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Park Air T6R Mk6 VHF Receiver
User Documentation

Foreword

This user documentation provides the information required by a user to install, use and maintain the Park Air T6R Mk6 VHF receiver. The maintenance procedures included in this documentation are limited to rectification by replacing faulty modules, fuses, cables, or fans.

User documentation is supplied on disk as Adobe Acrobat files. A hard copy may be printed from any file; the hard copy printout will include any interactive commands included in the file.

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www.northropgrumman.com/international

Configuration Page

This user documentation is applicable only to receivers that are configured as per the information given on this page.

Receivers

Configuration for the receivers applicable to this user documentation is listed in Table 1-1.

Table 1-1 Receiver Configuration

Model	Part Number	Mark	Modification State
Park Air T6R Mk6 standard frequency coverage receiver	B6100/IP/NB	6	20
Park Air T6R Mk6 extended frequency coverage receiver	B6100/IP/WB	6	20

Software Configuration

The receiver software configuration applicable to this user documentation is listed in Table 1-2. The software part numbers can be viewed at the receiver's front panel display as detailed on page 3-29.

Table 1-2 Software Configuration

Software	Software Part Number
Boot software	65-00000643
EBoot software	65-00000642
Mode software	As selected by user
Ethernet software	65-00000640
Fill 1 software AM-voice (default)	65-00000649
Fill 2 software VDL-2 (optional)	65-00000697

Modifications

Modifications to the receiver are listed below.

Modification State	Date	Detail	Applicable Park Air Change Notice
17	June 2010	Mk6 release	-
18	Nov 2010	Added protection screen over PSU	5004
19	Feb 2014	New power supply 68-61000060S fitted	6145A
20	Jul 2014	New power supply 69A61000065S fitted. Module fitted with Live ***and*** Neutral fuses.	6145B and 6167

Park Air T6R VHF Receiver

The Park Air T6R VHF receiver operates from a low voltage dc input supply, or a standard mains ac input supply. When using a mains supply, dangerous voltage is present on the rear panel ac connector and within the equipment. For this reason, only suitably qualified personnel should install and maintain the equipment.

CAUTION

DOUBLE POLE / NEUTRAL FUSING

All radios of Mod State 20 or higher use a power supply (Park Air part number 69A61000065S) which incorporates both live ***and*** neutral fuses.

Disposal

This product is covered by the European Directive 2002/96/EC.

It must not be disposed of in domestic waste.

Disposal should be made using designated collection facilities appointed by the government or the local authorities in your area.

Warnings and Cautions

The following warnings and cautions are used in Northrop Grumman documentation.

Warnings

A warning is used to indicate possible danger to personnel. Throughout Northrop Grumman user documentation, warnings are indicated by the following symbols:

WARNING 	**Indicates electrical danger to personnel.**
WARNING 	**Indicates a hazardous material.**
WARNING 	**Indicates a non-ionizing radiation hazard.**
WARNING 	**Indicates a specified danger to personnel.**

Cautions

A caution is used to indicate possible danger to the equipment. Throughout Northrop Grumman user documentation, cautions are indicated by the following symbols:

Caution 	**Indicates the presence of electrostatic sensitive devices (ESDs).**
Caution 	**Indicates a specified danger to the equipment.**

Customer Support

Contacting Northrop Grumman Ltd
Customer support is available using email or telephone. If you require help in configuring, installing or maintaining equipment, use any of the contact methods listed below.

Email

Address:	support@parkairsystems.com

Telephone

24 hours:	Within the UK,	01778 381557
	International,	44 1778 381557

Mail

Address:	Customer Services Department Northrop Grumman Park Air Systems Ltd Northfields Market Deeping Peterborough PE6 8UE England

Web Site

Web address:	www.northropgrummaninternational.com/capabilities/aviation-customer-support

Fault Reporting

To ensure the highest level of after sales service, it is necessary to gather as much information as possible about equipment faults. If any equipment supplied by us becomes unserviceable, please complete a copy of the fault report shown on the next page, and return it to the Customer Services department.

Fault Report

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Customer: . . . . . .

Address: . . . . . .

. . . . . .

. . . . . .

Telephone: . . . . . .

Email: . . . . . .

Fax: . . . . . .

Equipment Details

Works order number: . . . . . .

Equipment model: . . . . . .

Equipment serial number: . . . . . .

Service Details

Commissioning date: . . . . . .

Failure/repair date: . . . . . .

Software version (if known): . . . . . .

Supply voltage: . . . . . .

Equipment environment: Office area / dedicated equipment room / heated / air-conditioned (delete as applicable)

Fault Detail

Symptoms of fault: . . . . . .

. . . . . .

. . . . . .

. . . . . .

Results of any tests: . . . . . .

. . . . . .

Any repairs carried out: . . . . . .

. . . . . .

Comments/action requested: . . . . . .

. . . . . .

. . . . . .

. . . . . .

Approvals and Regulations

The following approvals and regulations apply to the Park Air T6R Mk6 VHF receiver.

Approvals
The equipment is designed to meet the essential requirements of Directives 1999/5/EC, 2004/108/EC.

Standards
The following standards are applied:

- EMC EN 301 489-1; EN 301 489-22
- This Class B digital apparatus complies with Canadian ICES-003
- Health & Safety, EN60950, CAN/CSA-C22.2 No. 60950, UL 60950
- Radio EN 300 676-1, IC RSS141, FCC part 15
- Telecom CS-03.

Interoperability of the European Air Traffic Management Network
Northrop Grumman Systems declares that the Park Air T6R Mk6 VHF receiver conforms to the essential requirements set out in Regulation (EC) No 552/2004 amended by Regulation (EU) No.1079/2012 for 8.33 kHz channel spacing on the Interoperability of the European Air Traffic Management Network.

FCC Statement-USA only
This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the supplier or an experienced radio/TV technician for help.

Changes or modifications to this equipment, not expressly approved by Park Air Systems Ltd could void your authority to operate this radio under FCC regulations.

This equipment is only licensed for operation on 25 kHz channel spacing.

EC Declaration of Conformity
The declaration of conformity is shown on the next page.

CE 0336

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DOC-124-001V2.0

Declaration of Conformity

We, the undersigned,

Company	*Park Air Systems Limited*
Address, City	*Northfields, Market Deeping, Peterborough PE6 8UE*
Country	*England*
Phone number	*+44 1778 345434*
Fax number	*+44 1778 342877*

certify and declare under our sole responsibility that the following equipment:

Product description / Intended use	VHF Ground to air communications receiver
EU / EFTA member states intended for use	**EU**: All countries **EFTA**: Switzerland, Iceland, Lichtenstein, Norway
Member states with restrictive use	*None*
Manufacturer	*Park Air Systems Limited*
Brand	PAE
Type	T6R

is tested to and conforms with the essential requirements for protection of health and the safety of the user and any other person and Electromagnetic Compatibility, as included in following standards:

Standard	Issue date
EN60950-1:2006	*2006*
EN301 489-1, EN301 489-22	*06/2005, 11/2003*

and is tested to and conforms with the essential radio test suites so that it effectively uses the frequency spectrum allocated to terrestrial/space radio communication and orbital resources so to as to avoid harmful interference, as included in following standards:

Standard	Issue date
EN 300 676	*V1.3.1 03/2003*
EN301 841-1	*V1.2.1 08/2003*

and therefore complies with the essential requirements and provisions of the Directive 1999/5/EC of the European Parliament and of the council of March 9, 1999 on Radio equipment and Telecommunications Terminal Equipment and the mutual recognition of their conformity and with the provisions of Annex IV (Conformity Assessment procedure referred to in article 10).

The following Notified Body has been consulted in the Conformity Assessment procedure:

Notified Body number	Name and address
0336	TNO Certification B.V., PO Box 15, 9822 ZG Niekerk, The Netherlands

The technical documentation as required by the Conformity Assessment procedure is kept at the following address:

Company	*Park Air Systems Limited*
Address, City	*Northfields, Market Deeping, Peterborough PE6 8UE*
Country	*England*
Phone number	*+44 1778 345434*
Fax number	*+44 1778 342877*

CE 0336

TCF/TF reference nr.	*TCF-124-001*
Drawn up in	*Northfields, Market Deeping, Peterborough PE6 8UE*
Date	*1 September 2010*
	
Name and position	*R W Allis. Technical Director*

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www.parkairsystems.com Registered in England 1951792 A subsidiary of Northrop Grumman Corporation

Glossary of Terms

The following terms are used in Northrop Grumman user documentation.

Automatic Gain Control (AGC)
AGC is a circuit function that compensates for a wide range of input RF signal levels to give a more uniform audio output.

E and M Signalling
Refers to PTT and the squelch indication signalling between a radio site and the control equipment. E represents 'Ear' (what is heard, or received) and M represents 'Mouth' (what is sent). Therefore:

- A PTT signal sent from the control equipment is referred to as the M signal; the same signal at the transmitter is referred to as the E signal
- A squelch indication at the receiver is referred to as the M signal; the same signal at the control equipment is referred to as the E signal.

Squelch
Squelch (also referred to as Mute in older receivers) is a circuit function that:

- Mutes a receiver's audio output during periods of no reception
- Mutes a receiver's audio output when signals weaker than the squelch threshold are received.

The adjustable squelch threshold's default setting is -107 dBm. The squelch function may be switched off (Squelch Defeated).

Squelch (Noise Compensated)
Noise compensated squelch is a circuit function that:

- Mutes a receiver's audio output during periods of no reception
- Mutes a receiver's audio output when signals weaker than the squelch threshold are received
- Mutes a receiver's audio output when signals stronger than the squelch threshold are received but are excessively noisy.

Squelch (Carrier Override)
The carrier override squelch facility is used in conjunction with the noise compensated squelch facility. If too many noisy signals are being lost due to noise compensation, carrier override can be switched on to reduce the squelch threshold by 10 dB. The default threshold of -107 dBm effectively becomes -97 dBm with carrier override switched on. All signals stronger than -97 dBm, irrespective of the noise level, are then heard in the normal way.

VCCS
A Voice Control and Communications Switch (VCCS) is the control centre equipment that is used to operate the radios.

VOGAD
Voice-Operated Gain Adjusting Device (VOGAD) is an automatic gain control that is normally applied to microphone circuits to prevent a transmitter over modulating. VOGAD is also applied to a transmitter's line inputs.

A VOGAD circuit has a very fast attack time, so that an initial loud voice signal does not cause a sudden burst of excessive modulation. In practice the attack time will be a few milliseconds. A much longer decay time is employed so that the gain does not get boosted too quickly during the normal pauses in natural speech. VOGAD circuits are adjusted so that, at low levels of input, the signal is not fully boosted, but instead follows a linear boost curve.

Phantom Keying
Phantom keying is when the keying potential is superimposed on the audio lines.

Phantom Squelch
Phantom squelch is when the squelch signal is superimposed on the audio lines.

Abbreviations

The following list details standard abbreviations.

A	ampere
ac	alternating current
AGC	automatic gain control
ALC	automatic level control
AM	amplitude modulation
ATC	air traffic control
BER	bit error rate
BIT	built-in test
bps	bits per second
C	celsius
CAS	channel associated signalling
CCE	control centre equipment
CD	compact disk
CSMA	carrier sense multiple access
dB	decibel
dc	direct current
DSB	double sideband
D8PSK	differentially encoded 8-phase shift keying
E1-RIC	E1-radio interconnect
ESD	electrostatic sensitive device
E-BIT	external bit signal
FCC	Federal Communications Commission
Fig	figure
FM	frequency modulation
FP	frequency preset
g	gramme
HPA	high power amplifier
Hz	hertz
IF	intermediate frequency
IP	internet protocol
k	kilo
kbits/s	kilobits per second
kg	kilogramme
kHz	kilohertz
LCD	liquid crystal display
LED	light emitting diode
LRU	line replaceable unit
M	mega
m	metre
mA	milliamp
MARC	multi-access remote control
Mbits/s	megabits per second
MHz	megahertz
mm	millimetre
ms	millisecond
MSK	minimum shift keying
mW	milliwatt
NB	narrow-band
N/A	not applicable
n/c	normally closed
n/o	normally open
PA	power amplifier
PC	personal computer
PCB	printed circuit board
pk-pk	peak-to-peak
PM	phase modulation
ppm	parts per million
PSU	power supply unit
PTT	press to transmit
RCMS	remote control and monitoring system
Ref	reference
RF	radio frequency
RF PA	radio frequency power amplifier
TDMA	time division multiple access

Abbreviations (continued)

RSSI	radio signal strength indication
THD	total harmonic distortion
TS	time slot
UHF	ultra high frequency
V	volt
VA	volt-ampere
VCCS	voice control and communication switch
VFP	virtual front panel
VHF	very high frequency
VOGAD	voice-operated gain adjusting device
VoIP	voice over internet protocol
VSWR	voltage standing wave ratio
W	watt
WB	wideband
WP	waveform profile

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Introduction

Purpose

The Park Air T6R Mk6 VHF multimode receiver (Fig 1-1) is intended for use in fixed ground environments such as airports and en-route centres. The receiver operates in voice and ICAO defined data modes at frequencies between 118 and 136.975 MHz for the standard model, and between 112 and 155.975 MHz for the extended frequency model. Dependent on the software loaded into the radio, the following operating modes can be selected:

- AM-voice (standard software fill)
  This software provides voice via 4-wire E & M, E1 or VoIP. It provides SNMP via Ethernet, and MARC via RS232, RS422, E1 and Ethernet. Note that the optional VoIP Configurator Application (VCA) software is required to input set-up parameters for VoIP operation
- VDL Mode 2 (optional).

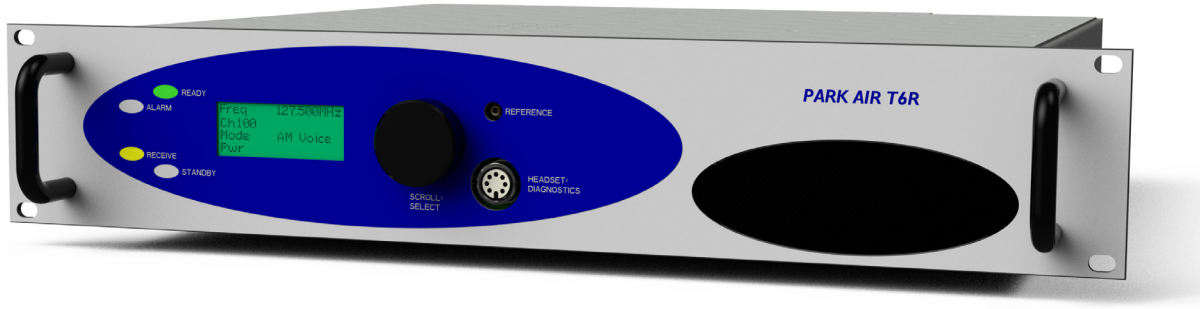

Fig 1-1 Park Air T6R Mk6 VHF Receiver

Models and Part Numbers

The following table identifies the receivers:

Description	Part Order Number	Frequency Range	Channel Spacing (AM-Voice)
Park Air T6R Mk6 standard frequency coverage receiver	B6100/IP/NB	118 to 136.975 MHz	25 kHz or 8.33 kHz
Park Air T6R Mk6 extended frequency coverage receiver	B6100/IP/WB	112 to 155.975 MHz	25 kHz or 8.33 kHz

What's in the Box

The following items are supplied with each receiver:

- A CD containing the radio's user documentation in interactive Adobe Acrobat™ format is supplied in the box.

Accessories

A virtual front panel maintenance application and a VoIP configurator application are available to purchase and are detailed below.

Virtual Front Panel Maintenance Application

Part number 70-T6000VFP.

The optional Virtual Front Panel (VFP) maintenance application software supplied on CD is compatible with any PC or laptop running Windows XP™, Windows Vista™ or Windows 7™. The VFP allows changes to a radio's settings and channel information, it displays the current BIT state, displays BIT history, allows security locks to be set, and provides maintenance facilities. Using the VFP has several advantages over setting a radio from the front panel; these are:

- A profile of the operational settings and channel information can be created, stored on disk, and then recalled to download into other radios
- A printout of the radio's profile can be made from the VFP
- The front panel controls can be locked. Front Panel Lock is available only when using the VFP.

The software is supplied with an interconnecting lead (part number 17E12600001) for RS232 connection to the radio's front panel.

VoIP Configurator Application (VCA)

Part number T6VCA.

The optional VoIP Configurator Application (VCA) software supplied on CD is compatible with any PC or laptop running Windows XP™, Windows Vista™ or Windows 7™. The user interface for this application is similar to the VFP. It allows the user to retrieve, save and load VoIP settings. Once these attributes and values are visible it is possible to edit parameters and update the radio. The user documentation on the CD provides instructions for its use.

T6 Series Connector Kit

The optional T6 series connector kit contains ac and dc power connectors, RF connectors and Facilities connector.

Connecting to Control Equipment

The receiver may be connected to suitable control equipment using a variety of analogue and digital methods. These include:

- 4-wire audio and signalling using analogue lines
- An E1 digital link
- Ethernet links.

Mechanical Installation

The receiver fits into an industrial standard 19 inch (483 mm) equipment cabinet and occupies 2U of space. Additionally, a receiver can be mounted free-standing; for this purpose a desk mount kit is available as an accessory.

Frequency Selection

The receiver is a single frequency synthesised radio that can operate with 25 kHz and 8.33 kHz channel spacing. The radio recognizes frequencies entered in ICAO format and automatically adjusts to the correct channel spacing. For multichannel operation up to 100 preset frequency channels can be stored in the radio for immediate recall; any combination of 8.33 kHz and 25 kHz channel spacing can be stored. Valid operating frequencies can be selected from the radio's front panel or a compatible remote control equipment.

Operating Parameters

The receiver's operating parameters are set using the front panel multi-purpose Scroll/Select switch, remotely from suitable control equipment or by using the optional Park Air Virtual Front Panel (VFP) software in conjunction with a PC or laptop.

When implementing VoIP on T6 radios the optional VoIP Configurator Application (VCA) software is used in conjunction with a PC or laptop to configure settings and parameters required for VoIP operation.

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Specification

General Specification

The general specification applies to a receiver irrespective of the selected operating mode. All radios operate in AM-voice mode. Additional software must be loaded to allow VDL Mode 2.

Variants

The Park Air T6R Mk6 VHF multimode receiver is available in two variants as listed in Table 2-1.

Table 2-1 Receiver Variants

Description	Part Order Number	Frequency Range
Standard frequency coverage receiver	B6100/IP/NB	118 to 136.975 MHz
Extended frequency coverage receiver	B6100/IP/WB	112 to 155.975 MHz

Number of Channels

The receiver can store a single frequency or up to 100 frequencies in its channel memory without the need for additional hardware.

Frequency Accuracy

Total drift in oscillator output due to environmental conditions and 1 year ageing is less than 1 ppm.

Power Requirements

The receiver operates from an ac mains supply, or a dc input supply. When both supplies are connected, the dc input acts as an automatic backup for the ac mains.

ac input supply — The receiver operates from a single phase supply between 47 and 63 Hz in the ranges 99 Vac to 264 Vac. Change-over between the ranges is automatic and requires no adjustments to be made. The power consumption figures are given in Table 2-2.

dc input supply — The receiver operates from a dc input supply between 21.6 and 32 Vdc (measured at the radio's input). Current loading is given in Table 2-2.

Table 2-2 Power Consumption

Switched On		Standby		Switched Off		Switch On Inrush
ac	dc	ac	dc	ac	dc	
Typically 40 VA 50 VA Maximum	Typically 900 mA 1.1 A Maximum	Typically 30 VA	Typically 700 mA	Typically 9 VA	Typically 30 mA	60 A Maximum

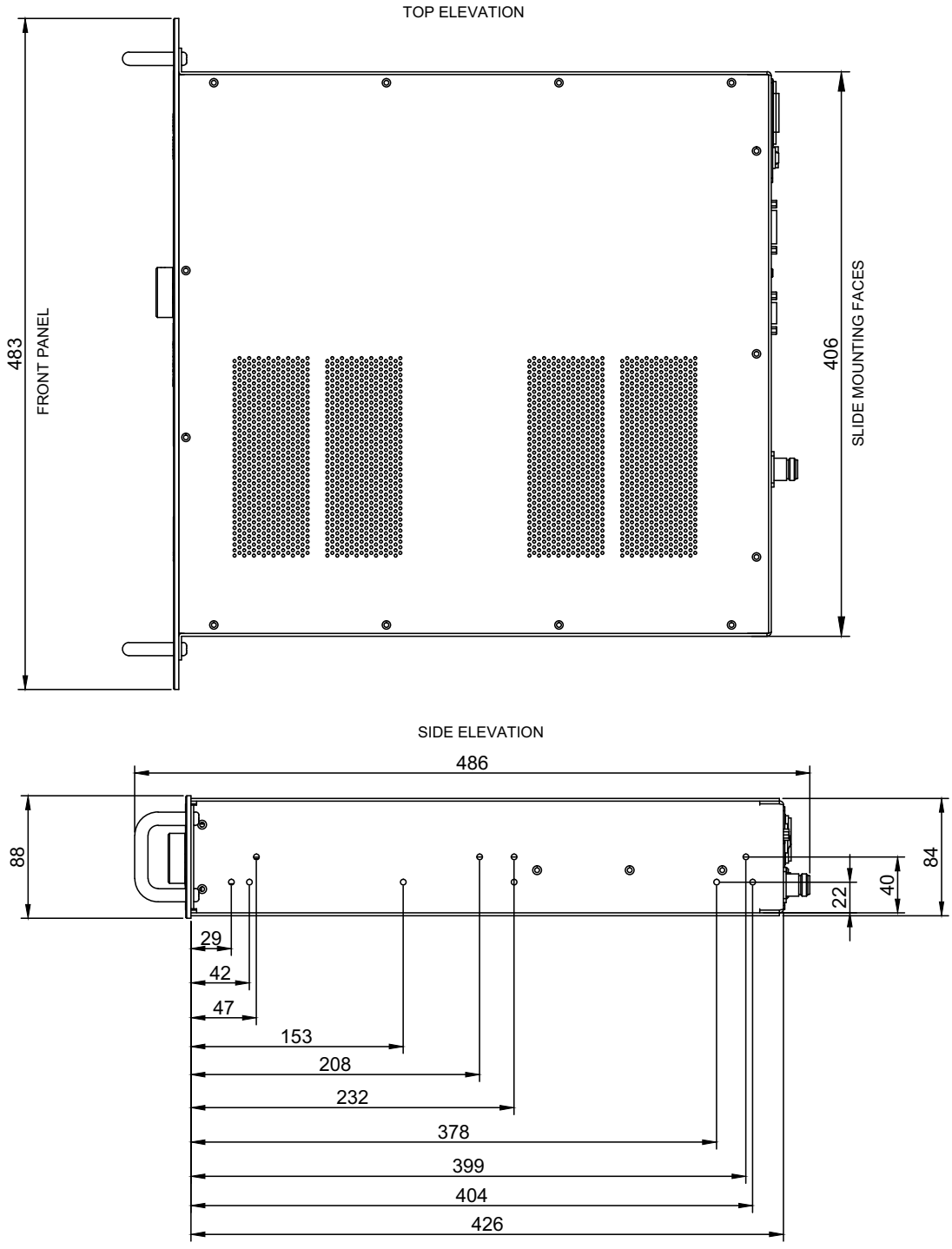
Standby Facility

The receiver has a standby facility to extend power supply life when not operational.

Dimensions and Weight

The dimensions of the receiver are shown in Fig 2-1.

The receiver weight is 6.0 kg (13.23 pounds).



All Measurements in mm

Fig 2-1 T6R Receiver Dimensions

Environmental

Temperature range	The receiver operates to specification at temperatures between -20 and +55°C. The receiver can be stored at temperatures between -30 and +70°C without causing damage.
Humidity	The receiver operates to specification at a relative humidity between 5% and 90% (non-condensing).
Altitude	The receiver operates to specification in locations up to 4572 m (15,000 feet). The receiver can be stored in locations up to 15240 m (50,000 feet) without causing damage.
Shock and vibration	The receiver complies with shock and vibration protection MIL-STD-810E, method 516.4, procedure VI - Bench Handling.
Ventilation	The receiver is cooled by natural convection.
Warm up time	The receiver is fully operational 20 seconds after switch on.

AM-Voice Mode

The receiver operates in AM-voice mode (standard) and VDL Mode 2 mode (optional). The following specifications apply to both modes unless stated otherwise.

Note that ETSI test methods specified in EN 300 676 are used where applicable.

RF Characteristics

Input Impedance
50 ohms. The VSWR is better than 2:1 at the tuned frequency.

Sensitivity

118 to 136.975 MHz	12 dB SINAD for -107 dBm (1 µV) 30% modulated.
112 to 117.975 MHz	12 dB SINAD for -105 dBm (1.25 µV) 30% modulated.
137 to 155.975 MHz	12 dB SINAD for -105 dBm (1.25 µV) 30% modulated.

Note: All references to SINAD include ITU-T recommendation P.53 weighting.

The receiver has a nominal 6 dB reduced sensitivity feature to improve co-location performance when maximum sensitivity cannot be realised because of strong unwanted signals. This is in the form of a 6 dB RF pre-attenuator.

Channel Spacing (AM-Voice only)
25 kHz or 8.33 kHz.

IF Selectivity

25 kHz channel spacing	At ±11 kHz from the centre frequency, the signal is attenuated by less than 6 dB.
	At ±25 kHz from the centre frequency, the signal is attenuated by more than 80 dB.
8.33 kHz channel spacing (AM-voice only)	At ±3.5 kHz from the centre frequency, the signal is attenuated by less than 6 dB.
	At ±8.33 kHz from the centre frequency, the signal is attenuated by more than 70 dB (60 dB using the ETSI test method).
	At ±25 kHz from the centre frequency, the signal is attenuated by more than 80 dB.

Unwanted Signal Suppression

Intermod signal suppression	The intermodulation signal suppression is 80 dB or greater (reference 12 dB SINAD) for two unwanted signals spaced 100 kHz (unmodulated) and 200 kHz (30% modulation) from the channel frequency.
Blocking ratio	95 dB or greater (reference 12 dB SINAD and degraded by 6 dB) in the presence of an unmodulated unwanted signal spaced at 200 kHz from the channel frequency. 105 dB or greater (reference 12 dB SINAD and degraded by 6 dB) in the presence of an unmodulated unwanted signal spaced at 3 MHz from the channel frequency.
Cross modulation rejection	95 dB or greater (reference 30 dB SINAD and degraded by 10 dB) in the presence of a 30% modulated unwanted signal spaced at 200 kHz from the channel frequency. 105 dB or greater (reference 30 dB SINAD and degraded by 10 dB) in the presence of a 30% modulated unwanted signal spaced at 3 MHz from the channel frequency.
Spurious signal suppression	The spurious signal suppression (reference 12 dB SINAD) is 80 dB, or greater (typically >100 dB) for a 30% modulated unwanted signal. This applies to unwanted signals up to 2 GHz and spaced by more than two channels from the tune frequency. Above 2 GHz, spurious signal suppression is 70 dB or greater (typically >100 dB).
1st image rejection	100 dB or greater.
Interfering signals	At least 6 dB SINAD is achieved for a wanted -87 dBm signal modulated with a 1 kHz tone at 30% in the presence of two -5 dBm interfering signals. Both interfering signals are FM modulated, one with a 19 kHz tone 7.5 kHz deviation at 107.9 MHz and varied by ±4 kHz; the other with a 19.1 kHz tone 7.5 kHz deviation with its frequency chosen such that one of the 3rd order products is located on the chosen receive frequency.

Antenna Radiation

Radiation at the antenna socket is less than -81 dBm, typically less than -100 dBm, within the frequency range 9 kHz to 4 GHz.

Maximum RF Input

The receiver can withstand an RF input of +36 dBm for 20 seconds, and a continuous +27 dBm input, without causing damage.

Modulation Characteristics

AM-Voice

Modulation	Double sideband (DSB) amplitude modulation (AM) full carrier.
Emission designator	For 25 kHz channels: 6K80A3EJN. For 8.33 kHz channels: 5K00A3EJN.

Frequency Response

25 kHz channel spacing	The variation in frequency response with reference to a 1 kHz signal, is within +1 dB and -2 dB across the frequency range 300 to 3400 Hz. The response is less than -20 dB for frequencies at or below 100 Hz, and less than -30 dB at 4 kHz and above.
8.33 kHz channel spacing (AM-voice only)	The variation in frequency response with reference to a 1 kHz signal, is within +1 dB and -2 dB across the frequency range 350 to 2500 Hz. The response is less than -10 dB for frequencies at or below 100 Hz, and less than -30 dB at 4 kHz and above.

