UHF/AM BASE STATION
MODEL TRM-U225

15 WATT RACK MOUNT UNIT, P/N 041222-1

Installation and
Operating Instructions

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WARNING

Do not make physical contact with antenna when transmitter is on. This unit can produce up to 20 watts of power (depending on configuration) when operated in high power mode.

CAUTION

This unit contains static sensitive devices. Wear a grounded wrist strap and/or conductive gloves when handling printed circuit boards.

WARRANTY INFORMATION

The Base Station Model TRM-U225 is under warranty for one year from date of purchase. Failed units caused by defective parts, or workmanship should be returned to:

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SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

Section 1 of this publication provides general information on the Technisonic UHF/AM Base Station System, Item No. TRM-U225. Information on its preparation for use and storage is located in section 2 and operating instructions for this base station can be found in Section 3.

The Base Station Systems consist of a simplex transceiver operating over the UHF/AM military band frequency range of 225.000 MHz to 399.975 MHz. This UHF/AM transceiver is intended for base station operation in an air traffic environment on the military aviation band. These systems can operate from AC power or external DC power in local and remote operating modes.

1.2 DESCRIPTION

The base station is based on a UHF/AM transceiver (FSG-7016) which is capable of direct keypad frequency entry or access to nine (9) pre-programmable frequencies from the front panel. The base station is capable of 15 watt high power operation or one (1) watt low power operation which is front panel selectable. The base station is also configured for use of a Line Interface/Control boards for remote operation. Each base station consists of a UHF/AM Transceiver, Power Supply Module, RF Amplifier Module, and Control Board (optional). Refer to Table 1-1 for system configuration details.

TABLE 1-1 UHF/AM BASE STATION CONFIGURATION

System	Transceiver	Power Supply	RF Amplifier	Remote Control
Model No. **TRM-U225** 19" Rack Mount UHF/AM, 15W Base Station, Part No. 041222-1	UHF/AM P/N FSG7016	110/220 VAC P/N 922083-1	15Watts (60Watts PEP) P/N 033597-1	DC/Tone/ Ground keying P/N's 923051-1 943180-1 (on request)

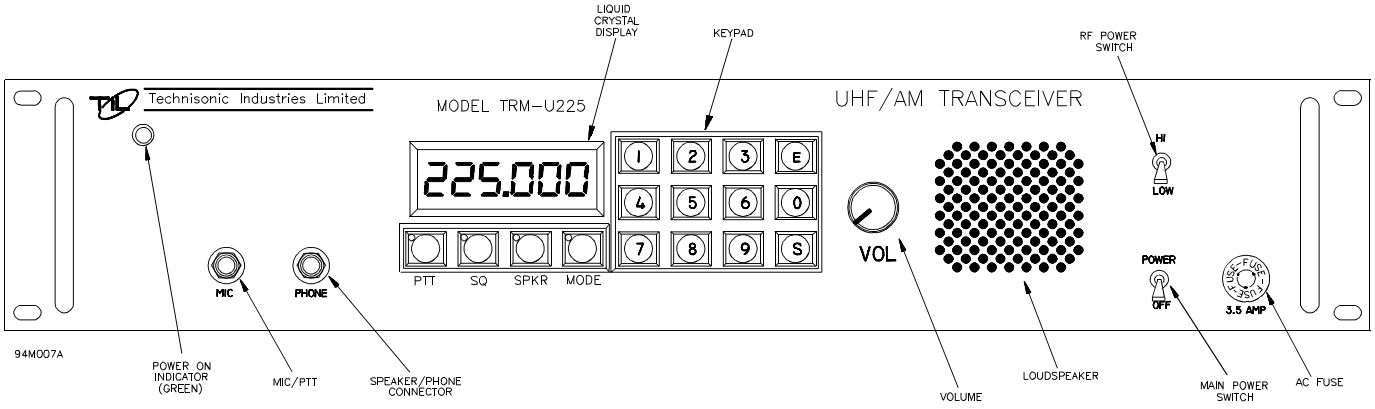


Figure 1-1 TRM-U225 19" Rack Mount 15W Base Station

1.2.1 Transceiver - P/N FSG7016

The FSG7016 in each transceiver is required to provide the RF capability of the UHF/AM Base Stations. The transceiver has a DC to DC convertor (P/N 863118-1) installed to facilitate operation with the RF Amplifier Module.

Transceiver Model FSG-7016, is a self-contained, 1 watt UHF/AM transceiver operating over the entire band of 225.000 to 399.975 MHz in 25 kHz steps. The transceiver in conjunction with the micro-processor controlled front panel will store nine (9) user selected frequency channels in addition to being capable of direct frequency entry or the scanning of user defined upper and lower ranges in the band. Memory entry, frequency selection and scan modes are all performed through the 16 key keypad. Current operating frequency is displayed on a backlit liquid crystal display (LCD).

1.2.2 Power Supply Module - P/N 922083-1

The Power Supply Modules provide the DC supply voltage to the Transceiver and Linear Amplifier, and houses a battery charger which can provide charging and trickle charging to external rechargeable batteries. The DC input supply (battery voltage) required by the Base Station is 24 Volts.

1.2.3 RF Amplifier Module - P/N 033597-1

The RF Amplifier modules provide 15 Watts (60 Watts PEP) of RF power output when the front panel switch is set to High. The RF Amplifiers are fed by the 1 Watt RF output from the transceiver. An internal mounted RF relay bypasses the RF Amplifier in receive and low power transmit modes.

1.2.4 Mother Board - P/N 043628-1

The Mother Board provides all interconnection between the External DC connector, RF Amplifier Module, Power Supply/Charger, Remote Control Board, and Transceiver. The Line Interface/Remote Control Boards are mounted on the Mother Board. The mother board provides a 25-pin D or 9-Pin Positronics connector and RJ-11 (2-wire audio available only) telephone style jack for access to signals provided by the remote control board. The Line Interface/Remote Control boards indicated in Table 1-1 are available for use with this mother board.

1.2.5 Remote Control Boards

1. Line Interface Board P/N 923051-1 (TLI-303)

Provides remote control transceiver operation on 2 wire or 4 wire 600 ohm lines. This board can be configured to key the transmitter using a 2175 Hz* continuous tone (see below), plus/minus DC Voltages, ground keying and internal or external DC (15 mA) current loop keying. Transmit and Receive audio is user selectable for two wires or four wires. *Crystals for tone frequencies other than 2175 Hz may be obtained by special order (ie/2380 Hz). An adjustable (30-300 second) Tx time out function is provided on this board.

2. Line Interface Board P/N 943180-1 (TLI-180)

Provides remote control transceiver operation on 2 wire dedicated 600 ohm lines utilizing the EIA multi-tone keying format found in the Land Mobile Industry. A high level 2175 tone followed by a 1950 Hz guard tone and then a low level 2175 Hz continuous tone is utilized to key the transceiver. The 943180-1 board can also be jumper strapped for standard aeronautical 2175 Hz continuous tone operation. DC (15mA) current loop and ground keying is also supported. However this board does not support 4 wire operation. An adjustable (30-300 second) Tx time out function is provided on this board.

NOTE P/N 923051-1 is the default board supplied in all units. The EIA multi-tone board P/N 943180-1 must be special ordered. To determine which remote card your TBS-series base station has installed, the Configuration label on the back of the chassis should be consulted.

1.2.6 Antenna

This unit is designed for use with a 50 ohm impedance antenna (not supplied). A 50 ohm RF N type connector is provided on the rear of the unit for interfacing with an antenna.

