



# Operators Guide

## MTP138

### Mission Transceiver Panel Mount



## Operators Guide

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## Section 1.0 Description

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### 1.1 Introduction

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This document provides basic operating instructions for the Mission Transceiver Panel mount, herein subsequently referred to as the MTP.

The MTP is highly configurable with a large set of options for both the Operator and the Administrator. Many of these options are outside the scope of this guide. For advanced configuration and operation please see the MTP138 product page on AEM's website, [www.aem-corp.com](http://www.aem-corp.com), or contact AEM Technical Support at [support@aem-corp.com](mailto:support@aem-corp.com).

**This guide supports firmware version 1.02.**

### 1.2 Description

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The MTP is a stand-alone VHF FM transceiver that is equipped with a main and guard radio. The MTP is capable of semi-duplex communication and features two operating modes: narrowband analog and wideband analog.

The MTP transmit and receive frequency range is the 136 – 174 MHz VHF band with high (10W) or low (1W) transmit output power selectable from the front panel interface.

Continuous Tone Code Squelch System (CTCSS) and Continuous Digital Coded Squelch System (CDCSS) encoding/decoding are selectable.

The MTP is compliant to applicable equipment performance standards TIA-603-E, DO-160G environmental standards.



Figure 1: MTP138-000GN

## 1.3 General Statements

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### 1.3.1 Warnings

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#### **WARNING**

**High volume settings can cause hearing damage.  
Set the headset volume control to the minimum volume setting prior to conducting tests, and slowly increase the headset volume to a comfortable listening level.**

### 1.3.2 Controlling Your Exposure to RF Energy

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RF is a form of electromagnetic energy (as is sunlight), and there are recommended levels of maximum RF exposure. To control your exposure to RF and comply with the maximum exposure limits for occupational/controlled environments, follow these guidelines:

1. Do not talk (transmit) on the radio more than the rated transmit duty cycle. This is important because the radio radiates more energy when it is transmitting than when it is receiving.
2. While you are transmitting (talking or sending data) on the radio, you must ensure that there is always a distance of 45.3 inches (1.15 m) between people and the antenna. This is the minimum safe distance.
3. Use the radio only with approved antennas and attachments and make only authorized modifications to the antenna otherwise you could damage the radio and violate FCC regulations.

For more information on what RF energy is and how to control your exposure to it, visit the FCC website at [www.fcc.gov/oet/rfsafety/rf-faqs.html](http://www.fcc.gov/oet/rfsafety/rf-faqs.html).

### 1.3.3 Regulatory and Compliance Statements

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Reference the Installation Manual (MTP138-000GN-815-0) for additional ISED and FCC regulatory and compliance statements.

### 1.3.4 Warranty

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Please refer to the standard product warranty conditions available on our website, [www.aem-corp.com](http://www.aem-corp.com).

## 1.4 Limitations

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Front Panel USB is for maintenance activities only and is not intended for use during flight. USB port door is to be closed.

## 1.5 Part Number Nomenclature

The product part number is defined as follows:

<b>M</b>	<b>T</b>	<b>P</b>	<b>1</b>	<b>3</b>	<b>8</b>		-	<b>0</b>	<b>0</b>	<b>0</b>	<b>G</b>	<b>N</b>
<b>1</b>			<b>2</b>		<b>3</b>			<b>4</b>		<b>5</b>	<b>6</b>	

Figure 2: Part Number Nomenclature

Item	Name	Description
<b>1</b>	Product Family	MTP: Mission Transceiver Panel Mount
<b>2</b>	Start Frequency (in MHz)	138: 138 MHz
<b>3</b>	Feature Character	N/A: Analog only D: Digital Capable
<b>4</b>	Derivative Identifier [000-999]	000: Base product
<b>5</b>	Feature Character	G: Guard receiver installed N/A: No Guard
<b>6</b>	Feature Character	N: NVIS compliant lighting N/A: Non-NVIS lighting

Table 1 :Unit Nomenclature

**End of Section 1.0 Description**

## Section 2.0 Operation

### 2.1 Introduction

The MTP is controlled using the front panel mounted keypad, knobs, and switches. The display is navigated using the front panel controls to select from menus.

### 2.2 Front Panel



Figure 3: Front Panel

Item	Name	Description
1	<b>Main Volume Knob</b> (MAIN VOL)	Adjusts the volume of the main radio. Detent turns the MTP OFF.
2	<b>Monitor</b> (MON)	Bypasses Squelch Threshold and Channel Signaling allowing all transmissions to be heard.
3	<b>Channel Recall</b> (RCL)	Returns to the previous channel.
4	<b>Radio Select</b> (MAIN GUARD)	Changes the Focused Radio.
5	<b>Transmit Power</b> (HI LO)	Changes transmit power.
6	<b>Guard Volume Knob</b> (GUARD VOL)	Adjusts the volume of the guard radio.
7	<b>Rotary Selector</b> (PUSH   ENTER)	Changes channel, navigates, and modifies options.
8	<b>Keypad and MENU</b>	Shows/hides the Menu. Changes channel, navigates, and modifies options.
9	<b>Data Port</b> (DATA)	USB Type-C port used for Profile Import/Export, Error Log Export, and Firmware Updates.