Distortion

25 kHz channel spacing	For RF input signals between -53 dBm and +10 dBm, the total harmonic distortion is less than 5% within the frequency range 300 Hz to 3.4 kHz when the modulation depth is between 30 and 90%.
8.33 kHz channel spacing (AM-voice only)	For RF input signals between -53 dBm and +10 dBm, the total harmonic distortion is less than 5% within the frequency range 350 Hz to 2.5 kHz when the modulation depth is between 30 and 90%.

Wanted Signal Dynamic Range (RF AGC)

For a 90% modulated on-channel signal, a change in signal level from -107 dBm to +10 dBm produces less than a 3 dB change in audio output. On-channel signals modulated at 90% up to a level of +17 dBm achieve at least 10 dB SINAD.

The RF AGC attack time is less than 40 ms and the decay time is less than 50 ms for a 40 dB step input.

Audio AGC (AM-Voice only)

The audio AGC compresses a 30% to 90% variation in input modulation depth to an audio output power change of 1 dB or less.

The audio output level is maintained at the equivalent of 90% modulation. Audio AGC can be disabled.

The audio AGC attack time is less than 20 ms; the decay time is greater than 1 s and less than 2 s for an input modulation depth change of 90% to 30%.

Squelch
The receiver has a noise compensated carrier operated squelch. It has a carrier adjustment range of -114 to -60 dBm without the RF pre-attenuator selected (these levels are increased by the value of the RF pre-attenuator when it is selected) and provides greater than 60 dB of quieting.

- Attack time is <20 ms for a signal rising 10 dB above the squelch setting
- Release time is <20 ms for a signal falling 10 dB below the squelch setting
- Hysteresis is 2 to 4 dB.

The squelch has a noise compensation disable facility to provide carrier only operation.

The squelch has a carrier override enable facility, which is preset at 10 dB (±2 dB) above the current squelch setting.

The squelch can also be defeated.

The squelch is independent of the audio output control.

Squelch tone signalling can be enabled in AM-voice mode. Frequency and level are adjustable.

Receiver Control

AM-Voice Audio Outputs
The receiver's outputs are the remote 600 ohm balanced audio line outputs, the headset output and the loudspeaker. Line level output is adjustable between -30 and +10 dBm (1 µW and 10 mW), 1 dB step size and a tolerance of ±2 dB.

An analogue Receiver Signal Strength Indication (RSSI) is available at the Facilities connector. This provides a 1 to 10 V output representing received signal strengths between -110 dBm and 10 dBm as detailed in Table 4-12 on page 4-23.

PCM Voice
Digitised voice is available via the E1 or IP interfaces. Line levels for these digital interfaces are not adjustable; they are fixed at a sine wave level of 0 dBm0 for IP and -3 dBm0 for E1.

- **E1** - 64 kbit/sec digitised 8-bit A-law encoded PCM voice is available via the T1/E1 connector. Audio uses TS1 and squelch is signalled using the four associated CAS bits on TS16. The CAS bits are also used to give an indication of received signal quality. There are four signal quality levels based on the RSSI value and the signal-to-noise. The lower three have preset levels whereas the highest can be set by the user in conjunction with an associated transmitter. The VCCS can use this information to indicate the failure of a channel. These levels can also be used for voting at the VCCS.
- **VoIP** - 64 kbit/sec digitised 8-bit A-law encoded PCM voice is available via the IP connector using VoIP Ethernet protocols. The mechanisms for call establishment, keying and signalling are compliant with ED-137. The standard AM-voice software fill provides VoIP functionality, however, the optional VoIP Configurator Application (VCA) software is required to input and edit operational parameters.

VDL Mode 2

VDL Mode 2 parameters are identical to AM-voice mode with the following exceptions.

RF Characteristics

Sensitivity
The receiver has a sensitivity better than -100 dBm for $1x10^{-3}$ Bit Error Rate (BER) with Reed Solomon decoding off.

Channel Spacing
VDL Mode 2 channel spacing is 25 kHz.

Modulation Characteristics

VDL Mode 2 uses Carrier Sense Multiple Access (CSMA) differentially encoded 8-phase shift keying (D8PSK), using a raised cosine filter with α = 0.6 (nominal value), emission designator 14K0G1DE.

Wanted Signal Dynamic Range (RF AGC)
A BER better than $1x10^{-3}$ with Reed Solomon decoding off is achieved for received signals of -100 dBm to +10 dBm.

Frequency Offsets
The receiver operates with frequency offsets up to 963 Hz.

Receiver Control

Outputs
All control information and received data is transferred via the IP connector. When a separate transmitter and receiver are deployed to provide a VDL Mode 2 air interface, signalling between the radios is passed via the IP port and attached network.

Intentionally Blank

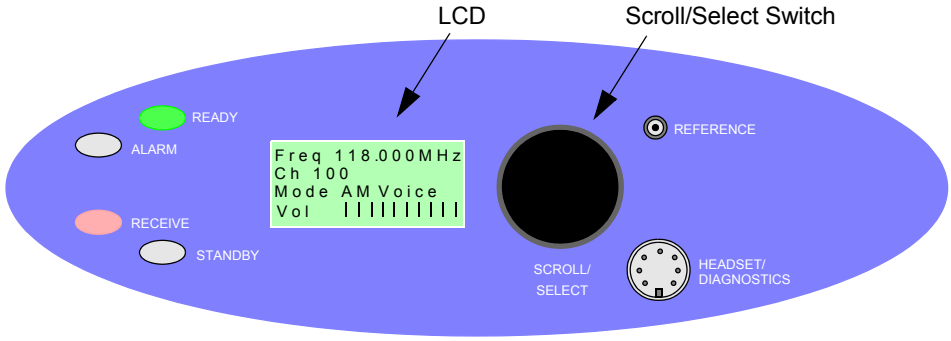
Operation

Controls, Indicators and Front Panel Connectors

This topic describes the receiver's controls, indicators and front panel connectors.

Front Panel

The receiver's front panel is illustrated below.



Scroll/Select Switch and LCD

The Scroll/Select switch is used in conjunction with the LCD to select most of the receiver's operational settings. During normal operation, the LCD shows the operating frequency, the channel number (if the channel store facility is used), and displays a graphical representation of the audio volume.

Ready Indicator

A green indicator that lights when the receiver is ready for use and no BIT faults have been detected.

Alarm Indicator

A red indicator that either flashes, or lights, when a BIT fault has been detected.

BIT indications are classified as either Alarms or Alerts:

- An 'alert' condition is shown if the supply voltage falls below a pre-defined level. The Alarm indicator flashes, the Ready indicator remains lit, and the receiver remains operational
- Any other BIT condition results in an alarm. When detected, the Alarm indicator lights and the Ready indicator becomes unlit; the receiver cannot be used.

Receive Indicator

An amber indicator that lights when a signal is received that is above the squelch threshold. Additionally, this indicator is lit when the receiver's squelch facility is switched off (squelch defeated).

Standby Indicator
A red indicator that lights when the receiver is in standby mode. When in standby mode, most of the receiver's circuits are inactive, and the display is blanked; the receiver is inoperable until standby mode is deselected.

Standby mode is selected and deselected using the front panel Scroll/Select switch and LCD, by initiating an instruction through a MARC system, through a T6 controller or through the VFP. For details of front panel selection and deselection see page 3-13.

Reference Connector
An SMB jack socket that allows a frequency counter to monitor the receiver's reference frequency. This connector is used only for maintenance purposes. The instructions for checking and adjusting the reference frequency are given in the Maintenance topic.

Headset/Diagnostics Connector
A dual purpose connector that allows either a headset, or a PC, to be connected to the receiver. The connector is a 7-pin self-locking DIN socket; the pin-out is shown in Table 4-3 on page 4-13.

A PC or laptop can be connected to allow the optional VFP to be displayed. Using the VFP is detailed in the Maintenance 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.

Rear Panel Supply Switch

Dangerous Voltage

When the Supply Switch is set to the Standby position, dangerous voltage is still present in the receiver's internal power supply circuitry. To ensure safe working, the receiver must be isolated from the ac and dc input supplies.

The rear panel's Supply switch is a 2-way rocker switch used to select between power on and standby.

 = On

 = Standby

Setting Up and Operation

Setting up the receiver involves using the front panel Scroll/Select switch to specify the operating parameters.

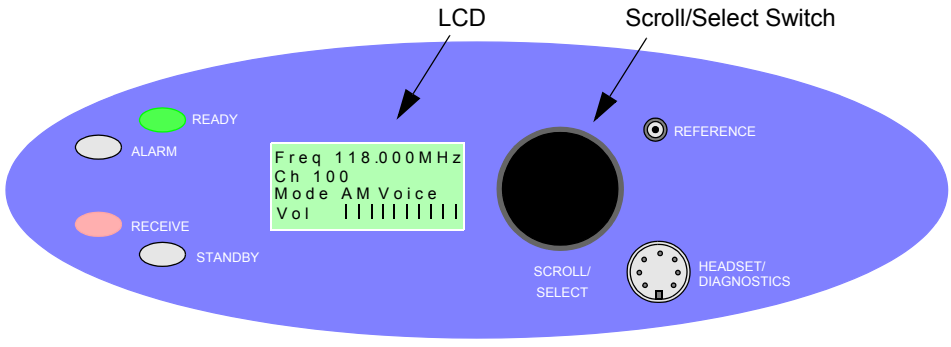
Operating parameters can also be set using the Virtual Front Panel (VFP), through a Multi-Access Remote Control (MARC) system, or from an associated T6 controller. VFP operation is described in the Maintenance topic; MARC and T6 controller functionality are described in separate documentation.

Table 3-8 on page 3-32 details the functions and parameters that can be set from all sources.

No attempt to set up the receiver should be made until the installation procedures, given in the Installation topic, are completed.

Normal Operation

During normal operation, the LCD displays the Main screen. This screen shows the operating frequency, the channel number (if the channel store facility is used) and displays a graphical representation of headset volume output. If the receiver has been set to Standby mode, which is shown by the front panel Standby indicator being lit, the LCD is blanked.



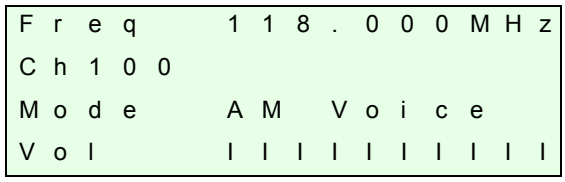
Using the Scroll/Select Switch

The Scroll/Select switch (referred to throughout this topic as the ‘switch’) is used to leave the Main screen and display the Control screen (page 3-7). Further use of the switch displays various selection menus and allows the required parameters to be set. The switch has three actions: it can be turned clockwise, anti-clockwise, or momentarily pushed in.

Screen Protocol

The following protocol is applicable to all screens described in this document.

Main screen During normal receiver operation, the Main screen, an example of which is shown below, is displayed.



Switch Refers to the front panel Scroll/Select switch. The switch is turned clockwise to scroll through fields from left to right, and from top to bottom. The switch is turned anti-clockwise to scroll through fields from right to left, and from bottom to top. The switch is pressed to make a selection.

Time out If during any setting up procedure the Scroll/Select switch is not operated for 30 seconds, the display returns to the Main screen. If editing any parameter has not been completed, the receiver stays on the original setting.

>> Indicates more fields are available other than those currently displayed. To access those fields, turn the switch clockwise through the last displayed field.

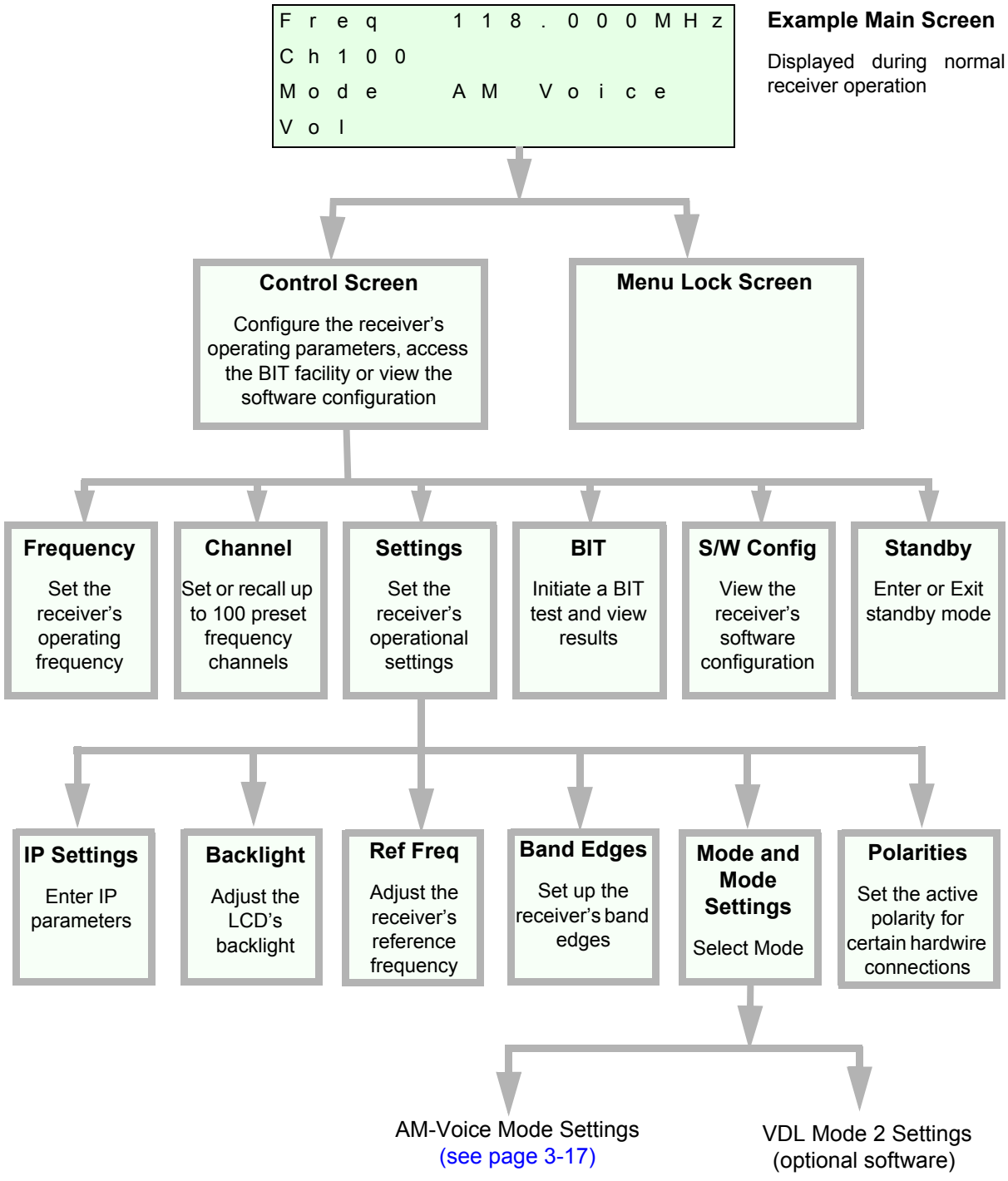
<< Indicates more fields are available other than those currently displayed. To access those fields, turn the switch anti-clockwise through the first displayed field.

Back When Back is selected, you are returned to the previous menu.

Exit When Exit is selected, you are returned to the Main screen.

Menu System

The front panel control of the radio is implemented through a menu system illustrated below.

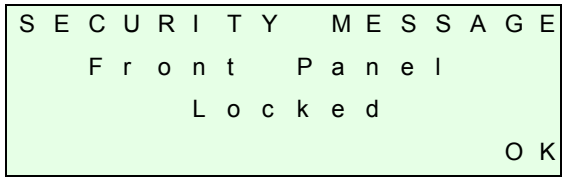


Menu System

Menu Lock Screen

A security facility available only from the VFP allows the receiver's front panel to be ‘locked’. When this facility is active, no operational settings can be made from the front panel until an ‘unlock’ command is sent from the VFP.

The following screen is displayed when ‘lock’ is active, and the front panel switch is pressed.



To exit the system lock screen:

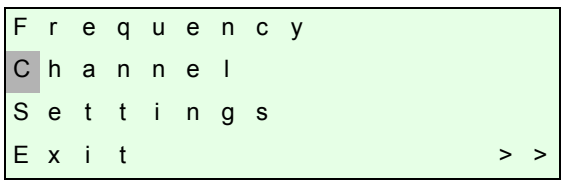
- Select OK, then press the switch. You are returned to the Main screen

  or,

- Wait for the 30 second time out to expire. You are returned to the Main screen.

Control Screen

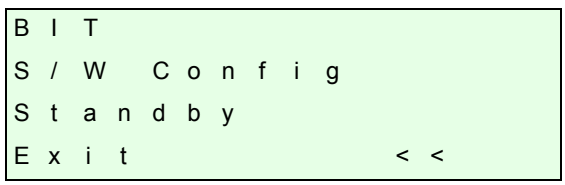
The Control screen is entered from the Main screen by pressing the switch. The following screen is displayed:



Change the receiver’s operating frequency.

Store or recall preset channel frequencies.

Select operating mode and mode settings.



Initiate a BIT test and view results.

View software configuration.

Enter or exit standby mode.

Notes for Setting Up the Receiver

The following notes should be read before setting up the receiver. They advise on the special frequency display when using 8.33 kHz channel spacing, and give guidance on the optimum line level settings.

Note that for operation in the United States of America, this equipment is certified only for operation using 25 kHz channel spacing.

Front Panel Display for 25 kHz and 8.33 kHz Channel Spacing

When setting the operating frequency of the receiver and 8.33 kHz channel spacing is required, the displayed frequency differs from the actual channel frequency. Table 3-1 shows the pattern used for 25 kHz and 8.33 kHz spaced channel frequencies from 118.0000 MHz to 118.1416 MHz. The pattern is the same for any frequency within the receiver's frequency range. The display conforms to ICAO convention for 8.33 kHz operation.

Table 3-1 25 kHz and 8.33 kHz Channel Spacing Displays

Actual Frequency (to 4 Decimal Places)	Channel Spacing	Display at Receiver'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

Line Level Setting

The output line level setting, displayed on the front panel, indicates the average line power for a speech signal (with a nominal 13 dB peak to average power ratio) when the receiver is demodulating an amplitude modulated signal and the peak amplitude of the speech corresponds to a modulation depth of 100%.

The receiver incorporates an audio AGC circuit that adjusts the peak line audio level to that which would be produced by a 100% modulated signal.

If the audio AGC is switched on:

- an AM sine wave test signal modulated between 30% and 100% produces an average line signal power 10 dB higher than the front panel line level setting.

If the audio AGC is switched off:

- an AM sine wave test signal modulated at 30% produces the same average line power as the front panel line setting
- an AM sine wave test signal modulated at 100% produces an average line signal power 10 dB higher than the front panel line setting.

Table 3-2 shows the relationship between line level, output levels with average speech and sine wave (assuming that the audio AGC is set to on, and the modulation depth is between 30% and 100%).

Table 3-2 Relationship between Line Level, Output Levels with Average Speech and Sine Wave

Line Level Setting (dBm)	Output Level with Average Speech (dBm)	Output Level with Sine Wave and Audio AGC Switched On (dBm)
+10	+10	+20
+5	+5	+15
0	0	+10
-5	-5	+5
-10	-10	0
-15	-15	-5
-20	-20	-10
-25	-25	-15
-30	-30	-20

Changing the Receiver's Operating Frequency

The receiver's frequency can be changed in two ways: either from the frequency screen, or by recalling a preset channel. This procedure details using the Frequency screen.

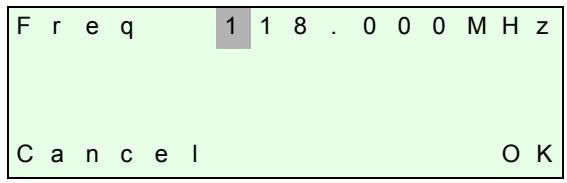
(1) From the Control screen, select frequency to display the Frequency screen.

(2) Turn the switch to highlight the digit to be changed, then press the switch.

(3) Turn the switch until the required digit is shown, then press the switch.

(4) Repeat until the required frequency is shown, then highlight OK and press the switch.

(5) Only frequencies that fall between the band edge settings can be selected.



To Store and Recall Frequency Channels

Up to 100 frequency channels can be stored in the receiver.

To Store a Frequency Channel

(1) From the Control screen, select Channel to display the Channel screen. Highlight Channel, press the switch and then turn it until the required channel number is displayed; press the switch.

(2) Highlight the MHz frequency value (see Example 2), press the switch and then turn it until the required MHz value is shown. Press the switch.

(3) Highlight the kHz frequency value (see Example 3), press the switch and then turn it until the required kHz value is shown. Press the switch.

(4) Highlight Store and press the switch. The new frequency is now stored in the selected channel number.

To recall a Stored Frequency Channel

(1) From the Control screen, select Channel to display the Channel screen.

(2) To make the receiver operate on any preset channel frequency, highlight Channel and press the switch. Turn the switch until the required channel number/frequency is displayed, then press the switch.

(3) Turn the switch to highlight Recall, then press the switch. Exit the screen. The receiver now operates on the recalled frequency channel.

Notes:

(1) If a frequency outside the band edge limits is entered, a message (see Example 3) is displayed.

(2) If a frequency not valid for the mode of operation is entered, a message (see Example 4) is displayed.

```
Ch  100
Freq  121.500MHz
Recall
Back          Exit
```

Channel Screen - Example 1

```
Ch  100
Freq  118.000MHz
Store
Back          Exit
```

Channel Screen - Example 2

```
Ch  100
Freq  118.000MHz
Outside Band Edge
Back          Exit
```

Channel Screen - Example 3

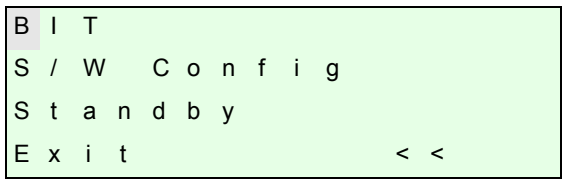
```
Ch  100
Freq  118.000MHz
Invalid for Mode
Back          Exit
```

Channel Screen - Example 4

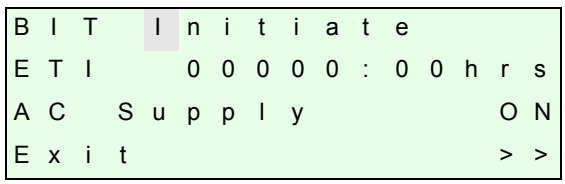
To Initiate a BIT Test

Use the following procedure to initiate an interruptive BIT test from the receiver's front panel. After a BIT test has been run, the BIT screen is displayed (see AM-Voice BIT Screen on page 3-26). An interruptive BIT test cannot be initiated in VDL Mode 2.

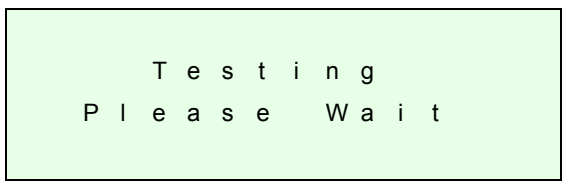
(1) From the Main screen, press the switch to display the Control screen. Turn the switch until BIT is highlighted. Press the switch.



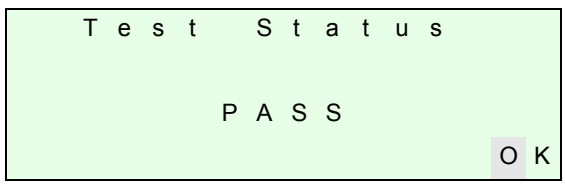
(2) Ensure the BIT screen is displayed. Turn the switch until BIT Initiate is highlighted. Press the switch.

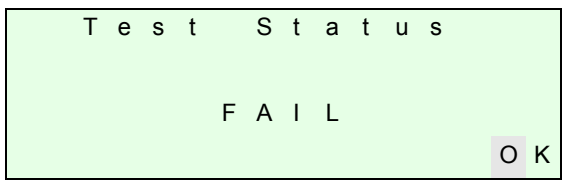


(3) During the test, which takes approximately two seconds, the Testing screen is displayed.



(4) On completion, and if the interruptive test was initiated from the front panel, one of the following screens will be shown.





(5) Selecting OK takes the user back to the BIT screen. If fail is displayed, scroll through the screen to check the cause of the failure.

Standby Mode

Standby mode is a power saving feature that can be used for non-operational receivers. When in standby mode, most of the receiver's circuits are inactive and the LCD is blanked. To put the receiver into standby mode, use the following procedure.

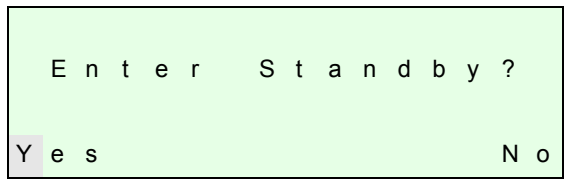
When the receiver is in standby mode, the red front panel Standby indicator is lit.

To Enter Standby Mode

(1) From the Control screen select Standby.

(2) At the Standby screen, select Yes.

(3) Check that the display blanks and the front panel Standby indicator is lit.

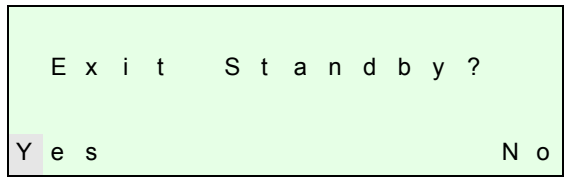


To Exit Standby Mode

(1) Press the Switch.

(2) Select Yes.

(3) Check that the Main screen is displayed and that the front panel Standby indicator is unlit.



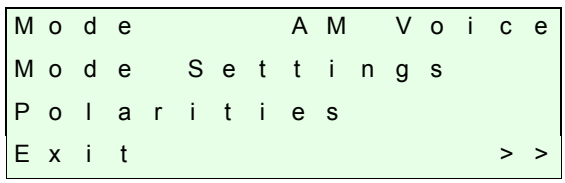
Settings

Operational settings for the receiver are configured at the front panel, through the VFP, or through an associated MARC system (or compatible control system). Some settings can also be made remotely via a T6 controller. The Settings screen is entered from the Control screen.

The settings that can be selected at the front panel Settings screen are:

- Mode - either AM-voice or VDL Mode 2 (optional)
- Mode settings - allows AM-voice mode parameters to be set (VDL Mode 2 parameters are set via the VFP application)
- Polarities
- Band edges
- Reference frequency
- Backlight
- IP settings.

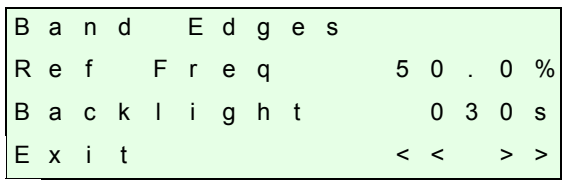
Note that the mode selection, reference frequency and backlight are set from this screen. When mode settings, polarities, band edges and IP settings are selected the user is taken to other screens. If Mode Settings is selected when in VDL Mode 2, a message is displayed informing the user that VDL Mode 2 parameters are set via the VFP application.



Select between AM-voice or VDL Mode 2 (optional).

Change AM-voice mode parameters.

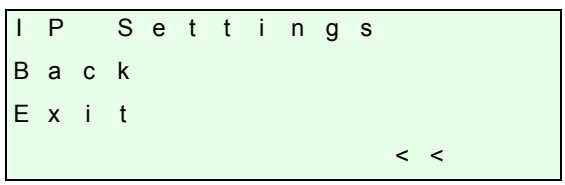
Set remote signal polarities.



Set the receiver's frequency band edges.

Align the receiver's reference frequency (See Note 1).

Adjust the LCD's backlight time out (See Note 2).



Set the receiver's Ethernet parameters.

Notes:

(1) Setting the receiver's reference frequency is a maintenance operation. The current value should not be reset unless the correct test equipment is connected. See Maintenance topic.

(2) The LCD's backlight can be set for permanently on, off, or timed to stay on for a period between 15 and 120 seconds.

General and mode specific settings, showing default values, are referenced in Table 3-3. Click on any required parameter by page number for further references.

