



VRS7000 Series P25 Trunked Cross-Band Vehicular Repeater Systems

VRS7010, VRS7020, and VRS7030

Includes VRBS7010, VRBS7020, VRBS7030,
VRMS7010, VRMS7020, and VRMS7030



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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.



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



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



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 radio frequency (RF) energy awareness and control information to ensure compliance with RF exposure guidelines.



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



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 P25 Vehicular Repeater System 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 P25 Vehicular Repeater System 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) for the VRMS radio equipment, and up to 100% for the VRBS radio equipment. The radio equipment 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 P25 Vehicular Repeater System 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).



Table 1-1 through Table 1-3 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). Table 1-1 and Table 1-2 have the distances for the respective VRMS section of the vehicular repeater on a per antenna basis. Table 1-3 has the distances for the VRBS section of the vehicular repeater on a per antenna basis. 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/VRMS7020 Transmit/Receive Antenna)**

ANTENNA PART NUMBER	ANTENNA DESCRIPTION	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA	
		CONTROLLED ENVIRONMENT	UNCONTROLLED ENVIRONMENT
AN-125001-002 (mount) with AN-225001-001 (element)	700/800 MHz Standard Rooftop-Mount; 3 dBd Gain	9.8 Inches (25 Centimeters)	21.7 Inches (55 Centimeters)
AN-125001-002 (mount) with AN-225001-002 (element)	700/800 MHz Standard Rooftop-Mount; Elevated-Feed 3 dBd Gain		
AN-125001-002 (mount) with AN-225001-003 (element)	700/800 MHz Standard Rooftop-Mount; Elevated-Feed, No Ground Plane 3 dBd Gain		
AN-125001-002 (mount) with AN-225001-004 (element)	700/800 MHz Standard Rooftop-Mount; Low-Profile 2 dBd Gain		
AN-125001-002 (mount) with AN-225001-005 (element)	700/800 MHz Standard Rooftop-Mount; 5 dBd Gain	11.8 Inches (30 Centimeters)	23.6 Inches (60 Centimeters)
AN-125001-004 (mount) with AN-225001-001 (element)	700/800 MHz Thick Rooftop-Mount; 3 dBd Gain	9.8 Inches (25 Centimeters)	21.7 Inches (55 Centimeters)
AN-125001-004 (mount) with AN-225001-002 (element)	700/800 MHz Thick Rooftop-Mount; Elevated-Feed 3 dBd Gain		
AN-125001-004 (mount) with AN-225001-003 (element)	700/800 MHz Thick Rooftop-Mount; Elevated-Feed, No Ground Plane 3 dBd Gain		
AN-125001-004 (mount) with AN-225001-004 (element)	700/800 MHz Thick Rooftop-Mount; Low-Profile 2 dBd Gain		
AN-125001-004 (mount) with AN-225001-005 (element)	700/800 MHz Thick Rooftop-Mount; 5 dBd Gain	11.8 Inches (30 Centimeters)	23.6 Inches (60 Centimeters)

(Table Continued on Next Page)

**Table 1-1: Recommended Minimum Safe Lateral Distance
from Transmitting Antenna for Mobile Radio-to-Network Radio Link
(VRMS7010/VRMS7020 Transmit/Receive Antenna)**

ANTENNA PART NUMBER	ANTENNA DESCRIPTION	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA	
		CONTROLLED ENVIRONMENT	UNCONTROLLED ENVIRONMENT
AN-125001-006 (mount) with AN-225001-001 (element)	700/800 MHz GPS Combo Rooftop-Mount; 3 dBd / 5.15 dBi Gain	9.8 Inches (25 Centimeters)	21.7 Inches (55 Centimeters)
AN-125001-006 (mount) with AN-225001-002 (element)	700/800 MHz GPS Combo Rooftop-Mount; Elevated-Feed 3 dBd Gain		
AN-125001-006 (mount) with AN-225001-003 (element)	700/800 MHz GPS Combo Rooftop-Mount; Elevated-Feed, No Ground Plane 3 dBd Gain		
AN-125001-006 (mount) with AN-225001-004 (element)	700/800 MHz GPS Combo Rooftop-Mount; Low-Profile 2 dBd Gain		
AN-125001-006 (mount) with AN-225001-005 (element)	700/800 MHz GPS Combo Rooftop-Mount; 5 dBd / 7.15 dBi Gain	11.8 Inches (30 Centimeters)	23.6 Inches (60 Centimeters)
AN-125001-008 (mount) with AN-225001-001 (element)	700/800 MHz Magnetic-Mount; 3 dBd Gain	9.8 Inches (25 Centimeters)	21.7 Inches (55 Centimeters)
AN-125001-008 (mount) with AN-225001-002 (element)	700/800 MHz Magnetic-Mount; Elevated-Feed 3 dBd Gain		
AN-125001-008 (mount) with AN-225001-003 (element)	700/800 MHz Magnetic-Mount; Elevated-Feed, No Ground Plane 3 dBd Gain		
AN-125001-008 (mount) with AN-225001-004 (element)	700/800 MHz Magnetic-Mount; Low-Profile 2 dBd Gain		
AN-125001-008 (mount) with AN-225001-005 (element)	700/800 MHz Magnetic-Mount; 5 dBd Gain	11.8 Inches (30 Centimeters)	23.6 Inches (60 Centimeters)

**Table 1-2: Recommended Minimum Safe Lateral Distance
from Transmitting Antenna for Mobile Radio-to-Network Radio Link
(VRMS7030 Transmit/Receive Antenna)**

ANTENNA PART NUMBER	ANTENNA DESCRIPTION	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA	
		CONTROLLED ENVIRONMENT	UNCONTROLLED ENVIRONMENT
AN102800V1	136 to 941 MHz, ¼-Wavelength*, Standard Rooftop-Mount; 0 dBd Gain	24.8 Inches (63 Centimeters)	55.1 Inches (140 Centimeters)
AN-125001-001 (mount) with AN-225002-001 (element)	136 to 174 MHz, Standard Rooftop-Mount; 0 dBd Gain		
AN-125001-003 (mount) with AN-225002-001 (element)	136 to 174 MHz, Thick Rooftop-Mount; 0 dBd Gain		
AN-125001-007 (mount) with AN-225002-001 (element)	136 to 174 MHz, Magnetic-Mount; 0 dBd Gain		

**Table 1-3: Recommended Minimum Safe Lateral Distance
from Transmitting Antenna for Vehicular Repeater-to-Portable Radio Link
(VRBS7010/VRBS7020/VRBS7030 Transmit/Receive Antenna)**

ANTENNA PART NUMBER	ANTENNA DESCRIPTION	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA	
		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	7.9 Inches (20 Centimeters)	7.9 Inches (20 Centimeters)
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		
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		

1.3.1 Mobile Antennas

The antennas for the radio must be installed in accordance with guidelines and procedures contained in the *Installation and Product Safety Manual*. These mobile antenna installation guidelines are limited to

metal body motor vehicles or vehicles with appropriate ground planes. The antenna must be installed in accordance with:

- The requirements of the antenna manufacturer/supplier included with the antenna.
- Instructions in the *Installation and Product Safety Manual*, including minimum antenna cable lengths. The *Installation and Product Safety 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 RADIO FREQUENCY INTERFERENCE

1.4.1 FCC Part 15

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

1.4.2 Industry Canada

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

1.5 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.

