



**M/A-COM**  
**P7100<sup>IP</sup> Series**  
Portable Radios

**MANUAL REVISION HISTORY**

REV	DATE	REASON FOR CHANGE
R1A	Mar/03	Initial release
R2A	Jun/03	Added UHF—H (4W) and P25 functionality.
R3A	Feb/04	Added UHF-L (4W).
D	Feb/04	Added CE Mark and safety symbol conventions.
E	May/04	Improved detail in operating instructions.
F	Nov/04	Added RU101219V71-V73 information. Updated battery information and CE marking information.
G	Jun/05	Added VHF maritime channel information and Preventive Maintenance recommendations for Immersion-rated radios. Updated options/accessories.
H	Jun/05	Updated for IC VHF maritime regulatory approval.
J	Oct/05	Added Radio TextLink, battery conditioning, P25T, & Select model radios.
K	Sep/06	Updated battery conditioning and safety symbols and added WEEE symbol and statement. Reformatted to 8.5 x 11.

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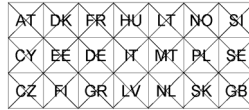


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**CE 0336**

**NOTICE!**

This device is a RF transceiver intended for land mobile radio applications. The device may have use restrictions, which require that the national authority be contacted for any system licensing requirements, frequency use, allowable power level, etc.

**Declaration of Conformity**

We, the undersigned,

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certify and declare under our sole responsibility that the following equipment:

<b>Product description / Intended use</b>	PTT handheld VHF radio for trunked and conventional radio systems.
<b>EU / EFTA member states intended for use</b>	Austria, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Sweden, United Kingdom, Norway, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia
<b>Member states with restrictive use</b>	
<b>Manufacturer</b>	M/A-COM, Inc.
<b>Brand</b>	P7100 <sup>IT</sup>
<b>Type</b>	VHF(136-174 MHz), UHF-L (378-430 MHz) and UHF-H (450-512 MHz)

is tested to and conforms with the essential requirements for protection of health and the safety of the user and any other person and Electromagnetic Compatibility, as included in following standards:

Standard	Issue date
EN 60950	2000
EN 301 489-1	2002-08
EN 301 489-5	2002-08
	2003

and is tested to and conforms with the essential radio test suites so that it effectively uses the frequency spectrum allocated to terrestrial/space radio communication and orbital resources so to as to avoid harmful interference, as included in following standards:

Standard	Issue date
EN 300 086-1 ( )	2001-03
EN 300 113-1 ( )	2003-09

and therefore complies with the essential requirements and provisions of the **Directive 1999/5/EC** of the European Parliament and of the council of March 9, 1999 on Radio equipment and Telecommunications Terminal Equipment and the mutual recognition of their conformity and with the provisions of Annex IV (Conformity Assessment procedure referred to in article 10).

The following Notified Body has been consulted in the Conformity Assessment procedure:

<b>Notified Body number</b>	<b>Name and address</b>
0336	TNO Electronic Products and Services PO Box 15, 9822 ZG Niekirk, The Netherlands

The technical documentation as required by the Conformity Assessment procedure is kept at the following address:

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TCF/TF reference nr.	MA COM P7100TCF
Drawn up in	Herndon, VA
Date	December 1, 2004

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Name and position	Daryl G. Popowitch, Regulatory Manager
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# 1 SAFETY TRAINING INFORMATION



The M/A-COM P7100<sup>IP</sup> portable radio generates RF electromagnetic energy during transmit mode. This radio is designed for and classified as “Occupational Use Only,” meaning it must be used only during the course of employment by individuals aware of the hazards and the ways to minimize such hazards. This radio is NOT intended for use by the “General Population” in an uncontrolled environment.

The P7100<sup>IP</sup> portable radio has been tested and complies with the FCC RF exposure limits for “Occupational Use Only.” In addition, this M/A-COM radio complies with the following Standards and Guidelines with regard to RF energy and electromagnetic energy levels and evaluation of such levels for exposure to humans:

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

## 1.1 RF EXPOSURE GUIDELINES



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

- DO NOT operate the radio without a proper antenna attached, as this may damage the radio and may also cause the FCC RF exposure limits to be exceeded. A proper antenna is the antenna supplied with this radio by M/A-COM or an antenna specifically authorized by M/A-COM for use with this radio. (Refer to Table 7-1: Options and Accessories.)
- DO NOT transmit for more than 50% of total radio use time (“50% duty cycle”). Transmitting more than 50% of the time can cause FCC RF exposure compliance requirements to be exceeded. The radio is transmitting when the “TX” indicator appears in the display. The radio will transmit by pressing the “PTT” (Push-To-Talk) button.
- Always transmit using low power when possible (refer to section “HIGH/LOW POWER A” on page 33). In addition to conserving battery charge, low power can reduce RF exposure.
- ALWAYS use M/A-COM authorized accessories (antennas, batteries, belt clips, speaker/mics, etc). Use of unauthorized accessories may cause the FCC Occupational/Controlled Exposure RF compliance requirements to be exceeded. (Refer to Table 7-1: Options and Accessories.)
- ALWAYS keep the device and its antenna at least 2 cm (0.8 inches) from the body and at least 5 cm (2 inches) from the face when transmitting to ensure FCC RF exposure compliance requirements are not exceeded. This radio has been tested for RF exposure compliance at the distances listed in Table 1-1. However, to provide the best sound quality to the recipients of your transmission, M/A-COM recommends you hold the microphone at least 5 cm (2 inches) from your mouth, and slightly off to one side.

**Table 1-1: RF Exposure Compliance Testing Distances**

RADIO FREQUENCY	TESTED DISTANCES ( <i>worst case scenario</i> )	
	Body	Face
800 MHz	1.1 cm	2.5 cm
VHF (136-174 MHz)	1.1 cm	2.5 cm
UHF-H (450-512 MHz)	1.1 cm	2.5 cm
UHF-L (378-430 MHz)	1.1 cm	2.5 cm

The information in this section provides the information needed to make the user aware of a RF exposure, and what to do to assure that this radio operates within the FCC RF exposure limits of this radio.

## **1.2 ELECTROMAGNETIC INTERFACE/COMPATIBILITY**

During transmissions, this M/A-COM radio generates RF energy that can possibly cause interference with other devices or systems. To avoid such interference, turn off the radio in areas where signs are posted to do so. DO NOT operate the transmitter in areas that are sensitive to electromagnetic radiation such as hospitals, aircraft, and blasting sites.



## 2 SAFETY SYMBOL CONVENTIONS

The following conventions are used 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 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 Electro-Static Discharge. Proper precautions must be taken to prevent ESD when handling circuit modules.



**WARNING** - The electrical hazard symbol indicates there is an electrical hazard present.

## **3 OPERATING TIPS**

Antenna location and condition are important when operating a portable radio. Operating the radio in low lying areas or terrain, under power lines or bridges, inside of a vehicle or in a metal framed building can severely reduce the range of the unit. Mountains can also reduce the range of the unit.

In areas where transmission or reception is poor, some improvement may be obtained by ensuring that the antenna is vertical. Moving a few yards in another direction or moving to a higher elevation may also improve communications. Vehicular operation can be aided with the use of an externally mounted antenna.

Battery condition is another important factor in the trouble free operation of a portable radio. Always properly charge the batteries.

### **3.1 EFFICIENT RADIO OPERATION**

For optimum audio clarity at the receiving radio(s), hold the portable radio approximately three inches from your mouth and speak into the microphone at a normal voice level.

Keep the antenna in a vertical position when receiving or transmitting a message.

Do not hold the antenna when the radio is powered on.



**Do NOT hold onto the antenna when the radio is powered on.**

#### **3.1.1 Antenna Care and Replacement**



**Always keep the antenna at least 0.4 inches (1.1 cm.) away from the body and 1 inch (2.5 cm.) from the face when transmitting to ensure FCC RF exposure compliance requirements are not exceeded.**



**Do not use the portable radio with a damaged or missing antenna. A minor burn may result if a damaged antenna comes into contact with the skin. Replace a damaged antenna immediately. Operating a portable radio with the antenna missing could cause personal injury, damage the radio, and may violate FCC regulations.**



Use only the supplied or approved antenna. Use of unauthorized antennas, modifications or attachments could cause damage to the radio unit and may violate FCC regulations. (Refer to Table 7-1: Options and Accessories.)

### 3.1.2 Electronic Devices



RF energy from portable radios may affect some electronic equipment. Most modern electronic equipment in cars, hospitals, homes, etc. are shielded from RF energy. However, in areas in which you are instructed to turn off two-way radio equipment, always observe the rules. If in doubt, turn it off!

### 3.1.3 Aircraft



**Always turn off a portable radio before boarding any aircraft!**

- Use it on the ground only with crew permission.
- DO NOT use while in-flight!!

### 3.1.4 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)

### 3.1.5 Potentially Explosive Atmospheres



Areas with potentially explosive atmospheres are often, but not always, clearly marked. These may be fuelling areas, such as gas stations, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Turn OFF two-way radios when in any area with a potentially explosive atmosphere. It is rare, but not impossible that a radio or its accessories could generate sparks.

## 4 MARITIME CHANNELS

As part of FCC Equipment Authorization Part 80 licensing, a maritime frequency usage plan has been included in this manual for reference.



NOTE

The antenna connector (between antenna and radio) is a nominal 50Ω impedance.

CHANNEL NUMBER			FREQUENCY (MHZ)	
USA	INT	CAN	TX	RX
	01	01	156.050	160.650
01a			156.050	156.050
	02	02	156.100	160.700
	03	03	156.150	160.750
03a			156.150	156.150
	04		156.200	160.800
		04a	156.200	156.200
	05		156.250	160.850
05a		05a	156.250	156.250
06	06	06	156.300	156.300
	07		156.350	160.950
07a		07a	156.350	156.350
08	08	08	156.400	156.400
09	09	09	156.450	156.450
10	10	10	156.500	156.500
11	11	11	156.550	156.550
12	12	12	156.600	156.600
13	13	13	156.650	156.650
14	14	14	156.700	156.700
15	15	15	156.750	156.750
16	16	16	156.800	156.800
17	17	17	156.850	156.850
	18		156.900	161.500
18a		18a	156.900	156.900
	19		156.950	161.550
19a		19a	156.950	156.950
20	20	20	157.000	161.600
20a			157.000	157.000
	21	21	157.050	157.050
		21	RX only	161.650
	22		157.100	161.700
22a		22a	157.100	157.100
	23	23	157.150	161.750
23a			157.150	157.150
24	24	24	157.200	161.800
25	25	25	157.250	161.850
		25	RX only	161.850
26	26	26	157.300	161.900
27	27	27	157.350	161.950
28	28	28	157.400	162.000
		28	Rx only	162.000
	60	60	156.025	160.625
	61		156.075	160.675
61a		61a	156.075	156.075
	62		156.125	160.725
		62a	156.125	156.125
	63		156.175	160.775
63a			156.175	156.175
	64	64	156.225	160.825
64a		64a	156.225	160.825
	65		156.275	160.875
65a	65a	65a	156.275	156.275

CHANNEL NUMBER			FREQUENCY (MHZ)	
USA	INT	CAN	TX	RX
	66		156.325	160.925
66a	66a	66a	156.325	156.325
67	67	67	156.375	156.375
68	68	68	156.425	156.425
69	69	69	156.475	156.475
70	70	70	156.525	156.525
71	71	71	156.575	156.575
72	72	72	156.625	156.625
73	73	73	156.675	156.675
74	74	74	156.725	156.725
75	75	75	156.775	156.775
76	76	76	156.825	156.825
77	77	77	156.875	156.875
	78		156.925	161.525
78a		78a	156.925	156.925
	79		156.975	161.575
79a		79a	156.975	156.975
	80		157.025	161.625
80a		80a	157.025	157.025
	81		157.075	161.675
81a		81a	157.075	157.075
	82		157.125	161.725
82a		82a	157.125	157.125
	83	83	157.175	161.775
83a		83a	157.175	157.175
		83	RX only	161.775
84	84	84	157.225	161.825
84a			157.225	157.225
85	85	85	157.275	161.875
85a			157.275	157.275
86	86	86	157.325	161.925
86a			157.325	157.325
88	88	88	157.425	162.025
88a			157.425	157.425

WX CHANNEL		FREQUENCY (MHz)	
		TX	RX
1		RX only	162.550
2		RX only	162.400
3		RX only	162.475
4		RX only	162.425
5		RX only	162.450
6		RX only	162.500
7		RX only	162.525
8		RX only	161.650
9		RX only	161.775
10		RX only	163.275

NOTE: Channels 02, 04, 60, and 62 are not available in the U.S.

