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In the village of Blunham, Bedfordshire.



AP 116E-0140-123

AUGUST 1988

# **FGRI 26145 ATC STANDBY COMMUNICATION SYSTEM (PLESSEY PTR175)**

## **GENERAL AND TECHNICAL INFORMATION GENERAL ORDERS AND MODIFICATIONS PARTS CATALOGUE**

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

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## PREFACE

1 The contents of this publication may be affected by Defence Council Instructions, 'General Orders and Modifications' leaflets in this AP or even in some others. If possible, Amendment Lists are issued to correct this publication. When an Instruction or leaflet contradicts any part of this publication, the Instruction or leaflet is to be taken as the overriding authority.

2 The inclusion of references to items of equipment does not constitute authority for demanding the items.

3 Each initial-issue leaf bears the date of issue only with subsequent sheets bearing the date of issue and the number of the Amendment List with which they were issued. New or amended material will be indicated by arrows positioned outside the text area ► — — — ◄ to show where material has been changed. When a Part, Section or Chapter has been completely revised, the arrows will not appear.

## LIST OF RELATED PUBLICATIONS

AP	Subject
AP 116E-0102-1B6	Power Unit (ac)
AP 116E-0116-series	UHF/VHF Transmitter-receiver (Plessey PTR 175)

## MODIFICATION RECORD

The following record confirms that this publication incorporates all technical changes necessitated by the modifications listed below. Information on modification titles, classification categories and Mark applicabilities is given in Topic 2.

## LEADING PARTICULARS

Purpose	...	...	...	...	...	R/T communication (tone modulation) for emergency, or as a standby equipment for airfield control installations.
Frequency range	...	...	...	...	...	117.5 MHz to 135.95 MHz VHF 225.0 MHz to 399.95 MHz UHF
Frequency channel	...	...	...	...	...	3870 at 50 kHz spacing; 18 present channels plus UHF guard.
Channel selection time	...	...	...	...	...	6 seconds (max); transmitter-receiver time interval 300 ms (max).
Input supply	...	...	...	...	...	200V to 250V ac mains, 45 to 65 kHz.
Temperature operating range	...	...	...	...	...	-20°C to +55°C.

TOPIC 1

**GENERAL AND TECHNICAL INFORMATION**

Chapter 1GENERAL INFORMATION

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INTRODUCTION

1 The fixed ground VHF/UHF installation FGRI 26145 is designed on the basis of a transmitter-receiver Type PTR175 where its small physical size, even including the required ancillary equipment, makes it eminently suitable as a standby equipment in airfield control towers. When installed complete with its ancillaries, the equipment will operate from an a.c. mains supply of 200V to 250V, 45 to 65 Hz.



2 A complete installation comprises the items listed in Table 1. The items are reviewed in subsequent paragraphs with reference to the associated publications listed in Table 2. Ancillary equipments used exclusively in this installation are fully described and, in addition, brief details and other sources of information are given for those ancillary items which are in common use throughout the service.

TABLE 1 FGRI 26145 INSTALLATION EQUIPMENT

Item	Description	Reference Number
1	Transmitter-receiver, radio, Type PTR175	5821-99-971-1781
2	Control unit, transmitter-receiver, radio Type C1607/4	5821-99-945-5739
3	Interconnecting box	5821-99-932-6361
4	Power unit (ac)	5821-99-943-7136
5	Connector set	5995-99-932-6393
6	Rack	(see para.1)
7	Mounting (Shelf and cable assembly)	5821-99-932-6394
8	Aerial System	(see para.15)
9	Plate, Mounting, Control box	5821-99-932-6395
10	Jack Type 48	10H/4439
11	Strip, connection, Type 2	10G/27

TABLE 2 LIST OF ASSOCIATED PUBLICATIONS

Air Publication No.	Title	Equipment Part No.
AP 116E-0102-1B6	Power unit (ac)	5821-99-943-7136
AP 116D-0116-series	UHF/VHF Transmitter-receiver (Plessey PTR175)	5821-99-971-1781

## DESCRIPTION

### General

3 The following description refers to a typical fixed ground installation, and details may vary between stations or commands. However any changes should be relatively small and principally imposed because of local conditions.

4 The transmitter-receiver, interconnecting box and power unit are fitted on a mounting (shelf and cable assembly), which is housed in a rack usually installed in a ground floor room of the control tower. The control unit is situated either in the main control room or in a separate radio room, but in either case, remote from the transmitter-receiver. A block diagram of a typical single-unit installation is shown in Fig 1 and a view of a complete multi-unit rack installation is given in Fig 2.

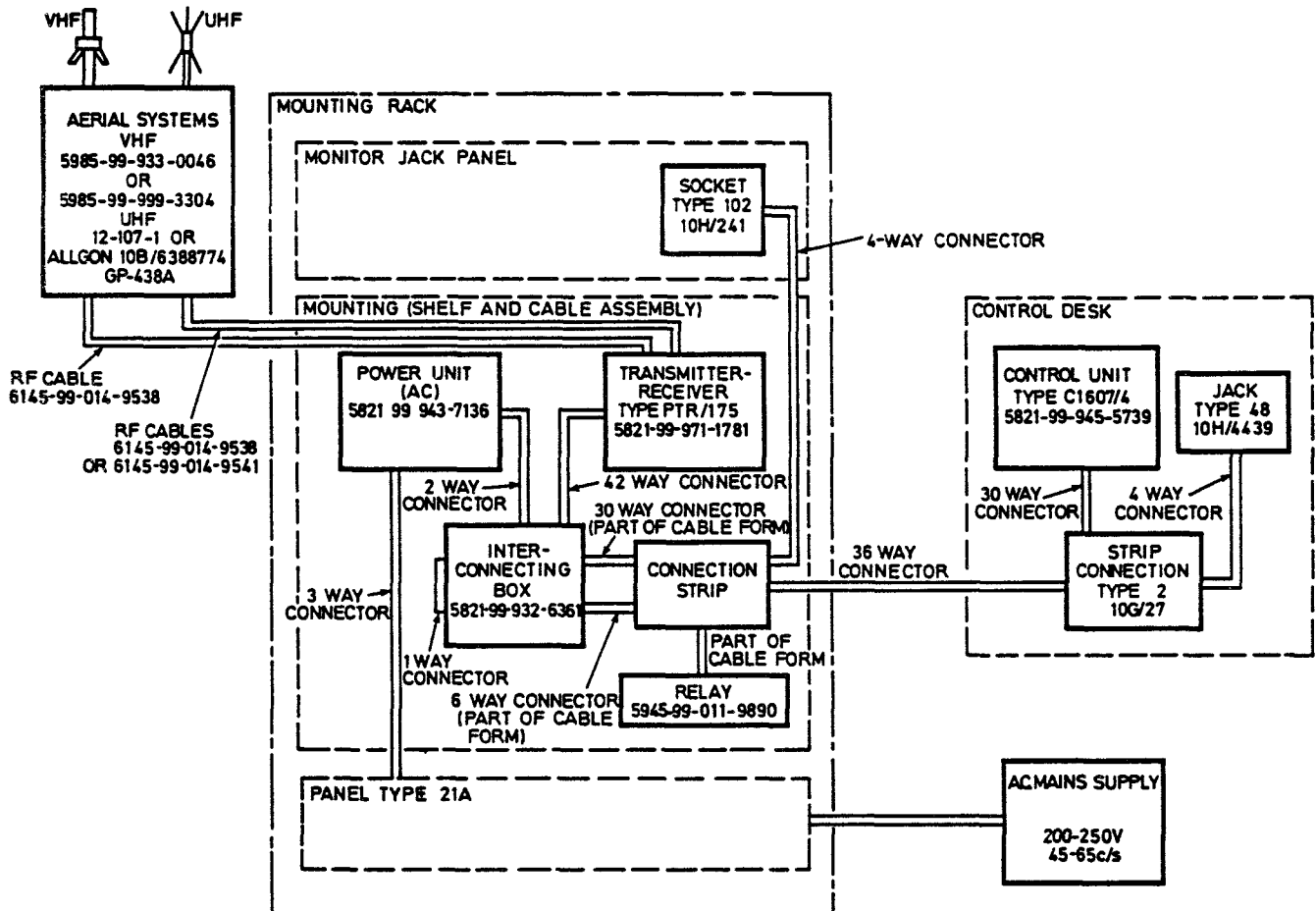


Fig 1 FGRI 26145 Installation, single-unit block schematic

#### Transmitter-receiver

5 This is a standard transmitter-receiver Type PTR175 and is described and illustrated in the AP-116D-0116-series of publications. Briefly it is a UHF/VHF R/T equipment operating over the frequency range 117.5 MHz to 135.95 MHz in the VHF band and 225.0 MHz to 399.95 MHz in the UHF band, affording 3870 frequency channels spaced at 50 kHz. A pre-selector provides the operator with automatic selection of up to eighteen pre-set channels. Alternatively, any of the 3870 frequency channels may be manually selected by use of four controls on the control unit. The transmitter-receiver also provides an MCW signal for direction finding or emergency purposes and a guard receiver facility in the UHF band at 238.0 MHz to 248.0 MHz.

Control unit

6 The control unit is a standard Type C1607/4 equipment and is described and illustrated in AP 116D-0116-1. Controls affecting frequency and other functions are sited on the front panel, and the controls for presetting up to 18 frequency channels are readily accessible by removing a plate at the bottom of the front panel.

Interconnecting box

7 This is also a standard unit used with transmitter-receiver PTR175 and Control unit C1607/4, and is again described and illustrated in AP 116D-0116-1. The interconnecting box provides connecting facilities between the main equipment and external units, eg. power supply unit, control unit, microphone etc.