1.6 COMMON HAZARDS



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 1-3. 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 **National Fire Protection Association 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.

1.7 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.

1.8 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 P25 Vehicular Repeater System 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 not 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.



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.

1.9 OPERATING TIPS

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

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



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

2 INTRODUCTION

2.1 VRS7000 SERIES OF P25 VEHICULAR REPEATERS

The VRS7000 series of Project 25 (P25) vehicular repeaters includes the three (3) distinctly different P25 Vehicular Repeater Systems: the VRS7010, the VRS7020, and the VRS7030. Unless otherwise stated, operating procedures presented in this manual apply to all three (3) repeaters. Each repeater has different radio frequency bands upon which it operates on. These bands are included in Figure 2-1 on page 15.



Henceforth, any reference of “VRS7000” in this manual applies to all three (3) P25 vehicular repeater systems, unless otherwise stated.

The VRS7000 vehicular repeater serves two functions. First, it can function as a standard mobile radio for P25 trunked and P25 conventional radio networks. Second, it can function as a vehicular repeater in a P25 trunked radio network.

The VRS7000 cannot operate as a vehicular repeater when it is operating as a mobile radio. Likewise, it cannot operate as a mobile radio when it is operating as a vehicular repeater.



As of the publication of this manual, only Harris-made P25 trunked radios can connect to (i.e., be “clients” of) a VRS7000 vehicular repeater when it is operating as a vehicular repeater.

The VRS7000 consists of two (2) mobile radio systems coupled together with specialized interface hardware. As illustrated in Figure 2-1, its Vehicular Repeater Mobile System (VRMS) provides the radio frequency (RF) link to the radio network, and the Vehicular Repeater Base System (VRBS) provides the RF link for nearby P25 radios. A control head, microphone speaker, and two (2) antennas complete the radio installation.

The VRS7000 has two (2) primary operating modes as described in the following section.

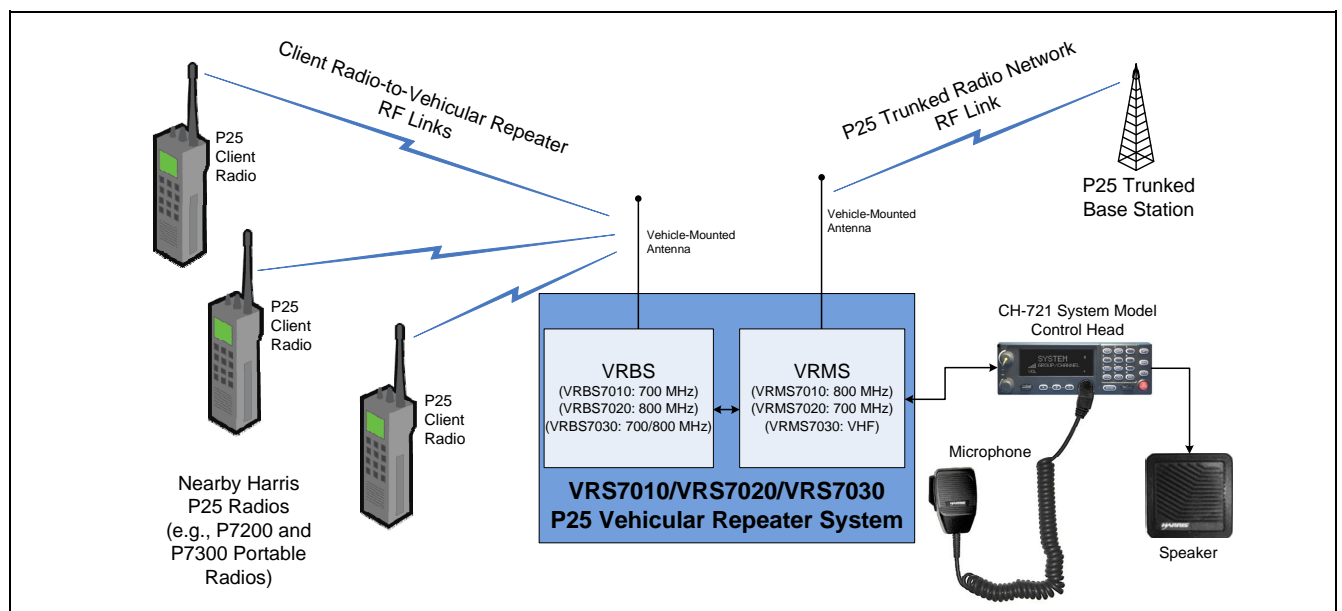


Figure 2-1: Simplified Block Diagram of Extended Coverage (XCOV) Vehicular Repeater Mode

2.1.1 Primary Operating Modes

2.1.1.1 Mobile Radio Mode (Vehicular Repeater Disabled)

The VRS7000 operates like a normal mobile radio when its vehicular repeater mode is disabled. In this case, the VRS7000 operates on and provides communications via a P25 trunked or P25 conventional radio system. 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. Using the control head, microphone and speaker, the user/operator can control the radio and communicate with other radio users and console dispatchers on the radio network.

In this mode, nearby P25 radio users can only communicate with the VRS7000 radio user/operator if they can also directly access the same radio network. Since the vehicular repeater functionality of the VRS7000 is completely disabled in the mobile radio mode, nearby P25 radios cannot link through the VRS7000 to the radio network.

Instructions on using the mobile radio mode are included in Section 4 of this manual.

2.1.1.2 Extended Coverage (XCOV) Vehicular Repeater Mode

When the VRS7000 is operating in the extended coverage vehicular repeater mode, it provides the network extension that enables nearby P25 radios operating on a vehicular repeater radio frequency channel to access a P25 trunked radio network. This mode of operation is sometimes abbreviated "vehicular repeater mode" or simply "XCOV mode." As illustrated in Figure 2-1, portable radio coverage is extended due to the VRS7000's high-performance mobile antenna system and higher transmitter output power used to access the P25 trunked radio network. The VRS7000 can significantly enhance in-building penetration for P25 trunked portable radios that can operate on the same radio frequency band as the vehicular repeater. Typical operational scenarios include in-building tactical operations and joint training exercises.

When a nearby P25 radio is communicating through the VRS7000, it is considered "connected" to or a "client" on the VRS7000. The VRS7000 cannot function as a standard/normal mobile radio when it is operating in the XCOV vehicular repeater mode. Instructions on enabling and disabling this VRS7000 mode are included in Section 3 of this manual.

P25 radio users connect to a VRS7000 by manually making a "system" change at the radio to connect to an active VRS7000 vehicular repeater. After selecting a system allocated for VRS7000 vehicular repeater operation, the radio then scans for an active vehicular repeater channel. Vehicular repeater channels are pre-programmed into each P25 radio requiring operation on a VRS7000. A P25 radio can only connect to a VRS7000 if the radio is registered for communications on the respective P25 trunked radio network.

After a P25 radio initially connects to a VRS7000, "REGISTER" briefly appears in the radio's display. This indicates the radio is registered on the P25 trunked radio network via the VRS7000. Therefore, the radio can be used to communicate with other radio users on the radio network and with radios connected to the VRS7000.

The VRS7000 operator can place the VRS7000 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 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 VRS7000 is operating in the XCOV vehicular repeater mode, it functions like a Voice and Data Over Control (VDOC) site for the nearby P25 radios connected to it. Essentially, the P25 client radios and the VRS7000 are linked together via P25 VDOC protocols on the VRS7000's VDOC RF channel. If properly programmed, both P25 portable and P25 mobile radios can connect to the VRS7000 when it is operating in the XCOV vehicular repeater mode.

