TFM-550

VHF High/VHF Low/UHF
MULTIBAND FM AIRBORNE TRANSCEIVER

Installation and Operating Instructions

TiL Document No. 99RE262
Rev. A Issue 10

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IMPORTANT INFORMATION

As of January 1st, 2013, the FCC will no longer allow transceivers to be delivered to the USA that are capable of wide band (25kHz) channel spacing in the commercial 2 way mobile / base sections of the VHF and UHF bands. TDFM-550 transceivers delivered to the USA after this date will no longer support wide band operation on those bands. VHF low band is not affected. Channels programmed by MultiTDP software on VHF and UHF to wide band will automatically change to narrow band when loaded into the TFM-550.

REVISION HISTORY
[99RE262]

REV	SECTION - PAGE -	DESCRIPTION	DATE	EDITED BY
99RE262 Rev A Issue 4	CR 08194 Overall A-Page:	No change to fit, form or function. Grammar and spelling check was done, corrected typos, etc. as needed or found. Added NOTICE regarding new address change that may appear different throughout this manual. Document was updated from one program format to another. See NOTE below.	MAR 2008	FM
99RE262 Rev A Issue 5	CR 08385 A-Page: Global Changes	Add Revision Page to record manual updates Changed Note to FCC Compliance Information [Footers changed to reflect Rev changes] [Corrected any spelling errors found] [minor page formatting changes done more spacing under header]	NOV 2008	FM
99RE262 Rev A Issue 6		NOTE: New document template/layout/format. - New Title page includes Logo, product photo. - Rev History Approval column change to Edited By. - Frontal matter, Contents and footer updated. - All other data remains unchanged. - Added Support Notes as Appendix B. - Warranty page added.		
	CR 10988 1-4 2-2	To correct errors introduced in last issue FCC testing has updated the temp stability spec Added (-30 to +65°C) ±2.6 ppm (+65° to +70°C) Replace incorrect Fig 2.1	FEB 2010	FM
Rev A Issue 7	A-2 A-5 A-6 A-7 B-1	Procedure A freq 39.3855 MHZ chg to 39.3850 MHz (typos chg MHZ to Mhz in table. Procedure C freq 36.0333 chg to 36.0325 freq 36.0333 chg to 36.0325 Procedure E freq 515 MHZ chg to 512 MHz Removed Appendix B “Support Notes”	MAR 2010	FM
Rev A Issue 8	-3- 1-4	Added flight test option to glide slope test FCC testing has updated the TX temp stability spec: ±2.5 ppm (-30°C to +55°C) ±2.6 ppm (-45°C, +60°C to +70°C)	AUG 2010	SM
Issue 9	1-1	Para. 1.4 added NV P/Ns	FEB 2012	FM
Issue 10		Added FCC 1 Jan 2013 notice.	JAN 2013	SM

NOTES

ESD CAUTION

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

FCC COMPLIANCE INFORMATION

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.

Do not use the TFM-550 in the frequency band 406.0 MHz – 406.1 MHz. This frequency band reserved for distress beacons.

WARNING AND DISCLAIMER

Changes or modifications not expressly approved by Technisonic Industries could void the user's authority to operate the equipment.

This manual is designed to provide information about the TFM-550. Every effort has been made to make this manual as complete and accurate as possible.

WARRANTY INFORMATION

The Model TFM-550 Transceivers are under warranty for one year from date of purchase. Failed units caused by defective parts, or workmanship should be returned to:

Technisonic Industries Limited
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Mississauga, Ontario L4Z 1W7

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

Summary of DO-160C Environmental Testing

Summary of DO-160C Environmental Testing for Technisonic Model TFM-550, Low-band VHF, High-band VHF and UHF Transceiver:

Conditions	Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to categories B2 and D1.
Vibration	8.0	Equipment is tested without shock mounts to categories B, M and N.
Magnetic Effect	15.0	Equipment is class A.
Power Input	16.0	Equipment tested to category B.
Voltage Spike	17.0	Equipment tested to category B.
RF Emission	21.0	Equipment tested to category Z.

INSTALLATION APPROVAL NOTE

Presently, no TSO standard exists for airborne FM transceivers. To make it easier for installation agencies to provide their customers with an approved installation supported by an effective Airworthiness Approval, Technisonic has secured Supplemental Type Certificate (STC) Approvals (both US and Canadian) on its Airborne FM products for many helicopters currently being delivered in the US and Canada as well as a number of single engine fixed wing aircraft. The above referenced DO-160C test data is also on file and available from Technisonic to support approval requirements in airframes for which Technisonic does not possess an STC.

Approved aircraft types are listed in the attachments to the formal STC documents. These STCs are the exclusive property of Technisonic and require the written authority of Technisonic for their use. To assist Factory Authorized Technisonic Dealers in the certification process, we have placed copies of our Canadian and US STCs on our web site along with a letter of authorization for their use. These documents may be downloaded and used as support for the technical submission to FAA or Transport Canada. Only authorized factory dealers/installers are permitted to download and make use of these documents on behalf of their customers (end users) in support of regulatory agency approval. Please refer to the Technisonic web site www.til.ca for the latest issue of available STCs and letter of authorization for use.

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1.1 INTRODUCTION

This publication provides operating and installation information on the TFM-550 Transceiver manufactured by Technisonic Industries Limited. The unit offers an extended frequency range with selectable channel spacing and is intended for use (in the U.S.) only by government agencies or contractors thereto, who have obtained licensing for operation in the 138-150 MHz portion of the VHF band. If the TFM-550 transceiver is used in CANADA, VHF operation is restricted to the following sub bands: 138-144, 148-148.99, 149.005-150.005 and 150.05-174 MHz. Furthermore the TFM-550 is a frequency agile transceiver which is restricted to airborne use and must not be operated as a base station in Canada.

1.2 DESCRIPTION

The TFM-550, Transceiver is a frequency agile, fully synthesized airborne FM transceiver capable of operating in the 30 to 50 MHz, 138 to 174 MHz and 403 to 512 MHz frequency range in 2.5 kHz increments with either 25 kHz or 12.5 kHz channel spacing. The Transceiver can operate without restriction on any split frequency pair in either band.

The TFM-550 Transceiver provides 200 operator accessible memory positions per band, each of which is capable of storing a transmit frequency, receive frequency, transmit frequency CTCSS tone or DPL code, receive frequency CTCSS tone or DPL code, an alphanumeric identifier for each channel and wideband (25 kHz) or narrowband (12.5 kHz) channel spacing assignment. Operating frequency and other related data are presented on a 96 character, four-line LED matrix display. Data entry and function control are performed via a 12 button keypad. Preset channels may also be scrolled and scanned (scanning only possible in VHF high and UHF bands) through keypad function activation. Data may also be entered via computer with the provided software and optional PC Up/download cable, P/N 993390-1.

1.3 PURPOSE OF EQUIPMENT

The TFM-550, VHF High/VHF Low/UHF Band FM Transceiver is designed to provide secondary airborne communications to facilitate operations which are typically performed in a low altitude environment. The transmitter sections of this unit have a minimum of 8 watts and do not exceed 10 watts output power, which may be reduced by a front panel switch to 1 watt, in order to reduce interference to land based systems.

1.4 MODEL VARIATION

There are four variations of the Model TFM-550 Transceiver plus 2 with NV. All units offer identical features and performance except for the following differences:

TFM-550, P/N 991095-1 (28V)	GREEN display and 28 Volt back lighting.
TFM-550, P/N 991095-1 (5V)	GREEN display and 5 Volt back lighting.
TFM-550, P/N 991095-1 (28V) *NV*	GREEN display and 28 Volt back lighting.
TFM-550, P/N 991095-1 (5V) *NV*	GREEN display and 5 Volt back lighting.
TFM-550, P/N 991095-2	RED display and 28 Volt back lighting.
TFM-550, P/N 991095-2 (5V)	RED display and 5 Volt back lighting.

Both P/N's 991095-1 and 991095-2 are always provided with 28 volt back lighting unless a specific request is made for 5 Volt AC operation.

1.5 TECHNICAL CHARACTERISTICS

Specification	Characteristic
GENERAL	
Model Designation:	TFM-550
Frequency Range:	30 to 50, 138 to 174 and 403 to 512 MHz
Tuning Increments:	2.5 kHz
Operating Mode:	F3E simplex or semi-duplex
Channel Spacing:	25 or 12.5 kHz
Physical Dimensions:	Approx. (L) 8.0" x (W) 5.75" x (H) 3.75"
Weight:	Approx. 5.1 Lbs (2.3 Kg)
Mounting:	Panel Mount via Dzus fasteners
Operating Temperature Range:	-45° C to +70° C
Power Requirement: Voltage: Current:	28.0 VDC ± 15% Receive - 1.2 A Max. 1 Watt Transmit - 2.2 A Max. 8-10 Watt Transmit - 3.4 A Max. 8-10 Watt Dual Transmit - 5 A Max.
Frequency Selection:	200 memories per band programmed with: a) Tx Frequency/Rx Frequency b) Tx/Rx CTCSS tone or DPL code c) 9-character alphanumeric title
CTCSS squelch/encoder:	All CTCSS tones available
DPL[1] digital squelch/encoder:	All standard DPL codes
DTMF encoder:	All standard DTMF tones
Audio Outputs:	0.5 Watts into 600 Ω
Speaker Output:	2.5 Watts min. into 4 Ω
Back Lighting:	28 Volts (standard) or 5 Volts (specify)
Display Colour:	Green (standard) or Red (specify)

[1] DPL is a trademark of Motorola Corporation

1.5 TECHNICAL CHARACTERISTICS (continued)

Specification	Characteristic
VHF RECEIVER	
Sensitivity at 12 dB SINAD	Better than 0.35 μV
Adjacent Channel Selectivity	-75 dB (25 kHz) -70 dB (12.5 kHz)
Spurious Attenuation	-90 dB
Third Order Intermodulation	-70 dB
Image Attenuation	-80 dB
FM Acceptance	±6 kHz
Hum and Noise	Better than 45 dB
Audio Distortion	less than 5%
Antenna Conducted Emission	less than -70 dBm
UHF RECEIVER	
Sensitivity at 12 dB SINAD	Better than 0.35 μV
Adjacent Channel Selectivity	-70 dB (25 kHz) -60 dB (12.5 kHz)
Spurious Attenuation	-80 dB
Third Order Intermodulation	-70 dB
Image Attenuation	-60 dB
FM Acceptance	±6 kHz
Hum and Noise	Better than 40 dB
Audio Distortion	less than 5%
Antenna Conducted Emission	less than -70 dBm

VHF LOW RECEIVER

All specifications identical to VHF receiver

VHF, VHF LOW and UHF TRANSMITTER

RF Power Output	1 Watt or 10 Watts
Output Impedance	50 Ω
Maximum Deviation (In narrowband mode)	±5 kHz (25 kHz mode) ±2.5 kHz (12.5 kHz mode)
Spurious Attenuation	-90 dB below carrier level
Frequency Stability	±2.5 ppm (-30°C to +55°C) ±2.6 ppm (-45°C, +60° to +70°C)
Microphone Circuit	Carbon or equivalent
Sidetone Output	0.5W (max) into 600 Ω
Harmonic Attenuation	-60 dB below carrier level
FM Hum And Noise	-40 dB
Audio Input	50 mV at 2.5 kHz into 200 Ω input circuit for ±3.5kHz deviation, adjust.
Audio Distortion	Less than 5%