Table 2: Front Panel Controls

## 2.3 J1 System Interface Connector

See the Installation Manual for more information.

Input	Functionality
PANEL LIGHTING	Panel and display dimming.
CHAN/SELECT +	Equivalent to rotary selector clockwise. Changes channel, navigates, and modifies options. Commonly installed on the airframe's cyclic stick
CHAN/SELECT -	Equivalent to rotary selector counterclockwise. Changes channel, navigates, and modifies options. Commonly installed on the airframe's cyclic stick.
MIC KEY IN	PTT (Push To Talk).

Table 3: System Interface Connector Inputs

## 2.4 Power On

To power on, rotate MAIN VOL clockwise past the detent. The display will briefly show a splash screen including the AEM logo, the firmware version, and the model number. Once initialization is complete, the display will show the Home Screen.

## 2.5 Home Screen

The Home Screen shows each radio's indicators, Active Channel, and Active Zone. One radio is Focused (expanded) while all others are Unfocused (collapsed).

All navigation within this guide begins from the Home Screen.

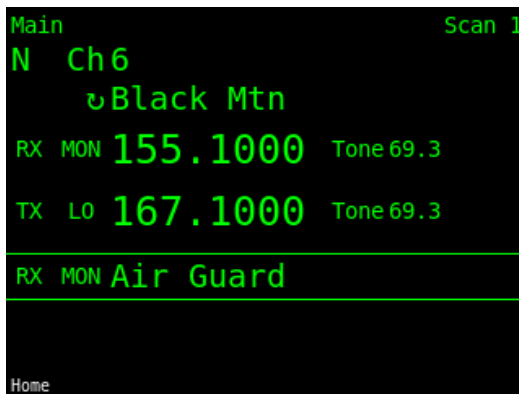


Figure 4: Main Radio Focused

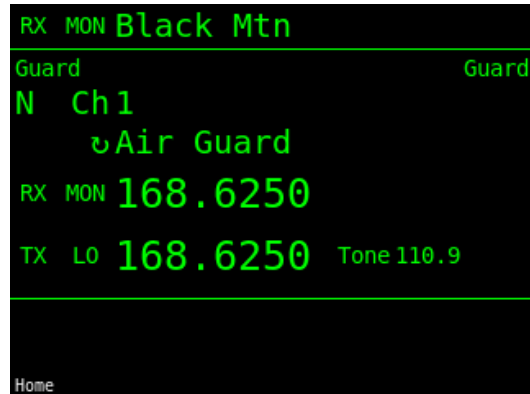


Figure 5: Guard Radio Focused

## 2.5.1 Focused Radio

Transmit, receive, and channel changes occur on the Focused Radio.

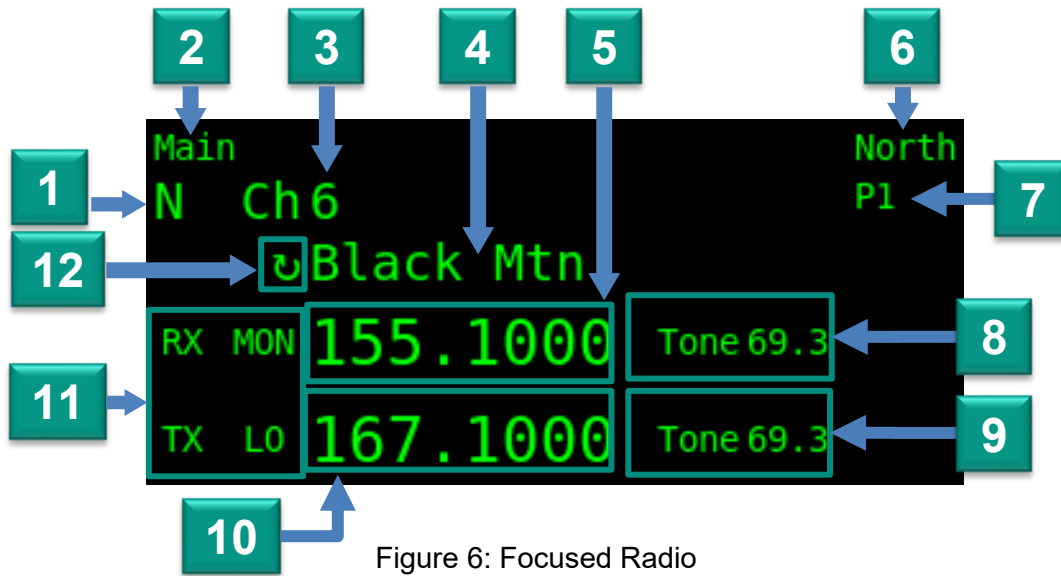


Figure 6: Focused Radio

Item	Description
1	Channel modulation. N: Narrowband Analog, 12.5kHz bandwidth. W: Wideband Analog, 25kHz bandwidth. Requires Wideband Key installed.
2	Radio name.
3	Channel number.
4	Channel name.
5	Receive frequency.
6	Zone name.
7	Scan priority enrolment. Configured per zone. Scanned under P, L+P, and Z+P scan algorithms.
8	Receive Channel Signaling. CTCSS, CDCSS.
9	Transmit Channel Signaling. CTCSS, CDCSS.
10	Transmit frequency.
11	Indicators.
12	Scan list enrolment. Scanned under L and L+P scan algorithms.

