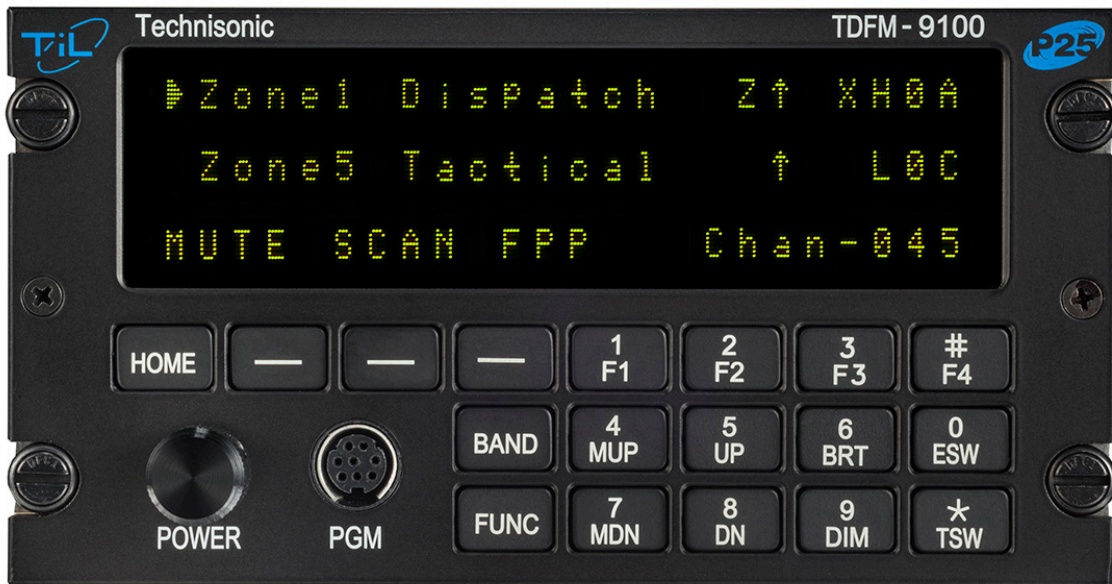




# TDFM-9100

MULTIBAND P25 AIRBORNE TRANSCEIVER



## Operating Instructions

TiL Document No. 13RE482  
Rev. H

JANUARY 2024

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### Technisonic Industries Limited

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**TECHNISONIC INDUSTRIES LIMITED**

**REVISION HISTORY**  
[ 13RE482 ]

For the most current revision of this document, please check the Technisonic website: [www.til.ca](http://www.til.ca)

REV	PAGE	DESCRIPTION	DATE	EDITED BY
A	2	Updated Module Nomenclature Table for T4000.	Jul. 16, 2016	JR
B	i	Added Website Information to Revision Page.	Nov. 15, 2016	AL
	5	Corrected Figure 1: Front Panel Controls.		
	17	Added Warranty Page.		
	All	Changed Format for Section Headers.		
	All	Page Numbers are now sequential.		
	All	Corrected Spelling & Grammar throughout document.		
C	17-19	Added instructions for added bands and Latitude Satellite control feature (Sections 2.21-2.25).	Apr. 20, 2018	SM
D	i	Corrected Page Numbers.	Jul. 24, 2018	AL
	v	Updated Table of Contents.		
	All	Corrected Spelling & Grammar throughout document.		
E	2.24	Updated S200-P12 controller section.	Oct. 07 2019	SM
F	1.4, 2.21	Added Band 3 specifications and instructions	June 17, 2022	SM
G	1.2, 1.3, 2.18	1.2: Reworded section to clarify the number of modules supported. 1.3: Reworked the module variation to include the second tray & T6 module nomenclature. 2.18: Added items to the Maintenance Menu.	Feb. 06, 2023	JR
H	13	Added more items to the maintenance menu	Jan. 22, 2024	SM

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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 90 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 TDFM-9100. Every effort has been made to make this manual as complete and accurate as possible.

### **WARRANTY INFORMATION**

The Model TDFM-9100 Transceiver is under warranty for one year from the 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

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### **SUMMARY OF DO-160G ENVIRONMENTAL TESTING**

Summary of DO-160G Environmental Testing for Technisonic Model TDFM-9100 Transceiver:

<b>Conditions</b>	<b>Category</b>
Temperature and Altitude	A2, B1, C4, D1
Temperature Variation	B
Humidity	A
Operational shock and Crash Safety	A
Vibration	S, U
Magnetic Effect	Z
Power Input	B
Voltage Spike	B
Audio Frequency Susceptibility	B
Induced Signal Susceptibility	AC
Radio Frequency Susceptibility	T
Radio Frequency Emission	M
Electrostatic Discharge	A

### **STC 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 on its Airborne FM products for a limited number of airframes. The above referenced DO-160G 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. Letters of permission are provided upon request. To assist Factory Authorized Technisonic Dealers in the certification process, we have placed copies of our STCs on our website. These documents may be downloaded and used as support for the technical submission to the 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 website [www.til.ca](http://www.til.ca) for the latest issue of available STCs.

