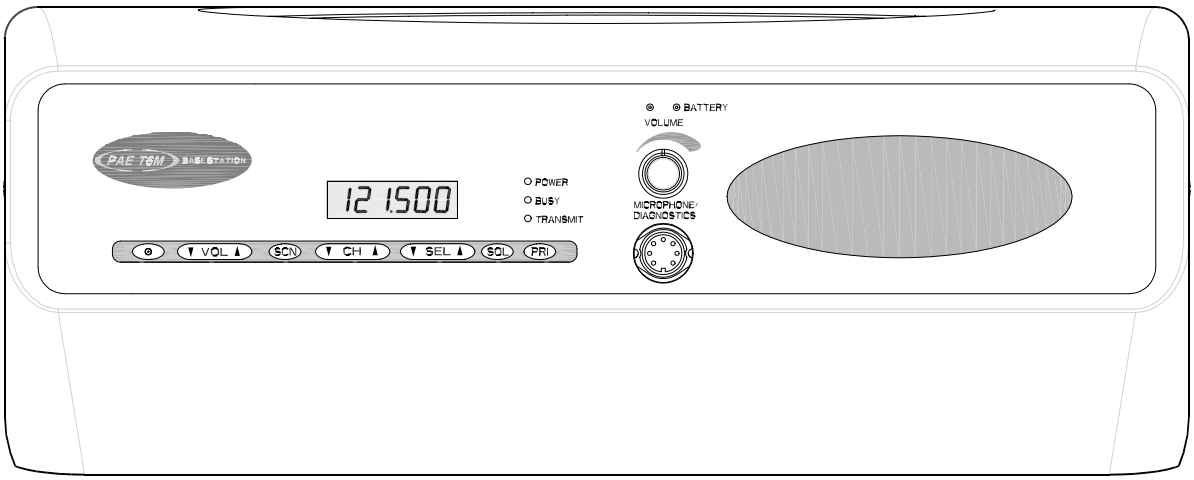
T6M Base Station
User Guide



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Amendment Record

Amendments to this User Guide, initiated by PAE, are recorded in the following table.

Amendment Number	Incorporated by:	Date	Brief Details

Modification Record

Changes or modifications to the T6M base station that are not expressly approved by Park Air Electronics could void your authority to operate the equipment.

Modifications to the T6M base station, authorized by PAE, are recorded in the following table.

Modification Number	Embodied by:	Date	Brief Details

SAFETY

Warnings

[Failure to comply with warnings can result in personal injury, fire, or electric shock.]

- ***DO NOT*** operate equipment at high volume levels. Hearing experts advise against continuous high volume operation. If you experience ringing in your ears, reduce the volume level, or discontinue use.
- The Radio module's power amplifier circuit contains beryllium oxide that can be extremely toxic. No instructions within this user guide remove any of the radio module's covers so users are not exposed to a potential beryllium hazard. If the radio module is to be disposed of, users must be aware of current disposal regulations regarding equipment containing beryllium.
- The antenna used with this radio equipment must be installed such that the resultant radiated field strength is below 10 W/m^2 in areas normally accessible to personnel.
- The base station can be fitted with an optional internal battery. It is a sealed lead-acid type with a thixotropic electrolyte. The battery has self sealing safety vents that may release small quantities of gas under extreme conditions. Because of this, users must ensure that the enclosure's vents are always free from obstruction.

FEDERAL COMMUNICATIONS COMMISSION (FCC) REGULATIONS

- This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.
- You are required to obtain a station licence before transmitting from your base station.
- This equipment is only licenced for operation on 25 kHz channel spacing. Operation on 8.33 kHz channel spacing is not allowed within the USA.
- The base station power output must not exceed the output necessary for satisfactory technical operation taking account of local conditions and the area to be covered.
- The base station's frequency and parameters should be checked by authorized service personnel before use, and at least yearly thereafter.

FOREWORD

This user guide describes the purpose, installation, and operation of the Park Air Electronics (PAE) T6M base station. Read all instructions given in this user guide before operating the equipment.

TRADEMARKS

The following trademarks are used in this user guide.

IBM	Is a registered trademark of International Business Machines.
Microsoft	Is a registered trademark of Microsoft Corporation in the USA and other countries.
Windows	Is a registered trademark of Microsoft Corporation in the USA and other countries.

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This chapter gives a brief overview of the T6M base station and its facilities.

ABOUT THIS HANDBOOK

This handbook describes the Park Air Electronics (PAE) T6M Base Station. Its purpose is to provide the information necessary for users to install, operate, and maintain the equipment to module level. To achieve this, the handbook is divided into eight chapters as follows:

Chapter 1.	Gives a brief overview of the equipment and its facilities.
Chapter 2.	Provides the equipment specification.
Chapter 3.	Details the equipment's controls, indicators and connectors, and provides the operating instructions.
Chapter 4.	Provides detailed installation procedures and defines all interfaces.
Chapter 5.	Describes how the base station's ‘personality’ can be changed.
Chapter 6.	Lists the spares available for the base station.
Chapter 7.	Gives maintenance information.
Chapter 8.	Contains the A3 size figures that are referred to throughout this user guide.

Associated Handbook

When reading this handbook it may be necessary to refer to the following handbook:

T6M Controller User Guide. Part number 31-3600T6MC.

INTRODUCTION TO THE T6M BASE STATION

The T6M multichannel base station provides two-way communication within the VHF aeronautical frequency band 118 to 136.9916 MHz. The radio provides a nominal 10 watt amplitude modulated (AM) output, and operates on both 25 kHz and 8.33 kHz spaced channel frequencies. A fist microphone, with an integral PTT switch, is provided for transmissions; received signals are monitored through the built-in loudspeaker.

Before use, the radio's ‘personality’ is programmed into its internal memory. The personality defines up to 760 channel frequencies, the required operating modes, and various secondary options. Three operating modes are available: Normal, Priority, and Scan.

Normal Mode	In normal mode, any channel frequency programmed into the base station can be selected using the front panel controls. Up to 760 channel frequencies can be programmed into the radio's personality.
Priority Mode	Priority mode allows faster access to frequently used channels. Up to 15 of the channel frequencies that are available in Normal mode can be programmed into the priority list.
Scan Mode	If scan mode is selected, the radio scans a number of pre-defined channels searching for a ‘busy’ one. When a busy channel is found, and depending on the programmed options, the radio remains tuned to that channel. Up to 15 scan groups can be set up, each group containing up to 15 channel frequencies.

FACILITIES

A facilities connector is fitted to the base station's rear panel. It provides the following interfaces:

- Audio in/out and PTT control for connection to a Voice Communication and Control System (VCCS).
- Audio out for connection to a tape recording system.
- An audio operated squelch signal that allows an external ‘busy’ indication.
- A transmit inhibit input signal. This input may be used to prevent the base station being keyed.

REMOTE CONTROLLERS

Up to four T6M Controllers can be connected to a base station. Each controller allows remote transmission and reception on the frequency currently selected at the base station. Full details of the controller are contained in the T6M Controller User Guide.

POWER SUPPLIES

The base station can operate from an ac mains supply, an external dc supply, or an internal battery (see ‘Options’ on page 11). When both an ac and a dc supply are connected, the base station operates from the ac input; the dc input acts as a backup in case the mains fails.

PROGRAMMING THE BASE STATION'S PERSONALITY

The base station's ‘personality’ is programmed into its internal memory and defines up to 760 channel frequencies, the required operating modes, and various secondary options. When the equipment is received from PAE, the personality is either:

- A personality programmed to the user's specific requirements.

  or,

- A default personality that covers the 760 channels (25 kHz spaced) available in the VHF aeronautical frequency band. No frequencies are allocated to the priority list, and no scan groups are set.

A programming kit is available from PAE. This allows a new personality to be programmed into the radio at any time.

The kit comprises software loaded on a CD-ROM, and a programming lead. An IBM™ compatible laptop, or Personal Computer (PC) running Microsoft Windows™ 95 or 98 must be available to reprogramme the radio.

To order the programming kit, contact PAE quoting part number 70-T6MPMKIT.

OPTIONS

Internal Battery

An internal battery can be fitted to act as a backup should the ac mains supply fail. This option may be required when no external dc backup supply is available.

The battery is float charged from the ac supply. If the mains fails, the battery provides a minimum two hours of operation, at 25 C, provided the duty cycle does not exceed 10%. When operating from the internal battery, the transmit power output is reduced by up to 3 dB.

When the battery option is fitted, link JP2 on the interface module must be correctly set (see ‘Setting Internal Links’ in the installation chapter).

Rack Mount Option

The base station is normally supplied in a free-standing desktop polymer enclosure. As an option, the base station's chassis can be fitted in a metal enclosure suitable for 19 inch (483 mm) rack mounting.

Local Monitoring of Transmitted Audio

Normally, transmit and received audio is monitored through the base station's internal loudspeaker; this allows a base station operator to monitor both sides of voice traffic when remote controllers are being used. Alternatively, the equipment can be configured so that only receiver audio is monitored through the loudspeaker.

This facility is enabled by setting link JP1 on the interface module (see ‘Setting Internal Links’ in the installation chapter).

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Chapter 2 gives the specification of the T6M base station.

GENERAL

The general parameters of the T6M base station are listed below.

Operation	Simplex VHF AM transmit and receive.
Operating modes	Normal, priority, and scan.
Channel bandwidth	25 kHz and 8.33 kHz.
Frequency range (at 25 kHz)	Between 118 and 136.975 MHz.
Frequency range (at 8.33 kHz)	Between 118 and 136.9916 MHz.
Frequency stability	1.5 ppm
Channel selection	In Normal mode up to 760 channel frequencies can be programmed into the radio. The channels can have 25 kHz spacing, 8.33 kHz spacing, or a mixture of both. Priority mode allows up to 15 of the stored channels to be allocated to a priority list. Channel selection can then be limited to those frequencies in the priority list. In Scan mode, the radio can have up to 15 scan groups each containing up to 15 channel frequencies.
Duty cycle (receive)	Continuous.
Duty cycle (transmit)	25% with a maximum transmit time of 5 minutes. A longer transmit time, or a higher duty cycle, reduces the output power by up to 6 dB. When the base station operates from the optional internal battery, a duty cycle above 10% rapidly discharges the battery (see ‘Optional Internal Battery’ on page 14).
Operating temperature range	Between -20°C and +55°C.
Storage temperature range	Between -40°C and +70°C.
Humidity	Can be operated in humidity up to 80%.
Cooling	Fan assisted air flow. Fan turns on at approximately 40°C; the fan's speed increases as temperature increases.

DIMENSIONS AND WEIGHT

The dimensions and weight of the base station fitted within the standard enclosure are:

Width	446 mm.
Height	176 mm.
Depth	400 mm.
Weight	9.5 kg without battery option fitted. 11.5 kg with battery option fitted.

The dimensions and weight of the rack mounted base station are:

Width	483 mm.
Height	89 mm (2U).
Depth	423 mm.
Weight	9 kg without battery option fitted. 11 kg with battery option fitted.

INPUT SUPPLIES

The base station can operate from an ac mains supply, or an external dc input supply. When both supplies are connected, the dc supply acts as a backup supply should the mains fail.

ac Supply

The base station requires the following ac input supply:

Input voltage	Between 98 and 254 V ac at either 50 or 60 Hz.
Maximum current	2 A.

dc Supply

The base station requires the following dc input supply:

Input voltage	Between 12 and 15.5 V. For maximum transmitter output power, the dc input must be between 14 and 15.5 V.
Maximum current	9 A.

OPTIONAL INTERNAL BATTERY

An optional internal battery can be fitted to power the base station when external supplies fail. The battery provides:

Voltage	12 V dc.
Operating time	The battery provides at least two hours of operation when the duty cycle does not exceed 10% (measured at a working temperature of 25 C). The transmitter output power is reduced by up to 3 dB during battery operation.

RECEIVE CIRCUIT

The specification of the receive circuit is listed below.

Sensitivity	-104 dBm at 30% modulation depth for 10 dB (S+N):N.
Selectivity	8.33 kHz spaced: <6 dB at ±3 kHz; >60 dB at ±8.33 kHz. 25 kHz spaced: <6 dB at ±8.5 kHz; >70 dB at ±25 kHz.
Intermodulation suppression	>70 dB.
Spurious response suppression	>80 dB.
Audio power output	2 W into 8 ohm integral speaker (<10% THD).
Distortion	<10% THD for 90% modulation depth.
RF input impedance	50 ohms.

TRANSMIT CIRCUIT

The specification of the transmit circuit is listed below.

RF output power	Adjustable between approximately 5 and 12 W.
Spurious	<-46 dBm when more than 1 MHz from the carrier.
Harmonics	<-36 dBm.
Modulation depth	Up to 85%. Compression above 85% to prevent over modulation.
RF load impedance	50 ohms.
Frequency stability	1.5 ppm.

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Chapter 3 - Operation

This chapter gives the instructions for operating the base station after it has been correctly installed. Users should note that the facilities available to an operator depend on how the radio's personality has been configured.

INTRODUCTION

The base station provides transmission and reception on any 25 kHz, or 8.33 kHz, spaced channel frequency within the VHF aeronautical frequency band between 118 and 136.9916 MHz. However, only those frequencies and operating modes that are pre-programmed into the radio can be selected. The radio can be reprogrammed at any time using the supplied software. Instructions for doing this are given in chapter 5 starting on page 37.

Three operating modes are available: Normal, Priority, and Scan. In Normal mode, any frequency programmed into the system can be selected using the radio's front panel controls. Priority mode is similar to Normal mode, but allows faster selection of up to 15 frequently used channels.

In Scan mode, the radio scans a number of pre-defined channels searching for a ‘busy’ one. When a busy channel is found, and depending on the programmed options, the radio remains tuned to that channel ready for use. Scanning can be resumed at any time.

When a T6M base station is received from PAE, the personality is either:

- A personality programmed to the user's specific requirements.

  or,

- A default personality that covers the 760 channels (25 kHz spaced) available in the VHF aeronautical frequency band. No frequencies are allocated to the Priority list, and no scan groups are set.

A programming kit is available from PAE. This allows a new personality to be programmed and downloaded. The radio does not have to be removed from its installed position to download a new personality.

Note that operation using 8.33 kHz channel spacing is not currently allowed within the USA.

The following topics are covered in this chapter:

- Description of front panel controls and indicators; page 18.
- Switching on and off; page 20.
- Operating the base station in normal mode; page 21.
- Operating the base station in priority mode; page 23.
- Operating the base station in scan mode; page 24.
- Programmable options; page 25.
- Front panel display for 25 kHz and 8.33 kHz channel spacing; page 26.
- Fault and error codes; page 28.

FRONT PANEL CONTROLS

Display

(Figure 3, Item 1). In Normal mode, the display shows the currently selected channel frequency. In Priority mode, the display shows the channel frequency but alternates to show a 'P' every few seconds.

In Scan mode, and when the radio is scanning, the display shows Scn and the currently selected scan group (a number between 1 and 15). When a busy channel is found, the channel's frequency is displayed.

The display, in the event of a detected unserviceability, shows fault and error codes.

Transmit Indicator

(Figure 3, Item 2). A red indicator that lights when the transmitter is keyed and producing power.

Busy Indicator

(Figure 3, Item 3). A yellow indicator that lights when a signal, of sufficient strength to overcome the squelch circuit, is received. This indicator is always lit when the squelch facility is switched off.

Power Indicator

(Figure 3, Item 4). A green indicator that lights when the radio is switched on by pressing the front panel Power button. The front panel Power button cannot be operated unless the rear panel power switch is set to on. Note that when the radio is switched off using the front panel Power switch, and the rear panel switch remains at on, the internal battery (if fitted) continues to charge.

Microphone/Diagnostics Connector

(Figure 3, Item 5). A 7-pin DIN socket used to connect the fist microphone normally supplied with the base station. This connector will also accept a microphone/headset; the connector's pin-out is shown on page 32.

This socket is also used to connect the base station to a laptop, or PC, so that the base station's personality can be programmed.

Volume Control

(Figure 3, Item 6). A rotary control used to adjust the volume of the internal loudspeaker. The control has an integral switch: when the control is pushed in, the loudspeaker is switched on; when the control is pulled out, the loudspeaker is switched off.

External Tx Inhibit Indicator

(Figure 3, Item 7). A red indicator that flashes when the external Tx inhibit facility is active. When active, the transmitter cannot be keyed on any frequency.

External Tx Inhibit is set, if required, by physically connecting pin 14 on the rear panel Facilities connector to earth (see 'Connecting External Facilities' in chapter 4).

Battery Indicator

(Figure 3, Item 8). This indicator is used only when the internal battery option is fitted. When the battery is charging, the indicator is amber. When the battery is charged to approximately 75% of its maximum, the indicator changes to green.

Loudspeaker Grille

(Figure 3, Item 9). The base station's internal loudspeaker is fitted behind this grille.

PRI Button

(Figure 3, Item 10). The Priority button is used to select Priority mode operation. This mode can only be selected when it is programmed into the base station's personality.

The Priority button is also used in the sequence to enter Test mode.

SQL Button

(Figure 3, Item 11). Used to switch the squelch facility on and off; it must be switched on before the squelch level is adjusted by using the VOL▲ and VOL▼ buttons . The Squelch button is also used in the sequence to enter Test mode.

SEL▲ and SEL▼ Buttons

(Figure 3, Item 12). The Select buttons have different functions for different operating modes.

In Normal mode, the select buttons skip through the programmed channel frequencies 10 channels at a time. These buttons are used in conjunction with the CH▲ and CH▼ buttons to select the required channel frequency.

In Priority mode, these buttons are used to select the required Priority channel frequency.