Table 4: Focused Radio Elements

## 2.5.2 Unfocused Radio

Unfocused radios can receive but cannot transmit.

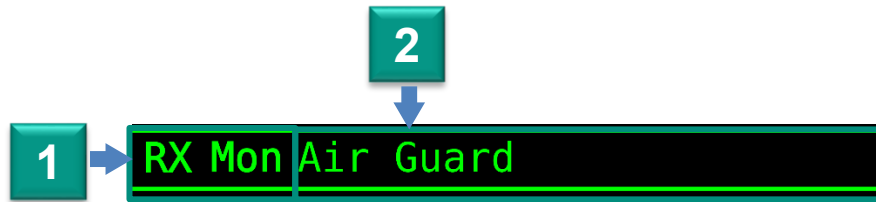


Figure 7: Unfocused Radio

Item	Description
1	Indicators.
2	Channel name.

Table 5: Unfocused Radio Elements

## 2.5.3 Indicators

Indicators show the receive and transmit status of each radio.









Indicator	Description
 	Highlights when a carrier is detected on the receive frequency.
 	Highlights when Squelch Threshold and Channel Signaling has been met allowing audio to be delivered to the headset.
 	Highlights when transmitting.
 	Highlights when transmit power is set to High.

Table 6: Home Screen Indicators

## 2.5.4 Simplex

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When TX channel options match the RX channel options, the TX options may be hidden by Auto Simplex (Figure 8). This can be changed on the User Options Screen.

1. MENU > More > Options
2. Choose Auto Simplex
  - On: TX information hidden when same as RX.
  - Off: TX information always shown.

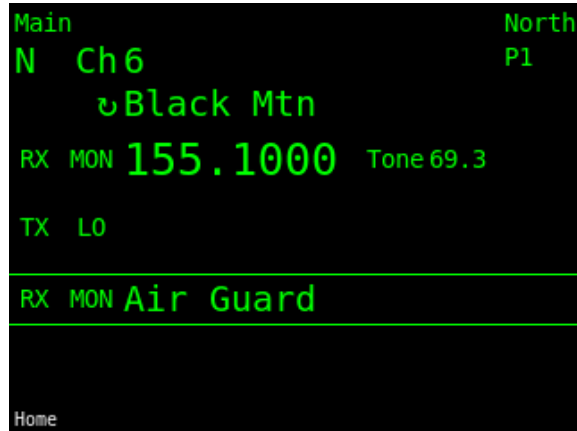


Figure 8: Auto Simplex Hiding TX Options

## 2.6 Menu

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The menu provides navigation and common actions. Press MENU to open it as a right-side overlay with content that varies by screen. An action is triggered by pressing the associated number on the keypad.

Some actions have consistent numbering across all screens such as Bright (0), Save (7), Back (7), and Cancel (8).

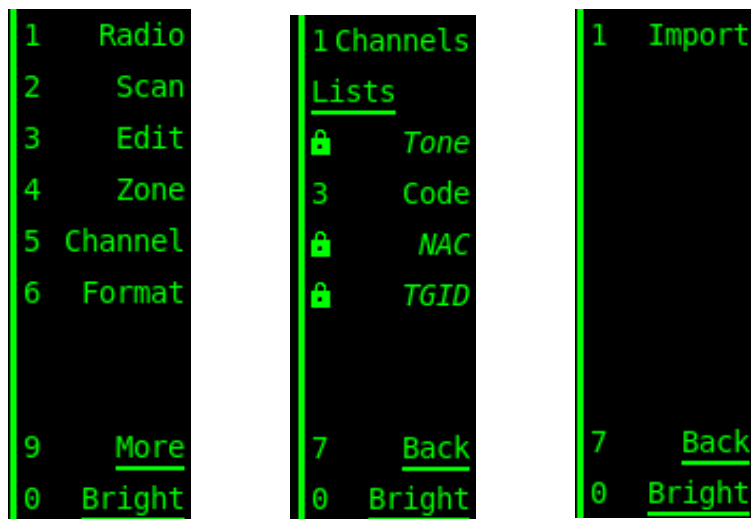


Figure 9: Example Menus

## 2.7 Active Channel

---

Radios use one channel at a time known as the Active Channel. The Active Channel dictates receive and transmit behavior of the radio. The Active Channel on the Focused Radio can be changed on the Home Screen by turning the rotary selector or by entering the channel number using the keypad.

