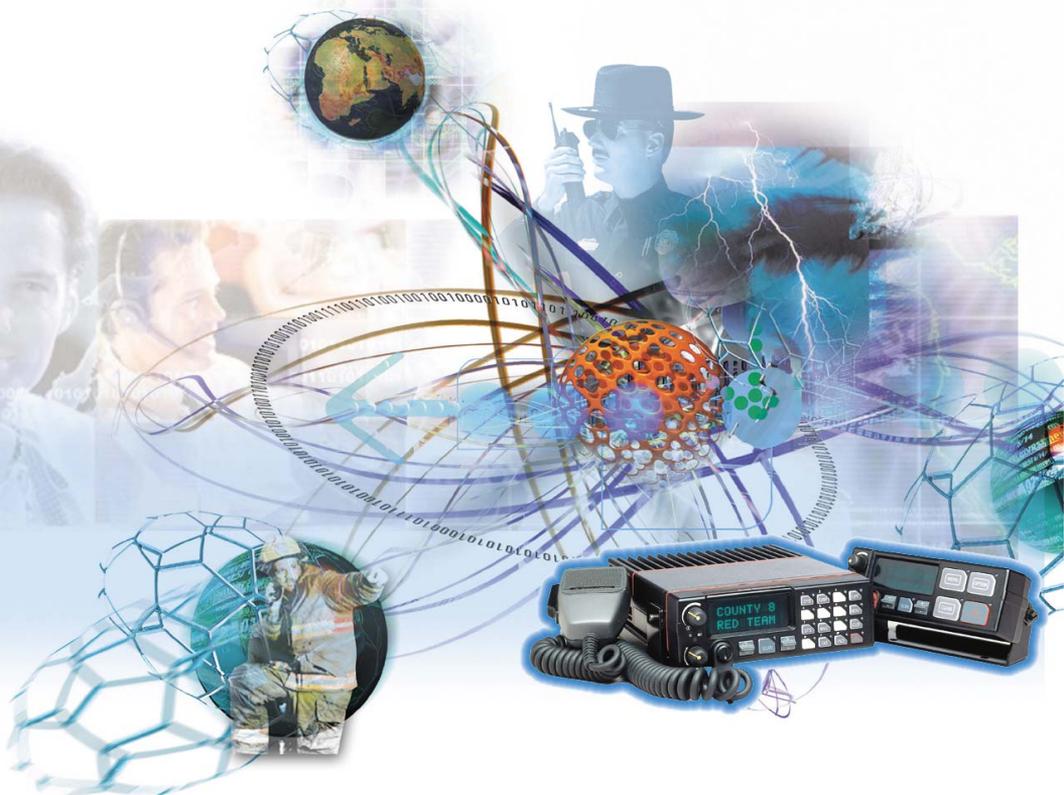


future
The Future of Mobile Radio



Orion™
Mobile Radio

MANUAL REVISION HISTORY

REV	DATE	REASON FOR CHANGE
N	Mar. 2005	Updated Nuisance Delete section.

PRODUCT SPECIFICATION FOR CE MARKED EQUIPMENT

Orion mobile radio units conform to the following Product Specifications.

EUROPEAN STANDARDS:

Safety: Not Applicable
EMC: EN 50082-1 (January 1992)
prEN 50082-1 (September 1995)
prETS 300 339 (June 1993)
EN 55022 Par. 5.1 (August 1994)
TTD: Not Applicable

SUPPLEMENTARY INFORMATION:

At this time, the Orion mobile radio may not be operated while in a desktop station in the European Community since it does not meet immunity requirements when operated in this mode.

The Orion mobile radio may be used in both trunked and conventional applications.

CREDITS

Voice Guard is a registered trademark Orion, ProVoice, Aegis, ProFile, ProSound, ProScan, SCAT, Failsoft, and G-STAR are trademarks of M/A-COM, Inc.

All other brand and product names are trademarks, registered trademarks, or service marks of their respective holders.

NOTICE

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 decompile, reverse engineer, or disassemble the Object Code, or in any way convert the Object Code into human-readable form.

The software contained in this device is copyrighted by M/A-COM, Inc. Unpublished rights are reserved under the copyright laws of the United States.

This manual covers M/A-COM, Inc. products manufactured and sold by M/A-COM, Inc.

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

This manual is published by **M/A-COM, Inc.**, without any warranty. Improvements and changes to this manual necessitated by typographical errors, inaccuracies of current information, or improvements to programs and/or equipment, may be made by **M/A-COM, Inc.**, at any time and without notice. Such changes will be incorporated into new editions of this manual. No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose, without the express written permission of **M/A-COM, Inc.**

TABLE OF CONTENTS

	<i>Page</i>
SAFETY INFORMATION	5
INTRODUCTION	6
USER INTERFACE	7
CONTROLS	8
POWER ON-OFF VOLUME KNOB	8
SYSTEM/GROUP CHANNEL KNOB	8
RAMP CONTROL	8
SCAN ON/OFF	9
SCAN ADD/DELETE	9
INDICATORS	9
KEYPAD	10
DISPLAY	14
RADIO STATUS ICONS	14
MESSAGES	15
ALERT TONES	20
CALL ORIGINATE	20
AUTOKEY (TRUNKED MODE ONLY)	20
CALL QUEUED (TRUNKED MODE ONLY)	20
SYSTEM BUSY (TRUNKED MODE ONLY)	20
CALL DENIED (TRUNKED MODE ONLY)	20
CARRIER CONTROL TIMER	21
KEY PRESS ALERT	21
DUAL CONTROL SWITCHING	21
OPERATION	22
TURNING ON THE RADIO	22
SELECTION MODE RULES	22
DIRECT ACCESS	24
MENU	24
FEATURE ENCRYPTION DISPLAY	29
SYSTEM/GROUP/CHANNEL SELECTION	32
TRUNKED MODE OPERATION	34
RECEIVING A CALL	34
SENDING A CALL	34
CONVENTIONAL FAILSOFT	35
EMERGENCY OPERATION	35
SYSTEM SCAN OPERATION	36
GROUP SCAN OPERATION	38
INDIVIDUAL CALLS	41
SCAT OPERATION	43
TELEPHONE INTERCONNECT CALLS	43
MOBILE DATA	46

TABLE OF CONTENTS

	<u>Page</u>
STATUS/MESSAGE OPERATION	49
EDACS CONVENTIONAL P1 SCAN	50
DYNAMIC REGROUP OPERATION.....	50
CONVENTIONAL MODE OPERATION	52
RECEIVING A CALL.....	52
SENDING A CALL.....	52
EMERGENCY OPERATION	53
SCANNING CONVENTIONAL CHANNELS.....	54
TURNING SCAN ON	56
TURNING SCAN OFF.....	56
SQUELCH ADJUST	57
NOISE BLANKER OPERATION.....	58
TYPE 99 DECODE (Conventional Only).....	58
DIRECT MODE OPERATION (Conventional System Only)	59
TRUNKED OR CONVENTIONAL MODE OPERATION.....	61
SIREN/LIGHT OPERATION.....	61
Digital Voice (ProVoice / Aegis / Voice Guard Operation).....	61
DUAL CONTROL OPERATION	67
MULTIPLE RADIO OPERATION.....	69
LAST SYSTEM/GROUP OR CHANNEL RECALL (Supervisory Radio Units Only).....	33
MACRO KEY OPERATION	71
SENDING A MANUALLY ENTERED INTERCONNECT CALL (SYSTEM MODEL ONLY)	71
KEYPAD REMAPPING	72
OPERATING RULES AND REGULATIONS	73
GLOSSARY.....	74

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

Wireless Systems Business Unit
M/A-COM, Inc.
Technical Publications
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

or fax your comments to: (434) 455-6851

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

SAFETY INFORMATION

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

A list of the possible hazards are:

1. Explosive Atmospheres

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

2. Interference To Vehicular Electronic Systems

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

3. Electric Blasting Caps

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

4. Radio Frequency Energy

To prevent burns or related physical injury from radio frequency energy, do not operate the transmitter when anyone outside of the vehicle is within two feet of the antenna.



Before jump starting or changing the vehicle battery, it is strongly suggested that the 3A fuse located in the Yellow lead (IGN A+) be removed. This will insure that the radio is protected from damage during the battery charging process. Replace fuse when charging is completed.

INTRODUCTION

This manual describes how to use the **Orion** Mobile Radio. The **Orion** is a synthesized, microprocessor-based, high performance mobile FM radio providing reliable two-way communications in both the **Enhanced Digital Access Communications System (EDACS)** trunking environment and conventional communication systems.

In the EDACS, or trunked system mode, the user selects a communications system and group. In this mode, 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 directly communicates 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 may be enabled or disabled through programming. Consult the system administrator for the particular features that are programmed into the **Orion**.

USER INTERFACE

The **Orion** operating controls are located on the radio's front panel (See Figures 1 & 2). A keypad, vacuum florescent display for radio status information, and a microphone jack are on the front panel. The front panel also provides a rotary **SYSTEM/GROUP/CHANNEL** knob, **POWER ON-OFF/VOLUME** control, a ramp up/ramp down control, Scan add/delete control, and a SCAN ON-OFF control for scan operation.

The keypad is used for manual number entry for individual calls, access to a telephone interconnect system and activation of various EDACS or conventional features such as menu selection. Each key has an associated LED for status indication.

The display has two lines with eight alphanumeric-characters used to show the operational mode of the radio. There is one LED for indicating transmitter **ON** and one LED to indicate **CHANNEL BUSY** located below the **POWER ON-OFF/VOLUME** Control.

