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VRS7010
P25 Trunked Cross-Band
Vehicular Repeater System

Includes
VRBS7010 for Vehicular Repeater Link,
VRMS7010 for Network Link,
and CH-721 Control Head

MANUAL REVISION HISTORY

REV.	DATE	REASON FOR CHANGE
–	Feb/10	Initial release.

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

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1 REGULATORY AND SAFETY INFORMATION

1.1 SAFETY SYMBOL CONVENTIONS

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

⚠ WARNING	**The WARNING symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING symbol until the conditions identified are fully understood or met.**
⚠ CAUTION	The **CAUTION** symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in damage to the equipment or severely degrade equipment performance.
ⓘ NOTE	The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.

1.2 RF ENERGY EXPOSURE AWARENESS AND CONTROL INFORMATION FOR FCC OCCUPATIONAL USE REQUIREMENTS

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

⚠ WARNING	**This radio is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to remain below RF exposure limits. This radio is NOT authorized for general population, consumer, or any other use.**
⚠ CAUTION	Changes or modifications not expressly approved by Harris could void the user's authority to operate the equipment.

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

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection. All two-way radios marketed in North America are designed, manufactured, and tested to

ensure they meet government-established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of two-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Please refer to the following websites for more information on what RF energy exposure is and how to control exposure to assure compliance with established RF exposure limits:

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

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

1.2.1 Federal Communications Commission Regulations

Before it was marketed in the United States, the VRS7010 P25 vehicular repeater with mobile radio was tested to ensure compliance with FCC RF energy exposure limits for mobile two-way radios. When two-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a label directing users to specific user awareness information. The radio has an RF exposure product label. Also, this Installation and Product Safety Manual and the applicable Operator's Manual include information and operating instructions required to control RF exposure and to satisfy compliance requirements.

1.3 COMPLIANCE WITH RF EXPOSURE STANDARDS

The VRS7010 P25 vehicular repeater with mobile radio is designed and tested to comply with a number of national and international standards and guidelines regarding human exposure to RF electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at duty-cycle times of up to 50% (50% transmit, 50% receive), and it is authorized by the FCC for occupational use. In terms of measuring RF energy for compliance with the FCC exposure guidelines, the radio's antenna radiates measurable RF energy only while it is transmitting (talking), not when it is receiving (listening), or in standby mode.

The VRS7010 P25 vehicular repeater with mobile radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission (FCC), Code of Federal Regulations; 47 CFR § 2 sub-part J.

- American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) C95.1-2005.

- Institute of Electrical and Electronic Engineers (IEEE) C95.1-2005.

- IC Standard RSS-102, Issue 2, 2005: Spectrum Management and Telecommunications Radio Standards Specification. Radiofrequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

CAUTION

Table 1-1 and Table 1-2 list the recommended minimum safe lateral distances for a controlled environment and for unaware bystanders in an uncontrolled environment, from transmitting antennas (i.e., monopoles over a ground plane, or dipoles). This data is based upon the mobile radio installed in a motor vehicle with the radio transmitting at its rated RF power level. Transmit only when unaware bystanders are at least the uncontrolled recommended minimum safe lateral distance away from the mobile radio's transmitting antenna.

**Table 1-1: Recommended Minimum Safe Lateral Distance from
Transmitting Antenna for Mobile Radio- to-Network Radio Link (VRMS7010 Transmit/Receive Antenna)**

ANTENNA PART NUMBER (CATALOG NUMBER)	ANTENNA DESCRIPTION	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA (Distance in Centimeters)	
		CONTROLLED ENVIRONMENT*	UNCONTROLLED ENVIRONMENT*
AN-025167-001 (MAMW-AN3J)	700/800 MHz Standard Rooftop-Mount; 3 dBd Gain	28	69
AN-025167-002 (MAMW-AN3K)	700/800 MHz Elevated-Feed Rooftop-Mount; 3 dBd Gain	28	69
AN-025167-004 (MAMW-AN3V)	700/800 MHz GPS Combo Rooftop-Mount; 3 dBd Gain	28	69
AN-025167-005 (MAMW-NAN3W)	700/800 MHz GPS Combo Elevated-Feed Rooftop-Mount; 3 dBd Gain	28	69
AN-025167-006 (MAMW-NAN3X)	700/800 MHz Magnetic-Mount; 3 dBd Gain	29	72
AN-025167-010 (MAMW-NAN5B)	700/800 MHz Low-Profile Rooftop-Mount; 2 dBd Gain	28	69
AN-025167-011 (MAMW-NAN5C)	700/800 MHz GPS Combo Low-Profile Rooftop-Mount; 2 dBd Gain	28	69
AN-025167-014 (MAMW-NAN5U)	700/800 MHz Standard Rooftop-Mount; 5 dBd Gain	39	87
AN-025167-015 (MAMW-NAN5V)	700/800 MHz GPS Combo Rooftop-Mount; 5 dBd Gain	39	87
AN-125001-002 (mount) with AN-225001-001 (element)	700/800 MHz Standard Rooftop-Mount; 3 dBd Gain	36	76
AN-125001-002 (mount) with AN-225001-005 (element)	700/800 MHz Standard Rooftop-Mount; 5 dBd Gain	36	79

!

CAUTION

Antennas listed in Table 1-1 above are approved for used with the VRS7010's VRMS7010 (i.e., the M7300 mobile radio with 800 MHz bandpass filter). Do **not** connect any of these antennas to the VRS7010's VRBS7010.

**Table 1-2: Recommended Minimum Safe Lateral Distance from
Transmitting Antenna for Vehicular Repeater-to-Portable Radio Link (VRBS7010 Transmit/Receive
Antenna)**

ANTENNA PART NUMBER	ANTENNA DESCRIPTION	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA (Distance in Centimeters)	
		CONTROLLED ENVIRONMENT	UNCONTROLLED ENVIRONMENT
AN-125001-002 (mount) with AN-225001-004 (element)	Standard Rooftop-Mount with Low-Loss Cable and 700/800 MHz Low-Profile 2 dBd Gain Element	20	20
AN-125001-004 (mount) with AN-225001-004 (element)	Thick Rooftop-Mount with Low-Loss Cable and 700/800 MHz Low-Profile 2 dBd Gain Element	20	20
AN-125001-008 (mount) with AN-225001-004 (element)	Magnetic-Mount with Low-Loss Cable and 700/800 MHz Low-Profile 2 dBd Gain Element	20	20

1.3.1   Mobile Antennas

The antennas for the radio must be installed in accordance with guidelines and procedures contained in this product's installation manual. These mobile antenna installation guidelines are limited to metal body motor vehicles or vehicles with appropriate ground planes. The radio installation's antenna must be installed in accordance with:

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

- Instructions in the VRS7010's Installation Manual, including minimum antenna cable lengths. The installation manual contains specific information on how to install the antennas to facilitate recommended operating distances to all potentially exposed persons.

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

1.3.2   Approved Accessories

The radio has been tested and meets FCC RF guidelines when used with accessories supplied or designated for use with it. Use of other accessories may not ensure compliance with the FCC's RF exposure guidelines, and may violate FCC regulations.

For a list of approved accessories refer to the product manuals, the Products and Services Catalog, or contact Harris Corporation at 1-800-368-3277.

1.3.3   Contact Information

For additional information on exposure requirements or other information, contact Harris Corporation at 1-800-528-7711 or at www.pspc.harris.com.

1.4 OCCUPATIONAL SAFETY GUIDELINES AND SAFETY TRAINING INFORMATION

To ensure bodily exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use. Always adhere to the following basic guidelines:

• The push-to-talk button should only be depressed when intending to send a voice message.

• The radio should only be used for necessary work-related communications.

• The radio should only be used by authorized and trained personnel. It should never be operated by children.

• Do not attempt any unauthorized modification to the radio. Changes or modifications to the radio may cause harmful interference and/or cause it to exceed FCC RF exposure limits. Only qualified personnel should service the radio.

• Always use only Harris-authorized accessories (antennas, control heads, speakers/mics, etc.). Use of unauthorized accessories can cause the FCC RF exposure compliance requirements to be exceeded.

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

1.5 COMMON HAZARDS

⚠️ **WARNING**

The operator of any mobile radio should be aware of certain hazards common to the operation of vehicular radio transmissions. Possible hazards include but are not limited to:

• **Explosive Atmospheres** — Just as it is dangerous to fuel a vehicle with its engine is running, be sure to turn the radio **OFF** while fuelling the vehicle. If the radio is mounted in the trunk of the vehicle, **DO NOT** carry containers of fuel in the trunk.

