



T6

ANALOG MULTIBAND RF MODULE

Installation and Operating Instructions

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NOTES

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 antennas shall be located outside of a vehicle and must not be co-located (kept at a separation distance of more than 20 cm from each other when installed). Also, they must be installed in such a way that they always maintain a separation distance of more than 113 cm from any person 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.

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 T6 Multiband transceiver module. Every effort has been made to make this manual as complete and accurate as possible.

WARRANTY INFORMATION

The Model T6 Transceiver Module is under warranty for one year from the date of purchase. Failed units caused by defective parts or workmanship should be returned to:

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SECTION 1: GENERAL DESCRIPTION

1.1 INTRODUCTION

This publication provides operating information for the T6 multiband transceiver module.

1.2 DESCRIPTION

The T6 multiband transceiver module is designed to be installed in an airborne multiband radio such as one of the TDFM-9000 series transceivers. The T6 module can operate on the following bands:

Band	Frequency Range	Modulation	Usage
VHF LO	30 to 50 MHz	FM	
VHF	108 to 118 MHz	AM	Navigational Beacons Receive only
VHF	118 to 138 MHz	AM	Civilian Aeronautical Communications
UHF	225 to 400 MHz	AM	Military Aeronautical Communications

The T6 module has no physical user interface. All control of the module is performed through a serial RS232 interface. The operating instructions in section 2 assume an installation in a Technisonic TDFM-9100 transceiver.

SECTION 2: OPERATING INSTRUCTIONS

2.1 GENERAL

An LED display, a keypad, and a rotary knob provide the operator control of RF modules installed in the unit. The T6 module will always be band 3. The display shows the activity of the selected module as well as the soft key menu of the active band. The active module is selected by pressing the BAND key. The knob has multiple functions including volume, channel, and zone.

2.2 FRONT PANEL

Refer to the diagram below:

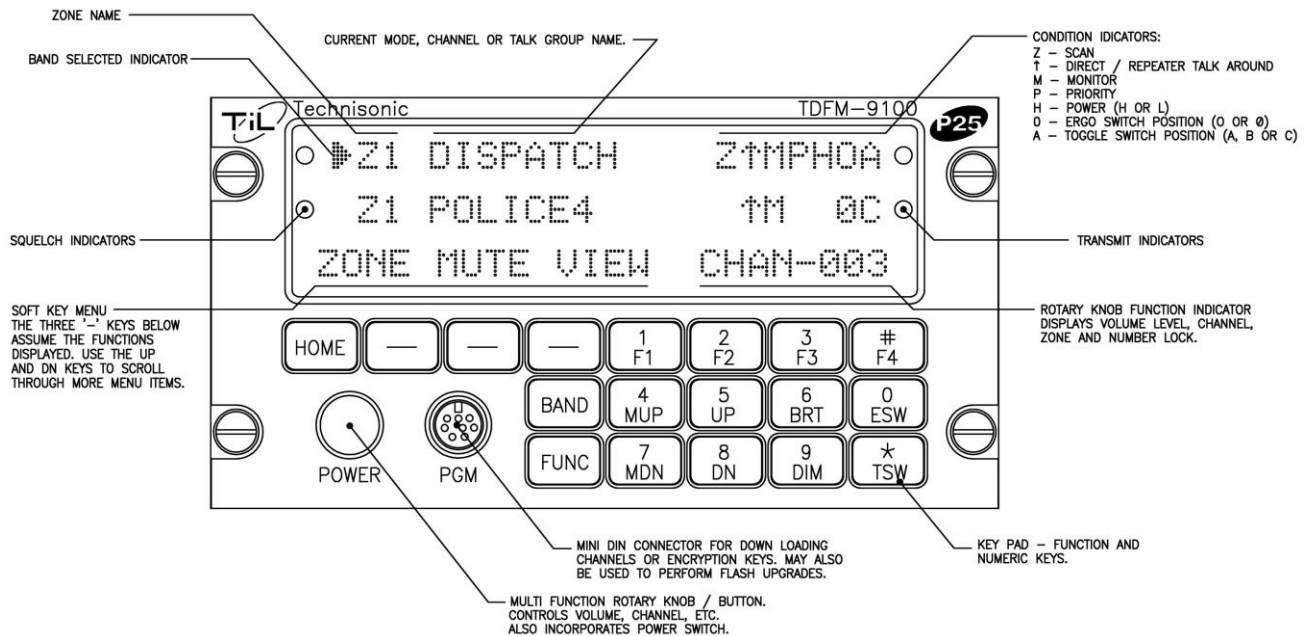


FIGURE 1: Front Panel Controls – TDFM-9100 Transceiver

2.3 POWER SWITCH

To switch the transceiver on, press and hold the knob until the radio powers up. The display will show TECHNISONIC and the software version installed followed by the model number, and which RF modules are installed. The display will then show the normal display. To switch off the transceiver at any time, press and hold the knob for 2 seconds until the display shows OFF; then release. If it is desired that the radio powers up with the radio master in the aircraft, an 'always on' mode can be set in the Configuration Menu.