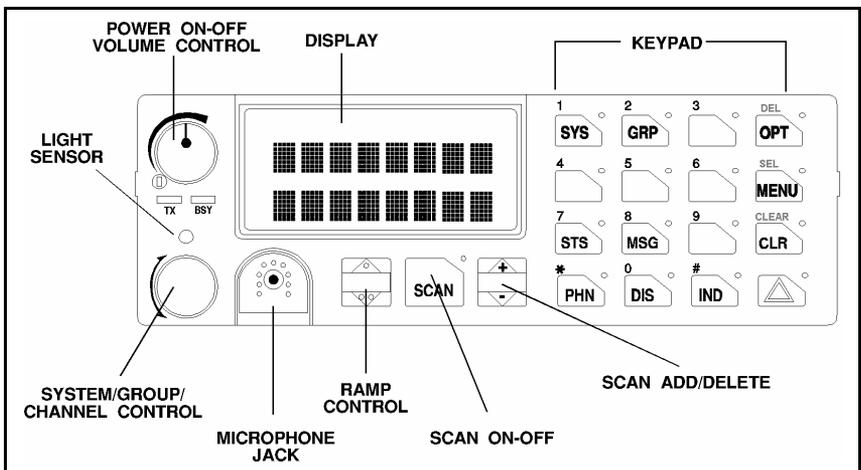


Figure 1 - Orion Mobile Radio SYSTEM Model Front Panel

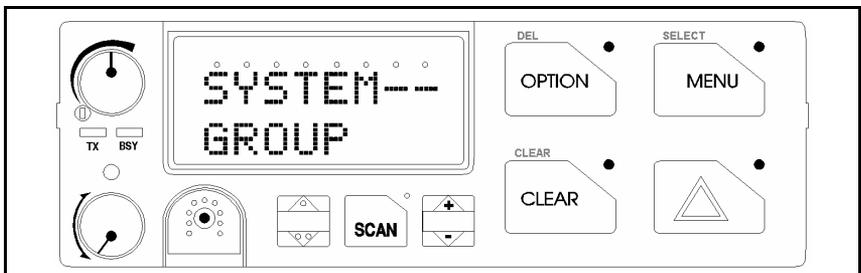


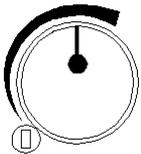
Figure 2 - Orion Mobile Radio SCAN Model Front Panel

CONTROLS

This section describes the buttons, keys and rotary knobs used to control the Orion Scan and System Model radios. All functions and controls of the Scan radio operate the same as the corresponding functions and controls on the System radio. The Scan radio is equipped with a 4-button keypad and the System radio is equipped with a 16-button keypad.

Many of the control buttons and keys have or can be programmed to have a primary function and a secondary function. The SCAN button can be programmed (as a secondary function) to toggle the keypad keys between their primary function and their secondary function.

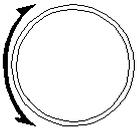
POWER ON-OFF VOLUME KNOB



This rotary Knob applies power to the radio and adjusts the receiver volume. Rotating the control clockwise out of detente applies power to the radio. A single alert tone sounds (if enabled through programming) to indicate the radio is operational.

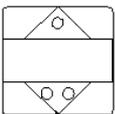
Rotating the control clockwise increases the volume level. Minimum volume levels may be programmed into the radio to prevent missed calls due to a low volume setting. While adjusting the volume, the display will momentarily indicate the volume level (i.e. VOL = 31). The volume range is from a minimum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

SYSTEM/GROUP CHANNEL KNOB



This rotary knob selects the systems or groups/channels, depending upon programming. This 16 position knob has no stop. See **SYSTEM/GROUP/CHANNEL SELECTION** for more details.

RAMP CONTROL



The primary function of this rocker type button is to scroll through the System list or the Group/Channel list depending upon programming. The secondary function is to increment or decrement items within a list (phone list for example). Press  to scroll in increasing order and press  to scroll in decreasing order. To auto-ramp, press and hold the button.

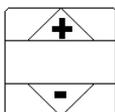
SCAN ON/OFF



The primary function of this button is to toggle scan operation on and OFF. When the radio is scanning, the SCAN LED is on and all groups or channels in the scan list of the currently selected systems are scanned.

The secondary function of the SCAN button is to toggle the keypad buttons between their primary function and their secondary function.

SCAN ADD/DELETE



This rocker type button is used to display the current SCAN status for a group/channel and then either add or delete the group/channel from the system scan list.

The add button will select the last scanned channel recall by pressing it twice when the radio is actively receiving or three times when the radio is not actively receiving.

INDICATORS



TX

Transmitter enabled - ON when the radio is transmitting.



BSY

BuSY - On indicates a carrier is being received (the channel is busy). Note that if the selected channel is programmed for Channel Guard (CG), Digital Channel Guard (DCG) or Type 99 (T99) tone decode operation, the radio will not un-squelch if a valid tone or code is not received; the BSY indicator will be on.

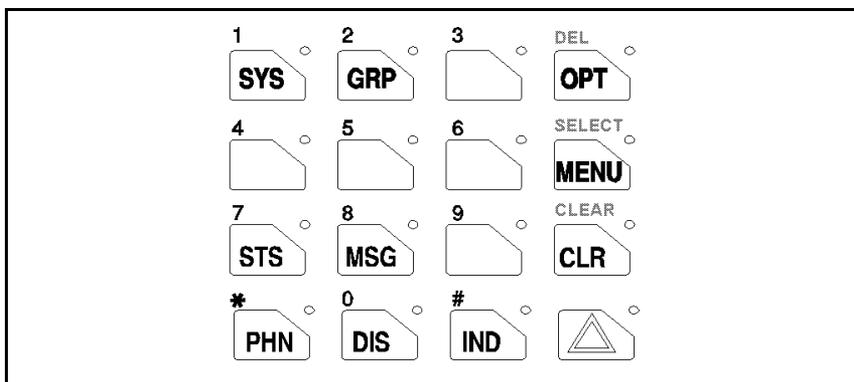


Figure 3 - Orion System Model Keypad

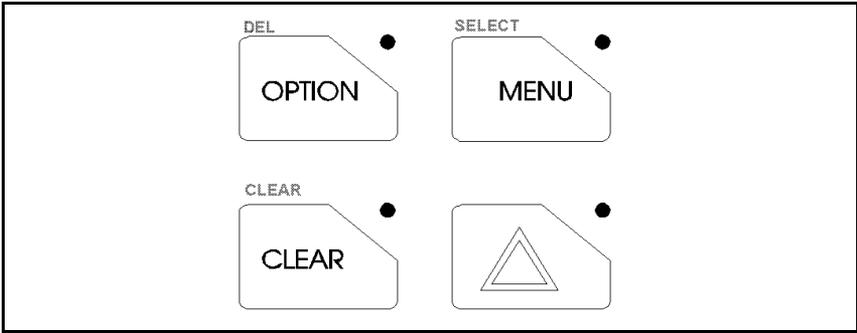


Figure 4 - Orion Scan Model Keypad

KEYPAD

The keypad is similar to a telephone keypad but with four (4) additional buttons on the side for a total of 16 keys. In addition to numbers (1-9, *, 0 and #), which is a secondary function, most of the keys have or can be programmed to have a primary function. A symbol or abbreviated word describing its primary function is labeled on the keycap. Each labeled keycap is associated with a radio feature (or primary function). The radio must be programmed to operate with the Standard or the Optional keypad configuration.

A key light (LED) is associated with each key or button. This may light when the associate function is active. In some conditions the key light may blink to indicate an action status.

The keypad key functions can be remapped to any of the primary function keys using the PC programming software. It is suggested that the blank keypad (located at the back of this manual) be completed if the keypad key functions are changed.

Standard Keycap Configuration

The Standard keycap package for the System radio includes five (5) labeled keycaps (MODE, HOME, CHN, AUX1 and AUX2) and six (6) blank keycaps, which can be placed on any of the five key locations (numbers 3-6 and 9) shown in Figure 5. The keycap represents the primary function programmed for that key location. See the **Key Description** section for a description of the primary function associated with these five (5) keycaps.

The Standard keycap package for the Scan radio includes five (5) labeled keycaps [MENU, CLEAR, SELECT, EMERGENCY (E), OPTION] and five (5) blank keycaps, which can be placed on any of the four (4) keypad keys. The keycap represents the primary function programmed for that key location.

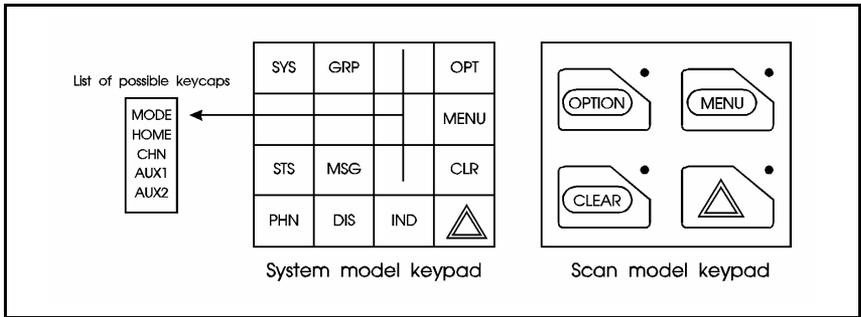


Figure 5 - Standard Orion Keycaps Configuration

Optional Keycap Configuration

The Optional keycap package for the System radio includes sixty (60) additional keycaps (shown in the Key Description section), which can be placed on any key location desired. Keep in mind, the keycap represents the primary function programmed for that key location.

Key Descriptions

MODE This key function is used to enter the Conventional System selection mode.

HOME This key function returns the radio to the Home System/Group where it is programmed.

CHN This key is used to enter the Channel select mode.

AUX1 & 2 These keys are used to control output 1 or 2. Their definition is PC programmable.

SYS This key is used to enter the System select mode.

GRP This key is used to enter the Group select mode.

OPT This key function is used to toggle a PC programmable feature ON and OFF.

DEL Secondary function - used to delete a digit during numeric entry (see **SELECTION MODE RULES**).

MENU Primary function - accesses the menu list. This is a list of additional features that are not available directly from the keypad. See MENU for details.

SELECT

Secondary function - activates a selected item within a list. After the menu list is accessed, select a menu item from the list via RAMP control , or . and activate it with this key. Once activated, MENU continues its secondary function for activating a selected parameter setting until the radio returns to its normal receive state. This is similar to an enter key.

 STS

The Status key permits the transmission of a pre-programmed status message to an EDACS site.

 MSG

The Message key permits the transmission of a pre-programmed message to an EDACS site.

 CLR

Serves several purposes depending on the operating mode. In trunked mode, the CLR button exits the current operation and removes all displays associated with it. The radio and display then return to the group receive state. In Conventional mode, pressing this button un-mutes the receiver so activity on the selected channel can be monitored. When pressed and held for approximately 3 seconds, this button toggles conventional channel decoding (Channel Guard, Digital Channel Guard, T99) on and OFF if programmed for the selected channel.

 PHN

Used to place telephone calls through the radio by selecting the interconnect special call function. See Telephone Interconnect Calls for details.

 DIS

Used to adjust the current display intensity and the keypad backlight level.

 IND

Used to call individual or make an all-call by selecting the individual call function. See Individual Calls for details.



ALM

This key function is used to declare emergencies.

Toggles the external alarm ON/OFF. The external alarm is used to indicate the radio is receiving an Individual Call. Press the key once to enable external alarm and press again to disable external alarm.