### **WARNING AND DISCLAIMER**

This manual is designed to provide information about the TDFM-9100. Every effort has been made to make this manual as complete and accurate as possible.

### **TRADEMARK NOTICES**

TDFM-9100 Transceivers contain two-way radio protocols licensed from Motorola, Inc.  
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**SECTION 1: GENERAL DESCRIPTION**

**1.1 INTRODUCTION**

This publication provides operating information on the TDFM-9100 airborne transceiver. The exact configuration depends on which and how many RF modules are installed.

**1.2 DESCRIPTION**

The TDFM-9100 transceiver is an airborne multi-band radio capable of operation in conventional, analog, P25 and P25 phase II digital FM systems, SmartNet/SmartZone trunking systems, and P25 9600 trunking systems. RF modules are available in single, dual, or Tri bands that support VHF, UHF-LO, UHF-HI, and 700/800 MHz bands. Up to 2 single or multiple band digital modules can be supported along with a third analog multiband module covering VLO, VHF AM and UHF AM.

These optional, additional features include P25 9600 trunking Phase 1 and 2 that may be combined with AES and/or DES-OFB encryption with OTAR in any of the available modules.

The P25 modules are not normally frequency agile. In order to have the ability to change the frequencies at the front panel, the FPP (front panel programming) option must be ordered for each band.

TDFM-9100 radios equipped with the MCP option Hardware (MOD 14) can support the connection of one or two remote radios, generally portable handhelds that can be plugged in for special missions. MOD 14 radios also support the Latitude S200-P12 satellite communications system. Control and display information is provided for the S200-P12 as well.

MOD 14 equipped radios can also support an additional internal analog multiband RF module covering VHF Low, VHF AM, UHF AM bands.

MOD 14 also provides a digital audio connection to the Technisonic TDAP-650 and TDAP-750 digital audio panels. A Bluetooth connection is provided to help load and/or clone configuration settings during installation.

**1.3 MODEL VARIATION**

There are several variations of the Model TDFM-9100 Transceiver. Each variation offers different features and performance based on the type of RF modules and options installed.

RF modules are mounted in trays with up to 2 trays supported. Up to 2 digital modules can be mounted in one tray (Tray 1). An optional analog multiband module (T6) occupies Tray 2.

The following is a breakdown of the TDFM-9100 model variations:

P/N 121270-D-91-TBB-T6-P91XXX

(PRODUCT TYPE)-(D)-(91)-(Tray 1)-(Tray 2)-(Project)

PRODUCT TYPE:	121270 = TDFM-9100 Series, 2 trays	Tray1: P25, Tray2: T6 Analog
DISPLAY TYPE (D):	1: STD GREEN   2: GREEN / NV	
SERIES VARIANT(9X)	91 = TDFM-9100	
TRAY BREAKDOWN (TBB)	T = Tray Module Type: A = Digital Modules T = Analog Module	B = Module Band Code (See the following tables for supported configurations)
PROJECT NUMBER	This is a unique number that describes the specific build of the radio	

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	DUAL BAND MODULES (T30xx)			TRI BAND MODULES (T4000)			
<b>SINGLE BAND</b>	1	VHF		5	VHF		
	2	UHF LO		6	UHF LO		
	3	UHF HI		7	UHF HI		
	4	700/800		8	700/800		
<b>DUAL BAND</b>	A	VHF	700/800	M	VHF	700/800	
	B	VHF	UHF LO	N	VHF	UHF LO	
	C	VHF	UHF HI	P	VHF	UHF HI	
	D	UHF LO	UHF HI	R	UHF LO	UHF HI	
	E	UHF LO	700/800	T	UHF LO	700/800	
	F	UHF HI	700/800	V	UHF HI	700/800	
	* G	700/800	VHF	-			
	* H	700/800	UHF LO	-			
	* I	700/800	UHF HI	-			
	* J	UHF LO	VHF	-			
	* K	UHF HI	VHF	-			
	* L	UHF HI	UHF LO	-			
<b>TRI BAND</b>	-			W	VHF	UHF LO	UHF HI
	-			X	UHF LO	UHF HI	700/800
	-			\$ Z	VHF	UHF	700/800

TYPE A Module Band Codes

BAND	FREQUENCY RANGE
VHF	136 – 174 MHz
UHF LO	380 – 470 MHz
UHF HI	450 – 520 MHz
700/800	764 – 870 MHz
UHF	380 – 520 MHz
T6 MULTIBAND	30 - 50 MHz FM 108 - 118 (RX ONLY) 118 - 156 MHz (AM) 225 - 400 MHz (AM)

RF BAND COVERAGE

**NOTE:** Blank module slots are represented as 0s for the TBB designation for the Tray 1. If no T6 Module is installed in tray 2, the -T6 is left off the part number.