NOTE: The letter "a" following the channel designator indicates simplex operation on a channel designated internationally as a duplex channel.

## 5 BATTERIES

The P7100 series portable radios use rechargeable, recyclable Nickel Cadmium (NiCd) or Nickel Metal Hydride (NiMH) batteries. Please follow the directions below to maximize the useful life of each type of battery.



**If the battery is ruptured or is leaking electrolyte that results in skin or eye contact with the electrolyte, immediately flush the affected area with water. If the battery electrolyte gets in the eyes, flush with water for 15 minutes and consult a physician immediately.**

### 5.1 CONDITIONING NIMH BATTERY PACKS

Condition a new NiMH battery before putting it into use. This also applies to rechargeable NiMH batteries that have been stored for long periods (weeks, months, or longer). Conditioning requires fully charging and fully discharging the battery three (3) times using a “battery analyzer/conditioner/charger.” M/A-COM recommends either the Cadex® C7400 or the Intelligent Technologies Co. BC3506QP-5 iTECH® iQfive® battery conditioners, purchased directly from M/A-COM. These units condition a battery pack by automatically charging and discharging (cycling) the battery.



Failure to properly condition NiMH battery packs before initial use will result in shortened performance by the battery.

### 5.2 CONDITIONING NICD BATTERY PACKS

A new NiCD battery does not require conditioning before use. Periodically condition NiCD batteries to avoid the memory effect. If a NiCD battery is repeatedly charged and not fully discharged, the result is lower voltage and lower capacity. Fortunately, both voltage and capacity are restored through battery conditioning.



Always use M/A-COM authorized chargers and conditioners. Use of unauthorized chargers and conditioners may void the warranty.

### 5.3 ADDITIONAL INFORMATION

For more information regarding the proper care of portable radio batteries or establishing a battery maintenance program, refer to ECR-7367 which may be ordered by calling toll free 1-800-368-3277, then select option 7.

## 5.4 CHANGING THE BATTERY PACK

### 5.4.1 Removing the Battery Pack

Make sure the power to the radio is turned OFF.

1. Press the latch at the bottom of the battery pack.
2. Lift the battery pack from the bottom.
3. Remove the battery pack from the radio.

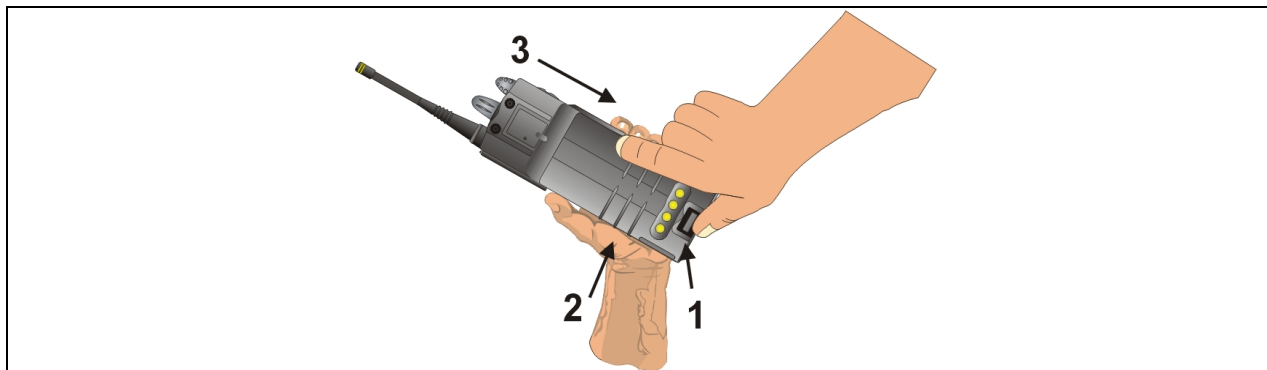


Figure 5-1: Removing the Battery Pack

### 5.4.2 Attaching the Battery Pack

Make sure the power to the radio is turned OFF.

1. Align the tab on the top of the battery pack with the slot at the top of the battery cavity.
2. Push the battery pack down to attach the battery to the radio.
3. Verify that the battery pack is properly latched to the radio.

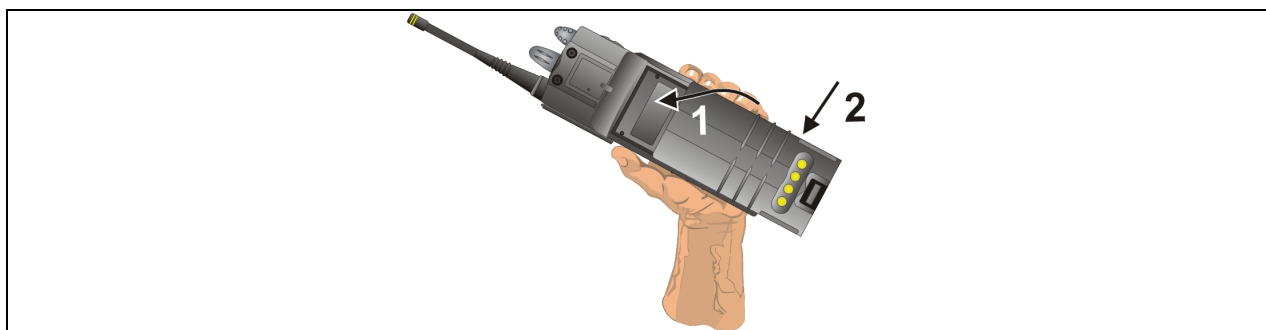


Figure 5-2: Attaching the Battery Pack

## 5.5 BATTERY DISPOSAL



In no instance should a battery be incinerated. Disposing of a battery by burning will cause an explosion.



**RECHARGEABLE BATTERY PACK DISPOSAL** – The product you have purchased contains a rechargeable battery. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local solid waste officials for details in your area for recycling options or proper disposal. Canadian and U.S. users may call Toll Free 1-800-8-BATTERY® for information and/or procedures for returning rechargeable batteries in your locality.

## **6 INTRODUCTION**

This manual describes how to use the P7100<sup>IP</sup> series portable radio. The P7100<sup>IP</sup> series radio is available without a front mounted keypad (P7130 – Select model), with a 6-button front mounted keypad (P7150 – Scan model) and with a DTMF front mounted keypad (P7170 – System model). The P7100<sup>IP</sup> series radios are synthesized, microprocessor-based, high performance portable FM radios providing reliable two-way communications in the Enhanced Digital Access Communications Systems (EDACS<sup>®</sup>) and P25 trunking environments as well as conventional communications systems.

In P25 Trunked and EDACS modes, the user selects a communications system and group. In these modes, channel selection is transparent to the user and is controlled via digital communication with the system controller. This provides advanced programmable features and fast access to communication channels.

In the conventional mode, the user selects a channel and communicates directly on that channel. In this mode, a system refers to a set of channels. A channel is a transmit/receive radio frequency pair.

The exact operation of the radio will depend on the operating mode, the radio's programming, and the particular radio system. Most features described in this manual can be enabled through programming. Consult the particular features programmed into the P7100<sup>IP</sup>.

For further detail about features and operation refer to the appropriate maintenance manual or contact the system administrator.

### **6.1 WATER RESISTANCE**

The P7100<sup>IP</sup> series portable radios operate reliably even under adverse conditions. These radios meet MIL-STD-810F specifications for driven rain, humidity, and salt fog.



## 7 OPTIONS AND ACCESSORIES

Table 7-1 lists the Options and Accessories tested for use with the P7100<sup>IP</sup> series portable radios. Items for use with a specific band split or part number are noted.

Refer to the maintenance manual or to M/A-COM's Products and Services Catalog for a complete list of options and accessories, including those items that do not adversely affect the RF energy exposure.



**Always use M/A-COM authorized accessories (antennas, batteries, belt clips, speaker/mics, etc). Use of unauthorized accessories may cause the FCC Occupational/Controlled Exposure RF compliance requirements to be exceeded. (Refer to Table 7-1: Options and Accessories.)**



*Always use the correct options and accessories (battery, antenna, speaker/mic, etc.) for the radio. Immersion rated options must be used with an immersion rated radio. Intrinsically safe options must be used with intrinsically safe radios. (Refer to Table 7-1: Options and Accessories.)*

**Table 7-1: Options and Accessories**

DESCRIPTION	PART NUMBER
<b>Antennas</b>	
Antenna, Helical Coil (136-151 MHz)	KRE 101 1219/1
Antenna, Helical Coil (150-162 MHz)	KRE 101 1219/2
Antenna, Helical Coil (162-174 MHz)	KRE 101 1219/3
Antenna, Helical Coil (150-174 MHz)	KRE 101 1219/21
Antenna, Helical Coil (378-403 MHz)	KRE 101 1219/9
Antenna, Helical Coil (403-430 MHz)	KRE 101 1219/10
Antenna, Quarter Wave (378-430 MHz)	KRE 101 1223/10
Antenna, Helical Coil (450-470 MHz)	KRE 101 1219/12
Antenna, Helical Coil (470-512 MHz)	KRE 101 1219/13
Antenna, Quarter Wave (450-512 MHz)	KRE 101 1223/12
High Gain Antenna (800 MHz)	KRE 101 1506/1
Whip Antenna, Quarter Wave (800 MHz)	KRE 101 1506/2
Whip Antenna, Quarter Wave (800 MHz)	KRE 101 1223/01
<b>Batteries (Immersion-Rated)</b>	
7.5V Nickel Cadmium (NiCd) Battery	BKB 191 210/33
7.5V Nickel Metal Hydride (NiMH) Battery	BKB 191 210/34
7.5V NiCd Battery-Intrinsically Safe <IS>	BKB 191 210/35
7.5V NiMH Battery-Intrinsically Safe <IS>	BKB 191 210/36

