



# VHF/AM BASE STATIONS

Model TiL-90-6R

LOW POWER SYSTEM NO. 920707 (TBS-100)

15 WATT SYSTEM NO. 910915 (TBS-200)

25 WATT SYSTEM NO. 910925 (TBS-300)



## Installation and Operating Instructions

TiL Document No. 92RE123

Rev. M

AUGUST 2012

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### Technisonic Industries Limited

240 Traders Boulevard, Mississauga, Ontario L4Z 1W7

Tel: (905) 890-2113 Fax: (905) 890-5338

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**REVISION HISTORY**  
[ 92RE123 ]

REV	SECTION - PAGE -	DESCRIPTION	DATE	Edited by
A		Refers to PL revised/replaced in 94RE149		RR
B		Fig.3-3 Layout picture updated to reflect latest configuration	OCT 6/1997	
C				
D		Sections 1, 2 and 3 updated to reflect latest configuration available. External frequency board and EIA tone card.	OCT 1997	
E		Sections 1,2 and 3 updated to cover new dual conversion information and battery back-up kits.	OCT 2002	RR
F	2	Notes Modification		RR
G	Global  Sect 2 Sect 3	New Document Template (new file format) Title page changed, Headers/Footers added Revision page approved changed to edited by Updated Fig 2.2 and 2.3 Table 3.3 correct jumper setting for 138MHz Added warranty page Remove reference of 91-DE from manual	JUN 2011	FM
H	1-7  2-5	Table 1.2 correct typo (missing minus sign) temp range to -25°C & -55°C Para 2.2.6 correct auto-numbering Fig 2.2 & 2.3 updated	OCT 2011	FM
J	3-8	Added <u>note</u> to §3.4 Channel Freq. Selection referring to units built after Jan 2012 with a USB port and added <u>Appendix A</u> (TDP-90 for USB AM units) with Installation and Operating Instructions.	DEC 2011	FM
K	2-9 2-10	Table 2.3 Note: SW2 must be in Land Line position Fig 2.2 updated as per Doc #106516B	APR 2012	FM
L	Title Pg iii  Global 1-7, 3-2  3.4 Appendix	Simplify System description Updated FCC information including antenna and FCC labeling instructions. Simplify description under "Warning" 7 Watt reference replaced by Low Power Revise Transmitter Characteristics for FCC and ICAN information Para updated -A- Updated TDP90 to REV A	JUL 2012	FM
M	2-8,2-10	Revised as per Test Procedure 106516 Rev C	AUG 2012	FM



## **WARNING**

Do not make physical contact with antenna when transmitter is on.

## **CAUTION ! STATIC SENSITIVE !**



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

## **FCC COMPLIANCE INFORMATION**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.



**WARNING:** For compliance with FCC RF Exposure Requirements the mobile transmitter antenna installation shall comply with the following two conditions:

1. The transmitter antenna gain shall not exceed 3 dBi.
2. The transmitter antenna is required to be located outside of a vehicle and kept at a separation distance of 90 cm or more between the transmitter antenna of this device and person(s) during operation.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

## **FCC LABELING INFORMATION:**

When this device is permanently mounted in an enclosure where the FCC ID label can not be seen, another label must be placed on the outside of the enclosure stating 'contains FCC ID: IMA90-6R'.

## **WARRANTY INFORMATION**

The Base Station Model TiL 90-6R series is under warranty for one year from date of purchase. Failed units caused by defective parts, or workmanship should be returned to:

Technisonic Industries Limited  
240 Traders Boulevard  
Mississauga, Ontario L4Z 1W7

Tel: (905) 890-2113  
Fax: (905) 890-5338

**NOTICE:** The above stated address supersedes all others that may appear otherwise in this manual.



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## **SECTION 1 - GENERAL DESCRIPTION**

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### **1.1 INTRODUCTION**

Sections 1 and 2 of this publication provide general information on Technisonic VHF/AM Base Station Systems, Item No.'s TBS-100, TBS-200 and TBS-300. Specific information for the Base Station Model indicated on the front cover can be found in Section 3.

All Base Station Systems consist of a simplex transceiver complete with microphone, operating over the frequency range of 117.975 MHz to 138.000 MHz. The Base Station Systems are intended for operation in an aeronautical environment and can operate from AC power or external DC power in local and remote operating modes.

### **1.2 DESCRIPTION**

The three base station configurations utilize the six channel (TiL 90-6R) pre-programmable transceiver configured for Low Power, 15 Watt or 25 Watt operation. All systems are now configured to accept the TLI-203 or TLI-180 Line Interface/Control board for remote operation. Each base station consists of a Transceiver, Power Supply Module, RF Amplifier Module, Microphone and Line Interface/Control Board (optional). Refer to Table 1.1 for system configuration details.

To improve the rejection of interfering signals, dual conversion receiver technology has been incorporated on the Transmitter/Receiver (Module A1) board used in Technisonic VHF/AM base stations. The second IF is 455 kHz using a ceramic filter, which is immune to high energy ringing. The dual conversion module also has a second local oscillator, second mixer and ceramic filter. The first local oscillator is the original VCO.

The dual conversion receiver board, P/N 003494-1 was implemented into TBS and TSC series base stations starting in January 2001. An option label on the chassis will indicate OPTION 94 if the dual conversion board is installed. It is possible to retro-fit the dual conversion receiver/transmitter board into older TSC/TBS series base station employing the single conversion board. Please contact Technisonic for availability of an exchange board.

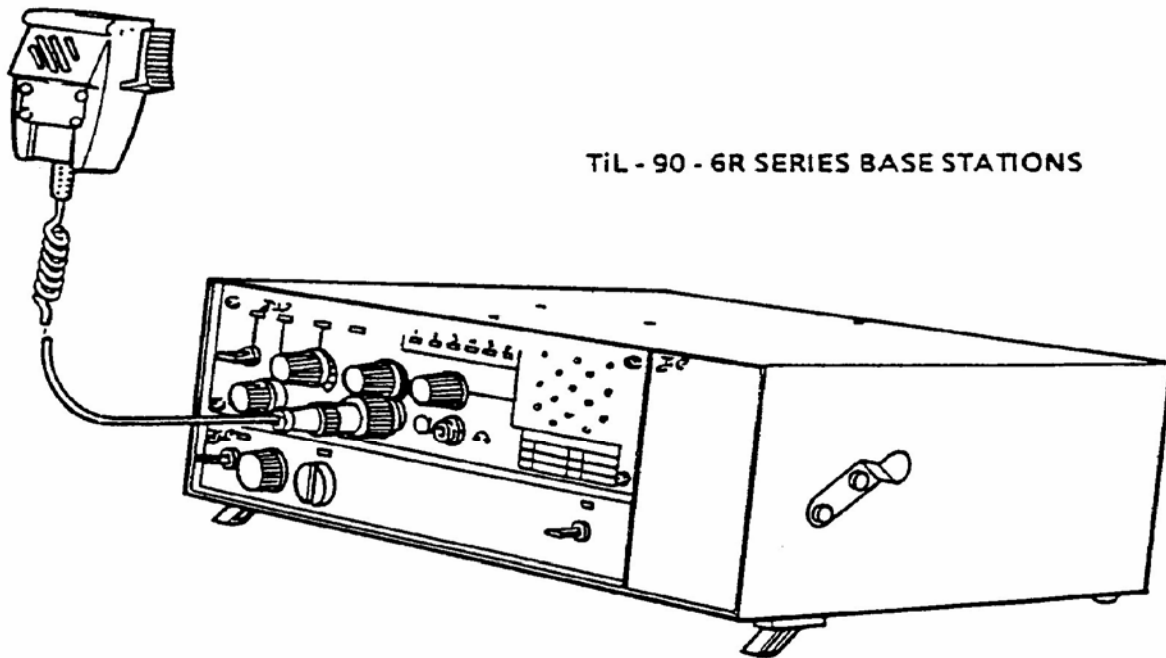
**Note:** If a new A1 Module has been retrofitted the squelch circuit must be aligned for the receiver squelch to operate correctly.

The dual conversion receiver's squelch knob must be rotated significantly more clockwise (4 o'clock position) to obtain the same squelch setting (3uV) as a single conversion receiver's squelch knob set to the 12 o'clock (straight up) position.

If the dual conversion receiver's squelch knob is set to the 12 o'clock position, signals with a level greater than 0.5uV will open the squelch. At most airports this will not be an adequate level of squelch. Please be aware of this squelch knob adjustment variance when setting and/or comparing squelch levels of dual conversion vs. single conversion base stations.

<b>TABLE 1.1 BASE STATION CONFIGURATIONS</b>				
<b>System</b>	<b>Transceiver</b>	<b>Power Supply</b>	<b>RF Amplifier</b>	<b>Line/Remote Control Card</b>
90-6R, *Low Power Base Station Item No. <b>TBS-100</b>	<b>Model 90-6R</b> P/N 861605	<b>SPG-007</b> P/N 921020-1	Not Required	Optional in all Units
90-6R, 15W Base Station Item No. <b>TBS-200</b>	<b>Model 90-6R</b> P/N 861605 Option 1	<b>SPG-015</b> P/N 911018-1	<b>PA-15</b> P/N 912025-1	<b>TLI-203</b> P/N 923051-1
90-6R, 25W Base Station Item No. <b>TBS-300</b>	<b>Model 90-6R</b> P/N 861605 Option 1	<b>SPG-025</b> P/N 911019-1	<b>PA-25</b> P/N 922062-1	<b>TLI-180</b> P/N 943180-1

**NOTE:** \*Low Power description is found in Table 1.2 under Power Output.



**FIGURE 1.1 TBS-Series Base Stations**

### 1.2.1 Transceiver Model TiL-90-6R, P/N 861605-2

The basic transceiver model is required for the Low Power Base Stations. Option 1 indicates that the basic transceiver has Module A6, DC to DC convertor (allows 24Vdc input) installed to facilitate operation with the RF Amplifier Module. Refer to Section 3 for specific details on the Transceiver unique to the systems indicated on the front cover of this document.

Transceiver Model 90-6R, Part Number 861605-2, is a Low Power VHF/AM transceiver which operates in simplex on six pre-programmable, frequency synthesized channels, with 25kHz channel spacing in the frequency range 117.975 MHz to 138.000 MHz.

Refer to above paragraph for details on new dual conversion receiver/transmitter A1 module.

### 1.2.2 Power Supply Modules - Models SPG-007, SPG-015, SPG-025

The Power Supply Modules provide the DC supply voltage to the Transceiver and Linear Amplifier, and house a battery charger which can provide charging and trickle charging to external rechargeable batteries. Model SPG-007 (12Vdc input) is for use in the Low Power units, Model SPG-015 (24 Vdc input) is for use in the 15 Watt units, Model SPG-025 (24 Vdc input) is for use in the 25 Watt configurations.