When using the XCOV vehicular repeater mode, P25 radios operating through the VRS7000 (i.e., “P25 client radios”) maintain the following P25 functions across the two RF links:

- **P25 Group Call** — P25 radios connected to the VRS7000 can communicate on a common talk group, or on multiple different talk groups. When it is operating in the XCOV vehicular repeater mode, the VRS7000 provides up to sixty-four (64) talk group paths (i.e., a different talk group selected at each radio). Digital clear voice and digital encrypted voice group calls are supported.
- **P25 Individual Call** — Unit-to-unit calls between two P25 client radios and between a P25 client 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 P25 client radio and the P25 trunked radio network.
- **P25 Emergency** — The link through the VRS7000 provides P25 emergency communications between the P25 client radios and 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 P25 client radios.
- **Call Grant and Call Queued Tones** — A P25 client radio generates call grant and call queued tones in a similar manner as if it is operating directly on the P25 radio network.

Up to sixty-four (64) P25 radios can connect to a VRS7000 at any given time, and these radio users can communicate via the same talk group or via multiple different talk groups. Although up to sixty-four (64) talk groups can be used by connected radios (i.e., a different talk group selected at each radio), excessive call queuing can result when multiple talk groups and/or individual calls are utilized by the P25 client radios. Refer to Section 2.3.5 on page 19 for additional information.

When operating in the extended coverage (XCOV) vehicular repeater mode, calls transmitted from the P25 client radios are not routed to the VRS7000’s speaker. Refer to Section 2.3.3 on page 18 for additional information.

The VRS7000 supports end-to-end Advanced Encryption Standard (AES) encrypted calls. If a P25 client radio is transmitting an encrypted call, the VRS7000 simply repeats the call to the network base station. It does not un-encrypt and then re-encrypt the call.

2.2 MULTIPLE ON-SCENE VEHICULAR REPEATERS

The VRS7000 P25 Vehicular Repeater System design supports multiple on-scene VRS7000s via multiple radio frequency channels assigned for system-wide vehicular repeater use. When XCOV vehicular repeater mode is enabled at a particular VRS7000, the VRS7000 automatically selects an unused pre-programmed channel allocated for vehicular repeater operations after a scanning algorithm determines the channel is available.

When multiple VRS7000s are on a scene, a P25 radio user must manually make a “system” change to connect to a VRS7000. Subsequently, the P25 radio will scan for and, if properly registered, connect to an available VRS7000 operating in the XCOV vehicular repeater mode. A P25 radio can only connect to a VRS7000 if the radio is registered for communications on the respective P25 trunked radio network.

VRS7000s in the network can be configured so when a VRS7000 leaves a scene, P25 client radios connected to it will automatically transition to a second on-scene VRS7000. This automatic hand-off operation requires proper vehicular repeater channel/frequency configuration in all VRS7000s and P25 client radios. During the transition, each P25 client radio displays “CC SCAN” while it is searching for another on-scene VRS7000.



Vehicles equipped with a VRS7000 must maintain an antenna separation distance of at least ten (10) feet during vehicular repeater operations.

2.3 LIMITATIONS OF THE VEHICULAR REPEATER

2.3.1 General Information

The VRS7000 P25 Vehicular Repeater System provides unique system advantages by extending network coverage to nearby P25 radios operating in otherwise poor radio frequency coverage areas of the P25 trunked radio network. It can significantly improve radio communications for P25 portable radio users operating in buildings or in other in-network weak-signal areas where portable radio communications is otherwise problematic or not possible. However, the VRS7000 presents certain communication limitations as described in this section.



All users must be properly trained on correct vehicular repeater operating procedures. This training should include but not be limited to familiarity with VRS7000 limitations, as described in the following subsections.

2.3.2 Limited Feature Set

When it is operating as a vehicular repeater, the VRS7000 cannot provide all the communication features normally provided by a direct radio link to P25 trunked radio network. The VRS7000 is not intended to replace the functionality of the P25 trunked radio network's fixed RF base station/site equipment. The VRS7000's limited feature set for vehicular repeater operations is listed in Section 2.1.1.2 of this manual.

2.3.3 XCOV Vehicular Repeater Mode Disables Mobile Radio Mode

The VRS7000 P25 Vehicular Repeater System cannot function as a normal mobile radio when it is operating as a vehicular repeater. The speaker and microphone connected to the control head are disabled when the VRS7000 is operating as a vehicular repeater. Also, the control head does not indicate network-only calls to the VRS7000, and other functions such as talk group scanning, are not possible. When the VRS7000 is operating as a vehicular repeater, the control head primarily indicates vehicular repeater mode-related operations.

2.3.4 Loss of Network Connectivity Disconnects Client Radios

If the VRS7000 P25 Vehicular Repeater System loses contact with the P25 trunked radio network that it is currently logged into, it automatically scans for another control channel to maintain network connectivity. During this time, a "CC SCAN" indication appears in the control head's display to indicate the VRS7000 is scanning/searching for a P25 radio network control channel. Also, if alert tones are programmed on, an alert tone sounds in the speaker when the control channel scan begins. A control channel scan can occur both when the vehicular repeater is operational/enabled (i.e., the VRS7000 is in the XCOV vehicular repeater mode), and when the vehicular repeater is not operational (i.e., the VRS7000 is in the mobile radio mode).

If the VRS7000 loses radio network connectivity for several seconds when the vehicular repeater is operational/enabled (i.e., as indicated by "CC SCAN" in the control head's display), it automatically disconnects all connected P25 radio clients and disables XCOV vehicular repeater mode. In this case, all P25 radios that were connected to the VRS7000 will themselves indicate the loss of connectivity with the VRS7000 by also indicating control channel scan ("CC SCAN"), and by sounding an alert tone if programmed to do so. After disconnecting, each P25 radio will automatically scan for another VRS7000

operating as a vehicular repeater. If another VRS7000 is found, the P25 radio will attempt to connect to that VRS7000. If connection is successful, communications through the VRS7000 can continue. If connection is not successful after a short period of time and radio communications must continue, the P25 radio user must manually make a “system” change to another available radio system, or select and use a pre-programmed talk-around channel.

**NOTE**

When arriving at a scene, a vehicle with the VRS7000 must be located/positioned so it has a reliable RF link to the P25 trunked radio system. If this is not the case, reposition the vehicle to another location, such as on the opposite side of the building, to reduce or eliminate “CC SCAN” indications before enabling the XCOV vehicular repeater mode.

If a reliable RF link cannot be achieved in the mobile radio mode, do **not** enable/activate the XCOV vehicular repeater mode. Using the XCOV vehicular repeater mode is **not** recommended if, while in mobile radio mode, “CC SCAN” is indicated more than once approximately every thirty (30) seconds.

2.3.5 One Talk Path

The VRS7000 P25 Vehicular Repeater System provides only one talk path for all P25 radios connected to it. From the vehicular repeater standpoint, this is a single-channel full-duplex talk path to and from connected/client P25 radios. Since there is only one talk path, significant call queuing can occur when multiple P25 radios are attached to the VRS7000. To minimize call queuing, P25 client radio users should minimize the total number of selected talk groups, and minimize individual call operations.

