

OpenSky®



M-803

Digital Mobile Radio
with Vehicular Tactical Network (V-TAC)

MANUAL REVISION HISTORY

REV	DATE	REASON FOR CHANGE
R1A	Jul. 2003	Original Release.
B	Mar. 2004	Replaced “blasting caps” hazard information with OSHA-standard blasting caps hazard information.
C	Nov. 2004	Updated safety information, personality section, menu structure figure, log-in and log-off sections, radio tones section, stealth mode section, V-TAC SOI mode section, selective call section, emergency communications section, and DTMF microphone section. Added information on telephone interconnect calls, GPS coordinates display, V-TAC XCOV-TG mode operations, and engineering data display.
D	Dec. 2004	Updated emergency communications and manual encryption sections. Separated selective alert subsection from selective call section.
E	May 2005	Modified MPE information for FCC compliance.

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TABLE OF CONTENTS

	<u>Page</u>
1 SAFETY INFORMATION	6
1.1 OCCUPATIONAL SAFETY GUIDELINES AND SAFETY TRAINING INFORMATION	8
1.2 COMMON HAZARDS	9
2 PRODUCT DESCRIPTION	10
2.1 VOICE OPERATION	11
2.2 DATA OPERATION	11
2.3 REMOTE CONTROL HEAD OPERATION	11
2.4 INTERCOM OPERATION	12
2.5 V-TAC OPERATION	12
2.6 PERSONALITY	12
2.6.1 Profiles	12
2.6.2 Talk Groups	13
2.7 GPS OPTION	13
2.8 FRONT PANEL	14
2.9 M-803 REAR PANEL	15
2.10 CONTROL HEAD REAR PANEL	16
2.11 V-TAC REAR PANEL	17
3 OPERATION	18
3.1 FRONT PANEL COMPONENTS OVERVIEW	18
3.2 DISPLAY OVERVIEW	20
3.2.1 Network Connectivity Icon	20
3.2.2 Volume Level Icon	20
3.2.3 Display's Top Line	21
3.2.4 Display's Bottom Line	21
3.2.5 Dwell Display	21
3.2.6 Menu Display and Control Area	24
3.2.7 Dwell Display User-Selectable	25
3.3 BASIC RADIO OPERATION	25
3.3.1 Turning the Radio On	25
3.3.2 Self-Test	28
3.3.3 "Logging In" to the Network	28
3.3.4 Logging Off the Network	29
3.3.5 Turning the Radio Off	29
3.3.6 Receiving and Transmitting Voice Calls	29
3.3.7 Radio Tones	30
3.3.8 Adjusting Side Tone Audio Level	32
3.3.9 Adjusting Display & Button Backlight Brightness	33
3.3.10 Adjusting Speaker/Headset Audio Treble Level	33
3.3.11 Stealth Mode	34
3.3.12 Checking or Changing the Active Profile	34
3.3.13 Checking or Changing the Selected Talk Group	35
3.4 INTERCOM MODE	36
3.5 TALK GROUP LOCK OUT	37
3.5.1 Locking Out a Talk Group	37
3.5.2 Unlocking a Talk Group	38
3.5.3 Caution Regarding Profile Changes	38
3.6 SCAN MODE	39
3.6.1 Checking or Changing Active Scan Mode	39
3.6.2 Changing Priority Talk Group	40

TABLE OF CONTENTS

	<i>Page</i>
3.7 SELECTIVE CALL	40
3.7.1 Making a Selective Call	40
3.7.2 Receiving a Selective Call	41
3.8 SELECTIVE ALERT	42
3.8.1 Sending Selective Alert Messages	42
3.8.2 Receiving Selective Alert Messages	43
3.8.3 Defining Pre-Programmed Messages	44
3.9 TELEPHONE INTERCONNECT CALLS	44
3.10 EMERGENCY COMMUNICATIONS	44
3.10.1 Declaring an Emergency Call or Alert	45
3.10.2 Clearing an Emergency Call or Alert	46
3.10.3 Receiving an Emergency Call	46
3.10.4 Dismissing an Emergency Call	47
3.11 DUAL-TONE MULTI-FREQUENCY KEYPAD	48
3.11.1 Password Entry	49
3.11.2 DTMF Overdial	50
3.12 ENCRYPTION	50
3.12.1 Automatic Encryption	50
3.12.2 Manual Encryption	51
3.13 PRESET BUTTONS	52
3.14 DYNAMIC REGROUPING	52
3.15 GPS COORDINATES	52
3.16 V-TAC FUNCTIONS	53
3.16.1 Extended Coverage Modes (“XCOV” & “XCOV-TG”) ..	53
3.16.2 Scene-Of-Incident Mode (“SOI”)	56
3.16.3 Mobile-Only Mode (“Mobile”)	57
3.16.4 Changing V-TAC Mode	57
3.16.5 Displaying VTAC Information	57
3.17 ENGINEERING DISPLAY	58
3.17.1 Voice and Data Registration Codes	58
3.17.2 Transceiver Status	59
3.17.3 Receive Signal Strength Indication (RSSI)	60
3.17.4 Control Block Symbol Error Rate (CBSER)	60
4 BASIC TROUBLESHOOTING	61
5 WARRANTY	63

TABLE OF CONTENTS

Page

FIGURES

Figure 2-1: Personality Structure Example.....	13
Figure 2-2: M-803 and CH-103/103PA Front Panel.....	14
Figure 2-3: M-803 Rear Panel (Half-Duplex Radio Shown)	15
Figure 2-4: CH-103 Control Head Rear Panel.....	16
Figure 2-5: V-TAC Rear Panel.....	17
Figure 3-1: Front Panel Components.....	18
Figure 3-2: Sample Display (Talk group Menu Session).....	20
Figure 3-3: Basic Menu Structure.....	23
Figure 3-4: Top and Bottom Display Lines	24
Figure 3-5: Power Button/Volume Dial.....	26
Figure 3-6: Dwell Display and Speaker Volume Icon	26
Figure 3-7: Side Tones Menu	33
Figure 3-8: Profile Menu	35
Figure 3-9: Talk Group Menu.....	36
Figure 3-10: Lock Out Menu	38
Figure 3-11: DTMF Microphone Keypad.....	48
Figure 3-12: Example Engineering Display.....	58

TABLES

Table 1-1: Minimum Allowable Distances.....	7
Table 2-1: V-TAC Connections.....	17
Table 3-1: Front Panel Controls and Functions	19
Table 3-2: Display Parts and Functions	21
Table 3-3: Scan Modes.....	39
Table 3-4: Selective Alert Status Messages.....	43
Table 3-5: Voice Registration Codes.....	59
Table 3-6: Data Registration Codes.....	60
Table 4-1: Basic Troubleshooting.....	61

1 SAFETY INFORMATION



The M-803 digital mobile radio generates RF electromagnetic energy during transmit mode. This radio is designed for and classified as “Occupational Use Only”, meaning it must be used only during the course of employment by individuals aware of the hazards and the ways to minimize such hazards. This radio is NOT intended for use by the “General Population” in an uncontrolled environment.

This radio has been tested and complies with the FCC RF exposure limits for “Occupational Use Only.” In addition, the M-803 digital mobile radio complies with the following Standards and Guidelines with regard to RF energy and electromagnetic energy levels and evaluation of such levels for exposure to humans:

- FCC OET Bulletin 65 Edition 97-01 Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
- American National Standards Institute (C95.1 – 1992), IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz.

Use of this radio as described below will result in user exposure substantially below the FCC recommended limits for human exposure to Radio Frequency Electromagnetic energy.

Before operating this radio:

- Do not operate this radio if any of the RF connectors are not secure or if open connections are not properly terminated.
- Do not operate this radio near electrical blasting caps or in an explosive atmosphere.

This radio has been tested and complies with the FCC RF exposure limits for Uncontrolled Exposure and Occupational exposure. The difference is in the minimum safe distance that people must be away from the antenna when transmitting RF energy. To assure optimal radio performance and that human exposure to RF electromagnetic energy is within the guidelines, transmit only when people are at least the minimum distance away from a properly installed antenna. Refer to Table 1-1 for the minimal allowable distances.

Note that the M-803 can transmit without pressing the PTT as part of the normal registration process the radio periodically performs. The TX light behind the SELECT button on the front panel will glow red when this or any transmission is in process.

Table 1-1: Minimum Allowable Distances

RATED POWER	ANTENNA GAIN	MPE¹ UNCONTROLLED*	MPE CONTROLLED*
43.9 dBm max 41.8 dBm nominal	0 dBd	62 cm (24.4 inches)	27.7 cm (10.9 inches)
43.9 dBm max 41.8 dBm nominal	3 dBd	87.6 cm (34.5 inches)	39.2 cm (15.4 inches)
*Refers to Controlled (Occupational Use) and Uncontrolled (General Population Use) exposure.			

The radio must be serviced and installed only by a qualified technician. Be sure that the radio is properly grounded according to the installation instructions.



Before jump starting or changing the vehicle battery, it is strongly suggested that DC power connector(s) be disconnected from the radio equipment (including control head(s), if any). This will prevent voltage surges that may occur from damaging the radio equipment.

This equipment generates or uses radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

Government law prohibits the operation of unlicensed transmitters within the territories under government control. Illegal operation is punishable by a fine, imprisonment, or both. Refer service to qualified technicians only. Do not operate the transceiver in explosive atmospheres (gases, dust, fumes, etc.).

¹ The MPE radius is the minimum distance from the antenna axis (distances listed in Table 1-1) that persons should maintain in order to avoid RF exposure higher than the allowable MPE level set by the FCC.

1.1 OCCUPATIONAL SAFETY GUIDELINES AND SAFETY TRAINING INFORMATION

The M-803 mobile radio transmits using a remote antenna. When it is ON, it receives and transmits radio frequency (RF) signals. In 1996, the Federal Communications Commission (FCC) adopted RF exposure guidelines with safety limits, based on the recommended limits of the National Council on Radiation Protection and Measurements (NCRP) and the American National Safety Institute (ANSI).

The design of the M-803 mobile radio complies with the FCC guidelines for Occupational/Controlled exposure to RF electromagnetic fields, as measured by the Maximum Permissible Exposure (MPE). To assure optimal performance and human exposure to RF electromagnetic energy is within the FCC guidelines, always adhere to the following:

1. The push-to-talk button should only be depressed when intending to send a voice message.
2. The radio should only be used for necessary work related communications.
3. The radio should only be used by authorized and trained personnel and should not be operated by children.
4. Do not operate the radio in explosive atmospheres (gases, dust, fumes, etc.) or near explosive blasting caps.
5. Do not attempt any unauthorized modification to the radio. Changes or modifications to the radio may cause harmful interference. Only qualified personnel should service the radio.
6. Always use M/A-COM authorized accessories (antennas, control heads, speakers/microphones, etc.). Use of unauthorized accessories can cause the FCC RF exposure compliance requirements to be exceeded.

The information listed above provides the user with the information needed to make him or her aware of a RF exposure, and what to do to assure that this radio operates within the FCC exposure limits of this radio.

1.2 COMMON HAZARDS

The operator of any mobile radio should be aware of certain hazards common to the operation of vehicular radio transmissions. Possible hazards are:

1. Explosive Atmospheres

Just as it is dangerous to fuel a vehicle with the motor running, be sure to turn the radio OFF while fueling the vehicle. Do NOT carry containers of fuel in the trunk of the vehicle if the radio is mounted in the trunk.

2. Interference To Vehicular Electronic Systems

Electronic fuel injection systems, electronic anti-skid braking systems, electronic cruise control systems, etc., are typical types of electronic devices that can malfunction due to the lack of protection from radio frequency (RF) energy present when transmitting. If the vehicle contains such equipment, consult the dealer for the make of vehicle and enlist his aid in determining if such electronic circuits perform normally when the radio is transmitting.

3. Electric Blasting Caps

To prevent accidental detonation of electric blasting caps, **DO NOT** use two-way radios within 1000 feet (304.8 meters) of blasting operations. Always obey the "Turn Off Two-Way Radios" signs posted where electric blasting caps are being used. (OSHA Standard: 1926.900)

4. Radio Frequency Energy

To prevent burns or related physical injury from radio frequency energy, do not operate the transmitter when anyone outside of the vehicle is within the minimum safe distance from the antenna as specified in Table 1-1.

5. Vehicles Powered By Liquefied Petroleum (LP) Gas

Radio installation in vehicles powered by liquefied petroleum gas, where the LP gas container is located in the trunk or other sealed-off space within the interior of the vehicle, must conform to the National Fire Protection Association Standard NFPA 58. This requires:

- a. The space containing radio equipment is isolated by a seal from the space containing the LP gas container and its fittings.
- b. Outside filling connections are used for the LP gas container.
- c. The LP gas container space is vented to the outside of the vehicle.

6. Vehicles Equipped With Airbags

For driver and passenger safety, avoid mounting the control head (or any other component) above or near airbag deployment areas. In addition to driver-side and passenger-side front-impact airbags, some vehicles may also be equipped with side-impact airbags. For occupant safety, verify the location of all airbags within the vehicle before installing the radio equipment.

2 PRODUCT DESCRIPTION

The M-803 digital mobile radio is a hardware component of the OpenSky[®] network, an integrated voice and data communications system that delivers end-to-end digital transmissions over a single wireless network to the dash-mounted or trunk-mounted radio receiver.

The M-803 is intended to operate in a mobile environment, typically a motor vehicle. The radio operates over both the Specialized Mobile Radio (SMR) and National Public Safety Planning Advisory Committee (NPSPAC) frequency bands. These bands provide more than 840 possible channels spread over the 806-824 MHz transmit and 851-869 MHz receive bands. The M-803 operates half-duplex with a 15W (typical) transmit output power. Optional full-duplex operation is also available.

The M803 is available in four hardware configurations, three of which are further defined for data operation as half- or full-duplex:

- Dash mount with built-in control head. Additional remote control heads can be added (half- or full-duplex).
- Trunk mount with a single or multiple remote control heads (half- or full-duplex).
- Data only – No control head (half- or full-duplex, PC required).
- V-TAC Full Duplex Vehicle Repeater with a one or more remote control heads.