### 1.2.3 RF Amplifier Modules - Models PA-15 and PA-25

The RF Amplifier Modules provide 15 Watt (Model PA-15) or 25 Watt (Model PA-25) power output when the front panel switches are set to High. The RF Amplifiers are fed by the Low Power RF output from the transceiver. An internal mounted RF relay bypasses the RF Amplifier in receive and low power transmit modes.

### 1.2.4 Distribution Board - P/N 923057-2

The distribution board provides all interconnection between the external DC connector, RF amplifier module, power supply/charger, remote control board (optional), and transceiver. The optional TLI-203/180 remote control card is mounted on the distribution board. The P/N 923057-1 distribution board is now standard and provides standard signal outputs (see Table 2.1), when used in conjunction with the optional TLI-203 or TLI-180 Line Interface/Remote Control boards.

### 1.2.5 Remote Control Boards

#### 1. Line Interface Board P/N 923051-1 (TLI-203)

Provides remote control transceiver operation on 2 wire or 4 wire dedicated 600 ohm lines. This board can be configured to key the transmitter using continuous tone (2175Hz standard), plus/minus DC Voltages, ground keying and 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 may be obtained by special order. Adjustable (30-300 seconds) Tx time out function provided.

#### 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 TLI-180 board can also be jumper strapped for standard aeronautical 2175 Hz continuous tone operation.

#### NOTE

The TLI-203 or TLI-180 remote control boards are extra cost options in TBS-series, Technisonic Base Stations. To determine if your Base station has a remote card installed the "Configuration Label" located on the rear of the base station chassis should be consulted. P/N 923051-1 is the default board supplied in all units when the optional card is ordered. The EIA multi-tone board P/N 943180-1 must be special ordered.

### 1.2.6 Microphone P/N 861902-1

An illustration of the Microphone Assembly Part Number 861902-1, is included in Figure 1.1. The Assembly P/N 861902-1 consists on microphone P/N 861901-1 and microphone retaining bracket P/N 863905-1. The unit is a rugged hand-held microphone housed in a high impact plastic case. The dynamic microphone is a noise cancelling type with a two-stage preamplifier, press-to-talk switch, and a retractable three-core cable terminated by a three-pin, male contacts, connector which mates with the MIC/PTT connector located on the front panel of the transceiver. The microphone dc supply for the microphone is supplied by the transceiver. The microphone bracket can be mounted on the left or right side of the Base Station as required.

### 1.2.7 Antenna

This unit is designed for use with a 50 ohm impedance antenna (not supplied). A 50 ohm RF "N" type connector (BNC available as an option) 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 Tx ON amber LED will go ON, indicating that the transmitter is activated.

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 Tx ON amber LED will go OFF, indicating that the transmitter is inhibited.

The setting of the SQUELCH CONTROL determines the squelch threshold level. When the SQUELCH CONTROL is rotated in the counter-clockwise direction, the SQUELCH INDICATOR green LED will go ON, indicating that the squelch circuit is connecting the demodulated audio to the VOLUME CONTROL. 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 base stations which employ the TiL-90-6R transceiver can operate in local and remote modes simultaneously. Please note that if a TLI-203 or 180 remote control card is not installed no remote signals will be available on the 9-pin D connector located on the rear of the base station chassis.

**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  $\pm$ 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 possible) or external 28 VDC (13.7 VDC for Low Power configurations). 220 VAC operation can be selected by moving a jumper on the AC power supply, module A8.

**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 for 15 watt and 25 watt configurations and within the range of 11.5 Vdc to 15.0 Vdc for Low Power configurations. 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 kits are available for TBS-series base stations:

**P/N 989978-1, 24 Volt Battery Back-up Kit (7.2 AH)**

For use with 15watt/25watt TBS-series Base Stations. Provides a minimum of 4 hours back-up for 25 watt unit with 20% Tx and 80% Rx duty cycle.

**Note:** Back-up time for 15 watt unit is approximately 40% 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.

**P/N 989979-1, 12 Volt Battery Back-up Kit (7.2 AH)**

For use with Low Power TBS-series Base Stations. Provides a minimum of 6.5 hours backup for Low Power unit with 20% Tx and 80% Rx duty cycle.

Kit includes:

- qty. (1) p/n 987370-3, DC mating cable with battery connectors.
- qty. (1) p/n LCR 12V7.2P, 7.2 amp hour sealed lead acid battery.
- qty. (1) packing log/ instructions.

## 1.4 TECHNICAL SUMMARY

A summary of electrical, operational, mechanical and physical characteristics of the Base Station are provided in Tables 1.2 and 3.1.



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**TABLE 1.2 BASE STATION SYSTEM LEADING PARTICULARS**

**POWER REQUIREMENTS:**

Low Power Base Stations

AC Input Voltage/Current .....	100 to 132 VAC @ 1.0 Amp
AC Input Voltage/Current (Available) .....	190 to 250 VAC @ 0.5 Amp
DC Input Voltage/Current .....	11.5 VDC to 15 VDC @ 3.5 Amp

15 Watt Base Stations

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 15 VDC @ 4.0 Amp

25 Watt Base Stations

AC Input Voltage/Current .....	100 to 132 VAC @ 2.0 Amp
AC Input Voltage/Current (Available) .....	190 to 250 VAC @ 1.0 Amp
DC Input Voltage/Current .....	21.6 VDC to 15 VDC @ 7.5 Amp

**POWER OUTPUT:**

**\*Low Power Base Stations**

*Power Output (FCC) .....	10 Watts MAX
*Power Output (ICAN) .....	8 Watts MAX
15 Watt Base Stations (*Low/High) .....	*Low/15 Watts MAX
25 Watt Base Stations (*Low/High) .....	*Low/25 Watts MAX

Microphone Compression Range .....	35 dB
Battery Charger Voltage & Current (15 & 25 watt configurations) .....	27.5Vdc 3.5 Amps MAX

**OPTIONAL REMOTE CONTROL BOARD - TLI-203**

Remote Audio Input .....	2 or 4 wire (selectable), balanced 600 $\Omega$ lines
Remote Tx Timeout .....	30 to 300 seconds

**Tone Keying:**

Impedance .....	600 $\Omega$ floating with respect to ground
Tx Control Tone .....	2175 Hz, standard
Tx Tone Input Level .....	0 to -40 dBm
Tx Tone Control Response Time .....	< 12 milliseconds
DC Keying .....	$\pm$ 48 Vdc
Loop Resistance .....	10 K $\Omega$ MAX
Ground Keying .....	Closure to Ground
Loop Resistance .....	4 K $\Omega$ MAX

**Remote RX:**

Range .....	+ 10 dBm to -15 dBm (Factory set to -10dBm)
Impedance .....	600 $\Omega$ floating with respect to ground

**RX/TX Interface Signals:**

Squelch Signal .....	Ground, Open circuit for Mute
TX RF Output Signal (Optional) .....	RF ON = Ground, RF OFF = Open Circuit
AGC Signal Output .....	Linear 0 to + 6Vdc

**Temperature & Humidity:**

Operating Temperature Range .....	-25°C(-13°F) to + 55°C(+ 131°F)
Storage Temperature Range .....	-55°C(-67°F) to + 65°C(+ 149°F)
Relative Humidity .....	100%

**Dimensions & Weight:**

Width .....	305 mm (12.0 in) MAX
Height (including feet) .....	166 mm (6.5 in) MAX
Depth .....	274 mm (10.75 in) MAX
Weight .....	5.5 Kg (12 lbs) MAX

\* Refer to Section 3 for Model 90-6R transceiver specifications

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## SECTION 2 – PREPARATION FOR USE AND STORAGE

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### 2.1 GENERAL

This section provides the information required for custom configuration of the base station, and storage. Custom system configuration includes customizing remote control set up, and removal and replacement of Power Amplifier Module, Transceiver, and Power Supply.

Refer to Section 3 for Channel/Frequency configuration.

**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 Microphone

##### REMOVAL

- (1) Disconnect microphone (item 7) from front panel of transceiver (item 8). Slide microphone clear of bracket (item 6).
- (2) Remove and Retain two screws (item 5) securing microphone bracket (item 6) to cover (item 2).

##### REPLACEMENT

- (1) Secure microphone bracket (item 6) to left or right side of cover (item 3) as required with two screws and two washers (item 5).
- (2) Connect microphone (item 7) to front panel connector on transceiver (item 8). Slide microphone onto bracket (item 6).

#### 2.2.2 Remove/Replace Cover Assembly

##### NOTE

**It is necessary to first remove Microphone Bracket before removing Cover.**

**Remove screws securing Heat Sink to cover last, after removing all other top and bottom screws.**

### 2.2.2 Remove/Replace Cover Assembly - continued

#### REMOVAL

- (1) Remove and retain two top screws (item 1) securing cover (item 3) to chassis (item 4).
- (2) Remove and retain four bottom screws (item 2) securing cover to chassis.
- (3) Remove and retain the two heatsink screws.
- (4) Slide cover forward or backward to lift cover clear of chassis.

#### REPLACEMENT

- (1) Slide cover (item 3) forward or backward onto chassis (item 4), positioning screw access holes on cover over chassis threaded inserts.
- (2) Secure heatsink to cover with two screws.
- (3) Secure cover to chassis with four bottom screws (item 2), then with two top screws (item 1).

### 2.2.3 Remove Replace Transceiver

#### REMOVAL

- (1) Remove Cover as described in paragraph 2.2.2.
- (2) Disconnect coaxial connector (item 9) from rear of transceiver (item 8).
- (3) Disconnect DC connector (item 10) from rear of transceiver.
- (4) Remove and retain two screws and two washers (item 11) securing flat cable (item 12) to transceiver. Disconnect flat cable from transceiver.
- (5) Remove and Retain two screws and two washers (item 13) securing transceiver to chassis bracket.
- (6) Slide transceiver toward rear of chassis. Lift transceiver clear of chassis.

