Appendix E: Manuals

Please refer to the following pages for the operator's and installation manuals.

Operator's Manual

MM23016
Rev. B, Aug/07

M/A-COM
M7200 Series
Digital Mobile Radio

Tyco Electronics
Our commitment. Your advantage.

MANUAL REVISION HISTORY

REV	DATE	REASON FOR CHANGE
-	Nov/06	Initial Release.
A	Jun/07	Included EDACS, Conventional, and P25 operation and updated OpenSky operation.
B	Aug/07	Included MPE information for motorcycle installations.

M/A-COM Technical Publications would particularly appreciate feedback on any errors found in this document and suggestions on how the document could be improved. Submit your comments and suggestions to:

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or fax your comments to: 1-434-455-6851

or e-mail us at: techpubs@tycoelectronics.com

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1 SAFETY SYMBOL CONVENTION

The following conventions are used throughout this manual to alert the user to general safety precautions that must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. M/A-COM, Inc. assumes no liability for the customer's failure to comply with these standards.

The WARNING symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING symbol until the conditions identified are fully understood or met.

The **CAUTION** symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in a risk of danger, damage to the equipment, or severely degrade the equipment performance.

The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.

The **ESD** symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of **E**lectro-**S**tatic **D**ischarge. Proper precautions must be taken to prevent ESD when handling circuit modules.

2 RF ENERGY EXPOSURE INFORMATION

2.1 RF ENERGY EXPOSURE AWARENESS, CONTROL INFORMATION, AND OPERATION INSTRUCTIONS FOR FCC OCCUPATIONAL USE REQUIREMENTS

Before using your mobile two-way radio, read this important RF energy awareness and control information and operational instructions to ensure compliance with the FCC's RF exposure guidelines.

This radio is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC limits. This radio device is NOT authorized for general population, consumer, or any other use.

Changes or modifications not expressly approved by M/A-COM, Inc. could void the user's authority to operate the equipment.

This two-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses RF energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, electric power, sunlight, and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which, when used improperly, can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection. All two-way radios marketed in North America are designed, manufactured, and tested to ensure they meet government established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of two-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Please refer to the following websites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits.

http://www.fcc.gov/oet/rfsafety/rf-faqs.html

http://www.osha.gov./SLTC/radiofrequencyradiation/index.html

2.1.1 Federal Communications Commission Regulations

Your M/A COM, Inc. M7200 mobile two-way radio is designed and tested to comply with the FCC RF energy exposure limits for mobile two-way radios before it can be marketed in the United States. When two-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a label directing users to specific user awareness information. Your M/A COM, Inc. M7200 two-way radio has an RF exposure product label. Also, your M7200 Installation and Operator's Manuals include information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

2.2 COMPLIANCE WITH RF EXPOSURE STANDARDS

Your MA/COM, Inc. M7200 mobile two-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to RF electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at duty factors of up to 50% talk-50% listen and is authorized by the FCC for occupational use. In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio antenna radiates measurable RF energy only while it is transmitting (talking), not when it is receiving (listening) or in standby mode.

Your M/A COM, Inc. M7200 mobile two-way radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission (FCC), Code of Federal Regulations; 47 CFR §§ 2 sub-part J.
- American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992.
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999.

CAUTION

Table 2-1 lists the recommended minimum lateral distance for a controlled environment and for unaware bystanders in an uncontrolled environment, from transmitting types of antennas (i.e., monopoles over a ground plane, or dipoles) at rated radio power for mobile radios installed in a vehicle. Transmit only when unaware bystanders are at least the uncontrolled recommended minimum lateral distance away from the transmitting antenna.

2.2.1 Mobile Antennas (Vehicle Installations)

Table 2-1: Rated Power and Recommended Minimum Safe Lateral Distance (Vehicle Installations)

MOBILE RADIO FREQUENCY SPLIT	ANTENNA P/N	RATED POWER OF VEHICLE-INSTALLED MOBILE TWO-WAY RADIO	RECOMMENDED SAFE MINIMUM LATERAL DISTANCE FROM TRANSMITTING ANTENNA	
			CONTROLLED	UNCONTROLLED
760 -870 MHz	MAMV-AN3J	15W	32 cm	70cm
	MAMV-AN3K			
	MAMV-AN3V			

Install the radio's antenna (refer to Table 2-1 for applicable antenna part numbers) in the center of the vehicle's roof. These mobile antenna installation guidelines are limited to metal body motor vehicles or vehicles with appropriate ground planes. The antenna installation should additionally be in accordance with the following:

- The requirements of the antenna manufacturer/supplier included with the antenna.
- Instructions in the M7200 Radio Installation Manual, including minimum antenna cable lengths.
- The installation manual providing specific information of how to install the antennas to facilitate recommended operating distances to all potentially exposed persons.

Use only the M/A-COM approved/supplied antenna(s) or approved replacement antenna. Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations.

2.2.2 Mobile Antennas (Motorcycle Installations)

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Table 2-2: Rated Power and Recommended Minimum Safe Lateral Distance (Motorcycle Installations)

MOBILE RADIO FREQUENCY SPLIT	ANTENNA P/N	RATED POWER OF VEHICLE-INSTALLED MOBILE TWO-WAY RADIO	RECOMMENDED SAFE MINIMUM LATERAL DISTANCE FROM TRANSMITTING ANTENNA	
			CONTROLLED	UNCONTROLLED
806-870 MHz	LE-OM806HDBKTNCDS	15W	20 cm	41 cm

Install the radio's antenna (refer to Table 2-2 for frequencies and corresponding part numbers of recommended antennas) on the end of the motorcycle case farthest away from the driver. These mobile antenna installation guidelines are limited to motorcycles fit with the motorcycle radio case with integral antenna grounding plane. The antenna installation should additionally be in accordance with the following.

- The requirements of the antenna manufacturer/supplier included with the antenna.
- Instructions in the M7200 Radio and Control Unit Motorcycle Installation Manual, including minimum antenna cable lengths.
- The installation manual providing specific information of how to install the antennas to facilitate recommended operating distances to all potentially exposed persons.

Use only the M/A-COM approved/supplied antenna(s) or approved replacement antenna(s).

Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations.

2.2.3 Approved Accessories

This radio has been tested and meets the FCC RF guidelines when used with the M/A-COM accessories supplied or designated for use with this product. Use of other accessories may not ensure compliance with the FCC's RF exposure guidelines, and may violate FCC regulations.

For a list of M/A-COM approved accessories refer to the product manuals, M/A-COM's Products and Services Catalog, or contact M/A-COM at 1-800-368-3277.

2.2.4 Contact Information

For additional information on exposure requirements or other information, contact M/A-COM, Inc. at 1-800-528-7711 or at http://www.macom-wireless.com.

3 OPERATION SAFETY RECOMMENDATIONS

3.1 TRANSMITTER HAZARDS

The operator of any mobile radio should be aware of certain hazards common to the operation of vehicular radio transmitters. A list of several possible hazards is given:

- **Explosive Atmospheres –** Just as it is dangerous to fuel a vehicle with the motor running, similar hazards exist when operating a mobile radio. Be sure to turn the radio off while fueling a vehicle. Do not carry containers of fuel in the trunk of a vehicle if the radio is mounted in the trunk.

  Areas with potentially explosive atmosphere are often, but not always, clearly marked. Turn OFF your radio when in any area with a potentially explosive atmosphere. It is rare, but not impossible that the radio or its accessories could generate sparks.

- **Interference to Vehicular Electronics Systems –** Electronic fuel injection systems, electronic anti-skid braking systems, electronic cruise control systems, etc., are typical electronic systems that can malfunction due to the lack of protection from radio frequency energy present when transmitting. If the vehicle contains such equipment, consult the dealer and enlist their aid in determining the expected performance of electronic circuits when the radio is transmitting.

- **Electric Blasting Caps –** To prevent accidental detonation of electric blasting caps, **DO NOT** use two-way radios within 1000 feet of blasting operations. Always obey the "**Turn off Two-Way Radios**" signs posted where electric blasting caps are being used. (OSHA Standard: 1926-900)

- **Liquefied Petroleum (LP) Gas Powered Vehicles –** Mobile radio installations in vehicles powered by liquefied petroleum gas with the LP gas container in the trunk or other sealed-off space within the interior of the vehicle must conform to the **N**ational **F**ire **P**rotection **A**ssociation standard **NFPA 58** requiring:
  - The LP gas container and its fittings.
  - Outside filling connections shall be used for the LP gas container.
  - The LP gas container shall be vented to the outside of the vehicle.

3.2 SAFE DRIVING RECOMMENDATIONS

(Recommended by AAA)

- Read the literature on the safe operation of the radio.
- Keep both hands on the steering wheel and the microphone in its hanger whenever the vehicle is in motion.
- Place calls only when the vehicle is stopped.
- When talking from a moving vehicle is unavoidable, drive in the slower lane. Keep conversations brief.
- If a conversation requires taking notes or complex thought, stop the vehicle in a safe place and continue the call.
- Whenever using a mobile radio, exercise caution.

4 OPERATING RULES AND REGULATIONS

Two-way FM radio systems must be operated in accordance with the rules and regulations of the local, regional, or national government.

In the United States, the M7200 mobile radio must be operated in accordance with the rules and regulations of the Federal Communications Commission (FCC). As an operator of two-way radio equipment, you must be thoroughly familiar with the rules that apply to your particular type of radio operation. Following these rules helps eliminate confusion, assures the most efficient use of the existing radio channels, and results in a smoothly functioning radio network.

When using your two-way radio, remember these rules:

- It is a violation of FCC rules to interrupt any distress or emergency message. As your radio operates in much the same way as a telephone "**party line**," always listen to make sure that the channel is clear before transmitting. Emergency calls have priority over all other messages. If someone is sending an emergency message – such as reporting a fire or asking for help in an accident – ***KEEP OFF THE AIR!***
- The use of profane or obscene language is prohibited by Federal law.
- It is against the law to send false call letters or false distress or emergency messages. The FCC requires that you keep conversations brief and confine them to business. To save time, use coded messages whenever possible.
- Using your radio to send personal messages (except in an emergency) is a violation of FCC rules. You may send only those messages that are essential for the operation of your business.
- It is against Federal law to repeat or otherwise make known anything you overhear on your radio. Conversations between others sharing your channel must be regarded as confidential.
- The FCC requires that you identify yourself at certain specific times by means of your call letters. Refer to the rules that apply to your particular type of operation for the proper procedure.
- No changes or adjustments shall be made to the equipment except by an authorized or certified electronics technician.

Under U.S. law, operation of an unlicensed radio transmitter within the jurisdiction of the United States may be punishable by a fine of up to $10,000, imprisonment for up to two (2) years, or both.

4.1 OPERATING TIPS

The following conditions tend to reduce the effective range of two-way radios and should be avoided whenever possible:

- Operating the radio in areas of low terrain, or while under power lines or bridges.
- Obstructions such as mountains and buildings.
- In areas where transmission or reception is poor, some improvement can be obtained by moving a few yards in another direction or moving to a higher elevation.

5 PRODUCT DESCRIPTION

The M7200 mobile is a state-of-the-art radio that operates seamlessly between the 800 MHz frequency band and the 700 MHz frequency band. The M7200 is designed to meet the critical communications demands of public service users and complies with MIL-STD-810F specifications.

The M7200 is capable of supporting multiple operating modes, including OpenSky digital operation, EDACS or ProVoice trunked modes, P25 digital trunked mode, P25 digital conventional mode, and conventional analog mode.

The M7200 uses Time Division Multiple Access (TDMA) technology in the OpenSky mode to allow multiple users to share a single RF channel. In addition, a single RF channel can support simultaneous digital voice and data communications.

The M7200 provides integrated voice and data services. Voice operation is provided using a microphone and speaker included in the radio installation kit. For data transfers, the M7200 is constructed with an industry-standard RS-232 interface serial port for connecting an optional laptop PC.

A PC, not included with the M7200, provides network connectivity through the standard serial (DCE-type) interface.

The M7200 has an integrated Global Positioning System (GPS) receiver. This allows the M7200 to fully support the Automatic Vehicular Locator (AVL) for fleet management and dispatch applications.

The OpenSky M7200 benefits from a flexible, software-based digital radio design. Features and user profiles are software-defined and can be reprogrammed over the air. The optional over-the-air programming feature allows communication protocols to be changed easily and added at any time.

5.1 REMOTE CONTROL HEAD OPERATION

For remote mount installations configured with a CH721 control head, all normal radio operations and interfaces can be handled via the control head connected to the radio unit by a single twisted-pair connection routed through a vehicle. Up to six control units may be attached to a trunk mount radio. Each control head provides a serial access point for data and any one (only one at a time) can be connected to a data device such as a personal computer.

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

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

6 CHANGE OPERATING MODE

6.1.1 Change from OTP Mode

To change from OTP operating mode to P25, EDACS, or Conventional:

1. Use  to cycle through the menu until the “Mode Menu” appears in the bottom line of the display.
2. Use  to choose an available mode. Press **MENU** and confirm (Y/N) with  and press **MENU** again.
3. Press the **MENU** button to confirm.

6.1.2 Change to OTP Mode

1. Use  to scroll through available systems until OpenSky is displayed.
2. After a few seconds, the radio transitions to OTP mode.

7 OPENSKY OPERATION

7.1 CH721 FRONT PANEL COMPONENTS

The front panel of the control head includes a dot matrix display, controls for menu navigation, an emergency button, three pre-set buttons, a Power On-Off/Volume Control knob, and a microphone connector. In addition, the system model control head features a DTMF keypad. Table 7-1 lists all default front panel controls and their functions.

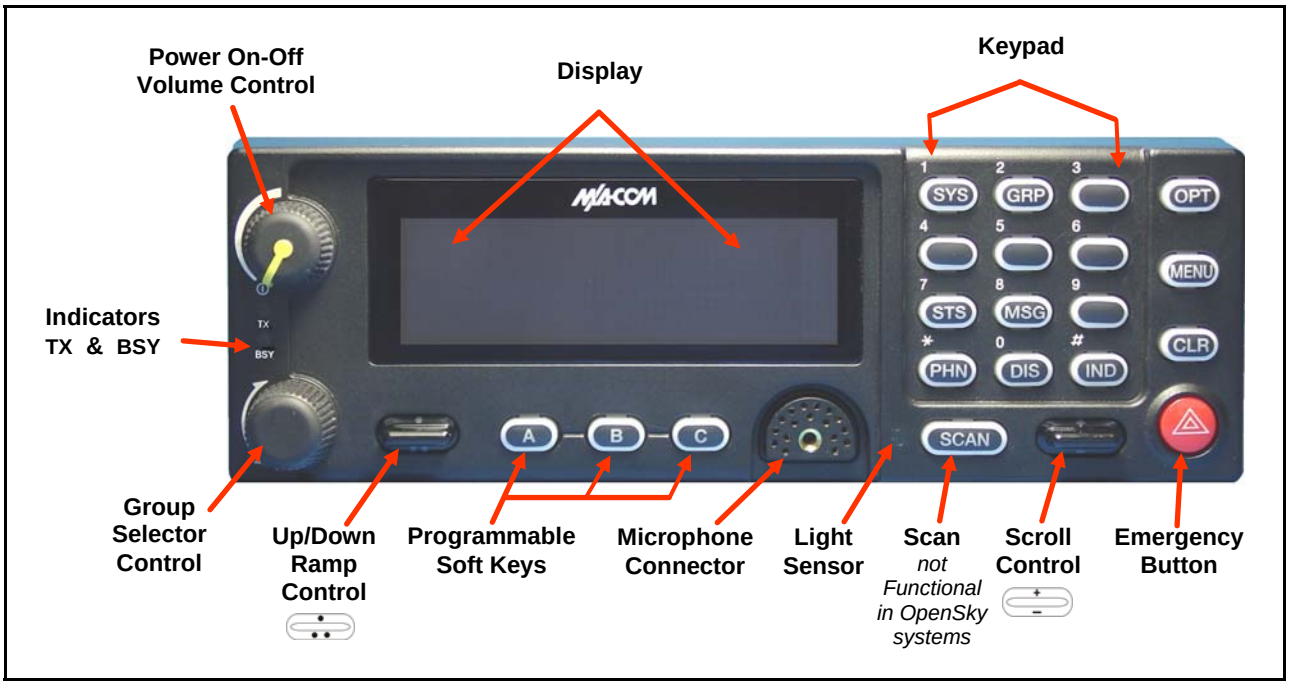


Figure 7-1: System Model

Figure 7-2: Scan Model

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

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

Table 7-1: Front Panel Default Controls and Functions

PART	FUNCTION
Power On-Off/Volume Control knob	Turn knob clockwise to power on the radio and increase volume. Turn counter-clockwise to decrease volume and power off the radio.
Mic Connection	Connection for hand-held, hands-free, speaker-mic, or headset.
Emergency Button	If enabled through programming, the emergency button sends an emergency alert and opens voice communication on the currently selected talk group or the default emergency talk group (depending upon how the system is defined). To end an emergency call, press and hold the emergency button for approximately four seconds.
Ambient Light Sensor	Radio automatically adjusts the display and button backlight brightness level based on ambient light. Do not block this sensor.
	While in the dwell display, scrolls through available talk groups. Scrolls through selections within the active menu (available talk groups, pre-programmed speed dial numbers, canned alert messages, etc.).
	Scrolls through available menu items.
OPT/OPTION	
CLR/CLEAR	
MENU	Press to activate the current selection. In some cases, this is not necessary as the last selection will automatically activate after a short period.
Display Area	Menu selections and messages. Network Connectivity icon. Current Volume Level icon. Volume represented numerically within the display (0 = Muted, 40 = Loudest). User may select which one of several dwell displays the radio uses.
Pre-Set Buttons	These buttons are used to store and recall user-selectable parameters such as scan mode, selected profile, selected talk group, and priority talk group. Different parameters can be stored at each of the three different pre-set buttons.

7.2 POWER UP AND VOLUME CONTROL

7.2.1 Power Up

1. Rotate the Power On-Off/Volume Control knob clockwise to power on the radio. The display will illuminate when the radio powers up.

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

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

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

3. When provisioning is complete, the radio will display the Dwell Display.

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

7.2.2 Volume Control

Turn the Power On-Off/Volume Control knob clockwise to increase the volume and counter-clockwise to decrease the volume.

7.3 SELF-TEST

After power-up, the M7200 radio undergoes a multi-function automatic registration procedure. As many as sixteen (16) possible radio profiles are downloaded to the radio from the network in response to the User's ID.

7.4 LOGIN TO THE NETWORK

Login occurs either automatically (auto registration) if the radio has a valid registration or, if enabled and authorized for encryption (Section 7.30), requires the user to enter a User ID and password.

If encryption is enabled and authorized on the radio, the user will be prompted to "Pls Login" with the *1 login command, a User ID, and password [System Model Control Head required].

1. Press *1 (Login command).
2. Enter the full 10-digit User ID.
3. Press the # key.
4. Enter the password.
   - If the radio is configured for alpha-numeric passwords and the password has consecutive duplicate numbers ("MES**33**" for example), enter # between the consecutive duplicate numbers so the radio will **not** interpret the entry as a letter ("D" in this example).
   - If the radio is configured for numeric-only passwords, do not enter # between duplicated numbers.
5. Press the # key twice.

The User ID may be remembered from the previous log-in. (Refer to Section 7.5 for further details regarding log-off commands.) The password will be established before the radio is put into operation. Contact the local OpenSky network administrator for more information.

NOTE

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

7.5 LOG OFF THE NETWORK

The *0## command de-registers the radio. Typically, this is automatically performed when powering down the radio. Using this method, the User ID is remembered by the radio so only the password is needed at next log-in. Manually log-off by pressing *0## (requires System Model).

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

7.6 TURNING THE RADIO OFF

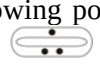
To turn the radio off, rotate the **Power On-Off/Volume Control knob** counter-clockwise. In multiple control head installations, turning off the last powered-up control head will also automatically turn off the radio.

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

NOTE

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

7.7 MENU DISPLAY AND CONTROL AREA

Following power-up, the radio display shows the default talk group (Figure 7-3). Pressing up or down with  changes the display to the next available menu. In many cases, the dwell display automatically re-appears after no menu buttons are pressed for a short period of time (between 10 and 30 seconds). For some menus such as the GPS and User ID menus, this does not occur until the user presses a front panel button.

When the dwell display is active, it will change dynamically to reflect the current profile, received talk group/caller ID (when available), or channel (when enabled).

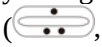
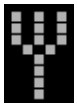
The radio's display is highly interactive. It responds in the top and bottom text lines as the user presses the menu buttons ( ,  and **MENU**) to scroll through the menu loop and the entries for each menu. Table 7-4 outlines the basic menu structure.

Figure 7-3: Typical Display

7.8 RADIO STATUS ICONS

Status Icons indicate the various operating characteristics of the radio. The icons show operating modes and conditions (see Table 7-2). The location of icons on the display may vary depending on configuration.

Table 7-2: Icons and Descriptions

ICON	DESCRIPTION
	Indicates data registration.
	Volume bars – indicates relative volume level.

7.9 DWELL DISPLAY

When not engaged in menu selection, the first two lines of the display default to the user-defined display, known as the "dwell display." The top line indicates the currently selected talk group. The second line will display the currently selected profile, caller ID/alias[1], received talk group, and current channel name. Press the  ramp control to scroll through and view one of these second line options.

7.10 PERSONALITY

As illustrated in Figure 7-4, a personality defines the profiles and talk groups available to the user. It is the structuring of a collection of profiles and privileges established by the OpenSky network administrator to provide the user with a comprehensive set of profiles to communicate effectively with the necessary talk groups or individuals.

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

[1] Alias is a logical ID name such as "J_Smith." The name corresponds to a user ID such as 003-542-0001.

7.10.1 Profiles

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

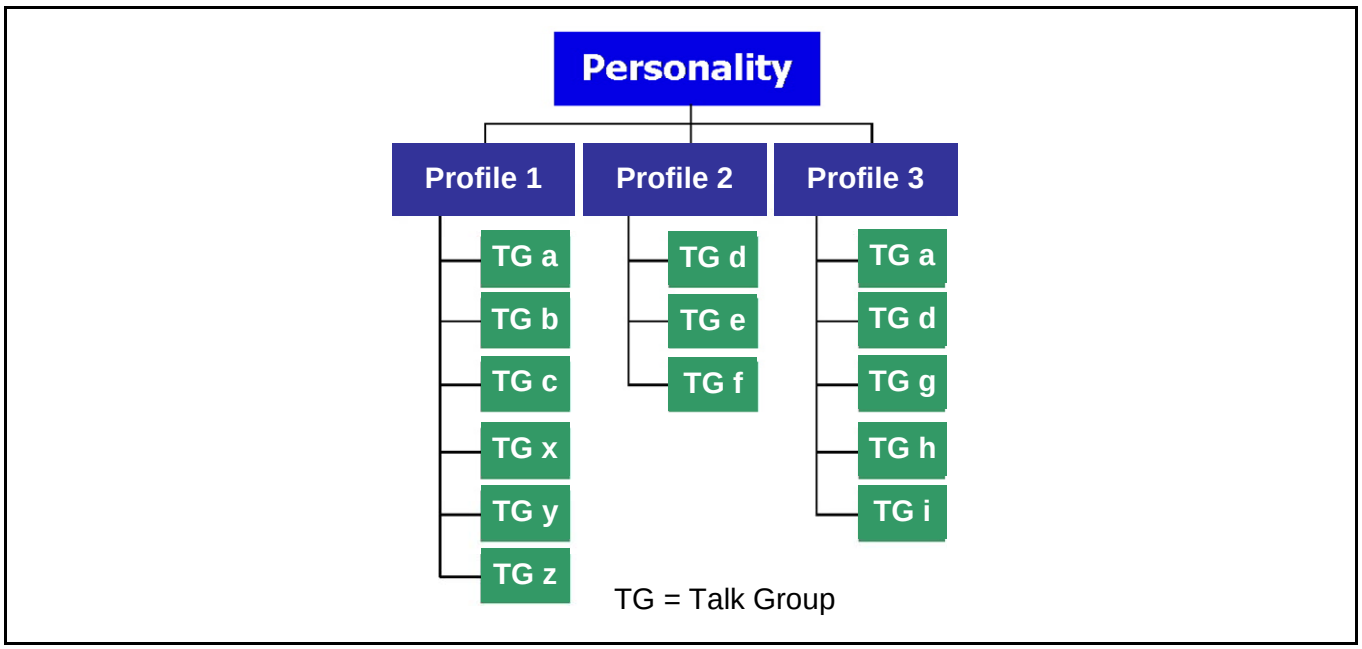


Figure 7-4: Personality Structure Example

NOTE

If Global Profile is enabled by the system administrator, the number of available talk groups to scan doubles.

7.10.2 Talk Groups

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

7.11 ALERT TONES

The M7200 radio also provides audible Alert Tones or "beeps" to indicate the various operating conditions (see Table 7-3).

Table 7-3: M7200 OpenSky Mode Alert Tones

NAME	TONE	DESCRIPTION
Call Queued	one low tone/two high tones	Call queued for processing.
Call Denied	three short	Radio is out of coverage area or requested talk group is active.
Grant (or Go-Ahead)	single short beep	Sounded when resources become available for a call request placed in the queue (if enabled) upon channel access. If the radio roams to another site while transmitting, then it will auto rekey and begin transmitting on that tower. It gives a second grant tone to let the user know they have roamed.
Call Removed	single long low-pitched tone	Notifies the user access to the channel has been lost (out of coverage area or pre-empted by higher-priority call)
Selective Alert Received	four short tones	Only played once to indicate a selective alert has been receive
Emergency Alert Tone	three (3) short beeps	Sounds when an emergency alert is declared
Emergency Cleared Tone	one long low-pitched tone	Sounds when an emergency is cleared
Selective Call Ring Tone	a ringing tone similar to a telephone	Ringing is repeated every four (4) seconds until the call is accepted or rejected by the radio being called or until the network drops the call if unanswered after one (1) minute
PSTN Ring Tones	a single medium-pitch repeating tone.	Two ring tone - one generated by the radio when there is an incoming telephone call or an outgoing telephone call attempt is waiting for the telephone interconnect gateway equipment to dial the Public Switched Telephone Network (PSTN). The second ring tone sounds when the gateway equipment has dialed the number.
Roam Tone	Two short tones, one high-pitched and one low-pitched	Sounds when the radio transitions from one radio base station site to another.

7.12 BASIC MENU STRUCTURE

Table 7-4 illustrates the basic M7200 OpenSky menu structure. Menu items will vary depending upon system programming, radio hardware, and optional configurations. All menus except the dwell display menu can be turned off by network administration personnel.

Table 7-4: Basic Menu Structure

Menu Name	Radio Displays (top and bottom lines)	Usage Notes
	To/From Dwell Display	
Engineering Display (Menu may not be available per programming.)	registration, RF sync and transceiver status codes bit-error rates and RSSI data	Displays radio system connection data. For engineering use.
Silent Emergency	OFF/ON "**SilentEmerg**"	Use ± to toggle Silent Emergency OFF/ON.
Operating Mode (e.g., OTP, EDACS, etc.)	available modes "**Mode Menu**"	Use ± to choose an available mode. Press **MENU** and confirm (Y/N) with ± and press **MENU** again.
GPS Fix	current latitude and longitude "**GPS Fix**"	Radio's current GPS latitude and longitude position scrolls across top line of the display. Applies to GPS-equipped radios only.
User ID	User ID # of user currently logged in "**User ID**"	User's identification/name scrolls across top line of the display (if programmed).
IP Address	Radio's IP address "**IP Address**"	Radio's Internet Protocol (IP) address scrolls across top line of the display.
Station Identification	station's call sign "**Station ID**"	Station's identification/name scrolls across top line of the display (if programmed).
Stealth Mode	"OFF" "**StealthMenu**"	Use ± to enable. Press any button to disable.
Treble Level	"LOW", "MEDIUM", "MEDHIGH", "HIGH" "**Treble Menu**"	Use ± to choose speaker/headset treble level. Press **Select** to return to dwell display.
Display Brightness	"<< >>" "**Bright Menu**"	Use ± to dim or brighten. Press **MENU** to return to dwell display.
Side Tone Level	"OFF", "LOW", "MED", "HIGH" "**Side Menu**"	Use ± to choose side tone level. Press **MENU** to return to dwell display.
Intercom	"ON" or "OFF" "**INTERCOM**"	Use ± to turn intercom on and off. Press **MENU** to return to dwell display.
Selected Channel (Menu may not be available per radio programming)	selected channel "**ChannelMenu**"	Displays the current channel. Press **MENU** to return to dwell display.

See Next Page

Menu Name	Radio Displays (top and bottom lines)	Usage Notes
	See Previous Page	
	⋮	
Scan Mode	current scan mode "**ScnModeMenu**"	Use ± to turn scan on and off. Press **MENU** to return to dwell display.
	⋮	
Talk group Lock Out	talk group "<" "**LockOutMenu**"	Use ± to choose a talk group for locking/unlocking. Press **MENU** to toggle "<" on (locked out) and off.
	⋮	
Priority 1 Talk group	current priority talk group "**Priority2**"	Use ± to choose new priority talk group. Press **MENU** to return to dwell display.
	⋮	
Priority 2 Talk group	current priority talk group "**Priority1**"	Use ± to choose new priority talk group. Press **MENU** to return to dwell display.
	⋮	
Emergency Dismiss	alert received "**EmgDismiss**"	Use ± to choose emergency talk group. Press **MENU** to dismiss.
	⋮	
Alerts Received	time/sender's name/ alias/message text "**AlertsRcvd**" or oldest message	"No alerts" or alert message text scrolls in display. Use ± to view messages.
	⋮	
Alert Destination	current speed dial # "**AlertDest**"	Use ± to choose a speed-dial number. Press **MENU** to go to "AlertMsg" menu. Scroll through canned messages with ±. Press **MENU** to send message and return to dwell display.
	⋮	
Speed Dial	current speed dial # "**SpeedDial**"	Use ± to choose a speed-dial number. Press **MENU**, then use ± to select canned message.
	⋮	
Profile Selection	currently active profile "**ProfileMenu**"	Use ± to choose an available profile. Press **MENU** to return to dwell display.
	⋮	
Talk group Selection	selected talk group "**TalkGrpMenu**"	Use ± to choose a talk group in current profile. Press **MENU** to return to dwell display.
	⋮	
Dwell Display	Selected talk group (bottom line option)	Use ± to scroll top line through talk groups. Press **MENU** to change bottom line option.
	Use ⋮, **CLR**, or **OPT** to scroll through menus.	

NOTE

Menus will vary depending upon system programming, radio hardware, and optional configurations.

7.13 DUAL-TONE MULTI-FREQUENCY

Dual-Tone Multi-Frequency (DTMF) is the system used by touch-tone telephones. DTMF assigns a specific tone frequency to each key so a microprocessor can easily identify its activation. The radio supports DTMF with a system model control head (Figure 7-1). This allows for specific tasks such as entering a user ID and password, or selective calling.

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

7.14 KEYPAD COMMANDS (SYSTEM MODEL CONTROL HEAD)

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

Table 7-5: Keypad Function Commands

***0**	**Log-off command:** *0## (logs the user off the system). See page 22 for additional information.
***1**	**Log-in command:** *1<User ID> # <Password> ## (required for encryption). See page 21 for additional information.
***4**	**Enter Scene of Incident Mode (SOI) on specified channel:** *4<LC>#<Band># where LC is the channel number that is being used as a SOI repeater and band is the number assigned to each frequency band. For example, if LC 25 800 MHz (band 0) is being used for SOI, then enter *4,25,#,0,#. Exit SOI Mode with *4#.
***7**	**Initiate Selective Alert command:** *7<Target ID>#[Choose Message]#. See page 37 for additional information.
***8**	**Radio-to-Radio Call command:** Selective call number # (PTT to dial).
***9**	**Public Switched Telephone Network (PSTN) Call command:** See page 38 for additional information.
***32**	**Begin Manual Encryption command:** *32<Pre-Determined Encryption Key ># 1 – 16 digit encryption key for 128 bit encryption; 17 – 32 digit encryption key for 256 bit encryption. See page 42 for additional information.
***33**	**End Manual Encryption command**.

7.14.1 Password Entry

Password entry requires a system model control head. Password characters are encrypted on the display using symbols to indicate the entry. The encryption symbols for each entry will appear in the display as they are scrolled through, for example: '-' and '+'. Press the # key twice to complete the entry process.