1.3 MODES OF OPERATION

Refer to Section 3 for additional operating modes.

1.3.1 Transmit/Receive (Local Mode)

The transceiver may be operated in either of two modes; transmit or receive, as selected by the Press-to-Talk (PTT) switch on the microphone.

(1) TRANSMIT MODE - When the PTT switch on the microphone is pressed, the transceiver operates in the transmit mode. The PTT signal line is grounded by the microphone PTT switch via the microphone lead and the MIC/PTT connector to the transceiver. The LED display will indicate the transmitter is activated and display the transmit frequency.

Transmission will occur on the channel frequency indicated on the front panel. Refer to Section 3 for transceiver details

(2) RECEIVE MODE - When the PTT switch on the microphone is released, the transceiver operates in the receive mode. The LED display will indicate that the unit is in the receive mode and display the receive frequency.

The setting of the VOLUME CONTROL determines the audio level produced from the internal speaker. When the VOLUME CONTROL is adjusted in the clockwise direction, the audio level will increase.

NOTE

When the connector of the external loudspeaker or head phone is connected to the SPEAKER/PHONE jack, the internal loudspeaker is disconnected and the VOLUME CONTROL will control the audio level of the external loudspeaker or headphone.

1.3.2 Local/Remote Operation

All UHF/AM Base Station transceivers operate in local and remote modes simultaneously.

1. LOCAL OPERATION - In local operation, voice audio, and keying (PTT) functions are routed from the microphone to the transceiver. Receive audio is routed to the internal loudspeaker.

2. REMOTE OPERATION - In Remote operation, transmit audio, keying (PTT), and receive audio functions are routed over land lines to the 600 ohm remote input. Internal jumpers can be set for ± DC, ground transmitter keying, tone keying or current loop keying, depending on the line interface/remote control board utilized.

1.3.3 AC and DC Operation

The unit can be operated by external 120 VAC (220 VAC operation available by setting jumper in power supply module) or external 28 VDC.

1. AC OPERATION - During AC operation, the unit can charge and trickle charge external batteries via the External DC connector mounted on the rear panel of the Base Station. Refer Table 1-2 for details.

2. DC OPERATION - The unit can be operated from an external DC supply within the range of 21.6 Vdc to 30 Vdc. A DC connector is mounted on the rear of the Base Station which mates with DC Power Cable P/N 863701-1 (Not Supplied) to facilitate external DC operation.

The following battery back-up kit is available for The TRM-U225 base station:

P/N 989978-1, 24 Volt Battery Back-up Kit (7.2 AH)
For use with 15watt TRM-U225 Base Station. Provides a minimum of 5 hours back-up for 15 watt unit with 20% Tx and 80% Rx duty cycle. Note: Back-up time for when the unit is set for 1 watt RF output power will be significantly longer.

Kit includes:
qty. (1) p/n 987370-3, DC mating cable with battery connectors.
qty. (2) p/n LCR 12V7.2P, 7.2 amp hour sealed lead acid batteries.
qty. (1) p/n 987246-2, battery interconnect cable.
qty. (1) p/n 968211, battery hook-up instructions.

1.4 TECHNICAL SUMMARY

A summary of electrical, operational, mechanical and physical characteristics of the Base Station are provided in Tables 1-2.

TABLE 1-2 MODEL TRM-U225 TRANSCEIVER LEADING PARTICULARS

GENERAL:

Dimensions & Weight:

Width	482.5 mm (19.0 in) MAX
Height	89 mm (3.5 in) MAX
Depth	430 mm (17.0 in) MAX
Weight	6.8 Kg (15 lb) MAX

TRANSMITTER:

Power Output	1 watt (low) or 15 Watts (high)
Modulation	80% Nominal, 70% MIN, 95% MAX
Audio Distortion @ 90% mod, 400 to 3000Hz	10% MAX
Audio Frequency Response	350 Hz to 3000 Hz, $6dB. (0dB = 1 kHz)
Spurious Emissions	60 dB below carrier
Frequency Stability (0 to +40 degrees C)	#2.5 ppm
Frequency Stability (-20 to +55 degrees C)	#5.0 ppm

RECEIVER:

RF Input Impedance	50S, VSWR 2:1 MAX
Sensitivity (10 dB SINAD) @ 1 KHz 30% Mod	#1.0 µVolt/-107dBm

Selectivity, 25 KHz Channel Spacing:

-6 dB	Greater than or equal to 8 KHz
-60 dB	Less than or equal to 17 KHz
-70 dB	Less than or equal to 25 KHz

Audio Distortion	# 15% with RF input 1mV, M = 90%, 400-3000Hz
Spurious Response Attenuation	Greater than 70 dB including IF image rejection
Maximum Receiver Input level	5 Volts/50 ohms without damage
RF AGC (1 µV to 500 mV/50 ohms)	# 5 dB

Intermodulation:

Ultimate Sensitivity	$ 65 dB
Spurious Attenuation	$ 70dB
Spurious Emission	# -70 dB
Audio Output	$ 4W into 4 ohms and $ 100mW into 600 ohms
Squelch Control	# 1.5 µvolts at 50 ohms, Hysteresis approx. 3dB SQ ON/OFF

TABLE 1-2 TRM-U225 TRANSCEIVER LEADING PARTICULARS - continued

POWER REQUIREMENTS:

15 Watt, TRM-U225 Base Station
- AC Input Voltage/Current . . . . . 100 to 132 VAC @ 1.5 Amp
- AC Input Voltage/Current (Available) . . . . . 190 to 250 VAC @ 0.8 Amp
- DC Input Voltage/Current . . . . . 21.6 VDC to 30 VDC @ 4.0 Amp

Battery Charger Voltage & Current . . . . . 27.5 Vdc, 3.5 Amps MAX

RF POWER OUTPUT
- 15 Watt Base Stations (Low/High) . . . . . 0.6-1.0/10-20 Watts
- Duty Cycle . . . . . 1 minute transmit, 4 minutes receive

OPTIONAL REMOTE CONTROL BOARD - (P/N 923051-1)

Remote Audio Input . . . . . 2 or 4 wire (selectable), balanced 600 S lines
Remote Tx Timeout . . . . . 30 to 300 seconds
Tone Keying:
Impedance . . . . . 600 S floating with respect to ground
Tx Control Tone . . . . . Selectable 1800 Hz to 3000 Hz
Tx Tone Input Level . . . . . 0 to -40 dBm
Tx Tone Control Response Time . . . . . < 12 milliseconds
DC Keying . . . . . ± 48 Vdc
Loop Resistance . . . . . 10 KS MAX
Ground Keying . . . . . Closure to Ground
Loop Resistance . . . . . 4 KS MAX
Remote RX:
Range . . . . . + 10 dBm to -15 dBm (Factory set to -10dBm)
Impedance . . . . . 600 S floating with respect to ground
RX/TX Interface Signals:
Squelch Signal . . . . . Ground, Open circuit for Mute
TX RF Output Signal . . . . . RF ON = Ground,RF OFF = Open Circuit
AGC Signal Output . . . . . Linear 0 to + 6 Vdc

Temperature & Humidity:
- Operating Temperature Range . . . . . -20EC to + 60EC
- Storage Temperature Range . . . . . -40EC to + 85EC
- Relative Humidity 100%

SECTION 2

PREPARATION FOR USE AND STORAGE

2.1 INTRODUCTION

This section provides the information required for custom configuration and storage of the UHF/AM Transceiver. This section includes information on customizing the remote control board functions and module replacement.