The M-803 uses Time Division Multiple Access (TDMA) technology to allow multiple users to share a single RF channel. In addition, a single RF channel can support simultaneous digital voice and data communications. The V-TAC takes advantage of OpenSky's TDMA ability to minimize interference between its local and network radio links when operating in an Extended Coverage mode (XCOV or XCOV-TG), an undesirable characteristic of many traditional vehicular repeater systems.

The M-803 provides integrated voice and data services. Voice operation is provided using a microphone and speaker included in the radio installation kit. For data transfers, the M-803 is constructed with an industry-standard RS-232 interface serial port for connecting an optional laptop PC.

A PC, not included with the M-803, provides network connectivity through the standard serial (DTE-type) interface.

The M-803 is a "soft" radio. Its functions are determined by the software applications installed.

The optional GPS tracking devices embedded in M-803 radios can provide quick and accurate positional information to a connected laptop locally in the vehicle. GPS can also provide positional information over the radio link, if configured to do so.

Unlike most dispatch radio systems, however, an active transmission can be pre-empted by a dispatcher or supervisor. This results in the transmitting radio instantly switching to receive the “priority” in-bound call. Normal operation can be resumed once the in-bound call is concluded. This feature is particularly useful for V-TAC users operating as a scene commander.

2.1 VOICE OPERATION

The voice path operates like a traditional dispatch radio, with a microphone to transmit (push-to-talk) and a speaker to receive. In OpenSky Trunked Protocol (OTP), there is no separate voice and data path – all transmitted information is digital.

2.2 DATA OPERATION

Data operation requires the connection of a laptop PC. OpenSky works through standard IP protocols such as UDP/IP. The data path operates similarly to the voice path, with a few differences. All external data information in and out of the radio uses the RS-232 serial port connection.

2.3 REMOTE CONTROL HEAD OPERATION

For remote mount installations configured with a CH-103 control head, all normal radio operations and interfaces can be made remotely from the radio unit via the remote control head connected to the radio unit by a single twisted-pair connection that is easy to route through a vehicle. Up to six control units may be attached to a trunk mount radio or V-TAC. Each control head provides a serial access point for data and any one (only one at a time) of these can be connected to a data device such as a personal computer.

Where multiple control heads are connected, or where a dash-mount radio is installed with additional remote control heads, several other features are available from each position:

- Outgoing voice calls can be initiated. (Any control head can initiate a call but only one can talk at a time. All other connected control heads will hear both sides of the conversation.)
- Incoming and outgoing audio can be heard. (Outgoing audio is not broadcast at the source position.)
- Independent audio control is available.
- Radio settings such as talk group, scan mode etc., can be controlled. (Any connected control head can override the radio settings of other connected control heads.)
- Comfort settings, such as volume and display brightness that are applicable to the individual control head can be adjusted and cannot be overridden by other control heads.

- An optional intercom function is available between control units. (Audio will be broadcast to ALL connected control heads.)

2.4 INTERCOM OPERATION

The intercom option, a licensed option, allows the M-803 radio to pass audio locally between control heads and not over the network. It gives users at multiple control heads connected to the same radio the ability communicate with each other without transmitting over-the-air. When activated, incoming network radio calls are still scanned and broadcast at each control head.

2.5 V-TAC OPERATION

V-TAC operation requires the V-TAC hardware configuration (RF Combiner, Vehicular Repeater Base VRB, and Mobile Radio Unit MRU) and offers the user four (4) different operating modes: Extended Coverage for individual users (XCOV), Extended Coverage for talk groups (XCOV-TG), Scene of Incident (SOI), and normal Mobile-Only operation. Refer to section 3.16 for operating information on these modes.

2.6 PERSONALITY

As illustrated in Figure 2-1, a personality defines the profiles and talk groups available to the user. It is the structuring of a collection of profiles and privileges established by the OpenSky network administrator to provide the user with a comprehensive set of profiles to communicate effectively with the necessary talk groups or individuals.

Personalities are stored on the network and downloaded over-the-air to the radio. This process is called “provisioning.” Provisioning occurs at radio power-up and at user log-in. Each personality can contain up to sixteen (16) profiles and each profile can contain up to sixteen talk groups.

2.6.1 Profiles

As stated above, each profile can contain up to sixteen (16) talk groups. A profile also defines the radio’s emergency behavior. All transmissions are made on the selected talk group (displayed on the top line of the dwell display). The user can change the selected talk group to any of the other talk groups within the profile.

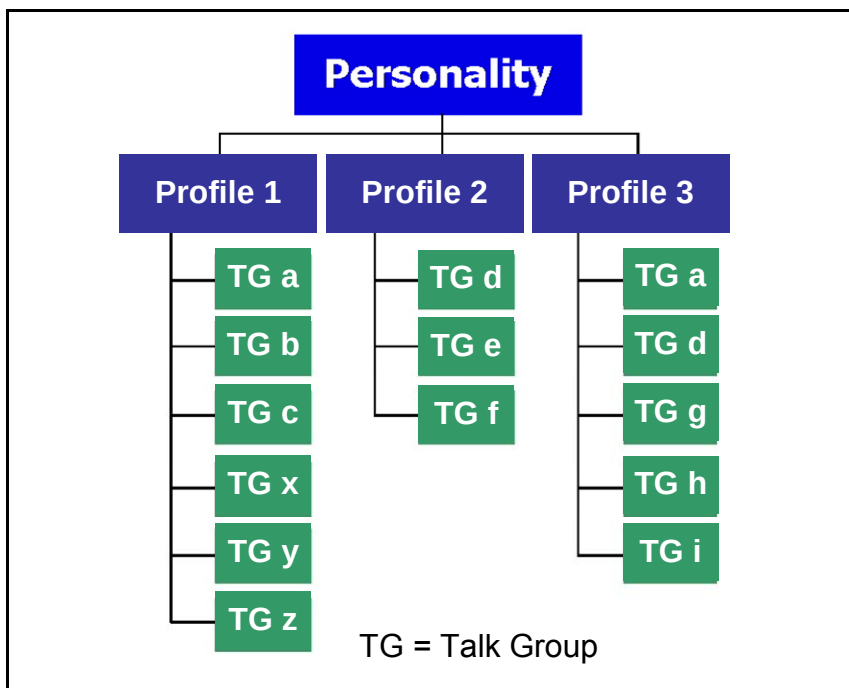


Figure 2-1: Personality Structure Example

2.6.2 Talk Groups

A talk group represents a set of users that regularly need to communicate with one another. There can be any number of authorized users assigned to a talk group. Talk groups are established and organized by the OpenSky network administrator. An OpenSky talk group is similar to a channel within a conventional FM radio system.

2.7 GPS OPTION

The radio can be equipped with an optional Global Positioning System (GPS) receiver. Utilized with a micro-patch antenna, this option allows the user to track his/her coordinates and report these to central dispatch when within range of an OpenSky network. See page 52 for additional information.

2.8 FRONT PANEL

The front panel provides the interface for the operator. It includes a 19-character (8 over 11) vacuum fluorescent display, navigation and select buttons for menu navigation, three pre-set buttons, a power button/rotary volume control knob, a microphone connector, and an emergency button. The front panel of the dash-mounted M-803 mobile radio is identical to the front panel of the CH-103 control head utilized in remote/trunk-mounted M-803 and V-TAC radio installations.

In addition, the front panel contains a light-level sensor that samples ambient light levels for automatic display and button backlight brightness adjustments. In other words, it automatically brightens the display and backlights when higher external light levels exist and it automatically dims the display and backlights during lower external light levels.

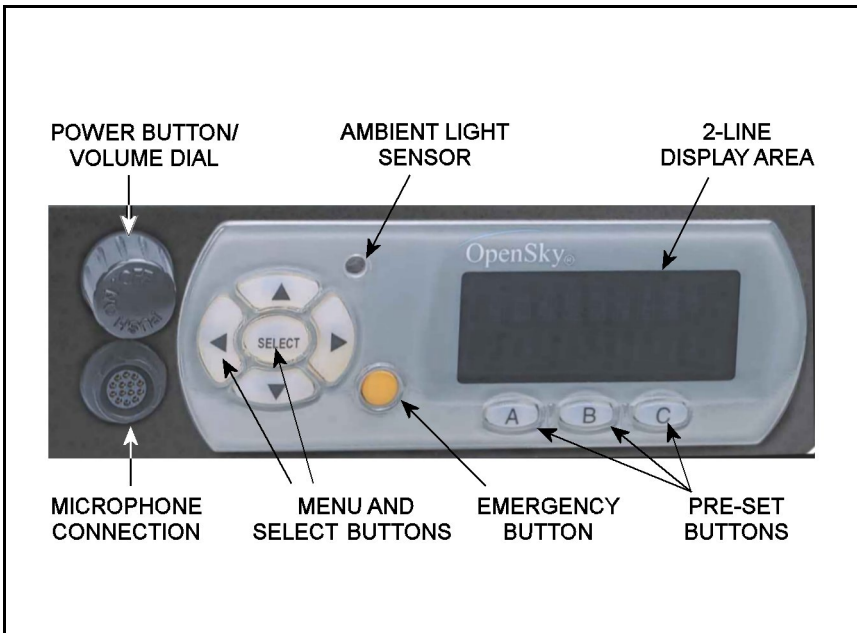


Figure 2-2: M-803 and CH-103/103PA Front Panel

2.9 M-803 REAR PANEL

The M-803 rear panel is shown in Figure 2-3. It contains most of the radio's cable connections. The DC power connector accepts vehicle battery power to power the radio and an ignition/accessory control sense input. The I/O connector contains the speaker output connections and optional connections, including NMEA-formatted GPS output data if the optional GPS receiver is installed in the radio. A serial port is provided for connection to a standard serial (DTE-type) device such as a mobile data terminal. An antenna port connection is also available for connecting a GPS antenna if the optional GPS receiver is installed in the radio. If not, a nylon plug is inserted into this hole. Connection to a CAN² device such as the CH-103 control head, is made through the 3-pin CAN connector.



The radio uses a nominal amount of battery power when it is turned off. If the vehicle in which the radio is installed is likely to be left unused for extended periods of time, M/A-COM recommends installing Time-Delay Relay (p/n MAMROS0088) to prevent excessive vehicle battery drain.

Finally, the TX/RX mini-UHF connector (half-duplex) provides connection for an RF antenna and the RX port is capped with a nylon plug. For full-duplex radios, the RX port has a TNC connector output and both RF ports and antenna are connected through an RF combiner.

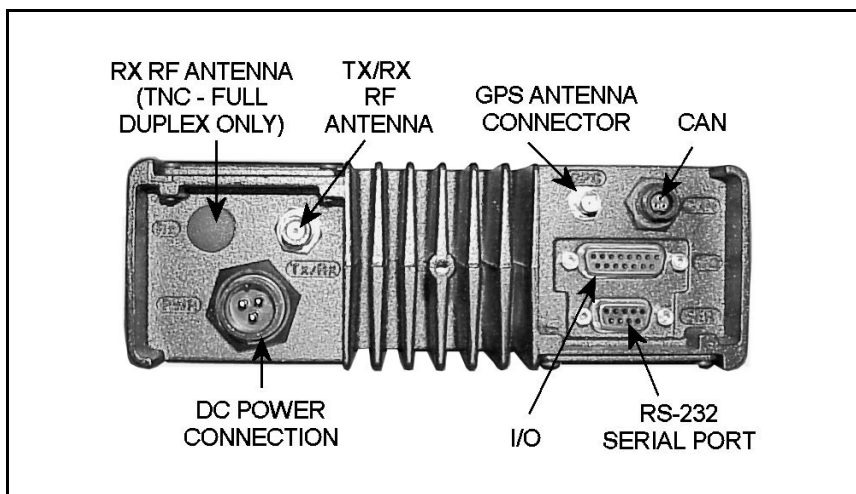


Figure 2-3: M-803 Rear Panel (Half-Duplex Radio Shown)

² Controller Area Network—a type of digital interface used to transfer control data and digitized voice data between the mobile radio and control head(s) connected to it.

2.10 CONTROL HEAD REAR PANEL

The rear panel of the CH-103 control head contains the interface connections necessary between the radio and control unit. As shown in Figure 2-4, five connection points are:

- **POWER** - The DC power connector accepts vehicle battery power to power the unit and an ignition/accessory control sense input for on/off control via the vehicles ignition switch/key.
- **AUDIO** – Provides connection to an external speaker.
- **SERIAL** – An serial port is provided to transfer data to and from a mobile data terminal or PC. It is configured as a DTE device.
- **CAN** – The two 3-pin CAN connectors are used to connect the CH-103 (a CAN device) to the M-803/V-TAC and to other control heads. These two connectors are connected in parallel to allow daisy chaining of additional control heads. A terminator (supplied) must be connected to the unused CAN port of the last control head.

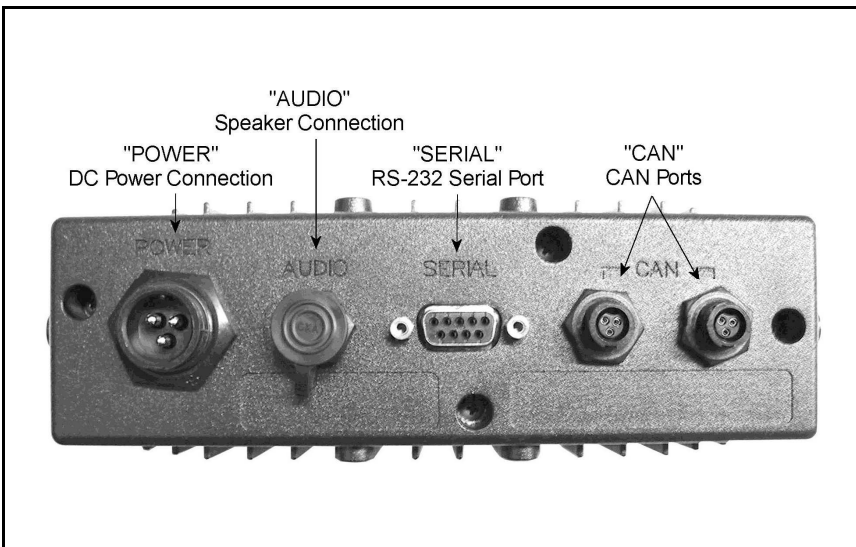


Figure 2-4: CH-103 Control Head Rear Panel

2.11 V-TAC REAR PANEL

As shown in Figure 2-5, the V-TAC consists of an RF Combiner and two radio units, assembled to allow operation from a single antenna. One of the radio units, the MRU, is configured as a mobile radio. The second radio unit, the VRB, is configured to operate with a base station frequency plan. Each unit requires connection to a DC power source. All cable connections are color coded on the rear panel of the V-TAC components. Refer to Table 2-1 for connection details.