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

7.14.2 DTMF Overdial

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

7.15 CHANGING THE ACTIVE PROFILE

The radio can store up to sixteen (16) standard profiles, one of which is the currently active profile. To change the currently active profile:

1. Scroll through the menu with  until "ProfileMenu" is displayed.
2. Use  to scroll through the list of available profiles.
3. Profile becomes active when selected for longer than 2 seconds, when the **MENU** is pressed, or when the menu is changed using  .

7.16 CHECKING OR CHANGING THE SELECTED TALK GROUP

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

First Method:

1. Use  to scroll through the menu until "TalkGrpMenu" appears on the bottom line of the display. The currently selected talk group appears in the top line of the display.
2. Use  to scroll through the available list of talk groups in the active profile. This list is determined by the OpenSky network administrator.

Second Method:

From the dwell display, use the talk group selection knob or  to scroll through the available list of talk groups in the active profile.

7.17 ADJUSTING DISPLAY & BUTTON BACKLIGHT BRIGHTNESS

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

1. Using  , scroll through the menu until "Bright Menu" appears.
2. Use  to increase or decrease brightness. Display and button backlight brightness will immediately dim or brighten.

7.18 STEALTH MODE

For some users, it is important to be able to turn off the radio's display lights, button backlighting, volume and side tones, but not the radio traffic. For example, in covert operations, lights and sounds could inadvertently expose an otherwise unobservable radio user. For this purpose, the radio has a Stealth feature that disables the radio display light, indicator light and audible side tones.

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

7.18.1 Enabling Stealth Mode

1. Using  , scroll through the menu until “StealthMenu” appears.
2. To immediately turn stealth mode on, press (**+**) or (**-**) with  .
3. To turn stealth mode off, press any button on the radio’s front panel.

7.18.2 Disabling Stealth Mode

Pressing any radio button other than the mic’s PTT button or the emergency button on front panel will immediately turn stealth mode off. For example, pressing the **MENU** button on the front panel will turn stealth mode off.

With stealth mode on, pressing any radio button (other than the mic’s PTT button or the emergency button) on front panel will immediately turn stealth mode off.

7.19 ADJUSTING SIDE TONE AUDIO LEVEL

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

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

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

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

Use the following procedure set side tone level:

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

7.20 CHANGE OPERATING MODE

4. Use  to cycle through the menu until the “Mode Menu” appears in the bottom line of the display.
5. Use  to choose an available mode. Press **MENU** and confirm (Y/N) with  and press **MENU** again.

7.21 RECEIVING AND TRANSMITTING VOICE CALLS

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

7.21.1 Receiving a Voice Call

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

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

Refer to Section 7.25 for detailed information on talk group scanning. Refer to Section 7.30 for detailed information regarding sending and receiving encrypted calls.

7.21.2 Transmitting a Voice Call

Transmit a voice call as follows:

1. Turn the radio on.
2. If required, log-in to the network using a user ID and password. See Section 7.4 beginning on page 21 as necessary.
3. Select the desired talk group for transmitting on.
4. Press and hold the **Push-to-Talk (PTT)** button on the hand-held microphone, pause for a moment, and then speak normally. For maximum clarity, hold the microphone approximately 1 ½ inches from the mouth and do not shout or whisper into it. If the call is queued by the network, wait for the grant tone to sound before speaking.
5. Release the PTT button when finished speaking.

Refer to Section 7.30 for detailed information regarding sending and receiving encrypted calls.

7.22 ADJUSTING AUDIO TREBLE LEVEL

The tone of received signals can be adjusted using the radio's "Treble Menu" as follows:

1. Use  to scroll through the menu until "Treble Menu" appears. The radio's current treble level setting indicates in the top line of the display. There are four levels available: low, medium, medium-high and high.
2. Use  to increase or decrease.
3. Press the **MENU** button or wait a few seconds to return to the Dwell Display.

7.23 INTERCOM MODE

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

1. Use  to cycle through the available menu items until "INTERCOM" appears in the display.
2. Use  to toggle between "On" and "Off."

When intercom mode is turned on:

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

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

7.24 TALK GROUP LOCK OUT

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

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

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

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

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

If the Scan Mode is "Fixed," P1 and P2 groups CANNOT be locked out. See Section 7.25 for more information.

The default emergency and emergency-capable talk groups can be locked out if they are NOT in an emergency state. If a talk group is locked out and is subsequently changed to the currently selected talk group, it will automatically be unlocked by the radio so the user can hear calls on the talk group. The radio may be configured so all talk groups are automatically locked out by default. In this case, they must be manually unlocked, if desired.

7.24.1 Lock Out a Talk Group

1. Use  to scroll through the menu until "LockOutMenu" appears in the bottom line of the display. The name of a talk group in the currently active profile will appear in the top line.
2. Use  to scroll through the list of talk groups, if any, until the desired talk group for lock out appears in the top line of the display.
3. Press the **MENU** button to lockout the displayed talk group. A less than symbol (<) appears next to the talk group's name.
4. Repeat steps 2 and 3, as needed, to lockout additional talk groups.

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

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

7.24.2 Unlock a Talk Group

1. Use  to scroll through the menu until "LockOutMenu" appears in the bottom line of the display. The name of a talk group in the currently active profile will appear in the top line.
2. Use  to scroll through the list of talk groups, if any, until the talk group desired for unlocking appears in the top line of the display. A less-than symbol ("<") appears next to the name of a talk group that is currently locked out.
3. Press the **MENU** button to unlock the talk group. The less-than symbol ("<") next to the name of the talk group disappears. The dwell display appears as soon as the radio acknowledges the selection.

- Changing the active profile removes any lockouts you have made.
- Turning off the radio removes any lockouts you have made.

7.25 SCANNING

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

As described in Table 7-6, the choice of scanning mode changes the span of communications with all the talk groups in the radio's profiles, but does not affect interaction with the talk groups.

Table 7-6: Scan Modes

SCAN MODE	EXPLANATION
No Scan	**Eliminates distractions**. Full communications (transmit and receive) on selected talk group. No calls received from other talk groups.
Normal (Default)	The user can scan all talk groups in the active profile that are not locked out as long as there is demand on the site. Priority (P1 and P2) groups are user selectable. Receive calls from more than one talk group, if available from the current site. Allows dragging of the selected talk group, P1, P2, and default emergency talk groups to the site on which the radio is registered. (If other calls are available at the site, they also can be heard but they will not be actively dragged.) The default emergency talk group, as well as any emergency-enabled talk groups, is only dragged if it is in emergency mode.
Fixed	The priority groups are fixed to the selected profile's pre-defined P1 and P2 groups (configured via the UAS). In this mode, P1 and P2 groups CANNOT be locked out. The user can scan all talk groups in the active profile that are not locked out, as long as there is demand on the site. Allows dragging of the P1, P2, and selected talk group to the site on which the radio is registered. If other calls are available at the site, they can also be heard, but they will not be actively dragged. The default emergency talk group, as well as any emergency-enabled talk groups, is only dragged if in emergency mode.

7.25.1 Checking or Changing Active Scan Mode

The currently active scan mode does not appear in the dwell display. To check it, access "ScnModeMenu" and observe it in the top line of the display. To change the active scan mode:

1. Use  to scroll through the menus until "ScnModeMenu" appears in the display.
2. Use  to scroll through the scan options until the desired mode appears. See Table 7-6.

7.25.2 Scanning Priority

The following lists the scanning priority order (from highest to lowest):

1. Selected talk group in emergency state.
2. Default emergency group in emergency state.
3. Selected talk group.
4. Emergency capable group in emergency state
5. Priority 1 talk group.
6. Priority 2 talk group.
7. Other (non-priority)

7.25.2.1 Changing Scanning Priority

Follow this procedure to set talk groups in the current profile as the Priority 1 or Priority 2 talk group:

1. Use  to scroll through the menu until “Priority1” or “Priority2” appears in the bottom line of the display (Priority1 group has higher priority than the Priorty2 group. The talk group currently set as the priority talk group appears in the top line of the display.
2. Use  to select a new priority talk group.
3. Press the **MENU** button to set the newly selected talk group as the priority talk group.

7.26 MAKING SELECTIVE CALLS

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

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

In addition, a properly equipped source radio can initiate a selective call to any radio in the system by entering the ten-digit voice user ID (which looks like a telephone number) of the target device. Entering a selective call number without using the speed dial feature requires a system model control head (Figure 7-1). See Section 7.13 for more detail.

Selective calls are terminated if an emergency is declared. The network limits selective calls to ten (10) minutes maximum.

7.26.1 Manually Dialing a Selective Call (System Model Control Head)

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

7.26.2 Speed Dialing a Selective Call

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

1. Scroll through the Menu options using  until "SpeedDial" appears in the bottom line of the display.
2. Using  , scroll through the pre-programmed speed-dial numbers until the desired number appears in the display.
3. Press and release the PTT button to ring the other user.
   a. The ring tone is sounded.
   b. If the other user accepts the call, the called user's alias will appear in the initiating caller's display. The two are now in a private call until one ends the call, the call is terminated due to an initiated emergency, or the maximum time limit of ten (10) minutes is reached.
4. To end the call, press the **MENU** button.

7.26.3 Receiving a Selective Call

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

A selective call will be interrupted if an emergency is declared on a monitored talk group.

7.27 SELECTIVE ALERT

Selective alert messaging is an OTP feature allowing one of up to eight (8) pre-programmed text messages (refer to Section 7.27.3) to be sent from one radio to another. The user specifies a destination radio's User ID, selects one of the pre-programmed text messages, and then transmits it to the destination radio. The message delivery system adds time-of-day information and forwards the message to the destination (receiving) radio. The sending radio receives a brief message noting the status of the transmission. Refer to Table 7-7 for a list of possible status messages.

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

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

7.27.1 Sending Selective Alert Messages

The destination radio's User ID can be selected via the menu or via the keypad on the system model control head.

Menu Button Method:

1. Using  , scroll through the menu until "AlertDest" (Alert Destination) appears in the bottom line of the display. The current speed dial number scrolls on the top line.
2. Use  to change to a different speed-dial number.
3. When the desired speed-dial number appears, press the **MENU** button to activate the selection.
4. Choose and send the message.

Keypad Method (System Model Control Head):

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

1. Press *7 on the keypad. "AlertDest" appears in the display.
2. Enter the number of the destination radio (e.g., 027-001-0006) using the DTMF keypad. If the region number (first 3 digits; 027 in this example) is the same as this radio's region number, these digits do not need to be entered. Likewise, if the region and agency numbers (first 6 digits; 027-001 in this example) are the same as this radio's numbers, these digits do not need to be entered. Leading zeros can also be ignored. Refer to Section 7.13.
3. Press the # key to enter the number.

Choosing and Sending the Message

After specifying the destination radio's User ID (Section 7.27.1), the radio automatically allows you to choose a message. The current message scrolls across the top line of the display. To choose a message:

1. Scroll through the message list using  . The next available message in the list is displayed. Pause between each arrow button press to observe the entire message as it scrolls across the top line of the display.
2. To select and send the displayed message, press the **Select** button, or press the # button on the keypad.
3. The status of the sent message will be momentarily displayed (Table 7-7).

Table 7-7: Status of Selective Alert

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

7.27.2 Receiving Messages

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

Displaying Received Messages

1. Using  , scroll through the menu until "AlertsRecvd" (Alerts Received) appears in the bottom line of the display. "No alerts" or the last received (newest) message appears in the display. It is preceded by the time the message was received, and the sender's name/alias.
2. View other received messages using  .
3. To delete the message currently being viewed, press the **MENU** button.

Deleting Received Messages

To delete a received message:

1. Display the message.
2. Delete the message by pressing the **MENU** button.
3. Confirm the deletion by pressing the **MENU** button again.

7.27.3 Defining Pre-Programmed Messages

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

7.28 TELEPHONE INTERCONNECT CALLS (SYSTEM MODEL CONTROL HEAD)

If the radio system is equipped with Public Switched Telephone Network (PSTN) interconnect equipment, telephone calls can be made from the M7200 using this procedure:

1. Press the *9 keys.
2. Enter the telephone number. Ignore dashes/spaces, and precede the number with any required access digits such as a 1 for long distance.

3. Press the # key.
4. Wait a few seconds and then press and release the mic's PTT button to initiate the call. An initial ring tone plays indicating call initiation. Once the gateway picks up the call, the ring tone changes.
5. When the caller answers, press the PTT button when speaking and release it to listen to the caller.
6. To hang-up, press the **MENU** button on the front panel.

7.29 EMERGENCY COMMUNICATIONS

The M7200 mobile radio can transmit both emergency voice calls and emergency alerts over the entire network. OpenSky handles emergency calls and alerts with the highest priority.

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

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

7.29.1 Declaring an Emergency Call or Alert

To declare an emergency call or emergency alert, press and release the orange Emergency button. This button is located just to the right of the 5-button Menu and Select keypad; see Figure 7-1 on page 19. Note the following:

- The OpenSky network administrator determines if the Emergency button is used to declare an emergency call or if it is used to declare an emergency alert. This is based upon the radio's currently active profile.
- The OpenSky network administrator also determines if the emergency is declared on the currently selected talk group or a "default" emergency talk group. Again, this is based upon the radio's currently active profile. A talk group upon which an emergency is declared on is considered an "emergency talk group."
- Upon successful emergency declaration:
  - An emergency tone will sound in the radio's speaker/headset if the radio is not in stealth mode.
  - At the declaring radio, the Emergency button flashes red if the radio is not in stealth mode. The administrator can configure the radio to automatically transmit upon successful emergency declaration, at which point the **MENU** button will flash red. However, the **MENU** button flashing red is not a requirement for successful emergency declaration.
  - For an emergency call declaration, "EMERGENCY" appears in the bottom line of the display. In addition, the emergency talk group's name appears in the top line of the display, followed by an asterisk (*). The emergency talk group can be forwarded across the OpenSky network for emergency communications.

- For an emergency alert declaration, "EMERG ALERT" appears in the bottom line of the display.
- For an emergency call declaration, other radio users and/or dispatchers at consoles will hear the emergency signal, a distinctive 3-tone burst. They will also hear audio from the declaring radio's "hot" microphone, if any.
- For an emergency alert declaration, only dispatchers at consoles will hear the emergency signal and, if any, audio from the declaring radio's "hot" microphone.
- For an emergency call, the declaring radio's microphone remains "hot" for a predetermined amount of time. In other words, the radio transmits audio for a period of time even when the microphone's PTT button is not pressed. Audio is transmitted over the emergency talk group. When the microphone is "hot" for this initial period (typically ten seconds), simply speak into it for voice transmission.

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

7.29.2 Silent Emergency

When this feature is enabled and an emergency call or alert is declared by pressing the emergency button, the radio will not play a tone and will display an abbreviated emergency message (default is EBA). This feature is enabled or disabled via programming or via the menu.

If the Silent Emergency feature is enabled or disabled via programming, the setting will survive power cycle. Enable/Disable selection via the menu will NOT survive power cycle and the enable/disable state will revert to the programmed setting at power up.

7.29.3 Clearing an Emergency Call or Alert

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

7.29.4 Receiving an Emergency Call

Upon receiving an emergency call declared by another radio:

- An emergency tone sounds in the radio's speaker/headset (three short high-pitched beeps).
- "EMERGENCY" flashes in the display if the radio is not in stealth mode.
- When the emergency talk group is selected, an asterisk (*) follows its name in the top line of the display. The asterisk identifies the selected talk group is in an emergency state. Some radios may be programmed by the system or network administration personnel to flash the **Emergency** button (red) when an emergency call is received. This occurs only if the radio is not in stealth mode.
- If scan mode is set to "No Scan" and the emergency was declared on the selected talk group, audio on the emergency talk group is heard in the speaker/headset. See page 33 for additional information on "No Scan" operation.

- If scan mode is set to “No Scan” and the emergency was declared on a talk group **other than** the selected talk group, the emergency talk group (identified by an “*”) must be selected before audio on it is heard in the speaker/headset.
- If scan mode is set to “Normal” and the emergency was declared on the selected talk group, the selected/emergency talk group’s name remains in the top line of the display. Audio on the emergency talk group is heard in the speaker/headset.
- If scan mode is set to “Normal” and the emergency was declared on a talk group **other than** the selected talk group, the emergency talk group’s name appears in the bottom line of the display. Audio on the emergency talk group is heard in the speaker/headset.
- The declaring radio's alias appears in the bottom line of the display when the emergency talk group is selected.
- An emergency call can be dismissed as described in the following section.

NOTE

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

7.29.5 Dismissing an Emergency Call

NOTE

An emergency is dismissed for a configurable amount of time only (default = 5 minutes).

To ignore an emergency call declared by another radio user:

1. Press  until “EmgDismiss” appears in the display.
2. Press  until the talk group in the emergency state appears, as indicated by an asterisk (*) following the talk group’s name.
3. Press the **MENU** button.

NOTE

The emergency dismiss timer is cleared when the emergency is cleared.

7.30 ENCRYPTION

In the OpenSky network, both data and voice use a 128-bit or 256-bit key encryption standard published by the Federal Information Processing Service (FIPS), called Advanced Encryption Standard (AES). AES is approved by the U.S. Department of Commerce for encryption of classified materials.

When encryption is enabled on the network, data is encrypted from the MDIS to the Mobile End System (MES) (e.g., M7200 mobile radio). This form of encryption provides air-link security.

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

7.30.1 Automatic Encryption

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

1. "Pls Login" appears displayed in the bottom line of the dwell display.
2. Login normally using the keypad on a system model control head to enter User ID and Password.

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

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

7.30.2 Manual Encryption (System Model)

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


NOTE

The key must be pre-determined by the users prior to making a manually encrypted call on a talk group and is entered into the radio using the keypad. For 128 bit encryption, this key is between 1 and 16 digits. For 256 bit encryption, this key is between 17 and 32 digits.

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

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


CAUTION

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

Perform the following to transmit or receive manually encrypted calls:

1. Press *32 on the keypad.
2. Enter the key (1 – 16 digits for 128 bit encryption; 17 – 32 digits for 256 bit encryption).
3. Press the # key.
4. To end manual encryption, press *33#.

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

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

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

7.31 PRESET BUTTONS

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

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

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

7.32 DYNAMIC REGROUPING

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

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

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

7.33 GPS COORDINATES

The radio’s current latitude and longitude coordinates may be displayed using the “GPS” menu. The following procedure assumes a GPS antenna is connected to the radio and it is receiving adequate signals from GPS satellites:

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

If the internal GPS receiver’s data is expired (30 minutes or more) or unavailable, the radio uses the serving base station’s coordinates [GPS (Site) is displayed]. The GPS Menu will also indicate if the data is aged (2 minutes or more) [GPS (Aged) is displayed]

8 EDACS OPERATION

8.1 CH721 FRONT PANEL COMPONENTS

The front panel of the control head includes a dot matrix display, controls for menu navigation, an emergency button, three pre-set buttons, a Power On-Off/Volume Control knob, and a microphone connector. In addition, the system model control head features a DTMF keypad.

Table 8-1 lists all default front panel controls and their functions. All functions and controls of the Scan radio operate the same as the corresponding functions and controls on the System radio.

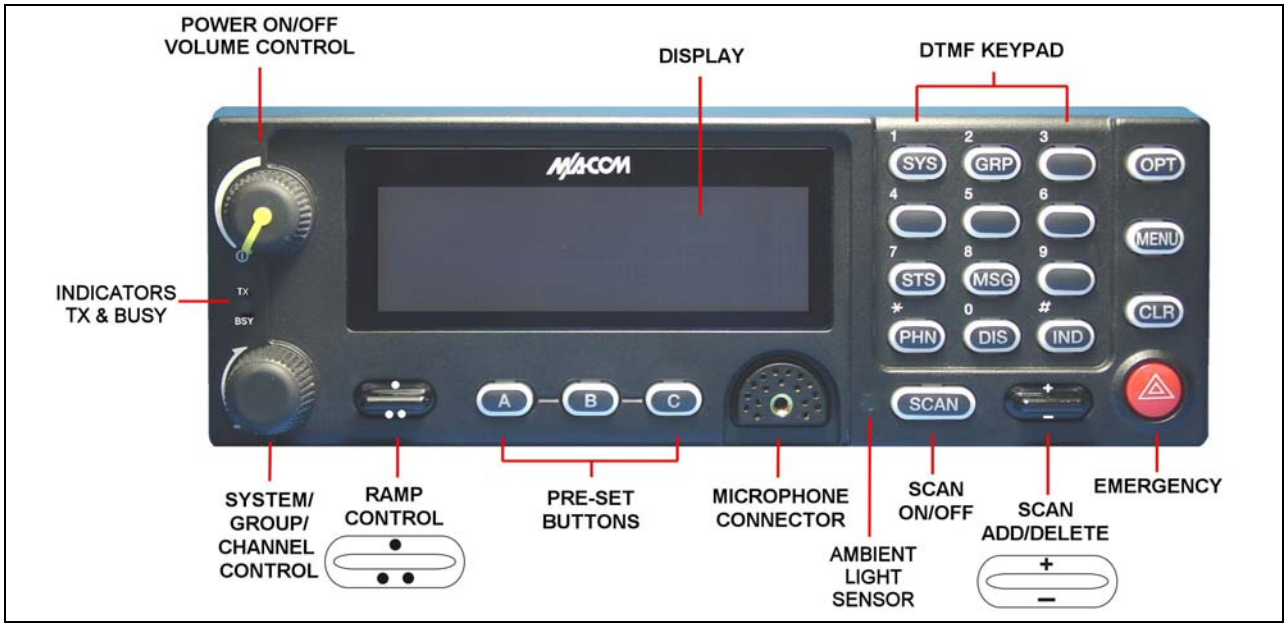


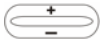
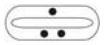
Figure 8-1: System Model

Figure 8-2: Scan Model

NOTE

Button function may vary depending upon system programming, radio hardware, and optional configurations. Complete the table in Section 14 if the keys have been remapped to provide new functions.

Table 8-1: Front Panel Default Controls and Functions

PART	FUNCTION
Power On-Off/Volume Control knob	Turn knob clockwise to power on the radio and increase volume. Turn counter-clockwise to decrease volume and power off the radio.
Mic Connection	Connection for hand-held, hands-free, speaker-mic, or headset.
	The Emergency button declares an emergency if enabled through programming.
Ambient Light Sensor	Radio automatically adjusts the display and button backlight brightness level based on ambient light. Do not block this sensor.
	This rotary switch selects the systems or groups/channels, depending upon programming.
	This rocker type button is used to display the current SCAN status for a group/channel and then add or delete the group/channel from the system scan list. Pressing the add/delete button twice while the radio is actively receiving or three times when the radio is not receiving selects the last scanned channel (Last Scanned Channel Recall).
	The primary function of this rocker type button is to scroll through the System list or the Group/Channel list depending upon programming. The secondary function is to increment or decrement items within a list (phone list for example).
OPT/OPTION	Toggle a PC programmable feature ON and OFF.
CLR/CLEAR	Exits the current operation and removes all displays associated with it. The radio and display then return to the group receive state.
MENU	Primary function - access the menu list. This is a list of additional features that are not available directly from the keypad. Secondary function - activate a selected item within a list, similar to an enter key.
SCAN	Primary function - toggle scan operation on and OFF. Secondary function - toggle the keypad buttons between their primary function and their secondary function.
Pre-Set buttons	Used to store and recall user-selectable parameters.
SYS	Used to enter the System select mode.
GRP	Used to enter the Group select mode.
STS	Permits the transmission of a pre-programmed status message to an EDACS site.
MSG	Permits the transmission of a pre-programmed message to an EDACS site.
PHN	Used to place telephone calls through the radio by selecting the interconnect special call function.
DIS	Used to adjust the current display intensity and the keypad backlight level.

PART	FUNCTION
IND	Used to call an individual or make an all-call by selecting the individual call function.

8.1.1 Primary Functions (Quick Access)

The secondary function of the **SCAN** button is to toggle the keypad buttons between their primary function and their secondary function. When the secondary keypad is active, i.e. entering phone digits for an interconnect call, the **SCAN** button can be used to toggle the keypad buttons back to their primary function, perform a task, and then toggle back to finish entering the digits for the phone number. **PRIMARY** is displayed when the **SCAN** button is used to toggle the keypad keys back to their primary functions. This provides quick access to the primary functions of the keypad. This is a programmable feature of the **SCAN** button only. Careful consideration should be given to possible operational conflicts before enabling this feature.

Several keys on the Scan version have a secondary function. The **MENU** key is the SELECT secondary function with the **CLEAR** key remaining the same for the secondary function. On the System version, the **OPT** has a secondary function of DELETE, **MENU** is SELECT, and **CLR** retains its CLEAR functionality.

8.2 RADIO STATUS ICONS

Status icons are indicators that show the various operating characteristics of the radio.

Figure 8-3: Typical Display

Table 8-2: Icons and Descriptions

ICON	DESCRIPTION
	Indicates the EDACS system is in Failsoft™ mode (if enabled through programming).
	Indicates selected group or channel is in scan list.
	Indicates selected group or channel is programmed as Priority 1 in scan list.

ICON	DESCRIPTION
	Indicates selected group or channel is programmed as Priority 2 in scan list.
	Scan mode enabled.
	Volume bars – indicates relative volume level.
	Indicates the current channel is set up as an analog channel.
	Indicates the current channel is set up as a ProVoice channel.
	Receiving or transmitting Encrypted Calls.
	Special call mode (individual or telephone).

8.3 MESSAGES

During radio operation, various messages are displayed on either line 1 or line 2. Typical messages include control channel status information, such as system busy or call denied, or messages associated with the radio's operation, (i.e. volume adjust). These messages are described as follows:

Table 8-3: Display Messages

MESSAGE	NAME	DESCRIPTION
QUEUED	Call Queued	Indicates the system has placed the call in a request queue.
SYS BUSY	System Busy	Indicates the system is busy, no channels are currently available, the queue is full or an individual call is being attempted to a radio that is currently transmitting.
DENIED	Call Denied	Indicates the radio is not authorized to operate on the selected system.
CC SCAN	Control Channel Scan	Indicates the control channel is lost and the radio has entered the Control Channel Scan mode to search for the control channel.
WA SCAN	Wide Area Scan	Indicates the control channel is lost and the radio has entered the Wide Area Scan mode to search for a new system (if enabled through programming).
RXEMER	Receive Emergency	Indicates an emergency call is being received. This message will be flashing on line 2.
TXEMER	Transmit Emergency	Indicates an emergency call has been transmitted. This message will be flashing on line 2.
VOL=31	Volume Level	Indicates the current volume level. The volume level display ranges from OFF (silent) to 31 (loudest).
UNKNOWN	Caller's ID Not Received	Indicates that an individual call is being received, but the caller's ID was not received.
TX DATA	Transmit Data	Indicates the radio is transmitting a data call.
RX DATA	Receive Data	Indicates the radio is receiving a data call. Displayed on line 2.
DATA OFF	Data OFF	Indicates the radio is in the data disabled state. Displayed on line 1.
DATA ON	Data ON	Indicates the radio has been toggled to the data enable state. Displayed for two seconds on line 1 when toggled to enable state.
SYSC ON	System Scan Features ON	Indicates the System Scan features are enabled.

MESSAGE	NAME	DESCRIPTION
SYSC OFF	System Scan Features OFF	Indicates the System Scan features are disabled.
PA ON	Public Address ON	Indicates that the public address function of the radio is enabled.
PA OFF	Public Address OFF	Momentary (2 seconds) indicates that public address function of the radio was disabled.
ALRM ON	External Alarm Enabled	Indicates that the external alarm function of the radio is enabled.
ALRM OFF	External Alarm Disabled	Momentary (2 seconds) indicates that the external alarm function of the radio was disabled.
PVT DIS	Private Mode Disabled	Indicates that private mode is disabled or no encryption key has been programmed for the selected group/channel or special call.
FRCD PVT	Forced Private Operation	Indicates that forced private operation has been pre-programmed into radio.
NO KEY #	Encryption Key Missing	Flashing indicator indicates that no encryption key or an incorrect encryption key is programmed into the radio.
BCKL=1-6	Backlight	Indicates the display intensity and keypad backlight level.
GR	Group ID	Indicates that the call is a group call and is followed by the GID of the caller.
ID	Individual ID	Indicates the call is an individual call and the ID number of the caller, example "ID 2725."
WHC=1	Who Has Called	This display indicates the number from the *Who Has Called* list. Individual calls received but not responded to are stored in a *Who Has Called* list. This list is accessible by pressing the # key and then the INDV key after the Individual call has timed out or the Clear button is pressed. This display is on line 2 and the LID of the caller is displayed on the top line. Currently the list is not implemented and the display will always be WHC=1.
PHONE	Phone Call	Displayed when a phone call is received from the site. It is displayed in line 1 of the display. Line 2 of the display will contain the display *INDV* when line 1 contains this message. The radio interprets a received phone call as an individual call.
CONV FS	Conventional Failsoft	Displayed when a failure of the EDACS system occurs. All communication will be in conventional mode.
MENU		Displayed when the menu key is pressed and remains displayed in line 1 until a menu item is selected.
SYS=1-64	System = 1 - 64	The system number for the current base station of the system displayed in line 1. It is displayed in line 2 of the display. Press the system key to obtain this display.
GRP=1-64	Group = 1 - 64	The group number of the group displayed in line 2 of display. It is displayed in line 1 of the display. Press the group key to obtain this display. There are up to 48 groups available (i.e. 3 banks of 16). The maximum number of groups programmed in a radio is determined by the personality.
INDV=1-99	Individual = 1 - 99	Indicates which item in the individual call list is being displayed. It is displayed in line 2 of the display. The name or ID of the item in the list is displayed in line 1 of the display.
PHN=1-99	Phone = 1 - 99	Indicates which item in the phone list is being displayed. It is displayed in line 2 of the display. Line 1 of the display will be the last 3 characters of the list item contents.
SEL PHN	Select Phone	After pressing the PHN key, selecting an entry from the phone list by typing the entry number will display this message on Line 1.
SEL INDV	Select Individual ID	Displayed on line 1 when an entry from the individual ID list is selected after pressing the INDV key. The entry is a number between 1 and 32 inclusive.
SYS ALL	System All Call	Displayed on line 1 to indicate a system all-call has been received.
Ggg-v.vv	Code Group and Revision Number	This is code group and revision number that is displayed in line 2 when the menu item “REVISION” is selected. The ‘gg’ is the group number of the software. The first ‘v’ is the hardware version and ‘vv’ is the revision of the software.
PHONE	Phone Call	Displayed when an initiated phone call is in progress. This is displayed on line 2 of the display.

MESSAGE	NAME	DESCRIPTION
NO ENTRY		Indicates that there is no data stored in one of the programmable items in either the phone list or individual call list. The user programmable items are items 1 through 10 in each list.
INV SYS	Invalid System	Displayed when the current system is an invalid type.
CHN=1-99	Channel = 1 - 99	Displayed on line 1 of the display. This is a conventional channel index displayed when the group key is pressed.
FIX LIST	Fixed List	The Priority scan list is fixed and cannot be changed using the add or delete keys.
FIXED P1	Fixed Priority 1	The Priority 1 scan channel is fixed and cannot be changed using the add or delete keys.
(c) 2004		Displayed in line 2 when the message 'M/A-COM' is displayed in line 1 while displaying different items under the menu when "REVISION" is selected by the operator.
EM	Emergency	Indicates an emergency has been declared by the LID that follows the display, "EM." An example of this is "EM 01201."
INDV	Individual Call	Displayed in line 2 of the display when an individual call is in progress (trunked and T99 modes only).
GROUP	Group Call	Indicates a group call is in progress and is displayed on line 1 of the display (trunked and T99 modes only).
SPKR ON	External Speaker ON	Displayed when the external speaker is enabled.
SPKR OFF	External Speaker OFF	Displayed when the external speaker is disabled.
BANK=1-8		The bank of keys that are going to be loaded when the keyloader loads encryption keys. This is only valid for radios that support VGS, VGE, or DES encryption. It is displayed on line 2 of the display when the encryption keyloader is connected.
REGR_0x	Dynamic Regroup	Indicates which group in the dynamic regroup operation has been enabled, where "x" is a digit of 1 to 8.
KEY LOAD		Displayed on line 1 of the display when the encryption keyloader is connected.
KEY ZERO		Displayed on line 2 of the display when the reset and option buttons are pressed simultaneously for approximately two seconds. The encryption keys are zeroed.
SYS KEY	System Key	Displayed on line 1 of the display in the display key mode of the menu. It is followed in the second line with a key number "KEY = <1..7>".
GRP KEY	Group Key	Displayed on line 1 of the display in the display key mode of the menu for trunked systems only. It is followed in the second line with a key number "KEY = <1..7>."
KEY=1-7		Displayed on line 2 of the display in the display key mode of the menu for conventional systems when the "SYS KEY" or "CHN KEY" is displayed in line 1 and for trunked systems when the "SYS KEY" or "GRP KEY" is displayed in line 1.
PRIMARY		Displayed on line 1 of the display when the primary keys are enabled.
PRS NAME	Personality Name	Displayed on line 1 of the display under the revision selection of the menu. The personality name is displayed on line 2 at the same time.
M/A-COM		Displayed on line 1 of the display under the revision selection of the menu. The copyright year is shown in line 2 of display at the same time "(c) 2007."