CAUTION: Antenna must be connected to transceiver before transmitting or permanent damage to the output stage may occur.

2.2 DISASSEMBLY/ASSEMBLY (Refer to Figure 2-1)

2.2.1 Remove/Replace Top Dust Cover Assembly

REMOVAL

(1) Remove and retain twelve screws securing top dust cover to the 19" rack chassis.

(2) Lift cover clear of chassis to expose internal view of transceiver as shown in Figure 2-1.

REPLACEMENT

(1) Position top cover on chassis.

(2) Position one screw in each corner of the top cover mounting holes.

(3) Secure cover to chassis with remaining screws.

2.2.2 Remove/Replace Transceiver Module

REMOVAL

(1) Remove dust cover as described in paragraph 2.2.1.

(2) Disconnect RF and Control cables from the side of the Transceiver module and Power cable from the Front Panel module, leading to the Transceiver module.

(3) Remove and retain the four (4) screws securing the Transceiver module, located on the bottom of the main chassis.

(4) Lift Transceiver module clear of chassis.

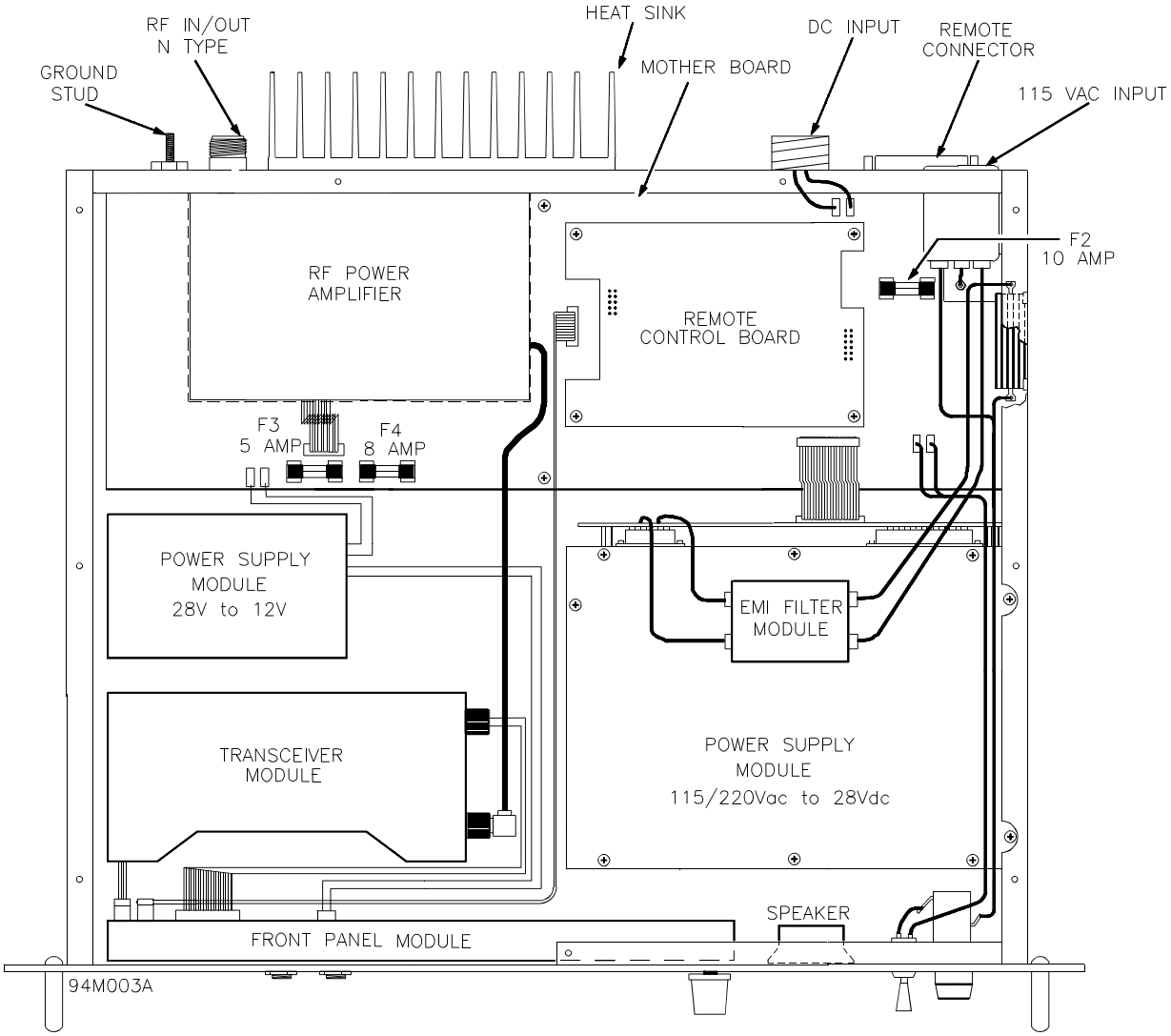


Figure 2-1 UHF/AM Rack Mount Transceiver - Internal View

REPLACEMENT

(1) Position and secure Transceiver module to the bottom of the Main chassis with the four screws.

(2) Re-connect RF and Control cables to the side of Transceiver module and the Power cable to the Front panel module.

(4) Replace top dust cover as described in paragraph 2.2.1.

2.2.3 Remove/Replace Control Board

REMOVAL

(1) Remove dust cover as described in paragraph 2.2.1.

CAUTION **Care must be taken when removing or replacing Control Board to avoid damage to Motherboard Connector Pins.**

(2) Remove and retain four screws securing Control Board "piggy back" to the Mother Board standoffs. Remove Control Board from Mother Board.

REPLACEMENT

(1) Align the two female connectors on the control board with the male connectors on the Mother Board using the four mounting holes and standoffs as a guide. Secure control board to the Mother Board standoffs with four screws and washers.

(2) Replace dust cover as described in paragraph 2.2.1.

2.3 REMOTE OPERATION SET UP - Line Interface Boards

The Procedures listed below enable the user to custom configure the unit for external remote control hardware. Refer to Table 2-1 for connector pin details on Remote Control D Connector located at rear of Base Station or Table 2-2 for connector pin out on the parallel connected Positronics 9-pin connector. Position jumpers on Line Interface Board as indicated Figures 2-2, or 2-3 as required. Verify Remote Control operation in accordance with manufacturers instructions.

TWO WIRE SETUP - In two wire operation, a single balanced 600 ohm pair is provided for transmit and receive audio. The transmitter can be keyed on the same pair or externally.

FOUR WIRE SETUP - In four wire operation, separate balanced 600 ohm pairs are provided for transmit and receive audio. The transmitter can be keyed on the Tx audio pair or externally.

DC KEYING - In ± DC keying, a positive voltage between +10 Vdc and +48 Vdc or negative voltage between -10 Vdc and -48 Vdc will key the transmitter. A DC voltage between -5 Vdc and +5 Vdc will not key the transmitter.

TONE KEYING - In Tone keying a tone of 2175 Hz or 2380 Hz (Optional) can be used to key the transmitter. Tone sensitivity is adjustable from -40 dBm to 0 dBm.

GROUND KEYING - In Ground Keying the transmitter is keyed by shorting the control point (landline or External Keying) to chassis ground

CURRENT LOOP KEYING - In Current Loop keying, an internal or external current source (15 mA) is used to key the transmitter

EIA TONE KEYING - The EIA multi-tone keying format is found in the Land Mobile Industry. A high level 2175 Hz tone followed by a 1950 Hz guard tone then a low level 2175 Hz continuous tone is utilized to key the transceiver.