DESCRIPTION	PART NUMBER
<b>Batteries (Wind Driven Rain)</b>	
7.5V NiCd Battery	BKB 191 210/43
7.5V NiMH Battery	BKB 191 210/44
<b>Miscellaneous Accessories</b>	
Speaker Mic <IS>	KRY 101 1617/183
Speaker Mic Antenna Version Plus <IS>	KRY 101 1617/184
Speaker Mic, Charger Compatible <IS>	KRY 101 1617/185
Speaker Mic, Ant. Version, Charger Comp. <IS>	KRY 101 1617/186
Speaker Mic, Immersible <IS>	KRY 101 1617/283
Speaker Mic, Ant. Version, Immersible <IS>	KRY 101 1617/284
Speaker Mic, Ant. Version, Immersible, Charger Comp. <IS>	KRY 101 1617/287
Speaker Mic, Ruggedized <IS>	KRY 101 1617/383
Speaker Mic, Antenna Version, Ruggedized	KRY 101 1617/384
Speaker Mic, Ruggedized, Charger Comp., <IS>	KRY 101 1617/385
Speaker Mic, Ant. Version, Ruggedized, Vehicular Charger Comp <IS>	KRY 101 1617/387
Metal Belt Clip	KRY 101 1647/1
Belt Loop with Swivel	KRY 101 1609/1
Swivel Mount Clip (part of KRY 101 1639 and 1648)	KRY 101 1608/2
Leather Case with Swivel & Belt Loop	KRY 101 1639/4
Nylon Case (Black) with Swivel	KRY 101 1648/1
Nylon Case (Orange) with Swivel	KRY 101 1649/1
Nylon T-Strap	KRY 101 1656/1
Earpiece Kit for Speaker Mic <IS>	LS103239V1
Speaker Mic, Industrial	OT-V2-10121
Speaker Mic, Industrial PLUS	OT-V2-10122
Ultra-Lite Headset with Inline PTT	OT-V4-10314
Liteweight Headset with Single Speaker	OT-V4-10315
Over-the-Head Headset	OT-V4-10316
Behind-the-Head Headset	OT-V4-10317
Earphone Kit, Black	OT-V1-10520
Earphone Kit, Beige	OT-V1-10521
Palm Microphone, 2-wire, Black	OT-V1-10522
Palm Microphone, 2-wire, Beige	OT-V1-10523
3-Wire Mini-Lapel (Beige)	OT-V1-10524
3-Wire Mini-Lapel (Black)	OT-V1-10525
The carrying accessories and antennas listed above can be used with Intrinsically Safe radios.	

## 8 USER INTERFACE

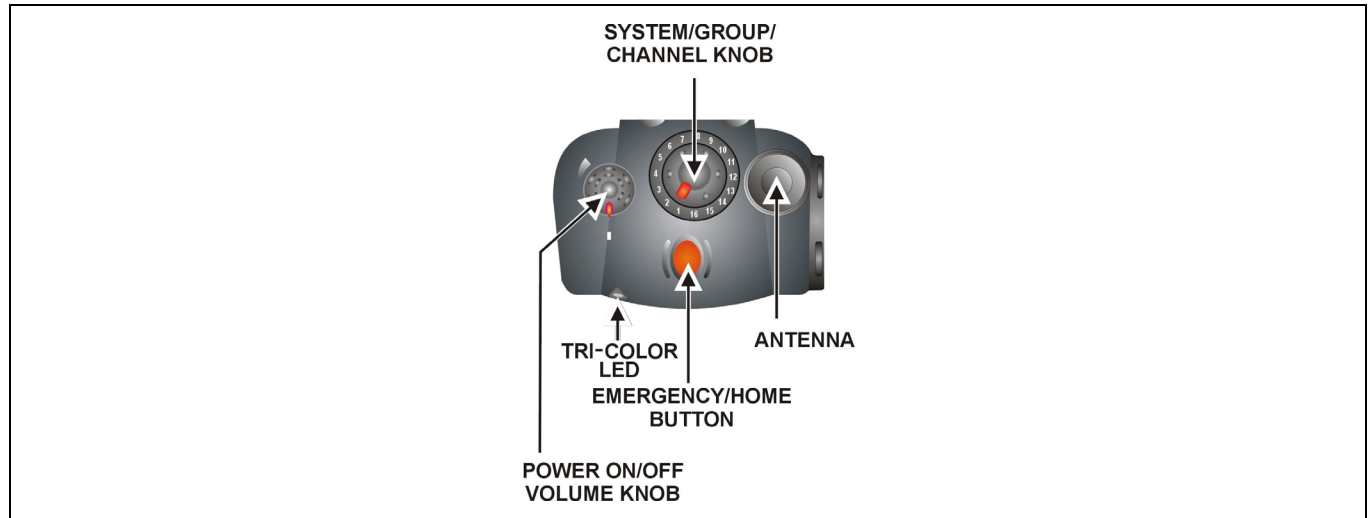


Figure 8-1: Top View

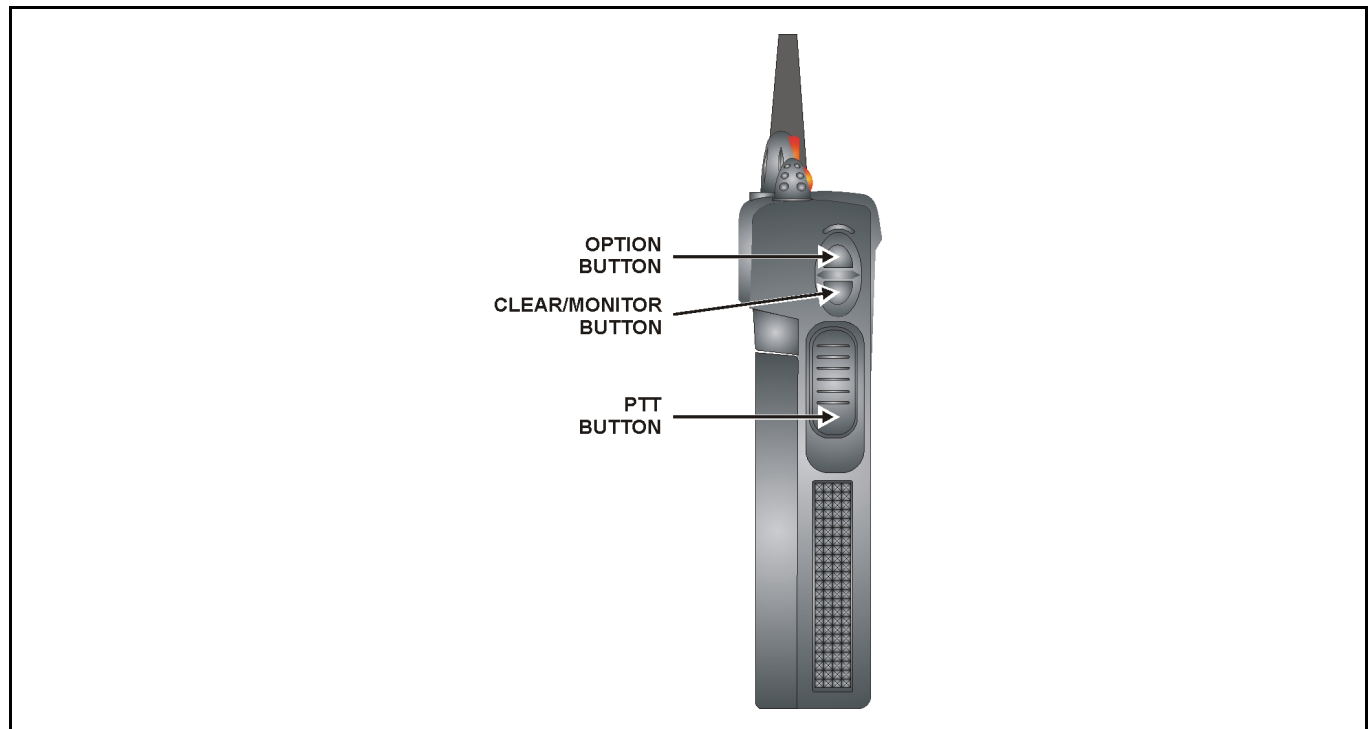


Figure 8-2: Side View



Figure 8-3: System Model

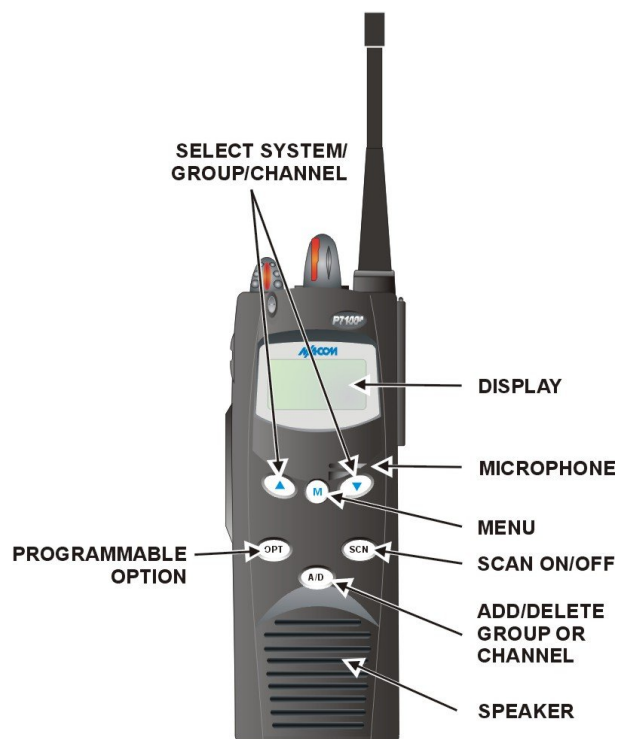


Figure 8-4: Scan Model

## 8.1 CONTROLS

The radio features two rotary control knobs and an emergency button mounted on the top of the radio. Push-To-Talk, option and monitor buttons are mounted on the side. The front mounted keypad has no buttons on the P7130<sup>IP</sup> Select model, six buttons on the P7150<sup>IP</sup> Scan model, and 15 buttons on the P7170<sup>IP</sup> System Radio.

### 8.1.1 Buttons and Knobs

This section describes the primary function of the button and knob controls. Other functions associated with these controls are detailed in later sections.

#### **POWER ON-OFF VOLUME KNOB**

Applies power to and adjusts the receiver's volume. Rotating the control clockwise applies power to the radio. A single alert tone (if enabled through programming) indicates the radio is operational.

Rotating the control clockwise increases the volume level. Minimum volume levels may be programmed into the radio to prevent missed calls due to a low volume setting. While adjusting the volume the display will momentarily indicate the volume level (i.e. **VOL=31**). The volume range is from a minimum programmed level of zero (displayed as **OFF** in the display) up to 31, which is the loudest level.

#### **CONTROL KNOB**

Selects systems or group/channels (depending on programming). This is a 16-position rotary knob.

**Note:** A mechanical stop, which can limit the positions accessed, is shipped with the radio but must be installed. To install the mechanical stop, remove the channel knob, loosen the set screw on the channel knob metal base (using a 1.27mm hex wrench), and remove the channel knob metal base. Replace the 16 channel ring with the channel stop ring located at the desired channel. Reinstall the channel knob metal base, tighten the set screw, and reinstall the channel knob.

#### **EMERGENCY/ HOME BUTTON**

Automatically selects the pre-programmed Group/System by pressing and holding for a programmed duration. It can also be used to declare an emergency by pressing and holding for a programmed duration. The button must be pre-programmed for either operation, but not both.

#### **PTT BUTTON**

Push-To-Talk must be pressed before voice transmission begins. In trunked mode the radio's ID is transmitted upon depression of the PTT button. (Refer to Figure 8-2.)

#### **CLEAR/MONITOR BUTTON**

In trunked mode: Exits the current operation (removing all displays associated with it) and returns the radio to the selected talk group. Terminates individual and telephone interconnect calls.

In conventional mode: Unsquels the receiver and allows channel monitoring prior to transmission. Momentarily removes the Channel Guard decoding from the channel.