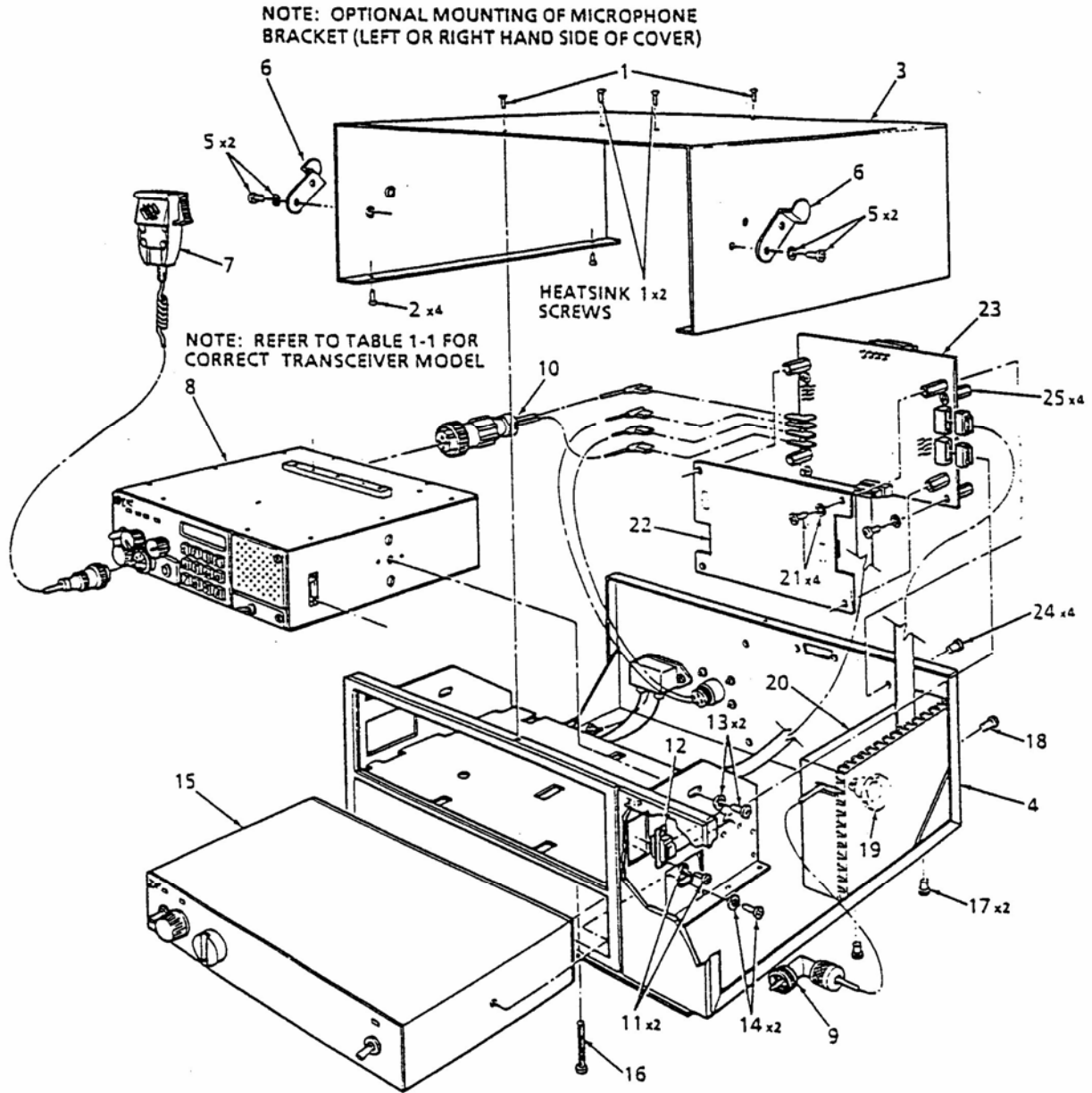


FIGURE 2.1 Base Station Assembly/Disassembly

### 2.2.3 Remove Replace Transceiver - continued

#### REPLACEMENT

- (1) Slide transceiver from rear of chassis into top window of front panel.
- (2) Secure transceiver to chassis bracket with two screws and two washers.
- (3) Connect flat cable (item 12) to transceiver. Secure flat cable to transceiver with two screws and two washers (item 11).
- (4) Connect DC connector (item 10) to rear of transceiver.
- (5) Connect coaxial connector (item 9) to rear of transceiver.
- (6) Replace Cover as described in paragraph 2.2.2.

### 2.2.4 Remove Replace Power Supply

#### REMOVAL

- (1) Remove Cover as described in paragraph 2.2.2.
- (2) Loosen two screws and two washers (item 14) securing Power Supply (item 15) to chassis (item 3).
- (3) Remove and Retain one screw (item 16) securing Power Supply to bottom of chassis.
- (4) Slide Power Supply forward through window using partially loosened screws (item 14). Remove and retain two screws and two washers.

#### REPLACEMENT

- (1) Slide Power Supply (item 15) part way into lower front panel window until screw inserts are visible through chassis bracket holes.
- (2) Partially install screws and washers (item 14).
- (3) Grasp two screws (item 14) with fingers to position Power Supply into chassis mounted connectors. Press into position from front panel.
- (4) Secure Power Supply to chassis with one screw (item 16) on bottom of chassis.
- (5) Tighten screws (item 14)
- (6) Replace Cover as described in paragraph 2.2.2.

### 2.2.5 Remove Replace RF Power Amplifier Module

#### REMOVAL

#### CAUTION

**Do not adjust nut or shaft (item 19) protruding from RF Power Amplifier Module. This is a Power Transistor Mounting Stud.**

- (1) Remove Cover as described in paragraph 2.2.2.
- (2) Disconnect coaxial connector (item 9) from Transceiver (item 8).
- (3) Disconnect Flat Cable from Distribution Board (item 23).
- (4) Remove and retain two bottom screws (item 17) and one rear screw (item 18) securing RF (15W) Power Amplifier (item 20) to chassis (item 4).  
**Note:** 25W RF Power Amplifier has four bottom screws (item 17) securing it to the chassis.

#### REPLACEMENT

- (1) Secure RF Power Amplifier (item 20) to chassis with bottom screws (item 17) and one rear screw (item 18).
- (2) Connect UHF Connector (item 9) to Transceiver and flat cable to distribution board.
- (3) Replace Cover as described in paragraph 2.2.2.

### 2.2.6 Remove Replace Distribution Board

#### REMOVAL

- (1) Remove Cover as described in paragraph 2.2.2. Disconnect flat ribbon cables.
- (2) Remove and retain four screws (item 25) securing the distribution and control boards (item 23, 24) to the rear of chassis (item 4).

#### REPLACEMENT

- (1) Secure Distribution Board and Control Board (item 23) to the rear of chassis (item 4) with four screws (item 25).
- (2) Reconnect flat ribbon cables and replace Cover as described in paragraph 2.2.2.

## 2.2.7 Remove Replace Control Board

### REMOVAL

- (1) Remove Cover as described in paragraph 2.2.2.
- (2) Remove Distribution Board as described in paragraph 2.2.6.

### CAUTION

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

- (3) Remove and retain four screws (item 21) securing Control Board (item 22) "piggy back" to the Distribution Board (item 23). Remove Control Board from Distribution Board.

### REPLACEMENT

- (1) Align the two female connectors on the control board with the male connectors on the Distribution Board using the four mounting holes and standoffs as a guide.
- (2) Secure control board "piggy back" to the distribution board (item 23) with four screws (item 21).
- (3) Replace Distribution Board as described in paragraph 2.2.6 and replace Cover as described in paragraph 2.2.2.

## 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 special order 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 manufacturer's 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  $\pm$  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.



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**2.3 REMOTE OPERATION SET UP - continued**

**\*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.

\*See Line Interface Card P/N 943180-1 for EIA multi-tone keying format.

<b>TABLE 2.1 9-Pin "D" TYPE CONNECTOR FUNCTIONS</b>			
<b>PIN NO</b>	<b>Two Wire Line Interface Board P/N's 943180-1</b>	<b>PIN NO</b>	<b>Four/Two Wire Line Interface Board P/N 923051-1</b>
8,9	Remote TX/RX Audio Line (600Ω)	8,9	Remote TX Audio Line (600Ω)
6	Ground	4,5	Remote RX Audio Line (600Ω)
2	RF Indicator (Optional)	6	Ground
7	Squelch	2	RF Indicator (Optional)
3	External PTT	7	Squelch
1	AGC	3	External PTT
4,5	Not Connected	1	AGC

**NOTE:** A modular RJ-11 Jack is also provided on the rear of the chassis (on later units) 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.

Units which employ the p/n 923051-1, Rev N and up (August 2006) have a combined Tx/Rx Audio or Recorder Out signal connected to the yellow (Rec Audio) and black (Rec Ground) wire connections located on either side of the two centre pins of the RJ-11. The Rec Audio signal is suitable for connection to a voice recorder but is not transformer isolated.

<b>TABLE 2.2 9-Pin POSITRONICS TYPE CONNECTOR FUNCTIONS</b>			
<b>PIN NO</b>	<b>Two Wire Line Interface Board P/N's 943180-1</b>	<b>PIN NO</b>	<b>Four/Two Wire Line Interface Board P/N 923051-1</b>
A,B	Remote TX/RX Audio Line (600Ω)	A,B	Remote TX Audio Line (600Ω)
J	Ground	D,C	Remote RX Audio Line (600Ω)
H	+ 12 Vdc Output	J	Ground
F	Squelch	H	+ 12 Vdc Output
K	External PTT	F	Squelch
E	Not Connected	K	External PTT
D,C	Not Connected	E	Not Connected

\*9-pin Positronics connector only supplied upon special order.

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

Provide 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 2.2 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.

<b>TABLE 2.3 REMOTE CONTROL BOARD P/N 923051-1 SETTINGS</b>	
<b>CONTROL</b>	<b>FUNCTION</b>
J1	Jumper Pin 1 and Pin 2 for DC Current Loop Keying Jumper Pin 2 and Pin 3 for ± DC Keying or Ground Keying. <b>Note: SW2 must be in position 2 if Pin 2 &amp; 3 are jumpered.</b>
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. <b>Note: Both options may be selected.</b> 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.

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

Provide 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 2.3 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 2175 Hz continuous) Tone keying or for **EIA** (multi-tone keying format).

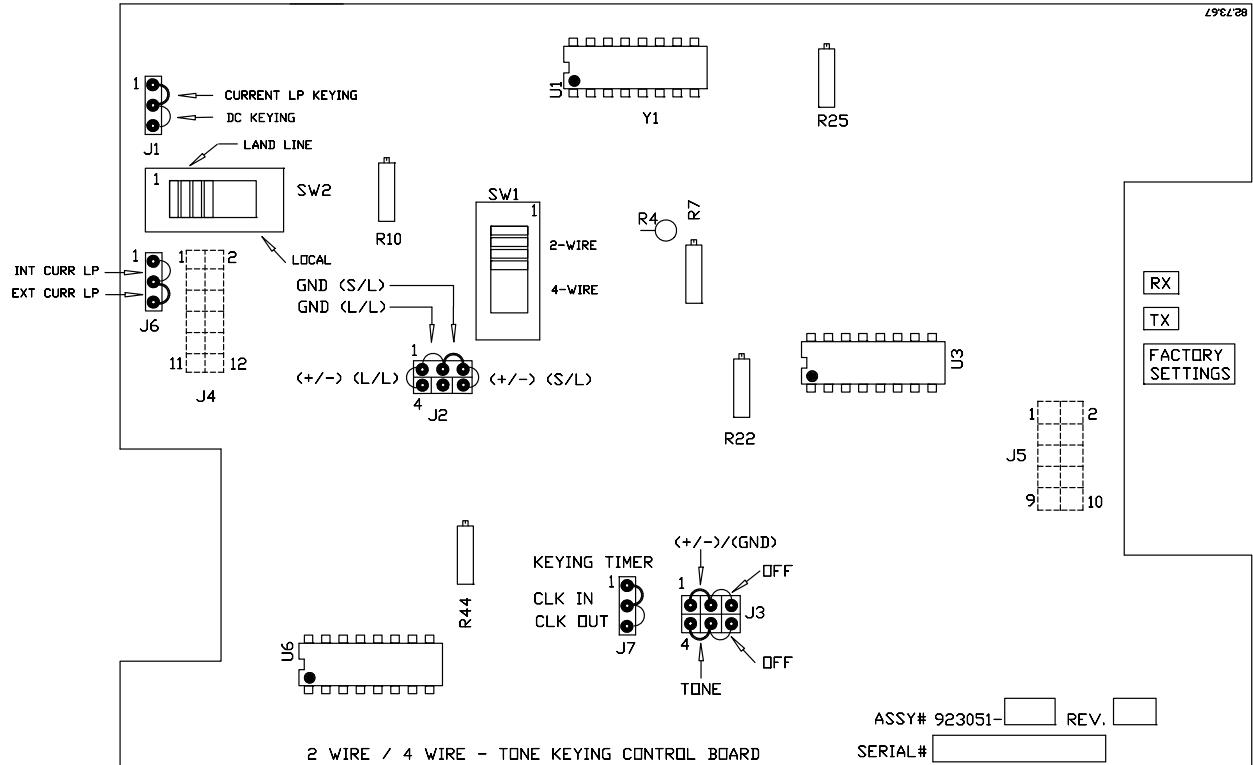
Set **J2** for Tone keying function **ON** (left jumper position) or **OFF** (right jumper position).