Power unit (ac)

8 The Power unit (5821-99-943-7136) is illustrated in Figs 3 and 4, it is a self contained unit with overall dimensions of 7½ in. x 7 in. x 15½ in. and weighs approximately 56 lbs.

9 The unit is powered from an ac mains supply of 200V to 250V ac, 45 to 65 Hz and provides a dc output of 27.5V (nominal) to the transmitter-receiver. The output voltage is regulated at between 25.2V to 29V dependent on the input voltage and the output load. Variations of output load from 7A to 15A produce a voltage drop of less than 1V and the maximum change in the output voltage per a rise in ambient temperature of +55°C is 1.5V. The maximum ripple of the output voltage is 2V peak-to-peak. The power unit is fully described in AP 116E-0102-1B6, together with servicing information, fault finding and reconditioning instructions.

Connector Set

10 This consists of three connectors (42-way, 2-way and 3-way) which provide interconnections between the transmitter-receiver, interconnecting box, power unit and the rack distribution panel (para.11.3). Details of the three connectors are as follows:

10.1 Connector 5995-99-932-4041, 1ft 8 in. long, with 42-pole, Amphenol plug and socket.

10.2 Connector 5995-99-932-4039, 9 in. long, with 2-pole MK4 plug and 6-pole MK4 socket.

10.3 Connector 5995-99-932-4037, 8ft long, with 4-pole MK4 socket at one end.

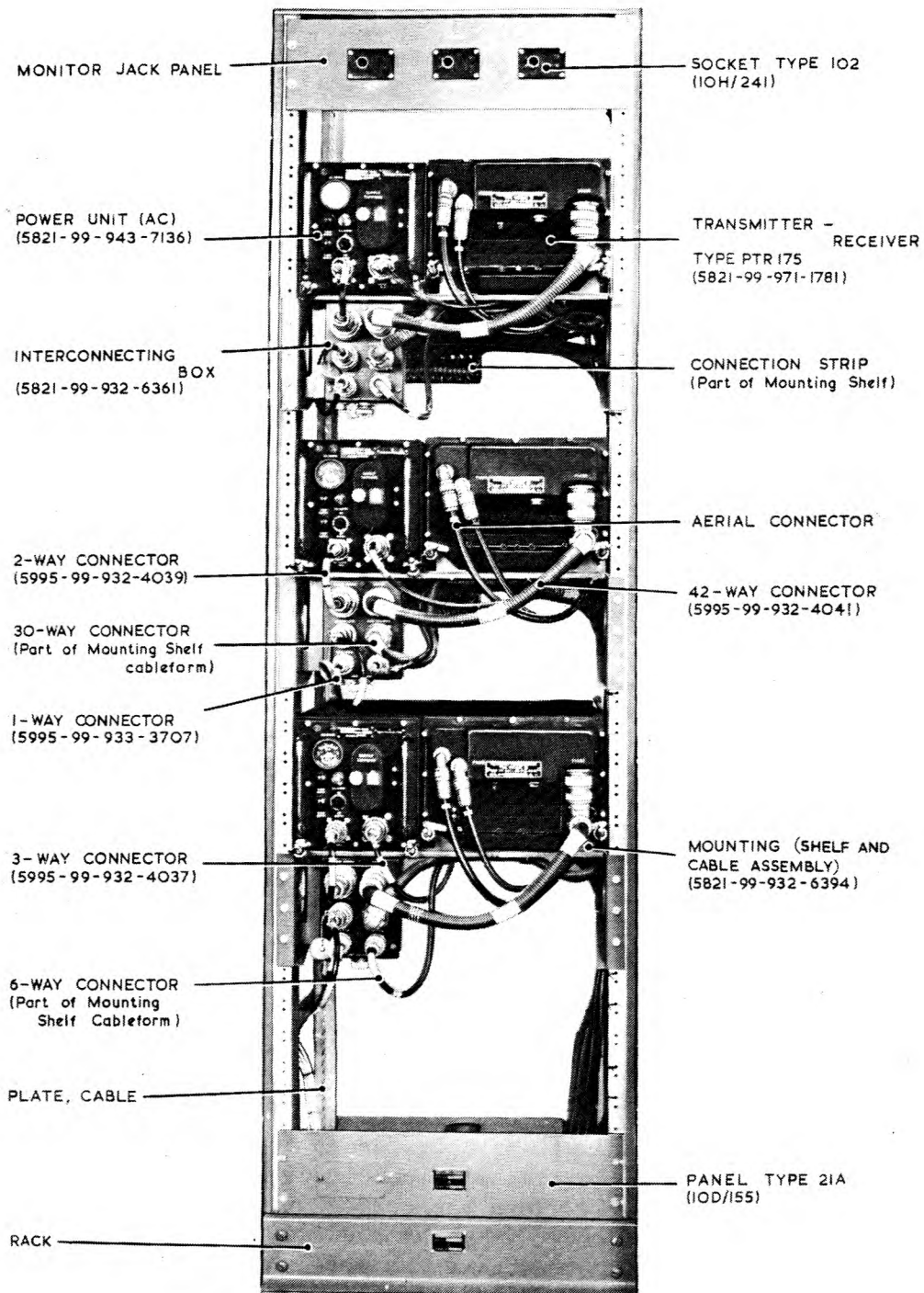


Fig 2 FGRI 26145 Installation multi-unit : general view

## Rack

11 The rack has provision for housing up to three complete installations, a general view of the rack with three installations fitted is given in Fig 2. The rack comprises of the following items:

11.1 A standard 19 in. rack Type 2, Ref.No. 10A/10942, modified by bolting a plate, cable (6 in. wide x 5ft 9 in. long) to each of its side members.

11.2 A monitor jack panel, fitted with three sockets Type 102, Ref.No. 10H/241, which provides monitoring facilities at the installation site and is fitted at the top of the rack with four 1BA cheese head screws and washers.

11.3 A panel Type 21A Ref.No. 10D/155, fitted at the base of the rack with four 1BA cheese head screws and washers. The panel comprises of seven 8-way terminal blocks, a 24V supply terminal block and two fuses which protect the mains supply. The mains supply is routed via a three-core cable and socket, to each pair unit within the installation.

## Mounting (Shelf and cable assembly)

12 The mounting comprises of a shelf, a connector set, electrical, 5935-99-932-4770, and a relay magnetic, sealed, 5945-99-011-9890. There may be up to three mountings fitted into the installation rack. Details of the component parts of the mounting are as follows:

12.1 The shelf is constructed of fabricated sheet steel and has provision on its upper surface for mounting a transmitter-receiver and a power unit (ac) side by side. A vertical bracket on the underside of the shelf provides a mounting for an interconnecting box.

12.2 The connector set comprises of a cableform assembly which is branched at one end to form one 30-way and one 6-way socket which couple to the control unit and mic/tel sockets respectively on the interconnecting box. The other end of the cableform is terminated at a connection strip which is coupled via the installation wiring (para.14) to the control unit and the jack type 48, and also to the monitor jack panel (para.11.2). The connection strip, which is situated at the rear of the shelf, is a strip, connection, Type 2, Ref.No. 10G/27, to which terminal code numbers have been added.

12.3 The relay is located at the rear of the shelf, adjacent to the connection strip (para.12.2) and operates in conjunction with a carbon microphone to complete the transmission circuits, a simplified circuit diagram is shown in Fig 5. When the carbon microphone is operated, the microphone energizing current from the transmitter-receiver causes the relay to operate, closing the relay contacts which complete the earth return for the transmit relays in the transmitter-receiver. A capacitor and a diode are connected in parallel across the relay coil, the capacitor providing a low impedance path for af currents and the diode protecting the capacitor against damage by the induced voltage surge in the relay coil when it is de-energized.