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

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

• **Electric Blasting Caps** — To prevent accidental detonation of electric blasting caps, **DO NOT** use two-way radios within 1000 feet (305 meters) of blasting operations. Always obey the "**Turn Off Two-Way Radios**" (or equivalent) signs posted where electric blasting caps are being used. (OSHA Standard: 1926.900).

• **Radio Frequency Energy** — To prevent burns or related physical injury from radio frequency energy, do not operate the transmitter when anyone outside of the vehicle is within the minimum safe distance from the antenna as specified in Table 1-1 and Table 1-2. Refer to Section 1.2 for additional information.

• **Vehicles Powered By Liquefied Petroleum (LP) Gas** — Radio installation in vehicles powered by liquefied petroleum gas, where the LP gas container is located in the trunk or other sealed-off space

within the interior of the vehicle, must conform to the **N**ational **F**ire **P**rotection **A**ssociation standard **NFPA 58**. This requires:

➢ The space containing the radio equipment must be isolated and sealed from the space containing the LP gas container and its fittings.

➢ Outside filling connections must be used for the LP gas container.

➢ The LP gas container space shall be vented to the outside of the vehicle.

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

1.6   SAFE DRIVING RECOMMENDATIONS

The American Automobile Association (AAA) advocates the following key safe driving recommendations:

• Read the literature on the safe operation of the radio.

• Keep both hands on the steering wheel and the microphone in its hanger whenever the vehicle is in motion.

• Place calls only when the vehicle is stopped.

• When talking from a moving vehicle is unavoidable, drive in the slower lane. Keep conversations brief.

• If a conversation requires taking notes or complex thought, stop the vehicle in a safe place and continue the call.

• Whenever using a mobile radio, exercise caution.

1.7   OPERATING RULES REGULATIONS

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

In the United States, the VRS7010 P25 vehicular repeater with mobile radio must be operated in accordance with the rules and regulations of the Federal Communications Commission (FCC). Operators of two-way radio equipment, must be thoroughly familiar with the rules that apply to the particular type of radio operation. Following these rules helps eliminate confusion, assures the most efficient use of the existing radio channels, and results in a smoothly functioning radio network.

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

• It is a violation of FCC rules to interrupt any distress or emergency message. The radio operates in much the same way as a telephone "party line." Therefore, always listen to make sure the channel is clear before transmitting. Emergency calls have priority over all other messages. If someone is sending an emergency message – such as reporting a fire or asking for help in an accident, do <u>not</u> transmit unless assistance can be offered.

• The use of profane or obscene language is prohibited by Federal law.

- It is against the law to send false call letters or false distress or emergency messages. The FCC requires keeping conversations brief and confined to business. Use coded messages whenever possible to save on-the-air time.

- Using the radio to send personal messages (except in an emergency) is a violation of FCC rules. Send only essential messages.

- It is against Federal law to repeat or otherwise make known anything overheard on the radio. Conversations between others sharing the channel must be regarded as confidential.

- The FCC requires self-identification 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 adjustments shall be made to the equipment except by an authorized or certified electronics technician.

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

1.8 OPERATING TIPS

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

- Operating the radio in areas of low terrain, or while under power lines or bridges.
- Obstructions such as mountains and buildings.

i NOTE	In areas where transmission or reception is poor, communication improvement may sometimes be obtained by moving a few yards in another direction, or moving to a higher elevation.

2 INTRODUCTION

2.1 VRS7010 P25 VEHICULAR REPEATER WITH MOBILE RADIO

The VRS7010 is a combination Project 25 (P25) vehicular repeater for P25 trunked radio networks and a mobile radio for P25 trunked and P25 conventional radio networks. The VRS7010 consists of two (2) mobile radios coupled together with specialized interface hardware. A control head, microphone speaker, and antennas are connected to the radio.

2.1.1 Operating Modes

The VRS7010 has two (2) primary operating modes as described in the following subsections:

2.1.1.1 Extended Coverage (XCOV) Vehicular Repeater Mode

As illustrated in Figure 2-1, when the VRS7010 is operating in the extended coverage vehicular repeater mode, it provides the network extension interface that enables nearby P25 radios operating on a 700 MHz radio frequency channel to access an 800 MHz P25 radio network through the VRS7010. This mode of operation is sometimes abbreviated "vehicular repeater mode" or simply "XCOV mode." Portable radio coverage is extended because VRS7010's high-performance mobile antenna system and higher transmitter output power is used to access the 800 MHz P25 radio network. See Figure 2-1. When a nearby P25 radio is communicating through the VRS7010, it is considered "connected" to or it is considered a "client" on the VRS7010. The VRS7010 cannot function as a standard mobile radio when it is operating in XCOV vehicular repeater mode. Instructions on enabling and disabling this mode are included in Section 4 of this manual.

Typically, the VRS7010 operator places the radio into XCOV vehicular repeater mode via a menu selection or preset button press at the radio's control head. Likewise, the operator can disable this mode via a CH-721 control head menu selection or preset button press. Alternately, the radio installation may be wired so this mode can be enabled and disabled by an external switch located on the vehicle's dash panel, console panel, or elsewhere.

When the VRS7010 is operating in XCOV vehicular repeater mode, the VRS7010's VRBS7010 functions like a Voice and Data Over Control (VDOC) site for the nearby P25 radios. Essentially, the nearby connected P25 radios and the VRBS7010 are linked together via P25 VDOC protocols on the VRBS7010
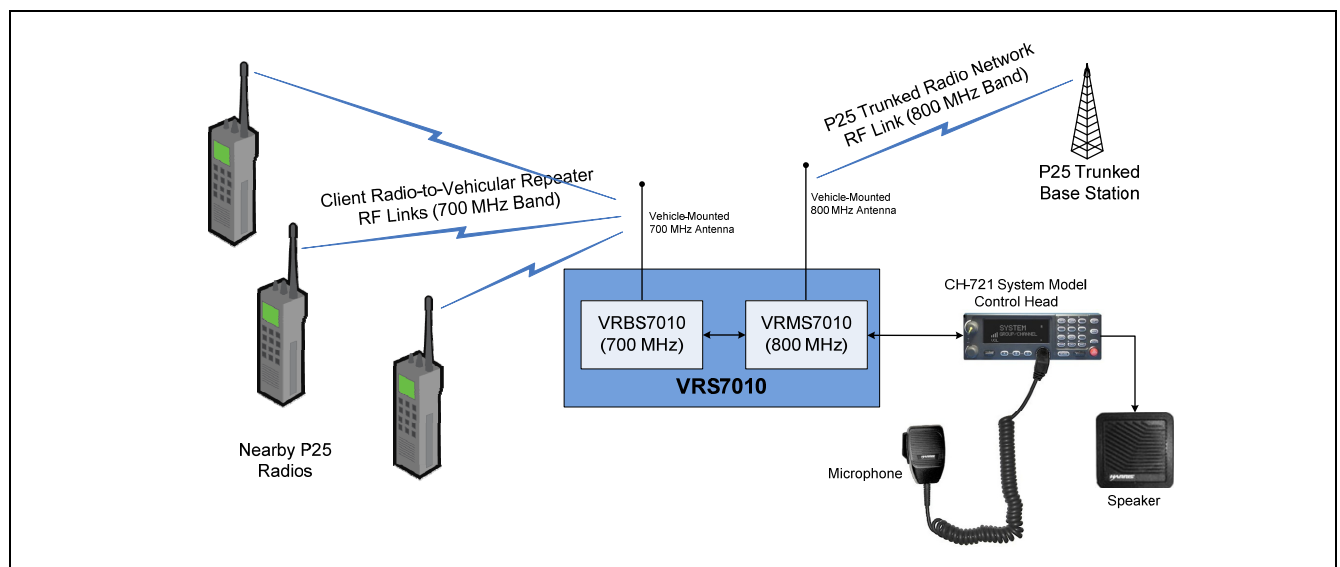

Figure 2-1: Simplified Block Diagram of Extended Network Coverage Mode

RF channel. Both P25 portable and P25 mobile radios can connect to the VRS7010 when it is operating in this mode.

The VRS7010 allows attachment of up to sixty-four (64) nearby P25 radios. When using the XCOV vehicular repeater mode, nearby P25 radios operating through the VRS7010 maintain the following P25 functions across the two RF links:

- **P25 Group Call** — P25 radios connected to the VRS7010 can communicate on a common talk group, or on multiple different talk groups. The VRS7010 provides 64 maximum talk group paths (up to one talk group per radio) when it is operating in the XCOV vehicular repeater mode. Digital clear voice and digital encrypted voice group calls are supported.

