OpenSky

Always on. Always there.

# M-803 Gemini Series

## Mobile Radio

**OPERATOR** MANUAL

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OCF 3.13

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# Preface

## Notices to the User and Safety Training Information

IMPORTANT INFORMATION ON SAFE AND OPTIMAL OPERATION. READ THIS BEFORE USING YOUR M-803 MOBILE RADIO

***WARNING***

**Your M-803 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, your M-803 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, be sure you:

- 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. The following lists these minimal allowable distances:

| **M-803 Radio Rated Power** | **Antenna Gain** | **Minimum Distance for Uncontrolled Exposure** | **Minimum Distance for Occupational Exposure** |
|---|---|---|---|
| 45 dBm max, 43 dBm nominal | 0 dB | 68.5 cm (27 inches) | 30.6 cm (12 inches) |
| 45 dBm max, 43 dBm nominal | 3 dB | 97.6 cm (38.4 inches) | 43.2 cm (17 inches) |

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.

**Note on jump-starting:** If you need to jump start an M-803 equipped vehicle, the positive radio lead from the radio must be disconnected from the vehicle battery. Disconnecting the lead will prevent damage to the radio.

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 fine or imprisonment or both. Refer service to qualified technicians only. Do not operate your transceiver in explosive atmospheres (gases, dust, fumes, etc.).

## Occupational Safety Guidelines and Safety Training Information

***CAUTION***

**To ensure that your exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use, always adhere to the following guidelines.**

Your M-803 Mobile Radio transmits using a remote antenna. When it is ON, it receives and also sends out radio frequency (RF) signals.

In 1996, the Federal Communications commission (FCC) adopted RF exposure guidelines with safety limits for portable devices, 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 make sure 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 your 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. Any servicing of the radio should only be performed by qualified personnel.
6. Always use M/A-COM authorized accessories (antennas, control heads, speakers/mics, 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.

# Table Of Contents

CHAPTER 1

# Welcome to the OpenSky Network

# OpenSky Overview

M/A-COM's OpenSky is a suite of radio communications products implementing an integrated digital voice and data system based on the Internet Protocol.

The OpenSky network is digital, but provides interoperability with analog radios, making it possible to integrate existing (legacy) equipment alongside the most sophisticated digital equipment available today.

If you've been issued an M-803 to replace a conventional analog voice-only radio, you'll particularly appreciate the integrated voice and data capabilities of the all-digital OpenSky mobile equipment.

Even experienced digital subscribers recognize and value the addressability precision and expanded coverage strength of the end-to-end TCP/IP OpenSky Intranet.

# Internet Protocol (IP) Network

OpenSky's Wireless Private Network is changing the nature of real-time communications for large fleet mobile businesses and public safety organizations alike.

## TCP / IP Backbone

Using Internet Protocol (IP) as a network backbone for end-to-end user applications, OpenSky integrates digital voice and packet data transmission over a single network that provides significant performance advantages over yesterday's uneasy alliances of independently-built radio networks trying unsuccessfully to interact.

- **Like tuning into a channel in a conventional FM radio system,** logging onto the OpenSky network with your pre-configured user profile will place you in contact with the members of a software-

defined talk group consisting of the set of users you need to talk with most.

- **Unlike your conventional FM radio,** your M-803 mobile radio is a node on an Internet-Protocol (IP) network with its own unique IP address.

### Addressable Headers

Messages intended for you (whether voice or data) are broken into packets with identifying headers, just like World Wide Web internet communications, and targeted to your specific IP address.

Like cell-phone calls, messages are delivered directly to your equipment.

But, like radio calls, users select which calls to receive by "tuning in" or "locking out" other user groups.

You can travel anywhere within your network, even a hundred miles or more from the sender, and messages intended for your IP address will find their way across the network, handed off from base station to base station, until they are re-configured and delivered to your personal receiving set.

This doesn't mean your communications are traveling across the World Wide Web. Far from it. OpenSky is a private wireless Intranet that adopts the best features of IP protocol for increased communications efficiency and capacity.

### System-Wide Voice Encryptability

Furthermore, your communications are packeted as they travel the network, so they can only be deciphered by networked equipment. Your sensitive conversations and data transfers can even be encrypted end-to-end for enhanced system-wide security.

## Integrated Voice and Data

Your M-803 Gemini Series Mobile Radio is a hardware component of the OpenSky network, an integrated voice and data communications system that delivers end-to-end digital voice and data transmissions over a single wireless network to your dash-mounted or trunk-mounted device.

## Digitized Voice, Text and Graphics

By converting analog voice waves to digital code before transmitting them over the network, OpenSky technology makes it possible for mobile radio users to send and receive voice transmissions at the same time they receive and view data (via the radio's serial port) on an optional equipment Mobile Data Terminal.

For graphics, interface a Mobile Data Terminal (MDT) through your radio's RS-232 peripheral port.

With an M-803 in your vehicle, you'll be able to scroll through complex instructions, driving directions, or emergency warnings on an optional mobile computer or terminal device while at the same time carrying on conversations with dispatchers or other mobile operators in your coverage area.

OpenSky and the M-803 eliminate the need to run separate systems for voice communication and data transmission. And, with OpenSky, you won't even have to switch between radio modes to do both simultaneously.

### *RS-232 Interface*

For data transfers or graphics, your M-803 is constructed with an industry-standard RS-232 interface serial port for connecting an optional equipment Mobile Data Terminal (MDT), laptop PC or third-party display or key-entry device.

OpenSky works seamlessly with equipment from popular manufacturers and off-the-shelf applications through a standard UDP/IP protocol, providing you with simple "plug and play" connectivity.

Suddenly and simply, the same M-803 you've been using for voice conversation and tuning radio frequencies becomes the device you use to view photographs, maps or driving directions, generate reports, access databases, in short to share any digital file your job requires.

# Multi-Agency Coverage

OpenSky is scalable and designed to accommodate a virtually unlimited number of mobile and portable devices from a single fleet, or even a complex network made up of several cooperating agencies.

Examples of how OpenSky improves cooperation:

- Every truck in the FedEx fleet can share one large national network.
- Every cruiser in a state-wide police agency can communicate with any other cruiser, from one end of the state to the other.
- Patrolmen with older analog equipment can connect seamlessly with newer digital devices over the same network.
- Emergency response agencies share the same network for improved communications during a massive crisis.
- With an M-803 at the heart of your trunk-mounted VTac Vehicular Tactical Network, your vehicle provides off-network user-to-user communications at the scene of an emergency.

## Promotes Interagency Cooperation

See full discussions of Talk Group, User Group and User Profile elsewhere in this manual.

In fact, the system is best suited to multi-agency public safety networks over areas as large as an entire state: every cruiser, ambulance and fire truck and all their dispatchers and support personnel sharing voice, data, even graphics over the same network.

### *Talk to Anyone on the Network*

Each user needs only one radio to connect seamlessly to many independent agencies or cooperating dispatch networks.

- There’s no need to monitor multiple frequencies on several pieces of equipment to maintain contact.

- User talk groups connect you at all times with precisely the users you need to reach, no matter who they work for, or where they're located within the network.

## Connectivity with Legacy Equipment

The all-digital, end-to-end TCP/IP OpenSky Intranet even provides support for legacy equipment and protocols both digital and analog.

Along with supplying voice and data to your M-803 mobile radio, the network will also support existing (or "legacy") radio equipment you may still need to use during a hardware rollover.

This also means you'll be able to make radio contact with cooperating agencies on the same network, whether or not they have made the conversion to OpenSky equipment, as long as they use their radios to network with OpenSky.

### *Voice and Data to a Single Device*

For graphics, you'll need to remain connected to your Mobile Data Terminal (MDT).

With OpenSky, you won't need independent system architecture to receive voice and data communications. And, with a Mobile Data Terminal connected through the peripheral interface, you'll have unprecedented ability to send and receive forms, NCIC profiles, maps, floorplans, all the complicated graphical data you need to make informed on-the-job decisions.

## Improved Coverage and Signal Strength

Part of OpenSky's scalability is its ability to accommodate as many base stations as your coverage area requires for robust voice and data transmissions, wherever your route may extend within the network.

### *Vehicular Tactical Network*

VTac devices (trunk-mounted M-803 radios arrayed with a duplexer and a vehicular repeater) and OpenSky cell sites automatically extend coverage into otherwise hard-to-reach areas.

With a VTac device in your vehicle, you'll enjoy extended signal reach into buildings or behind barriers, as well as repeater capability for off-network unit-to-unit communications.

### *Background Roaming and Switching*

Automated switching takes place in the background with OpenSky, so you'll no longer be required to scan for an open channel, or wait for an available channel, when you move through your coverage area.

Signal strength sensitivity is user-modifiable to reflect local conditions.

Instead of depending on choices from a central switching station, your radio itself constantly monitors signal strength and makes its own decision to roam to another base site for a more robust connection.

Chances are you'll never know your unit has been "handed off" to a new base station and automatically assigned to the best available channel.

## Better Peak-Time Performance

OpenSky's digital trunking architecture provides enormous advantages over conventional FM operation. Conversation capacity is effectively doubled by the system's ability to carry two voice-to-voice conversations over the same channel that was previously dedicated to just one.

### *TDMA Technology*

The M-803 uses TDMA technology to allow multiple users to share a single RF channel. In addition, a single 25kHz RF channel can support simultaneous digital voice and data communications.

By doubling the capacity of each channel, the OpenSky TDMA network relieves the pressure of heavy use without additional channels.

The M-803 supports multiple voice groups, multi-level priorities, priority scanning, dynamic voice group assignment, pre-emptive emergency calls and optional encryption.

### *Optional GPS Tracking*

GPS tracking devices embedded in optionally-equipped M-803 radios quickly and accurately locate users on a visual display screen for dispatchers, virtually eliminating the need for users to report their position. With an overview of the locations of all vehicles, dispatchers have the information they need to assign the nearest vehicle to a developing emergency.

GPS tracking uses a small fraction of system resources, but eliminates verbal location reporting for huge overall capability gains.

By eliminating the background chatter of constant location reporting, OpenSky frees up system resources for more critical communications, especially at peak traffic times.

# Software-Configured Device

Your M-803 is a “soft” radio. Its functions are determined by OpenSky software applications, in much the same way computer hardware is configured for different applications.

Unlike older analog radios you may have used, with their hardware-based proprietary functions, your M-803 converts voice waves into digital information before it transmits to the network, providing noise-free audio transmission and reception.

Make any radio in the system “your radio” by logging on with your identity code.

What’s more, because each user in the network has a unique identity code, you can activate your identity from any radio connected to the network. Any radio from your agency’s hardware stockpile can become “your” radio and log on with your profile.

## Multi-Mode Functionality

Finally, if you need to be multi-mode, your M-803 supports several (even several applications simultaneously) providing capability with the needs of different user groups.

You can operate under the OpenSky digital protocol or use the same device to access Conventional FM with CTCSS analog FM or APCO Project 25 Phase 1 operations, depending on the user configuration of your network or agency.

### *Analog-to-Digital Rollover*

The M-803 can work with existing analog infrastructure to enable an essentially seamless transition to fully digital communications

If your user group or another user group with whom you communicate is making the transition from analog to digital service over time, you'll be able to use your M-803 throughout the rollover by selecting the correct mode.

What's more, the M-803 is field re-programmable over the radio channel to allow for future capabilities without replacing the existing subscriber equipment.

- The principle operating mode currently in use is the **OpenSky Trunked Protocol** (OTP).
- From the Mode Selection Menu, you can also access **OpenSky Conventional FM** (OCF) with Continuous Tone Coded Squelch System (CTCSS).
- From the Mode Selection Menu, you can also access **OpenSky Conventional** (OCF) mode using APCO Project 25 Common Air Interface.