## 2.8 Active Zone

---

Radios use one zone at a time known as the Active Zone. The Active Zone dictates available channels to the radio and modifies behavior according to the contained options (priority scan channels, active signal lists, and permissions). The Active Zone can be changed on the Home Screen.

1. MENU > Zone.
2. Choose a zone.

Changing the Active Zone may be locked by an Administrator on a per-radio basis.

## 2.9 Transmit

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Transmit will begin on the Active Channel of the Focused Radio when PTT is active. Receive is not possible when transmitting. Transmit can occur with two power levels, Low (1W) and High (10W), and can be changed using the HI/LO button.

Transmit may timeout after a period defined by an Administrator. This is indicated by an exclamation mark on the transmit indicator (TX!) and can be cleared by re-transmitting.

## 2.10 Transmit DTMF Tones

---

DTMF tones 0-9 are sent from the keypad and A-D, #, \* from the Menu (Figure 10).

Transmitting DTMF tones may be disabled by an Administrator.

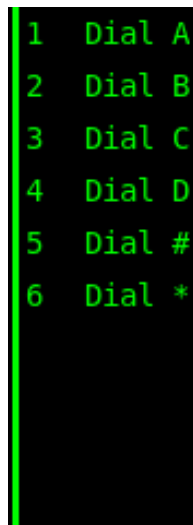


Figure 10: DTMF Tone Menu

## 2.11 Channel Signaling Display Format

The numerical display format for CTCSS tones Channel Signaling can be changed using the Format Menu. This menu will only show format options for the currently applicable Channel Signaling. The Format Menu is accessible on the Home Screen. See Table 7 for a list of all display format options.

1. MENU > Format.



Figure 11: Example Format Menus

Display Format	Description	Example
Frequency	Base 10 with 1 decimal place.	82.5
MCode	Motorola coded.	YZ
WCode	Wolfsberg coded.	06

Table 7: Display Format Options

## 2.12 LCD Brightness

The LCD brightness can be adjusted on the Brightness Screen accessible from most screens.

1. MENU > Bright.

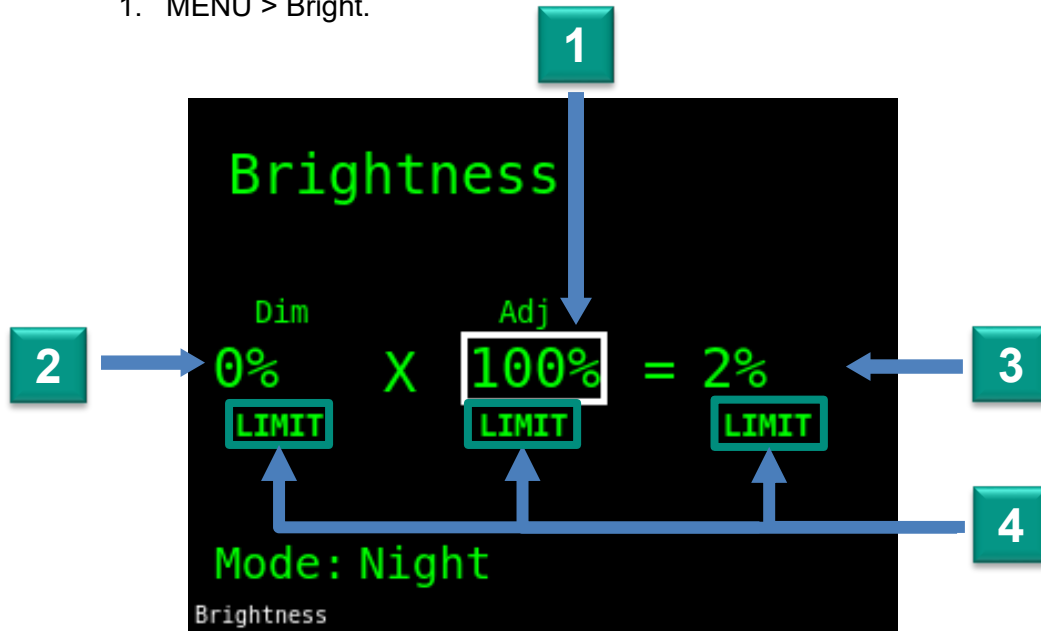


Figure 12: Brightness Screen

Item	Description
1	Brightness adjustment.
2	Dimming due to panel lighting input.
3	Combined LCD brightness.
4	Displayed when a value has reached it's minimum or maximum value.

Table 8: Brightness Screen Elements

## 2.13 LCD Brightness Mode

---

LCD Brightness Mode can be changed on the Brightness Screen Menu.

1. MENU > Bright.
2. MENU > Choose LCD Mode.
  - Day: Maximum brightness is not limited allowing the LCD to reach its highest possible brightness.
  - Night: Maximum brightness is limited for use in Night or NVIS applications. Dimming from panel lighting input is customizable by an Administrator.
  - Auto: Day or Night automatically chosen based on panel lighting input voltage. Customizable by an Administrator.



