

**Table 3-5 Example Waveform Profile Radio Parameters**

Parameter	AM-Voice	Maritime	Default Setting	Setting Range
RF power output	✓	✓	50 W (AM-Voice) 100 W (Maritime)	Between 1 and 50 W (1 W steps) AM-Voice Between 1 and 100 W (1 W steps) Maritime
Squelch level	✓	✓	-102 dBm	Between -60 and -110 dBm (1 dB steps)
Audio AGC	✓	✓	On	On or Off
Squelch noise compensation	✓	✓	On	On or Off
Squelch carrier override	✓	✓	Off	On or Off
Transmit timeout	✓	✓	180 s	0 to 600 s (5 s steps). Note that 0 s is Off (no timeout).
Mute	✓	✓	On	On or Off
RF power delay	✓	✓	Off	On or Off
Automatic level control	✓	✓	On	On or Off
Offset carrier	✓	✗	0 kHz	+8, +7.5, +7.3, +5, +4, +2.5 (kHz) 0 -8, -7.5, -7.3, -5, -4, -2.5 (kHz)
Operation mode	✗	✓	Ship	Ship or shore
Operation format	✗	✓	International	International or American

## Creating and Storing a Frequency Preset

Up to 400 frequency presets, designated FP1 to FP400, can be stored in the radio ready for immediate recall. A frequency preset stores a valid operating frequency plus an associated Waveform Profile; for example, 121.500 MHz operating with Waveform Profile WP5.

When the radio is received from Park Air, all 400 Frequency Presets are set to 118.000 MHz operating with the default Waveform Profile WP1. The Frequency Preset designations are factory set to be FP1 to FP400. These designations can be edited by the user to any name up to 8 characters long.

To create and store a frequency preset:

- From the Home screen (Fig 3-39) press Key 2 to display the list of frequency presets (Fig 3-40).

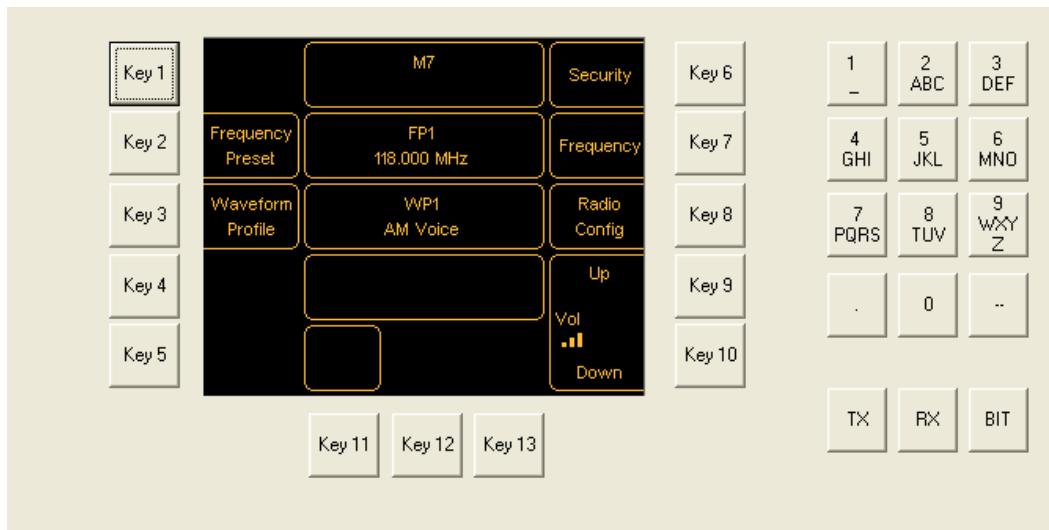


Fig 3-39 Home Screen

- Pressing Key 9 to scroll up, or Key 10 to scroll down, highlight the frequency preset to be edited then press Key 12 – *Edit* to display the Frequency Preset Edit screen (Fig 3-41).

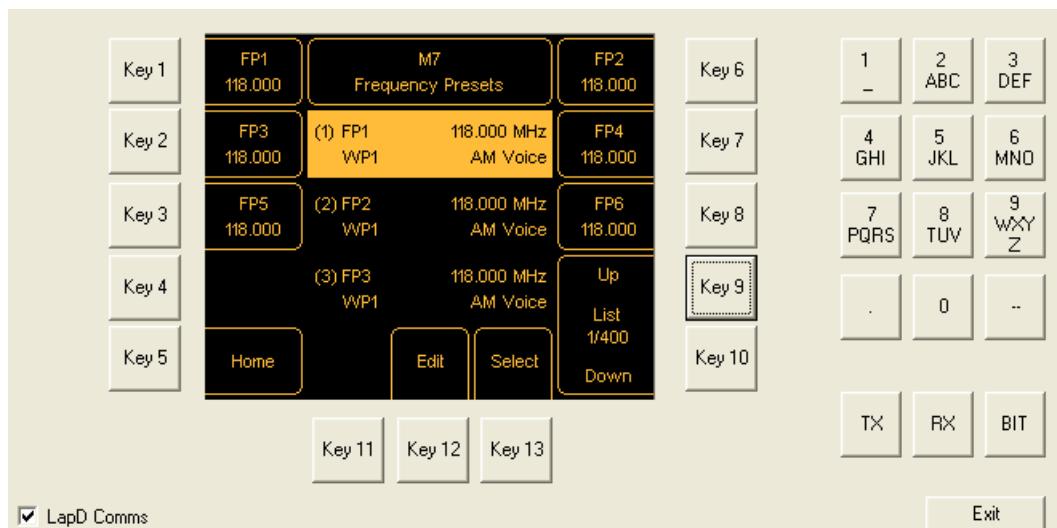


Fig 3-40 List of Frequency Presets

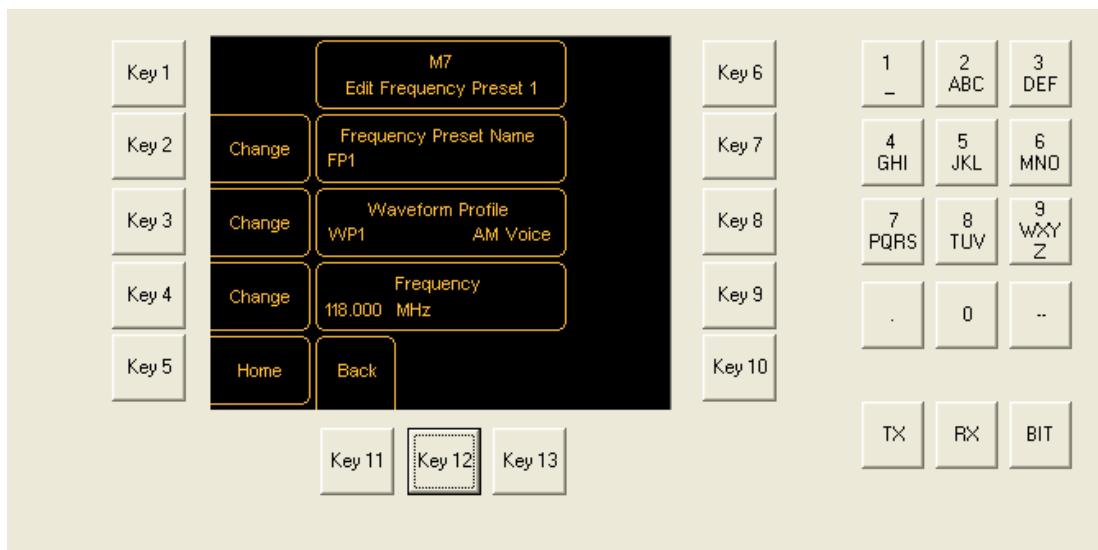


Fig 3-41 Frequency Preset Edit Screen

- (3) The first parameter that can be changed is the Name. A frequency preset can have any name up to eight characters long. In this example, the default designation FP1 is being changed to 'Approach' as shown in Fig 3-42. To change the name, press Key 2 – Change. The new name can be entered using the alphanumeric keypad.
- (4) When the new name has been entered, press Key 13 – Select. You are returned to the Frequency Preset Edit screen (Fig 3-41).

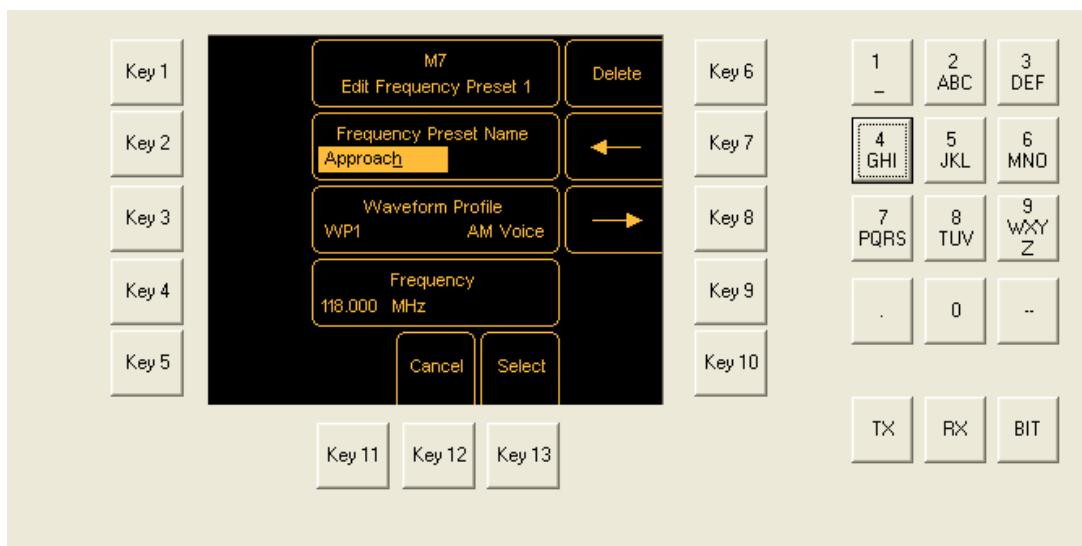


Fig 3-42 Edit Frequency Preset Name

(5) The next parameter is to attach a previously stored Waveform profile to the frequency preset. Press Key 3 – *Change* (Fig 3-41). Pressing Key 9 to scroll up, or Key 10 to scroll down, highlight the required waveform profile (Fig 3-43), then press Key 13 – *Select*.

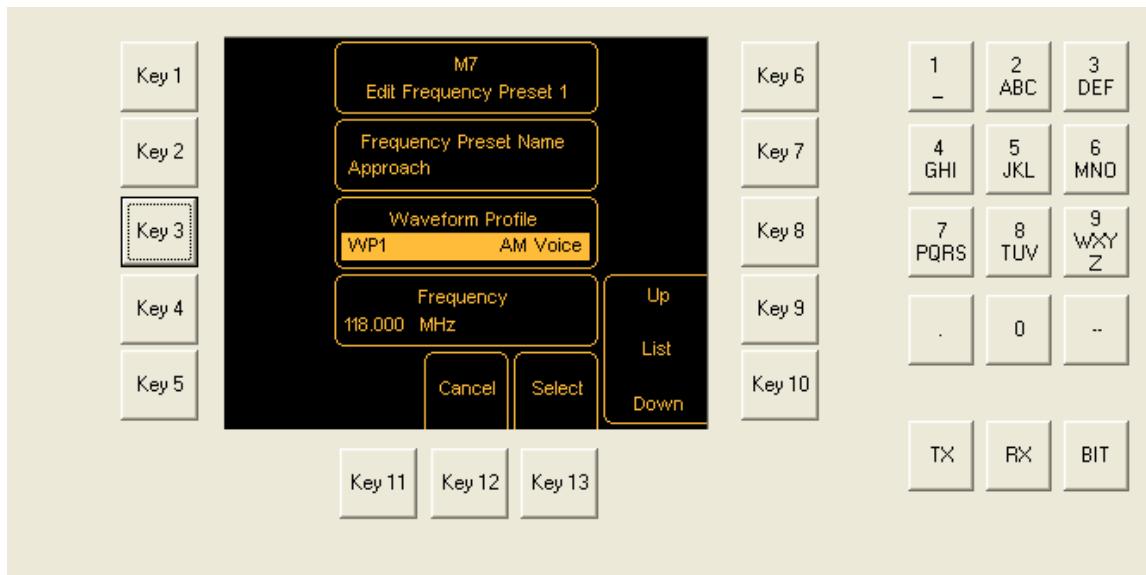


Fig 3-43 Select Waveform Profile

(6) From the Frequency Preset Edit screen, press Key 4 – *Change* to select the required Frequency (Fig 3-44). Using the keypad, enter the required frequency. [Note that any offset frequency is a parameter of the waveform profile; the operating frequency should *not* include any offset.] If a Maritime waveform profile is selected, a channel selection is required as shown in Fig 3-45.