In Scan mode, these buttons are used to select the required scan group.

These buttons are also used in the sequence to enter Test mode and as a coarse adjustment when setting the transmitter's output power.

CH▲ and CH▼ Buttons

(Figure 3, Item 13). The Channel buttons have different functions for different operating modes.

In Normal mode, the channel buttons are used to select, the required channel frequency.

In Scan mode, these buttons are used to resume scanning after a busy channel has been found and the radio is paused, or on hold.

These buttons are also used as a fine adjustment when setting the transmitter's output power.

SCN Button

(Figure 3, Item 14). This button is used to switch on and off Scan mode. The scan button is also used in the sequence to enter Test mode.

VOL▲ and VOL▼ Buttons

(Figure 3, Item 15). The Vol buttons are used to adjust the receiver's squelch threshold. ***These buttons do not adjust the loudspeaker volume***.

Power Button

(Figure 3, Item 16). The power button is used to switch on and off power to the radio circuits. When using this switch, it must be pressed, and kept pressed for approximately one second until the front panel display shows On or Off.

Note...

In addition to the front panel Power button, there is also a Power on/standby switch fitted on the rear panel (see ‘Switching On and Off’ on page 20).

Warning!

Neither the Power button, nor the rear panel Power switch, isolates the input supply from the equipment. Lethal voltages are still present in the base station's internal power supply. To ensure safe working during maintenance, the ac and dc input supplies must be disconnected from the base station.

SWITCHING ON AND OFF

To switch on the base station:

(1) Ensure the Supply switch fitted to the base station's rear panel is set to on. Note that there is no front panel indication as to whether the rear panel supply switch is on or set to standby.

(2) Press the front panel Power button for approximately one second until the display reads ‘On’. Then release the button.

(3) Check that a warbling sound is heard for a few seconds and then a channel frequency is displayed.

(4) The base station is now ready for use.

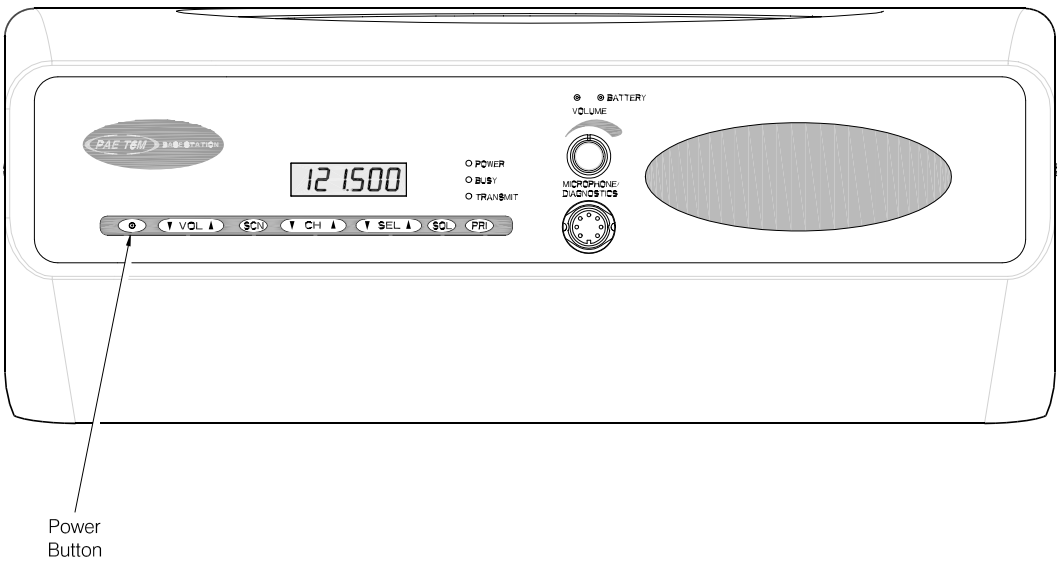
To switch off the base station, press the Power button until the display reads ‘Off’. Then release the button. Note that this action removes power only from the radio module; power to other modules is removed when the rear panel Supply switch is set to standby.

Warning!

Neither the Power button, nor the rear panel Power switch, isolates the input supply from the equipment. Lethal voltages are still present in the base station's internal power supply. To ensure safe working during maintenance, the ac and dc input supplies must be disconnected from the base station.

Note ...

Always switch off the rear panel Power switch, and allow at least 10 seconds, before disconnecting the ac and dc supply connectors. If this is not done, when next switched on the base station may revert to previous channel and mode settings, and not those that were active immediately before switching off.



Base Station Front Panel Power Button Location

OPERATING THE BASE STATION IN NORMAL MODE

Operating the base station in Normal mode requires the following operations. Each operation is explained in following paragraphs.

(1) Select Normal mode if not currently selected.

(2) Select the required channel frequency.

(3) Transmit using the fist microphone, and receive using the base station's internal loudspeaker.

(4) Adjust, if necessary, the Squelch facility.

Selecting Normal Mode

Normal mode is active when neither Priority mode or Scan mode is selected. If Priority mode is selected, the display shows ‘P’ every few seconds. If Scan mode is selected the display shows ‘Scn’ when scanning, or the frequency when locked onto a busy channel. To select Normal mode if currently in Priority or Scan mode:

- ❑ To select Normal mode if currently in Priority mode, press the CH▲ or CH▼ button.
- ❑ To select Normal mode if currently in Scan mode, press the SCN button.

Selecting a Channel Frequency

To select the required channel frequency, press the CH▲ or CH▼ button to scroll up or down through the channel frequencies that are programmed into the base station. Release the button when the required frequency is displayed.

In conjunction with the CH▲ and CH▼ buttons, the SEL▲ and SEL▼ buttons can be used to step 10 channels at a time.

Transmitting and Receiving

To key the transmitter press the fist microphone's PTT button. Check that the base station's Tx indicator lights, and then speak clearly into the microphone.

Reception is heard through the base station's internal loudspeaker. The volume is adjusted using the front panel's rotary Volume control that must be pushed in to switch on the loudspeaker. **Users should note that the VOL▲ and VOL▼ buttons do not adjust the volume.** When a signal is received, the base station's busy indicator lights if squelch is switched on; if squelch is switched off, the busy indicator is permanently lit.

Switching and Adjusting the Squelch Facility

The base station has an adjustable squelch facility that can also be turned on and off. The squelch facility, when correctly set, mutes unwanted background noise when no signals are being received.

During normal use of the base station the squelch facility should be switched on. After initially setting the squelch level, there should be no reason to adjust it unless a problem is evident. The symptoms of an incorrectly adjusted squelch level are:

- ❑ Background noise is continuously, or intermittently heard when no signals are being received. If this is the case, the setting is too low.
- ❑ Weak signals (signals below the squelch threshold) are not being received. If this is the case, the setting is too high.

These operating procedures assume the fist microphone that is normally supplied with the base station is being used. As an alternative to the fist microphone, a microphone/headset can be used.

To Switch On the Squelch

To switch on the squelch facility:

(1) Press the SQL button.

(2) Check that the display shows an ‘S’ and the current level (a number between 1 and 20).

(3) Check that after a few seconds the display changes to show the currently selected channel frequency. The squelch facility is now on.

To Switch Off the Squelch

To switch off the squelch facility:

(1) Press the SQL button.

(2) Check that the display shows an ‘S’ and the current level (a number between 1 and 20).

(3) Press the SQL button while the display is showing ‘S’ and the current level.

(4) Check that the display shows ‘S OFF’.

(5) Check that after a few seconds the display changes to show the currently selected channel frequency. The squelch facility is now off.

To Adjust the Squelch Level

To adjust the squelch facility:

(1) Press the SQL button.

(2) Check that the display shows an ‘S’ and the current level (a number between 1 and 20).

(3) Press the VOL▲ button to increase the squelch threshold, or the VOL▼ button to decrease it. The squelch should be set to the lowest threshold setting (a number between 1 and 20) that eliminates background noise when no signal is being received.

(4) After the required setting is selected, press no more buttons and check that after a few seconds the display changes to show the currently selected channel frequency. The squelch facility is now set.

OPERATING THE BASE STATION IN PRIORITY MODE

Priority mode allows faster access to frequently used channel frequencies. Up to 15 channel frequencies can be programmed into the base station's priority list. The Priority facility must be programmed into the base station before it can be selected, or used.

Operating the base station in Priority mode requires the following operations. Each operation is explained in following paragraphs.

(1) Select Priority mode if not currently selected.

(2) Select the required channel frequency.

(3) Transmit using the fist microphone, and receive using the base station's internal loudspeaker.

Selecting Priority Mode

Select Priority mode by pressing the PRI button. When selected, the display shows ‘P’ every few seconds.

Selecting a Priority Channel Frequency

To select the required channel frequency, press the SEL▲ or SEL▼ button to scroll up or down through the priority channel frequencies that are programmed into the base station. Release the button when the required frequency is displayed.

Transmitting and Receiving

To transmit, key the transmitter by pressing the fist microphone's PTT button. Check that the base station's Tx indicator lights, and then speak clearly into the microphone.

Reception is heard through the base station's internal loudspeaker. The volume is adjusted using the front panel's rotary Volume control that must be pushed in to switch on the loudspeaker. **Users should note that the VOL▲ and VOL▼ buttons do not adjust the volume.** When a signal is received, the base station's busy indicator lights if squelch is switched on; if squelch is switched off, the busy indicator is permanently lit. If the squelch facility requires adjusting, use the procedure ‘Switching and Adjusting the Squelch Facility’ given on page 21.

OPERATING THE BASE STATION IN SCAN MODE

In this mode the base station scans a number of pre-defined channel frequencies searching for a busy one. When a busy channel is found, the base station provides reception on that channel. The Scan facility must be programmed into the base station before it can be selected, or used.

Note …

A channel is defined as busy when it is receiving a signal strong enough to override the squelch setting.

What happens after a busy channel is found depends on how the base station is programmed. There are two possible options: Hold and Pause.

- If Hold is programmed, the base station remains tuned to the busy channel until the CH▲ button is pressed to resume scanning.
- If pause is programmed, the base station remains tuned to the busy channel for six seconds, then automatically resumes scanning. If during the six seconds the radio is keyed, or the CH▲ button is pressed, the base station remains tuned to the busy channel; scanning does not resume until the CH▲ button is pressed again.

The base station can be programmed with up to 15 scan groups, each containing up to 15 channel frequencies. Squelch is automatically switched on when scan mode is selected. Display blanking does not operate in scan mode.

Selecting Scan Mode

To select Scan mode, press the SCN button. Check that the display shows Scn and a number between 1 and 15; the number corresponds to the currently selected scan group.

Selecting a Scan Group

When in Scan mode, the required scan group (a number between 1 and 15) is selected by pressing the SEL▲ or SEL▼ button.

Transmitting and Receiving

To transmit when the scan function is on hold, or pause, key the transmitter by pressing the fist microphone's PTT button. Check that the base station's Tx indicator lights, and then speak clearly into the microphone.

Reception is heard through the base station's internal loudspeaker. The volume is adjusted using the front panel's rotary Volume control that must be pushed in to switch on the loudspeaker. **Users should note that the VOL▲ and VOL▼ buttons do not adjust the volume.** When a signal is received, the base station's busy indicator lights if squelch is switched on; if squelch is switched off, the busy indicator is permanently lit. If the squelch facility requires adjusting, use the procedure ‘Switching and Adjusting the Squelch Facility’ given on page 21.

PROGRAMMABLE OPTIONS

A number of options can be programmed into the radio's personality. The options are detailed in the following paragraphs.

Display Blanking

Display blanking is applicable only to Normal and Priority modes; not Scan mode.

When display blanking is programmed, the radio's normal frequency display is replaced by a flashing bar if the radio is not keyed during the display blanking time period (between 10 and 300 seconds).

Example,

Display blanking is programmed
Display blanking time is 60 seconds
Selected channel frequency is 121.500 MHz.

In this example, the display normally shows 121.500. If the transmitter is not keyed for 60 seconds, the display changes to a flashing bar.

Normal frequency display is reinstated when the radio is keyed, or when the VOL▲ or VOL▼ button is pressed. Note that the display can be reinstated by pressing any other button, but doing so may also alter other settings.

Warning Beeps

When programmed, the following conditions cause a warning beep to be heard when an attempt is made to key the transmitter:

- ❑ The radio has a fault that prevents transmissions.
- ❑ Trying to key the radio on a channel frequency that has the ‘Transmit Inhibit’ option set to ‘Always Inhibit’.
- ❑ Trying to key the radio on a busy channel that has the ‘Inhibit if Busy’ option selected.
- ❑ Imminent transmitter time out.

The volume of warning beeps is set in the personality (a value between 1 and 7); the front panel volume control does not affect the beeps.

Key Beeps

This option, when programmed, produces a single beep whenever a button is pressed on the radio's front panel. The volume of the beep is the same as the Warning beep.

Transmit Inhibit

Any frequency programmed into the radio can be made ‘receive only’. To achieve this, the transmit function on the channel is always inhibited, or the transmit facility can be inhibited only when the channel is busy. If warning sounds have been set, a warning is heard when an attempt is made to key the transmitter.

Maximum Transmit Time

A maximum continuous transmit time can be programmed into the radio's personality. The options are:

- No limit.
- A limit that can be set between 30 and 300 seconds.
- If a limit has been set, and warning sounds have been set, the radio produces warning beeps 10 seconds before the transmission time expires.

FRONT PANEL DISPLAY FOR 25 kHz AND 8.33 kHz CHANNEL SPACING

When selecting an 8.33 kHz channel frequency, the displayed frequency differs from the actual channel frequency. Table 1 on page 27 shows the pattern used for 25 kHz and 8.33 kHz spaced channel frequencies from 118.0000 MHz to 118.1916 MHz. The pattern is the same for any frequency within the radio's frequency range. The display conforms to ICAO convention for 8.33 kHz operation.

Note that operation using 8.33 kHz channel spacing within the USA is not currently allowed under FCC regulations.

Table 1. Display for 25 kHz and 8.33 kHz Channel Spacing

Actual Frequency (to 4 decimal places)	Channel Spacing	Displayed Frequency at Radio's Front Panel
118.0000 MHz	**25 kHz**	**118.000 MHz**
118.0000 MHz	8.33 kHz	118.005 MHz
118.0083 MHz	8.33 kHz	118.010 MHz
118.0166 MHz	8.33 kHz	118.015 MHz
118.0250 MHz	**25 kHz**	**118.025 MHz**
118.0250 MHz	8.33 kHz	118.030 MHz
118.0333 MHz	8.33 kHz	118.035 MHz
118.0416 MHz	8.33 kHz	118.040 MHz
118.0500 MHz	**25 kHz**	**118.050 MHz**
118.0500 MHz	8.33 kHz	118.055 MHz
118.0583 MHz	8.33 kHz	118.060 MHz
118.0666 MHz	8.33 kHz	118.065 MHz
118.0750 MHz	**25 kHz**	**118.075 MHz**
118.0750 MHz	8.33 kHz	118.080 MHz
118.0833 MHz	8.33 kHz	118.085 MHz
118.0916 MHz	8.33 kHz	118.090 MHz
118.1000 MHz	**25 kHz**	**118.100 MHz**
118.1000 MHz	8.33 kHz	118.105 MHz
118.1083 MHz	8.33 kHz	118.110 MHz
118.1166 MHz	8.33 kHz	118.115 MHz
118.1250 MHz	**25 kHz**	**118.125 MHz**
118.1250 MHz	8.33 kHz	118.130 MHz
118.1333 MHz	8.33 kHz	118.135 MHz
118.1416 MHz	8.33 kHz	118.140 MHz
118.1500 MHz	**25 kHz**	**118.150 MHz**
118.1500 MHz	8.33 kHz	118.155 MHz
118.1583 MHz	8.33 kHz	118.160 MHz
118.1666 MHz	8.33 kHz	118.165 MHz
118.1750 MHz	**25 kHz**	**118.175 MHz**
118.1750 MHz	8.33 kHz	118.180 MHz
118.1833 MHz	8.33 kHz	118.185 MHz
118.1916 MHz	8.33 kHz	118.190 MHz

FAULT AND ERROR CODES

A number of fault and error codes are shown on the radio's display if an internal fault is detected. The codes and their meaning are detailed in Table 2.

Table 2. Fault and Error Codes

Displayed Fault or Error Code	Title	Meaning
F1	Synthesiser failure	An internal fault on the synthesiser has been detected. Switch off the base station and switch on again after a few minutes. If the fault persists, refer to ‘Maintenance’ in chapter 7.
F2	Unstable output	An internal fault on the power amplifier has been detected. Switch off the base station and switch on again after a few minutes. If the fault persists, refer to ‘Maintenance’ in chapter 7.
F4	Over temperature	This condition may occur if the transmitter's duty cycle has been exceeded, or when transmitting for long periods. The fault should clear if the radio is not keyed and allowed to cool.
F16 **F32**	Low supply voltage High supply voltage	These two faults indicate the internal power supply is faulty. Switch off the base station and switch on again after a few minutes. If the fault persists, refer to ‘Maintenance’ in chapter 7. Fault code F16 may be displayed when operating using the battery option and the battery starts to run flat.
cErr	Critical error	This error is displayed when the base station is initially switched on and no personality information, or corrupted personality information, is detected. Refer to ‘Programming the Base Station’ on page 37 and load a personality into the base station.

Chapter 4 - Installation

The instructions in this chapter should be followed, in the order given, to install the T6M base station.

INTRODUCTION

Warning. Lethal Voltages!

The instructions given in this chapter involve connecting lethal voltages to the equipment. The instructions, therefore, must be carried out only by suitably qualified personnel.