- **P25 Individual Call** — Unit-to-unit call both between two connected P25 radios, and between a connected P25 radio and a radio/console on the P25 radio network are supported. Digital clear voice and digital encrypted voice individual calls are supported.

- **P25 User ID** — Caller identification information is sent between a connected P25 radio and the P25 trunked radio network.

- **P25 Emergency** — The link through the VRS7010 provides P25 emergency communications between the connected P25 radios the P25 trunked radio network.

- **P25 System All Call (from Network Only)** — A system-wide all-call transmission from the P25 radio network is forwarded to connected P25 radios.

- **Call Grant and Call Queued Tones** — An attached P25 radio generates call grant and call queued tones in a similar manner as if was operating directly on the P25 radio network.

When operating in the extended network coverage mode, calls transmitted from the connected P25 radios are not routed to the VRS7010's speaker.

The VRS7010 supports end-to-end Advanced Encryption Standard (AES) encrypted calls. In other words, if a P25 radio connected to the VRS7010 is transmitting an encrypted call, the VRS7010 simply repeats the call to the network base station. It does not un-encrypt and then re-encrypt the call.

2.1.1.2   Standard Mobile Radio Mode (Vehicular Repeater Disabled)

When operating as a mobile radio (i.e., P25 vehicular repeater disabled), the VRS7010 provides communications on P25 trunked and P25 conventional radio systems. Radio control and voice communications are accomplished via the radio's control head, the "push-to-talk" (PTT) type microphone, and the speaker connected to the control head. In this mode, the VRS7010 functions like a normal mobile radio. The radio operator uses the interfaces of the connected CH-721 control head (i.e., display, control buttons/keys, mic and speaker) to control the radio and to communicate with other radio users and console dispatchers on a trunked or conventional radio network.

Nearby radios cannot be linked through the VRS7010 to the radio network when the VRS7010 is operating in this mode, since the VRS7010's vehicular repeater functionality is disabled.

2.2   CH-721 SYSTEM MODEL CONTROL HEAD

The VRS7010 employs the CH-721 System model control head. Shown in Figure 3-1 on page 16, this control head provides the user/operator interface for the VRS7010. The CH-721 System model control head has a large easy-to-read 3-line graphical vacuum-fluorescent type display, an on/off/volume control knob, menu controls, an emergency/home button, a scan on/off button, and three (3) preset buttons. It also features a 12-key numeric keypad that provides Dual-Tone Multi-Frequency (DTMF) keypad functionality and easier operator system/group selection, three (3) preset buttons, and an emergency/home button. Other front panel components include a microphone connector and two (2) Light-Emitting Diode (LED)

type indictors. One LED indicator is the busy indicator that lights when the VRS7010 is receiving a call. The other is the transmitter-enabled indicator that lights when it is transmitting. The control head's buttons and keys are backlit for nighttime operation. An ambient light sensor on the head's front panel controls automatic display and button/key backlight dimming.

2.3   OPTIONS

2.3.1   AES Encryption

Advanced Encryption Standard (AES) is optionally available. AES provides maximum communications security.

2.3.2   GPS Receiver Option

The VRS7010 can be equipped with an optional built-in Global Positioning System (GPS) tracking receiver. GPS provides quick and accurate unit location information to dispatchers via the radio network. The GPS receiver determines the unit's location and the VRS7010 transmits it to the radio network. The GPS antenna can be integrated into the mobile transmit/receive antenna (i.e., a "combination" antenna). Alternately, the GPS antenna can be located/mounted completely separate from the mobile transmit/receive antenna.

2.3.3   Status

Status operation is an optional feature that permits the transmission of a pre-programmed status condition to the P25 trunked radio network.

2.3.4   Message

Message operation is an optional feature that permits the transmission of a pre-programmed message text to the P25 trunked radio network.

3 BEGINNING OPERATION

3.1 TURNING ON THE VRS7010

To turn on the VRS7010, rotate the control head's Power On/Off/Volume <u>clockwise</u> out of the detent position. The knob is shown in Figure 3-1 below. This action powers-up the VRS7010 and the control head. If enabled through programming, a short beep sounds in the speaker to indicate the radio is ready for operation, and the control head indicates the last selected system name on line 1 and the last selected group name on line 2.

> **NOTE**
>
> **The VRS7010 begins operating in the standard mobile radio mode. For complete operating instructions for this mode, refer to Section 5 which begins on page 22.**
>
> **To enable/activate the vehicular repeater mode, refer to Section 4 which begins on page 19.**

3.2 FRONT PANEL OF THE CONTROL HEAD

The front panel of the CH-721 System model control head includes a dot matrix display, ramp control and buttons for menu navigation, an emergency/home button, three (3) pre-set buttons, a power on/off/volume control knob, a microphone connector, and a 12-key DTMF keypad. Table 3-1 summarizes functions of the front panel controls.

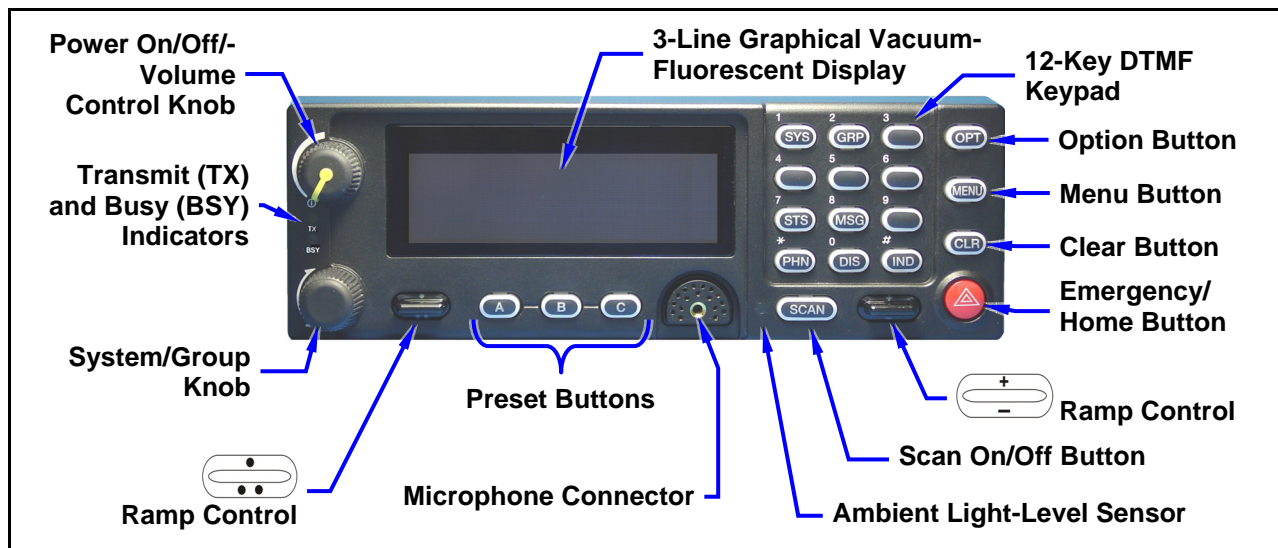**Figure 3-1: CH-721 System Model Control Head**

> **NOTE**
>
> Button and key functions may vary depending upon system programming, radio hardware, and optional configurations. The table in Section 7 is provided to record functions of remapped buttons/keys