Fig 3 Power unit (ac), 5831-99-943-7136

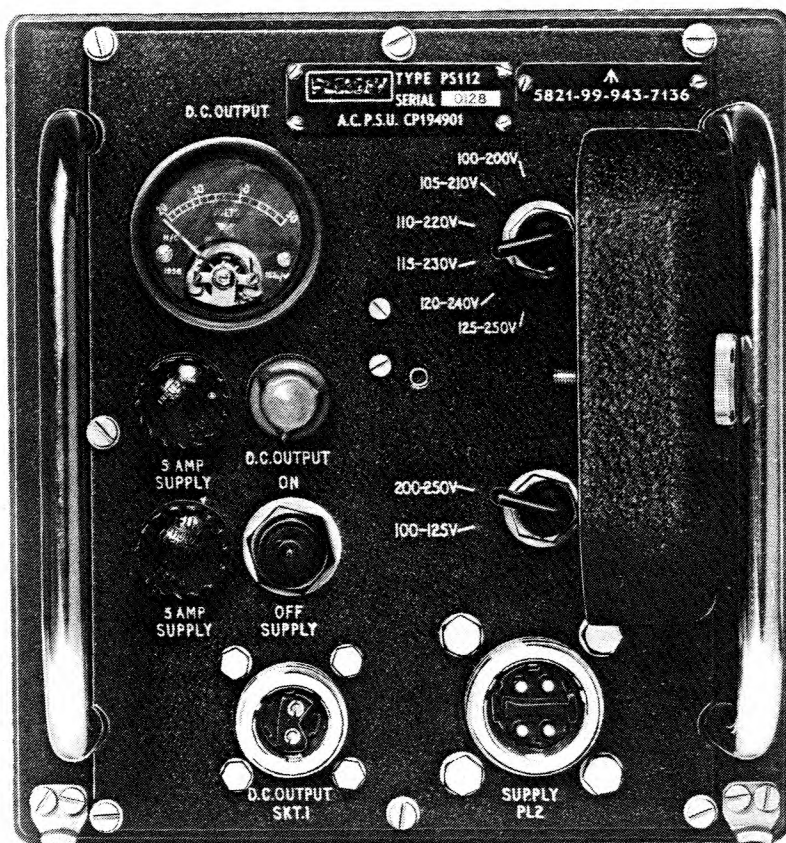


Fig 4 Power unit (ac) : front panel layout, which supply  
tappings cover open

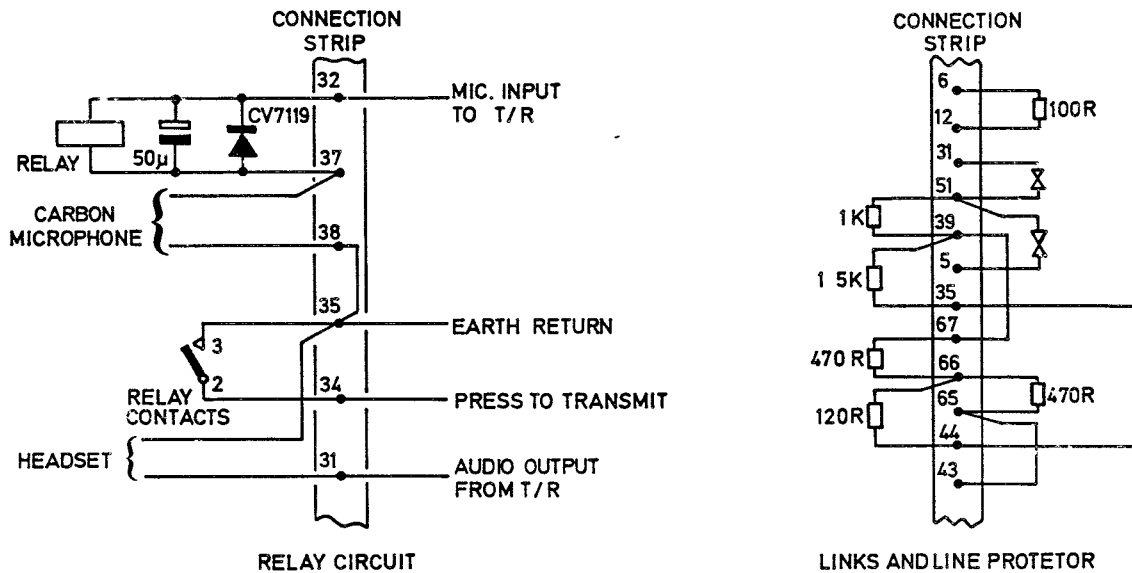


Fig 5 Mounting shelf : connection strip

Plate, mounting, control unit

13 This plate is used for mounting the control unit in its allotted position (usually in the control room, remote from the rack). It is made of sheet steel and is of rectangular construction, having clips for engaging the four DZUS fastners on the control unit. A cut out in the plate sufficient space for insertion of the control unit. The physical dimensions and characteristics of the plate are shown in Fig 6.

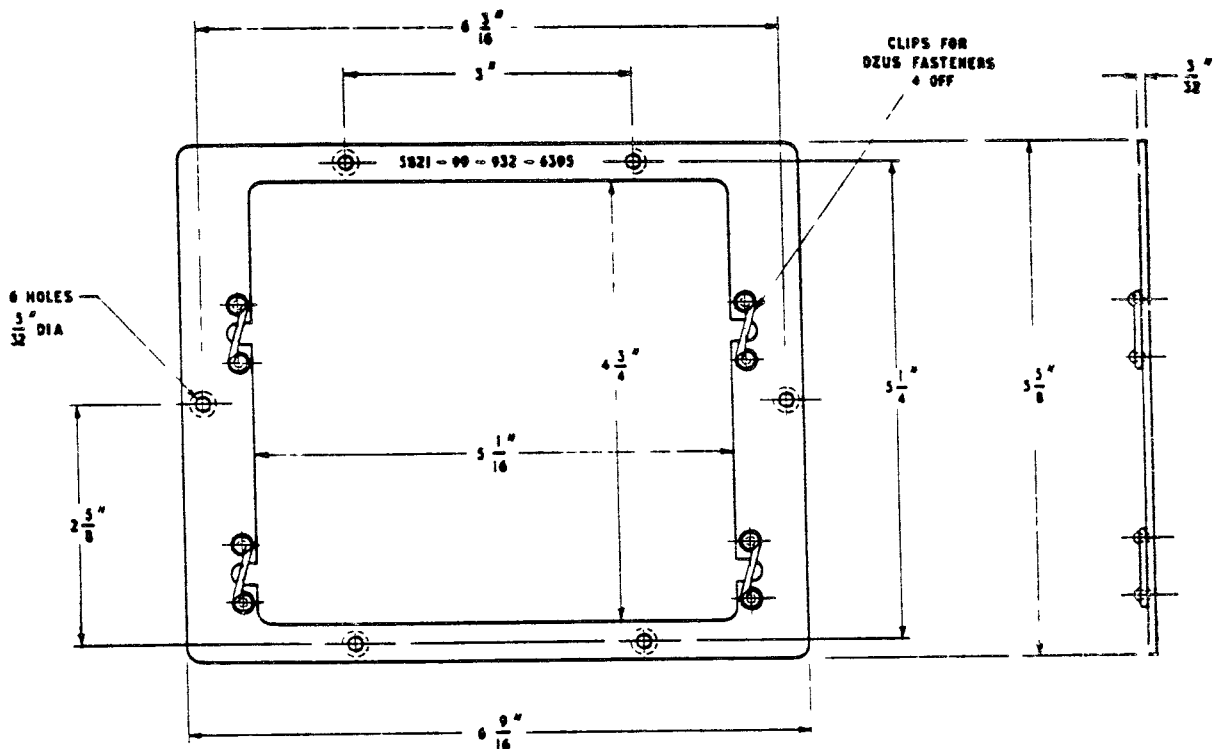


Fig 6 Plate, mounting, control unit

Installation wiring

14 The following cables are provided by the installation authority:

14.1 A single 36-way cable which couples the connection strip on the mounting shelf (para.12) to the strip, connection, Type 2 at the control desk. This cable conveys control information and both the microphone input and the af output.

14.2 A single 36-way cable, used at the control desk, for coupling the strip, connection, Type 2 to the control unit Type Cl607/4.

14.3 Two 4-way cables. One cable is employed at the installation rack for connecting between the connection on the mounting shelf and a socket Type 102 on the mounting jack panel. The second cable, used at the control desk, couples the jack Type 48 to the strip, connection, Type 2.

Note ...

When the installation is used in conjunction with FGRI 23169 (minicomms) as a main equipment, the jacks Type 48 and associated 4-way cable are not required.

14.4 A single-core cable assembly, 5995-99-933-3707 for connecting pole F of the TEST SET to pole A of the PC & tone socket on the interconnecting box, this ensures that indicator lamps on the control unit do not light until the transmitter-receiver is operating ie. the 27.5V supply has established.

14.5 When using UHF aerial, 5985-99-933-0046; the aerial is connected to the transmitter-receiver by two r.f. cables and these are 6145-99-014-0541 and 6145-99-014-0538. When using UHF antenna (assembly), 5985-99-194-1707 or aerial 5985-99-999-3304 the antenna is connected to the transmitter-receiver using r.f. cable 6145-99-014-9538 only.

14.6 The VHF antenna system is connected to the transmitter-receiver using a single r.f. cable assembly, 6145-99-014-9538 fitted with a plug type 5935-99-940-1095 at each end.

Aerial systems

## UHF

15 Either of two types of UHF aerial may be employed in the FGRI 26145 installation as follows:

15.1 Aerial, 5985-99-933-0046, a broad band dipole.

15.2 Antenna assembly, 5895-99-194-1707, comprising an antenna, 5895-99-194-1706 (radiating element) and a counterpoise, aerial 5985-99-999-3307.



## VHF

16 Either of two makes of VHF aerial may be employed in the FGRI 26145 installation as follows:

16.1 Aerial (H R Smith) 10B/745479 12-107-1.

16.2 Aerial (Allgon) 10B/6388774 GP-438A.

17 Both types of VHF aerial installation and the VHF aerial arrangement are illustrated in Fig 7.

## INSTALLATION DETAILS

### General

18 A block diagram of a single typical installation is given in Fig 1, which is used as the basis for the following review of installation details and requirements.

### Rack

19 As the transmitter-receiver has its own integral air cooling system, the rack must be carefully sited so as to permit free circulation about the front and rear of the equipment. Where ambient temperatures are liable range outside the normal operating limits of  $-55^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  additional heating or cooling facilities must be provided as appropriate. It is also essential that the rack is situated as to preclude the entry of sand or dust. The rack should preferably be positioned over a cable duct in the floor, thus avoiding protection for the incoming mains cable.

### Mounting (Shelf and cable assembly)

20 The mounting is secured to the rack by six 1BA hexagon heads, high tensile steel bulb, fitted through flanges at the front of the rack. The transmitter-receiver is secured on the top right-hand side of the shelf by locating dowels at the rear and wing-nuts at the front, the power unit (ac) secured alongside the transmitter-receiver in the same manner. The interconnecting box is fixed to the vertical bracket underneath the shelf by four 4BA cheese head screws.

### CAUTION ...

Before fitting the power unit (ac) to the mounting, the power unit must be connected for negative pole earthed output (para.21). Additionally, before installing the transmitter-receiver, the modulator linkages must be correctly connected and the modulation depth adjusted in accordance with the instructions given in the setting-up procedure (Chap 2, para 3).