**CAUTION**

When P25 client radios are using more than one talk group and/or making individual call(s), both calls originated from the P25 client radios to the network and calls originated from the P25 trunked radio network to the P25 client radios can be queued. All radio users and dispatchers must be aware of this fact when a VRS7000 is in operation. When critical communications must be accomplished through the VRS7000, it is recommended that all P25 client radio users utilize only one (1) common talk group, and not make any individual calls.

2.3.6 Slight Audio Delay Between Client Radios and Network

Because of the extra signal processing performed within the VRS7000 to route calls, call audio between a P25 radio connected to the VRS7000 and the P25 trunked radio network is delayed by approximately one-quarter (¼) of a second. This time delay can be heard by simultaneously monitoring a talk group’s call audio in the speakers of both a P25 radio connected to the VRS7000 and a P25 radio logged directly onto the respective P25 trunked radio network.

2.3.7 Other Limitations

The VRS7000 P25 Vehicular Repeater System does **not** support the following features/functions when it is operating as a vehicular repeater:

- Patched Talk Groups — When a talk group used by P25 radios connected to the VRS7000 is within a patch (patches are created by dispatch personnel), call audio on other groups within the patch is not routed to the P25 radios connected to a VRS7000. Also, call audio from a connected P25 radio on a particular talk group within the patch is not routed to other groups within the patch.
- Simulselected Talk Groups — When a talk group used by P25 radios connected to the VRS7000 is within simulselect (simulselects are created by dispatch personnel), call audio on other groups within the simulselect is not routed to the P25 radios connected to a VRS7000.

- Interconnect (PSTN) Calls — Telephone interconnect calls cannot be placed by or received by a P25 radio connected to a VRS7000.
- Data Calls — Data calls, such as mobile data calls, cannot be sent to or received by a P25 radio connected to a VRS7000.
- Message Trunked Calls — Message trunked calls cannot be sent to or received from a P25 radio connected to a VRS7000. Repeater channel “hang times” associated with messaged trunked group calls, emergency calls, and individual calls are not supported.
- Dynamic Regroup — Talk groups used by P25 radios connected to a VRS7000 cannot be dynamically regrouped.
- Roaming — P25 radios connected to a VRS7000 cannot automatically roam to another system. The radio operator must manually make a system change to access another radio system.
- Console Preempt when a P25 Client Radio is Keyed — A dispatcher cannot preempt a P25 radio connected to a VRS7000 while the radio is transmitting on a talk group.
- Motorola-Style Emergency Calls — The VRS7000 does not support Motorola-style emergency calls when it is operating in the XCOV vehicular repeater mode.
- Confirmed Unit-to-Unit Call — Unit-to-unit individual calls (“I-calls”) are not confirmed for P25 radios connected to the VRS7000.
- Acknowledged Unit-to-Unit Call — The acknowledged unit-to-unit individual (“I-call”) call feature is not provided to P25 radios connected to the VRS7000.
- Vehicular Repeater Mode when Operating on a P25 Conventional Radio Network — The VRS7000 must be operating on (i.e., registered on) a P25 trunked radio network before the XCOV vehicular repeater mode can be utilized.
- Talk Group Priorities — Talk groups used by P25 radios connected to the VRS7000 do not have talk group priorities.
- Individual Call (I-Call) Block — Individual calls to and from P25 radios connected to the VRS7000 cannot be blocked.
- Subscriber Administration Rights — The VRS7000 does not support subscriber administration rights.
- Invalidated Talk Group Emergency — The VRS7000 does not support the invalid talk group emergency feature.
- Mobile Radio Steering/Preempt — The VRS7000 does not support the mobile radio steering/preempt feature.
- Global Positioning System (GPS) — GPS location request and report messages are not routed through the VRS7000.
- Cross-Band Vehicular Repeater Operation — With the VRS7010 P25 vehicular repeater system, client P25 radios connect to the VRS7010 via the 700 MHz radio frequency band, and the network link is on the 800 MHz band. With the VRS7020 P25 vehicular repeater system, client P25 radios connect to the VRS7020 via the 800 MHz radio frequency band, and the network link is on the 700 MHz band. With the VRS7030 vehicular repeater system, client P25 radios connect to the VRS7030 via either the 700 MHz or the 800 MHz radio frequency band, and the network link is on the VHF radio frequency band (136 to 174 MHz).

2.4 CH-721 SYSTEM MODEL CONTROL HEAD

The VRS7000 employs the CH-721 System model control head. Shown in Figure 4-1 on page 26, this control head provides the user/operator interface for the VRS7000. 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 indicators. One LED indicator is the busy indicator that lights when the VRS7000 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.

3 VEHICULAR REPEATER OPERATION

3.1 TURNING ON THE VRS7000

To turn on the VRS7000, rotate the control head's Power On/Off/Volume control knob clockwise out of the detent position. The knob is shown in Figure 4-1 on page 26. This action powers-up the VRS7000 and the control head. If enabled through programming, a short beep sounds in the speaker to indicate the radio is ready for operation. The control head indicates the last selected system name on line 1 and the last selected group name on line 2.



NOTE

At power-up, the VRS7000 begins operating in the mobile radio mode. For complete operating instructions for this mode, refer to Section 4 which begins on page 26.


To enable/activate the vehicular repeater mode, refer to Section 3.2 that follows.

3.2 EXTENDED COVERAGE (XCOV) VEHICULAR REPEATER MODE

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

Before XCOV vehicular repeater mode can be enabled/activated, the VRS7000 must be operating on a P25 trunked radio system. Use one of the following methods to switch VRS7000 operation to a P25 trunked radio system:

3.2.1.1 Using the Ramp Control to Switch to a P25 Trunked Radio System

Use the control head's  ramp control to scroll through the menu until the desired P25 trunked radio network's name appears in the display. This ramp control is shown in Figure 4-1 on page 26. After a short delay, the VRS7000 will switch to the newly selected P25 trunked radio network, and begin operating on it. This is called a "system" change.

3.2.1.2 Using Keypad Entry to Switch to a P25 Trunked Radio System

1. Enter the "system" number of the respective P25 trunked radio network, per radio programming, via the control head's 12-key DTMF keypad. The front panel of the control head is shown in Figure 4-1 on page 26.
2. Press the **MENU** button to switch the VRS7000 to the entered P25 trunked radio network. After a short delay, the VRS7000 will begin operating on the newly selected network.

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 sections.




NOTE

When arriving at a scene, a vehicle with the VRS7000 must be located/positioned so it has a reliable RF link to the P25 trunked radio system. If this is not the case, reposition the vehicle to another location, such as on the opposite side of the building, to reduce or eliminate "CC SCAN" indications before enabling the XCOV vehicular repeater mode.

If a reliable RF link cannot be achieved in the mobile radio mode, do **not** enable/activate the XCOV vehicular repeater mode. Using the XCOV vehicular repeater mode is **not** recommended if, while in mobile radio mode, "CC SCAN" is indicated more than once approximately every thirty (30) seconds.

3.2.2 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 VRS7000 is not currently operating on a P25 trunked radio network, use one of the two methods presented in Section 3.2.1 to switch it to a P25 trunked radio network. The VRS7000 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. Subsequent control head indications are illustrated in Section 3.2.5.
4. With **VR STANDBY** or **VR ACTIVE** indicated, nearby P25 radio users with radios pre-programmed for P25 vehicular repeater operations can now connect to the VRS7000 by manually making a "system" change to the respective vehicular repeater channel. If necessary, consult with the radio network administration personnel or a communications supervisor for specific vehicular repeater system name(s).