2.4 KNOB

The knob is a rotary encoder, which turns endlessly. The knob also has a push button incorporated so you can press the knob as well. Pressing the knob will toggle through the following possible knob modes:

Volume
Channel
Zone
NumLock
Recall

Band 3 (T6 module) only supports volume and channel knob modes.

The current function of the knob is shown at the bottom right of the display. Some of these modes can be enabled or disabled in the Configuration Menu. The knob is only active for the band that is selected.

2.5 SOFT KEYS AND HOME

The 3 soft keys below the display assume the function shown on the menu above them. The functions displayed depend on how the module was programmed or which band is selected. The T6 module on band 3 will always have the following menu items:

- PWR** - Selecting PWR will allow the power output of the radio to be set to high or low.
- SCAN** - Selecting SCAN will put the radio in scan mode. Channels that were added to the scan list will be scanned.
- FPP** - Front Panel Programming mode allows you to program the frequencies, name, scan list, PL tone and DPL code for the current channel. See section 2.11.

At any time while in one of these functions, it is possible to return to the normal mode by pressing the HOME key.

2.6 BAND KEY

This button selects bands (RF modules) 1 through 5. The band displays are broken up into 3 pages. Page 1 = bands 1 and 2, page 2 = bands 3 and 4, page 3 = band 5. An arrow points at the active band on the current page. The active band will also be highlighted for a few seconds while changing bands.

2.7 MUP(4) AND MDN(7) KEYS (Memory Up and Down Keys)

These keys provide the same function as the rotary knob does when it is set to CHAN. These keys can be used to scroll through the channels. A single press will step the channel by one, but a push and hold will scroll to a desired channel number. The function of the rotary knob is temporarily set to CHAN when either of these keys is pressed.

2.8 BRT(6) AND DIM(9) KEYS

Use these keys to dim or brighten the display. The radio powers up at full brightness for normal use but can be dimmed for night operations.

2.9 DISPLAY

The transceiver has a three line 72 character LED display. The zone name, channel name, condition symbols (scan, direct, call, secure, monitor, etc.), and switch settings will be displayed for each module. The active band is indicated by a pointer on the left side of the display. The bottom line displays the menu items associated with the module selected and the mode of the knob.

2.10 GENERAL OPERATION

Switch on the transceiver by pressing and holding the knob until the display lights up. Select the desired band by pressing the BAND key. As mentioned in 2.6, the bands are divided up into 3 display pages assuming all bands are activated in the maintenance menu. Select the TDFM-9100 on the aircraft audio panel. Press the knob again so that CHAN shows up on the bottom right of the display. Rotate the knob until the desired channel or talk group is selected. Press the knob until VOL is again shown on the display. Adjust the volume by waiting until a signal is received or by pressing F1 (factory programmed for monitor function) and adjusting the rotary knob. The radio is ready to use. If the radio is installed in separate mode, remember that the band selected by the soft keys is the menu displayed on the screen but the band selected by the audio panel is the band transmitting and receiving. To use the DTMF keypad while transmitting, the band in use must be selected on the display.

2.11 FRONT PANEL PROGRAMMING

Band 3 (T6) is an analog multiband module that covers the following bands:

30 – 50 MHz FM
 108 – 118 MHz AM receive only (navigational VORs, ILS, etc)
 118 – 138 MHz AM (aviation band)
 225 – 400 MHz AM (military aviation band)

Selecting the FPP menu will initiate the following process:

- RX Frequency*** The receive frequency of the current channel will be displayed with the first digit blinking. Type in the desired frequency or just press the 'Next' menu key for no changes. The frequency must be in one of the ranges listed above. If an invalid frequency is entered, the radio will revert back to the previously programmed frequency. Pressing 'Exit' menu key or the HOME key at any time will escape the programming process and bring the radio back into normal operating mode. Press 'Next' or the knob to go to the next item.
- TX Frequency*** The transmit frequency can be edited in the same fashion as the RX frequency.
- RX CTCSS*** VHF LO and UHF bands only. Receive CTCSS tone (also known as a PL or TPL tone) will be displayed. Rotate the knob for the desired tone or 'OFF.' Press the knob or 'Next' menu key.
- RX DCS*** VHF LO and UHF bands only. RX DCS will only appear if the RX CTCSS was set to 'OFF.' The receive DCS code (also known as a DPL code) will be displayed. Rotate the knob to the desired code or 'OFF.' Selecting OFF will set the channel to carrier squelch only. Press the knob or 'Next' menu key.
- TX CTCSS*** VHF LO and UHF bands only. Transmit CTCSS tone will be displayed. Rotate the knob for the desired tone or 'OFF.' Press the knob or 'Next' menu key.

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TX DCS VHF LO and UHF bands only. TX DCS will only appear if the TX CTCSS was set to 'OFF.' The transmit DCS code will be displayed. Rotate the knob to the desired code or 'OFF.' Selecting off will set the channel to carrier only. Press the knob or 'Next' menu key.

Channel Name The Channel name will be displayed. Edit the channel name by rotating the knob to select the desired character. Press the knob to advance to the next character. The name is 9 characters long.

Press the knob one more time and the radio will return to normal operating mode.