SECTION 2 – OPERATING INSTRUCTIONS

2.1 FEATURES

The equipment has several important operating features which provide maximum flexibility, performance and versatility. These features include:

1. The UHF band can be configured to be operated independently of the VHF High and VHF Low bands or all three bands can operate as a single unit.
2. The unit can be set up as a cross band repeater, linking a VHF High and UHF frequency in both directions. The VHF Low band will not cross band repeat.
3. 200 memory positions per band which can each be programmed with a transmit and receive frequency with 25 or 12.5 kHz channel spacing, Tx/Rx CTCSS tones or DPL codes and a 9-character alphanumeric title.
4. Scanning of preprogrammed memories with selective memory scanning, in up to 5 scan lists, for the VHF High or UHF band. The VHF Low band does not scan.
5. Priority scan of memory channel 1 in VHF high or UHF band. The Scan function can only be used for one of these bands at a time. Simultaneous scanning on both bands is not possible.
6. Direct frequency entry mode.
7. Receive frequency simplex function. (Repeater talk around)
8. Switchable RF output power between 1 watt and 8-10 watts.
9. Lockout of keyboard to prevent inadvertent entries.
10. Variable frequency mode to manually scan up and down in 1 MHz, 100 kHz or 2.5 kHz steps.
11. LED display variable dimming mode.
12. Selectable 90 second Tx time out feature.
13. PC Memory Upload or Download capability.
14. **Configuration Menu**: Pressing ENTER, RCL and FUNC together, while turning the radio on, will put it into configuration mode. The programming features affected are:

    a) **DPL** - Can be turned on or off with the MUP and MDN (4 and 7) keys. This only removes the DPL entry step from the programming sequence and does not stop memories that already have DPL codes from working. This also applies to the rest of the on/off configurable items.

    b) **Scan** - Can be disabled. Selecting FUNC and SCAN will do nothing if Scan is off. The scan list indicator (+) will still display if was previously programmed.

    c) **Rx CTCSS** - Can be turned on or off from the programming sequence. This affects only the CTCSS tones for receive.

    d) **LAST MEM** - If set to on, the last memory channel on the display will be what comes up when the radio is turned on. If set to off, the last memory that changes were made to will be what comes up when the unit is switched on.

    e) **DUALMODE** - If set to ON, the UHF band is operated independently from the 2 VHF bands. (Example: UHF audio separately available on 9 pin connector). The radio is shipped with this feature OFF.

f) **REMOTE BS** - Only used when an RC-550 slave control head is attached. Setting this feature on will give the transmit selection to the Band Select switch on the RC-550 rather than on the radio. This is useful when the operator at the RC-550 is using the VHF high and low bands. Regardless of whether this feature is set to on or off, the fourth squelch light will light on both units when both BS switches are set to the same position.

g) **SIDETONE** - The TX audio circuit becomes active allowing you to adjust the sidetone level with the VHF volume knob. When the desired level is reached, press ENTER and this level will be set for both VHF and UHF bands. The factory setting is 23.

NOTE: The sidetone level must be set every time you go through the configuration menu since it takes the setting of the volume knob regardless of whether you set it or not.

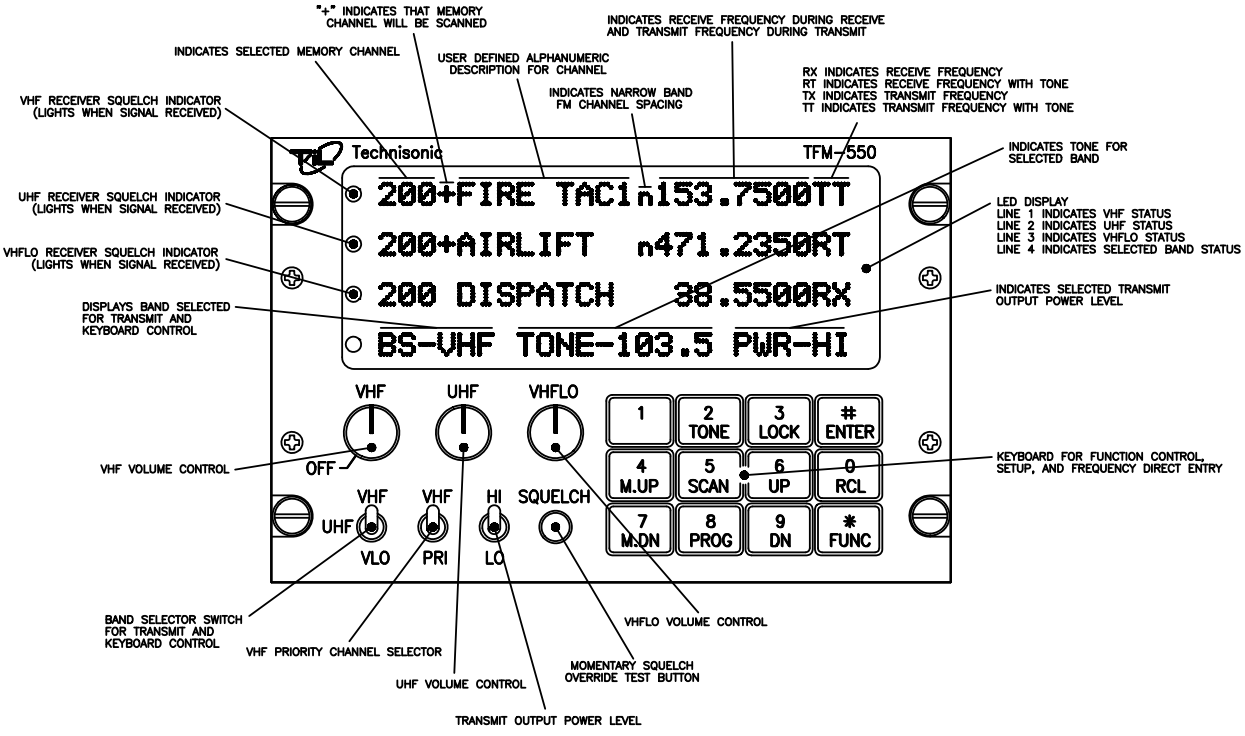

FIGURE 2.1 TFM-550 Operator's Switches and Controls

2.2 OPERATING INSTRUCTIONS (See Figure 2-1)

1. Switch power on by turning the VHF volume clockwise. Depending how the radio is configured, either the last programmed or last displayed frequencies will appear on the screen. The transceiver is now in normal operating mode.

   NOTE: VHF high band will be referred to as “VHF” and VHF low band as “VLO” in these instructions.

2. Adjust the audio level by adjusting the VHF, UHF and VLO volume knobs.

3. Pressing the squelch defeat button will open all receivers to confirm they work.

4. Read the display. The top line will indicate which VHF memory is selected followed by a "+" if the memory position is included in a scan list, an alphanumeric message, and the frequency of the VHF receiver. A small "n" before the frequency indicates 12.5 kHz narrowband channel spacing is in effect on this memory position. In the receive mode, the frequency is followed by an "RT" if an RX CTCSS tone or RX DPL code is programmed, or an "RX" if no receive tone/code is programmed. Similarity, in the transmit mode either a "TT" or "TX" is shown after the frequency. The second line shows the same information for the UHF band. The third line indicates the same information about the VHF LOW band.

5. Set the VHF/UHF/VLO (BS) switch to the desired band.

6. The VHF/PRI switch is spring loaded and is normally in the VHF position. Pressing this switch down will result in channel 001 being loaded on the VHF band.

7. Set the HI/LO switch to the desired RF output power.

8. Select the desired memory by using the M.UP and M.DN buttons, or the RCL button and a three digit number followed by ENTER.

9. To transmit DTMF tones, use the keyboard keys while holding the PTT button on the microphone. There is a 5 second PTT delay after pressing a key so that you may press several DTMF keys in sequence without having to hold the PTT. The keyboard returns to its normal function when the PTT is released.

The display always shows the status of both receivers and the transmitter. The light at the left of each line indicates which receiver is receiving. The display also indicates the memory channel is in use. A "TX" (no TX tone/codes programmed) or "TT"(either TX tone or code programmed) on the right side of the display indicates which band is active when transmitting. The transmit frequency is also shown. In the receive mode the display shows “RX” beside the receive frequency if no RX tone or DPL code is programmed and “RT” if a CTCSS tone or DPL code is programmed.

While in any programming mode, all receivers continue to function. When the transceiver is in either of the operating frequency or CTCSS tone/DPL code programming modes and you must respond to a call, click the microphone PTT once (the radio will not transmit during this click). This will cause the transceiver to revert back to the normal operating mode and communications with the caller can proceed in the usual fashion. Pressing the FUNC key has the same effect.

2.3 PROGRAMMING INSTRUCTIONS

To program one of the 200 memory channels in one of the bands:

1. Select the desired band on the band select (VHF/UHF/VLO) switch. This is required before any of the programming modes or functions.
2. Press the **FUNC** key. The display will show the function prompt.
3. Press the **PROG** key. The display will show the current receive frequency with a flashing curser on the first or second digit. (The first digit is always a one <1> on the VHF band and there is no hundreds digit on the VHF LOW band).
4. Type in the desired receive frequency. If you type in a frequency which is not a 2.5 kHz step, the nearest valid frequency will be automatically selected.
5. The curser will return to the second digit. You can retype the frequency if you have made an error or press **ENTER** to continue.
6. The transmit frequency will be displayed with the curser on the second digit. Follow the same method as in step 4 and 5.
7. The channel spacing increment of either 25.0 or 12.5 kHz is now displayed. Use the **M.UP** and **M.DN** keys to select the desired channel spacing for the memory position, then press **ENTER**.
8. The alpha-numeric title is now displayed. Use the **M.UP** and **M.DN** keys to scroll through the alphabet, numbers and symbols. When the desired character is displayed, press **ENTER** to advance to the next character. Press “1" to backspace.
9. Keep repeating step six until the last space is set (there are 9 characters). The display will show SCAN or LOCKOUT to enable this memory position as part of a scan list or lock it out of the scan lists. Use the **1,2,3,4,5** and **M.DN** keys to toggle between these functions (for details see paragraph 2.5). Once the desired condition has been selected, press **ENTER**. The TFM-550’s display will show a "+" beside the memory channel number if scan is enabled.

   NOTE: Scan function and Scan list feature not provided for VHF Low Band.
10. The display will now show the current memory number. Type in the 3 digit number of the memory you want to save to (if different from displayed one) and press **ENTER**.

2.4 PRIORITY SCANNING, SELECTIVE MEMORY SCANNING AND SCAN LISTS

Instead of breaking up the 200 channels into blocks for scanning, the TFM-550 has 5 scan lists per band (VHF high and UHF only). Any of the 200 channels can be assigned to any one or more of these 5 scan lists. This means the channels do not have to be repeated for them to be in more than one block and that you are not limited to the number of channels that can be scanned at once, since all 200 channels can be put into any scan list.

NOTE: Scanning is not available on the VHF Low band.

The priority memory channel is always memory position number 1. The priority memory channel is scanned every other step to ensure that no incoming messages are missed. (Example: 121314151...) The priority channel can be locked out, which will result in the normal scanning of the other memory positions.

