen supplies and stowage is provided.

Port perisextant
Prone bomb aimer
Starboard perisextant

On any control unit, Type 7681B, man A will select the speak-listen and listen only volume controls to OFF, the normal-off-direct switch to NORMAL. Man B, on depressing his call switch, is now able to transmit speech. Each isolated crew station is to be tested in this manner. ◀

▶ *External i/c*

47. With normal i/c selected (para.39), transmission and reception of speech is available between all crew stations fitted with control unit, Type 7681B, and each external plug and socket.

Tele-scramble installation

48. When normal i/c is selected (para.39) and the external i/c switch is selected to ON, reception of speech from the tele-scramble socket is available at all crew stations fitted with control units Type 7681B.

Airspeed audio warning

49. Whenever the installation is suspect, or if any part of the pitot-static system has been disturbed, a sense and leak test should be carried out in accordance with A.P.3158, Vol.2, Leaflet B.42. To test the audio warning system apply pressure to the pitot system and check that the tone generator is switched on giving a warning note on the first and second pilots' headsets 375 to 380 knots I.A.S.

A.R.I.18228 audio warning

50. Whenever the installation is suspect refer to A.P.101B-1902-1C, Cover 2, Sect.10, Chap.5.

Completion of tests

51. On completion of the functional tests, switch all services to OFF and remove the ground power supplies. ◀

REMOVAL AND INSTALLATION

General

52. Access to the majority of components is straightforward. When it is necessary to remove or replace any components, secure all loose connectors to the adjacent aircraft structure.

Amplifiers, Type A.1961

53. Each amplifier, Type A.1961, is fitted to an anti-vibration equipment rack. Disconnect socket SK1, plugs PL1 and PL2, from the front panel, and unscrew the knurled nut at the amplifier base, then slide the unit out by means of the transport handle. On replacing the unit, ensure that the locating dowels engage properly at the rear of the rack.

Control units, Type 7681B

54. These control units are located on panels or brackets; remove the retaining screws, withdraw the unit and disconnect the plugs.

Junction boxes, Type 7682, 7683 and 7684

55. These junction boxes are located on panels or airframe brackets. Disconnect the plugs and sockets from the units and remove the retaining screws. ◀