Band numbers indicate Single band equipped modules and letters indicate Dual or Tri band modules.

\* Band codes are special order and are not standard configuration.

\$ UHF Band specified covers both the UHF LO and UHF HI as one band (380 – 520 MHz).

Project Number: P91XXX represents a number that identifies specific options that are contained in each module and describes the full TDFM-9100 configuration.

All model variations are capable of supporting both 28 Volt and 5 Volt AC or DC backlighting. The units are shipped set to operate on 28 Volt backlighting. Equipment can be set to operate on 5V back lighting by using the software based configuration menu (see Section 2.17 Configuration Menu). No damage will occur if the incorrect voltage is applied.

1.4 TECHNICAL CHARACTERISTICS

<u>Specification</u>	<u>Characteristic</u>
Model Designation:	TDFM-9100
Physical Dimensions:	Approx. (L) 8.0" x (W) 5.75" x (H) 3.0"
Weight:	~3.5 lbs (1.6 Kg)
Operating Temperature Range:	-30° C to +60° C
Power Requirement:	
Voltage:	28.0 V <sub>DC</sub> ± 15%
Current:	500 mA minimum / 5A maximum
Audio Output Power (including sidetone):	65 mW into 600 Ω
Microphone Inputs:	Carbon or Equivalent
Panel Back Lighting:	
Voltage:	28 or 5 Volts AC or DC (selectable)
Current:	100 mA max

**APX RF Modules**

<u>Specification</u>	<u>Characteristic</u>
RF Output Power:	1 or 6 Watts (VHF) 1 or 5 Watts (UHF) 1 or 2.5 Watts (764 - 806) 1 or 3 Watts (806 - 870)
Frequency Range	
VHF Band:	136 to 174 MHz
UHF LO Band:	380 to 470 MHz
UHF HI Band:	450 to 520 MHz
UHF Band:	380 to 520 MHz
700 / 800 Bands:	764 to 870 MHz
No. of channels per band:	3000 pre-programmable channels

<b>Transmitter section</b>	<b>VHF</b>	<b>UHF</b>	<b>800</b>
FM Hum and noise in dB (wideband):	-48	-45	-45
Audio Distortion:	1%	1.0%	1.0%
Frequency Stability in ppm:	± 1.0	± 1.0	± 1.5
Modulation Limiting:	Wide band	± 5 kHz	
	Narrow band	± 2.5 kHz	

<b>Receiver section</b>	<b>VHF</b>	<b>UHF</b>	<b>800</b>
<i>Sensitivity</i> in uV:			
*Digital 1% BER (12.5 kHz)	0.29	0.32	0.40
*Digital 5% BER (12.5 kHz)	0.21	0.28	0.30
**Analog with 12 dB SINAD	0.25	0.25	0.25
 <i>Selectivity</i> in dB:			
25 kHz Channel	-80	-78	-72
12.5 kHz Channel	-70	-68	-67
Intermodulation **	-80	-80	-80

\* Measured in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.

\*\* Measured in analog mode per TIA / EIA 603 under nominal conditions.

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**T6 Multiband RF Module**

**Specification**

**Characteristic**

RF Output Power:	1 or 10 Watts (VLO) 1 or 4 Watts (VHF) 1 or 4 Watts (UHF)
Frequency Range	
VHF low Band:	30 - 50 MHz (FM)
VHF Band:	108 - 118 MHz (AM receive only) 118 - 156 MHz (AM)
UHF Band:	225 - 400 MHz (AM)
No. of channels:	200 pre-programmable channels

**Transmitter section**

<b>VLO</b>	<b>VHF</b>	<b>UHF</b>
> 45	> 45	> 45
< 5%	< 5%	< 5%
± 1.0	± 1.0	± 1.5
± 5 kHz	99%	99%
> 60	> 60	< 60

FM Hum and noise in dB:
Audio Distortion:
Frequency Stability in ppm:
Modulation Limiting:
Harmonic Attenuation in dB:

**Receiver section**

<b>VLO</b>	<b>VHF</b>	<b>UHF</b>
< 0.35	< 2.0	< 2.0
< 5%	< 5%	< 5%
> 65	> 65	> 65
> 65	> 65	> 65
> 65	> 65	> 65
	> 60	

<i>Sensitivity</i> in uV:
For 12 dB SINAD
Audio Distortion:
Intermodulation in dB:
<i>Adjacent Channel Rejection</i> in dB:
25 kHz Channel spacing
8.33 kHz Channel spacing

**SECTION 2: OPERATING INSTRUCTIONS**

**2.1 GENERAL**

An LED display, a keypad, and a rotary knob provide the operator control of up to 3 RF modules installed in the unit and up to 2 more remote radios (if MOD 14 is fitted) which may include handhelds or a Latitude S200 Satcom system . 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. The microphone, key line, and headphone audio can be wired separately for each module; therefore, switching from band to band is performed at an audio panel such as the Technisonic TDAP-611. This wiring setup allows for separate and simultaneous operation on each of the bands. The transceiver can also be connected so that all bands are available on one combined output. It is possible to connect the transceiver such that both methods are used simultaneously.