SG1-SG5

Corresponds to five (5) pre-programmed System/Groups. Pressing a key programmed for SG1 would switch the radio to the pre-programmed System/Group 1. Pressing a key programmed for SG2 would switch the radio to the pre-programmed System/Group 2, etc.

**WAIL, YLP,
RST, SL1-
SL8**

The **WAIL** and **YLP** (Yelp) keys are designed to control an optional Siren package. The **SL1-SL8** (Siren/Light) keys are designed to control an optional Siren/Light package. The **RST** (Reset) key is used to turn all sirens and lights OFF.

SPK

This key function is used to toggle the external speaker ON/OFF.

STO-ST9	The status 0-9 keys are used to send pre-programmed status message to the EDACS site.
PVT	Enables or disables Private Mode for the System/Group displayed. See the PRIVATE OPERATION section.
KEY	Displays the Encrypted Keys. This selects the DISP KEY operation from the menu functions.
G*	This key function is used in Conventional Mode to send G-STAR™ emergency signaling.
PA	This key function enables and disables the Public Address feature.
#	DTMF keypad function.
1-9	Keypad numbers.
*	DTMF Keypad function.

Primary Functions (Quick Access)

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

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

DISPLAY

The radio's display is shown in Figure 6. The two character lines are used to display system, group and channel names and also operational messages to the user. Each line contains eight alphanumeric character blocks. See Figure 2 for a typical display.

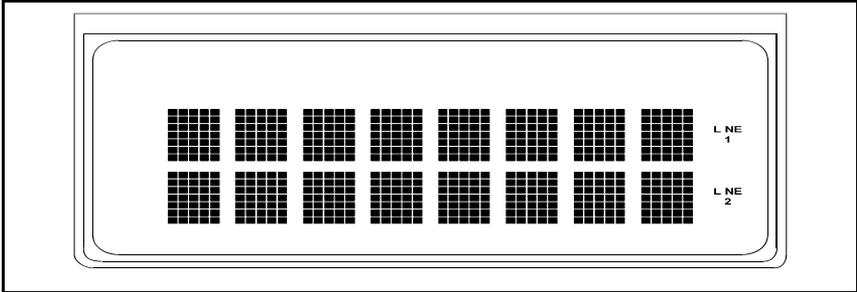
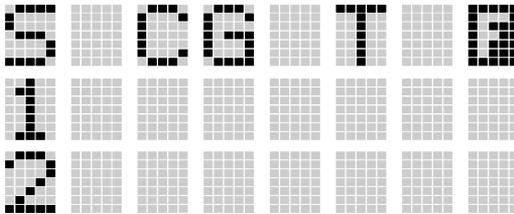


Figure 6 - Orion Display

RADIO STATUS ICONS

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



	<ul style="list-style-type: none"> • indicates selected group or channel is in scan list. • indicates selected group or channel is programmed as Priority 1 in scan list. • indicates selected group or channel is programmed as Priority 2 in scan list.
	<ul style="list-style-type: none"> • indicates conventional channel enabled with Channel Guard function.
	<ul style="list-style-type: none"> • indicates the EDACS system is in Failsoft™ mode (if enabled through programming).
	<ul style="list-style-type: none"> • indicates Type 99 Decode is enabled on a conventional channel.

MESSAGES

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

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

MESSAGE	NAME	DESCRIPTION
DATA ON	Data On	Trunked mode only. Indicates radio has been toggled to the data enable state. Displayed for two seconds on line 1 when toggled to enable state.
SYSC ON	System Scan Features On	Trunked mode only. Indicates the System Scan features are enabled.
SYSC OFF	System Scan Features OFF	Trunked mode only. Indicates the System Scan features are disabled.
T99 ON	Type 99 Decode On	Conventional mode only. Indicates the Type 99 Decode feature is enabled.
T99 OFF	Type 99 Decode OFF	Conventional mode only. Indicates the Type 99 Decode feature is disabled.
NB ON	Noise Blanker On	Conventional mode only. Indicates noise blanker feature is enabled on low band (29-50 MHz) version.
NB OFF	Noise Blanker OFF	Conventional mode only. Indicates noise blanker feature is disabled on low band (29-50 MHz) version.
PA ON	Public Address On	Indicates that the public address function of the radio is enabled.
PA OFF	Public Address OFF	Momentary (2 seconds) indicates that public address function of the radio was disabled.
ALRM ON	External Alarm Enabled	Indicates that the external alarm function of the radio is enabled.
ALRM OFF	External Alarm Disabled	Momentary (2 seconds) indicates that external alarm function of radio was disabled.
PVT DIS	Private Mode Disabled	Indicates that private mode is disabled or no encryption key has been programmed for the selected group/channel or special call.
FRCD PVT	Forced Private Operation	Indicates that forced private operation has been pre-programmed into radio.
NO KEY #	Encryption Key Missing	Flashing indicator indicates that no encryption key or an incorrect encryption key is programmed into the radio.
BCKL=1-6	Backlight	Display intensity and keypad back light level.
GR	Group ID	This indicates that the call is a group call and is followed by the GID of the caller (trunked mode only).
ID	Individual ID	This indicates the call is an individual call and the ID number of the caller, example "ID 2725" (trunked mode only).

MESSAGE	NAME	DESCRIPTION
WHC=1	Who Has Called	This display indicates the number from the <i>Who Has Called</i> list. Individual calls received but not responded to are stored in a <i>Who Has Called</i> list. This list is accessible by pressing the # key and then the INDV key after the Individual call has timed out or the Clear button is pressed. This display is on line 2 and the LID of the caller is displayed on the top line. Currently the list is not implemented and the display will always be WHC=1.
PHONE	Phone Call	Displayed when a phone call is received from the site. It is displayed in line one of the display. Line 2 of the display will contain the display *INDV* when line 1 contains this message. The radio interprets a received phone call as an individual call.
CONV FS	Conventional Failsoft	Displayed when a failure of the EDACS system occurs. All communication will be in conventional mode (trunked mode only).
MENU		Displayed when the menu key is pressed and remains displayed in line 1 until one chooses a menu item.
SYS=1-64	System = 1 - 64	This is the system number for the current base station of the system displayed in line 1. It is displayed in line 2 of the display. Press the system key to obtain this display.
GRP=1-64	Group = 1 - 64	This is the group number of the group displayed in line 2 of display. It is displayed in line 1 of the display. Press the group key to obtain this display. There are up to 48 groups available (i.e. 3 banks of 16). The maximum groups programmed in a radio are determined by the personality.
INDV=1-99	Individual = 1 - 99	This display indicates which item in the individual call list is being displayed. It is displayed in line 2 of the display. The name or ID of the item in the list is displayed in line 1 of the display.
PHN=1-99	Phone = 1 - 99	This display indicates which item in the phone list is being displayed. It is displayed in line 2 of the display. Line 1 of the display will be the last 3 characters of the list item contents.
SEL PHN	Select Phone	After pressing the PHN key, selecting an entry from the phone list by typing the entry number will display this message on Line 1.

MESSAGE	NAME	DESCRIPTION
SEL INDV	Select Individual ID	This is displayed on line 1 when an entry from the individual ID list is selected after pressing the INDV key. The entry is a number between 1 and 32 inclusive (trunked mode only).
SYS ALL	System All Call	Displayed on line 1 to indicate a system all call has been received (trunked mode only).
Ggg-v.vv	Code Group and Revision Number	This is code group and revision number that is displayed in line 2 when menu item "REVISION" is selected. The `gg` is the group number of the software. The first `v` is the hardware version. The last two, `vv`, is the revision of the software.
PHONE	Phone Call	This is displayed when an initiated phone call is in progress. This is displayed on line 2 of the display.
DUAL	Dual Control Operation	Displayed on idle control unit when configured as dual control operation.
NO ENTRY		This indicates that there is no data stored in one of the programmable items in either the phone list or individual call list. The user programmable items are items 1 through 10 in each list.
INV SYS	Invalid System	Displayed when the current system is an invalid type.
CHN=1-99	Channel = 1 - 99	This is displayed on line 1 of the display is conventional channel index when the group key is depressed.
FIX LIST	Fixed List	Priority scan list is fixed and cannot be changed using add and delete keys.
FIXED P1	Fixed Priority 1	Priority 1 scan channel is fixed and cannot be changed using add and delete keys.
(c) 2004		This is displayed in line 2 when the message "M/A-COM" is displayed in line 1 of the display while displaying different items under menu when `REVISION` is selected by the operator.
EM	Emergency	This indicates an emergency has been declared by the LID that follows the display, `EM`. An example of this is "EM 01201".
INDV	Individual Call	This is displayed in line 2 of the display when an individual call is in progress (trunked mode and T99 mode only).
GROUP	Group Call	This indicates a group call is in progress and is displayed on line 1 of the display (trunked mode and T99 mode only).

MESSAGE	NAME	DESCRIPTION
SPKR ON	External Speaker On	This is displayed when the external speaker is enabled.
SPKR OFF	External Speaker OFF	This is displayed when the external speaker is disabled.
BANK=1-8		This is the bank of keys, which are going to be loaded when the key loader loads encryption keys. This is only valid for radios that support VGS, VGE, or DES encryption. It is displayed on line 2 of the display when the encryption key loader is connected.
REGR_0x	Dynamic Regroup	Indicates which group in dynamic regroup operation has been enabled where "x" is a digit of 1 to 8 (trunked mode only).
KEY LOAD		This is displayed in line 1 of the display when the encryption key loader is connected.
KEY ZERO		This is displayed on line 2 of the display when the operator depresses the reset and option buttons simultaneously for approximately two seconds. The encryption keys are zeroed.
SYS KEY	System Key	This is displayed on line 1 of the display in the display key mode of the menu. The key of the key name display is displayed in line 2.
GRP KEY	Group Key	This is displayed on line 1 of the display in the display key mode of the menu for trunked systems only. It is followed in the second line with a key number `KEY = <1..7>'.
CHN KEY	Channel Key	This is displayed on line 1 of the display in the display key mode of the menu for conventional systems only. It is followed in the second line with a key number `KEY = <1..7>'.
KEY=1-7		This is displayed on line 2 of the display in the display key mode of the menu for conventional when `SYS KEY' or `CHN KEY' is displayed in line 1 and for trunked when `SYS KEY' or `GRP KEY' are displayed in line 1.
PRIMARY		This is displayed on line 1 of the display when primary keys are enabled.
PRS NAME	Personality Name	This is displayed in line 1 of the display under the revision selection of menu. The personality name is displayed on line 2 at the same time.
M/A-COM, Inc.		This is displayed on line 1 of the display under the revision selection of menu. The copyright year is shown in line 2 of display at the same time.