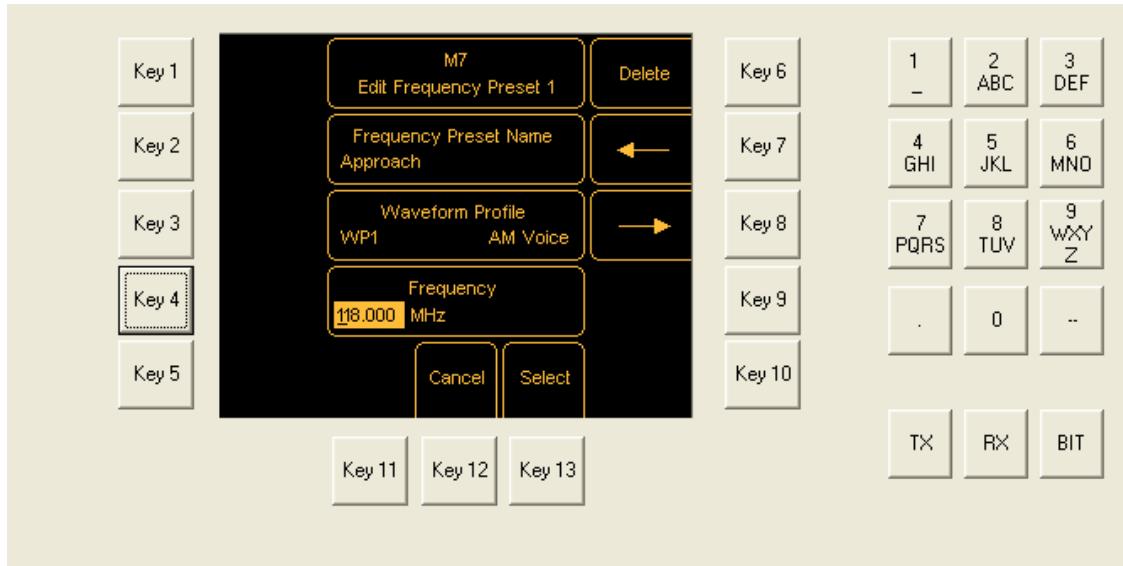
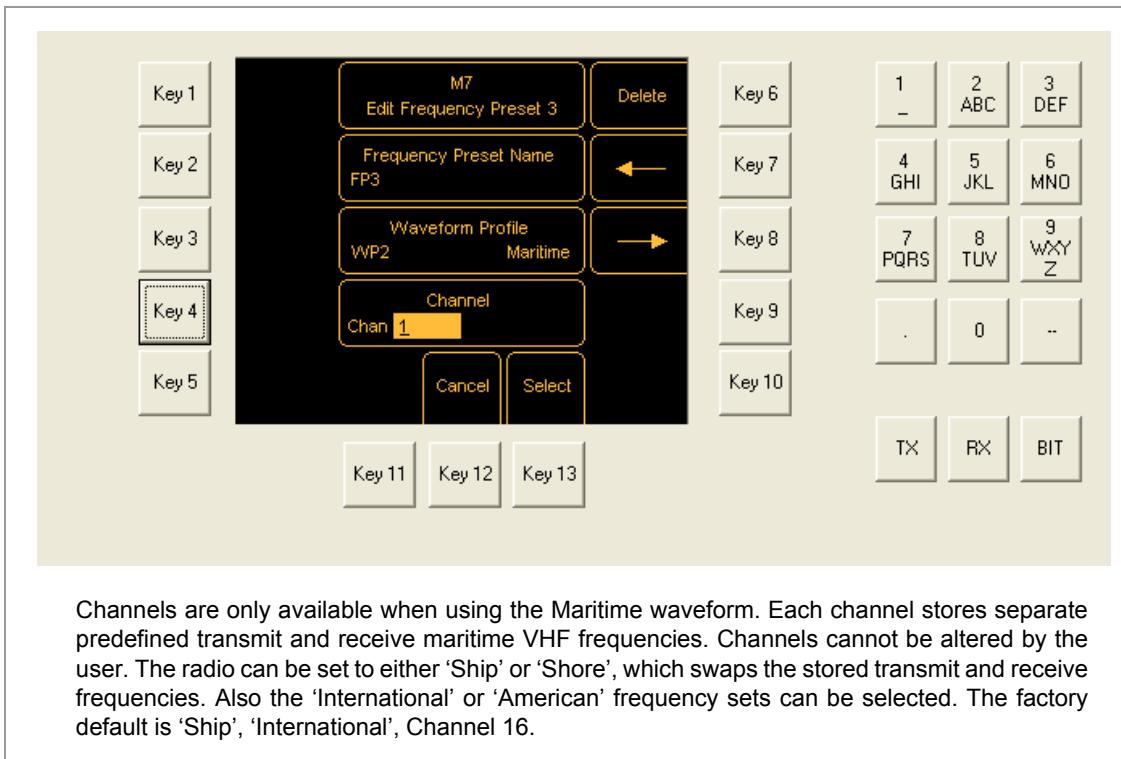


Fig 3-44 Select Frequency

(7) When the correct frequency (or channel) is shown, press Key 13 – *Select*. The frequency preset is now set up. Repeat this procedure for other frequency presets.



**Fig 3-45 Frequency Preset – Select Maritime Channel**



## Security

The radio has a security feature that allows certain operations, for example, changing the radio's configuration settings, to be performed only after a 4-digit PIN number has been entered.

The radio has three security profiles:

- Security Profile A (SPA). SPA limits access to defined radio functions via the front panel and associated M7 remote controllers
- Security Profile B (SPB). SPB limits access to defined radio functions via the front panel and associated M7 remote controllers
- Security Profile Z (SPZ). SPZ limits access to defined radio functions via its interfaces (not including the interface to M7 remote controllers).

The example given on the following pages show how to set security so that:

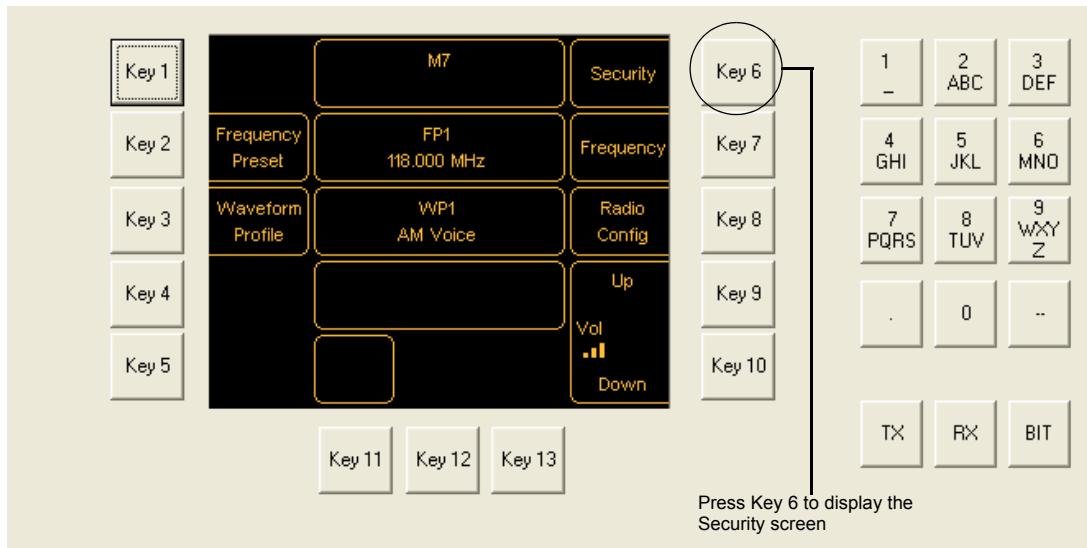
- (1) Personnel with knowledge of the Security Profile A PIN:
  - can change frequency by recalling stored frequency presets from the radio or associated M7 remote controller
  - cannot recall waveform profiles
  - cannot change the radio's configuration settings.
- (2) Personnel with knowledge of the Security Profile B PIN:
  - can change frequency by recalling stored frequency presets from the radio or associated M7 remote controller
  - can change frequency by recalling stored waveform profiles from the radio or associated M7 remote controller
  - cannot change the radio's configuration settings.
- (3) The radio's configuration settings cannot be changed from any remotely connected equipment (except the M7 remote controller).

**The administrator has no security restrictions.**

To define the security profiles:

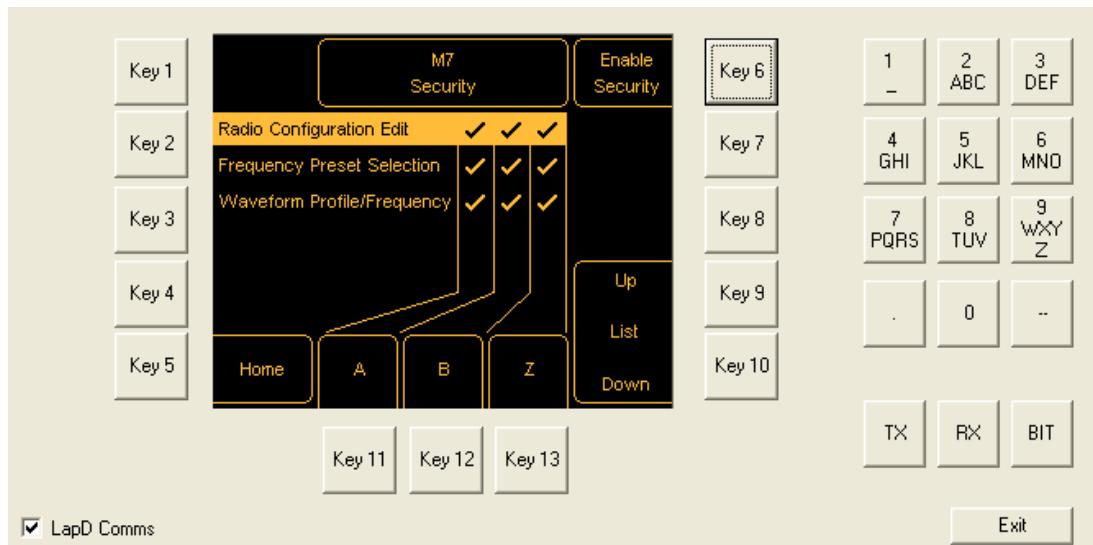
**This procedure should be completed only by the system administrator.**

- From the Home screen (Fig 3-46) press **Key 6 – Security** to display the Security screen (Fig 3-47).