Table 3-1: Controls of CH-721 System Model Control Head

CONTROL	FUNCTION
Power On/Off/Volume Control Knob	Turn this knob clockwise to turn on the VRS7010, and to increase volume. See Section 3.1 on page 16 for additional information.
	Turn this knob counter-clockwise to decrease volume, and to turn off the VRS7010.
Ambient Light Sensor	Radio automatically adjusts the display and button/key backlight brightness level based on ambient light. Do not block this sensor.
◯ System/Group Knob	When the vehicular repeater is disabled/inactive, use the System/Group knob to select a system/group combination, based upon radio programming. See Section 5.4 which begins on page 25 for additional information.
	This knob does **not** function when the vehicular repeater is enabled/active.
⊛ Emergency/Home Button	When the vehicular repeater is disabled/inactive, use the Emergency/Home button to declare an emergency, if the emergency feature is enabled. See Section 5.14 on page 34 for additional information. Alternately, this button can also be programmed to switch the radio to a home group when it is pressed.
	This button does **not** function when the vehicular repeater is enabled/active.
⬭ Ramp Control	This rocker-type ramp control has multiple functions.
	When the vehicular repeater is disabled/inactive, it is used to display the current scan status for a group, and to then add or delete the group from the system scan list. See Section 5.16 which begins on page 36 for additional information.
	It is also used for various other selection-type functions, as described elsewhere in this manual.
	This control does **not** function when the vehicular repeater is enabled/active.
⬭ Ramp Control	This rocker-type ramp control also has multiple functions.
	When the vehicular repeater is disabled/inactive, the primary function of this rocker-type ramp control is to scroll through the System list or the Group list, depending upon programming. A secondary function is to increment or decrement items within a list (phone list for example).
	This control is also used to enable/activate the vehicular repeater, as described in Section 4.
OPT (Option Button)	The OPT (option) button is used to toggle a programmable feature on and off when the vehicular repeater is disabled/inactive.
	This button does **not** function when the vehicular repeater is enabled/active.
MENU (Menu Button)	When the vehicular repeater is disabled/inactive, the primary function of the MENU button is to access the menu list. This is a list of additional features that are not available directly from the keypad. As a secondary function, it activates a selected item within a list, similar to an enter button/key.
	The MENU button is also used to enable/activate and to disable/de-activate the vehicular repeater. See Section 4 for additional information.
CLR (Clear Button)	When the vehicular repeater is disabled/inactive, the CLR (clear) button cancels the current operation and removes all displays associated with it. The radio and display then return to the group receive state.
	This button does **not** function when the vehicular repeater is enabled/active.

CONTROL	FUNCTION
SCAN (Scan Button)	When the vehicular repeater is disabled/inactive, the primary function of the SCAN button is to toggle group scan operation on and off. See Sections 5.16.4 and 5.16.6 for operating details. As a secondary function, this button toggles keypad keys between their primary function and their secondary function. When the secondary keypad is active (for example, when entering phone number digits for a telephone interconnect call), the SCAN button can be used to toggle the keypad keys back to their primary function, perform a task, and then toggle back to finish entering the digits for the phone number. "PRIMARY" is displayed when the SCAN button is used to toggle the keypad keys back to their primary functions. This provides quick access to the primary functions of the keypad. This is a programmable feature of the SCAN button only. Careful consideration should be given to possible operational conflicts before enabling this feature. This button does **not** function when the vehicular repeater is enabled/active.
A, **B** and **C** Pre-Set Buttons	A preset button may be pre-programmed to perform a particular task. For example, the C button could be programmed to enable/activate the vehicular repeater. A preset button can also be used to store and recall user-selectable parameters.
SYS (System Key)	This key is used to enter the system select mode. See Section 5.4.1 on page 25 for additional information.
GRP (Group Key)	This key is used to enter the group select mode. See Section 5.4.2 on page 25 for additional information.
DIS (Display Key)	This key is used to adjust the current display intensity and the keypad backlight level. See Section 3.3 for additional information.
IND (Individual Call Key)	This key is used to call an individual or make an all-call by selecting the individual call function. See Section 5.17 on page 38 for addition information.
PHN (Phone Key)	This key is used to place telephone calls through the radio system via the telephone interconnect special call function. See Section 5.18 on page 40 for additional information.
STS (Status Key)	This key is used to send pre-programmed status conditions to the P25 radio network. See Section 5.19 on page 41 for additional information.
MSG (Message Key)	This key is used to send pre-programmed message text to the P25 radio network. See Section 5.20 on page 42 for additional information.

3.3   ADJUSTING DISPLAY AND BUTTON/KEY BACKLIGHT BRIGHTNESS

A light sensor on the front panel of the control head automatically adjusts display brightness and button/key backlight brightness based upon to ambient light conditions. The display and button/key backlights automatically brighten at higher external light levels and automatically dim at lower external light levels. However, if the manual brightness adjustment menu is available (a programmable feature), manual brightness adjustment is also possible per this procedure:

1. Press the control head's **MENU** button.

2. Use the ramp control to scroll through the menu until **BCK LGHT** (for backlight) appears in the middle line of the display.

3. Press the **MENU** button again, and then use the ramp control to increase or decrease the brightness to the desired level.

4. Press the **CLR** button, or simply wait a few seconds and the menu operation will automatically end.

4 VEHICULAR REPEATER OPERATION

4.1 EXTENDED COVERAGE (XCOV) VEHICULAR REPEATER MODE

There are (3) possible methods that can be used to enable and disable the extended coverage (XCOV) vehicular repeater mode, as described in the following subsections.

⚠️ **CAUTION**

When the XCOV vehicular repeater mode is enabled/active, normal mobile radio communications are **not** possible with the VRS7010. In other words, the speaker and microphone connected to the CH-721 control head do **not** function when XCOV vehicular repeater mode is enabled/active.

4.1.1 Switch to a P25 Trunked Radio System (if not currently)

Before the XCOV vehicular repeater mode can be enabled/activated, the VRS7010 must be operating on a P25 trunked radio system. Use one of the following two methods to switch VRS7010 operation to a P25 trunked radio system:

4.1.1.1 Switch via Ramp Control

Simply use the control head's ⬚ ramp control to scroll through the menu until the required P25 trunked radio network's name appears in the display. This ramp control is shown in Figure 3-1 on page 16. This is a "system" change. After a short delay, the VRS7010 will switch to the newly selected P25 trunked radio network, and begin operating on it.

4.1.1.2 Switch via Keypad Entry

1. If not known, consult with the network administration personnel, as necessary, for the "system" number of the respective P25 trunked radio network.

2. At the control head, enter this number via its 12-key DTMF keypad. The front panel of the control head is shown in Figure 3-1 on page 16.

3. Press the **MENU** button to switch the VRS7010 to the entered P25 trunked radio network. After a short delay, the VRS7010 will begin operating on the newly selected network.

4.1.2 Enable/Disable XCOV Vehicular Repeater Mode via the Control Head's Menu

To enable the XCOV vehicular repeater mode via the control head's menu, follow this procedure:

1. If the VRS7010 is not currently operating on a P25 trunked radio network, use one of the two methods presented in Section 4.1.1 to switch it to a P25 trunked radio network. The VRS7010 must be operating on a P25 trunked radio network before XCOV vehicular repeater mode can be enabled/activated.

2. Press the control head's **MENU** button.

3. Use the control head's ⬚ ramp control to scroll through the menu until **P25 VR** appears in the middle line of the display, and then press the **MENU** button again. After a short delay, **VR Standby** appears in the display, indicating the VRS7010 is operating in XCOV vehicular repeater mode without any connected (client) P25 radios. When one or more P25 radios connect to the VRS7010, **VR Active** appears in the display. See section 4.1.5 for additional information.

To disable XCOV vehicular repeater mode, if no menu change has been made since XCOV vehicular repeater mode was enabled, simply press the **MENU** button to turn/toggle the mode off. If a menu change has occurred since the XCOV vehicular repeater mode was enabled, first press the **MENU** button, then navigate to the **P25 VR** menu again, and then press the **MENU** button again. Afterwards, the VRS7010 will return to a normal display, indicating network group and/or individual call information, etc.

4.1.3 Enable/Disable XCOV Vehicular Repeater Mode via Control Head Preset Button

The CH-721 control head has three (3) present buttons located just below its display. One of these buttons may be configured to toggle the XCOV vehicular repeater mode on and off. Consult with the system administrator to determine if the installed VRS7010 is configured in this manner before using this procedure:

1. If the VRS7010 is not currently operating on a P25 trunked radio network, use one of the two methods presented in Section 4.1.1 to switch it to a P25 trunked radio network. The VRS7010 must be operating on a P25 trunked radio network before XCOV vehicular repeater mode can be enabled/activated.

2. Press the respective preset button (A, B or C) to enable XCOV vehicular repeater mode. After a short delay, **VR Standby** appears in the display, indicating the VRS7010 is operating in XCOV vehicular repeater mode without any connected (client) P25 radios. When one or more P25 radios connect to the VRS7010, **VR Active** appears in the display. See section 4.1.5 for additional information.

To disable XCOV vehicular repeater mode, simply press the same preset button again, or press the **MENU** button. Afterwards, the VRS7010 will return to a normal display, indicating network group and/or individual call information, etc.