## Software Upgradeable

As with computer hardware, your mobile radio equipment is upgradeable each time the OpenSky software enables a new feature or operational enhancement.

Communications protocols, radio features, and protocols can be changed easily and transparently to the user, during a shift or during "sign-on" at the beginning of a new shift.

### *Enhanced Digital Features*

TIP

See full discussions of Talk Group, User Group and profiles in Chapter 2 of this manual.

The all-digital network and OpenSky's digital trunking features also enable a rich array of network enhancements unthinkable over historical FM broadcast systems.

Voice grouping (into talk groups, user groups, and profiles) is probably the most obvious advantage to individual users, but the interconnectivity of the OpenSky network also enables a variety of essential enhancements including:

- Priority scanning
- Multiple priority levels
- Pre-emptive emergency calls
- Selective calls directly to User ID
- Late-entry calls
- Autonomous roaming for wide area applications.

You'll benefit from high-quality, noise-free voice communications with enhanced speech clarity compared to analog, especially in noisy environments.

CHAPTER 2

# Network Organization



# Your Voice Feature Personality

When you activate your radio at the beginning of a shift and sign on with your unique identity code, your radio is assigned its IP address and "provisioned" with a radio personality that identifies the other users on the network with whom you are most likely to need to communicate.

Some users you'll only monitor, others you'll want to talk with during the course of your shift, just as with older analog equipment you talked over one frequency and monitored others to keep informed about the activities of users in your agency, workgroup, task force, fleet or geographic area.

Profiles are assigned by your network administrator to match your communication needs. You'll have access only to those users who fall within your profile.

Your overall radio personality is organized into **User Groups** (talk groups and listen groups), similar to a *channel* in a conventional FM radio system. These user groups are then organized into **Profiles** (collections of up to 16 user groups), similar to *banks of channels*. Finally, as many as 16 profiles make up your radio **Personality**.

Only one profile is active at any time. Within that profile, only one user group is your Talk Group; the others are Listen Groups. So, while you have tremendous capability to establish contact with a very large number of users, you'll need to select the profile that puts you into voice contact with the talk group you need at any time.

# User Groups

A user group is a set of users who regularly need to communicate (all the officers in a state police barracks, for instance, or all the drivers who work a particular shift).

- **In conventional FM** radio broadcast systems, these users work together by tuning to the same channel.
- **In the IP-backbone OpenSky digital network**, subscribers in a user group are connected by a bit of data in the header of every voice or data packet addressed to the members of the group.

With OpenSky, members of the same user group can stay in contact regardless of where they roam within the network, whether the network incorporates a single county, a state, even the entire nation.

TIP

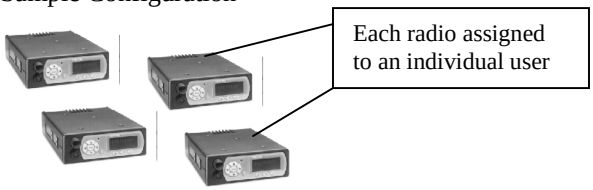
Network capacity is the only limitation on the number of users that can make up a group.

Dispatchers maintain contact with all members of the group, and each user can stay in "push-to-talk" contact with the dispatcher and all the users in their talk group, even if those users are from different, inter-networked agencies.

The Figure below illustrates a small user group of four M-803 mobile radios.

Figure 1 User Group

Sample Configuration




Nothing about this user group so far defines it as a Talk Group or a Listen Group. That determination is made when user groups are gathered together by the network administrator into the larger groups called profiles.

# Profiles

A profile is a set of up to 16 user groups. All sorts of configurations are possible within this simple architecture. Police officers on the same shift might make up a profile, for instance. Within this profile, each police station on the network might be assigned a user group. So the profile would connect all the cruisers from 16 stations for an entire shift.

Officers from each station would most likely be in "push-to-talk" contact with one another; all other officers on the same shift would most likely monitor the other groups for "listen-only" access to all other calls within the profile. But this is only one possible configuration.

TIP

Members of a talk group are not necessarily scanning the calls of the same listen groups.

A user group might just as easily include officers from several stations: a SWAT team, for example, or a special emergency task force might require the collaboration of special personnel or equipment from different police stations, or even other agencies.

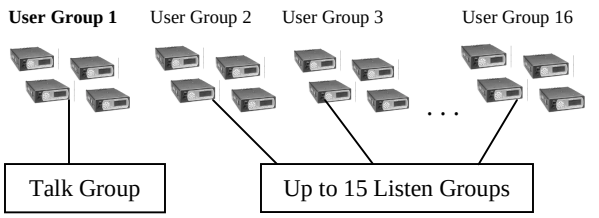
- **In conventional FM** radio broadcast systems, users with this sort of relationship would create an "ad hoc" profile by tuning to one channel for talk-group privileges and scanning an entire bank of channels to monitor the conversations of other groups.
- **In the IP-backbone OpenSky digital network**, members of the same talk group automatically receive every voice message addressed to the group, and monitor the voice messages of every other user group in the profile.

TIP

Of the 16 available profiles, Network Administrators will often reserve one for Dynamic Regroup use.

Each user in the OpenSky network can be assigned as many as 16 profiles by the network administrator. At any time during a network session, users can select the profile that suits their needs by using the front control keypad to access the Profile Menu. If selected for Dwell Display, the Current Profile selection will be visible in the radio's front panel display area.

Figure 2 User Profile




## Talk Groups

While your active profile can contain up to 16 user groups, only the primary group in any profile is your Talk Group. All the other user groups in your profile are listen-only groups. You'll hear the calls from these groups but they will not hear your voice *unless your user group is part of* ***their profile****.*

To initiate voice-to-voice contact with a particular user, you'll have to select the profile that makes that user part of your talk group. This is only possible if your network administrator has configured a talk group that contains both you and the other user.

If each of you has a profile that includes the other in a talk group, you can each select the profile that puts you into "push-to-talk" contact with the other. (Or one of you can reply to the other in Talkback Mode.)

## Listen Groups

All the other user groups in each of your up to 16 profiles are "listen groups". See the **User Profile** Figure above for an illustration of how user groups are related in a profile.

By adding different listen groups to your several profiles, your network administrator can change the configuration of the user groups you can monitor at any time by making the appropriate choice from the Profile menu.

You may only have one talk group, but that doesn't keep you from tuning in different profiles to monitor a different "bank of channels."

### Talkback Scanning

While you cannot initiate contact with users in your "listen groups," you can reply to their incoming calls using Talkback Scan mode.

With your radio in Talkback Mode, your display screen will show the identity of your most recent incoming caller. Press the **Push-to-Talk** button on your handset and send your voice reply.

## Radio Personality

Your radio personality is a collection of up to 16 profiles. The entire personality is organized by your network administrator and is unique to your communication needs.

TIP

If an emergency prompts your Network Administrator to enact a Dynamic Regrouping of user groups, you'll be prompted to conduct a mid-shift log-on to re-provision your radio with an updated personality that includes a pre-programmed or ad hoc emergency user profile.

When you activate your radio at the beginning of a shift and sign on with your unique identity code, your radio is assigned its IP address and "provisioned" with a radio personality that identifies the other users on the network with whom you are most likely to need to communicate by voice.

Your overall radio personality is organized into **User Groups** (talk groups and listen groups), similar to a *channel* in a conventional FM radio system. These user groups are then organized into **Profiles** (collections of up to 16 user groups), similar to *banks of channels*. Finally, as many as 16 profiles make up your personality.

Figure 3 Radio Personality

Sample Configuration

**Profile 1** (1 Talk Group and up to 15 Listen Groups)

**Profile 2** (1 Talk Group and up to 15 Listen Groups)

**...Profile 16** (1 Talk Group and up to 15 Listen Groups)

Radio personality architecture gives you tremendous flexibility to organize your communications needs, even as conditions change. Network administrators can even create ad hoc work groups and profiles to respond to emergent conditions, then prompt the affected users to re-provision their equipment while the emergency unfolds.

With 16 profiles you can participate in as many as 16 talk groups. Or, if you only need one talk group, you can still have up to 16 different profiles that can add more than 200 other user groups to your listen group pool, each with an almost unlimited number of subscribers.

Of course, with potentially hundreds of voice calls in your profile at any time, you'll appreciate the ability to establish Priority Scan groups, or even Lock Out others to help focus your incoming calls.

# Terminology

Most of the terms and concepts you'll need to communicate with your dispatcher, network administrator and other users have parallels in legacy analog networks.

| Digital | Compare to Analog |
|---|---|
| **User Group .....** | FM radio channel |
| **Profile .....** | Bank of FM radio channels |
| **Talk Group .....** | "Push-to-talk" connection with users tuned to the same channel |
| **Listen Group .....** | "Listen-only" connection to a bank of radio channels |
| **Profile .....** | Talk privileges on one channel while monitoring an entire bank of channels |

CHAPTER 3

# Getting Started

# Before Your First Shift

TIP

Don't read this manual cover-to-cover.

Most information in this manual is repeated in several places.

You'll probably learn most of what you need to know by browsing sections that interest you most.

If you're already familiar with mobile radio functions and the "profile and personality" architecture of an all-digital network, you'll find the features and controls of your new M-803 to be logically arranged and easy to understand.

But if you're new to cellular radio service, and especially if you're migrating to OpenSky from an analog radio environment, take some time to review the Network Organization chapter of this manual before operating your radio.

In either situation you'll want to completely familiarize yourself with the controls and indicators of your new radio before you start trying to use it on the job. In particular, you'll want to be able to scroll your way through menu display choices and quickly select the appropriate radio profile for the changing conditions of your work day.

# Radio Controls

Examine your radio thoroughly and familiarize yourself with the location and operation of its controls and indicators before studying their functions. Except for the rear-panel peripheral interface, all the operational controls for the M-803 are located on the control panel or handset.

Whether your passenger compartment is equipped with a dash-mount Mobile Radio Unit (MRU) or a subsidiary Control Head Unit (CHU), the following section will introduce you to all the controls and indicators of your radio's front panel.

# Front Panel Components

The front panel of your M-803 (or CH-103) includes the Power Button/Speaker Volume Dial, the Microphone/Speaker I/O Port, a 5-key “soft-button” keypad for making menu selections, a 19-character vacuum fluorescent Display Panel, 3 Mode Selector buttons, an Emergency Button and an Ambient Light sensor.

Your Push-to-Talk button is located on your hand-held detachable microphone or hands-free speaker box (not shown here).

Because an M-803 mobile radio can support **as many as five** Control Heads, your installation may or may not include the hardware “box” behind the front panel. The figure below shows the complete dash-mounted configuration of an M-803 mobile radio complete with front control panel.

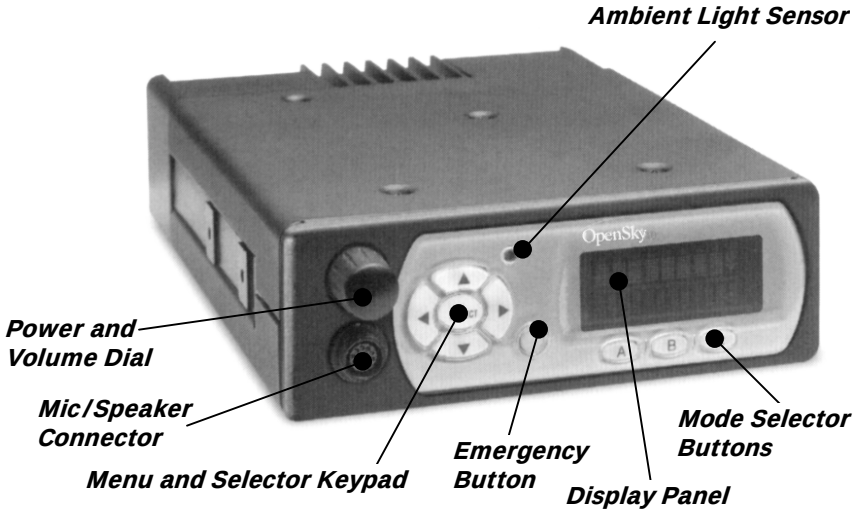
Peripheral equipment such as a mobile computer or data terminal connect to the M-803 through the rear-panel peripheral interface.