Set **J3** for Time out timer **OFF** (left jumper position) or **ON** (right jumper position).

See Figure 2.3 for location of jumpers and left/right orientation referred to in the Table 2.4.

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 <b>NOTE: Both options may be selected</b> 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 P/N 923051-1, Layout 929147



**NOTE: Bold Italics** indicate Factory default configurations.

- |  |  |
|--|--|
| <b>R7:</b> Tx Audio ( <b>-25 dBm</b> sensitivity; increases CW (clockwise).  | <b>J1:</b> Selects DC or <b><i>Current Loop</i></b> Keying operation   |
| <b>R10:</b> 2 Wire Rx Balance at 600Ω ( <b><i>1mV</i></b> RF at 1 kHz, 30% Mod.) R10 adjusted for <b><i>minimum amplitude</i></b> at C6/R4 junction. | <b>J2:</b> Selects either Land Line (L/L) or <b><i>Single Line (S/L)</i></b> and ± DC or <b><i>Ground keying</i></b> operation |
| <b>R22:</b> Keying Tone ( <b>-30 dBm</b> sensitivity; decreases CW)  | <b>J3:</b> Selects <b><i>Tone</i></b> and/or ± DC Keying enable or disable   |
| <b>R25:</b> Rx Audio ( <b>-10 dBm</b> output level; increases clockwise)   | <b>J6*:</b> Selects between Internal or <b><i>External</i></b> Current loop keying (ICL/ <b><i>ECL</i></b> )                   |
| <b>R44:</b> Time Out Timer (15 to 300 sec.; <b>90 sec.</b> nominal; increases clockwise)   | <b>J4:</b> Input Connector   |
| <b>SW1:</b> Selects either <b><i>2-Wire</i></b> or 4-Wire operation  | <b>J5:</b> Output Connector  |
| <b>SW2*:</b> Selects either Local or <b><i>Land Line</i></b> Current Loop Keying   | <b>J7:</b> Keying timer position <b><i>CLK IN</i></b> / CLK OUT  |

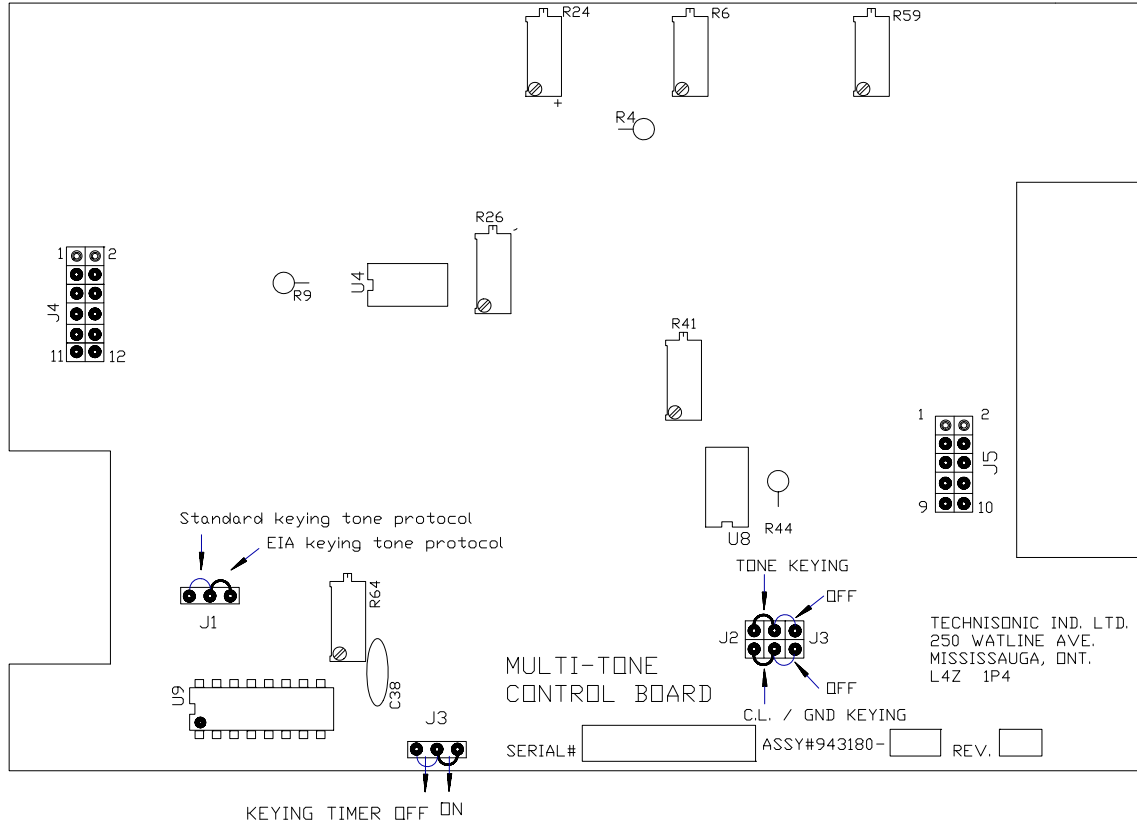
**NOTE:** P/N 923051-1 Rev N and up (Aug 2006) has SW2 and J6 removed.

\*The SW2 function is now hard wired in the **landline** current loop keying position and J6 is hard wired for **external** current loop.

**CAUTION:** Ensure that the J7 jumper is set to the **CLK IN** position, otherwise damage may occur when transmitting.

**FIGURE 2.2** Line Interface/Remote Control Board P/N 923051-1 (TLI-203)

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



○ DENOTES FACTORY DEFAULT CONFIGURATION

- |      |  |     |   |
|------|--|-----|---|
| R6:  | Tx audio level adjustment ( <b>-25 dBm</b> ) | J1: | Standard or <b>EIA</b> Keying tone protocol           |
| R24: | Keying Tone Attenuator                       | J2: | Selects <b>Tone</b> and/or <b>Current Loop (C.L.)</b> |
| R26: | 1950 Hz tone level adjustment                |     | <b>/Ground</b> - Keying enable or disable             |
| R41: | 2175 Hz tone level adjustment                | J3: | Selects Keying timer <b>Enable/Disable</b>            |
| R59: | Rx Audio level adjustment ( <b>-10 dBm</b> ) | J4: | Input Connector                                       |
| R64: | Time out timer ( <b>90 sec</b> default)      | J5: | Output Connector                                      |

**NOTE:** **Bold Italics**<sup>1</sup> indicate Factory default configurations.  
Refer to the maintenance manual (94RE149) for alignment and test.

**FIGURE 2.3** Line Interface/Remote Control Board P/N 943180-1 (TLI-180)

## 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 3.2.

### 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 of this document and the appropriate specified operating procedures during transmission.

## 2.6 STORAGE

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

## **SECTION 3 – OPERATING INSTRUCTIONS**

### **3.1 INTRODUCTION**

#### **3.1.1 Transceiver Model TiL-90-6R, P/N 861605-2**

The Transceiver is a frequency synthesized VHF/AM transceiver operating over the entire band of 117.975 to 138.000 MHz in 25 kHz steps. The transceiver can be pre-programmed with six user selected frequency channels. Option 1 of Model Til-90-6R P/N 861605-2 has an internal DC to DC convertor for operation with the RF Power Amplifier in the 15 Watt and 25 Watt Base Stations.

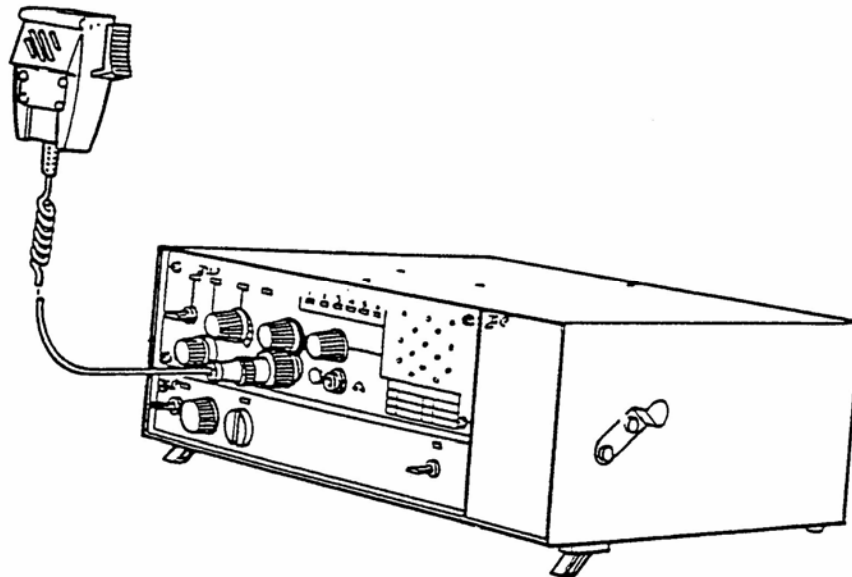
This section includes a functional description of each switch, control, indicator and connector located on the front and rear panels of the portable transceiver, including the PRESS-TO-TALK switch located on the microphone. Operating instructions for transmit/receive functions are also included.

#### **3.1.2 Technical Summary**

A summary of electrical, operational, mechanical and physical characteristics of the transceiver, are provided in Table 3.1.

### **3.2 OPERATOR'S SWITCHES, CONTROLS AND INDICATORS**

A view of the front and rear panel is given in Figure 3.2. A functional description of each of the operator's switches, controls and indicators, and the microphone PRESS-TO-TALK switch, is given in Table 3.2, Operator's Switches, Controls and Indicators.