Figure 2-5: V-TAC Rear Panel

Table 2-1: V-TAC Connections

RF COMBINER	VEHICULAR REPEATER BASE (VRB)	MOBILE RADIO UNIT (MRU)
From BTX (blue)	To TX/RX RF Antenna	
From MRX (red)		To RX RF Antenna
Antenna		
From MTX (green)		To TX/RX RF Antenna
From BRX (yellow)	To RX RF Antenna	
DC Power	DC Power	DC Power
From I/O Port	I/O Port	From I/O Port
	RS-232 Port	RS-232 Port
		GPS Antenna
	CAN Ports	CAN Ports

BTX = VRB transmit port; BRX = VRB receive port; MTX = MRU transmit port; MRX = MRU receive port

3 OPERATION

3.1 FRONT PANEL COMPONENTS OVERVIEW

The front panel of the dash-mounted M-803 mobile radio is identical to the front panel of the CH-103 control head utilized in remote/trunk-mounted M-803 and V-TAC radio installations. It includes a 19-character 2-line display, menu and select buttons for menu navigation, an emergency button, three pre-set buttons, a power button/rotary volume dial, a microphone connector. See Figure 3-1. Table 3-1 lists all front panel controls and their functions.

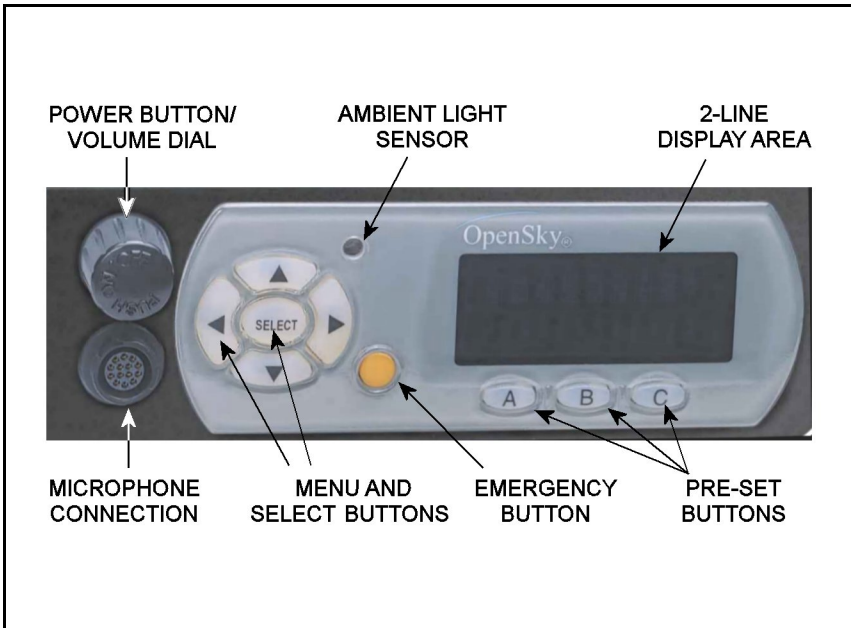


Figure 3-1: Front Panel Components

The buttons on the front panel are backlit for operation in a low ambient light level, such as nighttime operation. Some buttons also flash to provide feedback of various operating conditions.

In addition, the front panel contains a light-level sensor that samples ambient light levels for automatic display and button backlight brightness adjustments. In other words, it automatically brightens the display and backlights when higher external light levels exist and it automatically dims the display and backlights during lower external light levels.

Table 3-1: Front Panel Controls and Functions

PART	FUNCTION
POWER Button/ Volume Dial	• Push to turn the radio on³. • Push and hold for approximately one-half (0.5) of a second⁴ to turn the radio off. • Twist clockwise to increase volume. • Twist counter-clockwise to decrease volume.
Mic Connection	• Connect hand-held, hands-free, DTMF microphone, speaker-mic, or headset here.
EMERGENCY button	• Pressing the EMERGENCY button, if enabled through programming, will send an emergency alert and open voice communication on the currently selected talk group or the default emergency talk group (depending upon how the system is defined). • To end an emergency call, press and hold the emergency button for approximately four seconds.
AMBIENT LIGHT sensor	• Radio automatically adjusts the display and button backlight brightness level based on ambient light. Do not block this sensor.
MENU and SELECT buttons	• Cycle through the menu loop with UP ▲ and DOWN ▼ buttons. • Scroll through selections with LEFT ◀ and RIGHT ▶ buttons. • Press SELECT button to activate the current selection. In some cases, this is not necessary as the last selection will automatically activate after a short period. • The SELECT button flashes green when the radio is receiving and red when the radio is transmitting.
DISPLAY area	• Menu selections and messages. • Network Connectivity icon (Figure 3-2) • Current Volume Level icon (Figure 3-2) ♦ Volume numeric representation within the display (0 = Muted, 40 = Loudest). • User may select which one of several dwell displays the radio uses.
PRE-SET buttons	• These buttons are used to store and recall user-selectable parameters such as scan mode, selected profile, selected talk group, and priority talk group. Different parameters can be stored at each of the three different pre-set buttons.

³ The Power Button may be configured to function in different ways or be disabled altogether. Refer to Section 3.3.1 for more detail. At power-up to V-TAC mode (e.g., portable radio not in vehicular charger at V-TAC turn on), the V-TAC will sound four tones (high-medium-high-medium) as it initiates the default Extended Coverage mode.

⁴ The length of time necessary to hold the Power Button is configurable. The default time length is one-half of a second.

3.2 DISPLAY OVERVIEW

The display shows the radio status (Table 3-2). Network connectivity and volume icons appear on the right. The volume level is also represented numerically within the display with zero (0 or muted) being the lowest volume level and forty (40) being the highest/loudest level. “Mute” displays when the speaker is muted. The rest of the display consists of two text lines that change in response to user interaction with the menu buttons. A sample display is shown in Figure 3-2.

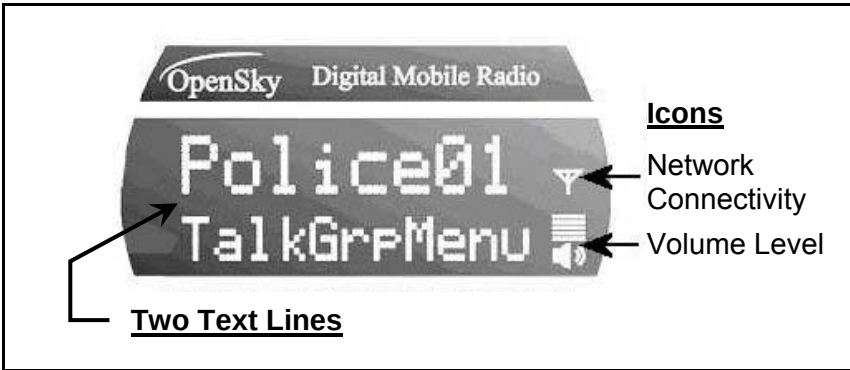


Figure 3-2: Sample Display (Talk Group Menu Session)

3.2.1 Network Connectivity Icon

The illuminated network connectivity icon (refer to Table 3-2) indicates network connectivity has been achieved. This icon will always be illuminated when the powered radio is connected to the “network.”



NOTE

Transmitting voice communications may be possible even if the Network Connectivity icon is not illuminated. However, reception of voice calls from others is not guaranteed while in this state.

3.2.2 Volume Level Icon

As shown in Figure 3-2, the volume level icon indicates the current speaker/headset volume setting. Turn the volume dial to change the setting.



NOTE

In addition to the volume level icon at the right of the display, volume level is also presented numerically within the display. This numeric representation only appears during, and briefly after, the volume adjustment is made.

3.2.3 Display's Top Line

The display's top line of text changes as the ◀ and ▶ menu buttons are pressed to scroll through the selections in the active menu. When the dwell display is present, press the ◀ and ▶ buttons to scroll through available talk groups. The top line of the display also indicates other information such as the selected talk group when the dwell display is active, and alert messages.

3.2.4 Display's Bottom Line

The display's bottom line of text changes as the ▲ and ▼ menu buttons are pressed to scroll through the menus. The menu structure is shown in Figure 3-3 on page 23. The bottom line of the display also indicates other information such a login prompt, emergency status, and dwell display messages as described in the following section.

3.2.5 Dwell Display

When not engaged in menu selection, the 2-line display defaults to the user-defined default display, known as the “dwell display.” The top line indicates the currently selected talk group. The bottom line indicates the currently selected profile, received talk group/caller ID/alias⁵, V-TAC mode, V-TAC channel, or radio channel. To set one of these bottom line options, press the **Select** button from the dwell display.

Table 3-2: Display Parts and Functions

COMPONENT	FUNCTION
Network Connectivity Icon 	When the network connectivity icon is illuminated, there is a network connection and not illuminated when there is no network connection.
VOLUME Icon 	Shows current speaker volume setting chosen by the user. Note that a momentary numerical representation will also be shown within the display while the volume is being adjusted.
TWO TEXT LINES	During a menu session, the display's bottom line responds to ▲ (up arrow) and ▼ (down arrow) buttons. It indicates the current menu. For example, the Talk group Menu is selected in Figure 3-4. The display's top line responds to the ◀ (left arrow) and ▶ (right arrow) buttons. It indicates the options within the current menu. For example, “Police1” is the currently selected talk group in Figure 3-4.

⁵ Alias is a logical ID name such as “J_Smith.” The name corresponds to a user ID such as 003-542-0001. Alias is limited to eight (8) characters.

Menu Name	Radio Displays (top and bottom lines)	Usage Notes
To/From Dwell Display (Bottom menu on page 23)		
Engineering Display (Menu may not be available per programming.)	registration, RF sync and transceiver status codes bit-error rates and RSSI data	Displays radio system connection data. For engineering use. See page 58.
GPS Fix	current latitude and longitude (degrees:- minutes:seconds) "GPS Fix"	Radio's current GPS latitude and longitude position scrolls across top line of the display. Applies to GPS-equipped radios only. See page 52.
User ID	User ID # of user currently logged in "User ID"	User's identification/name scrolls across top line of the display (if programmed).
IP Address	Radio's IP address "IP Address"	Radio's Internet Protocol (IP) address scrolls across top line of the display.
Station Identification	station's call sign "Station ID"	Station's identification/name scrolls across top line of the display (if programmed).
V-TAC Mode (e.g., XCOV, XCOV-TG, SOI)	V-TAC operating mode "Vmode Menu"	Use ◀ or ▶ to turn choose an available V-TAC operating mode. See page 53.
V-TAC Channels (Menu appears only if in SOI mode.)	V-TAC SOI channel "Vchan Menu"	Use ◀ or ▶ to turn choose an available V-TAC channel for Scene-Of-Incident (SOI) mode communications. See pages 53 and 56.
Operating Mode (e.g., OTP, OCF)	available modes "Mode Menu"	Use ◀ or ▶ to turn choose an available mode. Press Select and confirm (Y/N) with ◀ or ▶ and Select again.
Stealth Mode (blanks display when on)	"OFF" "StealthMenu"	Use ◀ or ▶ to turn on. Press any button to turn it off. See page 34.
Treble Level	"LOW", "MEDIUM", "MEDHIGH", "HIGH" "Treble Menu"	Use ◀ or ▶ to choose speaker/headset treble level. Press Select to return to dwell display. See page 33.
Display Brightness	"<< >>" "Bright Menu"	Use ◀ to dim and ▶ to brighten backlighting. Press Select to return to dwell display. See page 33.
Side Tone Level	"OFF", "LOW", "MED", "HIGH" "Side Menu"	Use ◀ or ▶ to choose side tone level. Press Select to return to dwell display. See page 32.
Intercom	"ON" or "OFF" "INTERCOM"	Use ◀ or ▶ to turn intercom on and off. Press Select to return to dwell display. See page 36.
See Next Page		

Menu Name	Radio Displays (top and bottom lines)	Usage Notes
	See Previous Page ▲ ▼	
Selected Channel (Menu may not be available per radio programming)	selected channel "ChannelMenu"	Displays the current channel. Press Select to return to dwell display.
Scan Mode	current scan mode "ScnModeMenu"	Use ◀ or ▶ to turn scan on and off. Press Select to return to dwell display. See page 39.
Talk group Lock Out	talk group "<" "LockOutMenu"	Use ◀ or ▶ to choose a talk group for locking/unlocking. Press Select to toggle "<" on (locked out) and off. See page 37.
Priority Talk group	current priority talk group "PriTG Menu"	Use ◀ or ▶ to choose new priority talk group. Press Select to return to dwell display. See page 40.
Emergency Dismiss	alert received "EmgDismiss"	Use ◀ or ▶ to choose emergency talk group. Press Select to dismiss. See page 47.
Alerts Received	time/sender's name/ alias/message text "AlertsRecvd" or oldest message	"No alerts" or alert message text scrolls in display. Use ◀ to view older messages and ▶ to view newer messages. See page 43.
Alert Message	alert received "AlertMsg"	Use ◀ or ▶ to choose message for sending/transmitting. See page 42.
Alert Destination	current speed dial # "AlertDest"	Use ◀ or ▶ to choose a speed-dial number. Press Select to return to dwell display. See page 42.
Speed Dial	current speed dial # "SpeedDial"	Use ◀ or ▶ to choose a speed-dial number. Press Select to return to dwell display. See page 40.
Profile Selection	currently active profile "ProfileMenu"	Use ◀ or ▶ to choose an available profile. Press Select to return to dwell display. See page 34.
Talk group Selection	selected talk group "TalkGrpMenu"	Use ◀ or ▶ to choose a talk group in current profile. Press Select to return to dwell display. See page 35.
Dwell Display	Selected talk group (bottom line option)	Use ◀ or ▶ to scroll top line through talk groups. Press Select to change bottom line option. See pages 21 & 24.
Use ▲ (up arrow) and ▼ (down arrow) to scroll through menus.		

