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JVCKENWOOD Group

Viking Mobile Radio
Operating Manual

for the
VM600 Radio

Project 25 Conventional and Trunking
Conventional Analog and Digital
SMARTNET®/SmartZone®

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Viking Mobile Radio Operating Manual

September 2015

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TECHNOLOGIES
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Safety Requirements

RF Energy Exposure Awareness and Control Information, and Operational Instructions for FCC Occupational Use Requirements

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

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

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 radio frequency (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 web sites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits.

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

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

Federal Communications Commission Regulations

The FCC rules require manufacturers to comply with the FCC RF energy exposure limits for mobile two-way radios before they can be marketed in the U.S. 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.

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Your EFJohnson Technologies two-way radio has a RF exposure product label. Also, your EFJohnson Technologies user manual, or product manual, or separate safety booklet includes information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

Compliance with RF Exposure Standards

Your EFJohnson Technologies two-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to radio frequency electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at duty factors of up to 50% talk and 100% listen and is authorized by the FCC for occupational use. In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio antenna radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

Your EFJohnson Technologies two-way radio complies with the following RF energy exposure standards and guidelines:

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

- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992.

- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition.

RF Exposure Compliance and Control Guidelines and Operating Instructions

To control exposure to yourself and others and ensure compliance with the occupational/ controlled environment exposure limits always adhere to the following procedures.

Guidelines

- User awareness instructions should accompany device when transferred to other users.

- Do not use this device if the operational requirements described herein are not met.

Instructions

Transmit no more than the rated duty factor of 50% of the time. To transmit (talk), push the Push-To-Talk (PTT) button. To receive calls, release the PTT button. Transmitting 50% of the time, or less, is important because this radio generates measurable RF energy exposure only when transmitting (in terms of measuring for standards compliance).

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Transmit only when people outside the vehicle are at least the recommended minimum lateral distance away, as shown in Table 1, from a properly installed according to installation instructions, externally-mounted antenna.

Note   *The following table lists the recommended minimum lateral distance for bystanders in an uncontrolled environment from transmitting types of antennas (i.e., monopoles over a ground plane, or dipoles) at several different ranges of rated radio power for mobile radios installed in a vehicle.*

Rated Power of Vehicle-Installed Two-Way Radio	Recommended Minimum Lateral Distance From Transmitting Antenna
Up to 50 watts	1.0 meter
50-110 watts	1.5 meter

Mobile Antennas

• Install antennas at the center of the roof or the center of the trunk deck taking into account the bystander exposure conditions of backseat passengers and the recommended minimum lateral distances in Table 1. These mobile antenna installation guidelines are limited to metal body motor vehicles or vehicles with appropriate ground planes. The antenna installation should additionally be in accordance with:

  • The requirements of the antenna manufacturer/supplier.

  • Instructions in the Radio Installation Manual, including minimum antenna cable lengths.

  • The installation manual should provide specific information of how to install the antennas to facilitate recommended operating distances to all potentially exposed persons.

• Use only EFJohnson Technologies-approved supplied antenna or EFJohnson Technologies-approved replacement antenna. Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations. Antennas tested with EFJohnson Technologies radios are listed below.

Frequency	Whip Model No.	Base Model No.
136-144 MHz	ASPJ1415	KM220
144-152 MHz	ASPA1415	KM220
152-162 MHz	ASPB1415	KM220
162-174 MHz	ASPC1415	KM220
400-430 MHz	ASPE1615	KM220
430-470 MHz	ASPD1615	KM220
470--512 MHz	ASPF1615	KM220
806-869 MHz	ASPA1855	KM220
890-960 MHz	ASPG1865	KM220

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Approved Accessories

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

For a list of EFJohnson Technologies approved accessories, refer to the radio service manual or contact EFJohnson Technologies as follows.

Contact Information

Toll-Free: 1-800-328-3911
Fax: 972-819-0639
E-Mail: customerservice@efji.com.

You may also contact the Customer Service Department by mail. Please include all information that may be helpful in solving your problem. The mailing address is as follows:

EFJohnson Technologies
Customer Service Department
1440 Corporate Drive
Irving, TX 75038-2401

Usage Compatibility

Do NOT operate the unit in areas that are sensitive to RF energy such as aircraft, hospitals, blasting sites, and fuel storage sites. Areas with potentially flammable atmospheres are usually, but not always, clearly posted. These may include gas stations, fuel and chemical storage and transfer stations, below deck on boats, and areas where the air contains flammable chemicals or particles such as grain dust or metal powders.

Electromagnetic Interference

This device complies with Part 15 of the FCC rules. Operation is subject to the condition that this device does not cause harmful interference. In addition, changes or modification to this equipment not expressly approved by the E.F. Johnson Company could void the user's authority to operate this equipment (FCC Rules, 47CFR Part 15.19).

Note   *This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or*

television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*

- *Increase the separation between the equipment and receiver.*

- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*

- *Consult the dealer or an experienced radio/TV technician for help.*

Note   *IC Notice to Users English/French in accordance with RSS GEN Issue 3: 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.*

Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence(s). Son utilisation est soumise à Les deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences et (2) cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

This device complies with Health Canada's Safety Code 6 / IC RSS-210. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement. Information can be obtained at: http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php#sc6

Cet appareil est conforme avec Santé Canada Code de sécurité 6 / IC RSS-210. Le programme d'installation de cet appareil doit s'assurer que les rayonnements RF n'est pas émis au-delà de l'exigence de Santé Canada. Les informations peuvent être obtenues: http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php#sc6

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Radio Overview

This manual is applicable to the Viking® Mobile radios. The availability of many of the features is controlled by the model of your radio, factory coding of your radio, installed options, firmware version, and field programming.

Figure 1.1   Viking Mobile Radio (Lightning Control Head)

Depending on the specific model (and options), the Viking mobile radio operates in the 700/800 (762-870 MHz) frequency range.

Note   *As of January 2013, the FCC has mandated all UHF/VHF radios shall not allow wideband (25 kHz) mode. Federal frequencies are not under FCC jurisdiction; therefore, Federal customers can continue to order wideband in VHF and UHF. This mandate does not affect 800 MHz and can continue to have wideband after January 1, 2013. This option shall prevent UHF/VHF radios bought after January 1, 2013 from operating in wideband mode.*

1.1   Capabilities & Features

The Viking mobile radio is designed to provide an extensive list of features and capabilities for most any communications application.

- **Capabilities**

  - 255 zones with 255 channels are supported. A maximum of 2048 channels total, depending on the option selected, may be enabled.

  - SMARTNET II®, SmartZone® Digital and Analog, and P25 Trunking

  - All supported protocols available simultaneously

  - Encryption is available depending on the model of your radio:

    o DES-OFB & AES-OFB Encryption with 126 keys is available for the Viking Mobile Radio

    o ARC4 Software Encryption with 126 keys is available for the Viking Mobile Radio (Compatible with Motorola ADP software encryption)

  - P25 Conventional & Trunked OTAR

  - P25 Phase 2 and Phase 2 Authentication

  - Conventional Vote Scan is standard

  - Supports key elements of MDC1200

  - Supports GE Star Encode

  - Supports Two Tone Encode/Decode

  - Compatible with Motorola Astro®

  - Simplified cabling with a single multi-function accessory connection in the rear

- **Operating Modes**

  - Conventional Analog and Project 25 Digital

  - Trunking Mode Project 25 (P25) Digital

  - SMARTNET II / SmartZone

- **Data and Control Interfaces**

  - Supports P25 Conventional IP Packet Data

  - P25 (Astro) IV & D

  - Supports GPS AVL Data

- **Simplified Feature Updates and Option Selection**

  - Over the Air Programming (OTAP) option enables you to program radios without connecting them to a computer

  - Over the Internet Programming (OTIP) option enables you to program radios connected through mobile ethernet interface or Wi-Fi dongle

  - Easy radio programming and feature updating for portable and mobile radios

- **Multiple Configuration Options**

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- Dash Mount and Remote Mount Configurations

- Standard and Lightning Control Head

- Dual Control Heads

- Internal or External Speaker

- Fixed Control Stations

- Siren Option

Note   *The availability of many features is controlled by field programming and by the options ordered. See the EFJohnson Technologies product description and the following sections in this manual for additional information.*

1.2   Radio Software and Configuration Programming

The radio operating software can be easily updated to accommodate new releases and updates issued from EFJohnson technical support.

1.3   Supported Software

This manual documents mobile radios with software release 8.12.x. Some information in this manual may not be compatible with earlier subscriber radio software releases.

1.4   Available Options

Availability of optional features is controlled by factory programming of the control logic. Only those features that are specifically ordered and enabled in a particular radio are available for use and can be programmed. The optional features controlled by factory programming are as follows:

P25 Options

- P25 Conventional Packet Data
- P25 Trunking Packet Data
- Digital Conventional

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- P25 Phase 2
- P25 Authentication

Encryption Options

- DES OFB
- AES OFB
- ARC4 Software Encryption

OTAR Options

- OTAR P25 Conventional
- OTAR P25 Trunking

Trunking Options

- SMARTNET analog operation
- SmartZone analog operation
- Digital SMARTNET/SmartZone
- STAR Roaming (Omnilink)
- P25 Trunking
- SNSZ 800 MHz Rebanding

Feature Options

- Keypad programming (Federal Government users only)
- 48, 128, 256, 512, 1024, 1536, or 2048 channels/talkgroups
- MDC 1200/GEStar
- P25 Conventional and Trunking OTAP
- Topaz
- Third Party Interface
- Over the Internet Programming (OTIP)

Currently, the only operating mode that is standard with all models is the conventional analog mode. Other variables such as frequency range are hardware dependent instead of software dependent.

Radios in the field may be upgraded with new features. A new feature can be purchased and a special encrypted code string keyed to the Electronic Serial Number (ESN) of the radio is then provided by EFJohnson Technologies. This string is in the form of a computer file which enables the feature, and is downloaded to the radio. With the new option file, the user will also receive a new model number label to be placed on the radio and a new "Model Number tag".

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1.5   Licensing

This radio operates on radio spectrum frequencies assigned and licensed by the Federal Communications Commission (FCC). The FCC can penalize anyone operating an unlicensed radio. It is the radio operator's responsibility to obtain the necessary license for this radio equipment.

1.6   Radio Accessories

Various accessories are available from EFJohnson that will provide added capability and enhanced operation for this radio. The following describes some of the accessories available.

1.6.1   Digital Keypad Microphone

An optional accessory microphone is available with an integral Digital Keypad. You can program various radio features to the keys. This can place often used functions conveniently on the microphone.

Figure 1.2   Digital Keypad Microphone

The control includes a display, DTMF keypad, volume and power controls, option switches, junction box, and an internal microphone. It does not have an internal speaker. A separate external speaker is required when the control unit is used with a remotely mounted radio.

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When the control is used with a remotely mounted radio, a Junction Box (Part No. 023-5300-130) must be used. This Junction Box provides various connections for the control and an external speaker, along with connections for programming and rekeying the remote radio.

1.6.2   Base Station Unit

A Base Unit power supply is available that can be used to power the Viking radio from 110 volt AC line voltage. This lets the Viking be used in a field office, base station, or headquarters building.

Figure 1.3   Viking Mobile Radio mounted in Base Station

Consult with your EFJohnson representative for additional accessories that can be used with your EFJohnson mobile radio.

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2

Controls & Display

2.1   Standard Control Head

The standard control head provides the primary controls, display, and speaker for the mobile radio.

2.1.1   Front Panel Controls

Figure 2.1 shows the controls for the Viking Mobile radio.

Figure 2.1   Front Panel Controls
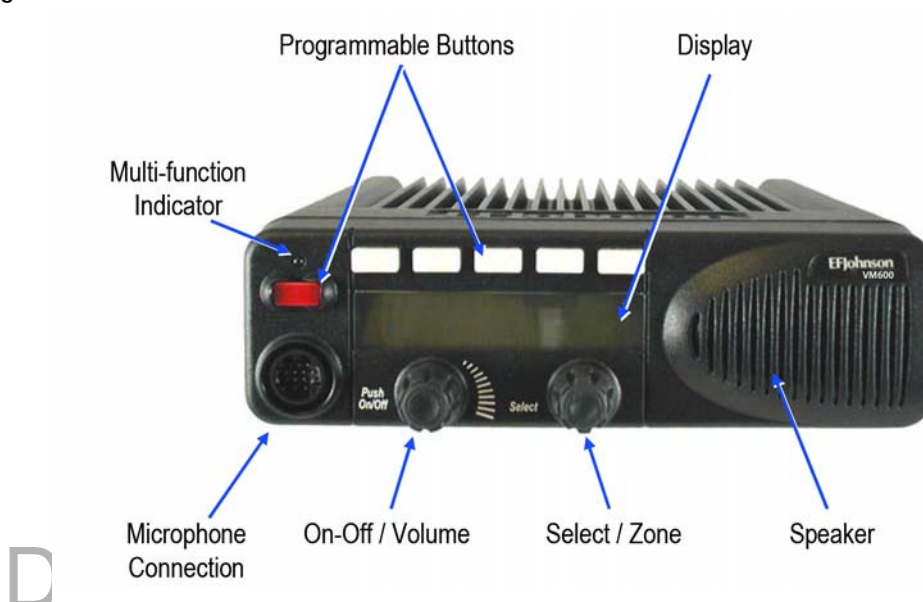
ON-OFF /Volume - Pressing this control turns power ON and OFF (soft power down can be programmed as in Section 3.1.1.3), and rotating it sets the volume level.

Select Switch - This switch can be pressed or rotated. An optional beep can be programmed to sound when it is pressed. Selects zones/channels and is also used for other functions such as selecting names from a call list. When selecting zones/channels, a bar above the zone or channel display (see Figure 2.3) indicates which is being changed. This bar is switched between displays by pressing this switch, and zone and channels are selected by rotating it (see Section 3.1.7.1). If this switch is pressed and held, the radio enters Menu Mode.

Multi-function Indicator - This is a two-color LED that indicates the following:

Red (constant) - Transmitter keyed in clear mode (PTT switch pressed).
Green (constant) - Busy condition (carrier detected in clear receive mode).
Orange (constant) - Transmitter keyed in encrypted mode (PTT switch pressed)
Red (flashing) - call received in encrypted mode

Note   *This indicator is disabled when the Surveillance mode is programmed (see Section 4.10) and you can program to disable when the backlight is off.*

Option Buttons - Each of the six options buttons on the front panel (including the one located to the left of the display) can be programmed by your system operator to control some function. The button functions can be different for each operating mode (conventional, SMARTNET/SmartZone, and Project 25 Trunking). Therefore, up to 18 functions can be controlled by these buttons. Refer to Section 4.1 for more information on option button functions.

Figure 2.2   Option Buttons

Programmable Option Buttons

F1   F2   F3   F4   F5   F6
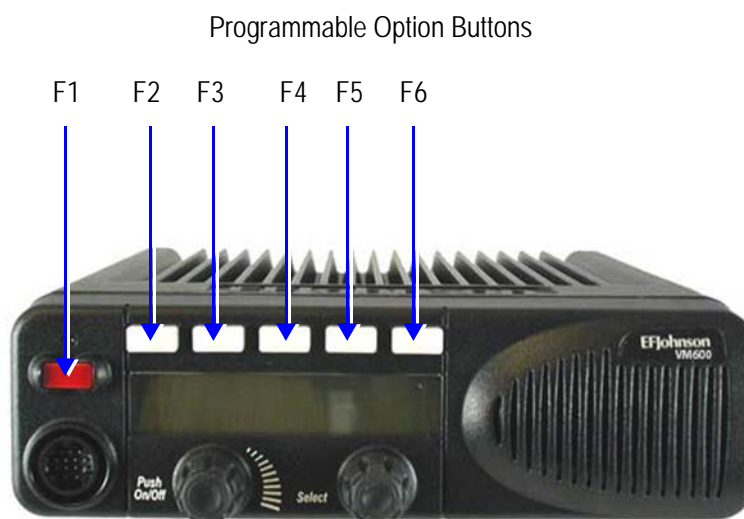
An option button can be programmed as an Emergency button to alert a dispatcher of an emergency condition. This button can also be programmed for other functions.

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The user can set an external line by pressing the emergency button. External devices can trigger off of the radio's external line. If the "Ext Emergency" Option is enabled by programming and the user presses the emergency button, the Aux B line on the accessory connect shall be set to low (0V). It remains low until the External Emergency Time has passed or the user exits the emergency. If the user presses emergency during the External Emergency Time, the timer starts over. If the user exits emergency before the External Emergency Time has passed, the output line returns to Vbatt.

Speaker - An internal 16-ohm, 5-watt speaker is located behind the grille. An optional 4-ohm, 12-watt external speaker may be used if desired. The internal speaker should be disabled when an external speaker is used.

2.1.2   Display

Figure 2.3 shows the front panel display.