**FIGURE 3.1** 90-6R Base Station Setup

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**TABLE 3.1 MODEL TiL-90-6R TRANSCEIVER LEADING PARTICULARS**

**GENERAL:**

**Dimensions & Weight:**

Width .....	216 mm (8.5 in) MAX
Height (including feet) .....	70 mm (2.75 in) MAX
Depth .....	260 mm (10.25 in) MAX
Weight .....	1.8 Kg (3 lbs 15 oz) MAX

**TRANSMITTER**

Power Output (FCC) .....	10 Watts MAX
Power Output (ICAN) .....	8 Watts MAX
Audio Input .....	0.05 Vrms to 2.0 Vrms
Speech Processor Dynamic Range .....	35 dB
Modulation .....	95% MAX
Audio Distortion @ 90% mod .....	10% MAX
Audio Distortion @ 90% mod (with 15W or 25W Linear Amplifier) .....	15% MAX
Audio Frequency Response .....	300 Hz to 2,500 Hz, +1 -3 dB
Spurious Emissions .....	60 dB below carrier
Hum and Noise .....	45 dB below modulated carrier

**RECEIVER**

RF Input Impedance .....	50Ω, VSWR 2:1 MAX
Sensitivity (12 dB SINAD) @ 1 KHz 30% Mod .....	1.5 μvolts

**Selectivity, 25 .Hz Channel Spacing:**

6 dB Bandwidth .....	Greater Than 15 kHz
80 dB Bandwidth .....	Less Than 50 kHz

**Selectivity, 50 .Hz Channel Spacing:**

6 dB Bandwidth .....	Greater Than 30 kHz
80 dB Bandwidth .....	Less Than 100 kHz

Adjacent Channel Selectivity .....	Greater Than 80 dB
Spurious Response Attenuation .....	Greater than 90 dB
Frequency Stability (-40°C to +55°C) .....	± 1,000 Hz MAX
RF AGC (5 μvolts to 1 volt) .....	Audio Level 3 dB

**Intermodulation:**

Ultimate Sensitivity .....	70 dB
30 μvolts .....	45 dB
300 μvolts .....	30 dB

Unwanted Radiation .....	Less than 80 μvolts into 50 Ω
Hum & Noise @ 1mV RF 30% MOD .....	40 dB
Interference Suppression .....	SINAD 6 dB MIN
Loudspeaker Output .....	3 W MAX
Phone Output .....	100 mW into 600 Ω
Audio Distortion 1mV RF Input, 30% MOD .....	5% MAX
Audio Distortion 1mV RF Input, 90% MOD .....	10% MAX
Audio Output Limiting .....	Less than 1 dB @30 to 100% MOD
Audio Frequency Response 300 Hz-2500 Hz .....	+1 -3 dB
Audio Acquisition Time .....	Less than 100 msecs

**Audio Squelch Characteristics:**

Squelch Type .....	Carrier Operated
Carrier Operated Squelch .....	Adjustable 2 to 15 μvolts



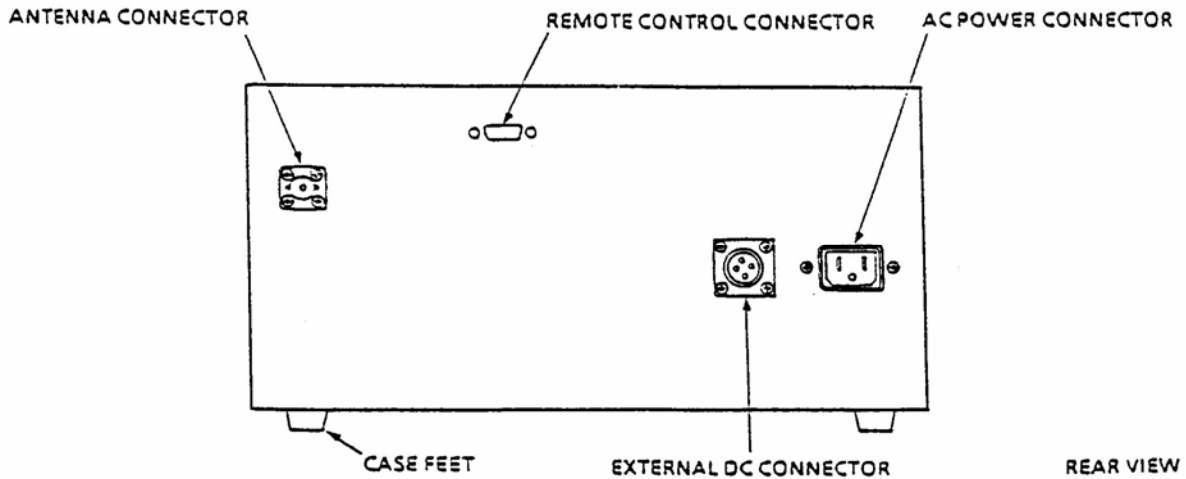
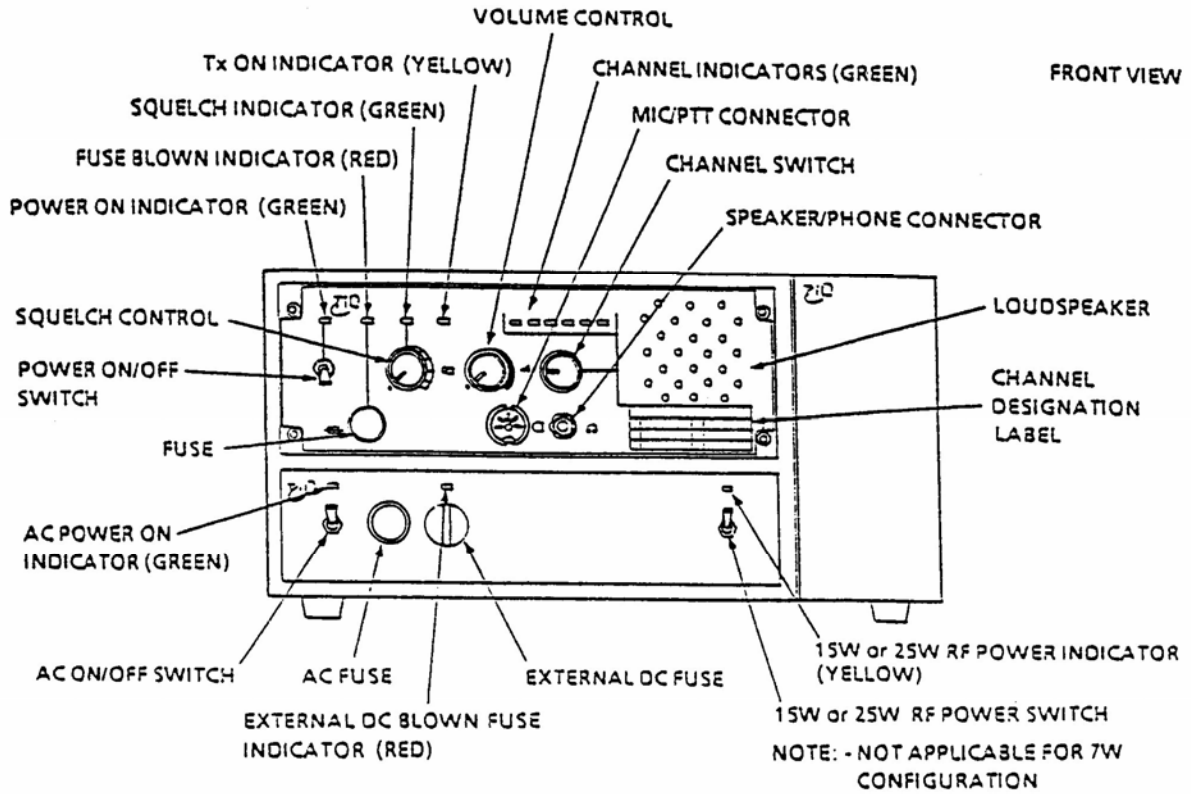


FIGURE 3.2 Base Station Front and Rear Panel Layout

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<b>TABLE 3.2 OPERATORS SWITCHES, CONTROLS AND INDICATORS</b>		
<b>FIG 3.2 No.</b>	<b>SWITCHES CONTROLS &amp; INDICATORS</b>	<b>FUNCTIONAL DESCRIPTION</b>
1	POWER ON/OFF SWITCH	A toggle switch applies the 27.5 volts nominal power supply to the transceiver. The transceiver is switched to ON in the toggle UP position the transceiver is switched OFF in the toggle DOWN position.
2	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.
3	FUSE	A 5 Amp FUSE protects the 27.5 volts nominal power supply line.
4	FUSE BLOWN RED LED INDICATOR	A RED LED indicates when the 5-Amp fuse is "blown", and External DC or AC power is present.
5	SQUELCH CONTROL	A linear potentiometer determines the squelch threshold level. When the SQUELCH CONTROL is rotated in the counter-clockwise direction, the SQUELCH GREEN LED indicates that the squelch is connecting demodulated audio to the VOLUME control.
6	SQUELCH INDICATOR	A GREEN LED indicates the squelch circuit is connecting demodulated audio signal to the VOLUME control.
7	Tx ON AMBER LED INDICATOR	An AMBER LED indicates when the transceiver is keyed by the microphone PRESS-TO-TALK (PTT) switch or remote land line, and the transceiver is operated in the Tx mode. The Tx ON AMBER LED switches OFF, when the transceiver is operated in the receive mode.
8	VOLUME CONTROL	A logarithmic 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 external speaker or headphone.
9	MIC/PTT CONNECTOR	A 5-pin connector functions as Microphone/PTT and Test Connector. Pin 1 - PTT Signal Line Pin 2 - Microphone Signal Ground Pin 3 - Microphone Signal and Microphone DC Supply Line Pin 4 - AGC test voltage Pin 5 - Squelch test voltage
10	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.

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**TABLE 3.2 OPERATORS SWITCHES, CONTROLS AND INDICATORS**  
(Continued)

<b>FIG 3.2 No.</b>	<b>SWITCHES CONTROLS &amp; INDICATORS</b>	<b>FUNCTIONAL DESCRIPTION</b>
11	CHAN SWITCH	Performs Chan/Freq Selection of 6 pre-programmed channels.
12	CHAN LABEL	Indicates the Frequencies programmed for each channel.
13	CHANNEL LED's	Six GREEN LEDs numbered 1 through 6 indicate the channel selected by the Channel Selector Switch.
14	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 Tx mode or when the SPEAKER/PHONE connector is in use.
15	SPEAKER/PHONE CONNECTOR	A 3-pole connector 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 external speaker or headphone.
16	AC SWITCH	A 1-pole switch applies AC power to the Base Station power supply.
17	AC POWER ON LED INDICATOR	A RED LED indicates when AC power is applied to the unit and the AC POWER SWITCH is set to ON. Also indicates that the Base Station power supply is functioning.
18	AC FUSE	A 2.5 Amp fuse protects the Base Station power supply from power supply internal short circuit or transceiver short circuit.
19	EXTERNAL DC FUSE	A 5 Amp fuse protects the 27.5 volt nominal power supply line. As part of reverse polarity protection, the fuse will "blow" when polarity of the External DC supply line is reversed.
20	EXT DC BLOWN FUSE INDICATOR	A RED LED indicates when External DC fuse is blown.