**TIP**

Up to five Control Head Units (CHU) can be supported by a single Mobile Radio Unit (MRU). The most typical multiple CHU configuration would be a large fire truck or other vehicle with a dash- or trunk-mounted M-803 and auxiliary control heads positioned elsewhere on the vehicle.

Figure 4 Front Panel Components

Dash-Mount M-803 Standalone Configuration



| Component | Function |
|---|---|
| **Power Button/ Volume Dial** | Push to Power Up. Push again to Power Down. Twist clockwise to increase speaker volume. Twist counter-clockwise to decrease speaker volume. |
| **Mic/Speaker Connector** | Attach hand-held microphone, hands-free speaker, or keypad/microphone here. |
| **Emergency Button** | In most setups, pressing this button will send an emergency alert and open voice communication with your default emergency talkgroup. |
| **Ambient Light Sensor** | Radio automatically selects Display Panel brightness level based on ambient light. Do not block this sensor. |
| **Menu and Selector Keypad** | Cycle through the menu loop with Up and Down buttons. Scroll through selections with Left and Right buttons. Press Select button to indicate your final choice. |
| **Display Panel** | Menu selections appear here, along with Signal Strength and Volume indicators. User may select which of several Dwell Screens the radio will display. |
| **Mode Selector Buttons** | Depending on setup choices made by your Network Administrator, you'll use these buttons to choose between software mode presets. |

# Peripheral Interface

The M-803 supports a variety of interfaces with its flexible interconnect. The rear panel provides power supply connectors and interfaces for both analog and digital peripherals.

## RS-232 Port

The serial RS-232 port operates in asynchronous ASCII mode for configuration and control and switches to Serial Line Internet Protocol (SLIP) mode for data communication between the fixed network and a mobile computer or terminal device.

## I/O Connector

The I/O connector provides interfaces for an external 10 Watt speaker.

## CAN 2.0 Bus

The rear panel also provides access to an industry standard Control Area Network (CAN) 2.0 Bus for reconfigurability and peripheral support.

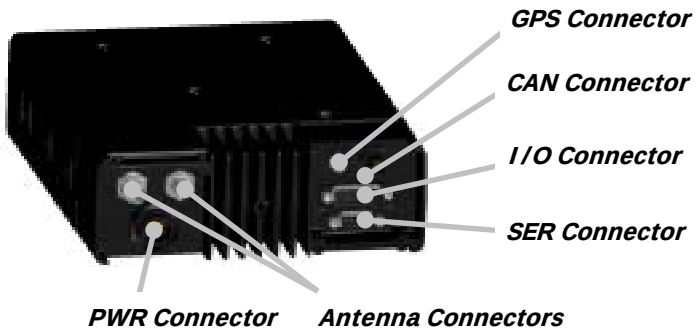
Through the CAN port the M-803 in either dash- or trunk-mounted installations can connect to as many as 5 Control Head Units (CH-103) or other CAN peripherals such as public address. A terminator is used if no CAN devices are used. The maximum length of the CAN bus is 40 meters.

# Hardware Connections

While day-to-day operations are conducted from the front panel controls, the rear panel connectors will be useful during installation, troubleshooting and hardware upgrades.

Figure 5 Rear Panel Components

Connectors and Interfaces




| Component | Function |
|---|---|
| **SER Connector.....** | Plug in your optional Mobil Data Terminal (MDT) to this serial RS-232 port. |
| **I/O Connector.....** | Plug in your optional 10 Watt Speaker to this port. |
| **CAN Connector.....** | Connect up to five Control Heads (CH-103) or other CAN devices such as public address through this port. |
| **GPS Connector.....** | Plug in your optional GPS antenna to this port. |
| **PWR Connector .....** | Cables from the vehicle battery supply power to the M-803 through this port. |
| **Antenna Connectors .....** | Plug in your radio antenna to these ports. If the radio has the Full-Duplex option, the radio will have both the TxRx and Tx connectors, otherwise it will have just the TxRx connector. Full-duplex capability provides increased data throughput performance. Full-duplex is recommended when using TCP/IP end user applications, or sending messages longer than 1000 bytes using UPD/IP. |

# Display Screen Overview

The display screen shows the current status of your radio setup. Signal strength and volume indicators reside in the right-hand sector. The rest of the screen is devoted to a 2-line Vacuum Fluorescent Display (VFD) that changes in response to user interaction with the Menu Selection buttons

- **Signal Strength Icon** (the 5-bar antenna icon) uses three bars to indicate three levels of connectivity strength and two bars to indicate the direction of RF data. The directional bars “animate” upward to indicate radio transmit, downward to indicate radio receive.
- **Speaker Volume Icon** (looks like a speaker) indicates user-selected speaker volume setting. Twist the volume knob to change this setting.
- **Selection Display** (the top line of VFD text) changes as you press the Left and Right menu selector buttons to scroll through the selections in the active menu loop.
- **Menu Display** (the bottom line of VFD text) changes as you press the Up and Down menu selector buttons to scroll through the menu loop.

TIP

Users who fail to select a dwell display will not track channels, calls, or profiles. Instead, the screen will display the most recent user menu selection until another menu choice is made.

- **Dwell Display** (the user-defined display default) When not engaged in menu selection, the 2-line VFD display defaults to the user-selected Dwell Display. The top line shows the current Transmit Talkgroup. The bottom line shows the user’s choice of the current Profile, Channel, Caller or Received Talkgroup.

The Figure below reflects just one of many possible displays for a front panel display screen. There is no pre-selected default screen for the OpenSky protocols. Instead, each user will select the display condition of his/her choice by making a choice from the Dwell Display menu.

After any Menu/Select procedure, your display screen will revert to whatever display you have chosen as your dwell display. Once the dwell display is active, it will change dynamically to reflect the current profile, caller, channel or received talkgroup.

Figure 6 Display Panel Elements

Sample Display


| Component | Function |
|---|---|
| **Signal Strength Icon** ..... | Resident in every display screen. As signal improves, more "waves" appear. Waves animate outward for Message Send, inward for Message Receive. |
| **Volume Icon** ..... | Resident in every display screen. Shows current speaker volume setting chosen by the user. |
| **Menu Selection Display** ..... | During a menu session the bottom line responds to the Up and Down menu buttons to show the active menu (Talkgroup Menu in this case). The top line responds to the Left and Right menu buttons to display the options within that menu (available Talkgroups within the active profile in this example). |

# Dwell Displays

The M-803 Display Screen is highly interactive and responds with a changing display in the upper and lower text lines as the user presses the Menu Selection buttons to scroll through the menu loop and the entries under each menu.

When the button-pressing stops, though, the screen will revert to the Dwell Screen and show the current status of whichever category of information the user has selected from the Dwell Display menu.

## Dwell Display User-Selectable

TIP

Your Dwell Display selection survives Power Down for your User ID, so whatever choice was active during your previous session is your ad hoc default selection the next time you Power Up.

The first line of any Dwell Display for Open Sky trunked mode operation is always the currently active Transmit Talkgroup for your selected profile. What appears in the second line, though, depends on what choice you make for your default display preference.

Whatever your preference, your radio will respond dynamically to changes in status, always displaying the current information about your network connection. You may elect to have the screen display your current Profile, current Channel name, current Caller, or Received Talkgroup.

The figure below shows the choices available for dwell display and some representative options available under each menu heading. Setups vary widely from network to network; don’t expect to find these actual options in your menu.

Figure 7 Dwell Display Hierarchy

Sample Setup

| *Profile* | *Caller* | *Received Talkgroup* | *Channel* |
|---|---|---|---|
| *TACTICAL* | *978240001* | *POLICE 01* | *OT450* |
| *SOUTH* | *...40002* | *DISPATCH* | *OT460* |
| *HIGHWAY* | *DISPATCH* | *EMS 09* | *0T550* |
| *METRO* | *No Caller* | *No Calls* | *OT999* |

Changing your Dwell Display choice is as simple as any other menu selection operation. Your choice, once made, persists until you change it again, even surviving Power Down and re-provisioning procedures for your User ID.

See the chapter on *Display Screen Functions* for step-by-step instructions on how to select or change your Dwell Display.

# Sample Dwell Displays

Figures in the section below are merely illustrative of how dwell displays might look in particular network setups. You should not expect to see these exact text selections in your own menu, which is prepared by your network administrator to suit the particular needs of your organization.

## Dwell Display–Profile

TIP

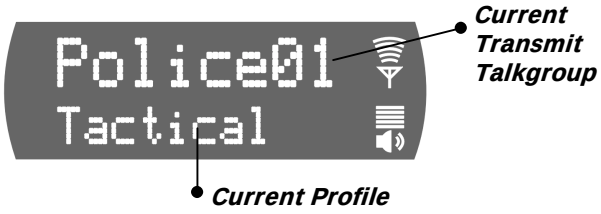
Profile is a largely static Dwell Display. It shows your current profile and active talkgroup, both of which are static unless overridden by user.

**If you select Profile** as your Dwell Display, the upper line of text will show the Transmit Talkgroup for the active profile. The lower line of text will show the name of the current profile.

Once selected, these displays will update to reflect user interaction. Selecting a new profile will update both the profile and the talkgroup fields to the current selection.

Figure 8 Dwell Display—Profile

Sample Screen




## Dwell Display-Caller

TIP

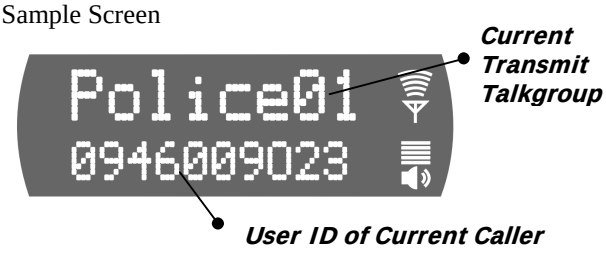
With Caller as your Dwell Display, the identity of your current caller updates dynamically, but the top line always shows your current Transmit Talkgroup.

**If you select Caller** as your Dwell Display, the upper line of text will show the Transmit Talkgroup for the active profile. The lower line of text will show the User ID of the current caller.

Once selected, these displays will update dynamically. Each new call you receive will change the bottom line caller display. When no call is active, the bottom line will display: No Caller.

Figure 9 Dwell Display—Caller

Sample Screen




## Dwell Display–Received Talkgroup

TIP

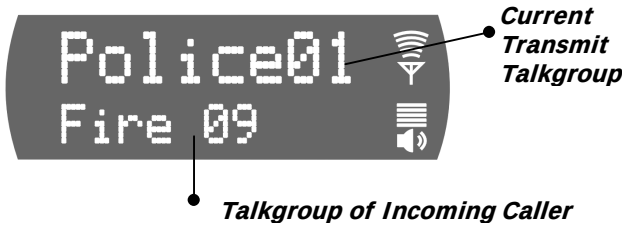
With Received Talkgroup as your Dwell Display, the Bottom Line updates dynamically to display your caller's Talkgroup, but the Top Line is static.