Note   *Radios are capable of displaying messages in English, French or Spanish.*

Figure 2.3   Front Panel Display
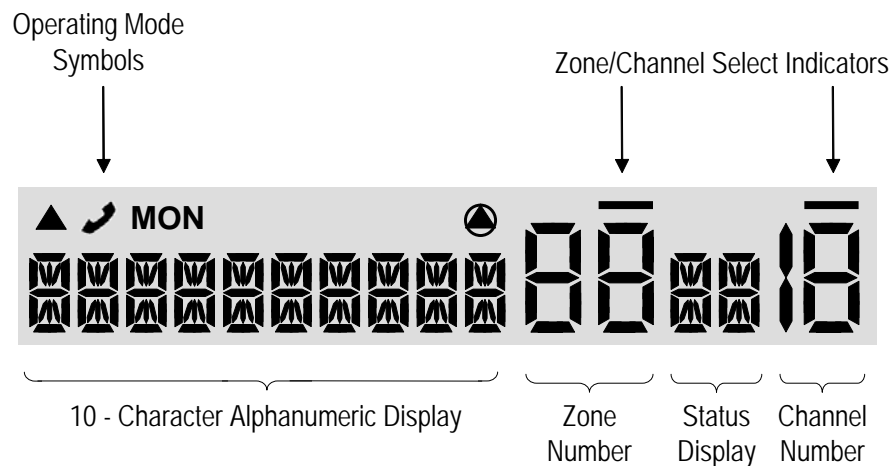
Alphanumeric Display - This ten-character area of the display indicates the alias (unique identification) for the selected zone, channel or combined aliases, depending on which select mode is active. It may also indicate such things as the channel frequency, ID numbers, and status and error messages.

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Zone Number - Indicates the currently selected zone from 1 up to 255, depending on the options installed. A zone is a collection of channels that can be any combination of the conventional, P25 Trunked, and SMARTNET/SmartZone types.

Note   *The zone/channel numeric display and the zone/channel select bars in all supported protocols and display operating modes can be inhibited by programming.*

Status Display - Two characters indicate various status information. See Table 2.1.

Channel Number - Indicates the currently selected channel (conventional) or talkgroup (other modes). The lines above the zone and channel displays indicate which display is changed if the Select switch is turned. To switch between displays, press the Select switch.

Table 2.2 lists the symbols used on the display to indicate various operating modes and status.

Table 2.1   Standard Control Head Display Symbols

Standard Control Head Display Symbols	
Operating Mode Symbols	
CALL	Unit (or Private) call mode active
BUSY	Busy (displayed when radio enters a busy transmit state)
MON	Monitor mode enabled
☎	Interconnect mode enabled
◉	Security enabled
▲	• Keypad programming/edit mode - displayed when the radio is in a mode where the user can edit radio parameters.
	• P25 data context enabled - radio is ready for data operations or call history (only when radio is in conventional unit call, call alert or text messaging and an applicable unit ID is selected.)
	• P25 data channel grant (radio is operating on a data channel) or text message mode active.
Status Display Symbols	
�	Scan enabled
P	The current channel is the priority channel in the enabled scan list (only when scan is on or when in scan edit mode; located in left position)
2	The current channel is the priority 2 channel in the enabled scan list (only when scan is on or when in scan edit mode; located in left position)

Standard Control Head Display Symbols (Continued)	
✳	The current channel is in the enabled scan list (only when scan is on or when in scan edit mode; located in left position)
RO	Radio wide scan mode enabled
R✳	Selected channel is in radio wide scan list (only when radio wide scan is on or when in radio wide scan edit mode)
TA	Repeater talk-around enabled

2.2   Lightning Control Head

An optional component for the Viking mobile radios is the Lightning Control Head illustrated in Figure 2.4. The Lightning Control Head offers superior readability and display options for the radio user. The control head can be fitted to both dash and remote mount mobile radio installations.

Figure 2.4   Radio with Lightning Control Head

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2.2.1   Front Panel Controls

The Lightning Control Head front panel controls are illustrated in Figure 2.5.

Figure 2.5   Lightning Control Head Controls
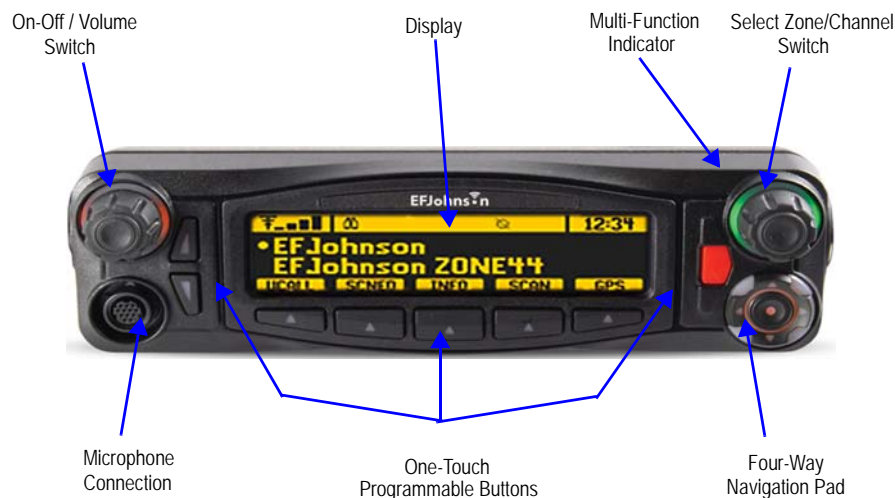
On-Off Volume - This control has two actions: rotation and press. Press the control to turn power on/off function to the radio. Rotate the control (when power is on) to adjust the radio speaker volume.

Display - The display shows all primary operating information such as active channel, zone, along with channel/zone alias, status symbols, and labels for the five function buttons under the display.

Multi-function Indicator - The halo light surrounding the Select Control is used to indicate radio transmit and receive status.

- **Steady Red**   - Radio transmitting in clear mode
- **Steady Green**   - Radio receiving clear
- **Steady Orange** - Radio idle
- **Steady Yellow** - Radio transmitting in encrypted mode
- **Flashing Red**   - Radio receiving encrypted

Select Zone / Channel - This control has two actions: rotation and press. In normal non-menu mode, press the control to select either the zone or the channel. Then rotate the control to change either the zone or channel depending on the selection. (It is indicated on the display whether zone or channel is selected.) Press and hold the select knob to enter menu mode.

Microphone Connection - A compatible microphone plugs into this jack connector.

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One-Touch Buttons - The control head has 8 one-touch buttons: two on the left of the display, five under the display, and an orange button on the right of the display. These buttons can be programmed with different radio functions. (See the Armada Programming manual for information on programming these button functions.)

Figure 2.6   Lightning Option Buttons
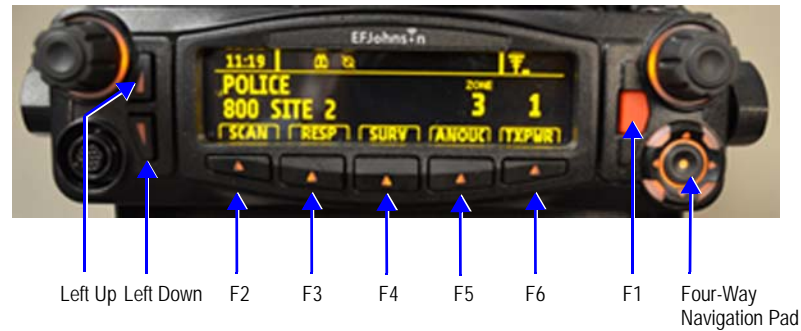
One Touch Programming Buttons

4-Way Navigation Pad - This button pad is used to navigate through various radio functions and menus. The left and right function of the pad can be programmed with different radio functions.

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2.2.2   Display

The Lightning Control Head includes a highly readable display. The display is a mono-chrome display with 320 x 80 pixels. The display supports both the Classic Single Line display mode (with the option to combine zone/channel on the display) or enhanced Dual Line functionality. In Classic Single Line mode, display will have primary fields corresponding to the fields available on the mobile Viking control head, with the addition of the soft menu keys. Figure 2.7 shows the front panel display.

Figure 2.7   Lightning Control Head Display
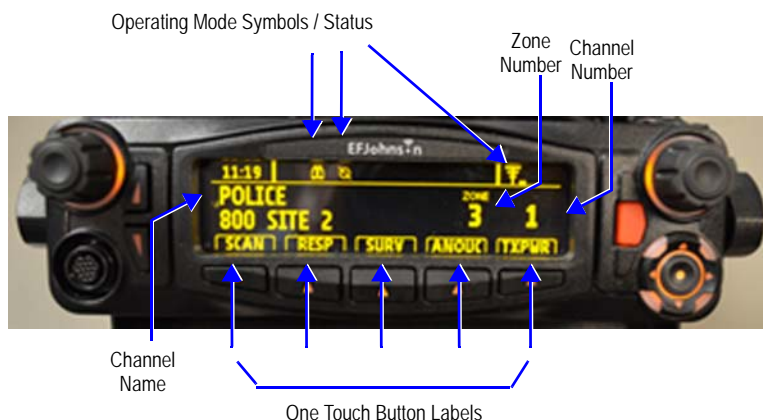
Table 2.2 lists the symbols used on the display to indicate various operating modes and status.

Table 2.2   Lightning Display Operating/Status Mode Symbols

Lightning Control Head Symbols	
⌨	Keypad programming/edit mode. Displayed when the radio is in a mode where you can edit radio settings.
⃔	Monitor mode enabled
⊤ₐ	Repeater Talk-Around mode enabled
Ƶ	Scan Enabled
⊘	Security Enabled
(S)	The current channel is in the enabled scan list (only when scan is on or when in scan edit mode)
|X|	The current channel is not in the enabled scan list (only when scan is on or when in scan edit mode)

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Lightning Control Head Symbols (Continued)

P	The current channel is the priority channel in the enabled scan list (only when scan is on or when in scan edit mode)
P₂	The current channel is the priority 2 channel in the enabled scan list (only when scan is on or when in scan edit mode)
☎	Interconnect mode enabled
	Unit call mode enabled
Ⓡ	Radio is DRS registered
iP	P25 data context enabled (radio is ready for data operations)
	P25 data channel grant (radio is operating on a data channel)
L	Site lock mode
▼ᵢₗ	Signal strength (indicates an acceptable site, and may range from 4 bars to no bars)
	GPS link active
M	Call history (only when radio is in conventional unit call, call alert or text messaging and an applicable unit ID is selected.
Abc	Text message mode active
Rz	Radio wide scan mode enabled
✕	Busy (displayed when radio enters a busy transmit state)
⌇	Transmit indication in surveillance mode, LED indicator is disabled, or "Always show Transmit/Receive Icon" setting is enabled
⌇	Indicates that the radio is receiving a Phase 1 (FDMA) call.
P2⌇	Indicates that the radio is making a Phase 2 (TDMA) call.
⌇P2	Indicates that the radio is receiving a Phase 2 (TDMA) call.
F⌇	Indicates that the radio is making a Failsoft call.
⌇F	Indicates that the radio is receiving a Failsoft call.
	Surveillance mode enabled

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Lightning Control Head Symbols (Continued)	
	Indicates that the radio is connected to a wireless access point.

2.2.3   Mobile Display Modes

If a Lightning control head is used, the zone and channel indicators can be either turned on or off depending on the display mode programmed. If Classic Display mode is programmed, 10 character aliases are supported. If Lightning Display mode is programmed, 16 character aliases are supported.

2.2.3.1   Classic Mobile Display with Zone / Channel Indicators

Classic display mode on the mobile indicates that only one line of text is present. This line of text can be up to up to 10 characters in length, and is located in the middle of the screen vertically and in the left 2/3 of the screen horizontally. A row of icons and a row of button labels is above and below the line of text, respectively. A combined zone/channel option is available in this display mode.

Figure 2.8   Classic Mobile Display with Zone and Channel Indicators
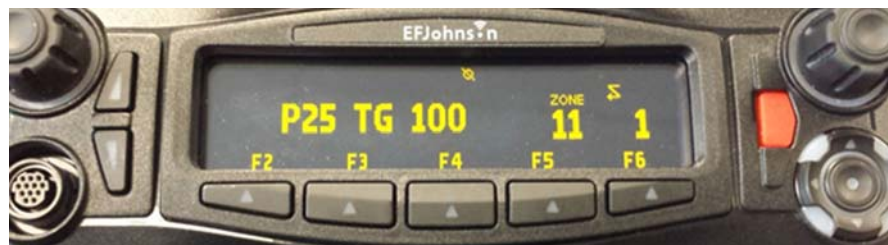
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2.2.3.2   Classic Mobile Display without Zone / Channel Indicators

This mode is the same as previous, except with the zone and channel indicators removed, the display text is located in the middle of the screen from both the horizontal and vertical standpoints. Additionally, the display text can contain up to 10 characters. The row of icons and button labels remains unchanged from Section 2.2.3.1. A combined zone/channel option is available in this display mode.

Figure 2.9   Classic Mobile Display without Zone and Channel Indicators

2.2.3.3   Lightning Mobile Display with Zone / Channel Indicators

Lightning display mode indicates another row of text will be added to the Classic display modes. The secondary row of text will be used to display the zone and/or event messages described in section 2.2. Both lines of text are limited to 16 characters. As the indicators are present again, both display lines will be left justified on the screen. This display mode can display time, date, or signal strength if programmed with an optional status bar. The icons are displayed in the middle of the status bar and the soft menu labels are displayed if programmed.

Figure 2.10   Lightning Mobile Display with Zone and Channel Indicators

2.2.3.4   Lightning Mobile Display without Zone / Channel Indicators

This mode is the same as Section 2.2.3.3, except with the zone and channel indicators removed, the display lines are located to the left of the screen with a dot next to the alias indicating zone/channel selection.

Additionally, the display lines can contain up to 16 characters. The icons, status bar, and soft menu labels remain unchanged.

Figure 2.11   Lightning Mobile Display without Zone and Channel Indicators

2.3   Rear Panel Connectors

The mobile rear panel connectors are shown in Figure 2.12. These are applicable to both the Standard and Lightning control heads.

Figure 2.12   Rear Panel Connectors

Antenna   DC Power   Accessory
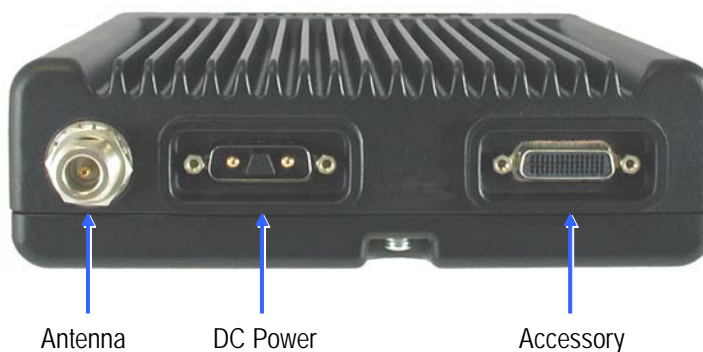
DC Power - Connection point for the nominal 12-volt, negative ground power source (see Figure 2.12).

Antenna - Type N for connecting the antenna.

Accessory - Black connector for connecting optional accessories such as an external speaker (4-ohm, 12-watt), horn alert, siren control, and ignition sense line.

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2.4   Dual Control Configurations

The Viking mobile radio is available in two dual-control configurations, each with different programming and setup requirements:

- Dash-mount radio with a remote mount control head
- Remote-mount radio with two remote control heads

Figure 2.13   Dash-Mount Radio with Remote Control Head

Figure 2.14   Remote-Mount Radio with Two Remote Control Heads

Note   *All heads are shipped from factory set as masters. One of the heads needs to be programmed as a slave to function correctly. Please refer to Section 2.4.4.*

2.4.1   Remote Conversion Kit 250-5300-002

This kit provides the material required to convert an existing dash-mount mobile to a remote-mount configuration. The kit includes:

- Blank faceplate for mobile unit
- Rear shroud for remote control head
- Remote control head mounting bracket
- Single remote accessory cable (part number 597-5357-706)
- 17 ft. remote control cable (part number 597-5357-775-02)

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The kit does not include the control head removal tool (part number 721-5100-010) which must be ordered separately if required.

The remote control cable is also available in 6 foot (part number 597-5357-775-01) and 50 foot (part number 597-5357-775-03) lengths, but these must be ordered separately.

2.4.2   Remote Control Head Kit 250-5300-003

This kit includes the material required to add a remote control head to an existing dash-mount or remote-mount configuration. The kit includes:

- Viking Remote control head with mounting bracket.

Due to differing operational requirements, the following items are not included in the kit and must be ordered separately:

- Microphone - see section 3 for further details
- Remote control cable - order 6 ft., 17 ft. or 50 ft. cable as required
- Remote accessory cable - see below for part numbers

Configurations using two remote control heads require the Dual Remote / Accessory / Data / Siren cable (part number 597-5357-741).

Configurations using a dash-mount mobile with one remote control head can use the following remote accessory cables, depending on the application:

- Single Remote / Accessory cable (part number 597-5357-706)
- Single Remote / Accessory / UDDI cable (part number 597-5357-736)
- Single Remote / Accessory / Data / Siren cable (part number 597-5357-716)

2.4.3   Hardware Setup

When shipped, the dual remote-mount configuration consists of a dash-mount radio, a remote control head, a conversion kit for the second control head, and required cabling. Upon receipt, the installer must convert the dash-mount mobile radio into a remote-mount configuration using instructions contained in the installation manual (part number 004-5300-73001) which is supplied with the unit.