Selective memory scanning allows the user to select which of the 200 memory channels are to be scanned or locked out when the scan function is invoked. To use this feature, follow PROGRAMMING INSTRUCTIONS found in paragraph 2.3. Once the screen displays **SCAN** or **LOCKOUT**, use the **1,2,3,4,5** or **M.DN** keys to toggle to the desired condition and press **ENTER**. Entering the any or all of the numbers 1,2,3,4 or 5 will include that memory channel in any of the five scan lists. In normal operating mode, the display will later show a "+" beside the memory channel number if it has been included in any of the 5 scan lists.

2.5 SCANNING FUNCTION (5 second talkback delay)

Select the band you wish to scan with the band switch. (You can not scan VHF Low band). To start scanning of the memory channels, press **FUNC** then **SCAN** and then the number (1,2,3,4,5) of the desired scan list.

The radio will scan through all the preset memory positions in the selected scan list (see above paragraph for priority and selective scan features) and will lock on to the first active channel in the scan sequence. It will remain on the channel until it becomes inactive. Scanning will resume again after five seconds of inactivity. To exit the scan mode, press the **SCAN** key. This will cause the radio to revert back to the normal operating mode.

If while scanning, you hear a call for you:

1. Respond to the call within 5 seconds. When scanning is interrupted by an incoming signal, the channel will remain open for five seconds before resuming scanning.
2. During communications the five second timer is reset from the last Rx or Tx signal encountered.

The radio resumes scanning once the Rx or Tx activity has ceased for more than five seconds. The **SCAN** key must be pressed to exit the scan mode.

2.6 DIRECT FREQUENCY ENTRY MODE

This mode is designed to facilitate quick frequency selection during emergency and other operational conditions requiring direct operating frequency selection. This operating mode is disabled along with the programming mode when the internal disable jumper is set.

1. When the transceiver is in the normal operating mode, press **FUNC** and the desired operating frequency. Example: 153.2750.
2. On the UHF band press **FUNC** and then 1 and the desired frequency. Example: 443.5500.
3. You will then be asked for 12.5 or 25.0 kHz channel spacing. Select with **MUP** or **MDN** and press ENTER.

Please note in the above operation, after **FUNC** and "**1**" are entered, the LED display will show memory channel "000" and then the remaining digits in the desired frequency are shown as they are entered. No alphanumeric message can be entered in this mode. Operation on the new frequency occurs in both transmit and receive (simplex only) modes. If RX or TX CTCSS tones/DPL codes are required they must be programmed in afterwards.

2.7 RECEIVE FREQUENCY SIMPLEX FUNCTION (Repeater talk around)

The receive frequency simplex function allows you to quickly change the transmit frequency, when operating on a split pair (repeater/semi-duplex mode), to the receive frequency to allow direct communications. Example: If you are transmitting on 152.000 MHz and receiving 152.555 MHz, select **VHF** on the band select switch and press **FUNC** then **UP** to transmit on 152.555 MHz. To return to the split pair condition, you must recall the memory channel again. This is quickly done by pressing **M.UP** for one step up, then back down one step with the **M.DN** key.

2.8 KEYBOARD LOCKOUT FUNCTION

The keyboard can be locked out so that accidental pressing of keys does not change frequency, etc., unknowingly to the operator. To lock the keyboard, press **FUNC** then **LOCK**. This will disable all keyboard functions (except keyboard unlock) in the receive mode. The DTMF function during transmit will not be affected. To unlock the keyboard, press and hold the **LOCK** key for two seconds until the display indicates "UNLOCK".

2.9 VARIABLE FREQUENCY MODE FUNCTION

To enter variable frequency mode, press **RCL, 0,0,0**, then **ENTER** or enter a frequency in the direct entry mode described above. The memory channel that you were just in will still be valid, but now you can manually adjust the frequency with the **M.UP, M.DN, UP** and **DN** keys. The **UP** and **DN** keys will make the frequency count up or down in steps of 2.5 kHz. The **M.UP** and **M.DN** keys will make the frequency count up or down in steps of 1 MHz. You can not change the label. The frequency in this mode cannot be stored in memory. To exit this mode, recall one of the 200 memory channels. (Example: **RCL, 0,0,1**). Variable frequency mode is disabled when the internal entry disable jumper is removed.

2.10 LED DISPLAY VARIABLE DIMMING MODE

1. With the transceiver in normal operating mode press the **UP** or **DN** keys to increase or decrease the intensity of the LED display.
2. Once maximum intensity of the display is achieved, the UP key no longer functions. Conversely, once minimum intensity is reached, the **DN** key ceases to function.

2.11 90 SECOND TRANSMITTER TIME OUT FEATURE

A selectable 90 second transmitter time out feature is provided to prevent accidental continuous transmission in the event of a faulty PTT switch. With this feature enabled the transceiver will stop transmitting after the PTT is engaged continuously for 90 seconds. The timer is reset by releasing then re-engaging the PTT switch.

Press the **FUNC** then the **M.UP** key. Use the **M.UP** and **M.DN** keys to select 90 SEC, which enables the feature, or NONE which disables it.

2.12 PROGRAMMING CTCSS TONES/DPL CODES

CTCSS tones (PL tones) or Digital DPL codes can be assigned to each memory channel on any of the three operating bands. To program a tone/code to a memory channel:

1. Select the desired band on the band select switch.
2. Use the **M.UP** and **M.DN** keys to select the memory channel that you want to assign a CTCSS tone or DPL code.
3. Press the **FUNC** key then the **TONE** key. The display will show "RX TONE:" and the current tone number, as well as the tone frequency in Hz.
4. Use the **M.UP** and **M.DN** keys to select the tone number you require. See **Table 2.1** for a list of the available CTCSS tones.
5. Press **ENTER**. "TX TONE" appears on the display. Repeat step 3.
6. The display will now show "RX DPL:" and the current 3 digit DPL code. If no DPL code is required "000" should be entered. Please note that if a DPL code is to be programmed a CTCSS tone should not be enabled.
7. Use the keypad to enter the required octal 3 digit DPL (Digital Coded Squelch or DCS) code. See **Table 2.2** for a list of all usable and unique octal 3 digit DPL/DCS codes.
8. Press **ENTER**. "TX DPL" appears on the display. Repeat step 6.

Number	Tone	Number	Tone	Number	Tone
01	67.0	26	162.2	51	177.3*
02	71.9	27	167.9	52	183.5*
03	74.4	28	173.8	53	189.9*
04	77.0	29	179.9	54	196.6*
05	79.7	30	186.2	55	199.5*
06	82.5	31	192.8	56	206.5*
07	85.4	32	203.5	57	210.7*
08	88.5	33	33.0*	58	218.1*
09	91.5	34	35.4*	59	225.7*
10	94.8	35	36.6*	60	229.1*
11	97.4	36	37.9*	61	233.6*
12	100.0	37	39.6*	62	241.8*
13	103.5	38	44.4*	63	250.3*
14	107.2	39	47.5*	64	No Tone
15	110.9	40	49.2*		(carrier squelch only)
16	114.8	41	51.2*		
17	118.8	42	53.0*		
18	123.0	43	54.9*		
19	127.3	44	56.8*		
20	131.8	45	58.8*		
21	136.5	46	63.0*		
22	141.3	47	69.4*		
23	146.2	48	159.8*		
24	151.4	49	165.5*		
25	156.7	50	171.3*		

TABLE 2.1 Available CTCSS tones
NOTE: The tones marked with * are non-standard tones.

017*	051	116	156	243	266*	346	431	466	612	721
023	053*	122*	162	244	271	351	432	503	624	731
025	054	125	165	245	274*	356*	445	506	627	732
026	065	131	172	246*	306	364	446*	516	631	734
031	071	132	174	251	311	365	452*	523*	632	743
032	072	134	205	252*	315	371	454*	526*	654	754
036*	073	143	212*	255*	325*	411	455*	532	662	
043	074	145*	223	261	331	412	462*	546	664	
047	114	152	225*	263	332*	413	464	565	703	
050*	115	155	226	265	343	423	465	606	712	

TABLE 2.2 Usable and unique octal 3 digit DPL/DCS
NOTE: * indicates GE Digital Coded Squelch (DCS) Code

2.13 CROSS BAND REPEAT

The TFM-550 can act as a cross band repeater between VHF (high band only) and UHF. To enter repeat mode, press FUNC and then 9. The status line will show REPEAT instead of the band switch selection. When a signal is received on one of the bands, the audio is routed to the transmitter of the other band. This process can only go in one direction at a time. While transmitting, short bursts of noise due to intermittent signal strength or interference will be muted while the transmitter continues to transmit. There is also a short delay of silence (tail) after the received signal ends. The operator at the TFM-550 can monitor communications in both directions but can only talk to one band at a time via the band select switch. If the radio is set up in dual mode, the band selection is made at the audio panel. To cancel cross band repeat mode, press ENTER.

2.14 PC MEMORY PROGRAMMING UP/DOWNLOAD CAPABILITY

The TFM-550 transceiver can be programmed by a Windows based personal computer using Technisonic software supplied on CD with each TFM-550.

Requirements:

1. PC compatible computer with a CD ROM drive, running Windows 95/98/NT/2000/ME.
2. Bench power supply of 28 volts DC.
3. A PC download cable, P/N 993390-1 which can be supplied or made from the wiring diagram at the back of this section.

Connections:

1. With the PC turned off, plug the 25 pin male 'D' connector into a serial port.
2. Plug the 9 pin 'D' connector into the back of the TFM-550 transceiver.
3. Connect the power supply to the TFM-550.

Installing the MultiTDP Program:

The CD supplied with each radio contains software for all of Technisonic's downloadable transceivers. Place the CD into your drive and use Windows Explorer to open the MultiTDP directory on the CD. Double-click the MultiTDP_Install.exe file. Follow the onscreen instructions to install the program onto your hard drive. When the program is installed, it can be run by selecting Programs from your Start menu, then select Technisonic from the submenu and finally MultiTDP.

Using the MultiTDP Program:

With the program running on your computer, a full MultiTDP instruction manual can be loaded by selecting Documentation in PDF format under the Help menu. Otherwise, to get started, pull down the File menu and select TFM-550. The program defaults to serial port com1 but can be set to com 2, 3 or 4 under the Com Port menu. The program is now ready to use. You may want to upload data from the radio and edit channels or start a new data file. The VHF and UHF bands are treated as separate radios and must be up or downloaded and edited separately. Editing is done on a channel by channel basis. Set the channel number you would like to edit and then modify the frequencies, labels, CTCSS tones, DPL codes, wide / narrow band setting and scan lists as desired. Press the Save Record button to store the changes you've made to the data base below. After you have edited the channel list your can save your changes to disk and/or download to the radio. Only channels selected with a check mark will download. It is recommended to use the Select All command in the Data Transfer menu to ensure the data base in the radio matches the one in the PC. When download is selected, a message box will appear on your screen asking you to press FUNC and DN on the radio. Press these buttons on the radio before you click OK in the message box, otherwise the download will fail.