Warning. Unauthorized Modifications!

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

Warning. Antenna Radiation!

The antenna used with this radio equipment must be installed such that the resultant radiated field strength is below 10 W/m^2 in areas normally accessible to personnel.

Installing the base station involves the following operations. Each operation is detailed in this chapter of the user guide.

- ❑ Unpacking and checking the installation kit is complete.
- ❑ Setting (if necessary) internal links.
- ❑ Siting the base station.
- ❑ Connecting one, or more, RCUs to the base station (if required).
- ❑ Connecting an antenna.
- ❑ Connecting the base station chassis to earth.
- ❑ Connecting the microphone (or a microphone/headset).
- ❑ Connecting external facilities (if required) to the base station.
- ❑ Connecting a dc input supply (if required).
- ❑ Connecting a mains supply (if required).
- ❑ Connecting a PC, or laptop, so that the base station's personality can be modified.

Before the base station is put into operational service, the required 'personality' information should be programmed in. This information, includes channel frequencies and operating modes.

When a T6M base station is received from PAE, the personality is either:

- ❑ A personality programmed to the user's specific requirements.

  or,

- ❑ A default personality that covers the 760 channels (25 kHz spaced) available in the VHF aeronautical frequency band. No frequencies are allocated to the Priority list, and no scan groups are set.

A programming kit is available from PAE. This allows a new personality to be programmed and downloaded. The base station does not have to be removed from its installed position to download a new personality.

[Note that operation using 8.33 kHz channel spacing is not currently allowed within the USA.]

UNPACKING

When the base station is received from PAE, remove the packaging and check that the items listed in Table 3 are included.

Table 3. Installation Materials

Item Number	Description	Quantity	PAE Part Number
1	Base station complete with enclosure	1	BT6MBS
2	Microphone terminated with 7-pin DIN plug	1	24-11030301
3	2 metres of mains cable terminated with a 3-pole socket (mates with AC input plug)	1	17-03000038S
4	15-way D-type plug (mates with Facilities socket) comprising: Plug connector Cover	 1 1	 20-01150100 20D09150101

If ordered, a programming kit may be included. This kit, part number 70-T6MPMKIT, comprises:

- ❑ CD containing the software.
- ❑ Base station to PC connecting cable.

SETTING INTERNAL LINKS

Two internal links must be correctly set before the base station is used. Both links are factory set, but may require checking if a replacement Interface module is fitted during the life of the base station. The two links are:

- ❑ Interface module JP1. This link determines whether received audio, or transmitted and received audio, is monitored through the internal loudspeaker (see ‘Local Monitoring of Transmitted Audio’ on page 11).
- ❑ Interface module JP2. This link is set to correspond with the internal battery being fitted, or not fitted.

When a base station is received from PAE, the links are normally set as per the user's requirements. If there are any doubts, however, check the links as follows:

(1) Refer to Figure 5 that shows the base station in its enclosure. Remove and retain the six M4 pan head screws and associated washers that secure the equipment within the enclosure.

(2) Slide the equipment forward out of the enclosure. Refer to Figure 8 and identify the Interface PCB. Refer to Figure 11 and identify links JP1 and JP2.

(3) Ensure the two links are set to the required positions.

(4) Slide the equipment back into its enclosure. Refit the six M4 securing screws and washers.

SITING THE BASE STATION

Site the base station away from sources of heat and in a position that allows access to the rear panel connectors and the On/Standby switch. If your base station is a rack mounted version, refer to Figure 2 and fit into an equipment rack either on telescopic slides, or fixed runners.

CONNECTING A T6M CONTROLLER TO THE BASE STATION

Up to four T6M Controllers can be connected to a base station. Users should refer to the T6M Controller User Guide (part number 31-3600T6MC) for installation details.

The controllers are terminated on any of the base station's four RCU connectors. Figure 4 shows the interconnections. The pin-out of the RCU connector is given in Table 4.

Table 4. RCU Connector Pin-Out

RCU Connector Pin Number	Signal
1	Ground
2	Line +
3	Line -
4	PTT (0 V active)
5	Not connected
6	Not connected
7	Not connected
8	Not connected
9	Not connected

CONNECTING AN ANTENNA

Warning. Antenna Radiation!

The antenna used with this radio equipment must be installed such that the resultant radiated field strength is below 10 W/m^2 in areas normally accessible to personnel.

A suitable antenna must be connected to the base station's rear panel Antenna connector (see Figure 1). An N-type plug should be used to connect the feeder cable; the connector is designed to accept UR67 or RG213 coaxial cable that has an overall diameter of approximately 10 mm. Figure 12 shows the RF cable to N-type connector termination. A suitable connector is PAE part number 19-01030301.

CONNECTING THE CHASSIS STUD TO EARTH

A chassis stud, marked is fitted to the base station's rear panel. When using the rack mounted version of the base station, and in order not to compromise the equipment's EMC the chassis stud must be connected to the equipment rack or the system earth. The connection should be made using a single tri-rated, green-and-yellow cable having a cross-sectional area of 2.5 mm^2. The cable should have CSA and UL1015 approval, and be connected to the chassis stud through an M6 eyelet.

CONNECTING A MICROPHONE

The supplied fist microphone (Table 3, item 2) plugs directly into the base station's front panel Microphone/Diagnostics connector.

The pin-out of the Microphone/Diagnostics connector is given in Table 5. Figure 4 shows the connections used for the fist microphone circuit.

As an alternative to the fist microphone, a microphone/headset can be used. The ‘receiver audio monitor’ (Table 5 pin 5) should be used as the headset connection.

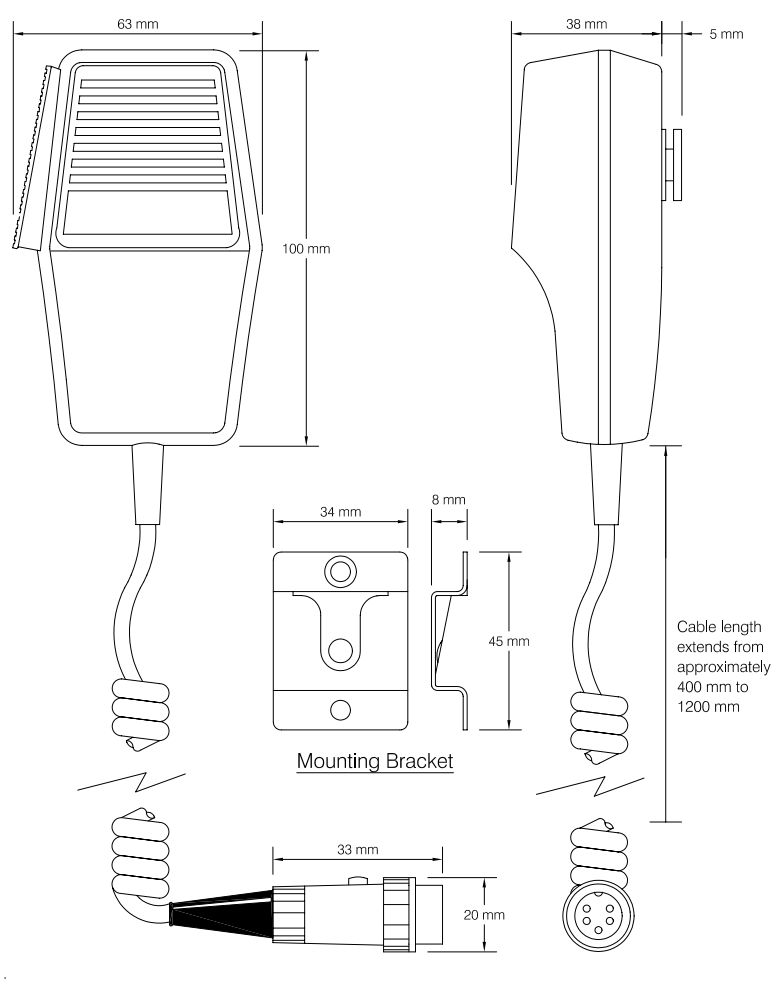
Table 5. Base Station Microphone/Diagnostics Socket Pin-Out

Pin Number	Signal	Input or Output	Signal Level
1	Microphone ground	Input	0 V
2	RS232 Tx	Output	RS232
3	Microphone PTT	Input	0 V = PTT
4	RS232 Rx	Input	RS232
5	Sidetone and receiver audio monitor	Output	Maximum 1 V rms. Rout = 200
6	Microphone audio	Input	Passive microphone
7	Ground	-	0 V

SECURING THE MICROPHONE BRACKET

A mounting bracket is supplied with each fist microphone (see illustration on the next page). The bracket should be fitted to any convenient vertical surface, noting that the coiled microphone lead extends from approximately 400 mm to 1200 mm.

Two screws secure the bracket to the chosen surface. The actual bracket should be used as a template for drilling the two screw holes.



Fist Microphone

CONNECTING EXTERNAL FACILITIES

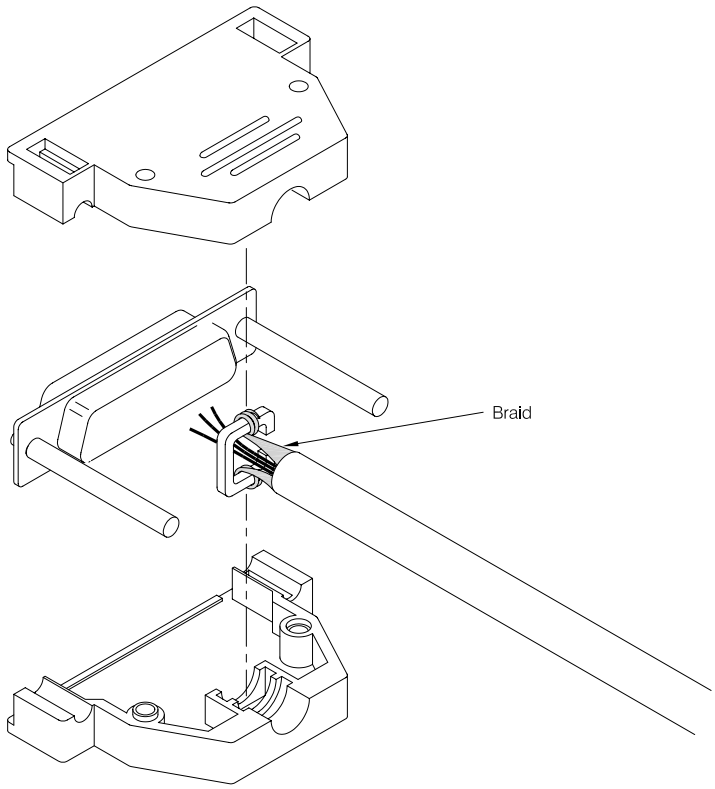
Four optional external facilities can be connected to the base station. They are:

- An audio output to drive an external tape recorder.
- Transmit audio, received audio, and PTT lines for use with a control desk.
- A transmit inhibit signal.
- An audio operated squelch signal.

The external facilities are connected to the base station's rear panel Facilities connector. This connector is detailed in Table 6. A 15-way D-type plug (Table 3, item 4) is provided to make the facilities connections. Connection to the plug should be made using screened cable; the braid should be connected to the plug's shell as shown in the illustration on page 35.

Table 6. Base station Facilities Connector Pin-Out

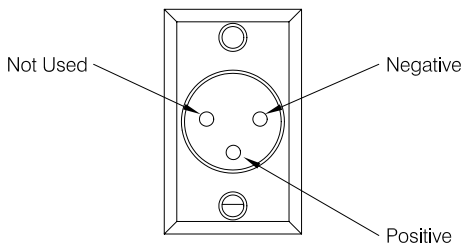
Base Station's Facilities Connector Pin Number	Signal	Input or Output	Description
1	Ground	-	0 V.
2 3	Tape + Tape -	Output	A balanced 600 twisted pair providing audio to drive a tape recording system. The output level is 0 dBm (sine wave on 600) for 85% modulation depth.
4	Audio operated squelch	Output	0 V when received audio having a modulation depth >20% is present. Open circuit at other times. This signal can be used as an external 'busy' indication.
5 6 7 8 9 10	Control Desk Rx + Control Desk Rx - Control Desk Tx + Control Desk Tx - Control Desk PTT + Control Desk PTT -	Output Input Input	A 6-wire system comprising two 600 twisted pair balanced lines for Rx and Tx audio, plus a line pair for PTT. The audio line levels are 0 dBm (sine wave on 600) for 85% modulation depth. PTT can be activated either by shorting together the PTT lines, or by phantom keying on the Tx lines. Note that Control Desk PTT - is internally connected to 0 V.
11 12 13	Not connected Not connected Not connected	-	-
14	External Tx inhibit	Input	When this line is connected to 0 V, the base station cannot be keyed.
15	Ground	-	0 V.



Cable Braid Connection to D-Type's Shell

CONNECTING A DC INPUT SUPPLY

The base station can operate using a 12 to 15.5 V dc input supply, or it can be used as a backup to the mains ac input. The DC Input connector fitted to the rear panel (see following illustration) is used for this supply. Connection should be made using a free XLR socket; for example, PAE part number 20-01030106.



DC Input Connector

CONNECTING AN AC INPUT SUPPLY

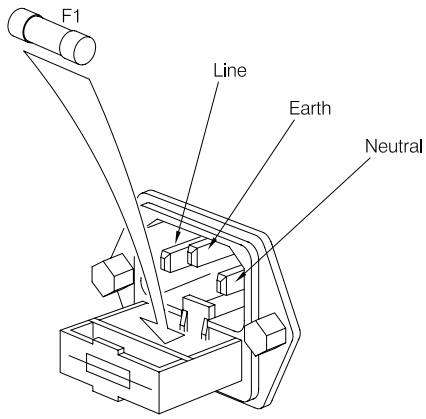
An ac input supply must be connected to the base station using the supply connector provided (Table 3, item 3). The free end of the cable should be terminated with a connector suitable for the local mains supply.

The T6M base station is a class 1 equipment. The ac supply cable must have a green-and-yellow protective earthing conductor electrically connected to the protective earthing terminal of the equipment connector, and the supply output connector.

The ac supply cable should be colour coded in accordance with the electrical appliance (colour code) regulations for the UK. That is:

Line:	Brown
Neutral:	Blue
Earth:	Green-and-yellow

Connections are shown below.



Base Station's Chassis AC Connector

CONNECTING A PC TO THE BASE STATION

To modify the base station's personality, the microphone is disconnected from the Microphone/Diagnostics connector and is replaced by an RS232 cable connected to a laptop, or PC. The cable is part of the T6M programming kit, part number 70-T6MPMKIT. Figure 4 shows the connections used for the RS232 cable.

Chapter 5 - Programming the Base Station

This chapter describes how a personality is compiled and then downloaded into the base station's internal memory.

INTRODUCTION

During manufacture, the base station is programmed with a default personality, or with a personality as per the user's requirements.

Note …

A personality is the programme that defines the radio's channel frequencies, operating modes, and other options.

A new personality can be compiled and loaded into the radio at any time using the programming kit (70-T6MPMKIT) available from PAE. The kit contains CD-ROM based software and a programming lead. A laptop computer, or PC, must be available to compile the personality.

The following topics and procedures are detailed in this chapter:

- Programmable options (see page 39).
- Installing the programming software onto a laptop computer, or PC (see page 40).
- Creating a new personality (see page 40).
- Saving a personality (see page 44).
- Opening a saved personality (see page 45).
- Loading a personality into the radio (see page 45).
- Reading a personality from the radio (see page 45).
- Printing a personality report (see page 46).

Table 7. Programming Options

Option	Range	Default	Notes
Display blanking	On or off	Off	See ‘Display Blanking’ on page 39.
Display blanking time	10 to 300 seconds	60 seconds	See ‘Display Blanking’ on page 39.
Maximum transmit time	30 to 300 seconds, or 0 (unlimited)	180 seconds	Limits the maximum continuous transmit time.
Hold on scan mode	On or off	On	See ‘Hold on Scan Mode’ on page 40.
Key beeps	On or off	On	See ‘Key Beeps’ on page 39.
Warning beeps	On or off	On	See ‘Warning Beeps’ on page 39.
Warning beep volume	1 to 7	3	See ‘Warning Beeps’ on page 39.
Personality description	46 character alphanumeric string	Empty string	A free format text string that defines the radios personality.
Use channel strings	Yes or no	No	Defines whether channel frequencies are to include descriptive strings. Selecting Yes for this option reduces the maximum number of channels that can be stored from 760 to 400.
Busy on time	0.1 to 5 seconds	0.5 seconds	Squelch must be open for this time before a channel is considered to be busy.
Offset channels	On or off	On	When set to on, the radio scans for the strongest frequency within a 25 kHz channel. Always set to On.
Frequency	118.000 to 136.9916 MHz	760 (25 kHz spaced) channels from 118.000 to 136.975 MHz	Enter this in ICAO format (see Table 1 on page 27); this format automatically defines the frequency and the bandwidth.
Priority channel	Yes or no	No	Up to 15 channels can be defined as priority channels.
Scan group	1 to 15 or not assigned	No scan groups assigned	Up to 15 channels can be assigned to each of 15 scan groups. A channel frequency can be included in more than one group.
Transmit inhibited	Never inhibit Always inhibit Inhibit if busy	Never inhibit	This option can be used to prevent the radio transmitting on any particular channel frequency.
Identification string	16 character alphanumeric string	Empty string	A free format text string that describes the channel frequency.
Base	Enabled or disabled	Disabled	***Must*** be enabled for correct operation of the base station.