Figure 13: Changing LCD Mode on the Brightness Screen

## 2.14 Receive Volume Range

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Minimum and maximum receive volume can be configured per radio on the User Options Screen. The volume knobs are automatically rescaled to the configured range. For example, setting the minimum volume to 20% will result in 20% volume when the volume knob is fully counterclockwise.

1. MENU > More > Options.
2. Scroll to desired radio section (Main or Guard).
3. Choose Min Volume or Max Volume.

## **2.15 Microphone Sidetone Volume**

---

Microphone sidetone volume can be changed on the Radio Options Screen.

1. MENU > Radio.
2. Scroll to Audio section.
3. Choose Sidetone Vol.

## **2.16 DTMF Sidetone Volume**

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DTMF sidetone volume can be changed independently of the microphone sidetone volume on the Radio Options Screen.

1. MENU > Radio.
2. Scroll to Audio section.
3. Choose DTMF Sidetone Vol.

## **2.17 Squelch Threshold**

---

Squelch threshold defines the required signal strength above noise to break squelch. Can be changed per radio on the Radio Options Screen.

1. MENU > Radio.
2. Scroll to desired radio section (Main or Guard).
3. Choose Sq. Threshold.
  - Low: Low strength signals will break squelch. Recommended when operating across large distances, or where RF activity is minimal.
  - Medium: Medium strength signals will break squelch. Recommended setting for urban and semi-urban environments where moderate RF activity is expected.
  - High: High strength signals are required to break squelch. Recommended in environments where high RF activity is expected.

## **2.18 Monitor Latch**

---

The persistence of Monitor when using the Monitor button can be changed on the User Options Screen.

1. MENU > More > Options.
2. Choose Monitor Latch.
  - Hold: Long press to latch monitor.
  - On: Short press latches monitor.
  - Off: Monitor never latches.

## **2.19 Auto TX Power**

---

Auto TX Power modifies what happens when the HI/LO button is pressed. It can be changed on the User Options Screen.

1. MENU > More > Options.
2. Choose Auto TX Power.
  - On: Radio TX power is set to the per-channel stored TX Power option on channel changes and startup. Pressing HI/LO will temporarily override the TX power until the next channel change or power cycle.
  - Off: Radio TX power persists across channel changes and power cycle. Pressing HI/LO will toggle and immediately save the TX power. Per-channel TX Power is ignored.

## **2.20 Go Home**

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When triggered the Go Home function immediately returns to the home screen saving all changes on the way back. The trigger of this function can be changed on the User Options Screen.

1. MENU > More > Options
2. Choose Go Home.
  - Off: Disabled.
  - PTT: When PTT is keyed.
  - Radio Sel.: When the MAIN/GUARD button is pressed.
  - Both: Either PTT or Radio Select.

## 2.21 Scanning

Scanning can be started and stopped from the Home Screen.

1. MENU > Scan.

The order of scanned channels is determined by the selected scan algorithm (Table 9) which can be changed by turning the rotary selector while scanning.

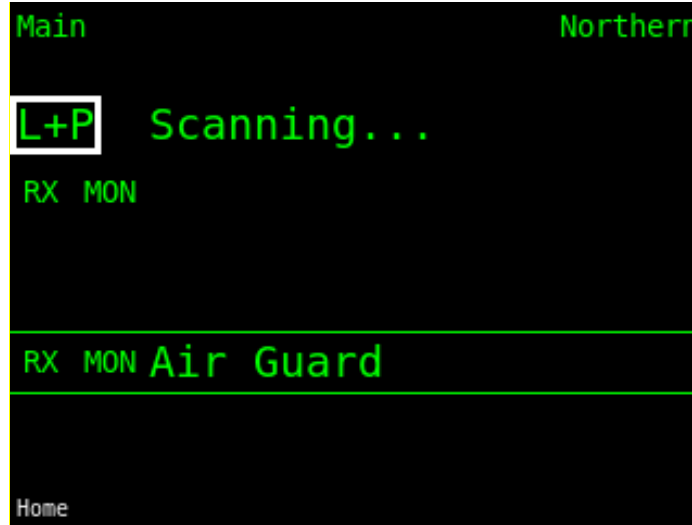


Figure 14: Scanning on the Home Screen

Algorithm	Description	Example
List <b>L</b>	Scans all channels in a zone in numerical order that have Channel Scan (☺) enabled.	Home, 1, 2, 3, Home, 1, 2, ...
Priority <b>P</b>	Scans zone P1, zone P2, and Home in order of priority.  When locked, the scanner will periodically check higher priority channels for transmissions.	P1, P2, Home, P1, P2, Home, P1, ...
List + Priority <b>L+P</b>	A combination of List and Priority algorithms where a single, incrementing, list channel is scanned after all Priority algorithm channels are scanned.	P1, P2, Home, <b>1</b> , P1, P2, Home, <b>2</b> , P1, P2, ...
Zone <b>Z</b>	Scans all channels in the Active Zone.	1, 2, 3, 4, 1, 2, ...
Zone + Priority <b>Z+P</b>	A combination of Zone and Priority algorithms where a single, incrementing zone channel is scanned after all Priority Algorithm channels are scanned.	P1, P2, Home, <b>1</b> , P1, P2, Home, <b>2</b> , P1, P2, ...