TFM-550 Upload/Download Programming Cable
P/N 993390-1 Wiring Diagram

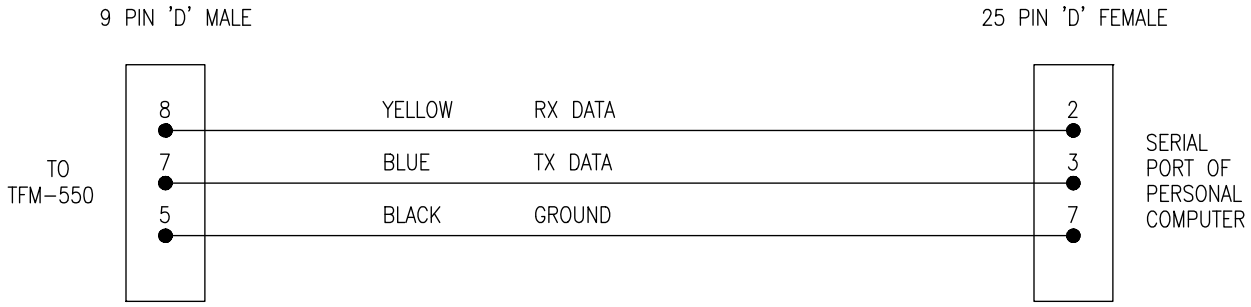

FIGURE 2.2 TFM-550 Transceiver PC Up/Download Cable - wiring diagram

NOTE: If your serial port is a 9 pin connector instead of the 25 pin, use a female 9 pin D connector, connecting:

Yellow	- pin 3
Blue	- pin 2
Black	- pin 5

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SECTION 3 – INSTALLATION INSTRUCTIONS

3.1 GENERAL

This section contains information and instructions for the correct installation of the TFM-550, VHF/FM Transceiver.

Make certain that the correct frequencies are pre-programmed in accordance with the equipment user's valid FCC operator's license, prior to installation.

3.2 EQUIPMENT PACKING LOG

Unpack the equipment and check for any damage that may have occurred during transit. Save the original shipping container for returns due to damage or warranty claims. Check that each item on the packing slip has been shipped in the container. Verify that the equipment display and backlighting configuration are the same as those ordered.

3.3 TRANSCEIVER INSTALLATION

The TFM-550 Transceiver is designed to be Dzus mounted and should be installed in conjunction with an IN-550 installation kit. See Figure 3.1a for an outline drawing of the unit with dimensions to facilitate the installation.

3.4 INSTALLATION KIT - CONTENTS

The IN-550 installation kit consists of:

1. One 15 pin Cannon D mating connector (female) complete with crimp pins and hood.
2. One 9 pin Cannon D mating connector (male) complete with crimp pins and hood.
3. Three BNC antenna mating RF connectors (male).

3.5 ANTENNA INSTALLATION

Antenna, Comant P/N CI-292-3 or suitable equivalent, may be utilized for VHF. Antenna, Comant P/N CI-275 or suitable equivalent, may be utilized for UHF and the Foxtronics model FLX-3050B antenna/tuning system or Sensor Systems P/N S65-8282-34 may be utilized for the VLO band. A suitable whip antenna cut for a specific VLO frequency may also be used. The antenna should be mounted on the bottom of the aircraft whenever possible and must be located at least 20 cm (8 inches) from any occupant in the airframe. Consult with instructions provided with the antennas. Connect RF cables from antennas to the back of the TFM-550 unit by utilizing the BNC mating connector provided in the installation kit. The VHF Low band (top) and UHF (middle) BNC connectors are located on the rear, above the 15 pin D connector and the VHF high band BNC connector is below the 9 pin D. If an external antenna tuner (ATU) is to be used, the ATC-550 (P/N 991102-1) will have to be utilized to control it. The ATC-550 is an external box to the TFM-550. See Figure 3.1b.

3.6 INSTALLATION - PIN LOCATIONS AND CONNECTIONS

The pin numbers and locations for the 15 pin and 9 pin Cannon D located on the rear of the TFM-550 transceiver are shown below. Pin connections are listed in TABLES 3.1 and 3.2.