#### **OPTION BUTTON**

Activates one of a number of programmable software options selected during PC programming. Programmable options include hi/low power settings, keypad lock, LCD contrast, LCD and keypad back lighting.

### 8.1.2 Keypad (Scan and System Models Only)

The keys on the Keypad have special functions and are labeled using a symbol or abbreviated word describing its primary function. Numeric entry is a secondary function of the keys. Each key is described in the following subsections.



Figure 8-5: Scan Radio Front Panel

KEY	FUNCTION
▲ ▼	<p><u>Primary Function:</u> Allows the user to select system, groups, or channels, depending on personality programming. The buttons act as <b>STEP UP</b> or <b>STEP DOWN</b>. Pressing one of these buttons displays the next or previous stored system, group or channel.</p> <p><u>Secondary Function:</u> Changes the selection for an item within a list.</p>
M	<p><u>Primary Function:</u> Accesses the pre-stored menu. The menu can include high/low power setting, keypad lock, LCD contrast, LCD and keypad backlighting.</p> <p><u>Secondary Function:</u> Activates a selected item within a list. After a menu list is accessed, scroll through the list using the ▲ or ▼ keys and then activate specific items with the M key. This is similar to an “Enter” key.</p>
A/D (Scan only)	Adds/Deletes selected groups or channels from the Scan list of the currently selected system.
SCN (Scan only)	Turns the Scan operation ON and OFF.
OPT (Scan only)	Activates one of a number of programmable software options.



Figure 8-6: System Radio Front Panel

KEY	FUNCTION
	Same as Scan Model.
	Same as Scan Model.
	Selects a specific system. If the rotary knob is used to select the system and more than 16 systems are programmed in the radio, the  key is used to select additional banks (groupings) of systems.
<b>1-9, *, 0, #</b>	These keys are used to place telephone interconnect and individual (unit-to-unit) calls. The keys operate like a normal telephone keypad.
	Selects a specific group.
	Turns the Scan operation ON and OFF.
	Enables or disables Private Mode for the system/group/channel displayed.
	Adds groups or channels from the currently selected system to the Scan list.
	Status. Access to the status list (0-9). The Status key permits the transmission of a pre-programmed status message to a P25 Trunked or EDACS site.
	Message. Access to the message list (0-9). The Message key permits the transmission of a pre-programmed message to a P25 Trunked or EDACS site.
	Deletes selected groups or channels of the currently selected system from the Scan list.
	Places telephone interconnect calls.
	Initiates individual calls.

Line 1  
(system)

Line 2  
(group)

Line 3  
(icons)

















### Figure 8-7: Radio Display

### 8.2.1 Radio Status Icons

24



Table 8-1: Display Descriptions

	<b>Steady</b> – “Busy” transmitting or receiving <b>Flashing</b> – call queued
	<b>Steady</b> – special call mode (individual or telephone)
	<b>Steady</b> – during all radio transmissions
	<b>Steady</b> – transmit at low power <b>If icon is not visible</b> – transmit at high power
	<b>Steady</b> – battery charge indicator (refer to Figure 8-8)
	<b>Flashing</b> – Low battery indicator (refer to Figure 8-8)
	<b>Steady</b> – Indicates the current channel is set up as an analog channel.
	<b>Steady</b> – trunked system in Failsoft™ mode
	<b>Steady</b> – group or channel in scan list
	<b>Steady</b> – priority 2 group or channel
	<b>Steady</b> – priority 1 group or channel
	<b>Steady (rotates clockwise)</b> – scan mode enabled <b>If icon is not visible</b> – scan is disabled
	<b>Steady</b> – transmit in encrypt mode <b>Flashing</b> – receiving an encrypted call
	<b>Steady</b> – Channel Guard enabled <b>If icon is not visible</b> – Channel Guard is disabled
	<b>Steady</b> – Indicates the current channel is set up as a ProVoice or Aegis channel
	<b>Steady</b> – Indicates the current channel is set up as a Project 25 (P25) channel.

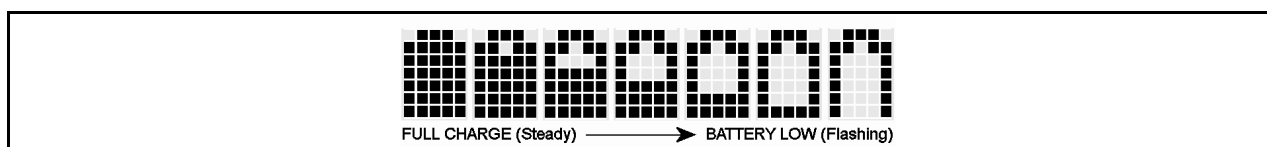


Figure 8-8: Battery Charge Icons (Full Cycle)

The battery icons (see Figure 8-8) indicate approximate level only, based on battery voltage.

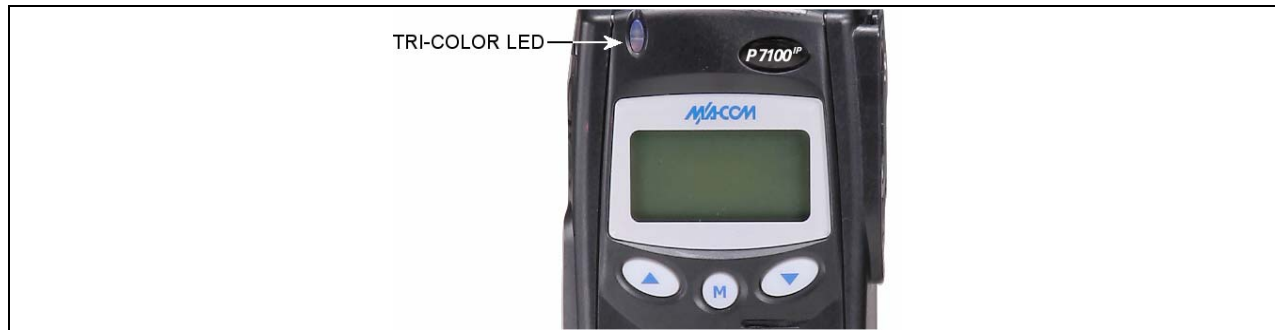


Figure 8-9: Tri-Color LED

### 8.2.2 Tri-Color LED

The Tri-Color LED changes color to indicate radio status and is visible from both the front and top of the radio (see Figure 8-9). The three colors of the LED and the status they represent are:

Green: Receiving

Red: Unencrypted transmission

Orange: Encrypted transmission

### 8.2.3 Status Messages

During radio operation, various radio Status Messages can be displayed. The messages are described below.

<u>MESSAGE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
<b>QUEUED</b>	Call Queued	<b>Trunked mode only.</b> Indicates the system has placed the call in a request queue.
<b>SYS BUSY</b>	System Busy	<b>Trunked mode only.</b> 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.
<b>DENIED</b>	Call Denied	<b>Trunked mode only.</b> Indicates the radio or talkgroup is not authorized to operate on the selected system and/or talkgroup.
<b>CC SCAN</b>	Control Channel Scan	<b>Trunked mode only.</b> Indicates the control channel is lost and the radio has entered the Control Channel Scan mode to search for the control channel (usually out of range indication).
<b>WA SCAN</b>	Wide Area Scan	<b>Trunked mode only.</b> Indicates the radio has entered the Wide Area Scan mode to search for a new system (if enabled through programming).
<b>TALKARND</b>	Talkaround	<b>Conventional mode only.</b> Indicates the radio is operating on conventional channels in talkaround mode (no repeater).
<b>SYSC ON</b>	System Scan Features On	<b>Trunked mode only.</b> Indicates the System Scan features are enabled.

<u>MESSAGE</u>	<u>NAME</u>	<u>DESCRIPTION</u>
<b>SYSC OFF</b>	System Scan Features Off	<b>Trunked mode only.</b> Indicates the System Scan features are disabled.
<b>LOW BATT</b>	Low Battery	Battery voltage has dropped to the point to where the radio is no longer able to transmit. The radio will still receive calls until the battery is discharged beyond the point of operation at which time the radio will automatically shutdown.
<b>RXEMER</b>	Receive Emergency	<b>Trunked and P25 modes only.</b> Indicates an emergency call is being received. This message will be flashing on line two.
<b>TXEMER</b>	Transmit Emergency	<b>Trunked and P25 modes only.</b> Indicates an emergency call has been transmitted on this radio. This message will be flashing on line two.
<b>VOL=31</b>	Volume Level	Indicates the current volume level. The volume level display ranges from OFF (silent) to 31 (loudest).
<b>WHC</b>	Who Has Called	<b>Trunked and P25 modes only.</b> Indicates an individual call has been received, but not responded to. The indicator turns OFF if the individual call mode is entered, the system is changed, or the radio is turned off and then on again.
<b>UNKNOWN</b>	Unknown ID	<b>Trunked and P25 modes only.</b> Indicates an individual call is being received from an unknown ID.

#### 8.2.4 Error Messages

If either of the Error Messages shown below is displayed, the radio is programmed incorrectly or needs servicing.

DSP ERR	or	DIG V
ERR=XXXX		ERR
(PowerUp only)		

Where: **XXXX** is the error code and **DSP ERR** or **DIG V ERR** is the message.

### 8.3 ALERT TONES

The P7100<sup>IP</sup> radio provides audible Alert Tones or “beeps” to indicate the various operating conditions (see Table 8-2).

Table 8-2: Alert Tones

NAME		tone	DESCRIPTION
Call Originate	(A)	one short mid-pitched	<i>OK to talk after pressing the push-to-talk button</i>
Call Queued	(T)	one high-pitched	<i>Call queued for processing</i>
Autokey	(T)	one mid-pitched	<i>Queued call received channel assignment</i>
System Busy	(T)	three low-pitched	<i>System busy or unable to complete call</i>
Call Denied	(T)	one low-pitched	<i>Radio is not authorized on the system or group</i>
Carrier Control Timer	(A)	five high-pitched / one long low-pitched	<i>PTT depressed for maximum length of time</i>
Low Battery	(A)	one low-pitched / one short mid-pitched	<i>Low battery</i>
TX Low Battery Alert	(A)	one low-pitched	<i>After PTT - battery too low to transmit</i>
Page	(P)	Three high-pitched	<i>If receiving radio accepts page, both radios emit tone</i>

(T) = trunked mode only (P25T and EDACS)

(A) = All modes

(P) =

P25T only

## 8.4 UNIVERSAL DEVICE CONNECTOR (UDC)

The Universal Device Connector (UDC) provides connections for external accessories such as a headset or a speaker-microphone. The UDC is located on the right side of the radio (opposite the PTT Button). When the radio is locked in a vehicular charger the UDC provides the audio and control connections between the radio and the vehicular charger. The UDC facilitates programming and testing the radio. The UDC pins perform different functions depending on the accessory attached to the UDC.


## 9 CONVENTIONAL OPERATION

In addition to the features covered in the following BASIC OPERATION section, the following functions are for the conventional mode. The radio functions in the conventional mode when using conventional communications channels (non-trunked).

### 9.1 RECEIVING A CALL

1. Select desired conventional system and channel or turn scan ON and make sure desired channel is in scan list.
2. When the radio receives a call, the radio will unmute and the channel name will appear in the display.

### 9.2 SENDING A CALL

1. Select desired system and channel.
2. Ensure the channel is not busy by pressing the **Clear/Monitor** button momentarily. If audio is heard or if the  icon is on, the channel is busy.
3. When sure that the channel is not busy, press the Push-To-Talk button and speak into the microphone.