TABLE 2-1 25-Pin "D" TYPE CONNECTOR FUNCTIONS

PIN NO	Two Wire Line Interface Boards P/N 943180-1	PIN NO	Four/Two Wire Line Interface Board P/N 923051-1
9, 21	2 Wire TX/RX Audio(600S)	9, 21	4 Wire Remote TX Audio **or** 2 Wire Rx/Tx Audio (600S)
10,22	Not Connected	10,22	Remote RX Audio Line (600S)
1,2,14,	Ground		Ground
15	Ground	1,2,1	Ground
25	Squelch	4	Squelch
13	External PTT	15	External PTT
12, 24	External DC In (+24 Vdc)	25	External DC In (+24 Vdc)
others	Not Connected (13 pins)	13	Not Connected (13 pins)
		12, 24 others	

NOTE: A modular RJ-11 Jack is also provided on the rear of the chassis for quick connection to the 2 wire, Tx/Rx Audio. The red and green wire connections (centre pins) on the RJ-11 are connected parallel to pins 8 and 9 on the 9 pin connector. This RJ-11 jack CANNOT be used if the remote control card is set to 4-wire operation as it does not have the necessary connections. The black and yellow wire connections on the RJ-ll contain a composite recorder out signal not found on any other connector.

TABLE 2-2 9-Pin POSITRONICS TYPE CONNECTOR FUNCTIONS			
PIN NO	**Two Wire Line Interface Board P/N's 943180-1**	**PIN NO**	**Four/Two Wire Line Interface Board P/N 923051-1**
A, B	2 Wire Remote TX/RX Audio(600S)	A, B	4 Wire Remote TX Audio Line **or** 2 Wire Rx/Tx Audio (600S)
D,C			4 Wire Remote RX Audio (600S)
J	Not Connected	D,C	Ground
K	Ground	J	External PTT
H	External PTT	K	External DC In (+24 Vdc)
E, F	External DC In (+24 Vdc) Not Connected	H E, F	Not Connected

2.3.1 Two/Four Wire Remote Control Board P/N 923051-1

Provides remote control base station operation on 2 wire or 4 wire, 600 ohm lines. This board can be configured to key the transmitter using a 2175 Hz tone (2380 Hz upon request), plus/minus DC Voltages, ground keying and internal or external current loop keying. Transmit and Receive audio is user selectable for two wires or four wires. Crystals for tone frequencies other than 2175 Hz or 2380 Hz may be obtained by special order.

See Table 2-3 for jumper settings and their functions. See Figure 2-3 for location of jumpers referred to in the Table 2-3. Pins are numbers increase as you go from top to bottom or left to right on the connector.

2.3.2 Two Wire Remote Control Board P/N 943180-1

Provides remote control Base Station operation on 2 wire 600 ohm lines. Two wire Line Interface board with EIA multi-tone, standard 2175Hz continuous tone, DC keying of ground keying over audio lines. The multi-tone keying format consists of a high level 2175 tone followed by a 1950 Hz guard tone and then a low level 2175 Hz continuous tone is utilized to key the transceiver. This board will also support 15mA current loop or ground keying. Refer to Figure 2-4 for jumper locations to set functions and line level adjustments for this board. Summary of jumper settings follow. Pins are numbers increase as you go from top to bottom or left to right on the connector.

Set **J1** for **ST** (standard 2175Hz continuous) Tone keying or
for **EIA** (multi-tone keying format).
Set **J2** for Tone keying function **ON** (left jumper position) or **OFF** (right jumper position).
Set **J3** for Time out timer **OFF** (left jumper position) or **ON** (right jumper position).

See Table 2-4 for jumper settings and their functions. See Figure 2-3 for location of jumpers and left/right orientation referred to in the Table 2-4.

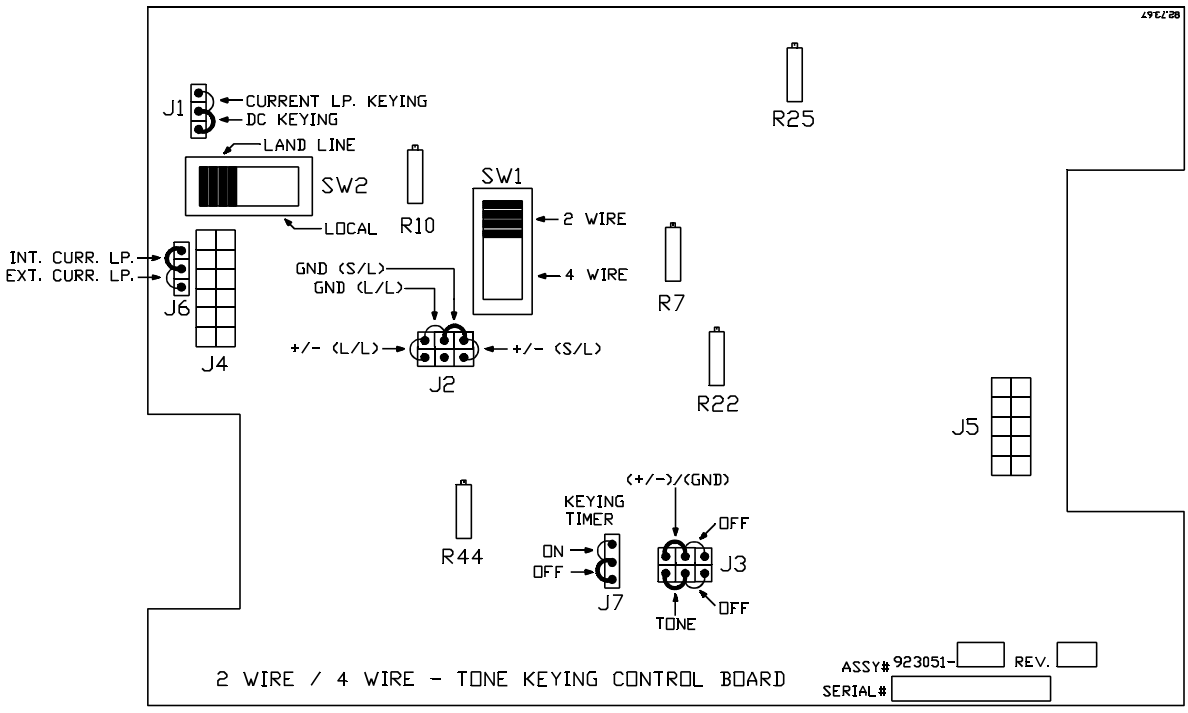
TABLE 2-3 REMOTE CONTROL BOARD P/N 923051-1 SETTINGS	
CONTROL	**FUNCTION**
J1	Jumper Pin 1 and Pin 2 for DC Current Loop Keying Jumper Pin 2 and Pin 3 for ± DC Keying or Ground Keying. **Note: SW2 must be in position 2 if Pin 2 and Pin 3 are jumpered.**
J2	Jumper Pin 1 and Pin 2 for Ground Keying (Land Line). Jumper Pin 1 and Pin 4 for ± DC Keying (Land Line). Jumper Pin 2 and Pin 3 for Ground Keying (Single Key Line). Jumper Pin 3 and Pin 6 for ± DC Keying (Single Key Line). Jumper Pin 2 and Pin 5 for No Function.
J3	Jumper Pin 1 and Pin 2 for ± DC or Ground Keying. Jumper Pin 4 and Pin 5 for Tone Keying. **Note: Both Options may be selected.** Jumper Pin 2 and Pin 3 for No Function. Jumper Pin 5 and Pin 6 for No Function.
J7	Jumper Pin 1 and Pin 2 to enable Timeout Timer. Jumper Pin 2 and Pin 3 to disable Timeout Timer.
J6 (*)	Jumper Pin 1 and Pin 2 to for Internal Current Loop Keying. Jumper Pin 2 and Pin 3 to for External Current Loop Keying.
SW1	Position 1 Selects 2 Wire Operation. Position 2 Selects 4 Wire Operation.
SW2 (*)	Position 1 Selects Normal (Land Line Keying). Position 2 Selects Local (Single Line Keying).
Y1,Y2	Determines Keying Tone Frequency.
R7	Sets Tx Audio IN Level (Range -18 dBm to +10 dBm).
R22	Sets Key Tone Level (Range -40 dBm to 0 dBm).
R25	Sets Rx Audio OUT Level (Range -15 dBm to +10 dBm).
R44	Sets Timeout Timer (Range 30 to 300 Seconds).
R10	Sets Receive Audio Output Balance.