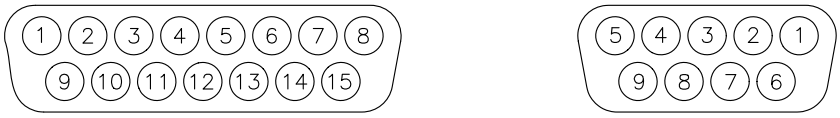


FIGURE 3 Transceiver mounted view of 15 pin female and 9 pin male connector

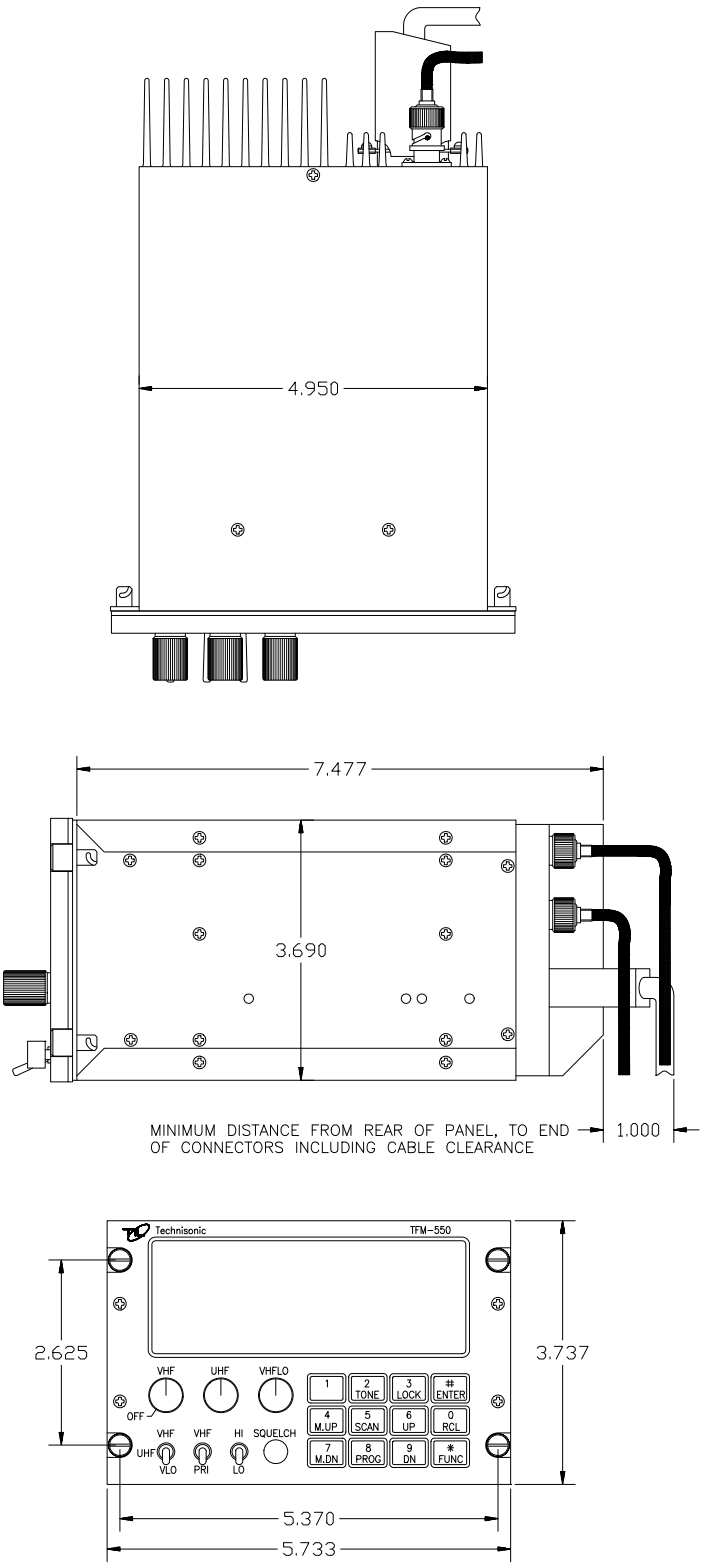


FIGURE 3.1a Outline Drawing for Model TFM-550 Transceiver

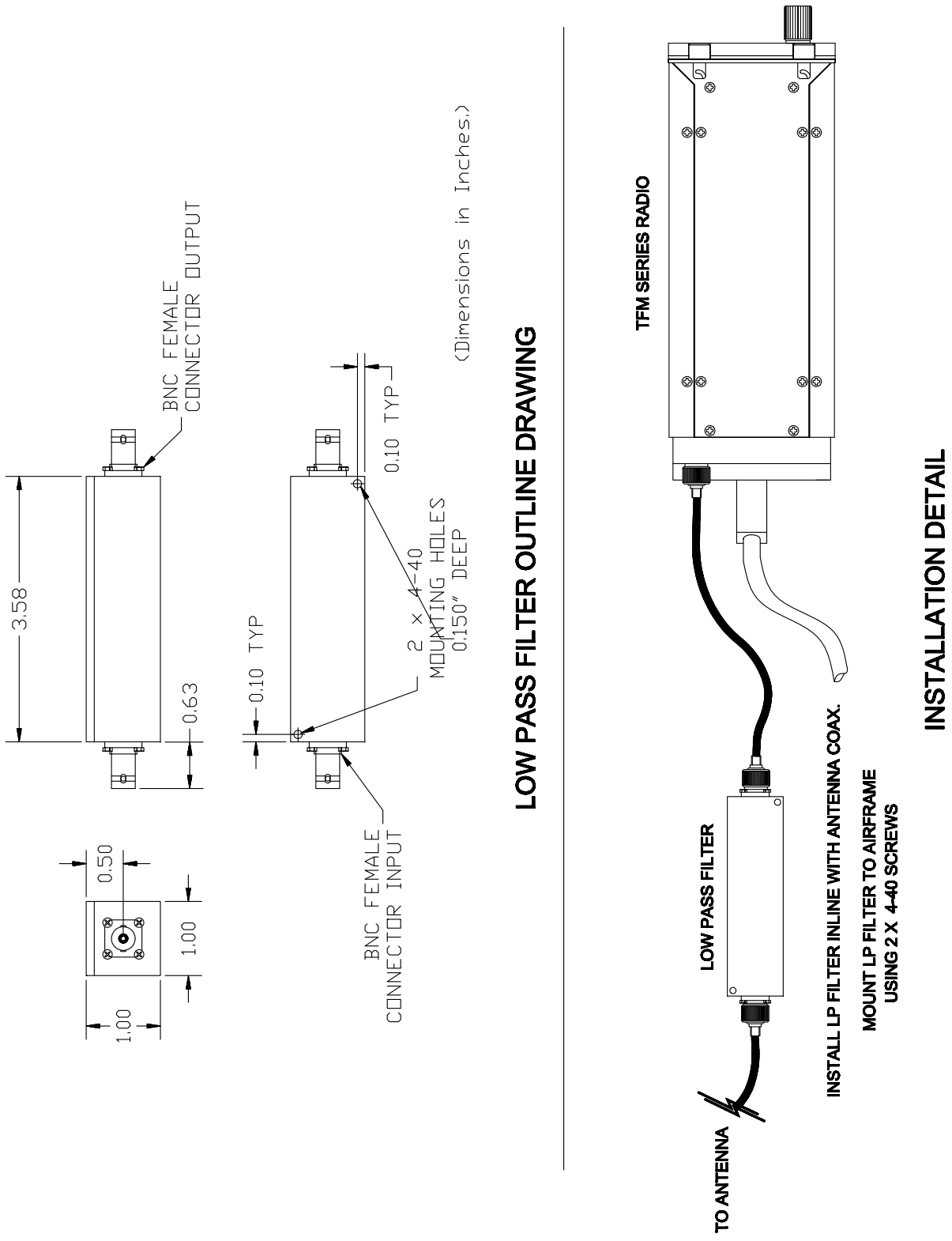


FIGURE 3.1b Low Pass Filter Outline Drawing and Installation Detail

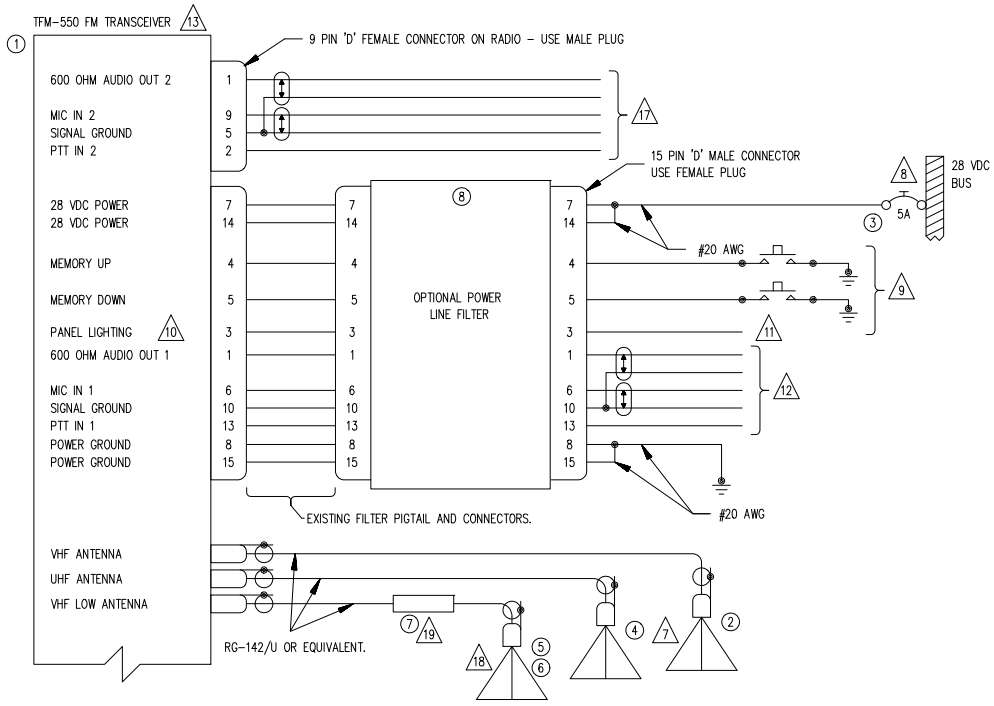
3.6 INSTALLATION - PIN LOCATIONS AND CONNECTIONS (continued)

TFM-550 Transceiver 15 Pin D Connections	
Pin #	**Description**
1	600Ω Output 1
2	Data Output
3	Panel Lighting (28VDC or 5VAC)
4	Memory Up
5	Memory Down
6	Mic Signal Input 1
7	Main Power +28VDC
8	Main Ground
9	4 ohm Speaker Output
10	4 ohm/600 ohm Output Ground
11	Data Input
12	DF Audio
13	PTT 1 (Ground Keying)
14	Main Power +28VDC
15	Main Ground

TABLE 3.1 Wire connections on a 15 Pin FEMALE D Connector

TFM-550 Transceiver 9 Pin D Connections	
1	600Ω Output 2 (UHF Band in Dual Mode)
2	PTT 2 (Ground Keying)
3	Reset
4	Background Debug Signal
5	Ground
6	Programming Voltage In
7	Serial Data Out
8	Serial Data In
9	Mic Signal Input 2

TABLE 3.2 Wire connections on a 9 Pin MALE D Connector



QTY	ITEM	PART NUMBER	DESCRIPTION	SPEC	MATERIAL
1	1	TFM-550	VHF/FM COMMUNICATIONS TRANSCEIVER.	TECHNISONIC INDUSTRIES LIMITED	
1	2	AT-150	ANTENNA - VHF HIGH BAND	TECHNISONIC INDUSTRIES LIMITED	
1	3	7274-11-5	CIRCUIT BREAKER, 5 AMPS	KLIXON	
1	4	AT-403	ANTENNA - UHF	TECHNISONIC INDUSTRIES LIMITED	
1	5	FLX-3050B	ANTENNA - VHF LOW BAND	FOXTRONICS	
1	6	S65-8282-34	ANTENNA - ALTERNATE VHF LOW BAND	SENSOR SYSTEMS	
1	7	061244-1	LOW PASS FILTER	TECHNISONIC INDUSTRIES LIMITED	
1	8	PLF-250	OPTIONAL POWER LINE FILTER	TECHNISONIC INDUSTRIES LIMITED	

NOTES:

1) ALL WIRE IAW MIL-W-22759 UNLESS OTHERWISE SPECIFIED.
2) ALL CABLE IAW MIL-C-27500 UNLESS OTHERWISE SPECIFIED.
3) COAXIAL CABLE IAW MIL-C-17 UNLESS OTHERWISE SPECIFIED. DO NOT USE COAX WITH PVC INSULATION.
4) FABRICATION & INSTALLATION OF WIRING HARNESS IAW AC 43.13-1A CHAPTER 11, SECTION 3, PARA 445 TO 462 AND SECTION 7.
5) GROUNDING AND BONDING IAW AC 43.13-1A CHAPTER 11, SECTION 3, PARA 452.
6) ALL SINGLE WIRE TO BE #22 AWG MINIMUM AND ALL SHIELDED WIRE TO BE #24 AWG MINIMUM, UNLESS OTHERWISE SPECIFIED.

△7 INSTALLATION OF ANTENNA IAW AC 43.13-1A CHAPTER 2, SECTION 3, CHAPTERS 5 & 6, AND AC 43.13-2A CHAPTER 3. IF POSSIBLE, THE ANTENNA SHOULD BE LOCATED A MINIMUM OF 12 FT FROM AIRCRAFT NAVIGATION RECEIVER ANTENNAS AND A MINIMUM OF 4 FEET FROM AIRCRAFT COMMUNICATIONS AND ELT ANTENNAS. BE CAREFUL NOT TO CHOSE SEPARATIONS THAT CLOSELY APROXIMATE 1/4 OR 1/2 OR WHOLE NUMBER MULTIPLES OF THE NAVIGATION OR COMMUNICATIONS SYSTEM WAVELENGTH.

△8 AN EQUIVALENT CIRCUIT BREAKER OR FUSE MAY BE USED.

△9 THE MEMORY UP/DOWN PUSH BUTTONS ARE OPTIONAL.

△10 THE TFM-500 IS AVAILABLE WITH 28V OR 5V PANEL LIGHTING. CHECK THE CONFIGURATION CONTROL LABEL FOR THE CORRECT VOLTAGE.

△11 CONNECT TO THE APPROPRIATE AIRCRAFT DIMMING BUSS.

△12 CONNECT TO THE AIRCRAFT AUDIO SYSTEM OR STAND-ALONE HEADSET JACKS.

△13 INSTALLATION OF TRANSCEIVER IAW AC 43.13-1A CHAPTER 2, SECTION 3 AND AC 43.13-2A, CHAPTER 2. PR 3 1/2 DZUS RAIL OR EQUIVALENT MAY BE USED.

14) TEST THE SYSTEM IN ACCORDANCE WITH THE POST-INSTALLATION TEST PROCEDURE IN THE INSTALLATION AND OPERATING INSTRUCTIONS MANUAL.

15) REFER TO THE AIRCRAFT STRUCTURAL REPAIR MANUAL AND THE MAINTENANCE MANUAL FOR INSTRUCTIONS AND INFORMATION PERTINENT TO THIS INSTALLATION.

16) THE USE OF RED DISPLAYS SHOULD BE MINIMIZED OR AVOIDED SO AS NOT TO DETRACT FROM THE ATTENTION GETTING CHARACTERISTICS NEEDED IN WARNING AND CAUTION ANNUNCIATORS. RED SHOULD BE USED TO ANNUNCIATE EMERGENCY CONDITIONS REQUIRING IMMEDIATE RESPONSE BY THE FLIGHT CREW. UNITS WITH RED DISPLAYS SHOULD NOT BE LOCATED IN CLOSE PROXIMITY TO WARNING AND CAUTION ANNUNCIATORS. THE INSTALLATION OF UNITS WITH RED DISPLAYS MUST BE EVALUATED ON A CASE BY CASE BASIS TO ENSURE THAT THE EFFECTIVENESS OF THE WARNING AND CAUTION ANNUNCIATORS IS NOT ADVERSELY AFFECTED.

△17 ONLY USED IF THE TRANSCEIVER WILL BE OPERATED IN DUAL MODE. (OPERATION OF 2 BANDS INDEPENDENTLY)

△18 INSTALL EITHER LOWBAND ANTENNA ITEM #5 OR ITEM #6.

△19 LOWBAND ANTENNA FILTER P/N 061244-1 MUST BE INSTALLED WHEN SENSOR SYSTEMS ANTENNA (ITEM#6) IS USED. FILTER MUST BE WELL BONDED TO RADIO CHASSIS.

Figure 3.2 Wiring connections for the TFM-550 Transceiver.

3.7 WIRING INSTRUCTIONS

Figure 3.2 shows all required connections and recommended wire sizes for the TFM-550 Transceiver. If problems with the correct operation of the UHF Transmit function of a TFM-550 are encountered on a specific airframe, a DC power line filter may be required. Typical problems encountered are that UHF will not transmit on high power or will not open a repeater when using a CTCSS transmit tone. Investigation has determined that once the ripple on the airframes DC (28V) power line becomes excessive, the UHF transmit function and tones will distort. If the airframes generators are turned off and the UHF transmit function works correctly from 28 Vdc battery power, the ripple on the DC power line is excessive. The use of DC power line filter PLF250, p/n 021214-1 is recommended and is available from Technisonic.

3.7.1 Main Power +28 VDC

The main power +28VDC (±15%) is connected to pins 7 and 14 of the transceiver. Both pins should be connected.

3.7.2 Main Ground

Ground connections for the transceiver are made on pins 8 and 15. Both pins should be connected.

3.7.3 PTT (Ground Keying)

The PTT line is connected to pin 13 and should be floating when the transceiver is in receive mode, and grounded during transmit mode. The PTT2 input is on pin 2 of the 9 pin connecter.

3.7.4 Front Panel Back Lighting

Front panel back lighting connection should be made on pin 3 of the transceiver. The opposite end of this lead should be connected to the panel lighting system of the aircraft. Before connecting, verify the required panel lighting voltage (28VDC or 5VAC) on the transceiver configuration control label.

3.7.5 Audio Outputs (600 ohms and 4 0hms)

There are two audio outputs available, (1 & 2). 600 ohm audio output 1 has audio from both VHF bands and the UHF band in single operator mode. When in dual operator mode, 600 ohm output 1 has audio from the VHF High and Low bands only, while the UHF audio will be on the 600 ohm output 2. None of these outputs need to be terminated if left unused.