The following is a list of supported CTCSS/PL/TPL tones with the corresponding Motorola PL codes:

PL (Hz)	MCODE	PL (Hz)	MCODE	PL (Hz)	MCODE	PL (Hz)	MCODE
67.0	XZ	97.4	ZB	141.3	4A	206.5	8Z
69.3	WZ	100.0	1Z	146.2	4B	210.7	M2
71.9	XA	103.5	1A	151.4	5Z	218.1	M3
74.4	WA	107.2	1B	156.7	5A	225.7	M4
77.0	XB	110.9	2Z	162.2	5B	229.1	9Z
79.7	WB	114.8	2A	167.9	6Z	233.6	M5
82.5	YZ	118.8	2B	173.8	6A	241.8	M6
85.4	YA	123.0	3Z	179.9	6B	250.3	M7
88.5	YB	127.3	3A	186.2	7Z	254.1	OZ
91.5	ZZ	131.8	3B	192.8	7A	CSQ	CSQ
94.8	ZA	136.5	4Z	203.5	M1		

TABLE 1: TDFM-9100 CTCSS/PL/TPL Tones vs Motorola PL Codes

The following is a list of TDFM-9100 supported DCS/DPL CODES:

023	072	152	244	343	432	606	723
025	073	155	245	346	445	612	731
026	074	156	251	351	464	624	732
031	114	162	261	364	465	627	734
032	115	165	263	365	466	631	743
043	116	172	265	371	503	632	754
047	125	174	271	411	506	654	
051	131	205	306	412	516	662	
054	132	223	311	413	532	664	
065	134	226	315	423	546	703	
071	143	243	331	431	565	712	

TABLE 2: TDFM-9100 DCS/DPL Codes

SECTION 3: INSTALLATION INSTRUCTIONS

3.1 GENERAL

The T6 Module is designed to be installed in a Technisonic airborne radio chassis as an option for extended frequency coverage. These radio chassis include, but are not limited to Technisonic transceiver models TDFM-9100, TDFM-9200 and TDFM-9300. A TDFM-9100 installation is shown below. The others are very similar.

The T6 is intended to be mounted in the TDFM 9300/9200 or 9100 chassis and is not visible. Therefore, a second label must be applied to the outside of the of the TDFM-9X00 that contains the following text:

For TDFM-9300 "TDFM 9300 Multiband, "Contains Module: FCC ID IMA-T6"

For TDFM-9200 "TDFM 9200 Multiband, "Contains Module: FCC ID IMA-T6"

For TDFM-9100 "TDFM 9100 Multiband, "Contains Module: FCC ID IMA-T6"

In addition, external labelling for Industry Canada shall be applied to the TDFM-9300, TDFM-9200, TDFM-9100 and future host units. The external label will include the following text:

For TDFM-9300 "TDFM 9300 Multiband, "Contains IC: 120A-T6"

For TDFM-9200 "TDFM 9200 Multiband, "Contains IC: 120A-T6"

For TDFM-9100 "TDFM 9100 Multiband, "Contains IC: 120A-T6"

The Final host/module combination also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

3.2 INSTALL INTERFACE BOARD

The interface board is only required in the TDFM-9100 Transceiver.

Remove top cover and install interface board assembly 203085.



Install 6 screws with lock washers.

3.3 INSTALL T6 MODULE

Fit module into top tray position ensuring proper header connection.



Install 4 screws holding the module tray.

Install 6 hex head screws into the heat sink block.

Connect the antenna coax as shown above.

Install new top cover #218212.

3.4 FINAL ALIGNMENT AND TEST

Perform final alignment procedure for appropriate transceiver model.

Perform final test procedure for appropriate transceiver model.

SECTION 4: SPECIFICATIONS

4.1 SPECIFICATIONS

<u>Specification</u>	<u>Characteristic</u>		
RF Output Power:	1 or 10 Watts (VLO) 1 or 4.5 Watts (VHF) 1 or 4.5 Watts (UHF)		
Frequency Range	30 - 50 MHz (FM)		
VHF low Band:	108 – 117.975 MHz (AM receive only)		
VHF Band:	117.975 – 136.975 MHz (AM)		
UHF Band:	225 – 399.975 MHz (AM)		
No. of channels:	400 pre-programmable channels		
Transmitter section	VLO	VHF	UHF
FM Hum and noise in dB:	> 45	> 45	> 45
Audio Distortion:	< 5%	< 5%	< 5%
Frequency Stability in ppm:	± 1.0	± 1.0	± 1.5
Modulation Limiting:	± 5 kHz	99%	99%
Harmonic Attenuation in dB:	> 60	> 60	< 60
Receiver section	VLO	VHF	UHF
<i>Sensitivity</i> in uV:			
For 12 dB SINAD	< 0.35	< 2.0	< 2.0
Audio Distortion:	< 5%	< 5%	< 5%
Intermodulation in dB:	> 65	> 65	> 65
<i>Adjacent Channel Rejection</i> in dB:			
25 kHz Channel spacing	> 65	> 65	> 65
8.33 kHz Channel spacing		> 60	