8.4 ALERT TONES

The M7200 series mobile radio also provides audible alert tones or "beeps" to indicate the various operating conditions. These alert tones can be enabled or disabled through programming.

Table 8-4: Alert Tones

NAME	TONE	DESCRIPTION
Call Originate	A short mid-pitched tone.	Sounds after keying the radio (Push-To-Talk button is pressed). Indicates the radio has been assigned a working channel
Autokey	A mid-pitched tone.	After being placed in a queue or releasing the PTT button prior to a working channel assignment, the site calls the radio when a channel becomes available. At this point, the radio automatically keys the transmitter (autokey) for a short period to hold the channel. The radio sounds a mid-pitched tone when it is clear to talk. Immediately press the PTT button to keep the assigned channel.
Call Queued	A high-pitched tone.	Sounds after pressing the PTT button indicating the system has placed the call request in the queue. The receiving unit(s) also sound(s) the tones to indicate they will receive a call shortly.
System Busy	Three low-pitched beeps.	Sounds if the radio is keyed when the system is busy, if no channels are available for sending the message, if the call queue is full, or if an individual call is being attempted to a radio that is transmitting.
Call Denied	A low-pitched tone.	Indicates the radio is not authorized on the system that has been selected.
Carrier Control Timer	Five short high-pitched warning tones followed by a long low-pitched tone.	Sounds if the programmed time for continuous transmission is exceeded. The transmitter will shut down shortly after the alert, interrupting communications. Release and re-key the PTT button to maintain communications. This will reset the carrier control timer and turn the transmitter back on.
Key Press Alert	A short tone.	Indicates a key has been pressed. A short low-pitched tone indicates no action was taken because the key is not active in the current mode.

8.5 TURNING THE RADIO ON

Rotate the **POWER ON-OFF/VOLUME** knob clockwise, out of detent to turn the radio on. A short beep (if enabled through programming) indicates the radio is ready for operation. The display indicates, if programmed, the last selected system name on line 1 and the last selected group or channel name on line 2.

In the EDACS environment, if communication with the system's control channel cannot be established, the **CC SCAN** message will be displayed. This can occur if, for example, the radio is out of range of the trunking site. It may be necessary to move to another location or select another trunking system to re-establish the control channel link for trunked mode operations.

8.6 SELECTION MODE RULES

Many operations require selection from a list such as system, group or phone number. This selection process is handled in the same manner for all lists. The ramp control, **MENU**, **0-9**, *****, **#**, and the **CLR** button are used during the selection process. The following example systems list is used to explain the process:

NOTE

The hookswitch functions the same as the **CLR** key in I-Call, phone call, and menu modes.

	SYSTEM
1	NORTH
2	SOUTH
3	EAST
4	WEST

After entering a selection mode, the following generic display format will appear:

```
XXXXXXXX
YYY = ZZZ
```

Line 1 shows the currently selected item name (XXXXXXXX) from the list. Line 2 indicates the list (YYY) that the selection is to be made from and the number of the selected item (ZZZ) within the list. (In some cases the information on lines 1 and 2 will be exchanged.) Enter the system selection mode by pressing the **SYS** key. If SYSTEM 2 is the current selection, the display appears as follows:

```
SOUTH
SYS = 2
```

Line 1 contains the current system name, SOUTH; and line 2, SYS = 2, indicates that selection is from the system list and it is the second system within the list.

A new system from the list is selected by using the ramp control or by directly entering the system number with the numeric keys. The ramp control scrolls through the list in increasing and decreasing order. In the previous example, pressing up with the ramp control selects the EAST system as shown in the next display.

```
EAST
SYS = 3
```

The radio can be programmed to wrap around from one end of a list to the other end or to stop at the ends.

8.7 DIRECT ACCESS

To directly access a selection, enter the corresponding number (e.g. 4) followed by **MENU** to activate the selection. The entered number is displayed on line 2 as shown below. Line 1 shows the current list being used for selection.

SEL SYS
4

If a mistake is made while entering the number, press the **DEL** button to backspace once and correct the entry. If an invalid number is entered, a short low-pitched tone sounds when **MENU** is pressed.

To exit the selection mode, press the **CLR** button or wait for the time-out. If the selection mode is cleared while an entry is pending (i.e., numbers are entered on line 2, but **MENU** has not been pressed), the entry on line 2 will be disregarded and the previous selection will remain active. If the time-out activates while an entry is pending, the entry on line 2 will be selected if it is within the valid range; if it is out of range, the entry on line 2 will be disregarded and the previous selection will remain active.

While in system, group or channel selection mode, the radio continues to receive calls normally and continues scanning, if it is enabled. If a call is received during the selection mode process the radio will return to the normal receive mode display. Continuing with the selection process will return the display to the same point in the selection process if the selection mode time out has not yet expired. Any press of the PTT button during the selection mode process will initiate transmission and exit the selection mode.

8.8 MENU

The menu function accesses features that are not available directly from the keypad. The order and specific number of menu items available is configurable through programming. Upon radio power up, the menu item at the beginning of the menu list will always be displayed first. Subsequent access to the menu function will return the last menu item that was shown in the display. To enter the menu mode, press **MENU**. The  ramp control, and **CLR** are used during the selection process. All of the selection mode rules previously detailed apply to the menu item selection process with the exception of direct access. The radio will continue to receive and transmit normally while in the menu function.

A new item is displayed by using the  ramp control to scroll through the list in increasing and decreasing order. The displayed menu item is made active by pressing **MENU**.

After entering the menu selection mode, the following generic display format will appear.

MENU
YYYYYYYY

Line 1 indicates the radio is in the menu selection mode. Line 2 indicates the menu item (YYYYYYYY) that is to be viewed or changed (some menu items provide radio information and do not have changeable parameters).

An example of the menu item selection process and menu item parameter change is detailed below for the contrast menu item.

1. Press **MENU** to enter the menu mode.
2. Press the  ramp control until the display shows:

M E N U
CONTRAST

3. Press **MENU.** The contrast menu item is activated and the display will be similar to the following:

CNTRST = X
Y Y Y Y Y Y Y Y

Line 1 shows the active menu item and its current parameter setting (XXX). Line 2 shows the currently selected system or group name (YYYYYYYY).

4. The menu item's parameter setting shown in the display can now be changed by using the  ramp control to scroll through the list of parameter values. Once the desired setting is reached, press **MENU** to store the value and return to the normal display. For menu items that display radio information, use  to scroll through a list of informational displays. The menu items are listed in Table 8-5.

Table 8-5: Menu Item Information

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Contrast Adjust	Menu Item: **CONTRAST** Once selected: CNTRST=	1, 2, 3, 4, 5, 6, 7, 8	Selects the Contrast level.
Radio Revision Information	Menu item: **REVISION**	Informational displays only (see radio); no user selectable settings.	Selects the information display to view.
Phone Call	Menu item: **PHN CALL** Once selected: See Telephone Interconnect Call Section		Allows access to the Phone Call Feature.
Individual Call	Menu Item: **IND CALL** Once Selected: See Individual Call Section		Allows access to the Individual Call Feature.
External Alarm	Menu Item: **EXTALARM** Once Selected: **EXTALARM**	ON, OFF	EXTALARM replaces the system name on the display as long as the external alarm feature is enabled.
Public Address	Menu item: **PUB ADDR** Once selected: **PA ON** or **PA OFF**	ON, OFF	Public Address is toggled ON and OFF.
External Speaker	Menu item: **EXT SPKR** Once selected: **SPKR ON** or **SPKR OFF**	ON, OFF	External Speaker is toggled ON and OFF.

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Encryption Key Loading	Menu item: **KEYLOAD** Once selected: **KEY LOAD BANK = N**	Up to 8 banks of 7 keys	Enables the radio to accept the loading of encryption keys.
Display Current Encryption Key(s)	Menu item: **DISP KEY** Once selected: **SYS KEY**, **GRP KEY** or **CHN KEY** and **KEY = N**		Displays current encryption key number.
Scan	Menu item: **SCAN**	ON, OFF	Toggles scan function ON or OFF.
Private Mode	Menu Item: **PRIVATE** Once selected: **PVT** or key light.	ON, OFF	Toggles private function ON or OFF.
Scan Add	Menu item: **SCAN ADD** Once selected: Proper scan icon displayed.	S, 2 or 1	Adds group or channel to scan list.
Scan Delete	Menu item: **SCAN DEL** Once selected: Scan icon goes out.		Deletes group or channel from scan list.
Scan Add/Delete	Menu item: **SCAN A/D** When selected: Toggles through scan selections	Toggle sequence S, 2, 1, S, ...	Changes present group or channel to next scan choice in scan list.
Last Scanned Channel Recall	Menu Item: SCAN ADD Press twice when actively receiving; three times when not receiving. Scan icon displayed.		Changes the selected channel to the last scanned channel.
Home group or channel selection	Menu item: **HOME** Once selected: Home group or channel displayed.		Changes to the group or channel defined for Home function.
System select	Menu item: **SYS SEL** Once selected: **SYS = n**	1-64 = (n)umber of desired system	Displays the system selected.
External alarm #2	Menu item: **EXTALRM2**	ON, OFF	Toggles external alarm #2 feature ON or OFF.
System and group selection	Menu item: **SYSGRP 1** Menu item: **SYSGRP 2** Menu item: **SYSGRP 3** Menu item: **SYSGRP 4** Menu item: **SYSGRP 5**		Changes to the System & Group/Channel programmed for SYSGRP 1-5.
Mute	Menu item: **MUTE**	ON, OFF	Toggles the mute function ON or OFF to control the audio output from the selected radio.
Mute #1	Menu item: **MUTE 1**	ON, OFF	Toggles the mute 1 function ON or OFF on radio #1.
Mute #2	Menu item: **MUTE 2**	ON, OFF	Toggles the mute 2 function ON or OFF on radio #2.
Multiple radio operation	Menu item: **RADIO**	ON, OFF	Toggles the currently selected radio.
Radio selection	Menu item: **RADIO 1**	ON, OFF	Changes to radio #1.
	Menu item: **RADIO 2**	ON, OFF	Changes to radio #2.
No Data	Menu item: **NO DATA**	ON, OFF	Toggles data feature ON or OFF.
EDACS Conventional Priority 1 Scan	Menu item: **ECP1SCAN**	ON, OFF	Toggles this feature ON or OFF.
Group selection	Menu item: **GRP SEL** Once selected: **GRP = n**	1-64 = (n)umber of desired group	Displays the group selected.
Status Condition	Menu item: **STATUS** Once selected: **ST =n**	0-9 = (n)umber of pre-programmed status	Transmits the pre-programmed status message.
Message Condition	Menu item: **MESSAGE** Once selected: **MSG =n**	0-9 = (n)umber of pre-programmed messages	Transmits the pre-programmed message.
Feature Encryption Display	Menu Item: **FEATURES** Once selected: See Feature Encryption Display section	Informational displays only; no user selectable settings	Indicates current features program- med into the radio as well as certain information required to add features to the radio (refer to the Table of Contents for Feature Encryption Display.

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
System Scan Enable	Menu Item: **SYS SCAN** Once selected: **SYSC ON** or **SYSC OFF**	ON, OFF	System Scan features like ProScan are toggled ON and OFF.

8.9 FEATURE ENCRYPTION DISPLAY

Feature Encryption Display is available through the menu function and, if programmed, appears in the menu as "**FEATURES**." This data indicates current features programmed into the radio as well as information required to add features to the radio.

Once the feature has been accessed, all normal menu functions work. The user can scroll up or down through all of the entries.

Feature Encryption Display provides the ability to view, in the order displayed, the following:

- Serial number ROM data - serial number of the ROM
- Feature encryption data stream - used to enable features
- Number Fields - defines limits
- Features enabled - displays bit fields of enabled features

8.9.1 Serial Number ROM (12 Hex Digits)

Example:

When the user wants to enable a feature in his radio, he will need to call M/A-COM, Inc. They will ask for the ROM serial number. The serial number shown here is for example only.

8.9.2 Feature Encryption Data Stream

Example:

These data streams define the features the user has enabled in his radio and are required by M/A-COM, Inc. to enable other features. The data streams shown here are for example only. ***Note:*** There are three displays: FD1, FD2, and FD3. All three are required.

Number Fields

Example:

These number fields show the set limits of the of the user's radio as:

- SG# XXX - Maximum number of system/groups combination available
- SY# XXX - Maximum trunked system limit
- CH# XXX - Maximum number of conventional channels available

The user needs to know the limits of his radio before attempting to enable other features. The numbers shown here are for example only.

8.9.3 Features Enabled

These numbers indicate which features are enabled.

Example:

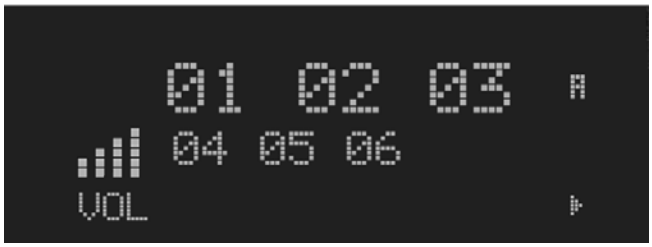


Table 8-6 lists possible features available in the user's radio.

Table 8-6: Available Feature Numbers

FEATURE NUMBER	POSSIBLE FEATURES	STANDARD OR OPTIONAL
01	Conventional Priority Scan	Standard
04	Group Scan (EDACS and P25 Trunked)	Standard
05	Priority System Scan (EDACS only)	Optional
06	WAscan/ProSound™/ProScan (EDACS only)	Optional
07	Dynamic Regroup	Standard
08	EDACS Emergency	Standard
09	Type 99 Encode	Standard
10	Conventional Emergency	Standard

FEATURE NUMBER	POSSIBLE FEATURES	STANDARD OR OPTIONAL
12	Aegis™ Digital Voice Encryption	Optional
14	DES Encryption	Optional
16	Mobile Data	Optional
17	Status/Message (EDACS only)	Optional
21	EDACS Security Key (ESK)	Optional
22	ProFile™ (EDACS only)	Optional
23	Narrowband	Standard
29	ProVoice™	Optional
32	FIPS-140-2	Optional
33	P25 Common Air Interface	Optional
34	Direct Frequency Entry	Optional
38	Radio TextLink	Optional

8.10 SYSTEM/GROUP/CHANNEL SELECTION

In the following description of **SYSTEM/GROUP/CHANNEL SELECTION**, the term group is used for both group and channel.

The M7200 **SYSTEM/GROUP/CHANNEL** knob and the  ramp control are programmable for maximum flexibility. If the SYSTEM/GROUP/CHANNEL knob is assigned to select groups, then the  ramp control is assigned to select systems. If the SYSTEM/GROUP/CHANNEL knob is assigned to select systems, then the  ramp control is assigned to select groups. System, group, and channel selection is the primary function for these controls.

Either systems or groups can also be selected by entering the select mode and following the selection mode rules described earlier. The system select or group select modes are entered by pressing **SYS** or **GRP**, respectively, from the standard receive mode. Using the  ramp control after entering a particular selection mode in this manner is the secondary function of these keys.

8.10.1 System Selection

Several methods, some of which depend on programming, can be used to select a new system. These procedures are presumed to be starting from the normal receive display.

METHOD 1: If system selection is programmed to the SYSTEM/GROUP/CHANNEL knob, select a system by turning the SYSTEM/GROUP/CHANNEL knob to the desired system position. The display registers the new system name on line 1. If the wrap option is OFF and the knob is moved to a position greater than the number of programmed systems, the highest programmed system will remain selected.

METHOD 2: If system selection is programmed as the primary function of the  ramp control, select a system by pressing up or down to scroll through the system list. The display registers the new system name on line 1.

METHOD 3: Press **SYS** to enter the system select mode and follow the selection mode rules detailed earlier. Use the  ramp control to scroll through the systems.

8.10.2 Group and Channel Selection

Several methods, some of which depend on programming, can be used to select a new group or channel. These procedures assume starting from the normal receive display.

METHOD 1: If group selection is programmed to the SYSTEM/GROUP/CHANNEL knob, select a group by turning the SYSTEM/GROUP/CHANNEL knob to the desired group. The display registers the new group name on line 2. If the wrap option is OFF and the knob is moved to a position greater than the number of programmed groups, the highest programmed group will remain selected.

METHOD 2: If group selection is programmed as the primary function of the  ramp control, select a group by pressing up or down, to scroll through the group list. The display registers the new group name on line 2.

METHOD 3: Press **GRP** to enter the group select mode and follow the selection mode rules detailed earlier. Use the  ramp control to scroll through different groups.

8.11 LAST SYSTEM/GROUP/CHANNEL RECALL

This feature, enabled through programming, allows the user to recall the last selected system/group after an emergency or home function or system/group key function. For example, if the Home button (pre-programmed) is pressed, the radio will go to the designated Home system/group or channel. If the Home button is pressed again, the radio returns to the previous system/group or channel. At this time, the user can toggle between the Home system/group or channel and the previous system/group or channel. The operation is the same for the SG1-SG5 buttons.

8.12 RECEIVING A CALL

1. Turn the radio on by rotating the POWER ON-OFF/VOLUME knob clockwise (out of detent). A short alert signal (if enabled through programming) indicates the radio is ready to use.
2. The display shows the last selected or the power up (depending on programming) system and group names. If the radio is unable to obtain a control channel, line 2 shows **CC SCAN**.
3. Adjust the POWER ON-OFF/VOLUME knob to the desired volume level.
4. Select the desired system and group. The display indicates the current system and group names.
5. The radio is now ready to receive calls.
6. When the radio receives a group call, it unmutes on the assigned working channel and the **BSY** indicator comes on. Line 1 shows **GR** followed by the logical ID number (if received) of the unit sending the message, or the associated name if the ID number is found in the individual call list.

8.13 SENDING A CALL

1. Turn the radio on and set the POWER ON-OFF/VOLUME knob to the desired volume level. Select the desired system and group.
2. Press and hold the PTT button. The radio will display the system and group names and perform the necessary signaling required to obtain a communication channel.
3. When the working channel is assigned, **TX** and **BSY** indicators are turned ON and a short beep is sounded indicating communication can begin.

NOTE

If two or more tones, or a high-pitched tone is heard, the system may be busy and the call request has been placed in queue or the request has been denied for some reason. Refer to the Section 8.4 for more details.

4. Hold the microphone approximately three inches from the mouth and speak in a normal voice.
5. Release the PTT button when the transmission is complete and listen for a reply.

8.14 CONVENTIONAL FAILSOFT

In the unlikely event of a failure of the EDACS system, communications can take place in conventional failsoft mode. The radio will be automatically directed to a communications channel set up for this purpose. During this mode of operation, the control unit will display **CONV FS** in the alphanumeric display. An increase in activity on the channel during conventional failsoft operation may be noticed, so be careful not to transmit until the channel is clear.

Operation during conventional failsoft will be the same as operation on a conventional system, except that it will not be possible to select a communications channel, or use emergency and special call. When trunking is restored, the radio will automatically be returned to normal operation.

NOTE

Emergency and Special Call are not operational during conventional failsoft. In addition, the **GRP** control will not operate.

8.15 EMERGENCY OPERATION

The radio's ability to declare an emergency, clear an emergency, remain locked on an emergency and group, and the emergency audio and display freeze can each be enabled or disabled through programming. When an emergency is declared scanning will stop and will restart only after the emergency has been cleared.

8.15.1 Receiving an Emergency Call

When receiving an emergency call from the selected group and system, an alert beep is heard and the **BSY** indicator lights. The message ***RXEMER*** flashes in the display on line 2 until the emergency condition is cleared. Follow standard emergency procedures.

8.15.2 Declaring an Emergency

To send an emergency call to the selected system and group (or on an optionally pre-programmed emergency group), proceed as follows:

1. Press and hold the red emergency button for approximately one second. (This time is programmable and therefore could be longer or shorter. Check with the system administrator.) The radio will transmit an emergency call request with the radio ID until an emergency channel assignment is received.
2. When the working channel assignment is received, the radio sounds a single beep (Autokey alert tone) indicating it is ready for voice transmission. *TXEMER* flashes on line 2 in the display until the emergency is cleared.
3. Press PTT and speak into the microphone in a normal voice.

4. Release PTT when the transmission is complete and listen for a reply.
5. The emergency can be cleared by pressing and holding the **CLR** button followed by pressing the red emergency button then releasing both buttons.

8.16 SYSTEM SCAN OPERATION

The radio can be programmed with the following System Scan features. These features are automatically enabled upon radio power up. A key or menu option is also defined to allow the System Scan features to be toggled during radio operation. This is covered in the Menu Selection and Pre-Programmed Keypad Key sections. The System Scan state will be maintained through system changes but will default to ON at power up.

8.16.1 Wide Area System Scan

The M7200 Series mobile radio can be programmed for wide area system scan operation for multi-site applications. Upon the loss of the currently selected system's control channel, radios can be programmed to automatically scan the control channels of other systems. If a new control channel is found, the radio will switch to the new system and sound an alert tone.

8.16.2 ProScan

The radio can be programmed for ProScan™ system scan operation for multi-site applications depending on the version of radio flash code. ProScan provides the radio with the ability to select a new system for the radio to communicate on, when the selected system drops below a predefined level. This is accomplished by enabling each radio to analyze the signal quality of its current control channel and compare it with the signal quality of the control channel for each site in its adjacency scan list. (The signal quality metric used for the ProScan algorithm is based on a combination of both Received Signal Strength Indicator [RSSI] and Control Channel Verification [CCV] measurements.) When the selected system's signal quality level degrades below a pre-programmed level, the radio will begin to look for a better control channel. Once a control channel that exceeds the pre-programmed parameters is found, the radio will change to the new system and emit a tone. If the control channel is completely lost the radio, will enter Wide Area System Scanning and search the programmed adjacent systems until a suitable control channel is found.

8.16.3 Priority System Scan

The radio can also be programmed for Priority System Scan. (To ensure that this feature operates correctly, the control channel of the priority system must be located on channel one unless you are using the ProScan algorithm.) The priority system is the desired or preferred system. While receiving the control channel of the selected system, the radio will periodically leave the selected system and search for the control channel of the priority system at a programmable rate. The programmable rate is defined by the value in the Priority Scan Time control, (unless the ProSound/ProScan algorithm is enabled as explained below). This priority scan timer is reset each time the PTT button is pressed or when a call is received. If the priority system control channel is found, or meets the predefined ProScan criteria, the radio will automatically switch to the priority system.

8.16.4 When Wide Area System Scan Is Enabled

If the radio cannot find the control channel of the selected system and begins Wide Area System Scan (WA Scan), the radio will only scan for the priority system control channel if the priority system is in the WA Scan list.

8.16.5 When ProScan Is Enabled

The radio monitors the priority system and will switch to the priority system if the priority system meets the criteria defined in the "ProSound/ProScan Options" dialog box. If ProScan is enabled, the rate at which the radio will scan for the priority system is defined by the System Sample Time control.

8.16.6 Menu Selection

Press **MENU** and then use the  ramp control to scroll through the selections until **SYS SCAN** is displayed. Then press **MENU** to toggle the System Scan state. The **SYSC ON** or **SYSC OFF** display message is displayed for two seconds to show the new state.

8.16.7 Pre-Programmed Keypad Key

Press the pre-programmed key and the **SYSC ON** or **SYSC OFF** display message is displayed for two seconds to show the new state.

8.17 GROUP SCAN OPERATION

Only Groups that are part of the radio's scan list will be scanned. Groups are added to the scan list on a per system basis through programming, the radio keypad, or both, dependent upon programming. This scan list can be changed by the user from the keypad unless programmed otherwise. Each system's group scan list is retained in memory when the radio is turned off. The M7200 Series mobile radio can also be programmed to provide Trunked Priority Group Scan capability, which operates similar to priority scan in Conventional mode.

The following is a description of programmable scan features that should be helpful in understanding the Group Scan Operation of the radio:

Scan Hang Time - the delay time the radio waits before resuming scan after the push-to-talk is released or after the carrier has dropped a channel.

TX Select - the group the radio will transmit on while scanning. The radio is programmed to transmit on either the scanned group or the selected group.

Scan List (privileges) - this feature allows or prohibits scan list changes by the user.

P1 Programming - priority group programming is accomplished by one (and only one) of three methods:

- From the keypad, where the Priority programming is not fixed and does not follow the selected channel,
- Priority 1 group programming follows the selected channel, or
- Priority 1 group programming is fixed during PC programming and cannot be changed by the user.

P1 Always Scan - determines if the Priority 1 Group will always be scanned, regardless of the scan state set by the user.

8.17.1 Adding Groups to a Scan List

1. With scan operation turned off, select the desired group to add to the selected Trunked system group scan list.

2. Press (**+**) or (**-**) with  to display the current priority status of the group on line 1 for a time-out period.

3. While the status is displayed, press (**+**) with  to add the group to the scan list.  is displayed.

4. Press (**+**) with  a second time to set the group to Priority 2.  is displayed.

5. Press (**+**) with  a third time to set the group to Priority 1.  is displayed in column 1, line 1. The priority level selection sequence only advances the group to next higher priority level and stops at priority level 1. To select a lower priority level, the group must be deleted from the scan list and then added back to the scan list. Each new group added to the scan list starts at the lowest priority. If the Priority 1 and Priority 2 groups are already set and a new group is assigned as Priority 1 or Priority 2, the previously assigned group will change to non-priority scanning.

8.17.2 Deleting Groups from a Scan List

1. With scan operation turned off, select the desired group to delete from the selected trunked system's group scan list.

2. Press (**+**) or (**-**) with  . The current scan status of the group is displayed for a time-out period.

3. Press (**-**) with  to delete the group from the scan list.  ,  or  turns off. Any group that is not in a trunked system group scan list will show a "**blank**" when it is the selected channel.

8.17.3 Nuisance Delete

A group can also be deleted from the scan list, if it is not the currently selected group by pressing (**-**) with  during scan operation while the radio is displaying the unwanted group. The group will be deleted from the system's group scan list in the same manner as if done using the steps above. Deletions performed in this manner will not remain deleted if the radio is turned off and then back on.

8.17.4 Turning Scan On

1. Toggle scan operation by pressing **SCAN**. The SCAN indicator turns on when the radio is scanning.

The **SCAN** key light blinks when temporarily disabled. Scanning will stop while microphone is off-hook if the hookswitch feature is enabled through programming.

2. When a group on the scan list receives a channel assignment, the radio unmutes on the assigned channel, the **BSY** indicator comes on and the received scan group is displayed.
   - The radio will continue scanning if a new group is selected when scan is on.
   - Pressing the PTT button when scan is on will cause the radio to transmit on the displayed group or on the currently selected group depending on programming.
   - Pressing up with  when scan is on will cause the radio to recall the scanned group that was last received. This group is recalled for a period equal to the scan hang time.

8.17.5 Priority Group Scanning

When scan is enabled and the Priority 1 and Priority 2 groups have been identified, the radio will listen to calls on those groups and the selected group. While receiving a scanned group call, the radio will continue to monitor the selected Priority 1 and Priority 2 groups and will drop the call if the selected group or other higher priority call becomes active. During a Priority 2 call the radio will continue to monitor for a Priority 1 group call.

The radio will monitor for Agency and Fleet calls that correspond to the Agency and Fleet associated with the Priority 1 and Priority 2 groups. Priority Agency and Fleet calls will be indicated by displaying **AGENCY** or **FLEET** on the System line of the display and associated Priority 1 or 2 group on the Group line of the display.

8.17.6 Turning Scan Off

Toggle scan operation off by pressing **SCAN**. The radio will resume operation on the selected group.

8.18 INDIVIDUAL CALLS

8.18.1 Receiving and Responding to an Individual Call

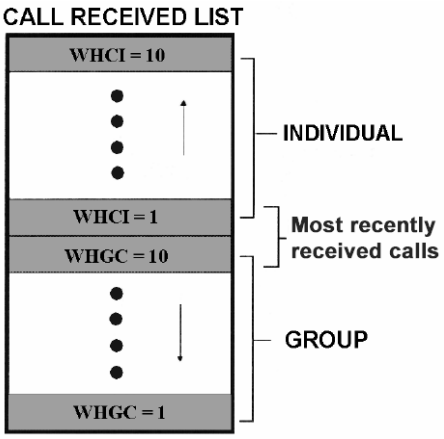
When the radio receives an individual call (a call directed only to the user's radio), it unmutes on the assigned working channel and turns on the **BSY** indicator. Line 1 shows “ID” followed by the logical ID number of the radio sending the message, or the associated name if the ID number is found in the individual call list. The individual call indicator will display ***INDV*** on line 2. The radio can be programmed to ring when an individual call is received. If enabled, the ring begins five seconds after the caller unkeys and will continue until the PTT button, the **CLR** button, or **IND** is pressed.

Hookswitch functions the same as **CLR** key in I-CALL, phone call, and menu modes.

If a response is made to the call prior to the programmed call-back time-out, the call will automatically be directed to the originating unit. If a response is not made before the call-back time-out, the radio will return to normal receive mode, but *** WHC *** will be displayed. If the caller's ID is not received, **UNKNOWN** will display for the duration of the call and there will be no call-back hang time.

To respond after the call-back time-out, press the **IND** key. The radio's display will show the callers ID on the first line and **WHCI=1** on the second line. Pressing the PTT button at this point will initiate an individual call back to the original caller. (If the last call was a group call, the display will show **WHCG=1**. Pressing the PTT button will place the call as an individual call.)

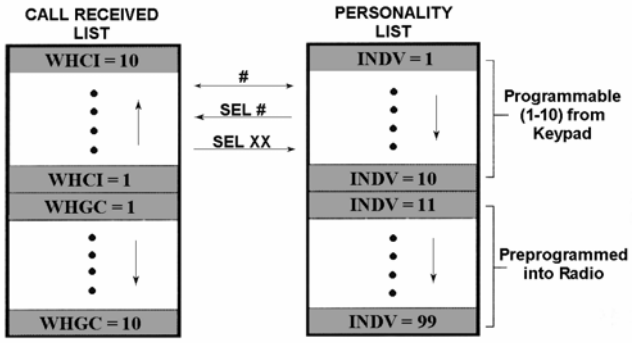
The radio stores the IDs of the last 10 callers in the Calls Received List as shown. Individual calls are stored in the top half of the list (1-10) and group calls are stored in the bottom half of the list (1-10). The most recent call is stored in position 1, the second most recent call is stored in position 2, etc.



To access the list, press the **IND** key twice. Use to scroll through the list. Press the **MENU** key to display the time elapsed since the call was received.

8.18.2 Call Storage Lists

There are two lists available for call storage in the radio, the calls received list (1-10) and the personality list (1-99 as defined by the user). When the individual call mode is entered by pressing **IND**, the calls received list is available. The user can toggle to the personality list by selecting any key other than **DIS** or toggle between the two lists by pressing the **IND** key. If wrap is enabled, the calls received list wraps on itself and not into the other list.



The saved call list shows all ten storage locations. If no calls have been received, the saved call list will be empty and the pre-stored list will be available upon entering the individual call mode.

When in the saved call list, pressing **MENU** toggles the time stamp ON and OFF. The time stamp indicates how long ago the call was received. The display indicates this information as HH:MM:SS where HH = hours, MM = minutes and SS = seconds.

When in the pre-stored list, pressing **MENU** toggles the **L**ogical **ID**entification (LID) ON and OFF.

8.18.3 Sending an Individual Call

The following procedures describe how to initiate and complete an individual call.

1. To select a previously stored individual, select the I-Call mode from the menu or press **IND** followed by the ramp control to scroll through the list of stored individuals. The selection mode rules

apply. While in the individual call list, the menu key will toggle the display between the call name and the unit ID number. If the individual is not stored in this list but the individual's unit ID is known, it can be entered directly from the keypad.

2. Press the PTT button; the radio performs the necessary signaling to obtain a communication channel. When the signaling is complete and the radio is clear to transmit, **TX** indicator turns ON and the channel access tone sounds. Line 1 shows the called individual's name if found in the list of stored individuals or ID followed by the logical ID number of the unit being called. The message ***INDV*** displays on line 2. Proceed with the message.