3.7.6 Audio Output Ground

Pin 10 is the ground for both the 4 ohm and 600 ohm audio output signals.

3.7.7 Mic Signal Input

The microphone input signal is to be provided on pin 6, utilizing shielded wire with the shield grounded to pin 10. Microphone signal 2 is on pin 6 of the 9 pin D connector.

3.7.8 Memory Up/Memory Down

Remote scrolling through the 200 memory positions can be achieved by providing a ground to pins 4 (up) and 5 (down) through a momentary contact cyclic switch. The memories will scroll only on the band selected.

3.7.9 Data Input

Data communications equipment requiring direct access to the modulator and discriminator can be connected via pins 2 and 11. Data cannot be transmitted in CANADA unless equipment is approved for use with the TFM-550 by the communications regulatory authority.

3.8 INTERNAL PROGRAMMING AND GUARD ENABLE/DISABLE JUMPER

The programming and direct frequency entry modes can be disabled by removing the internal enable/disable jumper strap from pins 1 and 2 of J10. Removal of this jumper will prevent operation on any frequencies other than those programmed in the 600 memory positions. The transceiver is always shipped with the two jumpers in the entry enable positions. To place either of the jumpers in the disable position:

1. Remove the left side of the radio.
2. Set or remove jumpers as necessary.
3. Re-install the left side cover.

Microprocessor Control Unit (MCU) PCB Module

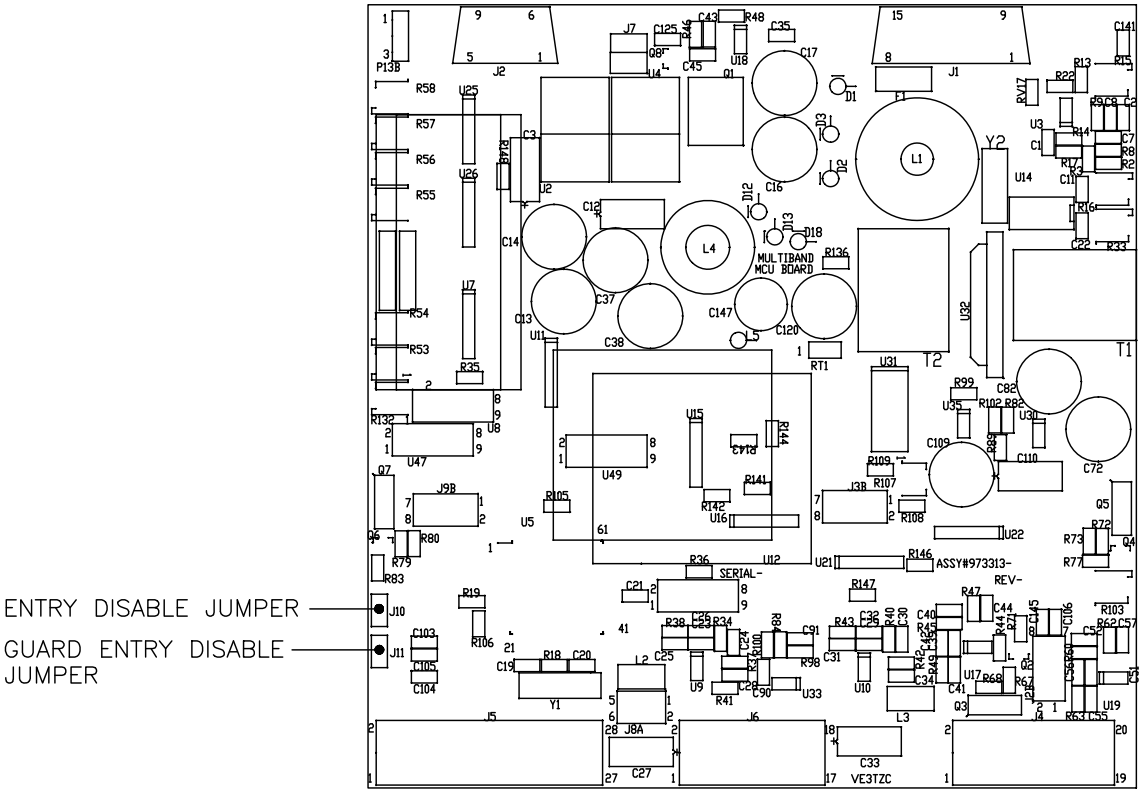


FIGURE 3.3 Internal Enable/Disable Jumper Locations
(The Guard Entry Disable Jumper has no effect to the TFM-550)

3.9 TRANSMITTER POWER ADJUSTMENTS

The transmitter power is adjusted to a maximum of 10 watts in high power mode, and 1 watt in low power mode over the transceiver operating bandwidth at the factory. If transmitter RF power readjustment is required, perform as follows:

1. Select the band that you wish to adjust on the band select switch.
2. Connect an RF through-line watt meter to the appropriate antenna connector. Set the operating frequency to 156.000 MHz for VHF or 457.000 MHz for UHF and key the transmitter.
3. In low power mode, set the low power adjustment potentiometer on the left side of the chassis to produce 1.0 watt of RF output power (See Figure 3.4).
4. In high power mode, set high power adjustment potentiometer on the left side of the chassis to produce 9.5 watts of RF output power.
5. Verify that the RF output power is between 9 and 10 watts on 138.000 MHz, and 174.000 MHz for VHF or 403.000 MHz, and 512.000 MHz for UHF.

3.10 TRANSMITTER MICROPHONE LEVEL ADJUSTMENT

1. Set the transceiver operating frequency to 156.000 MHz and connect an appropriate test receiver to the RF output connector. Ensure that the output of the transceiver is terminated into a proper dummy load.
2. Key the transmitter and input a -10 dBm (0.25 VRMS), 1 kHz audio signal into the microphone input.
3. Adjust the microphone level potentiometer (Mic Level 1) through the access hole located on the right side of the chassis (see Figure 3.5) to produce a 2.7 kHz deviation.
4. Verify that the deviation is at least 2.3 kHz on the following frequencies: 138.000 MHz, 162.000 MHz and 174.000 MHz.
5. For UHF, perform the same procedure using the Mic Level 2 pot on the left side of the transceiver and use the following frequencies: 403.000 MHz, 457.000 MHz and 512.000 MHz.

3.11 SQUELCH ADJUSTMENT

The squelch on all receivers is factory set to open at approximately 22 dB SINAD. This adjustment can be made or altered to suit local conditions as follows:

1. Set the receiver to 157.000 MHz for VHF, 457.000 MHz for UHF or 41 MHz for VHF Low band. Connect a signal generator to the antenna input of the desired band.
2. Set the signal generator to produce a ±3 kHz deviation with a 1 kHz tone on 157.000 MHz, 457.000 MHz or 41.000 MHz. Increase the signal generator RF level from 0.1 uV until the squelch indicator LED is on. Verify the squelch opens at the desired level.
3. If not, re-adjust receiver squelch potentiometer through the access hole located on the bottom of the transceiver chassis (see Figure 3.5).

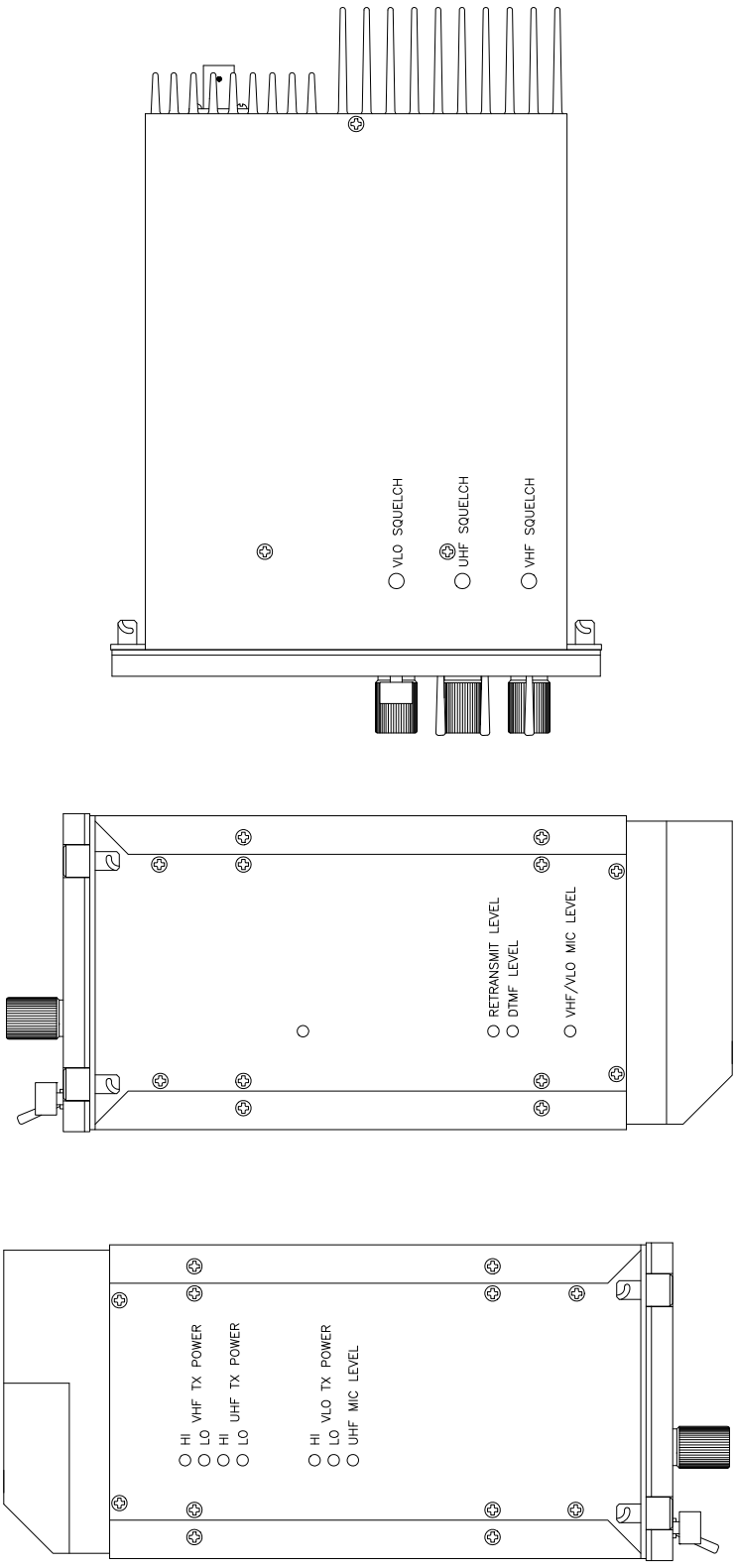


FIGURE 3.4 External Adjustment Access Holes

3.12 TRANSMITTER DEVIATION ADJUSTMENT

VHF:

1. Remove the bottom cover of the transceiver.
2. Set the VHF operating frequency to 157.000 MHz and connect an appropriate test receiver to the RF output connector. Ensure that the output of the transceiver is terminated into a proper dummy load.
3. Key the transmitter and input a +10 dBm (2.5 VRMS), 2.5 kHz audio signal into microphone input 1.
4. Adjust the wideband deviation limit potentiometer, R30 on the VHF Rx/Tx module (see Figure 3.5) to produce a ±4.20 kHz deviation. Select narrow band mode on the VHF band and adjust the narrowband deviation limit potentiometer, R76 on the VHF Rx/Tx module to produce a ±2.10 kHz deviation.
5. Verify that the deviation does not exceed ±5 kHz for wideband and ±2.5 kHz for narrowband on 138.000 MHz, and 174.000 MHz. Re-adjust R30 or R76 as required, if the deviation exceeds ±5 kHz or ±2.5 kHz, respectively.
6. Replace the bottom cover.