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<b>TABLE 3.2 OPERATORS SWITCHES, CONTROLS AND INDICATORS</b> (Continued)		
<b>FIG 3.2 No.</b>	<b>SWITCHES CONTROLS &amp; INDICATORS</b>	<b>FUNCTIONAL DESCRIPTION</b>
21	RF POWER SWITCH	Selects Low (Low Power) or High (15W/25W) Power transmit operation. Not provided on Low Power Base Stations.
22	15/25 W RF POWER LED INDICATOR	An AMBER LED indicates that 15W/25W (High) RF Power output has been selected and transceiver is operating in transmit mode. The LED is driven by sampled RF and indicates that RF is present.
23	*AC POWER CONNECTOR	3-Prong AC Connector for use with AC Power Cord P/N 927002-1.
24	*REMOTE CONTROL CONNECTOR	9-Pin "D" type connector provides connections required for remote operation. Refer to Table 2.1 for connector details.
25	*EXTERNAL DC CONNECTOR	Chassis mounted connector provides for Connection to External DC Supply Source. Mates with DC power cable P/N 863701-1.
* Denotes items located on rear panel.		

### **3.3 FRONT PANEL OPERATION**

To prepare the transceiver for use:

- (1) Remove the microphone from its mounting bracket, and ensure that the microphone connector is connected to the MIC/PTT connector of the transceiver.
- (2) Set the SQUELCH control in the fully counter-clockwise (CCW) position.
- (3) Set the VOLUME control in the 12 o'clock centre position.
- (4) Set the POWER ON/OFF switch to position 1, toggle-up "ON" position.
- (5) Verify that the FUSE BLOWN red LED is OFF.
- (6) Verify that the POWER ON green LED is ON.
- (7) Set the CHANNEL switch to the desired operating channel 1 through 6.
- (8) Verify that the appropriate CHANNEL INDICATOR green LED is ON.
- (9) Proceed to operation in the transmit mode as described in the next paragraph.

#### **3.3.1 Operation in Transmit Mode**

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

- (1) Hold the microphone in one hand, with the upper edge of the microphone as close as possible to the upper lip.
- (2) Depress and hold the PRESS-TO-TALK switch of the microphone during transmission.
- (3) Ensure that the Tx ON yellow LED is ON.
- (4) Speak slowly and distinctly into the microphone using specified operating procedures during transmission.
- (5) When message is ended, release the PRESS-TO-TALK switch of the microphone.
- (6) The transceiver is now operating in the receive mode.
- (7) Verify that the Tx ON yellow LED is OFF.

### 3.4 CHANNEL FREQUENCY SELECTION

Early radios have their frequencies programmed by a diode matrix as described in Section 3.4.4. For radio units shipped after July 2012 and equipped with a USB port, please refer to Appendix A (TiL TDP-90 Programming Software User's Guide for USB Programmable AM Series Transceivers) - Document 11RE439.

#### 3.4.1 Introduction

Transceiver Model 90-6R, Part Number 861605-2, will have Channel 1 operating frequency pre-programmed at 121.9000 MHz unless otherwise requested. Other channels are not pre-programmed. Before programming any other frequencies, perform an operational check, on Channel 1 at 121.9000 MHz, as outlined in paragraph 3.4.6. If there is any operational deficiency or equipment malfunction, return transceiver to the manufacturer. Before use, it is necessary to pre-program the operating frequency for each channel to be used.

#### 3.4.2 Frequency Range

The transceiver may be programmed for up six frequencies over the frequency range 117.975 MHz to 138.000 MHz with 25 kHz channel spacing.

#### 3.4.3 Preparation

90-6R Base Stations produced after June 1997 incorporate an external frequency-set module A5A1 mounted vertically on the right side of the Base Station housing. The external board utilizes jumper straps instead of diodes to set the six frequencies. See Figure 3.3. The base station chassis cover need only be removed (See par 2.2.2) to access the external frequency set board.

In older units, an internal Frequency Set-Memory Module A5 must be removed from the transceiver to allow frequency pre-programming by a diode matrix as follows:

- (1) Place the transceiver on a bench with the top cover of the transceiver located on the bench and the bottom cover exposed.
- (2) Remove and retain twelve screws and lockwashers securing the bottom cover to the main chassis of the transceiver.
- (3) Remove and retain the bottom cover.

**NOTE:**

**A folded ribbon cable is laid across the Frequency Set-Memory Module A5. Carefully move this cable to one side while handling the Frequency Set-Memory Module A5.**

- (4) Remove and retain four screws and lockwashers securing the Frequency Set-Memory Module A5.
- (5) Gently pull, with a rocking action, the Frequency Set-Memory Module A5 in an upwards direction until its male pin connector A5J1 is disengaged from its mating connector A2J2 on Audio Synthesizer Module A2. Remove Module A5 from the transceiver.
- (6) Reverse this procedure to reinstall the internal Frequency Set module A5.

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TABLE 3.3 FREQUENCY SELECTION MHz

OPERATING FREQUENCY (MHz)	JUMPER LOCATION					
	20 MHz	10 MHz	8 MHz	4 MHz	2 MHz	1 MHz
117	0	1	0	1	1	1
118	0	1	1	0	0	0
119	0	1	1	0	0	1
120	1	0	0	0	0	0
121	1	0	0	0	0	1
122	1	0	0	0	1	0
123	1	0	0	0	1	1
124	1	0	0	1	0	0
125	1	0	0	1	0	1
126	1	0	0	1	1	0
127	1	0	0	1	1	1
128	1	0	1	0	0	0
129	1	0	1	0	0	1
130	1	1	0	0	0	0
131	1	1	0	0	0	1
132	1	1	0	0	1	0
133	1	1	0	0	1	1
134	1	1	0	1	0	0
135	1	1	0	1	0	1
136	1	1	0	1	1	0
137	1	1	0	1	1	1
138	1	1	1	0	0	0

LEGEND: 0 = NO JUMPER REQUIRED 1 = JUMPER TO BE INSTALLED

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TABLE 3.4 FREQUENCY SELECTION KHz

OPERATING FREQUENCY (KHz)	JUMPER LOCATION					
	800 KHz	400 KHz	200 KHz	100 KHz	50 KHz	25 KHz
000	0	0	0	0	0	0
025	0	0	0	0	0	1
050	0	0	0	0	1	0
075	0	0	0	0	1	1
100	0	0	0	1	0	0
125	0	0	0	1	0	1
150	0	0	0	1	1	0
175	0	0	0	1	1	1
200	0	0	1	0	0	0
225	0	0	1	0	0	1
250	0	0	1	0	1	0
275	0	0	1	0	1	1
300	0	0	1	1	0	0
325	0	0	1	1	0	1
350	0	0	1	1	1	0
375	0	0	1	1	1	1
400	0	1	0	0	0	0
425	0	1	0	0	0	1
450	0	1	0	0	1	0
475	0	1	0	0	1	1
500	0	1	0	1	0	0
525	0	1	0	1	0	1
550	0	1	0	1	1	0
575	0	1	0	1	1	1
600	0	1	1	0	0	0
625	0	1	1	0	0	1
650	0	1	1	0	1	0
675	0	1	1	0	1	1
700	0	1	1	1	0	0
725	0	1	1	1	0	1
750	0	1	1	1	1	0
775	0	1	1	1	1	1
800	1	0	0	0	0	0
825	1	0	0	0	0	1
850	1	0	0	0	1	0
875	1	0	0	0	1	1
900	1	0	0	1	0	0
925	1	0	0	1	0	1
950	1	0	0	1	1	0
975	1	0	0	1	1	1

LEGEND: 0 = NO JUMPER REQUIRED 1 = JUMPER TO BE INSTALLED



### 3.4.4 Pre-programming Channel Frequencies

Determine the number of channels to be used and the specific frequency of each channel for the particular transceiver being worked on. Prepare a list of channel numbers and frequencies to be pre-programmed; then proceed as follows:

#### **FREQUENCY SELECTION MHz**

Refer to Table 3.3 Frequency Selection MHz. Using the OPERATING FREQUENCY (MHz) column, find the desired frequency in MHz. Cross-refer to the JUMPER LOCATION column, and install the jumper in the locations they are required to be installed, as indicated by a "1" entry.

#### **FREQUENCY SELECTION kHz**

Refer to Table 3.4, Frequency Selection kHz. Using the OPERATING FREQUENCY kHz column, find the portion of the desired frequency in kHz. Cross-refer to the JUMPER LOCATION column, and install the jumper in the locations they are required to be installed, as indicated by a "1" entry.

#### **NOTE**

**Channel 1 is already pre-programmed for 121.900 MHz. It will be necessary to remove existing jumper if changing Channel 1 from 121.900 MHz.**

#### **INSTALLATION OF DIODES** - For units with internal Frequency Memory Set boards

Using the required number of diodes as determined during FREQUENCY SELECTION MHz FREQUENCY SELECTION kHz instead of jumpers, install each diode in its applicable location CR1 through CR72 for each channel to be used.

Ensure that each diode is installed using the correct polarity (cathodes facing upwards) using Multicore Solder SN63, 1 mm, or equivalent, and appropriate soldering iron. Trim leads on underside of printed wiring board and remove solder flux residue.

