SIEMENS

SERVICE MANUAL

for

PTR4400U

VHF RECEIVER/TRANSMITTER

Publication No. 630/HA/43200

Siemens Plessey Systems

AMENDMENT RECORD SHEET

AMENDMENT No.	DATE INCORPORATED	SIGNATURE

MODIFICATION RECORD

1. Each of the items listed below bears a Modification Record Label which can be used to indicate the building standard of the item. Incorporation of a modification to an item is recorded by crossing out an appropriate number (strike-off number) on its Modification Record Label.

2. The modifications listed below are all incorporated in the contents of this manual.

PART NUMBER	ITEM	MODIFICATION STRIKE-OFF
640/1/43200	VHF T/R	
419/1/74720	RF Board 1	
419/1/74723	RF Board 2	
419/1/74690	Frequency Conversion Board	
419/1/74714	Modulator /Demodulator Board	
419/1/74702	Harmonic Filter Board	
419/1/74699	Power Amplifier Control Board	
419/1/74684	Power Amplifier RF Board	
419/1/74681	Synthesiser Board 1	
419/1/74687	Synthesiser Board 2	
419/1/74696	Power Supply Unit Board	
419/1/74693	Display Board	
419/1/74711	Controlier Board	
419/1/74705	Baseband 1 Board	
419/1/74708	Baseband 2 Board	
419/1/74726	Ancillary Highway Interface Board	
419/1/74729	Audio Interface Board	
419/1/81319	Remote Interface Board	
419/1/81313	UHF Filter Board	
419/1/74717	Motherboard	

WARNINGS AND CAUTIONS

WARNING. . .
THE RF POWER TRANSISTORS TR2, TR3, AND TR4 ON THE PA RF BOARD (419/1/74684) OF THE VHF T/R CONTAIN BERYLLIUM OXIDE MATERIAL WHICH, IF NOT PROPERLY HANDLED, CAN CONSTITUTE A SERIOUS HAZARD TO HEALTH.

WHEN BERYLLIUM OXIDE IS EXPOSED TO FIRE IT RELEASES LARGE QUANTITIES OF TOXIC FUMES. DUST FROM BERYLLIUM OXIDE PRESENTS A SERIOUS TOXIC HAZARD. UNDER NO CIRCUMSTANCES MUST THESE TRANSISTORS OR RESISTORS BE DELIBERATELY EXPOSED TO FIRE, BROKEN OPEN OR ABRADED.

SCRAP COMPONENTS MUST BE PLACED IN A CONTAINER WHICH IS CLEARLY LABELLED "DANGER BERYLLIUM OXIDE MATERIAL IN THIS CONTAINER". SUBSEQUENT ACTION MUST BE IN ACCORDANCE WITH THE APPROPRIATE NATIONAL REGULATIONS FOR DISPOSAL OF HAZARDOUS TOXIC MATERIALS.

WARNING. . .
THE HIGHEST VOLTAGE IN THIS UNIT IS -100 VDC. VOLTAGES OF UP TO 150 VDC MAY BE PRESENT DURING TESTING. CARE MUST BE TAKEN DURING TESTING AND WHERE POSSIBLE THE DC SUPPLY IS TO BE DISCONNECTED BEFORE THE UNIT IS OPENED.

WARNING. . .
THE OUTPUT OF THIS UNIT CAN BE UP TO 10 W OF RF POWER WHICH MAY CAUSE SKIN BURNS. ALL CONNECTIONS MUST BE MADE WITH THE UNIT SWITCHED OFF.

WARNING. . .
THE CASE OF THIS UNIT MAY GET WARM DURING CONTINUOUS OPERATION BUT SHOULD PROVIDE NO HAZARD. SOME PA COMPONENTS MAY GET HOT AND CARE MUST BE TAKEN TO AVOID BURNS TO THE SKIN.

WARNING. . .
FIRE, EXPLOSION, AND SEVERE BURN HAZARD APPLIES TO THE LITHIUM BATTERY. DO NOT RECHARGE, CRUSH, PIERCE, DISASSEMBLE, HEAT ABOVE 100°C, INCINERATE OR EXPOSE COMPONENTS TO WATER. DO NOT SHORT CIRCUIT. OBSERVE POLARITIES WHEN INSTALLING INTO UNIT.

CAUTION. . .
The radio can only be powered from negative-earth vehicles. It can only be used in positive-earth vehicles if a supply system isolated from the vehicle primary system is employed.

CAUTION. . .
The VHF T/R contains static sensitive devices (SSDs) which can be damaged by electric fields emanating from charged objects and from direct static discharge. Care must be taken when handling SSDs as follows:

SSDs must be removed from their protective packaging only at an approved electrostatic controlled or grounded work station by trained personnel and only when required for use. Protective packaging must always be in contact with the grounded work surface.

All handling of SSDs must be carried out at a grounded work station. Personnel must wear an earthing wrist band connected to the grounded work surface.

Electrostatic generating materials such as polythene and masking tape must not be placed on the grounded work surface.

All electronic and electrical test equipment must be electrically isolated from the grounded work surface. Only use soldering equipment and tools which are approved for use at a grounded work station.

SSDs must be replaced in their protective packaging when not required for use.