ALERT TONES

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

CALL ORIGINATE

A short mid-pitched alert tone sounds after keying the radio (Push-To-Talk button is pressed). This indicates the radio has been assigned a working channel or that the radio is transmitting on a conventional channel and voice communication may begin immediately. In conventional mode, this tone may be delayed after the PTT button is pressed due to G-STAR signaling (if enabled through programming).

AUTOKEY (TRUNKED MODE ONLY)

After being placed in queue or releasing the PTT button prior to a working channel assignment, the site calls the radio when a channel becomes available. At this point, the radio automatically keys the transmitter (autokey) for a short period to hold the channel. The radio sounds a mid-pitched tone when it is clear to talk; immediately press the PTT button to keep the assigned channel.

CALL QUEUED (TRUNKED MODE ONLY)

A high-pitched tone after pressing the PTT button indicates the system has placed the call request in the queue. The receiving unit(s) also hear the tones, indicating they will receive a call shortly. If the PTT button is released, the radios will autokey whenever a channel becomes available (see Autokey).

SYSTEM BUSY (TRUNKED MODE ONLY)

Three low-pitched beeps will be heard if the radio is keyed when the system is busy, if no channels are available for sending the message, if the call queue is full, or if an individual call is being attempted to a radio that is transmitting. Releasing the PTT button and re-keying initiates a new channel request.

CALL DENIED (TRUNKED MODE ONLY)

If the radio is keyed and a low-pitched tone is heard then the radio is not authorized on the system that has been selected.

CARRIER CONTROL TIMER

If the programmed time for continuous transmission is exceeded, five short high-pitched warning tones followed by a long low-pitched tone will be heard. The transmitter will shut down shortly after hearing the alert, interrupting communications. Release and re-key the PTT button to maintain communications. This will reset the carrier control timer and turn the transmitter back on.

KEY PRESS ALERT

A short tone or "beep" sounds to indicate a key has been pressed. A short low-pitched tone indicates no action was taken because the key is not active in the current mode.

DUAL CONTROL SWITCHING

When control is switched to a previously idle control unit, two short high-pitched tones will sound at the control unit where PTT was pressed, that is now the active controller.

OPERATION

The Orion mobile radio unit can be programmed to operate in either a trunked system or a conventional system or both. Operating features and functions have been grouped according to the type of system the radio is operational. This first section contains general operating procedures (e.g., Turning On The Radio). The second section, **TRUNKED MODE OPERATION**, covers those operating procedures that are only used in a trunked system (e.g., Group Scan). The third section, **CONVENTIONAL MODE OPERATION**, covers those operating procedures that are only used in a conventional system (e.g., Squelch Adjust). The fourth section, **TRUNKED OR CONVENTIONAL MODE OPERATION**, covers those operating procedures that may be used in either a trunked or conventional system (e.g., Multiple Radio Operation).

TURNING ON THE RADIO

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

In the EDACS trunked environment, if communication with the system's control channel cannot be established, the **CC SCAN** message will be displayed. 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.

SELECTION MODE RULES

Many operations require selection from a list such as system, group or phone number. This selection process is handled in the same manner for all lists. The

RAMP control  and , **SEL**, **0-9**, *****, **#**, the **DEL** button and the  button are used during the selection process. The following example systems list is used to explain the process:



The hook switch functions the same as the  key in I-Call, phone call, and menu modes.

The following example systems list is used to explain the process:

SYSTEM

- 1 NORTH
- 2 SOUTH
- 3 EAST
- 4 WEST

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

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

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

S O U T H
S Y S = 2

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

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

E A S T
S Y S = 3

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

DIRECT ACCESS

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

SEL SYS
4

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

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

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

MENU

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

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

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

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

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

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

PRESS: 

The menu mode is entered.

PRESS: The RAMP control  and  until the display shows:

M E N U
B C K L G H T

PRESS: **SEL**

The backlight menu item is activated and the display will be similar to the following:

B C K = X X X
Y Y Y Y Y Y Y Y

Line one shows the active menu item and its current parameter setting (XXX). Line two shows the currently selected system or group name (YYYYYYYY). The menu item's parameter setting shown in the display can now be changed

by using the RAMP control  and  to scroll through the list of parameter values. Once the desired setting is reached press **SEL** to store the value and return the normal display. For menu items that display radio information pressing  and  will scroll through a list of informational displays. The menu items are listed Table 1.

Table 1 - Menu Item Information

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Backlight Adjust	Menu Item: BCKLIGHT Once selected: BCKL=	OFF, 1, 2, 3, 4	Selects the light level for backlighting.
Radio Revision Information	Menu item: REVISION	Informational displays only (see radio); no user selectable settings.	Selects the information display to view.
Noise Blanker	Menu Item: NOISBLKR Once selected: NB ON or NB OFF	ON, OFF	Noise Blanker function toggled on and OFF.
PHONE CALL	Menu item: PHN CALL Once selected: See Telephone Inter-connect. Call Section		Allows access to the Phone Call Feature.
Individual Call (Trunked Systems Only)	Menu Item: IND CALL Once Selected: See Individual Call Section		Allows access to the Individual Call Feature.
External Alarm	Menu Item: EXTALARM Once Selected: EXTALARM	ON, OFF	EXTALARM replaces the system name on the display as long as the external alarm feature is enabled.
PUBLIC ADDRESS	Menu item: PUB ADDR Once selected: PA ON or PA OFF	ON, OFF	Public Address is toggled on and OFF.
EXTERNAL SPEAKER	Menu item: EXT SPKR Once selected: SPKR ON or SPKR OFF	ON, OFF	External Speaker is toggled on and OFF.
Encryption Key Loading	Menu item: KEYLOAD Once selected: KEY LOAD BANK = N	Up to 8 banks of 7 keys	Enables the radio to accept the loading of encryption keys.
Display Current Encryption Key(s)	Menu item: DISP KEY Once selected: SYS KEY, GRP KEY or CHN KEY and KEY = N		Displays current encryption key number.

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Front Panel Squelch Adjust (Conventional Only)	Menu item: SQUELCH Once selected: SQLCH=xx	1-16	Allows setting of squelch.
Scan	Menu item: SCAN	ON, OFF	Toggles scan function on or OFF.
Private Mode	Menu Item: PRIVATE Once selected: PVT or key light.	ON, OFF	Toggles private function on or OFF.
Scan Add	Menu item: SCAN ADD Once selected: Scan icon displayed.	S, 2 or 1	Adds group or channel to scan list.
Scan Delete	Menu item: SCAN DEL Once selected: Scan icon goes out.		Deletes group or channel from scan list.
Scan Add/Delete	Menu item: SCAN A/D When selected: Toggles through scan selections	Toggle sequence S, 2, 1, S, ...	Changes present group or channel to next scan choice in scan list.
Last Scanned Channel Recall	Menu Item: SCAN ADD When pressed twice if actively receiving or three times when not receiving: Scan icon displayed.		Changes the selected channel to the Last Scanned Channel.
Home group or channel selection	Menu item: HOME Once selected: Home group or channel displayed.		Changes to the group or channel defined for Home function.
System select	Menu item: SYS SEL Once selected: SYS = n	1-64 = (n)umber of desired system	Displays the system selected.
External alarm #2	Menu item: EXTALRM2	ON, OFF	Toggles external alarm #2 feature on or OFF.
System and group selection	Menu item: SYSGRP 1 Menu item: SYSGRP 2 Menu item: SYSGRP 3 Menu item: SYSGRP 4 Menu item: SYSGRP 5		Changes to the System & Group/Channel programmed for SYSGRP 1-5.
Mute	Menu item: MUTE	ON, OFF	Toggles the mute function on or OFF to control the audio output from the selected radio.
Mute #1	Menu item: MUTE 1	ON, OFF	Toggles the mute 1 function on or OFF on radio #1.

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Mute #2	Menu item: MUTE 2	ON, OFF	Toggles the mute 2 function on or OFF on radio #2.
Multiple radio operation	Menu item: RADIO	ON, OFF	Toggles the currently selected radio.
Radio selection	Menu item: RADIO 1	ON, OFF	Changes to radio #1.
	Menu item: RADIO 2	ON, OFF	Changes to radio #2.
No Data (Trunked System Only)	Menu item: NO DATA	ON, OFF	Toggles data feature on or OFF.
EDACS/Conventional Channel 1 Scan (Trunked System Only)	Menu item: ECPISCAN	ON, OFF	Toggles this feature on or OFF.
Group selection (Trunked System Only)	Menu item: GRP SEL Once selected: GRP = n	1-64 = (n)umber of desired group	Displays the group selected.
Status Condition (Trunked System Only)	Menu item: STATUS Once selected: ST =n	0-9 = (n)umber of pre-programmed status	Transmits the pre-programmed status message.
Message Condition (Trunked System Only)	Menu item: MESSAGE Once selected: MSG =n	0-9 = (n)umber of pre-programmed messages	Transmits the pre-programmed message.
Talk-around feature (Conventional System Only)	Menu item: TALKARND Once selected: TALKARND on line 1	ON, OFF	Toggles selected talk-around channel on or OFF.
Channel selection (Conventional System Only)	Menu item: CHN SEL Once selected: CHN = n	1-99 = (n)umber of desired channel	Displays the conventional channel selected.
Feature Encryption Display	Menu Item: FEATURES Once selected: See Feature Encryption Display section	Informational displays only; no user selectable settings	Indicates current features programmed into the radio as well as certain information required to add features to the radio (refer to the Table of Contents for Feature Encryption Display).
System Scan Enable	Menu Item: SYS SCAN Once selected: SYSC ON or SYSC OFF	ON, OFF	System Scan features are toggled on and OFF.
Type 99 Decode Enable	Menu Item: T99 ENAB Once selected: T99 ON or T99 OFF	ON, OFF	Type 99 Decode is toggled on and OFF.

FEATURE ENCRYPTION DISPLAY

Feature Encryption Display is available through the menu function and, if programmed, appears in the menu as "**FEATURES.**" This data indicates current features programmed into the radio as well as information required to add features to the radio. This feature applies to 512K RAM radios only.

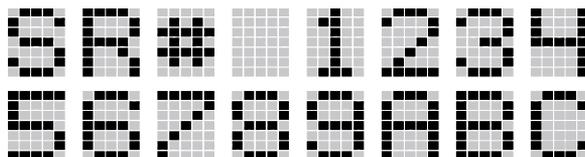
Once the feature has been accessed, all normal menu functions work. The user can scroll up or down through all of the entries.