Figure 3-3: Basic Menu Structure



Menus will vary depending upon system programming, radio hardware, and optional configurations. See the NOTE on the next page for details.



NOTE

All menus except the dwell display menu can be turned off by network administration personnel.

No V-TAC-related menus are displayed on non-V-TAC radios/control heads.

The “Vchan Menu” is not displayed if the V-TAC is in the Mobile-Only mode.

If a V-TAC is in an Extended Coverage mode (XCOV or XCOV-TG), the number of portable radios (“clients”) connected to the V-TAC is displayed in the bottom line of the dwell menu.

If a V-TAC is in the Extended Coverage for talk groups mode (XCOV-TG), the selected talk group and profile in use is displayed.

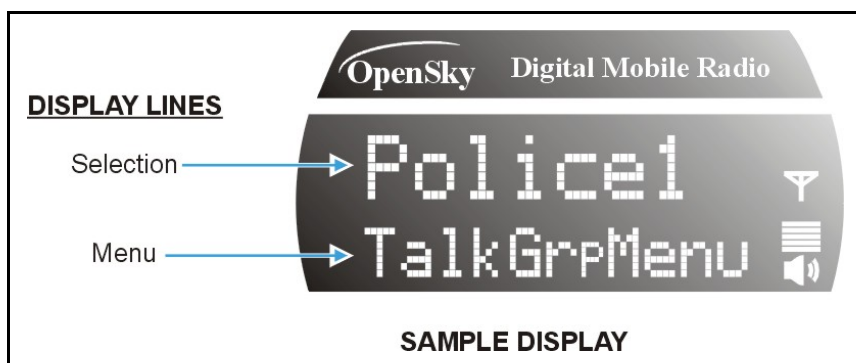


Figure 3-4: Top and Bottom Display Lines

3.2.6 Menu Display and Control Area

Following power-up, the radio display shows the default talk group. Pressing the ▲ and ▼ buttons change the display to the next available menu. Refer to Figure 3-3: Basic Menu Structure. In many cases, the dwell display automatically re-appears after no menu buttons are pressed for a short period of time (between 10 and 30 seconds). For some menus such as the GPS Fix and User ID menus, this does not occur until the user presses a front panel button.

When the dwell display is active, it will change dynamically to reflect the current profile, received talk group/caller ID (when available), or channel (when enabled). V-TAC mode or V-TAC channel can be displayed as well on V-TAC installations.

The radio’s display is highly interactive. It responds in the top and bottom text lines as the user presses the menu buttons (▲, ▼, ◀, ▶ and Select) to scroll through the menu loop and the entries for each menu.



NOTE

Although the radio display supports eight (8) characters on the top line, systems currently limit talk group names to seven (7).

3.2.7 Dwell Display User-Selectable

The top line of the dwell display for OpenSky trunked mode operation is always the selected talk group for the profile of the particular radio. What appears in the bottom line depends on the choice made as a dwell display option. From dwell display, press **Select** to change the bottom line display option by cycling through available options.

Whatever the preference, the radio will respond dynamically to changes in status, always displaying the current information about the current network connection. The bottom line indicates the currently selected profile, received talk group/caller ID/alias, V-TAC mode, V-TAC channel, or radio channel. To set one of these bottom line options, press the **Select** button from the dwell display. For V-TAC installations in a V-TAC mode, V-TAC mode or V-TAC channel can also be displayed. If a menu is not enabled it is not available for display in the bottom line of the dwell display.

Figure 3-3 shows the Basic Menu Structure and some options available. Available profiles, talk groups, and channels vary widely from network to network depending on system hardware, and option configuration.



NOTE

Visible menu items will vary depending on the system, hardware, and option configuration.

3.3 BASIC RADIO OPERATION

3.3.1 Turning the Radio On

1. If set-up to turn the radio on and off, press the **Power Button/Volume Dial** as indicated in Figure 3-5. The display will illuminate when the radio powers up. However, the **Power Button** portion of this control can be configured in another way as described in the following NOTE.

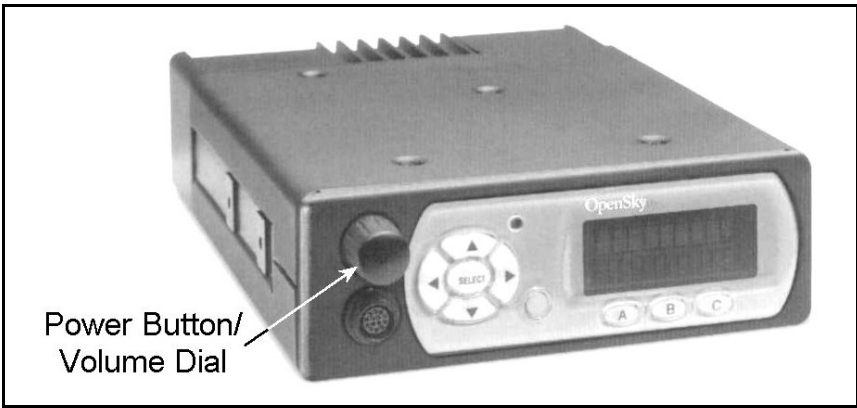


Figure 3-5: Power Button/Volume Dial

2. Wait for the power-up sequence to complete, which takes approximately ten (10) seconds.

During this time, if enabled for auto registration, the radio is provisioned with a customized user personality designed for the user's specific needs by the OpenSky network administrator.

If this personality contains encrypted talk groups or if the user is authorized for, and intends to use, manual encryption, User Login must be performed. This requires a microphone with a DTMF keypad so that the User ID and password can be entered.

3. When provisioning is complete, the radio will display the Dwell Display. See Figure 3-6.

If User Login is required, the bottom line of the Dwell Display will flash the message "Pls Login."



Figure 3-6: Dwell Display and Speaker Volume Icon

Shipped from the factory, the **Power Button** will need to be pressed a first time. It can then be configured to function in other ways. In most cases, the particular way is established during radio installation. The possibilities are:

- A. Turn the radio on and off by pressing the button.
- B. The button is disabled and the radio is turned on and off power with the vehicle's ignition key/switch.
- C. The button is disabled and the radio is turned on and off with a panel or dash-mounted switch (e.g., a toggle switch). Radio on/off power control is completely independent of the vehicle's ignition key/switch. This configuration is not recommended. If the radio is installed in this manner, it should be used with caution, as excessive battery drain can occur if the radio is left on for an extended period when the vehicle's engine is not running.
- D. A combination of power button control and ignition key/switch on/off power control (i.e., much like a standard car radio). For example, when the radio is turned off using the power button prior to turning the vehicle off using the ignition switch/key, it will not automatically turn back on when the vehicle is re-started. However, if the radio is left on when the vehicle is turned off, it will turn on and off with the vehicle's ignition key/switch. Unlike a standard car radio, and for public safety purposes, it is possible to turn the radio on while the vehicle is turned off.
- E. A setting can be changed to adjust the amount of time it takes for the radio to turn off to help prevent accidental press of the power button from turning the radio off. For example, a setting of two (2) seconds will require the power button be pressed and held for two seconds to turn the radio off. This feature is only available for the on-to-off transition.
- F. In multiple control head installations, the radio powers up when the first control head is turned on, and it powers down when the last control head is turned off.



NOTE

The radio has a power-off timer that, if enabled, automatically turns the radio (and control heads, if any) off after a period of no use (i.e., lack of button presses, voice or data transmissions, etc.) The timer's period is pre-programmed by the system or network administration personnel. Incoming voice traffic is not considered; in other words, these calls do not reset the automatic power-off timer.

3.3.2 Self-Test

After power-up, the M-803 radio undergoes a multi-function automatic registration procedure. As many as sixteen (16) possible radio profiles are downloaded to the radio from the network in response to the User's ID.

The M-803 mobile radio conducts a diagnostic Built-In Self-Test (BIST). This test is a battery of hardware diagnostic tests on the internal components of the Mobile Radio Unit (MRU). All processor and memory elements, interfaces, connectivity elements, and RF functionality are analyzed for operational integrity.

3.3.3 "Logging In" to the Network

Pushing the Power Button/Volume Dial will supply power to the radio (unless configured otherwise as noted in section 3.3.1). Login occurs either automatically (auto registration) if the radio has a valid registration or, if enabled and authorized for encryption (section 3.12), requires the user to enter a User ID and password.

If encryption is enabled and authorized on the radio, the user will be prompted to "Pls Login" with the *1 login command, a User ID, and password (DTMF microphone required, see section 3.11).

1. Press *1 (Login command).
2. Enter the full 10-digit User ID.
3. Press the # key.
4. Enter the password. See the following NOTE.
 - If the radio is configured for alpha-numeric passwords and the password has consecutive duplicate numbers ("MES33" for example), enter # between the consecutive duplicate numbers so the radio will not interpret the entry as a letter ("D" in this example).
 - If the radio is configured for numeric-only passwords, do not enter # between duplicated numbers.
5. Press the # key twice.

The User ID may be remembered from the previous log-in. (Refer to Section 3.3.4 for further details regarding log-off commands.) The password will be established before the radio is put into operation. Contact the local OpenSky network administrator for more information.



NOTE

If necessary, contact radio system administration personnel for log-in assistance and/or radio-specific log-in instructions.

3.3.4 Logging Off the Network

The *0## command de-registers the radio. Typically, it is automatically performed when correctly powering down the radio (i.e., not just disconnecting the radio from vehicle power). Using this method, the User ID is remembered by the radio so only the password is needed at next log-in. To manually log-off, press *0## on the DTMF microphone's keypad.

If a user is logged in using encryption features, it is necessary to log-off when encryption is no longer required.

3.3.5 Turning the Radio Off

To turn the radio off, push and hold the **Power Button/Volume Dial** for approximately one-half of a second (exact time is configurable). The radio's display fades to darkness. In a multiple control head installation, turning off the last powered-up control head will also automatically turn off the radio.

Several user-selected radio settings (i.e., scan mode, volume, pre-set buttons, and side tone levels) are maintained for the next operational session. At the next radio power-up, maintained settings will automatically restore, along with the network personality settings. In multiple control head installations, settings are maintained for each control head position.



If power is abruptly disconnected from the radio prior to executing the correct turn-off procedure, user-selected radio settings and last-tuned channel information will be lost. This can extend the time required for the radio to register with the network upon the subsequent power-up.

3.3.6 Receiving and Transmitting Voice Calls

As soon as the radio completes the startup/log-on/provision/self-test sequence and registers on the OpenSky network, voice calls from talk groups in the active profile will be audible.

3.3.6.1 Receiving a Voice Call

No action is required to receive a voice call. The display responds to incoming voice calls as follows:

- If the dwell display is set to received talk group/caller ID/alias, the display indicates either the User ID of the incoming caller, if available, or the talk group's name. If the selected talk group matches the receive talk group, caller ID/alias is displayed. Otherwise, the talk group (name) is displayed.
- If the dwell display is not set to received talk group, the display indicates the data appropriate to those displays, but provides no indication as to the identity of the incoming caller.

Refer to section 3.6 for detailed information on talk group scanning. Refer to section 3.12 for detailed information regarding sending and receiving encrypted calls.

3.3.6.2 Transmitting a Voice Call

Transmit a voice call as follows:

1. If not already, turn the radio on. See section 3.3.1 beginning on page 25 if necessary.
2. If required, log-in to the network using a user ID and password. See section 3.3.3 beginning on page 28 as necessary.
3. Select the desired talk group for transmitting on.
4. Depress and hold the **Push-to-Talk (PTT)** button on the hand-held microphone, pause for a moment, and then speak normally. For maximum clarity, hold the microphone approximately 1 ½ inches from the mouth and do not shout or whisper into it. If the call is queued by the network, wait for the grant tone to sound before speaking.
5. Release the PTT button when finished speaking.

Refer to section 3.12 for detailed information regarding sending and receiving encrypted calls.

3.3.7 Radio Tones

In addition to the volume level tones (sounded momentarily only when volume level is adjusted) and confirming tones (sounded momentarily when a menu or option is selected), the radio provides nine (9) other tones. These tones provide feedback to the user about whether the radio is able to transmit on the channel when the PTT button is pressed and are described below.

1. Deny Tone

If the radio is not able to access the channel when PTT is pressed, the radio will issue three short beeps, all of the same pitch, as the deny indication. The radio will issue the deny tone when the PTT is pressed if it is out of coverage, if the requested talk group is already active, or if the channel is busy. The user must release the Push-to-Talk button and re-key the PTT to make another call request.

2. Queued Tone

If the radio site is currently fully occupied with calls, a new call request may be queued by the system. The radio issues three tones, a low-pitched tone followed by two mid-pitched tones, to indicate the call has been placed in a queue. The user may release PTT at this point. When resources are available, the radio begins transmitting, the grant tone sounds, and the user must press PTT within five (5) seconds to hold the call up.

3. Grant Tone or Go-Ahead Tone

This feature must be enabled as part of the radio configuration to be active. When resources become available for a call request placed in the queue the grant tone sounds (if enabled) upon channel access. It is a short single tone beep. The user should press and hold the PTT button and begin speaking.

4. Removed Tone

After access to the radio channel has been granted and the user is transmitting, the radio may be pre-empted by a high priority call or by loss of coverage. The removed tone is a single long low-pitched tone, which notifies the user that access to the channel has been lost. When the removed tone is heard, access to the channel has been lost and the radio is no longer transmitting, even if the PTT button is being pressed. The PTT button must be re-keyed to regain channel access.

5. Start Emergency/Emergency Call Received

When an emergency call is initiated, all users configured to receive emergency call notification and the initiator of the call will hear three (3) short high-pitched tones.

6. Emergency Cleared Tone

When an emergency call has been initiated, the initiator of the call can clear the call by pressing and holding the emergency button until the emergency cleared tone (one long low-pitched) sounds. This tone sounds identical to the removed tone.

7. Emergency Alert Tone

This tone sounds when an emergency alert is declared. It is three (3) short beeps.