When XCOV vehicular repeater mode is enabled/active, normal mobile radio communications are **not** possible with the VRS7000. 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.

To disable XCOV vehicular repeater mode, if no menu change has been made since it was enabled, press the **MENU** button to toggle the mode off. If a menu change has occurred since it was enabled, first press the **MENU** button, navigate to the **P25 VR** menu again, and then press the **MENU** button again. The VRS7000 will return to a normal display, indicating network talk group and/or individual call information.

3.2.3 Enable/Disable XCOV Vehicular Repeater Mode via Control Head Button (If Programmed)

The VRS7000 can be configured so a button on the control head can be pressed to enable and disable the XCOV vehicular repeater mode. Typically, one of the three (3) preset buttons (A, B, or C) located just below the control head's display is configured for this function. Before using this procedure, consult with the system administrator to determine if the VRS7000 is configured in this manner, and which button has been configured for this function:

1. If the VRS7000 is not currently operating on a P25 trunked radio network, use one of the two methods presented in Section 3.2.1 to switch it to a P25 trunked radio network. The VRS7000 must be operating on a P25 trunked radio network before XCOV vehicular repeater mode can be enabled/activated.
2. Press the button to enable XCOV vehicular repeater mode. Subsequent control head indications are illustrated in Section 3.2.5.
3. With **VR STANDBY** or **VR ACTIVE** indicated, nearby P25 radio users with radios pre-programmed for P25 vehicular repeater operations can now connect to the VRS7000 by manually making a "system" change to the respective vehicular repeater channel. If necessary, consult with the radio network administration personnel or a communications supervisor for specific vehicular repeater system name(s).

To disable XCOV vehicular repeater mode, press the same button again, or press the **MENU** button. The VRS7000 will return to a normal display, indicating network group and/or individual call information.

3.2.4 Enable/Disable XCOV Vehicular Repeater Mode via External Switch

The VRS7000 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 VRS7000 is not currently operating on a P25 trunked radio network, use one of the two methods presented in Section 3.2.1 to switch it to a P25 trunked radio network. The VRS7000 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. Subsequent control head indications are illustrated in Section 3.2.5.
3. With **VR STANDBY** or **VR ACTIVE** indicated, nearby P25 radio users with radios pre-programmed for P25 vehicular repeater operations can now connect to the VRS7000 by manually making a "system" change to the respective vehicular repeater channel. If necessary, consult with the radio network administration personnel or a communications supervisor for specific vehicular repeater system name(s).

To disable the XCOV vehicular repeater mode, place the external switch in the disabled/deactivated position. The VRS7000 will return to a normal display, indicating network group and/or individual call information.



NOTE

The VRS7000 can also be configured so the external switch must be activated and a pre-configured button on the control head must be pressed to enable the XCOV vehicular repeater mode. In this case, to disable the mode, simply press the same button again or return the switch to the disable position.



NOTE

Other radio installation options also exist. For example, the VRS7000 can be wired so the XCOV vehicular repeater mode automatically activates/enables when a portable radio is removed from an in-vehicle charger. Consult with the radio network administration personnel or a communications supervisor for additional information.

3.2.5 Indications During XCOV Vehicular Repeater Mode Operations

When the XCOV vehicular repeater mode is activated/enabled **VR INIT** appears briefly in the display followed by **VR STANDBY**. **VR INIT** indicates the initialization/startup of the VRS7000 into XCOV vehicular repeater mode. **VR STANDBY** indicates the VRS7000 is operating in the XCOV vehicular repeater mode without any P25 client radios connected.

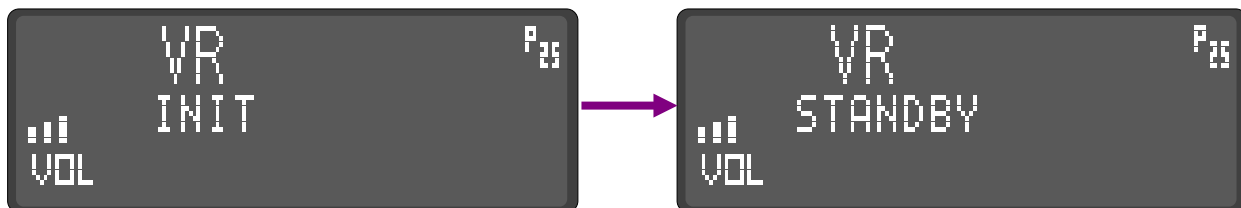


Figure 3-1: Control Head Indications during Vehicular Repeater Initialization

When one or more P25 client radios connect to the VRS7000, **VR ACTIVE** appears in the display. When a call is made from a P25 client radio or from a radio on the network (on a talk group also being used by the P25 client radios), **VR CALL** appears in the control head's display. The **VR CALL** indication replaces the **VR ACTIVE** indication during the call.

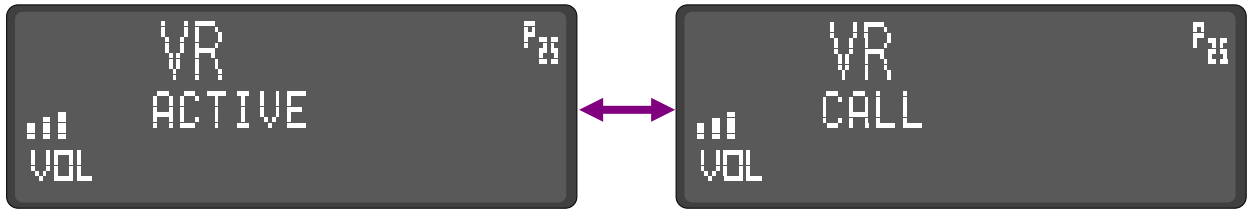


Figure 3-2: Control Head Indications with P25 Client Radio(s) Connected and a Call from a P25 Client Radio or from the Radio Network

When an emergency is declared on a talk group being used by the P25 client radio(s), **VR *RXEMER*** appears in the control head's display. **VR *RXEMER*** also appears when any radio (client or network) transmits on an emergency group currently being used by the P25 client radio(s).

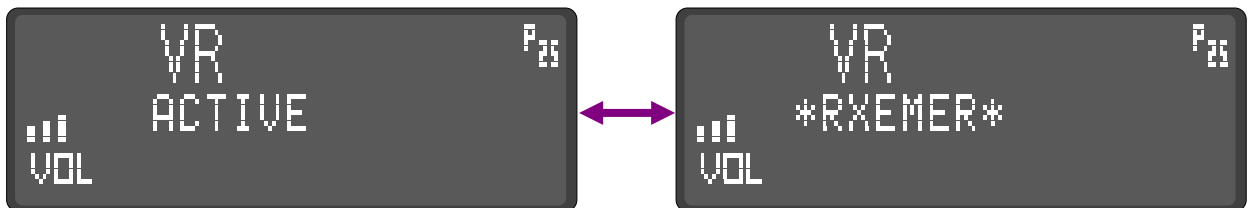


Figure 3-3: Control Head Indications with P25 Client Radio(s) Connected and an Emergency Call on a Vehicular Repeater Talk Group

4 MOBILE RADIO OPERATION

This section describes radio operations when the VRS7000 is operating as a normal mobile radio. For vehicular repeater operations, refer to Section 3 which begins on page 22.