(*) P/N 923051-1 with Rev N and up (Aug 2006) has SW2 and J6 removed. The SW2 function is now hard wired in the landline current loop keying position and J6 is hard wired for external current loop.

TABLE 2-4 REMOTE CONTROL BOARD P/N 943180-1 SETTINGS	
CONTROL	**FUNCTION**
J1	Jumper Pin 1 and Pin 2 for ST (standard 2175 Hz continuous) tone Keying Jumper Pin 2 and Pin 3 for EIA multi-tone Keying.
J2	Jumper Pin 1 and Pin 2 for Tone Keying. Jumper Pin 4 and Pin 5 for Current Loop (15mA DC) or Ground Keying. **NOTE: Both options may be selected** Jumper Pin 2 and Pin 3 to disable Tone Keying. Jumper Pin 5 and Pin 6 to disable Current Loop and Ground Keying.
J3	Jumper Pin 1 and Pin 2 to enable Timeout Timer. Jumper Pin 2 and Pin 3 to disable Timeout Timer.
R6	Tx audio level Adjustment
R24	Keying Tone Attenuator
R26	1950 Tone level Adjustment
R41	2175 Tone Level Adjustment
R59	Sets Rx Audio Level Adjustment (Range -15 dBm to +10 dBm).
R64	Sets Timeout Timer (Range 30 to 300 Seconds)

Control Configuration for 2/4 Wire (+/-)DC/Ground/Tone/ (Current Loop) Keying Control Board.

Assembly #: 923051



R7: Tx Audio (***-25 dBm*** sensitivity; increases clockwise).

R10: 2 Wire Rx Balance @ 600Ω (*1mV* RF @ 1KHz, 30% Mod.) R10 adjusted for ***minimum amplitude*** at C6/R4 junction.

R22: Keying Tone (***-30 dBm*** sensitivity; decreases clockwise).

R25: Rx Audio (***-10 dBm*** output level; increases clockwise).

R44: Time Out Timer (15 to 300 sec.; ***90 sec.*** Nominal; increases clockwise).

SW1: Selects either ***2 Wire*** or 4 Wire operation.

SW2 (*)**:** Selects either ***Local*** or Land Line Current Loop Keying.

J1: Selects ***DC*** or Current Loop Keying operation.

J2: Selects either ***Land Line (L/L)*** or Single Line (S/L) and +/- DC or Ground keying operation.

J3: Selects ***Tone*** and/or *+/- DC* Keying enable or disable.

J6 (*)**:** Selects between ***Internal*** or External Current loop keying (*ICL*/ECL).

J7: Keying timer Enable/***Disable***.

J4: Input Connector.

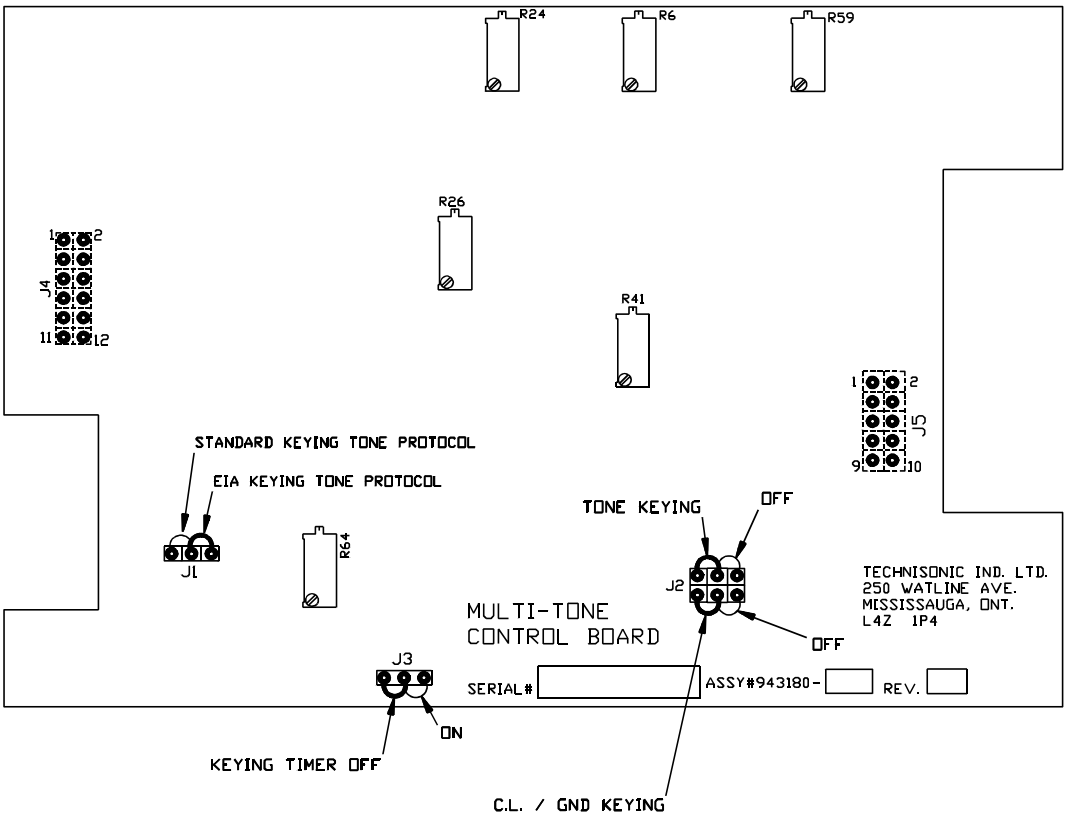
J5: Output Connector.

(*) P/N 923051-1 with Rev N and up (Aug 2006) has SW2 and J6 removed. The SW2 function is now hard wired in the landline current loop keying position and J6 is hard wired for external current loop.

NOTE: Bold Italics indicate Factory default configurations.

Figure 2-2 Line Interface/Remote Control Board P/N 923051-1

Control Configuration for Multi-Tone Control Board.
Assembly #: 943180



DENOTES FACTORY DEFAULT CONFIGURATION

R6: Tx audio level adjustment (**-25 dBm**).
R24: Keying Tone Attenuator.
R26: 1950 Hz tone level adjustment
R41: 2175 Hz tone level adjustment
R59: Rx Audio level adjustment. **(*-10 dBm*)**
R64: Time out timer **(*90 sec.* default)**

J1: Standard or ***EIA*** Keying tone protocol.
J2: Selects ***Tone* and/or *Current Loop/* Ground** Keying enable or disable
J3: Selects Keying timer Enable/***Disable***
J4: Input Connector
J5: Output Connector

NOTE: *Bold Italics* indicate Factory default configurations.