8.19 SCAT OPERATION

A SCAT™ (Single Channel Autonomous Trunking) System operates with the same set of features as a standard EDACS system. The only significant user change relates to the **BSY** indicator. Since only one channel, operating as both control and working channel, exists in a SCAT System, the **BSY** indicator will be ON when the SCAT channel is in the working channel mode. When the transmission on the channel is completed, the indicator turns OFF and indicates the return of SCAT control channel signaling.

8.20 TELEPHONE INTERCONNECT CALLS

8.20.1 Receiving a Telephone Interconnect Call (Trunked Mode Only)

Receiving a telephone interconnect call is identical to receiving an individual call. See the DTMF Overdial Operation section if access to services requiring "over-dial" is needed. Overdial operations are available for any special call whether it is an individual call or a telephone interconnect call.

8.20.2 Sending a Telephone Interconnect Call (Trunked Mode Only)

Use the following procedures to initiate and complete a Telephone Interconnect call:

1. To select a previously stored phone number, select phone call mode from the menu, press **PHN** and use the  ramp control to scroll through the list of stored phone numbers. The selection mode rules apply. While in the phone call list, the **MENU** key will toggle the display between the phone call name and the phone call number. If the phone number is not stored in this list but the phone number is known, it can be entered directly from the keypad. If necessary, a pause can be entered by pressing and holding **0**-**9**, *****, or **#** until an underscore appears in the display.
2. Press and release the PTT button; the radio performs the necessary signaling to obtain a communication channel. When the signaling is complete and the radio is clear to transmit, **TX** indicator turns on and the channel access tone sounds. Line 1 shows the accompanying name if selected from the list of stored numbers or the phone number if entered directly. The message ***PHONE*** is displayed on line 2. The radio then automatically transmits the programmed number stored in the special call queue.
3. Telephone ringing will be heard. When someone answers the phone, press the PTT button and speak into the microphone. Release the PTT button to listen to the caller. Unsuccessful interconnect signaling returns the radio to the normal receive mode and the number remains displayed until the special call is cleared by pressing the **CLR** button or the time-out expires or another group or system is selected.
4. To terminate the call, momentarily press the **CLR** button.

NOTE

The M7200 Series mobile radio is capable of half-duplex conversation only. The caller's message can only be sent if the PTT button is pressed (the radio is transmitting) and the caller can only be heard by the person being called when the PTT is released (the radio is receiving).

8.20.3 DTMF Overdial/Conventional Mode Telephone Interconnect

Once the radio has established a connection to the public telephone system, it may be necessary to "over-dial" more digits to access banking services, answering machines, credit card calls or other types of systems that require DTMF (Dual-Tone Multi-Frequency) access digits. Overdial operation can also be used to initiate a telephone interconnect call via DTMF signaling if a dial tone has already been accessed on the system. This is the method that is used for making a telephone interconnect call while operating in the conventional mode but will also function in trunked mode if a dial tone is directly accessible. Telephone numbers and other number sequences for overdialing can be stored in the phone list when programming the radio or stored by the operator in the first ten phone list entries. These numbers are accessed by pressing **PHN** then following the selection mode rules.

The following steps are required to dial these numbers:

1. Follow the procedure in **Sending a Telephone Interconnect Call (Trunked Mode Only**) to establish a connection to the telephone system or consult the system administrator for the procedure to access a dial tone on the trunked or conventional system.
2. Overdial numbers are transmitted using either method as follows:

   METHOD 1: Press and hold PTT while entering the overdial number sequence from the keypad. This method sends DTMF tones during individual, telephone interconnect, trunked group, or conventional channel calls. Anytime the PTT button is pressed and held, the keypad is enabled for DTMF entry.

   METHOD 2: Press **PHN** to enter the overdial select/entry mode and follow the selection mode rules to call up a stored number from the phone list or to directly enter the overdial digits. Press PTT to send the overdial sequence once. If the number needs to be transmitted again it must be selected or entered again (this prevents unwanted numbers from being sent the next time the PTT button is pressed during the call).

This overdial select/entry mode remains active until the call is dropped, cleared, or **MENU** is pressed. The overdial select/entry mode can be re-entered if the call is still active by pressing **PHN**.

8.20.4 Programmable Entries

Individual call ID numbers, telephone numbers and other number sequences for overdialing are stored in the special call lists when programming the radio. The first ten entry locations of these lists can be changed by the radio operator. The keypad is used when adding, changing and storing numbers in these entry locations.

Use the following procedure to store a number in one of the first ten entries of a special call list:

1. Press **IND** or **PHN** to enter the individual call list or the phone call list. The selection mode rules apply.
2. Scroll through the list using the  ramp control until one of the first ten entries is reached. **NO ENTRY** is displayed if the location is empty.

3. Enter the desired number. If necessary, a pause can be entered by pressing and holding **0-9**, (*****), or (**#**) until an underscore appears in the display. The individual call list entries will accept up to 5 digits. The phone call list entries accept a combination of up to 31 digits and pauses.
4. Press and hold **MENU** until the display changes indicating that the number has been stored.
5. Repeat the steps above if the number stored in an entry location needs to be changed.

8.21 MOBILE DATA

The M7200 Series mobile radios, when operating in the EDACS configuration, permit either voice or data calls to be transmitted or received. The radio can handle only one type of call at a time; however, selection of either data or voice is selected transparently by the operator through normal usage of the radio. Data communications is not supported in the conventional mode.

The mobile radios can be connected to Mobile Data Terminals (MDT) or to a host computer. Any RS-232 compatible device that supports the Radio Data Interface (RDI) protocol (Version 1.91 or greater) can be connected to the mobile radio. Support for MDTs or host computers is a programmable option per radio. Additionally, radios programmed for host computers can also be programmed for data only operation (no voice calls transmitted or received).

Turn power to the radio OFF before connecting or disconnecting any cables, including the data cable. Also, turn power to the radio OFF when docking or undocking a connected laptop computer. Failure to turn the power OFF can damage the radio, requiring service by a M/A-COM approved service center.

8.21.1 Displays

The following will be displayed on the control unit during the various states of data mode of operation.

TX DATA Displayed on bottom line of display when the radio is transmitting a data call.

RX DATA Displayed on bottom line of display when the radio is receiving a data call.

DATA OFF Displayed on top line of display when the radio is in the data disabled state.

DATA ON Displayed for two seconds on top line of display when the radio is toggled to the data enabled state.

8.21.2 DATA OFF Operation

The radio can be placed in the data disable state by any of the following methods. When the data state is disabled, the control unit displays **"DATA OFF"** on the top line. An ongoing data call is allowed to complete except when an emergency is declared.

- Removing the microphone from the hookswitch (hookswitch option must be enabled by pre-programming).
- Declaring an emergency (not to be used unless an actual emergency condition exists). Alert tone will sound.
- Pressing the **OPT** button (System Model) or **OPTION** (Scan Model) (pre-programmed). Alert tone will sound.
- Selecting the function using the **MENU** button (pre-programmed).

8.21.3 DATA ON Operation

The data state is enabled by one of the following (depending on how it was disabled). **"DATA ON"** will be displayed top line of display for 2 seconds then the display returns to normal.

- Replacing the microphone into the hookswitch (going on-hook). Only valid if the **"DATA OFF"** operation was entered by removing the microphone from the hookswitch (going off-hook).
- Clearing an emergency, but valid only if an emergency caused **"DATA OFF"** operation.

8.21.4 Exiting Data Calls

Under normal conditions, the radio enters the scan lockout mode and returns to the control channel after completion of a data call (transmit or receive). If, during a data call, one of the following conditions occurs, the data call is immediately terminated and the radio performs the desired function:

- The PTT is activated.
- The PTT is in Public Address mode.
- An emergency is declared by pressing the pre-programmed emergency button.
- A group or system change is made.

8.21.5 Scan Lockout Mode

Following the transmission or reception of a data call, if scan is enabled, scanning will stop temporarily (duration pre-programmed). During this time the scan LED will flash to indicate that scan is enabled but temporarily suspended. This mode is normally exited when the pre-programmed time expires; however, the following actions will terminate the scan lockout mode before the timeout is completed.

- The **CLR** (System Model) or **CLEAR** (Scan Model) button is pressed.
- The PTT is pressed.
- A group or system change is made.
- Enter phone call mode.
- Enter individual call mode.
- A new emergency assignment has been received.
- The PTT is pressed in Public Address Mode.
- An emergency is declared or cleared.
- Microphone is removed from hookswitch (OFF-hook).
- Receiving an individual or phone call.
- Receiving an Agency, Fleet or System All Call.
- Pressing the **SCAN** button to turn scan ON or OFF.

8.21.6 Data Lockout Mode

The data lockout mode is a pre-programmed mode when the radio will not respond to any data channel assignments and prevents receive data calls from interrupting voice calls. Transmit data calls will still be initiated when needed by the operator. After a pre-programmed time, the radio will respond to receive data calls; however, the following conditions will clear the data lockout mode:

- The **CLR** (System Model) or **CLEAR** (Scan Model) button is pressed.
- Transmitting a data call.
- Changing a system.
- An emergency is declared.
- Pressing the PTT while in Public Address mode.
- Turning scan ON with the SCAN button.

8.22 STATUS/MESSAGE OPERATION

Status and message operation is possible with either the Scan or System version of the M7200 Series mobile radio unit. The following procedure is applicable for the System version. For operation with the Scan version, the four primary keycaps must be reconfigured and pre-programmed for status/message operation.

8.22.1 Status Operation

Status operation permits the transmission of a pre-programmed status condition to the EDACS site.

To send a status condition, press the **STS** button (keylight comes on) then press one of the number buttons (**0-9**) to select the pre-programmed status. If no status has been programmed for the selected number button, the radio will display **NO ENTRY** and the radio will sound a low tone. A valid selection will permit the status text to appear in the display for a pre-programmed time. After the time-out expires or the **MENU** button has been pressed (the **MENU** button will override the time-out period), the status is selected and will be transmitted to the site or stored in the radio memory where it can be polled by the site at a future time. If the site receives the status properly, when transmitted or polled by the site, a high-pitched tone sounds and the keylight associated with that status will remain lit. If the site does not receive the status properly, a low-pitched tone sounds and the keylight associated with the status will blink.

If an incorrect status was selected or the incorrect number button was pressed, the status can be changed during the pre-programmed time-out period by pressing another number button. The status selection can also be cancelled by pressing the **CLR** button prior to the time-out period.

To view the currently selected status after it has been transmitted, press the **STS** button. If the status was not sent successfully to the site, the text associated with the status will flash in the display.

The radio can also be pre-programmed to redesignate the keypad buttons for **ST0** thru **ST9** to send status condition. In this configuration the radio status operation will operate as previously described except the **STS** button is not required. The keylight associated with **ST0** thru **ST9** will indicate which status is selected.

8.22.2 Message Operation

Message operation permits the transmission of a pre-programmed message text to an EDACS site.

To send a message, press the **MSG** button (keylight comes on) then press one of the number buttons (**0-9**) to select the pre-programmed message text. If no message text has been programmed for the selected number button, the radio will display **NO ENTRY** and a low-pitched tone sounds. A valid selection will permit the message text to appear in the display for a pre-programmed time. After the time-out expires or the **MENU** button has been pressed (the **MENU** button will override the time-out period), the message text is selected and will be transmitted to the site. If the site receives the message properly when transmitted, a high pitched tone sounds and the **MSG** keylight remains lit. If the site does not receive the message properly, a low-pitched tone sounds and the **MSG** keylight will blink.

If an incorrect message text was selected or the incorrect number button was pressed, the message text can be changed during the pre-programmed time-out period by pressing another number button. The message text selection can also be cancelled by pressing the **CLR** button prior to the time-out period.

To view the currently selected message text after it has been transmitted, press the **MSG** button and then the **CLR** button prior to the time-out period. If the message text was not sent successfully to the site, the text associated with the message will flash in the display.

8.23 EDACS CONVENTIONAL P1 SCAN

This feature permits the radio user to scan a pre-programmed conventional system and channel as a Priority 1 (**P1**) channel while the radio is selected for EDACS trunked system. If activity is detected on the conventional P1 channel, the radio will unmute and remain on this conventional channel for the programmable hang time.

The radio must be pre-programmed to designate a button for scan ON/OFF operation.

8.24 DYNAMIC REGROUP OPERATION

Dynamic regroup operation permits multiple talk groups (up to eight) to be added to a radio via the Communications Systems Director (CSD). The radio must be pre-programmed to respond to regrouping. Dynamic regrouping will not be activated in a radio until an activation message is sent by the system manager. Each radio that receives and acknowledges regrouping instructions is successfully regrouped.

Pressing and holding the **CLEAR** (Scan Model) or **CLR** (System Model) button for 2.5 seconds toggles the user into and out of the dynamic regroup group set. A double beep will sound for entry or exit. The display will indicate **REGR_0x** where "x" is a digit of 1 to 8 indicating the group when dynamic regroup has been enabled by the user. If the radio is in dynamic regroup and the user selects a group that has not been regrouped, the display will show **NO ENTRY**. The radio will be prevented from transmitting and receiving calls in this condition except for scanned groups.

8.24.1 Emergency Operation

If the pre-programmed group set on the currently selected system contains an EMER/HOME group and the radio is in dynamic regroup, the radio will exit dynamic regroup and declare the emergency on the HOME group. If no EMER/HOME group is present, the radio will declare the emergency on the currently selected dynamic regroup group.

9 CONVENTIONAL OPERATION

9.1 CH721 FRONT PANEL COMPONENTS

The front panel of the control head includes a dot matrix display, controls for menu navigation, an emergency button, three pre-set buttons, a power button/rotary volume dial, and a microphone connector. In addition, the system model control head features a DTMF keypad.

Table 9-1 lists all default front panel controls and their functions. All functions and controls of the Scan radio operate the same as the corresponding functions and controls on the System radio.

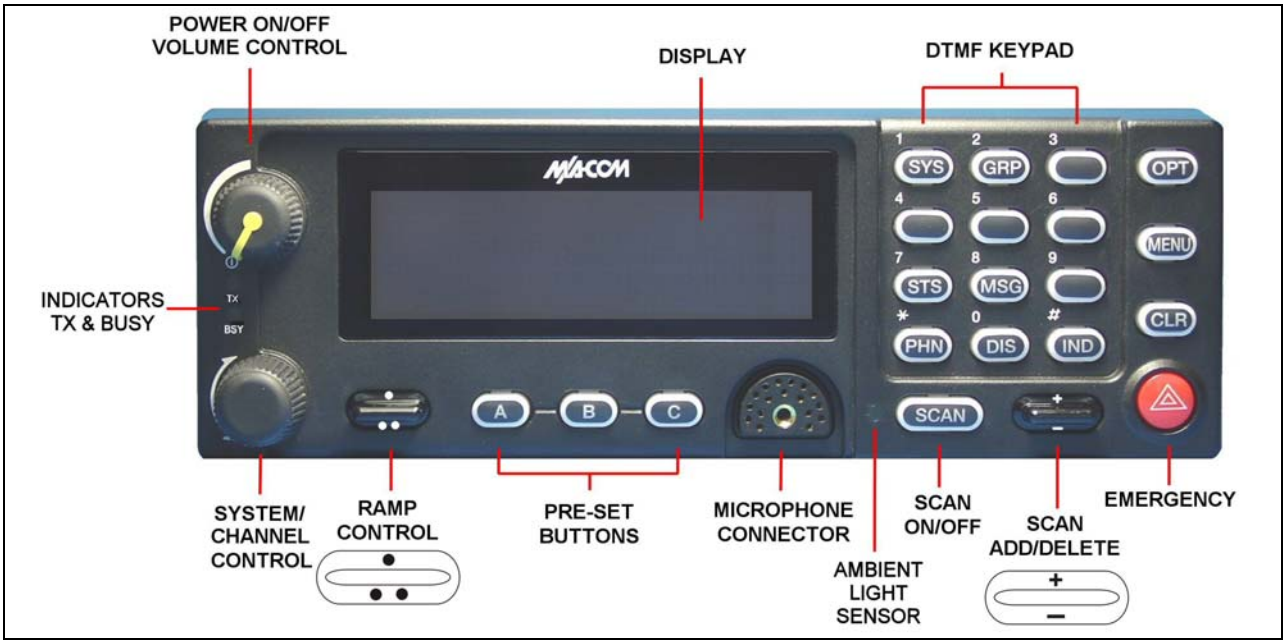


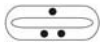
Figure 9-1: System Model

Figure 9-2: Scan Model

NOTE

Button function may vary depending upon system programming, radio hardware, and optional configurations. Complete the table in Section 14 if the keys have been remapped to provide new functions.

Table 9-1: Front Panel Default Controls and Functions

PART	FUNCTION
Power On-Off/Volume Control knob	Turn knob clockwise to power on the radio and increase volume. Turn counter-clockwise to decrease volume and power off the radio.
Mic Connection	Connection for hand-held, hands-free, speaker-mic, or headset.
	The Emergency button declares an emergency if enabled through programming.
Ambient Light Sensor	Radio automatically adjusts the display and button backlight brightness level based on ambient light. Do not block this sensor.
	This rotary switch selects the systems or channels, depending upon programming.
	This rocker type button is used to display the current SCAN status for a channel and then either add or delete the channel from the system scan list. Pressing the add/delete button twice while the radio is actively receiving or three times when the radio is not receiving selects the last scanned channel (Last Scanned Channel Recall).
	The primary function of this rocker type button is to scroll through the System list or the Channel list depending upon programming. The secondary function is to increment or decrement items within a list (phone list for example).
OPT/OPTION	Toggle a PC programmable feature ON and OFF.
CLR/CLEAR	Unmutes the receiver so activity on the selected channel can be monitored. When pressed and held for approximately 3 seconds, this button toggles conventional channel decoding (Channel Guard, Digital Channel Guard, T99) ON and OFF if programmed for the selected channel.
MENU	Primary function - access the menu list. This is a list of additional features that are not available directly from the keypad. Secondary function - activate a selected item within a list, similar to an enter key.
SCAN	Primary function - toggle scan operation on and OFF. Secondary function - toggle the keypad buttons between their primary function and their secondary function.
Pre-Set buttons	Used to store and recall user-selectable parameters.
SYS	Used to enter the System select mode.
PHN	Used to place telephone calls through the radio by selecting the interconnect special call function.
DIS	Used to adjust the current display intensity and the keypad backlight level.

9.1.1 Primary Functions (Quick Access)

The secondary function of the **SCAN** button is to toggle the keypad buttons between their primary function and their secondary function. When the secondary keypad is active, i.e. entering phone digits for an interconnect call, the **SCAN** button can be used to toggle the keypad buttons back to their primary function, perform a task, and then toggle back to finish entering the digits for the phone number. **PRIMARY** is displayed when the **SCAN** button is used to toggle the keypad keys back to their primary functions. This provides quick access to the primary functions of the keypad. This is a programmable feature of the **SCAN** button only. Careful consideration should be given to possible operational conflicts before enabling this feature.

Several keys on the Scan version have a secondary function. The **MENU** key is the SELECT secondary function with the **CLEAR** key remaining the same for the secondary function. On the System version, the **OPT** has a secondary function for DELETE, **MENU** is SELECT, and **CLR** retains its CLEAR function.

9.2 RADIO STATUS ICONS

Status icons are indicators that show the various operating characteristics of the radio. The icons appear on the first line of the display.

Figure 9-3: Typical Display

Table 9-2: Icons and Descriptions

ICON	DESCRIPTION
	Indicates selected group or channel is in scan list.
	Indicates selected group or channel is programmed as Priority 1 in scan list.
	Indicates selected group or channel is programmed as Priority 2 in scan list.
	Indicates a conventional channel enabled with Channel Guard Function.
	Indicates the current channel is set up as an analog channel.
	Special call mode.
	Volume bars – indicates relative volume level.
	Scan mode enabled.

9.3 MESSAGES

During radio operation, various messages are displayed on either line 1 or line 2. Typical messages include control channel status information, such as system busy or call denied, or messages associated with the radio's operation, (i.e. volume adjust). These messages are described as follows:

Table 9-3: Display Messages

MESSAGE	NAME	DESCRIPTION
TALKARND	Talk-around	Indicates the radio is operating on conventional channels in talk-around mode (no repeater).
VOL=31	Volume Level	Indicates the current volume level. The volume level display ranges from OFF (silent) to 31 (loudest).
UNKNOWN	Caller's ID Not Received	Indicates that an individual call is being received, but the caller's ID was not received.
T99 ON	Type 99 Decode ON	Indicates the Type 99 Decode feature is enabled.
T99 OFF	Type 99 Decode OFF	Indicates the Type 99 Decode feature is disabled.
PA ON	Public Address ON	Indicates that the public address function of the radio is enabled.
PA OFF	Public Address OFF	Momentary (2 seconds) indicates that public address function of the radio was disabled.
ALRM ON	External Alarm Enabled	Indicates that the external alarm function of the radio is enabled.
ALRM OFF	External Alarm Disabled	Momentary (2 seconds) indicates that the external alarm function of the radio was disabled.
PVT DIS	Private Mode Disabled	Indicates that private mode is disabled or no encryption key has been programmed for the selected group/channel or special call.
FRCD PVT	Forced Private Operation	Indicates that forced private operation has been pre-programmed into radio.
NO KEY #	Encryption Key Missing	Flashing indicator indicates that no encryption key or an incorrect encryption key is programmed into the radio.
BCKL=1-6	Backlight	Indicates the display intensity and keypad backlight level.
GR	Group ID	Indicates that the call is a group call and is followed by the GID of the caller.
WHC=1	Who Has Called	This display indicates the number from the *Who Has Called* list. Individual calls received but not responded to are stored in a *Who Has Called* list. This list is accessible by pressing the # key and then the INDV key after the Individual call has timed out or the Clear button is pressed. This display is on line 2 and the LID of the caller is displayed on the top line. Currently the list is not implemented and the display will always be WHC=1.
PHONE	Phone Call	Displayed when a phone call is received from the site. It is displayed in line 1 of the display. Line 2 of the display will contain the display *INDV* when line 1 contains this message. The radio interprets a received phone call as an individual call.
MENU		Displayed when the menu key is pressed and remains displayed in line 1 until a menu item is selected.
SYS=1-64	System = 1 - 64	The system number for the current base station of the system displayed in line 1. It is displayed in line 2 of the display. Press the system key to obtain this display.
INDV=1-99	Individual = 1 - 99	Indicates which item in the individual call list is being displayed. It is displayed in line 2 of the display. The name or ID of the item in the list is displayed in line 1 of the display.
PHN=1-99	Phone = 1 - 99	Indicates which item in the phone list is being displayed. It is displayed in line 2 of the display. Line 1 of the display will be the last 3 characters of the list item contents.
SEL PHN	Select Phone	After pressing the PHN key, selecting an entry from the phone list by typing the entry number will display this message on Line 1.
Ggg-v.vv	Code Group and Revision Number	This is code group and revision number that is displayed in line 2 when the menu item “REVISION” is selected. The ‘gg’ is the group number of the software. The first ‘v’ is the hardware version and ‘vv’ is the revision of the software.
PHONE	Phone Call	Displayed when an initiated phone call is in progress. This is displayed on line 2 of the display.
NO ENTRY		Indicates that there is no data stored in one of the programmable items in either the phone list or individual call list. The user programmable items are items 1 through 10 in each list.
INV SYS	Invalid System	Displayed when the current system is an invalid type.

MESSAGE	NAME	DESCRIPTION
CHN=1-99	Channel = 1 - 99	Displayed on line 1 of the display. This is a conventional channel index displayed when the group key is pressed.
FIX LIST	Fixed List	The Priority scan list is fixed and cannot be changed using the add or delete keys.
FIXED P1	Fixed Priority 1	The Priority 1 scan channel is fixed and cannot be changed using the add or delete keys.
(c) 2004		Displayed in line 2 when the message 'M/A-COM' is displayed in line 1 while displaying different items under the menu when "REVISION" is selected by the operator.
EM	Emergency	Indicates an emergency has been declared by the LID that follows the display, "EM." An example of this is "EM 01201."
INDV	Individual Call	Displayed in line 2 of the display when an individual call is in progress (trunked and T99 modes only).
GROUP	Group Call	Indicates a group call is in progress and is displayed on line 1 of the display (trunked and T99 modes only).
SPKR ON	External Speaker ON	Displayed when the external speaker is enabled.
SPKR OFF	External Speaker OFF	Displayed when the external speaker is disabled.
BANK=1-8		The bank of keys that are going to be loaded when the keyloader loads encryption keys. This is only valid for radios that support VGS, VGE, or DES encryption. It is displayed on line 2 of the display when the encryption keyloader is connected.
KEY LOAD		Displayed on line 1 of the display when the encryption keyloader is connected.
KEY ZERO		Displayed on line 2 of the display when the reset and option buttons are pressed simultaneously for approximately two seconds. The encryption keys are zeroed.
SYS KEY	System Key	Displayed on line 1 of the display in the display key mode of the menu. It is followed in the second line with a key number "KEY = <1..7>".
KEY=1-7		Displayed on line 2 of the display in the display key mode of the menu for conventional systems when the "SYS KEY" or "CHN KEY" is displayed in line 1 and for trunked systems when the "SYS KEY" or "GRP KEY" is displayed in line 1.
PRIMARY		Displayed on line 1 of the display when the primary keys are enabled.
PRS NAME	Personality Name	Displayed on line 1 of the display under the revision selection of the menu. The personality name is displayed on line 2 at the same time.
M/A-COM		Displayed on line 1 of the display under the revision selection of the menu. The copyright year is shown in line 2 of display at the same time "(c) 2007."

9.4 ALERT TONES

The M7200 series mobile radio also provides audible alert tones or "beeps" to indicate the various operating conditions. These alert tones can be enabled or disabled through programming.

Table 9-4: M7200 EDACS Mode Alert Tones

NAME	TONE	DESCRIPTION
Call Originate	A short mid-pitched tone.	Sounds after keying the radio (Push-To-Talk button is pressed). Indicates the radio has been assigned a working channel
Carrier Control Timer	Five short high-pitched warning tones followed by a long low-pitched tone.	Sounds if the programmed time for continuous transmission is exceeded. The transmitter will shut down shortly after the alert, interrupting communications. Release and re-key the PTT button to maintain communications. This will reset the carrier control timer and turn the transmitter back on.
Key Press Alert	A short tone.	Indicates a key has been pressed. A short low-pitched tone indicates no action was taken because the key is not active in the current mode.

9.5 TURNING THE RADIO ON

Rotate the **POWER ON-OFF/VOLUME** knob clockwise, out of detent to turn the radio on. A short beep (if enabled through programming) indicates the radio is ready for operation. The display indicates, if programmed, the last selected system name on line 1 and the last selected group or channel name on line 2.

9.6 SELECTION MODE RULES

Many operations require selection from a list such as system, channel or phone number. This selection process is handled in the same manner for all lists. The  ramp control, **MENU**, **0**-**9**, *****, **#**, and the **CLR** button are used during the selection process. The following example systems list is used to explain the process:

The hookswitch functions the same as the **CLR** key in I-Call, phone call, and menu modes.

SYSTEM

1 NORTH
2 SOUTH
3 EAST
4 WEST

After entering a selection mode, the following generic display format will appear:

```
X X X X X X X X
Y Y Y  = Z Z Z
```

Line 1 shows the currently selected item name (XXXXXXXX) from the list. Line 2 indicates the list (YYY) that the selection is to be made from and the number of the selected item (ZZZ) within the list. (In

some cases the information on lines 1 and 2 will be exchanged.) Enter the system selection mode by pressing the **SYS** key. If SYSTEM 2 is the current selection, the display appears as follows:

```
SOUTH
SYS = 2
```

Line 1 contains the current system name, SOUTH; and line 2, SYS = 2, indicates that selection is from the system list and it is the second system within the list.

A new system from the list is selected by using the ramp control or by directly entering the system number with the numeric keys. The ramp control scrolls through the list in increasing and decreasing order. In the previous example, pressing up with the ramp control selects the EAST system as shown in the next display.

```
EAST
SYS = 3
```

The radio can be programmed to wrap around from one end of a list to the other end or to stop at the ends.

9.7 DIRECT ACCESS

To directly access a selection, enter the corresponding number (e.g. 4) followed by **MENU** to activate the selection. The entered number is displayed on line 2 as shown below. Line 1 shows the current list being used for selection.

```
SEL SYS
4
```

If a mistake is made while entering the number, press the **DEL** button to backspace once and correct the entry. If an invalid number is entered, a short low-pitched tone sounds when **MENU** is pressed.

To exit the selection mode, press the **CLR** button or wait for the time-out. If the selection mode is cleared while an entry is pending (i.e., numbers are entered on line 2, but **MENU** has not been pressed), the entry on line 2 will be disregarded and the previous selection will remain active. If the time-out activates while an entry is pending, the entry on line 2 will be selected if it is within the valid range; if it is out of range, the entry on line 2 will be disregarded and the previous selection will remain active.

NOTE

While in system or channel selection mode, the radio continues to receive calls normally and continues scanning, if it is enabled. If a call is received during the selection mode process the radio will return to the normal receive mode display. Continuing with the selection process will return the display to the same point in the selection process if the selection mode time out has not yet expired. Any press of the PTT button during the selection mode process will initiate transmission and exit the selection mode.

9.8 MENU

The menu function accesses features that are not available directly from the keypad. The order and specific number of menu items available is configurable through programming. Upon radio power up, the menu item at the beginning of the menu list will always be displayed first. Subsequent access to the menu function will return the last menu item that was shown in the display. To enter the menu mode, press **MENU**. The ramp control, **MENU,** and **CLR** are used during the selection process. All of the

selection mode rules previously detailed apply to the menu item selection process with the exception of direct access. The radio will continue to receive and transmit normally while in the menu function.

A new item is displayed by using the  ramp control to scroll through the list in increasing and decreasing order. The displayed menu item is made active by pressing **MENU**.

After entering the menu selection mode, the following generic display format will appear.

M E N U
Y Y Y Y Y Y Y Y

Line 1 indicates the radio is in the menu selection mode. Line 2 indicates the menu item (YYYYYYYY) that is to be viewed or changed (some menu items provide radio information and do not have changeable parameters).

An example of the menu item selection process and menu item parameter change is detailed below for the contrast menu item.

1. Press **MENU** to enter the menu mode.
2. Press the  ramp control until the display shows:

M E N U
CONTRAST

3. Press **MENU.** The contrast menu item is activated and the display will be similar to the following:

CNTRST = X
Y Y Y Y Y Y Y Y

   Line 1 shows the active menu item and its current parameter setting (XXX). Line 2 shows the currently selected system or group name (YYYYYYYY).

4. The menu item's parameter setting shown in the display can now be changed by using the  ramp control to scroll through the list of parameter values. Once the desired setting is reached, press **MENU** to store the value and return to the normal display. For menu items that display radio information, use  to scroll through a list of informational displays. The menu items are listed in Table 8-5.

Table 9-5: Menu Item Information

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Contrast Adjust	Menu Item: **CONTRAST** Once selected: CNTRST=	1, 2, 3, 4, 5, 6, 7, 8	Selects the Contrast level.
Radio Revision Information	Menu item: **REVISION**	Informational displays only (see radio); no user selectable settings.	Selects the information display to view.
Phone Call	Menu item: **PHN CALL** Once selected: See Telephone Interconnect Call Section		Allows access to the Phone Call Feature.