In the dual remote control configuration, the EFJohnson noise-cancelling microphone (part number 589-0016-592) should be used on both control heads. This microphone can be identified by the small circular metal grill above the hang-up button on the rear of the microphone. Use of other microphones in this configuration will result in degraded operational performance.

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2.4.4   Master / Slave Programming

In both dual control configurations, either control head can be designated as the Master and the other as the Slave. The Master control head controls the volume of its internal speaker and any external speakers that are connected to the radio's eight-pin accessory connector (see installation manual for connection details).

All Viking mobile radios ship from the factory with the dash-mount control head and any remote control heads set as Master, so in all dual-control configurations, one control head must be set as the Slave to ensure correct operation.

Control head addressing is set as follows:

1 Power up the mobile radio

2 Press buttons F3, F4 and F5 at the same time, and release (see Figure 2.15).

3 The display will read "ADDRESS 21" if the control head is configured as the Master, or "ADDRESS 22" through "ADDRESS 27" if the control head is configured as the Slave.

4 Rotate the Select knob to select the appropriate address.

5 After a short time-out period, display will read "CYCLE PWR" (Standard Control Head) or "CYCLE POWER" (Lightning Control Head).

6 Power the radio off and back on, and the configuration will be updated.

Figure 2.15   Control Head Option Buttons

Programmable Option Buttons
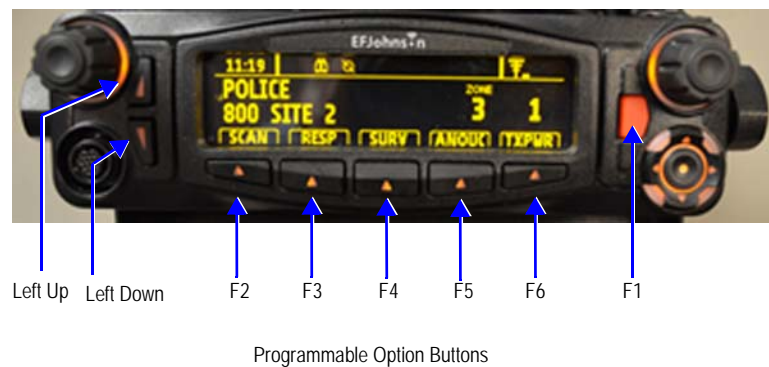
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2.4.5   Dual Control Operation

2.4.5.1   Programming Dual Remote Control Configurations

The Dual Remote configuration requires special programming to accommodate both remote control heads in the mobile radio system.

Removal of either control head will affect system performance.

2.4.5.2   Power On / Off

The power switching in dual configurations is such that either control head can switch the radio on, but both control heads must be off to turn the radio off.

If the power button on both control heads is pressed, then the power button on both control heads must be pressed again to turn the radio off.

It is therefore recommended to always turn the radio on and off using one control head, to simplify operation and avoid confusion.

2.4.5.3   Microphone Audio

In the dual remote control configuration, when transmitting from one of the control heads, it is possible for the push-to-talk (PTT) on the microphone of the second remote head to also be active. In this case, the voice transmissions of both users will be transmitted, resulting in a "party line" operation. This is done to allow either control unit access to the voice channel, and to eliminate the circumstance where one operator may be prevented from having their transmission heard because the other control head is already transmitting.

To prevent a second operator from interrupting a transmission already in progress, the user should look at the transmit indicator on the control head prior to pushing PTT to verify that the mobile radio is not already transmitting from the other control head.

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2.5   External Speaker

An optional 4 ohm, 12 watt external speaker is available from EFJohnson (Part No. 250-0151-006). This can be used to enhance radio audio or to provide primary audio for a remote-mount radio. Refer to the *Viking Mobile Radio Installation Guides* for additional installation information.

Figure 2.16   EFJohnson External Speaker

2.5.1   Internal / External Speaker Programming (Standard Control Head only)

All Viking mobile radios ship from the factory with the internal speaker in the control head enabled, and audio is also routed to the 8-pin accessory connector at the rear of the radio.

If you connect an external speaker to the 8-pin accessory connector (as described in the installation manual), the internal speaker will not be automatically disabled, and both speakers will be active.

To disable the internal speaker, proceed as follows:

1   Power up the mobile radio.

2   Press buttons F2 and F5 at the same time, and release (see Figure 2.15).

3   Rotate the Select knob, until display reads "SPKR DSABL".

4   After a short time-out period, display will read "CYCLE PWR".

5   Power the radio off and back on, and the internal speaker will be disabled.

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To re-enable the internal speaker, proceed as follows:

1 Power up the mobile radio.

2 Press buttons F2 and F5 at the same time, and release (see Figure 2.15).

3 Rotate the Select knob, until display reads "SPKR ENABL".

4 After a short time-out period, display will read "CYCLE PWR".

5 Power the radio off and back on, and the internal speaker will be enabled.

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3

General Operation

3.1   Basic Operation

3.1.1   Turning Power ON and Setting Volume

Power is turned ON and OFF by pressing the ON-OFF /Volume knob. The radio goes
through a self test when power is turned ON. When that is successfully completed,
software version, unit ID, zone, then channel are briefly displayed (except when a
conventional analog channel is selected), a tone sounds (if tones are enabled), and the
radio is ready for normal operation. If "ENTER PSWD" (Standard Control Head) or
"Enter Password" (Lightning Control Head) is briefly displayed, refer to the next section.

The radio can be programmed so that one of the following combinations are selected at
power up:

  - Last Zone/Last Channel

  - Programmed Zone/Last Channel

  - Programmed Zone/Programmed Channel

If the Radio Alias feature is enabled, the radio will display the (up-to-ten characters for the
Standard Control Head) and (up-to-sixteen characters for the Lightning Control Head)
Radio alias in place of the Self Test message during startup. Radio alias identifies the
personality file used to program the radio, the service area for which the radio is
programmed, or functional grouping for which the radio is programmed. The Radio ID
alias display will be included with the Radio Info display items in both button/scroll and
menu modes. If disabled, the Radio info menu mode will display a blank line.

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Note   *In dual control configurations, the power switch at either control point can be OFF for power to turn OFF.*

3.1.1.1   Setting Volume Level

The relative volume setting can be determined using a reference tone as follows:

• If the key press tones are enabled (see Section 4.6) and if so programmed, a short tone sounds when an option switch is pressed or the Select switch is pressed or rotated.

• If a conventional channel is selected, take the microphone off-hook and if someone is talking, voice may be heard. If the MON (Monitor) option switch is programmed (see Section 5.2), pressing it unsquelches the radio and either voice or background noise is heard. If a SMARTNET/SmartZone or P25 trunked channel is selected, the radio cannot be manually unsquelched.

The minimum volume level that the volume control can select can be programmed. This can be used to prevent missed messages caused by unintentionally turning the volume down too far. Relative levels of 0-255 can be set in steps of 1 ("0" sets the lowest minimum volume).

Note   *This setting is applicable to Viking mobile radios with Viking Remote Control Heads.*

3.1.1.2   Unprogrammed Tones

The Viking mobile radio can be programmed so that it will not play a tone in the following cases:

• Unprogrammed button pressed.

• Unprogrammed toggle switch activated.

• Switched to an unprogrammed channel.

3.1.1.3   Standard and Soft Power Down

To turn power off, press the ON-OFF/Volume knob.

A Soft Power Down feature can be programmed to prevent radio power from being turned off by accidentally pressing the on-off/volume knob. The display message portion of the display stops updating. The user is able to receive, transmit, and use function buttons, but the display message will not change. If the channel is changed the Zone/Channel indication will update.

The user can power the radio completely down by pressing the option button programmed for this purpose (F2, F6, or Select button).

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If the user presses the ON/OFF/Volume knob while soft is in effect, the radio returns to full power up operation.

3.1.2   Persistent Settings

Settings retained through power cycle of the Viking mobile radios include.

Global Persistent Settings
  Scan
  Radio Wide Scan
  Secure
  Tones
  Tx Power
  Radio Inhibit
  Keypad Lockout
Conventional Persistent Settings
  Selective Squelch
  Repeater Talk Around
  Display / Information
  Disable Call Guard
P25 Trunking Persistent Settings
  Dynamic Regrouping
  Site Lock
SmartNet/SmartZone Persistent Settings
  Dynamic Regrouping
  Site Lock

3.1.3   Power-Up Password

The power-up password feature prevents unauthorized use of the radio by requiring that a four to twelve digit password be entered to make it operational. This feature is enabled or disabled by programming.

When it is enabled, "ENTER PSWD" (Standard Control Head) or "Enter Password" (Lightning Control Head) is briefly displayed when power is turned on, the four to twelve digit numeric password must be entered by pressing and rotating the Select switch. A single beep sounds when the switch is pressed (if that option is enabled). If an incorrect password is entered, "INCORRECT" is displayed and it must be re-entered.

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The current User password can be changed if the "Change User Password" function is programmed. Selecting this function displays prompts for entering and confirming a new password.

Note   *Standard Control only allows up to a ten digit password while Lightning Control Head allows up to a twelve digit password.*

3.1.3.1   Programming Passwords

Passwords are set by programming. The applicable radio must be connected to the computer and powered up to program the password.

Note   *Any password changes made to the radio will be immediately applicable when Password Management is exited.*

3.1.3.2   Lost Passwords

If a password is lost, contact customer service.

3.1.3.3   Changing Passwords

An assigned user password can be changed by the user if the Change User Password function is programmed. Selecting this function displays prompts for entering and confirming a new password.

3.1.3.4   Password Entry Procedure

When a password is requested, rotate and press the Select switch. A single beep sounds when the switch is pressed (if that option is selected)

3.1.3.5   Zone Password

A zone password can be programmed with the Viking mobile radio. It prevents unauthorized reprogramming of zones by keypad programming.

Note   *The programming and usage of this password has not changed. It is independent from the preceding passwords, and is set by programming.*

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3.1.4   Speaking into the Microphone

For best results, hold the microphone about 1-2 inches from your mouth and speak at a
normal conversational level. Do not shout since it distorts your voice and does not
increase range.

Note   *If excessive background noise consistently interferes with communications, Microphone
Levels can be adjusted by programming.*

Make sure that the PTT (push-to-talk) switch is pressed before you begin to speak and
released as soon as the message is complete.

3.1.5   Display Backlight Control

If the Backlight function is programmed, it can be used to select Bright, Dim, or Off
backlight modes. Otherwise, the keypad and display backlight is fixed in one of these
modes by programming. The backlight is totally disabled when the Surveillance mode is
programmed (see Section 4.10).

3.1.6   Display Viewing Angle & Contrast Adjust (Standard Control Head Only)

If the display on the standard head is difficult to read from the angle you normally view it,
the viewing angle can be adjusted as follows: Press and hold F2 and F6 to enter angle
change mode. If you do not rotate the select switch for three seconds, it times out and goes
back to zone or channel change.

Note   *If the display appears blank or all icons are continuously displayed, the viewing angle is
probably improperly adjusted.*

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3.1.7   Zone / Channel Display and Select

The selected zone is shown on the radio display (Figure 3.1). When selected by the Zone/Channel switch (see Section 3.1.7.1), the select bar will display above the Zone Number. In addition, the alias text identifier for the selected zone will be shown on the display screen.

Figure 3.1   Zone Display

Zone Select Indicator

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Zone Identifier Alias   Zone   Channel
                              Number   Number
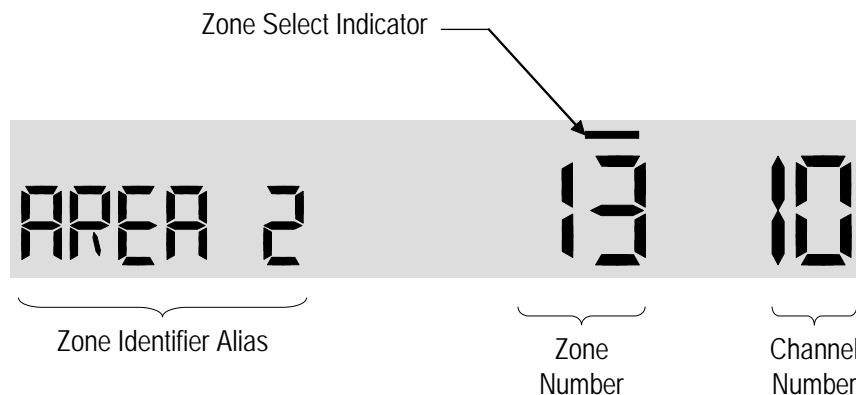
Similar to the selected zone, the selected channel is shown on the radio display (Figure 3.2). When selected by the Zone/Channel switch (see Section 3.1.7.1), the select bar will display above the Channel Number. In addition, the alias text identifier for the selected channel will be shown on the display screen.

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Channel alias can be a combination of zone and channel aliases. With conventional channels, the channel frequency may be displayed instead of the alias if the Display Information function is programmed (see Section 5.8).

Figure 3.2   Channel Display
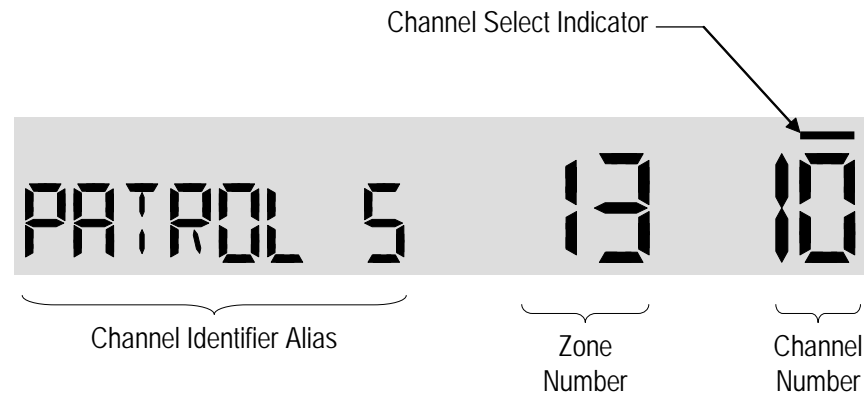
If channel scanning is enabled, the channel number will change to show the current active channel being scanned. The Channel Identifier Alias will also change to identify the current active scanned channel.

3.1.7.1   Zone / Channel Select

The front panel Select switch is used to change the zone and channel. Pressing this switch toggles between the zone and channel select modes, and rotating it changes the zone or channel. An optional beep can be programmed to sound when the switch is pressed or the channel is changed.

The current mode is indicated by the bar over the zone or channel display. For example, when the bar is over the zone display, the zone select mode is enabled.

Rotating the Select switch clockwise increases the zone or channel and rotating it counterclockwise decreases the zone or channel number. A single beep sounds when the channel is changed (if that option is enabled). After the highest zone or channel is displayed, wrap-around to the lowest zone or channel occurs and vice versa. If an unprogrammed channel is selected, "UNPROGRAMD" is displayed and a tone sounds. The radio may also be programmed so that only programmed channels are selected.

The radio can be programmed so that the bar defaults to either the zone or channel display when power is turned ON and after a change is made. The delay that occurs before it returns is programmed for 0-99 seconds. It can also be programmed to remain in the last selected mode.

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3.1.7.2   Direct Channel Select

The direct Channel Select feature is available if the Channel Select option switch or menu parameter is programmed. This feature allows channels to be directly selected using the Digital Keypad Microphone. Please note that a Digital Keypad Mic is required for Direct entry.

For direct selection purposes, channels are numbered sequentially starting with the lowest zone. Each zone can be programmed with up to 255 channels with up to 2048 channels total.

Seq. Ch. No.	Zone	Channel
1 ↓ 255	1	1 ↓ 255
256 ↓ 510	2	256 ↓ 510
511 ↓ 765	3	511 ↓ 765
. . 2048	. . .	. . 2048*

Proceed as follows to select channels using this mode:

1 Enable the direct Channel Select mode selecting it via the menu or by pressing the Channel Select option switch. A single beep sounds when the switch is pressed (if that option is enabled). The alias and sequential number of the current channel are alternately displayed.

2 Select the desired channel using the channel select knob or directly enter it using the 0-9 keys. A single beep sounds when the channel is changed (if that option is enabled). If using the 0-9 keys, the radio attempts to display the entered number after the third digit is entered or approximately two seconds after the last key is pressed.

3 To exit this mode and select the entered channel, press the Channel Select switch again. This mode is also exited automatically without changing the channel after approximately one minute of no activity.

Other features of this mode are as follows:

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- When using the Channel Select knob, wrap-around to the lowest zone/channel occurs after the last channel in the highest programmed zone is displayed and vice versa. For example, if Zone 1/Channel 5 is the highest programmed channel, wrap-around occurs after Zone 1/Channel 16 is displayed if the "Programmed Channels Only On Display" is not selected. If "Programmed Channels Only on Display" is selected, the wrap around occurs at Channel 5.