PROGRAMMABLE OPTIONS

A number of programmable options can be set in the base station's personality. These are listed in Table 7. The following paragraphs provide further explanation regarding display blanking, warning beeps, key beeps, and hold on scan.

Display Blanking

Display blanking is applicable only to Normal and Priority modes; not Scan mode.

When display blanking is enabled, the radio's normal frequency display is replaced by a flashing bar if the radio is not keyed during the display blanking time period.

Example,

Display blanking is enabled
Display blanking time is 60 seconds
Selected channel frequency is 121.500 MHz.

In this example, the display normally shows 121.500. If the transmitter is not keyed for 60 seconds, the display changes to a flashing bar.

Normal frequency display is reinstated when the radio is keyed, or when the VOL▲ or VOL▼ button is pressed. Note that the display can be reinstated by pressing any other button, but doing so may also alter radio settings.

Warning Beeps

When enabled, the following conditions cause a warning beep to be heard when an attempt is made to key the transmitter:

- ❑ The radio has a fault that prevents transmissions.
- ❑ Trying to key the radio on a channel frequency that has the ‘Transmit Inhibit’ option set to ‘Always Inhibit’.
- ❑ Trying to key the radio on a busy channel that has the ‘Inhibit if Busy’ option selected.
- ❑ Imminent transmitter time out.

The volume of warning beeps is set in the personality (a value between 1 and 7); the front panel volume control does not affect the beeps.

Key Beeps

This option, when enabled, produces a single beep whenever a button is pressed on the radio's front panel. The volume of the beep is the same as the Warning beep.

Hold on Scan Mode

When in scan mode, what happens after a busy channel is found depends on how the radio is programmed. There are two possible options: Hold and Pause.

- If Hold is programmed, the radio remains tuned to the busy channel until the CH▲ button is pressed to resume scanning.
- If pause is programmed, the radio remains tuned to the busy channel for six seconds, then automatically resumes scanning. If during the six seconds the radio is keyed, or the CH▲ button is pressed, the radio remains tuned to the busy channel; scanning does not resume until the CH▲ button is pressed again.

INSTALLING THE PROGRAMMING SOFTWARE ONTO A LAPTOP, OR PC

The programming software is supplied on a CD-ROM. The software should be installed onto a laptop computer, or PC, running Windows™ 95 or 98. To install the software:

(1) Insert the CD-ROM into the computer's CD drive.

(2) From Windows Explorer, select the CD-ROM drive, and run the programme called Setup.exe.

(3) Follow the on-screen instructions. The programming files are stored in the directory C:\Program Files\PAE unless a different directory is specified during installation. Icons, and an uninstall programme are automatically created during installation.

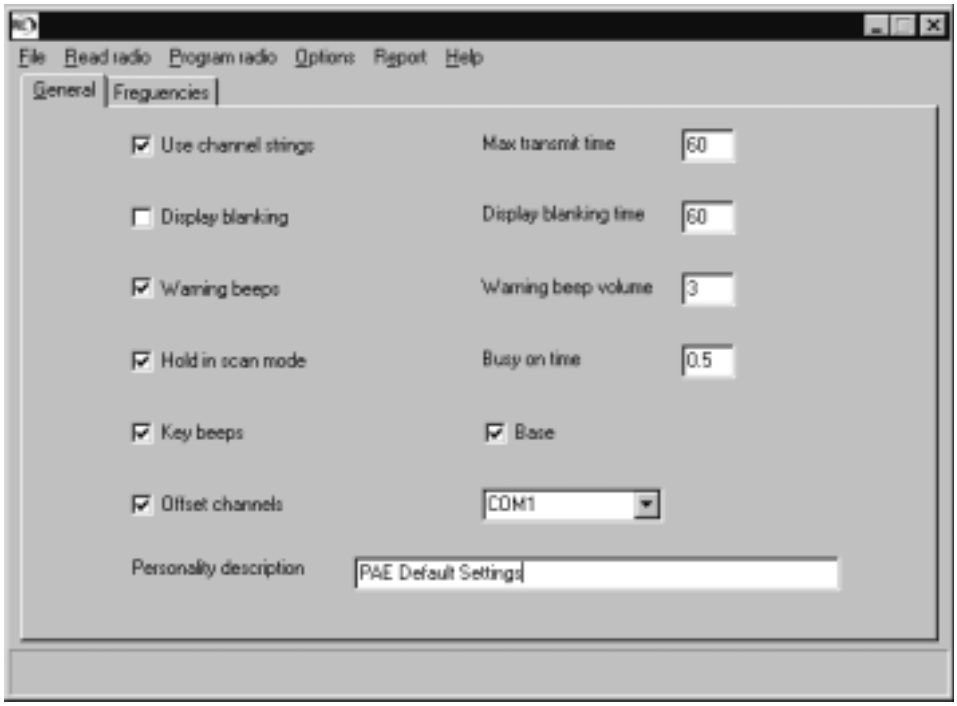
CREATING A NEW PERSONALITY

This procedure creates a new personality for use by the radio. The personality includes all channel frequencies, operating modes and programmable options that are required when the radio is in operational use. When the personality has been compiled, it can be loaded into the radio's memory by connecting the laptop (or PC) to the radio using the programming lead.

To create a new personality:

(1) At the laptop (or PC) run the PAE programmer software. Check that the General page (see page 41) is displayed. If the Frequencies page is displayed, select the General tab.

(2) From the menu-bar select File then New. This action resets all options to the default value and clears all entries, except one, in the frequency table.



General Page

[Note that the status line at the bottom of the page displays help messages when the mouse pointer is placed over a programmable option.]

(3) Use Channel Strings**.** Decide if you wish to store descriptive text for any of the channel frequencies that will be programmed. If you do, use the mouse to ensure the box is checked. If you do not wish to use this facility, use the mouse to ensure the box is empty.

Notes …

If the Use Channel Strings facility is selected, the maximum number of channel frequencies that can be stored is reduced from 760 to 400.

Descriptive text is shown on the frequency list within this programme; it is not displayed at the radio.

(4) Maximum Transmit Time. This setting alters the maximum time the transmitter can be keyed. Key in a value between 30 and 300 (seconds), or if no limit is required, enter 0. If a limit has been set, and warning beeps are set, a warning is heard 10 seconds before the radio stops transmitting.

(5) Display Blanking. Display blanking is described on page 39. If you require this facility use the mouse to ensure the box is checked. If you do not wish to use this facility, use the mouse to ensure the box is empty.

(6) Display Blanking Time. Enter a number between 10 and 300 (seconds). This is the time used when the display blanking facility is selected to be active. Display blanking is described on page 39.

(7) Warning Beeps. Warning beeps, as described on page 39, can be set to on or off. To set them to on use the mouse to ensure the box is checked. To switch them off, ensure the box is empty.

(8) Warning Beep Volume. The volume of warning beeps (if used) is represented by a figure between 1 and 7. Enter the required value in the box.

(9) Hold in Scan Mode. This facility, which is only applicable to scan mode, is explained on page 40. When this box is checked, hold in scan mode is selected; if not checked, pause in scan mode is selected.

(10) Busy On Time. This is the time a radio must be busy, when scan mode is selected, before the radio holds, or is paused. Enter a value between 0.1 and 5 seconds.

(11) Key Beeps. When key beeps are enabled, a single beep is heard whenever a button is pressed on the radio's front panel. The volume of the beep is the same as the Warning beep. To enable this facility, check the box; to disable it, ensure the box is empty.

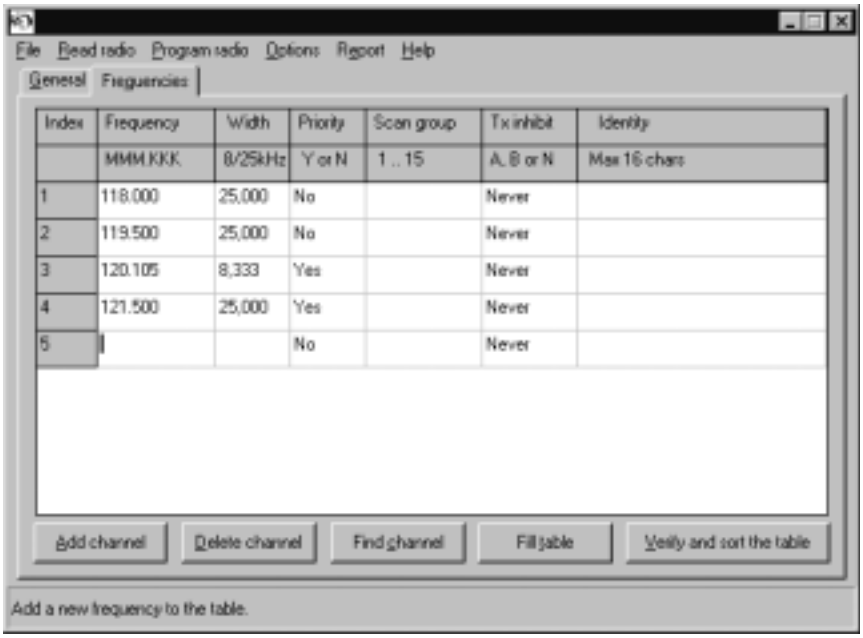
(12) Base. This check box ***must*** always display a tick. If it does not have a tick (unchecked), the base station will not operate correctly.

(13) COM1 or COM2 Selection. Either Com port 1, or Com port 2, can be selected from the drop-down menu. This selection determines which Com port on the laptop, or PC, the radio must be connected to when transferring the personality to the radio.

(14) Offset Channels. The offset channels box should **always** be checked. This is one of the radio's internal characteristics. It does not refer to offset frequency channels as defined by ICAO.

(15) Personality Description. A unique name for the personality can be entered here (maximum of 46 characters).

(16) When all fields on the General page are correctly configured, use the mouse and click on the Frequencies tab. Check that the Frequencies page is shown (see next page).



Frequencies Page

(17) When the Frequencies page is first selected there will be one default frequency shown. If this frequency is required leave it as it is; if not, click in the frequency box and change the frequency to that required.

Note …

Enter frequencies in ICAO format. The software recognizes the frequency and appropriate channel spacing (Width). There is no need to manually enter the channel spacing. The ICAO format is illustrated on page 27.

(18) If the frequency is required to be included in the Priority list, key in Y in the priority column. If not required, ensure the column reads No.

(19) If the frequency is required to be included in a Scan group, enter the scan group number (between 1 and 15) in the scan group column. If the frequency is to be included in more than one scan group, enter the group numbers, separating each with a comma. Note that up to 15 frequencies can be included in each scan group.

(20) The Tx inhibit facility must now be set for the frequency. This facility determines when the radio can transmit. Three options are allowed:

- Never. Key in N. This means the inhibit function is never enabled. The transmitter can be keyed at any time, including at times when the channel is busy.
- Busy. Key in B. This means the inhibit function is enabled when the channel is busy. The transmitter can however be keyed at all other times.
- Always. Key in A. This means the inhibit function is always enabled. The channel is therefore 'receive only' and the transmitter can never be keyed.

(21) If the Channel String option was selected from the General page, descriptive text (maximum of 16 characters) can be keyed into the Identity column.

(22) One frequency channel entry is now complete. Further channels can be entered in the same way by clicking on the Add channel box. To delete any entered channel, highlight the frequency and click on the Delete channel box. When all the required frequency channels have been entered, click on the 'Verify and sort the table' box. Any errors made when compiling the frequencies page are automatically identified to the user.

(23) As an alternative to manually entering frequency channels, and when many channels must be entered, a range of frequencies can be entered. To do this, click on the Fill table box and check that the Add channels sub-page is displayed.

Add Channels Sub-Page

(24) From the Add channels sub-page, enter the first and last frequencies in the required range. From the drop-down menu, select the channel spacing (bandwidth); this can be 25 kHz, 8.33 kHz, or both. From the drop-down menu select the Transmit inhibit condition (Always, Never, or Busy). When complete, click on the Add channels box. After the list of frequencies is displayed on the Frequencies page, any individual frequency can be amended, for example adding it to the priority list, as required. When all the required frequency channels have been entered, click on the 'Verify and sort the table' box. Any errors made when compiling the frequencies page are automatically identified to the user.

(25) When a lot of frequencies are entered and it is required to amend the entry, for example adding it to the priority list, a quick method of displaying the frequency is by clicking on the Find channel box. This displays the Find frequency sub-page. Enter the frequency on the sub-page and click on Find it. The frequency is then displayed on the Frequencies page. After amending the entry, click on the 'Verify and sort the table' box. Any errors made are automatically identified to the user.

Find Frequency Sub-Page

SAVING A PERSONALITY

When a personality has been compiled, it should be saved. To do this:

(1) From the programming menu, select File, then Save As.

(2) When the Save As window is displayed enter a file name for the personality. The file name must have the extension .PER.

(3) Click on Save to store the personality. Before the save process, the personality is automatically checked for any errors. If errors do exist they are highlighted to the user.

(4) If the save is successful, the file name appears at the top of the programming window. At any time, the personality can be edited and saved using the same filename.

OPENING A SAVED PERSONALITY

To open a previously saved personality:

(1) From the programming menu, select File, then Open.

(2) Select one of the personality files and click on Open.

LOADING A PERSONALITY INTO THE RADIO

Use the following procedure to load a personality into the radio:

(1) Switch off the laptop (or PC) and the radio.

(2) At the radio, disconnect the microphone from the front panel. Replace it with the programming lead.

(3) Connect the other end of the programming lead to the laptop's (or PC's) Com port 1 or Com port 2. Note that the appropriate port is set in the personality. The connected port must match that stated in the personality. Check, and amend if necessary.

(4) Switch on the laptop and then the base station (laptop must be switched on before the base station). At the base station check that Pr is shown on the front panel display.

(5) Ensure the programming software is running and display the required personality on screen.

(6) From the programming menu-bar select ‘Program radio’ and then ‘Personality’.

The programmer automatically verifies the personality is valid and downloads it to the radio. If it is not valid the nature of the error will be displayed. The progress of the programming operation is displayed on the status line at the bottom of the programming screen.

When programming is complete, switch off the radio and laptop, remove the programming lead, reconnect the radio's microphone and restore the equipment ready for operational use.

READING A PERSONALITY FROM THE RADIO

To read a personality from the radio:

(1) Switch off the laptop (or PC) and the radio.

(2) At the radio, disconnect the microphone from the front panel. Replace it with the programming lead.

(3) Connect the other end of the programming lead to the laptop's (or PC's) Com port 1 or Com port 2. Note that the appropriate port is set in the personality. The connected port must match that stated in the personality. Check, and amend if necessary.

(4) Switch on the laptop and then the base station (laptop must be switched on before the base station). At the base station check that Pr is shown on the front panel display.

(5) Ensure the programming software is running.

(6) From the programming menu-bar select ‘Read radio’ and then ‘Personality’.

The progress of the read operation is displayed on the status line at the bottom of the programming screen.

When complete, switch off the radio and laptop, remove the programming lead, reconnect the radio's microphone and restore the equipment ready for operational use.

PRINTING A PERSONALITY REPORT

A personality can be printed as follows:

(1) From the programming menu, select Report, then Generate.

(2) The programmer automatically verifies the personality is valid. If it is not valid the nature of the error will be displayed.

(3) A textual representation of the personality is displayed using the Windows Notepad programme. When Notepad displays the personality it can be saved as a text file, or printed.

Previously saved Notepad files containing personalities can be retrieved by selecting Report, then Open from the menu-bar.

INTRODUCTION

The base station is manufactured using surface mount technology. Because of this, and the specialist test equipment required to set up the circuits, spares are limited to modules and components as listed below.

LIST OF SPARES

The following spares are available from PAE. When ordering, the part number should always be quoted.

T6M base station (complete)	BT6MBS
Radio module	25F00000T6M
Interface module	68-T6MBS635
Switched mode power supply unit	69F07150135S
Reservoir capacitor 33000 F 63 V	14-06339200
Fan, dc, 12 V operation	69F12120612
Loudspeaker, 4 W, 4 ohm	04F05509034
Fuse 5 A anti-surge, 20 mm (located in ac connector)	29F01140102S
Fuse 15 A, size 0 (dc input)	29-01350201
Microphone	24-11030301
Optional battery	06F30012300
Programming kit (includes CD-ROM and programming lead)	70-T6MPMKIT

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This chapter details the scheduled maintenance required by the T6M base station. It also provides fault finding guidance.

SCHEDULED MAINTENANCE

Scheduled maintenance to the T6M base station involves the following checks:

(1) Transmit power and frequency accuracy test. This check should be carried out annually.

(2) Receiver sensitivity check. This check should be carried out annually.

(3) Battery replacement (applicable only to base stations fitted with the internal battery option). The life of the battery depends upon its usage; refer to 'Battery Replacement' on page 52.

Test Equipment Required

The test equipment necessary to complete the scheduled maintenance is listed in Table 8.

Table 8. List of test equipment

Item	Description
1	Through-line wattmeter.
2	20 dB attenuator (>15 W continuous power rating).
3	VHF Frequency counter.
4	RF signal generator.
5	AF wattmeter.
6	Test lead for connecting the base station to the AF wattmeter. [See next heading.]

Test Lead

The test lead (Table 8, item 6) connects the base station to the AF wattmeter during receiver sensitivity tests. The lead connections are detailed in Table 9.