Table 3-3 Operational Settings from the Front Panel

Parameter	Mode	Adjustment Range	Factory Default Setting	Further Reference
Menu lock screen	All	Locked or unlocked	Unlocked	page 3-7
Enter standby mode	All	Yes or No	-	page 3-13
Exit standby mode	All	Yes or No	-	page 3-13
Set mode of operation	All	AM-voice or VDL Mode 2 (optional)	AM-Voice	page 3-14
Set polarities	AM-Voice	STD or INV	STD	page 3-23
Band edges	All	118.000 to136.975 MHz or 112.000 to155.975 MHz	118.000 and 136.975 MHz or 112.000 and 155.975 MHz	page 3-30
LCD backlight	All	15 to 120 s, On or Off	30 s	page 3-14
Audio line out level	AM-Voice	-30 to +10 dBm	-13 dBm	page 3-18
Inhibit	AM-Voice	On or Off	Off	page 3-18
Squelch	AM-Voice	-114 to -60 dBm in 1 dB steps. With the RF pre-attenuator selected, the range is -108 to -54 dBm	-107 dBm	page 3-18 See also Squelch Setting Options on page 3-21
RF pre-attenuation	AM-Voice	On or Off	Off	page 3-18
Squelch defeat	AM-Voice	On or Off	Off	page 3-18
Squelch noise compensation	AM-Voice	On or Off	On	page 3-18
Squelch carrier override	AM-Voice	On or Off	Off	page 3-18
Audio AGC	AM-Voice	On or Off	On	page 3-18
Loudspeaker	AM-Voice	On or Off	On	page 3-18
Step (front panel step size)	AM-Voice	8.33 kHz, 25 kHz or both	25 kHz	page 3-18
High signal quality parameter (SQP)	AM-Voice	-10 dBm to -80 dBm	-80 dBm	page 3-19
Squelch tone signalling	AM-Voice	On or Off 1800 to 3000 Hz -2 to -25 dB	Off 1930 Hz -10 dB	page 3-18 and page 3-21
Radio Remote Control (RRC)	AM-Voice	Active or Inactive	Active	page 3-19

Table 3-3 Operational Settings from the Front Panel (continued)

Parameter	Mode	Adjustment Range	Factory Default Setting	Further Reference
IP (Ethernet) Settings				
DHCP	All	On or Off	Off	page 3-25
IP address	All	000.000.000.000 to 255.255.255.255	000.000.000.000	page 3-25
IP subnet mask	All	000.000.000.000 to 255.255.255.255	255.255.255.000	page 3-25
Default gateway	All	000.000.000.000 to 255.255.255.255	000.000.000.000	page 3-25
Control application TCP port number	All	05000 to 65535	05001	page 3-25
Maximum number of TCP connections	AM-Voice	00 to 07	01	page 3-25

AM-Voice Mode Settings Procedure

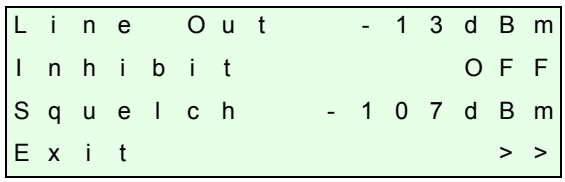
During this procedure, the following parameters can be set:

- Audio line output level
- Inhibit (on or off)
- Squelch level (see Squelch Setting Options on page 3-20)
- RF pre-attenuation (on or off - see page 3-21)
- Squelch defeat (on or off)
- Squelch noise compensation (on or off)
- Squelch carrier override (on or off)
- Audio AGC (on or off)
- Speaker (on or off)
- Step size (25 kHz, 8.33 kHz, or both)
- High SQP (see page 3-19)
- Squelch tone signalling (see page 3-21)
- RRC enable or disable (see page 3-19).

AM-Voice Mode Settings Screen

The AM-voice mode settings screen is accessed from the Settings screen. Use the Scroll/Select switch to select the parameter, then enter the required setting(s). Notes regarding optimum line levels are given on page 3-9.

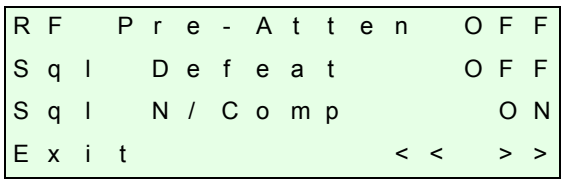
Adjustments



-30 to +10 dBm in 1 dB steps.

On or Off.

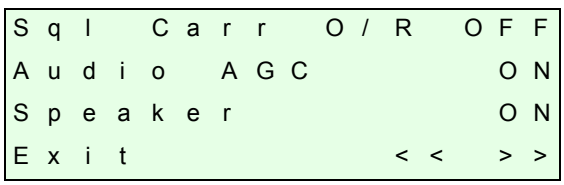
-114 to -60 dBm in 1 dB steps. With the RF pre-attenuator selected, the range is -108 to -54 dBm.



On or Off (see Using the RF Pre-Attenuator on page 3-21)

On or Off.

On or Off.



On or Off.

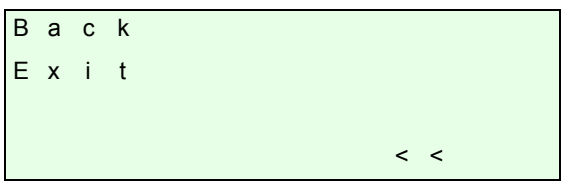
On or Off.

On or Off.

Front panel Step size. 25 kHz, 8.33 kHz, or both.

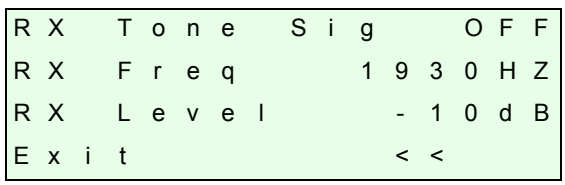
See Signal Quality Parameter on page 3-19.

See sub-menu and Squelch Tone Signalling on page 3-21.



Tone Signalling Screen

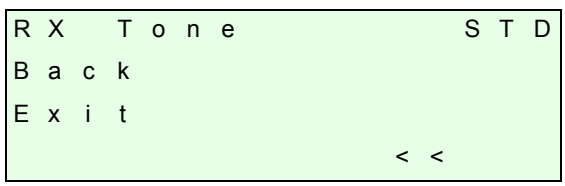
The tone signalling screen is accessed from the Mode Settings screen via the Settings screen.



On or Off.

1800 to 3000 Hz in 1 Hz steps.

-2 to -25 dB with respect to the equivalent sine wave line level in 1 dB steps.



STD or INV (see page 3-21).

Radio Remote Control (RRC)

A VoIP radio system uses the RRC block of the RTP Header Extensions as defined in ED-137 to allow for main/standby switching at a radio site. The RRC block is used to both indicate and configure whether the radio is selected to be Active or Inactive. The use of this facility is controlled through the radio's RRC configuration setting.

When RRC configuration is enabled the RRC state can be set Active or Inactive. When RRC configuration is not enabled the RRC state is not applicable.

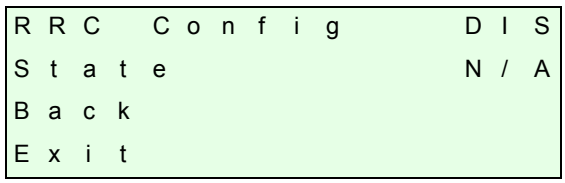
The RRC configuration is only enabled in VoIP radio systems to enable indication of active and inactive receivers and, any switching requirements within a VoIP radio system.

For non-IP based radio systems the RRC configuration should be disabled.

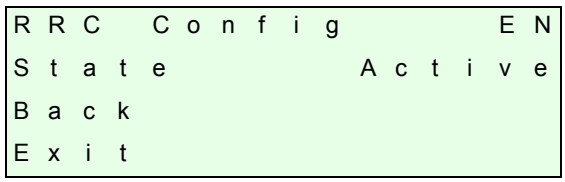
The RRC state can be set Active or Inactive via:

- The radio's front panel menu system
- MARC/RCMS
- The RTP header (RRC block).

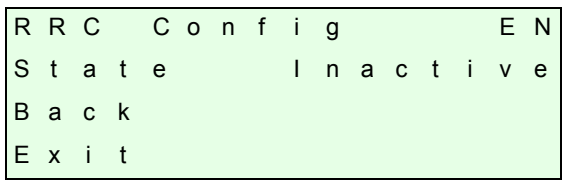
The RRC Configuration screen is accessed from the Mode Settings screen via the Settings screen.



RRC Configuration disabled - State not applicable.



RRC Configuration enabled - State active.



RRC Configuration enabled - State inactive.

A radio with RRC configuration enabled always powers up Active. Ensure the correct Active/Inactive state with any VCS/VCX requirement.

An RRC State output is provided on the Facilities connector, pin 15.

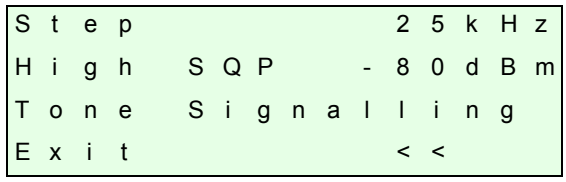
Signal Quality Parameter

The signal quality parameter (SQP) is used to control receiver voting when the receiver connects to a digital voice switch via an E1 data link. The receiver activates one of four levels dependent on received signal strength.

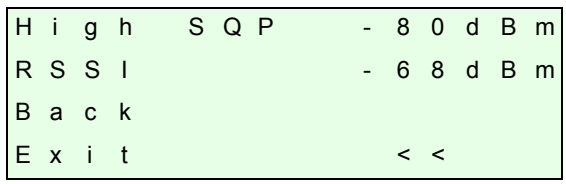
As an additional facility, the highest of the four levels (High SQP) is adjustable. This can be used to provide an indication that an associated co-located transmitter system is radiating power. When the associated transmitter is keyed, the receiver senses a strong signal and activates the High SQP level. The level is used by the digital voice switch to provide an appropriate indication.

A suggested method for setting the High SQP is given below:

(1) From the AM-Voice mode settings screen (see below) highlight High SQP and press the switch.



(2) Ensure the High SQP Setting screen (see below) is displayed.



(3) Arrange for the associated transmitter (operating on the same frequency) to be keyed and note the RSSI reading.

(4) Using the switch, set the High SQP level to be 12 dB below the RSSI level. For example, if the RSSI is -68 dBm, the SQP should be set to -80 dBm (High SQP is adjustable between -10 dBm and -80 dBm).

Squelch Setting Options

The receiver's squelch facility is configured from the AM-voice mode settings screen. The following fields are applicable to squelch operation.

Sql Defeat — The squelch defeat facility can be set to on or off.

- When set to on, the squelch facility does not operate
- When set to off the receiver's squelch facilities are available.

Squelch — The squelch field sets the threshold; the default setting is -107 dBm.

- During periods of no reception or when signals weaker than the threshold are received, the receiver is muted
- When signals stronger than the squelch threshold are received, the squelch circuits are defeated and reception is heard in the normal way.

Sql N/Comp — This field allows noise compensated squelch to be selected on or off. When this facility is on, the squelch circuits mute all signals weaker than the threshold, and also mute signals stronger than the threshold that are excessively noisy.

Sql Carr O/R — The carrier override squelch facility is used in conjunction with the noise compensated squelch facility. If too many noisy signals are being lost due to noise compensation, carrier override can be switched on to reduce the squelch threshold by 10 dB. The default threshold of -107 dBm effectively becomes -97 dBm with carrier override switched on. All signals stronger than -97 dBm, irrespective of the noise level, are then heard in the normal way.

Table 3-4 Squelch Facility Settings

Required Squelch Operation	Squelch Defeat Setting	Squelch Setting	Sql N/Comp Setting	Sql Carr O/R Setting
No squelch	On	Any	Off	Off
Squelch (without noise compensation)	Off	Required threshold	Off	Off
Noise compensated squelch	Off	Required threshold	On	Off
Noise compensated squelch with carrier override squelch	Off	Required threshold	On	On

When the receiver is used to monitor beacons such as Emergency Locator Transmitter frequencies it is suggested that the noise compensated squelch is set to off.

Squelch Indications

Squelch indication can be obtained directly from relay contacts or via the audio lines as phantom squelch. These signals are available at the MARC, MARC Audio and Facilities connectors on the rear panel of the receiver. These connectors are detailed in the Installation topic of this documentation. The receiver can also be configured for squelch tone signalling on the audio lines.

Squelch Tone Signalling

Squelch tone signalling can only be used in AM-voice mode and is enabled from the AM-voice mode settings screen. The tone frequency range can be set between 1800 and 3000 Hz in 1 Hz steps. The default tone frequency is 1930 Hz. The tone output level can be set between -2 and -25 dB (in 1 dB steps) with respect to the equivalent sine wave line level. The default setting is -10 dB. If, for example, a -23 dBm squelch tone is required with the line output level set at -13 dBm (-3 dBm equivalent sine wave level), set the squelch tone signalling level to -20 dB.

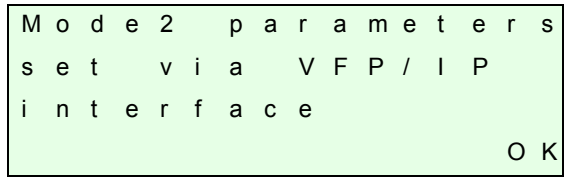
In STD (standard) mode the signalling injects a tone when the squelch has lifted. In INV (inverted) mode, the signalling injects a tone when the squelch is closed.

Using the RF Pre-Attenuator

Selecting the RF pre-attenuator to On provides a 6 dB reduced sensitivity feature to improve co-location performance where maximum sensitivity cannot be realised due to large unwanted signals.

VDL Mode 2 Settings Screen (Optional)

This is an advisory screen. Pressing OK returns the user to the previous screen.



AM-Voice Polarities Screen

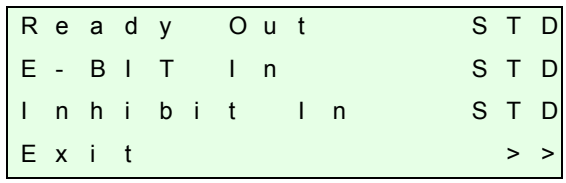
A number of remote indication and control signals can be hardwire connected to the receiver. The signals include squelch, squelch defeat, ready out, E-BIT in, inhibit in and BIT start in.

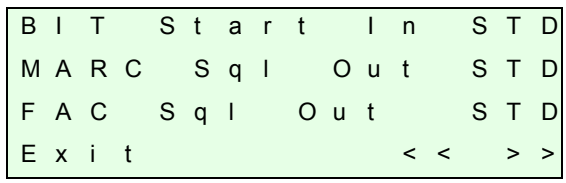
The Polarities screen is accessed from the Settings screen.

Polarity Settings

Each of the eight polarity settings applicable to AM-voice can be set to the default STD (standard) or INV (inverted) setting.

The signal connections are shown in Table 3-5 along with the conditions when STD or INV is selected.





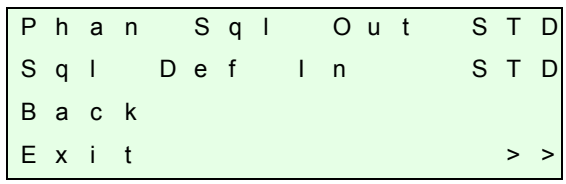
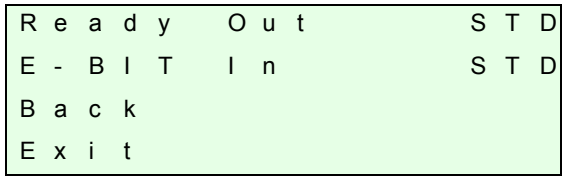


Table 3-5 AM-Voice Polarity Settings

Signal	Connector	Polarity Set to STD	Polarity Set to INV
Ready Out	Facilities, pin 13	An open collector grounded output when the radio is ready to receive and no BIT faults are detected.	An open collector high impedance output when the radio is ready to receive and no BIT faults are detected.
E-BIT In	Facilities, pin 2	TTL input. 0 V indicates an external fault.	TTL input. 5 V indicates an external fault.
Inhibit In	Facilities, pin 10	TTL input. 0 V inhibits receiver operation.	TTL input. 5 V inhibits receiver operation.
BIT Start In	Facilities, pin 11	TTL input. 0 V initiates an interruptive BIT test.	TTL input. 5 V initiates an interruptive BIT test.
Squelch signal at the MARC or MARC Audio connector (MARC Sql Out)	MARC Audio, pin 6 MARC, pin 4	Normally open relay contact that closes to give a 0 V output when the squelch circuits are defeated (aircraft calling).	Normally closed (0 V output) relay contact that opens when the squelch circuits are defeated (aircraft calling).
Squelch signal at the Facilities connector (FAC Sql Out)	Facilities, pins 5 and 6	Normally open relay contact that closes when the squelch circuits are defeated (aircraft calling). The relay contact can be configured to switch any potential between -60 V and +60 Vdc.	Normally closed relay contact that opens when the squelch circuits are defeated (aircraft calling). The relay contact can be configured to switch any potential between -60 V and +60 Vdc. The potential is superimposed on the audio lines.
Phantom squelch signal at the MARC or MARC Audio connector (Phan Sql Out)	MARC Audio, pins 1 and 2 MARC, pins 2 and 3	Phantom Squelch. Normally open relay contact that closes to connect a 0 V phantom potential to the audio lines when the squelch circuits are defeated (aircraft calling).	Phantom Squelch. Normally closed relay contact connecting a 0 V potential to the audio lines that opens when the squelch circuits are defeated (aircraft calling).
Squelch defeat input (Sql Def In)	Facilities, pin 7	TTL input. 0 V switches off the squelch circuits.	TTL input. 5 V switches off the squelch circuits.

VDL Mode 2 Polarity Settings (Optional)



The two VDL Mode 2 polarity settings can be set to the default STD (standard) or INV (inverted) setting.

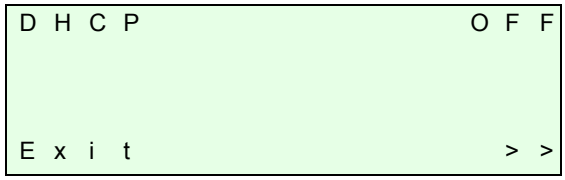
The signal connections are shown in Table 3-6 along with the conditions when STD or INV is selected.

Table 3-6 VDL Mode 2 Polarity Settings

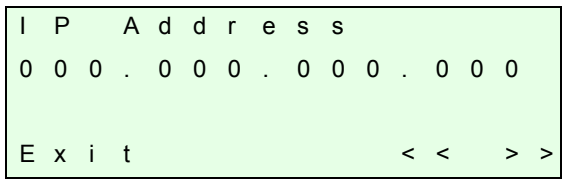
Signal	Connector	Polarity Set to STD	Polarity Set to INV
Ready Out	Facilities, pin 13	An open collector grounded output when the radio is ready to receive and no BIT faults are detected.	An open collector high impedance output when the radio is ready to receive and no BIT faults are detected.
E-BIT In	Facilities, pin 2	TTL input. 0 V indicates an external fault.	TTL input. 5 V indicates an external fault.

IP (Ethernet) Settings Screen

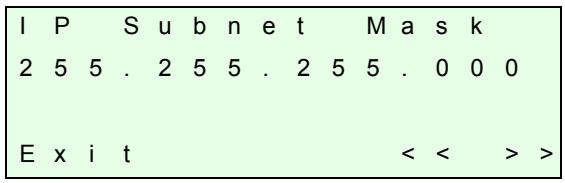
The IP (Ethernet) screen is accessed from the Settings screen.



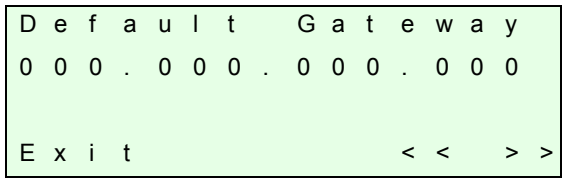
Dynamic host configuration protocol On or Off.



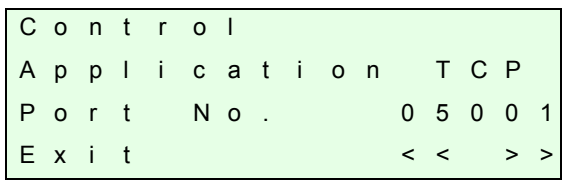
Range: 000.000.000.000 to 255.255.255.255.



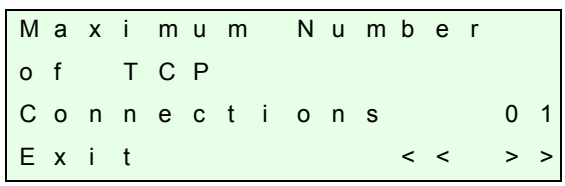
Range: 000.000.000.000 to 255.255.255.255.



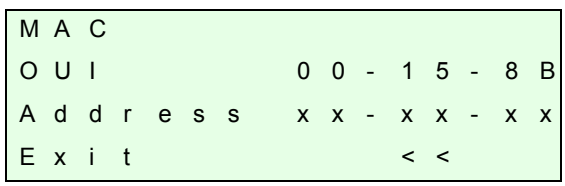
Range: 000.000.000.000 to 255.255.255.255.



Range: 00000 to 65535.



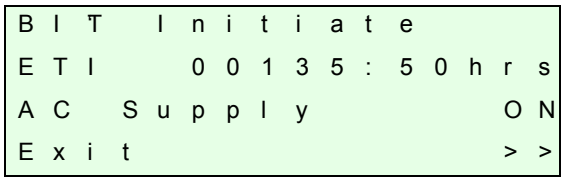
Range: 00 to 07.



The MAC address is configured during manufacture, replacing xx-xx-xx.

AM-Voice BIT Screen

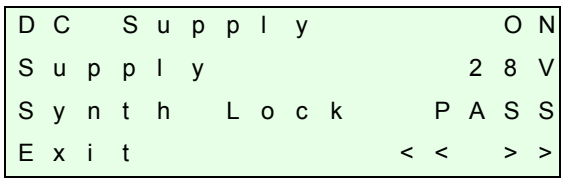
The AM-voice BIT screen is accessed from the Control screen.



Select to initiate BIT test.

Shows elapsed time 0:00 to 99999:59 (Hrs:Min).

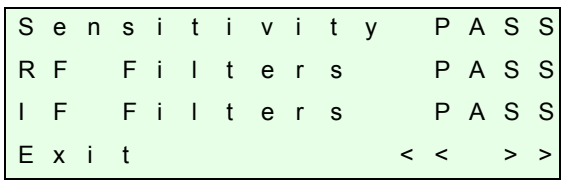
Shows state of ac supply (On or Off).



Shows state of dc supply (On or Off).

dc supply 0 to 40 V, <21.6 V Alert, <19 V Alarm.

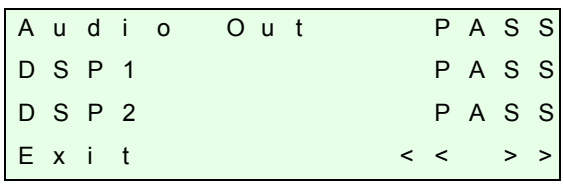
Pass or Fail (Out-of-Lock).



Pass, Fail or ? (Not Tested).

Pass, Fail or ? (Not Tested).

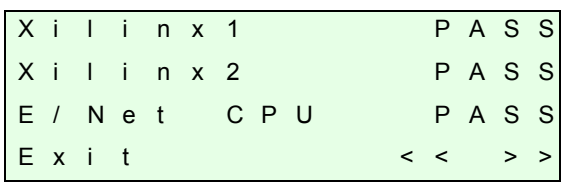
Pass, Fail or ? (Not Tested).



Pass, Fail or ? (Not Tested).

Pass, Fail or ? (Not Tested).

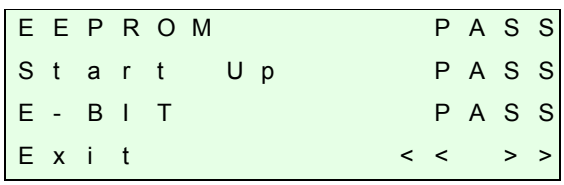
Pass, Fail or ? (Not Tested).



Pass, Fail or ? (Not Tested).

Pass, Fail or ? (Not Tested).

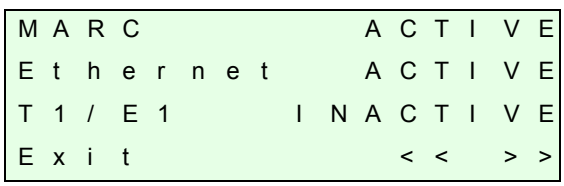
Pass, Fail or ? (Not Tested).



Pass, Fail or ? (Not Tested).

Pass, Fail or ? (Not Tested).

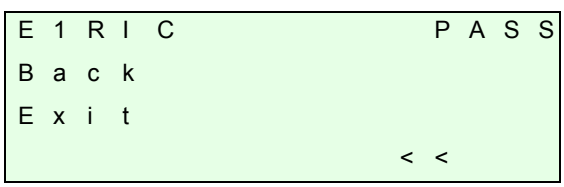
Pass or Fail.



Active or Inactive.

Active or Inactive.

Active or Inactive.



Pass or Fail.

Notes:

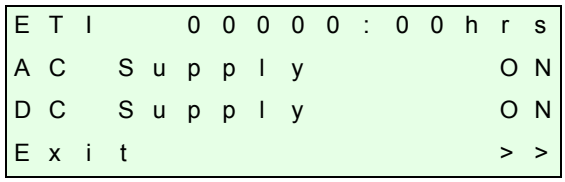
(1) When a receiver has been powered up without an T1/E1 connection, T1/E1 displays Inactive and E1RIC displays Pass.

(2) When a receiver is connected to an operational E1-RIC, T1/E1 displays Active and E1RIC displays Pass.

(3) If a connected E1-RIC fails or is disconnected, T1/E1 displays Inactive and E1RIC displays Fail.

VDL Mode 2 BIT Screen (Optional)

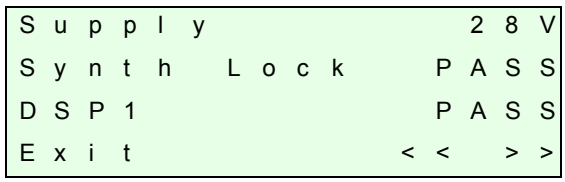
The VDL Mode 2 BIT screen is accessed from the Control screen.



Shows elapsed time 0:00 to 99999:59 (Hrs:Min).

Shows state of ac supply (On or Off).

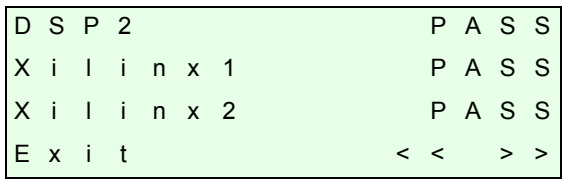
Shows state of dc supply (On or Off).



Shows value of dc supply.

Pass or Fail (Out-of-lock).

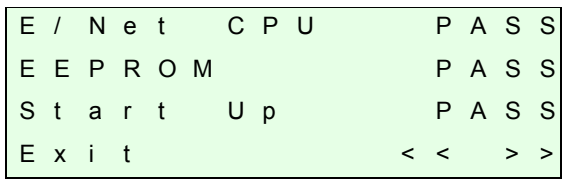
Pass or Fail.



Pass or Fail.

Pass or Fail.

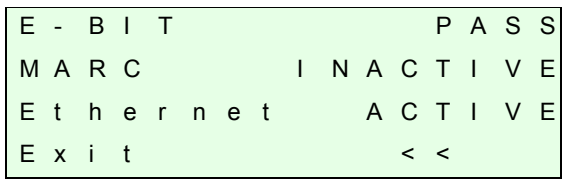
Pass or Fail.



Pass or Fail.

Pass or Fail.

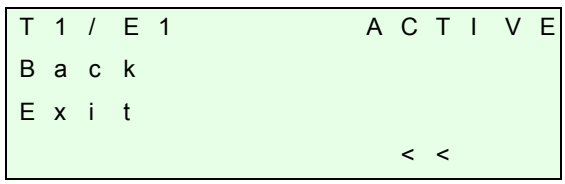
Pass or Fail.



Pass or Fail.

Active or Inactive.

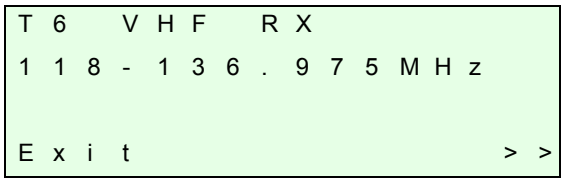
Active or Inactive.