**If you select Received Talkgroup** as your Dwell Display, the upper line of text will show the Transmit Talkgroup for the active profile. The lower line of text will show the Talkgroup of your incoming call.

Once selected, these displays will update dynamically. Each new call you receive will change the bottom line caller display. When no call is active, the bottom line will display: No Calls.

Figure 10 Dwell Display—Received Talkgroup

Sample Screen



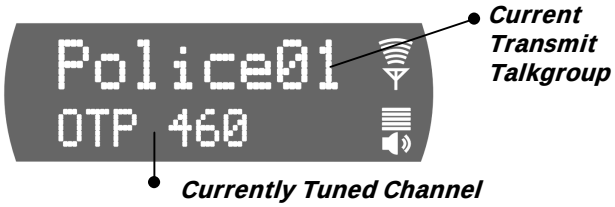

## Dwell Display–Channel

**If you select Channel** as your Dwell Display, the upper line of text will show the Transmit Talkgroup for the active profile. The lower line of text will show your currently tuned channel.

Once selected, these displays will update dynamically, but the only way to alter the display would be to tune in a new channel.

Figure 11 Dwell Display—Channel

Sample Screen




## Dwell Display–No Access

**No Access** is not an option in the Dwell Display menu. It's a default message your screen will display whenever your radio cannot make contact with the OpenSky network.

TIP

From the No Access screen there's no indication of which choice you've made for Dwell Display.

Figure 12 Display Screen—No Access

Sample Screen


You can wait for the condition to clear, or, if an off-network mode of operation will temporarily suit your needs, navigate to the Mode Menu and select a conventional radio mode.

CHAPTER 4

# Display Screen Functions

# Menu and Selector Keypad

Display Screen functions are launched from the Menu and Selector Keypad. Most user-selectable radio operations are conducted by using the keypad to make selections from the operations menus.

## User-Selectable Menu Operations

You'll use the keypad for mundane chores like adjusting your display screen brightness, and for critical operations like establishing your operational mode and setting your active profile. Below is a list of menu options.

### *Keypad-Accessible Menu Operations*

- Set your Operations Mode:
  *OpenSky Trunked, Conventional, Over-the-Air Download, or Coverage*
- Set your Active Profile
- Set your Priority Talkgroup
- Lockout any Talkgroup
- Set your Scanning Mode
  *Normal, Talkback, or No Scan*
- Select a Channel from the preset Channel Menu
- Set your Dwell Display
- Enable or Disable Audible Side Tones
- Change Brightness Setting of your Display Screen

## Keypad Navigation

With a few exceptions that will be discussed in specific sections below, the same basic steps will suffice for all menu selection procedures. In general, selecting a new menu option setting is a 3-step process:

1.) Repeatedly **Press the Up or Down key** to cycle through the list of available Menu headings. When the Menu you want appears in the Top line of the Display Screen . . .

2.) Repeatedly **Press the Left or Right key** to cycle through the list of available options for the Menu. When the option you want appears in the Bottom line of the Display Screen . . .

3.) **Press the Select button** to lock in your choice.

When the M-803 accepts your choice, the display screen will revert to the user-selectable Dwell Display you've chosen.

# Select Dwell Display

There is no specific "default screen" for the M-803. Rather, there are several user-selectable options for the categories of feedback the radio will display during operation. See the *Getting Started* chapter for a full discussion of your dwell display options.

If you're happy with the dwell display when your radio Powers Up, do nothing. You only need to change your Dwell Display to get information the radio is not already providing.

The first line of any Dwell Display for Open Sky trunked mode operation is always the currently active Transmit Talkgroup for your selected profile.

What appears in the second line, though, depends on what choice you make from the Dwell Display Menu for your default display preference.

In short, you'll use the menu buttons to establish your own default screen, depending on whether you want your radio to display the current Profile, the Channel, your current Caller, or your current caller's Talkgroup.

### ➢ How to set your Dwell Display Selection

1.) If the top line of your display screen shows the Transmit Talkgroup for your selected profile, you're ready to begin.

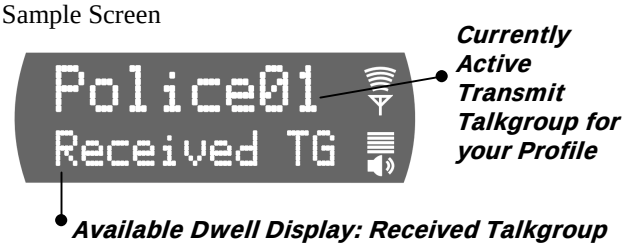
2.) Use the **Left and Right buttons** to cycle through the Dwell Menu options in the lower line of the display screen: Profile, Caller, Channel, Received Talkgroup.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice.

Figure 13 Dwell Display Selection

Sample Screen




| Component | Explanation |
|---|---|
| **Transmit Talkgroup**..... | The first line of any Dwell Display is the active talkgroup for your current profile. |
| **Menu Option**..... | Choose Caller, Profile, Channel or Received Talkgroup. For every call you receive, your radio will identify your caller's talkgroup. |

# Select Operational Mode

The M-803 is a "soft" radio, designed to operate under a variety of software-enabled, user-selectable operational modes. Under most work conditions, you'll

operate your radio as a fully-networked component of the OpenSky digital network and carry on rich-featured communications with similarly networked agencies or subscribers.

At startup, your M-803 automatically selects the OpenSky Trunked Protocol (OTP) to provide the full range of features available on your digital voice and data network.

TIP

Your only indication that you have logged on to the network is the name of your Talkgroup in the Dwell Display.

On the other hand, if your agency cooperates with several others in a multi-agency network supported by OpenSky's IP backbone, all agencies benefit from the advantages of the network architecture whether or not they've migrated from older analog equipment to digital OpenSky radios.

For those occasions when you need to communicate with radios using older protocols (such as conventional FM), you can manually change your radio's operating mode.

# Universal Connectivity

When conditions require it, you can re-configure your M-803, with a simple menu selection, to access conventional CTCSS analog FM or APCO Project 25 CAI operations. This is especially helpful when you need to communicate with users from other agencies or fleets not completely integrated with OpenSky.

- The principle operating mode currently in use is the **OpenSky Trunked Protocol** (OTP). Choose OTP for full-featured communications with other digital equipment connected to the OpenSky network.
- From the Mode Selection Menu, you can also access **OpenSky Conventional FM** (OCF) with Continuous Tone Coded Squelch System (CTCSS).
- When your Network Administrator initiates a mid-shift Personality Upgrade or Dynamic Regrouping, you'll engage the **Over-the-Air Download** mode.

- If you stray outside the network's strong coverage area and require an off-network conventional radio connection, select **Coverage** mode to temporarily improve your capabilities.

To protect against inadvertent or too-hasty mode changes, the M-803 software will force a confirmation sequence before accepting your new selection.

---

➢ How to set your Operational Mode

1.) Use the **Up and Down buttons** to cycle through the menu choices until Mode Menu appears.

2.) Use the **Left and Right buttons** to cycle through the Mode Menu options: *Trunked, Conventional, Over the Air Download, or Coverage.*


3.) Press the **Select button** to activate the fail-safe Confirmation process.

4.) Use the **Left and Right buttons** to cycle through the confirmation options: *Confirm?Y* to make the change; *Confirm?N* to abort the change.


5.) Press the **Select button** to lock in your choice.

6.) The display panel will flash the confirming message: *BOOTING* and your radio will reconfigure itself to operate in the Mode you selected.

# Duration of Mode Change

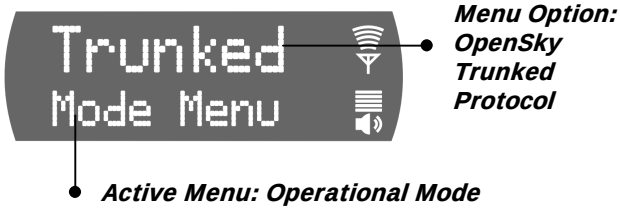
Mode change is a major operational commitment. It requires a Power Down and Reboot operation which

the radio itself will undertake when you press the Select button to confirm a mode change.

At Power Up, your radio automatically adopts the operating mode of its previous use. Any changes you make to the mode during your shift will remain in effect until you make another selection and Reboot.

Figure 14 Operational Mode Menu

Sample Display




| Component | Explanation |
|---|---|
| **Mode Menu** ..... | Determines whether your radio will operate as conventional analog equipment, or a fully-functioning digital OpenSky radio. |
| **Menu Option** ..... | When you access the Menu, the currently selected option appears in the option line. To change, scroll to a new option and press the Select button. |

# Select Profile

When you Power Up your radio at the beginning of a shift, your M-803 is provisioned by the network with a radio personality composed of as many as 16 profiles, one of which your network administrator has designated as your Active Profile by default.

Your default profile will contain your most common talk group and as many as 16 other user groups the radio treats as “listen groups.”

Each of your other profiles, if any, is another group of as many as 16 more user groups, one of which is always the default Talkgroup. See the *Getting Started* chapter for a full discussion of user groups, profiles, listen groups, talkgroups and radio personality.

If you need access to groups not part of your active profile, you can use the Menu Selector Buttons to access the Profile menu and switch to any other pre-set menu that is part of your radio personality.

It's a good idea to know the default Talkgroup for each Profile in your Personality so you can access it easily from the Profile Menu.

You'll have to be familiar enough with your profiles to know which user groups are organized under each name. Or, if just want to access a new talkgroup, you can tune in the profile for which the talkgroup you want to access is the default.

# Check or Change Active Profile Status

If your Dwell Display is set to Profile, your screen will display your active profile at all times. Otherwise, to see your current selection, use the Menu Selector keypad to access the Profile Menu.

To switch to a new active Profile during your work shift, access the Profile Menu from the Menu Selector keypad and make a new selection from the options.

## ➢ How to set your Active Profile

1.) Use the **Up and Down buttons** to cycle through the Menu choices until ProfileMenu appears.

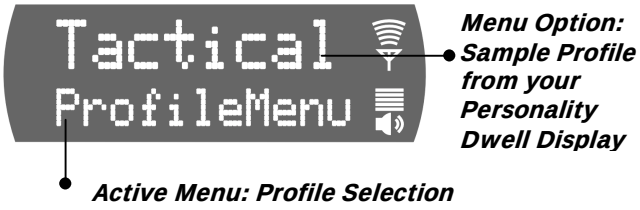
2.) Use the **Left and Right buttons** to cycle through the Profile Menu options established by your Network Administrator.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice.

Figure 15 Profile Selection Menu

Sample Display




| Component | Explanation |
|---|---|
| **Profile Menu**..... | Determines which group of up to 16 user groups will be your active Profile. |
| **Menu Option**..... | When you access the Menu, the currently selected Active Profile appears in the option line. To change, scroll to a new Profile and press the Select button. |

# Select Talkgroup

Only one of the up to 16 user groups in your active Profile is configured as a Talkgroup. The others, as determined by the Network Administrator, are listen groups. You will receive voice calls from the listen groups, but you can only instigate voice calls with them by assigning them Talkgroup status.

You can reply to incoming voice calls if your radio is operating in Talkback Scan Mode, but you cannot instigate these calls. See *Scan Mode* for more details.

## Check or Change Active Talkgroup

If your Dwell Display is set to Profile, your screen will display your active profile and your Transmit Talk-group at all times. Otherwise, to see your current

selection, use the Menu Selector keypad to access the Profile Menu.

To assign Talkgroup status to a new user group during your work shift, access the Talkgroup Menu from the Menu Selector keypad and make a new selection from the options.