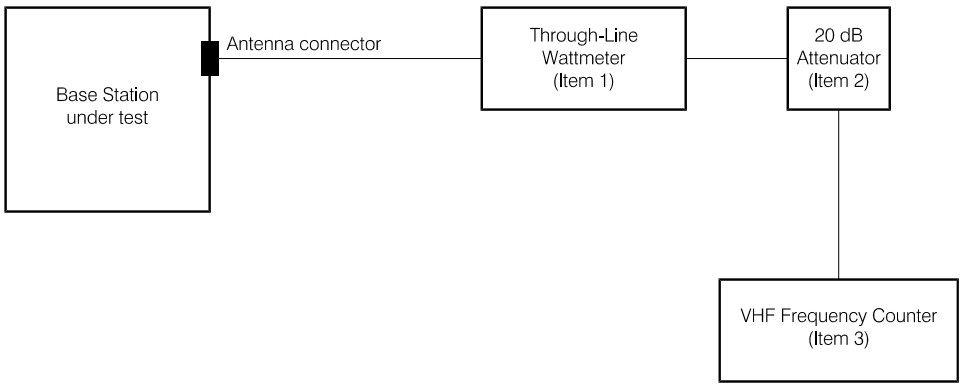
Table 9. Test Lead Connections

7-Pin DIN Plug (connects to base station's Microphone connector)	AF Wattmeter Connector
Pin 5, receiver audio monitor	Input
Pin 7, earth	0 V

Transmit Power and Frequency Accuracy Test

To check the base station's transmit power, and the accuracy of the carrier frequency, carry out the following procedure:

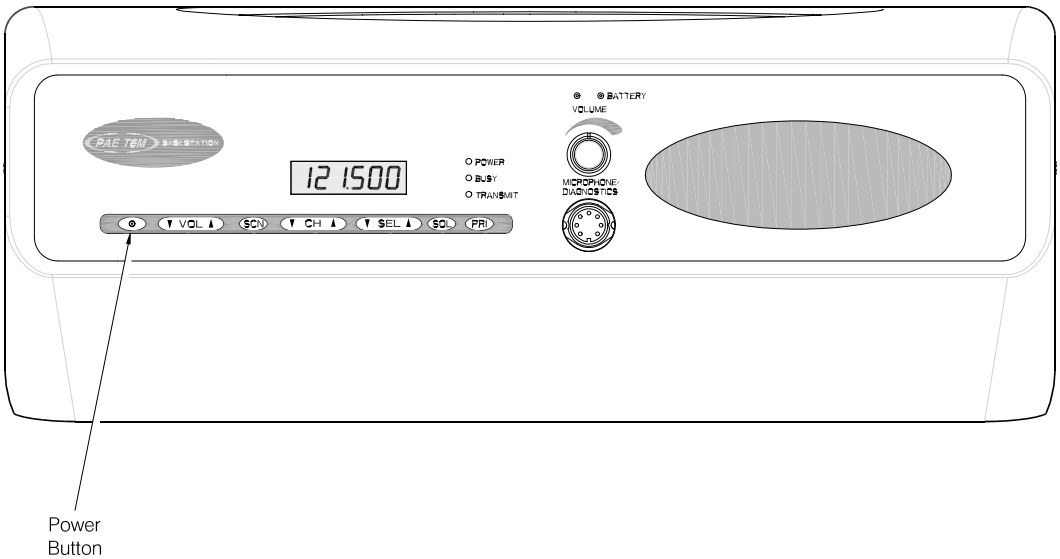
(1) Isolate power from the base station and connect the test equipment as shown below. Ensure the wattmeter is switched to forward power.



Transmit Power and Frequency Accuracy Test - Test Equipment Connection

(2) Reconnect the power and ensure the base station's rear panel Power switch is set to on.

(3) To enter Test mode switch on the base station by pressing, and keeping pressed, the front panel Power button. Without releasing the Power button, press and release the SQL button, then the SCN button, and finally the PRI button. Release the Power button.



Base Station Front Panel Power Button Location

(4) Check that the display shows tESt and after a few seconds it changes to show the current power level setting (a number between 1 and 240 representing approximately 6 to 12 watts).

(5) Press the SQL button to select the test frequency 127.500 MHz. The test frequency is displayed for a couple of seconds and the display then reverts to the power setting.

Note …

Using the SQL key to select a test frequency always selects a 25 kHz spaced channel. Squelch is automatically switched off in Test mode.

(6) Key the transmitter and note the wattmeter's reading.

(7) With the transmitter de-keyed, use the CH▲ and CH▼ buttons to increment or decrement the power setting in steps of 1. Alternatively, use the SEL▲ and SEL▼ buttons to increment or decrement the power setting in steps of 10. Then key the transmitter and note the wattmeter's reading. **The power setting cannot be adjusted when the transmitter is keyed**. Adjust the power output until the required power is set (nominally 8 watts).

Note …

The transmit indicator lights when the transmitter is keyed. If a fault is detected, the indicator does not light. No fault codes, however, are displayed in Test mode.

(8) Key the transmitter and check that the frequency counter reads between 127.499808 and 127.500192 MHz.

(9) To save the new power setting in the base station's memory, press and keep pressed the front panel Power button. Without releasing the Power button, press and release the PRI button, then the SCN button, and finally the SQL button.

(10) When the new setting is saved, the display shows ‘S’ and two short beeps are heard. Release the Power button.

(11) To switch off without saving the new power setting, press and release the Power button. The display shows nS and a single long tone is heard.

(12) Enter test mode again by pressing, and keeping pressed, the front panel Power button. Without releasing the Power button, press and release the SQL button, then the SCN button, and finally the PRI button. Release the Power button.

(13) Check that the display shows tESt and after a few seconds it changes to show the current power level setting.

(14) Press the SQL button to select the test frequency 118.000 MHz.

(15) Key the transmitter and check that the wattmeter reads between 6 and 12 watts. Check that the frequency counter reads between 117.999823 and 118.000177 MHz.

(16) Press the SQL button to select the test frequency 136.975 MHz.

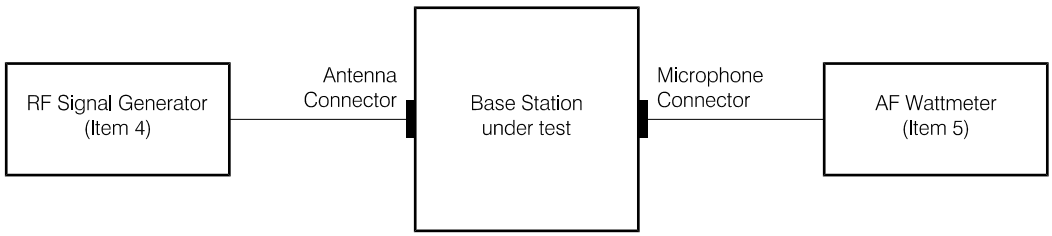
(17) Key the transmitter and check that the wattmeter reads between 6 and 12 watts. Check that the frequency counter reads between 136.974745 and 136.975205 MHz.

(18) On completion, switch off the base station and disconnect the test equipment. Restore the base station ready for operational use.

Receiver Sensitivity Check

To check the base station's receiver sensitivity carry out the following procedure:

(1) Isolate power from the base station and connect the test equipment as shown below.



Receiver Sensitivity Test - Test Equipment Connection

(2) Reconnect the power and ensure the base station's rear panel Power switch is set to on.

(3) Adjust the signal generator to operate at 118.000 MHz with an RF level of -100 dBm and a 1 kHz tone modulated at 30%.

(4) At the base station's front panel press the squelch (SQL) button. Check that the display shows an ‘S’ and a number between 1 and 20. This number is the squelch level setting.

(5) Adjust the squelch level, by pressing the VOL▲ and VOL▼ buttons, until the display shows a level of 2.

(6) Adjust the volume control until a reference reading (approximately mid-scale) is shown in the AF wattmeter. Note the reading in dB.

(7) Set the signal generator's modulation to off.

(8) Increase the sensitivity of the AF wattmeter until a reading is obtained. Note the reading in dB.

(9) Check that the difference in readings noted in steps (6) and (8) are not less than 10 dB.

(10) Repeat steps (3) to (9) for test frequencies of 127.500 MHz and 136.975 MHz.

(11) On completion, switch off the base station and disconnect the test equipment. Restore the base station ready for operational use.

Battery Replacement

An optional battery can be fitted to act as a backup supply if the mains supply fails. The lead acid battery is fitted in the position shown in Figure 8.

The battery should be replaced after a period of time that depends on usage. Table 10 details the replacement period according to usage.

Table 10. Battery Replacement

Battery Usage	Replacement After
Not used. Battery kept fully charged.	8 years.
Battery used until fully discharged (that is, 2 hours use at 10% duty cycle).	60 discharges.
Battery used for approximately 1 hour at 10% duty cycle (50% discharge).	120 partial discharges.
Battery used for approximately 30 minutes at 10% duty cycle (25% discharge).	240 partial discharges.
Battery used for approximately 10 minutes at 10% duty cycle (10% discharge).	600 partial discharges.

FAULT FINDING

Warning!

Neither the Power button, nor the rear panel Power switch, isolates the input supply from the equipment. Lethal voltages are still present in the base station's internal power supply. To ensure safe working during maintenance, the ac and dc input supplies must be disconnected from the base station.

The T6M base station contains the following replaceable modules (see Figures 6, 7, and 8):

- A T6M radio module (a self-contained transceiver).
- An interface module that interconnects the various external signals, and the power supplies, to the radio module.
- A switched mode power supply (SMPS).

The base station's modules are manufactured using surface mount technology. Because of this, and the specialist test equipment required to set up the circuits, spares are limited to modules and components as listed on page 47.

The following table gives help in fault diagnosis.

Table 11. Fault Diagnosis

Symptom	Check
No front panel indicators lit.	Check input supplies. Check ac supply input fuse (located in rear panel ac connector) and dc supply fuse. Check output of switched mode power supply (SMPS). This should be +15.6 V dc (wrt 0 V) at TP21 (located next to CN10) of the Interface PCB (see Figures 7 and 11). If the SMPS is suspect, remove it from the base station and test it on the workbench ensuring a load is connected across its output.
Fault, or error code displayed at front panel.	Fault and error codes are displayed on the front panel to indicate faults detected by the radio module. These codes are detailed in Table 12.
Transmit function not operating correctly. Transmit inhibit indicator flashing.	External transmit inhibit facility is deliberately or inadvertently enabled. This facility is enabled when pin 14 on the base station's Facilities connector is grounded (see Table 6 on page 34.
Transmit function not operating correctly. No fault code displayed.	Complete the 'Transmit Power and Frequency Accuracy Test' detailed on page 50. If the test fails, check for any obvious problems such as a faulty PTT switch. Note also that the signal from the microphone connector passes through the Interface module before being connected to the radio module (see Figures 6 and 7). If the signals are correct at the radio input, then change the radio module.
Receive function not operating correctly. No fault code displayed.	If some signals are not being received, refer to the operating instructions and check the squelch level is correctly set. Complete the 'Receiver Sensitivity Check' on page 52. If the test fails, use Figures 6 and 7 to determine where the fault lies. For example, audio out of the radio module can be monitored at the Interface module connector CN8 pins 3 and 7. The Interface module's audio output to the loudspeaker can then be monitored on CN7 pins 13 and 14. Using Figures 6 and 7 should enable the fault to be diagnosed to either the radio module, or the Interface PCB. If the 'Receiver Sensitivity Check' is OK, the fault is probably in the antenna system.

Table 12. Fault and Error Codes

Displayed Fault or Error Code	Title	Meaning
F1	Synthesiser failure	An internal fault on the synthesiser has been detected. Switch off the base station and switch on again after a few minutes. If the fault persists, replace the radio module with a serviceable spare.
F2	Unstable output	An internal fault on the power amplifier has been detected. Switch off the base station and switch on again after a few minutes. If the fault persists, replace the radio module with a serviceable spare.
F4	Over temperature	This condition may occur if the transmitter's duty cycle has been exceeded, or when transmitting for long periods. The fault should clear if the radio is not keyed and allowed to cool.
F8	High reflected power	Indicates a faulty antenna, antenna cable, or RF connector. Check the antenna circuit and replace any unserviceable component.
F16 **F32**	Low supply voltage High supply voltage	These two faults indicate the internal power supply is faulty. Switch off the base station and switch on again after a few minutes. If the fault persists, replace the power supply module with a serviceable spare. Fault code F16 may be displayed when operating using the battery option and the battery starts to run flat.
cErr	Critical error	This error is displayed when the base station is initially switched on and no personality information, or corrupted personality information, is detected. Refer to ‘Programming the Base Station’ on page 37 and load a personality into the base station.

REPLACING MODULES

If it is necessary to remove a module, refer to the following figures for guidance:

- ❑ Figure 8 Base station layout diagram
- ❑ Figure 9 Radio module and PSU removal
- ❑ Figure 10 Interface PCB and reservoir capacitor removal.

Modules are accessed as follows:

(1) Refer to Figure 5 that shows the base station in its enclosure. Remove and retain the six M4 pan head screws and associated washers that secure the equipment within the enclosure.

(2) Slide the equipment out of the enclosure.

Note that when fitting a new Interface module, two links must be correctly set. Refer to ‘Setting Internal Links’ on page 30.

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Chapter 8 - Figures

This chapter contains the A3 size figures referred to throughout this user guide.

1 Front and rear layout
2 Rack mounted version
3 Key to front panel controls
4 External connection diagram
5 Enclosure securing detail
6 Base station block diagram
7 Base station interconnection diagram
8 Base station layout diagram
9 Radio module and PSU removal
10 Interface PCB and reservoir capacitor removal
11 Interface PCB layout diagram
12 Cable termination at the N-type connector

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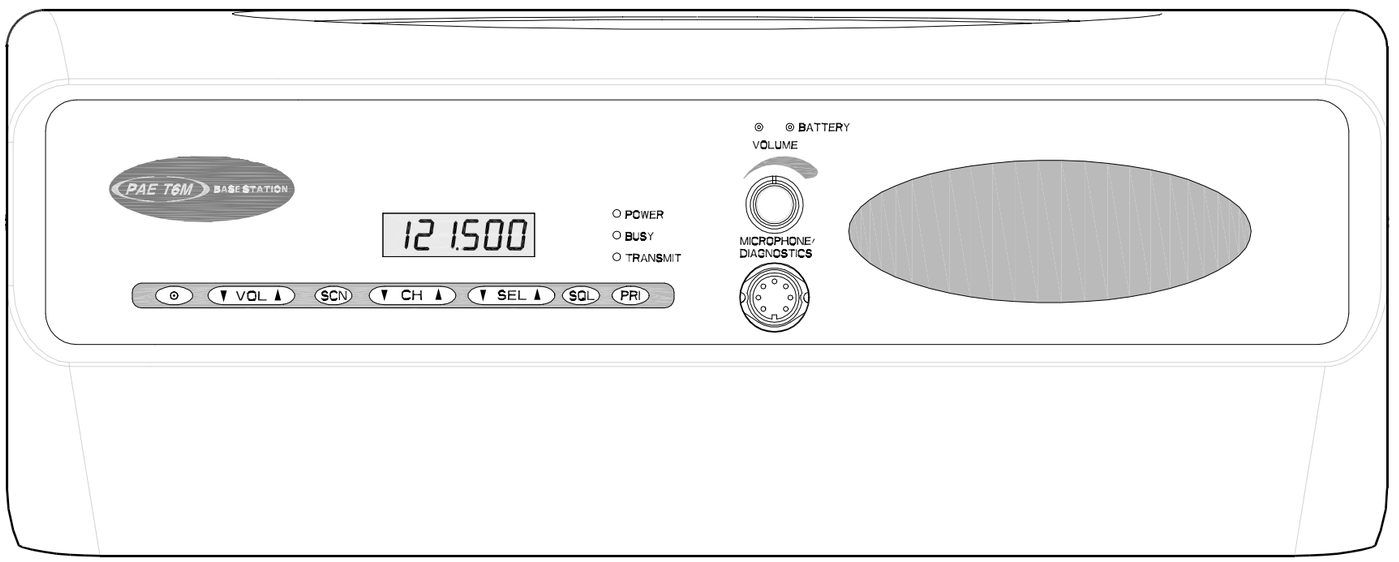
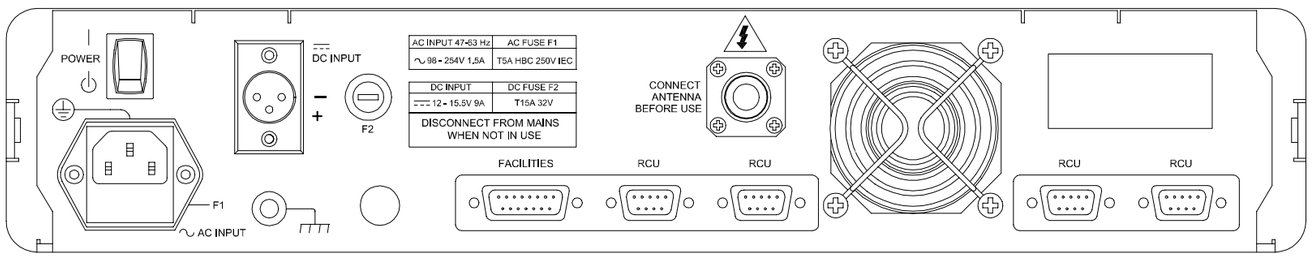
Front View