Table 9: Scan Algorithms

### 2.21.1 Scan Locked

---

If a signal is detected while scanning, the radio will lock to that channel to allow the transmission to be heard and responded to. When locked, the Home Screen Action Menu is modified with the following options:

1. Radio: Navigates to the Radio Options screen.
2. Scan: Stop scanning and return to the home channel.
3. Next: Skip this channel and continue scanning.
4. Stay: Stop scanning but return to the locked channel instead of home.
5. Delete: Temporarily remove the locked channel from the scan list. Channel won't be scanned again until scan is re-enabled.

Pressing PTT will transmit on the locked channel. Scan will continue after a short period of RX or TX inactivity.



Figure 15: Scan Locked on the Home Screen

## 2.22 Profiles

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Options and lists are stored in a JSON file (.json) called a Profile. Only one Profile is stored and used at a time.

### 2.22.1 Create a Profile

---

Profiles can be created using the AEM Radio Profile Editor found on AEM's website [www.aem-corp.com](http://www.aem-corp.com) on the MTP product page under software.

### 2.22.2 Import a Profile

---

Profiles can be imported from a USB storage device connected to the DATA port.

1. Copy profile into the root directory of the USB device.
2. MENU > More > Import.
3. Connect the USB device to the DATA port.
4. Select the desired profile from the list.
5. Confirm chosen profile by pressing MENU > Import.
6. Wait until a result is displayed. This may take a few minutes.

Result	Description
Success.	Import successful, profile saved.
Insufficient permissions.	Profile contains options that exceed current permission level. Login and try again.
Incompatible version.	Profile is not compatible with this firmware version. Convert using AEM Radio Profile Editor on AEM's website: <a href="http://www.aem-corp.com">www.aem-corp.com</a> .
Device error.	USB communication issue or a device compatibility problem. Try again or try a different device.
Invalid syntax or options.	File likely corrupted. Replace and try again.

Table 10: Import results

### 2.22.3 Export a Profile

---

Profiles can be exported to the root directory of a USB storage device connected to the DATA port.

1. MENU > More > Export.
2. Connect a USB device to the DATA port.
3. Enter desired file name.
4. MENU > Export.
5. Wait until one of the results in Table 11 is displayed. This may take a few minutes.

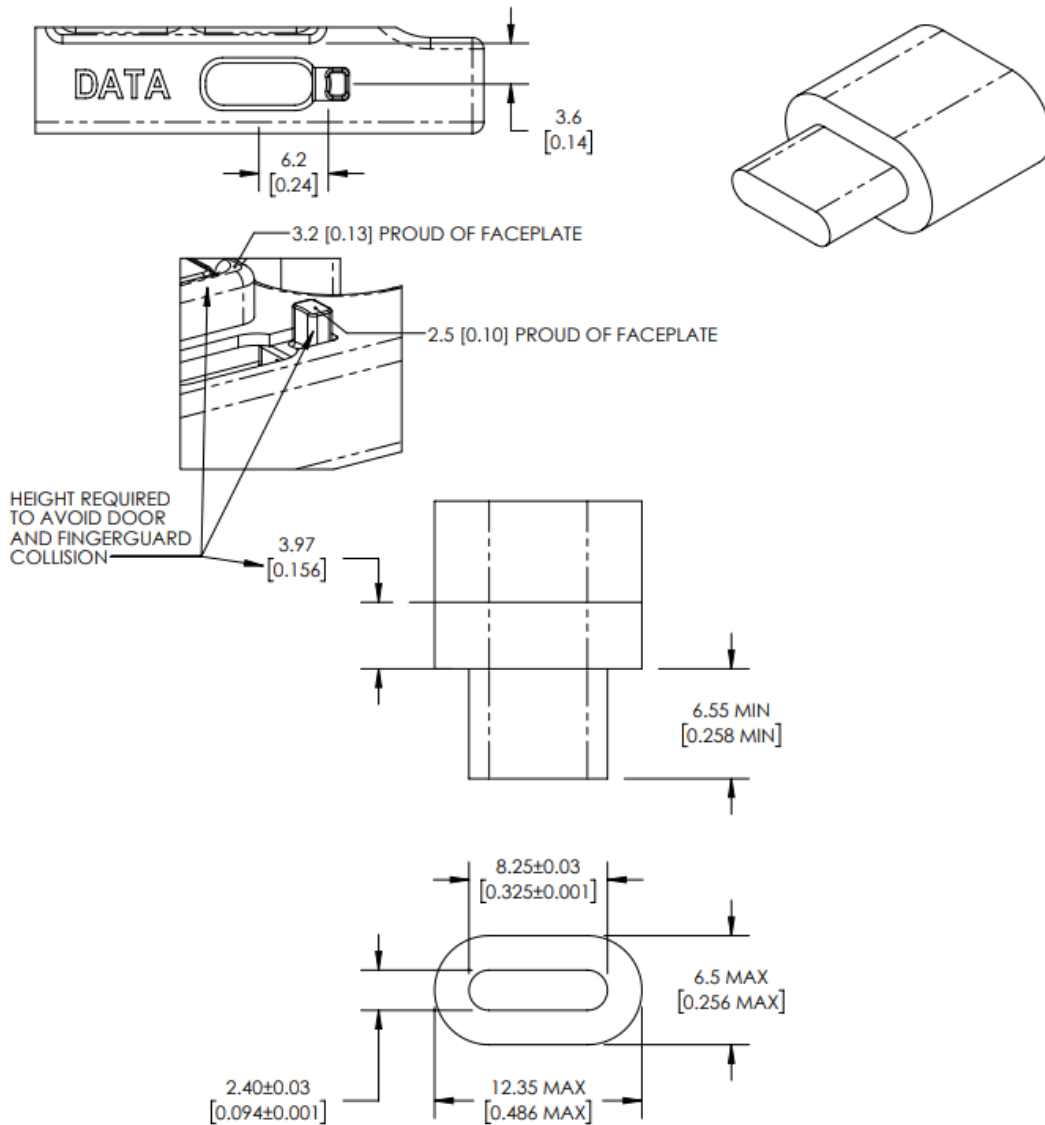
Result	Description
Success.	Export successful, profile saved to USB device.
Device error.	USB communication issue or a device compatibility problem. Try again or try a different device.