**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

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 with the customer programming software (APX CPS)<sup>™</sup>. These menu items can be different on a channel by channel basis. Typical menu items may include but are not limited to:

- ZONE** - Pressing this function will prompt you for a new zone number which can be entered directly (if the keypad is in NumLock mode) or scrolled using the UP(5) and DN(8) keys.
- MUTE** - Selecting this function will prompt you for an on or off entry using the soft keys to mute the tones. Tones refer to the beeps heard when pressing buttons.
- PWR** - Selecting PWR will allow the power output of the radio to be set to high or low.
- PROG** - Selecting PROG brings you to user programmable features of the radio such as telephone numbers or scan lists. The ability for the user to program phone numbers, scan lists, etc. can be enabled or disabled by the CPS<sup>™</sup>.
- VIEW** - The view function is used to view lists. Lists can include scan lists, phone numbers, call lists, and/or paging.
- FPP** - Front Panel Programming mode allows you to program at the front panel without the customer programming software. This option is available on all standard modules.

At any time while in one of these functions, it is possible to return to the normal mode by pressing the HOME key. When programming the modules with the APX CPS<sup>™</sup>, it is suggested not to double up functions. For example, programming a soft key to CHAN would be redundant since there is already a channel function using the knob.

**2.6 BAND KEY**

This button selects the active RF module for the display and keypad. It toggles through modules 1 through 5. The module displays are broken up into 3 pages. Page 1 = APX modules 1 and 2, page 2 = Analog module 3 and 4 (Ext. Transceiver 1), page 3 = module 5 (Ext. Transceiver 2 or S200). An arrow points at the active module on the current page. The active module will also be highlighted for a few seconds while changing selection. The Band key also determines what module will transmit when the radio is keyed from the combined port.

**2.7 FUNC KEY**

Pressing the FUNC key will bring up the following menu:



**FIGURE 2: TDFM-9100 Function Menu**

You can select the desired function by rotating and pressing the knob or by using the Sel and Enter soft keys.

- Cross Band Repeat*** Invokes the cross band repeat menu. Enabling cross band repeat allows received audio from one band to be automatically retransmitted on another band and vice-versa but only in one direction at a time. Only 2 bands can be selected for cross band repeat.
- Configuration*** Invokes the Configuration Menu (see 2.17 Configuration Menu). Various functions can be enabled or disabled to suit the operation.
- Simulcast*** Invokes the Simulcast Menu. You can select bands to transmit simultaneously. Simulcast is only available when using the combined input/output. Simulcast can be used in conjunction with the cross band repeat mode.
- Maintenance*** Invokes the Maintenance Menu (see 2.18 Maintenance Menu). Allows the setting of TX/RX audio levels and supervisory permissions for various functions (Password protected).

Pressing the HOME key at any time will return the radio to normal operating mode without making any further changes.

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**2.8 F1 – F4 KEYS**

Four function keys at the top of the keypad provide the same functions as the three side buttons and the top button found on the APX-8000 portable. They are as follows:

- F1** – Top side-button (purple button) on the portable.
- F2** – Centre side-button (with one dot) on the portable.
- F3** – Bottom side-button (with two dots) on the portable.
- F4** – Top button (orange button) on the portable.

**TDFM-9100 Transceiver Recommended Keypad Menu Defaults:**

<b>TDFM-9100 Transceiver ITEM</b>	<b>Portable ITEM</b>	<b>Conventional Operation</b>	<b>SmartNet / SmartZone Operation</b>
F1 Key	Upper Side Button 1	Monitor	Unprogrammed
F2 Key	Middle Side Button 2	Nuisance Delete	Unprogrammed
F3 Key	Bottom Side Button 3	Talkaround / Direct	Unprogrammed
F4 Key	Top Button	Volume Set Tone	Volume Set Tone
MUP and MDN keys	16-Position Rotary Knob	Channel Select	Talkgroup Select
ESW Key	Two-Position Concentric or Ergo Switch	Unprogrammed A (∅) Unprogrammed B (O)	Unprogrammed A (∅) Unprogrammed B (O)
TSW Key	Three-Position Toggle Switch	Blank (A) PL Disable (B) Scan (C)	Blank (A) PL Disable (B) Scan (C)

**NOTE:** It is possible to use Motorola’s Customer Programming Software (APX CPS™) to alter the default keypad settings of the TDFM-9100 radio. However if custom key settings are chosen it will not be possible for Technisonic to help the Pilot or other Radio User through operational difficulties. These questions will have to be referred to the Radio System Administrator responsible for customizing the settings. Technisonic recommends that the default key settings stay in place until all airframe installation and operational issues have been overcome.