8. Selective Call Ring Tone

When a selective call is placed, a ringing tone is heard at the called radio similar to that of a telephone. The ringing is repeated every four (4) seconds until the call is accepted or rejected by the radio being called or until the network drops the call if unanswered after one (1) minute.

9. Selective Alert Received Tone

When a selective alert is received, the radio will emit a series of four short tones: low, high, low, low. The four tones are only played once to indicate a selective alert has been received.

10. Roam Tone

The roam tone is a quick high-low beep sequence that sounds when the radio transitions from one radio base station site to another. If this tone sounds just after pressing the PTT button, keep the PTT button depressed and begin speaking into the microphone after the grant tone sounds.

11. V-TAC On Tone

This tone sounds when a V-TAC automatically transitions from the mobile-only mode to one of the V-TAC XCOV modes, and from V-TAC XCOV mode to mobile radio mode. It does not sound on manual transition. It is a quick high-low-high-low-pitched beep.

12. V-TAC Client Attach/Detach Tone

This tone sounds when a portable radio (“client”) attaches to or detaches from the V-TAC. It is a quick high-pitched beep.

13. PSTN Ring Tones

There are two ring tones. One is generated by the radio when there is an incoming telephone call or an outgoing telephone call attempt is waiting for the telephone interconnect gateway equipment to dial the Public Switched Telephone Network (PSTN). This is a single medium-pitch reiterative tone. The second ring tone sounds when the gateway equipment has dialed the number. It is a digital recreation of the actual ring from the PSTN telephone line.

3.3.8 Adjusting Side Tone Audio Level

The radio sounds confirming tones called “side tones” when its buttons are pressed. Most users find this audible confirmation helpful when navigating the menus. Side tone audio level can be adjusted or turned completely off using the “Side Menu.”

For covert operations, it may be necessary to turn off side tones. For safety’s sake, turning off the radio during covert operations is not recommended.



Neither activating Stealth Mode nor turning side tones off will eliminate the tones sounded when adjusting the volume of the radio. Use volume control with caution when operating covertly.

To temporarily disable the side tones that could expose the user’s presence and position, use the menu buttons to access the “Side Menu” and select “Off” from the menu choices (Figure 3-7).

If the radio is operating properly but side tones are not heard when the menu buttons are pressed, the side tones are probably turned off. To turn them back on, access the “Side Tone” menu and select a setting other than “off.”

Use the following procedure set side tone level:

1. Use the ▲ and ▼ buttons to cycle through the menu until the “Side Menu” appears in the bottom line of the display.
2. Use the ◀ or ▶ buttons to change to the desired level (Off, Low, Medium, High). To turn side tones completely off, use the “Off” setting.

3. Press the **Select** button to confirm and begin using the side tone level setting. The dwell display will appear when the radio begins using the new setting.

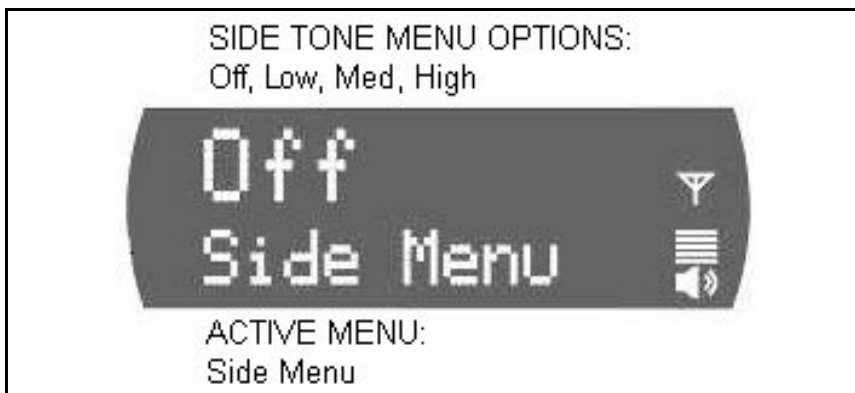


Figure 3-7: Side Tones Menu

3.3.9 Adjusting Display & Button Backlight Brightness

The radio uses a light sensor on the front panel to automatically adjust display brightness and button backlight brightness to ambient light conditions. The display and backlights automatically brighten at higher external light levels and automatically dim at lower external light levels. However, the “Bright Menu” gives the user some manual brightness control as follows:

1. Use the ▲ or ▼ button to scroll through the menu until “Bright Menu” appears. A “<< >>” symbol appears in the top line of the display.
2. Use the ◀ button to reduce the brightness or the ▶ button to increase the brightness. Display and button backlight brightness will immediately dim or brighten.

3.3.10 Adjusting Speaker/Headset Audio Treble Level

The tone of received signals heard in the speaker and headset can be adjusted using the radio’s “Treble Menu” as follows:

1. Use the ▲ or ▼ button to scroll through the menu until “Treble Menu” appears. The radio’s current treble level setting indicates in the top line of the display. There are four (4) levels available: low, medium, medium-high and high.
2. Use the ◀ button to reduce the treble level setting or the ▶ button to increase it.
3. Press the **Select** button to return to the Dwell Display.

3.3.11 Stealth Mode

The radio's display illumination and button backlighting can be completely turned off using stealth mode. Turn stealth mode on and off as follows:

1. Use the ▲ and ▼ buttons to cycle through the menu until "StealthMenu" appears.
2. To immediately turn stealth mode on, press either the ◀ button or the ▶ button once.
3. To turn stealth mode off, press any button on the radio's front panel.

When stealth mode is on, the radio continues to scan the programmed list of talk groups and the user can key-up on the selected talk group.



NOTE

With stealth mode on, pressing any radio button other than the mic's PTT button or the emergency button on front panel will immediately turn stealth mode off. For example, pressing the ▼ button on the front panel will turn stealth mode off.

3.3.12 Checking or Changing the Active Profile

The radio can store up to sixteen (16) standard profiles within its personality, one of which is always set as the currently active profile. Each profile can contain up to sixteen (16) talk groups. Each profile is typically configured to contain those talk groups specific to certain communication activities, such as police patrol.

If the dwell display is set to "profile," the currently active profile's name appears in the bottom line of the display. Otherwise, to determine which profile is currently active, use the menu buttons to access the Profile Menu. The active profile's name will appear in the top line of the display. To switch to/activate a different profile:

1. Press the ▲ or ▼ button until "ProfileMenu" appears in the bottom line of the display. The name of the currently active profile appears in the top line. For example, "TacNet" as shown in Figure 3-8.
2. Press the ◀ or ▶ buttons to choose the desired profile stored in the radio as established by the OpenSky network administrator.
3. Press the **Select** button to activate the newly chosen profile. After a short time (a few seconds), the newly chosen profile activates and the dwell display re-appears.



Figure 3-8: Profile Menu

3.3.13 Checking or Changing the Selected Talk Group

Each profile stored in the radio can have up to sixteen (16) talk groups. One talk group within the currently active profile is set as the “selected talk group.” For the radio user, the selected talk group is typically the focus of most voice transmissions and receptions. There are two ways to change the selected talk group:

First Method:

1. Use the ▲ and ▼ buttons to scroll through the menu until “TalkGrpMenu” appears on the bottom line of the display. The currently selected talk group appears in the top line of the display. For example, “Police1” as shown in Figure 3-9.
2. Use the ◀ or ▶ buttons to scroll through the available list of talk groups in the active profile. This list is determined by the OpenSky network administrator.

OR

Second Method:

1. From the dwell display, press the ◀ or ▶ buttons to scroll through the available list of talk groups in the active profile.



Figure 3-9: Talk Group Menu

3.4 INTERCOM MODE

The optional intercom mode gives users at multiple control heads connected to the same radio the ability communicate with each other without transmitting over-the-air. Turn intercom mode on and off using the “INTERCOM” menu as follows:

1. Use the ▲ and ▼ buttons to cycle through the available menu items until “INTERCOM” appears in the display.
2. Use the ◀ or ▶ buttons to toggle between “On” and “Off.”

When intercom mode is turned on:

- Incoming voice calls will override intercom communications for the duration of the voice call. The radio and associated control heads will remain in intercom mode and intercom communications will resume when the voice call ends.
- “TG: INTERCOM” appears in the control head’s display when talking on the intercom. This indicates microphone audio is not sent out on the selected talk group; rather, it remains localized between the radio control positions (i.e., the control heads connected to the mobile radio).
- If a call exists on the currently selected talk group when a PTT button is pressed at one of the control heads, “TG: in use” appears in the display to indicate intercom mic audio cannot preempt the call on the talk group.



A user at a radio with only one control head/front panel can turn intercom mode on. In this case, pressing the microphone’s PTT button will not send microphone audio anywhere.

3.5 TALK GROUP LOCK OUT

There are two ways of focusing voice communications by suppressing calls from talk groups in the currently active profile:

1. **No Scan.** By turning scan off (selecting “No Scan” via the “ScnModeMenu”), only the selected talk group is audible.
2. **Lock Out.** By locking out selected talk groups, the “chatter” of the locked-out talk groups cannot be heard. This focuses the user’s scanning resources to only calls on desired talk groups.

Talk group lock out is a scan-related feature. With lock out, one or more talk groups in the active profile can be temporarily disabled from being scanned. Calls are not received on locked-out talk groups. Lock out settings are not retained between profile changes or when the radio is power cycled.



NOTE

Lock out is a listening (receive) function and only blocks received calls on locked out talk groups. Lock out does not affect transmit capability. The above methods do not apply to recent emergency lock outs.

Only talk groups in the active profile can be locked out, since they are the only talk groups whose voice calls can be heard on the radio.



NOTE

Neither the currently selected talk group, the default emergency talk group, nor emergency-capable talk groups can be locked out.

In addition, if a talk group is locked out and is subsequently changed to the currently selected talk group, it will automatically be unlocked by the radio so the user can hear calls on the talk group.

The radio may be configured so all except the default emergency and other emergency-capable talk groups are automatically locked out by default. In this case, they must be manually unlocked, if desired.

3.5.1 Locking Out a Talk Group

1. Use the ▲ or ▼ button to scroll through the menu until “LockOutMenu” appears in the bottom line of the display. The name of a talk group in the currently active profile will appear in the top line. See Figure 3-10.
2. Use the ◀ or ▶ buttons to scroll through the list of talk groups, if any, until the desired talk group for lock out appears in the top line of the display.

3. Press the **Select** button to lockout the displayed talk group. A less than symbol (<) appears next to the talk group's name.
4. Repeat steps 3 and 4, as needed, to lockout additional talk groups.

The dwell display will re-appear a few seconds after button presses end.

While scrolling through talk groups in the active profile, the only talk groups that appear in the "LockOutMenu" are those in the active profile.

3.5.2 Unlocking a Talk Group

1. Use the ▲ or ▼ button to scroll through the menu until "LockOutMenu" appears in the bottom line of the display. The name of a talk group in the currently active profile will appear in the top line. See Figure 3-10.
2. Use the ◀ or ▶ buttons to scroll through the list of talk groups, if any, until the talk group desired for unlocking appears in the top line of the display. A less-than symbol ("<") appears next to the name of a talk group that is currently locked out.

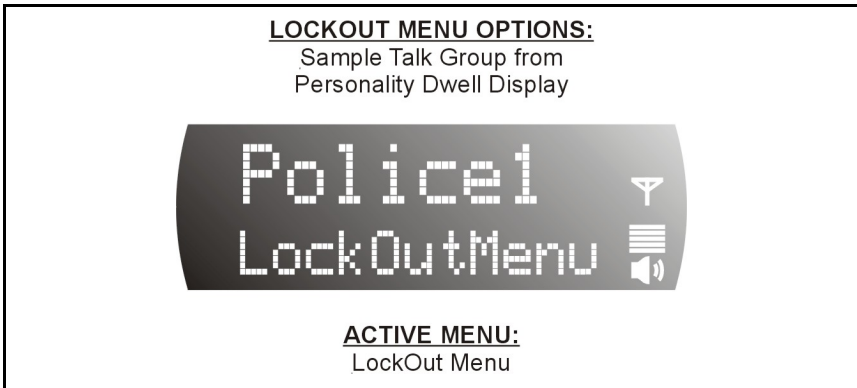


Figure 3-10: Lock Out Menu

3. Press the **Select** button to unlock the talk group. The less-than symbol ("<") next to the name of the talk group disappears. The dwell display appears as soon as the radio acknowledges the selection.

3.5.3 Caution Regarding Profile Changes

A talk group's lock out status does not survive a change of profile. If after locking out talk groups in the current profile and then selecting a new profile, all talk groups that were previously locked are automatically unlocked.

Compare options before changing to another profile. If the user's goal can be achieved by temporarily assigning priority talk group status to a talk group, it could be possible to avoid having to lock out the same talk groups again in a new profile. See the section entitled **Changing Priority Talk Group** on page 40 for additional information.

3.6 SCAN MODE

Two scanning modes are available for the radio, but only one can be active at any time. Changing the scanning mode changes the way the radio scans voice calls for all of profiles in the radio personality, no matter which profile is or becomes active.

As described in Table 3-3, the choice of scanning mode broadens or narrows the span of communications with all the talk groups in the radio's profiles, but does not affect interaction with the talk groups.

Table 3-3: Scan Modes

SCAN MODE	EXPLANATION
No Scan	Eliminates distractions. Full communications (transmit and receive) on selected talk group. No calls received from other talk groups.
Normal (Default)	Full communications (transmit and receive) on the selected talk group. Scans all talk groups in the active profile that are not locked out. Receive calls from more than one talk group, if available from the current site. Allows dragging of the selected and default emergency talk groups to the site on which the radio is registered. (If other calls are available at the site, they also can be heard but they will not be actively dragged.) An emergency-enabled talk group is only dragged if it is in emergency mode.

3.6.1 Checking or Changing Active Scan Mode

The currently active scan mode does not appear in the dwell display. To check it, access “ScnModeMenu” and observe it in the top line of the display. To change the active scan mode, access “ScnModeMenu” and select the other mode as described in the following section.

3.6.1.1 Changing Scan Mode

1. Use the ▲ and ▼ buttons to scroll through the menus until “ScnModeMenu” appears in the display.
2. Use the ◀ or ▶ buttons to scroll through the scan options until the desired mode appears. See Table 3-3.