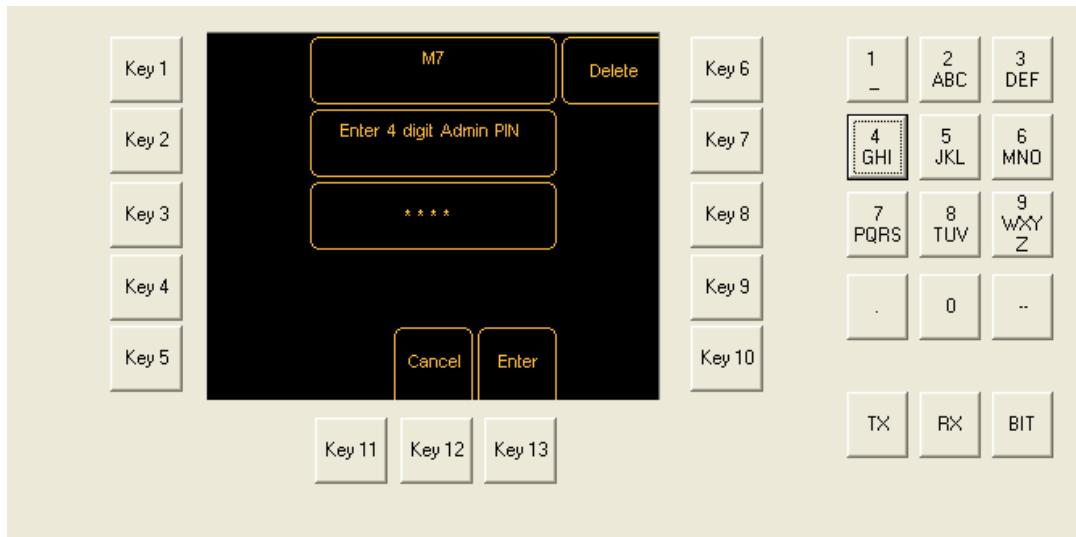
**Fig 3-46 Home Screen – Security Set Up**

- The Security screen shows the restrictions applicable to profiles SPA, SPB and SPZ. A restriction is indicated by a cross (X) and no restriction is indicated by a tick (✓). The example shown in Fig 3-47 has no security restrictions. To set up the profiles press **Key 6 – Enable Security**.



**Fig 3-47 Security Screen (Example A)**

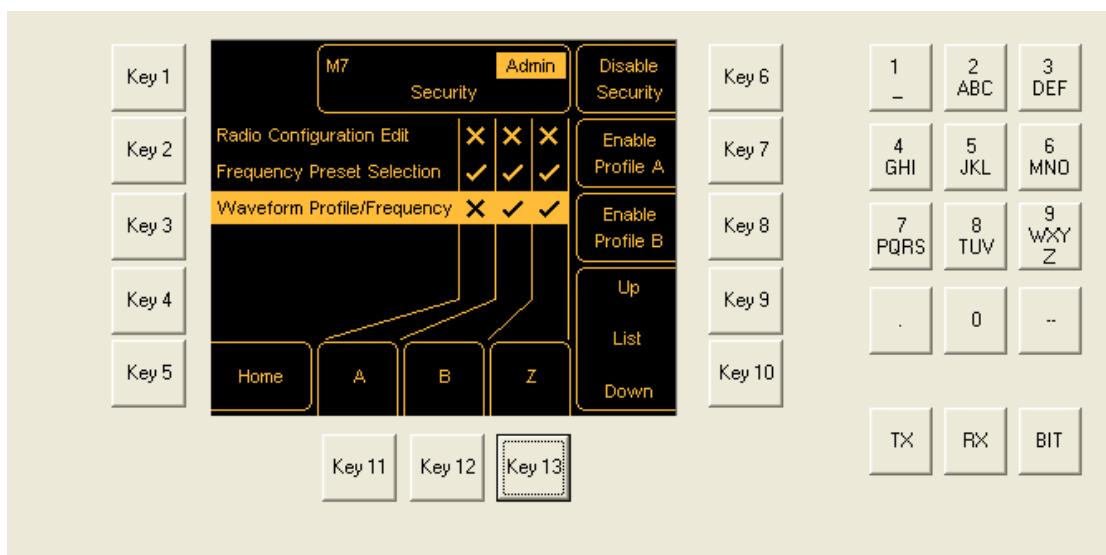
(3) Ensure the Enable Security screen (Fig 3-48) is displayed. Using the keypad, key in a 4 digit Administrator PIN number, then press *Key 13 – Enter*.



**Fig 3-48 Enable Security Screen**

(4) Ensure the Security screen is displayed. Use *Key 9 – Up* and *Key 10 – Down* to highlight one of the three functions. Use *Key 11 – A*, *Key 12 – B* and *Key 13 – Z* to toggle between restricted (✗) and no restriction (✓).

(5) When the Security screen is set up as required (Fig 3-49) press *Key 7 – Enable Profile A*. The Profile A Security screen (Fig 3-50) is displayed.

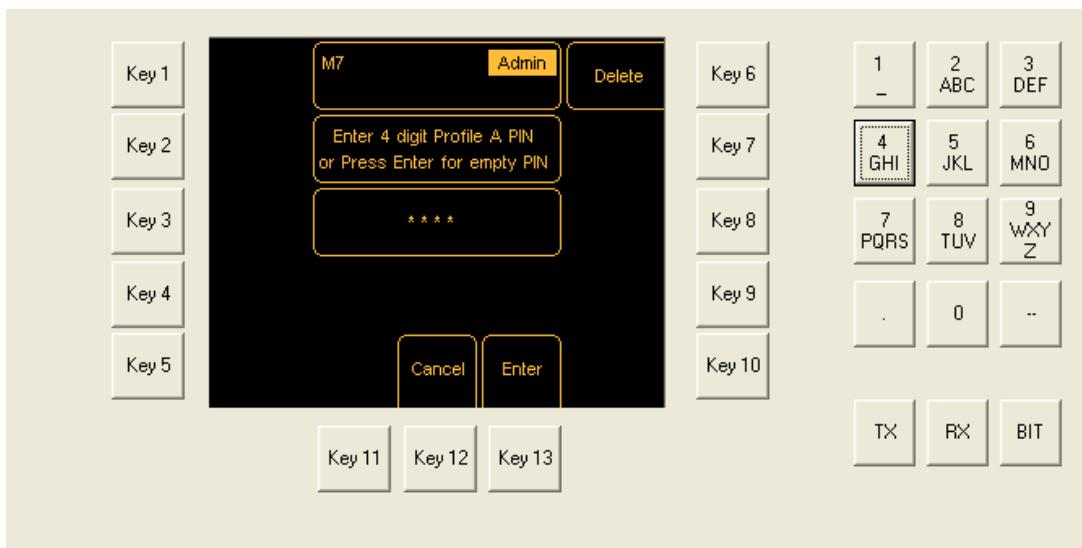


**Fig 3-49 Security Screen (Example B)**

(6) Enter a 4-digit PIN number for security profile A; then press *Key 13 – Enter*.

(7) Press *Key 8 – Enable Profile B*. The Profile B Security screen is displayed.

(8) Enter a 4-digit PIN number for security profile B; then press *Key 13 – Enter*.



**Fig 3-50 Profile A Security Screen**

- (9) Press Key 5 – *Home*.
- (10) Press Key 6 – *Security Log Out*. Security profiles are now set.



When security is applied, personnel must log in to make changes to the radio. How to log in is detailed on [page 3-10](#).



Intentionally Blank

[Back to Menu](#)



## Installation

## Warnings and Cautions

**WARNING**

**Dangerous Voltage**

The instructions given in this topic involve connecting dangerous voltage to the radio and should be carried out only by suitably qualified personnel.

**WARNING**

**Dangerous Voltage**

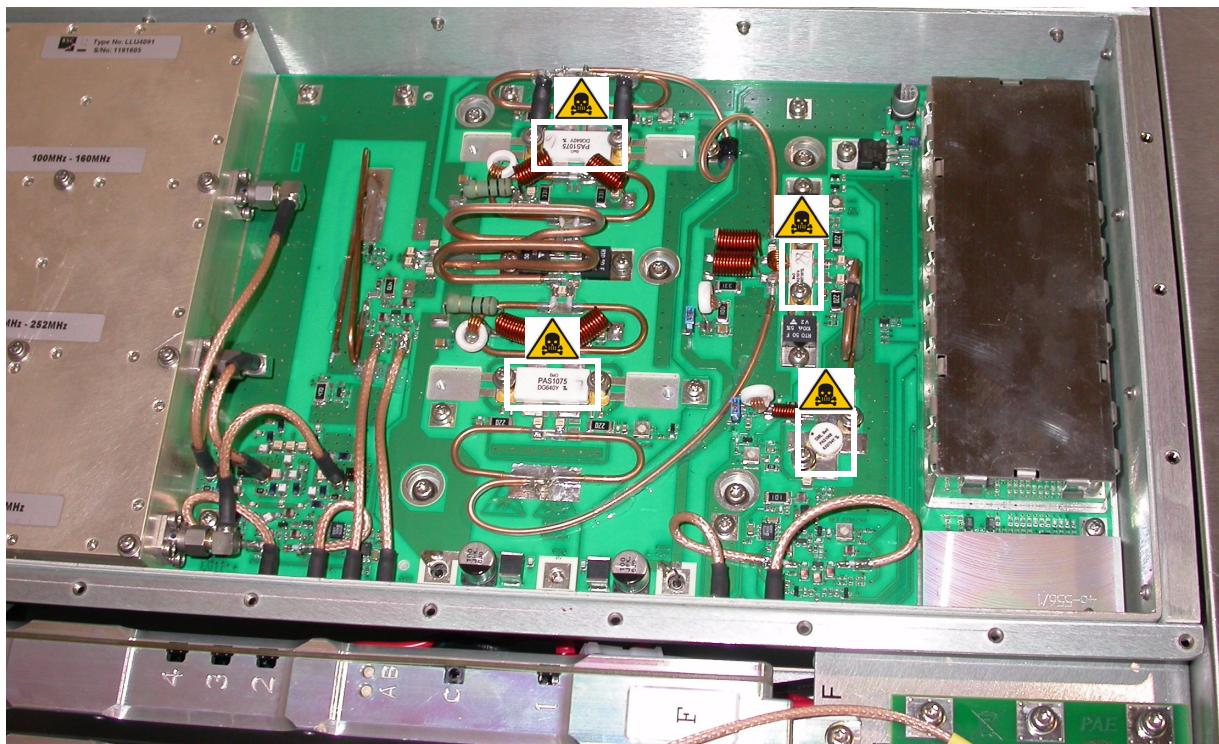
A mains isolating switch should be fitted close to, and easily accessible from, the radio's position. The isolation switch should isolate both live and neutral supplies, be clearly labelled, and adequately rated to protect the equipment.

**WARNING**

**Beryllium Hazard**

Four semiconductor devices used in the RF PA contain the toxic material beryllium. Although no procedures in this documentation instruct semiconductor replacement, equipment covers are removed exposing the devices. Users should be aware that there could be a hazard should the output transistors become damaged.

Fig 4-1 shows the RF PA; the four semiconductors containing beryllium are outlined and have the markings PAS1068, PAS1074 or PAS1075.



**Fig 4-1 Beryllium Hazard Components**

**WARNING****Antenna Radiation**

**The transmit antenna must be installed such that the resultant radiated field strength is below 10 W/m<sup>2</sup> in areas normally accessible to personnel.**

The RF field strength from the antenna can be predicted from the equation  $S=1.45PG/4\pi R^2$

[Where S = power density; P = power input to antenna; G = antenna gain; R = distance to centre of radiation and 1.45 = multiplication factor for average power based on a modulation index of 95%.]

Based on this formula, and using a 2 dBi antenna, the predicted safe distance from the centre of radiation would be approximately 1.3 m for a field strength of 10 W/m<sup>2</sup> (1 W/cm<sup>2</sup>). This meets the requirements of Health Canada Safety Code 6 for RF and microwave exposed workers.

For persons not classed as RF and microwave workers, and including the general public, the limit is 2 W/m<sup>2</sup> (0.2 mW/cm<sup>2</sup>) which increases the minimum safe distance to 2.9 m.

Further information on calculating the field strengths and power levels can be found in Health Canada Safety Code 6 'Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range 3 Hz to 300 GHz', RSS 102 'Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)' and also in FCC document OET Bulletin 5.