Table 11: Export results

## 2.22.4 USB Drive Requirements

The MTP only supports USB drives that meet the following requirements:

1. Formatted to FAT, FAT32, or exFAT.
2. Power consumption less than 4.5W.
3. USB-C or connected through a USB-C adapter.
4. Mechanical requirements as shown in Figure 16 below.



## 2.23 Wideband Operation (Key Required)

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To comply with FCC CFR Part 90.203, transmission of wideband channels (25 kHz) is disabled by default.

To enable this feature contact AEM Technical Support at [support@aem-corp.com](mailto:support@aem-corp.com) with the serial number of the unit to acquire a Wideband Key. Key installation steps can be found in the Installation Manual. It is the responsibility of the installer or operator to determine if they meet the regulatory exceptions to operate with this feature enabled.

## 2.24 Agile Operation (Key Required)

---

To comply with FCC CFR Part 90.203 and ISED RSS 119, modification of zones, channels, and signal lists from the front panel is disabled by default.

To enable this feature contact AEM Technical Support at [support@aem-corp.com](mailto:support@aem-corp.com) with the serial number of the unit to acquire an Agile Edit Key. Key installation steps can be found in the Installation Manual. It is the responsibility of the installer or operator to determine if they meet the regulatory exceptions to operate with this feature enabled.

### 2.24.1 Edit the Active Channel

---

The Active Channel of the Focused Radio can be edited without leaving the Home Screen.

1. MENU > Edit.
  - All: Choose which channel option to edit or create a new channel.
  - Name: Edit channel name.
  - RX/TX Freq: Edit channel frequency.
  - RX/TX Tone: Edit channel tone.
  - RX/TX Code: Edit channel code.

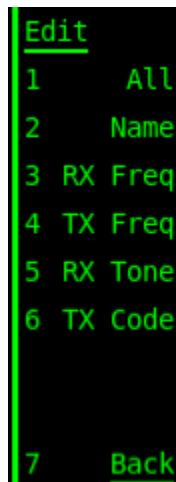


Figure 17: Edit Menu

### **2.24.2 Edit a Zone**

---

Zones can be edited on the Zone Edit Screen.

1. MENU > More > Lists > Zone.
2. Choose a zone.
3. Choose an option.

### **2.24.3 Add a Channel to a Zone**

---

Channels can be added on the Channel Select Screen.

1. MENU > More > Lists > Zone.
2. Choose a zone.
3. MENU > Channels.
4. MENU > Insert.
5. Choose the destination.

### **2.24.4 Edit a Channel in a Zone**

---

Channels can be edited on the Channel Edit Screen.

1. MENU > More > Lists > Zone.
2. Choose a zone.
3. MENU > Channels.
4. Choose a channel.
5. Choose an option.

### **2.24.5 Edit a Signal List**

---

Signal lists can be edited on the Tone or Code List Edit Screen.

1. MENU > More > Lists > Tone.
2. Choose a signal list.
3. Choose an option.

## 2.24.6 Edit a Signal in a Signal List

---

Signals can be edited on the Tone or Code Edit Screen.

1. MENU > More > Lists > Tone or Code.
2. Choose a signal list.
3. MENU > Tones or Codes.
4. Choose a signal.
5. Choose an option.

## 2.24.7 Edit with Auto Simplex

---

When TX channel options match the RX channel options any changes to RX options will be also applied to the TX options. This is indicated by a bar on the Home Screen while editing the Active Channel (Figure 18). Modifying any of the TX options unlinks the RX and TX options. This can be changed on the User Options Screen.