MAINTENANCE MANUAL
FOR PLESSEY TRANSMITTER/RECEIVER PTR 4400U

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PART 1 - OPERATION AND DESCRIPTION

PART 2 - SERVICING

LIST OF ABBREVIATIONS

AGC	-	Automatic Gain Control
ALC	-	Automatic Level Control
ATU	-	Antenna Tuning Unit
AVM	-	Anti-Vibration Mounting
BER	-	Bit Error Rate
BITE	-	Built-In Test Equipment
DHLA	-	Data Highway Logic Array
ECCM	-	Electronic Counter Counter Measure
EFP	-	Extended Front Panel
EMP	-	Electro-Magnetic Pulse
FID	-	Fill Input Device
FMSS	-	Frequency Management Subsystem
GLA	-	General Logic Array
LCD	-	Liquid Crystal Display
LSA	-	Loudspeaker Amplifier
PA	-	Power Amplifier
PAS	-	Production Acceptance Specification
PEC	-	Printed Electronic Circuit
PSU	-	Power Supply Unit
PTS	-	Production Test Schedule
RAM	-	Random Access Memory
RCB	-	Remote Crew Box
RCS	-	Remote Channel Selection
RF	-	Radio Frequency
RFI	-	Radio Frequency Interference
RH	-	Relative Humidity
ROM	-	Read Only Memory
RX	-	Receive
SINAD	-	Signal to Noise and Distortion
SRRCS	-	Single Radio Remote Control System
SRRCU	-	Single Radio Remote Control Unit
SRRLA	-	Single Radio Remote Line Adaptor
SSD	-	Static Sensitive Device
T/R	-	Transmitter/Receiver
TCXO	-	Temperature Compensated Crystal Oscillator
TX	-	Transmit
UART	-	Universal Asynchronous Receiver Transmitter
UHF	-	Ultra High Frequency
VA	-	Vehicle Adaptor
VCO	-	Voltage Controlled Oscillator
VHF	-	Very High Frequency
VIRCS	-	Vehicle Intercommunication and Radio Control System
VOGAD	-	Voice Operated Gain Adjusting Device
VSWR	-	Voltage Standing Wave Ratio

TECHNICAL SUMMARY

PHYSICAL DATA

1. Dimensions and Mass

(1)	Height	:	85 mm
(2)	Width	:	252 mm
(3)	Depth	:	229 mm
(4)	Mass	:	4.5 kg

PERFORMANCE

2. Operating Modes

(1) Voice
(2) Analogue data
(3) Digital data

3. Frequency range : 30 MHz to 87.9875 MHz

4. Channel spacing : 25 kHz with 12.5 kHz offset capability

5. Number of channels : 2320

6. Power output

(1)	High power	:	5 W nominal
(2)	Medium power	:	0.5 W nominal
(3)	Low power	:	0.1 W nominal

7. Modulation

(1)	Analogue FM voice	:	5 kHz or 10 kHz peak deviation using internal switch option.
(2)	Analogue FM data	:	5 kHz or 10 kHz peak deviation using internal switch option.
(3)	16 kbit FM data	:	5 kHz or 10 kHz peak deviation using internal switch option.

8. Modulation Sensitivity

(1)	Voice	:	AGC giving full deviation from whisper to shout.
(2)	Analogue data	:	0 dBm in 600 ohms, full deviation
(3)	Data	:	+/- 200 mV to +/- 5 V

9. Harmonics : - 3 dBm max.

10. Sensitivity

(1) Better than - 117 dBm for 10 dB SINAD
(2) Better than - 117 dBm for 10% BER

11. Audio output: Adjustable up to 2 V rms for each of the 2 outputs into 150 ohms.

12. Squelch

(1)	Voice	:	150 Hz tone, or noise, using internal switch option.
(2)	Analogue data	:	No squelch
(3)	Digital data	:	16 bit data squelch

ANTENNAS

13. Antenna connection : Whip antenna via internal ATU or 50 ohm BNC socket.

14. Antenna options

(1) Vehicle Installations :
(a) Whip antenna system 6504

(2) Ground and static vehicle installations :
(a) Elevated omni-directional whip antenna 6505 with GP mast 6432 (11 m high).
(b) Broadband high gain antenna 6506 with 6 m mast.

SELF TEST

15. Faults occurring during normal operation are flagged up by Built-in Test Equipment (BITE). Complete station may also be checked automatically by running a BITE routine.

ENVIRONMENTAL CONDITIONS

16. Environmental operating conditions are :

(1) Operating temperature range : -21 ^{o}C to +70 ^{o}C.
(2) Storage temperature range : -40 ^{o}C to +70 ^{o}C.

TRANSIT DATA

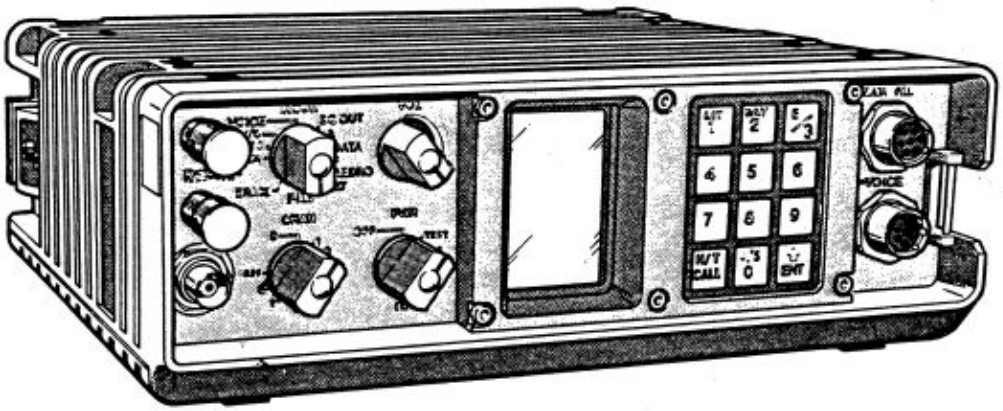
17. The T/R is capable of withstanding the vibration and shock experienced when :

(1) Transported, mounted or unmounted, in vehicles travelling along roads or cross country.
(2) Delivered by parachute, either dropped as stores or with a man.
(3) Being shipped by rail, sea or air.
(4) Being handled under field conditions.

The T/R is immersion proof and capable of unpressurised air transport up to 3000 m.

18. Stock Number/Designation : 630/1/43200 PTR 4400U VHF Transmitter - Receiver.

FRONTISPIECE



CHAPTER 1
GENERAL INFORMATION

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ILLUSTRATIONS

INTRODUCTION

1. The VHF Transmitter - Receiver PTR 4400U is a frequency modulated multi-channel radio, providing voice, analogue data or digital data modes of operation, in the 30 MHz to 87.9875 MHz frequency range. The radio can be employed as either, a manpack, clip-in, ground station or vehicle station and can be powered by primary or secondary batteries or by a vehicle supply using a power conditioning unit such as a Vehicle Adaptor PV 4420U.