### Power unit (ac)

21 Before installing the power unit, remove the outer casing and verify that the negative pole is earthed by a link soldered between LKA and terminal 1 of the saturable reactor X1; refit the casing. When installing the power unit, ensure that the connector, 5995-99-932-4037 is correctly connected at the distribution panel, ie. red lead to line terminal, black lead to neutral and green lead to earth.

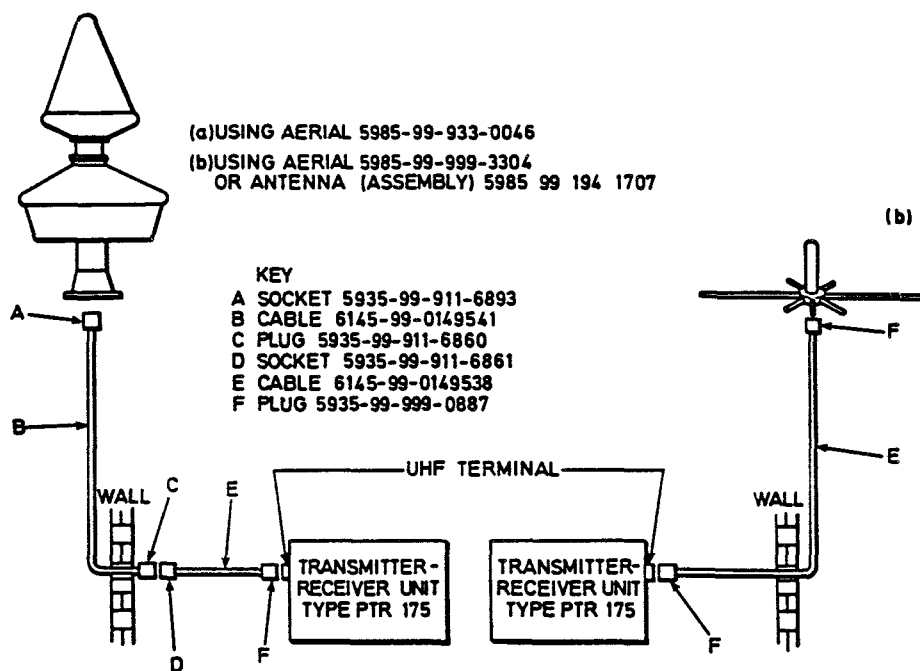


Fig 7 Typical UHF aerial installations

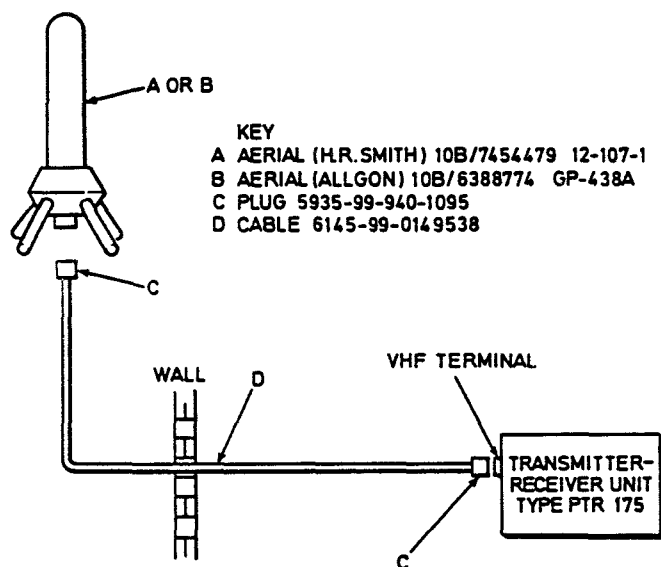


Fig 8 Typical VHF aerial installations

### Plate, mounting, control unit

22 The plate must be positioned such as to allow the operator easy access to the control unit from his normal station; adequate lighting (daylight and/or lamps) must be provided. Sufficient clearance must be allowed at the rear of the plate for the connector entry at the rear of the control unit. The actual clearance will depend upon whether the connector termination has a straight or angled entry. Dimensions and installation details of the plate are given in Fig 6.

### Aerials

23 Whichever aerial is employed (para.15) it must be erected several wavelengths above ground level and clear of buildings or natural obstacles which may shield the aerial and interfere with signals. When the aerial is mounted above a control tower, care must be taken to avoid possible interference caused by the close proximity of other aerials, radar antennae, etc.

24 Details of typical installations for both aerials are shown in Fig 7. Additional information for installations employing the more commonly used aerial, 5985-99-933-0046, is given in AP 116E-0253-1, Part 1, Section 4, Chap 1. In all installations, the length of the coaxial cable from the aerial to the transmitter-receiver should be kept to a practical minimum in order to reduce power loss.

### Multiple unit installations

25 A block diagram showing the schematic arrangement for a multi-unit installation is given in Fig 9. This shows a typical triple-unit system in which one complete transmitter-receiver equipment is installed for local control purposes and two equipments are provided for approach control.

26 Details of all rf cable connections to both types of aerial system are included in the aerial installation diagrams Fig 7 and 8. Termination connection of the installation wiring to the strips, connection, for the control units and the monitor jacks are detailed in Table 3 and 4 respectively.

TABLE 3 WIRING CONNECTIONS TO CONTROL UNITS

Connection strip (PTR175) Tag Nos.	Wire colours (see Note 1)	Strips, connections, Type 2, Tag Nos.			Control Unit connections	
		Local desk (for CU No.1)	Approach desk		Wire colours (see Note 2)	Socket poles
			(for CU No.2)	(for CU No.3)		
1	Blue/black	1	1	41	Blue/black	A
2	Blue/ orange	2	2	42	Blue/orange	B
3	Blue/green	3	3	43	Blue/green	C
4	Blue/grey	4	4	44	Blue/grey	D
5	Green/ yellow	5	5	45	Green/yellow	E
6	Green/ white	6	6	46	Green/white	F
7	Green/ black	7	7	47	Green/black	H
8	Green/ orange	8	8	48	Green/orange	J
9	Green/Grey	9	9	49	Green/grey	K
10	Brown/ yellow	10	10	50	Brown/yellow	L
11	Red/yellow	11	11	51	Red/yellow	M
12	Red/white	12	12	52	Red/white	N
13	Red/black	13	13	53	Red/black	P
14	Red/brown	14	14	54	Red/brown	R
15	Blue/ yellow	15	15	55	Blue/yellow	S
16	Blue/white	16	16	56	Blue/white	T
17	Light green	17	17	57	Light green	U
18	Grey	18	18	58	Grey	V
19	Red/blue	19	19	59	Red/blue	W
20	Red/green	20	20	60	Red/green	X

Continued ...

TABLE 3 WIRING CONNECTIONS TO CONTROL UNITS Cont'd

Connection strip (PTR175) Tag Nos.	Wire colours (see Note 1)	Strips, connections, Type 2, Tag Nos.			Control Unit connections	
		Local desk (for CU No.1)	Approach desk		Wire colours (See Note 2)	Socket poles
			(for CU No.2)	(for CU No.3)		
21	White	21	21	61	White	Y
22	Black	22	22	62	Black	Z
23	Brown	23	23	63	Brown	a
24	Violet	24	24	64	Violet	b
25	Orange	25	25	65	Orange	c
26	Pink	26	26	66	Pink	d
27	Green	27	27	67	Green	f
28	Yellow	28	28	68	Yellow	g
29	Red	29	29	69	Red	h
30	Blue	30	30	70	Blue	i
40	Screen	40	40	(see note 3)		

## Notes ...

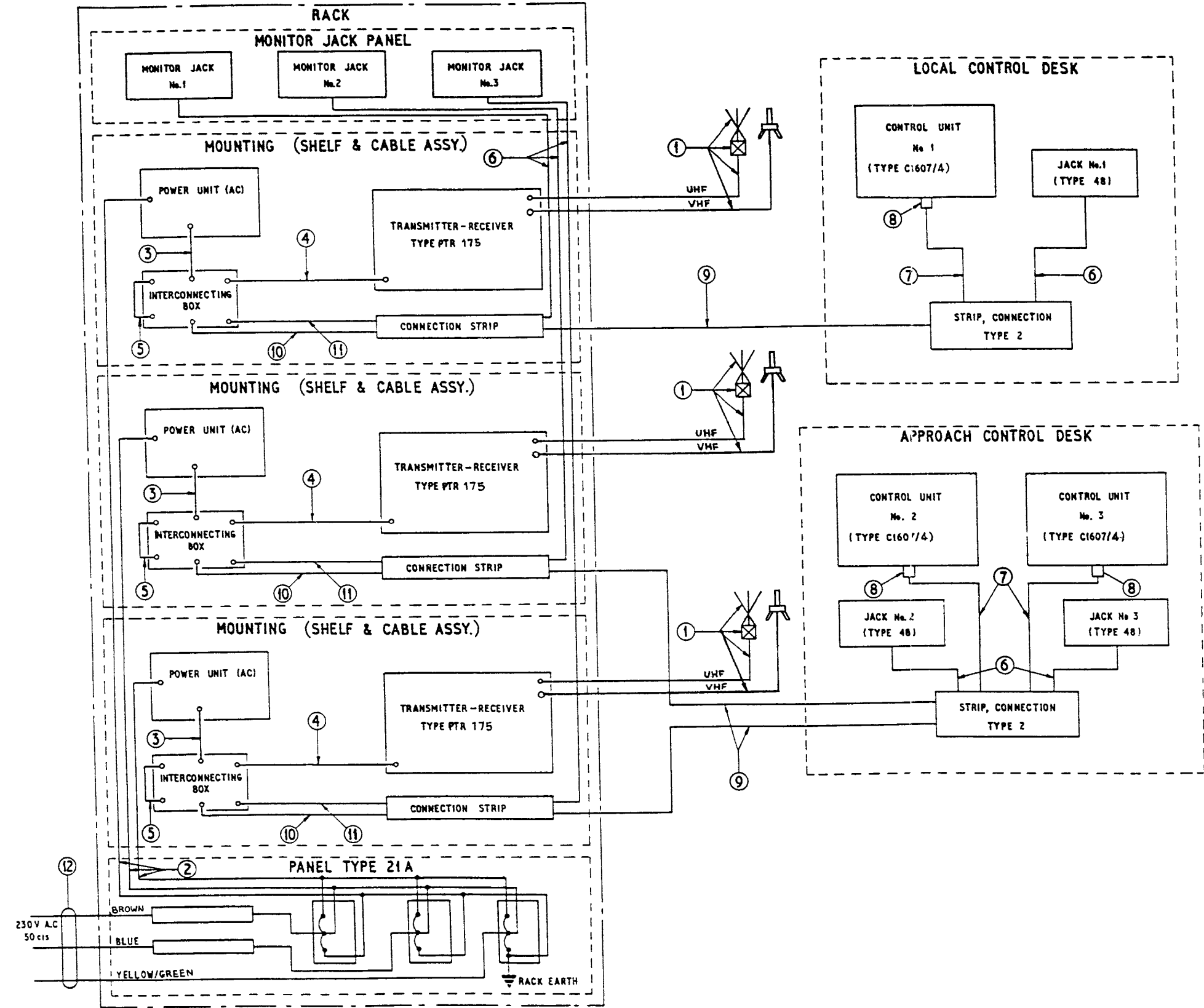
- (1) Using cable, electric, miniature, No.36C, 6145-99-910-0046 (3 off).
- (2) Using cable, electric, miniature, No.30A, 5E/4016 (3 off).
- (3) At PTR175 connection strip, comb outer screens into tails and connect to tag 40; strap tag 40 to tag 61. At the local desk strip, connection, strap tag 12 to tag 40. At the approach desk strip, connection, strap tags 12 and 52 to tag 40.