4.1 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 4-1 summarizes functions of the front panel controls.

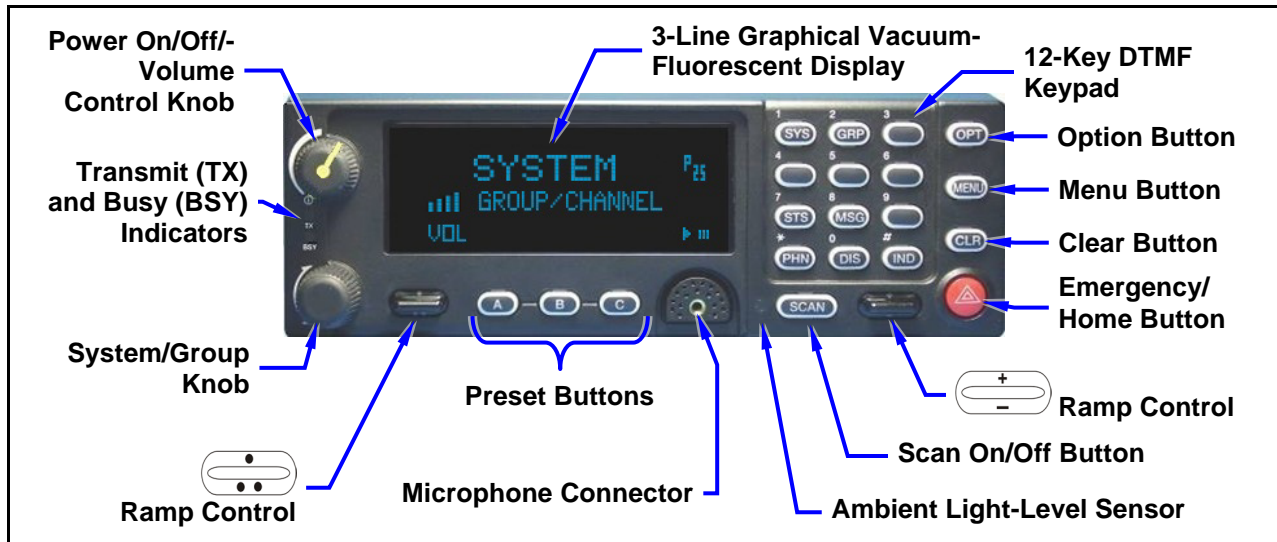


Figure 4-1: CH-721 System Model Control Head



Button and key functions may vary depending upon system programming, radio hardware, and optional configurations. The table in Section 6 is provided to record functions of remapped buttons/keys

Table 4-1: Controls of CH-721 System Model Control Head

CONTROL	FUNCTION
Power On/Off/Volume Control Knob	Turn this knob clockwise to turn on the VRS7000, and to increase volume. See Section 3.1 on page 22 for additional information. Turn this knob counter-clockwise to decrease volume, and to turn off the VRS7000.
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 4.7 which begins on page 32 for additional information. This knob does not function when the vehicular repeater is enabled/active.

Table 4-1: Controls of CH-721 System Model Control Head






CONTROL	FUNCTION
 Emergency/Home Button	<p>When the vehicular repeater is disabled/inactive, use the Emergency/Home button to declare an emergency, if the emergency feature is enabled. See Section 4.17 on page 43 for additional information. Alternately, this button can also be programmed to switch the radio to a home group when it is pressed.</p> <p>This button does not function when the vehicular repeater is enabled/active.</p>
 Ramp Control	<p>This rocker-type ramp control has multiple functions.</p> <p>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 4.19 which begins on page 45 for additional information.</p> <p>It is also used for various other selection-type functions, as described elsewhere in this manual.</p> <p>This control does not function when the vehicular repeater is enabled/active.</p>
 Ramp Control	<p>This rocker-type ramp control also has multiple functions.</p> <p>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).</p> <p>This control is also used to enable/activate the vehicular repeater, as described in Section 3.</p>
OPT (Option Button)	<p>The OPT (option) button is used to toggle a programmable feature on and off when the vehicular repeater is disabled/inactive.</p> <p>This button does not function when the vehicular repeater is enabled/active.</p>
MENU (Menu Button)	<p>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.</p> <p>The MENU button is also used to enable/activate and to disable/de-activate the vehicular repeater. See Section 3 for additional information.</p>
CLR (Clear Button)	<p>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.</p> <p>This button does not function when the vehicular repeater is enabled/active.</p>
SCAN (Scan Button)	<p>When the vehicular repeater is disabled/inactive, the function of the SCAN button is to toggle group scan operation on and off. See Sections 4.19.4 and 4.19.6 for operating details.</p> <p>This button does not function when the vehicular repeater is enabled/active.</p>
A, B and C Pre-Set Buttons	<p>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 settings.</p>
SYS (System Key)	<p>This key is used to enter the system select mode. See Section 4.7.1 on page 32 for additional information.</p>
GRP (Group Key)	<p>This key is used to enter the group select mode. See Section 4.7.2 on page 32 for additional information.</p>

Table 4-1: Controls of CH-721 System Model Control Head

CONTROL	FUNCTION
DIS (Display Key)	Press to display the encryption key's ID number, and whether or not the key is valid or available
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 4.20 on page 47 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 4.21 on page 48 for additional information.
STS (Status Key)	This key is used to send pre-programmed status conditions to the P25 radio network. See Section 4.22 on page 50 for additional information.
MSG (Message Key)	This key is used to send pre-programmed message text to the P25 radio network. See Section 4.23 on page 50 for additional information.


4.2 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** (Clear) button, or simply wait a few seconds and the menu operation will automatically end.


4.3 LOCKING AND UNLOCKING THE KEYPAD

The control head's keypad can be locked to prevent accidental button press operations. Lock and unlock it as follows:

1. Press the control head's **MENU** button.
2. Use the  ramp control to scroll through the menu until **KEY LOCK** appears in the middle line of the display.
3. Press the **MENU** button again to lock the head's keypad.

To unlock the keypad, simply press the **MENU** and **CLR** (Clear) buttons simultaneously.

4.4 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:



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

- | <u>SYSTEM</u> | |
|---------------|-------|
| 1 | NORTH |
| 2 | SOUTH |
| 3 | EAST |
| 4 | WEST |




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

XXXXXXX
YYY = ZZZ

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

SOUTH
SYS = 2

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

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

EAST
SYS = 3

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

4.5 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.



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.

4.6 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.

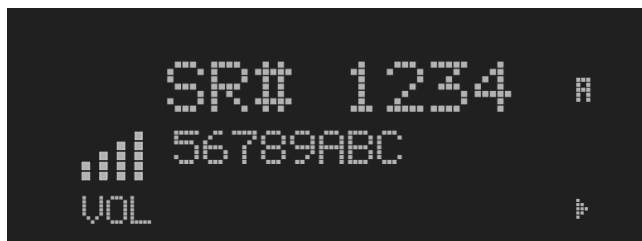
Once the feature has been accessed, all normal menu functions work. The user can scroll up or down through all of the entries.

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

4.6.1 ROM Serial Number (12 Hex Digits)

Example:



The ROM serial number must be reported to Harris Corporation before a new feature can be enabled. The number shown here is an example only.