2. The radio can be used in conjunction with a frequency hopping unit to provide Electronic Counter Counter Measure (ECCM) operation. It can be remotely operated or used in a retransmit role and when operated as a vehicle station it can be used within the Vehicle Intercommunication and Radio Control System (VIRCS).

3. It has the capability of providing 2320 channels at 25 kHz channel spacing, with the option of a 12.5 kHz offset. Sixteen preset channels can be stored in a CMOS memory which is powered by a memory retention battery when the main equipment supply is removed.

4. The sixteen preset frequencies can be entered manually by operation of the front panel controls and the keypad, or by means of a Fill Input Device (FID) when the MODE switch is set to Fill.

5. Three rf power levels are available, 0.1 W, 0.5 W and 5 W. The transmitter can operate into any load condition and has built in protection against open and short circuit conditions. In the event of over temperature, protection circuits reduce the transmitter power. Automatic gain control provides a constant modulation level for voice inputs ranging from whisper to shout.

6. A front panel Liquid Crystal Display (LCD) indicates the operational status of the radio, i.e. mode, channel, frequency etc. and also displays Built-in Test Equipment (BITE) information under fault conditions.

7. In the manpack role, a 1.6 metre whip antenna or a 1 metre low profile antenna is used, the radio is attached to a lightweight manpack carrier and power is supplied from 24 V Ni-Cad or Lithium batteries. The radio can, if required, be clipped into a vehicle rack and, using its own batteries and an extended Antenna Tuning Unit (ATU), form a simple vehicle station.

8. In a fixed vehicle installation the radio is secured to a vehicle mounting tray. The station is connected to the vehicle antenna and is powered from the 28 V vehicle supply via a power conditioning unit.

9. When used as part of a fixed ground station, it can be free standing (e.g. bench mounted), rack mounted or vehicle mounted and may be powered from any suitable 28 Vdc source. A ground station can be furnished by using a manpack or vehicle station connected to a ground mounted antenna.

10. Remote operation can be achieved up to a distance of 3 km, using the Single Radio Remote Control System (SRRCS) or a remote handset. The radio may also be used as a retransmit (RETRANS) station in conjunction with a second radio. Spark gaps are fitted to the antenna sockets and the remote terminals for EMP protection.

MECHANICAL DESCRIPTION

External

11. The transmitter - receiver is housed in a sealed case constructed from light aluminium alloy casting and has a single cast lid mounted on the lower surface, sealed by an 'O' ring. The lid is secured by socket headed machine screws and is completely removable to allow access to the internal modules.

12. All external controls, switches and the keypad are located on the front panel of the radio. Also located on the front panel are two audio connectors, the remote terminals, a 50 ohm BNC antenna socket and a display. The right hand side of the radio houses a socket to interface with the Frequency Hopper, the battery connection studs, a drying and sealing plug, and the battery and hopper retaining latches. A common ancillary socket is located on the rear panel of the radio and a whip antenna socket on the left hand side. A memory retention battery compartment and the fuse panel are located on the right hand side of the top panel and allows access to the battery and ancillary fuse without the necessity of opening the main case assembly.

13. Threaded holes located on the lower plate facilitate the fitting of the radio to a manpack carrier or vehicle mounting tray. All screw threads are ISO metric coarse and threaded holes are fitted with hardened inserts.

Internal

14. The radio incorporates the following main assemblies:

(1) RF Boards 1 and 2
(2) Frequency Conversion Board
(3) Modulator and Demodulator Board
(4) PSU Board
(5) Harmonic Filter Board
(6) Power Amplifier Control Board
(7) Power Amplifier RF Board
(8) Synthesiser Boards 1 and 2
(9) Display Board
(10) Controller Board
(11) Baseband Boards 1 and 2

15. Modular construction techniques are employed, the radio circuits being mounted primarily on a row of partitioned printed circuit boards (PCBs). The modules are double sided or multilayered PCBs constructed from epoxy glass fibre, with the exception of RF Board 1 which is a PTFE loaded PCB. The majority of the modules are mounted directly onto a four layer motherboard, the exceptions being the PA RF Board mounted on a heatsink secured to the case, and the UHF Filter which is mounted directly onto the internal screen. The motherboard is screwed to a cast screen and both are screwed to the case assembly.

16. Each PCB has an individual key system so that it can be located only in its own position on the motherboard, card guides are provided to ensure very accurate plug - socket alignment, preventing damage to plug pins. All connections in the radio, either between modules or from components on the motherboard to the front panel, are either flexible circuits or co-axial cables, with the exception of a few