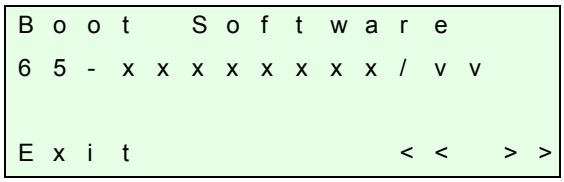
Active or Inactive.

Software Configuration Screen

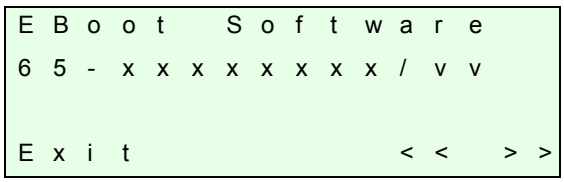
The Software Configuration screen is accessed from the Control screen.



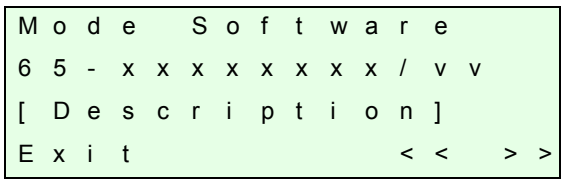
Second line variation for WB radios reads 112-155.975 MHz.



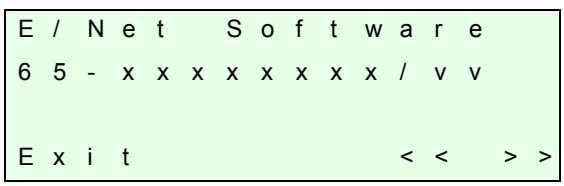
65-xxxxxxxx represents the software part number and /v v represents its version.



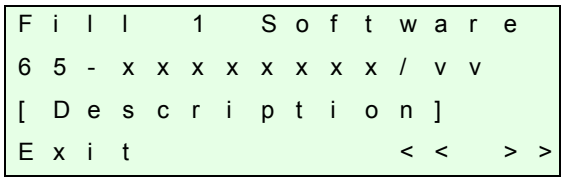
65-xxxxxxxx represents the software part number and /v v represents its version.



Current mode running. 65-xxxxxxxx represents the software part number and /v v represents its version.



65-xxxxxxxx represents the software part number and /v v represents its version.



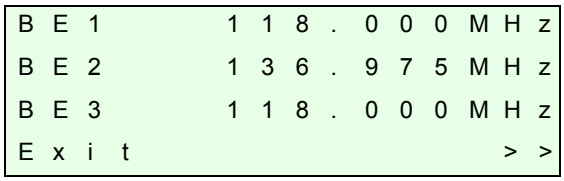
65-xxxxxxxx represents the software part number and /v v represents its version.

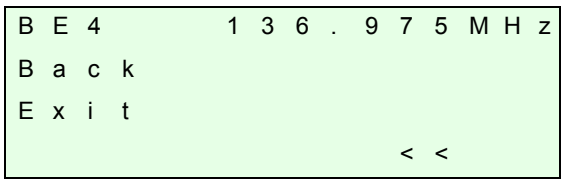
The receiver has four software fills. Fills 2, 3 and 4 screens are the same format as this example shown for Fill 1.

Band Edges

The frequency range of the receiver is 118 to 136.975 MHz for the B6100/IP/NB version, or 112 to 155.975 MHz for the B6100/IP/WB version.

If required, reception can be limited to either one or two smaller parts of the frequency band by setting the band edges BE1 to BE4. Reception is possible between BE1 and BE2 frequencies, and frequencies between BE3 and BE4.





The Band Edge screen is accessed from the Control screen.

Band edge frequencies can be set only in increments of 25 kHz.

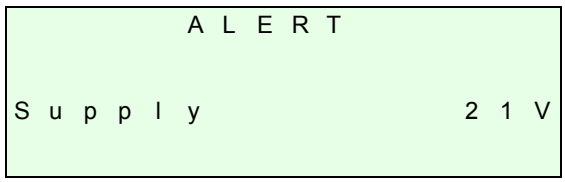
If the receiver is required to operate over the full range, the band edge parameters must be set to the lowest and highest values in the range (see Table 3-7).

Table 3-7 Band Edge Values

	BE1	BE2	BE3	BE4
B6100/IP/NB set so that the full frequency range can be received.	118.000	136.975	118.000	136.975
B6100/IP/WB set so that the full frequency range can be received.	112.000	155.975	112.000	155.975
Example: Receiver set to receive only those frequencies in the range 120 to 130 MHz.	120.000	130.000	120.000	130.000
Example: Receiver set to receive only those frequencies in the ranges 120 to 125 MHz and 130 to 135 MHz.	120.000	125.000	130.000	135.000

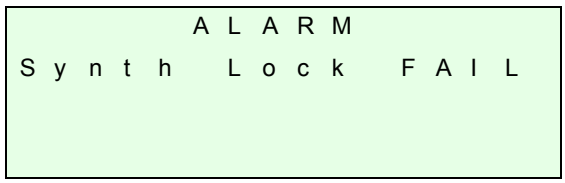
BIT Status Warning Screen

The following shows some example BIT screens. These screens alternate with the Main screen when an alert or alarm condition is present. Only the parameters causing the alert or alarm are displayed, and if both an alert and alarm condition exist simultaneously only the alarm information is displayed. If multiple parameters are signalling an alert or alarm condition, multiple screens are used to display the status alternating with the Main screen.



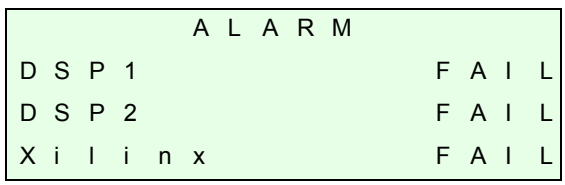
Alert:

Alarm indicator flashing.



Alarm:

Alarm indicator on
(showing a single cause of alarm).



Alarm:

Alarm indicator on
(showing multiple causes of alarm).

Table 3-8 Functions and Parameters

Function	Front Panel	VFP	MARC	T6 Controller	E1	IP	Default Setting
FREQUENCY							
Change frequency	✔	✔	✔	✔	✔	✔	118.000 MHz
FREQUENCY CHANNELS							
Store/Recall preset frequency channels	✔	✔	✔	✔	✔	✔	-
SETTINGS							
Select modulation mode	✔	✔	✔	✗	✔	✔	AM-Voice
Radio Settings (AM-Voice)							
Set audio output line level	✔	✔	✔	✗	✔	✔	-13 dBm
Set inhibit on or off	✔	✔	✔	✗	✔	✔	Off
Set squelch defeat on or off	✔	✔	✔	✔	✔	✔	Off
Set squelch threshold	✔	✔	✔	✔	✔	✔	-107 dBm
Set squelch carrier override on or off	✔	✔	✔	✗	✔	✔	Off
Set squelch noise compensation on or off	✔	✔	✔	✗	✔	✔	On
Set RF pre-attenuator on or off	✔	✔	✔	✗	✔	✔	Off
Set audio AGC on or off	✔	✔	✔	✗	✔	✔	On
Switch loudspeaker on or off	✔	✔	View State	✗	✗	View State	On
Set frequency step size (front panel step size)	✔	✔	✗	✗	✗	✗	25 kHz
Set high signal quality parameter (SQP) level	✔	✗	✗	✗	✗	✗	-80 dBm
Set squelch tone signalling on or off	✔	✔	✔	✗	✔	✔	Off
Set RRC configuration	✔	✔	✔	✗	✔	✔	Disabled
Radio Settings (Ethernet)							
DHCP on or off	✔	✔	✔	✗	✔	✔	Off
IP address	✔	✔	✔	✗	✔	✔	000.000.000.000
IP subnet mask	✔	✔	✔	✗	✔	✔	255.255.255.000
IP default gateway	✔	✔	✔	✗	✔	✔	000.000.000.000
TCP port number	✔	✔	✔	✗	✔	✔	05001
Maximum number of TCP connections	✔	✔	✔	✗	✔	✔	01

Table 3-8 Functions and Parameters (continued)

Function	Front Panel	VFP	MARC	T6 Controller	E1	IP	Default Setting
Radio Settings (VDL Mode 2)							
MAC TM1 (inter access delay)	✗	✔	✗	✗	✗	✗	4.5 ms
MAC TM2 (channel busy)	✗	✔	✗	✗	✗	✗	60 s
MAC p (persistence)	✗	✔	✗	✗	✗	✗	13/256
MAC M1 (maximum number of access attempts)	✗	✔	✗	✗	✗	✗	135
Scramble vector	✗	✔	✗	✗	✗	✗	4D4B (hex) 19787 (dec)
Set Reed Solomon decoding on or off	✗	✔	✗	✗	✗	✗	On
Set address filtering on or off	✗	✔	✗	✗	✗	✗	Off
Polarities							
Ready signal output polarity	✔	✔	View State	✗	✗	View State	STD (normally open)
Inhibit signal input polarity	✔	✔	View State	✗	✗	View State	STD
Squelch output polarity at the MARC or MARC Audio connector	✔	✔	View State	✗	✗	View State	STD (normally open)
Squelch output polarity at the Facilities connector	✔	✔	View State	✗	✗	View State	STD (normally open)
Phantom squelch output polarity	✔	✔	View State	✗	✗	View State	STD (normally open)
Squelch defeat input polarity	✔	✔	View State	✗	✗	View State	STD
BIT interruptive test input polarity	✔	✔	View State	✗	View State	✗	STD (active low)
E-bit input polarity	✔	✔	View State	✗	View State	✗	STD (active low)
Band Edges							
Set band edges	✔	✔	✗	✗	✗	✗	118.000 and 136.975 MHz or 112.000 and 155.975 MHz
Reference Frequency							
Adjust receiver's reference frequency	✔	✔	✗	✗	✗	✗	-

Table 3-8 Functions and Parameters (continued)

Function	Front Panel	VFP	MARC	T6 Controller	E1	IP	Default Setting
LCD Backlight							
Adjust LCD backlight time out	✔	✔	✗	✗	✗	✗	30 s
BIT							
Initiate BIT interruptive test	✔	✔	✔	✔	✔	✔	-
Standby							
Enter and exit the standby facility	✔	✔	✔	✔	✔	✔	Not in Standby
Software Configuration							
View the receiver's software configuration	✔	✔	✗	✗	✗	✗	-
Lock Facilities							
Front panel lock	✗	✔	✗	✗	✗	✗	Off
MARC lock	✗	✔	✗	✗	✗	✗	Off
T1/E1 lock	✗	✔	✗	✗	✗	✗	Off
IP lock	✗	✔	✗	✗	✗	✗	Off

SNMP Interface

The T6 Ethernet interface provides management ports using Simple Network Management Protocol (SNMP) as per the requirements of ED-137B Part 5. The ports are:

- Port 161 for read/write operations
- Port 162 for trap monitoring.

For integration into an SNMP system, a MIB (Management Information Base) is provided on the user documentation CD that is supplied with each radio.

Authority to access the SNMP system is performed by a community string. The community strings are “public” for read and “private” for writes, the community string for traps is “public”.

VoIP Configurator Application

The optional VoIP Configurator Application (VCA) software supplied on CD is compatible with any PC or laptop running Windows XP™, Windows Vista™ or Windows 7™. The user interface for this application is similar to the VFP. It allows the user to retrieve, save and load VoIP settings. Once these attributes and values are visible it is possible to edit parameters and update the radio. The user documentation on the CD provides instructions for its use.

Installation

Warnings and Cautions

WARNING  **Dangerous Voltage**

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

WARNING  **Dangerous Voltage**

The receiver is permanently connected to the mains supply when the mains connector is attached. Switching the rear panel Supply switch to Standby does not isolate all internal circuits from the mains supply. For this reason a mains isolating switch should be fitted close to, and easily accessible from, the receiver's position. The isolation switch should isolate both live and neutral supplies, be clearly labelled, and adequately rated to protect the equipment.

Caution  **ESDs**

The receiver's circuitry 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 Northrop Grumman, or parties authorized by Northrop Grumman, could void the user's authority to operate the equipment.

Introduction

The procedures required to install a receiver are listed in Table 4-1.

Table 4-1 Installation Procedures

Procedure		Reference
1	Read and understand the warnings and cautions given on page 4-2.	
2	Perform an initial inspection of the receiver and fit the correct ac input fuse.	page 4-10
3	Fit the receiver into an equipment cabinet (if required).	page 4-11
4	Make external signal connections. Use Fig 4-1 to Fig 4-5 as a guide.	page 4-12
5	Connect the chassis stud to the cabinet or system earth.	page 4-24
6	Connect the antenna.	page 4-24
7	Connect the dc input supply (if required).	page 4-24
8	Connect the ac input supply (if required).	page 4-25

Fuses and Connectors

The following list details the radio's supply fuses and the connectors. Some of the connectors (depending on your particular configuration) are required during installation.

Table 4-2 Fuses and Connectors

Component	Type	Park Air Part Number
Fuses:		
AC input fuse, F2, for 110 to 120 Vac input AC input fuse, F2, for 220 to 230 Vac input	T3.15A, 125V, UL T3.15A, 250V, IEC	29-01470102S 29C01100102S
DC input fuse, F1	3A size 0	29-11100202
Connectors:		
AC supply connector	IEC	20-02030102S
DC supply connector	XLR 3-pin socket	20-01030106
Antenna connector	N-type plug	19-01030301
MARC connector	9-way D-type plug	Plug: 20-01090100 Cover: 20-09090101
MARC Audio connector	RJ45 plug	20K01080100
MARC Data connector	RJ45 plug	20K01080100
Facilities connector	15-way D-type plug	Plug: 20-01150100 Cover: 20D09150101
IP connector	RJ45 plug	20K01080100
T1/E1 connector	RJ45 plug	20K01080100
Reference connector	SMB connector	19-01050300
Headset/Diagnostics connector	7-pin DIN plug	20-01070101

Configuration

Connection of external equipment depends on the configuration required. These configurations are as follows:

- Receiver configured for local operation (see Fig 4-1)
- Receiver configured for remote operation (see Fig 4-2)
- Receiver configured for use with an RSE2 (see Fig 4-3)
- Receiver configured for use with an E1-RIC (see Fig 4-4)
- Receiver Ethernet configuration (see Fig 4-5).