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Module 1 and 2 of the TDFM-9100 Transceiver are programmable by Motorola APX CPS™ software. The following settings may be programmed for each Conventional Channel in a module:

Tx Frequency	Zone
Tx PL/DPL Code	Channel
Rx Frequency	Name
Rx PL/DPL Code	RX Signal Voice Type
Time-Out Timer	TX Signal Voice Type
Scan List	Network Access Code
Phone Numbers	Tx Power
Talkgroup IDs	Private Call Type
Encryption Key Assignment	

The following settings can be programmed for each mode in a P25 Trunked and/or SmartNet/SMART ZONE equipped radio:

System Type	TG Strapping
System ID (NAC)	Zone
Individual ID (UID)	Scan List
Coverage Type	Scan Type
Affiliation Type	Interconnect
Control Channel (s)	Phone Display Format
Talkgroups	Private Call Operation
Status	Site Alias
Encryption Key Assignment	

The function keys, along with the rest of the keypad, revert to normal number keys during transmit and when NUM LOCK is selected by pressing the rotary knob.

### 2.9 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.

### 2.10 UP(5) AND DN(8) KEYS

The keys provide the same function as the left and right arrow keys on the portable. The UP key equates to the right arrow key and the DN is the left. These keys are used for a variety of functions but, in the normal operating mode, they are used to scroll through the soft key menus.

### 2.11 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.

### 2.12 ESW(0) KEY (Ergo Switch Key)

The ESW key provides the function of the concentric or 'ergo' switch on the portable. The switch has two conditions which are represented by 'O' and 'Ø'. Pressing the ESW key toggles the condition back and forth. The condition is displayed at the right hand side of the display line (second character from the right). The ergo switch condition is saved when the unit is turned off. There are separate conditions for each band installed. The ESW key can be programmed with the APX CPS™ to a variety of functions such as low power, scan and secure, or encrypted mode.

### 2.13 TSW(\*) KEY (Toggle Switch Key)

The TSW key provides the function of the toggle switch on the portable. The switch has three conditions which are represented by 'A', 'B' and 'C'. Pressing the TSW key toggles the condition A, B, C, A, B, etc. The condition is displayed at the far right hand side of the display line (last character on the right). The toggle switch condition is saved when the unit is turned off. There are separate conditions for each band installed. The TSW key can be programmed with the APX CPS™ to a variety of functions such as low power, scan, zone select, or PL disabled mode.

### 2.14 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.

### 2.15 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.

## 2.16 CUSTOMER PROGRAMMING SOFTWARE (APX CPS™)

Programming the Bands in the TDFM-9100 is usually done with the use of third party programming software. Customer programming software, or “APX CPS,” must be supplied by Motorola. However, conventional analog or P25 channels can be programmed at the front panel if each module is fitted with the Front Panel Programming option (FPP). See Section 2.19 for details.

A Programming cable “PC-9000” is required to connect the computer to the TDFM-9100. Bands 1 and 2 in the TDFM-9100 are considered an APX-7000 portable by the APX CPS™ software. To program a band in the transceiver, it must be selected by pressing the appropriate band select key before running the APX CPS™. Follow the instructions supplied with the APX CPS™.

The APX CPS Programming software (P/N HKVN4289 - SW download) must be purchased from Motorola On Line (MOL). Alternately, a DVD can be ordered (P/N RVN5224) via MOL.

For instructions on ordering Motorola parts and APX CPS™ software, see Technical Information Bulletin TIBFM 17-01.

This document is available on the Technisonic website at [www.til.ca](http://www.til.ca). On the main page, hover the cursor over “Project 25 Airborne FM.” A pull-down menu should appear. Click the TDFM-9100 link to go directly to the TDFM-9100 page and click the link for “APX CPS Programming Software/Cables Ordering Guide.” Refer to the section for Type “A” modules.

If encryption keys need to be loaded via a KVL-3000+, keyloader cable P/N 127500 may be also be obtained from Technisonic. This keyloader cable will plug into the front mini DIN connector of the TDFM-9100 transceiver.

The following cables for support of the TDFM-9100 can be purchased from Technisonic:

P/N 127499      Download/Programming Cable (See Figure 3).

P/N 127500      Encryption Keyload Cable (See Figure 4).