TABLE 4 WIRING CONNECTIONS TO MONITOR JACKS

Connection strip (PTR175) Tag Nos.	Wire colours (see Note 1)	Strips, connections, Type 2, Tag Nos.			Jack connections (see Note 3)	
		Local desk (for jack No.1)	Approach desk		Wire colours (see Note 3)	Poles
			(for jack No.2)	(for jack No.3)		
31	Violet/black	31	31	71	Red	1
35	Brown/white	35	35	75	Blue	4
37	Violet/yellow	37	37	77	Green	3
38	Violet/white	38	38	78	Yellow	2

## Notes ...

- (1) Part of cable, electric, miniature, No.36C (see Table 2).
- (2) Using cable, electric, miniature, No.4D, 6145-99-910-0016 (6 off) - see also Note 3.
- (3) Jack connections quoted apply to the jack Type 48 (on the control desks) and to the socket Type 102 (on the rack); the 4-way cable on the rack is connected from the socket Type 102 directly to the PTR175 connection strip tags.



KEY			
No	Description	Ref No	Remarks
1	AERIAL SYSTEM AND CONNECTORS	—	SEE NOTE 1
2	CONNECTOR (3-WAY)	5995-99-932-4037	Forming CONNECTOR SET 5995-99-932-6393
3	CONNECTOR (2-WAY)	5995-99-932-4039	
4	CONNECTOR (42 WAY)	5995-99-932-4041	
5	CABLE ASSEMBLY	5995-99-933-3707	SEE NOTE 2
6	CABLE ELECTRIC MINIATURE 40	6145-99-910-0016	
7	CABLE ELECTRIC MINIATURE 30A	5E/4016	
8	SOCKET ELECTRICAL	5935-99-940-3382	Forms part of MOUNTING (SHELF & CABLE ASSY)
9	and SHIELD PLUG/SOCKET ELECTRICAL	5935-99-940-3395	
10	CABLE ELECTRIC MINIATURE 36C	6145-99-910-0046	
11	CONNECTOR (30 WAY)	Part of CONNECTOR SET 5935-99-932-4770	
12	CONNECTOR (6 WAY)		
	CABLE ELECTRIC TRIPREN 9	5E/3075	

NOTES.

- 1 TYPICAL AERIAL INSTALLATIONS, INCLUDING DETAILS OF PLUGS, SOCKETS AND R.F. CABLES, ARE SHOWN IN FIG. 7 AND 8
- 2 CONNECTOR TERMINATION DETAILS ARE GIVEN IN TABLE 3 AND 4

Fig 9 FGRI 26145 Installation, multi-unit block schematic

Chapter 2SETTING UP AND OPERATING INSTRUCTIONS

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## Para.

- 1 Functions of the equipment
- 3 Functions of operating controls
- 4 Setting up the preset channels
- 8 Operating instructions
- 9 Main transmitter-receiver operation
- 10 Guard receiver
- 11 Main receiver on the guard frequency
- 12 Manual adjustment of frequencies

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| 2 | Control, radio set, Type Cl607/4, frequency selection ... .. | 4 |

Functions of the equipment

1 The PTR175 type equipments permit operation on any of 3500 frequency channels, spaced 50 kHz apart, in the 225 MHz to 399.95 MHz range or on any of 370 frequency channels with similar spacing in the 117.5 to 135.95 MHz range. The installations are primarily intended for R/T simplex communication between aircraft and ground, aircraft and ships and also between aircraft. The various operational controls are incorporated in the control unit Type Cl607/4, which provides for manual selection of the required frequency channel or automatic selection of one of eighteen preset frequency channel or automatic selection of one of eighteen preset frequency channels. In addition, the pre-selector system includes a guard channel frequency. Facilities are also included to enable the installations to be used with British or American direction finding equipment.

2 The control unit Cl607/4 is also used in ARI 23141 data link installations. Only when used in that role are the last three positions of the function switch applicable. Also, on the right-hand side of this control unit is a switch (Fig 1) which on installation must be set as follows:

2.1 For ARI 23143 (R/T installations) to the green, G (guard) position.

2.2 For ARI 23143 (data link installations) to the yellow, D/L (data link) position.

CAUTION ...

Before removing or refitting the 42-way connector at the transmitter-receiver, care must be taken to ensure that the function switch on the control unit is at OFF.



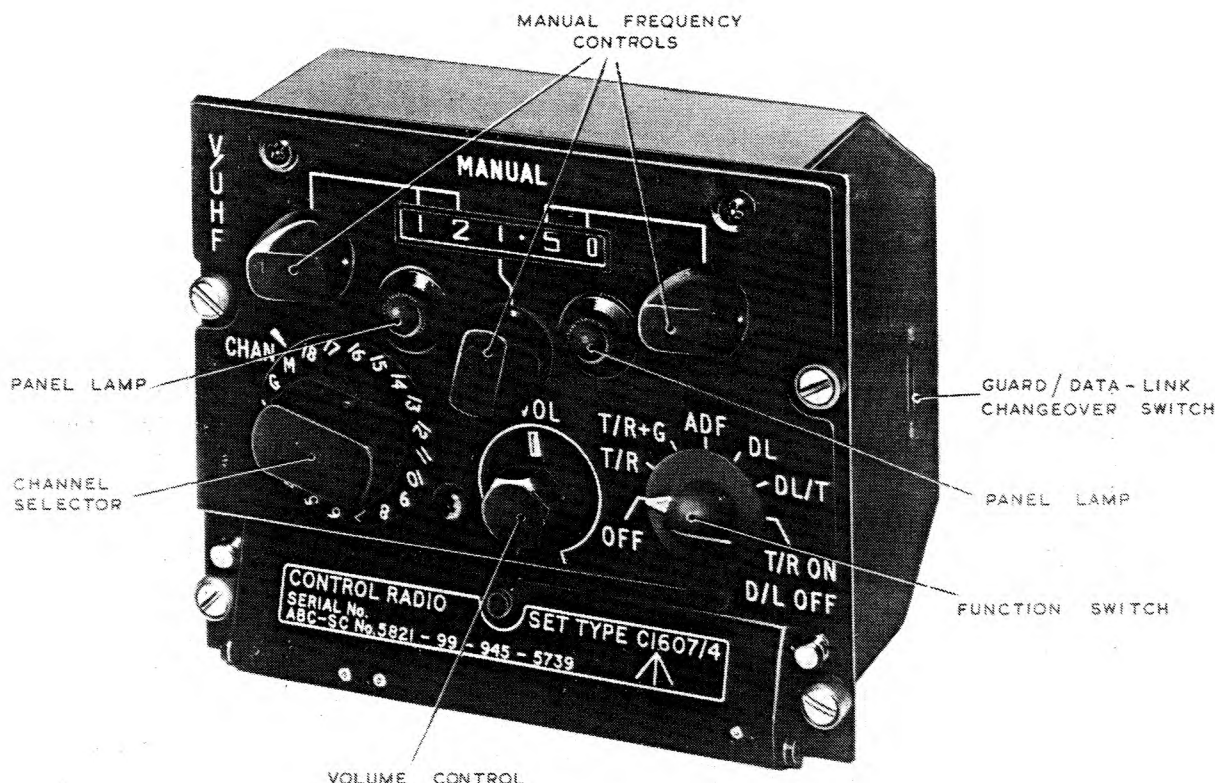


Fig 1 Control, radio set, Type C1607/4, operating controls

### Functions of operating controls

3 The operating controls for the basic equipment consist only of those on the front panel of the control unit (Fig 1) and they are as follows:

3.1 MANUAL frequency controls. Three controls are used for manually selecting the operating frequency; the CHAN switch must be in the M (manual) position. When the CHAN selector switch is not in the M position, the MANUAL selectors do not affect the operating frequency.

Note ...