Figure 2-3 Line Interface/Remote Control Board P/N 943180-1

2.4 OPTIONAL LOUDSPEAKER, HEADPHONE INSTALLATION

Provision is made for connection of an external loudspeaker or headphone to the SPEAKER/PHONE jack of the transceiver, as shown in Figure 3-1.

2.4.1 External Loudspeaker

When an external loudspeaker is to be installed, an 8-ohm nominal impedance loudspeaker should be used. The loudspeaker cable should be terminated by a 1/4 in., 3-pole telephone plug (male), with the loudspeaker connected between tip and sleeve (ground). Insert the external loudspeaker connector into the SPEAKER/PHONE jack located on the front panel of the transceiver. When the external loudspeaker is connected to the transceiver SPEAKER/PHONE jack, the internal loudspeaker is automatically disconnected.

2.4.2 Headset

Headset impedance should be 150 to 600 ohms. The headset cable must terminate in a 1/4 in. 3-pole telephone plug (male), to mate with the SPEAKER/PHONE jack located on the front panel of the transceiver. The internal loudspeaker is automatically disconnected. Connect the headset as indicated below for receiver audio with or without transmit audio.

(1) HEADSET WITHOUT TRANSMIT AUDIO - When receiver audio only without transmit audio is required, the headset should be connected between the tip and sleeve (ground) of the telephone plug.

(2) HEADSET WITH TRANSMIT AUDIO - When receiver audio with transmit audio is required, the headset should be connected between the ring and sleeve (ground).

2.5 OPERATIONAL CHECK

Perform an operational check of the transceiver after all adjustments. Check each channel in use in both the transmit and receive modes of operation, using the Operating Instructions given in Section 3.4 of this document and the appropriate specified operating procedures during transmission.

2.6 STORAGE

To store for an extended period, store unit in a dry place, in the original shipping container.

SECTION 3

OPERATING INSTRUCTIONS

3.1 INTRODUCTION

3.1.1 Transceiver Model TRM-U225

The Transceiver is a microprocessor controlled UHF/AM transceiver operating over the entire band of 225.000 to 399.975 MHz in 25 kHz steps. The transceiver will store nine user selected frequency channels in addition scanning with in an upper and lower limit selected by the user. Frequency Selection, Storage, Recall and Channel Scan modes are all selected by the 16 key keypad. Current operating frequency is displayed on a backlit liquid crystal display (LCD).

3.1.2 Scan Modes

1. FREQUENCY BAND SCAN MODE - In this Scan Mode, the transceiver cycles through the selected frequency band in 25KHz steps and locks on to the first channel received in scan sequence. Audio is enabled for 5 seconds for operator. Pressing the Press-to-Talk switch or key “E”exits the scan mode. If there is no operator action then the transceiver remains operating in the scan sequence continuously.

2. CHANNEL SCAN MODE - In this Scan mode the transceiver cycles through the preset Channels. Maximum of four (4) channels can be scanned. The transceiver locks on to the first channel received in the scan sequence and normal operation is resumed.

3.2 OPERATOR'S SWITCHES, CONTROLS AND INDICATORS

A view of the front and rear panel is given in Figure 3-1. A functional description of each of the operator's switches, controls and indicators is given in Paragraph 3.3 and Table 3-1.

This section includes a functional description of each switch, control, indicator and connector located on the front and rear panels of the Transceiver unit. These items are described in the order they appear on Figure 3-1 from left to right.

3.3 FRONT PANEL KEY PAD FUNCTIONS

Pressing the MODE key on the front panel will allow access to the following functions; Frequency Input functions, Scan functions, Set-up functions and Status functions. These functions are accessed via the front panel keypad. A description of how to utilize each of these groups of functions is provided in the remainder of this paragraph.

3.3.1 FREQUENCY INPUT FUNCTIONS

3.3.1.1 PROGRAM A FREQUENCY

Press and hold “MODE” key, display will show: 1-FREQ. INP., 2-SCAN, 3-SET-UP, 4-STATUS. Press #1, display will show “FREQUENCY INPUT” and second line **t t t t t t**.

Enter desired frequency (6 digits). After few seconds display will change to show “ACTIVE FREQUENCY” and second line the “ENTERED FREQUENCYMHz”.

Frequency programming is completed. Transceiver will operate on displayed frequency.

3.3.1.2 STORE A FREQUENCY

When display shows "ACTIVE FREQUENCY" and second line "frequency MHz", press and hold the desired memory number key. The display will show "ACTIVE FREQUENCY" and the second line will start with DOTS, then rrrrRRR, and at the end SS. When first "S" is displayed, release the memory key. The display will show M(location#) is not empty and on the second line "Press S to store". Press and hold "S" key. The display will show as final "ACTIVE FREQUENCY" and on the second line "M(location#) frequency MHz".

MEMORY STORE COMPLETE

3.3.1.3 RECALL A MEMORY

Press and hold desired Memory Location Key. The display will show "ACTIVE FREQUENCY" and second line starts with DOTS, then rrr. When the first r shows, release the held key. The display will show "ACTIVE FREQUENCY" and the second line "M(location#) frequency MHz".

MEMORY RECALL COMPLETE

3.3.2 SCAN PROGRAMMING FUNCTIONS

3.3.2.1 FREQUENCY BAND SCAN

Press and hold "MODE" key. Then press key #2 to select scan programming. Display will show: BAND SCAN – 1, CHANNEL SCAN– 2.

FOR FREQUENCY BAND SCAN press key #1, display shows "START FREQUENCY?". Enter start frequency (6 digits). Display shows "STOP FREQUENCY?". Enter stop frequency (6 digits).

Rx starts to scan in 25 KHz steps.

FREQUENCY BAND SCAN PROGRAMMING COMPLETE

To stop scanning, press "E" key. Transceiver will return to original "ACTIVE FREQUENCY" operation.

3.3.2.2 CHANNEL SCAN

FOR CHANNEL SCAN press key #2, "start display" shows: 1:SHOW, 2: SET, 3: START SCANNER

Press key #2 to enter Channel frequencies to be scanned. Maximum four (4) channels can be scanned. Press key #1 to display channels to be scanned. Press key "E" to return to "start display".

NOTE: Pressing key "E" second time will return to "ACTIVE FREQUENCY" operation.

Press key #3 to start SCAN.

CHANNEL SCAN PROGRAMMING COMPLETE

To stop scanning, press key "E". Transceiver will return to original "ACTIVE FREQUENCY" operation.

3.3.3 SET-UP PROGRAMMING FUNCTIONS

3.3.3.1 RF POWER PROGRAMMING

Press and hold "MODE" key. Then press key #3 to select set-up programming.
Press key #1, display shows "POWER is 1.0W", second line shows:"NEW LEVEL(0..3)".

Press "0" key for Receive only
Press "1" key for 0.1W
Press "2" key for 0.4W
Press "3" key for 1.0W

NOTE: During the above operation, momentary will be shown: "power is changed".

Final display is:
"ACTIVE FREQUENCY", second line, "frequency MHz" or "M(loc.#) frequency MHz".

NOTE: Pressing "E" key when commands are not complete, display returns to start status "ACTIVE FREQUENCY".

3.3.3.2 POWER AMPLIFIER ENABLE/DISABLE

Press and hold "MODE" key. Then press key #3 to select set-up programming.
Press key #2, display shows: "PA is enabled", 1 = change or "E" = exit .
By pressing #1 key, PA will be "enabled" if was disabled or will be "disabled" if was enabled . By pressing "E" key, existing state will not change.