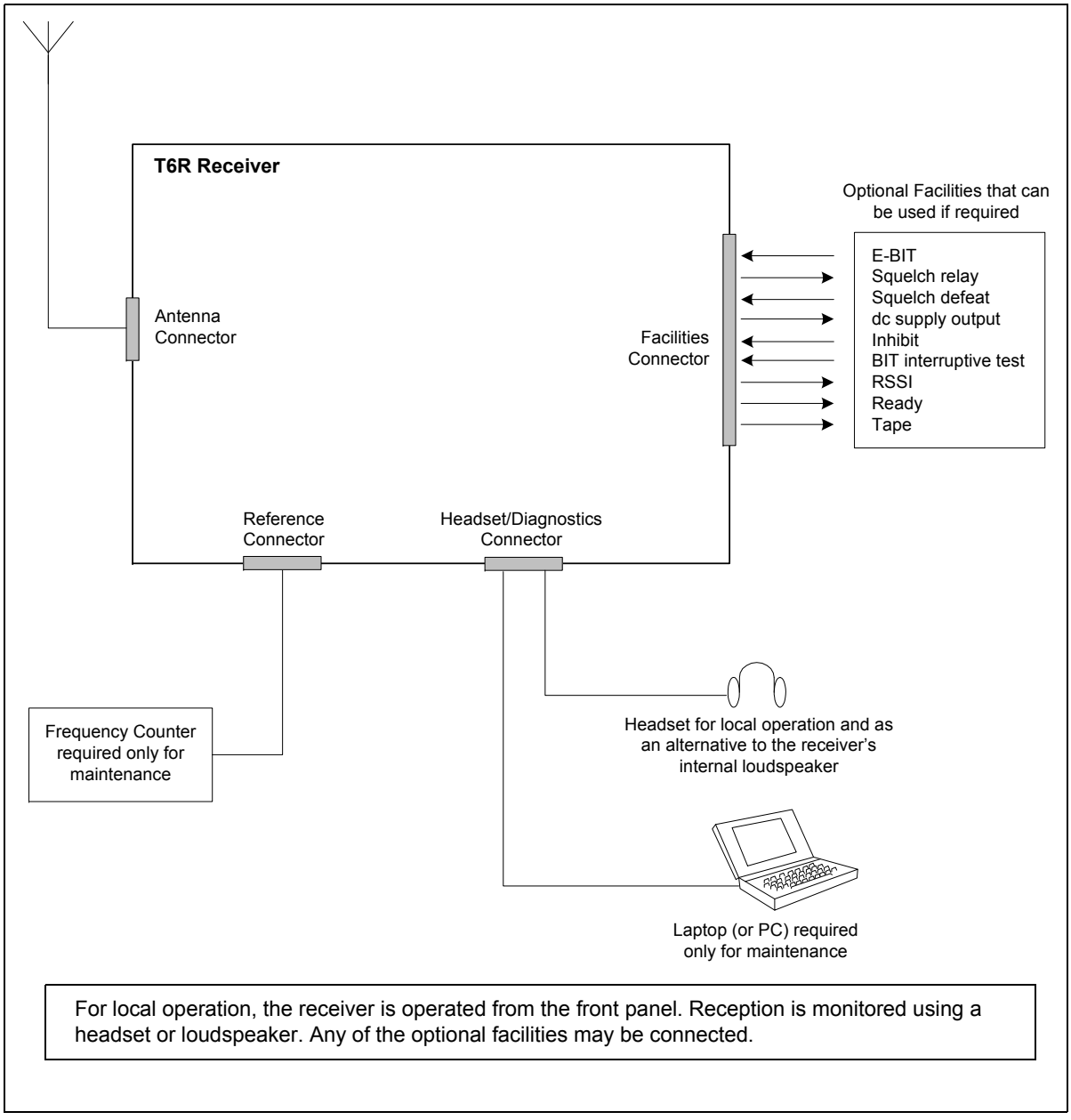


Fig 4-1 Receiver Configured for Local Operation

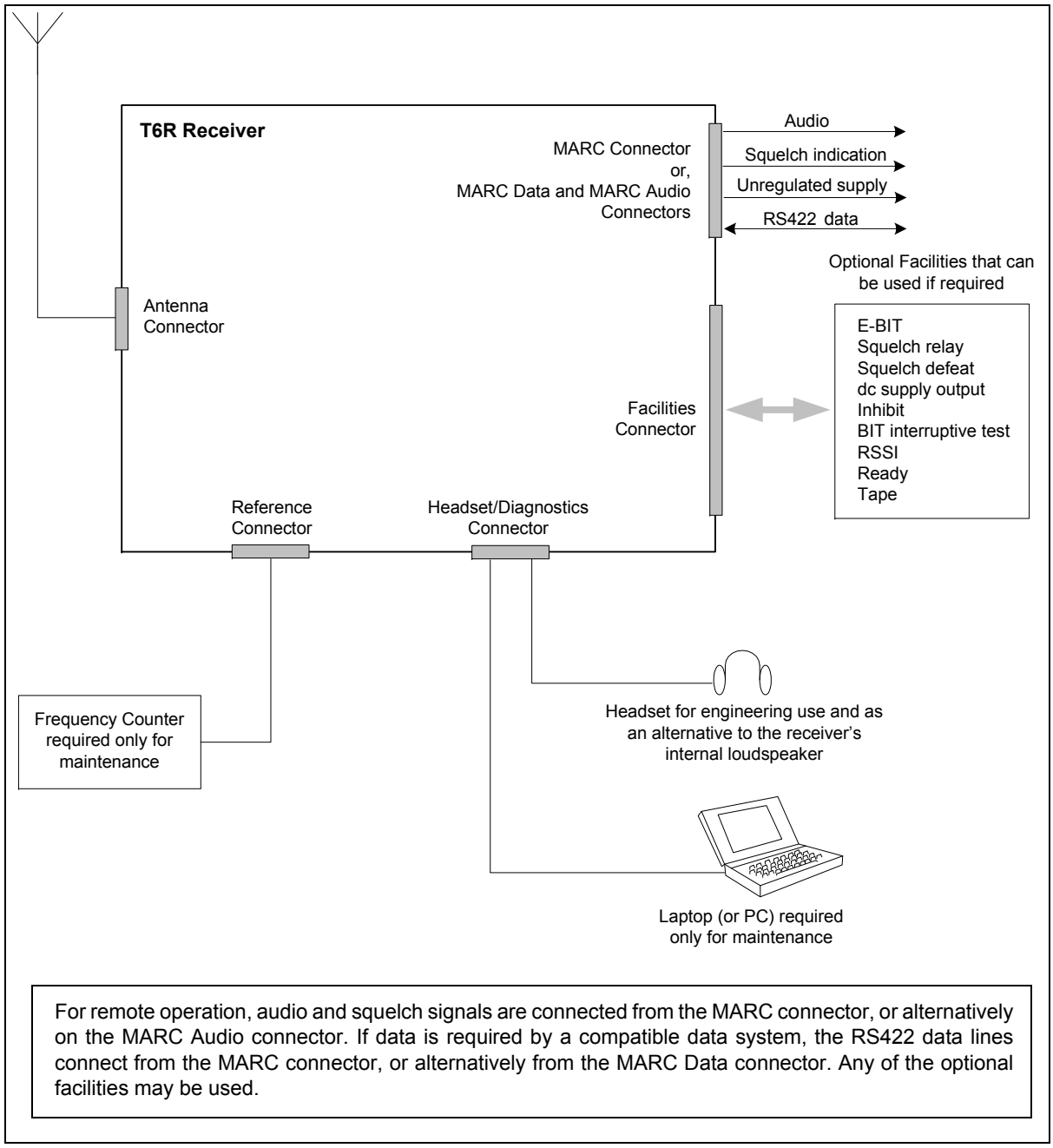


Fig 4-2 Receiver Configured for Remote Operation

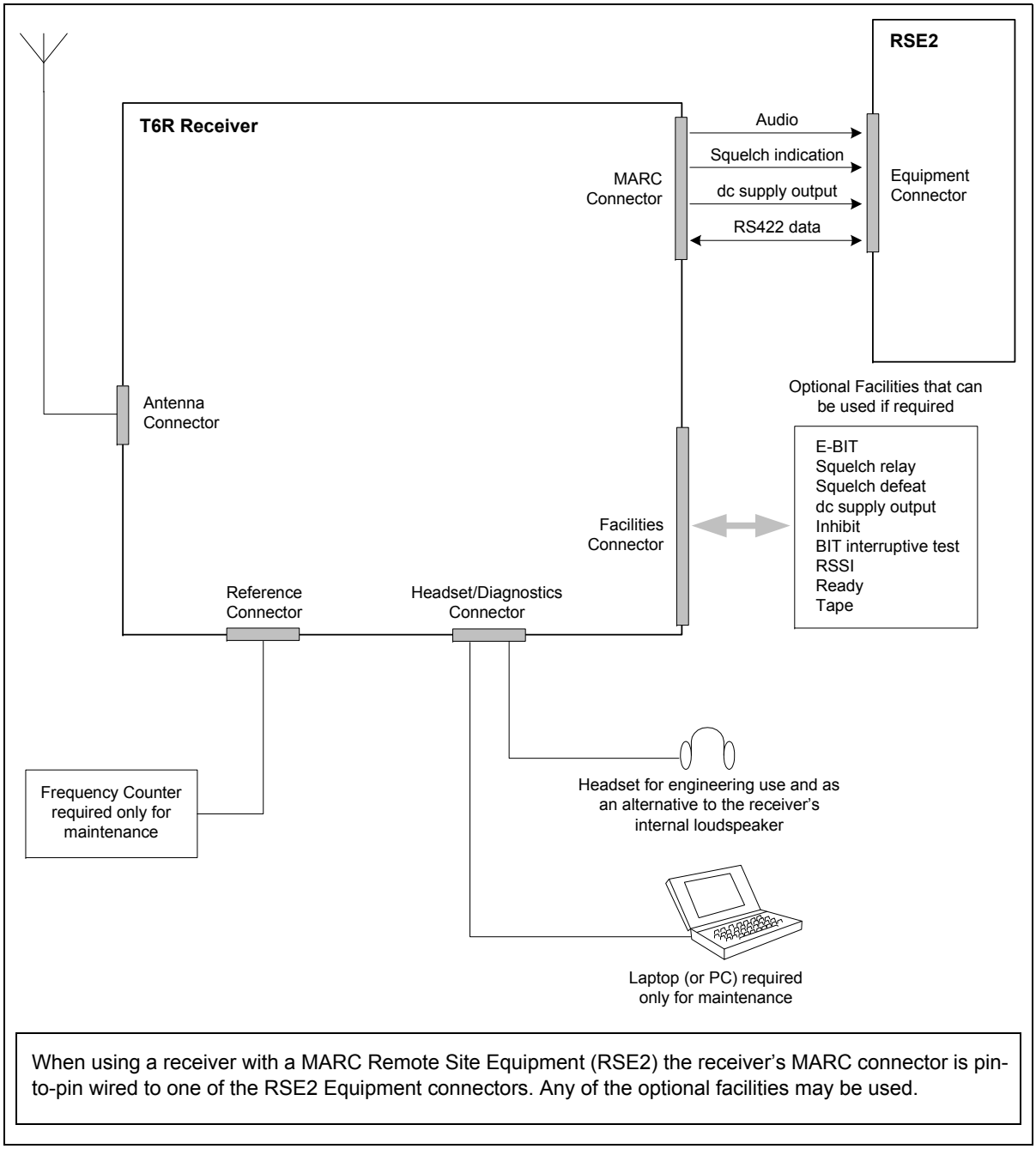


Fig 4-3 Receiver Configured for use with an RSE2

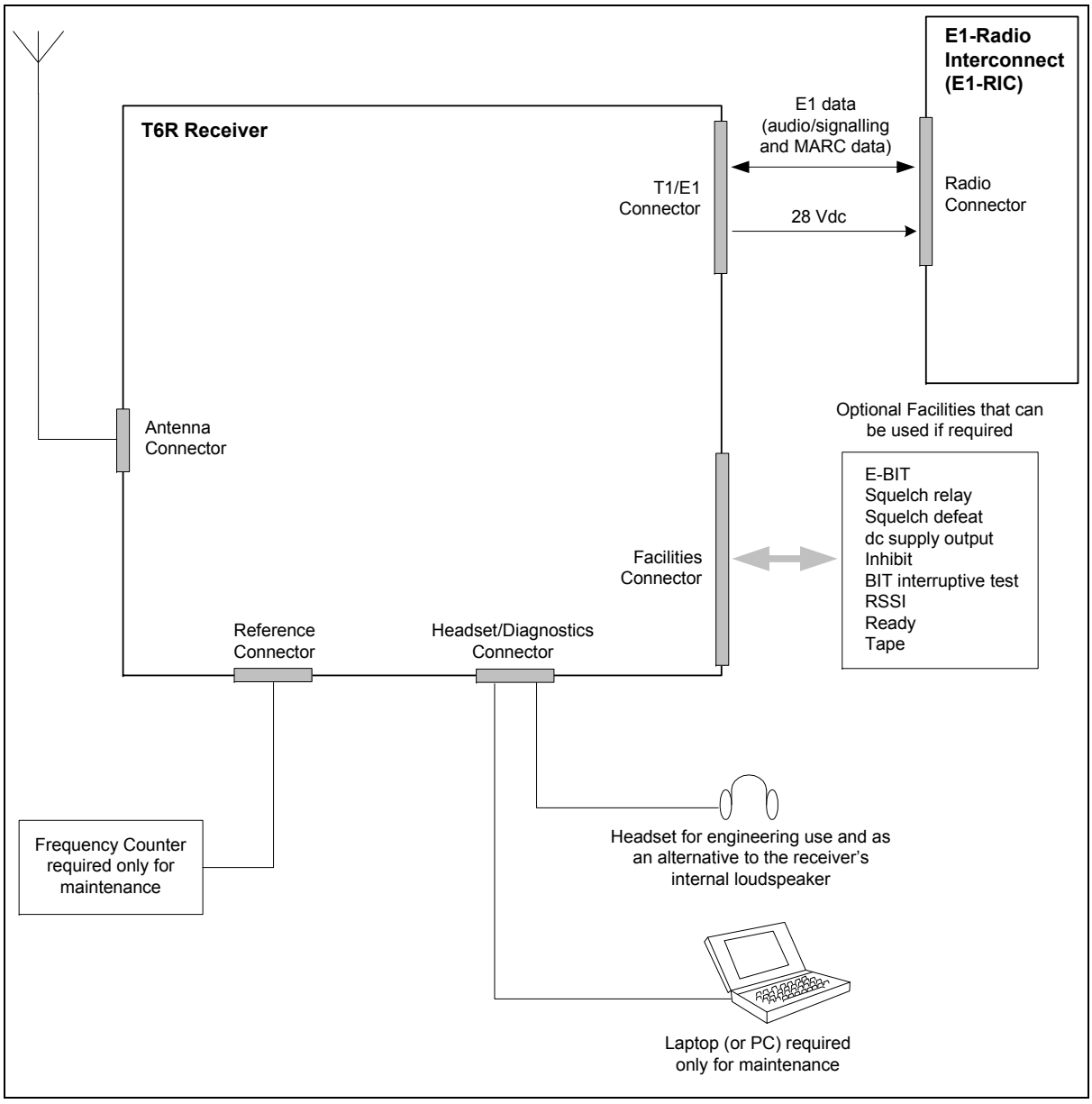


Fig 4-4 Receiver Configured for use with an E1-RIC

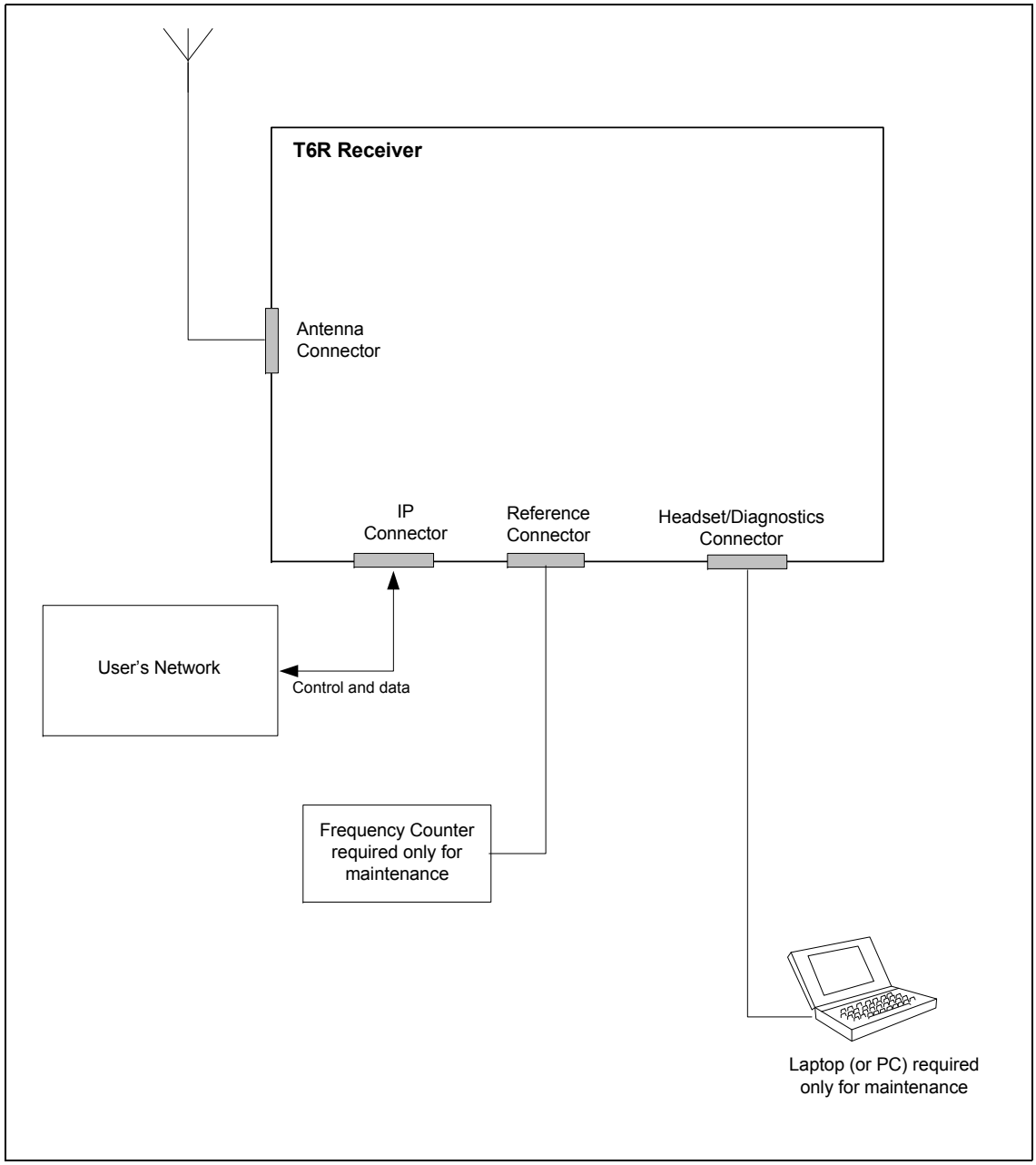


Fig 4-5 Receiver Ethernet Configuration

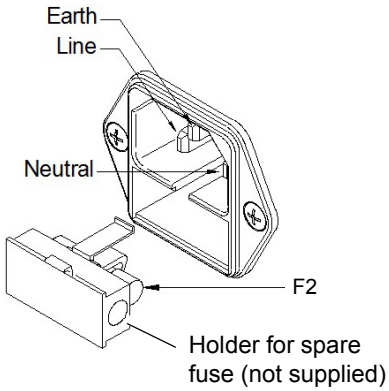
Installation Procedures

Initial Inspection of the Receiver

On receipt of the receiver, remove all transit packaging and check that there is no damage. If damage is evident, contact Northrop Grumman immediately and retain the original transit packaging. One copy of the user documentation CD is normally supplied with the receiver.

Fitting the Correct AC Input Fuse

The mains input fuse F2 is an integral part of the rear panel ac connector. The fuse type must be correct for the local mains supply as detailed below.



For a mains input in the range 110 to 120 Vac, fuse F2 should be rated T3.15A, 125V, UL.

For a mains input in the range 220 to 230 Vac, fuse F2 should be rated T3.15A, 250V, IEC.

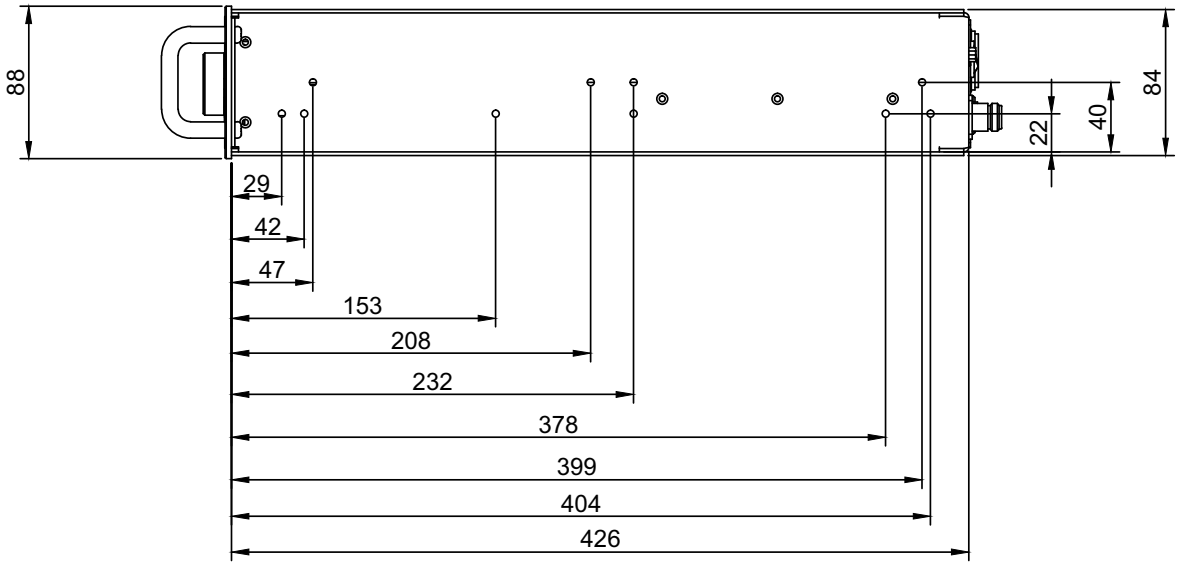
Fitting a Radio into an Equipment Cabinet

Caution **Mechanical Support**

It is essential that the chosen mechanical installation provides adequate support along the depth (front to rear) of the unit. The receiver must not be supported by the front panel; doing so can cause damage.

The receiver can be installed on telescopic slides, or on fixed runners, within a standard 483 mm (19 inch) equipment cabinet. M4 tapped holes, each 10 mm deep (see Fig 4-6) are provided on each side of the equipment to accept the slides. Details of suitable telescopic slides and fixed runners are available from Northrop Grumman.

When fitted in the cabinet, the receiver's front panel must be secured to the cabinet's chassis using four M6 x 16 mm screws and plastic washers.



All measurements in mm

Fig 4-6 Slide Fittings

Make External Signal Connections

Making the external signal connections involves configuring the receiver to suit its operational mode. Illustrations showing various configurations are shown in Fig 4-1 to Fig 4-5; these figures should be used only as a guide.

Front Panel Connectors

The front panel has two connectors; Headset/Diagnostics and Reference connectors. These are illustrated in Fig 4-7.

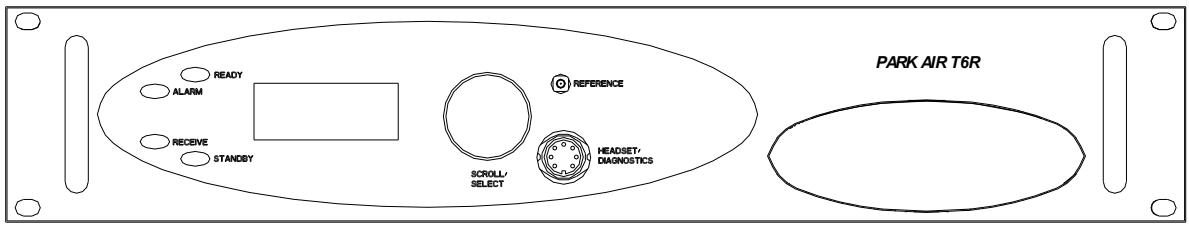
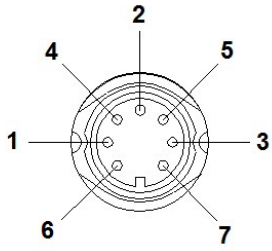


Fig 4-7 Front Panel

Headset/Diagnostics Connector

The Headset/Diagnostics connector is a self-locking 7-way DIN socket used for connecting a headset, PC or laptop. The connector pin-out is shown below and detailed in Table 4-3.



Pin-out of the Headset/Diagnostics connector looking into the mating face of the chassis mounted socket.

A suitable free plug is detailed in Table 4-2 on page 4-4.

Table 4-3 Headset/Diagnostics Connector

Pin Number	Signal	Characteristic	Usage
1	Headset ground	0 V.	Headset
2	Transmit data	RS232. 115200 baud, 8 data bits, 1 stop bit, no parity, no handshaking.	PC or laptop
3	Not connected	–	–
4	Receive data	RS232. 115200 baud, 8 data bits, 1 stop bit, no parity, no handshaking.	PC or laptop
5	Headset drive	The level is adjustable between 0 and 3 V peak-to-peak by using the volume control.	Headset
6	Not connected	–	–
7	Ground	0 V.	PC or laptop

Reference Connector

The Reference connector is an SMB plug used to monitor the radio's reference frequency. It monitors the frequency at a level of 100 mV (±50 mV) with less than -20 dBc harmonics.

Rear Panel Connectors

The rear panel connectors are shown in Fig 4-8 and detailed in Table 4-4.

Table 4-4 Rear Panel Connector Usage

Connector	Type	Usage
AC supply	IEC	Terminating the ac input supply.
DC supply	XLR 3-pin	Terminating the dc input supply.
Antenna	N-type	Terminating the antenna feeder coaxial cable.
External speaker	3.5 mm stereo jack	Connects an external loudspeaker.
MARC	9-way D-type	Used to connect to a MARC remote site equipment. Used to connect a T6 controller or hub. Used to terminate remote audio and squelch signals when a remote site equipment or T6 controller is not used.
MARC Audio	RJ45	Used as an alternative to the MARC connector for terminating remote audio and squelch signals.
MARC Data	RJ45	Used as an alternative to the MARC connector for terminating data signals to and from a compatible data system.
Facilities	15-way D-type	Provides a number of optional facilities that can be used as required.
T1/E1	RJ45	Used for connecting to a digital voice and data network. When AM-voice is selected, the T1/E1 connector automatically functions as an E1 port.
IP	RJ45	Used to connect to a 10/100 Base-T network.

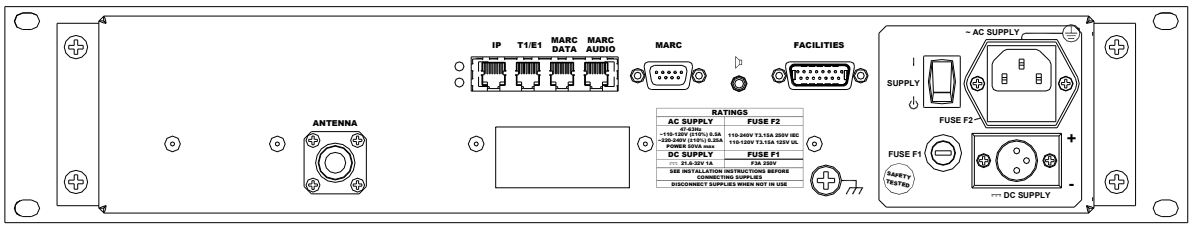


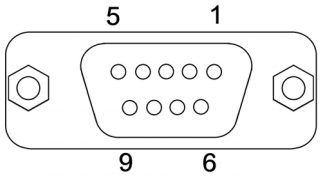
Fig 4-8 Rear Panel Connectors

MARC Connector

The MARC connector is a 9-way D-type socket used to connect the receiver to a MARC remote site equipment, or it can also be used for normal remote operation.

As an alternative to using this connector, the RJ45 style MARC Audio and MARC Data connectors can be used to provide the same functions.

The MARC connector pin-out is shown below and detailed in Table 4-5.



Pin-out of MARC connector looking into the mating face of the chassis mounted socket.

A suitable free plug is detailed in Table 4-2 on page 4-4.

Table 4-5 MARC Connector

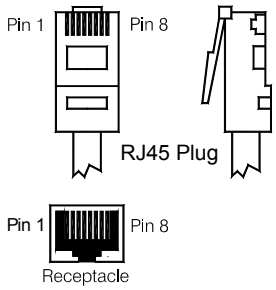
Pin Number	Signal	Characteristic
1	Ground	0 V.
2	Audio line out (+)	Balanced 600 ohm, -30 to +10 dBm. Phantom squelch (see Fig 4-9) - solid state relay, +60 to -60 Vac or dc, 200 mA maximum, configurable normally open or normally closed. Contact closure time is less than 20 ms. For squelch tone signalling see page 3-21 in the Operation topic.
3	Audio line out (-)	Pair to pin 2.
4	Squelch indication	Solid state relay, +60 to -60 Vac or dc, 200 mA maximum, configurable normally open or normally closed. Contact closure time is less than 20 ms.
5	Output supply	This output is between 21.6 and 32 V (nominally 28 V). The supply is fused at 500 mA.
6 7	Data in (+) Data in (-)	RS422 differential asynchronous data at 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.
8 9	Data out (+) Data out (-)	RS422 differential asynchronous data at 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.

Note:

The line level figures shown for the MARC and MARC Audio connectors are the limits when testing the receiver with sine wave modulation; the line level will be 10 dB above the line level setting. See the information supplied under the heading ‘Line Level Setting’ on page 3-9 in the Operation topic.

MARC Audio Connector

The MARC Audio connector is an 8-way RJ45 socket. It can be used as an alternative to the MARC connector for audio and squelch connections. The connector pin-out is shown below and detailed in Table 4-6.



Numbering is shown looking from the top of the connector.

The top is being viewed when the lever is on the bottom.

Table 4-6 MARC Audio Connector

Pin Number	Signal	Characteristic
1	Audio line out (-)	Balanced 600 ohm, -30 to +10 dBm. Phantom squelch (see Fig 4-9) - solid state relay, +60 to -60 Vac or dc, 200 mA maximum, configurable normally open or normally closed. Contact closure time is less than 20 ms. For squelch tone signalling see page 3-21 in the Operation topic.
2	Audio line out (+)	Pair to pin 1.
3	Not connected	–
4	Not connected	–
5	Not connected	–
6	Squelch indication	Solid state relay, +60 to -60 Vac or dc, 200 mA maximum, configurable normally open or normally closed. Contact closure time is less than 20 ms.
7	Ground	0 V.
8	Not connected	–

Note:

The line level figures shown for the MARC and MARC Audio connectors are the limits when testing the receiver with sine wave modulation; the line level will be 10 dB above the line level setting. See the information supplied under the heading ‘Line Level Setting’ on page 3-9 in the Operation topic.

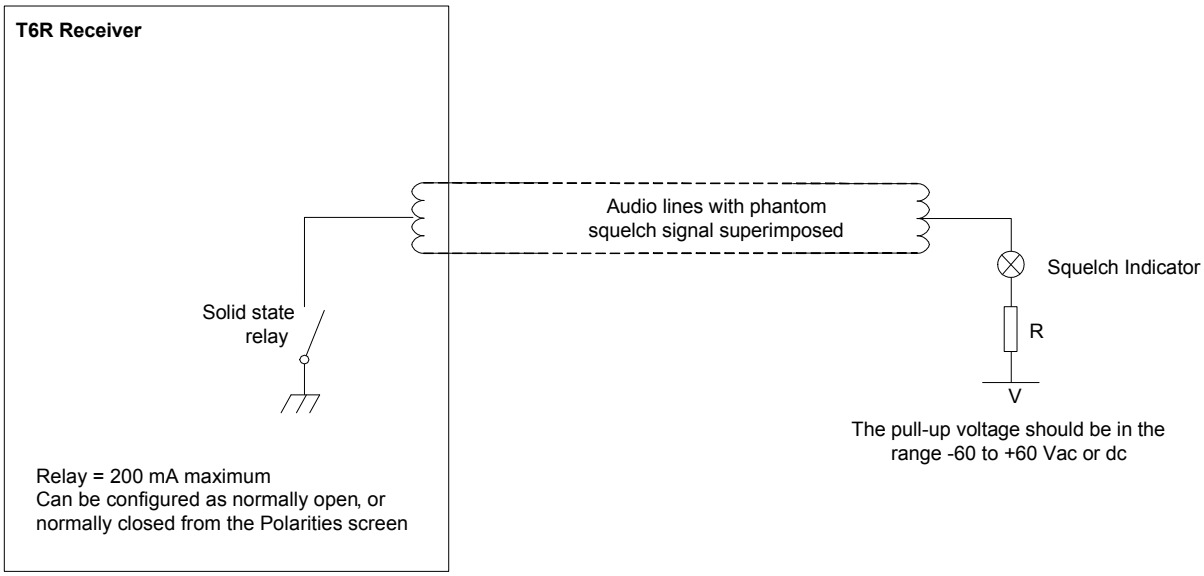
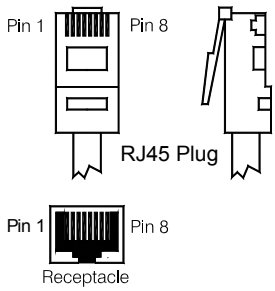


Fig 4-9 Example Use of Phantom Squelch Indication

MARC Data Connector

The MARC Data connector is an 8-way RJ45. It can be used instead of the MARC connector for data connections. The connector pin-out is shown below and detailed in Table 4-7.



Numbering is shown looking from the top of the connector.

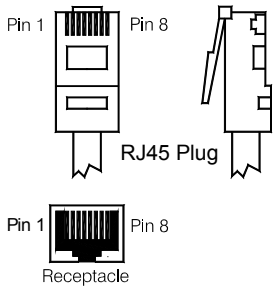
The top is being viewed when the lever is on the bottom.

Table 4-7 MARC Data Connector

Pin Number	Signal	Characteristic
1 2	Data in (-) Data in (+)	RS422 differential asynchronous data, 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.
3	Not connected	-
4 5	Data out (+) Data out (-)	RS422 differential asynchronous data, 9600 baud, 8 data bits, 1 stop bit, no parity, no handshaking.
6	Remote supply On/Off	0 V to switch off the radio. This input is pulled up to 5 V. Note: The rear panel Supply switch must be in the On position for this function to operate.
7	Ground	0 V.
8	Output supply	This output is between 21.6 and 32 V (nominally 28 V). The supply is fused at 500 mA.

T1/E1 Connector

The T1/E1 8-way RJ45 socket is used to connect to a digital voice and data network. When AM-voice mode is selected, the T1/E1 connector automatically functions as an E1 port. The connector pin-out is shown below and detailed in Table 4-8.



Numbering is shown looking from the top of the connector.

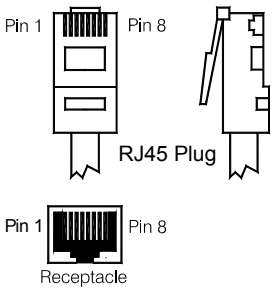
The top is being viewed when the lever is on the bottom.

Table 4-8 T1/E1 Connector Pin-Out

Pin Number	Signal	Characteristic
1	RRing	E1: balanced 120 ohm (±10%) 2.048 Mbits per second (±50 ppm) AMI/HDB3 coding. Protected with 28 V differential and common mode clamp and a 1.25 A fuse in each line.
2	RTip	
3	Not connected	-
4	TRing	E1: balanced 120 ohm (±10%) 2.048 Mbits per second (±50 ppm) AMI/HDB3 coding. Protected with 28 V differential and common mode clamp and a 1.25 A fuse in each line.
5	TTip	
6	Remote On/Off	An input that is primarily used by a Park Air E1-RIC equipment to switch the radio on and off (0 V = off, 5 V = on). For this facility to work, the radio's rear panel Supply switch must be set to On and the E1-RIC must be powered from an external source.
7	Ground	0 V.
8	20 to 35 Vdc (nominally 28 V)	Output supply used to power an E1-RIC.

IP Connector

The Internet Protocol (IP) connector is an 8-way RJ45 socket used for connecting to a 10/100 Base-T Ethernet network. The connector pin-out is shown below and detailed in Table 4-9.



Numbering is shown looking from the top of the connector.
The top is being viewed when the lever is on the bottom.

Table 4-9 IP Connector Pin-Out

Pin Number	Signal	Characteristic
1	TD +	Balanced 100 ohm, 10/100 Mbps.
2	TD –	
3	RD +	Balanced 100 ohm, 10/100 Mbps.
4	Not used	-
5		
6	RD –	Pair to pin 3.
7	Not used	-
8		

External Speaker

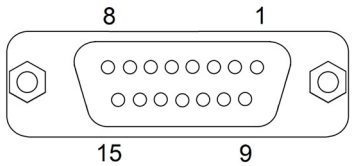
The External Speaker connector is a 3.5 mm stereo jack used for connecting an external speaker to the receiver. This speaker should be a high impedance active type. The jack plug arrangement is detailed in Table 4-10.

Table 4-10 External Speaker

Pin	Signal	Characteristic
Tip	Speaker drive (output)	0 to 3.5 V pk-pk. Connected directly to Ring.
Ring	Speaker drive (output)	0 to 3.5 V pk-pk. Connected directly to Tip.
Sleeve	Ground	0 V.

Facilities Connector

The Facilities connector is a 15-way D-type filtered socket used for connecting to associated parts of a system. The connector pin-out is shown below and detailed in Table 4-11.



Pin-out of Facilities connector looking into the mating face of the chassis mounted socket.

A suitable free plug is detailed in Table 4-2 on page 4-4.

Table 4-11 Facilities Connector

Pin Number	Signal	Characteristic
1	Ground	0 V.
2	E-BIT	An external BIT input that connects from any ancillary equipment having a compatible BIT alarm output. When this input is active, the receiver's front panel Alarm indicator flashes and an E-BIT message is displayed on the LCD. The input is TTL having a 4.7 kohm pull-up resistor to 5 V. The input is configurable from the front panel to be active high or low.
3	Not connected	-
4	Not connected	-
5 6	Squelch relay contact Squelch relay common	Pins 5 and 6 are relay contacts that operate when a signal above the squelch threshold is received. This circuit can switch voltage in the range -60 to +60 Vdc (200 mA maximum). The contacts can be configured from the front panel to be normally open, or normally closed. Contact closure time is less than 20 ms.
7	Squelch defeat	An input signal to the receiver that, when active, disables the receiver's squelch circuit. This is a TTL input pulled-up to 5 V. The active polarity is set from the front panel.
8	Ground	0 V.
9	Output supply	This output is between 21.6 and 32 Vdc (nominally 28 Vdc). The supply is fused at 500 mA.
10	Inhibit	An active input signal disables the receiver's audio output. This is a TTL input pulled-up to 5 V. The active polarity is configurable from the front panel.
11	BIT interruptive test	An input signal that initiates a BIT interruptive test. This is a TTL input pulled-up to 5 V. The active polarity of this signal is set from the front panel. The input signal must be active for a minimum of 300 ms; the signal cannot then be activated again for at least 3 seconds.
12	RSSI	An analogue Receiver Signal Strength Indication that varies between 0 volt and 10 volt. The output impedance is 10 ohm. RSSI can be used to provide relative indications when two receivers are configured as a main and standby pair, when using receiver voting, or when associated transmitter field strength monitoring is required. The output levels are detailed in Table 4-12.
13	Ready	This output is active when the radio is ready to receive and no BIT faults have been detected. It is an open collector grounding output, configurable from the front panel to be normally open, or normally closed.
14	Tape	An audio output that can be connected to a recording system. The output is 0 dBm into 600 ohm for 90% modulation depth.
15	RRC state	Used only when RRC Configuration is enabled. With RRC Configuration enabled and State active, pin 15 is low. With RRC Configuration enabled and State inactive, pin 15 is high. With RRC Configuration disabled, State is N/A and pin 15 is always high.

Table 4-12 RSSI Output

Received Signal Strength (dBm)	Voltage at the Facilities Connector Pin 12 (all voltage ±0.4 V)
-110	1.00
-100	1.75
-90	2.50
-80	3.25
-70	4.00
-60	4.75
-50	5.50
-40	6.25
-30	7.00
-20	7.75
-10	8.50
0	9.25
10	10.00

Chassis Stud Connection

WARNING **Chassis Earth**

A chassis stud is fitted to the receiver's rear panel. This stud is used to connect the equipment 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 receiver's Electromagnetic Compatibility (EMC) the chassis stud, marked ⏚ and fitted to the rear panel, 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^2. The cable should have CSA and UL1015 approval, and be connected to the chassis stud through an M6 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 2004/108/EC.

Connect the Antenna

The antenna connector is an N-type socket suitable for connecting a 50 ohm antenna.

Connect the DC Input Supply

The receiver operates from either an ac, or a dc input supply. When both ac and dc are connected, operation from the ac supply takes priority; automatic change-over to the dc supply occurs if the ac supply fails. On restoration of the ac supply, the equipment reverts to ac operation.

A dc input supply connector (see Fig 4-10) is fitted to the equipment's rear panel. The recommended minimum rating of the dc supply cable is: 2-core having a cross-sectional area of 1.5 mm^2 per core. The supply cable should be fitted with an XLR 3-pin socket (Park Air part number 20-01030106).

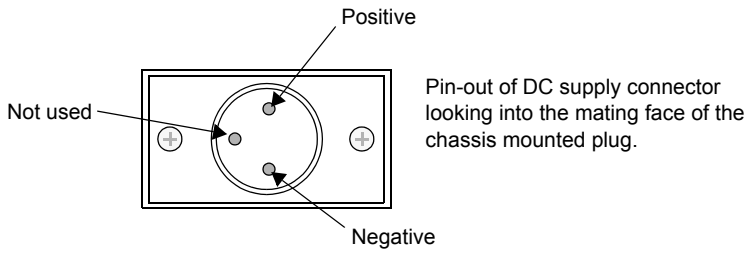


Fig 4-10 DC Supply Connector

Connect the AC Input Supply

WARNING **Dangerous Voltage**

The equipment is permanently connected to the mains supply when the mains connector is attached. Switching the rear panel Supply switch to Standby does not isolate all internal circuits from the mains supply. For this reason, a mains isolating switch should be fitted close to, and easily accessible from, the receiver'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**

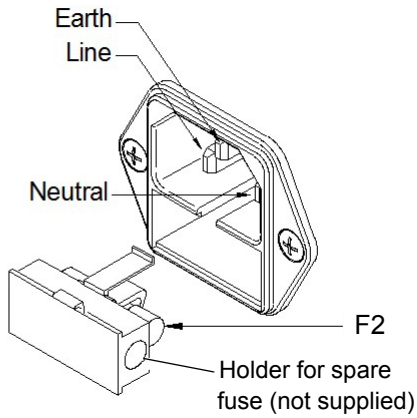
This equipment must be earthed. The earth terminal of the ac connector should be used as the safety earth.