**FIGURE 3:** Programming Cable: “PC-9000” P/N 127499



**FIGURE 4:** Encryption Keyloading Cable: “KVL-9000” P/N 127500

## 2.17 CONFIGURATION MENU

Some features of the TDFM-9100 transceiver can be configured to the user’s preference. The following menu items can be changed or modified. Rotate the knob to select the desired condition and press the knob to continue to the next configuration item:

<b><i>Knob Volume</i></b>	Can be Enabled or Disabled. If Enabled, Volume will be one of the available modes the knob can assume during normal operation.
<b><i>Knob Channel</i></b>	Can be Enabled or Disabled. If Enabled, Channel will be one of the available modes the knob can assume during normal operation.
<b><i>Knob Zone</i></b>	Can be Enabled or Disabled. If Enabled, Zone will be one of the available modes the knob can assume during normal operation.
<b><i>Knob Num Lock</i></b>	Can be Enabled or Disabled. When this knob mode is selected by pressing the knob in the normal operating mode, the keyboard will act as a numeric entry rather than the usual functions. The knob itself has no function in this mode. Num Lock mode can be used, for example, to select quick channel presets previously programmed in using the APX CPS™ software. Num Lock mode will time out after 3 seconds at which time the knob will revert back to the default mode (see below).
<b><i>Knob Recall</i></b>	In this mode a channel number can be directly entered via the keypad. Useful when there are many channels programmed.
<b><i>Knob Default</i></b>	Can be set to Volume or Channel. This is the mode the knob will assume when the TDFM-9100 is switched on or when the Num Lock mode times out.
<b><i>Pg 3 Revert</i></b>	If enabled, display page 3 is automatically selected when S200 satcom box is connected and is receiving a call. Disabled otherwise.
<b><i>S200 Units</i></b>	Miles or kilometres can be selected for the caller distance display when S200 satcom box is connected.
<b><i>Backlighting</i></b>	Can be set to 5 or 28 volts. This sets the operating range of the dimming input to the radio. The dimming input only controls the brightness of the keyboard and panel markings. The display brightness is controlled separately. No damage will occur to the TDFM-9100 if the wrong voltage is selected.
<b><i>Always On</i></b>	When enabled, the radio turns on and off with the aircraft radio master. When disabled, the knob must be used to switch on the radio.
<b><i>Sidetone</i></b>	The sidetone (transmit audio sent to the headset while transmitting) can be adjusted to a comfortable level while in this mode.

Press the knob to accept the setting. The radio will then return to normal operating mode. The radio will keep these settings until they are changed again.

## 2.18 MAINTENANCE MENU

Some technical specifications of the TDFM-9100 transceiver can be configured to suit the installation. ***The settings in this menu should only be adjusted by maintenance or technical personnel as incorrect settings can result in undesired operation.***

The Maintenance Menu is protected by a password. Enter 1-5-9-3-5-7 to access Maintenance.

The following menu items can be changed or modified. Rotate the knob to select the desired condition and press the knob to continue to the next configuration item:

<b><i>Mod 7</i></b>	This enables MOD 7 timing for radios with MOD 7 marked on the modification label. Rotate the knob to enable or disable as per MOD 7 markings.
<b><i>Band 1</i></b>	This item disables the band 1 display line and the band selector when set to disabled. Rotate the knob to enable or disable. (MOD 14 only)
<b><i>Band 2</i></b>	This item disables the band 2 display line and the band selector when set to disabled. Rotate the knob to enable or disable.
<b><i>Band 3</i></b>	Disables the band 3 display line and band selector when set to disabled. Rotate the knob to enable or disable. (MOD 14 only)
<b><i>Band 4</i></b>	Disables the band 4 display line and band selector when set to disabled. Rotate the knob to enable or disable. (MOD 14 only)
<b><i>Band 5</i></b>	Disables the band 5 display line and band selector when set to disabled. Rotate the knob to enable or disable. (MOD 14 only)
<b><i>Remote</i></b>	Selects RC-9100 specific interface or Remote Mode operation using a generic interface protocol. (MOD 14 only)
<b><i>Mic 1 Level</i></b>	Turning the knob will adjust the microphone input level for Band 1 transmit. The level is displayed as a number adjustable between 0 and 255.
<b><i>Mic 2 Level</i></b>	Turning the knob will adjust the microphone input level for Band 2 transmit.
<b><i>Mic 3 Level</i></b>	Turning the knob will adjust the microphone input level for Band 3 transmit. (MOD 14 only)
<b><i>Mic 4 Level</i></b>	Turning the knob will adjust the microphone input level for Band 4 transmit. (MOD 14 only)
<b><i>Mic 5 Level</i></b>	Turning the knob will adjust the microphone input level for Band 5 transmit. (MOD 14 only)
<b><i>Band 1 RX Audio</i></b>	Adjusts the audio output of the Band 1 RF module to the audio amplifiers in the TDFM-9100. This level is set at the factory for maximum undistorted audio at full volume. Adjustment is not recommended.