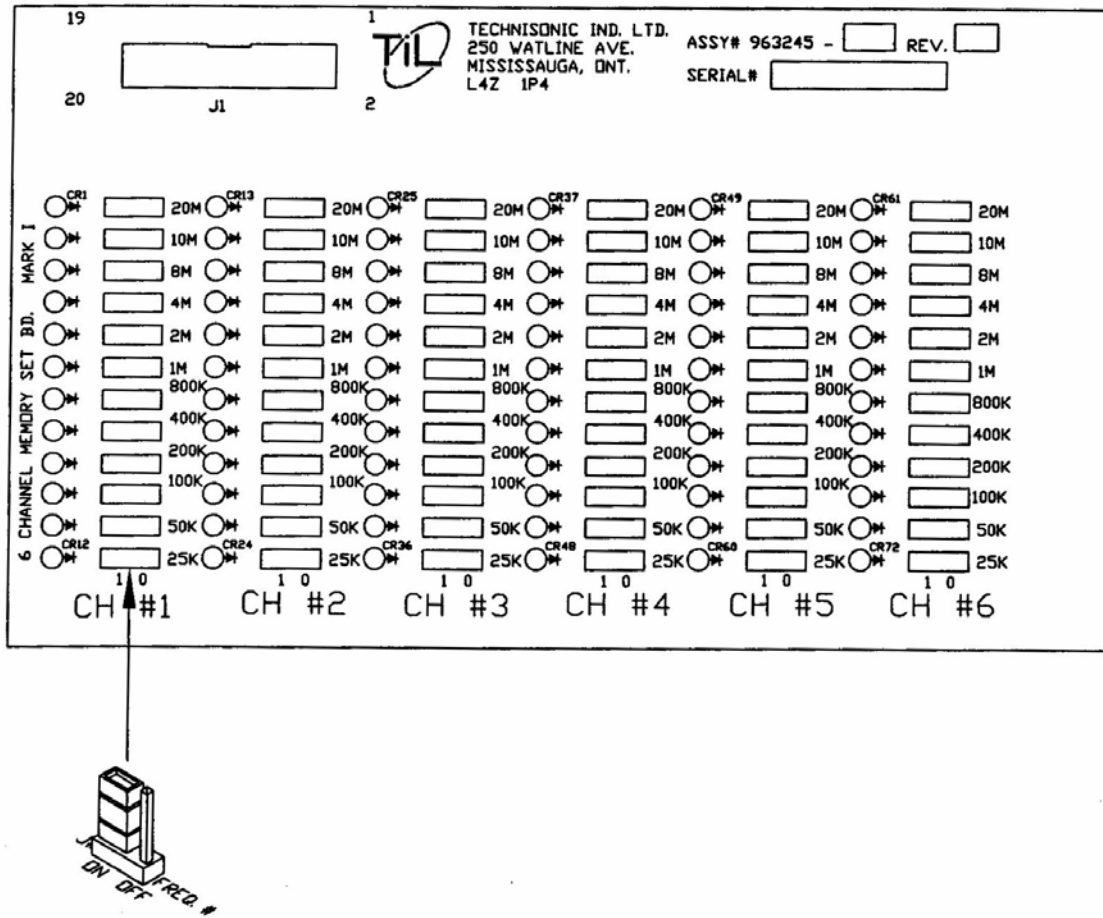


FIGURE 3.3 Frequency Set-Memory Module A5 - Component Layout

### 3.4.5 Completion of Programming Module A5

After frequency selection has been completed:

- (1) Install the cover on the base station chassis utilizing screws retained during disassembly. Tighten screws.
- (2) On the front panel label of the transceiver, mark the channel designation label with the appropriate frequency against each channel pre-programmed.

### 3.4.6 Operational Check

Connect the transceiver to a test bench, and perform an operational check of the transceiver in both transmit and receive modes of operation, checking each channel in use.

## 3.5 GENERAL OPERATING INSTRUCTIONS

This section covers general operating procedures applicable to all base station configurations. Set Up and Operating details for specific transceivers can be found in the previous paragraphs.

### 3.5.1 Preparation for Use

To prepare the transceiver for use (Refer to Figures 1.2, 3.2 and Table 3.2).

- (1) Location for Transmit/Receive Operation.

The VHF 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 meters will reflect the RF signal and foliage greatly attenuates signal strength.

**Do not make physical contact with antenna when transmitter is on.**

- (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 **N**-type or **BNC** connector.

### 3.5.1 Preparation for Use - continued

- (6) Ensure that the microphone connector is connected to the MIC/PTT connector of the transceiver.
- (7) Set the SQUELCH control in the fully counter-clockwise (CCW) position.
- (8) Set the VOLUME control in the 12 o'clock centre position.
- (9) Set the POWER ON/OFF switch to "ON".
- (10) Verify that the FUSE BLOWN red LED is OFF.
- (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 (if applicable) 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 Tx ON amber LED is ON.
- (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 Tx ON amber LED is OFF.

### 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 Tx ON amber LED is OFF.
- (2) Verify that the correct operating frequency is indicated on the front panel. Refer to paragraph 3.4 for Channel/Frequency selection.
- (3) Adjust the SQUELCH control to suit local reception conditions. When the SQUELCH control is rotated in the counter-clockwise direction, the SQUELCH indicator green LED will switch to ON, indicating that the squelch circuit is connecting the demodulated audio output to the VOLUME control.

Further adjustment of the SQUELCH control determines the squelch setting.

#### IMPORTANT NOTE

The dual conversion receiver's squelch knob must be rotated significantly more clockwise (4 o'clock position) to obtain the same squelch setting (3uV) as a single conversion receiver's squelch knob set to the 12 o'clock (straight up) position.

If the dual conversion receiver's squelch knob is set to the 12 o'clock position, signals with a level greater than 0.5uV will open the squelch. At most airports this will not be an adequate level of squelch.

#### Recommended procedure:

The squelch taper on a dual conversion receiver looks as follows:

Squelch knob position	Squelch setting
12 o'clock	0.5uV
3 o'clock	1.2uV
3:30 position	2.5uV
4 o'clock	3uV
Fully clockwise	9uV

It is recommended that the squelch be set to at least 2.5uV (3:30 knob position) at busy airport locations. If ACARS signals are present on adjacent or nearby channels the squelch level should be at least 3uV (4 o'clock) to prevent ACARS bleed through.

- (4) 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.

**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 and 25 watt units can operate within the range 21.6 Vdc to 30 Vdc. The Low Power units can operate within the range of 11.5 Vdc to 15 Vdc.

**Technisonic Industries Limited**  
240 Traders Blvd., Mississauga, ON Canada L4Z 1W7  
Tel: (905) 890-2113 Fax: (905) 890-5338

**IMPORTANT  
WARRANTY**

All communication equipment manufactured by Technisonic Industries Limited is warranted to be free of defects in Material or Workmanship under normal use for a period of one year from Date of Purchase by the end user.

Warranty will only apply to equipment installed by a factory approved and/or authorized facility in accordance with Technisonic published installation instructions. Equipment falling under the following is not covered by warranty:

- equipment that has been repaired or altered in any way as to affect performance,
- equipment that has been subject to improper installation,
- equipment that has been used for purposes other than intended,
- equipment that has been involved in any accident, fire, flood, immersion or subject to any other abuse.

Expressly excluded from this warranty are changes or charges relating to the removal and re-installation of equipment from the aircraft. Technisonic will repair or replace (at Technisonic's discretion) any defective transceiver (or part thereof) found to be faulty during the Warranty Period.

Faulty equipment must be returned to Technisonic (or its authorized Warranty Depot) with transportation charges prepaid. Repaired (or replacement) equipment will be returned to the customer with collect freight charges. If the failure of a transceiver occurs within the first 30 days of service, Technisonic will return the repaired or replacement equipment prepaid.

Technisonic reserves the right to make changes in design, or additions to, or improvements in its products without obligation to install such additions and improvements in equipment previously manufactured. This Warranty is in lieu of any and all other warranties express or implied, including any warranty of merchantability or fitness, and of all other obligations or liabilities on the part of Technisonic.

This Warranty shall not be transferable or assignable to any other persons, firms or corporations.

**For warranty registration please complete the on-line  
Warranty Registration Form found at [www.til.ca](http://www.til.ca).**





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## APPENDIX A

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# **TiL TDP-90 Programming Software User's Guide**

for USB Programmable  
AM Series Transceivers

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**Technisonic Industries Limited**

240 Traders Boulevard, Mississauga, Ontario L4Z 1W7

Tel: (905) 890-2113 Fax: (905) 890-5338

[www.til.ca](http://www.til.ca)

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## **INTRODUCTION**

This document contains instructions for proper installation and operation of the TDP 90 software for USB programmable Technisonic AM series transceivers and details the various elements of the Graphical User Interface (GUI).

**NOTE:** The images in this document are examples only and may not reflect your particular data settings, or current TDP software version.

The TDP-90 programming software can be found under the “Programming Software” link at <http://www.til.ca/>

## **SOFTWARE INSTALLATION**

**Note:** The USB driver must be installed before attempting to use the TDP-90 software.

### **USB Driver**

The USB hardware in your Technisonic AM transceiver is configured as a Virtual Com Port (“VCP”) which emulates a serial COM. This driver is available for free distribution from Future Technology Devices International (“FTDI”). Download and install the latest release of the VCP driver for Windows per the instructions on the web page located at this link:

<http://www.ftdichip.com/Drivers/VCP.htm>

### **TDP Software**

Download and install the latest release of the TDP-90 software for Windows from the web page located at this link:

<http://til.ca/content.php?page=programming-software-tdp90>

Once completed there will be a “TDP90” icon on your computer desktop.

## **TRANSCIVER TO COMPUTER CONNECTION**

Connect the transceiver to the computer USB port using a standard USB-A male to USB-B male cable. The USB port is located on the rear panel of mobile and base station transceivers and on the front panel of rack mount transceivers.

## **GETTING STARTED**

To start the TDP 90 program, double click the TDP90 icon on the desktop. The following Graphical User Interface will appear. The current version number is shown in square brackets on the title bar.

### **MAIN GRAPHICAL USER INTERFACE**

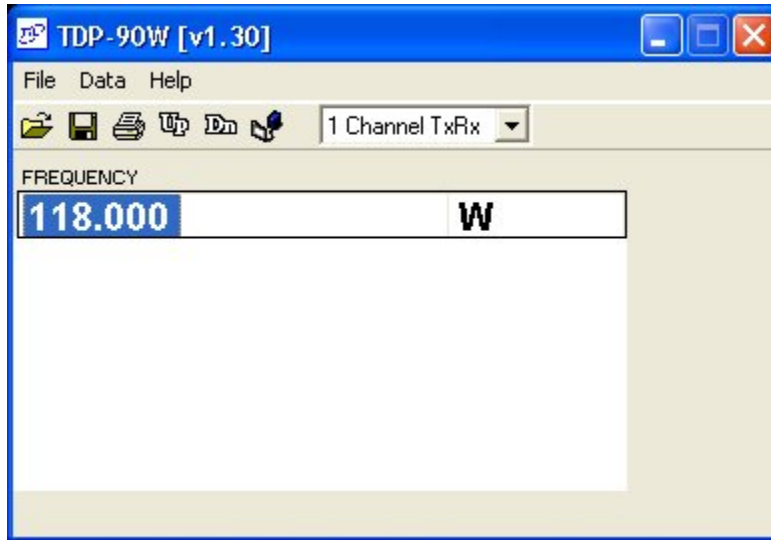


Figure 1

## ICONS AND PULL DOWN MENUS

The **icons and pull-down menus** provide the set-up and operating functions. The **Channels** pull-down tab provides selection for single or six channel transceivers (use the 6 channel window for 4 channel transceivers). The number of channels in the **Frequency editing window** changes accordingly. The frequency of each channel, as displayed in the **Frequency editing window**, can be changed by clicking on the desired channel window and entering the frequency..