The decimals switch mechanism may be set to give either 50 kHz or 100 kHz steps. The method of changing over the mechanism is described in AP 116D-133-1A.

3.2 CHAN selector switch. In addition to the M position (sub-para.3.1) there are eighteen positions for the preset channels of operation (para.4) and also a G position for the guard frequency of 243.0 MHz. Note that the G (guard) position can be reached by rotating the switch in either direction. Hence, the first positions against the stop is always guard. This is significant in installations where the control unit is not visible to the operator, who may select the required channel by counting switch positions from the stop.

3.3 VOL control. This permits the level of the audio signals in the telephones to be set to the required level.

3.4 Function switch. The seven positions of this switch are as follows:

3.4.1 OFF. The power supplies are switched off.

3.4.2 T/R. The power supply is switched on and the equipment is automatically set for receiving purposes. When it is required to transmit, the press-to-transmit switch must be operated.

3.4.3 T/R + G. The guard receiver is switched on, while normal transmit-receive facilities on the selected channel are retained.

3.4.4 ADF. This position is for use with both British and American direction finding equipment. The British equipment includes facilities to permit normal transmission and reception when the ADF position is in use. The American equipment does not include this facility.

3.4.5 DL. Equipment set for reception of data link signals. Transmitter inoperative.

3.4.6 DL/T. Equipment set for reception of data link test messages. Transmitter inoperative.

3.4.7 T/R ON DL OFF. This is an emergency position. It permits R/T communication in the event of the data link equipment becoming unserviceable and affecting normal R/T communication on the T/R position.

#### Setting up the present channels

4 The setting up scale is exposed by pulling open the cover plate. The channel to be set up is indicated by a white number on a red background at the extreme left-hand end of the scale. The channel number is rotated into the setting up position by the channel selector switch up purposes, the channel number indicated on the channel selector switch CHAN does not agree with that appearing on the setting up scale and, therefore, the setting of the CHAN switch should be ignored during this procedure.

5 Setting up is done by means of switch actuators mounted on a drum, there being one bank of actuators for each channel. A special presetting tool (Fig 2) is provided for sliding the actuators to the required positions. The actuators operate switches mounted inside the control unit. The position of the channel selector switch CHAN determines the bank of actuators which will operate the switches to obtain the operating frequency, and this bank corresponds with the number indicated on the channel selector switch. The bank of actuators accessible for adjustment is that indicated by a white number of a red background at the left-hand end of the scale.

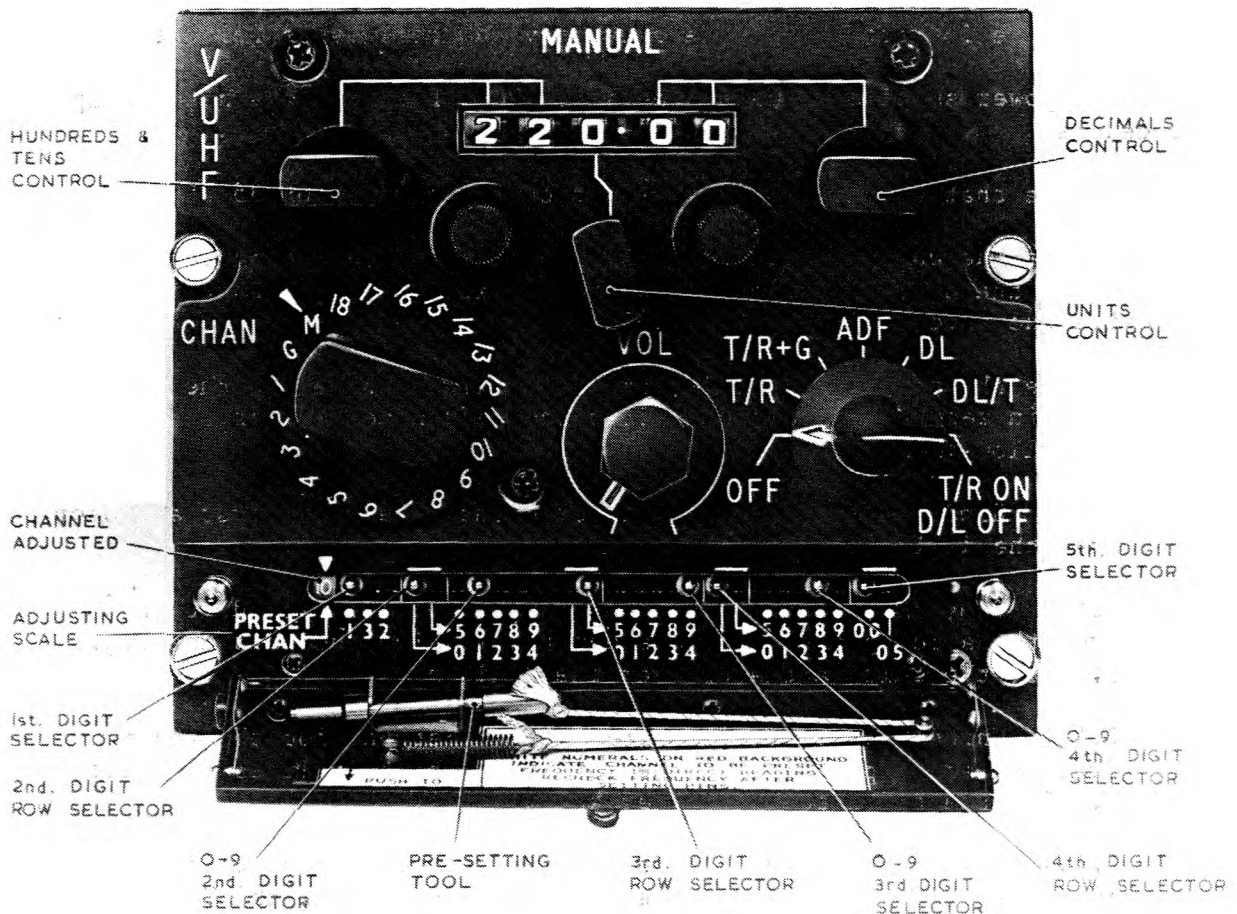


Fig 2 Control, radio set, Type C1607/4, frequency selection

6 The scale has four groups of digits and, reading from the left-hand to the right-hand side, they represent the frequency in MHz as follows:

6.1 The first group consists of digits 1, 2 and 3; these represent the hundreds of MHz within the frequency range of 117.5 MHz to 135.95 MHz, and 225.0 MHz to 399.9 MHz.

6.2 The second group consists of two rows of five digits which represent the tens of MHz within the frequency range. Two actuators are used with these digits, one to select the required row and the other to select the actual digit required.

6.3 The third group is similar to the second group and represents the units of MHz.

6.4 The fourth group is also similar to the second group and represents the tenths of MHz.

6.5 The fifth group represents the hundredths of MHz being designated 00 to 05.

7 The procedure for setting up the frequency channels is as follows:

7.1 The power supplies need not be switched off during the setting up procedure.

7.2 Assume that channel 7 is to be set to a frequency of 351.5 MHz.

7.3 Rotate the channel selector CHAN switch until the channel number 7 appears in the aperture adjacent to the setting up scale, that is, opposite the arrow pointing to PRE-SET CHAN.

7.4 Remove the presetting tool from its stowage and set up the actuators in sequence, commencing from the left-hand side of the control unit as follows:

7.4.1 Hundreds MHz, digit 3, first group. Set the first actuator over the digit 3.

7.4.2 Tens MHz, digit 5, second group. Set the second actuator over the arrow pointing to the upper row which includes the digit 5. Set the third actuator over the digit 5.

7.4.3 Units MHz, digit 1, third group. Set the fourth actuator over the arrow pointing to the lower row which includes the digit 1. Set the fifth actuator over the digit 1.

7.4.4 Tenths MHz, digit 5, fourth group. Set the sixth actuator over the arrow pointing to the upper row containing the digit 5. Set the seventh actuator over the digit 5.

7.4.5 Hundredths MHz, digit 00, fifth group. Set the eighth actuator over the digit 00.

7.5 The remaining channels can be set to the required frequency by first turning the CHAN switch so that the required channel number appears in the PRESET CHAN position (sub-para 7.3) and then repeating the procedure contained in sub-para 7.4) to set the actuators to the frequency required.

7.6 Channel G (guard frequency) is normally set to 243.0 MHz.

7.7 Channel M. The actuators cannot be removed, they are fixed in position to actuate the switch contacts which enable the MANUAL controls to be used for selecting a required frequency channel.

7.8 After completing the setting up procedure put the presetting tool back into its stowage position and close the cover plate.

### Operating Instructions

8 In the subsequent instructions, it is assumed that the sensitivity controls, which are on the main chassis right-hand gusset plate of the transmitter-receiver and, therefore, only accessible when the cover is removed, have been set by servicing personnel at the appropriate servicing lines.

(Instructions for setting these controls are given in Chap 6 of AP 116D-0116-1). It is also assumed that an overall test of the installation has been made in accordance with the procedure given in AP 116D-0116-1, and that the frequencies for the preset channels have been previously selected according to the instructions given in para.7.

#### CAUTION ...

It is of utmost importance to ensure that the equipment is at "receive" before changing channels. The transmitter-receiver may be seriously damaged if channels are changed whilst at "transmit".

#### Main transmitter-receiver

9 To operate the equipment on any one of the eighteen preset channels, proceed as follows:

- 9.1 Set the function switch on the control unit to the T/R position and wait approximately 30 seconds for the valves in the transmitter-receiver to warm up.
- 9.2 Set the channel selector CHAN to the required channel.
- 9.3 Adjust the VOL, control to approximately the centre of its travel.
- 9.4 After the first received signal is heard in the headphones, the VOL control may have to be readjusted to give the required level of sound.
- 9.5 Transmission is effected on the same channel by operating the PRESS -TO-TRANSMIT switch.