4.6.2 Feature Encryption Data Stream

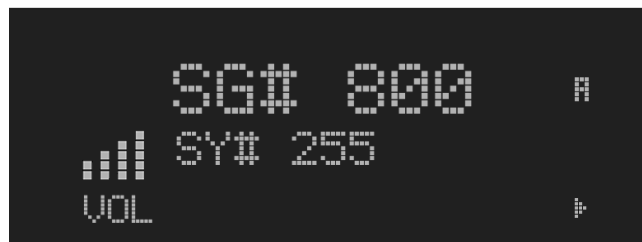
Example:



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:



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

4.6.3 Features Enabled

These numbers indicate which features are enabled.

Example:

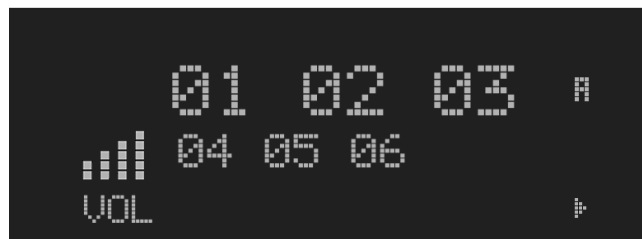






Table 4-2 lists standard and optional features available for the VRS7000.

Table 4-2: 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

4.7 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.

4.7.1 System Selection

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



METHOD 1: If system selection is programmed to the System/Group 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 29. Use the  ramp control to scroll through the programmed systems.

4.7.2 Group Selection

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 29. Use the  ramp control to scroll through programmed groups.

4.8 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.

4.9 DIGITAL VOICE OPERATION

4.9.1 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.

4.9.2 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.

4.9.2.1 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.

4.10 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.

4.11 RADIO STATUS ICONS

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

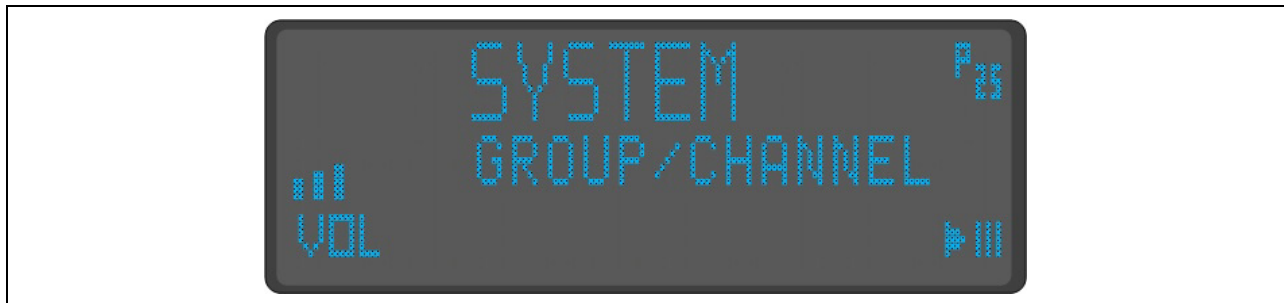









Figure 4-2: Typical Display during P25 Trunked Operation

Table 4-3: 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.
	Indicates the current channel is set up as an analog channel.
	Indicates receiving or transmitting encrypted calls.

4.12 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 4-4: Displayed 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.
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.

Table 4-4: Displayed Messages

MESSAGE	NAME	DESCRIPTION
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 <i>Who Has Called</i> list. Individual calls received but not responded to are stored in a <i>Who Has Called</i> list. This list is accessible by pressing the # key and then the INDV key after the Individual call has timed out or the Clear button is pressed. This display is on line 2 and the LID of the caller is displayed on the top line. Currently the list is not implemented and the display will always be WHC=1.
PHONE	Phone Call	Displayed when a phone call is received from the site. It is displayed in line 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	Menu Function	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" menu 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 a phone call is initiated. Displayed on line 2 of the display.
NO ENTRY	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 (example)	Radio Software Copyright Date	Displayed in line 2 when "REVISION" menu is selected.
EM	Emergency	Indicates an emergency has been declared by the LID that follows the display, "EM." An example of this is "EM 01201."

Table 4-4: Displayed Messages

MESSAGE	NAME	DESCRIPTION
INDV	Individual Call	Displayed in line 2 of the display when an individual call is in progress (trunked and T99 modes only).
GROUP	Group Call	Indicates a group call is in progress and is displayed on line 1 of the display (trunked and T99 modes only).
SPKR ON	External Speaker On	Displayed when the external speaker is enabled.
SPKR OFF	External Speaker Off	Displayed when the external speaker is disabled.
BANK=1-8	Bank Number	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	Key Load	Displayed on line 1 of the display when the encryption keyloader is connected.
KEY ZERO	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	Key Number	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	Primary Keys	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.
BND SCAN	Band Scan	Only displayed if the P25T system is configured for "EnhancedCC" mode of operation. When the radio cannot find a Control Channel in either the trunked frequency set or the list of discovered adjacencies, the radio is able to perform a full spectrum frequency scan to find a new Control Channel.
REGISTER	Registration/Affiliation	Displayed when the radio is performing a registration/affiliation on a P25 trunked radio system (site).


4.13 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 4-5: 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.
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.

4.14 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.

The radio has two (2) separate pre-configured menus—one is active when the radio is operating on a trunked system and the other is active when the radio is operating on a conventional system. Each menu can have up to twenty (20) menu items/selections, but typically less are pre-configured. Because of the separate menus, trunked menu selections can vary from the conventional menu selections. An operator cannot add or delete menu items/selections.


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 settings).

An example of the menu item selection process and menu item setting 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
C O N T R A S T
    