An ac input connector is fitted to the equipment's rear panel. 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^2 per core. Northrop Grumman 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)'.

The receiver is a 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. Northrop Grumman 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 or coloured black
- The core coloured brown must be connected to the terminal that is marked with the letter L or coloured red.



Switching On

WARNING  **Dangerous Voltage**

When the Supply switch is set to the Standby position, dangerous voltage is still present in the receiver's internal power supply circuitry. To ensure safe working, the receiver must be isolated from the ac and dc input supplies.

When installation is complete, the receiver should be switched on at the rear panel 2-way rocker Supply switch. The Supply switch is used to switch on, and switch off, power to the receiver's circuitry but does not remove power from the radio.

 = On  = Standby

Under normal circumstances this screen is displayed for a few seconds when the radio is switched on.

```
T6 Digital Radio
(c)2011 Park Air
Initialising...
.............
```

The bottom row begins empty and dots are added as the initialisation progresses. When the initialisation is complete the Main screen is displayed.

Setting Up

When installation has been successfully completed the receiver must be set up using the front panel controls or the VFP.

Setting up is detailed in the Operation topic.

When setting up the receiver, pay particular attention to the Polarities of any functions that have been hardwired during installation. Failure to select the correct settings will result in incorrect operation.

Maintenance

Introduction

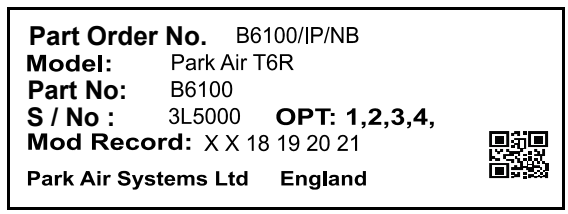
This topic gives the scheduled and unscheduled maintenance procedures applicable to the receiver and shows how to use the Virtual Front Panel (VFP).

Scheduled Maintenance	A scheduled maintenance procedure is given on page 5-3. Park Air recommends that this task be completed every twelve months.
Unscheduled Maintenance	Normally, the receiver is considered a Line Replaceable Unit (LRU) and should be replaced with a serviceable spare if a fault occurs. The faulty receiver should then be returned to Northrop Grumman for repair. In certain circumstances, Northrop Grumman Customer Support may suggest that the user changes one of the receiver's modules. Dismantling and assembly instructions are therefore given under the heading Unscheduled Maintenance starting on page 5-5.
Using the VFP (accessory)	Operating parameters can be set from the receiver's front panel, or by using the VFP. Some additional functions are available from the VFP. See page 5-14.

Hardware Configuration

The radio's hardware configuration is identified by the modification level. A modification label is fitted to the radio's rear panel showing the model of radio, the radio's part number and the radio's serial number.

The modification (Mod) record shows the configuration status. In the example shown, the radio is at Mod strike 17.



Modification Label

Replacement Modules

To ensure compatibility when replacing a radio or a module, the configuration should be the same (see the previous heading: Hardware Configuration).

Spare modules received from Northrop Grumman are supplied with a Spares Instruction that details the configuration of the module and any special instructions. If in any doubt regarding the suitability of spare modules contact Northrop Grumman Customer Support.

Scheduled Maintenance

Northrop Grumman recommends that scheduled maintenance is carried out at twelve-monthly intervals. Scheduled maintenance comprises the following checks:

Number	Check	Tools/Test Equipment Required
1	Ensure the equipment is clean and that external connectors are securely fitted.	Camel hair brush/clean lint-free cloths.
2	Check and reset (if required) the receiver's internal reference frequency.	VHF frequency counter.
3	Perform a BIT interruptive test.	
4	Perform an ac and dc change-over check (if both supplies are connected).	

Cleaning and Checking Security of Connectors

Remove all dust and dirt from the equipment's exterior using a lint-free cloth and camel hair brush. Check all external connections are secure and free from damage.

Setting the Receiver's Internal Reference Frequency

To set the receiver's internal reference frequency, use the following procedure. Note that references to the switch in the procedure mean the Scroll/Select switch.

(1) Connect a frequency counter to the front panel Reference connector.

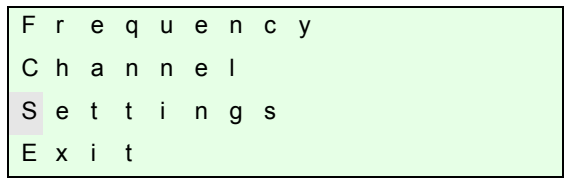
(2) From the Main screen, press the switch to display the Control screen. Turn the switch until Settings is highlighted. Press the switch.

(3) Ensure the Settings screen is displayed. Turn the switch until Ref Freq is highlighted, then press the switch.

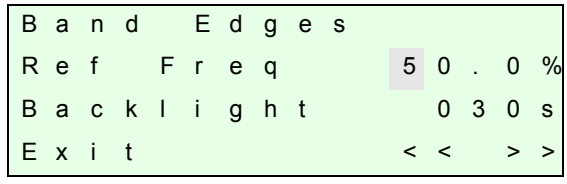
(4) With Ref Freq selected turn the switch clockwise or anti-clockwise until the frequency counter reads 20.950000 MHz ±10 Hz, then press the switch.

(5) Turn the switch clockwise until Exit is highlighted, then press the switch. You are returned to the Main screen.

(6) Disconnect the frequency counter.



Control Screen

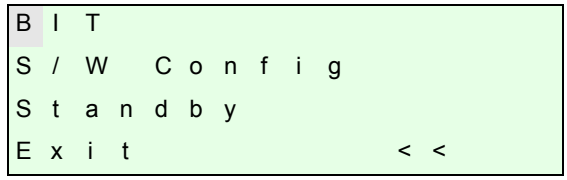


Settings Screen

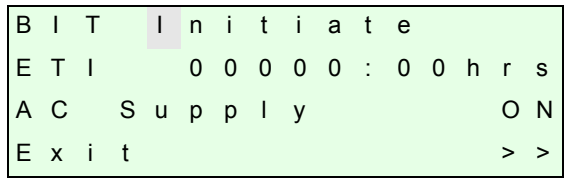
To Initiate a BIT Test

An interruptive BIT test cannot be initiated in VDL Mode 2.

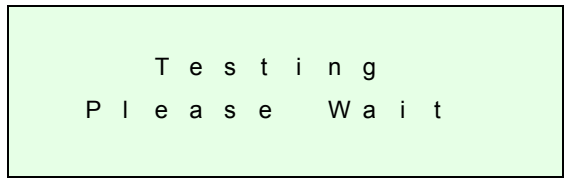
(1) From the Main screen, press the switch to display the Control screen. Turn the switch until BIT is highlighted. Press the switch.



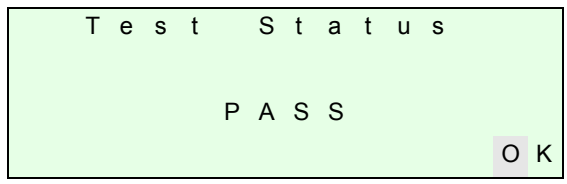
(2) Ensure the BIT menu is displayed. Turn the switch until BIT Initiate is highlighted. Press the switch.



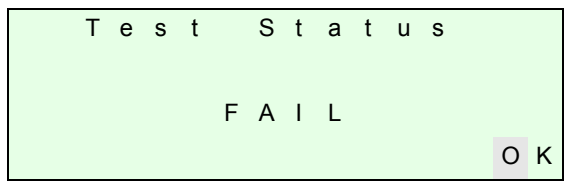
(3) During the test, which takes approximately two seconds, the Testing screen is displayed.



(4) After the test, either a Pass or Fail screen is displayed. Selecting OK takes the user back to the BIT screen.



(5) If fail is displayed, scroll through the screen to check the cause of the failure.



AC and DC Change-Over Check

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

(1) Confirm that both ac and dc supplies are connected to the receiver. Ensure that the rear panel Supply switch is set to the I (on) position.

(2) Confirm that the front panel Ready indicator is lit, the LCD is illuminated, and the receiver is operational.

(3) Switch off the ac supply from its source.

(4) Check that the receiver continues to operate correctly from the dc supply. If accessed, the front panel BIT screen will show AC Supply as off and DC Supply as on. The value of the dc supply is also shown.

Unscheduled Maintenance

WARNING  **Dangerous Voltage**

The instructions given in this topic involve working with dangerous voltage and must be carried out only by suitably qualified personnel.

When an ac supply is connected, dangerous voltage is present within the receiver. Care must be taken by personnel to avoid accidental contact with exposed circuitry during maintenance or alignment procedures.

When the Supply switch is set to the Standby position, dangerous voltage is still present in the receiver's internal power supply circuitry. To ensure safe working, the ac and dc input supplies must be disconnected from the receiver.

Caution  **ESDs**

The receiver's circuitry contains Electrostatic Sensitive Devices (ESDs). Personnel must be aware of the precautions necessary to prevent damage to such devices.

Caution  **Unauthorized Modifications**

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

Introduction

This topic provides the user with detailed instructions on the removal and replacement of modules and assemblies. When removing or refitting modules, observe antistatic handling precautions. The receiver's front and rear panels are shown in Fig 5-4 and the module interconnections are shown in Fig 5-5.

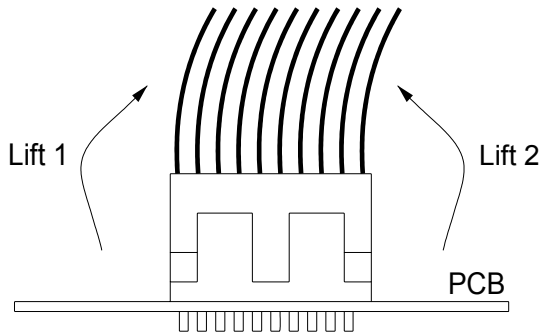
Molex KK Connectors

The receiver uses the following Molex KK connectors:

- CN7 on the PSU Regulator module
- CN3 on the Front Panel PCB.

To remove KK type connectors:

- Free the locking mechanism on the connector by moving one side of the connector up, then move the other side up (see the following diagram). The upward motion should only be as far as needed to free the locking mechanism
- DO NOT pull the cable to free the connector
- Note that KK type connectors are designed to be removed in this manner to free the locking mechanism. Do not use this procedure with non-KK type connectors as damage to the connector may occur.



Tools, Materials and Test Equipment Required

The following tools, materials and test equipment should be made available to complete the maintenance tasks described in this topic.

❑ Personal Computer (PC) ❑ General Purpose Tool Kit (including a 1.5 mm Allen Key) ❑ 5 mm Nut Spinner ❑ SMB to BNC Lead for Reference Frequency (Park Air part number 17K11000004)	❑ Camel Hair Brush ❑ Clean Lint-Free Cloths ❑ Frequency Counter ❑ VFP application (Park Air part number 70-T6000VFP) with PC to Radio Interconnection Lead (Park Air part number 17E12600001).

Removing the Top and Bottom Covers

WARNING **Dangerous Voltage**

Dangerous voltage is present within the receiver. Care must be taken by personnel to avoid accidental contact with exposed circuitry when the covers are removed and power is applied to the radio.

One top and one bottom cover screw are covered with a warranty label that should not be tampered with unless Northrop Grumman Customer Support has advised otherwise. When authorisation has been given the following procedures should be followed. Ensure that the receiver is isolated from the ac and dc input supplies.

To remove the top cover, locate and unscrew the 13 countersunk screws securing the top cover to the mainframe. Access can then be gained to the Processor module, PSU Regulator module and Power Supply.

To remove the bottom cover, locate and unscrew the 13 countersunk screws securing the bottom cover to the mainframe. Access can then be gained to the Rx RF module.

Access to the Front Panel assembly PCB requires both top and bottom covers to be removed.

Removing and Refitting the Processor Module

The Processor module is located as shown in Fig 5-6. A module removal diagram is shown in Fig 5-7.

WARNING **Dangerous Voltage**

Dangerous voltage is present within the receiver. Care must be taken by personnel to avoid accidental contact with exposed circuitry when the covers are removed and power is applied to the radio.

Removal

Before attempting to remove the Processor module, and if possible, save the radio's settings. To achieve this connect a PC, with the VFP software loaded, to the radio using the PC to radio interconnection lead (Park Air part number 17E12600001). With the VFP software active, upload the radio settings to a specified file.

Ensure that the receiver is isolated from the ac and dc input supplies. Then proceed as follows:

(1) Remove the receiver's top cover as described previously.

(2) Locate the Processor module and disconnect the following connectors:

- CN1 50-way connector (50-way ribbon cable from Rx RF module)
- CN2 SMB connector (from Rx RF module)
- CN3 14-way connector (14-way ribbon cable from PSU Regulator module)
- CN4 34-way connector (34-way ribbon cable from Front Panel module).

(3) Gain access to the rear of the receiver. Using a 5 mm nut spinner, remove the four 4-40 UNC 5 mm hex to 8 mm thread screws and wavy washers that secure the Processor module interface connectors CN5 and CN6 to the rear panel.

(4) Remove the eleven M3 x 8 mm screws that secure the module to the receiver's mainframe.

(5) Remove the module from the chassis.

Refitting

To refit the Processor module, proceed as follows:

(1) Place the module in position. Ensure no wires are trapped by the module. Ensure jumper JP2 on the module is set to 'R/TR' for receiver (see Fig 5-1).

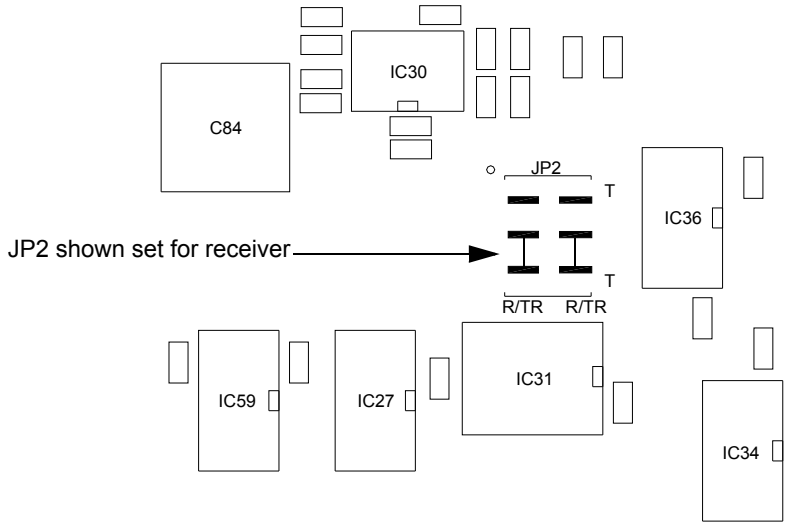


Fig 5-1 Processor Module JP2 Location

(2) Ensure the module's interface connectors CN5 and CN6 are located correctly and are aligned with the screw holes in the rear panel. Fit the four 4-40 UNC 5 mm hex to 8 mm thread screws and wavy washers, removed during the removal procedure, but leave them loose.

(3) Fit the eleven M3 x 8 mm screws, previously removed, that secure the module to the receiver's mainframe, but leave them loose.

(4) Using a 5 mm nut spinner, tighten the four 4-40 UNC 5 mm hex to 8 mm thread screws and wavy washers that secure the connectors; then tighten the eleven M3 x 8 mm screws that secure the module to the receiver's mainframe.

(5) Refit the following connectors to the module:

- CN1 50-way connector (50-way ribbon cable from Rx RF module)
- CN2 SMB connector (from Rx RF module)
- CN3 14-way connector (14-way ribbon cable from PSU Regulator module)
- CN4 34-way connector (34-way ribbon cable from Front Panel module).

(6) Re-establish the ac and/or dc supplies.

(7) Switch power on at the radio using the rear panel Supply switch.

(8) Ensure the front panel Ready indicator is lit and the Alarm indicator is unlit.

(9) If a new module has been fitted, connect the VFP PC to the radio using the PC to radio interconnection lead, Park Air part number 17E12600001 (if not already connected). Note that any module sent from Northrop Grumman as a spare for a particular radio will be programmed with compatible operating and Fill software. Northrop Grumman keeps records of module software in all radios supplied. Care must be taken when using a module removed from another radio as this module may not have compatible software.

(10) Download the saved radio settings from file using the VFP. Alternatively the settings can be edited by hand as described in the Operation topic of this document. Once entered, ensure the required settings appear in the VFP screen.

(11) Carry out a BIT interruptive test as detailed in the procedure To Initiate a BIT Test on page 5-4.

(12) Set the receiver's internal reference frequency by carrying out the procedure detailed on page 5-3.

(13) Set the rear panel Supply switch to Standby and remove the VFP connector. Isolate the receiver from the ac and/or dc supplies.

(14) Refit the receiver's top cover. The receiver can now be returned to service.

Removing and Refitting the PSU Regulator Module

The PSU Regulator module is located as shown in Fig 5-6. A module removal diagram is shown in Fig 5-8.

WARNING  **Dangerous Voltage**

Dangerous voltage is present within the receiver. Care must be taken by personnel to avoid accidental contact with exposed circuitry when the covers are removed and power is applied to the radio.

Removal

Before attempting to remove the PSU Regulator module, ensure that the receiver is isolated from the ac and dc input supplies. Then proceed as follows:

(1) Remove the receiver's top cover as described on page 5-7.

(2) Locate the PSU Regulator module and remove the three M3 x 8 mm screws that secure the module to the receiver's mainframe.

(3) Carefully raise the module to gain access to the module connectors.

(4) Disconnect the following connectors:

- CN5 10-way connector (10-way ribbon cable to Rx RF module)
- CN4 14-way connector (14-way ribbon cable to Processor module)
- CN7 3-way connector (3-wire loom to rear panel On/Off switch)
- CN2 2-way connector (2-wire loom from dc input connector on rear panel)
- CN1 4-way connector (2-wire cable from power supply)
- CN9 2-way connector (2-wire cable ac input to power supply)
- CN8 3-way connector (2-wire loom to rear panel ac input connector plus chassis connection).

(5) Remove the module from the chassis.

Refitting

To refit the PSU Regulator module, proceed as follows:

(1) While holding the module in position, connect the following connectors:

- CN8 3-way connector (2-wire loom to rear panel ac input connector plus chassis connection)
- CN9 2-way connector (2-wire cable ac input to power supply)
- CN1 4-way connector (2-wire cable from power supply)
- CN2 2-way connector (2-wire loom from dc input connector on rear panel)

- CN7 3-way connector (3-wire loom to rear panel On/Off switch)
- CN4 14-way connector (14-way ribbon cable to Processor module)
- CN5 10-way connector (10-way ribbon cable to Rx RF module).

(2) Locate the module in position. Ensure no wires are trapped by the module.

(3) Secure the module to the receiver's mainframe using the three M3 x 8 mm screws removed during the removal procedure.

(4) Re-establish the ac and/or dc supplies.

(5) Switch power on at the radio using the rear panel Supply switch.

(6) Ensure the front panel Ready indicator is lit and the Alarm indicator is unlit.

(7) Carry out a BIT interruptive test as detailed in the procedure To Initiate a BIT Test on page 5-4.

(8) Set the rear panel Supply switch to Standby. Isolate the receiver from the ac and/or dc supplies.

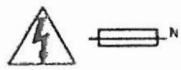
(9) Refit the receiver's top cover. The receiver can now be returned to service.

Removing and Refitting the Power Supply

The Power Supply is located as shown in Fig 5-6. A module removal diagram is shown in Fig 5-8.

WARNING  **Dangerous Voltage**

Dangerous voltage is present within the receiver. Care must be taken by personnel to avoid accidental contact with exposed circuitry when the covers are removed and power is applied to the radio.



CAUTION Double pole / neutral fusing
Double pôle / fusible sur le neuter

Only applies from Mod State 20

Removal

Before attempting to remove the power supply, ensure that the receiver is isolated from the ac and dc input supplies. Then proceed as follows:

(1) Remove the receiver's top cover as described on page 5-7.

(2) Locate the power supply and remove the four M3 x 8 mm washer screws that secure the protection screen over the power supply (if fitted).

(3) Disconnect the following connectors:

- J1 (ac connector)
- J2 (dc connector).

(4) Remove the four M3 x 30 mm hex spacers that secure the power supply to the mainframe.

(5) Remove the power supply from the receiver.

Refitting

To refit the Power Supply, proceed as follows:

(1) Locate the module in position.

(2) Ensure no wires are trapped by the module.

(3) Using the four M3 x 30 mm hex spacers, previously removed, secure the module to the receiver's mainframe.

(4) Connect the following connectors:

- J2 (dc connector)
- J1 (ac connector).

Note:
The protection screen (if removed) is no longer required with power supply (Park Air part number 69A61000065S).

(5) Re-establish the ac and/or dc supplies.

(6) Switch power on at the radio using the rear panel Supply switch.

(7) Ensure the front panel Ready indicator is lit and the Alarm indicator is unlit.

(8) Carry out a BIT interruptive test as detailed in the procedure To Initiate a BIT Test on page 5-4.

(9) Set the rear panel Supply switch to Standby. Isolate the receiver from the ac and/or dc supplies.

(10) Refit the receiver's top cover. The receiver can now be returned to service.

Removing and Refitting the Rx RF Module

The Rx RF module is located as shown in Fig 5-6. A module removal diagram is shown in Fig 5-9.

WARNING  **Dangerous Voltage**

Dangerous voltage is present within the receiver. Care must be taken by personnel to avoid accidental contact with exposed circuitry when the covers are removed and power is applied to the radio.

Removal

Before attempting to remove the Rx RF module, ensure that the receiver is isolated from the ac and dc input supplies. Then proceed as follows:

(1) Remove the receiver's bottom cover as described on page 5-7.

(2) Locate the module and disconnect the following connectors:

- CN3 50-way connector (50-way ribbon cable from Processor module)
- CN2 SMB connector (from Processor module)
- CN5 10-way connector (10-way ribbon cable from PSU Regulator module)
- CN6 RF connector (reference frequency connector from Front Panel)
- CN4 SMB connector (from rear panel Antenna connector).

(3) Remove the seven M3 x 8 mm washer screws that secure the module to the receiver's mainframe.

(4) Remove the module from the chassis.

Refitting

To refit the Rx RF module, proceed as follows:

(1) Place the module in position. Ensure no wires are trapped by the module.

(2) Fit the seven M3 x 8 mm washer screws, previously removed, that secure the module to the receiver's mainframe.

(3) Fit the following connectors:

- CN4 SMB connector (from rear panel Antenna connector)
- CN6 RF connector (reference frequency connector from Front Panel)
- CN5 10-way connector (10-way ribbon cable from PSU Regulator module)
- CN2 SMB connector (from Processor module)
- CN3 50-way connector (50-way ribbon cable from Processor module).

(4) Re-establish the ac and/or dc supplies.

(5) Switch power on at the radio using the rear panel Supply switch.

(6) Ensure the front panel Ready indicator is lit and the Alarm indicator is unlit.

(7) Carry out a BIT interruptive test as detailed in the procedure To Initiate a BIT Test on page 5-4.

(8) Set the receiver's internal reference frequency by carrying out the procedure that is detailed on page 5-3.

(9) Set the rear panel Supply switch to Standby. Isolate the receiver from the ac and/or dc supplies.

(10) Refit the receiver's bottom cover. The receiver can now be returned to service.

Removing and Refitting the Front Panel Assembly PCB

The Front Panel assembly is located as shown in Fig 5-6. An assembly PCB removal diagram is shown in Fig 5-10.

WARNING  **Dangerous Voltage**

Dangerous voltage is present within the receiver. Care must be taken by personnel to avoid accidental contact with exposed circuitry when the covers are removed and power is applied to the radio.

Removal

Before attempting to remove the Front Panel assembly PCB, ensure that the receiver is isolated from the ac and dc input supplies. Then proceed as follows:

(1) Remove the receiver's top and bottom covers as described on page 5-7.

(2) Disconnect CN4 at the Processor module. Carefully pull the cable through the aperture in the mainframe to free it.

(3) Disconnect CN6 at the Rx RF module. Remove the two ty-wraps securing the cable to the mainframe. Carefully pull the cable through the aperture in the mainframe to free it.

(4) Remove the four M3 x 8 mm countersunk screws from the top and bottom of the mainframe box section (see Fig 5-10, Diagram A).

(5) Remove the two black equipment handles by unscrewing and removing the four M5 x 16 mm panhead screws that secure them to the receiver. The front panel can now be moved forward and away from the mainframe.

(6) At the front panel, release the control knob by loosening the Allen head grub screw using a 1.5 mm Allen key. Withdraw the control knob from the spindle.

(7) Disconnect the speaker connector (CN3) from the Front Panel PCB.

(8) Remove the Front Panel PCB from the Front Panel assembly by removing the six M3 x 8 mm captive washer panhead screws (see Fig 5-10 Diagram B).

Refitting

To refit the Front Panel assembly PCB, proceed as follows:

(1) Place the PCB in position at the Front Panel assembly. Ensure the spindle of the control knob and Headset/Diagnostics connector are correctly located. Secure the PCB to the Front Panel assembly using the six M3 x 8 mm captive washer panhead screws previously removed (see Fig 5-10, Diagram B).

(2) Connect the speaker connector (CN3) to the Front Panel PCB.

(3) At the front panel place the control knob, previously removed, onto the spindle and using a 1.5 mm Allen key secure the Allen head grub screw.

(4) Secure the Front Panel assembly to the top and bottom of the mainframe box section using the four M3 x 8 mm countersunk screws previously removed. Fit the two black equipment handles, previously removed, using the four M5 x 16 mm panhead screws (see Fig 5-10, Diagram A).

(5) Route the SMB connector to CN6 on the Rx RF module (via the aperture in the mainframe assembly). Attach the cable to the mainframe using two ty-wraps.

(6) Route the ribbon cable to the Processor module connector CN4 (via the aperture in the mainframe) and connect it.

(7) Re-establish the ac and/or dc supplies.

(8) Switch power on at the radio using the rear panel Supply switch.

(9) Ensure the front panel Ready indicator is lit and the Alarm indicator is unlit.

(10) Carry out a BIT interruptive test as detailed in the procedure To Initiate a BIT Test on page 5-4.

(11) Set the rear panel Supply switch to Standby. Isolate the receiver from the ac and/or dc supplies.

(12) Refit the receiver's top and bottom covers. The receiver can now be returned to service.

Virtual Front Panel (VFP)

The optional Virtual Front Panel (VFP) software supplied on CD (Park Air part number 70-T6000VFP) is compatible with any PC or laptop running Windows XP™, Windows Vista™ or Windows 7™. The VFP allows changes to a radio's settings and channel information, it displays the current BIT state, displays BIT history, allows security locks to be set, and provides maintenance facilities.

A radio can be set up using the front panel Scroll/Select switch and LCD, or by using the VFP. Using the VFP has several advantages over setting the receiver from the front panel; these are:

- A profile of the receiver's operation settings and channel information can be created, stored on disk, and then recalled to download into other receivers
- A printout of the receiver's profile can be made from the VFP
- Front Panel Lock is available only when using the VFP. As part of the receiver's Settings (see typical screen display shown below), Front Panel Lock can be set to ON. When selected to on, no settings or frequency information can be changed from the front panel
- If the receiver is part of a MARC system or operates in a digital mode, a MARC Lock and T1E1 Lock are available when using the VFP. When selected to on, no settings or frequency information can be changed from the MARC equipment screen, or the digital control equipment.