## 10 BASIC OPERATION

### 10.1 TURNING ON THE RADIO







1. Power ON the radio by rotating the POWER ON-OFF/VOLUME knob clockwise. A short alert signal (if enabled through programming) indicates the radio is ready to use. Refer to Figure 8-1 for location of the POWER ON-OFF/VOLUME KNOB.
2. The display shows the last selected system and group or a default system and group (depending on programming).
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 transmit and receive calls.



NOTE

In the trunked environment, **CC SCAN** will be displayed if communication with the system's control channel cannot be established. This may 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. **CC SCAN** is displayed on the group line until a control channel is accessed.

### 10.2 SYSTEM SELECTION

- METHOD 1: From the control knob: If system selection is programmed to the SYSTEM/GROUP/CHANNEL SELECTION control knob, select a system by turning the knob to the desired system number position (1-16). The display registers the new system name on line one. The Option 1 button can be programmed to provide access to a "2<sup>nd</sup> bank" of 16 system number positions (17-32)
- METHOD 2: **(System and Scan model radios only)** From the keypad: If system selection is programmed as the primary function of  and , select a system by pressing  or  to scroll through the system list. The display registers the new system name on line one.
- METHOD 3: **(System model radios only)** Direct Access: Press  to enter the system select mode. Press the numeric key, which is mapped to the desired system. Press . The radio will move to the selected system.
- METHOD 4: **(Select model radios only)** If programmed, press the Option 1 button to scroll through and change systems. The display registers the new system name on line one.



NOTE

If system selection is programmed to the SYSTEM/GROUP/CHANNEL knob, direct access to systems will not be available. Pressing or will scroll through different sets of 16 systems each (banks) if more than 16 systems are programmed into the radio. The systems within each bank are then selectable via the SYSTEM/GROUP/CHANNEL knob as described previously in METHOD 1.

Example:

System: 1 = North	Group: 1 = Group 1
2 = South	2 = Group 2
3 = East	3 = Group 3
4 = West	4 = Group 4

Press . (South is the currently selected system.)

Press . (Press 4 to select “West” system.)

Press . (West is the newly selected system.)





### 10.3 GROUP/CHANNEL SELECTION


Several methods can be used to select a new group or channel.


- METHOD 1:** From the control knob: 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 number position. The display registers the new group name on line two. If the knob is moved to a position greater than the number of programmed groups, the highest programmed group will remain selected. The Option 1 button can be programmed to provide access to a “2<sup>nd</sup> bank” of 16 group number positions (17-32)
- METHOD 2:** **(System and Scan model radios only)** From keypad: If group selection is programmed as the primary function of and select a group by pressing or to scroll through the group list. The display registers the new group name on line two.
- METHOD 3:** **(System model radios only)** Direct Access: Press to enter the group select mode. Press the numeric key mapped to the desired group. Press . The radio will move to the selected group.
- METHOD 4:** **(Select model radios only)** If programmed for groups, press the Option 1 button to change groups. The display registers the new group name on line two. If programmed for channels, press the Option 1 button to change the channel. The display registers the new channel.


## **10.4 MODIFY SCAN LIST**

### **10.4.1 System Model**





1. Press  to toggle scan OFF and verify  is **not** displayed.
2. Select group or channel.
3. Press  once to remove group or channel from list.
4. Press  once to add as a normal group or channel.


Press  twice to add as a Priority 2 group.


Press  three times to add as a Priority 1 group.


5. Press  to re-start scanning.

### **10.4.2 Scan Model**

1. Press  to toggle scan OFF and verify  is **not** displayed.
2. Select group or channel.
3. Press  once to remove group or channel from the list.
4. Press  once to add as a normal group or channel.


Press  twice to add as a Priority 2 group.

Press  three times to add as a Priority 1 group.





5. Press  to re-start scanning.

## **10.5 NUISANCE DELETE (SYSTEM MODEL)**




A channel can temporarily be deleted from the scan list if it is not the currently selected channel.

1. Turn Scan ON.
2. When the radio receives a call on the channel, press the . The channel is removed from the scan list until the radio is power cycled.








## **10.6 BACKLIGHT ON/OFF**

1. Press  to access the menu.
2. Press   to scroll through menu until “BCKLGHT” appears.
3. Press  to select Backlight menu.








4. Press   to toggle backlight ON and OFF.
5. Press  to select new backlight setting.

## 10.7 CONTRAST ADJUST

1. Press  to access the menu.
2. Press   to scroll through menu until “CONTRAST” appears.
3. Press  to select Contrast menu.
4. Press   to adjust contrast setting from 1 - 4.
5. Press  to select new contrast setting.

## 10.8 DECLARING AN EMERGENCY

1. Press and hold the red Emergency/Home button (the length of time is programmable; check with the system administrator).
2. **\*TXEMER\*** will flash in the display, plus  and  will be displayed. After 2-3 seconds the transmit icon  will turn off.
3. **\*TXEMER\*** and  will remain until the emergency is cleared.
4. Press the PTT and  will reappear.
5. Release PTT when the transmission is complete.

## 10.9 LOCKING/UNLOCKING KEYPAD




1. Press  button.
2. Within 1 second, press the Option button on the side of the radio.

## 10.10 HIGH/LOW POWER ADJUSTMENT

Transmit power adjustment is possible if enabled through programming. Within conventional systems, transmit power is adjustable on a per channel basis. Within EDACS and P25 trunking systems, transmit power is adjustable on a per system basis.

There are two ways to toggle between high and low power:

### 10.10.1 Using the Menu Button

1. Press .
2. Using the  and  keys, scroll until the cursor (>) appears to the left of “TX POWER” in the display.

3. Press **M** again to toggle between High and Low power.
4. "POWER = HIGH" or "POWER = LOW" will appear momentarily on the top line of the display.

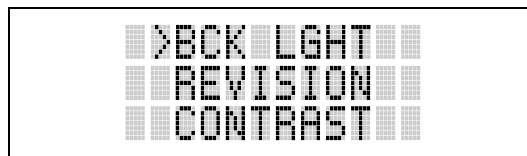
### **10.10.2 Using the Pre-Programmed Option Button**

Press the Option button. "POWER = HIGH" or "POWER = LOW" will appear momentarily on the top line of the display.

## **10.11 MENU**

The Menu function accesses features that are not available directly from the keypad. The order and actual menu items available is configurable through programming. Upon radio power up, the menu item that is at the top 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 and cursor position.

1. To enter the menu mode, press **M**.
2. Upon entering the menu selection mode, Menu options will appear in the display (see Figure 10-1).



**Figure 10-1: Menu Display**

3. The radio will continue to receive and transmit normally while in the menu function.
4. To scroll through the menu options use the **▲** or **▼** keys. When the required menu item has been found align the cursor with the option then press **M** to select it. The menu item's parameter setting shown in the display can now be changed by using **▲** or **▼** to scroll through the list of parameter values.
5. Once the desired setting is reached press **M** to store the value and return the menu option selection level.

For menu items that display radio information, pressing **▲** or **▼** will scroll through a list of informational displays. The possible menu items are in Table 10-1.

### **10.11.1 Menu Item Selection Process**

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

1. Press **M**.

The menu mode is entered.

2. Press **▲** or **▼** until the display shows:

```

>BCK LGHT
REVISION
CONTRAST

```

- Press **M**. The backlight menu item is activated. Line one shows the active menu item and its current parameter setting. Line two shows the currently selected system or group name (see Figure 10-2).

```

BCKL=ON
FIRE

```

**Figure 10-2: Backlight Menu Display**

- The menu item's parameter setting shown in the display can now be changed by using **▲** or **▼**.
- Once the desired setting is reached press **M** to store the value and return the menu option selection level.

For menu items that display radio information pressing **▲** or **▼** will scroll through a list of informational displays. An example of information displays is shown in Figure 10-3.



The TX POWER menu item, when selected, toggles LOW/HIGH power. It does not use **▲** or **▼** to scroll nor is an additional press of the **M** button required.

Table 10-1: Menu Item Information

FEATURE	DISPLAY	PARAMETER SETTING	COMMENT
Keypad Lock	Menu Item: KEY LOCK Once Selected: LOCKED	Locked Unlocked	Locks the keypad. To unlock; press and release "M" then within 1 second press the option button ( <i>NOTE: this sequence is also a short cut to locking the keypad.</i> )
Backlight Adjust	Menu Item: BCK LIGHT Once Selected: BCKL=	OFF/ON	Selects the light level for backlighting.
Contrast Adjust	Menu Item: CONTRAST Once Selected: CNTRST=	1, 2, 3, 4	Selects the display contrast level.
Transmit Power Select	Menu Item: TX POWER Once Selected: POWER=	HIGH or LOW	Selects radio output power mode.
Radio Revision Information	Menu Item: REVISION	N/A	Selects the information display to view. Informational display only (see Figure 10-3). <i>No user selectable settings.</i>
Toggle Scan On/Off	SCAN	ON/OFF	Toggles Scan operation ON/OFF.
Toggle Private Mode	PRIVATE	ON/OFF	Toggles Private Mode ON/OFF.
Display Current Encryption Key	DISP KEY	N/A	Displays current encryption key. Informational display only. <i>No selectable settings.</i>
Display Current Home Group/Channel	HOME	N/A	Selects Home Group/Channel
Select Desired System	SYS SEL	N/A	Selects a new system.
Add Group/Channel to Scan List	SCAN ADD	N/A	Adds to Scan List.
Delete Group/Channel	SCAN DEL	N/A	Deletes Group or Channel from Scan List.
Add/Delete Scan List	SCAN A/D	N/A	Add or Delete from Scan List.
Select Telephone Numbers From Phone List	PHN CALL	N/A	Trunked Only.
Data Operation	NO DATA	ON/OFF	Trunked Only. Toggles Data Operation ON/OFF.
Select Individual Call from IC List	IND CALL	N/A	Trunked Only.
Select Group	GRP SEL	N/A	Trunked Only.
Talkaround	TALKARND	ON/OFF	Conventional Only. Toggles Talkaround feature ON/OFF.
Select Channel	CHN SEL	N/A	Conventional Only.
Feature Encryption Display	Menu Item: FEATURES Once Selected: (See Feature Encryption Display Section)	N/A	Indicates current features programmed into the radio as well as certain information required to add features to the radio. <i>Informational display only. No user selectable settings.</i>
System Scan Enable	Menu Item: SYS SCAN Once Selected: SYSC ON or SYSC OFF	ON/OFF	Toggles System Scan feature ON/OFF.

PRS - NAME XXXXXXXX	Personality Name
EEPR SIZ	EEPROM Size
RAM SIZ	RAM Size
FLSH SIZ	Flash Size
RF BAND	Frequency Band
HSD RATE	Data Transfer Rate
PRS VER	Software Version
DSP _RAM	DSP Software Version
FLSH - VER	FLASH Software r - released, 01A - revision state
M/A-COM (C) – 2004	Copyright

Figure 10-3: Information Display

## 10.12 DIGITAL VOICE OPERATION

Digital voice programmed systems have three (3) different voice modes: clear (analog), digital, and private (encrypted). The voice modes are programmed on a per-group basis within each trunked system and on a per-channel basis within each conventional system.

### 10.12.1 Clear Mode

The Clear Mode is a voice mode in which the radio transmits and receives only clear (analog) voice signals. These analog signals are non-digitized and non-encrypted. Clear mode transmissions can be monitored easily by unauthorized persons.



Groups or channels programmed for clear operation cannot transmit or receive digital or private messages.