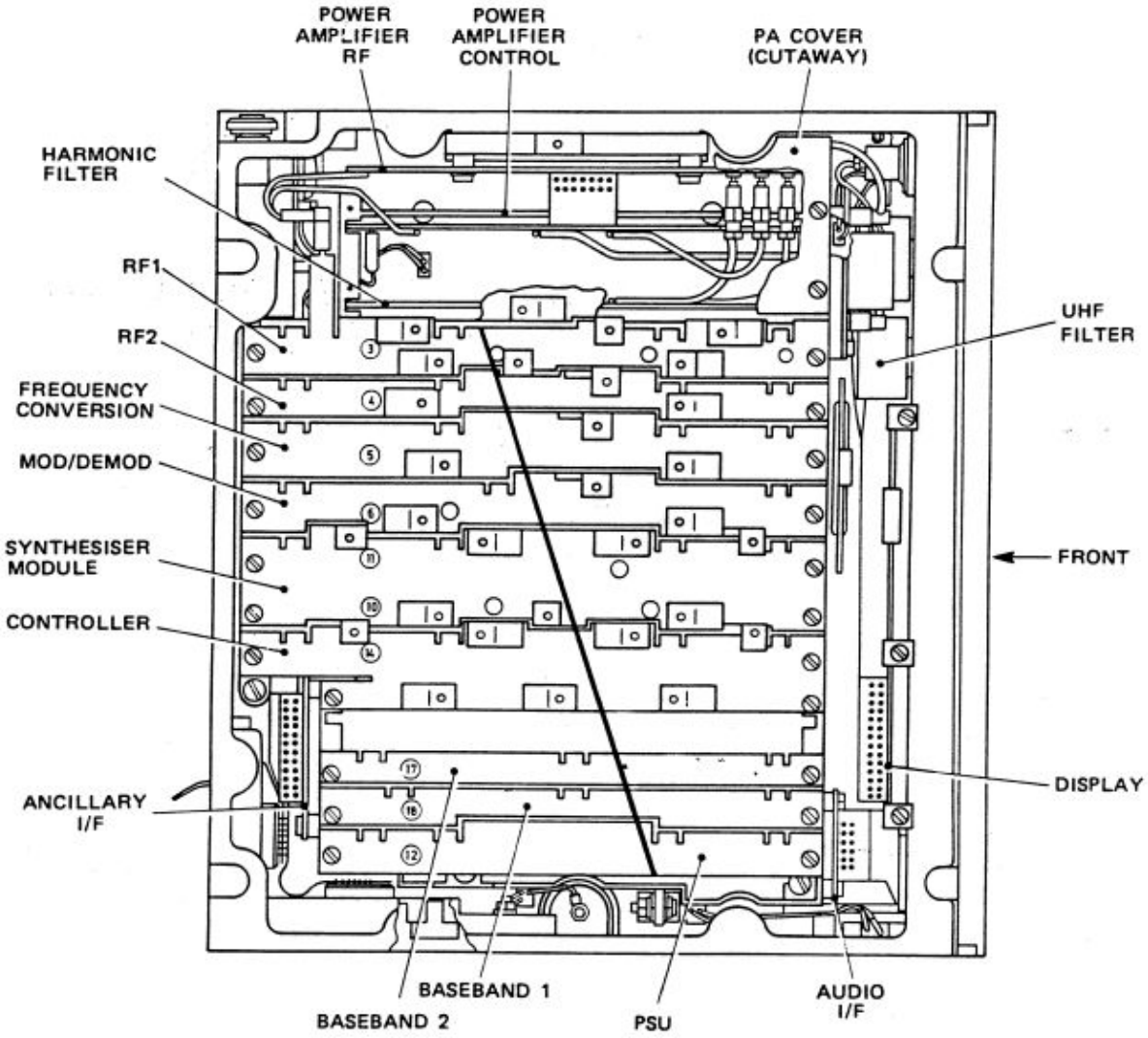

FIGURE 1 Internal View of VHF T/R

two pin BERG plugs and sockets to PTFE wire, e.g. fuse connections, remote terminals and antenna switches. Modules, and in some cases individual PCBs are shielded from each other by the internal cast screen.

CHAPTER 2
OPERATING INFORMATION

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ILLUSTRATIONS

FUNCTIONS OF RADIO CONNECTORS

1. Eight connectors are used to interface the radio to ancillary equipment, their functions are detailed in Table 1.

TABLE 1
CONNECTOR FUNCTIONS

CONNECTOR	DESIGNATION	FUNCTION
Upper 7 pole type 105 socket on front panel	- VOICE	Audio connections.
	- DATA or - FILL	Data connections to upper VOICE socket. Connects Fill Input Device to upper VOICE socket.
Lower 7 pole type 105 socket on front panel	- VOICE	Audio connections only.
One type BNC Co-axial	- RF	Connects the T/R to the vehicle antenna or to the vehicle adaptor R/T socket.
Two spring terminals on front panel	- REMOTE	Connects field telephone cables from Remote Control to T/R.

TABLE 1 (Continued)

CONNECTOR	DESIGNATION	FUNCTION
One 19 pole type 105 socket on rear panel	- ANCILLARIES	Connects external ancillaries to T/R.
One Whip antenna socket at left hand side panel	- ANT	Connects whip antenna to T/R.
Two terminal studs at right hand side panel	- (BATT)	Connects battery output volts to Radio
One 19 pole type 105 socket on side panel	- (ECCM)	Connects Radio to ECCM Unit

FUNCTIONS OF RADIO CONTROLS

2. The radio is controlled by four front panel switches and a keypad, their functions are detailed in Table 2.

TABLE 2
FRONT PANEL CONTROLS

CONTROL	DESIGNATION	FUNCTION
Mode switch		Eleven position switch.
	- REM	Connects input to the Radio remote terminals from the remote headset when connected by up to 3 km of D10 cable.
	- AUTO	Allows retransmit facilities via the remote terminals when connected to another radio by up to 3 km of D10 cable.
	- I/C	Selects Intercom to remote operator.
	- VOICE	Selects voice traffic with squelch.
	- SQ OUT	Selects voice traffic without squelch.
	- A DATA	Selects analogue data traffic.
	- D DATA	Selects 16 kbit traffic from data source.
	- RETRANS	Provides retransmit facility in conjunction with an associated Radio via ancillary connector.
	- EXT	Allows operation of Radio from an extended front panel or SRRCS.

TABLE 2 (Continued)

CONTROL	DESIGNATION	FUNCTION
Mode switch	- FILL	Enables Fill data to be entered from a FID and keypad. Allows preset frequencies to be entered manually.
	- ERASE	Enables all stored frequencies to be erased when E (Erase) keypad is operated.
PWR Switch	- OFF	Removes dc input voltage from transmitter - receiver and other subsystem and system units connected to the transceiver.
	- TEST	Selects BITE routine.
	- LP	Sets RF power output to 100 mW when Pressel operated.
	- MP	Sets RF power output to 500 mW when Pressel operated.
	- HP	Sets RF power output to 5 W when Pressel operated.
	- VA	Sets RF power output to 50 W if Vehicle Adaptor is fitted and Pressel operated.
VOL control	-	Sets level of audio output.
CHAN switch	- 0	With the appropriate mode switch position selected any channel frequency can be selected using the keypad controls.
	- 1	Preset channel 1 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 1 can be entered and stored.
	- 2	Preset channel 2 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 2 can be entered and stored.
	- 3	Preset channel 3 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 3 can be entered and stored.
CHAN switch	- 4	Preset channel 4 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 4 can be entered and stored.
	- 5	Preset channel 5 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 5 can be entered and stored.
	- 6	Preset channel 6 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 6 can be entered and stored.
	- 7	Preset channel 7 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 7 can be entered and stored.