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
External Alarm	Menu Item: **EXTALARM** Once Selected: **EXTALARM**	ON, OFF	EXTALARM replaces the system name on the display as long as the external alarm feature is enabled.
Public Address	Menu item: **PUB ADDR** Once selected: **PA ON** or **PA OFF**	ON, OFF	Public Address is toggled ON and OFF.
External Speaker	Menu item: **EXT SPKR** Once selected: **SPKR ON** or **SPKR OFF**	ON, OFF	External Speaker is toggled ON and OFF.
Encryption Key Loading	Menu item: **KEYLOAD** Once selected: **KEY LOAD BANK = N**	Up to 8 banks of 7 keys	Enables the radio to accept the loading of encryption keys.
Display Current Encryption Key(s)	Menu item: **DISP KEY** Once selected: **SYS KEY**, **GRP KEY** or **CHN KEY** and **KEY = N**		Displays current encryption key number.
Front Panel Squelch Adjust	Menu item: **SQUELCH** Once selected: **SQLCH=xx**	1-16	Allows setting of squelch.
Scan	Menu item: **SCAN**	ON, OFF	Toggles scan function ON or OFF.
Private Mode	Menu Item: **PRIVATE** Once selected: **PVT** or key light.	ON, OFF	Toggles private function ON or OFF.
Scan Add	Menu item: **SCAN ADD** Once selected: Proper scan icon displayed.	S, 2 or 1	Adds group or channel to scan list.
Scan Delete	Menu item: **SCAN DEL** Once selected: Scan icon goes out.		Deletes group or channel from scan list.
Scan Add/Delete	Menu item: **SCAN A/D** When selected: Toggles through scan selections	Toggle sequence S, 2, 1, S, ...	Changes present group or channel to next scan choice in scan list.
Last Scanned Channel Recall	Menu Item: SCAN ADD Press twice when actively receiving; three times when not receiving. Scan icon displayed.		Changes the selected channel to the last scanned channel.
Home group or channel selection	Menu item: **HOME** Once selected: Home group or channel displayed.		Changes to the group or channel defined for Home function.
System select	Menu item: **SYS SEL** Once selected: **SYS = n**	1-64 = (n)umber of desired system	Displays the system selected.
External alarm #2	Menu item: **EXTALRM2**	ON, OFF	Toggles external alarm #2 feature ON or OFF.
System and group selection	Menu item: **SYSGRP 1** Menu item: **SYSGRP 2** Menu item: **SYSGRP 3** Menu item: **SYSGRP 4** Menu item: **SYSGRP 5**		Changes to the System & Group/Channel programmed for SYSGRP 1-5.
Mute	Menu item: **MUTE**	ON, OFF	Toggles the mute function ON or OFF to control the audio output from the selected radio.
Mute #1	Menu item: **MUTE 1**	ON, OFF	Toggles the mute 1 function ON or OFF on radio #1.
Mute #2	Menu item: **MUTE 2**	ON, OFF	Toggles the mute 2 function ON or OFF on radio #2.
Multiple radio operation	Menu item: **RADIO**	ON, OFF	Toggles the currently selected radio.

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Radio selection	Menu item: **RADIO 1**	ON, OFF	Changes to radio #1.
	Menu item: **RADIO 2**	ON, OFF	Changes to radio #2.
Talkaround feature	Menu item: **TALKARND** Once selected: **TALKARND** on line 1	ON, OFF	Toggles talkaround ON or OFF (transmit frequency changed to receive frequency).
Channel selection	Menu item: **CHN SEL** Once selected: **CHN = n**	1-99 = (n)umber of desired channel	Displays the conventional channel selected.
Feature Encryption Display	Menu Item: **FEATURES** Once selected: See Feature Encryption Display section	Informational displays only; no user selectable settings	Indicates current features program- med into the radio as well as certain information required to add features to the radio (refer to the Table of Contents for Feature Encryption Display.
Type 99 Decode Enable	Menu Item: T99 ENAB Once selected: **T99 ON** or **T99 OFF**	ON, OFF	Type 99 Decode is toggled ON and OFF.
System Scan Enable	Menu Item: **SYS SCAN** Once selected: **SYSC ON** or **SYSC OFF**	ON, OFF	System Scan features like ProScan are toggled ON and OFF.

9.9 FEATURE ENCRYPTION DISPLAY

Feature Encryption Display is available through the menu function and, if programmed, appears in the menu as "**FEATURES**." This data indicates current features programmed into the radio as well as information required to add features to the radio.

Once the feature has been accessed, all normal menu functions work. The user can scroll up or down through all of the entries.

Feature Encryption Display provides the ability to view, in the order displayed, the following:

- Serial number ROM data - serial number of the ROM
- Feature encryption data stream - used to enable features
- Number Fields - defines limits
- Features enabled - displays bit fields of enabled features

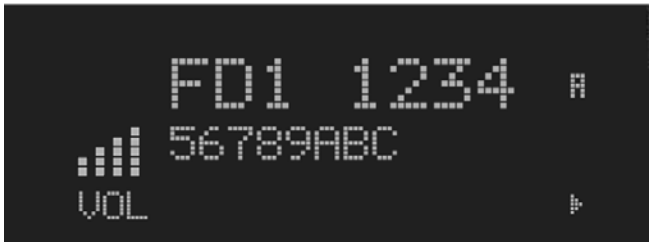
9.9.1 Serial Number ROM (12 Hex Digits)

Example:

When the user wants to enable a feature in his radio, he will need to call M/A-COM, Inc. They will ask for the ROM serial number. The serial number shown here is for example only.

9.9.2 Feature Encryption Data Stream

Example:



These data streams define the features the user has enabled in his radio and are required by M/A-COM, Inc. to enable other features. The data streams shown here are for example only. ***Note:*** There are three displays: FD1, FD2, and FD3. All three are required.

Number Fields

Example:

These number fields show the set limits of the of the user's radio as:

- SG# XXX - Maximum number of system combinations available
- CH# XXX - Maximum number of conventional channels available

The user needs to know the limits of his radio before attempting to enable other features. The numbers shown here are for example only.

9.9.3 Features Enabled

These numbers indicate which features are enabled.

Example:

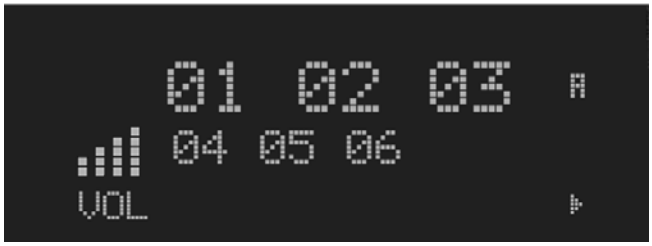


Table 9-6 lists possible features available in the user's radio.

Table 9-6: Available Feature Numbers

FEATURE NUMBER	POSSIBLE FEATURES	STANDARD OR OPTIONAL
01	Conventional Priority Scan	Standard
07	Dynamic Regroup	Standard
08	EDACS Emergency	Standard
09	Type 99 Encode	Standard
10	Conventional Emergency	Standard
12	Aegis™ Digital Voice Encryption	Optional
14	DES Encryption	Optional
16	Mobile Data	Optional
21	EDACS Security Key (ESK)	Optional
23	Narrowband	Standard
29	ProVoice™	Optional
32	FIPS-140-2	Optional
33	P25 Common Air Interface	Optional
34	Direct Frequency Entry	Optional

9.10 SYSTEM/CHANNEL SELECTION

The M7200 **SYSTEM/CHANNEL** knob and the  ramp control are programmable for maximum flexibility. If the SYSTEM/CHANNEL knob is assigned to select channels, then the  ramp control is assigned to select systems. If the SYSTEM/CHANNEL knob is assigned to select systems, then the  ramp control is assigned to select channels. System and channel selection is the primary function for these controls.

Either systems or channels can also be selected by entering the select mode and following the selection mode rules described earlier. The system select or channel select modes are entered by pressing **SYS** or **GRP**, respectively, from the standard receive mode. Using the  ramp control after entering a particular selection mode in this manner is the secondary function of these keys.

9.10.1 System Selection

Several methods, some of which depend on programming, can be used to select a new system. These procedures are presumed to be starting from the normal receive display.

METHOD 1: If system selection is programmed to the SYSTEM/ CHANNEL knob, select a system by turning the SYSTEM/CHANNEL knob to the desired system position. The display registers the new system name on line 1. If the wrap option is OFF and the knob is moved to a position greater than the number of programmed systems, the highest programmed system will remain selected.

METHOD 2: If system selection is programmed as the primary function of the  ramp control, select a system by pressing up or down to scroll through the system list. The display registers the new system name on line 1.

METHOD 3: Press **SYS** to enter the system select mode and follow the selection mode rules detailed earlier. Use the  ramp control to scroll through the systems.

9.10.2 Channel Selection

Several methods, some of which depend on programming, can be used to select a new group or channel. These procedures assume starting from the normal receive display.

METHOD 1: If channel selection is programmed to the SYSTEM/CHANNEL knob, select a channel by turning the SYSTEM/CHANNEL knob to the desired channel. The display registers the new channel name on line 2. If the wrap option is OFF and the knob is moved to a position greater than the number of programmed channels, the highest programmed channel will remain selected.

METHOD 2: If channel selection is programmed as the primary function of the  ramp control, select a channel by pressing up or down, to scroll through the group list. The display registers the new group name on line 2.

METHOD 3: Press **GRP** to enter the channel select mode and follow the selection mode rules detailed earlier. Use the  ramp control to scroll through different groups.

9.11 LAST SYSTEM/CHANNEL RECALL

This feature, enabled through programming, allows the user to recall the last selected system/channel after an emergency or home function or system/channel key function. For example, if the Home button (pre-programmed) is pressed, the radio will go to the designated Home system or channel. If the Home button is pressed again, the radio returns to the previous system or channel. At this time, the user can toggle between the Home system or channel and the previous system/group or channel. The operation is the same for the SG1-SG5 buttons.

9.12 RECEIVING A CALL

1. Turn the radio on by rotating the **POWER ON-OFF/VOLUME** knob clockwise (out of detent). A short alert signal (if enabled through programming) indicates the radio is ready to use.
2. Adjust the **POWER ON-OFF/VOLUME** knob to the desired volume level.
3. Select the desired conventional system and channel. The display indicates the current conventional system and channel names.
4. The radio is now ready to receive calls.
5. When the radio receives a call (and the correct encoding is decoded, if programmed and enabled), it unmutes on the channel and the **BSY** indicator comes on.

9.13 SENDING A CALL

1. Turn ON the radio and set the **POWER ON-OFF/VOLUME** knob to the desired volume level. Select the desired conventional system and channel.
2. Ensure that the channel is not busy by pressing the **CLR** button to briefly disable any channel decoding and unmute the receiver or observe the unlit **BSY** indicator. If the Channel Busy Lockout feature is programmed for the selected channel, the radio will not transmit when the channel is busy.

3. Press and hold the PTT button. The **TX** indicator will turn on and a short beep sounds (if programmed) indicating that communication can begin.
4. Hold the microphone approximately three inches from the mouth and speak in a normal voice.
5. Release the PTT button when the transmission is complete and listen for a reply.

9.14 EMERGENCY OPERATION

If enabled, G-STAR emergency signaling can be transmitted when operating in the conventional mode. This G-STAR signaling will transmit 5 times with a delay between each transmission. To send an emergency call on the selected conventional system and channel (or on an optionally pre-programmed conventional emergency system and channel), proceed as follows:

Press and hold the red Emergency button for approximately one second (this time is programmable and, therefore, could be longer or shorter; check with the system administrator). The radio turns on the **TX** indicator and proceeds to transmit the pre-programmed G-STAR emergency signaling sequence.

G-STAR is programmed to transmit in one of the following methods:

METHOD 1: G-STAR is transmitted on the selected channel. If the channel is changed the emergency signaling will continue to be transmitted on the newly selected channel.

METHOD 2: Same as METHOD 1 but the radio will lock on to the currently selected channel. Any attempts to change the system or channel will be disabled.

METHOD 3: G-STAR is transmitted on a pre-programmed conventional emergency system and channel regardless of the selected channel. In this case the selected channel is available for voice transmission and the radio will periodically change to the pre-programmed emergency system and channel to send the emergency signaling and then change back to the selected channel.

METHOD 4: Same as METHOD 3 but the radio will lock on to the pre-programmed emergency system and channel. Any attempts to change the system or channel will be disabled.

The emergency state can be cleared by turning the radio OFF and then back ON.

9.14.1 Using 5-Tone Signaling to Declare an Emergency

If 5-Tone signaling is defined for emergency declaration in place of G-STAR emergency signaling, a pre-programmed tone sequence will be transmitted instead of the G-STAR sequence. This emergency declaration functions as the G-STAR emergency in all other respects.

9.14.2 Tone Encode Transmission

In conventional mode two keys can be defined to be tone encode triggers. If either one of the pre-programmed tone encode triggers is pressed, a pre-programmed tone sequence will be transmitted on the current system and channel. (See Section 9.14 if the emergency key is used.) The **TX** indicator will light during tone transmission and a beep will sound at the end of the transmission. If enabled, audible side tones will be heard in the radio speaker as well. If PTT is pre-programmed as one of the triggers, the microphone will become active for voice communication after the tone sequence is complete.

Tone encode will be transmitted with Channel Guard if one is defined, and tones are always transmitted in clear voice mode, even if the channel is set for digital or private (see **VOICE MODES**). Digital or private voice transmission will resume normally after the tone transmission.

9.15 SCANNING CONVENTIONAL CHANNELS

Channels, which have been previously added to the scan list on a per system basis, can be scanned. The selected channel is scanned (if enabled through programming) whether or not it is in the scan list. Each conventional system's channel scan list is retained in memory when the radio is turned OFF.

The scan rate will vary depending upon the number of channels in the scan list and whether or not the radio is programmed to scan for channels with decoding enabled. Fewer channels will result in a faster scan rate. If programmed for dual-priority scan operation, the priority-one, priority-two and the remaining scan list channels are scanned. Once a signal is detected and the correct encoded squelch signal is decoded (if programmed), the radio receives the message and displays the received scan channel. At the same time, scanning continues on the priority-one and priority-two channels. If a priority-one or priority-two channel carrier, regardless of encoded squelch decoding, is detected while a non-priority channel is being received, the display name is updated and the received channel is switched to the priority channel. Scanning of the priority-one channel will continue if a message is being received on the priority-two channel.

While receiving a call on a non-priority or a priority two channel, the radio periodically checks the priority one and two channels. If Scan with Channel Guard is enabled, the radio will use Channel Guard to decide whether to unmute on a priority channel. The radio will stop, on squelch detection, on a priority channel. In normal operation, the radio will unmute only on detecting the correct Channel Guard; otherwise, it will remain muted until the priority channel call and hang time have ended. An optional feature allows the radio to continue scanning upon the detection of the wrong Channel Guard on a priority channel. The user can then select the rate at which this channel is scanned until the call ends.

9.15.1 Adding Channels to a Scan List

1. With scan operation turned OFF, select the desired channel to add to the selected conventional system channel scan list.

2. Press (**+**) or (**-**) with  to display the current scan status on line 1 of the display for a time-out period.

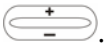
3. While current scan status is displayed, press (**+**) to add the channel to the scan list.  is displayed. This sets the selected channel for non-priority scanning.

4. Press (**+**) again to set the channel for Priority 2 (P2) scanning and  is displayed.

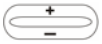
5. A third press of (**+**) sets the channel for Priority 1 (P1) scanning and  is displayed on line 1. If the P1 or P2 channels are already set and a new channel is then assigned as the P1 or P2 channel, the previously assigned priority channel will change to non-priority scanning. The priority setting selection sequence is set and stops at P1, therefore the channel must be deleted from the scan list by pressing (**-**) before the channel is set to a previous priority setting. Any channel that is in a system's channel scan list will show  ,  , or  when it is the selected channel.

9.15.2 Deleting Channels From A Scan List

1. With scan operation turned OFF select the desired channel to delete from the selected conventional system's channel scan list.

2. Press (**+**) or (**-**) with  . The current status is displayed for a time-out period. Press **-** with  to delete the channel from the scan list.  ,  , or  will turn OFF.

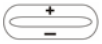
9.15.3 Nuisance Delete

A channel can also be deleted from the scan list, if it is not the currently selected channel, by pressing down with  twice during scan operation while the radio is displaying the unwanted channel. The channel will be deleted from the conventional system's channel scan list in the same manner as if done using the steps above. Deletions done in this manner will not remain deleted if the radio is turned OFF and then back ON.

9.16 TURNING SCAN ON

1. Toggle the scan operation ON by pressing **SCAN**. The SCAN indicator will turn ON when the radio is scanning.

Scanning will stop while the microphone is off-hook if the hookswitch feature is enabled through programming.

2. When a channel on the scan list receives a channel assignment, the radio unmutes on the assigned channel, **BSY** indicator comes ON and the received scan channel is displayed.
   - The radio will continue scanning if a new channel is selected when scan is ON.
   - Pressing the PTT button when scan is ON will cause the radio to transmit on the displayed channel or to the currently selected channel depending on programming.
   - Pressing (**+**) with  when scan is ON causes the radio to recall the scanned channel that was last received. This channel is recalled for a period equal to the scan hang time.

9.17 TURNING SCAN OFF

Toggle the scan operation OFF by pressing **SCAN**. The radio will resume operation on the selected channel.

9.18 SQUELCH ADJUST

In the conventional mode of operation, the squelch can be re-adjusted in the MENU selection mode or from a front panel key on the keypad that has been pre-programmed. A default value of 9, or any user level between 1 and 16, can be selected using programming software. The user can change this setting either of two ways from the front panel keys.

A value of 16 requires a strong signal to open squelch, a value of 2 requires a very weak signal to open squelch, and a value of 1 is open squelch.

When the squelch adjust feature is activated, Channel Guard, T99 decode, and Scan are disabled. When the squelch adjust feature is exited, Channel Guard, T99 decode, and Scan are restored to their previous states.

9.18.1 Menu Selection

1. Press the **MENU** key and then use the RAMP control  to scroll through the selections until **SQUELCH** is displayed. Then press **MENU** (select) again.
2. The display will show **SQLCH=xx**, where "xx" is the value between 1 and 16.
3. Use the RAMP control  to scroll through the values. Then press the **MENU** (select) key to save the new value after the display time-out (2 seconds). The displayed value will be selected and saved.
4. If the **MENU** or **CLR** key is pressed before the time-out, the menu feature will exit and the squelch level will not be updated. The original value will be restored.

9.18.2 Pre-Programmed Keypad Key

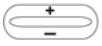
1. Press the pre-programmed key and the display will indicate **SQLCH=xx**, where "xx" is the value between 1 and 16.
2. Use the RAMP control  to scroll through the values. Then press **MENU** to save the new value or wait for the display time-out (2 seconds). The displayed value will be selected and saved.
3. If the **CLR** key is pressed before the time-out, the squelch level will not be updated and the original value will be restored.

9.19 TYPE 99 DECODE

If the Type 99 Decode Option has been pre-programmed, individual selective calling is possible. The radio can now decode individual, group or supergroup paging calls. Two sets of Type 99 paging codes must be pre-programmed into the radio. When the radio decodes an appropriate Type 99 code sequence, an alert tone and visual indicator is provided to the user. The receiver then operates as a noise squelched unit until Type 99 is reset. Type 99 decode continues to operate during this noise squelched period. The appropriate Type 99 alert tone will sound again if it detects a valid two-tone sequence.

Type 99 operation can be reset manually or automatically (pre-programmed). Manual reset is achieved by briefly pressing **CLR**, if programmed. Automatic reset, if enabled, occurs after a 30 second interval following the most recent decode of a Type 99 tone sequence. Hookswitch (pre-programmed) can also enable or disable Type 99 decode. The pre-programmed key light will blink when Type 99 is disabled by the hookswitch.

Type 99 decode will continue to be active while the radio's **CLR** button is pressed. This allows the user to monitor calls and still be alerted when a call is directed to the user. While the user continues to press **CLR**, the user will hear both calls and all Type 99 tone signals. If **CLR** is pressed for longer than two (2) seconds, Type 99 decode will either be disabled or re-enabled depending upon its present state.

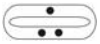
To check the Type 99 enable status, press the Scan Add/Delete  ramp control. The current status of Type 99 decode will be displayed for a time-out period.

If a Horn Alert Option is installed and enabled with the Type 99 Decode Option, the radio can beep the vehicle horn when a Type 99 call is received. This option permits alerting persons out of the vehicle when a call is received.

NOTE

Type 99 is automatically disabled when Scan is enabled.

9.19.1 Menu Selection

Press **MENU** and then use the  ramp control to scroll through the selections until **T99 ENAB** is displayed. Then press **MENU** to toggle the Type 99 decode state. The **T99 ON** or **T99 OFF** display message is displayed for two seconds to show the new state.

9.19.2 Pre-Programmed Keypad Key

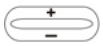
Press the pre-programmed key and the **T99 ON** or **T99 OFF** display message is displayed for two seconds to show the new state.

9.20 DIRECT MODE OPERATION

The direct mode (or talk-around) provides short range, line of sight communications. One of the buttons on the control unit must be pre-programmed for this feature to function.

1. Make sure the radio is ON and then select the desired conventional system and channel.
2. Press the pre-programmed button to toggle the talk-around function ON.
3. Ensure that the channel is not busy by pressing the **CLR** (System version) or **CLEAR** (Scan version) to briefly disable any channel decoding and unmute the receiver or observe the unlit **BSY** indicator. If the Channel Busy Lockout feature is programmed for the selected channel, the radio will not transmit when the channel is busy.
4. Press and hold the PTT button. The **TX** indicator will light and a short beep sounds (if pre-programmed) indicating that communication can begin.
5. Release the PTT button when the transmission is complete and listen for a reply.
6. When the communications is completed, press the pre-programmed button to toggle the talk-around function OFF.

9.21 LAST SCANNED CHANNEL RECALL

The Last Scanned Channel Recall feature can be used to recall the last *scanned* channel from the scan list when it is not the currently selected channel. Pressing up with  twice when the radio is actively receiving or three times when the radio is not receiving. The selected channel will change to the last scanned channel from the conventional system's scan list.

10 P25 CONVENTIONAL

10.1 CH721 FRONT PANEL COMPONENTS

The front panel of the control head includes a dot matrix display, controls for menu navigation, an emergency button, three pre-set buttons, a power button/rotary volume dial, and a microphone connector. In addition, the system model control head features a DTMF keypad.

Table 10-1 lists all default front panel controls and their functions. All functions and controls of the Scan radio operate the same as the corresponding functions and controls on the System radio.

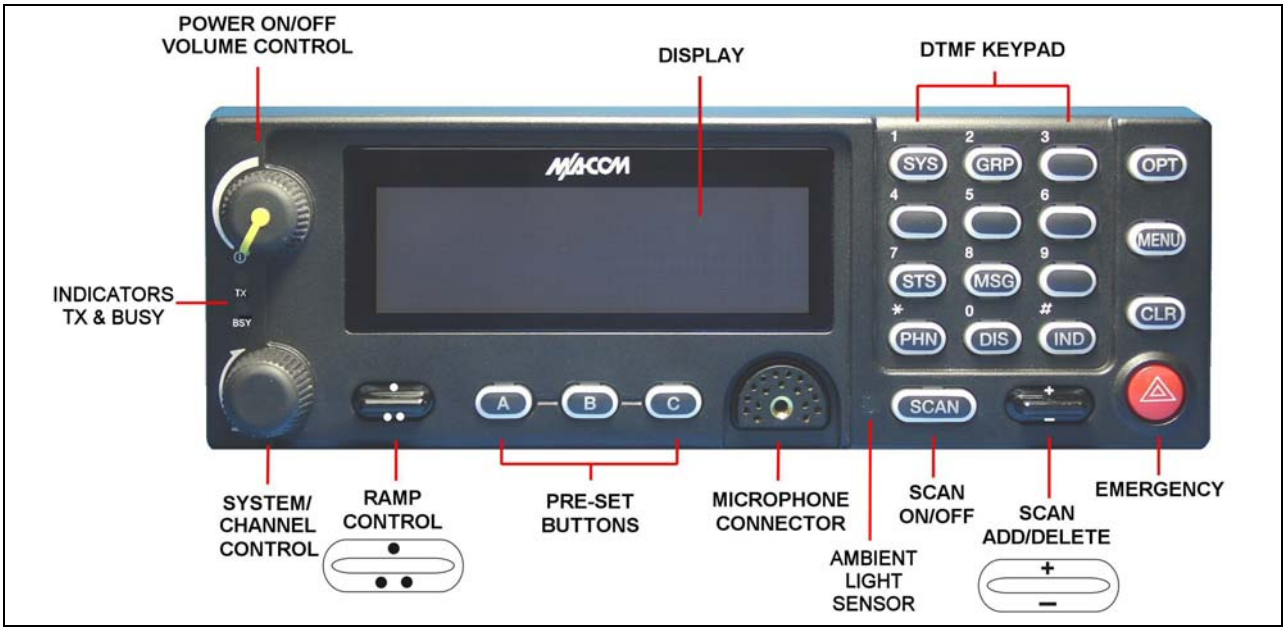


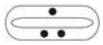
Figure 10-1: System Model

Figure 10-2: Scan Model

NOTE

Button function may vary depending upon system programming, radio hardware, and optional configurations. Complete the table in Section 14 if the keys have been remapped to provide new functions.

Table 10-1: Front Panel Default Controls and Functions

PART	FUNCTION
Power On-Off/Volume Control knob	Turn knob clockwise to power on the radio and increase volume. Turn counter-clockwise to decrease volume and power off the radio.
Mic Connection	Connection for hand-held, hands-free, speaker-mic, or headset.
	The Emergency button declares an emergency if enabled through programming.
Ambient Light Sensor	Radio automatically adjusts the display and button backlight brightness level based on ambient light. Do not block this sensor.
	This rotary switch selects the systems or channels, depending upon programming.
	This rocker type button is used to display the current SCAN status for a channel and then either add or delete the channel from the system scan list. Pressing the add/delete button twice while the radio is actively receiving or three times when the radio is not receiving selects the last scanned channel (Last Scanned Channel Recall).
	The primary function of this rocker type button is to scroll through the System list or the Channel list depending upon programming. The secondary function is to increment or decrement items within a list (phone list for example).
OPT/OPTION	Toggle a PC programmable feature ON and OFF.
CLR/CLEAR	Unmutes the receiver so activity on the selected channel can be monitored. When pressed and held for approximately 3 seconds, this button toggles conventional channel decoding (Channel Guard, Digital Channel Guard, T99) ON and OFF if programmed for the selected channel.
MENU	Primary function - access the menu list. This is a list of additional features that are not available directly from the keypad. Secondary function - activate a selected item within a list, similar to an enter key.
SCAN	Primary function - toggle scan operation on and OFF. Secondary function - toggle the keypad buttons between their primary function and their secondary function.
Pre-Set buttons	Used to store and recall user-selectable parameters.
SYS	Used to enter the System select mode.
PHN	Used to place telephone calls through the radio by selecting the interconnect special call function.
DIS	Used to adjust the current display intensity and the keypad backlight level.
IND	Used to call an individual or make an all-call by selecting the individual call function.

10.1.1 Primary Functions (Quick Access)

The secondary function of the **SCAN** button is to toggle the keypad buttons between their primary function and their secondary function. When the secondary keypad is active, i.e. entering phone digits for an interconnect call, the **SCAN** button can be used to toggle the keypad buttons back to their primary function, perform a task, and then toggle back to finish entering the digits for the phone number. **PRIMARY** is displayed when the **SCAN** button is used to toggle the keypad keys back to their primary functions. This provides quick access to the primary functions of the keypad. This is a programmable feature of the **SCAN** button only. Careful consideration should be given to possible operational conflicts before enabling this feature.

Several keys on the Scan version have a secondary function. The **MENU** key is the SELECT secondary function with the **CLEAR** key remaining the same for the secondary function. On the System version, the **OPT** has a secondary function for DELETE, **MENU** is SELECT, and **CLR** retains its CLEAR function.

10.2 RADIO STATUS ICONS

Status icons are indicators that show the various operating characteristics of the radio. The icons appear on the first line of the display.

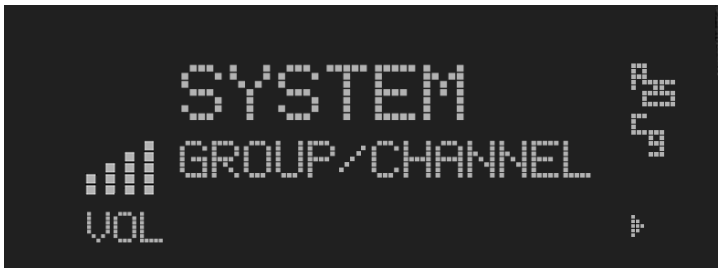


Figure 10-3: Typical Display

Table 10-2: Icons and Descriptions

ICON	DESCRIPTION
	Indicates selected group or channel is in scan list.
	Indicates selected group or channel is programmed as Priority 1 in scan list.
	Indicates selected group or channel is programmed as Priority 2 in scan list.
	Indicates a conventional channel enabled with Channel Guard Function.
	Transmitting or receiving in encrypted mode.
	Indicates the current channel is set up as an analog channel.
	Indicates the current channel is set up as a ProVoice channel.
	Scan mode enabled.
	Indicates the current channel is set up as a Project 25 (P25) channel.

10.3 MESSAGES

During radio operation, various messages are displayed on either line 1 or line 2. Typical messages include control channel status information, such as system busy or call denied, or messages associated with the radio's operation, (i.e. volume adjust). These messages are described as follows:

Table 10-3: Display Messages

MESSAGE	NAME	DESCRIPTION
TALKARND	Talk-around	Indicates the radio is operating on conventional channels in talk-around mode (no repeater).
VOL=31	Volume Level	Indicates the current volume level. The volume level display ranges from OFF (silent) to 31 (loudest).
UNKNOWN	Caller's ID Not Received	Indicates that an individual call is being received, but the caller's ID was not received.
T99 ON	Type 99 Decode ON	Indicates the Type 99 Decode feature is enabled.
T99 OFF	Type 99 Decode OFF	Indicates the Type 99 Decode feature is disabled.
PA ON	Public Address ON	Indicates that the public address function of the radio is enabled.
PA OFF	Public Address OFF	Momentary (2 seconds) indicates that public address function of the radio was disabled.
ALRM ON	External Alarm Enabled	Indicates that the external alarm function of the radio is enabled.
ALRM OFF	External Alarm Disabled	Momentary (2 seconds) indicates that the external alarm function of the radio was disabled.
PVT DIS	Private Mode Disabled	Indicates that private mode is disabled or no encryption key has been programmed for the selected group/channel or special call.
FRCD PVT	Forced Private Operation	Indicates that forced private operation has been pre-programmed into radio.
NO KEY #	Encryption Key Missing	Flashing indicator indicates that no encryption key or an incorrect encryption key is programmed into the radio.
BCKL=1-6	Backlight	Indicates the display intensity and keypad backlight level.
GR	Group ID	Indicates that the call is a group call and is followed by the GID of the caller.
WHC=1	Who Has Called	This display indicates the number from the *Who Has Called* list. Individual calls received but not responded to are stored in a *Who Has Called* list. This list is accessible by pressing the # key and then the INDV key after the Individual call has timed out or the Clear button is pressed. This display is on line 2 and the LID of the caller is displayed on the top line. Currently the list is not implemented and the display will always be WHC=1.
PHONE	Phone Call	Displayed when a phone call is received from the site. It is displayed in line 1 of the display. Line 2 of the display will contain the display *INDV* when line 1 contains this message. The radio interprets a received phone call as an individual call.
MENU		Displayed when the menu key is pressed and remains displayed in line 1 until a menu item is selected.
SYS=1-64	System = 1 - 64	The system number for the current base station of the system displayed in line 1. It is displayed in line 2 of the display. Press the system key to obtain this display.
INDV=1-99	Individual = 1 - 99	Indicates which item in the individual call list is being displayed. It is displayed in line 2 of the display. The name or ID of the item in the list is displayed in line 1 of the display.
PHN=1-99	Phone = 1 - 99	Indicates which item in the phone list is being displayed. It is displayed in line 2 of the display. Line 1 of the display will be the last 3 characters of the list item contents.
SEL PHN	Select Phone	After pressing the PHN key, selecting an entry from the phone list by typing the entry number will display this message on Line 1.
Ggg-v.vv	Code Group and Revision Number	This is code group and revision number that is displayed in line 2 when the menu item “REVISION” is selected. The ‘gg’ is the group number of the software. The first ‘v’ is the hardware version and ‘vv’ is the revision of the software.
PHONE	Phone Call	Displayed when an initiated phone call is in progress. This is displayed on line 2 of the display.
NO ENTRY		Indicates that there is no data stored in one of the programmable items in either the phone list or individual call list. The user programmable items are items 1 through 10 in each list.
INV SYS	Invalid System	Displayed when the current system is an invalid type.