## ➢ How to set your Active Talkgroup

1.) Use the **Up and Down buttons** to cycle through the Menu choices until TalkGrpMenu appears.

2.) Use the **Left and Right buttons** to cycle through the list of user groups in your Active Profile, as established by your Network Administrator.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice.

Figure 16 Talkgroup Selection Menu

Sample Display


| Component | Explanation |
|---|---|
| **Talkgroup Menu**..... | Determines which of up to 16 user groups will be your Talkgroup. |
| **Menu Option**..... | When you access the Menu, the currently active Talkgroup appears in the option line. To change, scroll to a new user group and press the Select button. |

# Prioritizing a Talkgroup

TIP

Priority Scan is different from Talkgroup status. Even if you give a user group Priority Scan status, your Talkgroup is still your Talkgroup.

At different times during your shift you may want to improve your radio's sensitivity to incoming calls from a particular user group. If you make no such changes during a radio use session, the Default Talkgroup for each profile will maintain automatic scanning priority over all other user groups in the profile.

Increasing the scanning priority of a group other than the Default Talkgroup improves your receptiveness to that group's calls compared to all the other groups in your active profile, *including the Default Talkgroup*.

You may use the procedure below to establish one new priority scanning group for every profile in your radio personality. There's no ranking order in scanning priority: one group per profile is the priority group; all other groups in the same profile are "non-priority."

## ➢ How to Assign Priority to a Talkgroup

1.) Use the **Up and Down buttons** to cycle through the Menu choices until PriTGMenu appears.

2.) Your display screen shows PriTGMenu in the bottom line and the current Priority Scan group in the top line.

3.) Use the **Left and Right buttons** to cycle through the list of user groups in your selected Profile, until the group you want to assign Priority Talkgroup status appears onscreen.

4.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice.

Figure 17 Priority Talkgroup Menu

Sample Screen


| Component | Explanation |
|---|---|
| **Priority Talkgroup Menu** | When this menu is active, the Left and Right buttons will scroll you through the user groups in your selected profile. |
| **Menu Option** | Scroll through groups and use the Select button to confirm the group you wish to make your temporary Talkgroup. |

## Duration of Priority Assignments

If you make no priority assignments during your shift, each profile selects the Default Talkgroup as the priority scan group. When you use the Priority Scan menu to assign scanning priority to a new group, your assignment stays in effect until you change it or turn your radio off. Powering Off erases all scanning priority assignments and resets your radio to the defaults.

# Lock Out Talkgroup

There are at least two ways to focus your voice communications by suppressing calls from user groups in your active profile.

- **No Scan.** By changing your Scanning Mode to NOSCAN you can block all non-emergency voice calls from the “listen groups” in your profile,

concentrating your attention entirely on your Default, Selected or Priority Talkgroup.

- **Lock Out.** By locking out selected Talkgroups, you can eliminate just the background "noise" you select, focusing your scanning resources on just the groups whose calls you wish to track.

**Emergency calls** will cut through your lock-out command, but you won't be distracted by the other voice call activity from user groups you've locked out, until you elect to run the menu again and remove the lock.

# Groups You Can Lock Out

- **Active Profile.** It stands to reason that only groups in your active profile can be locked out, since they're the only groups whose voice calls you'll hear. The Lockout menu responds to incoming voice call activity, loading the names of calling groups into the menu as the calls are received.
- **Received Call Menu.** If you don't find a name you're looking for in the Lockout menu, either it's not in your active profile, or you haven't received a call from that group yet in this radio session. Until you do take a call from that group, you can't lock them out.

To protect against inadvertent or too-hasty Lockout procedures, the M-803 software will force a confirmation sequence before accepting your new selection.

## ➢ How to Lock Out a Listen Group

1.) Use the **Up and Down buttons** to cycle through the Menu choices until LockOutMenu appears.

2.) Your display screen shows LockOutMenu in the bottom line and, in the top line, the name of a user group from your active profile you've received a voice call from since Powering Up.

3.) If the word NONE appears in the top line, you haven't received any voice calls from user groups in this profile, so Lock Out is not an option.

4.) Use the **Left and Right buttons** to cycle through the list of candidates, if any, until the user group you want to **Lock Out** appears onscreen.


5.) Press the **Select button** to activate the fail-safe Confirmation process.

6.) Use the **Left or Right button** to cycle through the confirmation options: *Confirm?Y* to lock out the group; *Confirm?N* to remove a lock.


7.) Press the **Select button** to confirm your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your Lockout choice.

## ➢ How to Unlock a Listen Group

1.) Use the **Up and Down buttons** to cycle through the Menu choices until LockOutMenu appears.

2.) Your display screen shows LockOutMenu in the bottom line and, in the top line, the name of a user group from your active profile you've received a voice call from since Powering Up.

3.) If the word NONE appears in the top line, you haven't received any voice calls from user groups in this profile, so Lock Out is not an option.

4.) Use the **Left and Right buttons** to cycle through the list of candidates, if any, until the user group you want to **Unlock** appears onscreen.


5.) Press the **Select button** to activate the fail-safe Confirmation process.

6.) Use the **Left or Right button** to cycle through the confirmation options: *Confirm?Y* to lock out the group; *Confirm?N* to remove a lock.


7.) Press the **Select button** to confirm your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your Unlock choice.

Figure 18 Lock Out Menu

Sample Screen


| Component | Explanation |
|---|---|
| **Menu Option** ..... | As you scroll through the user groups in your active profile, notice they only appear in the Lock Menu if you |

| | |
|---|---|
| | have received a voice call from them since Powering Up. |
| **Lock Out Talkgroup** ..... | Both Locked-Out and Not-Locked groups appear in the Menu. You can't confirm the status of any group except by pressing the Select button to enter the Confirmation cycle. |

## Caution Regarding Profile Changes

Talkgroup Lockout status does not survive a change of Profile. If you need to select a new Profile after taking the time to Lockout several talkgroups from your current profile, understand that making the change will Unlock all groups.

Compare your options before changing your profile. If you can achieve your goal by temporarily assigning Priority Talkgroup status to a user group, you may be able to avoid having to lock out the same groups twice.

# Select Scan Mode

Three scanning modes are available for the M-803, but only one can be active at any time. Changing your scanning mode changes the way your radio scans voice calls for all of the profiles in your radio personality, no matter which profile is or becomes active.

Your choice of scanning mode will broaden or narrow the span of your communications with all the listen groups in your profiles, but does not affect your interaction with your talk groups.

Your scanning mode choice will stay in effect until you change it again; even if you turn off your radio, your current selection will be saved until your next use.

| Scan Mode | Explanation |
|---|---|
| **No Scanning ..... ** | **Eliminates distractions**. Full communications (listen and talk) with your talk group. |

No calls from listen groups.

**Normal Scanning** ..... **This is the default setting.** Network administrator has established this as the most effective configuration for everyday use.

Full communications (listen and talk) with your talk group.

Receive calls from the listen groups.

**Talkback Scanning** ..... **Place talkback voice calls** to the most recent listen group by pressing the Push-to-talk button before the Talkback timer expires.

Full communications (listen and talk) with your talk group.

Receive calls from the listen groups.

# Check or Change Active Scan Mode

The Dwell Display screens do not show active Scan Mode status. To see your current selection, use the Menu Selector keypad to access the Scan Mode Menu. The scan mode status displayed in the top line of the screen display is your active status.

To change scan mode during your work shift, access the Scan Mode Menu from the Menu Selector keypad and make a new selection from the options available.

- To **narrow** your scanning list to just the talk group in your active profile, choose No Scan from the Scan Menu.
- To select the **default scanning mode** which scans all the listen groups in your active profile, choose Normal from the Scan Menu.
- To **broaden** your communications range by enabling talkback voice calls to your active listen groups, choose Talkback from the Scan Menu.

### ➢ How to set your Scan Mode

1.) Use the **Up and Down buttons** to cycle through the Menu choices until ScnModeMenu appears.

2.) Use the **Left and Right buttons** to cycle through the list modes until your choice appears: Normal, Talkback or No Scan.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice.

Figure 19 Scan Mode Menu

Sample Display


| Component | Explanation |
|---|---|
| **Scan Mode Menu**..... | Determines whether you will scan or suppress your listen groups for incoming voice messages. Enables or disables Talkback to your most recent caller. |
| **Menu Option**..... | When you access the Menu, the currently active Scan Mode appears in the option line. To change, scroll to a new mode and press the Select button. |

## Duration of Scanning Mode Selections

Scanning Mode selections survive Power Down. At startup, your radio will default to the scanning mode of your last use. Any selection you make during your shift will remain in effect until you make a new selection from the Scan Mode menu.

# Select Channel

If your reception is poor or you are repeatedly denied channel access, you can manually change the radio to a different channel. When you use the menu buttons to choose Channel, the M-803 adjusts to show you the first of the available channels from which you may choose.

## ➢ How to Change the Channel

1.) Use the **Up and Down buttons** to cycle through the Menu choices until ChannelMenu appears.

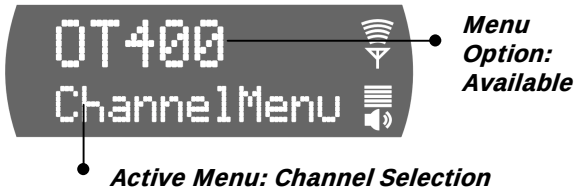
2.) Use the **Left and Right buttons** to cycle through the pre-sets until the channel you want appears onscreen.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice. If your active Dwell Display is Channel, your newly selected channel name will appear in the display panel (along with the active talkgroup) as soon as it tunes in. Otherwise, you'll have to access the Channel Menu again to check your channel.

Figure 20 Channel Change Menu

Sample Screen




| Component | Explanation |
|---|---|
| **Channel Menu**..... | Used to tune in any available pre-set channel from the menu. |

**Menu Option**..... When you access the Menu, the first available channel appears in the option line. To change, scroll through the pre-sets and confirm your choice with the Select button.

# Enable/Disable Side Tones

Your radio sounds confirming tones when you press the Menu or Selector buttons. Most users find this audible confirmation helpful in navigating the menus in the Display Panel.

TIP

Turning off your radio does not affect your Side Tone setting, which will be saved for your next use.

You can disable the side tones, if you wish, by navigating to the Side Tone menu, and selecting Off. To re-enable the tones, you'll need to navigate back to the same menu (without the benefit of side tones) and this time select On.

For covert operations, it is important to be able to turn off the audible side tones that occur when you press a Menu or Selector button. For safety's sake, though, you probably won't want to shut your radio down for the time you're planning to go covert.

To temporarily disable the tones that could expose your presence and position, use the Menu Selector buttons to access the Side Tone Menu. There are only two choices in the Side Tone Menu (On, Off).

If your radio is operating properly but you don't hear tones when you press the Menu or Select buttons, your side tones are probably disabled. Access the Side Tone menu and reset your Tones to On.

## ➢ How to Enable or Disable Side Tones

1.) Use the **Up and Down buttons** to cycle through the Menu choices until SideMenu appears.

2.) Use the **Left or Right button** to change the display from On to Off or vice versa.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice.

Figure 21 Side Tones Menu

Sample Screen


| Component | Explanation |
|---|---|
| **Side Tones Menu**..... | Used to tune in any available pre-set channel from the menu. |
| **Menu Option**..... | When you access the Menu, the screen will indicate whether your sidetones are On or Off. To change the setting, press the Left or Right button and confirm your choice with the Select button. |

# Select Brightness Setting

Your M-803 uses a front-panel light sensor to adjust the display to ambient light conditions. However, the Brightness Selection gives users some control over the screen display.