- When an unprogrammed channel is displayed, the sequential channel number and "UNPROGRAMD" are alternately displayed.

- If an invalid channel number is entered using the 0-9 keys, or the Channel Select option switch is pressed with "UNPROGRAMD" displayed, an error tone sounds, "INVALID" is briefly displayed, and the displayed channel does not change.

3.1.8   Setting Squelch Control

The user can program a menu item, soft button item (Lightning Control Head only), or function button, for squelch adjust. While on a conventional analog channel without emergency or scan active, the user can select the programmed button or menu item for squelch adjust. The current squelch setting will show on the display. Using the up and down navigation buttons, or turning the rotary knob clockwise or counter-clockwise on the mobile radio, the user can adjust the squelch setting to a desired level from -7 to +7. Increasing the value towards +7 causes the squelch to open sooner for weaker signals while decreasing towards -7 has the opposite effects. Pressing the select button will store the new squelch setting and return the user to the main display.

The squelch level is preset and may not require readjustment. However, if the squelch threshold needs to be changed on a conventional analog channel, it can be changed in the same way as though using keypad programming if available (see Section 5.14).

Note   *The Keypad programming feature is available to Federal Government users only.*

3.1.9   Zone Edit

Users can build a virtual zone consisting of channels already present in the radio. They can add or remove channels from zones while the radio is running, allowing changes to be made at runtime.

The Zone Edit feature can be programmed. It can be toggled on or off on a per-zone basis. When enabled, it allows you to copy and delete existing channels from a zone.

Only channels within Zone Edit enabled zones can be selected for editing.

- Zone Edit mode can be entered via button press or the menu.
- A momentary button press performs channel copy.

• A press-and-hold performs channel delete.

To copy a channel:

1 Navigate to the channel and select "channel copy".

2 Select the destination, first the zone and then the channel.

3 These can be selected by the navigation pad or using direct entry.

4 If the destination channel exists, it is overwritten without warning.

When deleting a channel, first select a zone and then the channel to delete.

There are a number of restrictions in place to prevent you from causing problems with the existing radio configuration. If you want to copy or delete a channel that is blocked by one of these restrictions, the radio programming software can be used to make the change. (Please contact your system administrator.)

Condition	Copy Allowed?	Delete Allowed?
The destination channel is the current channel	No	No
The selected zone is full (255 Channels)	No	Yes
The radio has no free channels	No	Yes
The channel is a fire mode channel	No	No
The channel is a scan list channel	No	No
The channel is a RWS list channel	No	No
The channel is a global emergency channel	No	No

3.1.10   Transmit Disable

Transmitting can be disabled on each conventional, SMARTNET, SmartZone, and P25 Trunking channel so that the channel is monitor-only. When transmitting is attempted on a receive-only channel, "RX ONLY" (Standard Control Head) or "Receive Only" (Lightning Control Head) is displayed and an error tone sounds.

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3.1.11　Operation At Extended Range

When approaching the limits of radio range, the other party may not be able to hear your transmissions and there may be an increase in background noise when messages are received. You may still be out of range even though you can hear a message. The reason for this is that the signal you are receiving is usually transmitted at a higher power level than the one transmitted by your radio. Communication may be improved by moving to higher ground or away from shielding objects such as tall buildings or hills.

The radio can be programmed to provide an out-of-range indicator when used on an EFJohnson Infrastructure system. For more information, please see Section 5.13.4.

3.1.12　Preventing Vehicle Battery Discharge

In the standby mode (power on, not transmitting), radio power consumption is relatively low. Therefore, you can probably leave the radio ON for one or two days without operating the vehicle and the battery should not become seriously discharged. However, if the outdoor temperature is low enough to significantly decrease battery capacity, the radio should be turned OFF when not in use. Also if display is on "high" and you are receiving calls, the battery charge can drain in less than a day.

Since power consumption is significantly higher when transmitting, it is good practice to have the vehicle running while transmitting. This ensures that optimum power is being delivered to the radio and that the battery does not become discharged.

3.1.13　Cleaning the Control Head

The radio Control Head requires periodic cleaning, depending upon the operating environment.

You will need a soft brush of a size that can access all exposed areas of the Control Head. You will also need a vacuum cleaner that is portable enough to easily access the Control Head.

To clean the Control Head:

1　Use the brush to remove the bulk of sand and dust from the Control Head.

⚠ **CAUTION**　*Ensure that this is done in an environment that does not allow other equipment to be affected by the removed sand and dust. If necessary, use the vacuum to collect material as it is removed.*

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2   When the bulk of sand and dust is removed, use the brush to clean the interface joint between the buttons and Control Head plastic.

3   Position the vacuum nozzle two inches (or more, as required) from the face of the Control Head. Use the brush to remove any remaining sand and dust.

4   Repeat this procedure until the Control Head is completely clean.

3.1.14   Radio Service

If "UNPROGRAMD" is displayed, the cause can be any of the following:

• An unprogrammed channel is selected. Select a programmed channel.

• The selected channel is programmed for an option that is not installed or an error in programming was detected. Contact your system operator for service.

If the channel is programmed for a system type not programmed, "DISABLED" is displayed.

If no characters or all characters appear in the display, the viewing angle may be improperly adjusted. If some other problem is occurring, turn power OFF and then ON again to reset the control logic. Also make sure that the controls are properly set and that the power, external speaker, and accessory cables (if used) are securely plugged into the back of the radio.

If the radio is completely inoperative, check the Main power and ignition sense line fuse. If it is blown, remedy the cause if possible and replace it with the same type (1A, 15A). If the radio still does not operate properly, return it to your system operator for service.

Note   *There are no user-serviceable components in the radio. Altering internal adjustments can cause illegal emissions, void the warranty, and result in improper operation that can seriously damage the radio.*

Note   *If the vehicle itself needs to be jump started, the mobile fuses must be pulled before jump starting to prevent damage to the radio!*

3.2   Single Touch

The Single Touch feature allows a Viking radio user to send a predefined Status, Message, Call Alert, Unit Call, or Interconnect Call by pressing and holding a button. For each system, up to four buttons in Armada can be programmed for Single Touch. The Single Touch feature allows a user to bypass the menu and PTT to send a Status, Message, Call Alert, Unit Call, or Interconnect Call. A maximum of four buttons are programmable to

the radio per system and zone. The Single Touch buttons are press and hold buttons preventing a user from sending statuses, messages, and calls by accident. On a Single Touch button press, the radio displays two dual temp messages; the first displays which Single Touch button was pressed along with the press and hold message. The second displays the Alias and the ID/Phone Number (If applicable – for Status and Message only the Alias is displayed since neither has an ID).

3.2.1   Single Touch Buttons

1   The Single Touch buttons are activated on a press and hold which will be in the range of 0.5 to 2.5 seconds. This is set in Armada.

2   Both physical and soft buttons may be used for Single Touch, but it is not available as a menu item.

3   If a Single Touch button is pressed, or pressed and held, but the Feature combo box is set to Disabled, then "Disabled" is displayed along with a short bad beep tone.

4   The supported Single Touch functions for each system are shown below.

Function	Supported Functions			Specific Entry Type
	Conventional	P25 Trunking	Smartnet / Smartzone	
Disabled	✓	✓	✓	-
Unit Call	✓	✓	✓	Call List
Call Alert	✓	✓	✓	Call List
Status	✓	✓	✓	Status List
Message	✓		✓	Message Aliases List
Interconnect Call		✓	✓	Phone List

3.2.2   Detailed Single Touch Operation

The following describes how each supported Single Touch function operates, and how it varies slightly from system to system. As a note, only Digital conventional channels support Single Touch. If a Single Touch button is used on an Analog Conventional channel, the temporary message "Analog" is displayed.

3.2.2.1   Conventional Unit Call

This is the only function that requires the user to press the PTT to send the call.

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To Send a Single Touch Unit Call

1 Press and Hold the Single Touch button assigned to Unit Call.

2 The Unit ID to call is displayed on the top line with the Alias displayed on the bottom line.

3 To send the call, press the PTT button.

4 The operation will now continue the same as Unit Call.

5 To exit the call, either press the Clear button or the Single Touch button pressed for entry.

To Answer a Unit Call Using Single Touch

1 When the radio is receiving an incoming call, press and hold the Single Touch button assigned to Unit Call.

2 The PTT button must then be pressed to answer.

3 Once the PTT button has been pressed the operation continues the same as the normal Unit Call.

4 To exit the call, either press the Clear button or the Single Touch button assigned to Unit Call.

3.2.2.2   Conventional Call Alert

1 To use Call Alert, the Call Alert Encode option must be checked in **Armada** under **Systems (Conventional) → General Options → P25 Conv System Options**.

2 Without this checked a bad tone will sound on a press and hold.

3 To send a Call Alert, press and hold the Single Touch button assigned to Call Alert.

4 While sending the Call Alert, the Unit ID of the radio the alert is being sent to is displayed on top along with the alias on the bottom line.

5 Once a Call Alert has been sent operation continues the same as the normal Call Alert.

6 To exit the call alert, either press the Clear button or the Single Touch button assigned to Call Alert.

3.2.2.3   Conventional Status

1 To send a Status, press and hold the Single Touch button assigned to Status.

2   While sending a Status, the alias of the Status being sent is displayed.

3   Once the Status has been sent operation continues the same as the normal Status with the exception being that only the PTT may be used to resend the Status while the transmission is still active.

4   Once the status transmission is successful or fails, a success or failure message is displayed.

5   After a success or failure, the radio will exit the status mode.

6   To exit before the Status finishes, either press the Clear button or the Single Touch button assigned to Status.

3.2.2.4   Conventional Message

This is the same operation as Conventional Status except that a Message is being sent.

1   To send a Status, press and hold the Single Touch button assigned to Message.

2   While sending a Status, the alias of the Message being sent is displayed.

3   Once the Message has been sent operation continues the same as the normal Message with the exception being that only the PTT may be used to resend the Message while the transmission is still active.

4   Once the Message transmission is successful or fails, a success or failure message is displayed.

5   After a success or failure, the radio will exit the Message mode.

6   To exit before the Message finishes, either press the Clear button or the Single Touch button assigned to Message.

3.2.2.5   P25 Unit Call

In Armada the Unit Call can be set to Standard or Enhanced. Single Touch supports both and they each operate the same as a normal Standard or Enhanced Unit Call. To answer a unit call the PTT needs to be pressed after the Single Touch button is pressed and held.

To Send a Single Touch Unit Call

1   To send a Unit Call, press and hold the Single Touch button assigned to Unit Call.

2   For the radio to send, the Unit Call Usage in Armada under Systems(P25) → Lists → Call Settings must be set to Unlimited or List Only.

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3   If it is set to Disabled or Response Only; when the Single Touch button is pressed and held the radio will display "Disabled", "RSPNS ONLY" (Standard Control Head), or "Response Only" (Lightning Control Head)

4   Once the Unit Call has been sent, operation continues as normal for Unit Call.

5   The alias of the radio being called followed by "wait" will be displayed.

6   If the radio called does not answer, a time-out message is displayed. When this is displayed any key on the radio exits the Unit Call.

7   To exit the call either press the Clear button or the Single Touch button assigned to Unit Call.

To Answer a Unit Call Using Single Touch

1   When receiving a Unit Call, press and hold the Single Touch button assigned to Unit Call.

2   Then press the PTT button to answer the Unit Call.

3   For the radio to receive, the Unit Call Usage in Armada under Systems(P25) → Lists → Call Settings must be set to Response Only, List Only, or Unlimited.

4   Once the received Unit Call is active, operation continues as normal for Unit Call.

5   The alias of the calling radio will be displayed.

6   To exit the call either press the Clear button or the Single Touch button assigned to Unit Call.

3.2.2.6   P25 Call Alert

1   To send a Call Alert, press and hold the Single Touch button assigned to Call Alert.

2   For the radio to send the Call Alert, the Call Alert Usage in Armada under Systems(P25) → Lists → Call Settings must be set to List Only or Unlimited.

3   Once the alert is sent, operation continues as normal for Call Alert.

4   After finishing either an Ack Received message or a No Ack message is displayed and Call Alert is exited.

5   To exit before those messages either press the Clear button or the Single Touch button assigned to Call Alert.

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3.2.2.7   P25 Status

1 To send a Status, press and hold the Single Touch button assigned to Status.

2 The Status alias programmed to Single Touch is displayed for one second.

3 Either an Ack Received message or a Status Fail message is displayed after the Status has been sent.

4 Once the Status is sent, operation continues as normally would in a Status. For example the same buttons are available for use as they would be by sending a Status through the menu.

5 The Status is not able to be exited while sending unless it is canceled by another function. The user must wait for the Ack or the Fail message.

3.2.2.8   P25 Interconnect

1 To start an Interconnect Call, press and hold the Single Touch button assigned to Interconnect.

2 The alias of the phone number being called will be displayed.

3 Once the call is started through Single Touch, operation continues as normal for Interconnect Call.

4 To exit the call either press the Clear button or the Single Touch button assigned to Interconnect.

5 To answer an Interconnect Call with the Single Touch button press and hold it.

6 Once pressed and held the incoming call will be answered and operation will continue as would on a normal Interconnect Call answer.

3.2.2.9   SNSZ Unit Call

In Armada the Unit Call can be set to Standard or Enhanced. Single Touch supports both and they each operate the same as a normal Standard or Enhanced Unit Call. To answer a unit call the PTT needs to be pressed after the Single Touch button is pressed and held.

To Send a Single Touch Unit Call

1 To send a Unit Call press and hold the Single Touch button assigned to Unit Call.

2 For the radio to send, the Unit Call Usage in Armada under Systems (Smartnet/ Smartzone) → Lists → Call Settings must be set to Unlimited or List Only.

3   If it is set to Disabled or Response Only; when the Single Touch button is pressed and held the radio will display "Disabled", "RSPNS ONLY" (Standard Control Head), or "Response Only" (Lightning Control Head).

4   The alias of the radio being called will be displayed.

5   The operation will now continue the same as a normal Unit Call.

6   If the radio called does not answer, a no ack message is displayed. When this is displayed any key on the radio exits the Unit Call.

7   To exit the call either press the Clear button or the Single Touch button assigned to Unit Call.

To Answer a Unit Call Using Single Touch

1   When receiving a Unit Call, press and hold the Single Touch button assigned to Unit Call.

2   Then press the PTT button to answer the Unit Call.

3   For the radio to receive, the Unit Call Usage in Armada under Systems (Smartnet/ Smartzone) → Lists → Call Settings must be set to Response Only, List Only, or Unlimited.

4   Once the received Unit Call is active, operation continues as normal for Unit Call.

5   The alias of the calling radio will be displayed.

6   To exit the call either press the Clear button or the Single Touch button assigned to Unit Call.

3.2.2.10   SNSZ Call Alert

1   To send a Call Alert, press and hold the Single Touch button assigned to Call Alert.

2   For the radio to send the Call Alert, the Unit Call Usage in Armada under Systems (Smartnet/Smartzone) → Lists → Call Settings must be set to List Only or Unlimited.

3   The Unit ID the radio is sending to is shortly displayed followed by the wait message until an Ack or No Ack message is displayed.

4   Once the alert is sent, operation continues as normal for Call Alert and all buttons that are available in Call Alert are available in Single Touch Call Alert.

5   To exit before those messages either press the Clear button or the Single Touch button assigned to Call Alert.

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3.2.2.11   SNSZ Status

1   To send a Status, press and hold the Single Touch button assigned to Status.

2   The Status alias programmed to Single Touch is displayed for one second.

3   Either an Ack Received message or a Status Fail message is displayed after the Status has been sent.

4   Once the Status is sent, operation continues as normal for Status.

5   The Status is not able to be exited while sending unless it is canceled by another function. The user must wait for the Ack or the Fail message.

3.2.2.12   SNSZ Message:

This is same operation as Smartnet/Smartzone Status except that a Message is being sent.

1   To send a Message, press and hold the Single Touch button assigned to Message.

2   The Message alias programmed to Single Touch is displayed for one second.

3   Either an Ack Received message or a Message Fail message is displayed after the Message has been sent.

4   Once the Status is sent, operation continues as normal for Message.

5   The Message is not able to be exited while sending unless it is canceled by another function. The user must wait for the Ack or the Fail message.

3.2.2.13   SNSZ Interconnect:

1   To start an Interconnect Call, press and hold the Single Touch button assigned to Interconnect.

2   The alias of the phone number being called will be displayed.

3   Once the call is started through Single Touch, operation continues as normal for Interconnect Call.

4   To exit the call either press the Clear button or the Single Touch button assigned to Interconnect.

5   To answer an Interconnect Call with the Single Touch button press and hold it.

6   Once pressed and held the incoming call will be answered and operation will continue as normal for Interconnect Call.

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3.3   Radio Inhibit

The radio can receive inhibit commands over the air or through the side port. When the radio receives an inhibit command the screen goes blank, audio stops, lights turn off, and most of the controls are disabled. The radio is (from the user's perspective) frozen. Behind the scenes, however, the radio is still running. It is waiting for an uninhibit command. If it receives an uninhibit command, the radio User Interface is enabled and the radio will operate normally. The general idea behind the feature is fairly simple but there are exceptions.