**Caution****ESDs**

**The M7 radio contains Electrostatic Sensitive Devices (ESDs). Personnel must be aware of the precautions necessary to prevent damage to such devices. During installation all precautions necessary to prevent ESD damage must be taken.**

**Caution****Unauthorized Modifications**

**Changes or modifications made to this equipment that are not expressly approved by Park Air, or parties authorized by Park Air, could void the user's authority to operate the equipment.**

## Introduction

The procedures necessary to install an M7X or M7R are listed in Table 4-1.

**Table 4-1 Installation Procedures**

Procedure		Reference
1	Read and understand the warnings and cautions given on <a href="#">page 4-2</a> and <a href="#">page 4-3</a> .	
2	Perform an initial inspection of the radio.	see <a href="#">page 4-4</a> .
3	Fit the radio into an equipment cabinet (if required).	see <a href="#">page 4-5</a> .
4	Extend the Control Head if required.	see <a href="#">page 4-7</a> .
5	Select the required antenna option.	see <a href="#">page 4-9</a> .
4	Connect an antenna, or antennas, as required.	see <a href="#">page 4-12</a> .
5	Connect the chassis stud to the cabinet or system earth.	see <a href="#">page 4-13</a> .
6	Connect the dc input supply (if required).	see <a href="#">page 4-14</a> .
7	Connect the ac input supply (if required).	see <a href="#">page 4-15</a> .
8	Connect a microphone (if required)	see <a href="#">page 4-16</a> .
9	Make external signal connections as required.	see <a href="#">page 4-18</a>

## Initial Inspection of the Radio

On receipt of the radio, remove all transit packaging and check that there is no damage. If damage is evident, contact Park Air immediately and retain the original transit packaging.

The following items are supplied with each radio.

- ❑ CD containing the user documentation in interactive Adobe Acrobat format
- ❑ Customer kit, part number 70-M7VUCUST, containing:
  - (1) dc input connector (female), part number 20S02040103 (Quantity 1)
  - (2) ac input lead complete with IEC connector, part number 17-03000038S (Quantity 1)
  - (3) RJ45 to RJ45 communication lead (pin-to-pin), part number 17H12000020 (Quantity 2)
  - (4) 10 amp anti-surge, 20 mm, ac input fuse, part number 29-01100102 (Quantity 2)
  - (5) 30 amp, 1½ x ¼ inch, dc input fuse, part number 29-01460202 (Quantity 2).
- ❑ CD containing the Park Air radio software as installed during manufacture.

## Fit the Radio into an Equipment Cabinet

The radio is designed to be fitted onto telescopic slides within a standard 19 inch (483 mm) equipment cabinet. Slide mounting positions are shown in Fig 4-2 and the radio chassis width in Fig 4-3. Details of suitable slides are available from Park Air.

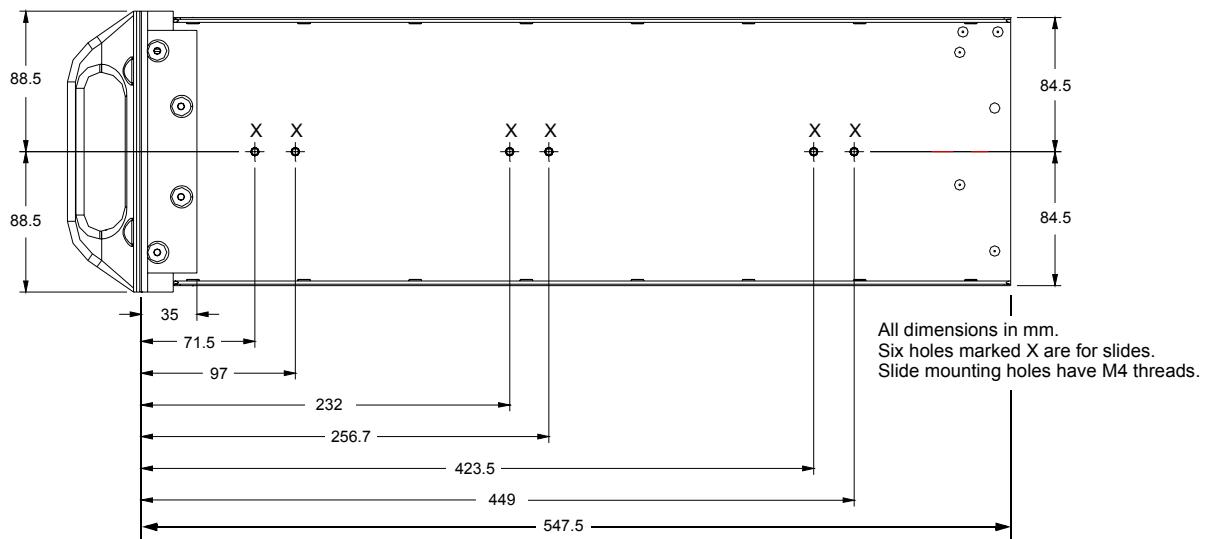


Fig 4-2 Slide Mounting Positions

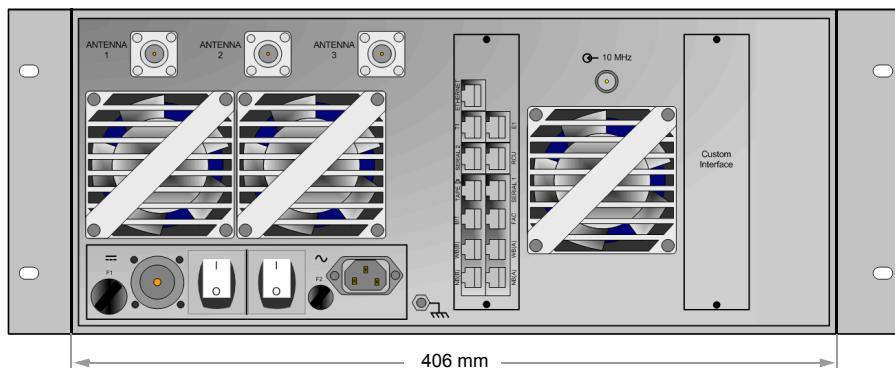
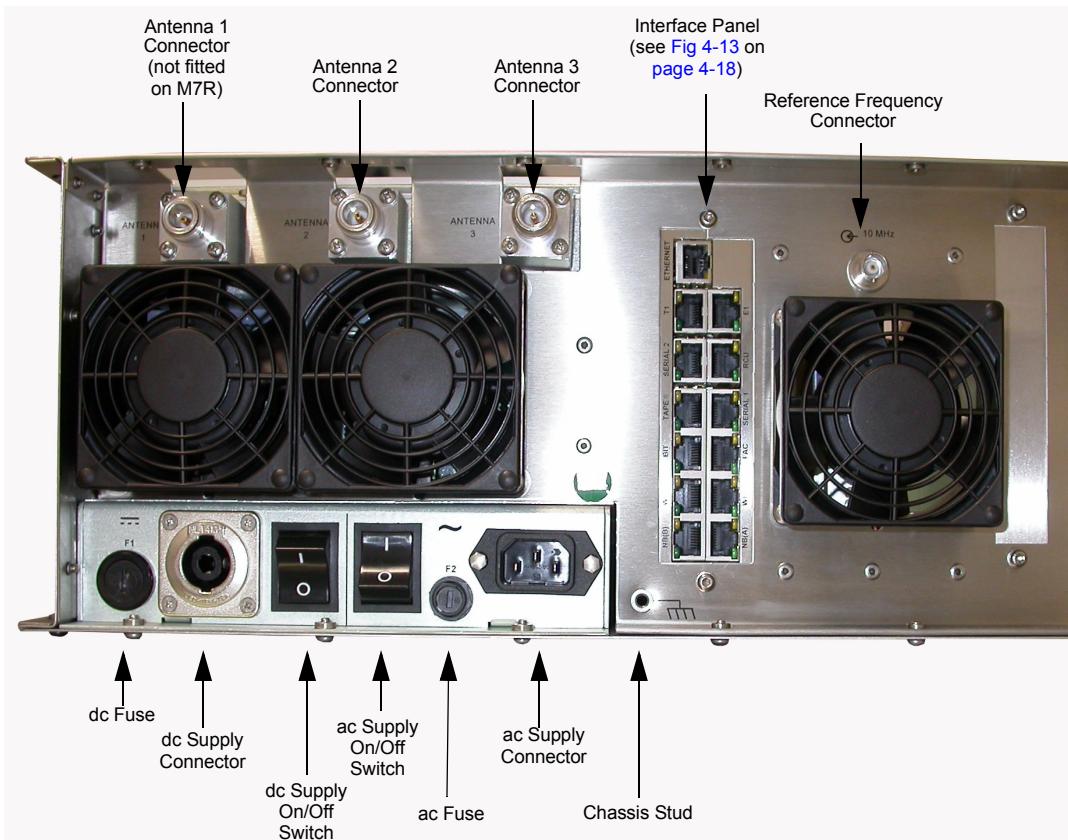


Fig 4-3 Radio Chassis Width (for Slide Fixing)



**Fig 4-4 M7X/M7R Radio Rear Panel Controls and Connectors**

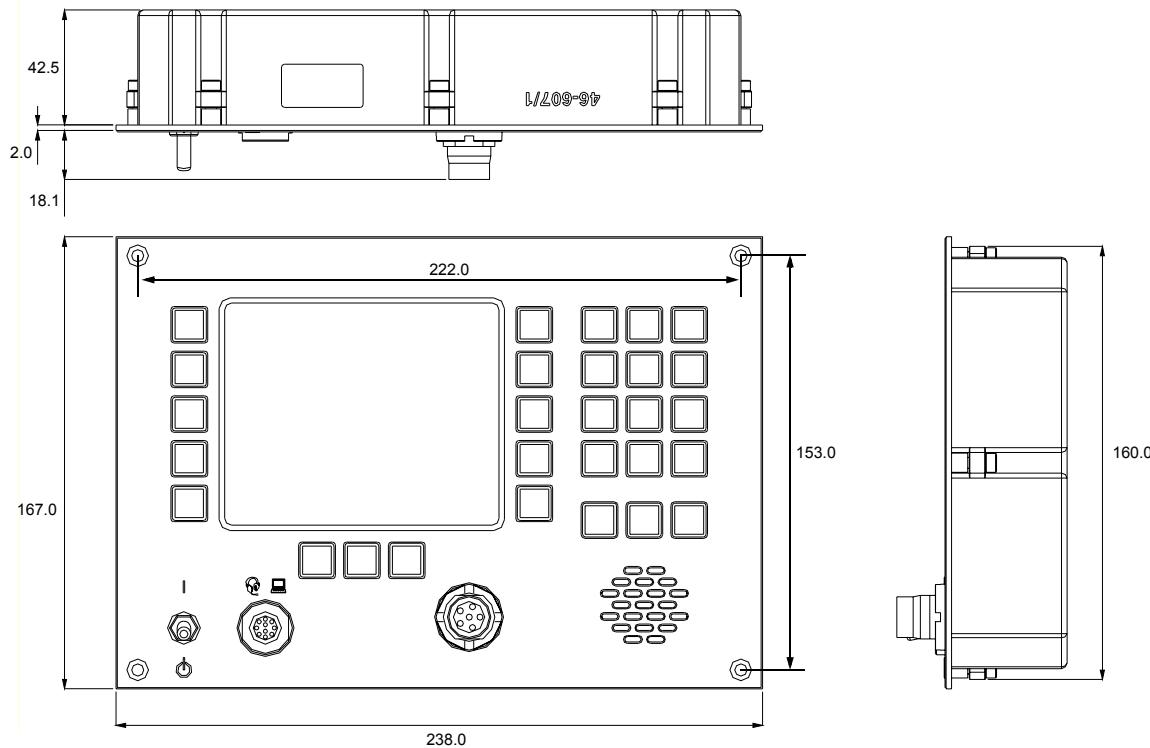
## Extending the Control Head

Usually, if the radio is to be operated from a remote position, an M7 Controller is used to operate one or more radios. The controller is a self-contained unit operating from its own power supply.

In some applications it may be desirable to extend the radio's Control Head up to 10 metres away from the radio. In this configuration, the Control Head continues to be powered from the radio.