TABLE 2 (Continued)

CONTROL	DESIGNATION	FUNCTION
CHAN switch	- 8	Preset channel 8 is selected for day 1 or day 2. With the MODE switch at FILL and using the keypad controls, preset channel frequency 8 can be entered and stored.
	- RCS	Allows remote selection of preset channels using a remote channel selector unit connected via the rear panel ancillary connector. Day 1 or day 2 is still operable on the keypad. Allows HAIL channel to be selected from RCS when Hopper is fitted.
Keypad	- LIT/1	Pressing in turn ENT and LIT/1 keypad illuminates panel lights for 20 seconds. Each subsequent key press produces 20 seconds of illumination from the key press. Pressing 1 and ENT enters fill net 1 data if FID connected. Also provides digit 1 for keypad entries.
	- DAY/2	Pressing in turn ENT and DAY/2 keypads toggles preset channel selection between day 1 and 2. Also provides digit 2.
	- E/3	With MODE switch set to ERASE and E/3 pressed all stored frequency data is erased. Also provides digit 3.
	- 4	Provides digit 4.
	- 5	Provides digit 5.
	- 6	Provides digit 6.
	- 7	Provides digit 7.
	- 8	Provides digit 8.
	- 9	Provides digit 9.
	- CALL/HT	Sends a CALL tone to a remote operator connected via the 2-wire remote terminals. Pressing ENT and CALL/HT toggles the HAIL warning tone disable on and off in hopping operation. When disabled, an X is displayed in the lower right of the LCD. Pressing CALL also restarts an off-line BITE test if it has stopped to display an error report from an ancillary equipment.
	- O/S/0	Pressing in turn ENT and O/S/0 toggles the positive 12.5 kHz offset on all channel frequencies. When operative, * is displayed after the frequency on the top line of the LCD. Used alone, provides the digit 0.
	- ENT	Provides the executive command keypad entries. Also calls second functions LIT, DAY, O/S, HT.

INTEROPERABILITY MODES

3. The T/R is capable of operating in NARROW or WIDE bandwidth modes and with TONE or NOISE squelch. Wide bandwidth and noise squelch are for interoperability with older types of equipment, e.g. PRC77. These modes are set by links in the Modulator/Demodulator module, Chapter 5.2. The conditions set up by the selections made are as follows:

(1) Wide bandwidth:	Tx deviation +- 10 kHz, Rx bandwidth +- 15 kHz for 50 kHz channel spacing
(2) Narrow bandwidth:	Tx deviation +- 5 kHz Rx bandwidth +- 10 kHz for 25 kHz channel spacing
(3) Tone squelch:	150 Hz tone required to operate squelch in Rx 150 Hz tone sent in Tx
(4) Noise squelch:	Carrier operated squelch in Rx, no tone sent.