3.6.2 Changing Priority Talk Group

When scanning, the default emergency talk group has the highest scan priority (1st), followed by the currently selected talk group (2nd), a talk group set as the priority talk group (3rd), followed by other talk groups in the currently active profile that are not locked out. Follow this procedure to set a talk group in the current profile as the priority talk group:

1. Use the ▲ or ▼ button to scroll through the menu until “PriTG Menu” (Priority Talk group) appears in the bottom line of the display. The talk group currently set as the priority talk group appears in the top line of the display.
2. Use the ◀ or ▶ button to select a new priority talk group.
3. Press the **Select** button to set the newly selected talk group as the priority talk group.

3.7 SELECTIVE CALL

Selective calling is a feature that allows two radio units to obtain and utilize an independent voice path for a private call. Radios can be configured to both initiate and receive selective calls or to only receive selective calls.

In the OpenSky system, a source radio can be configured to initiate selective calls through a pre-programmed list in memory. This method uses the “speed dial list” set up by the OpenSky network administrator and provisioned as part of the registration process.

In addition, a properly equipped source radio can initiate a selective call to any radio in the system by entering the ten-digit voice user ID (which looks like a telephone number) of the target device. Entering a selective call number without using the speed dial feature requires an optional DTMF microphone. See section 3.11 for more detail.



NOTE

Selective calls are terminated if an emergency is declared.

3.7.1 Making a Selective Call

Use the keypad on the microphone to input digits to place the call. If the radio is not equipped with a keypad microphone, use the ▲ or ▼ buttons to scroll through the menu until “SpeedDial” appears in the bottom line of the display.



NOTE

Speed dial numbers are defined and provisioned by the OpenSky network administrator and cannot be manually entered into the radio by the user. Contact the administrator if changes to the speed dial list are required.

1. If using the microphone's DTMF keypad:

- A. Press *8 on the keypad.
- B. Enter the number of the radio to be called (e.g., 027-001-0006). Like dialing a telephone number, ignore/do not enter dashes. If the region number (first 3 digits; 027 in this example) is the same as this radio's region number, these digits do not need to be entered. Likewise, if the region and agency numbers (first 6 digits; 027-001 in this example) are the same as this radio's numbers, these digits do not need to be entered. Leading zeros can also be ignored.
- C. Press and release the # key.
- D. Wait approximately two (2) seconds.
- E. Press and release the PTT button to initiate the selective call request. When the called party accepts the call, press the PTT again and begin speaking.

If using the buttons on the front of the radio:

- A. Scroll through the Menu options using the ▲ and ▼ buttons until "SpeedDial" appears in the bottom line of the display.
 - B. Using the ◀ and ▶ buttons, scroll through the pre-programmed speed-dial numbers until the desired number appears in the display.
2. Continue by pressing the PTT button when speaking (transmitting) to the caller.
 3. To end the call, press the **Select** button. The network limits selective calls to ten (10) minutes maximum.

3.7.2 Receiving a Selective Call

When someone calls in from another radio using the selective call function a ring will sound in the speaker and/or headset. Press the ▶ button to answer the call and press the microphone's PTT button when speaking (transmitting) to the caller. Press the **Select** button to end the call.

A selective call will be interrupted if an emergency is declared on a monitored talk group. The network limits selective calls to ten (10) minutes maximum.

3.8 SELECTIVE ALERT

Selective alert messaging is an OTP feature allowing one of up to eight (8) pre-programmed text messages (refer to section 3.8.3) to be sent from one radio to another. The user specifies a destination radio's User ID, selects one of the pre-programmed text messages, and then transmits it to the destination radio. The message delivery system adds time-of-day information and forwards the message to the destination (receiving) radio. The sending radio receives a brief message noting the status of the transmission. Refer to Table 3-4 for a list of possible status messages.

The first few characters of a message are part of the message text entered when the message is programmed. This programming is performed by the system or network administration personnel.

Messages successfully received by the destination radio are stored in it until read or until it is power cycled.

3.8.1 Sending Selective Alert Messages

3.8.1.1 Specifying the Destination

The destination radio's User ID can be selected via the menu buttons on the radio's front panel, or via the keypad on the DTMF microphone if the radio is so equipped:

Menu Button Method

1. Using the ▲ or ▼ button, scroll through the menu until "AlertDest" (Alert Destination) appears in the bottom line of the display. The current speed dial number scrolls on the top line.
2. Press the ◀ or ▶ button to change to a different speed-dial number. Pause between each arrow button depress to observe the entire number as it scrolls across the top line of the display.
3. When the desired speed-dial number appears, press the **Select** button to activate the selection.
4. Continue with section 3.8.1.2.

Keypad Method (DTMF Microphone Required)

To select the destination radio's User ID using the keypad, perform the following:

1. Press *7 on the keypad. "AlertDest" appears in the display.
2. Enter the number of the destination radio (e.g., 027-001-0006) using the DTMF keypad. Like dialing a telephone number, ignore/do not enter dashes. If the region number (first 3 digits; 027 in this example) is the same as this radio's region number, these digits do not need to be entered. Likewise, if the region and agency numbers (first 6 digits; 027-001 in this

example) are the same as this radio's numbers, these digits do not need to be entered. Leading zeros can also be ignored. Refer to Section 3.11.

3. Press the # key to enter the number.

3.8.1.2 Choosing and Sending the Message

After specifying the destination radio's User ID (section 3.8.1.1), the radio automatically allows you to choose a message. The current message scrolls across the top line of the display. To choose a message:

1. Scroll through the message list using the ◀ or ▶ button. The next available message in the list is displayed. Pause between each arrow button depress to observe the entire message as it scrolls across the top line of the display.

If the destination radio's User ID was chosen via the keypad on the DTMF microphone, the keypad's 4 and 6 buttons can also be used to scroll through the available messages.

2. To select and send the displayed message, press the **Select** button, or press the # button on the keypad.
3. The status of the sent message will be momentarily displayed. Possible status messages and their meanings are listed in Table 3-4.

Table 3-4: Selective Alert Status Messages

STATUS MESSAGE	DEFINITION
Delivering	Select Alert message transmit attempt
Congested	Too busy – Try again
Dest Down	Receiving radio not logged on – Not registered
Not Reg	Transmitting radio not logged on – Not registered
Delivered	Transmission complete
Unreach	No response
Partial	Transmission interrupted

3.8.2 Receiving Selective Alert Messages

When a selective alert message is received by a radio, a four-beep tone is heard and "NewAlert" flashes until the new message is read. Up to eight (8) received messages are stored. If another message is received, the first (oldest) message automatically deletes to make room for the new incoming.

3.8.2.1 Displaying Messages Received

1. Using the ▲ or ▼ button, scroll through the menu until "AlertsRecvd" (Alerts Received) appears in the bottom line of the display. "No alerts" or

the last received (newest) message appears in the display. It is preceded by the time the message was received, and the sender's name/alias.

2. View other received messages using the ◀ and ▶ buttons. Use ◀ to view older messages and ▶ to view newer messages.
3. To delete the message currently being viewed, press the **Select** button.

3.8.2.2 Deleting Messages Received

To delete a received message:

1. Display the message (refer to Section 3.8.2.1).
2. Delete the message by pressing the **Select** button.
3. Confirm the deletion by pressing the **Select** button again.

3.8.3 Defining Pre-Programmed Messages

All selective alert messages are pre-defined by the radio system's maintenance personnel. These messages are sometimes referred to as "canned" messages. Custom selective alert messages cannot be created by the radio user. The entire selective alert message, including the abbreviation, can include up to two hundred (200) text characters.

3.9 TELEPHONE INTERCONNECT CALLS

If the radio system is equipped with Public Switched Telephone Network (PSTN) interconnect equipment, telephone calls can be made from the M-803's DTMF microphone using this procedure:

1. Press the *9 keys.
2. Enter the telephone number. (Ignore dashes/spaces, and precede the number with any required access digits such as a 1 for long distance.)
3. Press the # key.
4. Wait a few seconds and then press and release the mic's PTT button to initiate the call. An initial ring tone plays indicating call initiation. Once the gateway picks up the call, the ring tone changes.
5. When the caller answers, depress the PTT button when speaking and release it to listen to the caller.
6. To hang-up, press the **Select** button on the front panel.

3.10 EMERGENCY COMMUNICATIONS

The M-803 and V-TAC mobile radios can transmit both emergency voice calls and emergency alerts over the entire network. OpenSky handles emergency calls and alerts with the highest priority.

For critical voice communications, an emergency call can be raised on the default talk group or the currently selected talk group by “declaring” an emergency on the talk group. The exact talk group is determined by the currently active profile. After successfully declaring an emergency on a talk group, the declaring radio’s microphone remains “hot” for a predetermined amount of time. In other words, the radio transmits audio for a period of time even when the microphone’s PTT button is not depressed. An emergency talk group is provided greater priority and infinite hang-time by the radio system’s infrastructure. Hang-time is the maximum duration of quiet time between transmissions on the talk group before the infrastructure assets are automatically taken away. Because an emergency call is handled on a talk group, it is received by all radios and consoles monitoring the talk group.

An emergency alert is a data message sent by the radio to the MIS console (or any console capable of receiving it). It identifies the radio declaring the emergency, and the radio’s location (if the radio is equipped with a GPS receiver). Voice audio is not automatically transmitted during the emergency if the administrator configures the radio for alert notification only.

3.10.1 Declaring an Emergency Call or Alert

To declare an emergency call or emergency alert, press and release the orange **Emergency** button. This button is located just to the right of the 5-button Menu and Select keypad; see Figure 3-1 on page 18. Note the following:

- The OpenSky network administrator determines if the **Emergency** button is used to declare an emergency call or if it is used to declare an emergency alert. This is based upon the radio’s currently active profile.
- The OpenSky network administrator also determines if the emergency is declared on the currently selected talk group or a “default” emergency talk group. Again, this is based upon the radio’s currently active profile. A talk group upon which an emergency is declared on is considered an “emergency talk group.”
- Upon successful emergency declaration:
 - An emergency tone will sound in the radio’s speaker/headset if the radio is not in stealth mode.
 - At the declaring radio, the **Emergency** button flashes red if the radio is not in stealth mode. The administrator can configure the radio to automatically transmit upon successful emergency declaration, at which point the **Select** button will flash red. However, the **Select** button flashing red is not a requirement for successful emergency declaration.

- For an emergency call declaration, “EMERGENCY” indicates in the bottom line of the display. In addition, the emergency talk group’s name appears in the top line of the display, followed by an asterisk (*). The emergency talk group can be forwarded across the OpenSky network for emergency communications.
- For an emergency alert declaration, “EMERG ALERT” indicates in the bottom line of the display.
- For an emergency call declaration, other radio users and/or dispatchers at consoles will hear the emergency signal, a distinctive 3-tone burst. They will also hear audio from the declaring radio’s “hot” microphone, if any.
- For an emergency alert declaration, only dispatchers at consoles will hear the emergency signal and, if any, audio from the declaring radio’s “hot” microphone.
- For an emergency call the declaring radio’s microphone remains “hot” for a predetermined amount of time. In other words, the radio transmits audio for a period of time even when the microphone’s PTT button is not depressed. Audio is transmitted over the emergency talk group. When the microphone is “hot” for this initial period (typically ten seconds), simply speak into it for voice transmission.

If an emergency declaration is not successful, the radio will periodically re-attempt until it is successful. During this retry period, the radio will flash “EMERG PEND” on the bottom line of the display. It will display “EMERG RETRY” for each attempt.

3.10.2 Clearing an Emergency Call or Alert

To clear an emergency, press and hold the **Emergency** button for at least three (3) seconds. However, this can only be accomplished at the radio where the emergency was originally declared (the initiating radio), by a dispatcher at a console, at a supervisory radio, or by the network administrator. When the emergency is successfully cleared, the remove tone will sound at the initiating radio. Also, for an emergency call, the asterisk (*) will clear from the display.

3.10.3 Receiving an Emergency Call

Upon receiving an emergency call declared by another radio:

- An emergency tone sounds in the radio’s speaker/headset (three short high-pitched beeps).
- “EMERGENCY” flashes in the display if the radio is not in stealth mode.

- When the emergency talk group is selected, an asterisk (*) follows its name in the top line of the display. The asterisk identifies the selected talk group is in an emergency state. Some radios may be programmed by the system or network administration personnel to flash the **Emergency** button (red) when an emergency call is received. This occurs only if the radio is not in stealth mode.
- If scan mode is set to “No Scan” and the emergency was declared on the selected talk group, audio on the emergency talk group is heard in the speaker/headset. See page 39 for additional information on “No Scan” operation. Also see the following NOTE.
- If scan mode is set to “No Scan” and the emergency was declared on a talk group other than the selected talk group, the emergency talk group (identified by an “*”) must be selected before audio on it is heard in the speaker/headset.
- If scan mode is set to “Normal” and the emergency was declared on the selected talk group, the selected/emergency talk group’s name remains in the top line of the display. Audio on the emergency talk group is heard in the speaker/headset.
- If scan mode is set to “Normal” and the emergency was declared on a talk group other than the selected talk group, the emergency talk group’s name appears in the bottom line of the display. Audio on the emergency talk group is heard in the speaker/headset.
- The declaring radio’s alias appears in the bottom line of the display when the emergency talk group is selected.
- An emergency call can be dismissed as described in the following section.



NOTE

A radio declaring an emergency on a talk group has a “hot” mic time period of typically ten (10) seconds just after it declares the emergency. This time period may be adjusted by system or network administration personnel on a per radio basis.

3.10.4 Dismissing an Emergency Call

To ignore an emergency call declared by another radio user, dismiss it as follows:

1. Press the ▲ or ▼ button until “EmgDismiss” appears in the display.
2. Press the ◀ or ▶ buttons until the talk group in the emergency state appears, as indicated by an asterisk (*) following the talk group’s name.
3. Press the **Select** button.

3.11 DUAL-TONE MULTI-FREQUENCY KEYPAD

Dual-Tone Multi-Frequency (DTMF) is the system used by touch-tone telephones. DTMF assigns a specific tone frequency to each key so a microprocessor can easily identify its activation. The radio supports DTMF using a microphone with an alphanumeric keypad (see Figure 3-11). This allows for specific tasks such as entering a user ID and password, or selective calling.