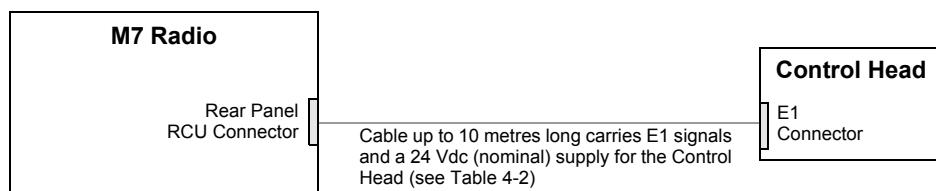
To extend the Control Head:

- (1) Refer to the Maintenance topic and remove the radio's Control Head. Remove and retain (for possible future use) the E1 and Supply cables that connected to the Control Head.
- (2) At the radio, fit a blank panel in place of the Control Head. A suitable blank panel is available from Park Air: part number 46-00000494.
- (3) Under local arrangements, fit the control head into the required operating position. Fig 4-5 shows dimensions of the Control Head.



**Fig 4-5 Control Head Dimensions**

- (4) Using a standard Cat 5 non cross-over cable (no longer than 10 metres) connect the radio's rear panel RCU connector and the E1 connector at the rear of the Control Head as shown below. [Table 4-2](#) details the connections.



**Table 4-2 Radio to Control Head Interconnections**

M7 Radio Rear Panel RCU Connector		Characteristic	Control Head E1 Connector	
Pin	Signal		Pin	Signal
1	RRing	Balanced 120 ohm, 2.048 Mbps, HDB3 coding	1	TRing
2	RTip		2	TTip
3	Ground	0 V	3	Ground
4	TRing	Balanced 120 ohm, 2.048 Mbps, HDB3 coding	4	RRing
5	TTip		5	RTip
6	Supply out	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V) When the radio is operating from a dc input, the output is between 20 and 32 Vdc The Supply output is fused at 500 mA	6	Supply in
7	Ground	0 V	7	Ground
8	Supply out	As pin 6	8	Supply in



## Selecting the Required Antenna Option

### M7X Transceiver

The M7X transceiver has three antenna connectors (designated Antenna 1, 2 and 3) as shown in [Fig 4-4](#) on [page 4-6](#). Six antenna configurations are possible as detailed in Table 4-3.

For example, Configuration A is a common transmit/receive antenna at Antenna connector 1.

**Table 4-3 M7X Transceiver Antenna Options**

Configuration	Antenna 1	Antenna 2	Antenna 3
A	TX and RX		
B	TX and RX		GD
C	TX, RX and GD		
D	TX	RX	
E	TX	RX	GD
F	TX	RX and GD	

### M7R Receiver

The M7R receiver does not have Antenna 1 connector fitted. Three antenna configurations are possible as detailed in Table 4-4.

**Table 4-4 M7R Receiver Antenna Options**

Configuration	Antenna 1	Antenna 2	Antenna 3
G		RX	
H		RX	GD
I		RX and GD	



## Changing the Configuration



**Dangerous Voltage**

Ensure the input ac and dc supplies are disconnected before removing the top cover.

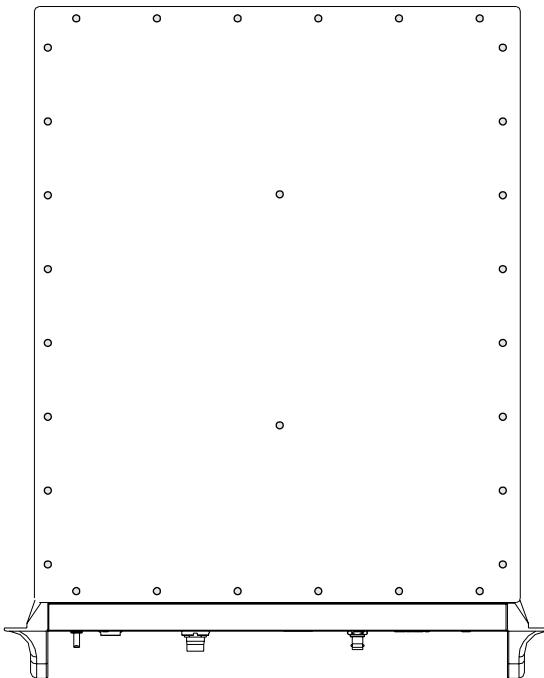


**ESDs**

This equipment contains devices sensitive to electrostatic discharge. Precautions applicable to handling such equipment, including wearing a static protection wrist strap connected to earth, should always be taken.

To change the radio's current antenna configuration:

- (1) Place the radio on a suitable work surface and ensure that the input ac and dc supplies are disconnected from the radio.
- (2) Using a Torx T20 screwdriver, remove and retain the 30 M4 x 6 mm screws (part number 36T65340060) that secure the top cover to the chassis; see [Fig 4-6](#). Remove the cover.

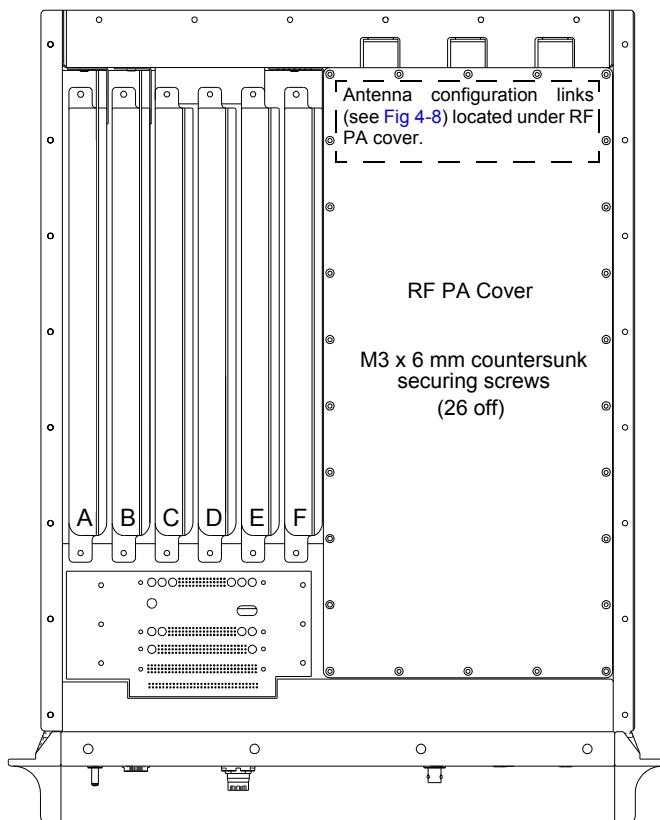


The radio's top cover is secured to the chassis using thirty M4 x 6 mm Torx head screws.

Use only a Torx T20 screwdriver to remove and refit the securing screws.

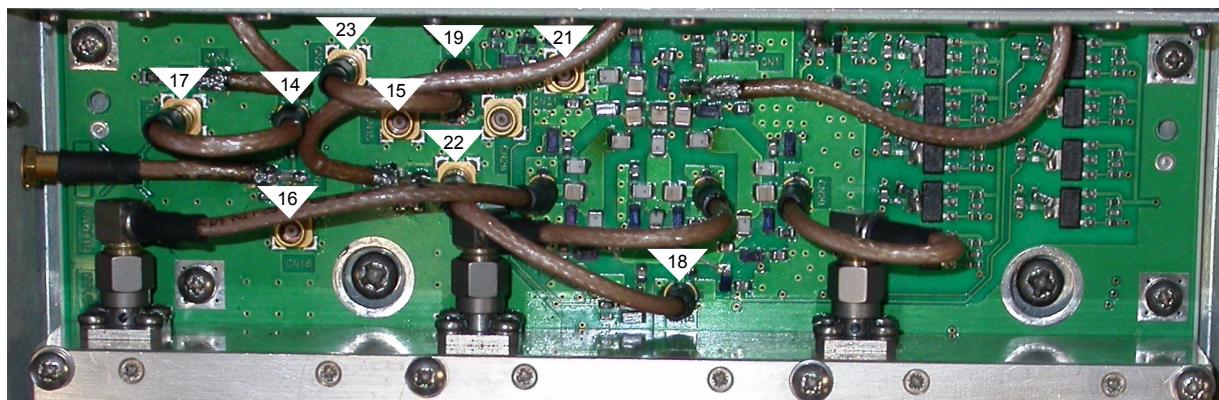
**Fig 4-6 Radio's Top Cover**

- (3) Identify the RF PA cover, shown in [Fig 4-7](#), and using a Torx T10 screwdriver, remove and retain the 26 securing screws (part number 36T46330060). Remove and retain the RF PA cover.



**Fig 4-7 RF PA Cover**

- (4) Identify the antenna configuration links (Fig 4-8) that are located at the rear of the RF PA (see Fig 4-7). Set links, as detailed in Table 4-5, to suit the required configuration.
- (5) Refit the RF PA cover using the screws removed in step (3).
- (6) Refit the top cover using the screws removed in step (2).



**Fig 4-8 Antenna Configuration Links**

**Table 4-5 Antenna Configurations**

Configuration	Antenna 1	Antenna 2	Antenna 3	Link CN14 to:	Link CN18 to:	Link CN19 to:
A	TX and RX	Not used	Not used	CN16	CN21	CN23
B	TX and RX	Not used	GD	CN17	CN21	CN23
C	TX, RX and GD	Not used	Not used	CN15	CN20	CN21
D	TX	RX	Not used	CN16	CN22	CN23
E	TX	RX	GD	CN17	CN22	CN23
F	TX	RX and GD	Not used	CN15	CN20	CN22
G	Not used	RX	Not used	CN16	CN22	CN23
H	Not used	RX	GD	CN17	CN22	CN23
I	Not used	RX and GD	Not used	CN15	CN20	CN22

### Connecting the Antenna(s)

The antennas connect to the Antenna 1 (not M7R) Antenna 2 and Antenna 3 connectors as shown in Fig 4-4 on page 4-6 and as applicable to the antenna options selected.



## Connect the Chassis Stud

**WARNING**



**Chassis Earth**

**A chassis stud is fitted to the radio's rear panel. This stud is used to connect the radio to the equipment cabinet, or to the user's system earth point. The stud must not be used as the safety earth.**

In order not to compromise the radio's Electromagnetic Compatibility (EMC) the chassis stud, marked  and fitted to the rear panel (see [Fig 4-4 on page 4-6](#)) must be connected to the equipment cabinet (if a cabinet is being used) or to the user's system earth point. The connection should be made using a single tri-rated, green-and-yellow cable having a cross-sectional area of 2.5 mm<sup>2</sup>. The cable should have CSA and UL1015 approval, and be connected to the chassis stud through an M5 eyelet (for example, Park Air part number 20-08010103).