3.3.3.3 SPEAKER ON/OFF PROGRAMMING

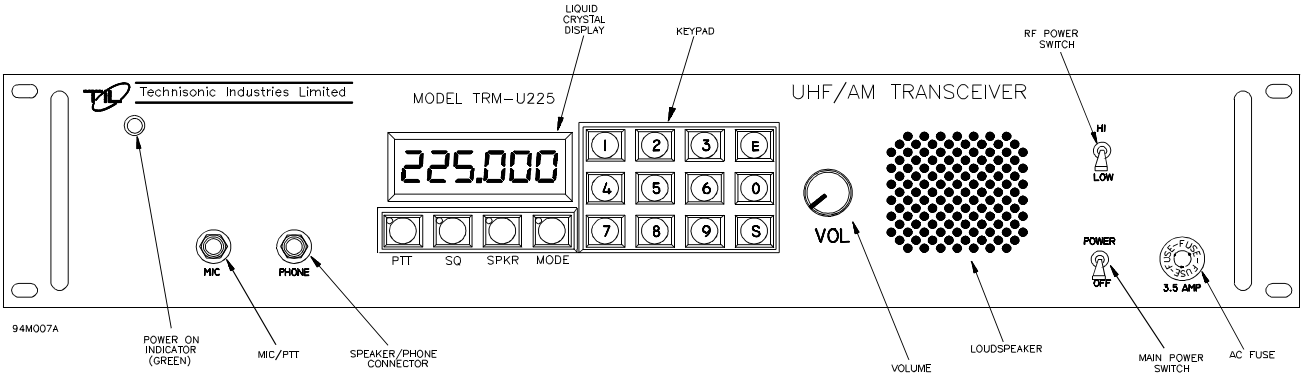
Press and hold "MODE" key. Then press key #3 to select set-up programming.
Press key #3, display shows: "SPKR enable/disable", "1" = change "E" = exit.
By pressing #1 key, Speaker will be "disabled" if it was enabled or will be enabled if it was disabled. By pressing "E" key, existing state will not change.

3.3.3.4 MEMORIES CLEAR COMMAND

Press and hold "MODE" key. Then press key #3 to select set-up programming.
Press key #4, display shows: "ALL MEMORIES CLEAR", clear = 1 exit = E. To clear all memories press key #1, for no change press key "E".

3.3.4 TRANSCEIVER STATUS FUNCTIONS

Press and hold "MODE" key. Then press key #4 to select "STATUS INFO".
Display will show operating software version and diagnostic information. Press "E" key to exit.



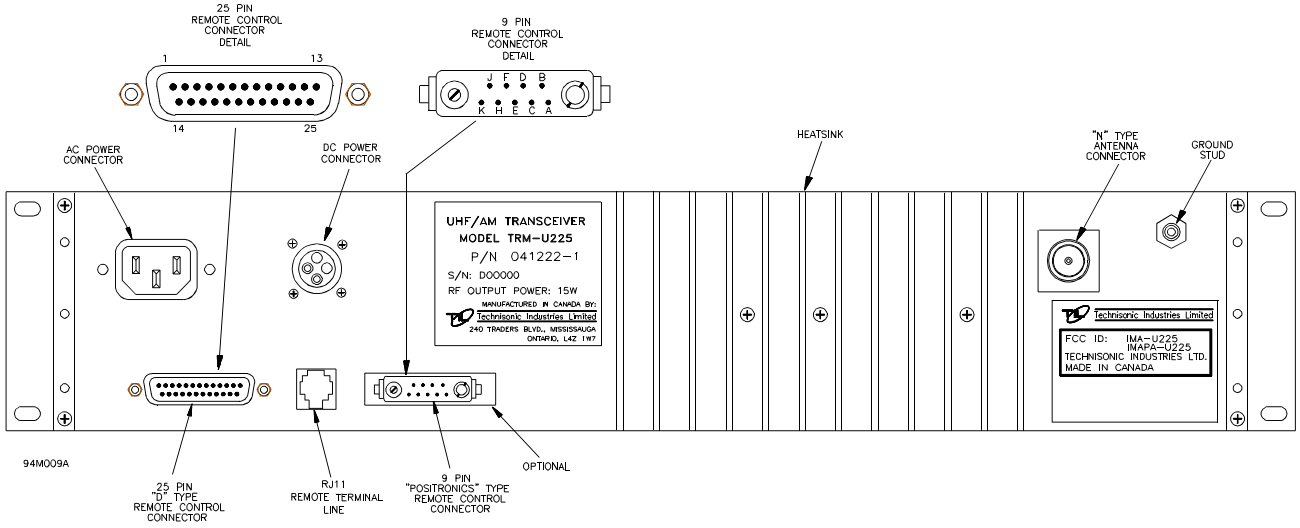


Figure 3-1 Base Station Front and Rear Panel Layout

TABLE 3-1 OPERATORS SWITCHES, CONTROLS AND INDICATORS		
No.	**SWITCHES CONTROLS & INDICATORS**	**FUNCTIONAL DESCRIPTION**
1	POWER ON LED INDICATOR	A GREEN LED Indicates when the POWER ON/OFF switch is set to ON and voltage is applied to the transceiver.
2	MIC/PTT CONNECTOR	The 0.2" connector jack functions as a Microphone/PTT Connector. Tip - PTT Signal Line Ring - Microphone Signal Sleeve - Ground
3	SPEAKER/ PHONE CONNECTOR	The 0.25" connector jack provides interconnection to either an external loudspeaker or headphone. When in use, the internal speaker is disconnected and the VOLUME control sets the audio level applied to the headphone. A transmit sidetone signal is also provided in the headset audio.
4	LIQUID CRYSTAL DISPLAY	A 6-digit Liquid Crystal Display (LCD) displays the FREQUENCY that the transceiver is currently operating on. Additional information is displayed during programming and memory recall modes.
5	PTT KEY	Pressing the PTT key will place the transceiver in the transmit mode and the small red LED in the upper left corner of the PTT key will illuminate. Releasing the PTT key will allow the transceiver to key down.
6	SQ KEY	Pressing the SQ (Squelch) key will defeat the receiver squelch. Pressing it again will toggle the squelch back on. A small red LED will illuminate in the upper left corner of the SQ key when the squelch is active.
7	SPKR KEY	Pressing the SPKR (speaker) Key will toggle the internal speaker on or off. When the speaker is active a small red LED in the top left corner of the SPKR key will illuminate.
8	MODE	Pressing the MODE key will allow access to the following functions: 1- FREQ. INPUT 2- SCAN 3- SET-UP 4- STATUS Refer to Paragraph 3.3 for details on how these functions work. When the mode key is depressed a small red LED in the top left corner of the mode key will illuminate.
9	KEYPAD	Performs Channel/Frequency selection and other functions in combination with the MODE key. (Refer to Paragraph 3.3).
10	VOLUME CONTROL	The VOLUME CONTROL potentiometer determines the audio level applied to the internal speaker when the transceiver is operated in the receive mode. When the SPEAKER/PHONE connector is in use the internal loudspeaker is disconnected and the VOLUME CONTROL sets the audio level applied to the headphone.
11	MICROPHONE PTT	PRESS-TO-TALK (PTT) switch determines transceiver operating mode. When the PTT switch is pressed, the transceiver operates in Tx mode. When the PTT switch is released, the transceiver operates in Rx mode.