When a key on the DTMF keypad is pressed, a single low-pitched tone will be heard from the microphone. The key tones are not adjustable.



NOTE

Although the “Q” is not shown on the 7 key, and the “Z” is not shown on the 9 key on the DTMF keypad, both letters are supported by the system. To enter a “Q” from the keypad, press the 7 key 3 times (7, P, Q). To enter a “Z” from the keypad, press the 9 key 5 times.

Because the Q and Z are recognized by the system, that the number of presses to enter other characters from those keys may be different. For instance, 5 key presses are required to enter an “S” using the 7 key (7, P, Q, R, S).

If the key is pressed too many times, continue pressing the key to scroll through the remaining characters and returning to the first character. Remember to consider the characters not shown on the keys.



Figure 3-11: DTMF Microphone Keypad

To perform a command from the keypad, press the * key followed by one of the pre-set function keys as follows:

- *0 Log-off command:** *0## (logs the user off the system). See page 29 for additional information.
- *1 Log-in command:** *1<User ID> # <Password> ## (required for encryption). See page 28 for additional information.
- *4 V-TAC Scene-Of-Incident (SOI) channel attachment command:** SMR/NPSPAC channel number authorized for SOI radio communications. See page 56 for additional information.
- *5 Single Site Channel command:** *5<SMR/NPSPAC channel>#
- *6 Load Default Personality command:** *6#. This command applies only if the radio is not voice-registered on the network.
- *7 Initiate Selective Alert command:** *7<Target ID>#[Choose Message]#. See page 42 for additional information.
- *8 Radio-to-Radio Call command:** Selective call number # (PTT to dial). See page 40 for additional information.
- *9 Public Switched Telephone Network (PSTN) Call command:** See page 44 for additional information.
- *32 Begin Manual Encryption command:** *32<Pre-Determined Encryption Key of Up To 16 Digits># See page 51 for additional information.
- *33 End Manual Encryption command:** *33#.



When entering letters or numbers from the keypad that has if two or more adjacent characters represented by the same key on the keypad, the pound (#) key must be pressed after all but the last of the adjacent characters. For example, to enter MACOM6, press the following keys: 6 key twice (M), 2 key twice (A), # key, 2 key 4 times (C), 6 key 4 times (O), # key, the 6 key twice (M), # key, and then the 6 key once (6). Press the # key twice to complete the entry.

3.11.1 Password Entry

Password entry requires a DTMF microphone. Password characters are encrypted on the display using symbols to indicate the entry. The encryption symbols for each entry will appear in the display as they are scrolled through, for example: ‘-‘ and ‘+’. Press the # key twice to complete the entry process. Refer to the above NOTE for more details.

If the radio is configured for alpha-numeric passwords and the password has consecutive duplicate numbers (“MES33” for example), enter # between the consecutive duplicate numbers so the radio will **not** interpret the entry as a

letter (“D” in this example). If the radio is configured for numeric-only passwords, do not enter # between duplicated numbers.



NOTE

If the password is wrong, the radio will not successfully register with the network for wide area voice reception. The radio can still be used in single-site mode.

3.11.2 DTMF Overdial

Using the DTMF microphone, the radio can transmit DTMF tones corresponding to numbers/characters 0 — 9, * and # on the mic’s keypad. To overdial numbers/characters, transmit by pressing and holding the PTT button and then, press the corresponding keys (one at a time) on the keypad.

3.12 ENCRYPTION

In the OpenSky network, both data and voice use a 128-bit key encryption standard published by the Federal Information Processing Service (FIPS), called Advanced Encryption Standard (AES). AES is approved by the U.S. Department of Commerce for encryption of classified materials.

When encryption is enabled on the network, data is encrypted from the MDIS to the Mobile End System (MES) (e.g., M-803 mobile radio). This form of encryption provides air-link security.

Voice encryption is handled either automatically or manually. Automatic encryption is initiated through the Network Administration Server (NAS) for a specific talk group and requires nothing from the user. Manual encryption is initiated by two or more radio users and requires DTMF microphones. Both methods of encryption are discussed in the following sections.

3.12.1 Automatic Encryption

For automatic encryption, a network administrator will select the talk group to be encrypted at the interface to the NAS. Once the talk groups have been selected and identified as secure, credentials for key generation are generated automatically by the system and provisioned to authorized users. This process requires that authorized users login to the network and be authenticated. Encryption keys require no manual handling and are never sent “in the clear” over any network interface or air-link.

1. “Pls Login” appears displayed in the bottom line of the dwell display.
2. Login normally using the DTMF microphone to enter User ID and Password.

If a user is engaged in a call on a talk group encrypted at the network administrator level, “Secure Call” will appear in the bottom line of the dwell display if the user is logged in to that talk group.

If a secure call is in progress elsewhere and the user has not logged in, the bottom of the dwell display will alternate between “No Access” and the alias of the radio that is currently engaged in the secure call.

3.12.2 Manual Encryption

Two or more users can manually encrypt a call, if enabled, without an established encrypted talk group. A pre-determined key and a DTMF microphone are required at each radio.



NOTE

The key must be pre-determined by the users prior to making a manually encrypted call on a talk group. It can be between one and sixteen (1 - 16) digits and it is entered into the radio using the keypad on the DTMF microphone.

If two communicating radios have different (manually-defined) keys, receive audio at each radio will sound garbled.

With manual encryption enabled, unencrypted radio users on the talk group can still make standard voice (unencrypted) calls on the talk group. However, if a unencrypted user attempts to transmit on the talk group when one of the encrypted users is already transmitting on the talk group, the unencrypted radio will sound a deny tone and “No Access” will appear in the display. Also, the encrypted user can hear standard unencrypted calls, but cannot respond while still manually encrypted.



CAUTION

Do not set a talk group for manual encryption if it has been set for encryption by the network administration personnel.

Perform the following to transmit or receive manually encrypted calls:

1. Press *32 on the DTMF microphone keypad.
2. Enter the key (up to 16 digits).
3. Press the # key.



NOTE

Due to inherent qualities of the DTMF microphone, there is a two (2) second delay between entering the encryption key and manual encryption feature taking affect.

4. To end manual encryption, press *33#.

If a user is engaged in a call on a talk group that has been manually encrypted at the radio level, the user will see “Secure Call” on the bottom of the dwell display.

If a secure (encrypted) call is in progress, and the user has not entered the key, the bottom of the dwell display will alternate between “No Access” and the alias of the radio that is currently engaged in the secure call.

Once the user has terminated manual encryption, “UnSecure” appears temporarily in the bottom line of the dwell display.

3.13 PRESET BUTTONS

The front panel contains three buttons labeled A, B, and C. By holding one of these buttons down for approximately three (3) seconds, the following current information is saved to the function of that button:

- Selected talk group
- Selected profile
- Selected priority talk group
- Lockouts
- Scan mode
- Intercom mode

When information has been saved to a preset, the button will be illuminated green. If the button is not designated as a preset, it will be illuminated red.

Presets are saved and restored to/from non-volatile memory. Changing the User ID (login in as a different user) will clear the presets, as they are stored on a per-user basis. Changing control heads will not recall presets for the previous control head.

3.14 DYNAMIC REGROUPING

Dynamic regrouping requires that the network administrator determine which radio users should be formed into an impromptu talk group to respond to particular emergency conditions.

The administrator will edit the personalities of the affected radios to include an emergency profile, then page the affected radios to re-register with the network to receive their edited personalities.

In response, affected radios automatically re-register to receive their edited personalities. During re-registration, subscriber equipment will default to the emergency profile selected by the administrator.

3.15 GPS COORDINATES

If the radio is equipped with a Global Positioning System (GPS) receiver, the radio’s current latitude and longitude coordinates (“fix”) may be displayed using the “GPS Fix” menu. The following procedure assumes a GPS antenna

is connected to the radio and it is receiving adequate signals from GPS satellites:

1. Press the▲ or ▼ button until the “GPS Fix” menu appears in the bottom line of the display. Current GPS coordinate latitude and longitude data continuously scrolls in the top line of the display in a degrees:minutes:seconds format.
2. Press the▲ or ▼ button to change to another menu.

3.16 V-TAC FUNCTIONS

When a mobile radio detects that it is part of a V-TAC configuration, two additional menu items become available: “Vmode Menu” and “Vchan Menu.” The “Vchan Menu” is available only when a V-TAC is operating in the special mode referred to as the Scene-of-Incident mode (“SOI”).

The “Vmode Menu” permits user selection and control of one of four (4) different V-TAC operating modes:

- Extended Coverage for Individual Users (display reads “XCOV”)
- Extended Coverage for Talk groups (display reads “XCOV-TG”)
- Scene-of-Incident (display reads: “SOI”)
- Mobile-Only (display reads: “Mobile”)

These modes are described in detail in the following subsections.

3.16.1 Extended Coverage Modes (“XCOV” & “XCOV-TG”)

3.16.1.1 General Information

In addition to all standard mobile radio operating capabilities, Extended Coverage adds the V-TAC’s bridging (vehicular repeat) functionality for accessing the OpenSky radio network using connected portable radios. Each portable radio connected to the V-TAC using Extended Coverage is considered a “client” on the V-TAC. Extended Coverage benefits (permitted) portable radios since it allows them to get network connectivity using the V-TAC’s higher transmit output power and better antenna system. In addition, dispatchers can communicate with the portable radios (the clients) connected to the V-TAC and logging recorders can record their tactical communications.

The V-TAC supports two Extended Coverage modes: Extended Coverage for individual users (XCOV) and Extended Coverage for talk groups (XCOV-TG). Up to eight (8) client radios can connect to the V-TAC via the XCOV mode, having fully radio functionality including selective calling and mobile data. Using the XCOV-TG mode, up to thirty (30) client radios can connect to the V-TAC. XCOV-TG is designed to support a large number of client radios in a tactical scenario. However, unlike XCOV, radios connected to using XCOV-TG are limited to communicating only on the XCOV-TG talk group and emergency communications. Advanced features such as selective

calling and mobile data operations are not available to the XCOV-TG connected clients.



NOTE

The Extended Coverage for talk groups mode (XCOV-TG) is only available in OpenSky radio firmware versions 9.0 and later.

When operating in an Extended Coverage mode, the V-TAC acts both as a local base station by operating on a base station frequency plan to communicate with the attached client radios, and as a mobile radio by operating on a mobile frequency plan to connect to the OpenSky radio network. The V-TAC rebroadcasts voice traffic received from connected client radios, routes the received audio to its speaker, and relays this voice traffic to the network for distribution to other users. It also routes received audio network traffic to its speaker and forwards this audio to the connected client radios. However, filtering of some network traffic can occur.

Typically, Extended Coverage is utilized after the vehicle's operator has exited the vehicle with a portable radio unit and the portable unit requires this bridging functionality to access the OpenSky radio network. When the V-TAC transitions between the Mobile-Only mode and an Extended Coverage mode, a four-beep high-medium-high-medium tone sequence sounds in the speaker. Also, for ten (10) seconds, the V-TAC's control head flashes "XCOV" if it is in the Extended Coverage for individual users mode, or "XCOV-TG" if it is in the Extended Coverage for talk groups mode. When in the Mobile-Only operating mode, neither of these mode identifiers appears in the display. XCOV vs. XCOV-TG mode determination methods are described later. When the V-TAC goes from XCOV mode to Mobile-Only mode, it the tone sounds and "Mobile" flashes in the display for ten (10) seconds.

In most cases, the V-TAC's Mobile-Only mode is desired when the vehicle is in motion and an Extended Coverage mode is desired when the vehicle is stationary (a configurable parameter). The exact method used for mode selection depends upon the specific radio installation. For example, one V-TAC radio installation could have a 2-position toggle switch mounted on the vehicle's dash panel for manual mode selection, while another could automatically enable an Extended Coverage mode when the portable radio is removed from its cradle/charger within the vehicle.



Operating the V-TAC in an Extended Coverage mode when the vehicle is in motion can have serious consequences to system operation and performance and is therefore not recommended. This condition is sometimes referred to as a “rolling V-TAC.”

If necessary, contact the local administrator and/or radio installation personnel for mode selection information for a particular installation.

The V-TAC operator has control of the following functions affecting call processing:

- Talk group selection
- Talk group scanning
- Call preemption of the portable and mobile radio clients (e.g., by the Tac Scene Commander)

V-TAC Extended Coverage modes do not allow attachment of other mobile radios, only portables. This is because it is expected that mobiles can connect to the network in the same manner as the V-TAC does. Portable radios, having less transmit output power, inferior antennas, and in-building use capabilities (or other areas where coverage may be degraded), can take advantage of the V-TAC’s Extended Coverage modes.

The V-TAC takes advantage of OpenSky’s TDMA capability to minimize interference between its local and network radio links when operating in an Extended Coverage mode (XCOV or XCOV-TG), an undesirable characteristic of many traditional vehicular repeater systems. However, unlike OpenSky network radio channels, Extended Coverage supports only one active voice call at a time.

Frequency selection is automatic from a predetermined list of channels. This list is defined as part of the configuration being available for V-TAC operation. The process is supported by GPS location information that allows the V-TAC to be aware of its location and choose accordingly from its channel list. If no Extended Coverage channels have been configured, the V-TAC will remain in Extended Coverage mode and it will continue to search its V-TAC channel list.

3.16.1.3 Changing Between Extended Coverage Modes

By default, the specific Extended Coverage mode utilized, either XCOV or XCOV-TG, is determined by commands sent to the V-TAC and portable radios from the system administrator or radio installation personnel. In other words, these commands determine which Extended Coverage mode the V-TAC and radios normally utilize when transitioning from the Mobile-Only mode. Therefore, they also determine the access method that must be

employed at a portable radio to connect to the V-TAC. After commands of this type are sent to the V-TAC and portable radios, each must be rebooted (powered off and then back on) before the change will take effect.

However, both the V-TAC and the portable radios can manually override this command-determined default mode. At the V-TAC, this is accomplished by a selection from the “Vmode Menu”. Manual override at a portable radio is accomplished by pressing a pre-defined key sequence; refer to the respective portable radio’s operator manual for exact key sequences required.

3.16.1.4 Additional XCOV-TG Mode Information

The talk group used for Extended Coverage for talk groups (XCOV-TG) communications is the talk group that was selected at the V-TAC when it entered XCOV-TG mode.