There are only three choices in the Brightness Menu. You'll use the menu in high- or low-light situations to make the screen one step Brighter or Dimmer than the current (Nominal) setting.

## ➢ How to Change Screen Brightness

1.) Use the **Up and Down buttons** to cycle through the Menu choices until Bright Menu appears.

2.) Use the **Left button** to change the display from Nominal to Dimmer, or the **Right button** to change the display to Brighter.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice. Your display screen should be immediately brighter or dimmer as you requested.

Figure 22 Brightness Selection Menu

Brightness Selection Menu


| Component | Explanation |
|---|---|
| **Brightness Menu**..... | Used to change screen display one increment brighter or dimmer than the automatic (nominal) setting. |
| **Menu Option**..... | When you access the Menu, the screen will indicate Nominal. Change to Brighter or Dimmer, and confirm your choice with the Select button. |

CHAPTER 5

# Basic Radio Operations

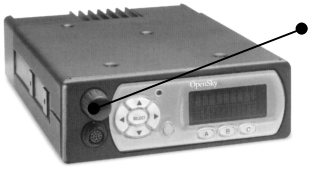
# Power Up

Power Up, Power Down, and Volume functions are all handled from the Power Button/Volume Dial, a front panel component.

## ➢ How to Turn Your Radio On

1.) Push the **Power Button/Volume Dial**. Your radio's vacuum fluorescent display panel will glow to indicate Power Up.

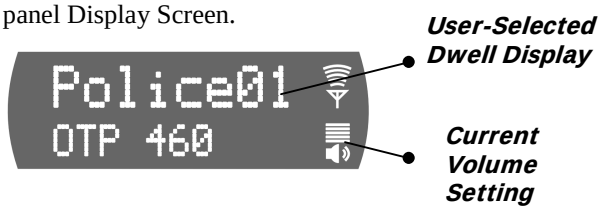
2.) If required by the radio network, use the Mobile Data Terminal (MDT) **Keyboard** to enter your User ID. If your system doesn't require a Log-On, the radio proceeds through the **Startup Sequence**.




3.) Wait through the **Startup Sequence**, which lasts approximately 10 seconds.

*During this time your radio is provisioned with your customized radio personality, emergency conduct and user specifications, all designed for your specific needs by the Network Administrator and prompted by your User ID.*

4.) When provisioning is complete, the M-803 will display your last-saved **Dwell Display** in the front panel Display Screen.



# Log-On

If the radio network requires a Log-On, pushing the Power Button/Volume Dial will supply power to your radio, but will not connect it to the OpenSky network. Your radio will not boot and provision itself until you use the MDT keyboard to log on with your User ID.

Even if you want to use your radio for non-network traditional RF communications, you'll still need to log on to the network first, then select Talkaround Mode to work off-network.

## ➢ How to Log On to the Network

1.) Push the **Power Button/Volume Dial**. Your radio's vacuum fluorescent display panel will glow to indicate Power Up.

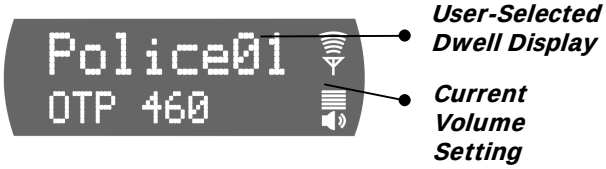
2.) If required by the radio network, use the Mobile Data Terminal (MDT) **Keyboard** to enter your User ID. If your system doesn't require a Log-On, the radio proceeds through the **Startup Sequence**.

***Power Button / Volume Dial***

3.) Wait through the **Startup Sequence**, which lasts approximately 10 seconds.

*During this time your radio is provisioned with your customized radio personality, emergency conduct and user specifications, all designed for your specific needs by the Network Administrator and prompted by your User ID.*

4.) When provisioning is complete, the M-803 will display your last-saved **Dwell Display** in the front panel Display Screen.




# Self-Test

After Power Up and your M-803 radio undergoes a multi-function automatic Boot procedure.

- Your radio is "provisioned" with your radio personality: as many as 16 radio profiles are downloaded to your equipment from the network in response to your User ID.
- Emergency behavior is provisioned along with each profile.
- Your radio conducts a diagnostic Built-In Self-Test (BIST).

The Self-Test is a battery of hardware diagnostic tests on the internal components of the Mobile Radio Unit. All processor and memory elements, interfaces, connectivity elements and RF functionalities are diagnosed for operational integrity.

## ➢ How to Read the Self-Test Results

1.) The **BIST** (Built-In Self-Test) is automatic on Power Up.

2.) . . . **BIST PASS**. If all components, elements, interfaces and functionalities test OK, the M-803 will deliver a **PASS** message to the front panel Display Screen.


3.) The PASS message remains onscreen briefly, then yields to the last-saved **Dwell Display** for the logged-on radio subscriber.

4.) . . . **BIST FAIL**. If a radio component, element, interface or functionality fails the diagnostic test, the M-803 will deliver a **FAIL** message to the front panel Display Screen.


5.) . . .If the Self-Test detects a **Fatal** operational error, the FAIL message and Error Code will remain on screen. Log-on will not proceed.

6.) . . .If the Self-Test reveals a **Nonfatal** failure, the FAIL message and Error Code remain onscreen long enough for the user to record, then yields to the last-saved **Dwell Display** for the logged-on User ID.

7.) To force a re-test, or to get another look at the Error Code, first Power Down, then Power Up.

# Power Down

Power Up, Power Down, and Volume functions are all handled from the Power Button/Volume Dial, a front panel component.

### ➢ How to Turn Your Radio Off

1.) Push the **Power Button/Volume Dial**. Your radio's vacuum fluorescent display panel will fade to darkness to indicate Power Down.


2.) Several user-selected radio settings, including your current Dwell Display, will survive the Power Down procedure.

3.) At your next Power Up, these saved settings will automatically default, along with your network personality settings.

# Set Volume

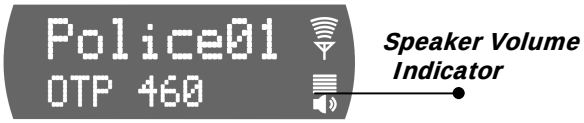
Power Up, Power Down, and Volume functions are all handled from the **Power Button/Volume Dial**, a front panel component.

Your radio's front panel Display Screen always displays the current volume, whether you are receiving an active call or not.

### ➢ How to Change the Volume

1.) Rotate the **Power Button/Volume Dial** clockwise to increase the Speaker Volume, counter-clockwise to decrease the Speaker Volume.


2.) Whether you are receiving a voice call or not, your volume setting change will immediately reflect in the front panel display screen Speaker Volume indicator.




# Voice Calls

As soon as your radio completes the Startup/Log On/Provision/Self-Test sequence and goes live on the OpenSky network, you'll begin to hear voice calls from the talk and listen groups in your active profile.

No action is required on your part, but the following list details how your radio responds to incoming voice messages.

## ➢ How to Take a Voice Call

1.) . . . If your Dwell Display is set to **Caller**, your front panel display screen shows the User ID of the incoming caller.

2.) . . . If your Dwell Display is set to **Received Talkgroup**, your front panel display screen shows the talkgroup to which your incoming caller belongs.

3.) . . . If your Dwell Display is set to **Profile** or **Channel**, your front panel display screen shows the data appropriate to those displays, but provides no clue to the identity of your incoming caller.

4.) Regardless of your active Dwell Display, the display screen's **Signal Strength** Indicator glows brightly for a strong signal from the incoming caller, dimly for a weak signal.

The steps for making a voice call are similar to those for a conventional portable radio.

## ➢ How to Make a Voice Call

1.) First, if you haven't already, Power Up your radio by pressing the **Power Button/Volume Dial** to Power Up, and Log On with your User ID. (See *How to Turn Your Radio On*.)

2.) Check the **Signal Strength** indicator light for clearance. If the light is burning brightly, you are receiving a call.


***Signal Strength Indicator***

3.) Wait for clearance if necessary. A single **End of Message** tone will indicate the end of your incoming call.

4.) Depress and hold the **Push-to-Talk** button on your remote hand-held microphone and speak normally. For maximum clarity, hold the transceiver approximately 1½ inches from your mouth.

5.) Release the **Push-to-Talk** button to terminate your outgoing voice call.

## ➢ What the Beeping Means

If the network is clear, you won't hear anything when you depress the Push-to-Talk button. Just hold the button down and talk, then release the button.

1.) If you hear **3 rapid beeps**, the network is too busy to transmit or even queue your call. You cannot place a call in this situation. Wait a few seconds and try your call again.

2.) If you hear a **3-beep sequence** (Medium tone / Medium tone / High tone), the network has acknowledged your request for clearance and placed your call in the queue.

When the network becomes available, the radio will automatically transmit for 10 seconds and the radio will alert you that the network is clear for your call.

Depress and hold the **Push-to-Talk** button to place your call.

# Talkback Calls

With your radio in Talkback Scanning mode, you can respond to voice calls from listen groups in your active profile.

You can't initiate outgoing voice calls to just any listen group, but you can immediately respond to any incoming call by pressing your Press-to-Talk button before the Talkback timer expires. Your call will go out only to the most recent listen group you heard.

## ➢ How to Place a Talkback Call

Set your radio to **Talkback Scanning** mode.

1.) When you hear an incoming listen group call you want to respond to, press the **Push-to-Talk** button.

2.) . . . If you respond before the expiration of the talkback timer, your call will transmit as a voice call to the most recent listen group you heard.

3.) . . . If you fail to beat the timer, your call will transmit to the talk group for your active profile.

4.) . . . If you repeatedly exceed the talkback time limit, consider asking the network administrator to extend the time allowed.

# Emergency Communications

Your radio can send out an Alert or place Voice Calls over the entire network in an emergency. OpenSky handles Emergency Calls and Alerts with the very highest priority, giving you and the people you serve access to the help you need no matter how much traffic the network is handling.

## ➢ How to Place an Emergency Call

1.) Press the orange **Emergency Button** on your radio to send an emergency alert. You'll find the button just to the right of the 5-button Menu and Selector keypad (see the Figure: *Front Panel Components*).

2.) You'll hear nothing, but other users will hear the **Emergency Alert** signal, a distinctive 3-tone burst of sound.

3.) At the same time, the network enables an **Emergency Talk Group**.

4.) Press the **Push-to-Talk** button to send your voice out over the emergency talk group.

5.) All the radios in the **Emergency Talk Group** will hear your call and see the emergency talk group displayed on their radio, overriding any other displays that may have been active there.

6.) When your emergency ends, press and hold the orange **Emergency Button** a second time to clear the emergency alert and call. Only you, the user who initiated the alert, can clear it.

CHAPTER 6

# Advanced Radio Operations

# Fine-Tuning Your Personality

Access to as many as 16 profiles within your pre-determined radio personality gives you tremendous responsiveness to the changing needs of your workday.

What's more, within each profile, the flexibility of the IP-protocol OpenSky network makes it possible to fine-tune your radio's sensitivity to incoming voice calls by changing the Scanning Priority of specific user groups, changing radio scanning modes and channels, even locking out the incoming voice calls of entire user groups.

In some ways, these sensitivity tunings are analogous to operations familiar to users of analog equipment.

# Dynamic Regrouping

In the event of an emergency, the network administrator will determine what radio users should be formed into an ad hoc talk group to respond to the emergent conditions.

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

- In response, affected users Log-On with their User ID numbers to receive their edited personalities.
- During Log-on, subscriber equipment will default to the dynamically regrouped profile.
- In all likelihood, one profile per personality will be reserved for Dynamic Regrouping use.

### ➢ How to Re-Provision for an Emergency

1.) "Punch In" your User ID when directed by the Network Administrator.