MESSAGE	NAME	DESCRIPTION
CHN=1-99	Channel = 1 - 99	Displayed on line 1 of the display. This is a conventional channel index displayed when the group key is pressed.
FIX LIST	Fixed List	The Priority scan list is fixed and cannot be changed using the add or delete keys.
FIXED P1	Fixed Priority 1	The Priority 1 scan channel is fixed and cannot be changed using the add or delete keys.
(c) 2004		Displayed in line 2 when the message 'M/A-COM' is displayed in line 1 while displaying different items under the menu when "REVISION" is selected by the operator.
EM	Emergency	Indicates an emergency has been declared by the LID that follows the display, "EM." An example of this is "EM 01201."
INDV	Individual Call	Displayed in line 2 of the display when an individual call is in progress (trunked and T99 modes only).
GROUP	Group Call	Indicates a group call is in progress and is displayed on line 1 of the display (trunked and T99 modes only).
SPKR ON	External Speaker ON	Displayed when the external speaker is enabled.
SPKR OFF	External Speaker OFF	Displayed when the external speaker is disabled.
BANK=1-8		The bank of keys that are going to be loaded when the keyloader loads encryption keys. This is only valid for radios that support VGS, VGE, or DES encryption. It is displayed on line 2 of the display when the encryption keyloader is connected.
KEY LOAD		Displayed on line 1 of the display when the encryption keyloader is connected.
KEY ZERO		Displayed on line 2 of the display when the reset and option buttons are pressed simultaneously for approximately two seconds. The encryption keys are zeroed.
SYS KEY	System Key	Displayed on line 1 of the display in the display key mode of the menu. It is followed in the second line with a key number "KEY = <1..7>".
KEY=1-7		Displayed on line 2 of the display in the display key mode of the menu for conventional systems when the "SYS KEY" or "CHN KEY" is displayed in line 1 and for trunked systems when the "SYS KEY" or "GRP KEY" is displayed in line 1.
PRIMARY		Displayed on line 1 of the display when the primary keys are enabled.
PRS NAME	Personality Name	Displayed on line 1 of the display under the revision selection of the menu. The personality name is displayed on line 2 at the same time.
M/A-COM		Displayed on line 1 of the display under the revision selection of the menu. The copyright year is shown in line 2 of display at the same time "(c) 2007."

10.4 ALERT TONES

The M7200 series mobile radio also provides audible alert tones or "beeps" to indicate the various operating conditions. These alert tones can be enabled or disabled through programming.

Table 10-4: M7200 EDACS Mode Alert Tones

NAME	TONE	DESCRIPTION
Call Originate	A short mid-pitched tone.	Sounds after keying the radio (Push-To-Talk button is pressed). Indicates the radio has been assigned a working channel
Carrier Control Timer	Five short high-pitched warning tones followed by a long low-pitched tone.	Sounds if the programmed time for continuous transmission is exceeded. The transmitter will shut down shortly after the alert, interrupting communications. Release and re-key the PTT button to maintain communications. This will reset the carrier control timer and turn the transmitter back on.
Key Press Alert	A short tone.	Indicates a key has been pressed. A short low-pitched tone indicates no action was taken because the key is not active in the current mode.

10.5 TURNING THE RADIO ON

Rotate the **POWER ON-OFF/VOLUME** knob clockwise, out of detent to turn the radio on. A short beep (if enabled through programming) indicates the radio is ready for operation. The display indicates, if programmed, the last selected system name on line 1 and the last selected group or channel name on line 2.

10.6 SELECTION MODE RULES

Many operations require selection from a list such as system, channel or phone number. This selection process is handled in the same manner for all lists. The ramp control, **MENU**, **0-9**, *****, **#**, and the **CLR** button are used during the selection process. The following example systems list is used to explain the process:

NOTE

The hookswitch functions the same as the **CLR** key in I-Call, phone call, and menu modes.

SYSTEM	
1	NORTH
2	SOUTH
3	EAST
4	WEST

After entering a selection mode, the following generic display format will appear:

```
XXXXXXXX
YYY = ZZZ
```

Line 1 shows the currently selected item name (XXXXXXXX) from the list. Line 2 indicates the list (YYY) that the selection is to be made from and the number of the selected item (ZZZ) within the list. (In some cases the information on lines 1 and 2 will be exchanged.) Enter the system selection mode by pressing the **SYS** key. If SYSTEM 2 is the current selection, the display appears as follows:

```
SOUTH
SYS = 2
```

Line 1 contains the current system name, SOUTH; and line 2, SYS = 2, indicates that selection is from the system list and it is the second system within the list.

A new system from the list is selected by using the ramp control or by directly entering the system number with the numeric keys. The ramp control scrolls through the list in increasing and decreasing order. In the previous example, pressing up with the ramp control selects the EAST system as shown in the next display.

```
EAST
SYS = 3
```

The radio can be programmed to wrap around from one end of a list to the other end or to stop at the ends.

10.7 DIRECT ACCESS

To directly access a selection, enter the corresponding number (e.g. 4) followed by **MENU** to activate the selection. The entered number is displayed on line 2 as shown below. Line 1 shows the current list being used for selection.

SEL SYS
4

If a mistake is made while entering the number, press the **DEL** button to backspace once and correct the entry. If an invalid number is entered, a short low-pitched tone sounds when **MENU** is pressed.

To exit the selection mode, press the **CLR** button or wait for the time-out. If the selection mode is cleared while an entry is pending (i.e., numbers are entered on line 2, but **MENU** has not been pressed), the entry on line 2 will be disregarded and the previous selection will remain active. If the time-out activates while an entry is pending, the entry on line 2 will be selected if it is within the valid range; if it is out of range, the entry on line 2 will be disregarded and the previous selection will remain active.

While in system or channel selection mode, the radio continues to receive calls normally and continues scanning, if it is enabled. If a call is received during the selection mode process the radio will return to the normal receive mode display. Continuing with the selection process will return the display to the same point in the selection process if the selection mode time out has not yet expired. Any press of the PTT button during the selection mode process will initiate transmission and exit the selection mode.

10.8 MENU

The menu function accesses features that are not available directly from the keypad. The order and specific number of menu items available is configurable through programming. Upon radio power up, the menu item at the beginning of the menu list will always be displayed first. Subsequent access to the menu function will return the last menu item that was shown in the display. To enter the menu mode, press **MENU**. The ramp control, **MENU,** and **CLR** are used during the selection process. All of the selection mode rules previously detailed apply to the menu item selection process with the exception of direct access. The radio will continue to receive and transmit normally while in the menu function.

A new item is displayed by using the ramp control to scroll through the list in increasing and decreasing order. The displayed menu item is made active by pressing **MENU**.

After entering the menu selection mode, the following generic display format will appear.

MENU
YYYYYYYY

Line 1 indicates the radio is in the menu selection mode. Line 2 indicates the menu item (YYYYYYYY) that is to be viewed or changed (some menu items provide radio information and do not have changeable parameters).

An example of the menu item selection process and menu item parameter change is detailed below for the contrast menu item.

1. Press **MENU** to enter the menu mode.
2. Press the ramp control until the display shows:

M E N U
CONTRAST

3. Press **MENU.** The contrast menu item is activated and the display will be similar to the following:

CNTRST = X
Y Y Y Y Y Y Y Y

Line 1 shows the active menu item and its current parameter setting (XXX). Line 2 shows the currently selected system or group name (YYYYYYYY).

4. The menu item's parameter setting shown in the display can now be changed by using the  ramp control to scroll through the list of parameter values. Once the desired setting is reached, press **MENU** to store the value and return to the normal display. For menu items that display radio information, use  to scroll through a list of informational displays. The menu items are listed in Table 8-5.

Table 10-5: Menu Item Information

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Contrast Adjust	Menu Item: **CONTRAST** Once selected: CNTRST=	1, 2, 3, 4, 5, 6, 7, 8	Selects the Contrast level.
Radio Revision Information	Menu item: **REVISION**	Informational displays only (see radio); no user selectable settings.	Selects the information display to view.
Phone Call	Menu item: **PHN CALL** Once selected: See Telephone Interconnect Call Section		Allows access to the Phone Call Feature.
External Alarm	Menu Item: **EXTALARM** Once Selected: **EXTALARM**	ON, OFF	EXTALARM replaces the system name on the display as long as the external alarm feature is enabled.
Public Address	Menu item: **PUB ADDR** Once selected: **PA ON** or **PA OFF**	ON, OFF	Public Address is toggled ON and OFF.
External Speaker	Menu item: **EXT SPKR** Once selected: **SPKR ON** or **SPKR OFF**	ON, OFF	External Speaker is toggled ON and OFF.
Encryption Key Loading	Menu item: **KEYLOAD** Once selected: **KEY LOAD BANK = N**	Up to 8 banks of 7 keys	Enables the radio to accept the loading of encryption keys.
Display Current Encryption Key(s)	Menu item: **DISP KEY** Once selected: **SYS KEY**, **GRP KEY** or **CHN KEY** and **KEY = N**		Displays current encryption key number.
Scan	Menu item: **SCAN**	ON, OFF	Toggles scan function ON or OFF.
Private Mode	Menu Item: **PRIVATE** Once selected: **PVT** or key light.	ON, OFF	Toggles private function ON or OFF.

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Front Panel Squelch Adjust	Menu Item: **SQUELCH** Once selected: **SQLCH=xx**	1-16	Allows setting of squelch.
Scan Add	Menu item: **SCAN ADD** Once selected: Proper scan icon displayed.	S, 2 or 1	Adds group or channel to scan list.
Scan Delete	Menu item: **SCAN DEL** Once selected: Scan icon goes out.		Deletes channel from scan list.
Scan Add/Delete	Menu item: **SCAN A/D** When selected: Toggles through scan selections	Toggle sequence S, 2, 1, S, ...	Changes present group or channel to next scan choice in scan list.
Last Scanned Channel Recall	Menu Item: SCAN ADD Press twice when actively receiving; three times when not receiving. Scan icon displayed.		Changes the selected channel to the last scanned channel.
Home channel selection	Menu item: **HOME** Once selected: Home group or channel displayed.		Changes to the group or channel defined for Home function.
System select	Menu item: **SYS SEL** Once selected: **SYS = n**	1-64 = (n)umber of desired system	Displays the system selected.
External alarm #2	Menu item: **EXTALRM2**	ON, OFF	Toggles external alarm #2 feature ON or OFF.
System and Channel selection	Menu item: **SYSGRP 1** Menu item: **SYSGRP 2** Menu item: **SYSGRP 3** Menu item: **SYSGRP 4** Menu item: **SYSGRP 5**		Changes to the System & Channel programmed for SYSGRP 1-5.
Mute	Menu item: **MUTE**	ON, OFF	Toggles the mute function ON or OFF to control the audio output from the selected radio.
Mute #1	Menu item: **MUTE 1**	ON, OFF	Toggles the mute 1 function ON or OFF on radio #1.
Mute #2	Menu item: **MUTE 2**	ON, OFF	Toggles the mute 2 function ON or OFF on radio #2.
Multiple radio operation	Menu item: **RADIO**	ON, OFF	Toggles the currently selected radio.
Radio selection	Menu item: **RADIO 1**	ON, OFF	Changes to radio #1.
	Menu item: **RADIO 2**	ON, OFF	Changes to radio #2.
Talkaround feature	Menu item: **TALKARND** Once selected: **TALKARND** on line 1	ON, OFF	Toggles talkaround ON or OFF (transmit frequency changed to receive frequency).
Feature Encryption Display	Menu Item: **FEATURES** Once selected: See Feature Encryption Display section	Informational displays only; no user selectable settings	Indicates current features program- med into the radio as well as certain information required to add features to the radio (refer to the Table of Contents for Feature Encryption Display.
System Scan Enable	Menu Item: **SYS SCAN** Once selected: **SYSC ON** or **SYSC OFF**	ON, OFF	System Scan features like ProScan are toggled ON and OFF.
Type 99 Decode Enable	Menu Item: T99 ENAB Once selected: **T99 ON** or **T99 OFF**	ON, OFF	Type 99 Decode is toggled ON and OFF.

10.9 FEATURE ENCRYPTION DISPLAY

Feature Encryption Display is available through the menu function and, if programmed, appears in the menu as "**FEATURES**." This data indicates current features programmed into the radio as well as information required to add features to the radio.

Once the feature has been accessed, all normal menu functions work. The user can scroll up or down through all of the entries.

Feature Encryption Display provides the ability to view, in the order displayed, the following:

- Serial number ROM data - serial number of the ROM
- Feature encryption data stream - used to enable features
- Number Fields - defines limits
- Features enabled - displays bit fields of enabled features

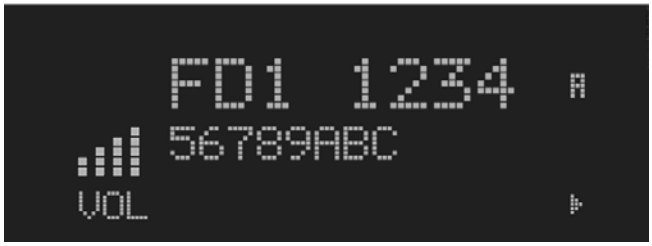
10.9.1 Serial Number ROM (12 Hex Digits)

Example:

When the user wants to enable a feature in his radio, he will need to call M/A-COM, Inc. They will ask for the ROM serial number. The serial number shown here is for example only.

10.9.2 Feature Encryption Data Stream

Example:



These data streams define the features the user has enabled in his radio and are required by M/A-COM, Inc. to enable other features. The data streams shown here are for example only. ***Note:*** There are three displays: FD1, FD2, and FD3. All three are required.

Number Fields

Example:

These number fields show the set limits of the of the user's radio as:

- SG# XXX - Maximum number of system combinations available
- CH# XXX - Maximum number of conventional channels available

The user needs to know the limits of his radio before attempting to enable other features. The numbers shown here are for example only.

10.9.3 Features Enabled

These numbers indicate which features are enabled.

Example:

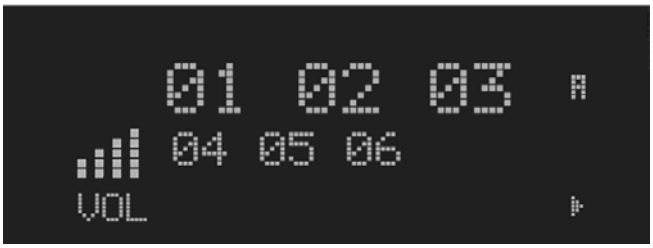


Table 8-6 lists possible features available in the user's radio.

Table 10-6: Available Feature Numbers

FEATURE NUMBER	POSSIBLE FEATURES	STANDARD OR OPTIONAL
01	Conventional Priority Scan	Standard
07	Dynamic Regroup	Standard
08	EDACS Emergency	Standard
09	Type 99 Encode	Standard
10	Conventional Emergency	Standard
12	Aegis™ Digital Voice Encryption	Optional
14	DES Encryption	Optional
16	Mobile Data	Optional
21	EDACS Security Key (ESK)	Optional
23	Narrowband	Standard
29	ProVoice™	Optional
32	FIPS-140-2	Optional
33	P25 Common Air Interface	Optional
34	Direct Frequency Entry	Optional

10.10 SYSTEM/CHANNEL SELECTION

The M7200 **SYSTEM/CHANNEL** knob and the ramp control are programmable for maximum flexibility. If the SYSTEM/CHANNEL knob is assigned to select channels, then the ramp control is assigned to select systems. If the SYSTEM/CHANNEL knob is assigned to select systems, then the

 ramp control is assigned to select channels. System and channel selection is the primary function for these controls.

Either systems or channels can also be selected by entering the select mode and following the selection mode rules described earlier. The system select or channel select modes are entered by pressing **SYS** or **GRP**, respectively, from the standard receive mode. Using the  ramp control after entering a particular selection mode in this manner is the secondary function of these keys.

10.10.1 System Selection

Several methods, some of which depend on programming, can be used to select a new system. These procedures are presumed to be starting from the normal receive display.

METHOD 1: If system selection is programmed to the SYSTEM/ CHANNEL knob, select a system by turning the SYSTEM/CHANNEL knob to the desired system position. The display registers the new system name on line 1. If the wrap option is OFF and the knob is moved to a position greater than the number of programmed systems, the highest programmed system will remain selected.

METHOD 2: If system selection is programmed as the primary function of the  ramp control, select a system by pressing up or down to scroll through the system list. The display registers the new system name on line 1.

METHOD 3: Press **SYS** to enter the system select mode and follow the selection mode rules detailed earlier. Use the  ramp control to scroll through the systems.

10.10.2 Channel Selection

Several methods, some of which depend on programming, can be used to select a new group or channel. These procedures assume starting from the normal receive display.

METHOD 1: If channel selection is programmed to the SYSTEM/CHANNEL knob, select a channel by turning the SYSTEM/CHANNEL knob to the desired channel. The display registers the new channel name on line 2. If the wrap option is OFF and the knob is moved to a position greater than the number of programmed channels, the highest programmed channel will remain selected.

METHOD 2: If channel selection is programmed as the primary function of the  ramp control, select a channel by pressing up or down, to scroll through the group list. The display registers the new group name on line 2.

METHOD 3: Press **GRP** to enter the channel select mode and follow the selection mode rules detailed earlier. Use the  ramp control to scroll through different groups.

10.11 LAST SYSTEM/CHANNEL RECALL

This feature, enabled through programming, allows the user to recall the last selected system/channel after an emergency or home function or system/channel key function. For example, if the Home button (pre-programmed) is pressed, the radio will go to the designated Home system or channel. If the Home button is pressed again, the radio returns to the previous system or channel. At this time, the user can toggle between the Home system or channel and the previous system/group or channel. The operation is the same for the SG1-SG5 buttons.

10.12 GROUP CALLS IN P25 MODE

10.12.1 Transmitting a Group Call

1. Select the desired P25 system.
2. Select the Talk Group/Conventional Channel. (Selected simultaneously using either the system/group/channel knob or the group key.)
3. Press and hold the PTT.
4. When a grant tone is received (if enabled through programming), speak into the microphone.
5. Release PTT and wait for response.

10.12.2 Receiving a Group Call

The radio will unmute according to the squelch mode defined in the radio personality (monitor, normal, selective).

1. Select the desired P25 system and Talk Group/Channel or turn scan on and make sure the desired channel is in the scan list.
2. When the radio receives a P25 call, the radio will unmute and the channel name will appear in the display.
3. Press the PTT button to respond.

10.13 INDIVIDUAL CALLS IN P25 MODE

10.13.1 Transmitting an Individual Call

1. Select the desired P25 system.
2. Select the radio unit to call (callee source ID) from the pre-programmed individual call list or enter the ID number on the radio keypad.
3. Press and hold the PTT.
4. When grant tone is received (if enabled through programming) speak into the microphone.
5. Release the PTT.

10.13.2 Receiving an Individual Call

The radio will unmute according to the squelch mode defined in the radio personality (monitor, normal, selective).

1. Select the desired P25 system and Talk Group/Channel or turn scan on and make sure the desired channel is in the scan list.
2. When the radio receives a P25 call, the radio will unmute and the ID of the transmitting radio will appear in the display.
3. Press the PTT button to respond.

Unanswered calls will appear in the Who Has Called (WHC) list.

10.14 EMERGENCY GROUP CALLS IN P25 MODE

NOTE

There is no method available for a system-wide Emergency clear. An emergency group call must be cleared on each individual radio.

10.14.1 Declaring an Emergency Group Call

1. Select the desired P25 system and Talk Group/Channel.
2. Press the red emergency button on the top of the radio. The radio will broadcast a short emergency transmission with the emergency bit set. "**TXEMER**" will appear in the display of the transmitting radio.
3. To send a voice message, press the PTT and speak into the microphone.
4. To clear an emergency from the transmitting radio, perform one of the following steps:
   a. Change systems.
   b. Change channels (if not prohibited by programming).
   c. Cycle power by turning radio off and then back on.
   d. Press the Clear and Emergency buttons simultaneously, providing the Clear Emergency option is enabled in the Supervisory Options in the personality.

10.14.2 Receiving an Emergency Group Call

1. Select the desired P25 System and Talk Group/Channel.
2. When the radio detects an incoming Emergency Group Call, the radio will sound an alert tone and "**RXEMER**" will appear in the display.
3. Voice or emergency transmissions will be heard at the receiving radio.
4. To clear an emergency from the receiving radio, perform one of the following steps:
   a. Change systems.
   b. Change channels (if not prohibited by programming).
   c. Cycle power by turning radio off and then back on.
   d. Press the Clear and Emergency buttons simultaneously, providing the Clear Emergency option is enabled in the Supervisory Options in the personality.

11 P25/EDACS/CONVENTIONAL COMMON OPERATION

11.1 DIGITAL VOICE OPERATION (PROVOICE)

11.1.1 Voice Modes

Each system (trunked or conventional) in the radio is programmed for no digital voice operation (analog only) or digital voice format ProVoice. ProVoice programmed systems have three (3) different voice modes: clear (analog), digital, and private. The voice modes are programmed on a per-group basis within each trunked system and on a per-channel basis within each conventional system. A radio must be equipped with the encrypt/decrypt option before it will operate in private mode.

Current ProVoice Conventional operation is for talk-around mode only.

Table 11-1: Transmit/Receive Mode Compatibility for ProVoice Operation

GROUP/CHANNEL PROGRAMMING (TRANSMIT)	CLEAR RECEIVE	DIGITAL RECEIVE	PRIVATE RECEIVE
CLEAR	Yes	No	No
DIGITAL	Yes	Yes	No
PRIVATE	Yes	No	Yes

11.1.2 Clear Modes

In Clear Mode, the radio transmits and receives only clear (analog) voice signals. These analog signals are non-digitized and non-encrypted. Clear Mode transmissions can easily be monitored by unauthorized persons. Groups or channels programmed for clear operation cannot transmit or receive unencrypted digital or private messages.

11.1.3 ProVoice Digital Mode

ProVoice digital mode allows the radio to transmit and receive digitized voice signals. These digital signals provide improved weak signal performance and they cannot be easily monitored with a standard receiver. Groups and channels programmed for ProVoice digital operation transmit only digital signals. Private calls cannot be received or transmitted when the radio is in ProVoice digital mode because the radio does not know the cryptographic key used.

Message trunked group calls and individual calls will be answered back in the mode they were received, assuming the call or hang time is still active. Individual, phone, all and emergency calls will be transmitted clear if digital mode is disabled or inoperative.

- If receiving an analog message trunked call, the radio will respond in analog mode during the hang time on the working channel.
- If receiving an analog I-Call, the radio will respond in analog mode during the hang time.

- When using the "WHC" feature to respond to an I-Call (after the hang time has expired), the call will be transmitted in the mode defined by the system mode as programmed for the current system if the ID being called is not in the I-Call list. If the ID is in the I-Call list, then the call will be transmitted as defined by the I-Call mode programmed in the list for that ID.

DTMF

The overdial and hot keypad features for transmitting DTMF tones are not available while in ProVoice Digital Mode.

ERROR Messages

If any of the following error messages are displayed, the radio was either programmed incorrectly or needs servicing:

DSP ERR **ERR=xxxx**	**DSP ERR**	**DIGV ERR**

Power Up Only

If the ProVoice circuit board is not responding, correctly, one of the following error messages will be displayed and the radio needs servicing:

HARDWARE **ERR= 3X**

3X will be a number between 30 and 38

11.1.4 ProVoice Private Mode

ProVoice private mode allows the radio to transmit encrypted messages and receive clear or private transmissions. The radio will transmit private if the group/channel is programmed for private operation and forced operation is pre-programmed.

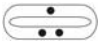
If the radio was pre-programmed for auto-select, the radio will transmit in the following modes;

- If Private mode is enabled, transmissions are always in private mode.
- If Private mode is disabled and a private call is received, the Reply transmission will be in Private mode if the transmission is made during the scan hangtime. If the reply transmission occurs after the scan hangtime, the transmission will be in Clear mode.

When operating on a group or channel programmed for private mode, all transmissions will be private transmissions and the radio will receive clear and private signals. If the selected group or channel is programmed for auto-select capability, the mode can be toggled between private and clear with the **OPT** or **OPTION** button. Radios programmed for forced private operation do not allow a change of the transmit mode; therefore, the **OPT** or **OPTION** has no effect.

11.1.4.1 Displaying the Currently Used Cryptographic Key Number

To display the cryptographic key currently in use for either the system encryption key (for special call such as individual, phone, all, agency or fleet) or the group/channel key (for group or conventional calls), perform the following procedure (Not Available on Conventional radios):

1. Press the **MENU** button.
2. Use  to select **DISP KEY**. Then press the **MENU** button.

3. Then use  to toggle between displaying the system key or the group/channel key.

Table 11-2: Current Cryptographic Key Display

ENCRYPTION KEY DISPLAYED	MESSAGE DISPLAYED
System	"SYS KEY" "KEY = 1"
Group/Channel	"GRP KEY"/"CHN KEY" "KEY = 2"/KEY = 2"

11.1.4.2 Key Zero

All cryptographic keys can be zeroed (erased from radio memory) by pressing the **CLR** button (System Model) or **CLEAR** (Scan Model) and while still pressing this button, press and hold the **OPT** button (System Model) or **OPTION** (Scan Model). Press both buttons for 2 seconds. A series of warning beeps will begin at the start of this 2-second period and then switch to a solid tone after the keys have been zeroed. The display will indicate **KEY ZERO**.

If the cryptographic key(s) are zeroed, one or more keys must be transferred from the Key Loader into the radio before private communications can continue. (Refer to Key Manager TQS3416 Administration and Software Release Notes for further information.)

11.1.5 Private Operation

11.1.5.1 Receiving an Encrypted Call

When receiving, the radio automatically switches between clear or private operation. If the transmission being received is an encrypted transmission, it will be decrypted, the receiver will unsquelch and the message will be heard in the speaker. The selected group or channel must be programmed for private operation and the correct cryptographic key must be loaded into the radio for this to occur.

11.1.5.2 Transmitting an Encrypted Call

1. Select the desired group or channel.
2. Place the radio in private mode by pressing the **OPT** button (System Model) or **OPTION** (Scan Model).

   If the last state of the radio was private mode, the private mode will be enabled on power up. In addition, the private mode will be enabled if forced operation has been programmed in the radio

   If a group or channel is not programmed for private mode operation, **PVT DIS** will be displayed if an attempt is made to enable private transmit mode. It is not possible to operate on this group/channel in private mode.

   If the radio is programmed for forced private transmit operation, **FRCD PVT** will be displayed if an attempt is made to disable private transmit mode. It is not possible to transmit on this group/channel in clear mode.

   If the radio does not have the correct encryption key loaded, **NO KEY #** will be displayed and the call will not be transmitted.

3. Continue with standard transmission procedures. A private mode access tone will be heard when the PTT button is pressed.

11.1.5.3 Scanned Group Calls

Receiving a scanned group call is the same as receiving a selected group call. During the scan hang time, if the radio was programmed for auto-select, it will transmit back in the same mode it received the call. For example, if a clear group is entered in the scan list, it will only receive clear calls. If the same group was available in private and entered in the scan list, it can receive clear and private calls, provided auto-select was programmed in the radio. The user can select transmitting on the scanned or selected group. If a group is entered in the scan list more than once in different modes (clear, digital, private), only the first occurrence of the group will be used.

11.1.6 Conventional Operation

11.1.6.1 Outside Address

The same outside address (works similar to Channel Guard operation) must be programmed in the transmitting and receiving radios when ProVoice digital or private operation is enabled. If address is not correct, the radios will not communicate.

11.1.6.2 Channel Guard

Channel Guard encode is transmitted on analog clear channels only. Channel Guard decode will operate on either a clear or private channel. The exception is when G-STAR signaling is used (see G-STAR paragraph).

11.1.6.3 G-STAR

When G-STAR is programmed on a private channel, the radio will transmit G-STAR in clear mode and then switch to private for the voice portion of the call. If G-STAR is sent with Channel Guard, then both are sent in clear mode and the radio switches to private mode. Emergency G-STAR data burst is transmitted in clear mode.

11.2 MACRO KEY OPERATION

Macro key operation permits the user to accomplish a series of keystrokes with a single "macro" keystroke. Up to ten (10) macro keys can be defined, each capable of executing up to twenty (20) keystrokes, to any pushbutton input (i.e., keypad keys, buttons, etc.). Each macro key can be pre-programmed to activate when pressed or when released.

A macro key can also be pre-programmed to change the keystroke sequence the next time the macro key is activated.

For detail operation and assignment of macro keys, contact your communications supervisor or administrator.

11.3 INTERCONNECT CALL (SYSTEM MODEL ONLY)

To send a manually entered telephone interconnect call:

1. Select a channel in the radio system that has telephone interconnect capability. The radio should be programmed for DTMF operation on this channel.
2. Press the **SCAN** button to toggle the keypad to the DTMF function (secondary function).
3. Press and hold PTT to key the transmitter. While holding the PTT, press the ***** or **#** key (as required by the radio system to obtain a telephone line). The radio will transmit the selected tone.
4. Release the PTT and listen for a dial tone. When the dial tone is heard, press and hold the PTT while entering the desired telephone number. As each digit is entered and transmitted, the DTMF side tone will be heard from the speaker, if programmed to do.
5. After all the digits have been entered and transmitted, release the PTT.
6. When the call is answered, press the PTT and speak directly into the microphone. Release the PTT immediately to receive a reply.
7. When the call is finished, press and hold PTT and then press the ***** or **#** key (as required by radio system) to terminate the interconnect call. Release the PTT.
8. To return to the primary function of the keypad, press **SCAN**. To continue with another interconnect call, repeat steps 3 through 8.

12 BASIC TROUBLESHOOTING

If the radio is not operating properly, check Table 12-1 for likely causes. For additional assistance, contact a qualified service technician.

Table 12-1: Basic Troubleshooting

SYMPTOM	CAUSE	SOLUTION
Radio will not turn on.	No power.	Test the connection to the vehicle power supply.
Radio will not turn off.	If in multiple control head configuration, one of the attached control heads is still powered up.	Power off all control heads.
Radio will not register or does not receive provisioning data.	Bad logon credentials.	Check logon and password.
No audio.	Speaker volume is muted.	Increase the volume level.
Poor audio.	Transmitting or receiving in a poor coverage area or subject to interference.	Check network connectivity and move to a better coverage area if possible. Report the area without coverage to an authorized network technician.
Poor display visibility.	Ambient Light Sensor is obstructed.	Clear the obstruction and give the sensor a clear path to ambient light.
No network connectivity icon in display.	Radio is out-of-range or cannot connect with the OpenSky network. Base station network connection has failed.	Return to coverage area if possible and wait for condition to clear. Use single-site trunking or switch to an alternate channel.
Radio will not transmit.	Radio may be out of coverage area or may be overheated.	Return to coverage area if possible. If overheated, let radio cool before retrying transmission. Report this failure to an authorized technician.
“Warning: No MRU” Message.	Radio control head is unable to communicate with mobile radio unit (radio transceiver).	Have the radio connections checked by an authorized technician.
Control head randomly changes display.	In multiple control head configurations, another user is operating the radio from another control head.	None
Encrypted calls cannot be made.	Not authorized to use.	Contact system administrator to request encryption privileges.
Screen displays: UNAUTH3	The radio network ID has not been added to the network.	Contact system administrator.
Screen displays: NOAUTHV	Radio authentication of the VNIC failed.	Contact system administrator.

SYMPTOM	CAUSE	SOLUTION
Screen displays: NOAUTHM	VNIC authentication of the radio failed.	Contact system administrator.
Screen displays: NOSUPRT	The voice authentication security policy is set to only allow authenticated users.	Contact system administrator.
Encrypted calls cannot be made.	User not logged in.	Log in (refer to Section 7.14.1).

13 TECHNICAL ASSISTANCE

The Technical Assistance Center's (TAC) resources are available to help with overall system operation, maintenance, upgrades and product support. TAC is the point of contact when answers are needed to technical questions.

Product specialists, with detailed knowledge of product operation, maintenance and repair provide technical support via a toll-free (in North American) telephone number. Support is also available through mail, fax and e-mail.

For more information about technical assistance services, contact your sales representative, or call the Technical Assistance Center at:

North America:	1-800-528-7711
International:	1-434-385-2400
Fax:	1-434-455-6712
E-mail:	tac@tycoelectronics.com

14 KEYPAD REMAPPING

If the keys have been remapped to provide new functions, fill in the following template for future reference.

Button	Function	Button	Function
Emergency		1	
Preset A		2	
Preset B		3	
Preset C		4	
Rocker •		5	
Rocker ••		6	
Rocker **+**		7	
Rocker **-**		8	
MENU		9	
OPT/OPTION		*	
CLR/CLEAR		0	
SCAN		#	

15 RADIO SETUP

RADIO TYPE:

FREQUENCY BAND:

OPERATOR'S NAME:

EMERGENCY GROUP:

SYSTEM NUMBER	SYSTEM NAME	TRK/CNV	GRP/CHN NUMBER	GRP/CHN NAME	USE

SYSTEM NUMBER	SYSTEM NAME	TRK/CNV	GRP/CHN NUMBER	GRP/CHN NAME	USE

SYSTEM NUMBER	SYSTEM NAME	TRK/CNV	GRP/CHN NUMBER	GRP/CHN NAME	USE

SYSTEM NUMBER	SYSTEM NAME	TRK/CNV	GRP/CHN NUMBER	GRP/CHN NAME	USE

16 WARRANTY

A. M/A-COM, Inc. (hereinafter "Seller") warrants to the original purchaser for use (hereinafter "Buyer") that Equipment manufactured by or for the Seller shall be free from defects in material and workmanship, and shall conform to its published specifications. With respect to all non-M/A-COM Equipment, Seller gives no warranty, and only the warranty, if any, given by the manufacturer shall apply. Rechargeable batteries are excluded from this warranty but are warranted under a separate Rechargeable Battery Warranty (ECR-7048).