• Smartport cannot be used to uninhibit a radio. (Unless an "Allow Uninhibit with RSD" security policy is on the radio)

• If the radio is rebooted while inhibited, the radio is forced to power up on the channel it was inhibited on.

• When powering up while inhibited, the backlight and LED will not come on.

• When powering down while inhibited, the display will not display "Powering Down".

• In conventional mode, the radio waits until the inhibit/uninhibit acknowledgement is sent before becoming inhibited/uninhibited. This is important mainly for uninhibit where a race condition existed between the ack being sent and rebooting. If the radio cannot send the ack, the system will need to retry the inhibit/uninhibit command.

3.4   Setting Squelch

The user can program a menu item, soft button (Lightning Control Head only), or function button, for squelch adjust. While on a conventional analog channel without emergency or scan active, the user can select the programmed button or menu item for squelch adjust. The current squelch setting will show on the display. Using the up and down button on the Navigation Pad (Lightning Control Head Only) or rotating the select knob on the mobile radio, the user can adjust the squelch setting to a desired level from -7 to +7. Increasing the value towards +7 causes the squelch to open sooner for weaker signals while decreasing towards -7 has the opposite effects. Pressing the select button will store the new squelch setting and return the user to the main display.

The squelch level is preset and may not require readjustment. However, if the squelch threshold needs to be changed on a conventional analog channel, it can be changed in the same way as though using keypad programming if available. The squelch level is preset during alignment. If the keypad programming feature is available (see Section 5.14), the squelch threshold can be changed by the user on each conventional analog channel.

Note   *The Keypad Programming feature is available to Federal Government users only.*

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3.5   Operating Modes

Each selectable channel can be programmed for the conventional (analog or Project 25 digital), SMARTNET/SmartZone, or Project 25 digital trunking operating mode. For example, Zone 1/Channel 1 could be a conventional channel, Zone 1/Channel 2 a SMARTNET channel, and so on. More information on these modes follows.

Note   *All operating modes utilize certain functions that are activated/deactivated by pressing and holding a particular button or switch. The "hold" interval is preset. When instructed to "press and hold", do so until the desired action occurs or a tone sounds indicating the option is activated. For other operations (not specified "press and hold") only momentary pressing is required.*

3.5.1   Conventional Mode

This is a non-trunked operating mode which accesses independent radio channels. There is no automatic access to several channels. Selecting a conventional channel selects a transmit and receive frequency and other channel parameters such as squelch control coding.

Conventional channels can be either standard (analog), Project 25 (digital), or mix mode. With digital operation, the DSP (Digital Signal Processor) converts the audio signal to digital data packets. Another difference is that analog channels use Call Guard (CTCSS/ DCS) squelch control and Project 25 channels use a NAC (Network Access Code) and talkgroup ID codes.

With Project 25 operation, a NAC is transmitted which must match the NAC programmed in the repeater or base station equipment and the radio(s) being called for communication to occur. In addition, to receive standard group calls, the receiving radio must be programmed to detect the transmitted talkgroup ID code.

With conventional operation, a busy channel condition is detected automatically if the busy channel lockout (transmit disable on busy) feature is programmed. Otherwise, it must be detected manually. If the Out of Range indicators are not programmed, an out-of-range condition is not indicated by special tones or messages as with trunking operation because there is no initial data exchange with the repeater that allows this condition to be detected. (For more information about Out of Range indicators, please see Section 3.1.11.) Operating features unique to conventional channels are described in Section 5.

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3.5.2 SMARTNET / SmartZone Mode

This is a trunked operating mode in which automatic access is provided to several RF channels. ID codes are used to select what radios are being called and what calls are received. Monitoring is performed automatically and special messages and tones indicate busy and out-of-range conditions.

SMARTNET and SmartZone operation and programming is very similar. Basically, SMARTNET operation is limited to a single repeater site and SmartZone operation allows automatic roaming between sites. SMARTNET/SmartZone features include roaming (SmartZone only), telephone, unit, emergency calls, Call Alert™, and messaging. Either analog or digital signaling may be used. Enhanced SMARTNET/SmartZone features provide the same, plus gives you responses from the system. For example, if the ID you are calling is turned OFF, the system will display "NOT AVAILABLE".

When a SMARTNET or SmartZone channel is selected or the radio is powered up on one of those channels, it searches for a control channel. While searching, the alias (name) of the selected channel is displayed and the radio attempts to register on the trunked system. If a control channel could not be found (because of an out of range condition or the system ID is not correct, for example), "NO SYS" (early units) or "OUT OF RNG" (later units) is displayed and the radio continues to search for a control channel.

The control channel transmits and receives system information to and from all radios registered on the system. Therefore, once a control channel is found, it is continuously monitored for incoming call information and is used to make call requests. When the radio is keyed, a channel grant request is sent through the control channel. The system then informs the requesting radio what traffic channel to use, through the control channel. Once the request is granted by the system, the radio moves to the designated traffic channel for the actual talkgroup call. Once the transmission has ended, the radio returns to the control channel.

Operating features unique to SMARTNET/SmartZone channels are described in Section 6.

3.5.3 P25 Trunking Mode

The P25 Trunking operating features are very similar to the SmartZone type just described. Since SmartZone features are also similar to SMARTNET features, all three modes are described in Section 6. Some differences between the P25 Trunking and SmartZone modes are as follows:

- Digital signaling is always used with P25 calls. Either analog or digital signaling may be used for SmartZone calls.

- Calls made to a specific radio in the P25 mode are called Unit Calls. In the SMARTNET/SmartZone mode they are also called Unit Calls.

- Telephone calls are available in this mode.

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- The P25 control channel data rate is 9600 baud and the digital voice data rate is also 9600 baud. With SmartZone operation, the control channel data rate is 3600 baud (both digital and analog calls) and the narrowband digital voice data rate is 9600 baud.

- The P25 mode uses a system ID, Wide Area Communications Network (WACN) ID, and RF Subsystem ID (RFSS). The SmartZone mode does not use the WACN and RFSS IDs.

- P25 Unit IDs can be 1-16,777,211 (000001-FFFFFB hex) and SmartZone Unit IDs can be 1-65,534 (0001-FFFE hex).

3.5.4   Systems, Channels, and Zones

A zone and channel are selected to place and receive calls. The following describes the relationship between systems, channels, and zones.

3.5.4.1   Systems

A system is a collection of channels or talkgroups belonging to the same repeater site. It defines all the parameters and protocol information required to access a site. Up to 255 systems of any type can be programmed depending on the option enabled.

The maximum number of channels assignable to a system is limited to 2048. Channels may also be limited by radio limitations, programmed options, and/or available memory space as described in the following information.

3.5.4.2   Channels

A channel selects a radio (RF) channel or talkgroup as follows:

Conventional Analog Mode - A channel selects a specific radio channel, Call Guard (CTCSS/DCS) squelch coding, and other parameters unique to that channel.

Conventional Project 25 Mode - A channel selects a specific radio channel, NAC squelch coding, talkgroup ID, and other parameters unique to that channel.

SMARTNET/SmartZone and Trunked Project 25 Modes - A channel selects a specific talkgroup/announcement group, emergency group, and other parameters unique to that talkgroup.

A maximum of up to 2048 channels can be programmed with the preceding modes depending on the option enabled. These channels can belong to a single system or multiple systems.

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3.5.4.3   Zones

A zone is a collection of up to 255 channels of any type. For example, a zone could include 12 conventional channels and four P25 Trunking channels. One use of zones may be to program the channels used for operation in different geographical areas. The maximum number of zones is 255.

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4

Radio Wide Features

Radio wide features are features common to all operating modes.

4.1   Option Buttons

Six option buttons on the front panel (one is located to the left of the display) can be programmed to control a different set of functions for each of the three operating modes. Therefore, up to 24 different functions can be controlled by these buttons (six each for Conventional, SMARTNET/SmartZone, and P25 Trunking).

Figure 4.1   Option Buttons

Left Up Left Down   F2   F3   F4   F5   F6   F1   4-Way
                                                                                          Navigation Pad
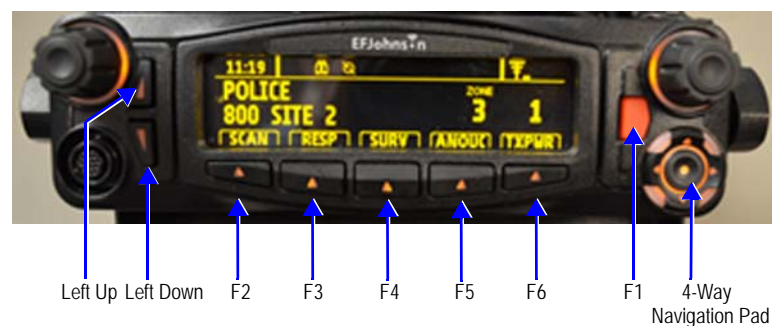
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The available functions in each mode are shown in Table 4.1

Table 4.1 Programmable Option Button, Soft Button, and Menu Mode Functions

Function	X = Available in Mode:				Menu Display (Standard Control Head)	Menu Display (Lightning Control Head)	Soft Button Display (Lightning Control Head)
	Conventional	Project 25 Trunking	SMARTNET	SmartZone			
Alert tones	X	X	X	X	TONES	Tones	TONE
Analog Noise Reduction	X		X	X	ANALOG NR	Analog Noise Rd	ANR
Authentication Keyload		X			AUTH KEY	Auth Keyload	AUTH
Auto Site Search		X	X	X	AUTO SITE	Auto Site	SITE
Backlight Bright/Dim/Off	X	X	X	X	BACKLIGHT	Backlight	BKLHT
Call Alert (Paging)	X	X	X	X	CALL ALERT	Call Alert	ALERT
Call Response		X	X	X	CALL RESP.	Call Response	RESP
Cancel Dynamic Regroup		X	X	X	CANCEL DR	Cancel Dyn Rgrp	CANDR
Change Keyset	X	X	X	X	CHG KEY-SET	Change Key-set	KYSET
Change User Password	X	X	X	X	PASSWORD	Password	PSWD
Channel Announcement	X	X	X	X	CHAN ANNCMNT	Chan Announce	ANNCH
Channel Select	X	X	X	X	CHAN SELCT	Channel Select	CHAN
Clear/Secure Encryption Select	X	X	X	X	SECURITY	Security	SECR
Clock	X	X	X	X	CLOCK	Clock	CLOCK
Disable Call Guard	X				DISABLE CG	Disable CG	DISCG
Display GPS	X	X	X	X	DISPLAY GPS	Display GPS	GPSDP
Display Information	X				DISPLAY	Display	DISP
Emergency Mode	X	X	X	X	EMER-GENCY	Emergency	EMER
Emergency Clear	X	X	X	X	EMERG CLR	Emergency Clear	EMCLR
Erase Keys	X	X	X	X	ERASE KEYS	Erase Keys	KYCLR
Function Recall	X	X	X	X	FUNC RCALL	Function Recall	FRCAL
GPS	X	X	X	X	GPS	GPS	GPS
High/Low Power	X	X	X	X	TX POWER	Tx Power	TXPWR
Home	X	X	X	X	HOME	Home	HOME

Shaded Features support the secondary press and hold function.

Table 4.1   Programmable Option Button, Soft Button, and Menu Mode Functions

Function	X = Available in Mode:				Menu Display (Standard Control Head)	Menu Display (Lightning Control Head)	Soft Button Display (Lightning Control Head)
	Conventional	Project 25 Trunking	SMARTNET	SmartZone			
Home 2	X	X	X	X	HOME 2	Home 2	HOME2
Horn Honk	X	X	X	X	HORN HONK	Horn Honk	HORN
Key Select	X	X		X	KEY SELECT	Key Select	KYSEL
Keypad Programming	X				KEYPAD PRG	Keypad Program	KPPRG
Message	X	X	X	X	MESSAGE	Message	MSG
Mic To PA	X	X	X	X	MIC TO PA	Mic To PA	MICPA
Monitor Mode	X				MONITOR	Monitor	MON
Mute/Unmute	X	X	X	X	AUDIO MUTE	Audio Mute	MUTE
Normal/Selective Squelch	X				SQUELCH	Squelch	SQUEL
OORI Tone	X				OORI TONE	OORI Tone	OORI
P25 Packet Data	X	X			P25 DATA	P25 Data	DATA
Phone Call	X	X	X	X	PHONE	Phone	PHONE
Priority Channel Select	X				PRIORITY	Priority	PRI
RWS List Edit	X	X	X	X	RWS EDIT	RWS Edit	RWSED
RWS List Select	X	X	X	X	RWS SELCT	RWS Selct	RWSLS
Radio Info	X	X	X	X	RADIO INFO	Radio Info	INFO
Radio Wide Scan	X	X	X	X	RW SCAN	RW Scan	RWS
Rekey Request	X	X			OTAR REKEY	OTAR Rekey	OTAR
Remote Access	X	X	X	X	RMT ACCESS	Remote Access	RMOTE
Repeater Talk Around	X				TALK ARND	Talk Around	RTA
Request to Talk	X				RTT	RTT	RTT
RX to PA	X	X	X	X	RX TO PA	Rx To Pa	RX PA
Scan Mode	X	X	X	X	SCAN	Scan	SCAN
Scan List Edit	X	X	X	X	SCAN EDIT	Scan Edit	SCNED
Scan List Select	X	X	X	X	SCAN SELCT	Scan Select	SCSEL
Single Tone Encoder	X				SNG TN ENC	Single Tone Enc	SNGTN
Single Touch 1	X	X	X	X			STCH1
Single Touch 2	X	X	X	X			STCH2
Single Touch 3	X	X	X	X			STCH3
Single Touch 4	X	X	X	X			STCH4
Shaded Features support the secondary press and hold function.							

Table 4.1 Programmable Option Button, Soft Button, and Menu Mode Functions

Function	X = Available in Mode:				Menu Display (Standard Control Head)	Menu Display (Lightning Control Head)	Soft Button Display (Lightning Control Head)
	Conventional	Project 25 Trunking	SMARTNET	SmartZone			
Site Lock		X		X	SITE LOCK	Site Lock	LOCK
Site Search		X		X	SITE SRCH	Site Search	SSRCH
Squelch Adjust	X				SQL ADJ	Squelch Adjust	SQLAD
Squelch Select List	X				SQLCH CODE	Squelch Code	SQSEL
Status	X	X	X	X	STATUS	Status	STS
Surveillance Mode	X	X	X	X	SURV MODE	Surv Mode	SURV
Talkgroup Lock	X				TG LOCK	TG Lock	TG LK
Talkgroup Select	X				SELECT TG	Select TG	TGSEL
Text Messaging	X				TEXT MSG	Text Message	TEXT
Tone Volume Edit - Alert	X	X	X	X	ALERT VOL	Alert Volume	AVOL
Tone Volume Edit - Keypress	X	X	X	X	KEYPRS VOL	Keypress Vol	KVOL
Two Tone Encoder	X				TWO TN ENC	Two Tone Enc	TWOTN
Two Tone Encoder	X				TWO TN ENC	Two Tone Enc	TWOTN
Unit Call	X	X	X	X	UNIT CALL	Unit Call	UCALL
Unprogrammed	X	X	X	X			
Voice Announcements	X	X	X	X	ANNOUNCE	Announce	ANOUC
Wi-Fi	X	X	X	X	WI-FI	Wi-Fi	WIFI
Zone Edit	X	X	X	X	ZONE EDIT	Zone Edit	ZONEE
Zone Select	X	X	X	X	ZONE SELCT	Zone Select	ZONE
Shaded Features support the secondary press and hold function.							

4.2   Menu Mode

To enter menu mode on the Viking mobile, press and hold the "Select" button.

To scroll through the items on the menu list, turn the select switch to the desired item.

To select the desired item, once again press the "Select" button. A single beep sounds when the switch is pressed (if that option is enabled).

For many radio features, *<F5>* performs as the "Back" button. In these features, to return to the previous screen press *<F5>*.

Some radio features use "Left" and "Right" action buttons. On the Lightning Control Head, these buttons are the left and right arrows on the 4-Way Navigation Pad. On the Standard Control Head *<F2>* performs as the "Left" button, and *<F3>* performs as the "Right" button.

To exit menu mode, press *<F6>*.

4.3   Time-Out Timer

The time-out timer disables the transmitter if it is keyed for longer than the programmed time. It can be programmed on each channel for times of 15 seconds to 3 minutes, 45 seconds or it can be disabled.

If the transmitter is keyed continuously for longer than the programmed time, the transmitter is disabled, a continuous tone sounds, and "TX TIMEOUT" is displayed. Five seconds before time-out occurs, a warning beep sounds to indicate that time-out is approaching. The timer and tone are reset by releasing the PTT switch.

A different time can be programmed for each system, and the timer can be enabled or disabled on each conventional channel. With conventional channels, a penalty time can also be programmed that prevents further transmissions for a certain time after the transmitter is disabled (see Section 5.5).