2.) Re-registration will default to Dynamically-Regrouped Emergency Profile.

# Talkaround Mode

In the absence of a nearby Base Station, in deep woods or valleys, or in other weak coverage areas, it is possible to work "off-network" by selecting Talkaround Mode and placing radio-to-radio calls in conventional FM or Project 25 Digital Common Air Interface modes.

*VTac Vehicular Tactical Network*

Also useful for supporting a local tactical operation, Talkaround is a digital air link protocol that allows unit-to-unit communication without talk paths to the base site and switching center.

### ➢ How to Place Talkaround Calls

1.) Use the **Up and Down buttons** to cycle through the Menu choices until Talk Menu appears.

2.) Use the **Left and Right buttons** to cycle through the Talkaround Menu options established by your Network Administrator.

3.) Press the **Select button** to lock in your choice.

Your selected Dwell Display will appear as soon as the M-803 accepts your choice.

# Troubleshooting

If your radio does not operate properly, check the chart below for likely causes. For additional assistance, contact a qualified service technician.

| Symptom | Likely Cause | Solution |
|---|---|---|
| **Radio will not turn on** | Dislodged power connector. | Press in the power connector on the rear of the radio. |
| | In-line fuse is blown. | Replace the in-line fuse. |
| | Your radio may be **too hot**. | Allow the radio to cool or operate the radio in a cooler environment. Report this failure to authorized technician. |
| **No audio** | Speaker volume is muted. | Increase the volume level. |
| | Speaker cable is not connected. | Press in the speaker cable on the rear of the radio. |
| **Poor audio** | You are in a poor coverage area or not on the network. | Move to a better coverage area using the signal quality indicator on the display as a guide, or use Mode Menu to enable conventional FM radio operation. |
| | Speaker cable is loose. | Press in the speaker cable on the rear of the redio. |
| | Antenna connection is loose. | Ensure that the antenna is properly connected to the radio. |

| Symptom | Likely Cause | Solution |
|---|---|---|
| **Poor display visibility** | Ambient light sensor is obstructed. | Clear obstruction and give sensor a clear path to ambient light. |
| **Screen displays: No Access** | Your radio is out-of-range or **cannot connect** with the OpenSky network. | Move to a better coverage area using the signal quality indicator on the display as a guide, or use Mode Menu to enable conventional FM radio operation. |
| **Radio will not transmit** | Your radio may be **too hot**. The M-803 will cease transmitting if it exceeds an operational temperature threshold. | Let the radio cool before attempting to transmit. Report this failure to authorized technician. |
| | Your radio may be experiencing **low voltage**. The M-803 will cease to transmit when voltage drops below 9 volts. | Reduce the load on your vehicle's battery and try again. Report this failure to authorized technician. |
| **Radio unexpectedly Powers Down** | Your radio may be experiencing **very low voltage**. The M-803 automatically powers down when voltage drops below 4.5 volts. | Reduce the load on your vehicle's power supply and try again. Report this failure to authorized technician. |

CHAPTER 7

# CH-103 Control Head

# Features and Components

The OpenSky CH-103 provides remote access for voice and data, as well as remote user interfaces to control M-803 mobile radios and VTac Vehicular Tactical Networks.

OpenSky's digital interface allows easy connection to mobile radios, vehicular repeaters, control stations, mobile data terminals and CAN peripherals to support the public safety mission.

TIP

On a large vehicle with several Control Heads, each will share access to a single M-803 mobile radio. See *Multiple Control Head* for more details.

### *Local or Broadcast Intercom*

The control head can also function as an intercom by broadcasting received voice calls to all consoles, to specific installed consoles, or by allowing users to bypass the network to communicate with each other.

### *Full Feature Set*

Because the OpenSky M-803 is the core component of any dash- or trunk-mounted configuration, each Control Head can access the full range of features supported by the radio it controls.

### *Front Panel Interface*

The front panel of the CH-103 is the front panel of an M-803 mobile radio, with the same display screen, menu buttons and controls as described elsewhere in this manual. See *Front Panel Components* for more details.

### *Rear Panel Peripheral Interface*

The CH-103 provides interfaces for analog and digital peripherals, similar but not identical to those supported by the M-803 mobile radio. See *Peripheral Interface* for more details.

# Equipment Configurations

The M-803 mobile radio supports multiple control heads for vehicles that require more than one display screen and user interface.

TIP

The CH-103 Control Head unit brings the convenience of the user interface and optional peripherals to several locations in a vehicle without the expense of mounting several radios.

### *Dash Mount Mobile*

In the most basic configuration, the M-803 radio and user interface are combined in one dash-mounted hardware case without additional control heads.

### *Dash Mount with Control Heads*

The dash-mount radio can support up to five control heads at different locations on the vehicle, each with its own display screen and interfaces for handsets, mobile data terminals and other peripherals.

### *Trunk Mount Mobile*

The M-803 can also be remotely trunk-mounted without a front-panel user interface. This configuration supports up to five control heads placed throughout the vehicle.

### *Vehicular Tactical Network*

With the addition of a trunk-mounted duplexer and signal repeater, the M-803 functions as a local cell on the OpenSky network and also provides off-network scene-of-incident coverage for voice-to-voice communication.

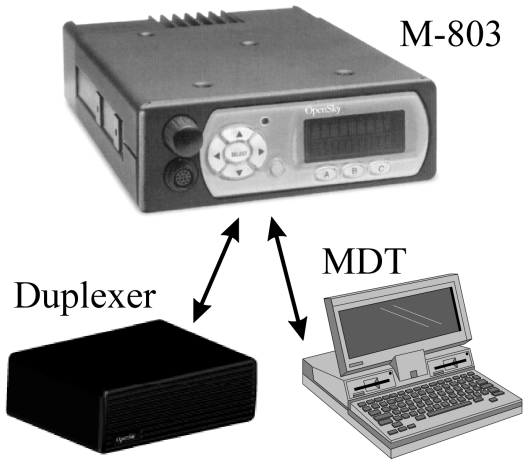
# Dash-Mount Mobile Configuration

The first several chapters of this manual describe the basic dash-mount mobile configuration for the M-803.

In this common standalone installation radio functions, front-panel user controls and back-panel peripheral interfaces are combined in a single hardware case.

Figure 23 Dash-Mount Mobile

Sample Installation




| Component | Explanation |
|---|---|
| **Duplexer** ..... | M-803 supports optional duplexer for **Full Duplex** operation. |
| **MDT** ..... | M-803 supports optional **Mobile Data Terminal** for full-feature graphics. |

# Dash-Mount Mobile with CH-103

TIP

The control heads provide **shared** voice access to the M-803, **not** additional radio personalities or channels.

The dash-mounted M-803 described above can be expanded for larger or special needs vehicles with the addition of up to five optional Control Heads (CH-103).

As in the standalone installation, the dash-mounted mobile supports an optional duplexer for full duplex operation and a mobile data terminal for full-feature graphics. Voice operations to and from the multiple control heads share a single mobile radio RF channel.

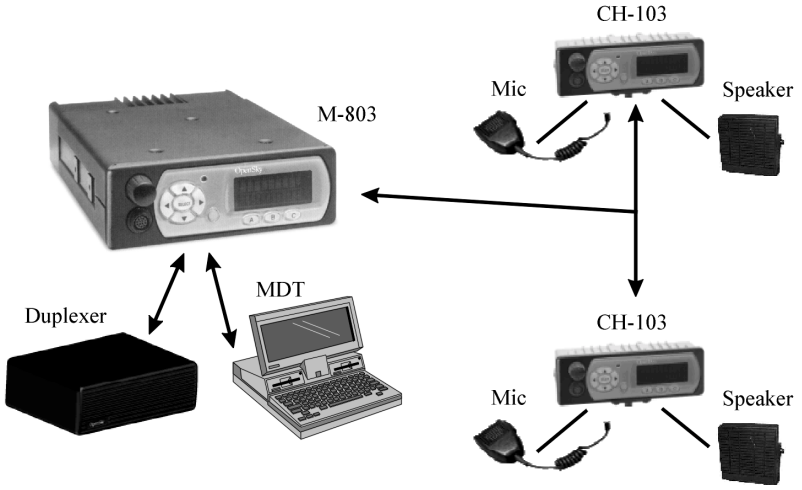
In addition, each Control Head provides the following components and capabilities:

- **Remote Shared Voice** access to the M-803,
- **Remote Control** for the M-803,

- Complete common **User Interface** including display screen, preset buttons, and menu/selector keypad,
- Individual **Audio** controls,
- I/O port for wired Microphone/Speaker,
- Alternate interface site for Mobile Data Terminal (limit one MDT per installation).

Figure 24 Dash-Mount with Control Heads

Sample Installation




| Component | Explanation |
|---|---|
| **Duplexer** ..... | M-803 supports optional duplexer for **Full Duplex** operation. |
| **MDT**..... | M-803 supports optional **Mobile Data Terminal** for full-feature graphics. |
| **CH-103**..... | Each **Control Head** supports mic/speaker and an alternate site for MDT installation. |

# Trunk-Mount Mobile Configuration

TIP

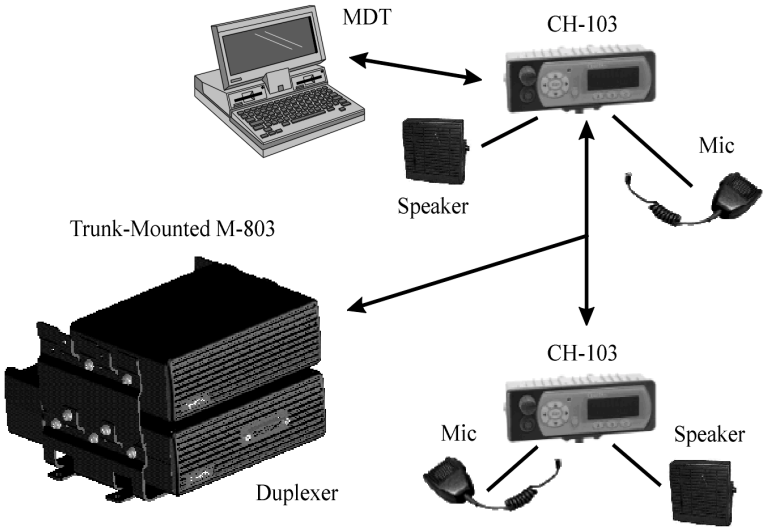
The control heads provide **shared** voice access to the M-803, **not** additional radio personalities or frequencies.

For trunk-mount installation, the M-803 is installed without a front panel user interface. Instead, one or as many as five Control Head units throughout the vehicle provide remote control for radio functions.

The M-803 supports an optional duplexer for full duplex operation.Voice operations to and from multiple control heads share a single mobile radio RF channel.

Figure 25 Trunk-Mount Mobile

Sample Installation




| Component | Explanation |
|---|---|
| **Duplexer** ..... | M-803 supports optional duplexer for **Full Duplex** operation. |
| **MDT** ..... | Each CH-103 provides interface for optional **Mobile Data Terminal** (MDT). |
| **CH-103** ..... | Each **Control Head** supports a microphone and speaker. |

In addition, each Control Head provides the following components and capabilities:

- **Remote Shared Voice** access to the M-803,
- **Remote Control** for the M-803,
- Complete common **User Interface** including display screen, preset buttons, and menu/selector keypad,
- Individual **Audio** controls,
- I/O port for wired Microphone/Speaker,
- Alternate interface site for Mobile Data Terminal (limit one MDT per installation).