4.1.4 Enable/Disable XCOV Vehicular Repeater Mode via External Switch

The VRS7010 installation may be wired to an external switch used to enable and disable the XCOV vehicular repeater mode. The external switch may be located on the vehicle's dash panel, on a console panel near the control head, or elsewhere. Follow this procedure to enable XCOV vehicular repeater mode via an external switch:

1. If the VRS7010 is not currently operating on a P25 trunked radio network, use one of the two methods presented in Section 4.1.1 to switch it to a P25 trunked radio network. The VRS7010 must be operating on a P25 trunked radio network before XCOV vehicular repeater mode can be enabled/activated.

2. Place the external switch in the enabled/activated position. After a short delay, **VR Standby** appears in the display, indicating the VRS7010 is operating in XCOV vehicular repeater mode without any connected (client) P25 radios. When one or more P25 radios connect to the VRS7010, **VR Active** appears in the display. See section 4.1.5 for additional information.

To disable the XCOV vehicular repeater mode, place the external switch in the disabled/deactivated position, and then press the **MENU** button on the control head. Afterwards, the VRS7010 will return to a normal display, indicating network group and/or individual call information, etc.

4.1.5 Additional Information on the XCOV Vehicular Repeater Mode

When VRS7010's extended coverage (XCOV) vehicular repeater mode is enabled/active, up to sixty-four (64) nearby P25 radios can connect to the VRS7010 for extended coverage communications on the P25 trunked radio network. P25 radios operating through the VRS7010 maintain the following P25 functions through to the P25 trunked radio network:

- **P25 Group Call** — P25 radios connected to the VRS7010 can communicate on a common talk group, or on multiple different talk groups. The VRS7010 provides 64 maximum talk group paths (up to one talk group per radio) when it is operating in the XCOV vehicular repeater mode. Digital clear voice and digital encrypted voice group calls are supported.

- **P25 Individual Call** — Unit-to-unit call both between two connected P25 radios, and between a connected P25 radio and a radio/console on the P25 radio network are supported. Digital clear voice and digital encrypted voice individual calls are supported.

- **P25 User ID** — Caller identification information is sent between a connected P25 radio and the P25 trunked radio network.

- **P25 Emergency** — The link through the VRS7010 provides P25 emergency communications between the connected P25 radios the P25 trunked radio network.

- **P25 System All Call (from Network Only)** — A system-wide all-call transmission from the P25 radio network is forwarded to connected P25 radios.

- **Call Grant and Call Queued Tones** — An attached P25 radio generates call grant and call queued tones in a similar manner as if was operating directly on the P25 radio network.

When a call is made from a connected P25 radio, **VR Call** appears in the control head's display. During the call, the **VR Call** indication replaces the **VR Active** indication.

When operating in the extended network coverage mode, calls transmitted from P25 radios connected to the VRS7010 are not routed to the VRS7010's speaker.

The VRS7010 supports end-to-end Advanced Encryption Standard (AES) encrypted calls. In other words, if a P25 radio connected to the VRS7010 is transmitting an encrypted call, the VRS7010 simply repeats the call to the network base station; it does not un-encrypt and then re-encrypt the call.

5 MOBILE RADIO OPERATION ON A P25 TRUNKED NETWORK

5.1 SELECTION MODE RULES

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

> ℹ️ **NOTE**   The hookswitch functions the same as the **CLR** button in individual call, phone call, and menu modes.

	SYSTEM
1	NORTH
2	SOUTH
3	EAST
4	WEST

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

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

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

> S O U T H
> S Y S =   2

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

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

> E A S T
> S Y S =   3

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

5.2 DIRECT ACCESS

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

```
SEL SYS
4
```

If a mistake is made while entering the number, press the **OPT** button to backspace once and correct the entry. If an invalid number is entered, a short low-pitched tone sounds when the **MENU** button 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 the **MENU** button has not been pressed), the entry on line 2 will be disregarded and the previous selection will remain active. If the time-out activates while an entry is pending, the entry on line 2 will be selected if it is within the valid range; if it is out of range, the entry on line 2 will be disregarded and the previous selection will remain active.

> **NOTE**
>
> While selecting a system or group, 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 returns to the normal receive mode display. Continuing with the selection process returns 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 initiates transmission and exits the selection mode.

5.3 FEATURE ENCRYPTION DISPLAY

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

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

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

- Serial number ROM data - serial number of the ROM

- Feature encryption data stream - used to enable features

- Number Fields - defines limits

- Features enabled - displays bit fields of enabled features

5.3.1 Serial Number ROM (12 Hex Digits)

Example:
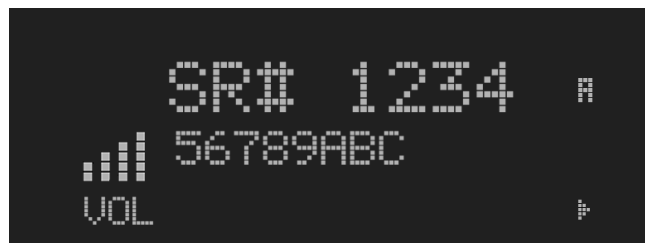
When the user wants to enable a feature in his radio, he will need to call Harris Corporation. They will ask for the ROM serial number. The serial number shown here is for example only.

5.3.2   Feature Encryption Data Stream

Example:

```
FD1 1234  A
.ıll 56789ABC
VOL           ▸
```

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

Number Fields

Example:

```
SG# 800   A
.ıll SY# 255
VOL           ▸
```
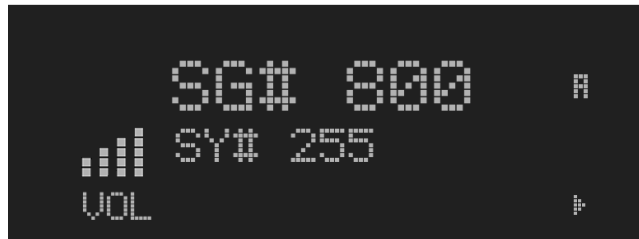
These number fields show the set limits of the of the user's radio as:

• SG# XXX - Maximum number of system/groups combination available

• SY# XXX - Maximum trunked system limit

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

5.3.3   Features Enabled

These numbers indicate which features are enabled.

Example:

```
01 02 03  A
.ıll 04 05 06
VOL           ▸
```
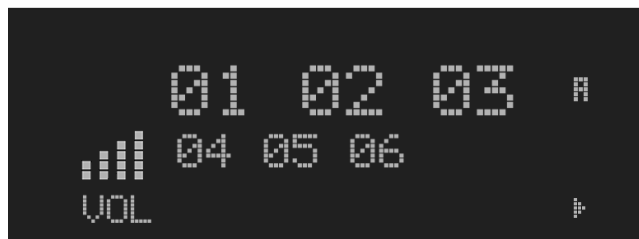
Table 5-1 lists standard and optional features available for the VRS7010.

Table 5-1: Feature Numbers (Standard and Optional)

FEATURE NUMBER	FEATURE	STANDARD OR OPTIONAL
04	Group Scan	Standard
08	Emergency	Standard
15	AES Encryption	Optional
17	Status/Message	Optional
23	Narrowband	Standard
32	FIPS-140-2 Encryption	Optional
38	Radio TextLink	Optional

5.4   SYSTEM/GROUP SELECTION

The System/Group knob and the ⬬ ramp control are programmable for maximum flexibility. If the System/Group knob is assigned to select groups, then the ⬬ ramp control is assigned to select systems. If the System/Group knob is assigned to select systems, then the ⬬ ramp control is assigned to select groups. System and group selection is the primary function for these two 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 either the **SYS** key or **GRP** key 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.

5.4.1   <u>System Selection</u>

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

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

METHOD 3:   Press the **SYS** key to enter the system select mode and follow the selection mode rules presented on page 22. Use the ⬬ ramp control to scroll through the programmed systems.

5.4.2   <u>Group Selection</u>

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

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

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

METHOD 3: Press the **GRP** key to enter the group select mode and follow the selection mode rules presented on page 22. Use the ⬭ ramp control to scroll through programmed groups.

5.5 LAST SYSTEM/GROUP RECALL

The last system/group recall programmable feature allows the user to recall the last selected system/group after an emergency or home function, or system/group key selection function. For example, if the Home button (pre-programmed) is pressed, the radio will go to the designated home system/group. If the Home button is pressed again, the radio returns to the previous system/group. At this time, the user can toggle between the home system/group and the previous system/group.

5.6 DIGITAL VOICE OPERATION

5.6.1 Receiving an Encrypted Call

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

5.6.2 Transmitting an Encrypted Call

1. Select the desired group.

2. Place the radio in private mode by pressing the control head's **OPT** button.

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

   If a group 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 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 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.