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

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

Serial Number ROM (12 Hex Digits)

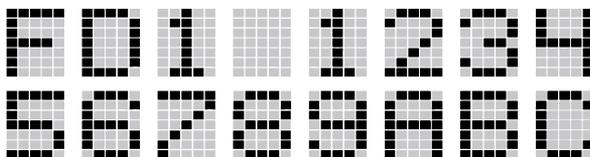
Example:



To enable a feature in the radio, contact M/A-COM and provide the ROM serial number. The serial number shown here is for example only.

Feature Encryption Data Stream

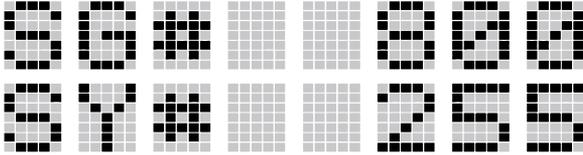
Example:



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

Number Fields

Example:



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

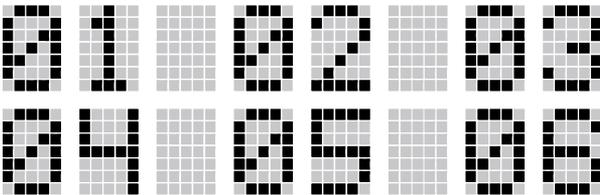
- SG# XXX - Maximum number of system/groups combination available
- SY# XXX - EDACS maximum trunked system limit
- CH# XXX - Maximum number of conventional channels available

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

Features Enabled

These numbers indicate which features are enabled.

Example:



The following numbers indicate features available in the user's radio.

BIT FIELDS	POSSIBLE FEATURES
01	Conventional mode Priority Scan
02	EDACS 3 Site System Scan
03	Public Address operation
04	EDACS Group Scan operation
05	EDACS Priority System Scan
06	ProSound™/ProScan™
07	EDACS Dynamic Regroup operation
08	EDACS Emergency Operation
09	Type 99 Encode
10	Conventional mode Emergency operation
11	RF Pre-amp enable
12	Aegis™ Digital Voice operation
13	VGE encryption
14	DES encryption
15	User-defined speech encryption
16	Mobile Data operation
17	Status and Message operation
18	Test Unit Operation
21	Alternate Language Operation
22	Over The Air Personality Programming (ProFile™)
23	Narrow Band Operation 12.5 kHz Channel Spacing
29	ProVoice™ Operation

SYSTEM/GROUP/CHANNEL SELECTION

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

The **ORION SYSTEM/GROUP/CHANNEL** knob and the RAMP control

,  pair are programmable for maximum flexibility. If the SYSTEM/GROUP/CHANNEL knob is assigned to select groups, then the

RAMP control ,  is assigned to select systems. If the SYSTEM/GROUP/CHANNEL knob is assigned to select systems, then the

RAMP control ,  keys are assigned to select groups. System, group and channel selection is the primary function for these controls.

Either systems or groups can also be selected by entering the select mode and following the selection mode rules described earlier. The system select or group select modes are entered by pressing SYS or GRP, respectively, from

the standard receive mode. Using the RAMP control, ,  after entering a particular selection mode in this manner is the secondary function of these keys.

System Selection

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

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

METHOD 2 If system selection is programmed as the primary function of the RAMP control  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 Press  to enter the system select mode and follow the selection mode rules detailed earlier. Presses of the RAMP control  or  will now scroll through the systems.

Group And Channel Selection

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

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

METHOD 2 If group selection is programmed as the primary function of the RAMP control  and , selects a group by pressing  or , to scroll through the group list. The display registers the new group name on line two.

METHOD 3 Press  to enter the group select mode and follow the selection mode rules detailed earlier. Presses of the RAMP control will now scroll through different groups.

LAST SYSTEM/GROUP OR CHANNEL RECALL (Supervisory Radio Units Only)

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

TRUNKED MODE OPERATION

Digital trunking provides fast communication access at all times, even during busy hours. In this mode the operator selects a communications system and group and the audio communication or working channel (WC) is allocated through digital signaling with the site.

RECEIVING A CALL

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

SENDING A CALL

1. Turn ON the radio and set the POWER ON-OFF/VOLUME knob to the desired volume level. Select the desired system and group.
2. Press and hold the PTT button. The radio will display the system and group names and perform the necessary signaling required to obtain a communication channel.
3. When the working channel is assigned, **TX** and **BSY** indicators are turned ON and a short beep sounds indicating that communication can begin. (**NOTE:** If two or more tones, or a high pitched tone is heard, the system may be busy and the call request has been placed in queue or the request has been denied for some reason. Refer to the ALERT TONES section for more details).
4. Hold the microphone approximately three inches from the mouth and speak in a normal voice.
5. Release the PTT button when the transmission is complete and listen for a reply.

CONVENTIONAL FAILSOFT

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

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



NOTE

Emergency and Special Call are not operational during conventional Failsoft. Also, the GROUP control will not operate.

EMERGENCY OPERATION

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

Receiving An Emergency Call

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

Declaring An Emergency Call

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

1. Press and hold the red  button for approximately one second (this time is programmable and therefore could be longer or shorter; check with the system administrator). The radio will transmit an emergency call request with the radio ID until an emergency channel assignment is received.

2. When the working channel assignment is received, the radio sounds a single beep (Autokey alert tone) indicating it is ready for voice transmission. *TXEMER* flashes on line two in the display until the emergency is cleared.
3. Press PTT and speak into the microphone in a normal voice.
4. Release PTT when the transmission is complete and listen for a reply.
5. The emergency can be cleared by pressing and holding the  button followed by pressing the  button then releasing both buttons.

SYSTEM SCAN OPERATION

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

Wide Area System Scan

The **Orion** radio may be programmed for wide area system scan operation for multi-site applications. Upon the loss of the currently selected system's control channel, radios may 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.

ProSound

The radio may be programmed for ProSound system scan operation for multi-site applications. ProSound is an enhanced multi-site system-scanning algorithm, compared to Wide Area System Scan. ProSound provides the radio with the ability to select a new system for the radio to communicate on, when the selected system drops below a predefined level. This is accomplished by enabling each radio to analyze the signal quality of its current control channel and compare it with the signal quality of the control channel for each site in its adjacency scan list. (The signal quality metric used for the ProSound algorithm is based on Digital Received Signal Strength Indicator (RSSI) measurements). When the selected systems signal quality level degrades below a pre-programmed level, the radio will begin to look for a better control channel. Once a control channel that exceeds the pre-programmed parameters is found, the radio will change to the new system and emit a tone. If the control channel is completely lost the radio will enter Wide Area System Scanning and search the programmed adjacent systems until a suitable control channel is found.

ProScan

The radio may be programmed for ProScan system scan operation for multi-site applications depending on the version of radio flash code. (The ProScan algorithm is available on the Orion Platform with Group 32 or higher radio flash code). ProScan is an improved multi-site system scanning algorithm designed to replace the ProSound algorithm. ProScan provides the radio with the ability to select a new system for the radio to communicate on, when the selected system drops below a predefined level. This is accomplished by enabling each radio to analyze the signal quality of its current control channel and compare it with the signal quality of the control channel for each site in its adjacency scan list. (The signal quality metric used for the ProScan algorithm is based on a combination of both Received Signal Strength Indicator (RSSI) and Control Channel Verification (CCV) measurements). When the selected systems signal quality level degrades below a pre-programmed level, the radio will begin to look for a better control channel. Once a control channel that exceeds the pre-programmed parameters is found, the radio will change to the new system and emit a tone. If the control channel is completely lost the radio will enter Wide Area System Scanning and search the programmed adjacent systems until a suitable control channel is found.

Priority System Scan

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

When Wide Area System Scan Is Enabled

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 System Scan list.

When ProSound/ProScan Is Enabled

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

Menu Selection

Press  and then use the   control 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.

Pre-Programmed Keypad Key

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

GROUP SCAN OPERATION

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

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

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

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

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

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

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

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

Adding Groups To A Scan List

1. With scan operation turned OFF, select the desired group to add to the selected Trunked system group scan list.
2. Press  or  on the SCAN add/delete control. The current priority status of the group will be displayed in column 1 of line one 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  to add the group to the scan list. "S" is displayed on line one.
4. Press  a second time to set the group to Priority 2. A "2" is displayed on line one.
5. Press  a third time to set the group to Priority 1. A "1" is displayed on line one. 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 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.

Deleting Groups From A Scan List

1. With scan operation turned OFF, select the desired group to delete from the selected trunked system's group scan list.
2. Press  or  on the SCAN add/delete control. The current status of the group is displayed for a time-out period.
3. Press  to delete the group from the scan list. "S," "2," or "1" turns OFF. Any group that is not in a trunked system group scan list will show a "blank" for the time period when it is the selected channel.

Nuisance Delete

A group can also be deleted from the scan list, if it is not the currently selected group, by pressing  twice 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 turned OFF and then back ON.

Turning Scan ON

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



NOTE

The  key light will blink when temporarily disabled.

Scanning will stop while microphone is OFF-hook if hook switch feature is enabled through programming.

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

Priority Group Scanning

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

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

Turning Scan OFF

Toggle scan operation OFF by pressing . The radio will resume operation on the selected group.

INDIVIDUAL CALLS

Receiving and Responding To An Individual Call

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 turns on the **BSY** indicator. Line one shows ID followed by 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 individual call indicator display ***INDV*** is displayed on line two. 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 **CLR** button, or **IND** is pressed.



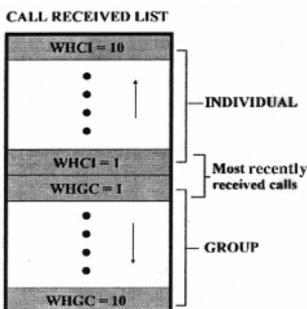
NOTE

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

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

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

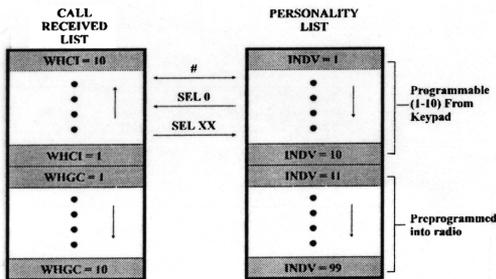
The radio stores the ID's of the last 10 callers in the Calls Received List as shown. Individual calls are stored in the top half of the list (1-10) and group calls are stored in the bottom half of the list (1-10). The most recent call is stored in position 1, the second most recent call is stored in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



To access the list, press the **IND** key twice. Use the **▲** or **▼** keys to scroll through the list. Pressing the **MENU** key will display the time elapsed since the call was received.