# VTac Vehicular Tactical Network

*The Vehicular Tactical Network is described in detail in the following chapter.*

For a trunk-mounted VTac installation, the M-803 is installed without a user interface. Instead, as many as five Control Head units at locations throughout the vehicle provide remote control for all radio functions.

TIP

The OpenSky M-803 is the core component of the Vehicular Tactical Network.

Your VTac radio will perform all the best functions of the M-803 **plus** additional coverage enhancements.

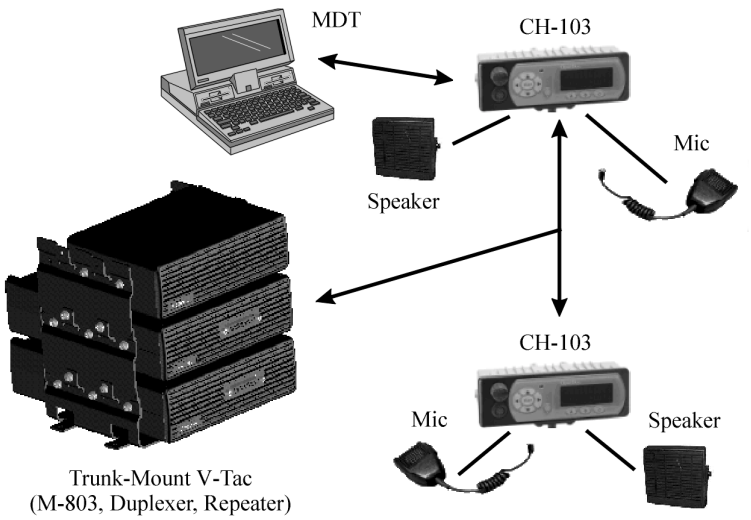
VTac includes a duplexer for Full Duplex operation and a voice repeater to provide off-network scene-of-incident coverage.

In short, the VTac supports a rich array of radio communications features, including:

- All **M-803** voice and data radio functions,
- **Network Extension** support for portables in weak coverage areas or in-building use,
- **Scene of Incident** support for voice-to-voice off-network communications,
- **Full Duplex** operation,
- **Up to five** control heads and one mobile data terminals.

Figure 26 VTac Vehicular Tactical Network

Sample Installation




| Component | Explanation |
|---|---|
| **VTac** ..... | Three hardware components mounted together make up the VTac array. |
| **MDT** ..... | Each CH-103 provides interface for optional **Mobile Data Terminal** (MDT). |
| **CH-103** ..... | Each **Control Head** supports a microphone and speaker. |

# Full or Shared Radio Controls

The Control Head unit provides remote voice, data, and control paths to the M-803 for one or as many as five control heads per installation.

In an installation with a **Single Control Head**, the sole CH-103 has full control of the mobile radio as well as the front panel interface and local speaker.

In an installation with **Multiple Control Heads**, communications functions are generally shared among all control heads, while local interface functions like volume and brightness are independently controlled for each CH-103.

# Single Control Head

In Single Control Head mode, the CH-103 is the sole user interface for the trunk-mounted mobile and the full features of the front panel and local speaker.

Features operated by the Control Head unit in Single Control mode include:

- Speaker volume
- Screen brightness
- Mode selection
- Voice group selection
- Emergency mode

Since the radio is controlled by a single control head, there is no need for the mobile radio unit to arbitrate control of radio functions.

# Multiple Control Heads

The Multiple Control Head configuration organizes operational functions into an Independent group and a Shared group.

## Independent Functions

Each Control Head in a multi-head installation can be adjusted for local conditions without affecting the settings on the other control heads.

Independent control head functions include:

- Speaker volume
- Screen brightness
- Side tones on or off

## Shared and Arbitrated Functions

TIP

The general rule for shared functions is: any control head can change shared functions for all control heads.

Examples of shared functions which will affect the operational status of all connected control heads:

- Power Up and Log-On
- Mode selection
- Voice group selection
- Emergency mode

For shared functions, the action of one user affects the operation of shared mobile radio unit functions. If one user changes from Trunked mode to Scene of Incident mode, for example, all control heads will update to the same mode.

CHAPTER 8

# VTac Vehicular Tactical Network

# Vehicular Tactical Network

The Vehicular Tactical Network (VTac-803) is an 800 MHz software-based digital mobile network repeater for extending network coverage to portable radios, providing scene-of-incident capability and the full feature set of an M-803 mobile radio.

VTac supports the OpenSky communication protocol in the 800 MHz SMR and NPSPAC frequency bands with a high performance data modem that gateways both voice and data to the OpenSky wide area wireless data network.

More capable than a stand-alone M-803, the VTac-803 is a hybrid product that combines several hardware components into a multi-use communications device to extend the capabilities of a movable Base Station wherever you position your vehicle.

## Backward and Forward Compatibility

The software-based architecture allows the VTac-803 to be programmed for a variety of modulation techniques, providing legacy support and guarding against obsolescence.

VTac can host several applications simultaneously to support users running the OpenSky digital protocol, Conventional FM with CTCSS, or Project 25 Phase 1.

### *Over-the-Air Programmability*

For agencies engaged in an analog-to-digital transition, The VTac-803 can function with existing analog infrastructure today and, when the time is right, receive over-the-air field reprogramming for a virtually seamless transition to fully digital communications without replacing equipment.

# Operational Modes

By combining the functions of several components, the VTac-803 operates in a variety of modes:

- **Mobile Radio.** This is the default mode of operation activated at Power-Up. Under ordinary conditions, the VTac-803 is a fully-functioning subscriber device performing all the functions of an M-803 radio on the OpenSky network;
- **Extended Coverage.** In weak coverage areas, the VTac Base Station can be activated to act as a mobile base station, extending OpenSky network connectivity to portable radios in the vicinity. The VTac continues to provide normal mobile radio functions in Extended Coverage mode;
- **Scene-of-Incident.** For radios on the OpenSky network, VTac acts as a voice repeater in OpenSky Trunked mode, supporting two concurrent voice calls between subscribers at the scene;
- **Mutual Aid.** For radios not on the OpenSky network, VTac can still provide a limited set of communication capabilities, acting in Scene-of-Incident mode as a public safety “micro-cell” to connect users in a conventional FM Mutual Aid network.

# “A Base Station in a Trunk”

Most commonly, VTac is a trunk-mounted installation of components that adds the most important functions of a single-channel OpenSky Base Station to the radio functions of an M-803 Mobile.

The VTac-803 is designed specifically with the Public Safety user in mind. Its digital interface easily connects to peripheral devices including the Control Head and CAN Peripherals that are often used to support the Public Safety mission.

# Hardware Components

The VTac-803 is a 4-piece array of hardware components consisting of:

- An **M-803** Full Duplex Trunk Mounted Mobile Radio Unit (MRU), also known in this configuration as the VTac Mobile;
- A **VTac Base Unit**. This component brings the communications interface and transceiver functionalities of an OpenSky Base Station DCX to the trunk of a patrol car;
- An **RF combiner**;
- A **CH-103 Control** Head located in the passenger compartment of the vehicle controls the three trunk-mounted components.

Additional Control Head units may be located elsewhere in larger vehicles for user convenience.

## VTac Mobile Unit

The VTac Mobile provides the connection between the OpenSky network, operator, mobile data terminal, and the VTac Base Unit.

As a mobile radio, it operates like a standard-installation M-803, providing network communications for a single vehicle through one or more CH-103 Control Head Units.

In a VTac installation, the VTac Mobile is connected to the VTac Base Unit by a serial cable that conducts voice and data between the two components.

### *One-Button Activation*

Powering Up the VTac Mobile automatically enables all the connected hardware components of the VTac array. Unless they’re needed, though, the RF Combiner and VTac Base Unit stand by in a quiescent state until called on for use.

### VTac Base Unit

The VTac Base Unit has the same transceiver and digital controller components as the OpenSky Base Station DCX, but in a VTac installation these components only operate as needed, when enabled by the subscriber.

When **Extended Coverage** is required, the VTac Base Unit provides the extended connection between the network and portable radios in the vicinity.

When **Scene-of-Incident** coverage is required, the VTac Base Unit provides communication between subscriber devices at the scene.

### RF Combiner

The RF Combiner provides the VTac Network with the ability to create an ad hoc talk group for Scene-of-Incident emergency communications.

## Extended Coverage

The VTac-803 can be used as a mobile base station to ensure that portable radios are connected to the network at all times, in-building, or out.

Subscribers with VTac equipment can enable Extended Coverage mode before leaving their vehicles to enter buildings or spotty coverage areas, thereby assuring signal strength to networked portables.

### User Interaction

Extended Coverage requires subscriber activation. Without interaction the subscriber's mobile and portable radios are served by the nearest network cell.

By selecting Extended Coverage mode, the subscriber activates the VTac Base Unit as a local cell on the OpenSky network.

# Scene of Incident

The VTac-803 can also be a vital link at the scene of an incident, providing a repeater among OpenSky subscriber radios, or alternatively, among radios in a Mutual Aid network that connects different radio types, whether they subscribe to OpenSky or not.

**In Scene-of-Incident (SOI) Mode**, OpenSky Network communications are sacrificed to enable full emergency connectivity between cooperating agencies at the scene. The tradeoff of network isolation provides increased channel capacity while relieving traffic for other subscribers on the network.

**In Scene of Incident mode with OpenSky Trunking**, VTac supports multiple talk groups. Like a tower site base station, it continues to support agency-specific talk groups while at the same time creating an ad hoc talkgroup for units at the scene.

## User Interaction

Scene-of-Incident coverage is not automatic. The VTac-equipped subscriber will make an on-scene command decision to manually activate SOI mode and become the local cell for all calls on an ad hoc network.

In addition, all portable radio users must select SOI mode and tune to the VTac frequency to join the emergency network.

# Public Safety Hardened

The VTac-803 is designed specifically with the Public Safety user in mind.

The case is manufactured with enhanced environmental hardening making the VTac compliant with MIL-STD-810 for temperature, altitude, solar radiation, rain, humidity, salt, fog, sand, dust, vibration, and shock, ensuring that it will perform under the wide range of public safety environmental conditions.

# GPS Option

The OpenSky VTac-803 can be supplied with an optional embedded GPS receiver. GPS data can be reported either over-the-air to remote dispatch positions or to a local terminal connected directly to the mobile radio.

Additionally the I/O connector provides a serial GPS port which outputs GPS NEMA messages. Reporting characteristics can be configured remotely and can be event driven.

GPS functions are transparent to the subscriber and require no user interaction.

# Connectivity Interface

The VR-803 supports a variety of interfaces with its flexible interconnect. The M-803 and VRB connect to the RF Combiner via the antenna ports located on the rear panel.

### *Peripheral Support*

The rear panel also provides interfaces for both analog and digital peripherals.

The serial RS-232 port operates in asynchronous ASCII mode for configuration and control and switches to Serial Line Internet Protocol (SLIP) mode for data communication between the fixed network and a mobile computer or terminal device.

Figure 27 VTac Connectors

Rear Panel Schematic

### *I/O Connector*

The I/O connector provides interfaces for an external 10 Watt speaker and duplexer support. Additionally, the I/O connector provides access to a GPS serial port which outputs NEMA messages.

### *Power Supply*

The power supply interface is designed to power the VR-803 from the vehicle car battery.

### *CAN Peripheral Bus*

The rear panel also provides access to an industry standard 1 Mbit Controller Area Network (CAN) 2.0B bus for reconfigurability and peripheral support.

This allows the VR-803 to be controlled by up to five Control Head (CH-103) units and connect with public address and other CAN peripherals.

The CAN bus enables modularity and upgradeable for new applications. The maximum length of the CAN bus is 40 meters.

# Indexes and Tables

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