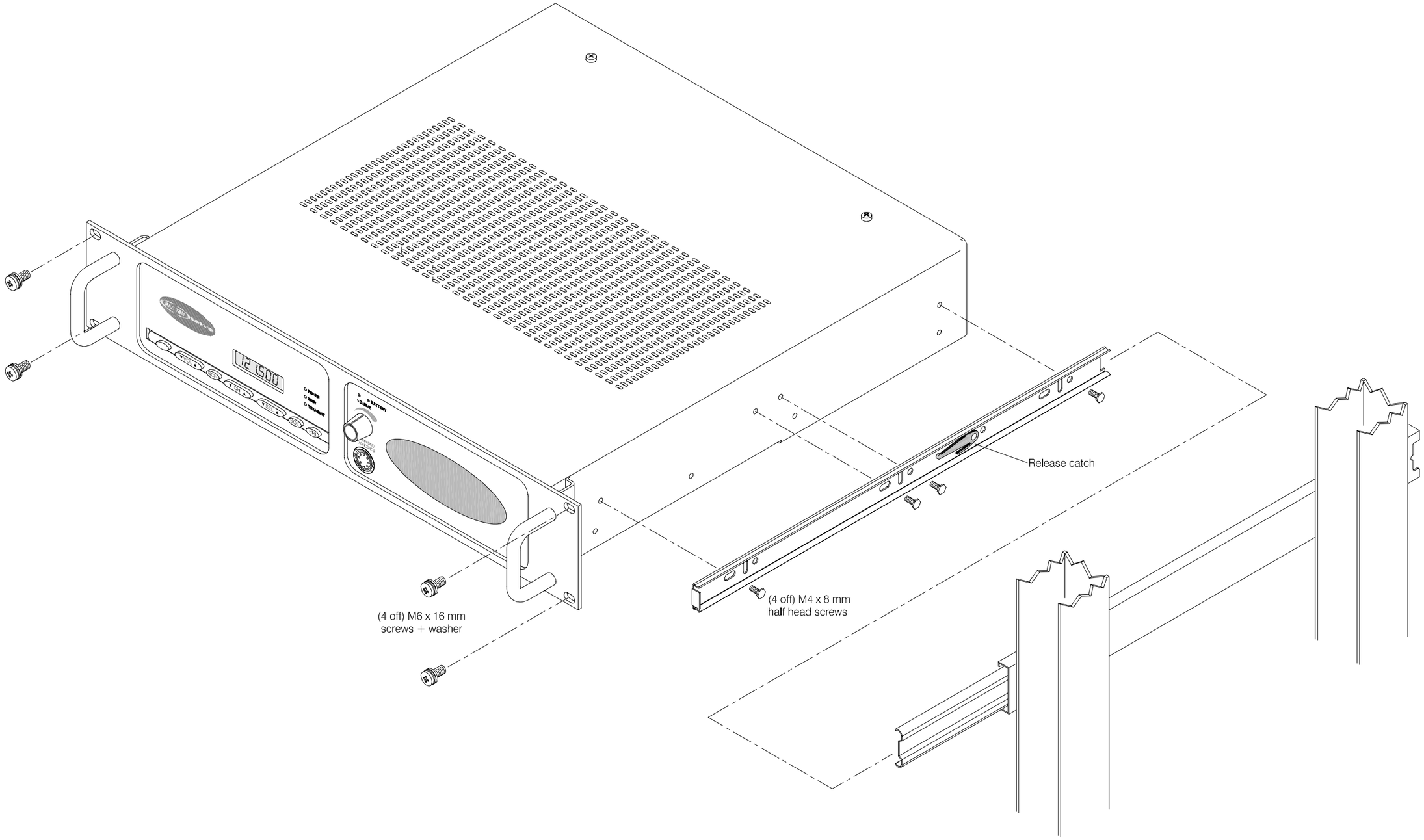


Rear View



Front and Rear Layout

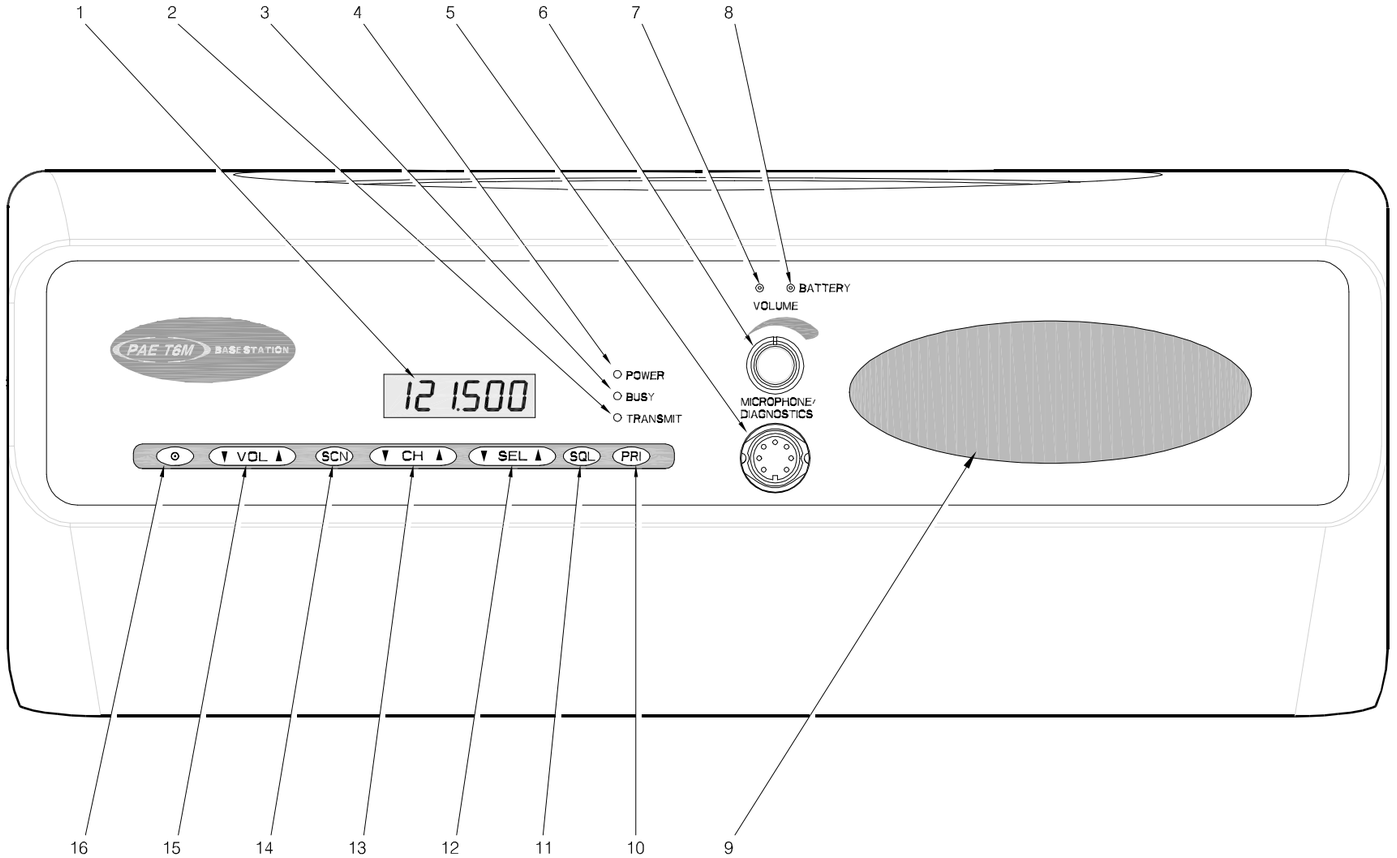
Figure 1



Rack Mounted Version

BT6MBS-13

Figure 2

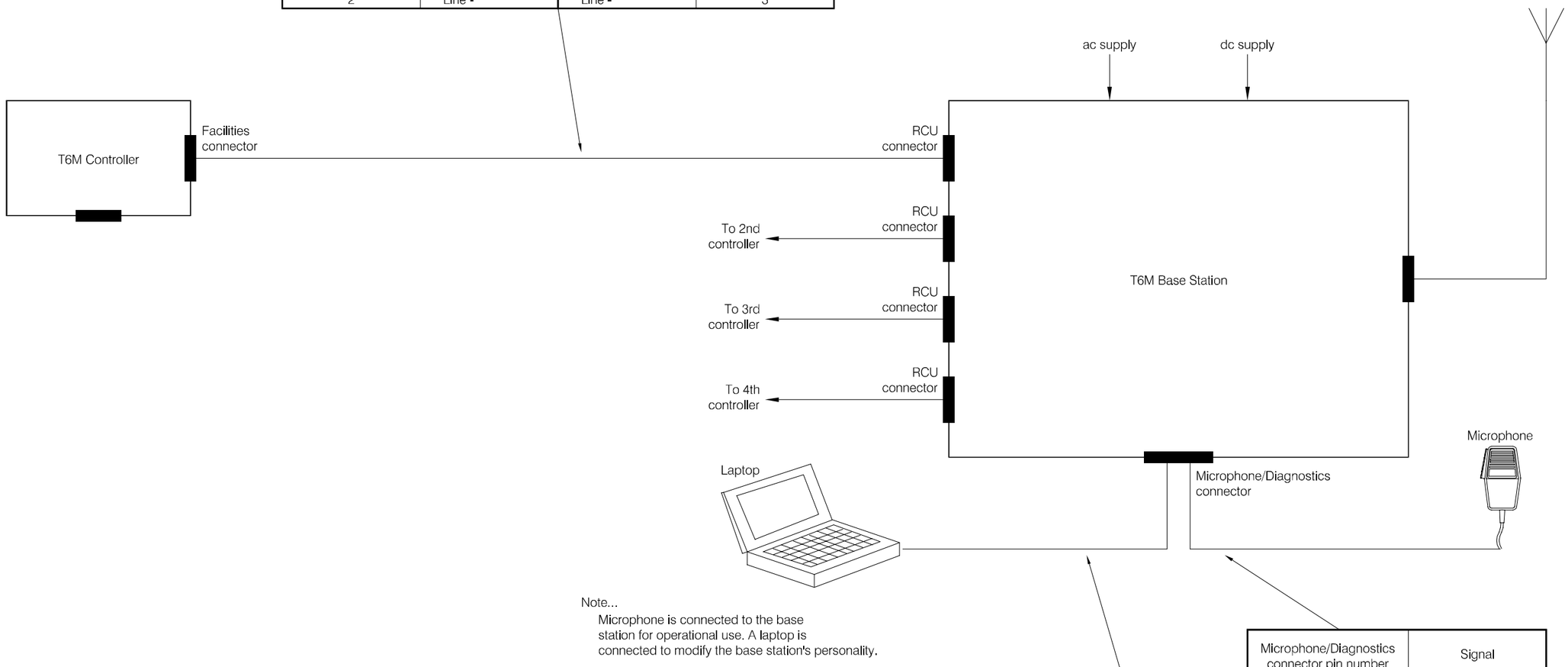


For description of controls, see text in chapter 3.

Key to Front Panel Controls

Figure 3

T6M Controller		T6M Base station	
Facilities connector pin number	Signal	Signal	RCU connector pin number
12	Ground	Ground	1
1	Line +	Line +	2
2	Line -	Line -	3

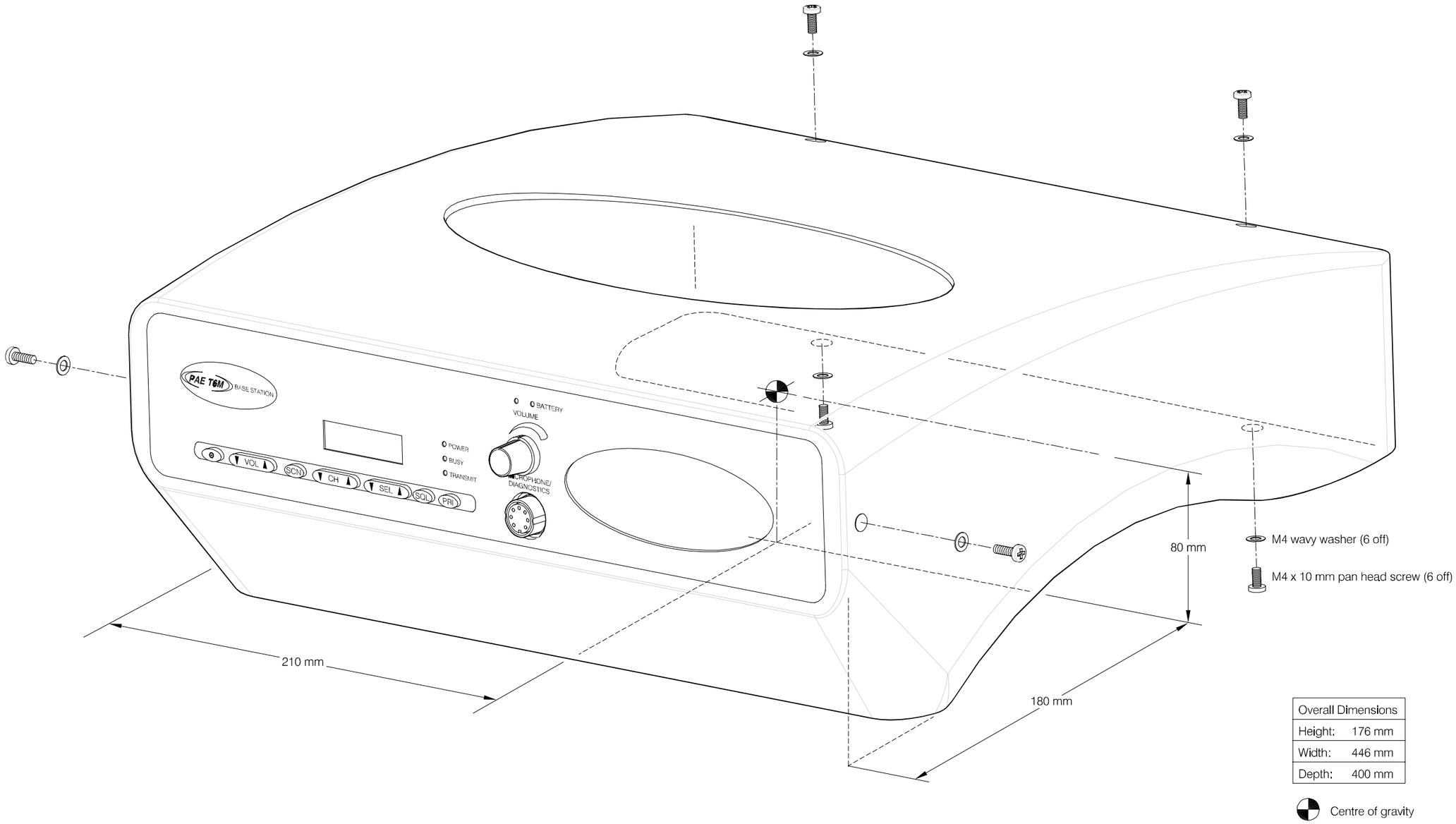


Note...
Microphone is connected to the base station for operational use. A laptop is connected to modify the base station's personality.

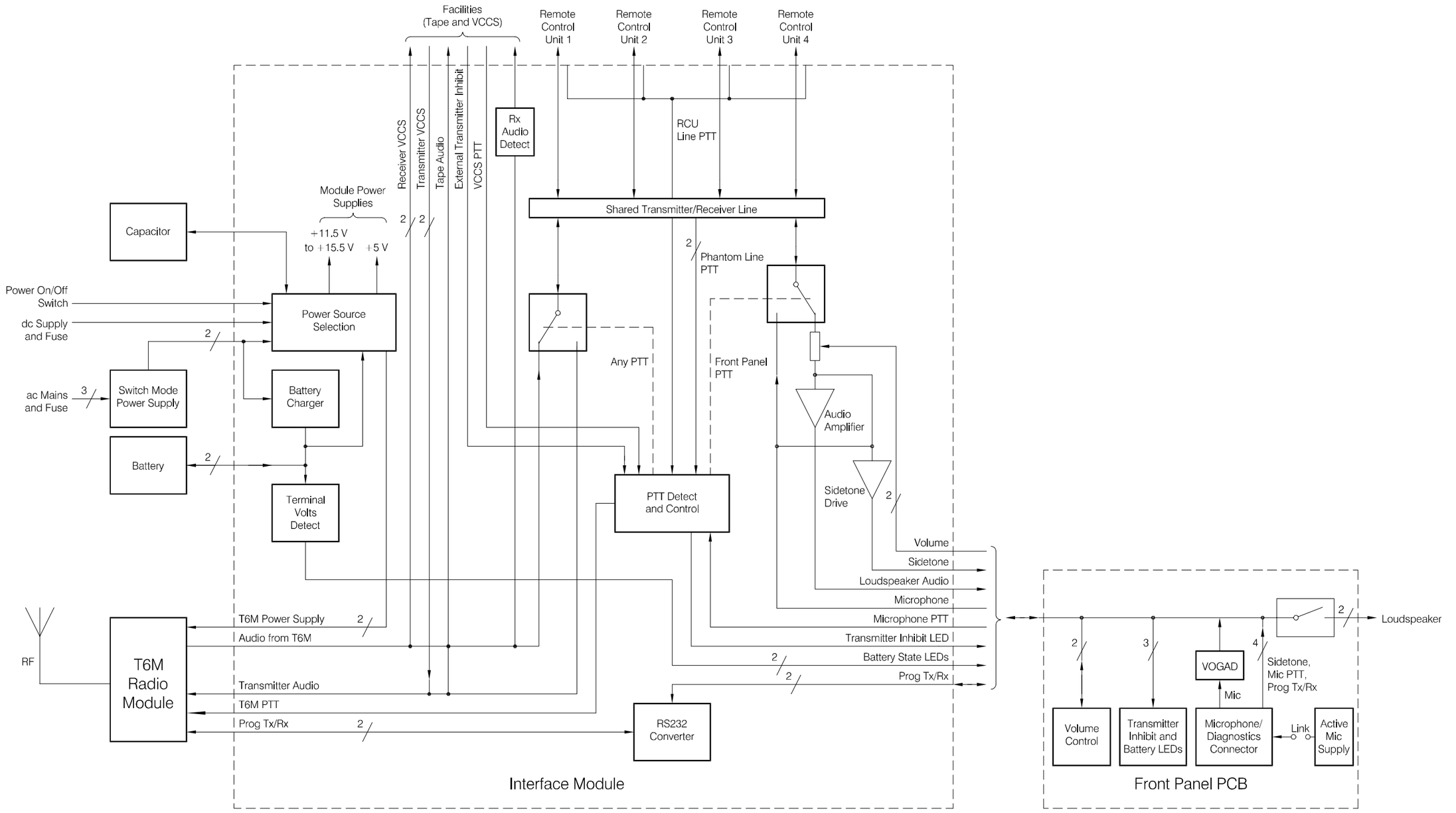
Microphone/Diagnostics connector pin number	Signal
1	Microphone ground
3	Microphone PTT
6	Microphone audio