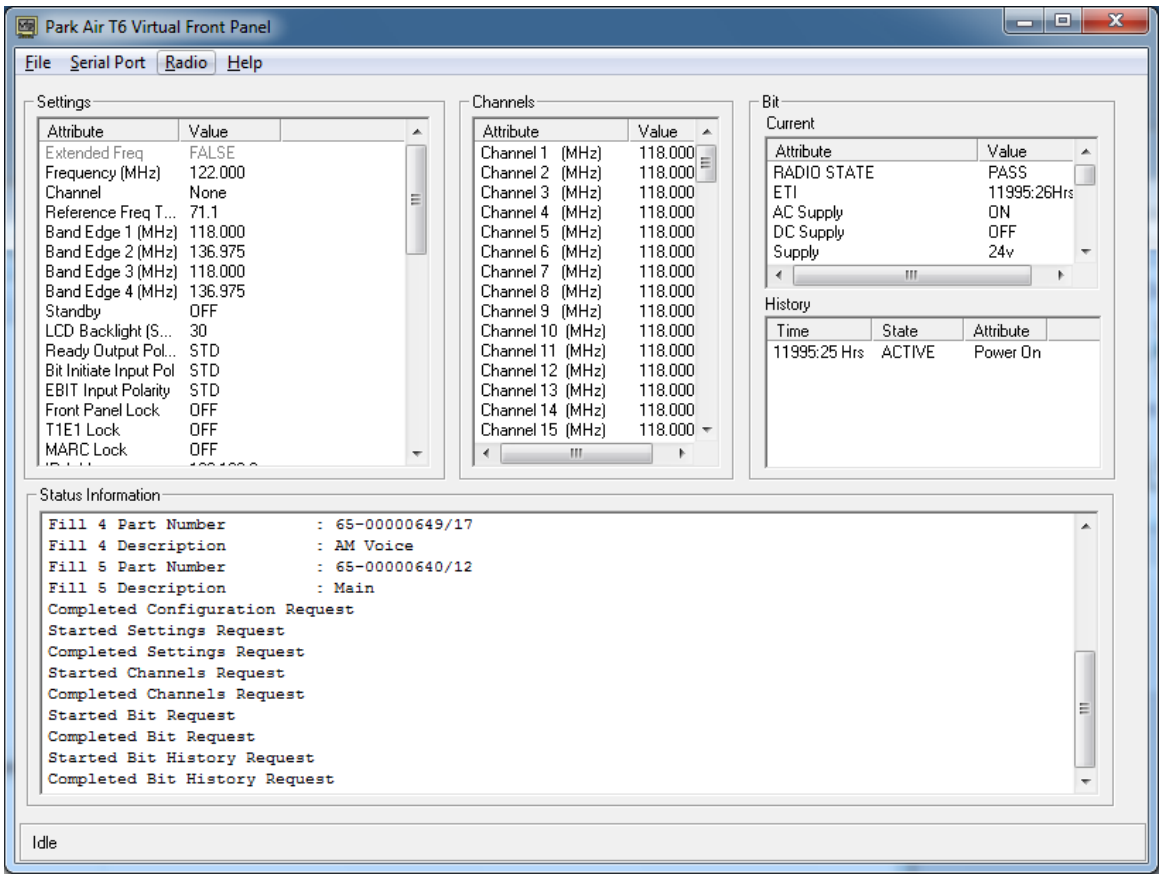


Fig 5-2 Typical VFP Screen - AM-Voice Profile Shown

Installing the VFP Software

The VFP software is supplied by Northrop Grumman on CD (Park Air part number 70-T6000VFP). The software can be run from the Main page or installed on your PC via Explorer.

To install the software onto your PC:

(1) Using explorer, display the contents of the CD supplied by Northrop Grumman. Identify the file named S0473Vxx.EXE (where xx is the version number).

(2) Using the mouse, right click on the file and then select *Copy*.

(3) Display the Windows desktop. Right click anywhere on the desktop and select *Paste*.

(4) Check that the VFP icon is shown on the desktop. Reposition the icon as required. The VFP application is now installed on the PC's desktop.

VFP Icon

VFP Features

The VFP screen is divided into four main windows: Settings, Channels, BIT and Status Information. Four colours are used to display text. The colours have the following meanings:

- Black indicates a valid parameter that has been accepted by the radio
- Red indicates an invalid parameter that has been rejected by the radio, or a BIT failure
- Green indicates text that has not yet been downloaded to the radio. Text loaded into the VFP from a previously stored file, or any text that is manually amended is green until it is downloaded into the radio; after being downloaded into the radio the text changes to black, or if it is invalid, to red
- Blue indicates Help text and is shown in the Status Information window.

The Menu-Bar

The menu-bar has four categories: File, Serial Port, Radio and Help.

File	Has the sub-categories: Open, Save and Print. These sub-categories allow the user to open previously saved profiles, save a new profile, or print a profile. A special sub-category: File > Save > Diagnostics should be used only when advised by Northrop Grumman.
Serial Port	Opens the Serial Port Settings dialogue box. Before the VFP can be used, the appropriate Com Port (1 to 99) must be selected to correspond with the PC's Com Port used for the radio connection.
Radio	Has the sub-categories: Retrieve, Send, Calibrate and Test. [Note that Calibrate is non-functional for receivers.] These sub-categories allow a radio's profile to be loaded into the VFP, allow a profile to be downloaded from the VFP to a radio, calibrates a radio (not receivers) and initiates a BIT test.
Help	Provides detail about the VFP software.

Settings Window
This window lists all attributes that can be adjusted by the user. If any individual attribute is clicked on using the mouse, help information is displayed in the Status Information window showing the range of adjustment for that attribute. Click on the value and use the keyboard to amend it; press Enter to confirm the new value noting that the amended text is green until it is downloaded into the radio.

Any invalid parameters are not indicated until the Settings are downloaded to the radio. It is the radio that rejects invalid parameters, not the VFP.

The receiver's reference frequency setting is displayed in the window. Adjusting the reference frequency is a maintenance operation that requires external test equipment to be connected. The value shown in the Settings window should not be changed; instead, adjustment of the reference frequency should be performed using the radio's front panel controls as detailed on page 5-3.

Channels Window
Up to 100 preset channels can be stored in the radio. These are listed in the Channels window. Any channel frequency can be amended by clicking on the value to amend it and pressing Enter to confirm the new value. Note that the amended channel is green until it is downloaded into the radio.

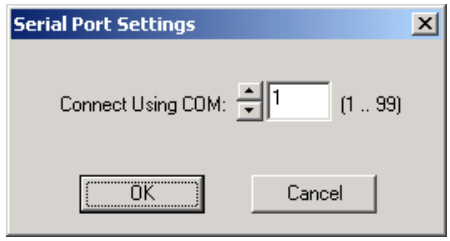
Any invalid frequencies are not indicated until the Channels are downloaded to the radio. It is the radio that rejects invalid frequencies, not the VFP.

BIT Window
Two lists of information are presented. The current BIT status and the BIT history. The BIT history shows the last 100 entries.

Status Information Window
The Status Information window gives information regarding the type of radio, the software fills, recent VFP actions and Help information.

Serial Port Error Message
When the VFP application is started it attempts to open Com 1 as a default selection. If this is not possible an error box is displayed.

A valid serial port can be selected from the Serial Port Settings box.



To Change the Receiver's Profile or Save a Profile

(1) Using a PC to radio interconnection lead, Park Air part number 17E12600001, connect the radio's front panel Headset/Diagnostics connector to the PC's Com Port (note which Com Port is used).

(2) Run up the VFP software and check that a blank VFP screen (Fig 5-3) is displayed.

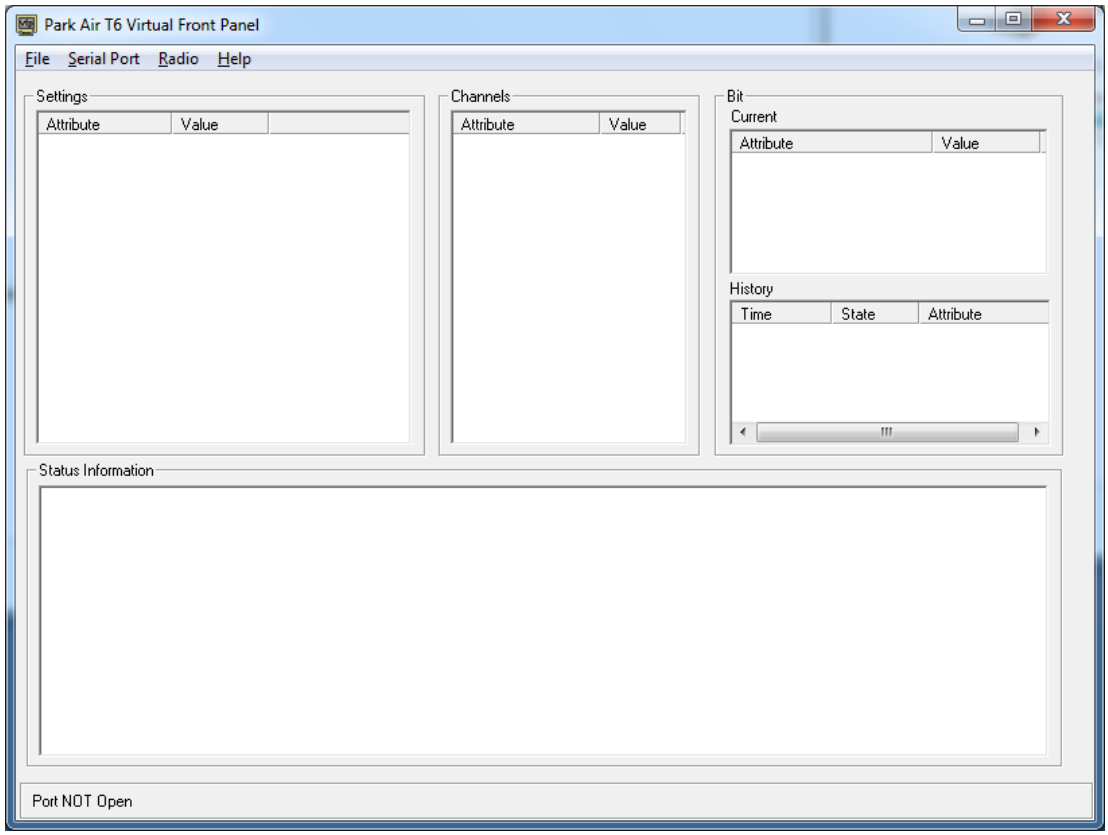


Fig 5-3 Blank VFP Screen

(3) At the menu-bar, click on *Serial Port* and select *Com 1* to *Com 99.* The selection must correspond to the port used to connect to the radio.

(4) Load the required information from the radio, or from a stored file. The required information can be radio settings, frequency channels, BIT information, or all of these.

To load a previously stored file, select *File* > *Open* > *All*
or, *File* > *Open* >*Settings*
or, *File* > *Open* > *Channel*
or, *File* > *Open* > *BIT*

To load information from the radio, select *Radio* > *Retrieve* > *All*
or, *Radio* > *Retrieve* > *Settings*
or, *Radio* > *Retrieve* > *Channel*
or, *Radio* > *Retrieve* > *BIT*

(5) If required, amend any radio Settings or Channel information.

(6) Download the radio's profile as shown on the VFP screen to either the radio, or to a file.

To download into the radio, select *Radio* > *Send* > *All*
or, *Radio* > *Send* > *Settings*
or, *Radio* > *Send* > *Channel*

To download to a file, select *File* > *Send* > *All*
or, *File* > *Send* > *Settings*
or, *File* > *Send* > *Channel*
or, *File* > *Send* > *BIT*

(7) Check that after downloading to a radio, no invalid parameters are returned (such parameters are displayed as red text). If there are invalid parameters, amend them and then repeat the download.

(8) When there is no further requirement for using the VFP, exit the VFP software and disconnect the radio from the PC.

To Initiate a BIT Test

(1) Using a PC to radio interconnection lead, Park Air part number 17E12600001, connect the radio's front panel Headset/Diagnostics connector to the PC's Com Port (note which Com Port is used).

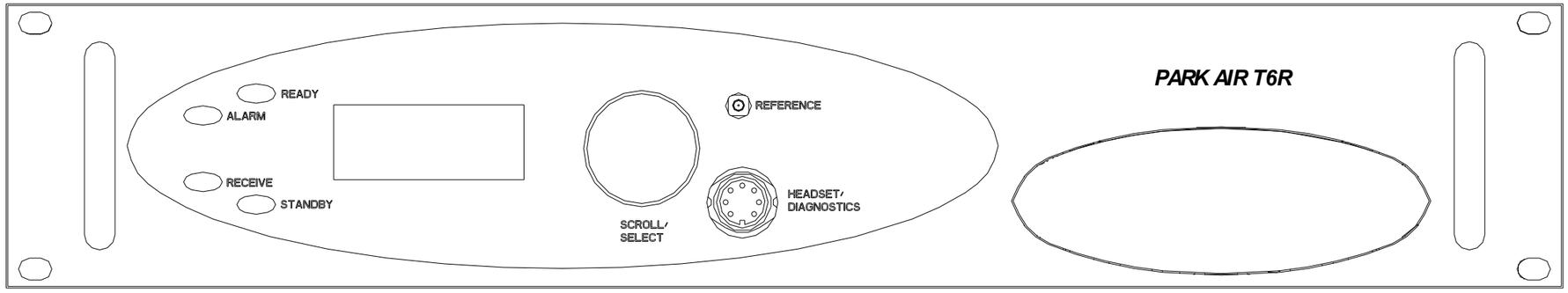
(2) Run up the VFP software and check that a blank VFP screen is displayed.

(3) At the menu-bar, click on *Serial Port* and select *Com 1* to *Com 99*. The selection must correspond to the port used to connect to the radio.

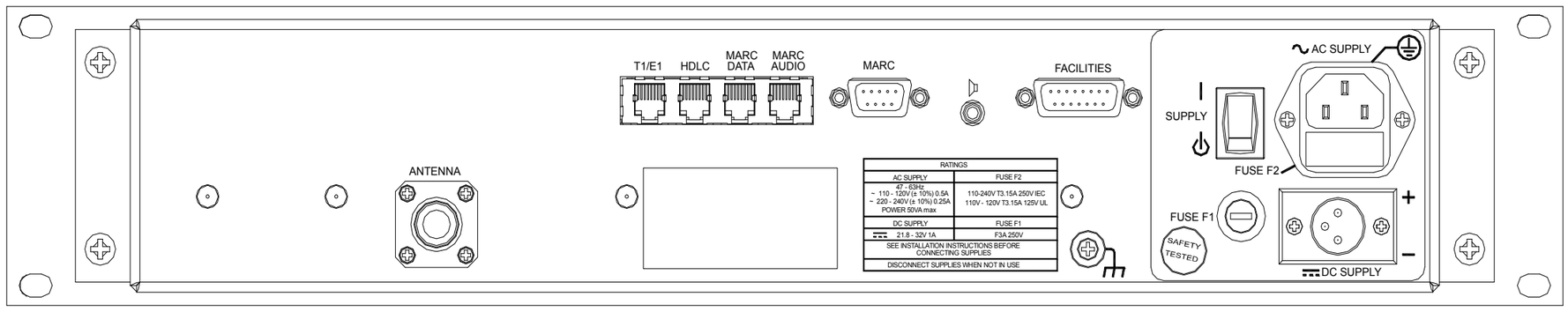
(4) At the menu-bar select *Radio* > *Test*.

(5) An interruptive BIT test now takes place. The results are displayed in the BIT window.

(6) When there is no further requirement for using the VFP, exit the VFP software and disconnect the radio from the PC.



Front View



Rear View

Fig 5-4 T6R Receiver Front and Rear Panels

Connections		Name	Characteristic
Processor	Front Panel		
CN4-1	CN1-1	LED Alarm	Open collector (5mA)
CN4-2	CN1-2	LED Ready	Open collector (5mA)
CN4-3	CN1-3	LED Standby	Open collector (5mA)
CN4-4	CN1-4	LED Rx	Open collector (5mA)
CN4-5	CN1-5	LCD RS	TTL
CN4-6	CN1-6	LCD R/W	TTL
CN4-7	CN1-7	LCD Enable	TTL
CN4-8	CN1-8	Data 0	TTL
CN4-9	CN1-9	Data 1	TTL
CN4-10	CN1-10	Data 2	TTL
CN4-11	CN1-11	Data 3	TTL
CN4-12	CN1-12	Data 4	TTL
CN4-13	CN1-13	Data 5	TTL
CN4-14	CN1-14	Data 6	TTL
CN4-15	CN1-15	Data 7	TTL
CN4-16	CN1-16	LCD Backlight	Open collector (200mA)
CN4-17	CN1-17	Transmit Data	RS232
CN4-18	CN1-18	+5 V Supply	+5 V
CN4-19	CN1-19	Receive Data	RS232
CN4-20	CN1-20	-5 V Supply	-5 V
CN4-21	CN1-21	Ground	0 V
CN4-22	CN1-22	+15 V Supply	+15 V
CN4-23	CN1-23	Ground	0 V
CN4-24	CN1-24	LED RX (not used)	Open collector (5mA)
CN4-25	CN1-25	Turn +	5 V pull-up
CN4-26	CN1-26	Turn -	5 V pull-up
CN4-27	CN1-27	Push	5 V pull-up
CN4-28	CN1-28	Mic PTT (not used)	0 V=PTT,5 V pull-up=PTT
CN4-29	CN1-29	Ground	0 V
CN4-30	CN1-30	Sidetone (Headset Drive)	3 Vac pk-pk
CN4-31	CN1-31	Loudspeaker Amp Drive	2V p-p maximum
CN4-32	CN1-32	Ground	0V
CN4-33	CN1-33	Mic Input (input)	1.6V p-p maximum
CN4-34	CN1-34	Ground	0V

Connections			Name	Characteristic
Front Panel	Headset/ Diagnostics			
CN2-1	MD-1		Ground - Microphone	0 V
CN2-2	MD-2		Transmit Data	RS232
CN2-3	MD-3		MIC PTT	n/c
CN2-4	MD-4		Receive Data	RS232
CN2-5	MD-5		Sidetone (Headset Drive)	3 Vac pk-pk, 200R
CN2-6	MD-6		Microphone Input	n/c
CN2-7	MD-7		Ground	0 V

**

Connections		Name	Characteristic
Processor	MARC Port		
CN6-1	1	Ground	0 V
CN6-2	2	Line Out+	+20 dBm to -20 dBm 600R
CN6-3	3	Line Out-	+20 dBm to -20 dBm 600R
CN6-4	4	Squelch Output	Grounding output +/- 60V, 200mA max.
CN6-5	5	Unregulated Supply	Fused 500mA, 21.6 to 32 V
CN6-6	6	Data RX B - Data In +	RS422
CN6-7	7	Data RX A - Data In -	RS422
CN6-8	8	Data TX B - Data Out +	RS422
CN6-9	9	Data TX A - Data Out -	RS422

* CN7A

Pin Number	Name	Characteristic
1	TD+	100R 10/100Mbps
2	TD-	
3	RD+	
4	Not Used	
5	Not Used	
6	RD-	100R 10/100Mbps
7	Not Used	
8	Not Used	

* CN7C

Pin Number	Name	Characteristic
1	Data Rx A (Data In -)	RS 422
2	Data Rx B (Data In +)	RS 422
3	n/c	
4	Data Tx B (Data Out +)	RS 422
5	Data Tx A (Data Out -)	RS 422
6	Remote Supply On/Off	
7	Ground	0V
8	Unregulated Supply	21.6V to 32V

* CN7B

Pin Number	Name	Characteristic
1	RRING	ANSI T1.403-1995 (T1), ITU-T: G.703 (E1)
2	RTIP	
3	n/c	
4	TRING	ANSI T1.403-1995 (T1), ITU-T: G.703 (E1)
5	TTIP	
6	n/c	
7	n/c	
8	n/c	

* CN7D

Pin Number	Name	Characteristic
1	Line Out-	+20 dBm to -20 dBm 600R
2	Line Out+	+20 dBm to -20 dBm 600R
3	Fast Antenna Change Over / PTT (not used)	NPN open collector grounding transistor
4	Not used	+20 dBm to -20 dBm 600R
5	Not used	+20 dBm to -20 dBm 600R
6	Squelch Output	Grounding output +/- 60V, 200mA max.
7	Ground	0 V
8	Not used	0 V or +10 V to +60 V or -10 V to -60 V at 6mA

Connections		Name	Characteristic
Front Panel			
CN3-1	Loudspeaker	Loudspeaker output	2V p-p maximum
CN3-2	Loudspeaker	Ground	0 V
CN3-3		n/c	n/c

Connections		Name	Characteristic
DC Input	Regulation		
Input-1	CN2-2	dc Input	Fused 21.6 to 32 V
Input-2	CN2-1	Ground Supply	0 V
Input-3		n/c	n/c

Connections		Name	Characteristic
Regulation	Processor		
CN4-1	CN3-1	+15 V Supply	+15 V
CN4-2	CN3-2	+15 V Supply	+15 V
CN4-3	CN3-3	+5 V Supply	+5 V
CN4-4	CN3-4	+5 V Supply	+5 V
CN4-5	CN3-5	Ground	0V
CN4-6	CN3-6	Ground	0V
CN4-7	CN3-7	-15 V Supply	-15 V
CN4-8	CN3-8	-15 V Supply	-15 V
CN4-9	CN3-9	ac Detect	15V on, 0V off
CN4-10	CN3-10	dc Detect	Open collector
CN4-11	CN3-11	V Unreg	21.6 to 32 V
CN4-12	CN3-12	V Unreg	21.6 to 32 V
CN4-13	CN3-13	Remote on/off	0 V = off, open collector = on
CN4-14	CN3-14	n/c	n/c

Connections		Name	Characteristic
Regulation	Rx RF		
CN5-1	CN6-1	+15 V Supply	+15 V
CN5-2	CN6-2	+15 V Supply	+15 V
CN5-3	CN6-3	+5 V Supply	+5 V
CN5-4	CN6-4	+5 V Supply	+5 V
CN5-5	CN6-5	Ground	0V
CN5-6	CN6-6	Ground	0V
CN5-7	CN6-7	-15 V Supply	-15 V
CN5-8	CN6-8	-15 V Supply	-15 V
CN5-9	CN6-9	ac Detect	n/c
CN5-10	CN6-10	dc Detect	n/c

Connections		Name	Characteristic
RX RF	Processor		
CN2-1	CN2-1	IF	450 kHz

Connections		Name	Characteristic
PSU	Regulation		
1	CN1-1	Ground Supply	0 V
	CN1-2		
3	CN1-3	ac Power	24 V nominal
	CN1-4		

Connections		Name	Characteristic
Processor	External Speaker		
CN8 Tip	1	External Speaker Drive	3.5 Vac pk-pk max
CN8 Ring	2	External Speaker Drive	3.5 Vac pk-pk max
CN8 Sleeve	3	Ground	0 V

Connections		Name	Characteristic
Processor	Facilities		
CN5-1	1	Ground	0 V
CN5-2	2	E Bit	TTL pull-up active low
CN5-3	3	PTT (not used)	Grounding output +/- 60V, 200mA max.
CN5-4	4	External VSWR (not used)	TTL pull-up active low
CN5-5	5	Squelch	Grounding output +/- 60V, 200mA max.
CN5-6	6	Squelch	Grounding output +/- 60V, 200mA max.
CN5-7	7	Squelch Defeat	TTL pull-up active low
CN5-8	8	Ground	0 V

Connections		Name	Characteristic
Processor	Facilities		
CN5-9	9	Unregulated Supply	Fused 500mA 21.6 to 32 V
CN5-10	10	Inhibit	TTL pull-up active low
CN5-11	11	BIT Interruptive Test	TTL pull-up active low
CN5-12	12	RSSI	Potential range 0 V to 10 V
CN5-13	13	Ready Output	Open collector, 0 V = Ready
CN5-14	14	Tape Output	-10 dBm. 100R
CN5-15	15	Reserved	n/c

Connections		Name	Characteristic
	RX RF		
Antenna Port	CN4-1	RF	Sensitivity: - 107dBm Max continuous: 5 V rms

Connections		Name	Characteristic
RX RF	Front Panel		
CN6-1	CN4-1	Reference frequency	Maximum: - 10 dBm

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Connections		Name	Characteristic
Processor	RX RF		
CN1-1	CN3-1	Ground	0 V
CN1-2	CN3-2	IF AGC (Not used)	0 to 2.5 V
CN1-3	CN3-3	Ground	0 V
CN1-4	CN3-4	RF AGC (Not used)	0 to 2.5 V
CN1-5	CN3-5	Ground	0 V
CN1-6	CN3-6	IF AGC	0 to 2.5 V
CN1-7	CN3-7	Ground	0 V
CN1-8	CN3-8	BIT I Monitor (Not used)	±2.5 V
CN1-9	CN3-9	Ground	0 V
CN1-10	CN3-10	BIT Q Monitor (Not used)	±2.5 V
CN1-11	CN3-11	Ground	0 V
CN1-12	CN3-12	RF AGC	0 to 2.5 V
CN1-13	CN3-13	Ground	0 V
CN1-14	CN3-14	Frequency Trim	0 to 4 V / 0 to 6V
CN1-15	CN3-15	Tx/Rx Detect (Not connected)	TTL
CN1-16	CN3-16	Power Down	TTL pull up active low
CN1-17	CN3-17	Ground	0 V
CN1-18	CN3-18	Filter 0	TTL
CN1-19	CN3-19	Filter 1	TTL
CN1-20	CN3-20	Filter 2	TTL
CN1-21	CN3-21	Filter 3	TTL
CN1-22	CN3-22	Filter 4	TTL
CN1-23	CN3-23	Ground	0 V
CN1-24	CN3-24	Synth Load	TTL
CN1-25	CN3-25	Data	TTL
CN1-26	CN3-26	Clock	TTL
CN1-27	CN3-27	Synth Clamp (Phase Load)	TTL
CN1-28	CN3-28	Reserved	TTL
CN1-29	CN3-29	Tx Key (Not used)	TTL
CN1-30	CN3-30	Auto Level Control	0V
CN1-31	CN3-31	PA Temperature (Not used)	10 mV / °C
CN1-32	CN3-32	Reflected Power (Not used)	0 to 2.5 V
CN1-33	CN3-33	PAC / Rx RF Temp. (not used)	10 mV / °C
CN1-34	CN3-34	External VSWR (Not used)	TTL
CN1-35	CN3-35	Narrow/Wide	TTL
CN1-36	CN3-36	BIT Control 0	TTL
CN1-37	CN3-37	BIT Control 1	TTL
CN1-38	CN3-38	BIT Open Loop (not used)	TTL
CN1-39	CN3-39	BIT Synth Lock	TTL
CN1-40	CN3-40	BIT Loop Correct (Not used)	TTL
CN1-41	CN3-41	BIT VSWR OK (Not used)	TTL
CN1-42	CN3-42	RF PA Bias Disable (not used)	TTL
CN1-43	CN3-43	Fan Enable (Not used)	TTL - High fan on
CN1-44	CN3-44	OXCO Fitted (Not used)	TTL - Low OCXO fitted
CN1-45	CN3-45	Reserved	TTL
CN1-46	CN3-46	Step Size (Not used)	TTL
CN1-47	CN3-47	TR Detect (Not connected)	TTL
CN1-48	CN3-48	V/U Detect (Not connected)	TTL
CN1-49	CN3-49	BIT Control 2 (Not used)	TTL
CN1-50	CN3-50	BIT Control 3 (Not used)	TTL