However, at the V-TAC, the selected talk group and/or profile can be changed to another talk group and/or profile when XCOV-TG is in use. The selected talk group and profile in effect when the V-TAC transitioned to XCOV-TG mode will continue to be used to validate portable radio connections and filter the network voice traffic sent to the portable radios.

The selected talk group and profile in use when the V-TAC transitioned to XCOV-TG mode is displayed on the bottom line of the dwell menu preceded by an “X-”.

3.16.2 Scene-Of-Incident Mode (“SOI”)

SOI mode is user-selectable using the V-TAC’s the “Vmode Menu.” SOI mode provides a local repeater function with no network connection. It supports two concurrent voice calls, and it supports communication between other mobiles and portables.



When using the SOI mode, both the V-TAC and any connected portable radios (the clients) are off the OpenSky network. Therefore, communications with radios and dispatch personnel on the network is not possible.

Frequency selection is performed manually from a list of pre-defined channels using the V-TAC’s “Vchan Menu.” The radio indicates the FCC channel number for each in addition to its alpha-numeric identifier.

In SOI mode, the V-TAC supports the following features:

- Talk group selection
- Talk group scanning
- Call preemption of the client radios (i.e., Scene Commander can preempt a call from a portable or mobile radio)

3.16.3 Mobile-Only Mode (“Mobile”)

The Mobile-Only mode is user-selectable from the “Vmode Menu” or the radio can be configured to enter this mode automatically. When utilized, portable radios (clients) cannot connect to the V-TAC. In this mode, the V-TAC provides two-way communications and it acts like a standard M-803 mobile radio. Refer to the following section for instructions on choosing this mode.

3.16.4 Changing V-TAC Mode

Use the following procedure to change between the Mobile-Only mode and one of the three (3) V-TAC-related modes:

1. Press the ▲ or ▼ button until “Vmode Menu” appears in the bottom line of the display. The current mode appears in the top line (Mobile, XCOV, XCOV-TG or SOI).
2. Press the ◀ or ▶ button to select another mode.
3. Press the **Select** button. A yes/no confirmation prompt appears.
4. To confirm the new selection, press ▶ to toggle to “Y” (yes).
5. Press the **Select** button.
6. If the SOI mode was selected, the “Vchan Menu” automatically appears; choose a radio frequency channel using the ◀ and ▶ buttons, and confirm by pressing the **Select** button. If selecting the SOI mode, observe the **WARNING** on page 56.



Instead of using the “Vmode Menu,” some radio installations may be configured to automatically enter a V-TAC mode when a dash-mounted switch is flipped or some other action is performed. For example, the V-TAC can be wired and configured to automatically enter the XCOV mode when the vehicle’s portable radio is removed from its vehicular charger. See section 3.16.1.3 on page 55 for additional information.

3.16.5 Displaying VTAC Information

When using a V-TAC mode, repeated depressions of the **Select** button causes the following information to appear in the bottom line of the dwell display:

- **XCOV and XCOV-TG modes only:** Total number of portable radios (clients) currently connected to the V-TAC.
- **XCOV-TG mode only:** Talk group currently used for XCOV-TG communications.

- **XCOV-TG mode only:** Profile currently used for XCOV-TG communications.
- **All V-TAC modes:** Current V-TAC channel. (Does not apply to the Mobile-Only mode.)
- **All V-TAC modes:** Currently utilized V-TAC mode (XCOV, XCOV-TG, SOI, or Mobile-Only mode).

3.17 ENGINEERING DISPLAY

Some radios may have access to an engineering display that presents various data related to the radio system. An example display is shown in the following figure. Typically, this display is accessed by pressing the ▼ button once from the dwell display.

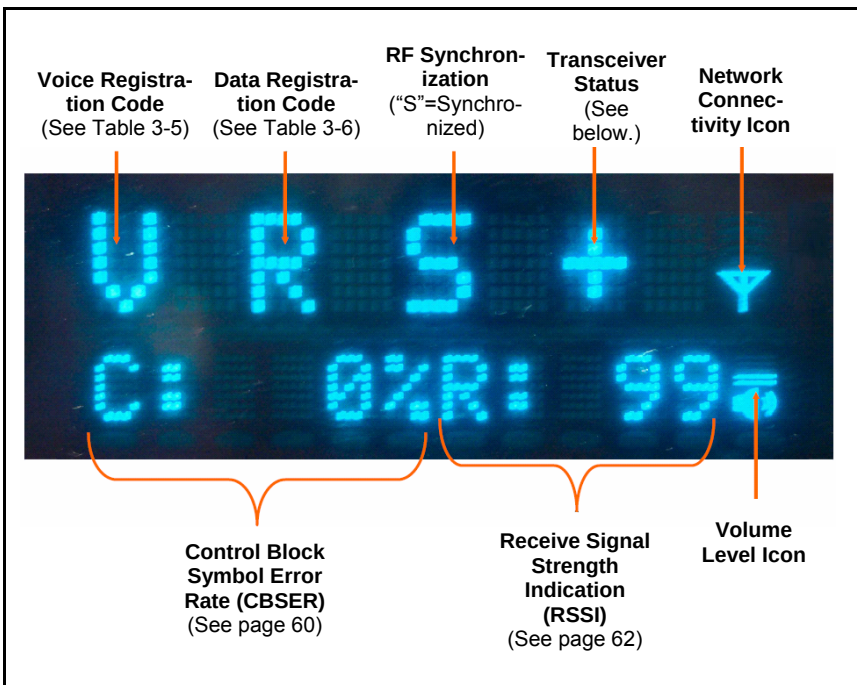


Figure 3-12: Example Engineering Display

3.17.1 Voice and Data Registration Codes

The engineering display's voice and data registration codes identify the current registered operational status of the radio on the OpenSky network. Voice registration is granted by the VNIC (Voice Network Interface Controller) computer and data registration is granted by the MDIS (Mobile Data Intermediate System) computer. See Table 3-5 and Table 3-6 respectively.

3.17.2 Transceiver Status

The engineering display's transceiver status is a plus (“+”) symbol during normal operations. If the radio is a full-duplex M-803 or a V-TAC, a status of “C” indicates there is a problem with the radio's RF combiner.

Table 3-5: Voice Registration Codes

DISPLAYED CODE	LOWER DISPLAY	RETRY	MEANING
(none)	(none)	No	Off network.
a	VDENIED	No	Voice denied: Unknown reason.
b	BAD VID	No	Voice denied: Unknown MES ID. (Check User ID.)
c	(none)	No	Voice denied: Duplicate MES ID.
d	(none)	No	Voice denied: IP address denied.
e	(none)	No	Voice denied: Duplicate IP address.
f	BAD PWD	No	Voice denied: Missing password.
g	BAD PWD	No	Voice denied: Invalid password.
h	HOM DWN	Yes	Voice denied: Home VNIC down.
i	SRV BSY	Yes	Voice denied: Serving VNIC congested.
j	(none)	Yes	Voice denied: Aged reg. seq. number.
k	MAX USR	Yes	Voice denied: Too many login instances.
l	NAS BSY	Yes	Voice denied: NAS changing talk group.
V	(none)	No	Voice registered.
v	(none)	No	Voice registration pending.
R	(none)	No	Data registered only.

Table 3-6: Data Registration Codes

DISPLAYED CODE	LOWER DISPLAY	RETRY	MEANING
R	(none)	No	Data registered.
1	(none)	No	Network access denied. Unknown reason.
2	(none)	No	Network ID unsupported.
3	UNAUTH3	No	Network ID not authorized. (Check IP.)
4	UNAUTH4	No	Bad authentication.
5	UNAUTH5	No	Unsupported authentication.
6	MDS BSY	Yes	MDIS fully loaded.
7	DUP IP	No	Service denied: Duplicated IP address.
p	(none)	No	Data registration pending.
d	(none)	No	Data deregistration pending.

3.17.3 Receive Signal Strength Indication (RSSI)

The engineering display's RSSI number represents, in absolute value, the dBm level of the signal received from the OpenSky's base station transmitter. It represents a negative unit of measure, but a negative/minus sign does not precede the number in the display. Because the displayed number represents a negative value, higher/increasing numbers represent lower/decreasing received signal strengths.

Values lower than -110 (125 for example) indicate a possible antenna problem, or radio operation in a fringe or no-coverage area.

Higher RSSI values, -85 for example (displayed 85), with CBSER values greater than zero (0) generally indicate RF interference is being induced into the receiver or radio's antenna system along with the received signal.

It is not uncommon for an OpenSky signal with low RSSI and degraded CBSER to be decoded by the radio and heard at the speaker without any problem.

3.17.4 Control Block Symbol Error Rate (CBSER)

The engineering display's CBSER value indicates data distortion or interference. Zero (0) represents no errors. When operating in RF fringe areas, this number may increase as interference in the received data signals increases.

4 BASIC TROUBLESHOOTING

If the radio is not operating properly, check Table 4-1 for likely causes. For additional assistance, contact a qualified service technician.

Table 4-1: Basic Troubleshooting

SYMPTOM	CAUSE	SOLUTION
Radio will not turn on.	No power.	Test the connection to the vehicle power supply.
Radio will not turn off.	If in multiple control head configuration, one of the attached control heads is still powered up.	Power off all control heads.
V-TAC will not transmit.	V-TAC channels and/or geographic coverage zones are not defined or base stations are not configured with geographic coordinates provisioned to V-TAC radios.	Contact system administrator.
Radio will not register or does not receive provisioning data.	Bad logon credentials.	Check logon and password.
No audio.	Speaker volume is muted.	Increase the volume level.
Poor audio.	Transmitting or receiving in a poor coverage area or subject to interference.	Check network connectivity and move to a better coverage area if possible. Report the area without coverage to an authorized network technician.
Poor display visibility.	Ambient Light Sensor is obstructed.	Clear the obstruction and give the sensor a clear path to ambient light.
No network connectivity icon in display.	Radio is out-of-range or cannot connect with the OpenSky network. Base station network connection has failed.	Return to coverage area if possible and wait for condition to clear. Use single-site trunking or switch to an alternate channel.

SYMPTOM	CAUSE	SOLUTION
Radio will not transmit.	Radio may be out of coverage area or may be overheated.	Return to coverage area if possible. If overheated, let radio cool before retrying transmission. Report this failure to an authorized technician.
Radio will not transmit (transmit indicator does not flash).	Radio may be experiencing low voltage.	The M-803 will cease to transmit if the voltage drops below 8.5 volts. Have the battery checked by an authorized technician.
Radio powers off for no apparent reason.	Radio may be experiencing very low voltage.	The M-803 automatically powers down when voltage drops below +5.0 volts. Have the battery checked by an authorized technician.
“Warning: No MRU” Message.	Radio control head is unable to communicate with mobile radio unit (radio transceiver).	Have the radio connections checked by an authorized technician.
Control head randomly changes display.	In multiple control head configurations, another user is operating the radio from another control head.	None
Encrypted calls cannot be made.	Not authorized to use.	Contact system administrator to request encryption privileges.
Encrypted calls cannot be made.	User not logged in.	Log in (refer to Section 3.11.1).
V-TAC Menu does not display.	Unit not set up as a V-TAC. VRB is not responding.	None Check power connection. Ensure front panel (VRB-VRM) data cable is connected. Report the problem to a technician.

5 WARRANTY

- A. M/A-COM, Inc. (hereinafter "Seller") warrants to the original purchaser for use (hereinafter "Buyer") that Equipment manufactured by or for the Seller shall be free from defects in material and workmanship, and shall conform to its published specifications. With respect to all non-M/A-COM Equipment, Seller gives no warranty, and only the warranty, if any, given by the manufacturer shall apply. Rechargeable batteries are excluded from this warranty but are warranted under a separate Rechargeable Battery Warranty (ECR-7048).
- B. Seller's obligations set forth in Paragraph C below shall apply only to failures to meet the above warranties occurring within the following periods of time from date of sale to the Buyer and are conditioned on Buyer's giving written notice to Seller within thirty (30) days of such occurrence:
1. for fuses and non-rechargeable batteries, operable on arrival only.
 2. for parts and accessories (except as noted in B.1) sold by Seller's Service Parts Operation, ninety (90) days.
 3. for PANTHER™ Series handportable and mobile radios, two (2) years.
 4. for all other equipment of Seller's manufacture, one (1) year.
- C. If any Equipment fails to meet the foregoing warranties, Seller shall correct the failure at its option (i) by repairing any defective or damaged part or parts thereof, (ii) by making available at Seller's factory any necessary repaired or replacement parts, or (iii) by replacing the failed Equipment with equivalent new or refurbished Equipment. Any repaired or replacement part furnished hereunder shall be warranted for the remainder of the warranty period of the Equipment in which it is installed. Where such failure cannot be corrected by Seller's reasonable efforts, the parties will negotiate an equitable adjustment in price. Labor to perform warranty service will be provided at no charge during the warranty period only for the Equipment covered under Paragraph B.3 and B.4. To be eligible for no-charge labor, service must be performed at a M/A-COM factory, by an Authorized Service Center (ASC) or other Servicer approved for these purposes either at its place of business during normal business hours, for mobile or personal equipment, or at the Buyer's location, for fixed location equipment. Service on fixed location equipment more than thirty (30) miles from the Service Center or other approved Servicer's place of business will include a charge for transportation.
- D. Seller's obligations under Paragraph C shall not apply to any Equipment, or part thereof, which (i) has been modified or otherwise altered other than pursuant to Seller's written instructions or written approval or, (ii) is normally consumed in operation or, (iii) has a normal life inherently shorter than the warranty periods specified in Paragraph B, or (iv) is not properly stored, installed, used, maintained or repaired, or, (v) has been subjected to any other kind of misuse or detrimental exposure, or has been involved in an accident.
- E. The preceding paragraphs set forth the exclusive remedies for claims based upon defects in or nonconformity of the Equipment, whether the claim is in contract, warranty, tort (including negligence), strict liability or otherwise, and however instituted. Upon the expiration of the warranty period, all such liability shall terminate. The foregoing warranties are exclusive and in lieu of all other warranties, whether oral, written, expressed, implied or statutory. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES.

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