#### Guard receiver

10 The guard receiver is brought into operation by setting the function switch of the control unit to the T/R + G position. The channel selector switch CHAN should be set to any of the channels other than G. Thus watch can be maintained on both the guard frequency and the frequency at which the main transmitter-receiver is being operated. The level of the audio output of the guard receiver relative to that of the main receiver is preset by an internal control, while the level of the audio signals in the telephones is adjustable, by the VOL control on the control unit. The Type C1607/4 control unit has a two-position switch visible through the case on the right-hand side. In ARI 23143 installations, this switch should be in the green G (guard) position.

#### Main receiver on the guard frequency

11 Should it be necessary to operate the main receiver at the guard frequency or transmit and receive at this frequency, the function switch should be set to T/R and the CHAN selector switch set to G. The guard receiver output is cut off and the equipment should be operated as described in para.9.

12 To operate the equipment on manually adjusted frequencies proceed as follows:

12.1 Rotate the channel selector switch CHAN to the M position.

12.2 Set the function switch to the desired type of operation, ie. T/R or T/R + G.

12.3 Adjust each of the MANUAL frequency controls at the top of the control unit front panel to show the desired operating frequency. Fig 2 shows the MANUAL controls set a frequency of 220.00 MHz and Fig 1 shows them set to 121.50 MHz.

Note ...

Only frequencies in the bands 117.5 MHz to 135.95 MHz and 225 MHz to 399.95 MHz are operative even though the MANUAL controls on the control unit may be set so that frequencies outside these bands appear in the window.

12.4 Operate the equipment as described in para.9, sub-para.9.3 to 9.5.

Chapter 3SERVICING INFORMATION AND INSTALLATION TESTING

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GENERAL

1 First line servicing of the transmitter-receiver and associated equipment comprising FGRI 26145 installations is limited to a series of functional test which are made periodically (as instructed in the servicing schedule) in order to establish that the equipment is in satisfactory operating order. In the event of a defect, either a part or the whole of the equipment must be removed from the rack housing and serviceable items substituted for those suspected of faulty operation. The procedure for subsequent servicing of a faulty transmitter-receiver Type PTR175 or any of its component modules is fully described in the associated publication AP 116D-0116-1.

2 Faults attributed to the wiring of the rack, mounting, Type 2 or of the panel, distribution, Type 21A included in this installation must be rectified in accordance with local instructions for the servicing of such equipment.

3 Before applying power to the equipment and prior to any testing, a thorough examination should be made of all units in the installation. The points to watch for in this preliminary inspection are summarized as follows:

3.1 Ensure that all component units are securely mounted in the rack and are clean and dry. Include in this inspection the control unit Type C1607/4 which is usually mounted remote from the transmitter-receiver equipment.

3.2 Carefully examine all installation wiring to be sure that it is connected correctly and remains in good condition. Where station supply cables are installed in underfloor ducting ensure that the floor channel is dry.

3.3 See that all connectors are in good condition and securely fitted to the appropriate unit plugs or sockets. It is a good plan periodically to smear the threads of plugs and sockets (very lightly) with a silicon grease in order to prevent binding of the threads and also to help in forming a damp-roof connection.

3.4 Operate all controls and verify that they are undamaged and operable.

#### SERVICING

4 Daily servicing of the component items of equipment should only be concerned with the cleaning of the exterior casings of all units, and with the verification of clean, dry connections between all unit connectors and equipment units. The power unit (ac) 5821-99-943-7136 should, in addition, be given a short functional test in the following manner:

4.1 Switch on and ensure that the DC OUTPUT lamp lights up and that the DC OUTPUT meter indicates an output voltage of 27.5V.

4.2 Vary the load by switching the transmitter-receiver from the receive condition to transmit and back again; the reading on the DC OUTPUT meter should not change by more than 1V.

5 The extent of the cleaning necessary at each servicing will depend, of course, on local climatic conditions and the site of the installation; but every effort should be made to avoid the condensation of moisture upon the equipment units and connectors, or the ingress of dust and sand.



INSTALLATION TESTINGTest equipment

6 When the complete installation has been examined and correctly connected up, the transmitter-receiver is ready for an operational test. A list of test equipment which should be available at first line servicing is given in Table 1.

TABLE 1 LIST OF TEST EQUIPMENT

Item	Reference No.	Nomenclature	Further details
1	6625-99-943-1524	Multimeter set	AP 2536C
	or		
	5QP/16411	Multimeter Type 1	AVO 8S
	or		
	6625-99-943-1532	Multimeter unit	AVO 7X
	or		
	10S/9556255	Multimeter set, electronic	CT 471C
	or		
2	5QP/1	Testmeter Type F	AVO 7
	or		
	5QP/10610	Testmeter Type D1	
2	5G/152	Tester, insulation, resistance, Type C	AP 4343S
	or		
	F1C/5047	Tester, insulation	
3	6625-99-943-4149	Test set, UHF equipment Type 15056	AP 117M-0101-1
4	10AH/14	Headset Type 9	AP 830 (2 off)
5	10AH/18	Microphone assembly Type 71	(2 off)
6	6B/117	Stop watch, Mk 3	
7		Pressure gauge	
8		Pressurizing pump	

Continued ..

TABLE 1 LIST OF TEST EQUIPMENT Cont'd

Item	Reference No.	Nomenclature	Further details
9	6625-99-943-7031 or 6625-99-943-7032	Bench connector set	Bench test only
10	5821-99-943-7136	Power supply	Bench test only

Equipment interconnections

7 If the equipment is being tested in a workshop, connect the transmitter-receiver, control unit and the receiver muting control to the test bench. Set the DC SUPPLY changeover switch to:

TR5 for the PTR175.

Make connections to power supplies:

7.1 Nominal 27.5V dc supply.

7.2 Nominal 115V, phase-to-neutral 400 Hz, 3 phase ac supply (for ARI 23143/2 only).

8 Interconnect the test set (UHF) Type 15056 and the equipment as in Fig 1:

8.1 Connect the TEST socket on the test set to SKT2 on the interconnecting box using the 12-way test connector.

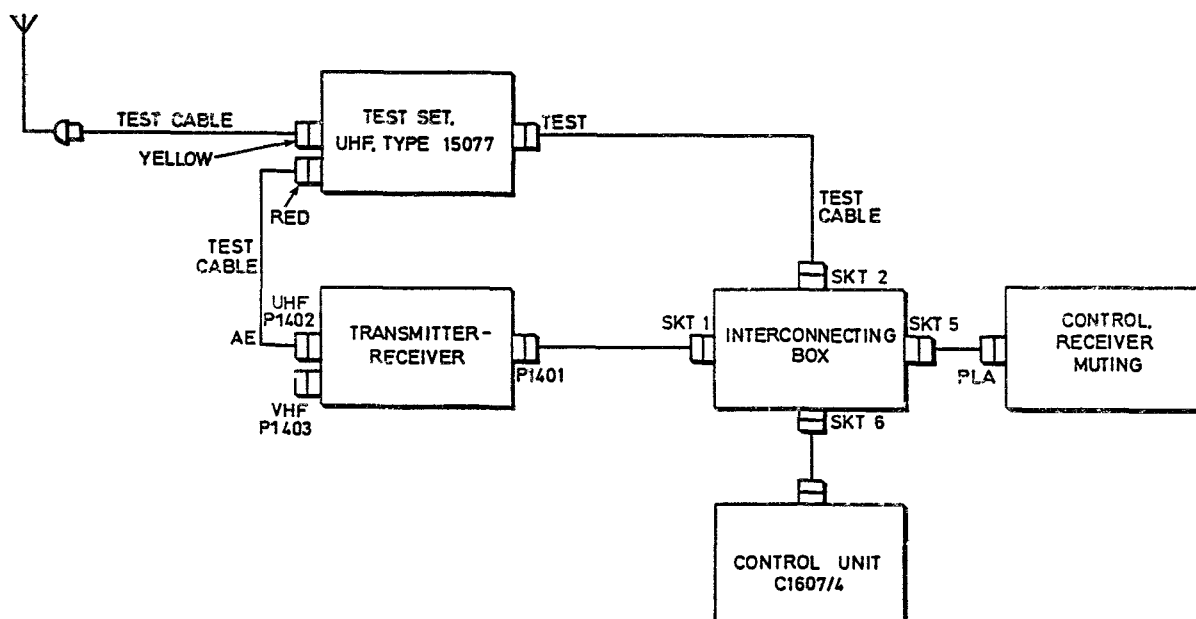


Fig 1 Interconnections of test set, UHF, Type 15056

8.2 Disconnect the UHF aerial lead from the transmitter-receiver and connect it to the AERIAL socket (yellow) on the test set through the coaxial connector provided.

Note ...

The aerial lead must not be connected to the test set under conditions of radio silence.

8.3 Connect the RADIO socket (red) of the test set to the aerial socket (P1402/P1403) of the transmitter-receiver by means of the coaxial connector provided.

8.4 Connect one of the headsets to the MIC/TEL sockets on the test set and the other to the test set bench interconnecting box.

8.5 Switch on the test set.

#### Switching on and power supply tests

9 Ensure that the TRANSMIT/RECEIVE switch is at RECEIVE, then switch on the DC SUPPLY and also, if a PTR175A is to be tested, the 3-PHASE SUPPLY.

10 On the control unit, set the function switch to T/R + G. Allow 30 seconds for the equipment to warm up and stabilize, then test the power supplies as follows:

10.1 On the test set, measure the dc supply by setting the METER SWITCH to DC1; the reading on the test meter should be in the blue zone.