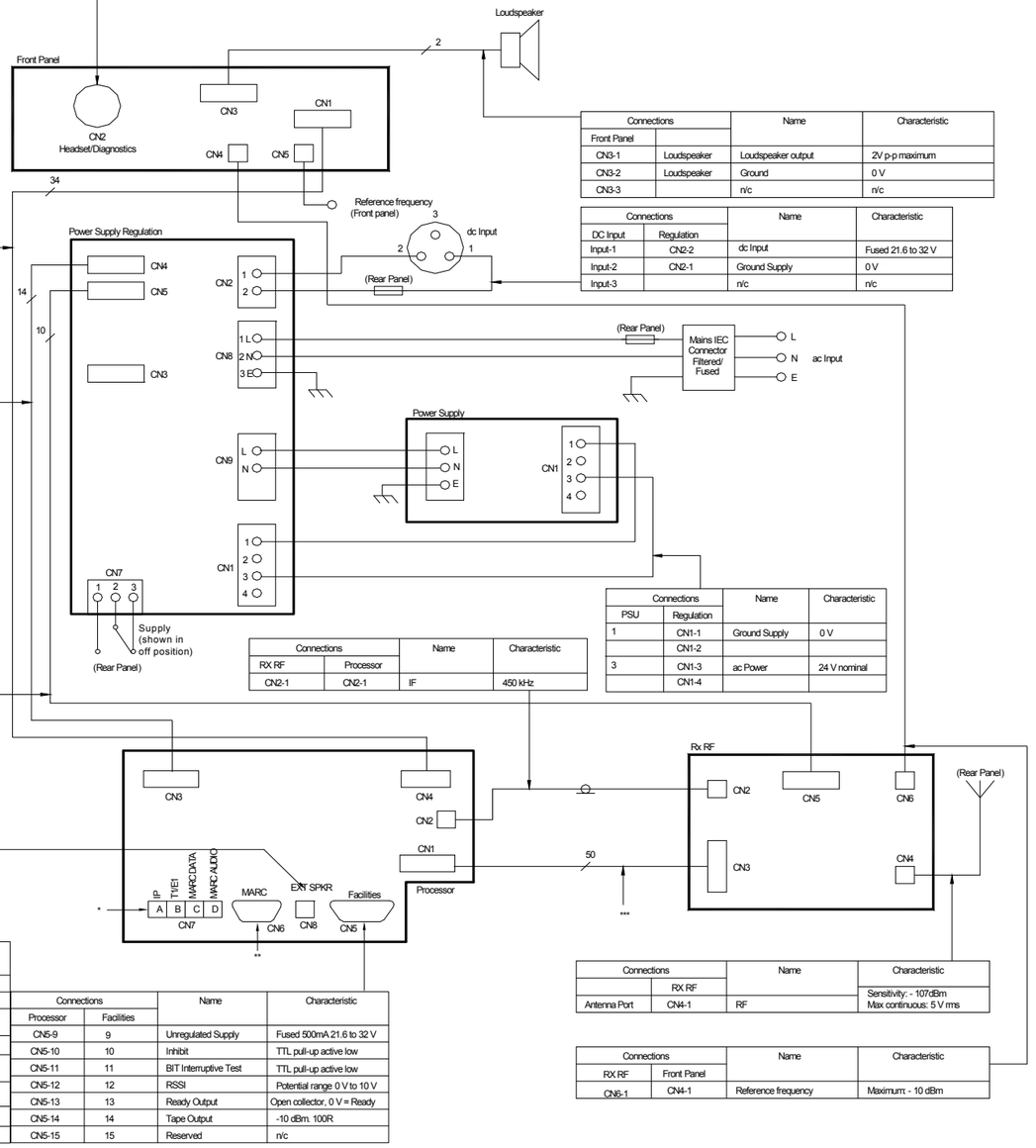
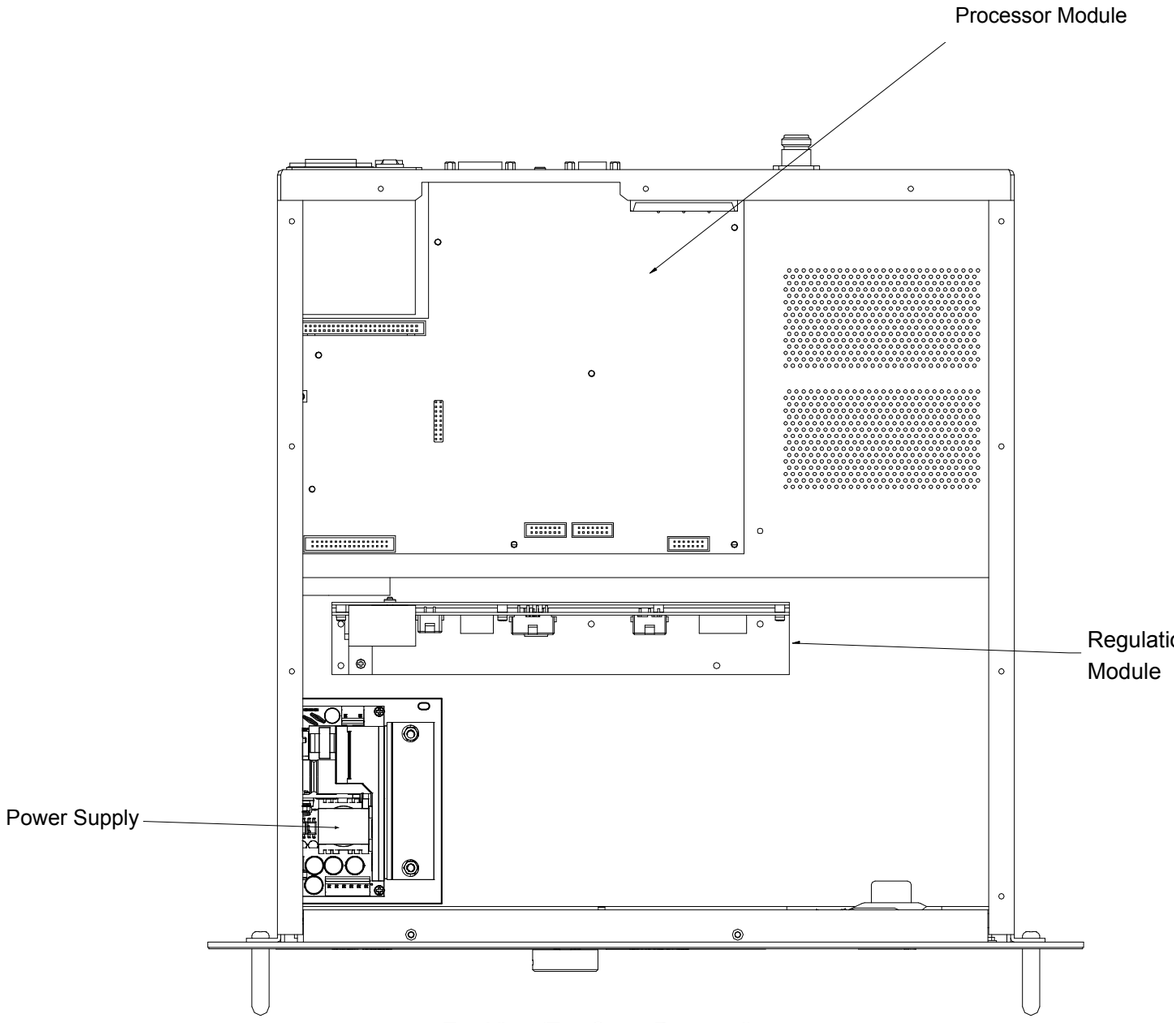
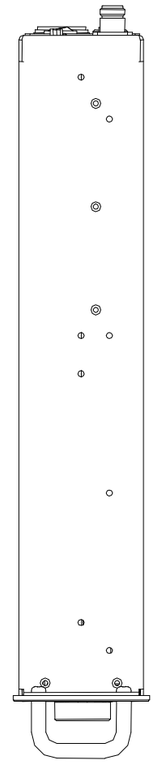
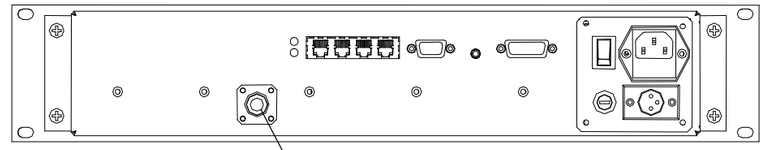


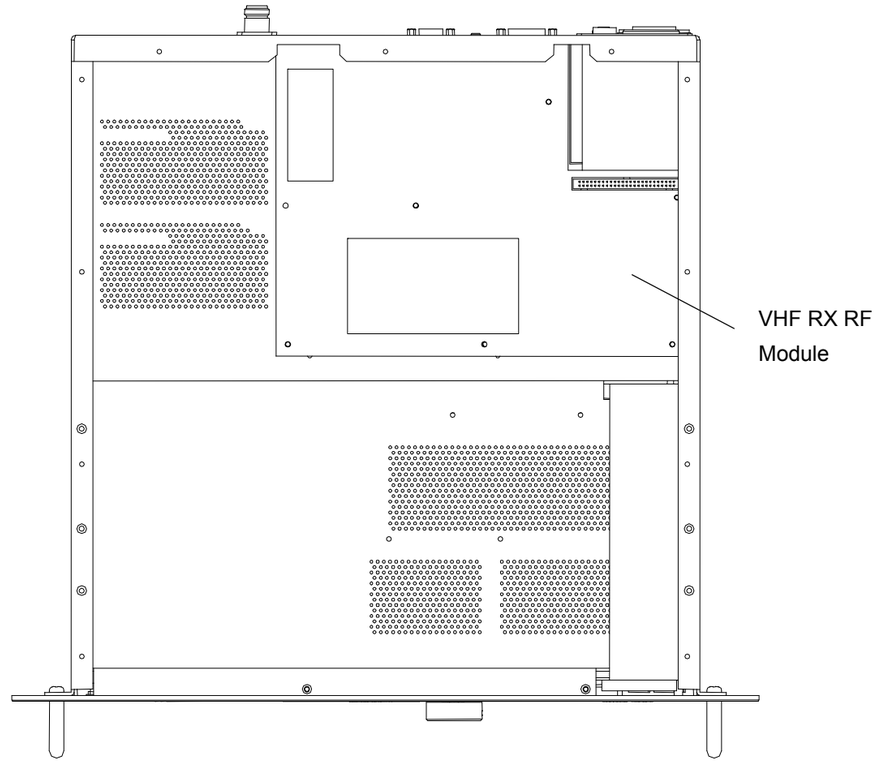
Fig 5-5 Wiring and Interconnection Diagram



Top View (Top Cover Removed)







View on Underside (Bottom Cover Removed)

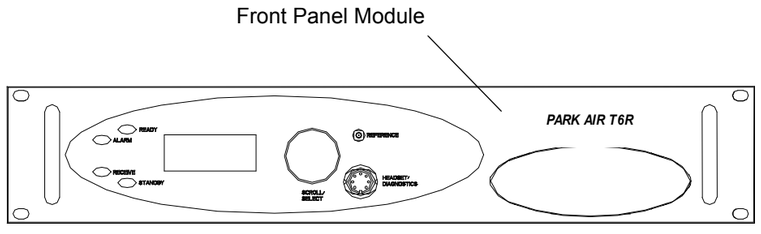


Fig 5-6 Module Location Diagram

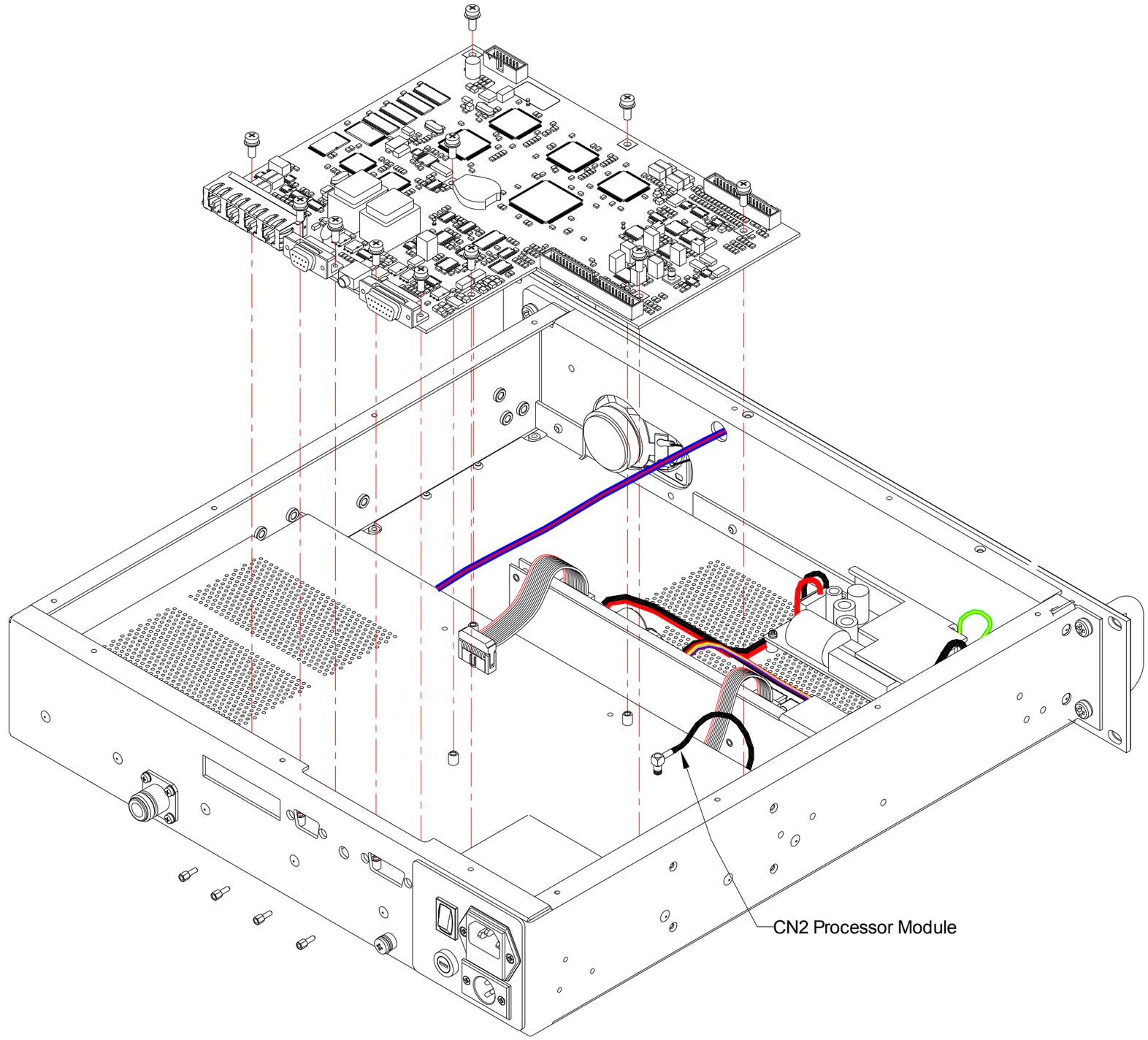


Fig 5-7 Processor Module - Removal and Refitting Detail

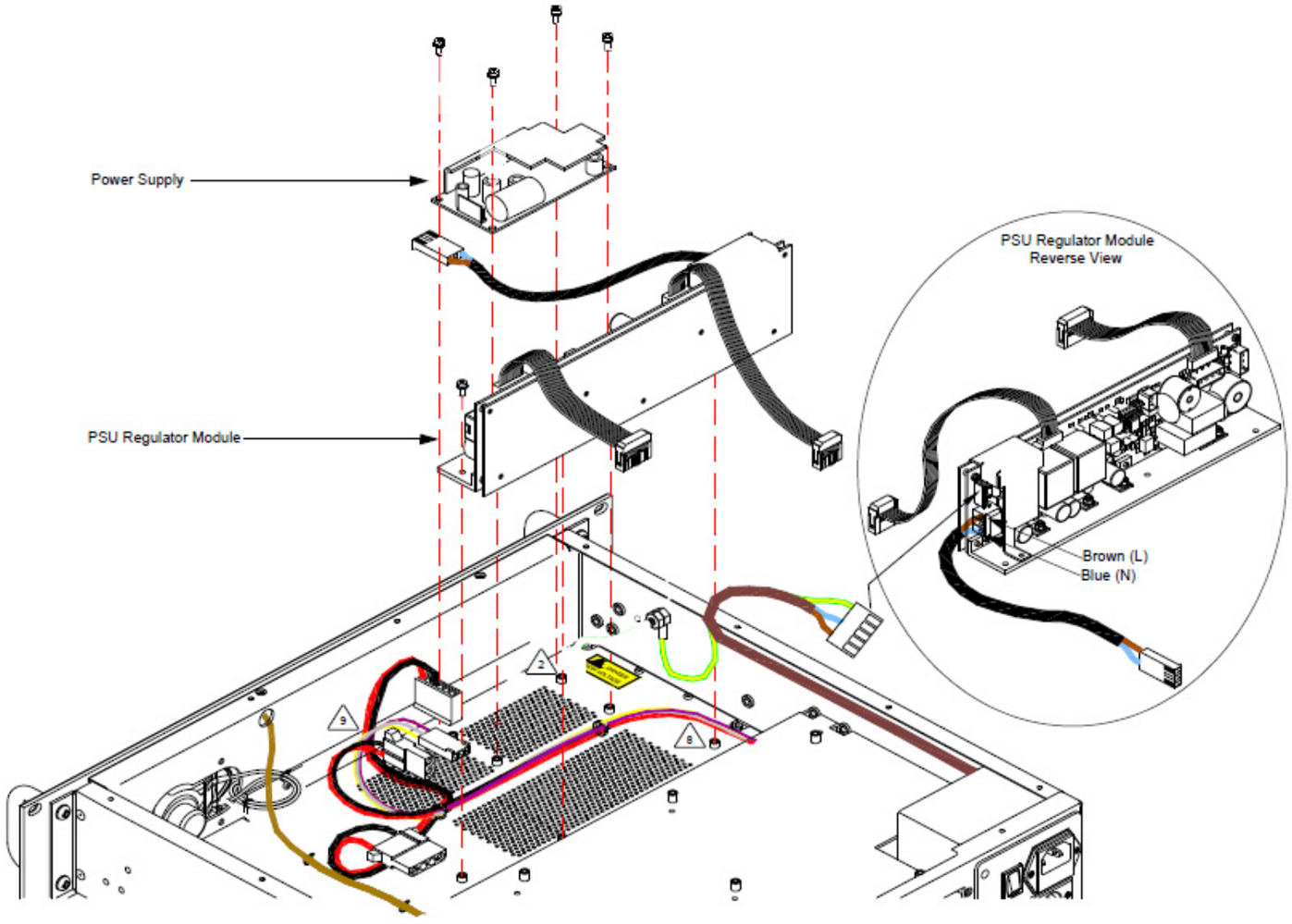


Fig 5-8 Power Supply and PSU Regulator Module - Removal and Refitting Detail

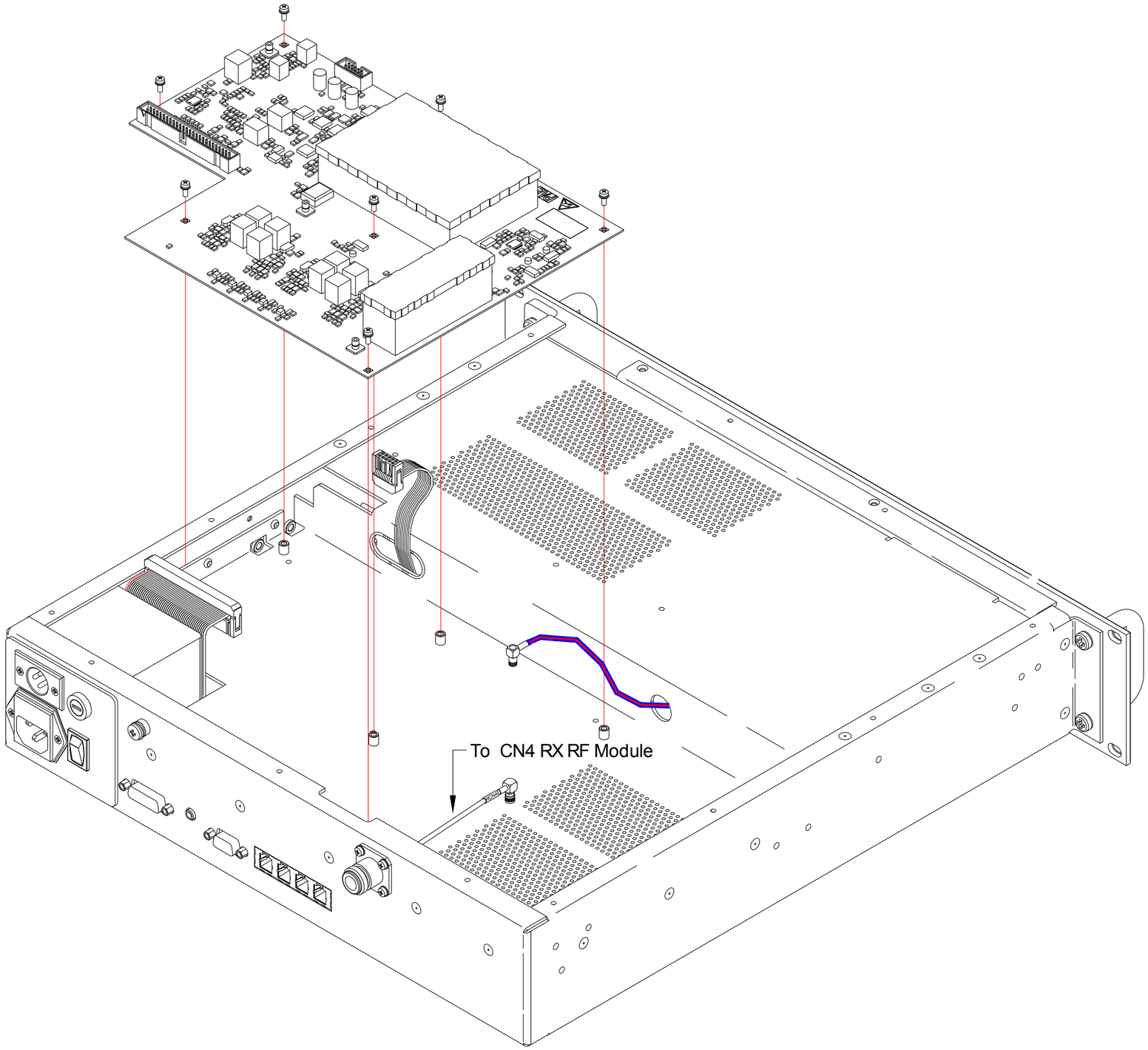


Fig 5-9 Rx RF Module - Removal and Refitting Detail

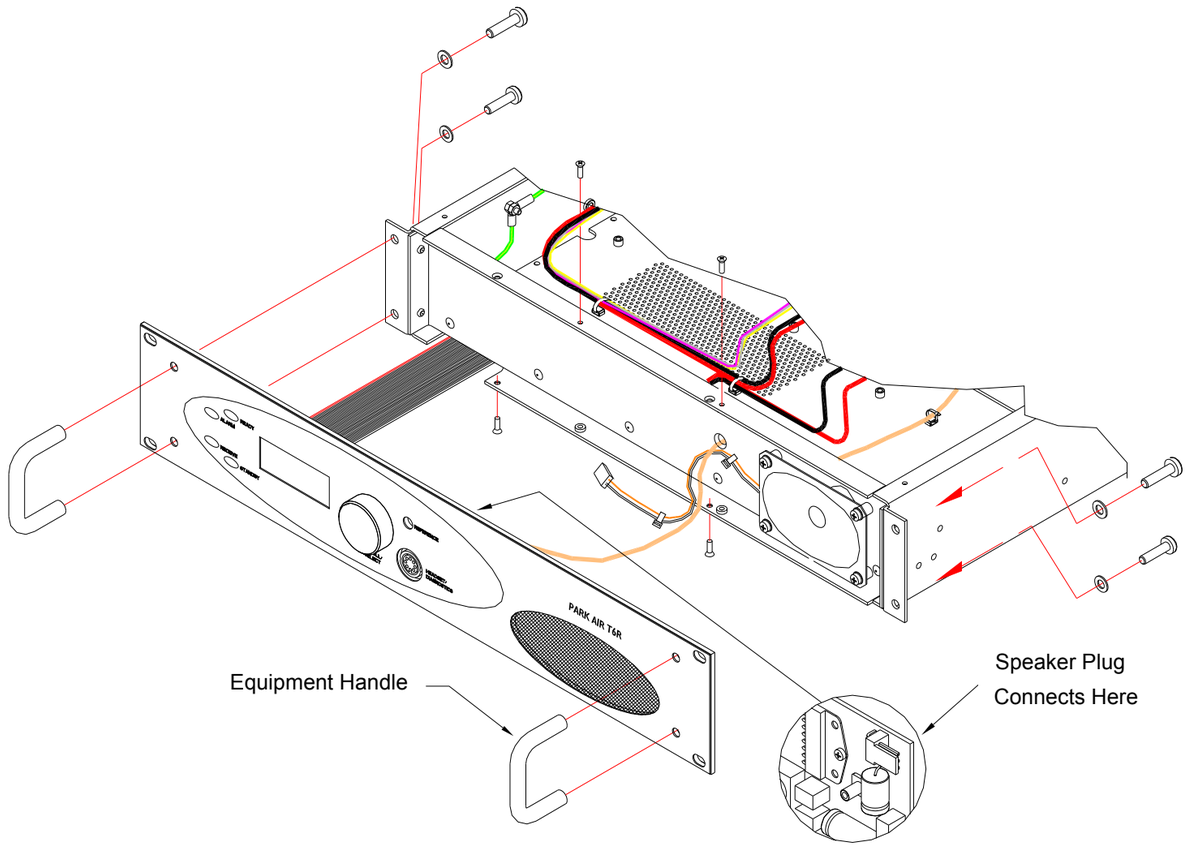


Diagram A

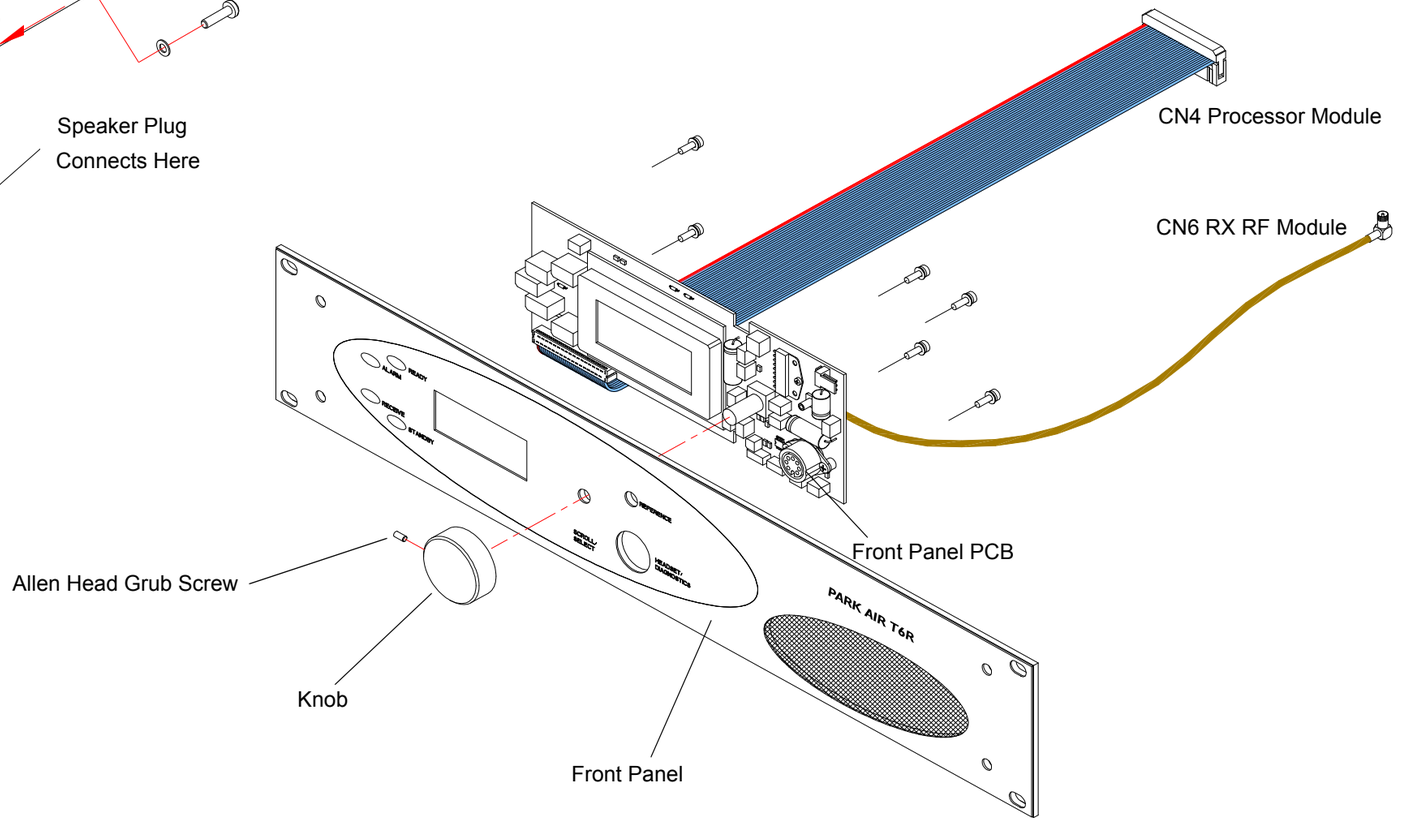


Diagram B

Fig 5-10 Front Panel Assembly PCB - Removal and Refitting Detail