TABLE 3-1 OPERATORS SWITCHES, CONTROLS AND INDICATORS (Continued)		
FIG 3-1 No.	**SWITCHES CONTROLS & INDICATORS**	**FUNCTIONAL DESCRIPTION**
12	LOUDSPEAKER	An 8-ohm internal speaker reproduces the receiver audio output. The audio line is disconnected from the internal loudspeaker when the transceiver is operated in Transmit mode or when the SPEAKER/PHONE connector is in use.
13	RF POWER SWITCH	Selects RF output power to be Low (1W) or High Power (15W) during Transmit Operation.
15	ON/OFF SWITCH	A (2) two pole switch applies external AC power or external DC to the Base Station power supply.
14	AC FUSE	A 3.5 Amp fuse protects the Base Station power supply from power supply internal short circuit or transceiver short circuit.
15	*AC POWER CONNECTOR	3 Prong AC Connector for use with AC Power Cord P/N 927002-1.
16	*25 PIN D REMOTE CONTROL CONNECTOR	25 Pin “D” type connector provides connections required for remote operation of the base station. This connector supports connections for either 2-wire or 4 wire operation. Refer to Table 2-1 for connector details.
17	*EXTERNAL DC CONNECTOR	Chassis mounted connector provides for Connection to External DC Supply Source. Mates with DC power cable P/N 863701-1.
18	*RJ-11 REMOTE CONTROL CONNECTOR	Modular RJ-11 jack supports 2-wire audio operation on green and red wire connections (centre pins) which are parallel connections to pins 9 and 21 on the 25-pin “D”. The black and yellow wire connections support a composite recorder audio signal which is not found on any other connector.
19	*9 PIN REMOTE CONTROL CONNECTOR	9 Pin "Positronics" type connector provides connections required for remote operation. 2 or 4 wire operation is supported on this connector. The pins on this connector are connected parallel to the same signals on the 25 pin “D” connector. Refer to Table 2-1 for connector details.
20	*ANTENNA CONNECTOR	An “N” type antenna connector is provided to connect a base station UHF/AM antenna to the transceiver.
21	*GROUNDING STUD	A GROUND STUD is provided to ground the base station chassis to the installation rack.
* Denotes items located on rear panel.		

3.4 OPERATIONAL CHECK

(1) Connect the transceiver to a suitable Tx/Rx test monitor.

(2) Turn the unit ON.

(3) Recall Channels “1" through “9" (refer to paragraph 3.3.3). Ensure that the frequencies indicated for each channel displayed correspond to those selected.

(3) Transmit on one channel. Observe that the RF power level selected by the switch on the front panel is indicated on the test monitor’s RF power meter. Verify modulation and envelope distortion. Audio input 100mV, 1kHz, modulation 75-90% with maximum distortion of 15%.

(4) Set the RF generator to the same frequency as the unit under test. Verify receiver operation. Sensitivity should be at least 2uV, 1kHz at 30% modulation for 12 dB SINAD.

3.5 GENERAL OPERATING INSTRUCTIONS

This section covers general operating procedures applicable the TRM-U225. Set Up and Operating details for the remote mode can be found in the previous SECTION.

3.5.1 Preparation for Use

To prepare the transceiver for use (Refer to Figures 3-1and Table 3-1).

(1) Location for Transmit/Receive Operation.

The UHF frequency band is essentially line of site communication. When selecting an antenna location there should be no obstacles between the communicating radio sites. Objects greater than two metres will reflect the RF signal and foliage greatly attenuates signal strength.

WARNING

Do not make physical contact with antenna when transmitter is on. This unit can produce up to 20 Watts of power (depending on configuration) when operated in High Power Mode.

(2) Install Microphone in Microphone (PTT) connector.

(3) Ensure that transceiver POWER ON/OFF switch is set to OFF.

(4) Install AC line cord in AC chassis connector on rear panel and/or install External DC Cable in External DC chassis connector on rear panel as required.

(5) Connect antenna connector to rear panel chassis type “N” connector.

(6) For Remote Operation Connect Land Line to DB-25 or RJ-11 connector provided on rear of Base Station.

NOTE

The TRM-U225 Base Station is capable of simultaneous local and remote operation. No switch is provided for exclusive remote or local mode operation.

Refer to previous section and appropriate Operating Instructions for remote use with a remote DC or tone controller. The following operating procedures are intended specifically for Local Operation.

(7) Ensure that the microphone connector is connected to the MIC/PTT connector of the transceiver.

(8) Set the SQUELCH control button so that the receiver is open and the red LED in the corner of the SQ button is off.

(9) Set the VOLUME control in the 12 o'clock centre position.

(10) Set the POWER ON/OFF switch to "ON".

(11) Verify that the POWER ON green LED is ON.

(12) Proceed to operate in the transmit mode, paragraph 3.5.3 or operate in the receive mode, paragraph 3.5.4 as required.

3.5.2 Transmitter Operation

To operate the transceiver in the transmit mode, proceed as follows:

(1) Set RF POWER switch to desired operating level.

(2) Hold the microphone in one hand, with the upper edge of the microphone as close as possible to the upper lip.

NOTE

This technique activates the noise cancelling feature of the microphone. The microphone is most effective when sound is ½ inch (12.7 mm) or more away from the microphone.

(3) Press and hold the PRESS-TO-TALK switch of the microphone during transmission.

(4) Ensure that the small red LED in the upper left corner of the PTT key is illuminated.

(5) Speak slowly and distinctly into the microphone using specified operating procedures during transmission.

(6) When message is ended, release the PRESS-TO-TALK switch of the microphone.

(7) The transceiver is now operating in the receive mode.

(8) Verify that the small red LED in the upper left corner of the PTT key is not illuminated.

(9) Refer to previous paragraphs for Transceiver Operation and additional operating modes.

3.5.3 Receiver Operation

To operate the transceiver in the receive mode, proceed as follows:

(1) Ensure that the PRESS-TO-TALK switch on the microphone is NOT depressed, and verify that the small red LED in the upper left corner of the PTT key is not illuminated.

(2) Verify that the correct operating frequency is indicated on the front panel LCD display.

(3) The VOLUME control can then be adjusted in a clockwise direction to increase the audio level, or in a counter-clockwise direction to decrease the audio level which can be heard on the internal loudspeaker.

NOTE

When an external loudspeaker or headset is connected to the SPEAKER/PHONE jack of the transceiver, the internal loudspeaker is automatically disconnected. The VOLUME control will now control the audio level applied to the external loudspeaker or headset, as applicable.

(4) Refer to previous paragraphs for transceiver specific operating modes.

3.5.4 Switching OFF

To switch off the transceiver:

(1) Set the POWER ON/OFF on transceiver to switch to OFF.

(2) Verify that all indicator LED's on the front panel are OFF.

NOTE

When the transceiver is switched OFF there is no current drain from external DC

3.5.5 Battery Charging

(1) Set AC ON/OFF switch to OFF.

(2) Install External DC Power Cable P/N 863701-1 (Not Supplied) or equivalent to DC Connector on rear of Panel. Connect to batteries to be charged.

(3) Set AC ON/OFF switch to ON.

3.5.6 External DC Operation

(1) Set AC ON/OFF switch to OFF.

(2) Install External DC Power Cable P/N 863701-1 (Not Supplied) or equivalent to DC Connector on rear of Panel. Connect to External DC Source.

NOTE

Ensure that the DC source voltage does not exceed 30 Vdc. The 15 watt watt unit can operate within the range 21.6 Vdc to 30 Vdc.