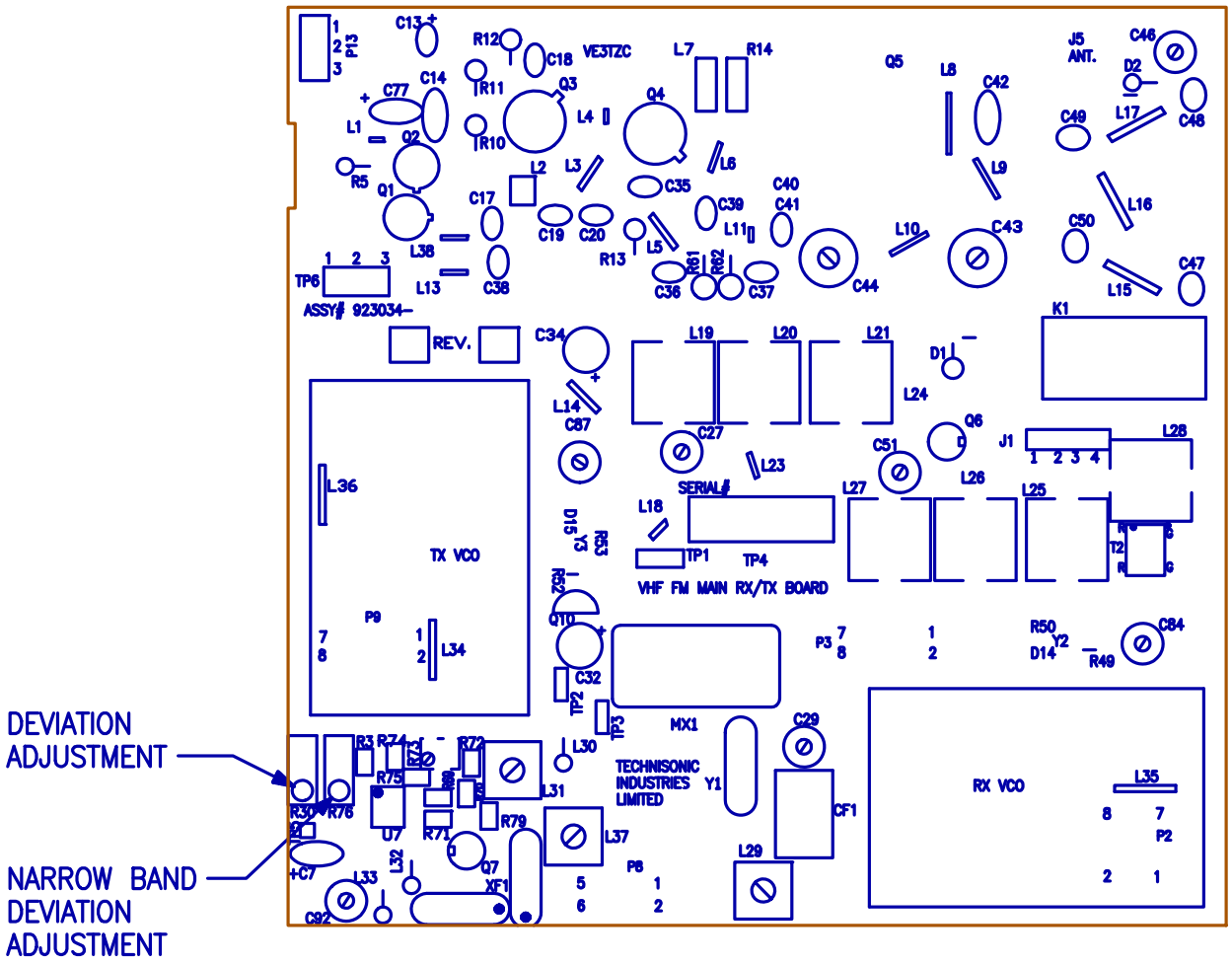
UHF:

1. Remove the left side cover of the transceiver.
2. Select the UHF band.
3. Set the UHF operating frequency to 457.000 MHz and connect an appropriate test receiver to the RF output connector. Ensure that the output of the transceiver is terminated into a proper dummy load.
4. Key the transmitter and input a +10 dBm (2.5 VRMS), 2.5 kHz audio signal into microphone input 1 if in single mode or microphone input 2 if in dual mode.
5. Adjust the wideband deviation limit potentiometer, R30 on the UHF Rx/Tx module (see Figure 3.6) to produce a ±4.20 kHz deviation. Select narrow band mode on the UHF band and adjust the narrowband deviation limit potentiometer, R76 on the UHF Rx/Tx module to produce a ±2.10 kHz deviation.
6. Verify that the deviation does not exceed ±5 kHz for wideband and ±2.5 kHz for narrowband on 403.000 MHz, and 512.000 MHz. Re-adjust R30 or R76 as required, if the deviation exceeds ±5 kHz or ±2.5 kHz, respectively.
7. Replace the bottom cover.

VHF LOW:

1. Remove the top cover of the transceiver.
2. Set the VLO operating frequency to 41.000 MHz and connect an appropriate test receiver to the RF output connector. Ensure that the output of the transceiver is terminated into a proper dummy load.
3. Key the transmitter and input a +10 dBm (2.5 VRMS), 2.5 kHz audio signal into microphone input 1.
4. Adjust the wideband deviation limit potentiometer, R21 on the VLO Rx/Tx module (see Figure 3.7) to produce a ±4.20 kHz deviation. Select narrow band mode on the VHF band and adjust the narrowband deviation limit potentiometer, R16 on the VHF Rx/Tx module to produce a ±2.10 kHz deviation.
5. Verify that the deviation does not exceed ±5 kHz for wideband and ±2.5 kHz for narrowband on 30.000 MHz, and 50.000 MHz. Re-adjust R21 or R16 as required, if the deviation exceeds ±5 kHz or ±2.5 kHz, respectively.
6. Replace the top cover.

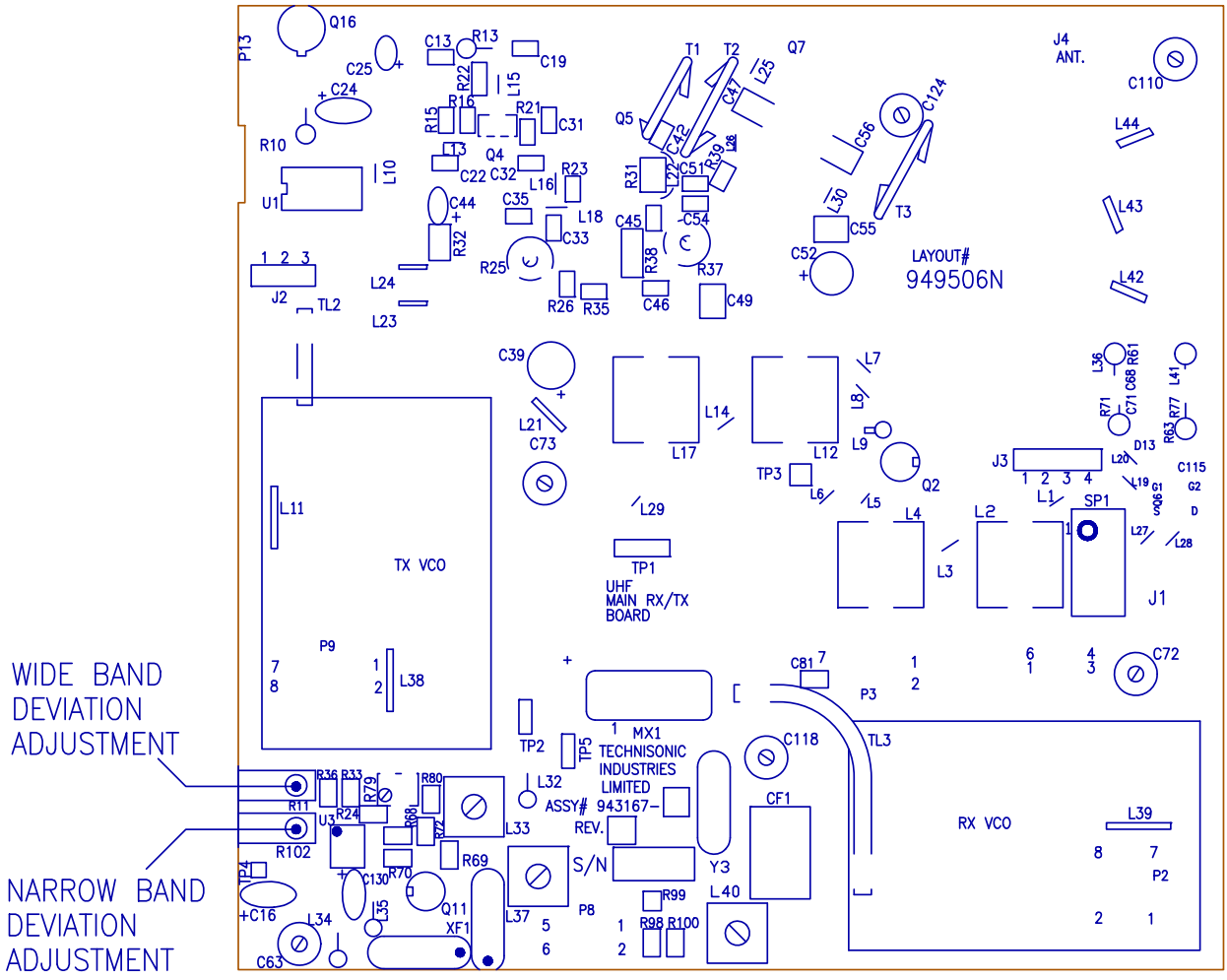
VHF Receiver/Transmitter PCB Module



Notes: R30 is for 25 kHz (wideband) Deviation Adjustment
R76 is for 12.5 kHz (narrowband) Deviation Adjustment

FIGURE 3.5 Deviation Adjustment Potentiometer Location

UHF Receiver/Transmitter PCB Module



Notes: R11 is for 25 kHz (wideband) Deviation Adjustment
R102 is for 12.5 kHz (narrowband) Deviation Adjustment

FIGURE 3.6 Deviation Adjustment Potentiometer Location

VHF LOW Band Receiver/Transmitter PCB Module

Notes: R21 is for 25 kHz (wideband) Deviation Adjustment
R16 is for 12.5 kHz (narrowband) Deviation Adjustment

FIGURE 3.7 VHF LOW Deviation Adjustment Potentiometer Location

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APPENDIX – TO "INSTALLATION INSTRUCTIONS"

POST INSTALLATION EMI TEST

PURPOSE

The purpose of this test is to identify any interference that the TFM-550 may cause with existing aircraft systems. As the TFM-550 installation may include the ATC-550 antenna tuner controller, this test, as required, will also identify any interference caused by the ATC-550.