**Failure to comply with this instruction could result in non-compliance with the European Commission EMC Directive 89/336/EEC.**

## Connecting the Input Supply

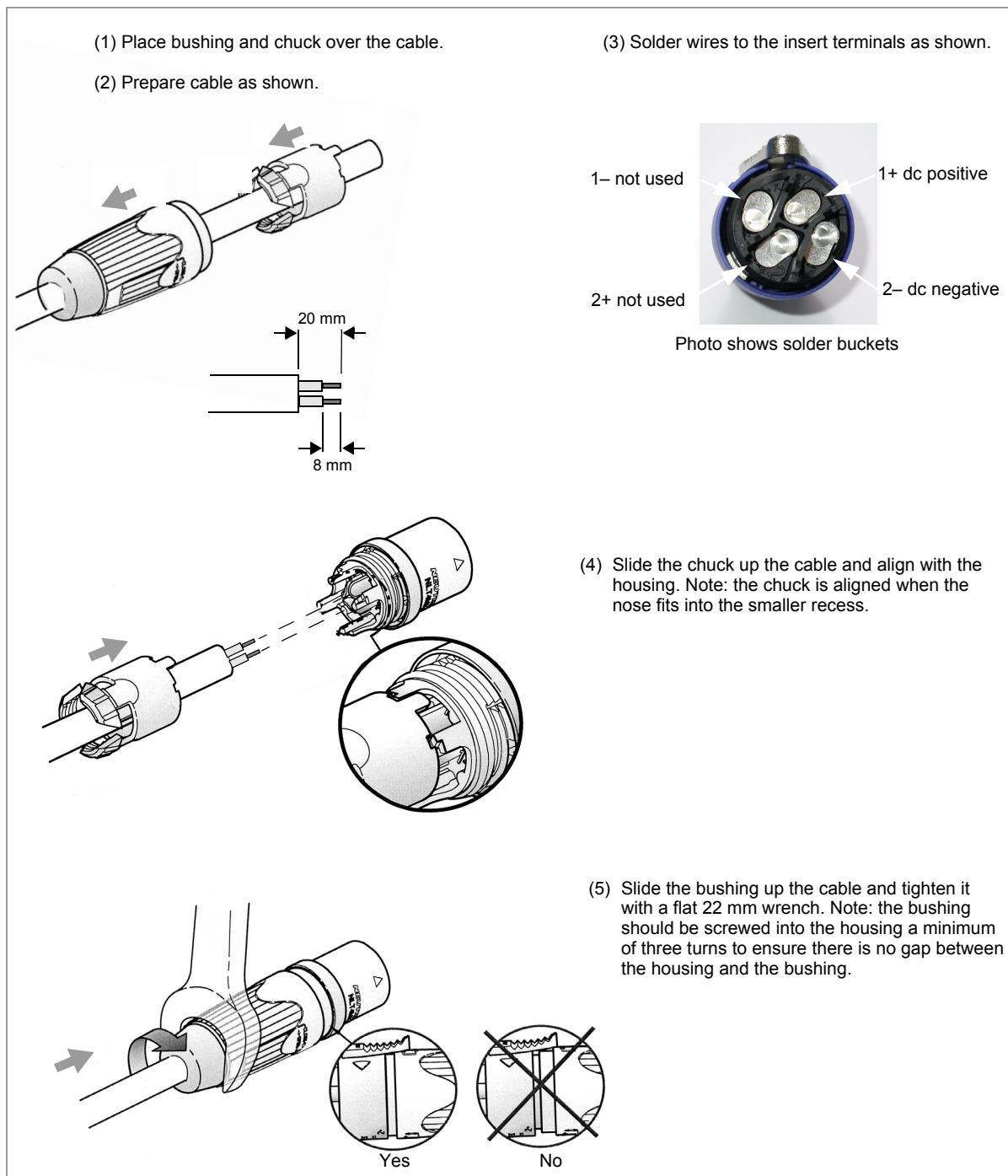
The M7 radio operates from a standard ac mains supply, or a low voltage dc supply; the specification for the ac and dc supplies is given in topic 2 – Specification.

When both supplies are connected, operation from the ac supply takes priority; automatic change-over to the dc supply occurs if the mains supply fails. On restoration of the ac supply, the equipment reverts to ac operation.

### Connecting the dc Input Supply

The dc input supply connects to the radio's rear panel dc supply connector as shown in [Fig 4-4](#) on [page 4-6](#). Connection is made using the dc input connector supplied with the radio (item 1 of the customer kit – see [page 4-4](#)).

Instructions for fitting the connector are shown in [Fig 4-9](#).



**Fig 4-9 Fitting the dc Input Connector**

## Connecting the ac Input Supply

**WARNING**



**Dangerous Voltage**

**A mains isolating switch should be fitted close to, and easily accessible from, the radio's position. The isolation switch should isolate both live and neutral supplies, be clearly labelled, and adequately rated to protect the equipment.**

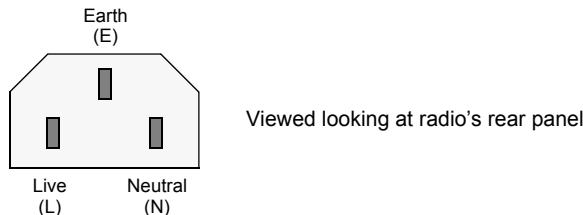
**WARNING**



**Earth Connection**

**This equipment must be earthed. The earth terminal of the ac connector should be used as the safety earth.**

An ac input IEC connector is fitted to the equipment's rear panel as shown in [Fig 4-4](#) on [page 4-6](#). The connector's pin-out is shown in [Fig 4-10](#).



**Fig 4-10 ac Connector Pin-out**

The cable used to connect between the equipment and the user's ac power source should be 3-core (to IEC 227) rated 250 Vac at 8 amps, and have a minimum cross-sectional area of 1.0 mm<sup>2</sup> per core. Park Air recommends the use of polyvinyl chloride (PVC) insulated cable. The cable must be fitted with the IEC approved equipment connector and conform to the following specification:

- ❑ If PVC insulated, be not lighter than ordinary polyvinyl chloride sheathed flexible cord according to IEC publication 227 (designation H05 VV-F, or H05 VVH2-F).
- ❑ If rubber insulated, be of synthetic rubber and not lighter than ordinary tough rubber-sheathed flexible cord according to IEC publication 245 titled 'Rubber Insulated Cables of Rated Voltage up to and Including 450/750 V' (designation H05 RR-F).

M7 radios are Class 1 equipment. The ac supply cable should have a green-and-yellow protective earthing conductor electrically connected to the protective earthing terminal of the equipment connector and the mains plug. Park Air recommends the ac supply cable is colour coded in accordance with the electrical appliance (colour code) regulations for the UK. That is:

- ❑ The core coloured green-and-yellow must be connected to the terminal in the plug that is marked with the letter E or by the earth symbol or coloured green-and-yellow.
- ❑ The core coloured blue must be connected to the terminal that is marked with the letter N.
- ❑ The core coloured brown must be connected to the terminal that is marked with the letter L.



## Control Head Interfaces

The Control Head has two interfaces (Fig 4-11): a Microphone/Headset/Maintenance connector and a Fill connector.



**Fig 4-11 Location of Microphone/Headset/Maintenance and Fill Connectors**

### Microphone/Headset/Maintenance Connector

This is a Lemo 10-way socket used for connecting a microphone, headset or maintenance computer. The connector's pin-out is listed in [Table 4-6](#) and the pin arrangement shown in [Fig 4-12](#).



When connecting a microphone, the appropriate microphone settings (passive/active and low/high sensitivity) must be selected in the Radio Config Settings. See Configuring the Radio in the Operation topic.



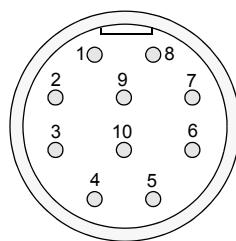
To avoid interference from the USB system when using the audio functions on this connector, the USB interface can be disabled from the front panel. This is achieved by setting USB Interface to OFF in the Radio Config Settings. See Configuring the Radio in the Operation topic.



Hearing loss can result when listening to audio at excessively high levels, or for prolonged periods of time. Always set the volume control to a safe (low) level before using headphones.

**Table 4-6 Microphone/Headset/Maintenance Connector Pin-Out**

Pin	Signal	Characteristic	Input or Output
1	Headset A+ (non-boom side)	Adjustable between 0 and 3 V pk-pk	Output
2	Headset A ground	0 V	-
3	PTT	0 V to PTT	Input
4	Ground	0 V	-
5	Headset B+ (boom side)	Adjustable between 0 and 3 V pk-pk	Output
6	Headset B ground	0 V	-
7	Microphone +	Between 2 and 35 mV rms on the High sensitivity setting to remain in ALC range Between 8 and 140 mV rms on the Low sensitivity setting to remain in ALC range Use Active setting for a powered microphone. Use the Passive setting for a non-powered microphone	Input
8	Microphone ground	0 V	-
9	USB D-	-1 to +4.6 V differential voltage	Input/Output
10	USB D+		



This illustration shows the radio's chassis mounted connector as seen looking from the front of the radio.

**Fig 4-12 Microphone/Headset/Maintenance Connector Pin Arrangement**

## External Signal Connections

External signal connections, except the external 10 MHz reference frequency, are made using one or more of the thirteen RJ48 connectors fitted to the Interface panel. The panel is located as shown in Fig 4-4 on page 4-6, and detailed in Fig 4-13. The 10 MHz reference frequency connector is detailed on page 4-33.

The pin-out of an RJ48 connector is shown in Fig 4-14.

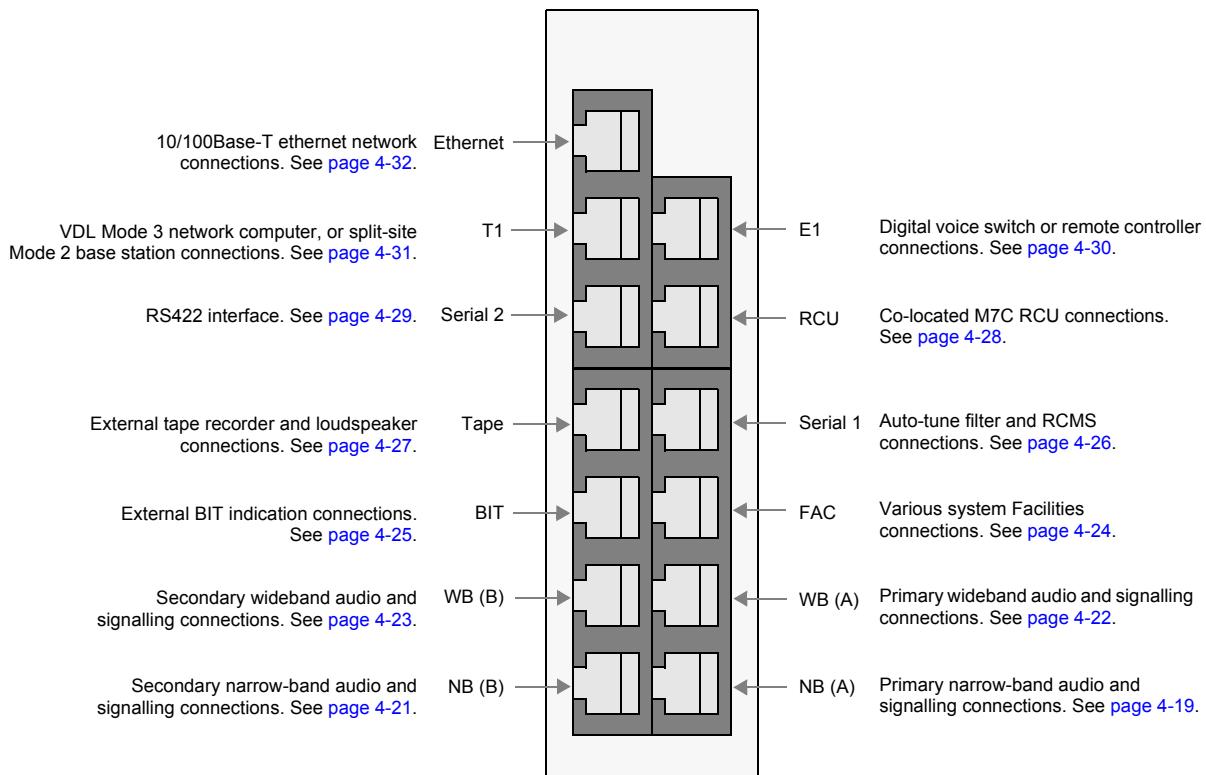


Fig 4-13 Interface Panel

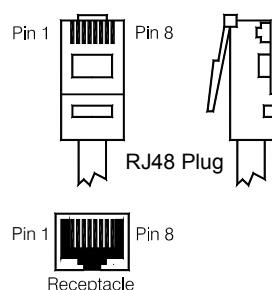


Fig 4-14 RJ48 Connector Pin-Out



### **Audio – Narrow-band (A) Connector**

An 8-way RJ48 socket marked NB(A) that is used to connect the primary narrow-band audio and signalling. All inputs and outputs are configurable to allow for system connection requirements. It can also be configured to combine Guard signals simultaneously with the main receiver audio and squelch.