LCD DISPLAY INFORMATION

4. The LCD panel is used to indicate function or status information. Details are shown in Fig.1.

5. For full operating instructions for the Radio refer to the User Handbook.

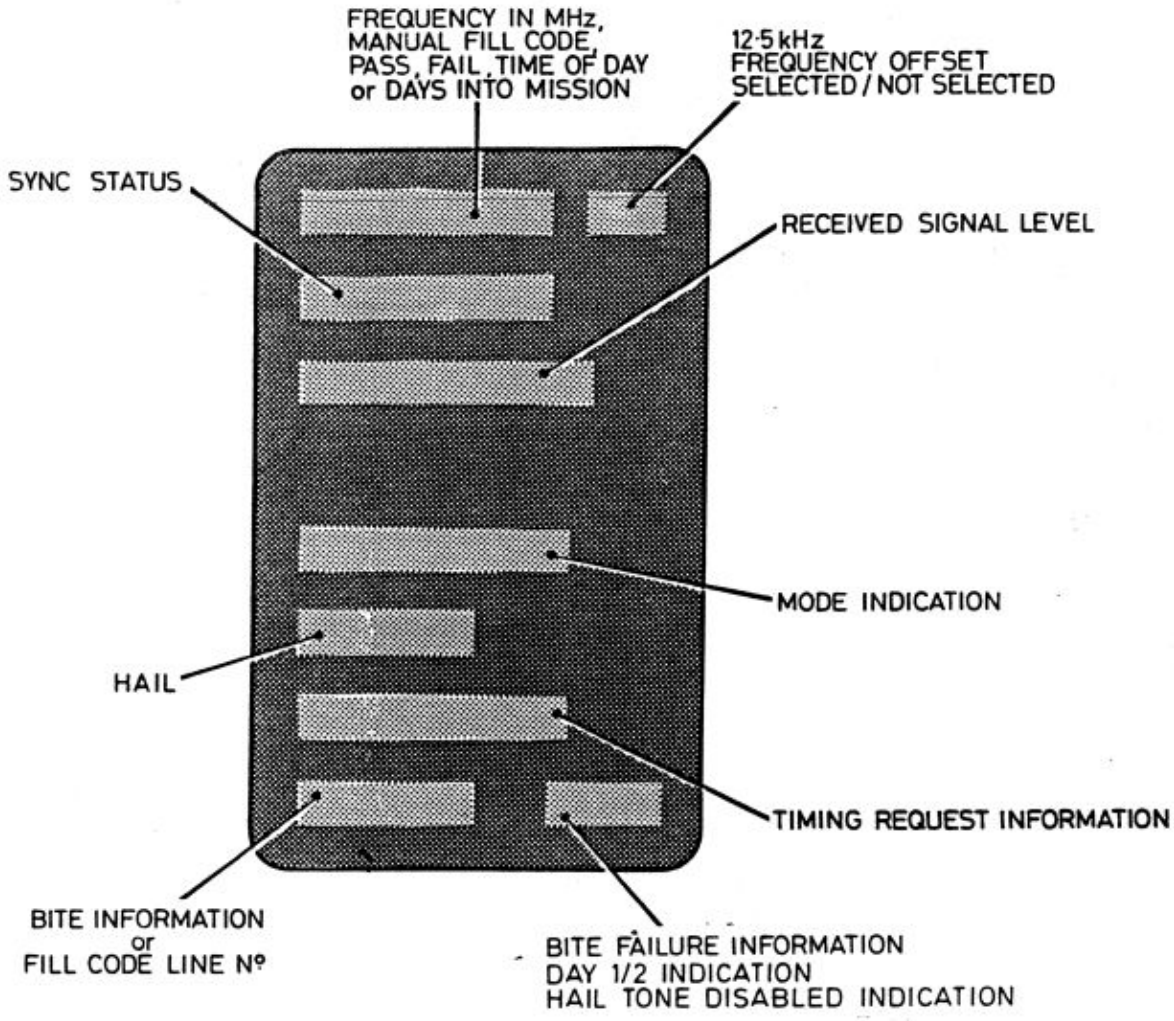

FIGURE 1 LCD Information

CHAPTER 3
INSTALLATION INFORMATION

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ILLUSTRATIONS

GENERAL

1. The VHF T/R, vehicle Adaptor and Frequency Hopper (when used) all fit onto a lightweight Mounting Tray which is bolted to either a suitable position in a vehicle or if used as a Ground Station any convenient location.

2. For Manpack Stations the T/R is bolted to a backpack frame. The Vehicle Adaptor is not used with Manpack Stations.

3. The Mounting Tray has four anti-vibration mountings (AVMs) to isolate the equipment from vibrations and shocks. Mounting Tray details are shown in Fig. 1.

4. Refer to the System User Handbook for specific station setting-up procedures.

EQUIPMENT DIMENSIONS:

5 (1) Mounting Tray
- Width : 316 mm
- Depth : 400 mm Max.
- Height : 76 mm Max.

(2) VHF T/R
- Width : 252 mm
- Depth : 229 mm
- Height : 85 mm
- Mass : 4.5 kg

(3) Vehicle Adaptor
- Width : 310.2 mm
- Depth : 145.2 mm
- Height : 194.7 mm
- Mass : 6.9 kg