### 10.12.2 Digital Mode

The Digital Mode allows the radio to transmit and receive digitized voice signals. Digital signals provide improved weak signal performance and cannot be easily monitored with a standard receiver. Groups and channels programmed for digital operation transmit only digital signals. Message trunked group calls and individual phone calls (I-Calls) are answered back in the mode in which they were received assuming the call or hang time is still active. Individual phone, all call, and emergency calls are transmitted clear if the digital mode is disabled or inoperative.



1. If receiving an analog message trunked call, the radio responds in the analog mode during the hang time on the working channel.
2. If receiving an analog I-Call, the radio responds in the analog mode during the hang time.
3. When using the **\*WHC\*** feature to respond to an I-Call (after the hang time has expired), the call is 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 is transmitted as defined by the I-Call mode programmed in the list for that ID.

The over dial DTMF tones are not available while in the Digital Mode.

### 10.12.3 Private Mode






The Private Mode allows the radio to transmit encrypted messages and receive clear or private transmissions. The radio transmits private if the group/channel is programmed for private operation and forced operation is pre-programmed. If autoselect operation is pre-programmed and the radio is in the Private Mode, the radio transmits in the mode of the received call if the hang time is active. If no hang time is active, the radio transmits private.

Cryptographic keys are transferred to the radio using a cryptographic Keyloader. Up to seven (7) different cryptographic keys, numbered 1-7, can be transferred from a Keyloader and stored in the radio. An individual key is automatically selected on a per-group/channel basis according to the radio programming. Groups and channels within the digital system can be programmed for keys 1-7 (private). Up to 8 banks of 7 keys can be stored for private systems. The bank is specified per system.

When operating on a group or channel programmed for Private Mode, all transmissions are private transmissions and the radio receives clear and private signals. The status icon  is displayed when the Private Mode is enabled. If the selected group or channel is programmed for auto-select capability, the mode may be toggled between private and clear with the  key, then following the selection mode rules. Radios programmed for forced private operation do not allow a change of the transmit mode.

#### 10.12.3.1 Displaying the Currently Used Cryptographic Key Number

To Display the Currently Used Cryptographic Key Number 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:

1. Press the  button.
2. Use the  or  button to select "DISP KEY."
3. Then use the  or  button to toggle between displaying the system key or the group/channel key.

##### 10.12.3.1.1 System Encryption Key

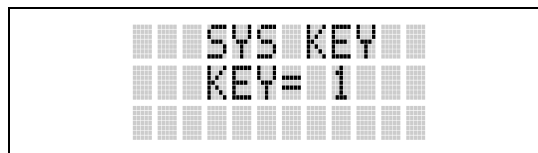


Figure 10-4: System Encryption Key Display

##### 10.12.3.1.2 Group/Channel Encryption Key

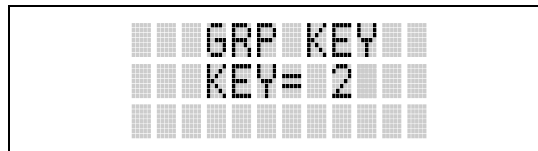


Figure 10-5: Group/Channel Encryption Key Display


### 10.12.3.2 Key Zero

All cryptographic keys can be zeroed (erased from radio memory) by pressing the MONITOR/CLEAR button and while still pressing this button, press and hold the OPTION button. Press both buttons for 2 seconds. A series of beeps will begin at the start of the 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 Keyloader into the radio before private communications may continue.

## 10.12.4 Private Operation

### 10.12.4.1 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  icon is displayed, the receiver will unsquelch and the message will be heard in the speaker. For this to occur the selected group or channel must be programmed for private operation and the correct cryptographic key must be loaded into the radio.

### 10.12.4.2 Transmitting an Encrypted Call

1. Select the desired group or channel.
2. Place the radio in Private Mode by pressing  key, then follow the selection mode rules. On a System radio, the  key can be used to toggle the Private Mode ON/OFF. When Private Mode is enabled, the  icon is displayed.

If the last state of the radio was Private Mode, the Private Mode will be enabled on power up. Also, 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 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.

### 10.12.4.3 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 autoselect, 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 autoselect 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 and in different modes (clear, digital, private), only the first occurrence of the group will be used.

**Table 10-2: Transmit/Receive Mode Compatibility for  
Digital Voice Operation**

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

\*assumes the proper cryptographic key is loaded

**NOTE**

Conventional Digital or encrypted channels require Channel Guard on the channel to operate correctly. The voice coding technology embodied in this product is protected by intellectual property rights including patent rights, copyrights, and trade secrets of Digital Voice Systems, Inc. The user of this technology is explicitly prohibited from attempting to de-compile, reverse engineer, or to disassemble the Object Code, or in any other way convert the Object Code into a human-readable form.



## 11 TRUNKED OPERATION







This section describes P25 Trunked and EDACS operation.

### 11.1 SCANNING TRUNKED GROUPS

Groups that have been previously added to the scan list on a per system basis may be scanned. Each system's group scan list is retained in memory when the radio is powered OFF or when the battery pack is removed.

The following procedures outline scan operations for trunked groups. See the conventional mode operating procedures for specific procedures on conventional channel scanning.












#### 11.1.1 Turning Scan On and Off



1. Toggle Scan operation ON by pressing  (Scan model) or  (System model).  icon rotates clockwise to indicate radio is scanning.
2. Toggle Scan operation OFF by again pressing  (Scan model) or  (System model).  will disappear.
  - If the radio scans to a group other than the selected group then receives a call on the selected group, the radio will switch to the selected group. However, if the “scanned-to” group is programmed at a higher priority the radio will remain on the “scanned-to” group.
  - 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 to the currently selected group (depending on programming).

#### 11.1.2 Adding Groups to a Scan List

##### 11.1.2.1 Scan Model

1. Scan must be OFF to add/delete groups to/from the scan list. If the Scan icon  is ON, press the  key to turn Scan OFF.
2. Select the desired group using the SYSTEM/GROUP/CHANNEL knob and/or the  or  keys. If the selected group is currently on the list, pressing  will display  on line three.
3. If the scan list status icon is blank () , the group can be added to the scan list by pressing the  key.  will be displayed on line three.
4. Press the  key a second time to set the group to Priority 2. A  is displayed on line three.

Press  a third time to set the group to Priority 1. A  is displayed on line three. The priority level section sequence only advances the group to the next high 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. One of the following messages may be momentarily displayed:

- SCAN DIS** The radio is not programmed to scan.
- FIXED P1** A Priority 1 group has been pre-programmed into the radio. A new Priority 1 group cannot be selected.
- FIXD LST** A fixed scan list has been pre-programmed into the radio. It is not possible to change the list without reprogramming the radio.



NOTE

To quickly view multiple group scan status, press **AD** then slowly but consistently rotate the group knob. Each group status will appear on the display.

### 11.1.2.2 System Model

1. With scan operation turned OFF, select the desired group to add to the selected trunked system group scan list.
2. Press **6 ADD MNO**. The current priority status of the group will be displayed in column 10 of line three for a time-out period. If the group is not part of the scan list the status will be blank.
3. While the status is displayed, press **6 ADD MNO** to add the group to the scan list. **||||** is displayed on line three.
4. Press **6 ADD MNO** a second time to set the group to Priority 2. A **||** is displayed on line three.

Press **6 ADD MNO** a third time to set the group to Priority 1. A **|** is displayed on line three. 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. One of the following messages may be momentarily displayed:

- SCAN DIS** The radio is not programmed to scan.
- FIXED P1** A Priority 1 group has been pre-programmed into the radio. A new Priority 1 group cannot be selected.
- FIXD LST** A fixed scan list has been pre-programmed into the radio. It is not possible to change the list without reprogramming the radio.








NOTE

To quickly view multiple group scan status, press either **6 ADD MNO** or the **9 DEL WXYZ** key. Then slowly but consistently rotate the group knob. Each group status will appear on the display.


### 11.1.3 Deleting Groups from a Scan List





#### 11.1.3.1 **Scan Model**

1. With scan operation turned OFF, select the desired group to delete from the selected trunked system group scan list.
2. Press . The current status of the group is displayed for a time-out period.



While the current status is displayed, press  until the group from the scan list is "**blank**". The sequence is "**blank**", , , , "**blank**". Any group that is not in a trunked system group scan list will show a "**blank**" for the time-out period when it is the selected channel.

#### 11.1.3.2 **System Model**

1. With scan operation turned OFF, select the desired group to delete from the selected trunked system's group scan list.
2. Press . The current status of the group is displayed for a time-out period.

While the status is displayed, press  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**" for the time out period when it is the selected channel.

#### 11.1.3.3 **Nuisance Delete**

A group can also be deleted from the scan list, if it is not the currently selected group, by pressing the  key (Scan model) or the  key (System model) 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 done in this manner will not remain deleted if the radio is powered OFF and then powered ON.

## 11.2 **SCANNING TRUNKED SYSTEMS**

The radio can be programmed with the following System Scan features. These features are automatically enabled when the radio is powered ON. 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 when the radio is powered ON.

### 11.2.1 **Wide Area System Scanning**

The P7100<sup>IP</sup> series radios can be programmed for Wide Area System Scan operation for roaming across mobile systems. 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.

### **11.2.2 Priority System Scan**

The radio can also be programmed for Priority System Scan. 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. This is done at a programmable rate defined by the value in the Priority Scan Time control (unless the ProScan™ algorithm is enabled, as explained in the following sections). This priority scan timer is reset each time the PTT button is pressed or when the call is received. If the priority system control channel is found, (or meets the predefined criteria <ProScan>), the radio will automatically switch to the priority system.

#### **11.2.2.1 Enabling the Wide Area System Scan Function**

If the radio cannot find the control channel of the selected system and begins to wide area system scan, the radio will only scan for the priority system control channel if the priority system is in the wide area scan list.





#### **11.2.2.2 When ProScan is Enabled**

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

### **11.2.3 ProScan**

The radio may be programmed for ProScan system scan operation for multi-site applications depending on the version of radio flash code. ProScan is an improved multi-site system scanning algorithm designed to replace ProSound™ scanning. 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 compares it with the signal quality of the control channel for each site in its adjacent 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 degrades to 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 enabled through programming). 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.

### **11.2.4 Menu Selection**

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


### **11.2.5 Pre-Programmed Keypad Key**

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

## 11.3 EMERGENCY OPERATION



The radio's ability to declare an emergency, clear an emergency, remain locked on an emergency system 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 restarts only after the emergency has been cleared.

### 11.3.1 Receiving an Emergency Call

When receiving an Emergency Call on the selected group and system, an alert beep is heard and  is displayed. The message **\*RXEMER\*** flashes in the display on line two until the emergency condition is cleared.

### 11.3.2 Declaring an Emergency Call


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

1. Press and hold the red EMERGENCY button that is on top of the radio in front of the antenna 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 indicating the radio has auto keyed (see Table 8-2) and is ready for voice transmission. **\*TXEMER\*** flashes on line two in the display until the emergency is cleared.
3. Press PTT and speak into the microphone in a normal voice.  and  momentarily turn ON.
4. Release PTT when the transmission is complete.

To clear the emergency first press and hold the CLEAR/MONITOR button. While continuing to hold the CLEAR/MONITOR button, press the EMERGENCY button. (This will work if the radio is programmed to clear emergencies.)

## 11.4 INDIVIDUAL CALLS

### 11.4.1 Receiving and Responding to an Individual Call (Trunked Mode Only)

When the radio receives an individual call (a call directed only to the user's radio), it un-mutes on the assigned working channel and displays . The first line on the display shows the logical ID number of the unit sending the message, or the associated name if the ID number is found in the individual call list. The radio can be programmed to ring when an individual call is received. If enabled, the ring begins five seconds after the caller un-keys and will continue until the PTT button, the CLEAR/MONITOR button or the individual call mode is entered.