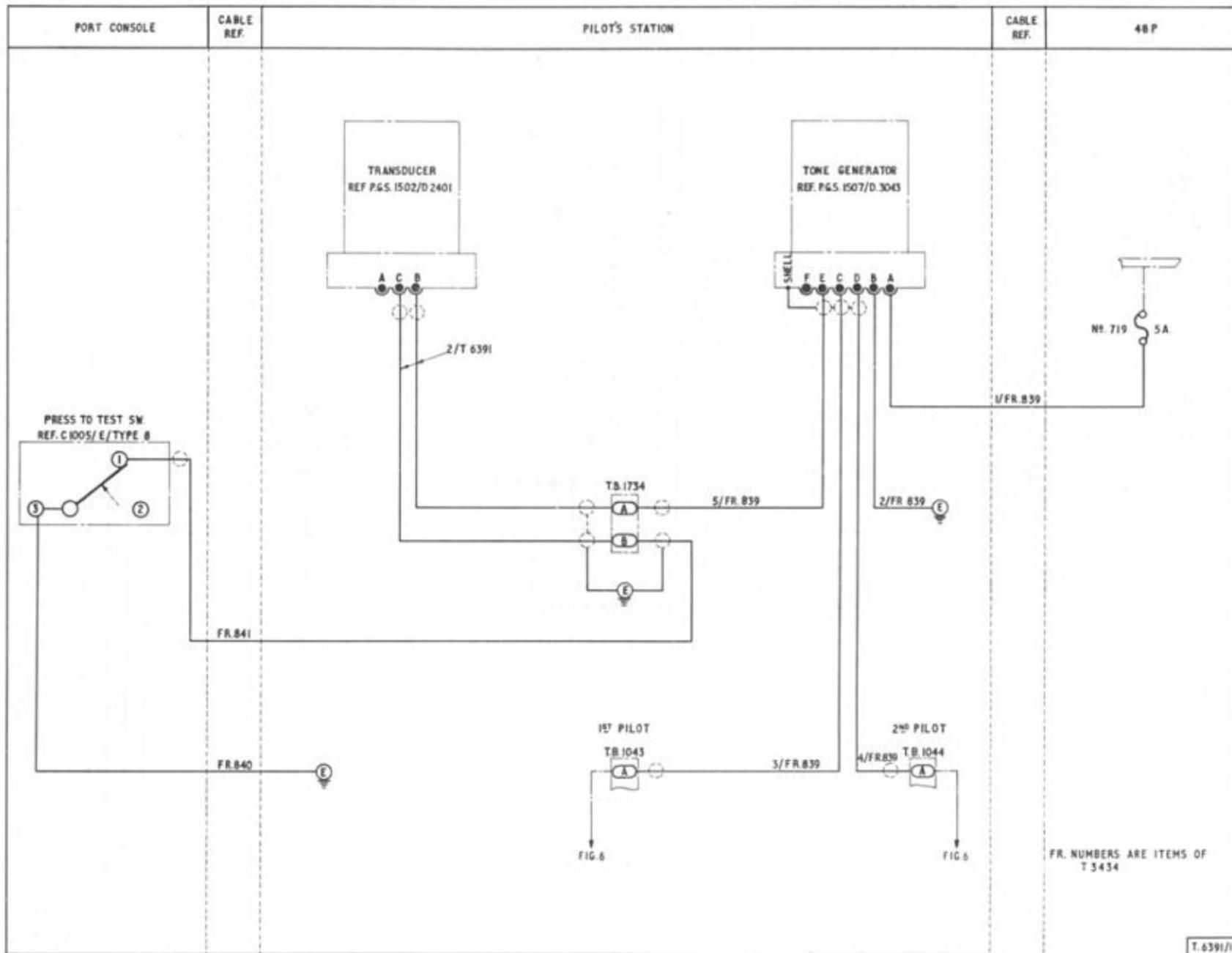


Fig. 5 Airspeed audio warning

«Minor corrections»

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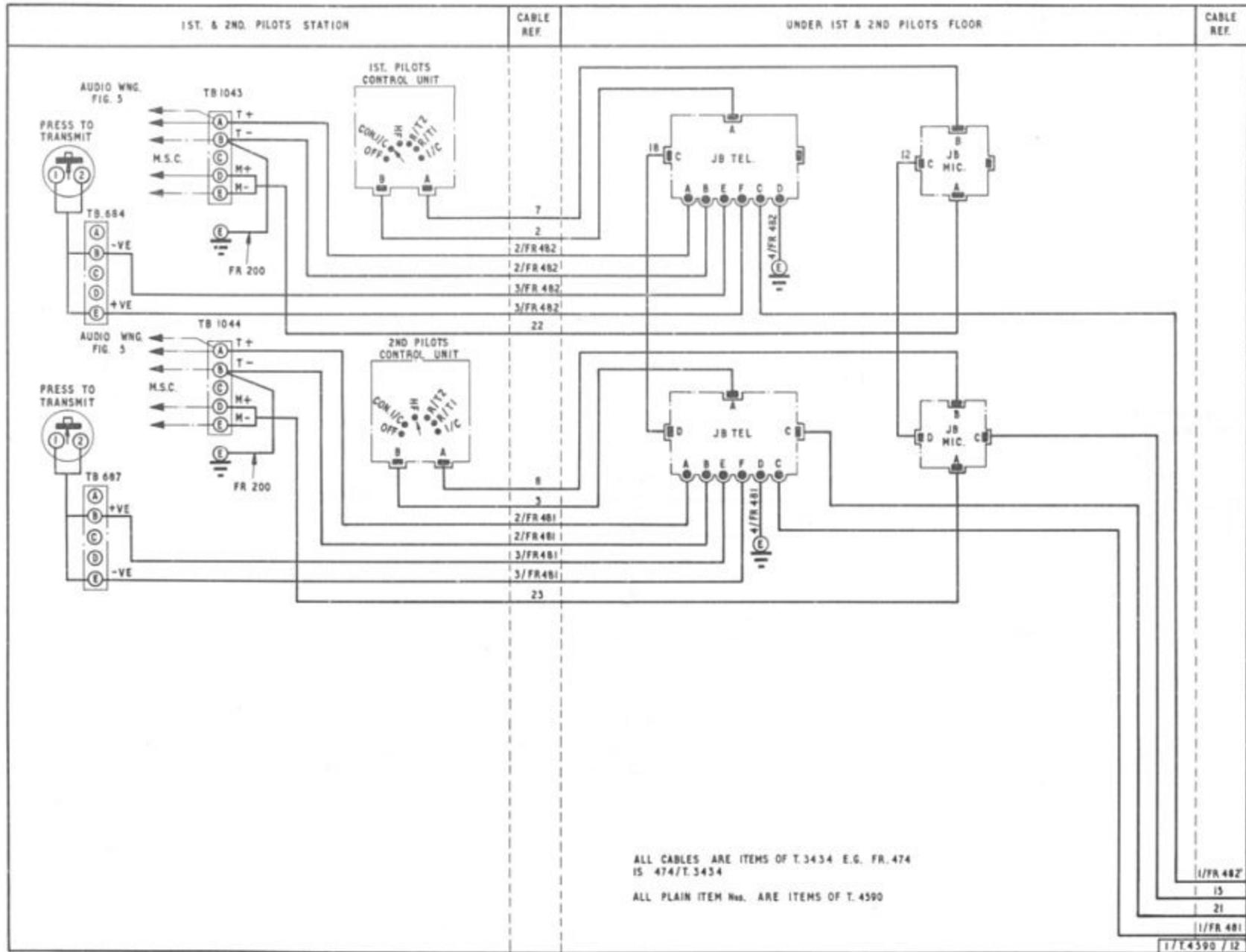