### ICONS

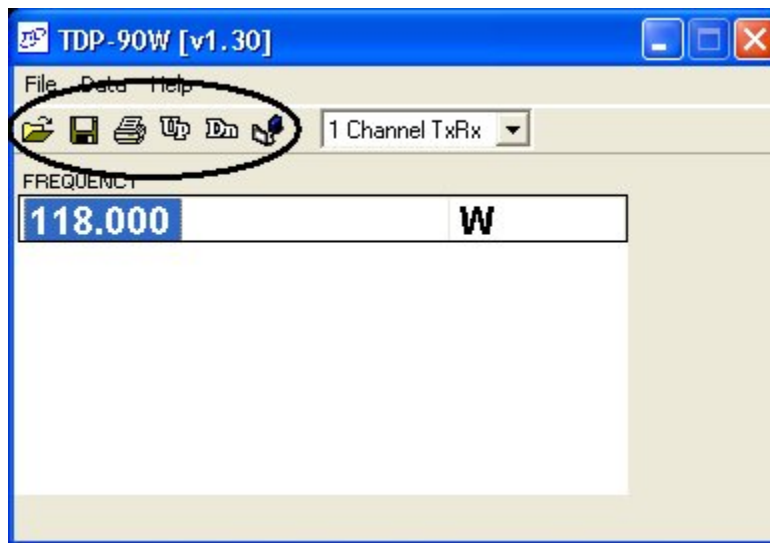


Figure 2

The icons provide single-click access to the features in the pull down menus. Details of these features are explained in the Pull Down Menu descriptions that follow.

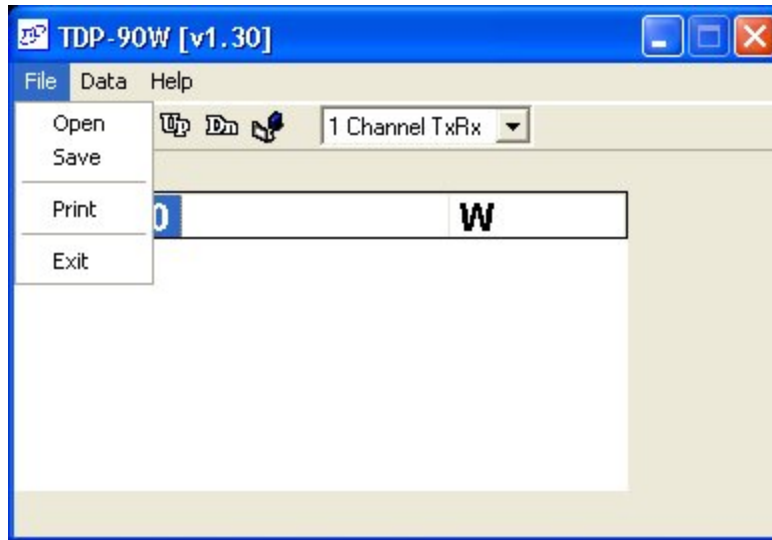
**FILE MENU**

Figure 3

**Open** will allow you to select and load an existing file that was previously saved on disk. The yellow folder icon provides the same function in a single mouse click.

**Save** will allow you to save the current data into a file with a name of your choice. The filename may be any length up to 64 characters. The program will automatically append the .90 suffix to the filename. The diskette icon provides the same function in a single mouse click.

**Print** will create a text file of the channel list, as presented in the Frequency List window. Once the Print function is invoked, you will be prompted to enter the serial number of the currently connected transceiver. The printout will append a header to the top of the page that includes the serial number of the transceiver as well as the time and date. The printout can be filed as a record of the frequencies that are programmed into that particular transceiver. The printer icon provides the same function in a single mouse click.

**Exit** will quit the TDP-90 program. If you have not saved your data, or if any changes were made to your data set since your last save, the TDP will warn you of this, and allow you to do so before quitting.

## DATA MENU

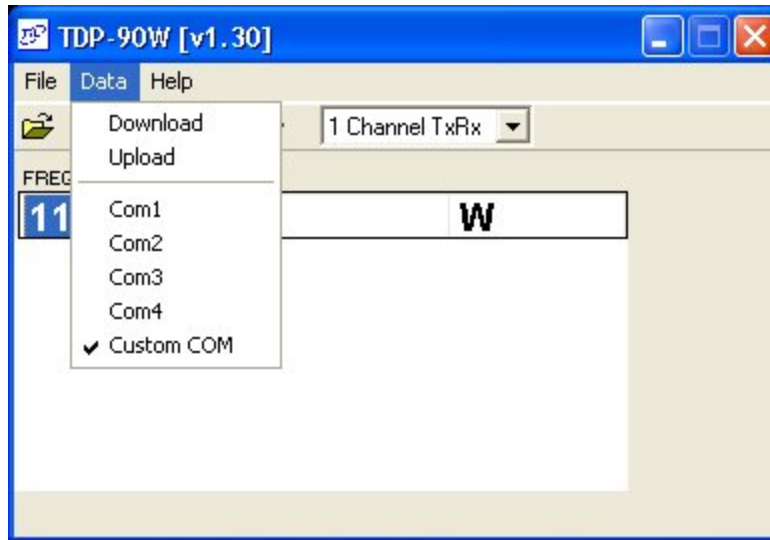
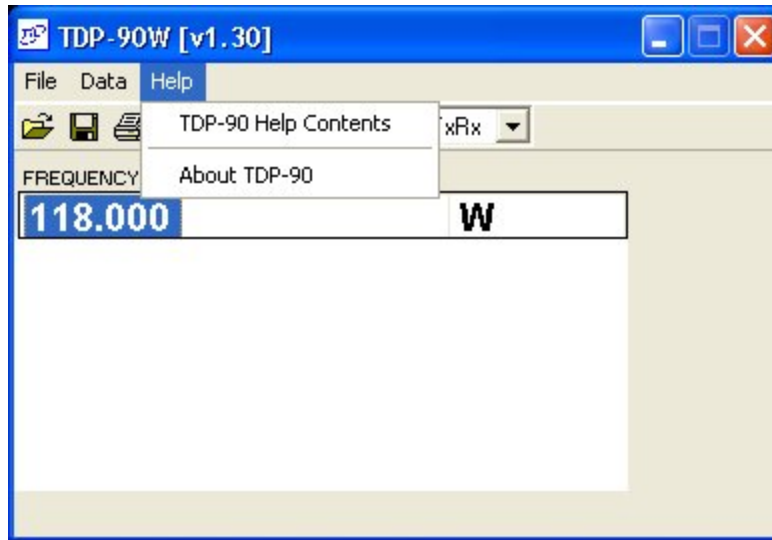


Figure 4

**Download (to Radio)** instructs the TDP 90 software to transfer the frequency data in the list to the memory channels in the connected AM transceiver. The Dn icon provides the same function in a single mouse click.

**Upload (from Radio)** instructs the TDP 90 program to wait for and read the channel data from the memory channels in the connected AM transceiver. The Up icon provides the same function in a single mouse click.

**Com1 (2,3,4, Custom COM)** allows you to select the COM port on your computer to which the transceiver is connected. The computer may assign a random unused COM port number to the Virtual Com Port (VCP) when the USB driver is installed so “Custom COM” can be selected when it is beyond the normal range of COM1-4. The assigned VCP can be determined by accessing the Device Manager (access in WinXP by right-clicking on “My Computer – Properties – Hardware – Device Manager – Port (COM & LPT) ). Note the COM number that was assigned to USB Serial Port. The Port (5th) icon provides the same function in a single mouse click.

**HELP MENU****Figure 5**

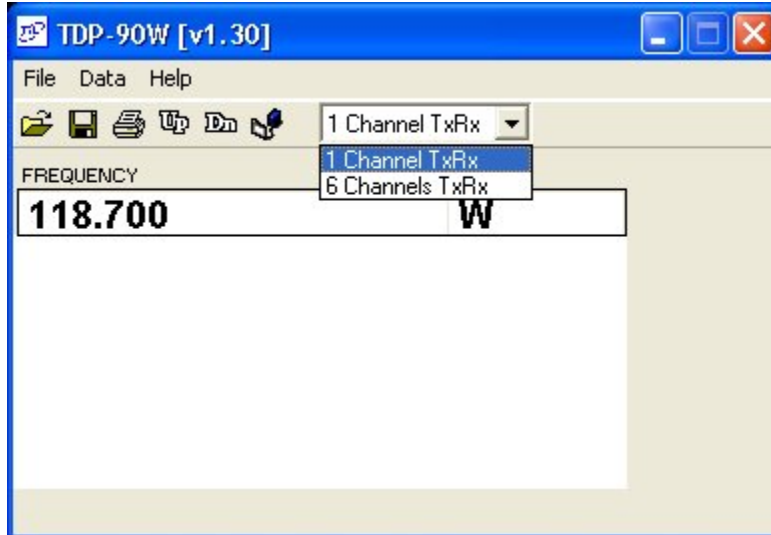
**TDP-90 Help Contents** opens the Windows Help dialog for the TDP-90 software. Here, you will find hardware connection and operating information as well as troubleshooting tips and answers to some Frequently Asked Questions.

**About** selection displays Technisonic company and contact information as well as the revision number of the TDP software in the “Terminal window” screen.



**CHANNEL SELECTION PULLDOWN**

**1 CHANNEL TRANSCEIVER**



**Figure 6**

**6 CHANNEL TRANSCEIVER**



**Figure 7**

The **x Channel(s)** pull-down tab allows you to select for single or six channel AM transceiver use. The frequency editing window changes accordingly. The “W” indicates that the channels are 25kHz (**Wide**) channel spacing and as such, only channels in 25kHz increments are accepted. Be sure to set the channel pulldown appropriately for your transceiver otherwise frequency programming may be unpredictable. For 4 channel transceivers use the first 4 entries in the 6 channel window.

## SAMPLE UPLOAD AND DOWNLOAD

- (1) Connect the transceiver to the computer USB port using a standard USB-A male to USB-B male cable. The USB port is located on the rear panel of mobile and base station transceivers and on the front panel of rack mount transceivers. Turn on the power to the transceiver.
- (2) Assuming that the USB driver is already installed, determine which Virtual Com Port has been assigned by accessing the Device Manager (accessed in WinXP by right-clicking on "My Computer – Properties – Hardware – Device Manager – Ports (COM & LPT) ). Note the COM number that was assigned to USB Serial Port.
- (3) Run the TDP-90 program on the computer.
- (4) Click on the **Data** pull-down list and select the serial port to which the transceiver is connected. Select Custom COM and enter the assigned port number if it is outside the normal range of Com1-4.
- (5) Set the program for 1 or 6 channels as applicable using the channel pulldown list.
- (6) Click on the **Up** icon to retrieve the frequencies from the radio. "UPLOADING" will appear at the bottom of the window as data is being transferred.
- (7) Edit the frequencies as desired. (The program only accepts 25 kHz spaced frequencies.)
- (8) Click on the **Dn** icon to copy the frequencies to the transceiver. "DOWNLOADING" will appear at the bottom of the window as data is being transferred.
- (9) Click on the **diskette** icon to save the file. Hint: Use the transceiver serial number or some other unique filename to identify the specific transceiver. The program will automatically append the .90 suffix to the filename.
- (10) Click on the **printer** icon to print a hard-copy of the frequencies.