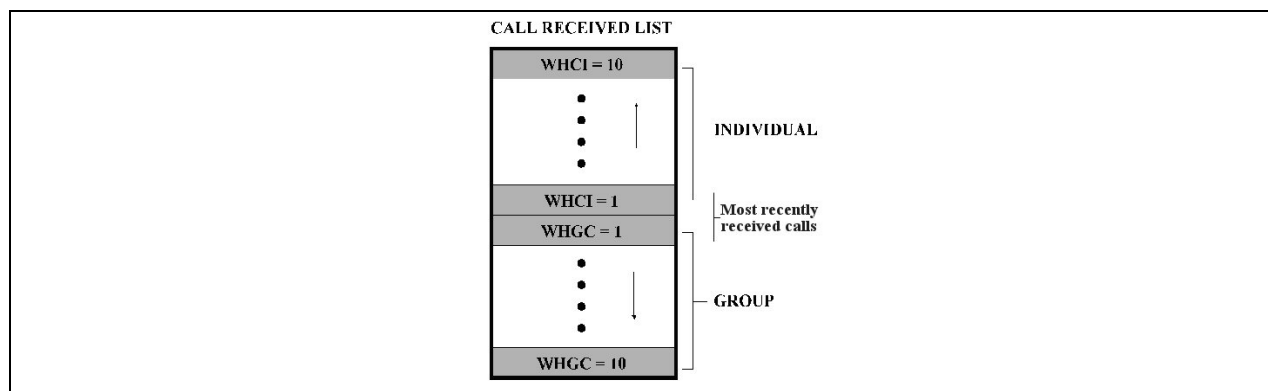


The volume of the ring is adjustable through the volume control levels.

If a response is made by pressing the PTT 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 display, and **\*WHC\*** will appear on the first line of the LCD.

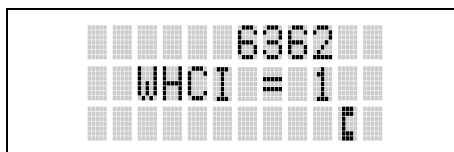
To respond after the call-back time-out, press the **#IND** key. The radio's display will show the callers ID on the first line and **WHCI=1** on the second line. Pressing the PTT button at this point will initiate an individual call back to the original caller.

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.



**Figure 11-1: Calls Received Lists**

To access this list, press the **#IND** key twice. Use the **▲** or **▼** buttons **▲** or **▼** buttons to scroll through the list. Pressing the **M** key will display the time elapsed since the call was received. After pressing **#IND** an example of the display is shown in Figure 11-2:



**Figure 11-2: WHC Individual Call Display**







Pressing PTT will initiate an individual call to the displayed logical ID. Powering the radio OFF and ON will clear this list.

## 11.4.2 Sending an Individual Call (Trunked Mode Only)











### 11.4.2.1 Pre-Stored Individual Calls

The following procedures describe how to initiate and complete a Pre-Stored Individual Call.

## SYSTEM MODEL



1. To select a pre-stored individual phone number, enter the individual call mode using the  key.  is displayed. Then scroll through the list of stored numbers using the  or  key.
2. Press the PTT button; when the radio is clear to transmit,  turns ON,  turns OFF and the channel access tone sounds. Line one shows the called individual's name if found in the list of stored individuals or **LID** followed by the logical ID number of the unit being called. The message **\*INDV\*** displays on line two.

## SCAN MODEL



1. To select a pre-stored individual number, enter the menu mode by pressing the  key. Scroll through the mode list using the  or  key.
2. Press .  is displayed. Scroll through the list of stored phone numbers using the  or  key until the desired number is displayed. Press .
3. Press the PTT button; when the radio is clear to transmit  turns ON,  turns OFF and the channel access tone sounds. Line one shows the called individual's name or LID. The message **\*INDV\*** displays on line two.

### 11.4.2.2 Direct Dial Individual Calls (System Model Only)

The following procedure describes how to initiate and complete a Direct Dial Individual Call.

1. The individual call ID is not stored in the pre-stored list of call IDs but the individual unit ID is known, it can be entered directly from the keypad.
2. Press and hold the PTT button to transmit.  will turn ON,  will turn OFF, and the channel access tone will sound. Line one shows the called individual's ID followed by the logical ID number of the unit being called. The message **\*INDV\*** displays on line two. Proceed talking into the microphone.

### 11.4.3 Call Storage Lists

There are two lists available for call storage in the P7100<sup>IP</sup> series radios, 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 , the **calls received** list is available. The user can toggle to the personality list by selecting any index other than 0 or toggle between the two lists by pressing the  key. If wrap is enabled, the **calls received** list wraps on itself and not into the other list.

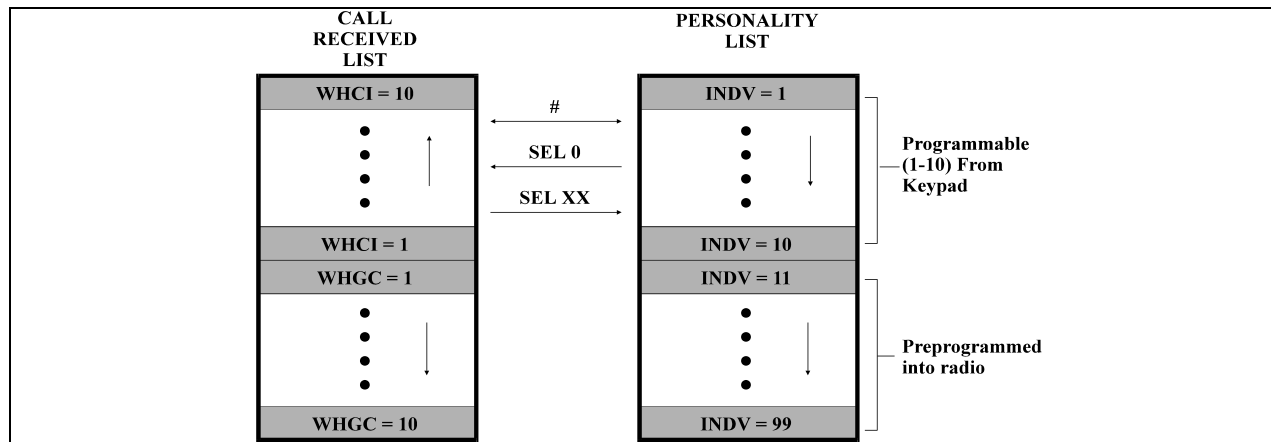


Figure 11-3: Calls Received and Personality Lists

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 the  $\text{M}$  key toggles the time stamp ON and OFF. The time stamp indicates how long ago the call was received. When in the pre-stored list pressing the  $\text{M}$  key toggles the *Logical IDentification (LID)* ON and OFF.

## 11.5 TELEPHONE INTERCONNECT CALLS

### 11.5.1 Receiving a Telephone Interconnect Call (Trunked Mode Only)

When the radio receives a telephone interconnect call (a call directed only to the user's radio), it un-mutes on the assigned working channel and displays  $\text{T}$ . The first line displays **\*PHONE\***. The second line displays **\*INDV\***. Proceed with the call. Press PTT to talk, release PTT to listen.

### 11.5.2 Sending a Telephone Interconnect Call (Trunked Mode Only)

#### 11.5.2.1 Pre-Stored Number

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

1. **System Model:** To select a previously stored phone number, press  $\text{PHN}$ . Use the  $\blacktriangle$  or  $\blacktriangledown$  keys to scroll through the list of stored numbers.

**Scan Model:** To select a previously stored phone number, press  $\text{M}$ . Use the  $\blacktriangle$  or  $\blacktriangledown$  keys to select the menu option **PHN CALL**. Press the  $\text{M}$  key again then use the  $\blacktriangle$  or  $\blacktriangledown$  keys to scroll through the list of pre-stored numbers.

2. Press and release the PTT button. When the radio is clear to transmit,  $\text{T}$  turns ON,  $\text{M}$  turns OFF and the channel access tone sounds. Line one shows the accompanying name selected from the list of stored numbers. The message **\*PHONE\*** displays on line two. The radio then automatically transmits the programmed number stored in the special call queue.




3. A telephone ring will be heard from the speaker. When someone answers the phone, press the PTT button and speak into the microphone. Release the PTT button to listen to the callee. Unsuccessful interconnect signaling returns the radio to the normal receive mode and the number remains displayed until the special call is cleared or the time-out expires or another group or system is selected. Terminate a call by pressing the CLEAR/MONITOR button.



NOTE


In half-duplex mode, only one person may talk at a time. The radio PTT button needs to be pressed in order to communicate to the individual called and released for the individual called to be heard.

### 11.5.2.2 Direct Dialing of Phone Calls (System Model Only)

1. If the phone number is not stored in the pre-stored list of phone numbers, but the phone number is known, it can be entered directly from the keypad. Start by pressing the , then enter the required number from the keypad.



NOTE


The last number directly entered can be recalled by first pressing  then pressing the PTT button.

2. A telephone ring can be heard from the speaker. When someone answers the phone, press the PTT button and speak into the microphone. Release the PTT button to listen to the individual called. Unsuccessful interconnect signaling returns the radio to the normal receive mode and the number remains displayed until the special call is cleared or the time-out expires or another group or system is selected.
3. To terminate the call, momentarily press the CLEAR/MONITOR button.

### 11.5.3 Dual-Tone Multi-Frequency: Overdial/Conventional Mode

Once the radio has established a connection to the public telephone system, it may be necessary to “overdial” more digits to access banking services, answering machines, credit card calls, or other types of systems that require Dual-Tone Multi-Frequency (DTMF) access digits.

Overdial operation can also be used to initiate a telephone interconnect call via DTMF signalling if a dial tone has already been accessed on the system. This method makes 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. These numbers are accessed by pressing , then following the selection mode rules. The following steps are required to dial these numbers:

#### SCAN MODEL

1. Follow the procedure in Section 11.5.2 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 by entering the phone mode using the **M** button.

Press **M** to enter the overdial select/entry mode and follow the selection mode rules to call up a stored number from the phone list. **■** is displayed. 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 **M** is pressed. The overdial select/entry mode can be re-entered if the call is still active by pressing **M**.

## **SYSTEM MODEL**

1. Follow the procedure in Section 11.5.2 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:

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

## **11.6 PROGRAMMABLE ENTRIES**

### **11.6.1 Pre-Storing Individual and Telephone Interconnect Calls from the Keypad**

Individual Call ID numbers, telephone numbers and other number sequences for overdialing are stored in the special calls 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. **■** is displayed.
2. Scroll through the list using the **▲** or **▼** 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, **#IND**, or **\*PHN** until an underscore appears in the display (telephone interconnect only). 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 **M** until the display changes indicating that the number has been stored.

Repeat steps 1-4 above if the number stored in an entry location needs to be changed.

## 11.7 STATUS/MESSAGE OPERATION

Status operation permits the transmission of a pre-programmed status condition to the P25 Trunked or EDACS site. Message operation permits the transmission of a pre-programmed message text to a P25 Trunked or EDACS site.