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<b>Band 2 RX Audio</b>	Adjusts the audio output of the Band 2 RF module to the audio amplifiers in the TDFM-9100. This level is set at the factory for maximum undistorted audio at full volume. Adjustment is not recommended.
<b>8.33 KHz</b>	Enables or Disable 8.33 KHz mode for VHF AM on module 3. (European use only)
<b>B3 Mod Level</b>	Turning the knob will adjust the modulation level for Band 3 transmit. (MOD 14 only)
<b>B3 Max Dev NB</b>	Turning the knob will adjust the maximum narrow band deviation level for Band 3 transmit. (MOD 14 only)
<b>B3 Max Dev WB</b>	Turning the knob will adjust the maximum wide band deviation level for Band 3 transmit. (MOD 14 only)
<b>B3 AM Comp LVL</b>	Turning the knob will adjust the audio compression level for Band 3 AM transmit. (MOD 14 only)
<b>B3 FM Comp LVL</b>	Turning the knob will adjust the audio compression level for Band 3 FM transmit. (MOD 14 only)
<b>Initialize BT</b>	Initializes Bluetooth transceiver. Only required once during manufacture or if Bluetooth transceiver replaced. (MOD 14 only)
<b>Clone settings over BT to another TDFM-9100</b>	Pressing the 'Yes' soft key will cause the TDFM-9100 to search for another TDFM-9100 using Bluetooth and if found, transfer all of its configuration and maintenance settings to it. The other TDFM-9100 must also have the maintenance menu open to be found. This is useful if the radio is being replaced or to set up another radio for installation in a similarly equipped aircraft. (MOD 14 only)
<b>Setup Digital Audio?</b>	Pressing 'Yes' allows you to program which and where bands will show up on a Technisonic TDAP-650 or TDAP-750 digital audio panel. Comms 3 through 8 on these audio panels are available for TDFM-9100 bands while Comms 1 and 2 are reserved for primary (AM com) communications. (MOD 14 only)

Press the knob to accept the setting. The radio will then return to normal operating mode. The radio will keep these settings until they are changed again.

## 2.19 MODULES 1 & 2 FRONT PANEL PROGRAMMING (FPP) MODE

Modules 1 and 2 have the capability to program channel information such as frequencies, PL tones, and modulation types, etc. from the front panel provided the modules were ordered with the FPP option. FPP also must be activated in the APX CPS™ software for 'FPP' to appear in the soft menu.

**NOTE:** Individual zones must be activated for FPP in order to allow editing of channel information. For zones that have FPP disabled, the FPP menu will still function but no changes can be made to the channels in that zone. FPP can only be used on zones containing conventional analog or P25 channels. Zones with P25 Trunking or Motorola Trunking channels can only be programmed via APX CPS™ software.

Pressing FPP 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. 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. If an invalid frequency is entered, the radio will revert back to the previously programmed frequency.
- TX Frequency** The transmit frequency can be edited in the same fashion as the RX frequency.
- RX Mode** The receive mode will be displayed. The mode can be Analog, Digital (P25), or Mixed (both). Press the knob or the 'Next' menu key.
- TX Mode** The transmit mode will be displayed. Transmit mode can only be Analog or Digital and can only be changed if the receive mode was Mixed.
- RX CTCSS** 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** 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** Transmit CTCSS tone will be displayed. Rotate the knob for the desired tone or 'OFF.' Press the knob or 'Next' menu key.
- TX DCS** 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.
- RX NAC** The receive network access code will be displayed. The NAC is a 3 digit hexadecimal number which can include digits 0-9 and letters A-F. The keypad will act as numbers or letters. '123' or 'ABC' will be displayed on the bottom right corner of the display to indicate the mode which can be changed by rotating the knob. Press the knob or the 'Next' menu key when the desired NAC is entered.
- TX NAC** Enter the TX NAC as described above.

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**Zone Name** The Zone name will be displayed. The first letter will be flashing. Rotating the knob will scroll through the available letters, numbers, and symbols. Press the knob to move to the next letter. Press 'Next' when done editing.

**Channel Name** The Channel name will be displayed. Edit the channel name as described above.

**Talkgroup ID** The Talkgroup ID will be displayed. This is a 4 digit hexadecimal number that can be edited as described under RX NAC above. Press 'Next' when done editing.

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**



**2.20 MODULES 1 & 2 PROGRAMMING CONSIDERATIONS**

Every attempt has been made to allow the RF modules to behave as the Motorola APX-8000 portable. In most cases, an existing code plug can be loaded into one of the TDFM-9100 RF modules and it will operate normally. However, there are some situations that must be considered when programming the TDFM-9100 through APX CPS™ software or FPP at the front panel:

- Zone/Channel Name** Although both zone and channel names can contain as many as 14 characters each, there are only 14 character spaces on the display available in total. It is suggested the zone name be no longer than 5 characters and the channel name no longer than 9 characters to be displayed properly. Longer names will be cut off at the end.
- Menu items** Programming CHAN or ZONE into the soft menu would be redundant and confusing as the TDFM-9100 already has the knob performing these functions. Other soft menu items such as CLOCK are not supported due to insufficient display space.