The pin-out is listed in Table 4-7.

The connector has an integral amber indicator that lights when the PTT input is active.

Note:

All line levels for this connector are equivalent to the average speech level regardless of the waveform selected. The peak to average ratio of speech is taken to be 13 dB, whereas the peak to average ratio of a sine wave is 3 dB. Therefore, sine wave test tones are expected to be 10 dB higher than line level setting.

An average speech signal applied at the same level as the line in setting (or a sine wave signal applied at 10 dB above the line in setting) with the ALC off, will result in the transmitter achieving its specified modulation level. Similarly, receiving a signal at the same modulation level as the transmitter specified level, with the audio AGC off, will result in an average speech signal being the same level as the line out setting (or a sine wave signal being 10 dB above the line out setting).

**Table 4-7 Narrow-band (A) Audio Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1 2	NB (A) line out - NB (A) line out +	Balanced 600 ohm, transformer coupled audio output adjustable between -20 dBm and +10 dBm in 1 dB steps. The factory default setting is -13 dBm.  A phantom squelch output, superimposed on the audio lines, is available; this is a normally open solid-state relay operating between -60 V and +60 V ac or dc, at a maximum 100 mA.	Output
3	PTT indication	Grounding solid-state relay that indicates an active PTT. The relay, configurable to be normally open or normally closed, operates between -60 V and +60 V ac or dc, at a maximum 100 mA. The factory default setting is normally open.	Output
4 5	NB (A) line in + NB (A) line in -	Balanced 600 ohm, transformer coupled audio input that is adjustable between -20 dBm and +10 dBm in 1 dB steps. The factory default setting is -13 dBm.  Phantom PTT is active when the input differs from the reference by less than $\pm 1$ V. Maximum input is $\pm 60$ V with respect to reference. Input draws less than 6 mA and requires at least 1 mA to operate. Common reference with pin 8 that is programmable to be +14, 0 or -14 V ( $\pm 1$ V). The factory default is +14 V.	Input
6	NB (A) squelch	Grounding solid-state relay providing a squelch indication output. The relay operates between -60 and +60 V ac or dc at a maximum current of 100 mA. The relay is configurable to be normally open or normally closed. The factory default setting is normally open.	Output
7	Ground	0 V.	-
8	NB (A) PTT	PTT input that is active when input differs from reference by more than $\pm 10$ V and inactive when input differs from reference by less than $\pm 1$ V. Maximum input $\pm 60$ V with respect to reference. Input draws less than 6 mA and requires at least 1 mA to operate. Configurable as Standard or Inverted; factory default is Standard.  Pin 8 has a common reference with pin 5 that is programmable to be +14, 0 or -14 V ( $\pm 1$ V). The factory default is +14 V.	Input

### Audio – Narrow-band (B) Connector

An 8-way RJ48 socket marked NB (B) that is used to connect secondary narrow-band audio and signalling; this could be, for example, connections to extended analogue controllers.

This connector does not have the same level of configuration as the primary narrow-band audio and signalling connector, NB (A).

NB (B) can be configured to combine Guard signals simultaneously with the main receiver audio and squelch.

The pin-out is listed in Table 4-8.

The connector has an integral amber indicator that lights when the PTT input is active.

**Note:**

All line levels for this connector are equivalent to the average speech level regardless of the waveform selected. The peak to average ratio of speech is taken to be 13 dB, whereas the peak to average ratio of a sine wave is 3 dB. Therefore, sine wave test tones are expected to be 10 dB higher than line level setting.

An average speech signal applied at the same level as the line in setting (or a sine wave signal applied at 10 dB above the line in setting) with the ALC off, will result in the transmitter achieving its specified modulation level. Similarly, receiving a signal at the same modulation level as the transmitter specified level, with the audio AGC off, will result in an average speech signal being the same level as the line out setting (or a sine wave signal being 10 dB above the line out setting).

**Table 4-8 Narrow-band (B) Audio Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	NB (B) line out -	Balanced 600 ohm, transformer coupled audio output adjustable between -20 dBm and +10 dBm in 1 dB steps. The factory default setting is -13 dBm.	Output
2	NB (B) line out +		
3	PTT indication	Grounding, normally open, solid-state relay that indicates an active PTT. The relay operates between -60 V and +60 V ac or dc, at a maximum 100 mA.	Output
4	NB (B) line in +	Balanced 600 ohm, transformer coupled audio input that is adjustable between -20 dBm and +10 dBm in 1 dB steps. The factory default setting is -13 dBm.	Input
5	NB (B) line in -		
6	NB (B) squelch	Grounding, normally open, solid-state relay providing a squelch indication. The relay operates between -60 and +60 V ac or dc at a maximum current of 100 mA.	Output
7	Ground	0 V.	-
8	NB (B) PTT	TTL input. An active low keys the transmitter circuit.	Input

### Audio – Wideband (A) Connector

An 8-way RJ48 socket marked WB(A) that is used to connect wideband audio and signalling.

WB (A) is used for the primary wideband audio connection point for data systems.

The pin-out is listed in Table 4-9.

The connector has an integral amber indicator that lights when the PTT input is active.

Note:

All line levels for this connector are equivalent to sine wave level regardless of the waveform selected. The peak to average ratio of a sine wave is 3 dB.

A sine wave signal applied at the same level as the line in setting, with the ALC off, will result in the transmitter achieving its specified modulation level. Similarly, receiving a signal at the same modulation level as the transmitter specified level, with the audio AGC off, will result in a sine wave signal being the same level as the line out setting.

**Table 4-9 Wideband (A) Audio Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1 2	WB (A) line out - WB (A) line out +	Balanced 600 ohm output adjustable between -10 dBm and +10 dBm in 1 dB steps. The factory default setting is 0 dBm.	Output
3	PTT indication	Grounding, normally open, solid-state relay that indicates an active PTT. The relay operates between -60 V and +60 V ac or dc, at a maximum 100 mA.	Output
4 5	WB (A) line in + WB (A) line in -	Balanced 600 ohm input adjustable between -10 dBm and +10 dBm in 1 dB steps. The factory default setting is 0 dBm.	Input
6	WB (A) squelch	Grounding, normally open, solid-state relay providing a squelch indication output. The relay operates between -60 and +60 V ac or dc at a maximum current of 100 mA.	Output
7	Ground	0 V.	-
8	WB (A) PTT	TTL input. An active low keys the transmitter circuit.	Input

### Audio – Wideband (B) Connector

An 8-way RJ48 socket marked WB(B) that is used to connect wideband audio and signalling. Uses include connection to a data system, or connection to an encryption system for COMSEC operation.

The pin-out is listed in Table 4-10.

The connector has an integral amber indicator that lights when the PTT input is active.

**Note:**

All line levels for this connector are equivalent to sine wave level regardless of the waveform selected. The peak to average ratio of a sine wave is 3 dB.

A sine wave signal applied at the same level as the line in setting, with the ALC off, will result in the transmitter achieving its specified modulation level. Similarly, receiving a signal at the same modulation level as the transmitter specified level, with the audio AGC off, will result in a sine wave signal being the same level as the line out setting.

**Table 4-10 Wideband (B) Audio Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	WB (B) line out -	Balanced 600 ohm output adjustable between -10 dBm and +10 dBm in 1 dB steps. The factory default setting is 0 dBm.	Output
2	WB (B) line out +		
3	PTT indication	Grounding, normally open, solid-state relay that indicates an active PTT. The relay operates between -60 V and +60 V ac or dc, at a maximum 100 mA.	Output
4	WB (B) line in +	Balanced 600 ohm input adjustable between -10 dBm and +10 dBm in 1 dB steps. The factory default setting is 0 dBm.	Input
5	WB (B) line in -		
6	WB (B) squelch	Grounding, normally open, solid-state relay providing a squelch indication output. The relay operates between -60 and +60 V ac or dc at a maximum current of 100 mA.	Output
7	Ground	0 V.	-
8	WB (B) PTT	TTL input. An active low keys the transmitter circuit.	Input

**Facilities Connector**

An 8-way RJ48 socket marked FAC that provides connection to various system facilities.

The pin-out is listed in Table 4-11.

The connector has an integral amber indicator that lights when the Inhibit input is active.

**Table 4-11 Facilities Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	Inhibit	A TTL input that inhibits radio operation. A low input is required to inhibit the radio.	Input
2	Not connected	-	-
3	RSSI	0 to 10 V output depending on received signal strength.	Output
4	Reserved	TTL input, active low.	Input
5	Reserved	Open collector NPN transistor grounding output, 200 mA maximum, normally open.	Output
6	Standby	0 V input to switch the radio to Standby mode. An open circuit switches the radio to normal operation. <i>Note that the front panel Standby switch must be set to On for this facility to operate.</i>	Input
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**BIT Connector**

An 8-way RJ48 socket marked BIT used to connect BIT signals to associated parts of the system.

The pin-out is listed in Table 4-12.

The connector has an integral green indicator that lights when the Ready output is active.

**Table 4-12 BIT Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	Ready	Open collector NPN transistor grounding output, 200 mA maximum. This signal is a low impedance to ground when Ready is active, and a high impedance to ground during a fault condition.	Output
2	E-BIT (A)	TTL input, active low.	Input
3	E-BIT (B)	TTL input, active low.	Input
4	Not connected	-	-
5	Reserved	TTL input, active low.	Input
6	Reserved	Open collector NPN transistor grounding output, 200 mA maximum, normally open.	Output
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**Serial 1 Connector**

An 8-way RJ48 socket marked Serial 1 that is used to connect the radio to auxiliary equipment such as an auto-tune filter or an RCMS.

The pin-out is listed in Table 4-13.

The connector has an integral amber indicator that lights when data is being transferred.

**Table 4-13 Serial 1 Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	Data RX A (-)	RS422/485 differential asynchronous data, 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.	Input
2	Data RX B (+)		
3	Not connected	-	-
4	Data TX B (+)	RS422/485 differential asynchronous data, 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.	Output
5	Data TX A (-)		
6	Not connected	-	-
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**Audio – Tape/External Speaker Connector**

An 8-way RJ48 socket marked TAPE  that is used to connect a tape recorder or an external loudspeaker.

The pin-out is listed in Table 4-14.

**Table 4-14 Tape/External Speaker Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	TX/RX tape line out -		
2	TX/RX tape line out +	Balanced 600 ohm, -13 dB ( $\pm 2$ dB).	Output
3	Not connected	-	-
4	Speaker drive	3.5 V pk-pk.	Output
5	Speaker ground	0 V.	-
6	Not connected	-	-
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**RCU Connector**

An 8-way RJ48 socket marked RCU that is used to connect a co-located (less than 10 metres) M7C RCU. The link provides E1 digital voice and data, plus power for the RCU.

The pin-out is listed in Table 4-15.

The connector has an integral green indicator that lights when a valid E1 signal is detected.

**Table 4-15 RCU Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	RRing		
2	RTip	Balanced 120 ohm, 2.048 Mbps, HDB3 coding.	Input
3	Ground	0 V.	-
4	TRing		
5	TTip	Balanced 120 ohm, 2.048 Mbps, HDB3 coding.	Output
6	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**Serial 2 Connector**

An 8-way RJ48 socket that provides a general purpose RS422 interface. The pin-out is listed in Table 4-16.

The connector has an integral amber indicator that lights when data is being transferred.

**Table 4-16 Serial 2 Connector Pin-Out (Configured as a RS422 Interface)**

Pin	Signal	Characteristics	Input or Output
1	Data RX A (-)	RS422/485 differential asynchronous data, 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.	Input
2	Data RX B (+)		
3	Not used	-	-
4	Data TX B (+)	RS422/485 differential asynchronous data, 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.	Output
5	Data TX A (-)		
6	Not used	-	-
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**E1 Connector**

An 8-way RJ48 socket marked E1 that is used to connect the radio to a digital voice and data network such as a voice switch or remote controller.

The pin-out is listed in Table 4-17.

The connector has an integral green indicator that lights when a valid E1 signal is detected.