B. Seller's obligations set forth in Paragraph C below shall apply only to failures to meet the above warranties occurring within the following periods of time from date of sale to the Buyer and are conditioned on Buyer's giving written notice to Seller within thirty (30) days of such occurrence:

1. for fuses and non-rechargeable batteries, operable on arrival only.
2. for parts and accessories (except as noted in B.1) sold by Seller's Service Parts Operation, ninety (90) days.
3. for PANTHER™ Series hand portable and mobile radios, two (2) years.
4. for all other equipment of Seller's manufacture, one (1) year.

C. If any Equipment fails to meet the foregoing warranties, Seller shall correct the failure at its option (i) by repairing any defective or damaged part or parts thereof, (ii) by making available at Seller's factory any necessary repaired or replacement parts, or (iii) by replacing the failed Equipment with equivalent new or refurbished Equipment. Any repaired or replacement part furnished hereunder shall be warranted for the remainder of the warranty period of the Equipment in which it is installed. Where such failure cannot be corrected by Seller's reasonable efforts, the parties will negotiate an equitable adjustment in price. Labor to perform warranty service will be provided at no charge during the warranty period only for the Equipment covered under Paragraph B.3 and B.4. To be eligible for no-charge labor, service must be performed at a M/A-COM factory, by an Authorized Service Center (ASC) or other Servicer approved for these purposes either at its place of business during normal business hours, for mobile or personal equipment, or at the Buyer's location, for fixed location equipment. Service on fixed location equipment more than thirty (30) miles from the Service Center or other approved Servicer's place of business will include a charge for transportation.

D. Seller's obligations under Paragraph C shall not apply to any Equipment, or part thereof, which (i) has been modified or otherwise altered other than pursuant to Seller's written instructions or written approval or, (ii) is normally consumed in operation or, (iii) has a normal life inherently shorter than the warranty periods specified in Paragraph B, or (iv) is not properly stored, installed, used, maintained or repaired, or, (v) has been subjected to any other kind of misuse or detrimental exposure, or has been involved in an accident.

E. The preceding paragraphs set forth the exclusive remedies for claims based upon defects in or nonconformity of the Equipment, whether the claim is in contract, warranty, tort (including negligence), strict liability or otherwise, and however instituted. Upon the expiration of the warranty period, all such liability shall terminate. The foregoing warranties are exclusive and in lieu of all other warranties, whether oral, written, expressed, implied or statutory. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES.

This warranty applies only within the United States.

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Preliminary

Installation Manual

MM-010046-001
Rev. p4, Aug/07

M7200
Digital Mobile Radio & Control Unit

Motorcycle Installation

Tyco Electronics
Our commitment. Your advantage.

MANUAL REVISION HISTORY

REV	DATE	REASON FOR CHANGE
-	Aug/07	Initial release.

M/A-COM Technical Publications would particularly appreciate feedback on any errors found in this document and suggestions on how the document could be improved. Submit your comments and suggestions to:

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or e-mail us at: techpubs@tycoelectronics.com
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ACKNOWLEDGEMENTS

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This product conforms to the European Union WEEE Directive 2002/96/EC. Do not dispose of this product in a public landfill. This product should be taken to a recycling center at the end of its life.

NOTICE

Repairs to this equipment should be made only by an authorized service technician or at a facility designated by the supplier. Any repairs, alterations, or substitutions of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

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TABLE OF CONTENTS

1 SAFETY SYMBOL CONVENTIONS

The following conventions are used throughout this manual to alert the user to general safety precautions that must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. M/A-COM, Inc. assumes no liability for the customer's failure to comply with these standards.

The WARNING symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING symbol until the conditions identified are fully understood or met.

The electrical hazard symbol indicates there is an electrical shock hazard present!

The **CAUTION** symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in damage to the equipment or severely degrade the equipment performance.

The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.

The **ESD** symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of **E**lectro-**S**tatic **D**ischarge. Proper precautions must be taken to prevent ESD when handling circuit modules.

2 RF ENERGY EXPOSURE INFORMATION

2.1 RF ENERGY EXPOSURE AWARENESS, CONTROL INFORMATION, AND OPERATION INSTRUCTIONS FOR FCC OCCUPATIONAL USE REQUIREMENTS

Before using your mobile two-way radio, read this important RF energy awareness and control information and operational instructions to ensure compliance with the FCC's RF exposure guidelines.

This radio is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC limits. This radio device is NOT authorized for general population, consumer, or any other use.

Changes or modifications not expressly approved by M/A-COM, Inc. could void the user's authority to operate the equipment.

This two-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses RF energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, electric power, sunlight, and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which, when used improperly, can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection. All two-way radios marketed in North America are designed, manufactured, and tested to ensure they meet government established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of two-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Please refer to the following websites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits.

http://www.fcc.gov/oet/rfsafety/rf-faqs.html

http://www.osha.gov./SLTC/radiofrequencyradiation/index.html

2.1.1 Federal Communications Commission Regulations

Your M/A-COM, Inc. M7200 mobile two-way radio is designed and tested to comply with the FCC RF energy exposure limits for mobile two-way radios before it can be marketed in the United States. When two-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a label directing users to specific user awareness information. Your M/A-COM, Inc. M7200 two-way radio has an RF exposure product label. Also, your M7200 Installation and Operator's Manuals include information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

2.2 COMPLIANCE WITH RF EXPOSURE STANDARDS

Your M/A-COM, Inc. M7200 mobile two-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to RF electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at duty factors of up to 50% talk-50% listen and is authorized by the FCC for occupational use. In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio antenna radiates measurable RF energy only while it is transmitting (talking), not when it is receiving (listening) or in standby mode.

Your M/A-COM, Inc. M7200 mobile two-way radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission (FCC), Code of Federal Regulations; 47 CFR §§ 2 sub-part J.
- American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992.
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999.

Radios intended for motorcycle installations are factory-configured to 25 watts or less. It is important that radios not intended for motorcycle installations are not substituted for motorcycle radio units.

CAUTION

Table 2-1 lists the recommended minimum lateral distance for a controlled environment and for unaware bystanders in an uncontrolled environment, from transmitting types of antennas (i.e., monopoles over a ground plane, or dipoles) at rated radio power for mobile radios installed on a motorcycle. Transmit only when unaware bystanders are at least the uncontrolled recommended minimum lateral distance away from the transmitting antenna.

NOTE

Although the M7200 mobile radio is a dual-band radio, motorcycle installations are limited to the 800 MHz band.

Table 2-1: Rated Power and Recommended Minimum Lateral Distance

MOBILE RADIO FREQUENCY SPLIT	ANTENNA PART NUMBER	RATED POWER OF VEHICLE-INSTALLED MOBILE TWO-WAY RADIO	RECOMMENDED SAFE MINIMUM LATERAL DISTANCE FROM TRANSMITTING ANTENNA	
			CONTROLLED	UNCONTROLLED
806-870 MHz	LE-OM806HDB KTNCDS	15W	20 cm	41cm

2.2.1 Mobile Antennas – Motorcycle Installation

NOTE

This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Install the radio's antenna (refer to Table 2-1 for frequencies and corresponding part numbers of recommended antennas) on the end of the motorcycle case farthest away from the driver. These mobile antenna installation guidelines are limited to motorcycles fit with the motorcycle radio case with integral antenna grounding plane. The antenna installation should additionally be in accordance with the following:

- The requirements of the antenna manufacturer/supplier included with the antenna.

- Instructions in the M7200 Radio and Control Unit Motorcycle Installation Manual, including minimum antenna cable lengths.
- The installation manual providing specific information of how to install the antennas to facilitate recommended operating distances to all potentially exposed persons.

Use only the M/A-COM approved/supplied antenna(s) or approved replacement antenna(s). Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations.

2.2.2 Approved Accessories

This radio has been tested and meets the FCC RF guidelines when used with the M/A-COM accessories supplied or designated for use with this product. Use of other accessories may not ensure compliance with the FCC's RF exposure guidelines, and may violate FCC regulations.

For a list of M/A-COM approved accessories refer to the product manuals, M/A-COM's Products and Services Catalog, or contact M/A-COM at 1-800-368-3277.

2.2.3 Contact Information

For additional information on exposure requirements or other information, contact M/A-COM, Inc. at 1-800-528-7711 or at http://www.macom-wireless.com.

3 OPERATION SAFETY RECOMMENDATIONS

3.1 TRANSMITTER HAZARDS

The operator of any mobile radio should be aware of certain hazards common to the operation of radio transmitters. A list of several possible hazards is given:

- **Explosive Atmospheres –** Just as it is dangerous to fuel a vehicle with the motor running, similar hazards exist when operating a mobile radio. Be sure to turn the radio off while fueling the motorcycle. Do not transport containers of fuel.

  Areas with potentially explosive atmosphere are often, but not always, clearly marked. Turn OFF your radio when in any area with a potentially explosive atmosphere. It is rare, but not impossible that the radio or its accessories could generate sparks.

- **Interference to Vehicular Electronics Systems –** Electronic fuel injection systems, electronic anti-skid braking systems, electronic cruise control systems, etc., are typical electronic systems that may malfunction due to the lack of protection from radio frequency energy present when transmitting. If the vehicle contains such equipment, consult the dealer and enlist their aid in determining the expected performance of electronic circuits when the radio is transmitting.

- **Electric Blasting Caps –** To prevent accidental detonation of electric blasting caps, **DO NOT** use two-way radios within 1000 feet of blasting operations. Always obey the "**Turn Off Two-Way Radios**" signs posted where electric blasting caps are being used. (OSHA Standard: 1926-900)

- **Liquefied Petroleum (LP) Gas Powered Vehicles –** Mobile radio installations in vehicles powered by liquefied petroleum gas with the LP gas container in the trunk or other sealed-off space within the interior of the vehicle must conform to the **N**ational **F**ire **P**rotection **A**ssociation standard **NFPA 58** requiring:

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

3.2 SAFE DRIVING RECOMMENDATIONS

(*Recommended by AAA*)

- Read the literature on the safe operation of the radio.
- Use both hands to steer and keep the microphone in its hanger whenever the vehicle is in motion.
- Place calls only when the vehicle is stopped.
- When talking from a moving vehicle is unavoidable, drive in the slower lane. Keep conversations brief.
- If a conversation requires taking notes or complex thought, stop the vehicle in a safe place and continue the call.
- Whenever using a mobile radio, exercise caution.

Figure 3-1: Typical M7200 Motorcycle Installation

4 GENERAL INFORMATION

This manual contains instructions for installing the M7200 mobile radio, M7200 control unit, and associated hardware on a motorcycle. The instructions in this manual are typical installation instructions, and are not intended to cover all makes and models of motorcycles.

Final installation of the radio equipment is left to the discretion of the radio installer.

To simplify installation and minimize difficulties, it is suggested that the installer read the entire manual prior to installation. Figure 3-1 shows a typical motorcycle installation.

M/A-COM, Inc. does not assume liability for possible degradation of the radio or motorcycle performance due to mounting procedures.

4.1 RELATED DOCUMENTATION

M7200 Digital Mobile Radio Operator's Manual MM23016

M7200 Digital Mobile Radio with Installation Manual MM-010019-001

M7200 Digital Mobile Radio Motorcycle Installation Manual
.....MM-010046-001

M7200 Mobile Radio Maintenance Manual
700/800 MHz..... MM20117

5 OPTIONS AND ACCESSORIES

Some of the options and accessories applicable to motorcycle installations are defined below in Table 5-1. **NOTE**: The M7200 mobile radio, control unit, accessory kits, and microphone are ordered separately and then modified for motorcycle applications. Applicable hardware is included with each option. Refer to M/A-COM's Products and Services Catalog for the full line of options and accessories.

Table 5-1: M7200 Motorcycle Mounted Option and Accessory Kits

OPTION	DESCRIPTION
ANTENNA	
LE-OM806HDBKTNCDS	Whip Antenna, Stranded Coax (700/ 800 MHz)
REMOTE MOUNT ACCESSORIES, MOTORCYCLE WITH CH721	
MAMV-NZN6Z FOR CH721	Includes motorcycle CAN cable, motorcycle power cable, microphone hanger kit, motorcycle radio mounting kit, motorcycle control unit mounting kit (includes special mic hanger), motorcycle radio case, motorcycle radio case bracket, antenna mounting bracket, 3 hardware kits, TX power turn down label, control unit weather covers, and motorcycle installation manual.

5.1 HARDWARE KITS

The typical motorcycle mount application requirements are shown in Figure 5-1 (radio, control unit, microphone, and antenna are all ordered separately). Hardware Kits 350A1396G1, G2, and G4 are shown in Figure 5-2, Figure 5-3, and Figure 5-4. Hardware kit 350A1396G1 is used to *factory-install* the radio mounting bracket and dual terminal block to the weather-resistant case. Hardware kits, 350A1396G1, G2, and G4, are used by the customer *in the field* to mount the case and control head to the motorcycle (and may require the optional Harley-Davidson® adapter bracket).

- MIL-STD weather-resistant locking M7200 radio case with integral antenna ground plane
- Motorcycle Case hardware kit
- Motorcycle Radio Mounting bracket and hardware
- Case/Antenna bracket
- Case/Antenna Mounting hardware kit
- Control Unit Mounting hardware kit and alternate mic hanger
- Case Adapter bracket (for Harley-Davidson motorcycles)
- Case Adapter Mount hardware kit
- MIL-STD weatherproof speaker
- Power Cable
- CAN Cable

Figure 5-1: Typical Motorcycle Kit

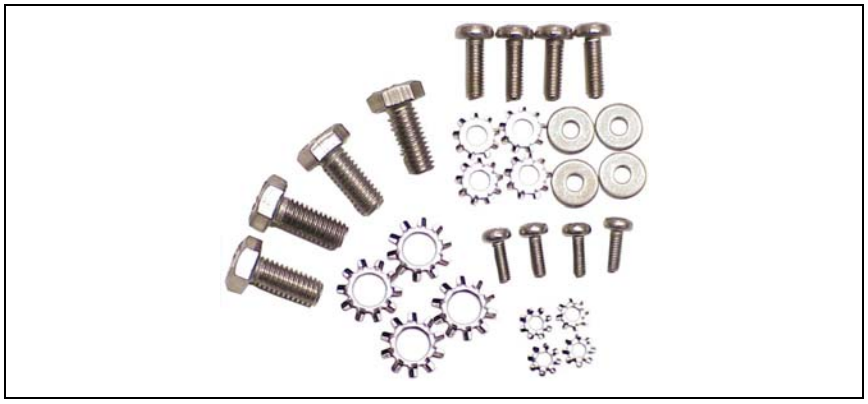


Figure 5-2: Hardware Application Kit 350A1396G1

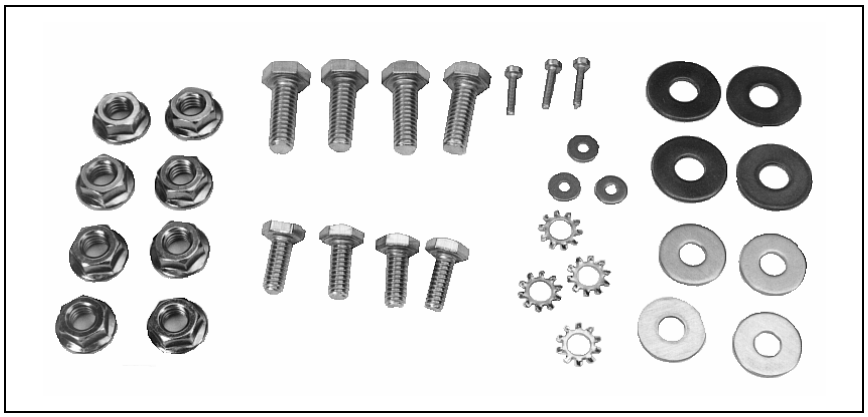


Figure 5-3: Case/ Antenna Assembly Hardware Kit 350A1396G2

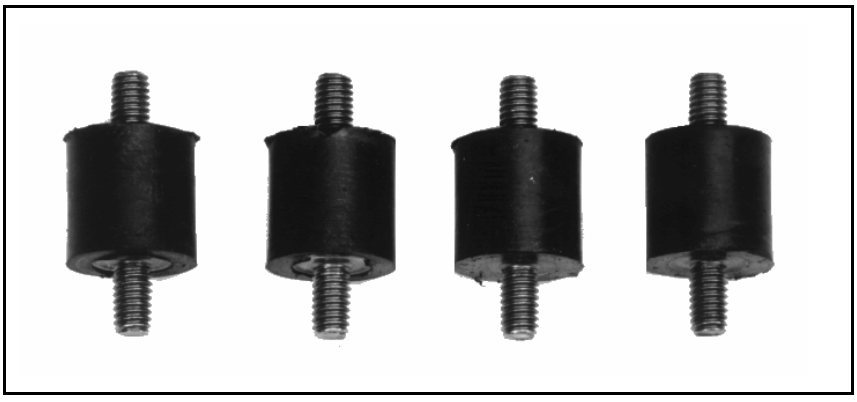


Figure 5-4: Motorcycle Adapter Mounting Kit 350A1396G4

Figure 5-5: Control Head Mounting Bracket Kit KT-008608

5.2 USER SUPPLIED EQUIPMENT

5.2.1 Motorcycle Bracket

The motorcycle's interface with the Motorcycle Radio Case and associated hardware. Refer to Ⓐ and Ⓒ in Figure 6-1 and Figure 6-2.

5.3 POWER CONSIDERATIONS

The motorcycle may be equipped with additional lights, light flashers, sirens, PA systems, etc. Therefore, consideration must be given to the total system current drain. It is recommended that the radios be set to not exceed the applicable rated RF power output and current drain shown in Table 5-2 for all M7200 motorcycle applications.

CAUTION

Do NOT use a M7200 mobile radio with power exceeding the power limits shown in Table 5-2 for motorcycle applications. To do so will result in damage to the motorcycle alternator, battery, and all circuits. Also, the possibility of interference is increased if the proper RF power level is not used. As a final note, RF power may not be set to exceed the maximum regulatory RF power specified by that country's regulatory agency.

5.3.1 RF Power Adjustments

For factory installed options, the maximum RF power levels are factory preset and should only require verification in the field. See Table 5-2.

Typical RF power tracking data settings are listed in the M7200 Mobile Radio Maintenance Manuals in the programming sections.

Table 5-2: RF Power versus Current Setting

M7200 MOBILE RF POWER (Standard Application)		M7200 MOBILE RF POWER (Motorcycle Application)		
RF PWR (Rated)	**CURRENT (Typical)**	**RF POWER (Rated)**	**RF POWER (Actual)**	**CURRENT (Typical)**
800 MHz (Repeater Input Band 806-825 MHz)				
15W	6A	15W	16W ± 0.5W	6A
800 MHz (Talkaround Band 851-870 MHz)				
15W	6A	15W	16W ± 0.5W	6A

6 INSTALLATION

Installation of the M7200 mobile radio and control unit consists of:

- Assembling and installing the weather resistant motorcycle case assembly, including the adapter bracket, case/antenna mounting bracket, and bottom case (previously assembled) to the existing interface bracket (user supplied) on the motorcycle.
- Installing the radio in the radio mounting bracket located inside the weather-resistant case
- Installing the control unit, microphone, and speaker
- Installing the antenna
- Routing the power and CAN cables
- Connecting all cables, including the power and CAN cables
- Performing an operational check

All mounting hardware consists of stainless steel screws, locknuts, nuts, and lockwashers to resist corrosion.

6.1 TOOLS REQUIRED

- Socket wrench set U.S./metric with 3" extender
- Open end wrench, adjustable
- Wire strippers
- TORX® BIT set, small metric
- Phillips Head Screwdriver

6.2 EQUIPMENT INSTALLATION

6.2.1 Weather Resistant Case Assembly and Installation

The motorcycle Weather Resistant Case Assembly may be installed on almost any motorcycle. Installation instructions provided here include information for the Harley-Davidson Dyna® and Road King® models as illustrated in Figure 6-1 and Figure 6-2. Refer to these diagrams during installation. Installation on other motorcycles is at the discretion of the installer.

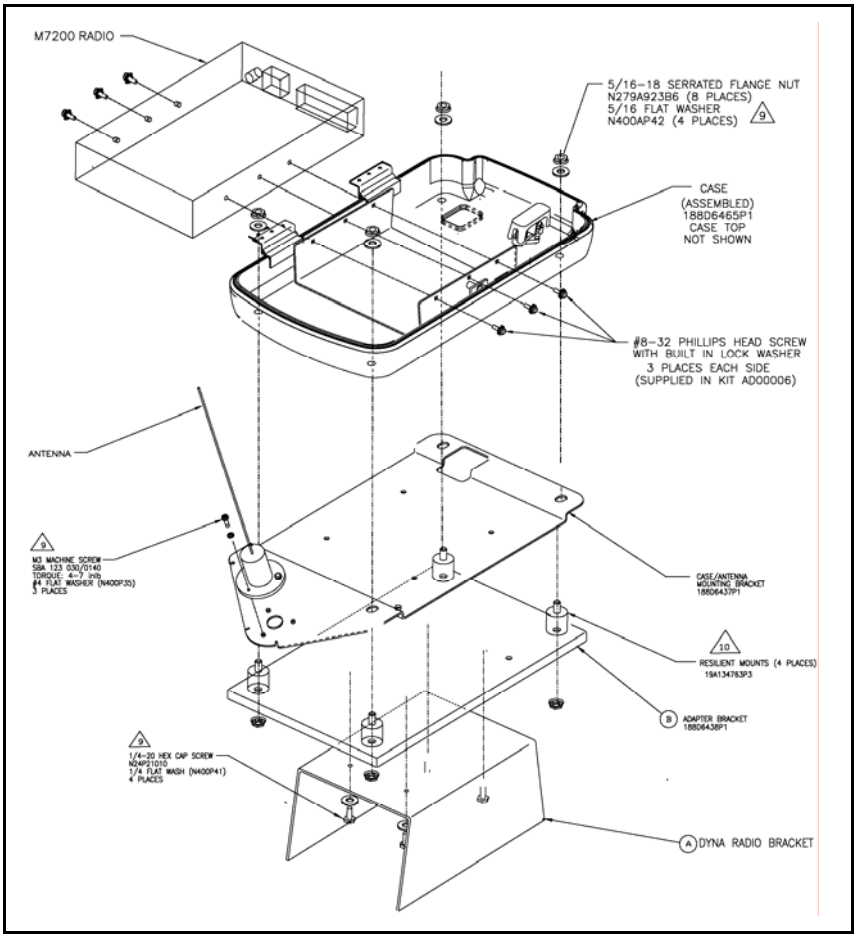


Figure 6-1: Radio Installation
(AA01-236405, Sh. 2a, Rev. -)

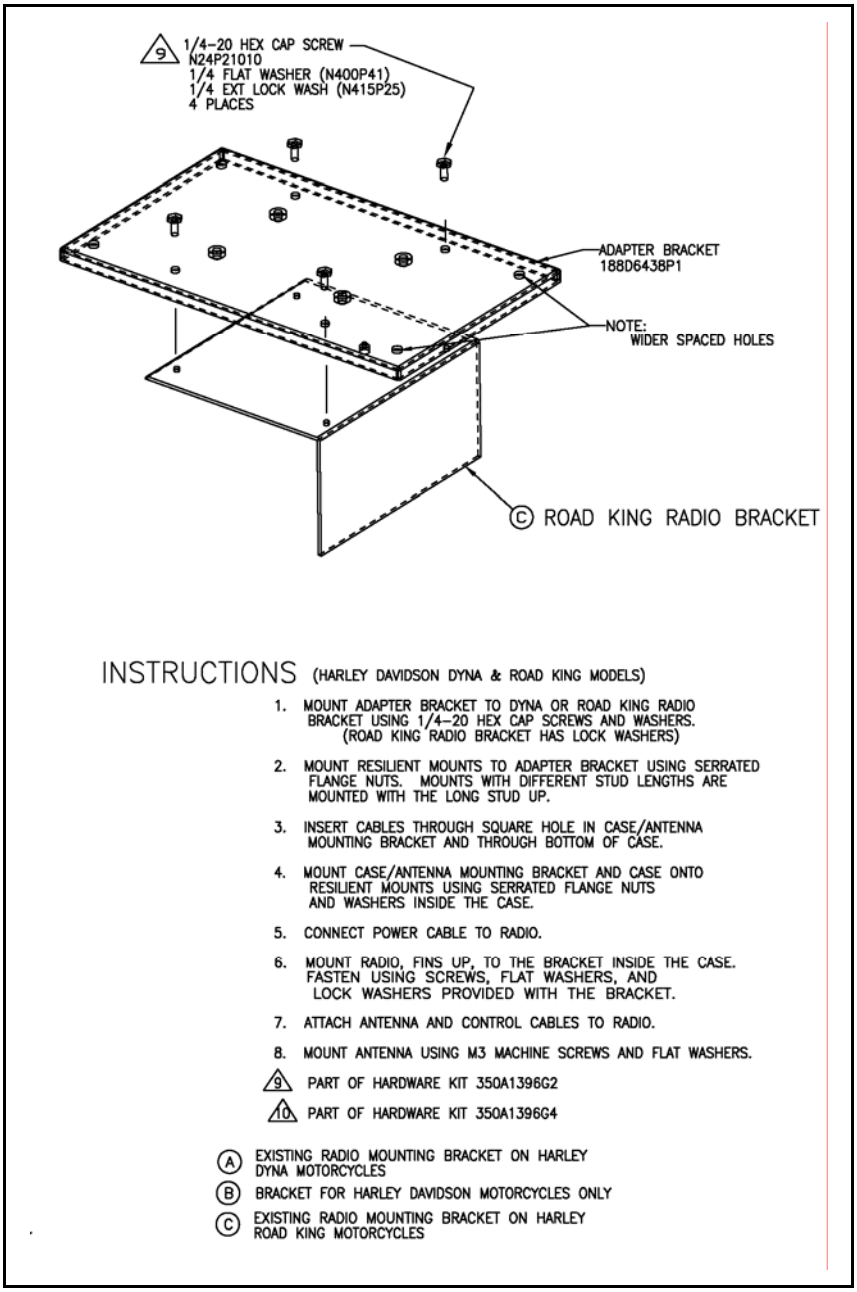


Figure 6-2: Radio Installation
(AA01-236405, Sh. 2b, Rev. -)

6.2.2 Harley-Davidson Installation

1. Unpack the weather resistant motorcycle case, remove the key taped to the top cover and open the case.
2. Refer to Figure 6-1 and Figure 6-2 and verify all components shown in the diagrams are available.
3. Mount the adapter bracket to the existing Dyna or Road King (interface) bracket on the motorcycle (user supplied) using the 1/4-20 x 5/8 screws provided.

The interface radio mounting bracket (user supplied) for the Dyna and Road King models are different and require a different mounting hole configuration. See Figure 6-1 and Figure 6-2.

4. Insert the power, CAN, and antenna cables through the square hole in the case/antenna mounting bracket and then through the bottom case assembly.
5. Mount the case mounting bracket and bottom case assembly onto the 4 resilient mounts using the serrated flange nuts and flat washers included inside the case. Refer to Figure 6-1, Figure 6-3.
6. Refer to Figure 6-5 and connect the power cable to the radio. (Refer to Cable Connections.)
7. Position the radio, top up (refer to Figure 6-4), rear of radio facing front of bike inside the bracket in the bottom case assembly. Lock in place using the Phillips head screws (AD00006 Kit). The radio mounting screws have lock washers installed.
8. Mount the antenna to the case/antenna mounting bracket using the M3 x 16 mm pan head screws provided. Refer to Figure 6-3.
9. Connect the antenna and CAN cable to the radio. (Refer to Antenna Installation.)

6.3 RADIO MOUNTING BRACKETS

Radio mounting brackets are not available from M/A-COM for all models of bikes. Should a special application arise for a custom-made radio mounting bracket, it must be made using 0.125" steel (minimum). When designing and mounting the bracket, corners/edges should be rounded to the maximum extent possible.

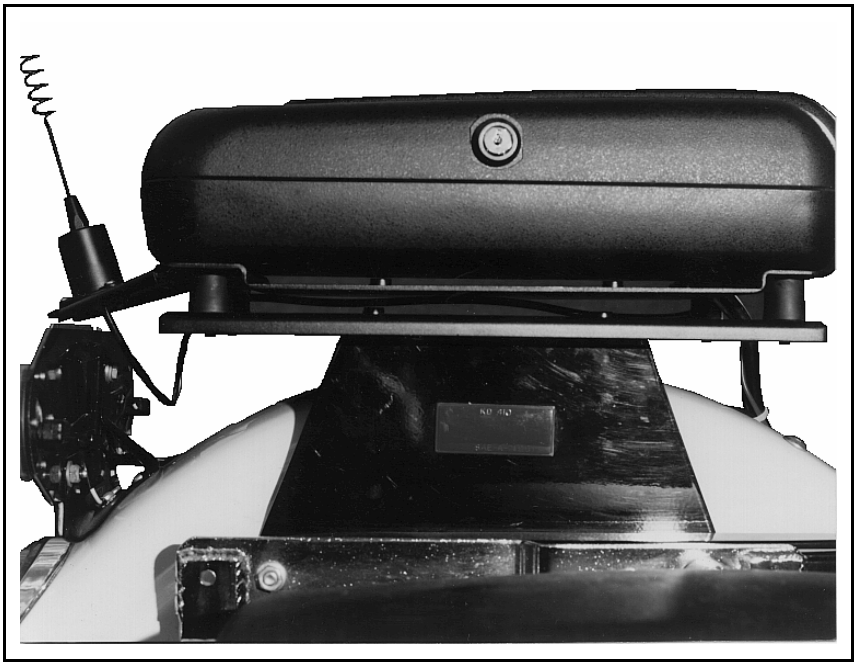


Figure 6-3: Case Mounting Bracket and Case Assembly

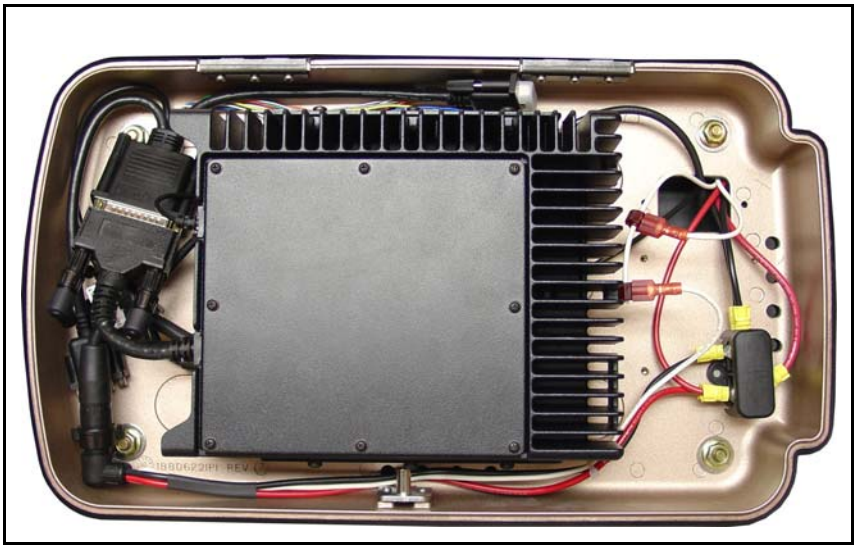


Figure 6-4: Radio Connections (shown with I/O cable installed) for CH721 Installations

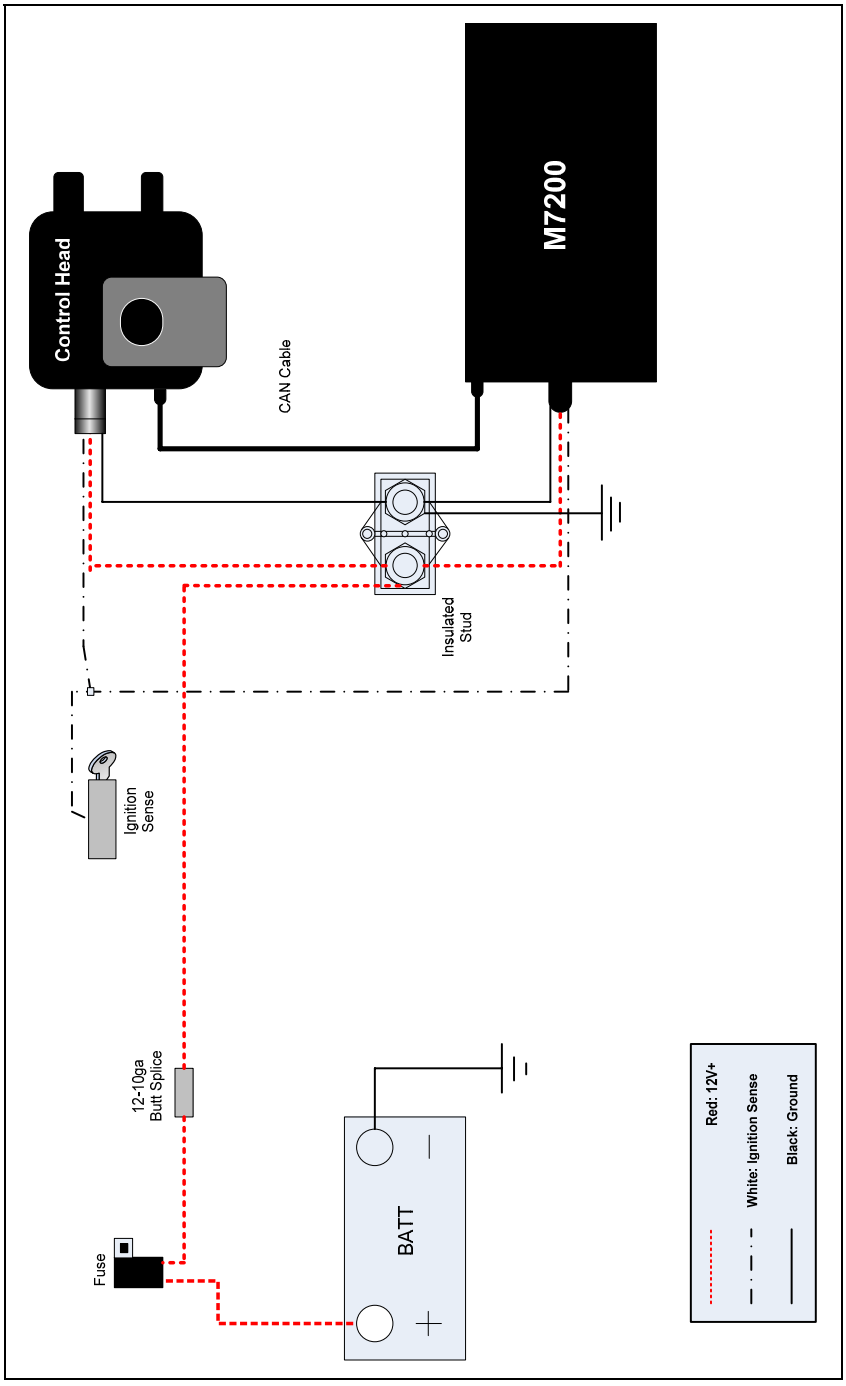


Figure 6-5: Cable and Wire Connections (CH721 Installs)

7 CONTROL UNIT MOUNTING

Mount the control unit within convenient reach of the operator, and where it will not interfere with the safe operation of the motorcycle. Figure 7-1 shows a typical installation of the control unit and microphone.