1. MENU > More > Options
2. Choose Auto Simplex
  - On: Changes to RX options applies to TX options when they are the same.
  - Off: Changes to RX options do not modify TX options.

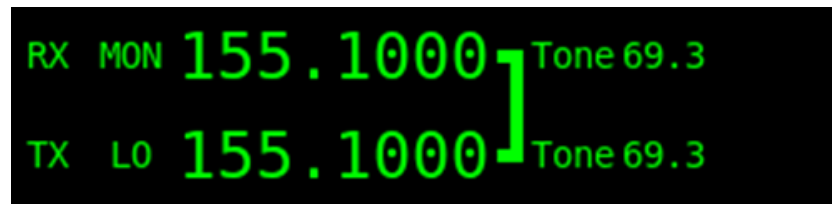


Figure 18: Auto Simplex Link Bar

## 2.25 Supported Channel Signaling (CTCSS, CDCSS)

FREQ	MCODE	WCODE	FREQ	MCODE	WCODE	FREQ	MCODE	WCODE
67.0	XZ	1	118.8	2B	21	183.5	N/A <sup>2</sup>	56
69.3	WZ	51	123.0	3Z	22	186.2	7Z	36
71.9	XA	2	127.3	3A	23	189.9	N/A <sup>2</sup>	57
74.4	WA	3	131.8	3B	24	192.8	7A	37
77.0	XB	4	136.5	4Z	25	196.6	N/A <sup>2</sup>	58
79.7	WB <sup>1</sup>	5	141.3	4A	26	199.5	N/A <sup>2</sup>	61
82.5	YZ	6	146.2	4B	27	203.5	M1	38
85.4	YA	7	151.4	5Z	28	206.5	8Z	62
88.5	YB	8	156.7	5A	31	210.7	M2	41
91.5	ZZ	11	159.8	N/A <sup>2</sup>	52	218.1	M3	42
94.8	ZA	12	162.2	5B	32	225.7	M4	43
97.4	ZB	13	165.5	N/A <sup>2</sup>	53	229.1	9Z	47
100.0	1Z	14	167.9	6Z	33	233.6	M5	44
103.5	1A	15	171.3	N/A <sup>2</sup>	54	241.8	M6	45
107.2	1B	16	173.8	6A	34	250.3	M7	46
110.9	2Z	17	177.3	N/A <sup>2</sup>	55	254.1	0Z	63
114.8	2A	18	179.9	6B	35			

Table 12: Supported CTCSS Tones

CDCSS Codes							
0nn	1nn	2nn	3nn	4nn	5nn	6nn	7nn
017	114	205	306	411	503	606	703
023	115	212	311	412	506	612	712
025	116	223	315	413	516	624	723
026	122	225	325	423	523	627	731
031	125	226	331	431	526	631	732
032	131	243	332	432	532	632	734
036	132	244	343	445	546	654	743
043	134	245	346	446	565	662	754
047	143	246	351	452		664	
050	145	251	356	454			
051	152	252	364	455			
053	155	255	365	462			
054	156	261	371	464			
065	162	263		465			
071	165	265		466			
072	172	266					
073	174	271					
074		274					

Table 13: Supported CDCSS Codes

<sup>1</sup> Alternative MCODE SP not supported.

<sup>2</sup> No MCODE assigned to this CTCSS tone. Will remain displayed in frequency format when format is set to MCODE.

## 2.26 Troubleshooting

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If a problem persists or a serious problem occurs, discontinue use, and contact AEM Technical Support at [support@aem-corp.com](mailto:support@aem-corp.com).

Problem	Solution
Unable to edit channels, zones, signal lists, or signals.	Administrator has restricted the ability to make changes using permissions or the Agile Edit Key. Contact Administrator or AEM.
Cannot hear sidetone.	Ensure Sidetone is enabled, and Sidetone Volume is sufficiently high (Radio Options Screen).
Poor audio quality.	Refer to the Installation Manual to verify installation. If issue persists, contact AEM.
Unable to transmit.	<ul style="list-style-type: none"><li>• Transmit timeout may have been reached (indicated by TX!). Re-key PTT.</li><li>• Ensure Active Channel is not disabled.</li></ul>
Transmit power overridden to low (LO!).	Radio is overheating. Refer to the Installation Manual to verify installation. Ensure it is not installed close to high heat emitting equipment. If issue persists, contact AEM.
Hearing static or adjacent channel communication.	<ul style="list-style-type: none"><li>• Increase Squelch Threshold.</li><li>• Confirm channel modulation is correctly configured.</li></ul>
Unable to hear a received signal.	<ul style="list-style-type: none"><li>• Increase volume.</li><li>• Use Monitor to test whether squelch sensitivity or incorrect Channel Signaling is the cause of the problem.</li><li>• Reduce Squelch Threshold.</li></ul>
Unable to use wideband modulation.	Wideband Key not installed. Contact Administrator or AEM.
Radio Fault.	Contact AEM.
CRC failure.	Contact AEM.
Unexpected restart.	Contact AEM.

Table 14: Troubleshooting

## End of Section 2.0 Operation

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