5.6.2.1 Scanned Group Calls

Receiving a scanned group call is the same as receiving a selected group call. During the scan hang time, if the radio was programmed for auto-select, it will transmit back in the same mode it received the call.

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

5.7   MACRO KEY OPERATION

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

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

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

5.8   RADIO STATUS ICONS

Status icons are indications on the control head's display that indicate various operating characteristics of the radio.

Figure 5-1: Typical Display during P25 Trunked Operation

Table 5-2: Radio Status Icons

ICON	DESCRIPTION
▦	Indicates selected group is in scan list.
▌	Indicates selected group is programmed as Priority 1 in scan list.
▐	Indicates selected group is programmed as Priority 2 in scan list.
▶	Indicates scan mode enabled.
▃▅▇	Volume bars – indicates relative volume of speaker/headset receive audio.

ICON	DESCRIPTION
	Indicates the current channel is set up as an analog channel.
	Indicates receiving or transmitting Encrypted Calls.

5.9 MESSAGES

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

Table 5-3: Display Messages

MESSAGE	NAME	DESCRIPTION
QUEUED	Call Queued	Indicates the system has placed the call in a request queue.
SYS BUSY	System Busy	Indicates the system is busy, no RF channels are currently available, the queue is full or an individual call is being attempted to a radio that is currently transmitting.
DENIED	Call Denied	Indicates the radio is not authorized to operate on the selected system.
CC SCAN	Control Channel Scan	Indicates the control channel is lost and the radio has entered the Control Channel Scan mode to search for the control channel.
WA SCAN	Wide Area Scan	Indicates the control channel is lost and the radio has entered the Wide Area Scan mode to search for a new system (if enabled through programming).
RXEMER	Receive Emergency	Indicates an emergency call is being received. This message will be flashing on line 2.
TXEMER	Transmit Emergency	Indicates an emergency call has been transmitted. This message will be flashing on line 2.
VOL=31	Volume Level	Indicates the current volume level. The volume level display ranges from OFF (silent) to 31 (loudest).
UNKNOWN	Caller's ID Not Received	Indicates that an individual call is being received, but the caller's ID was not received.
TX DATA	Transmit Data	Indicates the radio is transmitting a data call.
RX DATA	Receive Data	Indicates the radio is receiving a data call. Displayed on line 2.
DATA OFF	Data Off	Indicates the radio is in the data disabled state. Displayed on line 1.
DATA ON	Data On	Indicates the radio has been toggled to the data enable state. Displayed for two seconds on line 1 when toggled to enable state.
SYSC ON	System Scan Features On	Indicates the System Scan features are enabled.
SYSC OFF	System Scan Features Off	Indicates the System Scan features are disabled.
PA ON	Public Address On	Indicates that the public address function of the radio is enabled.
PA OFF	Public Address OFF	Momentary (2 seconds) - indicates that public address function of the radio was disabled.
ALRM ON	External Alarm Enabled	Indicates that the external alarm function of the radio is enabled.
ALRM OFF	External Alarm Disabled	Momentary (2 seconds) - indicates that the external alarm function of the radio was disabled.
PVT DIS	Private Mode Disabled	Indicates that private mode is disabled or no encryption key has been programmed for the selected group or special call.
FRCD PVT	Forced Private Operation	Indicates that forced private operation has been pre-programmed into radio.

MESSAGE	NAME	DESCRIPTION
NO KEY #	Encryption Key Missing	Flashing - indicates that no encryption key or an incorrect encryption key is programmed into the radio.
BCKL=1-6	Backlight	Indicates the display intensity and keypad backlight level.
GR	Group ID	Indicates that the call is a group call and is followed by the GID of the caller.
ID	Individual ID	Indicates the call is an individual call and the ID number of the caller, example "ID 2725."
WHC=1	Who Has Called	This display indicates the number from the *Who Has Called* list. Individual calls received but not responded to are stored in a *Who Has Called* list. This list is accessible by pressing the # key and then the INDV key after the Individual call has timed out or the Clear button is pressed. This display is on line 2 and the LID of the caller is displayed on the top line. Currently the list is not implemented and the display will always be WHC=1.
PHONE	Phone Call	Displayed when a phone call is received from the site. It is displayed in line 1 of the display. Line 2 of the display will contain the display *INDV* when line 1 contains this message. The radio interprets a received phone call as an individual call.
MENU		Displayed when the menu key is pressed and remains displayed in line 1 until a menu item is selected.
SYS=1-64	System = 1 - 64	The system number for the current base station of the system displayed in line 1. It is displayed in line 2 of the display. Press the system key to obtain this display.
GRP=1-64	Group = 1 - 64	The group number of the group displayed in line 2 of display. It is displayed in line 1 of the display. Press the group key to obtain this display. There are up to 48 groups available (i.e. 3 banks of 16). The maximum number of groups programmed in a radio is determined by the personality.
INDV=1-99	Individual = 1 - 99	Indicates which item in the individual call list is being displayed. It is displayed in line 2 of the display. The name or ID of the item in the list is displayed in line 1 of the display.
PHN=1-99	Phone = 1 - 99	Indicates which item in the phone list is being displayed. It is displayed in line 2 of the display. Line 1 of the display will be the last 3 characters of the list item contents.
SEL PHN	Select Phone	After pressing the PHN key, selecting an entry from the phone list by typing the entry number will display this message on Line 1.
SEL INDV	Select Individual ID	Displayed on line 1 when an entry from the individual ID list is selected after pressing the INDV key. The entry is a number between 1 and 32 inclusive.
SYS ALL	System All Call	Displayed on line 1 to indicate a system all-call has been received.
Ggg-v.vv	Code Group and Revision Number	This is code group and revision number that is displayed in line 2 when the menu item "REVISION" is selected. The 'gg' is the group number of the software. The first 'v' is the hardware version and 'vv' is the revision of the software.
PHONE	Phone Call	Displayed when an initiated phone call is in progress. This is displayed on line 2 of the display.
NO ENTRY		Indicates that there is no data stored in one of the programmable items in either the phone list or individual call list. The user programmable items are items 1 through 10 in each list.
INV SYS	Invalid System	Displayed when the current system is an invalid type.
CHN=1-99	Channel = 1 - 99	Displayed on line 1 of the display. This is a conventional channel index displayed when the group key is pressed.
FIX LIST	Fixed List	The Priority scan list is fixed and cannot be changed using the add or delete keys.
FIXED P1	Fixed Priority 1	The Priority 1 scan group is fixed and cannot be changed using the add or delete keys.
(c) 2009		Displayed in line 2 when "REVISION" is selected by the operator.
EM	Emergency	Indicates an emergency has been declared by the LID that follows the display, "EM." An example of this is "EM 01201."
INDV	Individual Call	Displayed in line 2 of the display when an individual call is in progress (trunked and T99 modes only).
GROUP	Group Call	Indicates a group call is in progress and is displayed on line 1 of the display (trunked and T99 modes only).
SPKR ON	External Speaker On	Displayed when the external speaker is enabled.

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

5.10 ALERT TONES

Via the control head, the radio also provides audible alert tones or "beeps" to indicate the various operating conditions. These alert tones can be enabled or disabled through programming.

Table 5-4: Alert Tones for P25 Trunked Operation

NAME	TONE	DESCRIPTION
Call Originate	A short mid-pitched tone.	Sounds after keying the radio via its Push-To-Talk (PTT) button. Indicates the radio has been assigned a working channel. After it sounds, begin speaking into the microphone, while holding the PTT button depressed.
Autokey	A mid-pitched tone.	After being placed in a queue or releasing the PTT button prior to a working channel assignment, the site calls the radio when a channel becomes available. At this point, the radio automatically keys the transmitter (autokey) for a short period to hold the channel. The radio sounds a mid-pitched tone when it is clear to talk. Immediately press the PTT button to keep the assigned channel.
Call Queued	A high-pitched tone.	Sounds after pressing the PTT button indicating the system has placed the call request in the queue. The receiving unit(s) also sound(s) the tone to indicate they will receive a call shortly.
System Busy	Three low-pitched tones.	Sounds if the radio is keyed when the system is busy, if no channels are available for sending the message, if the call queue is full, or if an individual call is being attempted to a radio that is transmitting.
Call Denied	A low-pitched tone.	Indicates the radio is not authorized on the system that has been selected.