**2.21 MODULE 3 FRONT PANEL PROGRAMMING (FPP) MODE**

Module 3 is a T6 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)
- 138 – 156 MHz AM (extended aviation band)
- 225 – 400 MHz AM (military aviation band)

FPP programming on module 3 is similar to 1 and 2 but is limited to:

- RX Freq** The receive frequency of the current channel. Enter a frequency within the ranges specified above. For low band frequencies, a leading zero must be entered. Eg: 042.460.
- TX Freq** Transmit frequency of the current channel. (Leading zero required for Low Band frequency)
- RX CTCSS** Receive tone. FM band only.
- TX CTCSS** Transmit tone. FM band only.
- RX DCS** Receive DCS code. FM band only.
- TX DCS** Transmit DCS code. FM band only.
- Scanning** Place current channel in scan list 1 – 5 or disable
- Channel Name** 0 to 9 characters.

**2.22 MODULES 4 & 5 (EXTERNAL TRANSCEIVERS 1 & 2)**

Up to 2 external radios can be connected to the TDFM-9100. In most cases, these will be portable handhelds that can be plugged into the aircraft via a special harness. The TDFM-9100 supplies the audio interface (mic, headset, and PTT) and generates transmit sidetone. Channel selection and programming must be done on the handheld. The knob function defaults to volume only. The volume on the handheld should be set midrange for best results.

### 2.23 LATITUDE S200-P12 SATCOM CONTROL

Band 5 can also support the Latitude Technologies S200-P12 Satellite Communications System. When the S200-P12 is connected, Band 5 becomes the controller. The Latitude S200-P12 provides the following services:

- GPS position reporting
- Iridium messaging
- Iridium satellite phone
- PTT communications network

The S200-P12 can be in one of two modes – PTT or Phone mode. The S200-P12 can be configured to always start up in one or the other mode. In PTT mode, only PTT network communications can occur. In Phone mode, position reporting, messaging, and satphone communications can occur.

### 2.24 LATITUDE S200-P12 PTT MODE

In PTT mode, the display will show 'SATPTT' followed by the channel name. There are up to 15 channels available. The second line is the status line followed by the menu / knob function line.



To transmit, key the PTT in the usual manner and wait. The display will initially show 'TX Pending' on the status line. If a connection is made, the acceptance tones will be heard and the status line will show 'TX Granted' along with an illuminated TX LED on the top right of the display.



At this point, you may speak normally. Transmit time is limited to 20 seconds. If transmit time runs out or connection is lost for any reason, you will hear the disconnect tones. Transmit may not be granted if there is no signal, the channel is busy, or the selected channel is not authorized for use. The reason will be displayed on the status line. During receive, the squelch LED on the top left of the display will illuminate and the caller ID, direction, and distance will be shown on the status line.



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Any or all of the channels can be put into a scan list and scanned. To edit the scan list, press the SCAN soft key. By selecting the desired channels with the knob and pressing the +/- soft key, channels can be added or removed from the scan list. Selected channels will display a '+' at the end of the channel name on the top line.



To scan the selected channels, press the SCAN soft key. The channel name will show as 'SCANNING.' Press the STOP soft key to stop.



### 2.25 LATITUDE S200-P12 PHONE MODE

In PTT mode, pressing the PHN soft key will switch the S200-P12 into phone mode. The display will show 'SATPhone' followed by blank spaces or the last phone number entered.



An incoming call can be answered by pressing the ANS soft key. There is also ringtone heard in the headset which is useful if the TDFM-9100 is on another band. To make a call, a phone number can be entered directly from the keypad or retrieved from the S200-P12 built-in phone book. To access the phone book, press the CALL soft key and then the PBK soft key.



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Press the DIAL soft key to dial the number. When finished with the call, press the HUP soft key to hang up. Phone mode also supports text messages to be sent through the Iridium system. These are not the same as normal phone text messages and can only be sent to the dispatcher. The TDFM-9100 can save and recall up to ten commonly used messages.



To enter a message, press the CALL soft key and then the TXT soft key. Turning the knob will scroll the first character through the alphabet, numbers, and symbols until the desired character is reached. Pressing the knob advances the cursor to the next position. Continue until your message is complete and press SEND. If you want to save the message first, press SAVE and a memory number from 0 to 9. When a message is received by the S200-P12, it will be displayed on the status line until confirmed by pressing the ESC soft key. Another message may be waiting in the queue. When there are no more messages, the display returns to the normal SATPhone screen. While in this screen, you can return to PTT mode by pressing the PTT soft key.

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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 online  
Warranty Registration Form found at [www.til.ca](http://www.til.ca).**