(4) Frequency Hopper

Width	:	58 mm
Depth	:	229 mm
Height	:	85 mm
Mass	:	1 kg

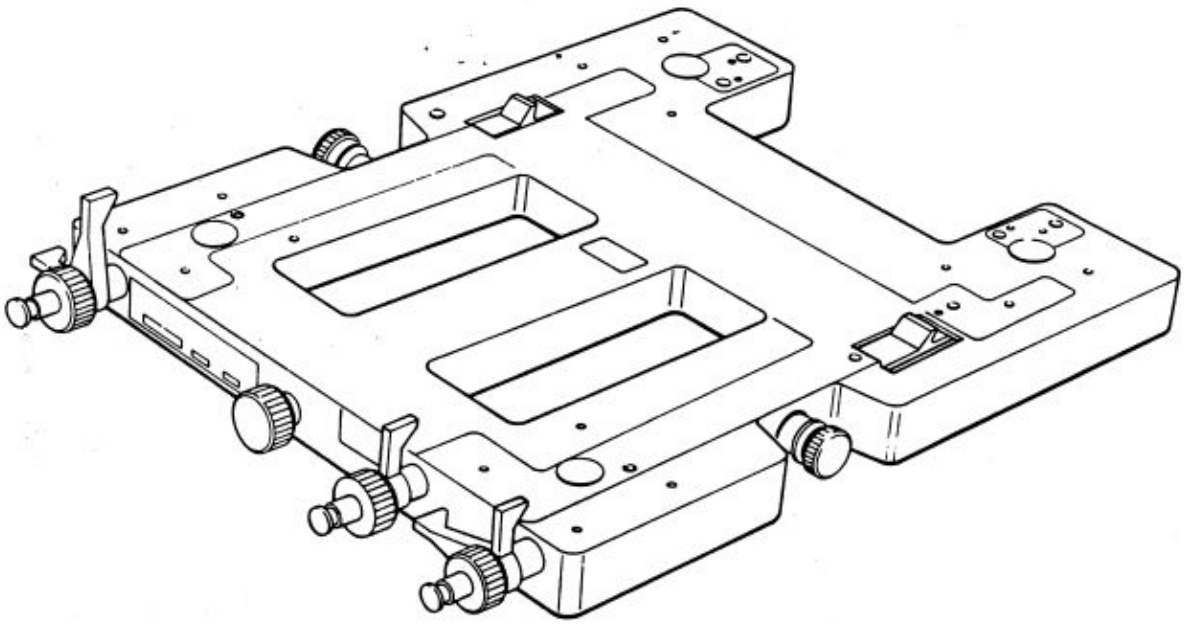

FIGURE 1 Mounting Tray Details

CONNECTOR DETAILS

6. Table 1 lists the radio connectors and pin details.

TABLE 1
T/R CONNECTOR DETAILS

CONNECTOR	PIN	SERVICE
Upper VOICE DATA/FILL (7 pole)	A	MIC A/Data A
	B	MIC B/Data B
	C	+ 24 Vdc Ancillary output
	D	Phone/Data output/Fill A
	E	Earth
	F	Pressel
	G	Phone/Fill B
Lower VOICE (7 pole)	A	MIC A
	B	MIC B
	C	+ 24 Vdc Ancillary output
	D	Phone
	E	Earth
	F	Pressel
	G	Phone
RF (BNC)	-	Antenna or VA connection RF I/O
REMOTE	1	Remote + ve
	2	Remote - ve
ANC (Rear 19 pole)	A	Harness MIC A
	B	Harness MIC B
	C	+ 24 Vdc Ancillary output
	D	Harness phone/data output
	E	Earth
	F	Pressel
	K	Retrans override
	L	36 kbit/s data
	M	VA control
	N	Retrans I/O
	R	Hop timing
	S	Data A 2.4 kbit/s
	T	Data B 2.4 kbit/s
	U	36 kHz clock
	V	+ 24 Vdc in.
ANT (side)	-	Whip antenna connection RF I/O
ECCM (side 19 pole)	A	Memory protect
	C	+ 24 Vdc Ancillary output
	E	Earth
	F	Pressel
	H	Proc Hop Sig output
	J	+ 5 Vdc from PSU
	K	Slow
	L	36 kbit/s data
	M	Clear D/V from hopper
	N	Spare

TABLE 1 (Continued)

CONNECTOR	PIN	SERVICE
	P	Unproc Hop sig input
	R	Hop Timing
	S	Data A 2.4 kbit/s
	T	Data B 2.4 kbit/s
	U	36 kHz clock
	V	+12 Vdc from PSU

Tone Squelch Alignment

45. (1) Set the T/R front panel switches as follows:

(a) MODE to VOICE

(b) CHAN to 0 (30.025 MHz) (re-enter 30025 ENT at the Keypad)

(c) VOL to fully clockwise

(d) PWR to LP

(2) Set the CMS RF O/P to 30.025 MHz at a level of -121 dBm, frequency modulated by 1 kHz with a deviation of 5 kHz and 150 Hz at +/- 1.3 kHz.

(3) Set the AF MONITOR switch to AUDIO and the AUDIO switch to LOWER AUDIO (75 Ω).

(4) Adjust R135 on Synthesiser board 1 (Module 10) to mute the audio output, then readjust to just demute.

(5) Set the T/R PWR switch to OFF.

Squelch and Deviation Switches

46. (1) On the Mod/Demod board, set switch S1 to Tone Squelch (open) or as required.

(2) On the Mod./Demod board, set switch S2 to Narrow Deviation (closed) or as required.

(3) Refit the T/R covers.

FAULT DIAGNOSIS USING BITE

47. There are two forms of BITE:

(1) ON LINE, where an error is flagged during normal operation of the T/R.

(2) OFF LINE, where the T/R PWR switch is set to TEST to initiate the internal BITE.

48. On-Line BITE fault indications inform the user that a fault has occurred, but give little more information. The Off-Line Test BITE should be run to determine the suspect module. The BITE indications for the T/R On-Line BITE are given in Table 5 and the indications for the T/R Off-Line BITE are given in Table 6. Fig. 6 shows the BITE data format on the T/R display. Information on the bit data of the BITE word for each board is in Table 7. Table 8 gives a BITE trace, commencing from a T/R chassis containing only the PSU, inserting the other modules in sequence and checking that the indication given in the Table is shown.