Call Storage Lists

There are two lists available for call storage in the radio, the calls received list (1-10) and the personality list (1-99 as defined by the user). When the individual call mode is entered by pressing **IND**, the calls received list is available. The user can toggle to the personality list by selecting any key other than **DIS** (0) or toggle between the two lists by pressing the **IND** key. If wrap is enabled, the calls received list wraps on itself and not into the other list.



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

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

When in the pre-stored list, pressing **MENU** toggles the Logical Identification (LID) on and OFF.

Sending An Individual Call

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

- To select a previously stored individual, select the I-Call mode from the menu or press **IND** followed by the RAMP control **▲** or **▼** to scroll through the list of stored individuals. The selection mode rules apply. While in the individual call list, the menu key will toggle the display between the call name and the unit ID number. If the individual is not

stored in this list but the individual's unit ID is known, it can be entered directly from the keypad.

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

SCAT™ OPERATION

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

TELEPHONE INTERCONNECT CALLS

Receiving A Telephone Interconnect Call (Trunked Mode Only)

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

Sending A Telephone Interconnect Call (Trunked Mode Only)

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

1. To select a previously stored phone number, select phone call mode from the menu; press **PHN** and use the **RAMP** control  or  to scroll through the list of stored phone numbers. The selection mode rules apply. While in the phone call list, the **MENU** key will toggle the display between the phone call name and the phone call number. If the phone number is not stored in this list but the phone number is known, it can be entered directly from the keypad. If necessary, a pause can be entered by pressing and holding **0-9**, *****, or **#** until an underscore appears in the display.

2. Press and release the PTT button; the radio performs the necessary signaling to obtain a communication channel. When the signaling is complete and the radio is clear to transmit, **TX** indicator turns on and the channel access tone sounds. Line one shows the accompanying name if selected from the list of stored numbers or the phone number if entered directly. The message ***PHONE*** displays on line two. The radio then automatically transmits the programmed number stored in the special call queue.
3. The telephone ringing will be heard. When someone answers the phone, press the PTT button and speak into the microphone. Release the PTT button to listen to the caller. Unsuccessful interconnect signaling returns the radio to the normal receive mode and the number remains displayed until the special call is cleared by pressing the **CLR** button or the time-out expires or another group or system is selected.
4. To terminate the call, momentarily press the **CLR** button.



NOTE

The Orion radio is capable of simplex (one-way) conversation only. The caller can only hear the radio if the PTT button is pressed (the radio is transmitting) and the caller can only be heard when PTT is released (the radio is receiving).

DTMF Overdial/Conventional Mode Telephone Interconnect

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

The following steps are required to dial these numbers:

1. Follow the procedure in **Sending A Telephone Interconnect Call (Trunked Mode Only)** to establish a connection to the telephone system or consult the system administrator for the procedure to access a dial tone on the trunked or conventional system.

2. Overdial numbers are transmitted using either method as follows:

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

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

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

Programmable Entries

Individual call ID numbers, telephone numbers and other number sequences for overdialing are stored in the special call lists when programming the radio. The radio operator can change the first ten entry locations of these lists. 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  or  to enter the individual call list or the phone call list. The selection mode rules apply.
2. Scroll through the list using the **RAMP** control  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**, **(*)**, or **(#)** until an underscore appears in the display. The individual call list entries will accept up to 5 digits. The phone call list entries accept a combination of up to 31 digits and pauses.
4. Press and hold  until the display changes indicating that the number has been stored.
5. Repeat the steps above if the number stored in an entry location needs to be changed.

MOBILE DATA

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

The mobile radios may 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 mobile radio. Support for MDT's or host computers is a programmable option per radio. Additionally, radios programmed for host computers may also be programmed for data only operation (no voice calls transmitted or received).



Turn the power of the radio OFF before connecting or disconnecting any cables, including the data cable. Also, turn the power of the radio OFF when docking or undocking a connected laptop computer. Failure to turn the power of the radio OFF may damage the radio, requiring the replacement of an internal non-user serviceable fuse.

Displays

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

- | | |
|-----------------|---|
| TX DATA | Displayed on bottom line of display when the radio is transmitting a data call. |
| RX DATA | Displayed on bottom line of display when the radio is receiving a data call. |
| DATA OFF | Displayed on top line of display when the radio is in the data disabled state. |
| DATA ON | Displayed for two seconds on top line of display when the radio is toggled to the data enabled state. |

Data OFF Operation

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

- Removing the microphone from the hook switch (hook switch option must be enabled by pre-programming).

- Declaring an emergency (not to be used unless an actual emergency condition exists). Alert tone will sound.
- Pressing the **OPT** button (System Model) or **OPTION** (Scan Model) (pre-programmed). Alert tone will sound.
- Selecting the function using the m button (pre-programmed).
- Pressing the ND button (System Model Only) (pre-programmed).

Data On Operation

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

- Replacing the microphone into the hook switch (going on-hook). Only valid if the data OFF operation was entered by removing the microphone from the hook switch (going OFF-hook).
- Pressing the ND key toggles data state on or OFF.
- Clearing an emergency but valid only if emergency caused data OFF operation.

Exiting Data Calls

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

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

Scan Lockout Mode

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

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

Data Lockout Mode

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

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

STATUS/MESSAGE OPERATION

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

Status Operation

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

To send a status condition, press the **STS** button (key light comes on) then press one of the number buttons (0-9) to select the pre-programmed status. If no status has been programmed for the selected number button, the radio will display **NO ENTRY** and the radio will sound a low tone. A valid selection will permit the status text to appear in the display for a pre-programmed time.

After the time-out expires or the **MENU** button has been pressed (the **MENU** button will override the time-out period), the status is selected and will be transmitted to the site or stored in the radio memory where it can be polled by the site at a future time. If the site receives the status properly, when transmitted or polled by the site, a high-pitched tone sounds and the key light associated with that status will remain lit. If the site does not receive the status properly, a low-pitched tone sounds and the key light associated with the status will blink.

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

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

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

Message Operation

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

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

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

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

EDACS CONVENTIONAL P1 SCAN

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

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

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 an activation message is sent by the system manager. Each radio that receives and acknowledges regrouping instructions is successfully regrouped.

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

Emergency Operation

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

CONVENTIONAL MODE OPERATION

The radio functions in the conventional mode when using conventional communications channels (non-trunked). Each channel consists of a preset frequency pair for transmit and receive during repeater operation, or a single frequency for both transmit and receive during talk-around (no repeater) operation. To use this mode, the operator selects a conventional system, which includes one or more conventional channels. Each conventional channel may have one or more features, such as Channel Guard, programmed when the channel is selected.

The  button un-mutes the receiver so activity on the selected channel can be monitored. When pressed and held for approximately 3 seconds this button toggles conventional channel decoding (Channel Guard, Digital Channel Guard or T99) on and OFF, if programmed for the selected channel.

RECEIVING A CALL

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

SENDING A CALL

1. Turn ON the radio and set the **POWER ON-OFF/VOLUME** knob to the desired volume level. Select the desired conventional system and channel.
2. Ensure that the channel is not busy by pressing the  button to momentarily disable any channel decoding and un-mute the receiver or observe the unlit **BSY** indicator. If the Channel Busy Lockout feature is programmed for the selected channel, the radio will not transmit when the channel is busy.
3. Press and hold the PTT button. The **TX** indicator will turn on and a short beep sounds (if programmed) indicating that communication can begin.
4. Hold the microphone approximately three inches from the mouth and speak in a normal voice.

5. Release the PTT button when the transmission is complete and listen for a reply.

EMERGENCY OPERATION

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

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

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

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

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

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

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

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

Using 5-Tone Signaling for Emergency Declaration

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

Tone Encode Transmission

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

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

SCANNING CONVENTIONAL CHANNELS

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

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

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

Adding Channels To A Scan List

1. With scan operation turned OFF select the desired channel to add to the selected conventional system channel scan list.
2. Press \triangleup or \triangledown on the **SCAN** add/delete control. The current status will be displayed in column 1 of line one for a time-out period. Press \triangleup to add the channel to the scan list. **S** is displayed on the line. This sets the selected channel for non-priority scanning. A second press of \triangleup sets the channel for priority-two scanning and **2** is displayed on line one. An additional press of \triangleup sets the channel for priority-one scanning and **1** is displayed on line one. If the priority-one or priority-two channels are already set and a new channel is then assigned as the priority-one or priority-two channel, the previously assigned priority channel will change to non-priority scanning. The priority setting selection sequence is set and stops at priority-one therefore the channel must be deleted from the scan list by pressing \triangledown before the channel is set to a previous priority setting. Any channel that is in a system's channel scan list will show **S**, **2** or **1** for the time-out period when it is the selected channel.

Deleting Channels From A Scan List

1. With scan operation turned OFF select the desired channel to delete from the selected conventional system's channel scan list.
2. Press \triangleup or \triangledown on the **SCAN** add/delete control. The current status is displayed for a time-out period. Press \triangledown to delete the channel from the scan list. **S**, **2** or **1** turns OFF. Any channel that is not in a conventional system channel scan list will show a "**blank**" for the time-out period when it is the selected channel.

Nuisance Delete

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

Last Scanned Channel Recall

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



NOTE

Orion requires Flashcode OG44400 or Group R44 version or higher to support this feature.

TURNING SCAN ON

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



NOTE

Scanning will stop while microphone is OFF-hook if hook switch feature is enabled through programming.

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

TURNING SCAN OFF

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

SQUELCH ADJUST

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



NOTE

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



NOTE

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

Menu Selection

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

Pre-Programmed Keypad Key

1. Press the pre-programmed key and the display will indicate **SQLCH=xx**, where "xx" is the value between 1 and 16.
2. Use the RAMP control  or  to scroll through the values. Then press the  (SELECT) key to save the new value or wait for the display time-out (2 seconds). The displayed value will be selected and saved.

3. If the  key is pressed before the time-out, the squelch level will not be updated and the original value will be restored.

NOISE BLANKER OPERATION

A noise blanker feature is available in the low band (29-50 MHz) version of the Orion radio, which provides ignition noise filtering. The feature can be enabled through either the pre-programmed menu selection or a pre-programmed key on the control unit. The noise blanker state is remembered through a power cycle and its state will be displayed at power-up (i.e., **NB ON** or **NB OFF**). The menu selection or the pre-programmed key will toggle the state of the noise blanker and display the new state.