NAME	TONE	DESCRIPTION
Carrier Control Timer	Five short high-pitched warning tones followed by a long low-pitched tone.	Sounds if the programmed time for continuous transmission is exceeded. The transmitter will shut down shortly after the alert, interrupting communications. Release and re-key the PTT button to maintain communications. This will reset the carrier control timer and turn the transmitter back on.
Key Press Alert	A short tone.	Indicates a key has been pressed. A short low-pitched tone indicates no action was taken because the key is not active in the current mode.
Page (P25 T Only)	Three high-pitched tones.	In P25 trunked mode, if the receiving radio accepts a page, both the receiving and transmitting radios emit three high-pitched tones.
Out of Range	One low pitched tone.	Indicates the radio is in Wide Area Scan. Radio will periodically beep when in Wide Area Scan.

5.11 MENU

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

A new item is displayed by using the ⊂••⊃ ramp control to scroll through the list in increasing and decreasing order. Press the **MENU** button to activate the displayed item.

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

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

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

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

1. Press the **MENU** button to enter the menu mode.

2. Press the ⊜ ramp control until the display shows:

> M E N U
>
> CONTRAST

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

> CNTRST = X
>
> Y Y Y Y Y Y Y Y

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

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

Table 5-5: Menu Item Information

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

FEATURE	DISPLAY	PARAMETER SETTINGS	COMMENT
Encryption Key Loading	Menu item: **KEYLOAD** Once selected: **KEY LOAD BANK = N**	Up to 8 banks of 7 keys	Enables the radio to accept the loading of encryption keys.
Display Current Encryption Key(s)	Menu item: **DISP KEY** Once selected: **SYS KEY**, **GRP KEY** or **CHN KEY** and **KEY = N**		Displays current encryption key number.
Scan	Menu item: **SCAN**	ON, OFF	Toggles scan function on and off.
Private Mode	Menu Item: **PRIVATE** Once selected: **PVT** or key light.	ON, OFF	Toggles private function on and off.
Scan Add	Menu item: **SCAN ADD** Once selected: Proper scan icon displayed.	S, 2 or 1	Adds group to scan list.
Scan Delete	Menu item: **SCAN DEL** Once selected: Scan icon goes out.		Deletes group 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 to next scan choice in scan list.
Home group selection	Menu item: **HOME** Once selected: Home group displayed.		Changes to the group 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 and 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 programmed for SYSGRP 1-5.
Mute	Menu item: **MUTE**	ON, OFF	Toggles the mute function on and off to control the audio output from the selected radio.
Mute #1	Menu item: **MUTE 1**	ON, OFF	Toggles the mute 1 function on and off on radio #1.
Mute #2	Menu item: **MUTE 2**	ON, OFF	Toggles the mute 2 function on and offf on radio #2.
Multiple radio operation	Menu item: **RADIO**	ON, OFF	Toggles the currently selected radio.
Radio selection	Menu item: **RADIO 1**	ON, OFF	Changes to radio #1.
	Menu item: **RADIO 2**	ON, OFF	Changes to radio #2.
No Data	Menu item: **NO DATA**	ON, OFF	Toggles data feature on and off.
Convent-ional Priority 1 Scan	Menu item: **ECP1SCAN**	ON, OFF	Toggles this feature on and off.
Group selection	Menu item: **GRP SEL** Once selected: **GRP = n**	1-64 = (n)umber of desired group	Displays the group selected.
Status Condition	Menu item: **STATUS** Once selected: **ST =n**	0-9 = (n)umber of pre-programmed status	Transmits the pre-programmed status message.
Message Condition	Menu item: **MESSAGE** Once selected: **MSG =n**	0-9 = (n)umber of pre-programmed messages	Transmits the pre-programmed message.
Feature Encryption Display	Menu Item: **FEATURES** Once selected: See Feature Encryption Display section	Informational displays only; no user selectable settings	Indicates current features programmed into the radio as well as certain information required to add features to the radio.
System Scan Enable	Menu Item: **SYS SCAN** Once selected: **SYSC ON** or **SYSC OFF**	ON, OFF	System Scan features like ProScan are toggled on and off.

5.12 RECEIVING A CALL

1. Turn the radio on by rotating the Power On/Off/Volume control knob clockwise out of its detent position. A short alert signal (if enabled through programming) indicates the radio is ready to use.

2. The display shows the last selected or the power up (depending on programming) system and group names. If the radio is unable to obtain a control channel, line 2 shows **CC SCAN**.

3. Adjust the Power On/Off/Volume control knob to the desired volume level.

4. Select the desired system and group. The display indicates the current system and group names.

5. The radio is now ready to receive calls.

6. When the radio receives a group call, it unmutes on the assigned working channel and the **BSY** indicator comes on. Line 1 shows **GR** followed by the logical ID number (if received) of the unit sending the message, or the associated name if the ID number is found in the individual call list.

5.13 SENDING A CALL

1. Turn the radio on and set the Power On/Off/Volume control knob to the desired volume level. Select the desired system and group.

2. Press and hold the PTT button. The radio will display the system and group names and perform the necessary signaling required to obtain a communication channel.

3. When the working channel is assigned, **TX** and **BSY** indicators are turned on and a short beep is sounded indicating communication can begin.

> **NOTE**
> If two or more tones, or a high-pitched tone is heard, the system may be busy and the call request has been placed in queue or the request has been denied for some reason. Refer to the Section 5.10 for more details.

4. Hold the microphone approximately 1 ½ 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.

5.14 EMERGENCY OPERATION

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

5.14.1   Receive an Emergency Call

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

5.14.2   Declare an Emergency

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

1. Press and hold the red Emergency/Home button for approximately one second. (This time is programmable and therefore could be longer or shorter. Check with the system administrator.) The

radio will transmit an emergency call request with the radio ID until an emergency channel assignment is received.

2. When the working channel assignment is received, the radio sounds a single beep (Autokey alert tone) indicating it is ready for voice transmission. *TXEMER* flashes on line 2 in the display until the emergency is cleared.

3. Press PTT and speak into the microphone in a normal voice.

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

5. The emergency can be cleared by pressing and holding the **CLR** button followed by pressing the red Emergency/Home button then releasing both buttons.

5.15 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.

5.15.1 Wide Area System Scan

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

5.15.2 ProScan™

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

5.15.3 Priority System Scan

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

5.15.4   When Wide Area System Scan Is Enabled

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

5.15.5   When ProScan Is Enabled

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

5.15.6   Menu Selection

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

5.15.7   Pre-Programmed Keypad Key

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

5.16   GROUP SCAN OPERATION

Only groups that are part of the radio's scan list will be scanned. Groups are added to the scan list on a per system basis through programming, the radio keypad, or both, dependent upon programming. This scan list can be changed by the user from the keypad unless programmed otherwise. Each system's group scan list is retained in memory when the radio is turned off. The radio can also be programmed to provide trunked priority group scan capability.

The following is a description of programmable scan features that should be helpful in understanding the group scan operation of the radio:

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

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

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

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

- From the keypad, where the priority programming is not fixed and does not follow the selected channel,

- Priority 1 group programming follows the selected channel, or

- Priority 1 group programming is fixed during radio programming and cannot be changed by the user.

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

5.16.1   Add Groups to a Scan List

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

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

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

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

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

5.16.2   Delete Groups from a Scan List

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

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

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

5.16.3   Nuisance Delete

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

5.16.4   Turn Scan On

1. Toggle scan operation on by pressing the **SCAN** button. Scan icon ▦ turns on when the radio is scanning.

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

2. When a group on the scan list receives a channel assignment, the radio unmutes on the assigned channel, the **BSY** indicator comes on and the received scan group is displayed.

   - The radio will continue scanning if a new group is selected when scan is on.

   - Pressing the PTT button when scan is on will cause the radio to transmit on the displayed group or on the currently selected group depending on programming.

   - Pressing up with ⬚ when scan is on will cause the radio to recall the scanned group that was last received. This group is recalled for a period equal to the scan hang time.

5.16.5 Priority Group Scanning

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

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

5.16.6 Turn Scan Off

Toggle scan operation off by pressing the **SCAN** button. Scan icon ▐ turns off (disappears from the display) when the radio is not scanning. After turning scan off, the radio resumes operation on the selected group.

5.17 INDIVIDUAL CALLS

5.17.1 Receive and Respond to an Individual Call

When the radio receives an individual call (a call directed only to the user's radio), it unmutes on the assigned working channel and turns on the **BSY** indicator. Line 1 shows "ID" followed by the logical ID number of the radio sending the message, or the associated name if the ID number is found in the individual call list. Also, ***INDV*** is displayed in line 2 of the display. The radio can be programmed to ring when an individual call is received. If enabled, the ring begins five (5) seconds after the caller unkeys. It will continue until the PTT button, the **CLR** button, or the **IND** key is pressed.