### 11.7.1 Status Operation

To send a status condition, press the **(M)** key followed by **(▲)** or **(▼)** key to select the pre-programmed status. STATUS and 0 through 9 pre-programmed status selections are available from the menu. If STATUS is selected you need to enter the number of the status message you intend to transmit. If no status has been programmed for the selected number key, the radio will display **NO ENTRY**. 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 **(M)** key has been pressed (the **(M)** key 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. Status messages can also be programmed for single key operation so that a single press of a key assigned to a status message automatically transmits that message. If the site does not receive the status properly, the radio will sound a low pitched tone.

The status selection can also be cancelled by pressing the CLEAR button prior to the time-out period.

To view the currently selected status after it has been transmitted, press the **(M)** key and then the **(▲)** key to ramp to STS, re-press the **(M)** key again and then the CLEAR button prior to the time-out period. If the status was not sent successfully to the site, the text associated with the status will flash in the display.

### 11.7.2 Message Operation

Message Operation is performed in the same manner as status operation in the previous section.

### 11.7.3 Dynamic Regroup Operation

Dynamic Regroup Operation permits multiple talk groups (up to eight) to be added to a radio via the system manager. The radio must be pre-programmed to respond to regrouping. Dynamic regrouping will not be activated in a radio until the system manager sends an activation message. Each radio that receives and acknowledges the regrouping instructions is successfully regrouped.

Pressing and holding the CLEAR/MONITOR button for 2.5 seconds toggles the user into and out of the dynamic regroup groupset. A double beep will sound for entry or exit. The display will indicate **REGRP\_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.

### 11.7.4 Emergency Operation

If the pre-programmed groupset on the currently selected system contains an EMER/HOME group and the radio is in dynamic regroup, the radio will declare the emergency on the currently selected dynamic group.

### **11.7.5     Macro Key Operation**

Macro key operation permits the user to accomplish a series of keystrokes with a single "macro" keystroke. Each Macro Key is capable of executing up to twenty (20) keystrokes, to any push button input (i.e., keypad keys, OPTION button, etc.). Each macro key can be pre-programmed to activate when pressed or when released.

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

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

## **11.8 PORTABLE DATA**

The P7100<sup>IP</sup> series portable radios, when operating in the P25 Trunked or 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, 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 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) may be connected to the radio. Support for MDTs or host computers is a programmable option per radio. Additionally, radios may also be programmed for data only operation (no voice calls transmitted or received).

### **11.8.1     Displays**

The following will be displayed during the various states of data mode of operation:

<b>TX DATA</b>	Appears on top line of display when the radio is transmitting a data call.
<b>RX DATA</b>	Appears on top line of display when the radio is receiving a data call.
<b>DATA OFF</b>	Appears on top line of display when the radio is in the data disabled state.
<b>DATA ON</b>	Appears for two seconds on top line of display when the radio is toggled to the data enabled state.

### **11.8.2     DATA OFF Operation**

The radio can be placed in the data disabled state by any of the following methods. When the data state is disabled, **DATA OFF** appears on the top line of the display.

- Declaring an emergency (not to be used unless an actual emergency condition exists). Alert tone will sound.
- Pressing the OPTION button (if pre-programmed for "no data" key). Alert tone will sound.
- Pressing the "no data" (ND) key (pre-programmed).

### **11.8.3     DATA ON Operation**

The data state is enabled by one of the following (depending on how it was disabled). **DATA ON** will appear on the top line in the display for two seconds then the display will return to normal.

- Pressing the “no data” (ND) key toggles data state ON or OFF.
- Clearing an emergency. (Valid only if the emergency caused “Data OFF” operation.)



#### 11.8.4 Exiting Data Cells

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:

- PTT is activated.
- Emergency is declared by pressing the pre-programmed emergency button.
- A group or system is changed.

#### 11.8.5 Scan Lockout Mode

Following the transmission or reception of a data call, if scan is enabled, scanning will stop temporarily (two independent pre-programmed times; after a receive data call and after a transmit data call). During this time the scan indicator 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 CLEAR button is pressed. The PTT is pressed.
- The group or system is changed.
- Phone call mode is entered.
- Individual call mode is entered.
- A new emergency assignment has been received.
- An emergency is declared or cleared.
- An individual or phone call is received.
- An Agency, Fleet or System All Call is received.
-  or  is pressed to toggle Scan ON or OFF.







#### 11.8.6 Data Lockout Mode

During the voice call scan hang time (pre-programmed) the radio will not receive data calls.

### 11.9 PAGE (P25 TRUNKING ONLY)

Page sends a PING message to a radio and functions similar to Individual Call.

The following procedures describe how to initiate and complete a Pre-Stored Page.

1. To select a pre-stored individual phone number, enter the Page mode using the  and the  or  key until **PAGE** is displayed. Select Page with the  key. Then scroll through the list of stored numbers using the  or  key.

2. Press the PTT button. If the receiving radio receives the Page and responds, both radios will emit three high-pitched tones.

#### **11.9.1.1 Direct Dial Page (System Mode Only)**

The following procedures describe how to initiate and complete a Direct Dial Page.

1. The ID is not stored in the pre-stored list of call IDs but the individual unit ID is known, it can be entered directly from the keypad.
2. Press and hold the PTT button. If the receiving radio receives the Page and responds, both radios will emit three high-pitched tones.

## 12 PROJECT 25 (P25) CONVENTIONAL OPERATION

### 12.1 GROUP CALLS IN P25 MODE

#### 12.1.1 Transmitting a Group Call

1. Select the desired P25 system. (P25 icon will appear in display.)
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.

#### 12.1.2 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.

### 12.2 INDIVIDUAL CALLS IN P25 MODE

#### 12.2.1 Transmitting an Individual Call

1. Select the desired P25 system. (The P25 icon will appear in the display.)
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.

#### 12.2.2 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.

## **12.3 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.

### **12.3.1 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. While the PTT is NOT pressed, the mic will be open and the radio will broadcast an approximately 2 second transmission (e.g., background noise) which will be repeated at 10-30 second intervals.
4. Press the PTT to stop the short transmissions.
5. To send a voice message, press the PTT and speak into the microphone.
6. To clear an emergency from the transmitting radio, perform one of the following steps:
  - Change systems.
  - Change channels (if not prohibited by programming).
  - Cycle power by turning radio off and then back on.
  - Press the Clear and Emergency buttons simultaneously, providing the Clear Emergency option is enabled in the Supervisory Options in the personality.

### **12.3.2 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:
  - Change systems.
  - Change channels (if not prohibited by programming).
  - Cycle power by turning radio off and then back on.
  - Press the Clear and Emergency buttons simultaneously, providing the Clear Emergency option is enabled in the Supervisory Options in the personality.



## 13 RADIO TEXTLINK OPERATION (EDACS ONLY)

Radio TextLink provides a simple means of exchanging text messages. This section describes how to send messages if the Radio TextLink feature is enabled.

### To send a text message:

1. Select **SEND MSG** with the **M** and scroll through the list of pre-defined messages using the **▲** or **▼** keys.
2. Select the desired message with the **M** key.
3. Using the **▲** or **▼**, scroll through the list of available IDs and select the desired ID with the **M** key.

### To view received messages:

1. Select **RD MAIL** with the **M** key and scroll through the list of received messages the **▲** or **▼** keys.
2. Selecting a received message with the **M** key will bring up a reply to sender option.

### To delete messages:

Selecting **DEL MAIL** with the **M** key will allow you to delete ALL of the messages in the inbox.

### To view the current time:

Select **TIME** with the **M** key to retrieve the current date and time.

## 14 OPERATION FOLLOWING WATER CONTACT

If the P7100<sup>IP</sup> model radio has been immersed in water or if the microphone air path or speaker grill become clogged with water, follow instructions under “Radio Microphone” and “Radio Speaker” sections to assure the highest quality transmitted and received messages.

### 14.1 RADIO MICROPHONE

In the event the P7100<sup>IP</sup> microphone air path becomes clogged with water, blow two quick successive breaths of air directly into the radio microphone air hole. Refer to Figure 14-1. This will help to clear any water trapped in the microphone air path and allow the microphone to function properly.



Figure 14-1: Radio Microphone

### 14.2 RADIO SPEAKER

To assure the user receives the highest quality receive audio possible after the radio has contacted water or been immersed, it may be necessary to clear excess water from the speaker cavity and grill. The speaker grill has been designed for easy drainage. To facilitate maximum drainage and the highest quality speaker output, shake the radio vigorously with speaker grill face down.

## 15 IMMERSIBLE P7100<sup>IP</sup> PREVENTIVE MAINTENANCE

Those P7100<sup>IP</sup> radios labeled “immersible” (see Figure 15-1) require periodic testing using specialized equipment to verify the radio’s watertight integrity.

### Preventive Maintenance for Immersion-Rated Radios



P7100<sup>IP</sup> model radios with Immersion Option HTMR must be serviced by a service center authorized and certified by M/A-COM to perform the necessary tests to verify watertight integrity. As part of a thorough preventive maintenance plan, M/A-COM recommends Immersion-Rated P7100<sup>IP</sup> portable radios be, at a minimum, tested and re-certified on an annual basis. M/A-COM further recommends that the radios be tested on or close to the anniversary of the ship date printed on the Model Number label on the back of the radio (see Figure 15-1).



Figure 15-1: Labels

## **15.1 TECHNICAL ASSISTANCE – IMMERSIBLE P7100<sup>IP</sup>**

To preserve the watertight integrity of the P7100<sup>IP</sup> portable radio, the radio must be serviced by a service center authorized and certified by M/A-COM to perform the necessary tests to verify the watertight integrity. Use one of the following methods to locate the nearest service center authorized to service the radios warranted under Option HTMR.

- Contact M/A-COM's Technical Assistance Center (TAC) at 1-800-528-7711 (in the U.S. and Canada) or at 1-434-385-2400 (worldwide) for a listing of service centers authorized by M/A-COM to service P7100<sup>IP</sup> radios with Option HTMR

or

- If a TECH-LINK subscriber, access M/A-COM's TECH-LINK web site for a list of Customer Service Managers (CSM) or Regional Service Managers (RSM) that will provide a list of the nearest service shops authorized by M/A-COM to service P7100<sup>IP</sup> radios with Option HTMR.

## 16 BATTERY WARRANTY

- A. M/A-COM, Inc. (hereinafter "Seller") warrants to the original purchaser for use (hereinafter "Buyer") that nickel-cadmium and nickel-metal hydride batteries supplied by Seller shall be free from defects in material and workmanship, and shall conform to its published specifications for a period of twelve (12) months from the date of purchase.
- B. For purposes of this warranty, batteries shall be deemed defective if (1) the battery capacity is less than 80% rated capacity, or (2) the battery develops leakage.
- C. If any battery fails to meet the foregoing warranty, Seller shall correct the failure by issuing a replacement battery upon receipt of the defective battery at an Authorized Service Center (ASC) or M/A-COM factory (for OpenSky® Equipment only).
- D. Replacement batteries shall be warranted only for the remaining unexpired warranty period of the original battery. This warranty becomes void if:
1. The battery has been subjected to any kind of misuse, detrimental exposure, or has been involved in an accident.
  2. The battery is used in equipment or service other than the radio equipment for which it is specified.
- E. The preceding paragraphs set forth the exclusive remedies for claims based upon defects in or non-conformity of any battery, 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 COMPANY BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES.

This warranty applies only within the United States.

**M/A-COM, Inc.**  
1011 Pawtucket Blvd.  
Lowell, MA 01853  
1-877-OPENSKY

**M/A-COM, Inc.**  
221 Jefferson Ridge Parkway  
Lynchburg, VA 24501  
1-800-528-7711

ECR-7048B

## 17 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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**NOTES**



Our commitment. Your advantage.

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