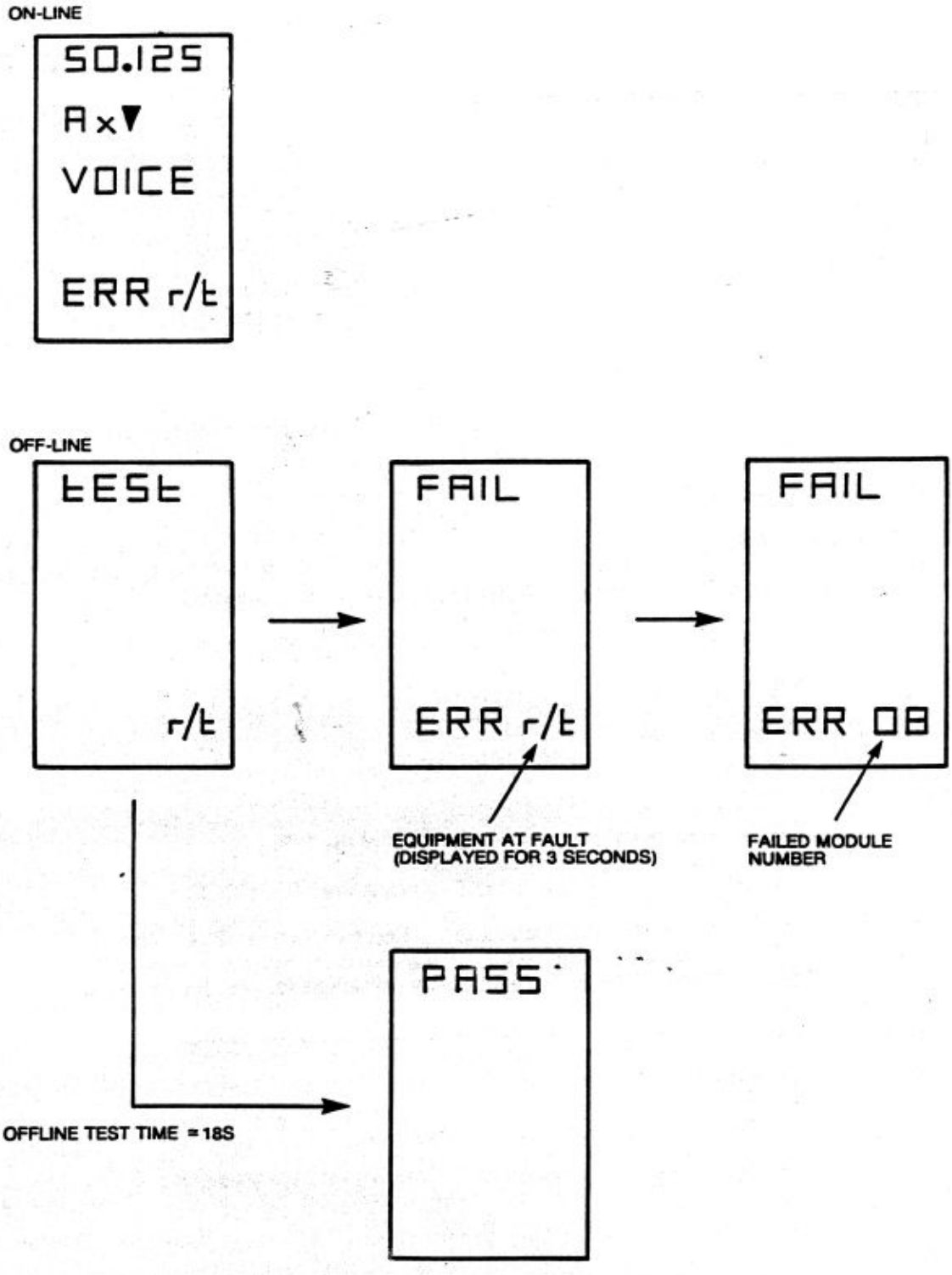

FIGURE 6 BITE Displays

TABLE 5
T/R ON-LINE BITE INDICATIONS

FAULT DESCRIPTION	TONE WARNING	R/T DISPLAY
Internal Power Supply Failure	Primary	ERR r/t
Synthesiser Out of Lock	Primary	ERR r/t
Power Amp Harmonic Filter Failure	Primary	ERR r/t
Power Amp Over-Current	Primary	ERR r/t
Data Highway Failure	Primary	ERR r/t
Front End Receive Over-Load	Secondary	Rx O/L
High VSWR	Secondary	ANT
Low R.F. Output Power (Front Panel)	Secondary	ERR r/t
Low R.F. Output Power (Whip)	Secondary	ERR r/t
Equipment Over Temperature	Secondary	O/t
Low Battery Voltage	Secondary	BAT

TABLE 6
T/R OFF-LINE BITE INDICATIONS

FAULTY BOARD/MODULE	R/T DISPLAY
R.F. Module (RF1 and RF2)	ERR 03
Frequency Conversion Board	ERR 05
Mod/Demod Board	ERR 06
Harmonic Filter Board	ERR 07
R.F. Power Amp Controller Board	ERR 08
R.F. Power Amp Board	ERR 09
Synthesiser Module	ERR 10
Power Supply Board	ERR 12
Display Board	VISUAL CHECK (ALL SEGMENTS ON)
Controller Board	ERR 14
Baseband 1 Board	ERR 17
Baseband 2 Board	ERR 18

TABLE 7
BOARD BITE DATA

BOARD	BIT NO.	INFORMATION	CORRECT INDICATION
Baseband	0	Local Pressel Tx	1
Baseband	0	Local Pressel Rx	0
Baseband	1	Remote Pressel Tx	1
Baseband	1	Remote Pressel Rx	0
Baseband	2	Digital squelch lifted	0
Baseband	3	BITE Pass - Signal	1
Baseband	3	BITE Pass - No Signal	0
Baseband	4	Supplies present	1
Synthesiser	0	Not used	0
Baseband	5	Battery OK	1
Baseband	6	Rebro Override	-
Baseband	7	Call Local	1
Baseband	7	Call Remote	0
Mod/Demod	0	Noise squelch lifted	Var
Mod/Demod	1	Narrow selected	0
Mod/Demod	2	Noise squelch selected	0
Mod/Demod	3	)	Var
Mod/Demod	4	) Signal strength indication	Var
Mod/Demod	5	) from 0000 to 1111	Var
Mod/Demod	6	)	Var
Mod/Demod	7	Not used	0
PA Controller	0	Filter DC path OK	0
PA Controller	1	Power to ANT OK (High power only)	1
PA Controller	2	Aerial selection - Whip	1
PA Controller	2	Aerial selection - 50 ohm	0
PA Controller	3	Tx demuted	0
PA Controller	4	Power to 50 Ω OK (High power only)	1
PA Controller	5	Temperature normal	1
PA Controller	6	VSWR normal (50 Ω and High power)	1
PA Controller	7	Current normal	0
Synthesiser	1	Not used	0
Synthesiser	2	Not used	0
Synthesiser	3	Not used	0
Synthesiser	4	Not used	0
Synthesiser	5	Squelch lifted	Var
Synthesiser	6	Not used	0
Synthesiser	7	In lock	0
RF2	0	Not used	0
RF2	1	Not used	0
RF2	2	Not used	0
RF2	3	Not used	0
RF2	4	Not used	0
RF2	5*	Relay BITE - Tx	0
RF2	5*	Relay BITE - Rx	1
RF2	6	Rx O/L not present	1
RF2	7	Not used	0

* BITE indication from Frequency Converter Board.

TABLE 8
T/R BITE TRACE

MODULES IN CIRCUIT (Display always present)	REMARKS	BITE
PSU (Module 12) only	All segments lit on display (freq may be jumbled) PSU Current 0.0A	-
Plus CONTROLLER (Module 14)	Display Blank PSU Current 0.01A	
Plus SYNTHESISER (Modules 10 & 11)	'BAT' Error PSU Current 0.06A	'BAT'
Plus BASEBAND 2 (Module 18)	PSU Current 0.07A	10
Plus BASEBAND 1 (Module 17)	PSU Current 0.08A	10
Plus MOD/DEMOD (Module 6)	PSU Current 0.09A	10
Plus FREQ CONV (Module 5)	PSU Current 0.01A	05
Plus RF2 (Module 4)	PSU Current 0.11A	03
Plus RF1 (Module 3)	Not affected by coax conns.	07
Plus HARMONIC FILTER (Module 7)	Not affected by coax conns.	
Plus PA CONTROL (Module 8)	No connections made to other boards	12
Plus PA CONTROL (Module 8)	Just 'FLEXI' to RF PA	07
Plus PA CONTROL (Module 8)	All connections made PSU Steady Current 0.14A	PASS