Fig 6 (1) A.R.1 18089 with conference I/C

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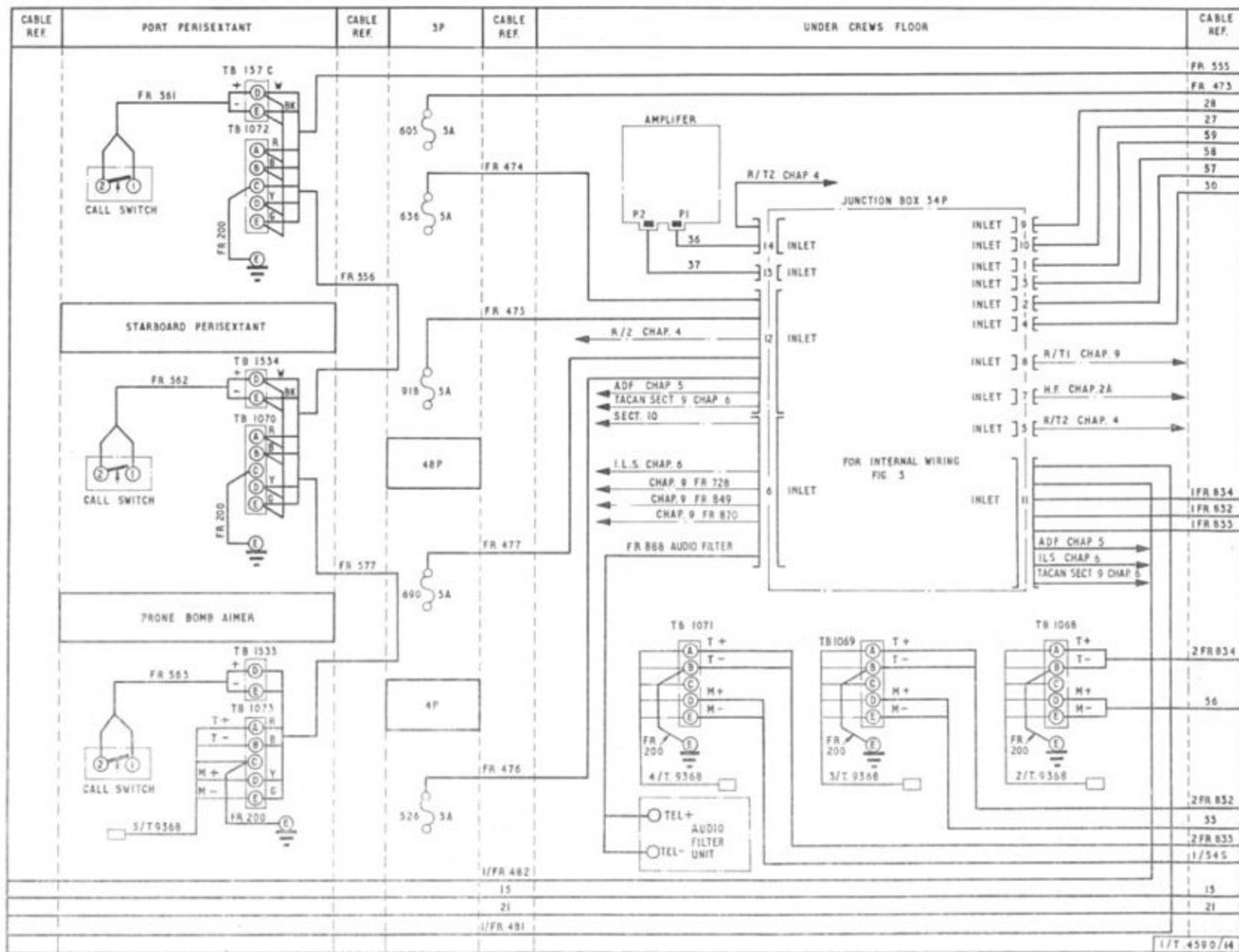