**Table 4-17 E1 Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	RRing	Balanced 120 ohm, 2.048 Mbps, HDB3 coding.	
2	RTip	Protected with 28 V differential and common mode clamp and a 1.25 A fuse in each line.	Input
3	Not connected	-	-
4	TRing	Balanced 120 ohm, 2.048 Mbps, HDB3 coding.	
5	TTip	Protected with 28 V differential and common mode clamp and a 1.25 A fuse in each line.	Output
6	Standby	0 V input to switch the radio to Standby mode. An open circuit switches the radio to normal operation. <i>Note that the front panel Standby switch must be set to On for this facility to operate.</i>	Input
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**T1 Connector**

An 8-way RJ48 socket marked T1 that is used to connect the radio to a digital voice and data network such as a VDL Mode 3 network computer.

This connector can also be used to connect a split-site transmitter and receiver together when operating as a VDL Mode 2 base station.

The pin-out is listed in Table 4-18.

The connector has an integral green indicator that lights when a valid T1 signal is detected.

**Table 4-18 T1 Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	RRing	Balanced 100 ohm, 1.544 Mbps, AMI/B8ZS coding.	
2	RTip	Protected with 28 V differential and common mode clamp and a 1.25 A fuse in each line.	Input
3	Not connected	-	-
4	TRing	Balanced 100 ohm, 1.544 Mbps, AMI/B8ZS coding.	
5	TTip	Protected with 28 V differential and common mode clamp and a 1.25 A fuse in each line.	Output
6	Not connected	-	-
7	Ground	0 V.	-
8	Supply	When the radio is operating from an ac input, the output is 24 Vdc ( $\pm 1$ V). When the radio is operating from a dc input, the output is between 20 and 32 Vdc. The Supply output is fused at 500 mA.	Output

**Ethernet Connector**

An 8-way RJ48 socket marked Ethernet that is used to connect the radio to a 10/100Base-T ethernet network.

The pin-out is listed in Table 4-19.

The connector has two integral indicators:

- Green indicator. Lit indicates 100Base-T; unlit indicates 10Base-T.
- Amber indicator. Lit indicates a valid link is detected; flashing to indicate link activity.

**Table 4-19 Ethernet Connector Pin-Out**

Pin	Signal	Characteristics	Input or Output
1	TD +		
2	TD -	Balanced 100 ohm, 10/100 Mbps.	Output
3	RD +	Balanced 100 ohm, 10/100 Mbps.	Input
4	Not used	Connected to 0 V (via 75 ohm and 1 nF).	-
5	Not used	Connected to 0 V (via 75 ohm and 1 nF).	-
6	RD -	Paired with pin 3.	Input
7	Not used	Connected to 0 V (via 75 ohm and 1 nF).	-
8	Not used	Connected to 0 V (via 75 ohm and 1 nF).	-

## 10 MHz Reference Frequency

The Reference Frequency connector (see Fig 4-4 on page 4-6) is a BNC socket marked  10 MHz. This connector is used to connect an external reference frequency. The applied signal (if used) should be 400 mV rms  $\pm$  200 mV.

If an external reference frequency is used, the Radio Config Reference Select must be set to 'External' as shown in Fig 4-15. Setting up the radio, which includes Radio Config (configuration), is detailed in the Operation topic.

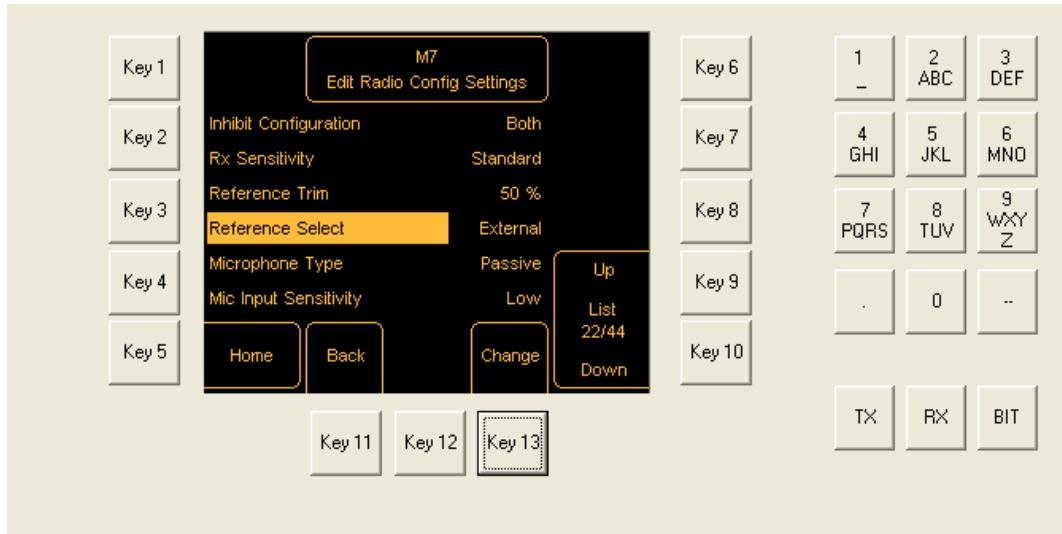


Fig 4-15 Select External Reference



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## **Maintenance**



## Introduction

This topic details scheduled and unscheduled maintenance procedures for the M7 radio.

Additionally the Data Loader Application (DLA), which is used to set up radios using a PC or laptop instead of the front panel, is described from [page 5-39](#) onwards. The DLA is also used to download software into the radio.



## Scheduled Maintenance

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Park Air recommends that scheduled maintenance be carried out at twelve-monthly intervals. If the radio is operated in harsh conditions, scheduled maintenance may be required more frequently. Scheduled maintenance comprises the following actions:

Number	Action	Tools/Test Equipment Required
1	Ensure the radio is clean and that external connectors are securely fitted.	Camel hair brush. Clean lint-free cloths.
2	Check the radio's internal frequency reference. Adjust as required.	Frequency counter able to measure 10 MHz.
3	Perform an ac and dc change-over check (if both input supplies are connected to the radio).	

### Cleaning and Checking Security of Connectors

- Remove any dust and dirt from the radio's exterior surfaces using a lint-free cloth and camel hair brush.
- Take particular care when cleaning the display: dust should be removed using the camel hair brush. Any marks that remain after brushing should be removed by gently wiping with a very lightly dampened *clean* lint-free cloth. Do not use a dirty cloth to wipe the display; any grit particles may scratch the display screen.
- Ensure that all external connectors are secure and free from damage.

## Checking the Internal Frequency Reference

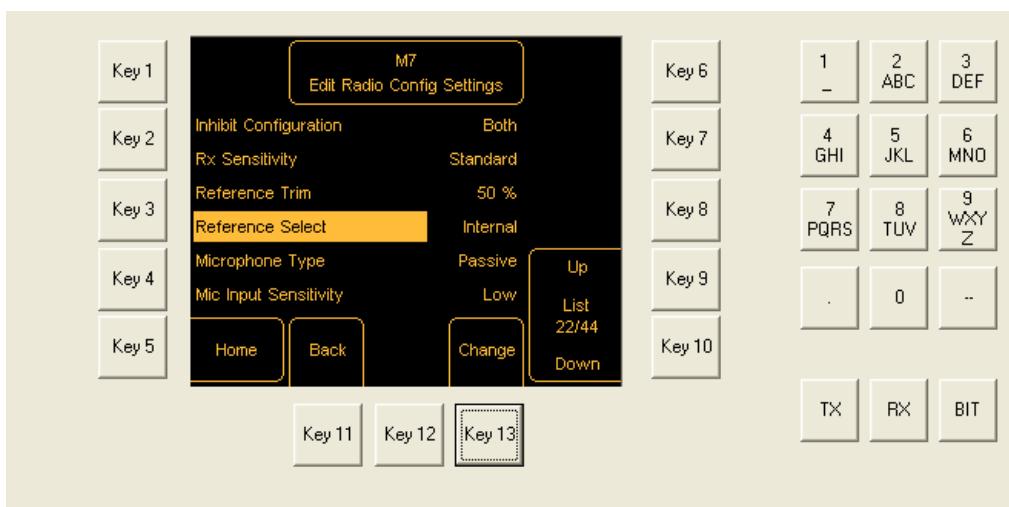
The radio can operate from an internal frequency reference, or from an external frequency reference connected to the rear panel 10 MHz connector. To set the radio's internal frequency reference, use the following procedure.

- (1) Connect a frequency counter to the front panel 10 MHz Reference Frequency Out connector; Fig 5-1.



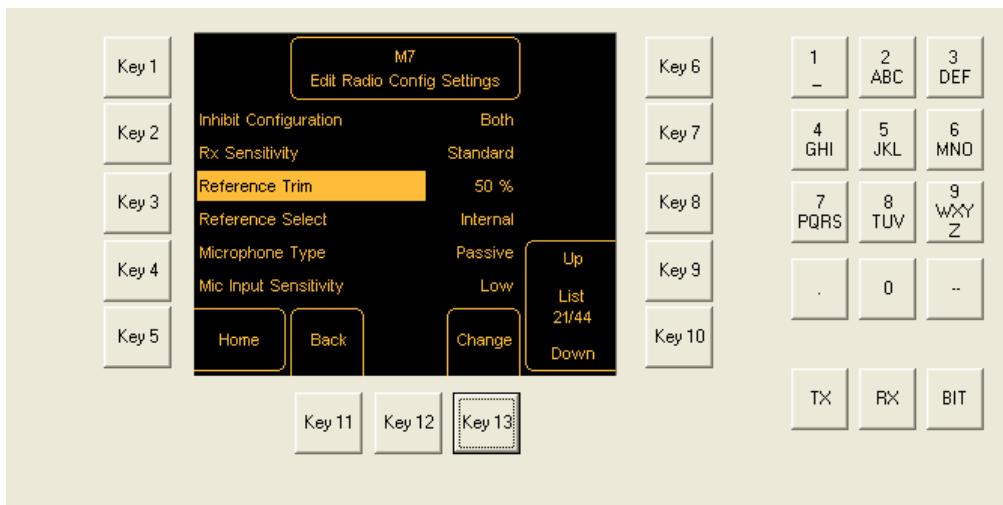
**Fig 5-1 10 MHz Frequency Reference Out Connector**

- (2) Switch on the radio and from the display's Home page select *Key 8 – Radio Config*.
- (3) Using *Key 9* and *Key 10* to scroll up and down the configuration list, highlight Reference Select as shown in Fig 5-2. Ensure Internal is selected. If external is selected, press *Key 13 – Change*; then press *Key 9* or *Key 10* to display External; finally, press *Key 13 – Store*.



**Fig 5-2 Internal Frequency Reference Selected**

(4) Using Key 9 and Key 10 to scroll up and down the configuration list, highlight Reference Trim as shown in Fig 5-3.



**Fig 5-3 Reference Trim Selected**

- (5) Press Key 13 – *Change*, then use Key 9 and Key 10 to adjust the percentage figure, then press Key 13 – *Store*.
- (6) Check the frequency counter display. Keep repeating step (5) until the frequency counter reads as close as possible to exactly 10.000 MHz.
- (7) If an external reference is to be used with the radio, highlight Reference Select and select External.
- (8) Press Key 5 – *Home*.
- (9) Disconnect the frequency counter.

### Checking the ac and dc Change-Over

When both an ac and a dc input supply are connected to the radio, operation is normally from the ac mains supply. Should the mains supply fail, operation automatically switches to the dc supply without any interruption to service.

If both ac and dc input supplies are connected to the radio, carry out the following check:

- (1) Confirm that both ac and dc supplies are connected to the radio. Ensure that the rear panel ac and dc power switches are set to the I (on) position.
- (2) Confirm that the front panel ac and dc indicators are lit, the display is lit, and the radio is operational.
- (3) Switch off the ac supply from its source.
- (4) Check that the radio continues to operate from the dc supply and the front panel ac indicator is unlit. Note that the BIT indicator flashes when the ac supply is switched off.



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