One use of this feature is to prevent a channel from being kept busy for an extended period by an accidentally keyed transmitter. It can also prevent possible transmitter damage caused by transmitting for an excessively long period.

4.4   Home Channel Select

If the HOME option switch is programmed, pressing it selects the preprogrammed home channel. This provides a quick way of returning to a frequently used channel. Pressing and holding this switch until a tone sounds makes the currently selected channel the new Home. A secondary Home, Home2, may also be programmed.

Note   *The radio can be optionally programmed so that Pressing and holding the Home option switch causes the radio to switch to the existing Home or Home 2 instead of making the current selection the new Home.*

Home Zone and Home Channel cannot be set to "Selected" simultaneously. The same applies for Home Zone 2 and Home Channel 2. If Home or Home 2 is set to "Selected," then Home Channel or Home Channel 2, respectively, will populate with channels 1 to 256.

4.5   Power Output Select

Each conventional channel, SMARTNET/SmartZone, and P25 Trunking system can be programmed for High, Low, or Switchable transmit power. If Switchable power is programmed on the channel or system, the Hi/Lo Power option switch can then be used to select high or low transmitter power. All models support switchable power. The low power level is typically 15 watts and the rated power output level of the radio at the high power level is typically 25 - 30 watts, depending on frequency band.

Pressing the Hi/Lo Power switch toggles the power setting. The new level is flashed in the display when this switch is pressed as "HI POWER" or "LOW POWER". If selectable power is not permitted on the current channel or system, the fixed power level is flashed and no power change occurs. The selected power level is permanent until it is manually changed again. The power levels are set at the factory or when the radio is tuned using the Viking Tune™ software.

4.6   Alert Tone Select

The various alert tones that sound are described in Section 9.1. These tones can be enabled and disabled if the TONE option switch is programmed. To turn all tones OFF, press this switch and "TONE OFF" is displayed. Then to turn all tones on again, press it and "TONE ON" is displayed. If this switch is not programmed, tones are fixed in the ON or OFF condition by programming. Alert tones can be disabled depending on programming. If the Surveillance mode is programmed (see following), tones are totally disabled.

The Alert Tone volume can be adjusted relative to the volume control setting. This is done by programming and also by the user if the Alert Tone Volume option switch is programmed. Relative levels of –170 to +170 can be set with "0" the default setting. The range is divided into the number of volume ticks set in "Volume Ticks". For example, if "Volume Ticks" is 10, the tone adjustment on the radio will go from 1 to 10. A minus value decreases the tone volume and a plus value increases it. The user adjusted level permanently overrides the programmed level if applicable.

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4.7   Ignition Power Down Duration

The radio can be installed so that the vehicle ignition switch as well as the front panel power switch of the radio control power. This is done by connecting the accessory cable ignition switch input to the vehicle ignition switch. Refer to the *Viking Mobile Radio Installation Manual* for more information. A Power Down Duration of up to 1,440 minutes can then be programmed, or this feature can be disabled by programming "Infinite" delay so that there is no automatic power-off.

Both the ignition switch and the power switch must then be on for radio power to turn on. The delay can be overridden at any time by turning power OFF using the front panel power switch or turning the ignition switch back ON.

This power down delay can allow calls to be received or the horn alert to be active for a time after the ignition switch is turned OFF. At the same time, advantages of ignition switch control are used such as preventing the battery discharge that may occur if the radio is left ON for an extended period.

4.8   Horn Alert

The horn alert feature sounds an external alert such as the vehicle horn when certain calls are received. It is available if a Horn option switch is programmed and the proper connection has been made to the external alert. The horn alert output is pin 4 of the accessory cable, and an external driver circuit of some type is usually required. Refer to the *Viking Mobile Radio Installation Guide* for more information on how to install this feature.

Additional information on the horn alert feature follows:

• It activates when receiving any Unit Call or Call Alert in the P25 conventional, SMARTNET/SmartZone, and P25 Trunking modes. It does not sound when receiving standard Group or telephone calls, and is not programmable on a per call basis.

• It must be manually enabled and disabled by the Horn option switch. It is not controlled by the vehicle ignition switch. When it is enabled, "HORN ON" is briefly displayed, and when it is disabled, "HORN OFF" is briefly displayed. It defaults to the OFF mode whenever power is turned on.

• If a power down duration is programmed as just described, it is functional during that delay.

• When activated, it can be programmed to sound for three 1-second beeps or continuously for 2 to 255 seconds. It then turns OFF until another Unit call or Call alert is received.

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4.9　Microphone Off-Hook Detect

The microphone hanger can be connected to chassis ground and the radio programmed to detect an off-hook condition (Hangup Box Monitor selected). The following operation then occurs when the microphone is taken off-hook:

Conventional Channel Selected - Scanning temporarily halts (if applicable) and the Monitor Mode described in Section 5.2 is enabled. However, the receiver unsquelches only if a carrier is detected.

SMARTNET/SmartZone/P25 Trunking Channel Selected - Scanning temporarily halts if applicable.

If the off-hook condition is not detected (Hangup Box Monitor not selected), the microphone hook state has no affect on radio operation.

4.10　Surveillance Mode

If the Surveillance mode is programmed, the backlight, all alert tones, and front panel LED indicator can be disabled individually or totally, based on programming.

The transmit/receive LED indicator, display and keypad backlight, and all alert tones can be disabled. When setting is enabled, the radio will power up in Surveillance mode with the selected options active. A function button can also be assigned which will activate and deactivate surveillance mode at the user's discretion. It overrides any other programming of these functions such as a Tone or Backlight option switch.

This feature can be turned ON and OFF by the user via menu selection or by the Surveillance Mode option button (if programmed). The user selected mode permanently overrides the programmed mode if applicable.

4.11　Public Address

This feature allows a single microphone to be used for either radio or public address. An external public address system can be connected to the radio accessory pigtail cable. External PA function without a siren controller is provided for cases when the siren function is not required. This is a low level output, so some type of PA amplifier is required. The Mic To PA option button (or menu selection) controls this feature.

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In the public address mode, microphone audio is always routed to the PA system, and the radio can be programmed so that receive audio is also routed. When the PA is enabled/disabled, "EXT PA ON/OFF" is displayed momentarily. The radio can also be programmed to display "EXT PA ON" continuously. A button/menu function also allows the user to turn the "Receive Audio to External PA" function on and off.

The cable, Part No. 597-5357-716.01 (Single Remote Control Head) or 597-5357-741.01 (Dual Remote) allows the radio to directly interface with a Federal Signal Omega 90 external PA amplifier without an intervening siren control box. For the mute indication to be sent to correctly to the amplifier, the radio Aux B output must be configured for "Ext PA Mute Inv". This setting provides a mute signal on Aux B just like the existing "Ext PA Mute" setting, only with opposite polarity as required by the amplifier.

4.12   Scanning

Scanning monitors the channels in the scan list for traffic the radio is programmed to receive. When traffic is detected, scanning stops and the message is received. Shortly after traffic is complete, scanning resumes.

The user can enter the scan list edit mode for the selected scan list while the radio is scanning without manually turning scan off. If the user presses the scan edit button while the radio is scanning, the radio shall stop scan and enter directly into scan list edit mode for the selected scan list. The scan edit mode shall timeout after seven seconds of inactivity. If the scan edit mode times out, or the user exits the mode via the exit button or the scan list edit function button, the radio shall save the changes to the scan list and restart scan.

If the microphone off-hook condition is detected (Hangup Box Monitor selected by programming), scanning stops and selective squelch (such as Call Guard CTCSS or NAC/group ID detect) is disabled on conventional channels. If the microphone off-hook condition is not detected (Hangup Box Monitor is not programmed), taking the microphone off-hook has no affect on radio operation. When a call is received in the scan mode, the alias of the channel on which a call is received (and any other display parameters that may be programmed) are displayed until scanning resumes. The selected channel alias is then displayed if applicable.

There are two scan modes available: Priority (standard) and Radio Wide. The operation of the priority type is unique to the system type programmed on the selected channel, and the operation of the Radio Wide type is the same regardless of the system type programmed on the selected channel. Only one type of scanning can be enabled at a time. For example, if priority scanning is enabled and Radio Wide Scan is enabled, priority scanning is automatically disabled and vice versa. Refer to the following for more information.

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4.12.1   Priority (Standard) Scanning

Priority scanning (also referred to as standard scanning) monitors only channels that are the same type as that currently selected. For example, if a conventional channel is selected, only conventional channels are scanned and likewise for SMARTNET/SmartZone and Project 25 trunking channels.

For more information on scanning functions in the Conventional mode, refer to Section 5.10, and for more information on how it functions in the other modes, refer to Section 6.11. Scanning is turned ON and OFF by menu selection or (if programmed) by the Scan option switch as follows.

• To turn priority scanning on, press the Scan option switch (or select via menu). Scanning is enabled when a rotating ⁊ is indicated in the right status display (Standard Control Head) or ⚡ is displayed in the top middle of the display (Lightning Control Head)

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Scan Enable Indicator

• To turn scanning OFF, press the SCAN option switch again. Scanning is disabled when "SCAN OFF" is briefly displayed and ⁊ (Standard Control Head) or ⚡ (Lightning Control Head) is no longer indicated in the status display.

• If the zone or channel is changed while scanning is selected, scanning continues on the same or a different scan list (see Section 4.13.1).

Note   *Each Conventional, SMARTNET/SmartZone and P25 trunked channel can be programmed so that scanning is automatically enabled when the channel is selected.*

4.12.2   Radio Wide Scanning

Radio wide scanning monitors the channels in the preprogrammed radio wide scan list. This scan list may contain up to 16 channels of any type assigned to any zone (see Section 4.13.2). Radio wide scanning is turned ON and OFF by menu selection or by the RWS option switch (if programmed) as follows:

Note   *Use radio wide scanning only if two different types of channels need to be scanned at the same time such as conventional and SMARTNET/SmartZone. Otherwise, use the more efficient priority scanning because there is less chance of missed calls.*

• To turn radio wide scanning on, press the RWS option switch and "RW SCAN ON" (Standard Control Head) or "RW Scan On" (Lightning Control Head) is briefly

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displayed. In addition, ⅂⅂ (Standard Control Head) or Z (Lightning Control Head)is displayed along with an **R** in the left Status position.

- To turn radio wide scanning OFF, press the RWS option switch again and "RW SCN OFF" is briefly displayed and ⅂⅂ (Standard Control Head) or Z (Lightning Control Head) with **R** is no longer displayed.

- If the zone or channel is changed while radio wide scanning, scanning continues normally.

4.12.3   Scan Hold Time

When traffic is received or transmitted while scanning, there is a delay before scanning resumes. The delay after receiving a call prevents other traffic from being received before a response can be made. The delay after transmitting a call ensures that a response is heard and prevents other traffic from occurring on some other channel.

Separate delay times are programmable for radio wide and priority scanning. With radio wide scanning, delays of 2 to 7.5 seconds can be programmed. With priority scanning, delays of 0 to 7.5 seconds can be programmed. With SMARTNET/SmartZone and P25 Trunking scanning, scan delays of 0 to 8 seconds can be programmed.

4.12.4   Transmitting in the Scan Mode

Priority Scan Mode - When the transmitter is keyed while scanning is enabled, the transmission may occur on various channels as follows.

    Conventional Operation - Transmissions can be programmed to always occur on the priority, selected, or receive channel (if applicable). Refer to Section 5.10 for more information.

    SMARTNET/SmartZone/P25 Trunking Operation - If scanning is halted to receive a message, programming determines if transmissions occur on the selected or active channel. Transmissions at other times occur on the selected channel.

Radio Wide Scan Mode - The radio can be programmed to transmit on the selected or active channel similar to SMARTNET/SmartZone and P25 trunking operation just described.

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4.12.5   Nuisance Channel Delete

With priority scanning, channels can be temporarily deleted from the scan list, for example, if messages become annoying. This feature is not available with radio wide scanning. Channels can also be permanently added or deleted from a scan list as described in the next sections. Proceed as follows to temporarily delete a channel:

Note   *The selected channel and also conventional priority channels cannot be deleted from the scan list.*

1   While receiving a message on the channel to be deleted, press and hold the SCAN option switch until a tone sounds (based on radio programming). The channel is then deleted and scanning of the remaining channels in the scan list resumes.

Note   *Pressing and holding this switch with scanning OFF may select the scan list. Refer to Section 5.10.1 for more information.*

2   Deleted channels are added back into the scan list if any of the following events occur:

-    Scanning is turned OFF and then ON again using the SCAN option switch.

-    Radio power is turned OFF and then ON again.

-    The scan list is reselected by changing channels (SMARTNET/SmartZone) or using the SCAN option switch (conventional).

4.13   Scan Lists

Priority and Radio Wide Scan lists can be programmed.

Note   *With scan disabled by programming, the user can reset the scan lists to their default programmed state. Pressing and holding the Scan Edit button allows the user to access the feature. "RSET LISTS" (Standard Control Head) or "Reset Lists" (Lightning Control Head) will be displayed. Pressing the select key will reset the lists and "LISTS RSET" (Standard Control Head) or "Lists Reset" (Lightning Control Head) will be temporarily displayed before returning the user to the main display. Selecting Exit will return the user to the main display without reverting the scan lists. Pressing and holding Scan Edit while scan is on will result in a "tone bad" beep. This shall only be accessible through a function button press and hold and is not implemented though a menu item.*

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4.13.1   Priority Mode Scan Lists

A scan list is simply the channels that are scanned when scanning is enabled. With all operating modes, as many priority scan lists as are required can usually be programmed (up to 255). The only limitation is the available memory. Each list can include up to 255 channels/talkgroups. More information follows on selecting and editing priority scan lists.

Note   *The selected channel is always scanned.*

4.13.1.1   Determining Channels in Priority Scan List

Channels in the conventional priority scan lists are determined as follows. Channels in the SMARTNET/SmartZone/P25 Trunked priority scan lists are indicated only when editing a list (see "Editing a Priority Scan List").

1   Enable Priority scanning as described in Section 4.12.1. Also select the scan list if applicable as described in the following "Selecting a Priority Scan List" description.

2   Select the desired zone and then scroll through the channels by rotating the Select switch. When the displayed channel is in the scan list (scanned normally), the ⚶ symbol (Standard Control Head) is displayed next to the zone number as shown in the following illustration. The ⚡ (Lightning Control Head) symbol is displayed on the top of the screen in the following illustration..

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Scan List Indicator ⬏   Channel Number

4.13.1.2   Selecting a Priority Scan List

Conventional Operation - The scan list is user selectable by the SCAN option switch. The scan list can also be temporarily changed if the Scan (List) Select option switch is programmed or by pressing/holding the scan button. Refer to Section 5.10.1 for more information.

SMARTNET/SmartZone/P25 Trunked Operation - The scan list can be temporarily changed if the Scan (List) Select option switch is programmed or by pressing/holding the scan button. Refer to Section 6.11.2 for more information.

Both of the above operations are also menu and soft button (Lightning Control Head Only) selectable.

Note   *Only Priority scan lists are selectable.*

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4.13.1.3   Editing a Priority Scan List

If the Scan Edit option switch is programmed, priority scan lists can be user edited as follows (all operating modes). This option is also selectable via the menu. Changes are permanent (cycling power does not reselect a default condition). Proceed as follows:

1   Select a conventional, SMARTNET/SmartZone/P25 Trunked channel corresponding to the scan list being edited.

2   Select the scan list edit mode by pressing the Scan Edit option switch. This mode is indicated by a triangle in the upper left corner of the display (see Figure 2.3) for the Standard Control Head. This mode is indicated by a ⚡ on the top of the display for the Lightning Control Head.

3   If applicable, select the list to be edited by rotating and then pressing the Select switch. A single beep sounds when the switch is pressed (if that option is enabled). The selected scan list is indicated as "LIST x" as described in the preceding section. If user programming is disabled on a list (conventional channels only), "NO EDIT" is momentarily displayed and it cannot be edited.

4   Select the channel you want to add or delete by rotating the Select switch. After the last channel in the current zone is displayed, the first valid channel in the next zone is displayed and vice versa. Lists are limited to 256 channels. If an attempt is made to add more than 256, "LIST FULL" is displayed and a channel must be deleted before another can be added.

Note   *Priority channels can be deleted.*

5   If the selected channel is in the scan list (scanned), the ⚇ symbol is displayed next to the zone number as just described for the Standard Control Head. The ⚡ is displayed on the top of the Lightning Control Head display.. To change the scan list status of the displayed channel, press the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

With conventional channels only, if the selected scan list is programmed with <u>fixed</u> priority channel(s), the next press of the Select switch makes the current channel the priority channel indicated by "**P**" in the left status display next to the zone number. If dual priority channels are used, pressing the Select switch again makes it the second priority channel indicated by "**2**" in the left status display. Then pressing the Select switch again takes the channel out of the scan list. Refer to Section 5.10.2 and Section 5.10.3 for more information on priority channel sampling.