Fig. 6 (2) A.R.1 18089 with conference 1/C

Mod 2509

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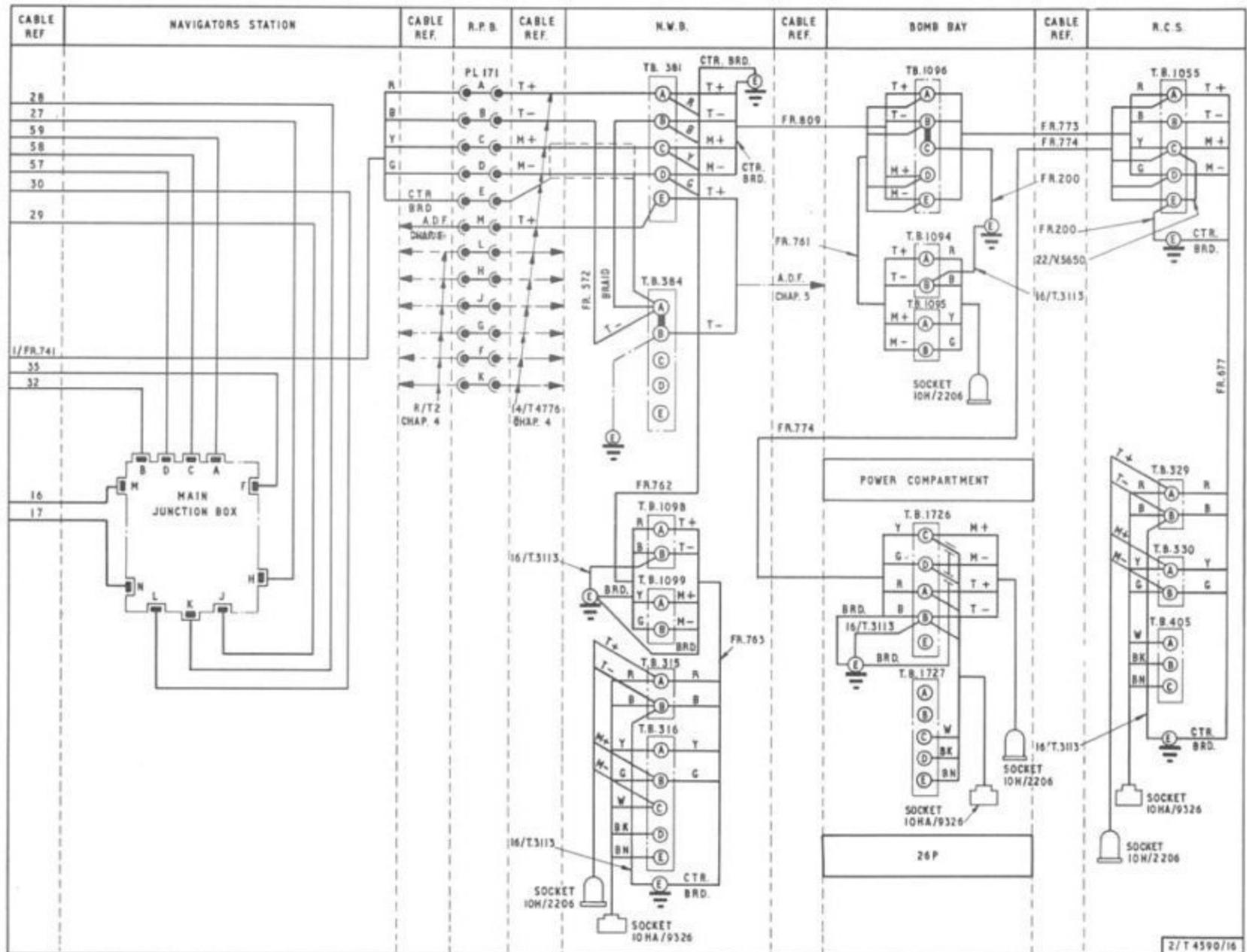


Fig 6 (4) A.R.1 18089 with conference 1/C

(◀ Re-drawn ▶)



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