TEST CONDITIONS

The TFM-550 transceiver and any accessories (e.g., RC-550, ATC-550) should be installed and function tested. The antenna VSWR should be checked. A forward/reverse power check with a in-line wattmeter should show no more than 10% reflected power. For the following tests, insure that the power switch is in the high position.

METHODOLOGY

Most of the EMI tests can be accomplished on the ground. In some cases flight testing is required or is easier. If the aircraft is approved for IFR operations, then it is mandatory that interference between the TFM-550 Airborne FM and the approach aids be checked in flight.

The GPS should be operational and navigating with at least the minimum compliment of satellites. The VHF comm should be set to the frequencies indicated with the squelch open. VOR/DME receivers should be set to the frequencies indicated and selected for display. If possible, set up a DME ramp test set on the frequencies indicated and adjust the output until the flags are out of view. The transponder and encoder should be monitored with ramp test equipment. Set the output of the transponder test set to 3db above the output necessary to achieve 90% reply. If possible set the ADF to a nearby navigation station.

Modulate the TFM-550 transmitter on the indicated frequencies for at least 20 seconds.

Observe the GPS for any degradation in satellite status or availability or flags. Listen for any noise or detected audio signals on the VHF comm(s). Listen for any noise or detected audio signals on the VOR/LOC receiver audio; look for any moment of flags or needles on the VOR/LOC/GS navigation display(s). Observe the transponder for any loss of reply or spurious reply.

List the power plant, fuel and other electric instruments in the chart provided and note any anomalies that occur while transmitting. Assess the results.

If the aircraft is equipped with an autopilot or a stability augmentation system, then test fly the aircraft and verify that operation of the TFM-550 transceiver does not have adverse effects on these systems. After checking for gross effects at a safe altitude, fly an approach with each of the different navigation systems coupled to the autopilot (ILS, GPS etc.) and look for any anomalies.

When the installation includes the ATC-550 antenna tuner controller, this test (where indicated by an asterisk "*") will also identify any interference caused by the ATC-550. In these cases, the ATC-550 must be turned on and off by means of its breaker as often as required, while monitoring the victim equipment.

RESULTS

If the installed system passes all of the applicable EMI tests, then no further action is required. If interference is observed, then the interference must be assessed against the appropriate standards of airworthiness for the system in question. For example, it is permissible for a VFR certified GPS to lose navigation capability while the TFM-550 unit is transmitting, providing that it recovers properly and promptly. It is not permissible for an IFR Approach certified GPS to be affected in the same way. A complete discussion of all the standards of airworthiness to be applied in assessing EMI effects is beyond the scope of this document.

PROCEDURE

A. Operate the TFM-550 transmitter on the following frequency for at least 20 seconds. Observe the GPS for any degradation in satellite status or availability or flags.

FREQUENCIES	**GPS #1**		**GPS #2**	
TFM-550	**PASS**	**FAIL**	**PASS**	**FAIL**
39.3850 MHz				
143.180 MHz				
143.1825 MHz				
157.5000 MHz				
157.5425 MHz				
512 MHz				

NOTES:

B. Determine if the image frequency for the VHF Comm falls within the range of the TFM-550. If so, select a set of frequencies that will cause the TFM-550 to be set as close as possible to the image frequency. Any one of the many possible sets will suffice. Record those values in the spaces provided in the following chart. Modulate the TFM-550 transmitter on the following frequencies for at least 20 seconds. Listen for any noise or detected audio signals on the VHF comm.

Example - Bendix/King KY 196A:
The first IF frequency is 11.4 MHz. The L.O. is above the received frequency (high side injection), therefore the image frequency is 22.8 MHz above the selected frequency. Set the KY 196A to 120.000 MHz and the TFM-550 to 142.8000 MHz.

(Note: Where indicated by an asterisk (*), required action is to switch ATC-550 on and off as often as necessary.)

FREQUENCIES		**RESULTS**	
VHF #1	**TFM-550**	**PASS**	**FAIL**
118	34		
118	45		
135.975	138		
121.15	157.5		
131.25	157.5		
128	*		
Image:			

FREQUENCIES		RESULTS	
VHF #2	**TFM-550**	**PASS**	**FAIL**
118	34		
118	45		
135.975	138		
121.15	157.5		
131.25	157.5		
128	*		
Image:			

NOTES:

C. Determine if the image frequency for the VOR/ILS Nav falls within the range of the TFM-550. If so, select two sets of frequencies that will cause the TFM-550 to be set as close as possible to the image frequency. Choose one set in the localizer frequency range and one in the VOR frequency range. Record those values in the spaces provided in the following chart.

Establish the relative ultimate sensitivity of the ILS receiver using a NAV simulator, then increase the simulator signal by 17db. Modulate the TFM-550 transmitter on or as close to the following frequencies for at least 20 seconds. Listen for any noise or detected audio signals on the receiver audio; look for any movement of flags or needles on the navigation displays.

A placard is required unless the above test is performed and passed. The placard shall read "Use of the transmitting function of the TFM-550 in the range of 36 to 40 MHz is prohibited during IFR approach operations.". This placard must be placed adjacent to the TFM-550 and RC-550 (if installed). The placard must be high contrast, clearly legible and indelible.

Note: Where indicated by an asterisk (*), required action is to switch ATC-550 on and off as often as necessary.

FREQUENCIES		**RESULTS**	
VOR/ILS #1	**TFM-550**	**PASS**	**FAIL**
108	36		
108	162		
108.1	36.0325		
108.1	162.15		
112	*		
Image:			

FREQUENCIES		RESULTS	
VOR/ILS #2	**TFM-550**	**PASS**	**FAIL**
108	36		
108	162		
108.1	36.0325		
108.1	162.15		
112	*		
Image:			

NOTES:

D. The following procedure checks for second harmonic interference to the glide slope receiver from the TFM-550. All transceivers produce harmonics (multiples of the wanted frequency) and while the TFM-550 far exceeds FCC requirements, interference can still be experienced depending upon antenna position and separation. Furthermore, harmonics can be generated by other equipment in the aircraft and the structure of the aircraft where dissimilar metals make contact or where grounds are isolated, etc. This is also true of aircraft hangers, therefore testing should be done outside away from any structures where possible.

With a portable glide slope generator, provide enough signal to firmly activate the indicator needle and hide all flags. Increase the signal level by 3 dB. Modulate the TFM-550 transmitter on the following frequencies for at least 20 seconds. Observe the Glide Slope displays. Look for any movement of flags or needles on the navigation display. If an interference condition is detected, then the installation will have to be flight tested according to the following procedure: Using the table below, determine the glide slope frequency based on the localizer frequency of the ILS to be used. Divide the glide slope frequency by 2 and program into the TFM-550. Fly the aircraft to intercept the localizer and glide slope (both needles centered) at 26 nm from the runway. Transmit on the TFM-550 for 10 seconds and watch for any deflections or flags. Repeat the test every 2 nm until the indicators are not affected. If the distance is greater than 18 nm then a pass shall be recorded. Otherwise the TFM-550 shall be placarded "Do not transmit while on ILS approach".

Localizer	Glide slope	Localizer	Glide slope
108.10	334.70	110.10	334.40
108.15	334.55	110.15	334.25
108.30	334.10	110.30	335.00
108.35	333.95	110.35	334.85
108.50	329.90	110.50	329.60
108.55	329.75	110.55	329.45
108.70	330.50	110.70	330.20
108.75	330.35	110.75	330.05
108.90	329.30	110.90	330.80
108.95	329.15	110.95	330.65
109.10	331.40	111.10	331.70
109.15	331.25	111.15	331.55
109.30	332.00	111.30	332.30
109.35	331.85	111.35	332.15
109.50	332.60	111.50	332.90
109.55	332.35	111.55	332.75
109.70	333.20	111.70	333.50
109.75	333.05	111.75	333.35
109.90	333.80	111.90	331.10
109.95	333.65	111.95	330.95

FREQUENCIES		RESULTS	
VOR/ILS #1	**TFM-550**	**PASS**	**FAIL**
334.7 (108.1)	33.47		
334.7 (108.1)	167.35		

FREQUENCIES		RESULTS	
VOR/ILS #2	**TFM-550**	**PASS**	**FAIL**
334.7 (108.1)	33.47		
334.7 (108.1)	167.35		

NOTES:

E. Operate the TFM-550 transmitter on the following frequency for at least 20 seconds. Observe the Transponder for any spurious replies or loss of reply to test set.

FREQUENCIES	TRANSPONDER #1		TRANSPONDER #2	
TFM-550	**PASS**	**FAIL**	**PASS**	**FAIL**
512 MHz				

NOTES:

F. Modulate the TFM-550 transmitter on the following frequencies for at least 20 seconds. Observe the DME displays. Look for loss of distance information on the display.

FREQUENCIES		**RESULTS**	
DME 1	**TFM-550**	**PASS**	**FAIL**
978 (108.0)	489		
1020 (112.1)	510		

FREQUENCIES		**RESULTS**	
DME2	**TFM-550**	**PASS**	**FAIL**
978 (108.0)	489		
1020 (112.1)	510		

NOTES:

G. * While turning the ATC-550 on and off as often as required, listen for any noise or detected audio signals on the HF receiver audio.

FREQUENCIES	**RESULTS #1**	
HF #1	**PASS**	**FAIL**
16 MHz		

FREQUENCIES	**TRANSPONDER #1**	
HF #2	**PASS**	**FAIL**
16 MHz		

NOTES:

NOTE: For the following tests, select a frequency at the top, middle and bottom of each band of the TFM-550 transceiver.

	30 to 50 MHz Band	138 to 174 MHz Band	403 to 512 MHz Band
Frequency #1			
Frequency #2			489
Frequency #3			510

H. At a safe altitude engage the autopilot or stability augmentation system. Modulate the TFM-550 transmitter on the above frequencies for at least 20 seconds. Observe any effect on the autopilot or stability augmentation system.

Observations:

I. Perform a coupled ILS approach to the aircraft's certified limits. Modulate the TFM-550 transmitter on the above frequencies for at least 20 seconds. Observe any effect on the autopilot. Repeat for second flight director/autopilot if equipped.

Observations:

J. List the power plant, fuel and other electric instruments in the chart provided and note any anomalies that occur while transmitting or switching ATC-550 antenna tuner controller on and off. Assess the results.

STEP	SYSTEM	PASS	FAIL	NOTES
1	Com 1&2 (High Band)			
2	Transponder & Encoder (Low Band and Mid Band)			
3	ADF 1 & 2			
4	VG			
5	Glideslope 1&2 (High Band)			
6	VOR/LOC 1&2 (High Band)			
7	Compass			
8	Directional Gyro			
9	Fuel Pressure			
10	Oil Temp			
11	Amps			
12	Bus Voltage			
13	Fuel %			
14	Ng			
15	TOT			
16	Torque %			
17	Annunciators			
18	Digital Clock			
19	Oil Pressure			
20	DME 1&2 (Low Band and Mid Band)			
21	GPS			

NOTES:

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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.