Menu Selection

Press  and then use the RAMP control  or  to scroll through the selections until **NB ON** or **NB OFF** is displayed. Then press  to toggle the noise blanker state (**NB ON** or **NB OFF**). After the display time-out (2 seconds) then press  again to save the new noise blanker state and return to normal operations.

Pre-Programmed Keypad Key

Press the pre-programmed key and the display will indicate **NB ON** or **NB OFF**. Press the key again to toggle the function.

TYPE 99 DECODE (Conventional Only)

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

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

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

To check the Type 99 enable status, press the Scan Add/Delete \triangle or ∇ . The current status of Type 99 decode will be displayed for a time-out period. Type 99 is enabled when the letter **T** is displayed in the third segment from right on the first line of the LCD display.

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



Type 99 is automatically disabled when Scan is enabled.

Menu Selection

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

Pre-Programmed Keypad Key

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

DIRECT MODE OPERATION (Conventional System Only)

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

1. Make sure the radio is ON and then select the desired conventional system and channel.
2. Press the pre-programmed button to toggle the talk-around function ON.

3. Ensure that the channel is not busy by pressing the  or  (Scan Version) to momentarily disable any channel decoding and un-mute the receiver or observe the unlit **BSY** indicator. If the Channel Busy Lockout feature is programmed for the selected channel, the radio will not transmit when the channel is busy.
4. Press and hold the PTT button. The **TX** indicator will light and a short beep sounds (if pre-programmed) indicating that communication can begin.
5. Release the PTT button when the transmission is complete and listen for a reply.
6. When the communications is completed, press the pre-programmed button to toggle the talk-around function OFF.

TRUNKED OR CONVENTIONAL MODE OPERATION

SIREN/LIGHT OPERATION

Each siren/light key is designed to control an optional siren/light package. Pressing a siren/light key will light the key indicator. Each siren/light key (except RESET) can be programmed for either CANCEL or ADDITIVE operation. If programmed for CANCEL, then all other siren/light activity is cancelled except for the activity associated with this key. If programmed for ADDITIVE, then a key press will add its respective siren/light activity to the current siren/light activity. It is important to note that while the lights are additive, only a single siren can be active at a time. The current siren will be determined from the recently pressed key that contains a siren assignment.

Each siren/light key (except RESET) can be programmed for Toggle, Momentary or Timed. In **Toggle**, each key press will toggle the state of the key between ON and OFF. In **Momentary**, a key's respective feature will only be active while the key is pressed and held. When programmed for **Timed**, the siren/light key activity will only be active during the programmable time-out window. The duration of the time-out window is programmable between from .5-127.5 seconds. During the time-out window the respective key indicator will be ON. When the timer expires, the activity will be terminated and the indicator will turn OFF. If an additional time-out key (programmed for ADDITIVE) is pressed during the time-out window, then the time-out window is reset and both activities will terminate at the same time.

Digital Voice (ProVoice / Aegis / Voice Guard® Operation)

Voice Modes

Each system (trunked or conventional) in the radio is programmed for no digital voice operation or one of the three-supported Digital Voice formats (ProVoice/Aegis, or Voice Guard). Aegis or ProVoice programmed systems have three (3) different voice modes: clear (analog), digital and private. Voice Guard systems have two (2) voice modes: clear (analog) and private. The voice modes are programmed on a per-group basis within each trunked system and on a per-channel basis within each conventional system. A radio must be equipped with the encrypt/decrypt option before it will operate in private mode.



NOTE

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

**TRANSMIT/RECEIVE MODE COMPATIBILITY
FOR AEGIS/PROVOICE OPERATION**

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

**TRANSMIT/RECEIVE MODE COMPATIBILITY
FOR VOICE GUARD OPERATION**

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

*assumes the proper cryptographic key is loaded



NOTE

Conventional Aegis or encrypted channels require Channel Guard on the channel to operate correctly.

Clear Modes

Aegis clear, ProVoice clear, and Voice Guard clear modes are identical voice modes 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 easily monitored by unauthorized persons. Groups or channels programmed for clear operation cannot transmit or receive unencrypted digital or private messages.

AEGIS/ProVoice Digital Mode

Aegis/ProVoice digital mode allows the radio to transmit and receive digitized voice signals. These digital signals provide improved weak signal performance and they cannot be easily monitored with a standard receiver. Groups and channels programmed for Aegis or ProVoice digital operation transmit only digital signals. Private calls cannot be received or transmitted

when the radio is in the Aegis or ProVoice digital mode because the radio does not know the cryptographic key used.

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

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

DTMF

The over dial and hot keypad features for transmitting DTMF tones are not available while in the Aegis Digital Mode or ProVoice Digital Mode.

ERROR Messages

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

DSP ERR
ERR=xxxx

DSP ERR

DIGV ERR

Power Up Only

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

HARDWARE
ERR= 3X

3X will be a number between 30 and 38

AEGIS Private, ProVoice Private, And Voice Guard Private Modes

The Aegis, ProVoice, and Voice Guard private modes allow the radio to transmit encrypted messages and receive clear or private transmissions. The

radio will transmit private if the group/channel is programmed for private operation and forced operation is pre-programmed.

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

- Private mode enabled, transmission always in private mode.
- Private mode disabled and private call received. Reply transmission will be private mode if made during scan hang time. If reply transmission occurs after scan hang time, transmission will be in clear mode.

Aegis or ProVoice transmissions cannot be received by a radio set to receive a Voice Guard transmission. Accordingly, Voice Guard or ProVoice transmissions cannot be received by a radio set to receive an Aegis transmission. Neither of the Aegis or Voice Guard transmissions can be received by a radio set to receive ProVoice.

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's programming. Groups and channels within Aegis, ProVoice, or Voice Guard systems can be programmed for keys 1-7. Up to 8 banks of 7 keys can be stored for Aegis (DES and VGE) systems.

DES radios require a DES Keyloader (Option V4025 with software version 3.n or later). VGE radios require a VGE Keyloader (Option V4028 with software version 2.n or later).

When operating on a group or channel programmed for private mode, all transmissions will be private transmissions and the radio will receive clear and private signals. The PVT key light (System Model) or OPTION key light (Scan Model) turns ON 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 PVT button (System Model) or o button (Scan Model). Radios programmed for forced private operation do not allow a change of the transmit mode; therefore, the PVT button (System Model) or o button (Scan Model) has no effect.

Transferring Keys Into The Radio

The following procedure outlines basic key transferring steps.

1. Turn the radio OFF.
2. Ensure that the PC programming cables and adapter box are disconnected from radio unit.
3. Plug the modular connector of the Keyloader cable into the Keyloader modular jack.

4. Connect the Keyloader cable to the Keyloader level converter and then to the extended options cable DB25 on the rear of the radio.
5. Press the PWR button on the Keyloader and wait for the Keyloader to display "MASTER MODE."
6. Press the TRN button on the Keyloader. If necessary, select a different cryptographic key to be transferred into the radio.
7. Turn the radio ON. Use the  button to access the menu options then the RAMP  ,  control to select **KEYLOAD**.
8. Press  (SELECT). Then use the RAMP control  or  to select the bank location.
9. Press the EXE button on the Keyloader to transfer the key. The Keyloader will display "GOOD 1.x TRANSFER" where "x" is the selected cryptographic key number.
10. Disconnect the cable from the extended option cable. Press the  (Scan Model) or  (System Model) button to exit the Keyload operation. The radio will change to the selected group or channel as indicated in the display.

Displaying The Currently Used Cryptographic Key Number

To display the cryptographic key currently in use for either the system encryption key (for special call such as individual, phone, all, agency or fleet) or the group/channel key (for group or conventional calls), perform the following procedure:

1. Press the  button.
2. Use the  or  button (ramp control) to select **DISP KEY**. Then press the  (SEL) button.
3. Then use the   button to toggle between displaying the system key or the group/channel key.

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

Key Zero

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

If the cryptographic key(s) are zeroed, one or more keys must be transferred from the Keyloader into the radio before private communications may continue.

Private Operation

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 PVT key light (System Model) or OPTION key light (Scan Model) will flash, the receiver will un-squelch 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.

Transmitting An Encrypted Call

1. Select the desired group or channel.
2. Place the radio in private mode by pressing the PVT button (System Model) or **OPTION** (Scan Model). When private mode is enabled, the PVT key light (System Model) or **OPTION** key light (Scan Model) will be ON.

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

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

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

Scanned Group Calls

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

Conventional Operation

Outside Address

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

Channel Guard

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

G-STAR

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

DUAL CONTROL OPERATION

The Orion mobile radio may be programmed to operate from two separate Control Units. This permits radio operation from two separate locations in the vehicle. Dual control operation is available in both trunked and conventional modes. Only one control unit can control the mobile radio unit at a time. The control unit, which controls the radio's operation, is called the active controller and the second unit is called the idle controller.

Switching Control

Control can be switched to the idle controller by pressing the push-to-talk (PTT) on the microphone associated with the idle controller. Once PTT is pressed, the radio will switch control to the idle controller unless the active controller is currently transmitting (i.e., PTT pressed on active controller), in which case the switch will not occur. When control is switched to the idle controller, two short high-pitched tones will sound at the controller where PTT was pressed to indicate that the idle controller is now the active controller and the previous active controller is now the idle controller.

Control Switching Modes

The radio can be pre-programmed for two modes of dual operation, Slaved and Independent. In the Slaved mode the two controllers will use the same radio System and Group settings. The Independent mode permits each controller to have its own saved System and Group settings.

Slaved Mode Operation

During Slaved mode operation either controller can operate the radio with no change in System and Group settings when control is switched. Both controllers display the current information. If a key is pressed at the idle controller, other than PTT,  or siren and light keys as noted in following paragraphs, a low tone will sound and the display will temporarily show **DUAL** on line one of the idle controller.

When control is switched in a Slaved mode system, all of the radio settings and states will remain in effect that have been selected on the active controller.

Independent Mode Operation

During Independent operation, the radio system operates as if there are two radio units each controlled by a separate control unit. Each control unit maintains its own System and Group settings, which are restored when control is switched.

The idle controller will display **DUAL** on line one to indicate that it is idle. If a key is pressed at the idle controller, other than PTT,  or siren and light keys as noted in following paragraphs, a low tone will sound at the idle controller.

When control is switched in Independent mode, the idle controller will restore its own System and Group settings instead of using the settings of the previously active controller. Any pending operations at the active controller, other than  or siren and light operations, will be terminated.

Emergency Operation

Either control unit (active or idle controller) can declare an emergency, provided radio has been pre-programmed to enable emergency declaration. If the idle controller declares an emergency, control is switched to the idle controller and any current transmission from the previously active controller is terminated.