6   To exit this mode and save the changes, press the Scan Edit option switch again.

4.13.2   Radio Wide Scan List

With radio wide scanning, up to 255 scan list can be added regardless of the type of channel selected. This list is user programmable, and can contain up to 255 channels of any type. More information on selecting and editing radio wide scan lists follows.

Each scan list can be selected as User Editable. With this option selected, the user can edit the active scan list only from their radio. The user can also select which scan list is active through a programmed function button or menu function selection. This active scan list is retained through power down.

4.13.2.1   Determining Channels in Radio Wide Scan List

The channels can be determined only by selecting the scan list edit mode (see "Editing Radio Wide Scan List" which follows).

When the displayed channel is in the scan list (scanned normally), the ☼ symbol is displayed next to the zone number as shown in the following illustration (Standard Control Head). The 🗙 is displayed at the top of the screen for the Lightning Control Head.

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Scan List Indicator   Channel Number
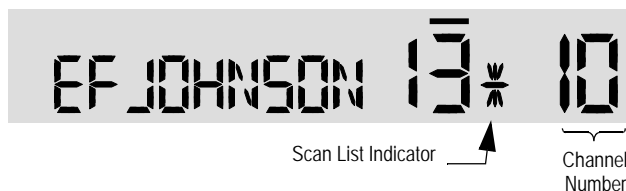
4.13.2.2   Editing a Radio Wide Scan List

If the RWS Edit option switch is programmed, the radio wide scan list can be edited. Changes are permanent (cycling power does not reselect a default condition). Proceed as follows:

1   Make sure that both priority and radio wide scanning are OFF. Select the scan edit mode by pressing the RWS Edit option switch. This mode is indicated by a triangle in the upper left corner of the display (see Figure 2.3).

2   Select the channel you want to add or delete by rotating the Select switch. A single beep sounds when the channel is changed (if that option is enabled). After the last channel in the current zone is displayed, the first valid channel in the next zone is displayed and vice versa. The list is limited to 255 channels. If an attempt is made to add more than 255, "LIST FULL" is displayed and a channel must be deleted before another can be added.

3   If the selected channel is in the scan list (scanned), "**R**" and the ☼ symbol are displayed next to the zone number for the Standard Control Head. If the selected channel is in the scan list, the 🗙 is displayed at the top of the screen for the Lightning Control Head. To change the scan list status of the displayed channel, press the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

4   To exit this mode and save the changes, press the RWS Edit option switch again.

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4.14   Over the Air Programming

OTAP is an "Over the Air" programming feature for the subscriber parameter (code plug) files. Using the OTAP feature, parameter files can be updated and changed in the field, eliminating the need to take the radio out of service to perform the updates. Firmware updates cannot be made using this feature. Firmware version 8.10.x or later is required to use conventional OTAP or P25 Trunking OTAP.

4.14.1   Radio Set Up

The current profile in the radio controls how an OTAP download is handled. How this is programmed determines the possible actions the radio should take: "Activate Immediately" or "Update on Reboot".

Update on Reboot

• The Standard Control Head displays "OTAP UPDAT RECEIVED. RBOOT RDIO" after a successful OTAP download, prompting the user to reboot the radio to apply the update.

• The Lightning Control Head displays the message "OTAP Update Received. Reboot radio to update." after a successful OTAP download, prompting the user to reboot the radio to apply the update.

4.14.2   OTAP Transfer Times

Larger files tie up the radio for a long time. Therefore, any user interface event, such as a channel change, zone change, button press or toggle switch position change (portable radios only) stops the OTAP procedure and returns the radio to normal operating mode. For button presses/toggle switch position changes, the radio exits OTAP mode only if a function is programmed for the button/toggle switch; otherwise, the bad tone sounds.

Low signal conditions may also cause the radio to exit OTAP. If the radio does not receive a response from programming one minute after receiving its last data packet, the radio stops the OTAP procedure and returns to normal operating mode.

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4.15   Over the Internet Programming

Over the Internet Programming (OTIP) enables you to program Viking mobile radios remotely using IP-based network services. It works with both wired (Ethernet) and wireless (Wi-Fi) networks.

Note   *OTIP is only supported by Viking mobile radios running 8.12.x or later software with the OTIP option enabled. Portable radios do not support OTIP.*

4.15.1   Security

There are inherent security risks with exposing your radios on a LAN or WAN. Your system administrator or IT department should be made aware that Viking mobile radios using OTIP will periodically use Multicast DNS and DNS-Based Service Discovery to coordinate availability. You may choose to completely disable OTIP functionality by not ordering the OTIP option.

Because OTIP-enabled radios are available to all computers on the network, you should use network security policies with upload/download restrictions.

4.15.2   Voice Announcements

OTIP has no special restrictions for voice announcements. You can use the OTIP interface to quickly transfer large codeplugs with many voice announcements.

4.15.3   Encryption

Armada supports industry-standard (SSH) encrypted transfers when using USB, Ethernet or Wi-Fi network connections. If Wi-Fi is configured, you must use WPA2 Pre-Shared Key (PSK).

4.15.4   Limitations

4.15.4.1   Disconnection Events

Armada may show a radio OTIP-connected when it is not. This is due to the nature of service discovery on IP networks. Here are a few examples of scenarios in which this may happen. There may be other such scenarios also:

- A Wi-Fi-connected radio goes out of range.

- An Ethernet-connected radio gets its Ethernet cable disconnected suddenly.

   - When you disconnect a radio's USB programming cable to replace it with a Wi-Fi dongle—or vice versa—wait at least 3 seconds after you disconnect the first device before you connect the second device.

- Miscellaneous unexpected network events occur.

USB connections can interfere with OTIP connection and disconnection events. Do not use OTIP with more than 2 USB-connected radios. (EFJohnson plans to address this limitation in a future Armada release.)

4.15.4.2   Concurrent Transfers

Do not try to update a single radio from multiple instances of Armada at the same time. In general, radio administrators are expected to coordinate with each other when managing radios. OTIP is designed to allow a radio service center to connect to mobile radios without running cables.

4.16   Auto / Unmute

The user can mute the radio so they do not have to listen to dispatch. (An example is an EMT who uses a radio's call alert feature for notification of an emergency event.) When receiving a call alert the radio will automatically unmute and notify the EMT of the event.

If the user has the radio muted, this feature automatically unmutes the radio if certain programmable events occur. These events include the reception of a Call Alert, Unit Call, or Emergency Call.

4.17   Location Services

Location Services provides GPS location information to the radio user and to network administrators using a standardized IP based protocol. For example, a radio can send its current location over the radio network and then IP to an application that is mapping user locations. That application can also send commands to the radio telling it what data to report and when to report it.

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It is supported on the Viking Mobile Radio, software version 8.10.x or later. Location service requires an external GPS module connected though the RS232 serial port. The Viking radio supports any receiver with RS232 serial output. The receiver must be configured to transmit the GPGGA and GPRMC NMEA sentences. P25 Trunking and Conventional IP data between a radio and an application with access to the fixed host is supported. Basically, data flows between the radio and the system. Radio to radio operation is not currently supported.

The radio processes GPS data from the receiver and sends it over the system to the Location Services Host System (LSHS). The LSHS is an application that can request and receive GPS data from radios (sometimes called "Location Server"). The Tier 2 Location Services Standard defines a protocol between the LSHS and the radios. The protocol is called the Location Request/Response Protocol (LRRP). EFJohnson radios with software supporting Location Services, support the LRRP protocol. The system must support IP data and can be P25 Digital Conventional and/or P25 Trunking.

The radio has two general Location Service features. The first is the ability to display GPS data on the radio's display. The second is the ability to receive commands from and send data to a location server.

The "Display GPS" function does two things:

1 Button Press activates the GPS Data Display menu.

2 Button Press and Hold sends GPS data to the location server.

Refer to the software manual for function programming. The following table shows the GPS data display that will display.

Table 4.2   GPS Data Display

Element	Description	Notes
Lat/Long	The current latitude and longitude of the radio.	Pressing the Menu/Select button will toggle between display formats for this element.
Altitude	The altitude.	
Ground Speed	The horizontal speed.	
Course	The course over ground in degrees.	
Date/Time	The current GPS time and Date.	Adjusted for the time zone programmed by Armada.
Num of Sat	The number of satellites used in the current GPS fix.	This element displays the satellites used in the current fix not the number of satellites currently in view.

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The "GPS" function allows the user to turn GPS on or off. Pressing the button will toggle the GPS. The display will show "GPS On" or "GPS Off".

Figure 4.2 GPS Icon

The GPS icon is only applicable to the LCH. The standard Viking Series control head does not have a GPS icon. The GPS icon has the following three modes:

Table 4.3 GPS Icon Modes

Mode	Description
Off	The icon is not visible because GPS hasn't been enabled or has been turned off.
Flashing	GPS is enabled and turned on but has not gotten satellite sync.
On	The radio has satellite sync and valid data.

4.17.1   LRRP

LRRP is the TIA standard that defines sending and receiving location commands and location data. The radio supports receiving commands from an LSHS and sending data to the LSHS. The following table shows the LRRP messages supported by the radio. These interactions do not cover all possible interactions defined in the standard. See the TIA Tier 2 Location Services Document for the full LRRP specification (TIA-102.BAJC).

Table 4.4 Supported LRRP Messages

Message	Description
Immediate-Location-Request	Sent from the LSHS to the radio. The radio responds with data or an error.
Immediate-Location-Report	Send from the radio to the LSHS in response to the Immediate-Location-Request.
Triggered-Location-Request	Sent from the LSHS to the radio. Radio determines if it can do the specified trigger and responds.
Triggered-Location-Answer	Sent from the radio to the LSHS in response to the Triggered-Location-Request. Contains information about whether or not the radio can support the requested trigger.
Triggered-Location-Report	Sent from the radio to the LSHS when a trigger happens.

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Table 4.4   Supported LRRP Messages

Message	Description
Triggered-Location-Stop-Request	Sent from the LSHS to the radio to tell it to stop doing a previously specified trigger.
Triggered-Location-Stop-Answer	Sent from the radio to the LSHS to acknowledge the Triggered-Location-Stop-Request.
Unsolicited-Location-Report	Sent from the radio to the LSHS when the user sends data using the "Display GPS" function.
Location-Protocol-Request	Sent from the LSHS to the radio to determine the LRRP protocol version of the radio.
Location-Protocol-Report	Sent from the radio to the LSHS in response to the Location-Protocol-Request

4.17.2   Triggering

There are many different types of triggers and many more combinations of those types. See the TIA standard for more information about triggers.

Triggers are divided into two types. One Shot triggers happen once and then are complete. Periodic triggers happen periodically. Triggers **may** have start and stop times. Triggers will only be armed within their specified start/stop times.

Triggering can be started both by commands from an LSHS and from programming. Triggers marked with a * below are programmable.

The radio only supports a single trigger of each type. Sending a new trigger of a type that is already in use will overwrite the existing trigger. This includes triggers set by the LSHS and programming software.

The following table shows the supported triggers. The radio does not support combinations of triggers.

Table 4.5   Supported Triggers

Trigger	Description
One Shot	This trigger happens once at the time specified in the Triggered-Location-Request.
One Shot PTT	This trigger happens once when the user PTTs the radio. This trigger is activated when the user presses the PTT button but the data will usually be sent after the call is over. We do this to avoid delaying the call.
One Shot Emergency	This trigger happens once when the user puts the radio into emergency.
Periodic*	This trigger happens every period specified by the Triggered-Location-Request.

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Table 4.5   Supported Triggers

Trigger	Description
Periodic PTT*	This trigger happens every time the user presses PTT. This trigger is activated when the user presses the PTT button but the data will usually be sent after the call is over. We do this to avoid delaying the call.
Periodic Emergency*	This trigger happens every time the user puts the radio into emergency.
Periodic Distance*	This trigger happens every time the user moves the radio a distance defined in the Triggered-Location-Request.
* Programmable in Armada.	

4.18   Emergency Alarm Receive Indicator

The Emergency Alarm Rx feature allows a user to receive an Emergency Alarm display and/or alert on their radio when another radio on the same system sends out an Emergency. This feature is supported in both P25 and SmartNet/SmartZone systems. On SmartNet/SmartZone systems the Emergency Alarm can only be received on a radio with the same Talkgroup as the sending radio. On P25 systems the Emergency Alarm can be received by any radio on the same system.

When an Emergency Alarm is received the radio will either sound an alert tone, display the sending radio's ID or Alias, or do both depending on the settings programmed. When received, the display context of the radio is changed to display "EA Received" on the top line and either the ID or the Alias of the radio who sent the Emergency Alarm. If the received ID is in the Call List, then the Alias will be displayed. If it is not, the ID will be displayed.

An Emergency Alarm will not be received when the radio is active on a voice channel, in Emergency, or in Radio Wide Scan Mode. Also, if in Surveillance mode, the backlight will not turn on when an Emergency Alarm is received.

When received, the display context of the radio is changed to display "EA Received" on the top line and either the ID or the Alias of the radio who sent the Emergency Alarm. If the received ID is in the Call List, then the Alias will be displayed. If it is not, the ID will be displayed.

After an Emergency Alarm has been received, any press of a button (except for the PTT) will exit the display and clear the ten-second timer. If no buttons are pressed, the display will continue to show "EA Received" along with the ID or Alias for ten seconds. However, the alert tone is only heard once upon receiving the alarm. There is also a timer that will not allow the radio to receive another Emergency Alarm from the same ID for twenty seconds. This timer is only cleared on a channel change, zone change, or after twenty seconds has expired.

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If multiple Emergency Alarms from different radios are received within the ten second period while the display is still showing, then only the most recent Emergency Alarm ID is shown and the ten-second timer is reset.

4.19   Kiosk Mode

A computer may be set up in Kiosk Mode to simplify updating a user's radio. Kiosk Mode is a special view mode of Armada that simplifies radio interaction. It hides the entire configuration from the user so anyone can connect their radio and have clear instructions about what to do. Kiosk Mode is intended to be run on a remote/satellite machine. It is more commonly used with the portable radio, but is also compatible with the mobile radio.

Before a radio connects, a screen is displayed, telling you to connect your radios.

Multiple radios may be connected at once. Each radio receives its own portion of the screen. The user needs to follow the instructions as they display on the screen. (For more detailed information, please refer to the *Armada Programming Manual*.)

When no radio is connected, a message is displayed indicating a radio may be connected to start. This, or a similar message while radios are connected, indicate that more radios may be connected.

When updates are required, Armada displays a single progress bar for all updates. When the progress bar gets to 100%, the user is instructed to disconnect their radio. The radio will flash after it is programmed (the identify radio functionality) to help indicate which radio completes if multiple radios are connected at once.

4.20   Analog Noise Reduction

If your administrator configures Analog Noise Reduction, the radio filters out background noise on Conventional Analog channels, SmartNet channels, and SmartZone Analog channels. To use this feature on your radio, an Analog Noise Reduction button, menu item, or soft button must be programmed to turn on noise reduction.

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5

Conventional Mode Features

Conventional mode features are radio features unique or used only when operating in conventional mode.

5.1   Monitoring Before Transmitting

With conventional operation, you may need to manually monitor the channel before transmitting to make sure that it is not being used by someone else. If you were to transmit while someone else was using the channel, you would probably disrupt their conversation. With SMARTNET/SmartZone and P25 Trunked operation, monitoring is performed automatically. Monitor conventional channels automatically or manually as follows:

5.1.1   Automatic Channel Monitoring

If the selected channel is programmed for Busy Channel Lockout (also called Transmit Disable On Busy), monitoring is performed automatically. Refer to Section 5.3 for more information on this feature.

5.1.2   Manual Channel Monitoring

The automatic monitoring just described may occasionally disable the transmitter when the channel is not in use, such as if the repeater has extended hang time. In this case, you may not want to use it and the channel must then be monitored manually as follows:

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Busy Indicator - With scanning disabled, note if the multi-function indicator on the front panel is steady green. If it is green, a carrier is being detected, so the channel may be busy. If it is not, the channel is not being used and a call can be transmitted.

Monitor Mode - There may be times when the busy indication is displayed even though no one is using the channel. Monitoring should then be performed by disabling Call Guard squelch (or group ID detect on P25 channels). This is usually done by selecting the Monitor Mode (see following) or by the Normal/Selective option switch (see Section 5.4.1).

5.2   Monitor Mode

The monitor mode unsquelches the receiver and monitors the channel even if a carrier is not detected. Other features of this mode are as follows:

- Call Guard (CTCSS/DCS) squelch is disabled on analog channels and NAC and group ID detect are disabled on P25 (conventional) channels.

- Signalling-dependent Busy Channel Lockout options for Tone/NAC and P25 status are ovrerridden (see next section). (Noise option is not overridden: Monitor mode disables the protocol-signalling events that the Busy Channel Lockout option Tone/NAC/Status depend on, but not carrier events.)

- Scanning temporarily halts.

The Monitor Mode operates as follows:

1   To monitor the transmit frequency for activity before transmitting, briefly press the Monitor option switch. The display then indicates "MON" (see Figure 2.3) for the Standard Control Head or 🔲 for the Lightning Control Head. The receiver unsquelches and noise is heard even if carrier not present. The transmit frequency can also be monitored by selecting **TX Channel** in the Monitor menu function's sub menu.