Laptop		T6M Base Station	
Signal	COM port 1 or 2 pin number	Microphone/Diagnostics connector pin number	Signal
RS232 Tx	2	2	RS232 Tx
RS232 Rx	3	4	RS232 Rx
Ground	5	7	Ground

External Connection Diagram



Enclosure Securing Detail



GA10547 Iss. 3

Base Station Block Diagram

Figure 6

Connections		Name	Characteristic
Output from	Input to		
IM CN2/3/4/5-1	RP CN2/3/4/5-1	Ground	0 V
IM CN2/3/4/5-2	RP CN2/3/4/5-2	Line + In/Out	0 dBm (sine wave on 600 R)
IM CN2/3/4/5-3	RP CN2/3/4/5-3	Line - In/Out	Ground centre tap for PTT
RP CN2/3/4/5-4	IM CN2/3/4/5-4	PTT	0 V = PTT
IM CN2/3/4/5-5	RP CN2/3/4/5-5	n/c	
IM CN2/3/4/5-6	RP CN2/3/4/5-6	n/c	
IM CN2/3/4/5-7	RP CN2/3/4/5-7	n/c	
IM CN2/3/4/5-8	RP CN2/3/4/5-8	n/c	
IM CN2/3/4/5-9	RP CN2/3/4/5-9	n/c	

Connections		Name	Characteristic
Output from	Input to		
IM CN6-1	RP CN6-1	Ground	0 V
IM CN6-2	RP CN6-2	Tape +	0 dBm (sine wave on 600 R)
IM CN6-3	RP CN6-3	Tape -	
IM CN6-4	RP CN6-4	Rx Squelch	0 V when Rx Audio present
IM CN6-5	RP CN6-5	VCCS Rx +	0 dBm (sine wave on 600 R)
IM CN6-6	RP CN6-6	VCCS Rx -	
RP CN6-7	IM CN6-7	VCCS Tx +	0 dBm (sine wave on 600 R)
RP CN6-8	IM CN6-8	VCCS Tx -	Ground centre tap for PTT
RP CN6-9	IM CN6-9	VCCS PTT +	0V = PTT
RP CN6-10	IM CN6-10	VCCS PTT -	0V
IM CN6-11	RP CN6-11	n/c	
IM CN6-12	RP CN6-12	n/c	
IM CN6-13	RP CN6-13	n/c	
RP CN6-14	IM CN6-14	External PTT Inhibit	0V = PTT Inhibit
IM CN6-15	RP CN6-15	Ground	0V

Connections		Name	Characteristic
RP CN8-2	IM CN11-1	Ground	0V
RP CN8-3	IM CN11-2	+V (dc derived)	+12 V to +15.5 V

Connections		Name	Characteristic
Output from	Input to		
RP CN7-L	SMPS CN1-1	Live	85 V ac - 264 V ac
RP CN7-N	SMPS CN1-3	Neutral	0 V
RP CN7-E	SMPS CN1-5	Frame Ground	0 V (earth)

Connections		Name	Characteristic
Output from	Input to		
FPP CN1-1	IM CN7-1	Mic	280 mV
FPP CN1-2	IM CN7-2	Mic PTT	0 V = PTT
IM CN7-3	FPP CN1-3	Sidetone	1 V rms (max), R out = 200 R
FPP CN1-4	IM CN7-4	Prog RxD	RS232 levels
IM CN7-5	FPP CN1-5	Prog TxD	RS232 levels
IM CN7-6	FPP CN1-6	Mic Ground	0 V
IM CN7-7	FPP CN1-7	Volume Out	775 mV rms
FPP CN1-8	IM CN7-8	Volume Return	0 - 775 mV
IM CN7-9	FPP CN1-9	Charging LED	5 V, R out = 150 R
IM CN7-10	FPP CN1-10	BATT Ready LED	5 V, R out = 150 R
IM CN7-11	FPP CN1-11	Inhibit LED	5 V, R out = 270 R
IM CN7-12	FPP CN1-12	n/c	
IM CN7-13	FPP CN1-13	Loudspeaker +	4 V rms (max)
IM CN7-14	FPP CN1-14	Loudspeaker -	0 V
IM CN7-15	FPP CN1-15	Ground	0 V
IM CN7-16	FPP CN1-16	Loudspeaker +	4 V rms (max)
IM CN7-17	FPP CN1-17	Loudspeaker -	0V
IM CN7-18	FPP CN1-18	Ground	0V
IM CN7-19	FPP CN1-19	FPP Power	+11.5 V to +15.5 V
IM CN7-20	FPP CN1-20	FPP Power	+11.5 V to +15.5 V

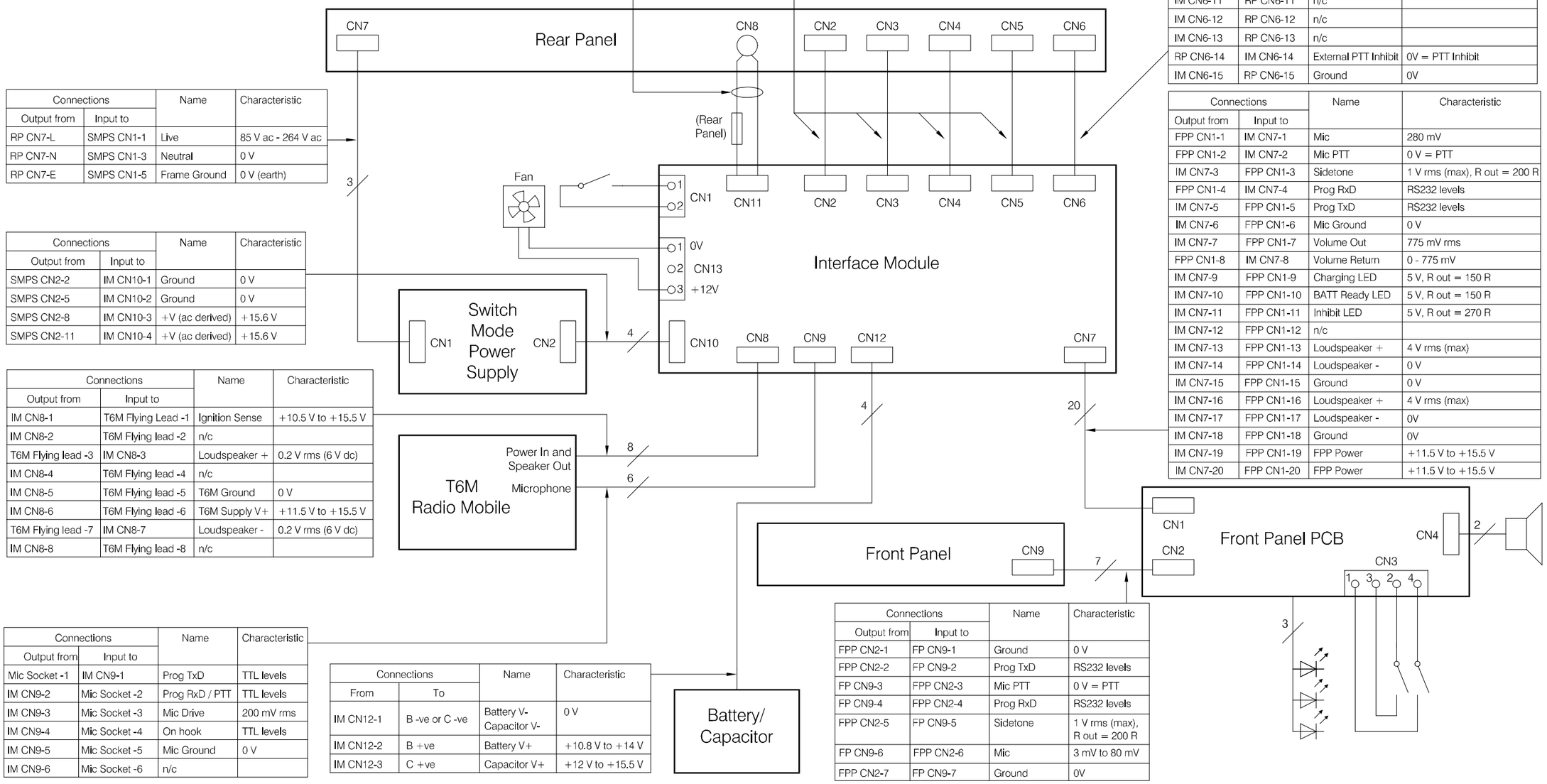
Connections		Name	Characteristic
Output from	Input to		
SMPS CN2-2	IM CN10-1	Ground	0 V
SMPS CN2-5	IM CN10-2	Ground	0 V
SMPS CN2-8	IM CN10-3	+V (ac derived)	+15.6 V
SMPS CN2-11	IM CN10-4	+V (ac derived)	+15.6 V

Connections		Name	Characteristic
Output from	Input to		
IM CN8-1	T6M Flying Lead -1	Ignition Sense	+10.5 V to +15.5 V
IM CN8-2	T6M Flying lead -2	n/c	
T6M Flying lead -3	IM CN8-3	Loudspeaker +	0.2 V rms (6 V dc)
IM CN8-4	T6M Flying lead -4	n/c	
IM CN8-5	T6M Flying lead -5	T6M Ground	0 V
IM CN8-6	T6M Flying lead -6	T6M Supply V+	+11.5 V to +15.5 V
T6M Flying lead -7	IM CN8-7	Loudspeaker -	0.2 V rms (6 V dc)
IM CN8-8	T6M Flying lead -8	n/c	

Connections		Name	Characteristic
Output from	Input to		
Mic Socket -1	IM CN9-1	Prog TxD	TTL levels
IM CN9-2	Mic Socket -2	Prog RxD / PTT	TTL levels
IM CN9-3	Mic Socket -3	Mic Drive	200 mV rms
IM CN9-4	Mic Socket -4	On hook	TTL levels
IM CN9-5	Mic Socket -5	Mic Ground	0 V
IM CN9-6	Mic Socket -6	n/c	

Connections		Name	Characteristic
From	To		
IM CN12-1	B -ve or C -ve	Battery V- Capacitor V-	0 V
IM CN12-2	B +ve	Battery V+	+10.8 V to +14 V
IM CN12-3	C +ve	Capacitor V+	+12 V to +15.5 V

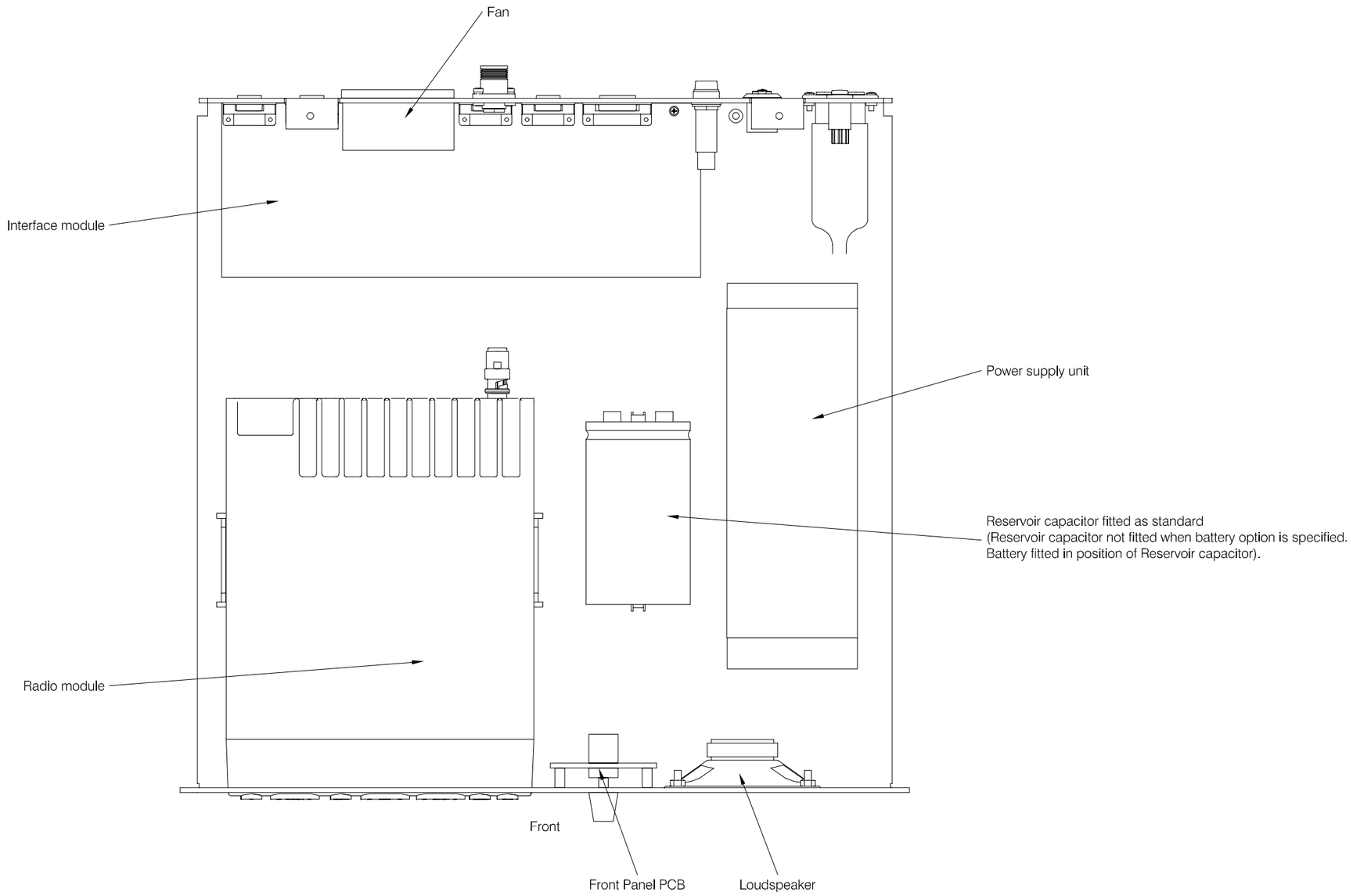
Connections		Name	Characteristic
Output from	Input to		
FPP CN2-1	FP CN9-1	Ground	0 V
FPP CN2-2	FP CN9-2	Prog TxD	RS232 levels
FP CN9-3	FPP CN2-3	Mic PTT	0 V = PTT
FP CN9-4	FPP CN2-4	Prog RxD	RS232 levels
FPP CN2-5	FP CN9-5	Sidetone	1 V rms (max), R out = 200 R
FP CN9-6	FPP CN2-6	Mic	3 mV to 80 mV
FPP CN2-7	FP CN9-7	Ground	0V