Siren And Light Control

Siren and light control is only available from the control unit that is pre-programmed for these functions. Typically, the control unit at the driver's location would be programmed. The control unit that has these functions programmed can activate them regardless of whether it is an active or an idle controller.

Dual Control Audio

Audio output during dual control operation is a pre-programmed function. Default operation routes audio only to the active controller.

MULTIPLE RADIO OPERATION

Orion mobile radio may be configured to operate in a multiple radio mode that permits more than one radio to be controlled from a single control unit or control location. The radios could be different frequency splits, trunked/conventional, etc.

In the multiple radio operation, the radios continue to operate as individual radios except with a common control unit. The control unit is used for display and control. The control unit display is shared by the multiple radio units and, when selected, a radio can be controlled by the control unit.

For multiple radio operation the control unit keypad must be pre-programmed for a variety of multiple radio buttons such as radio selection and radio mute.

Changing Selected Radio

A radio unit may be selected by pressing the radio selection button (pre-programmed) on the control unit. Also, a button may be pre-programmed to rotate selection through the radio units; e.g., if radio #1 is selected, pressing the radio select button will select radio #2. Similarly, radio #2 will be selected if the radio select button is pressed when radio #1 was selected.

Shared Control Unit Display Modes

Radios in the multiple radio operation share the control unit display. Pre-programming the radios determines what the control unit displays. There are two modes of display: alternating radio display or first come first serve display. See also the following paragraph on Audio Modes.

Alternating Radio Display

In this mode the control unit display will alternate between showing the call information for the radios when more than one call is being received. This mode is available only if audio is summed (see following paragraph on Audio Modes).

First Come First Serve Display

In this mode the control unit display will show the call information of the radio that is providing the audio. A call in process prevents audio from other radios from being heard for the duration of the call. This mode corresponds with the first come first serve audio mode (see following paragraph on Audio Modes).

Audio Modes

In multiple radio operation, the audio from the mobile radio units can be pre-programmed to be summed or available on a first come first serve process.

Audio Summed

When audio is summed, the audio from all radios will be available whenever the radios receive a call. If two radios receive a call simultaneously both calls will be heard in the speaker.

Audio First Come First Serve

When audio is pre-programmed for first come first serve, the audio from the radio that receives a call first will be heard from the speaker for the duration of the call. During this time audio from the other mobile radios will be muted.

Muting A Specified Radio

Pressing the control unit mute button associated with a particular radio will mute its audio for a pre-programmed time period. The time period can be cleared by pressing the control unit mute button or the radio selection button.

Multiple Radio And Siren & Light Operation

For siren and lights to function correctly, both the master and slave radios must be programmed with the same siren and light information.

Multiple Radio And Data Operation

Only the master radio supports mobile data operation.

MACRO KEY OPERATION

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

A macro key 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.

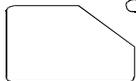
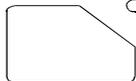
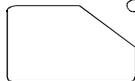
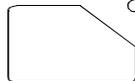
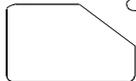
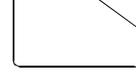
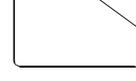
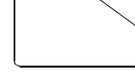
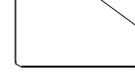
SENDING A MANUALLY ENTERED INTERCONNECT CALL (SYSTEM MODEL ONLY)

1. Select a channel in the radio system that has telephone interconnect capability. The radio should be programmed for DTMF operation on this channel.
2. Press the  button to toggle the keypad to the DTMF function (secondary function).
3. Press and hold PTT to key the transmitter. While holding the PTT, press the * or # key (as required by the radio system to obtain a telephone line). The radio will transmit the selected tone.
4. Release the PTT and listen for a dial tone. When the dial tone is heard, press and hold the PTT while entering the desired telephone number. If pre-programmed, as each digit is entered and transmitted, the DTMF side tone will be heard from the speaker.
5. After all the digits have been entered and transmitted, release the PTT.
6. When someone answers, press the PTT and speak directly into the microphone. Release the PTT as soon as you stop talking to receive a reply.
7. At the completion of the call, press and hold PTT and then press the * or # key (as required by radio system) to terminate the interconnect call. Release the PTT.

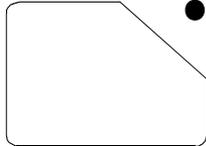
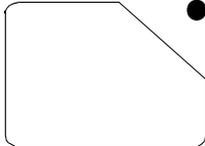
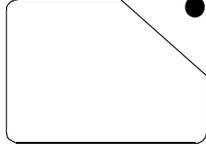
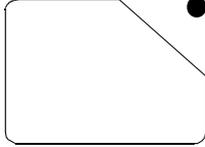
8. Press  to toggle the keypad back to the primary function if no more interconnect calls is to be made.

KEYPAD REMAPPING

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

1 	2 	3 	DEL 
4 	5 	6 	SEL 
7 	8 	9 	CLR 
* 	0 	# 	

Orion System Model Keypad

DEL 	SEL 
CLR 	

Orion Scan Model Keypad

OPERATING RULES AND REGULATIONS

Two way FM radio systems must be operated in accordance with the rules and regulations of the Federal Communications Commission (FCC). As an operator of two way radio equipment, the user must be thoroughly familiar with the rules that apply to the intended type of radio operation. Following these rules will help to eliminate confusion, assure the most efficient use of existing radio channels, and result in a smoothly functioning radio network.

When using the radio, remember these rules:

- It is a violation of FCC rules to interrupt any distress or emergency message. In conventional mode the radio operates in much the same way as a telephone "party line" therefore always listen to make sure that the line is clear--that no one else is on the air--before sending any messages. If someone is sending an emergency message--such as reporting a fire or asking for help in an accident- -**KEEP OFF THE AIR!**
- Use of profane or obscene language is prohibited by Federal Law.
- It is against the law to send false call letters or a false distress or emergency message.
- The FCC requires that conversations be brief and confined to business. To save time, use coded messages whenever possible.
- Using the radio to send personal messages (except in an emergency) is a violation of FCC rules. Only those messages essential for the business operation may be sent.
- It is against the Federal law to repeat or otherwise make known anything overheard on the radio. Conversations between others sharing a communications channel must be regarded as confidential.
- The FCC also requires that the caller be identified at certain specific times by means of call letters. Refer to the rules that apply to the particular type of operation for the proper procedure.
- No changes or adjustment shall be made to the equipment except by an authorized or certified electronic technician.

GLOSSARY

- Agency** - An agency is composed of multiple fleets. Units can be programmed to initiate agency calls to access multiple fleets. (Trunked Mode Only)
- Base/Unit Operation** - A programmed option used in some fleets so units can only hear and talk to a base dispatch unit, not to other mobiles or personals in the group. In this mode of operation, when a unit in a particular group is talking to the base dispatch unit, all other mobile and personal radios in that group will receive a "System Busy" tone if they try to access the system. (Trunked Mode Only)
- Control Channel** - a radio channel in a trunked system that is used to digitally communicate with the radios operating on the system when they are not engaged in active voice communications.
- Conventional-Channel** - a radio channel (transmit/receive) that is allocated for conventional (non-trunked) use and may be manually selected by the operator.
- Conventional-Mode** - communicating on radio channels allocated for conventional use (i.e. conventional system).
- CCT** - Carrier Controlled Timer - a programmable timer that will disable a transmission if the length is exceeded.
- CG** - Channel Guard - a method of controlling speaker mute with a tone or digital code.
- Fleet** - A fleet of users consists of multiple groups (sub fleets). Radios can be programmed to make fleet calls to simultaneously access multiple user groups. (Trunked Mode Only)
- Group Or Subfleet** - A group of users share the same program group identification number in their mobile and personal radios. All units in the same group will receive a dispatch call placed by any one unit in the group. (Trunked Mode only)
- Group Scan** - Programming that allows the radio to monitor many groups simultaneously (multi-group decode), permitting the user to both monitor and receive calls from these groups. The radio may be programmed with a scan hang time which causes the radio to remain on the scanned group for a pre-programmed amount of time, responding only to calls of a higher priority such as priority scan group calls, individual calls, fleet calls, agency calls, etc. When activity on the scan group

ends, and the pre-programmed time has expired, the radio returns to monitoring multiple groups. (Trunked Mode Only)

- Individual Call** - Every radio in the system is programmed with a unique individual identification code. A mobile or personal unit can be programmed to call another particular unit by selecting the individual by name or ID number. (Trunked Mode Only)
- Queueing** - The process that occurs when all channels in a trunked system are busy and calls must be addressed on a priority basis.
- Site Controller** - The computer controlled radio equipment at the repeater site that controls a trunking system.
- System (area)** - The terms "system" and "area" are used interchangeably to refer to the particular group of station repeaters currently providing service to the radio.
- System Manager** - A computer that performs the data basing and system monitoring for the site controller.
- System Scan** - A programmed feature to scan (monitor activity on) separate trunked systems and receive calls on any of these systems. (Trunked Mode Only)
- Talk-around Mode** - Also referred to as "direct mode", talk-around provides a direct unit-to-unit short range communications link. It is intended to maintain communications outside of the main system coverage area.
- Telephone Inter-Connect** - This feature allows the user to initiate or receive telephone calls through the radio if the system is configured for this operation. (Trunked Mode Only)
- Trunked Group** - A radio communications path shared by two or more users.
- Trunked Operation** - Trunked Operation refers to the use of a set of radio frequency channels by multiple user groups. By using high speed digital data the radio goes to an unused channel when a call is initiated and will also only respond to calls in the same user group. In this way conversation privacy between user groups is assured.
- Trunked Radio System** - A radio system in which a limited number of radio channels is dynamically allocated to groups of people for communication purposes.
- Trunked System** - A set of one or more trunked groups.

- T99** - Type 99 - a method of opening mute for selective page operations using sequential tones.
- Wide Area Encode** - A programmed option, which ensures all system scanning mobile and personal radios have time to lock onto the call before the initiating unit is allowed to talk.
- Working Channel** - A radio channel (transmit/receive) that is automatically assigned by the site controller for voice or data communications.

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.

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-7047C

NOTES

EMERGENCY NUMBERS

Police

State Police

Fire

Poison Control

Ambulance

Life Saving and Rescue Squad

OPERATING TIPS

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

- Operating the radio in low areas of terrain or while under power lines or bridges.
- In areas where transmission or reception is poor, some improvements may be obtained by insuring that the antenna is vertical (particularly if a glass mount antenna is used). Moving a few yards in another direction or moving to a higher elevation may also improve communications.