Due to the large number of different makes and models of motorcycles, it is up to the installer to decide how to mount the control unit and optional equipment. Mounting brackets for all makes and models are not available from the factory, making it necessary to obtain a custom made bracket.

When designing and mounting the control unit bracket, the following guidelines should be considered.

- The installation must NOT interfere with steering or operation of the motorcycle.
- Mounting locations must NOT interfere with the driver or with instrument visibility.
- The installation should provide easy access to the radio operating controls.
- Rounded corners/edges should be employed to the maximum extent possible.

CAUTION

Be careful to avoid damaging some vital part of the motorcycle if it becomes necessary to drill mounting holes. Also, always check to see how far the mounting screws will extend below the mounting surface before installing. Caution must be exercised to not drill through the gasoline tank.

Figure 7-1: Typical Control Unit Installation (CH721 shown)

7.1 CONTROL UNIT AND MIC HANGER INSTALLATION

Refer to Figure 7-2 for a detailed mechanical drawing of the control unit and microphone mounting assembly. For some models, an additional adapter bracket may be required.

1. Using the hardware supplied, mount the control unit bracket to the motorcycle.

2. Attach the weatherproof covers, FM-104859-001 and FM-104859-002. Torque the cover screws to 3.5 in.-lbs.

NOTE

A special spacer may be required between the control unit bracket and the motorcycle to raise the level of the control unit bracket. This spacer, if needed, must be constructed locally.

3. Mount the control unit to the mounting bracket. Mount the mic hanger in a location that does not interfere with the safe operation of the motorcycle.

After installing the control unit, do not make any cable connections until all cables have been run and secured. Speaker and CAN connectors are shown on the Interconnection Diagrams listed in the Table of Contents.

7.2 SPEAKER MOUNTING

Mount the speaker where the operator can hear it, and where it does not interfere with the safe operation of the motorcycle. On some motorcycles, the speaker can be attached to the windshield bracket using existing bolts to secure the speaker mounting bracket (see Figure 7-2).

Figure 7-2: Typical Speaker Mounting

7.3 CABLE ROUTING

7.3.1 Power and CAN Cables

Cable routing consists of planning and routing the cable runs between the radio, control unit, and battery. The cables should be routed away from exhaust pipes, mufflers, and moving parts, or where mechanical damage may result. Secure all cables with cable ties to provide a clean installation.

The power and CAN cables exit the radio case assembly through the square hole in the front of the box and are routed to the area beneath the saddle. The fused power cables from the radio terminate here and are connected to the

battery. The CAN cable and CH721 control unit power cable are routed through the triangular frame assembly to the rear of the control unit.

7.3.2 Typical Harley-Davidson Installation

1. Disconnect gas line from tank and drain gas into an approved container.
2. Remove cowling, gas tank, and fairing, if required, to gain access to the triangular frame assembly, beneath the gas tank, to permit cable routing.
3. Push saddle support springs forward to release the saddle and tilt it forward to gain access to the area beneath the saddle.

NOTE

The power cable is designed for negative ground systems only. The power cable consists of three separate cables: RED (positive), BLACK (negative), and WHITE (ignition).

4. Pass the power and control cables through the square hole in the bottom of the radio case assembly to the area beneath the saddle.
5. Refer to Figure 7-3 and route the cables through the center of the triangular frame assembly to the area at the rear of the control unit. The cable may be routed along side existing cables and secured to them with cable ties.

NOTE

It may be necessary to notch a portion of the cowling at the control unit end and at the saddle area to provide entrance and exit holes for the cable. The entrance and exit cutaway holes are required to permit the cowling to be remounted flush to the gas tank.

6. Route the CAN cable to the rear of the control unit and make the connection to the right rear of the control unit as shown in Figure 7-4. Any excess cable will reside beneath the saddle area.
7. Route the power cable to the rear of the control unit and make the connection to the right rear of the control unit as shown in Figure 7-4. Any excess cable will reside beneath the saddle area.
8. Re-examine cable routing and be sure that all cables are neatly routed and secured with cable ties.
9. Install a cable clamp on saddle mounting bracket (left side) and secure the power and CAN cables from the radio case assembly.
10. Route speaker leads from the control unit underneath the handlebar to the rear of the instrument panel assembly in the vicinity of the speaker.

Secure to headlight cabling with cable ties. Excess cable should be bundled and secured with cable ties behind the instrument panel assembly.

11. Refer to Figure 6-5 for power wiring diagram.
12. Connect negative power lead to the battery negative (-) terminal.
13. Connect positive power lead to the battery positive (+) terminal.
14. Connect white to ignition sense. Refer to Figure 6-4 and Figure 6-5.
15. Reinstall gas tank, cowling, and secure saddle.
16. Verify all electrical connections: radio, control unit, antenna, option switch, speaker, and battery.
17. Close and lock radio case assembly.

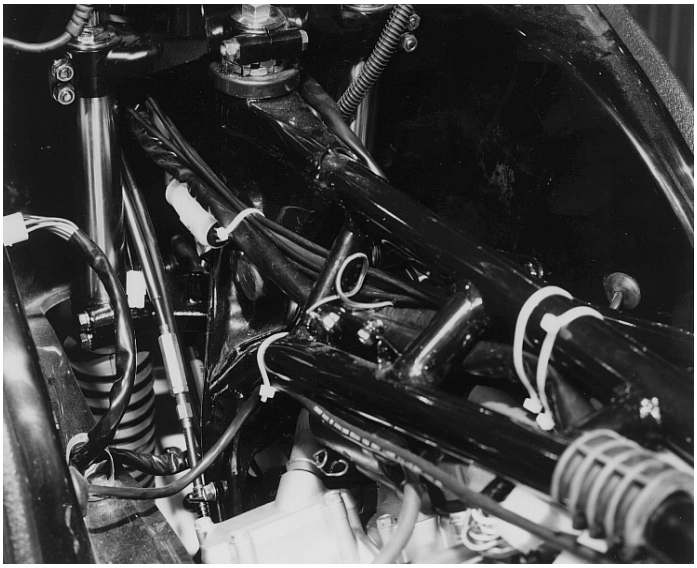


Figure 7-3: Triangular Frame Assembly

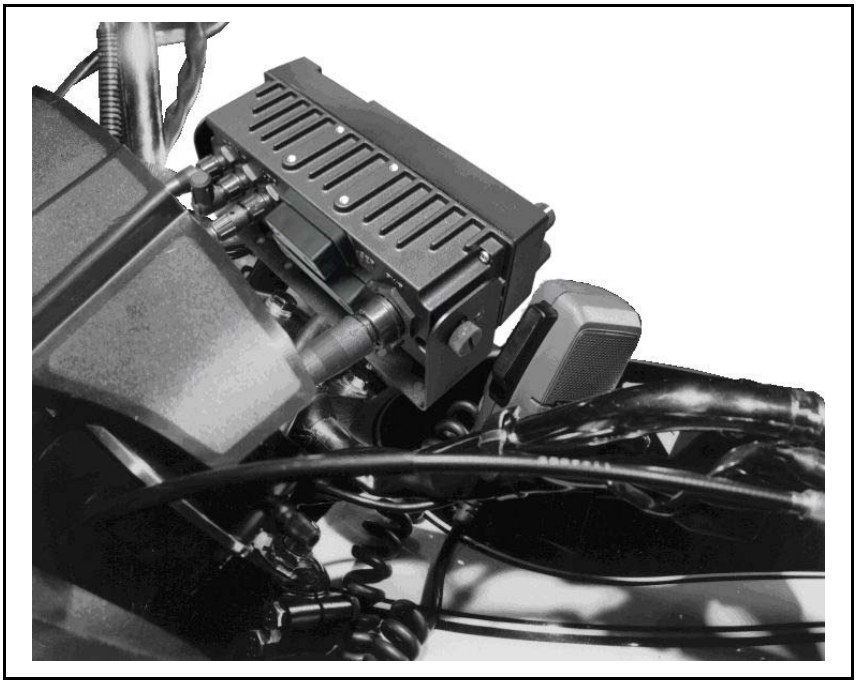


Figure 7-4: Control Unit Connections (CH721 shown)

7.3.2.1 For Motorcycle Models Equipped with Gas Tank Fairing

The cable may be routed from the saddle area, under the fairing, around the left side of the gas tank filler pipe, and up to the area of the control unit. The fairing may have to be notched to provide entrance and exit space. Run the control cable as directed in Steps 1 through 3.

1. Remove all the screws securing the fairing. Next, unscrew and remove the gas tank cap and lift off the fairing. Replace the gas cap immediately.

Always replace the gas cap as soon as the fairing is replaced/removed. This is necessary to reduce the possibility of an explosion as well as to prevent drill shavings or other debris from getting into the gas tank.

2. Run the cables from the saddle area up the left side of the gas tank to the area of the control unit.

NOTE

It may be necessary to notch a portion of the fairing at the control unit end and at the saddle area to provide entrance and exit holes for the cable. The entrance and exit cutaway holes are required to permit the fairing to be remounted flush to the gas tank.

3. Before replacing the fairing, the CAN cable may be run under the fairing also. Replace the fairing by removing the gas cap, repositioning the fairing, then replacing the gas cap and the screws that secure the fairing.

7.3.2.2 For Motorcycles Not Equipped with a Gas Tank Fairing

After making power connections, run the CAN cables up the left side of the motorcycle to the control unit and secure the cables with the cable ties. **Note:** All cables connect to the back of the control unit.

7.4 CABLE CONNECTIONS

Cable connections consist of connecting the power cables (individual red + ,black -, and white), the radio CAN cable, and the antenna cable. Verify that all cables have been connected and are secure.

7.4.1 Power Cable

As shipped from the factory, the power cable (MAMR050075-N1210). The power cable supplies power from the battery to the radio.

1. The Power cable includes sense (white) wire.
2. Route the cables to the battery and then connect the black (-) and the red lead (+) to the battery terminals (connect the sense according to Figure 6-5).
3. Install the Fuse Kits (included in MAMRO50068 TRNK1 and MAMRO50068 CNTR1).
4. The power cables can be cut to length if needed.

7.4.2 CAN Cable

The CAN cable is routed between the control unit and the motorcycle radio case.

The control head connections include the microphone, speaker, and the CAN cable. The speaker connection is on the rear control center head.

Plug the CAN cable into the rear receptacle of the control unit. Plug one CAN terminator (MACDOS0010) into the unused CAN connector on the control unit.

7.5 ANTENNA INSTALLATION

7.5.1 General

The M/A-COM M7200 motorcycle installation includes use of the antennas listed in

Although the M7200 mobile radio is a dual-band radio, motorcycle installations are limited to the 800 MHz band.

Table 2-1 and Table 5-1. These antennas are end-fed high-impedance antennas that provide the proper VSWR and radiation pattern without the use of a ground plane. Typical antenna gain without a ground plane is 0 dBd.

The case/antenna mounting plate (188D6437P1) was designed to fit the hole mounting pattern for all these antenna mounts.

Since the antennas are high impedance, voltage fed antennas, the length of the coaxial cable from the antennas to the M7200 RF port is critical. It cannot be just any arbitrary length. To prevent possible extraneous radiation, RFI feedback from the antenna to the radio, high VSWR, or antenna ground currents, select an antenna coaxial cable length that is close to a multiple of an odd quarter-wavelength. (See Section 7.5.1.2)

7.5.1.1 Thru-line Wattmeter Use

To properly use a thru-line wattmeter, one of the following two conditions must be met:

- If the wattmeter is installed right at the M7200 RF port and the odd multiple of a quarter-wavelength of coax to the antenna is used, correct readings will result. Any other length of coax will result in improper readings.
- If a length of coax equal to a multiple of a half-wave length is installed between the M7200 RF port and the thru-line wattmeter and an odd multiple of a quarter-wavelength of coax to the antenna is used, correct readings will also result. Any other length of coax will result in improper readings.

7.5.1.2 Cable Length Calculations

To calculate the proper cable length of the antenna coaxial cable, proceed as follows:

1. Determine the center frequency of the majority of programmed transmit channel frequencies.

2. Use the formula: $\frac{1}{4}\lambda \text{ in} = \frac{2805}{F(MHz)}$

Example 1: Assume the customer has an 800 MHz M7200 with most of the transmit frequencies between 816-821 MHz. Therefore, center frequency is 818.5 MHz. Applying the above formula results in:

$\frac{1}{4}\lambda \text{ in} = \frac{2805}{818.5} = 3.43$ inches

$\frac{1}{2}\lambda$ wavelength (in inches)= 6.85 inches

The cable length should be 3.43 + n x 6.85 inches. Since the installer will need a length of the coax from the antenna to the radio to be at least 36 inches long to physically connect the antenna to the radio, he must calculate a length of coax that will meet the odd quarter-wavelength requirement and be greater than 32 inches.

Choose n=5. Coaxial cable length is 3.43 + 5 x 6.85= 37.68inches.

Example 2: Assume the center frequency is 155 MHz. Applying the formula: $\frac{1}{4}\lambda$ = 18.10 inches; ½ wavelength = 36.19 inches; n=1.

Coaxial cable length is 18.10 + 1 x 36.19= 54.29 inches.

7.5.2 Typical Motorcycle Mount Antenna Installation

It is important to refer to the minimum lateral distance recommendations when installing your antenna (see

Although the M7200 mobile radio is a dual-band radio, motorcycle installations are limited to the 800 MHz band.

Table 2-1). The minimum lateral distances are calculated using a 50% duty cycle.

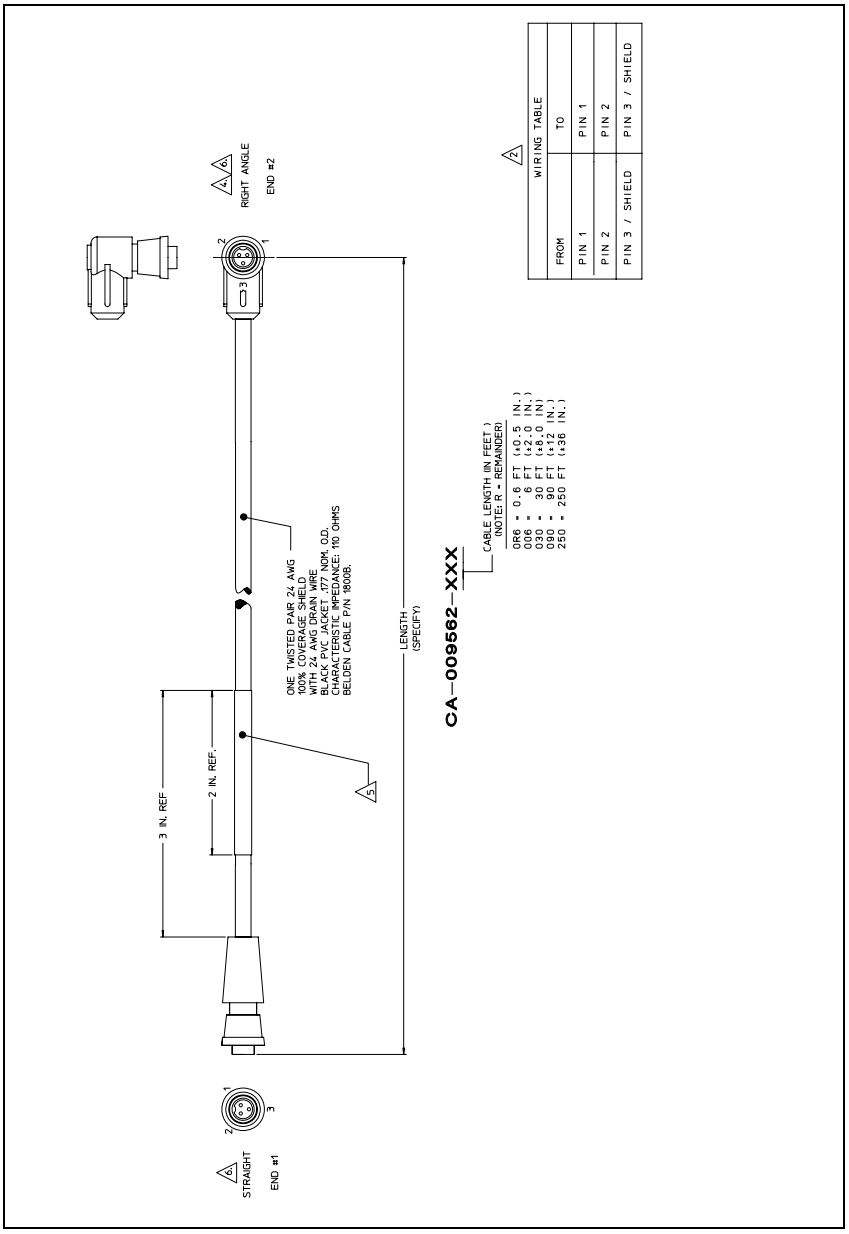
1. After the proper length of coax cable has been calculated, cut the coax cable so that when the TNC crimp style connector is installed the overall length will equal the calculated length.

2. Route the assembled proper length coax from the antenna, under the antenna bracket, and into the weather-resistant case.
3. Connect the antenna cable to the RF port on the M7200 radio.

See Section 2, RF ENERGY EXPOSURE INFORMATION, at the beginning of this manual for further information regarding Maximum Permissible Exposure (MPE) limits set by the FCC.

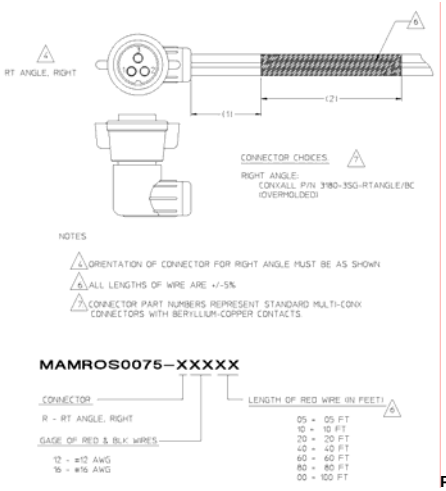
8 FINAL CHECKS AND CONNECTIONS

After the weather resistant case is installed, all cables run, and the radio, control unit, speaker, and microphone installed, refer to the interconnection diagrams and verify that all connections have been made and the equipment is properly grounded. Make a final check of all cables to make sure they are properly connected and dressed away from all moving parts and exhaust pipes, and secured with cable ties. Then recheck all electrical connections and radio mounting hardware.

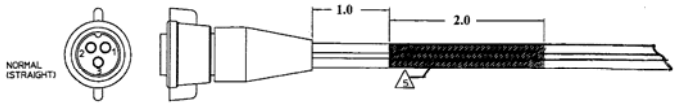


CAN Cable

(CA-009562-030)



Power Cable, Right Angle
(MAMROS0075-R1210, Rev. A)



NOTES:

4. **CONNECTOR:** STRAIGHT:
CONXALL P/N 3180-3SG-3XX/BC
(OVERMOLDED)

6. ALL LENGTHS OF WIRE ARE +/-5% unless otherwise specified

7. The following items (A, B, C and D) are to be packaged in a plastic bag and attached to cable assembly:

A) The following to be placed unassembled in an individual small plastic bag:
Quantity = 1 Fuse holder: BUSSMAN HFB
Quantity = 1 Fuse: 5 AMP BUSSMAN AGC5 or equivalent

B) The following to be placed unassembled in an individual small plastic bag:
Quantity = 1 Fuse holder: BUSSMAN HFB
Quantity = 1 Fuse: 3 AMP BUSSMAN AGC3 or equivalent

C) Quantity = 2 RING TERMINAL: TYCO (AMP) PART NUMBER 322242

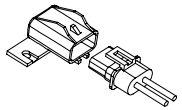
D) Quantity = 1 SPADE TERMINAL: TYCO (AMP) PART NUMBER 60998-1

Power Cable, Straight
(CA-012616-001, Rev. A)

Fuse Kit

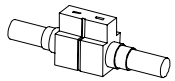
(MAMROS0068-TRNK1, Rev. A or MAMROS0068-CTRL1, Rev. A)

ITEM 1
ATC FUSE HOLDER



CONSISTS OF THE FOLLOWING
DELPHI-PACKARD COMPONENTS:
12020341 BODY
12077383 BODY SEAL
12033731 CAP
12176854 #10 AWG TERMINAL (QTY. 2)
12040972 CABLE SEAL
WIRE, UL-1015, PVC TYPE,
#10 AWG, RED, 8 IN. ±.5 IN. (QTY. 2)
REF: WAYTEK WIRE P/N 46033-29053

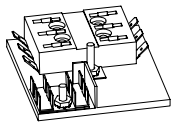
ITEM 2
ATM FUSE HOLDER



REF: LITTLEFUSE P/N 153002
WAYTEK WIRE P/N 46036

IN-LINE EASY-CRIMP FOR
#16-20 AWG

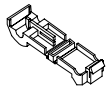
ITEM 3
ATC FUSE PANEL



2. REF: BUSSMANN P/N 15600-06-21

SIX CIRCUIT FUSE PANEL WITH
GROUND TERMINAL BASE

ITEM 4
T-TAP DISCONNECT



#22-18 AWG, RED
REF: 3M P/N 951X OR
WAYTEK WIRE P/N 30572

#18-14 AWG, BLUE
REF: 3M P/N 952X OR
WAYTEK WIRE P/N 31572

	•VTAC	•TRNK2	•TRNK1	•DASH2	•DASH1	•CTRL1	ITEM NO.	NOMENCLATURE/DESCRIPTION
	QTY REQ'D							PARTS LIST
	1	1	1	1	1	1	17	MNG18BCMK MOIST-RESIST BUTT SPLICE, #22-18 AWG (3M OR EQUIV)
	2	2	2	3	2	2	16	MNG10BCMK MOIST-RESIST BUTT SPLICE, 12-10 AWG (3M OR EQUIV)
	2	2	2	-	-	-	15	322455 RING TERMINAL, #10 STUD (AMP OR EQUIV)
	5	5	5	2	2	2	14	322242 RING TERMINAL, Ø.390 (AMP OR EQUIV)
	1	-	-	1	1	1	13	MTI14-250L FULL-INSUL. CRIMP TAB #16-14 AWG, .250" (3M OR EQUIV)
	6	4	2	-	-	-	12	4-520448-2 FULL-INSUL. CRIMP RECEPT. #12 AWG, .250"(AMP OR EQUIV)
	20	20	20	-	-	-	11	WIRE, UL-1015 PVC, #10 AWG, RED (QTY IN FEET)
	1	1	1	-	-	-	10	WIRE, UL-1015 PVC, #10 AWG, BLACK (QTY IN FEET)
	1	1	1	-	-	-	9	ATC-30, BLADE TYPE FUSE, 30A (BUSSMAN OR EQUIV)
	2	1	1	1	1	-	8	ATC-15, BLADE TYPE FUSE, 15A (BUSSMAN OR EQUIV)
	1	1	-	1	-	1	7	ATC-5, BLADE TYPE FUSE, 5A (BUSSMAN OR EQUIV)
	1	-	-	1	1	1	6	ATM-2, MINI-BLADE TYPE FUSE, 2A (BUSSMAN OR EQUIV)
	1	-	-	1	1	1	5	T-TAP DISCONNECT, #18-14 AWG (SEE DETAIL)
	1	-	-	1	1	1	4	T-TAP DISCONNECT, #22-18 AWG (SEE DETAIL)
	1	1	1	-	-	-	3	ATC FUSE HOLDER (SEE DETAIL)
	1	-	-	1	1	1	2	ATM FUSE HOLDER (SEE DETAIL)
	1	1	1	2	1	1	1	ATC FUSE HOLDER (SEE DETAIL)

PARTS LISTS

Option # MAMV-NZN6Z: M7200 (with CH-721) Motorcycle Kit

PART NUMBER	DESCRIPTION
188D6437P1	Case/Antenna Bracket
188D6438P1	Case Adapter Bracket
188D6464P1	Radio Mount Case (Black)
LS102824V10	OpenSky® 4 Ohm Mobile Speaker
350A1396G1	Motorcycle Case Hardware Kit
350A1396G2	Case/ Antenna Mount Hardware Kit
AD00006	SEMS 8-32 PAN HD Screw, Package of 4
350A1396G4	Case Adapter Mount Hardware Kit
KT-009992	M-803/ M7200 Motorcycle Application Kit
1000022683	Motorcycle Kit Bracket
MAMROS0075-R1210	#12AWG, 10 feet, Right Angle DC Power Cable
CA-012616-001	#12AWG, 10 feet, Straight DC Power Cable
MACDOS0010	3-Pin CAN Terminator Load
MAMROS0068-CTRL1	CH-103 Fuse Kit
MAMROS0068-TRNK1	M-803 Half Duplex Remote Mount Fuse Kit
KT-008608	CH721 Control Unit Mounting Bracket Kit
CA-009562-030	30 ft. CAN Cable Assembly
FM-104859-002	CH721 Accessory Connector Waterproof Cover
FM-104859-001	CH721 Serial Connector Waterproof Cover
188D6556G1	Alternate Microphone Hanger
MAMROS0034-NN006	CH-103, 6 inch, Straight Speaker Cable Assembly

Motorcycle Radio Mount Case and Hardware

PART NO.	DESCRIPTION
Motorcycle Radio Case – 188D6464P1	
188D6215P1	Case Top
188D6221P1	Case Bottom
19B804433P1	Hinge (top & bottom)
350A1341P1	Gasket
19B804263P1	Catch Assembly
EMKA 1048-U14	Lock Assembly (lock, tumbler, mounting nut, bolt and key)
19B804711P1	Lock Stop
EMKA 1109-SU10	Key; unmolded
EMKA 1108-U35 or 19B804717P2	Key
19B804715P2	Friction Washer
19B804429P2	Hooked Cam
SBA 123 030/0060	Cap screw (used to secure hinge)
19A149819P1	Thread Locker (Loctite® 425)
19A115204P1	Cam Lubricant (Lubriplate® 130A)
344A1396G1	Motorcycle Case Hardware Kit
L14BP15014	Screw, Hex Head, Mach (Qty. 4)

Motorcycle Radio Case Adapter Bracket Mounting Kit

PART NO.	DESCRIPTION
188D6438P1	Bracket, Case Adapter
Case Adapter Bracket Mounting Hardware Kit 350A1396G4	
19A134763P3	Mount, Rubber

Motorcycle Case Hardware Kit 350A1396G1

PART NO.	DESCRIPTION
N415P25	Washer, Lock (Qty. 4)
N400P35	Washer, Flat (Qty. 4)
SBA123030/0080	Screw, SS (Qty. 4)
SBA123040/0120	Screw, Pan Head, Torx SS (Qty. 4)
N415P11	Washer, Metal, Lock (Qty. 4)
N415P16	Washer, Lock, SS (Qty. 4)
L14BP15014	Screw, Hex Head, Mach (Qty. 4)

9 WARRANTY

A. M/A-COM, Inc. (hereinafter "Seller") warrants to the original purchaser for use (hereinafter "Buyer") that Equipment manufactured by or for the Seller shall be free from defects in material and workmanship, and shall conform to its published specifications. With respect to all non-M/A-COM Equipment, Seller gives no warranty, and only the warranty, if any, given by the manufacturer shall apply. Rechargeable batteries are excluded from this warranty but are warranted under a separate Rechargeable Battery Warranty (ECR-7048).

B. Seller's obligations set forth in Paragraph C below shall apply only to failures to meet the above warranties occurring within the following periods of time from date of sale to the Buyer and are conditioned on Buyer's giving written notice to Seller within thirty (30) days of such occurrence:

1. for fuses and non-rechargeable batteries, operable on arrival only.
2. for parts and accessories (except as noted in B.1) sold by Seller's Service Parts Operation, ninety (90) days.
3. for PANTHER™ Series handportable and mobile radios, two (2) years.
4. for all other equipment of Seller's manufacture, one (1) year.

C. If any Equipment fails to meet the foregoing warranties, Seller shall correct the failure at its option (i) by repairing any defective or damaged part or parts thereof, (ii) by making available at Seller's factory any necessary repaired or replacement parts, or (iii) by replacing the failed Equipment with equivalent new or refurbished Equipment. Any repaired or replacement part furnished hereunder shall be warranted for the remainder of the warranty period of the Equipment in which it is installed. Where such failure cannot be corrected by Seller's reasonable efforts, the parties will negotiate an equitable adjustment in price. Labor to perform warranty service will be provided at no charge during the warranty period only for the Equipment covered under Paragraph B.3 and B.4. To be eligible for no-charge labor, service must be performed at a M/A-COM factory, by an Authorized Service Center (ASC) or other Servicer approved for these purposes either at its place of business during normal business hours, for mobile or personal equipment, or at the Buyer's location, for fixed location equipment. Service on fixed location equipment more than thirty (30) miles from the Service Center or other approved Servicer's place of business will include a charge for transportation.

D. Seller's obligations under Paragraph C shall not apply to any Equipment, or part thereof, which (i) has been modified or otherwise altered other than pursuant to Seller's written instructions or written approval or, (ii) is normally consumed in operation or, (iii) has a normal life inherently shorter than the warranty periods specified in Paragraph B, or (iv) is not properly stored, installed, used, maintained or repaired, or, (v) has been subjected to any other kind of misuse or detrimental exposure, or has been involved in an accident.

E. The preceding paragraphs set forth the exclusive remedies for claims based upon defects in or nonconformity of the Equipment, whether the claim is in contract, warranty, tort (including negligence), strict liability or otherwise, and however instituted. Upon the expiration of the warranty period, all such liability shall terminate. The foregoing warranties are exclusive and in lieu of all other warranties, whether oral, written, expressed, implied or statutory. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES.

This warranty applies only within the United States.

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