GA10548 Iss. 3

Base Station Interconnection Diagram

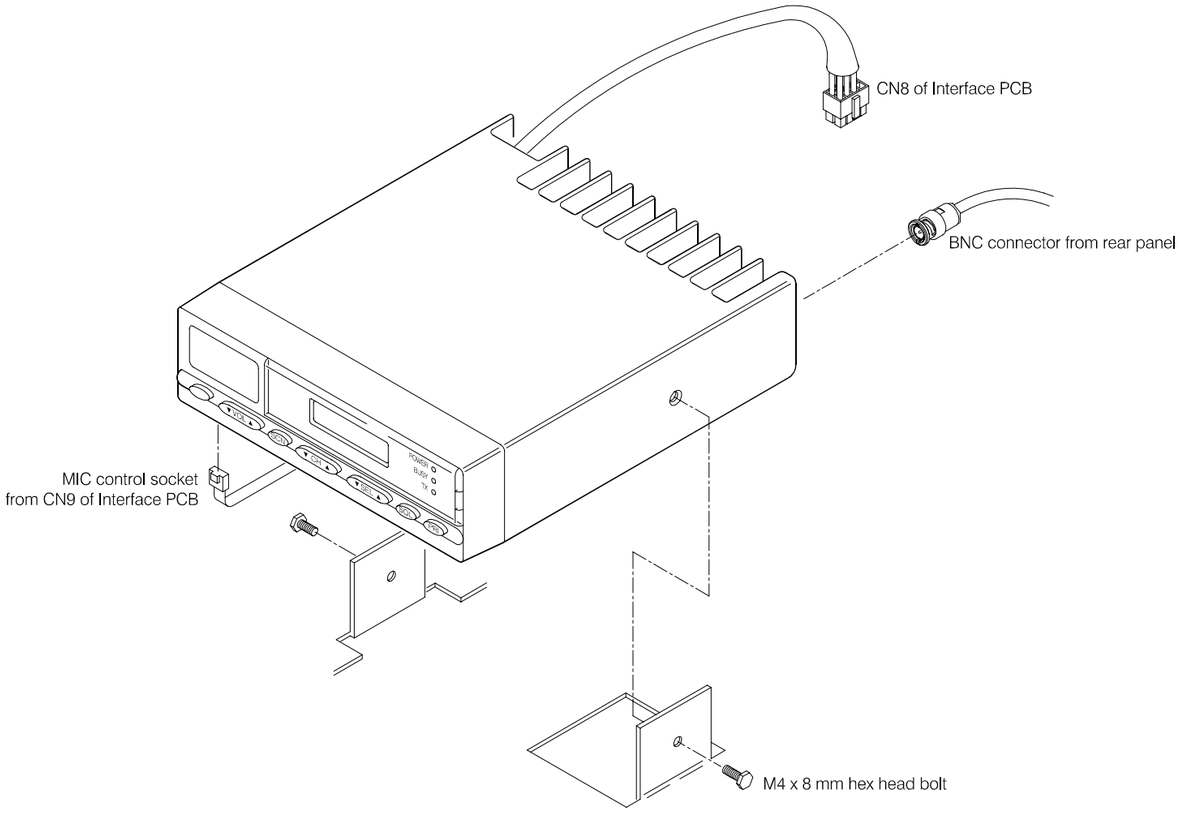
Figure 7



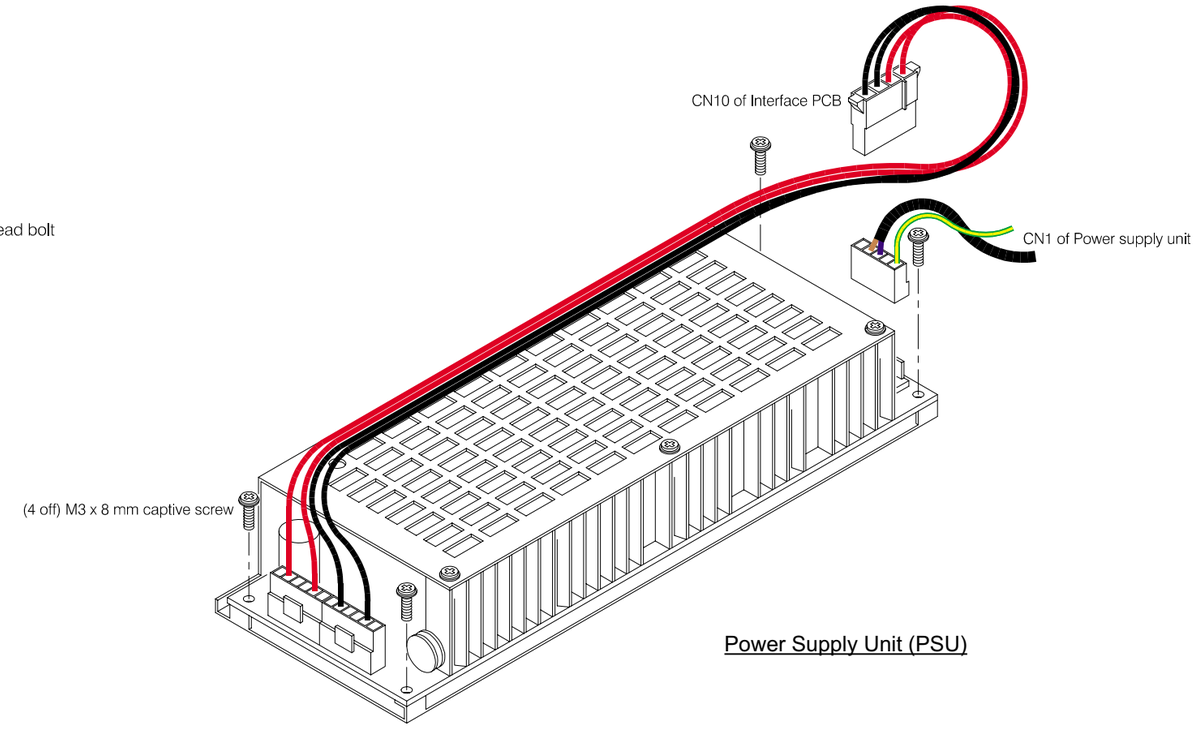
GA10719 Iss. 1

Base Station Layout Diagram

Figure 8



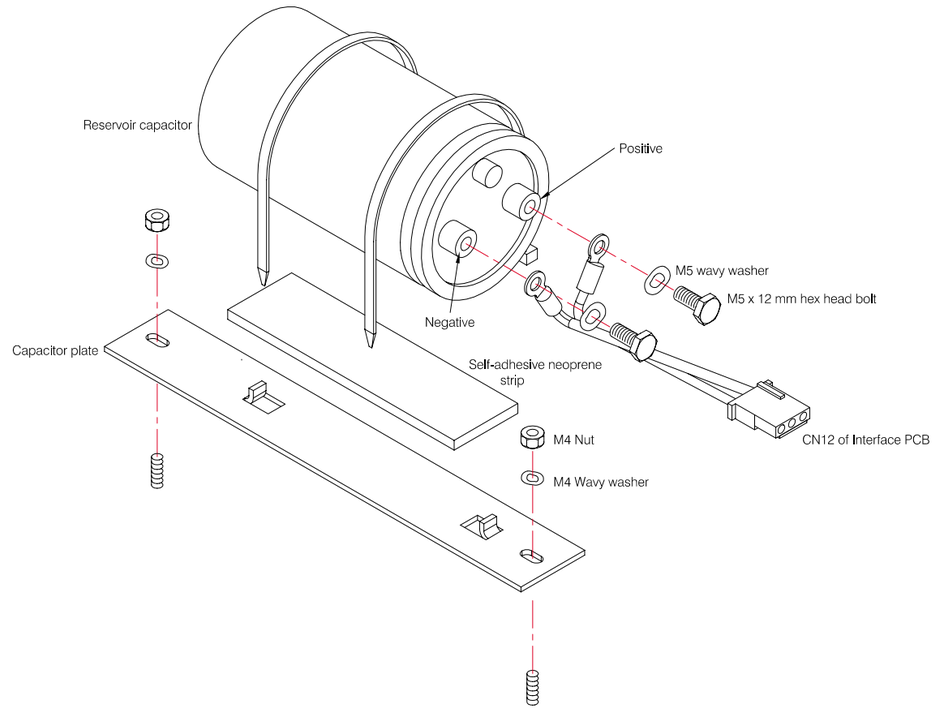
Radio Module



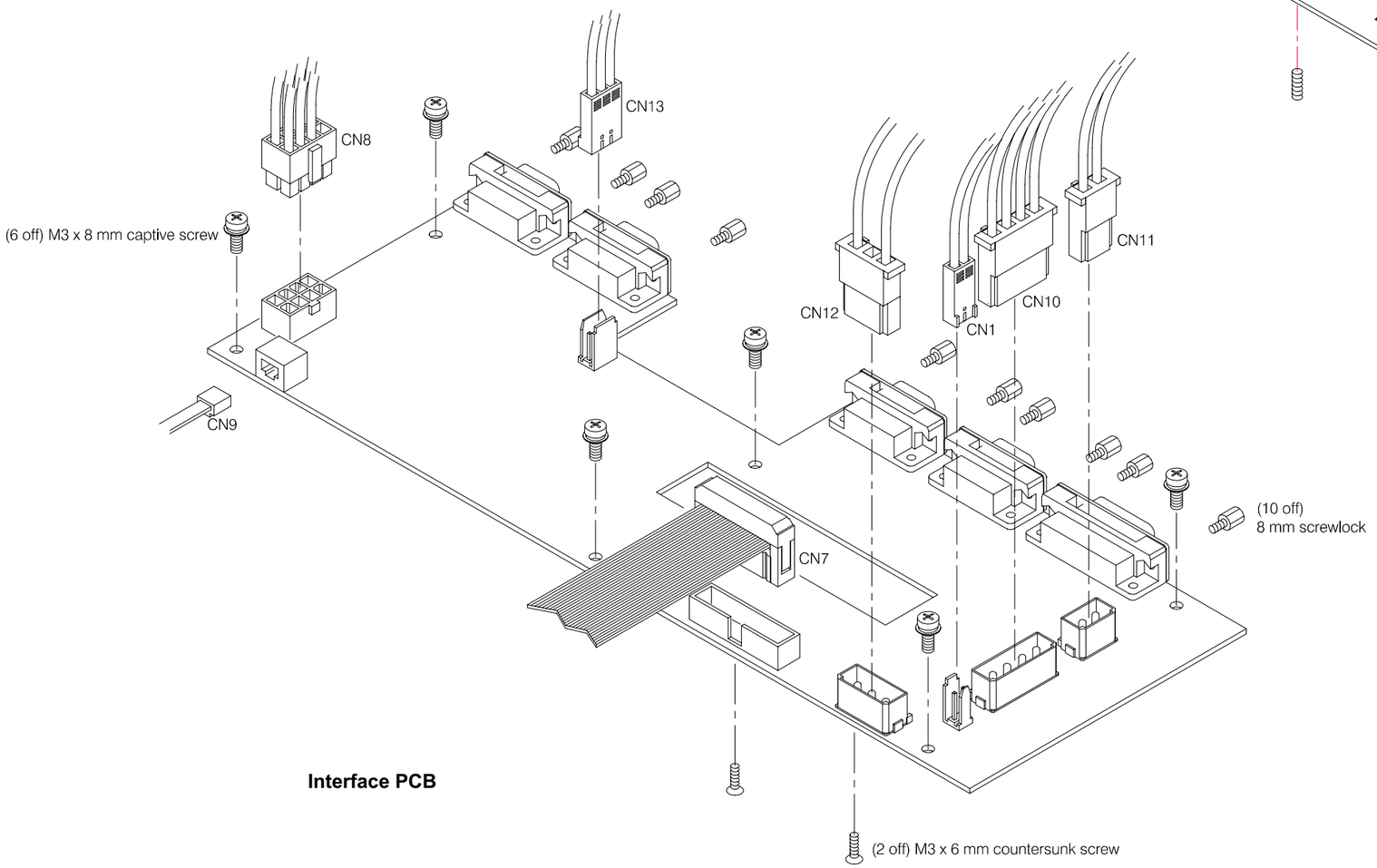
Power Supply Unit (PSU)

Radio Module and PSU Removal

Figure 9



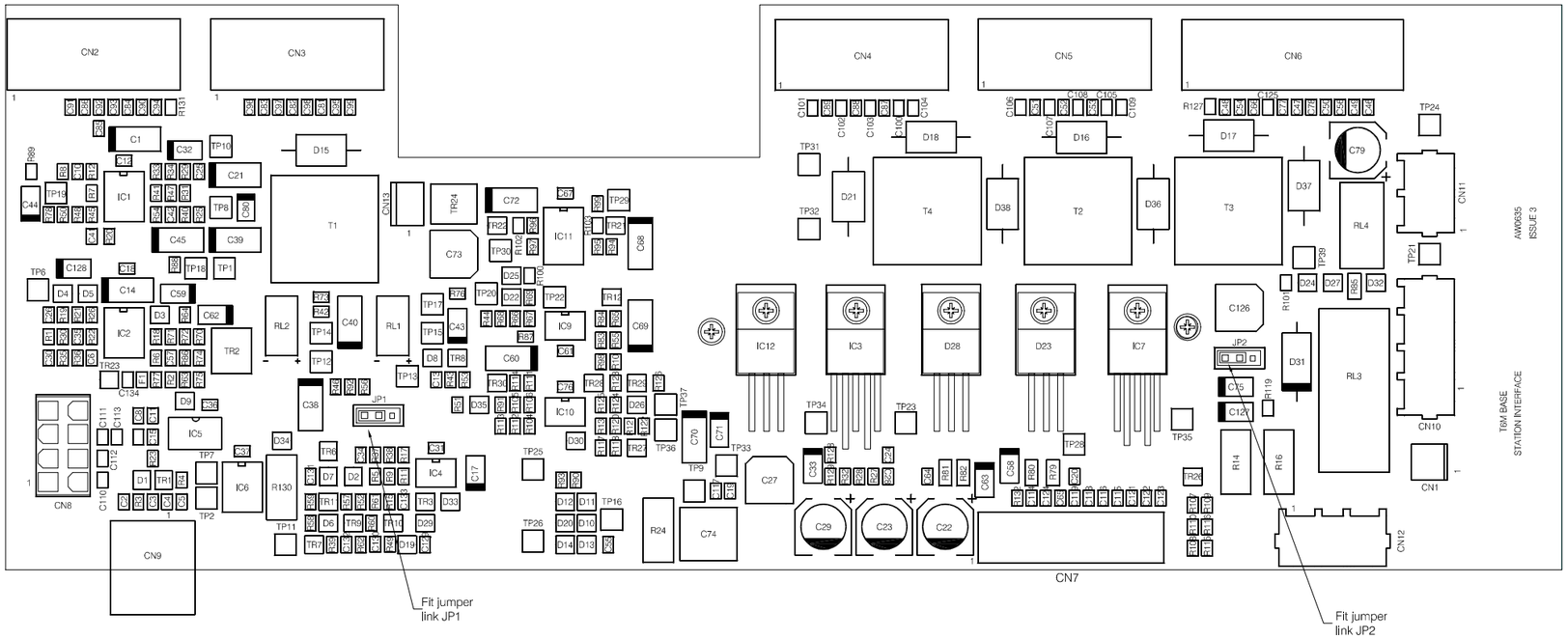
Reservoir Capacitor



Interface PCB

Interface PCB and Reservoir Capacitor Removal

Figure 10



JP1 Rx Audio through loudspeaker

JP1 Tx and Rx Audio through loudspeaker

JP2 Battery not fitted

JP2 Battery fitted

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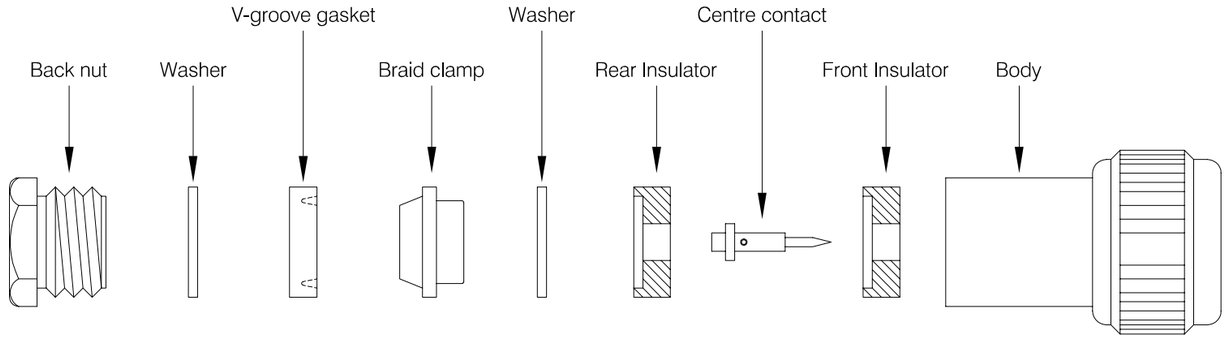
Interface PCB Layout Diagram

Figure 11



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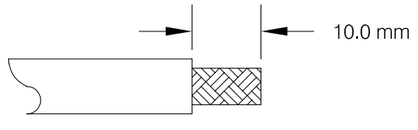

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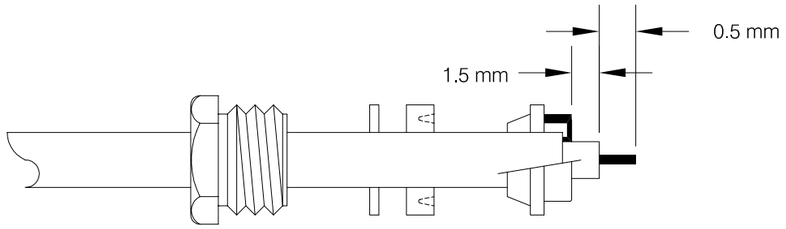

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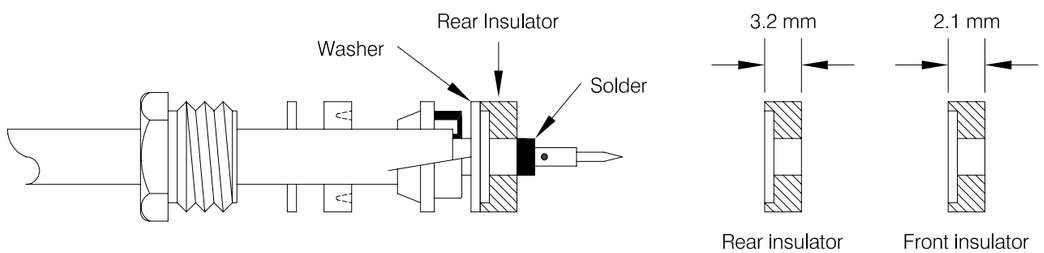

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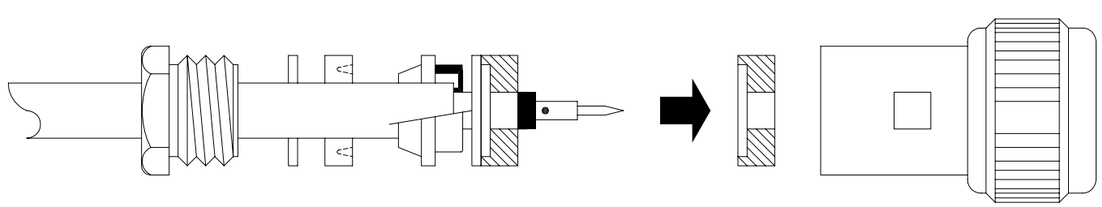

Cable Termination at the N-Type Connector

BT6MBS-12-1

Figure 12