10.2 For ac equipments (PTR175A), set the test set METER SWITCH to AC2; the reading on the test set meter should be in the yellow zone.

#### Channel selection time

11 Set the channel selector CHAN of the control unit to position M and set up the MANUAL controls for a frequency of 235.1 MHz. Select 235.0 MHz and, at the same time use a stop-watch to record the time taken from the instant of selecting this latter frequency until the mechanical drive ceases to operate; it should not exceed six seconds.

#### Guard receiver sensitivity and af power

12 Measure the af output and the sensitivity of the guard receiver in the following manner:

12.1 Connect the attenuator between the SIG. GEN. and RX sockets, set the METER SWITCH to position 3, AF POWER, and set the SIG. GEN. FREQ. switch to X.

12.2 On the control unit, set the MANUAL controls to 300.0 MHz and turn the VOL. control fully clockwise.

12.3 Verify that the test set meter reading exceeds A and that a tone is audible in the interconnecting box headset; if the meter reading is low, momentarily disconnect the headset.

12.4 On the test set, remove the attenuator from the SIG. GEN. and RX sockets and substitute the coaxial link.

12.5 Verify that the meter reading exceeds B and that a tone is audible in the interconnecting box headset; if the reading is low, momentarily disconnect the headset.

#### Main receiver, UHF operation

13 Tests should be made to verify the audio outputs, sensitivity and tuning accuracy of the receiver when operating on UHF channels; the procedure is described in the following paragraphs.

#### 14 AF power

14.1 Set the control unit function switch to T/R and the MANUAL controls to 243.00 MHz.

14.2 With the VOL. control turned fully clockwise verify that the test set meter reading exceeds B; if the reading is low, momentarily disconnect the headset.

Note ...

The pass mark specified in 14.2 applies only where the loading resistance can be readily switched out of circuit. If the load cannot be switched out, the pass mark is A with a load of the order of 50 ohms.

14.3 If a control receiver muting is connected, set the MUTE/NORMAL switch on the interconnecting box, to MUTE and verify that the headset tone is muted; return the switch to NORMAL.

#### 15 Auxillary audio output

15.1 Turn the test set METER SWITCH to position 10, AUX. AUDIO, and verify that the meter reading is between 25 and 55.

#### 16 Sensitivity

16.1 On the test set, transfer the coaxial link to the RX and NOISE GEN. sockets and set the METER SWITCH to position 4, RX SENS.

16.2 Set the control unit MANUAL controls to each of the appropriate UHF test frequencies listed in Table 2 and, at each frequency, perform the tests in sub-para 15.3 and 15.4.

16.3 On the test set, operate the NOISE GEN. switch to MOD.ON and adjust the DC CAL. controls, FINE and COARSE, for a meter reading of C.

16.4 Set the NOISE GEN. switch to MOD.OFF and verify that the meter reading is less than A.

TABLE 2- TEST FREQUENCY SWITCH POSITIONS

Test frequency (MHz)	SIG. GEN. FREQ. switch position	Test frequency (MHz)	SIG. GEN. FREQ. switch position	Test frequency (MHz)	SIG. GEN. FREQ. switch position
119.35	Y	267.30	X	292.95	Y
124.30	Z	271.25	Y	303.75	X
133.65	X	279.45	X	316.40	Z
226.00	Z	282.10	Y	327.70	Z
230.85	X	368.90	Y	336.35	Y
243.00	X	376.65	X	347.20	Y
249.55	Y	388.80	X	358.05	Y
255.15	X	390.60	Y	364.50	X

### 17 Tuning accuracy

17.1 On the test set, transfer the coaxial link to the SIG. GEN. and RX sockets and set the METER SWITCH to position 5, RF POWER.

17.2 Set the control unit MANUAL controls to each of the appropriate UHF test frequencies listed in Table 2, switching the SIG. GEN. FREQ. switch on the test set to the position indicated, and perform the test described in sub-para.17.3 at each frequency.

17.3 Adjust the control unit VOL. control as necessary and verify that a tone is audible.

### Transmitter, UHF operation

18 Test should be made to verify the RF power output and the modulation depth and quality of the transmitter, these tests are described in the following paragraphs.

### 19 RF power

19.1 On the test set, transfer the coaxial link to the TX and LOAD sockets and set the METER SWITCH to position 5, RF POWER.

19.2 Perform the test described in sub-para.19.3 with the control unit MANUAL controls set to each of the appropriate UHF test frequencies listed in Table 2.

19.3 Operate the TALK switch of the test set to ON and verify that the meter reading exceeds B; release the TALK switch to OFF.

### 20 Modulation depth and quality

20.1 Set the control unit MANUAL controls to 300.50 MHz.

20.2 On the test set, turn the METER SWITCH to position 6, DC CAL., operate the TALK switch and adjust the DC CAL. controls, FINE and COARSE, for a meter reading of D.

- 20.3 Turn the METER SWITCH to position 7, % MOD., and verify that the meter reading is not less than B (50%); release the TALK switch to OFF.
- 20.4 Return the METER SWITCH to position 6, DC CAL., operate the TONE MOD. switch and adjust the DC. CAL. controls for a meter reading of D.
- 20.5 Set the METER SWITCH to position 7, % MOD., and verify that the meter reading is not less than B; release the TONE MOD. switch to OFF.
- 20.6 Turn the DC CAL. controls fully clockwise and the METER SWITCH to position 9, TX QUAL. and operate the TALK switch to ON.
- 20.7 An assistant should speak into the interconnecting box microphone while the tester assesses the modulation quality of the side-tone in the headset connected to the test set. Release the TALK switch to OFF.

### Reflection coefficient

Note ...

This test must not be implemented during conditions of radio silence.

21 For testing the reflection coefficient of the installation aerials and feeders, first set the channel selector CHAN to any little used preset UHF channel other than G, then proceed as follows:

- 21.1 Disconnect the coaxial link from the LOAD socket on the test set and connect it between the AERIAL socket (small) and the TX socket.
- 21.2 Set the METER SWITCH to position 5, RF POWER.
- 21.3 Listen out before transmitting, set the METER SWITCH to position 6, DC CAL, then operate the TALK switch and adjust the DC CAL. controls for full scale deflection (D) on the meter.
- 21.4 With the TALK switch still depressed, set the METER SWITCH to position 8, REFL. COEFF.; the meter reading must not exceed B. Return the TALK switch to OFF position.
- 21.5 Remove the coaxial link from the AERIAL socket (small) and the TX socket (sub-para.20.1) and replace it in its stowage position in the lid.

### Main receiver, VHF operation

22 Transfer the connector (coupled to the RADIO socket of the test set) from P1402 to P1403 on the transmitter-receiver and verify the performance of the receiver on the VHF channels by measuring the audio outputs, sensitivity and tuning accuracy as follows:

- 22.1 On the test set, connect the coaxial link between the SIG. GEN. and RX sockets. The SIG. GEN. FREQ. switch should be set to position X and the METER SWITCH to position 3, AF POWER.
- 22.2 Set the control unit MANUAL controls to 121.50 MHz and measure the AF power in accordance with para. 13.2 and 13.3.

22.3 Perform the sensitivity test described in para.15 but with the control unit MANUAL controls set to each of the VHF test frequencies listed in Table 2.

22.4 Check the tuning accuracy in accordance with para.16 but with the control unit MANUAL control set to each of the VHF test frequencies listed in Table 2.

### Transmitter, VHF operation

23 Verify the transmitter output power and the modulation depth and quality when operating on the VHF channels; the procedure is described in the following paragraphs.

#### 24 RF power

24.1 On the test set, connect the coaxial link between the TX and LOAD sockets and set the METER SWITCH to position 5, RF POWER.

24.2 Set the control unit MANUAL controls to each of the VHF test frequencies listed in Table 2 and perform the test described in sub-para.24.3 at each frequency.

24.3 On the test set, operate the POWER switch to LOW and the TALK switch to ON and ensure that the meter reading exceeds 40 (2 watts). Release the TALK switch to OFF and the POWER switch to HIGH.

#### 25 Modulation depth and quality

25.1 Set the control unit MANUAL controls to 121.50 MHz.

25.2 Set the microphone switch on the headset to OFF.

25.3 On the test set, turn the METER SWITCH to position 6, DC CAL., operate the TALK switch to ON and adjust the DC CAL. controls, FINE and COARSE, for a meter reading of B.

25.4 Turn the METER SWITCH to position 7, % MOD., and verify that the reading is not less than 25 (50%).

25.5 Release the TALK switch to OFF.

25.6 Repeat sub-para. 25.3 and 25.4 but with the TONE switch operated instead of the TALK switch; when the test is completed, release the TONE switch to OFF.

25.7 Turn the DC CAL. controls fully clockwise, set the METER SWITCH to position 9, TX QUAL., and operate the TALK switch to ON.

25.8 An assistant should speak into the interconnecting box microphone while the tester assesses the modulation quality of the side-tone in the headset connected to the test set. Release the TALK switch to OFF.

25.9 Set the control unit MANUAL controls to 117.50 MHz and 135.95 MHz and repeat the operations in sub-para. 25.2 to 25.8 at each of these frequencies.

Reflection coefficient

26 Repeat the procedure given in para.21 with the channel selector CHAN on the control unit set to a VHF channel. Having switched to position 8 REFL. COEFF. on the test set, man A should obtain a meter reading of less than 12 in this case. Remove the coaxial link between AERIAL and TX on the test set and replace it in its stowage position in the lid.

Conclusions

27 On completion of the overall performance tests switch off all test equipment and disconnect.

28 Allow the transmitter-receiver to cool then check pressurization, details are given in Publication No. AP 116D-0116-1.