```

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

```

C N T R S T = X
Y Y Y Y Y Y Y Y
    
```

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



4. The menu's setting shown in the display can now be changed by using the  ramp control to scroll through the list of available settings. 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 4-6.

Table 4-6: Menu Item Information

FEATURE	DISPLAY	MENU SETTINGS	DESCRIPTION
Display Contrast Level Adjustment	Menu Item: CONTRAST Once selected: CNTRST=	1, 2, 3, 4, 5, 6, 7, 8	Selects the display's contrast level for adjustment.
Display and Button Backlight Brightness Adjustment	Menu Item: BCK LGHT Once selected: BCKL ADJ	1, 2, 3, 4, 5, 6	Selects the display's brightness for adjustment. Adjustment also affects button backlight brightness.
Radio Revision Information	Menu item: REVISION	Informational displays only; no user selectable settings	Selects the information display to view.

Table 4-6: Menu Item Information

FEATURE	DISPLAY	MENU SETTINGS	DESCRIPTION
Radio Transmit Power Level	Menu Item: TX POWER Once selected: LOW PWR or HIGH PWR	Low or High Transmitter Power Level	Used to switch the radio's transmitter power level between the low and high power settings.
Key Lock	Menu Item: KEY LOCK Once selected: LOCKED or UNLOCKED	Unlocked or Unlocked	Used to lock the control head's keypad. To unlock, press the MENU and CLR (Clear) buttons simultaneously. See Section 4.3 on page 28 for additional information.
Phone Call	Menu item: PHN CALL Once selected: See Section 4.21 on page 48	(Accesses the phone call list)	Allows access to the Telephone Interconnect Call feature. See Section 4.21 on page 48.
Individual Call	Menu Item: IND CALL Once Selected: See Section 4.20 on page 47	(Accesses the individual call list)	Allows access to the Individual Call feature. See Section 4.20 on page 47.
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	Toggles the Public Address (PA) feature on and off. Usage requires an external PA speaker/horn.
External Speaker	Menu item: EXT SPKR Once selected: SPKR ON or SPKR OFF	ON, OFF	Toggles the external speaker on and off. Usage requires an external speaker. Affects the path of receive audio only.
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	(current key)	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.

Table 4-6: Menu Item Information

FEATURE	DISPLAY	MENU SETTINGS	DESCRIPTION
Scan Delete	Menu item: SCAN DEL Once selected: Scan icon goes out.	(none)	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.	(Programmed groups)	Changes to the group defined for the Home function.
System Select	Menu item: SYS SEL Once selected: SYS = n	1 to 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	(none)	Selects the respective pre-programmed system & group/channel.
Mute	Menu item: MUTE	ON, OFF	Toggles the mute function on and off to control the audio output from the radio.
No Data	Menu item: NO DATA	ON, OFF	Toggles data feature on and off.
Conventional Priority 1 Scan	Menu item: ECP1SCAN	ON, OFF	Toggles the conventional priority 1 scan feature on and off.
Group Selection	Menu item: GRP SEL Once selected: GRP = n	1 to 64 = (n)umber of desired group	Displays the group selected.
Status Condition	Menu item: STATUS Once selected: ST = n	0 to 9 = (n)umber of pre-programmed status	Transmits the pre-programmed status message.
Message Condition	Menu item: MESSAGE Once selected: MSG = n	0 to 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.

Table 4-6: Menu Item Information

FEATURE	DISPLAY	MENU SETTINGS	DESCRIPTION
System Scan	Menu Item: SYS SCAN Once selected: SYSC ON or SYSC OFF	ON, OFF	Toggles System Scan features like ProScan on and off.
Page	Menu Item: PAGE Once selected: (List of stored individual callers)	(I-Call list)	The Page feature sends a ping-type message over the radio system to a selected radio. See Section 4.24 on page 51 for details.
Squelch Control	Menu Item: SQUELCH Once selected: SQLCH = n	SQLCH=1 to SQLCH=16	Use to adjust receiver squelch level. For analog conventional and P25 conventional systems only.
ProFile	Menu Item: PROFILE Once selected: PROF OFF or PROF ON	ON, OFF	The ProFile feature sends radio personality information "over-the-air" (i.e., via a radio frequency channel). For radio network administration personnel use only.
Radio Programming	Menu Item: PROGRAM	—	Enables radio programming mode. For radio network administration personnel use only.
Reverse Warm Start Segment	Menu Item: RWSS	—	This Over-the-Air-Rekeying (OTAR) related feature can be used to manually request new encryption key information (TEKs and KEKs) from the radio system. Normally only used by radio network administration personnel.
Service-Related Information	Menu Item: FCC MENU	—	Displays radio service-related information. For radio network administration personnel use only.

4.15 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.

4.16 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 4.13 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.

4.17 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.

4.17.1 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.

4.17.2 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.

4.18 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.

4.18.1 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.

4.18.2 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 settings 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 searches the programmed adjacent systems until a suitable control channel is found.

4.18.3 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.


4.18.4 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.

4.18.5 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.

4.18.6 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.

4.18.7 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.

4.19 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.

PI 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.





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

4.19.1 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.

4.19.2 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.

- 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.

4.19.3 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.


4.19.4 Turn Scan On

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



NOTE

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


- 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.

4.19.5 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.

4.19.6 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.

4.20 INDIVIDUAL CALLS

4.20.1 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.

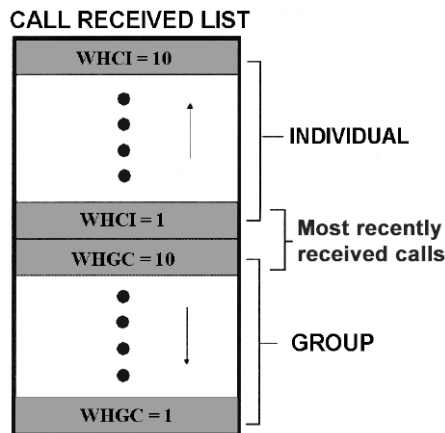


The hookswitch functions the same as **CLR** button in individual call, phone call, and menu modes.

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.)

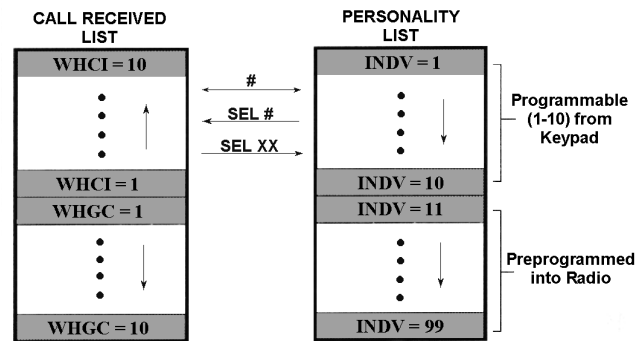
The radio stores the IDs of the last 10 callers in the Calls Received List as shown. Individual calls are stored in the top half of the list (1-10) and group calls are stored in the bottom half of the list (1-10). The most recent call is stored in position 1, the second most recent call is stored in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



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.

4.20.2 Call Storage Lists

There are two lists available for call storage in the radio: The calls received list (1 to 10) and the personality list (1 to 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 Logical IDentification (LID) on and off.

4.20.3 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.

4.21 TELEPHONE INTERCONNECT CALLS

4.21.1 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.

4.21.2 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.



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).

4.21.3 DTMF Overdial/Conventional Mode Telephone Interconnect

Once the radio has established a connection to the public telephone system, it may be necessary to "overdial" more digits to access banking services, answering machines, credit card calls or other types of systems that require 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**.

4.21.4 Programmable Entries

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

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

1. Press **IND** or **PHN** to enter the individual call list or the phone call list. The selection mode rules apply.
2. Scroll through the list using the  ramp control until one of the first ten entries is reached. **NO ENTRY** is displayed if the location is empty.
3. Enter the desired number. If necessary, a pause can be entered by pressing and holding **0-9**, **(*)**, or **(#)** until an underscore appears in the display. The individual call list entries will accept up to 5 digits. The phone call list entries accept a combination of up to 31 digits and pauses.
4. Press and hold **MENU** until the display changes indicating that the number has been stored.
5. Repeat the steps above if the number stored in an entry location needs to be changed.

4.22 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 assign 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.

4.23 MESSAGE OPERATION

Message operation is an optional feature that permits the transmission of a pre-programmed message 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. If no message 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 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 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 was selected or the incorrect number button was pressed, the message can be changed during the pre-programmed time-out period by pressing another number button. The message selection can also be cancelled by pressing the **CLR** key prior to the time-out period.

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

4.24 PAGE

The Page feature sends a ping-type message over the radio system to a selected radio. It functions similar to Individual Call feature. To initiate and complete a Page:

1. Press the **MENU** key and then select the Page menu.
2. Use the  ramp control to scroll through the list of stored individual callers. The selection mode rules apply. While in the individual call list, press the **MENU** key to toggle the display between the call name and the unit ID number. The individual caller's unit ID can also be entered directly from the keypad.
3. Press the PTT button. The radio then performs the necessary signaling. On the calling radio, line 1 shows the called unit ID'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.

5 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

6 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		#	

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), 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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