> **NOTE**
>
> The hookswitch functions the same as **CLR** button in individual call, phone call, and menu modes.

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

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

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

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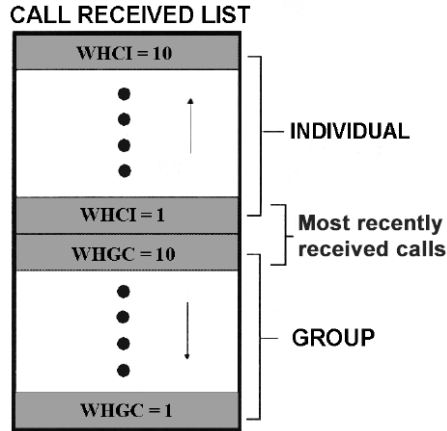
To access the list, press the **IND** key twice. Use ⬭ to scroll through the list. Press the **MENU** button to display the time elapsed since the call was received.

5.17.2   Call Storage Lists

There are two lists available for call storage in the radio, the calls received list (1-10) and the personality list (1-99 as defined by the user). When the individual call mode is entered by pressing the **IND** key, the calls received list is available. The user can toggle to the personality list by selecting any key other than **DIS** or toggle between the two lists by pressing the **IND** key. If wrap is enabled, the calls received list wraps on itself and not into the other list.
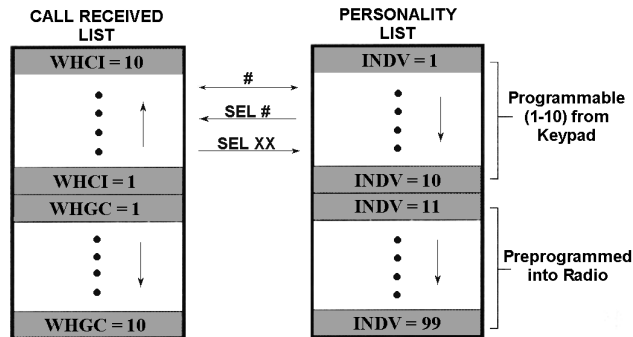
The saved call list shows all ten storage locations. If no calls have been received, the saved call list will be empty and the pre-stored list will be available upon entering the individual call mode.

When in the saved call list, pressing the **MENU** button 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 the **MENU** button toggles the **L**ogical **ID**entification (LID) on and off.

5.17.3   Send an Individual Call

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

1. To select a previously stored individual, select the I-Call mode from the menu or press **IND** followed by the ⬭ ramp control to scroll through the list of stored individuals. The selection mode rules apply. While in the individual call list, the menu key will toggle the display between the call name and the unit ID number. If the individual is not stored in this list but the individual's unit ID is known, it can be entered directly from the keypad.

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

5.18 TELEPHONE INTERCONNECT CALLS

5.18.1 Receive a Telephone Interconnect Call

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.

5.18.2 Send a Telephone Interconnect Call

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

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

2. Press and release the PTT button; the radio performs the necessary signaling to obtain a communication channel. When the signaling is complete and the radio is clear to transmit, **TX** indicator turns on and the channel access tone sounds. Line 1 shows the accompanying name if selected from the list of stored numbers or the phone number if entered directly. The message ***PHONE*** is displayed on line 2. The radio then automatically transmits the programmed number stored in the special call queue.

3. Telephone ringing will be heard. When someone answers the phone, press the PTT button and speak into the microphone. Release the PTT button to listen to the caller. Unsuccessful interconnect signaling returns the radio to the normal receive mode and the number remains displayed until the special call is cleared by pressing the **CLR** button or the time-out expires or another group or system is selected.

4. To terminate the call, momentarily press the **CLR** button.

> **NOTE**
>
> The radio provides half-duplex conversation only. The caller's message can only be sent if the PTT button is pressed (the radio is transmitting) and the caller can only be heard by the person being called when the PTT is released (the radio is receiving).

5.18.3 DTMF Overdial/Conventional Mode Telephone Interconnect

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

programming the radio or stored by the operator in the first ten phone list entries. These numbers are accessed by pressing **PHN** then following the selection mode rules.

The following steps are required to dial these numbers:

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

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

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

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

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

5.18.4   Programmable Entries

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

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

1. Press **IND** or **PHN** to enter the individual call list or the phone call list. The selection mode rules apply.

2. Scroll through the list using the $\overline{\underline{}}$ ramp control until one of the first ten entries is reached. **NO ENTRY** is displayed if the location is empty.

3. Enter the desired number. If necessary, a pause can be entered by pressing and holding **0-9**, (*****), or (**#**) until an underscore appears in the display. The individual call list entries will accept up to 5 digits. The phone call list entries accept a combination of up to 31 digits and pauses.

4. Press and hold **MENU** until the display changes indicating that the number has been stored.

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

5.19 STATUS OPERATION

Status operation is an optional feature that permits the transmission of a pre-programmed status condition to the P25 trunked radio network.

To send a status condition, press the **STS** key (key's backlight lights) then press one of the number keys (**0** through **9**) to select the pre-programmed status. If no status has been programmed for the respective number, **NO ENTRY** will be displayed 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 P25 trunked radio network, or stored in the radio memory where it

can be polled by the P25 network at a future time. If the P25 network receives the status properly, when transmitted or polled by the P25 network, a high-pitched tone sounds and the respective key's backlight will remain lit. If the P25 network does not receive the status properly, a low-pitched tone sounds and the key's backlight associated with the status will blink.

If an incorrect status was selected or the incorrect number key was pressed, the status can be changed during the pre-programmed time-out period by pressing another number key. 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** key. If the status was not sent successfully to the P25 network, the text associated with the status will flash in the display.

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

5.20 MESSAGE OPERATION

Message operation is an optional feature that permits the transmission of a pre-programmed message text to the P25 trunked radio network.

To send a message, press the **MSG** key (key's backlight lights) and then press one of the number buttons (**0** through **9**) to select the pre-programmed message text. If no message text has been programmed for the respective number, 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 P25 network. If the network receives the message properly when transmitted, a high pitched tone sounds and the **MSG** key's backlight remains lit. If the P25 network does not receive the message properly, a low-pitched tone sounds and the **MSG** key's backlight 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** key prior to the time-out period.

To view the currently selected message text after it has been transmitted, press the **MSG** key and then the **CLR** button prior to the time-out period. If the message text was not sent successfully to the P25 network, the text associated with the message will flash in the display.

5.21 PAGE

Page sends a PING message to a radio and functions similar to Individual Call. The following procedures describe how to initiate and complete a Page.

1. To select a previously stored individual, select the Page mode from the menu followed by the ⊖⁚⁚ ramp control to scroll through the list of stored individuals. The selection mode rules apply. While in the individual call list, the **MENU** key toggles the display between the call name and the unit ID number. The individual's unit ID can also be entered directly from the keypad.

2. Press the PTT button; the radio performs the necessary signaling on the control channel. On the calling radio, line 1 shows the called individual's name if found in the list of stored individuals or ID followed by the logical ID number of the unit being called. If the receiving radio receives the Page and responds, both radios will emit three high-pitched tones. The receiving radio will also display PAGE and the ID of the calling radio.

6   TECHNICAL ASSISTANCE

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

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

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

- United States and Canada: 1-800-528-7711 (toll free)
- International: 1-434-385-2400
- Fax: 1-434-455-6712
- E-mail: PSPC_tac@harris.com

7   KEYPAD REMAPPING

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

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

8   RADIO SETUP

RADIO TYPE:

FREQUENCY BAND:

OPERATOR'S NAME:

EMERGENCY GROUP:

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

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

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

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

WARRANTY

A. Harris Corporation, a Delaware Corporation, through its RF Communications Division (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-Seller 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 P7300, P7200, P7100^{IP}, P5400, P5300, P5200, P5100, P3300, M7300, M7200 (including V-TAC), M7100^{IP}, M5300 and M3300 radios, two (2) years, effective 10/01/2007.

4. for Unity™ XG-100P, three (3) years.

5. 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 Seller's factory, by an Authorized Service Center (ASC) or other Servicer approved for these purposes either at its place of business during normal business hours, for mobile or personal equipment, or at the Buyer's location, for fixed location equipment. Service on fixed location equipment more than thirty (30) miles from the Service Center or other approved Servicer's place of business will include a charge for transportation.

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

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

This warranty applies only within the United States.

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