2   To monitor the receive frequency instead, press and hold the Monitor option switch until a tone sounds (based on radio programming). This can be used, for example, to improve reception if intermittent squelching is making a weak message difficult to understand.

3   To disable the monitor mode and return to normal operation, press the Monitor option switch again (or select **Off** from the menu).

If off-hook detection is enabled, taking the microphone off-hook monitors the receive frequency similar to Step 2. However, the receiver unsquelches only if a carrier is detected (see Section 4.9). Pressing the Normal/Selective option switch disables Call Guard squelch/P25 group ID detect but not scanning and P25 NAC detect (see Section 5.4).

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5.3   Busy Channel Lockout

The Busy Channel Lockout (also called Transmit Disable on Busy) feature automatically disables the transmitter if the channel is busy when the PTT switch is pressed. When the transmitter is disabled by this feature, "BUSY" is displayed, a busy tone sounds, and the transmitter is disabled.

The Busy Channel Lockout feature can be programmed to operate as follows. Each conventional channel can be programmed differently.

"Off" - Busy channel lockout is disabled and the transmitter keys even if the channel is busy.

"Noise" - If a carrier is detected on the channel, the transmitter is disabled when the PTT switch is pressed.

"Tone (NAC)" - If an incorrect Call Guard (CTCSS/DCS) or P25 NAC code (see Section 5.13.3) is detected, the transmitter is disabled when the PTT switch is pressed. An incorrect code is any code other than the one programmed for the current channel.

"Status" - Transmission is disabled if the repeater inbound channel busy status symbol is detected.

"Talkgroup" - Prevents transmission during calls with a different NAC or talkgroup. Transmission is allowed during data or short terminators with the correct NAC. Applicable to Conventional Digital channels.

If Busy Channel Override is permitted by programming, it is possible to transmit even when the transmitter is disabled by this feature. Release the PTT switch and then quickly press it again within one second.

5.4   Call Guard Squelch

Tone or digital Call Guard squelch (also called CTCSS/DCS signaling) can be programmed on each conventional analog transmit and receive channel in any order desired. The reverse burst and turn-off code are always transmitted and also detected on channels programmed with Call Guard squelch.

The Call Guard squelch feature eliminates distracting messages intended for others using the channel. This is done by using a subaudible tone or digital code to control the squelch. This tone or code is unique to a user or a group on that channel. This tone or code is transmitted with the voice signal but is not heard because it is in the subaudible range and is attenuated by a filter. Call Guard squelch must be used in both the transmitting and receiving radio to be functional.

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5.4.1   Call Guard Squelch Enable / Disable

The Normal/Selective option switch (if programmed) can be used to disable receive Call Guard squelch (Normal/Selective Squelch) on analog channels or group ID code detection on P25 channels. This option is also selectable via the menu. When selective squelch is disabled, "SQ NORMAL" is flashed in the display. When it is enabled, "SQ SELECT" is flashed on the Standard Control Head and "Squelch Selective" on the Lightning Control Head.

When Normal Squelch is selected, the receiver unsquelches only if a carrier is detected. Scanning and P25 NAC detection are not disabled with this mode selected. The selected mode remains in effect until it is manually changed. Selecting another channel or cycling power does not reselect a default condition. There is a programmable option to display the monitor icon when the Normal Squelch mode is selected.

5.4.2   Tone Call Guard Squelch

Tone-type Call Guard squelch uses subaudible CTCSS tones from 67-254.1 Hz. Although there are 42 tones assigned, those above 33 (210.7 Hz) are normally not used because of their close proximity to the voice band which starts at 300 Hz. In addition, tones 11 (97.4 Hz), 39 (69.3 Hz), 40 (206.5 Hz), 41 229.1 Hz), and 42 (254.1 Hz) are normally not used because they may cause interference with adjacent tones.

A reverse burst is transmitted when the push-to-talk switch is released and also detected when calls are received. It is a 180-degree phase reversal for a period of time determined by the tone frequency, and it eliminates the squelch tail (noise burst) in the receiving radio. Both the transmitting and receiving radio must be equipped with this feature for it to be used. The radio can be programmed to turn OFF the reverse burst feature so that the squelch tail is not eliminated.

5.4.3   Digital Call Guard Squelch

Digitally Coded Squelch (DCS) uses digital data instead of subaudible tones to control the squelch. This data consists of continuous repetitions of 23-bit words. There are 84 DCS digital data tones to select from. No bit or word synchronization information is used. When the push-to-talk switch is released, a turn-off code is transmitted which eliminates the squelch tail similar to the reverse burst.

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5.4.4   Disable Call Guard

The Disable Call Guard feature option lets the radio disregard any CTCSS/DCS or NAC/ Talkgroup information on the current channel. This programmable feature is best described as a monitor mode with no white noise. In analog it is functionally the same as turning the squelch mode to "normal." In digital mode it is analogous to checking the "digital squelch" box when programming the radio. The function can be programmed to any button and the menu. The mode will stay active though channel changes (between conventional channels) and during scan. While the feature is active the monitor icon will be displayed.

5.4.5   Conventional Squelch Adjust

Squelch settings on a conventional analog channel can be changed by the user from -7 to +7. A menu item or function button can be programmed for squelch adjust. While on a conventional analog channel without emergency or scan active, the user can select the programmed button or menu item for squelch adjust. The current squelch setting will show on the display.

Using the up and down navigation buttons on the mobile radio, or turning the rotary knob clockwise or counter-clockwise, the user can adjust the squelch setting to a desired level from -7 to +7. Increasing the value towards +7 causes the squelch to open sooner for weaker signals while decreasing towards -7 has the opposite effects. Pressing the select button will store the new squelch setting and return the user to the main display.

5.4.6   Selective Squelch Code Select (CTCSS / DSC / NAC)

This feature allows the normal transmit and receive Call Guard (CTCSS/DCS/NAC) programming to be temporarily overridden with a code selected from a preprogrammed list. It is available if the Squelch Select List option switch and a CTCSS/NAC code list have been programmed. It is also selectable via the menu and soft buttons (Lightning Control Head only).

In addition, with the Digital Keypad Microphone, conventional systems can be programmed for the Keypad CTCSS/DSC feature. Codes can then be selected directly from the table by pressing the key for the code. For example, to select code 3 from the table, simply press the "3" key. No other conventional mode functions can then be assigned to these keys.

The CTCSS/DCS/NAC list is programmed with up to 255 tone (CTCSS) or digital (DCS) Call Guard codes. Different codes can be programmed for the transmit and receive modes, and carrier squelch (selective squelch disabled) can be programmed if desired. In addition, each position can be programmed with an NAC code for use with P25 operation.

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When the Call Guard code is changed using this feature, it remains selected even if other channels are selected. However, if radio power is cycled or a talk-around channel is selected, the normal codes are reselected. When scanning, the selected code also applies to all scanned channels. Each channel can also be programmed to always ignore the code selected from this list and use the default code instead.

If both analog and digital (Project 25) channels can be selected or scanned, the CTCSS/DCS code for the selected position is used for analog channels and the NAC code for the selected position is used for P25 channels. If a channel is programmed for mixed mode operation, the selective squelch type (analog or digital) programmed for the transmit mode determines the selective squelch type used.

Note   *Call Guard codes may be permanently reprogrammed by keypad programming (see Section 5.14).*

Proceed as follows to select a code using the Squelch Select List option switch:

1 Press the Squelch Select List option switch and then rotate the Select switch to select the desired position. The display indicates "SQ xx" where, "xx" is the selected code from 1-255. The code number and actual code are alternately displayed (NACs are displayed in hexadecimal).

2 To select the displayed code and return to the normal display, press the Squelch Select List (Squelch Code Select) switch again.

3 To check which code is selected, press the Squelch Select List option switch once to display the current selection and then again to return to normal operation.

4 To return to the normal selective squelch codes, select "DEFAULT" in this mode. As previously described, the normal codes are also automatically reselected whenever radio power is cycled or a talk-around channel is selected.

5.5   Penalty Timer

A penalty timer may be programmed on conventional systems to prevent transmissions for the programmed time after the time-out timer disables the transmitter (see Section 4.3). The penalty timer can be programmed for the same times as the time-out timer, and timing starts when the PTT switch is released. If the PTT switch is pressed while the timer is running the timer stops, and continues when the PTT switch is released. When the penalty timer expires, a beep sounds and the transmitter can then be keyed.

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5.6   Conversation Timer

A conversation timer can be programmed on conventional systems in addition to the time-out timer (see Section 4.3). This timer limits that total length of a conversation rather than just the length of each transmission as with the time-out timer. The following is more information on this timer.

• It can be programmed for times up to 7.5 minutes.

• It is reset when the time between transmissions exceeds the time programmed for the penalty timer.

• A warning beep sounds five seconds before this timer disables the transmitter.

• When this timer disables the transmitter, a continuous tone sounds and the red transmit indicator turns OFF. The PTT switch must then be released until the penalty timer expires (indicated by a beep).

5.7   Repeater Talk-Around

Normally, all transmissions go through a repeater which usually increases range. However, there may be times when a radio is out of range of the repeater and therefore unable to talk to anyone even though the radio being called is only a short distance away. To allow communication in this situation, repeater talk-around can be selected. Transmissions then occur on the receive frequency which permits direct radio-to-radio communication.

Repeater talk-around can be selected if the RTA option switch is programmed. This feature can also be selected via the menu. When talk-around is enabled by this switch, "RTA ON" is flashed in the display, and when it is disabled, "RTA OFF" is flashed. This feature remains enabled during scanning, and changing channels or turning power OFF does not change the selected condition. Talk-around is available on conventional channels only. The Talkaround capability can be Disabled on a per-channel basis, requiring the user to use the infrastructure if disabled. (Radio-to-Radio communication is not allowed.)

5.8   Displaying Transmit / Receive Frequency

If the Display Information option switch is programmed, it can be used to display the channel frequency in megahertz. Pressing this switch toggles between displaying the standard channel alias and the frequency. The receive frequency is displayed while receiving and the transmit frequency is displayed while transmitting. This feature may also be selected via the menu and soft buttons (Lightning Control Head only).

This feature is available on conventional channels only.

5.9   Emergency Alarm and Call

Emergency Alarms and Calls are separate functions that can be individually enabled or disabled on each analog and P25 conventional system. The Emergency option switch (or menu selection) is required for these functions. Emergency Alarms and Calls are transmitted on the global (radio wide) emergency zone/channel if one is programmed and a smart console with message receiving capabilities is used. If it is not programmed, the emergency is transmitted on the selected channel. The emergency programming of the system to which that channel is linked controls the emergency operation.

The user can set an external line by pressing the emergency button. External devices can trigger off of the radio's external line. If the "Ext Emergency" Option is enabled by programming and the user presses the emergency button, the Aux B line on the accessory connect shall be set to low (0V). It remains low until the External Emergency Time has passed or the user exits the emergency. If the user presses emergency during the External Emergency Time, the timer starts over. If the user exits emergency before the External Emergency Time has passed, the output line returns to Vbatt.

5.9.1   Emergency Alarms

An emergency alarm is a special transmission that alerts a dispatcher of an emergency situation. It is sent automatically by pressing Emergency option switch. The system to which the emergency channel is linked must have Emergency Alarms enabled. If it does not, Emergency Alarms are disabled. Emergency alarms and calls can be received on smart consoles with message receiving capabilities.

In the P25 conventional mode, a special P25 emergency data transmission is sent, and in the conventional analog mode, an DTMF emergency ID is sent. Refer to Section 5.12.5 for information on the MDC1200 Emergency Alert.

Proceed as follows to send an emergency alarm:

1   If required, select a channel of a system on which Emergency Alarms are enabled and then press the Emergency option switch. The radio then automatically transmits the emergency alarm.

2   Either Normal or Silent operation can be programmed. With the Normal mode, the red LED lights, the emergency tone sounds, and "EMERGENCY" flashes in the display. This indication continues to flash until the alarm mode is ended (see Step 4).

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If silent programmed, none of these indications occur. If "No Receive Activity During Emergency" is programmed, receive audio, the front panel LED, and receive icons are disabled in the receive mode.

3   When the emergency alarm is acknowledged by the dispatcher, "ACK RECVD" is briefly displayed on the Standard Control Head, "ACK Received" on the Lightning Control Head, and the emergency acknowledge tone (two beeps) sounds. This alert tone can be disabled if desired, and neither occur if Silent operation is programmed.

Retries will automatically occur for conventional analog until the retry counter completes.

4   The emergency alarm mode is exited when radio power is cycled or by pressing and holding the Emergency option switch.

5.9.2   Emergency Call Alert

This feature notifies a user when an emergency call is being made on their selected P25 Conventional or P25 Trunking Talkgroup. The radio should also be programmed with an "Emergency Clear" button.

If an emergency call is received by the radio on the selected channel, the emergency alarm ACK tone will sound (five consecutive tones), and the Emergency Received message will display, followed by the unit ID of the emergency radio. If any other emergency calls are made after this initial one using a different radio, the tone will not sound, but the unit ID will be updated to reflect the most recent emergency call. To exit out of this state, press the "Emergency Clear" button. The radio should return to its normal display, and the Emergency Received message should no longer show.

5.9.3   Emergency Calls

The Emergency Call feature allows a user to place an emergency voice call by pressing the PTT switch after pressing the Emergency option button. If the Emergency Hot Mic feature is enabled, the emergency call is automatically transmitted without having to press the PTT switch (see following description). The system to which the emergency channel is linked must have Emergency Calls enabled. Analog and Digital (P25) calls can be individually enabled.

If the emergency call is sent on a P25 channel, an emergency indication is sent according to the P25 standard (the emergency bit is set in the Common Air Interface). If it is sent on an analog channel, the DTMF Emergency ID is sent in place of the ANI DTMF PTT ID if applicable.

Note   *The DTMF Emergency ID is sent only if pre- or post- DTMF ANI is enabled on the channel by programming.*

5.9.3.1   Emergency Hot Mic

If Emergency Hot Mic has been enabled for emergency calls for the system, automatic transmitting occurs with microphone audio unmuted without having to manually press the PTT switch. The automatic transmit period is programmed for 10-120 seconds in ten-second intervals. If this feature or emergency calls are not enabled, automatic transmitting does not occur. This feature is initiated only on the first press of the Emergency switch. Subsequent presses do not trigger automatic transmissions. To reset this function, hold emergency button or cycle power.

5.9.3.2   Placing an Emergency Call

To place an Emergency Call:

1   If required, select a channel of a system on which Emergency Calls are enabled and press the Emergency option switch. The Emergency Call is then sent as described in Section 5.9.1 if applicable.

2   If the preceding Emergency Hot Mic feature is enabled, the call is automatically transmitted without pressing the PTT switch. If it is disabled, press the PTT switch and begin speaking as with a standard call. If the channel is changed, operation continues on the new channel in the emergency mode.

3   With analog calls, subsequent presses of the PTT switch cause the DTMF emergency ID to be sent according to the ANI programming (if DTMF ANI is enabled on the channel). With digital calls, the calls continue to have the emergency bit set.

4   If the Surveillance Mode is enabled (see Section 4.10), all indicators, lights, and tones are disabled. If "No Receive Activity During Emergency" is programmed, receive audio, the front panel LED, and receive icons are disabled in the receive mode.

5   To exit this mode, cycle radio power or press and hold the Emergency switch.

5.9.4   Emergency Press and Hold

The Viking radio provides two means of activating emergency mode. With an emergency button programmed, the radio will enter emergency mode upon a press or a press and hold. Pressing and holding the emergency button while in emergency mode will cancel emergency. When enabled, the Emergency Press and Hold feature restricts activation to the press and hold scenario.

With the emergency press and hold feature enabled, the emergency button must be pressed and held for the duration of the press and hold timer for emergency mode to be activated. If the button is released before the timer has expired a bad beep tone sounds and emergency mode fails to activate. To cancel emergency mode, the emergency button must be pressed and held for the duration of the press and hold timer again.

The user has the ability to use two different timers for Emergency mode (Conventional system) - one to enable and one to disable emergency mode, preventing accidental enabling and disabling of emergency mode. With Emergency Press and Hold enabled, emergency mode is enabled when the Button Press/Hold Duration Timer expires. In both cases, emergency mode is cancelled when the Emergency Cancel Timer expires.

5.9.5   Emergency Talkgroup

A user may program an Emergency Talkgroup. If Emergency is activated, the radio uses the Emergency Talkgroup instead of the programmed talkgroup. If Talkgroup Lock is programmed, the Emergency Talkgroup has priority.

5.10   Conventional Mode Channel Scanning

Channel scanning features common to all operating modes are described in Sections 4.12 and 4.13. The following information describes features unique to conventional operation.

5.10.1   Selecting a Scan List

Conventional systems are programmed with a default scan list that is normally selected by all channels in that system. However, there is a programmable option to slave a particular conventional scan list to a zone. This then becomes the default list for all conventional channels in that zone (it overrides the system programming). This slave feature is programmed.

The default scan list (which is to be used by all conventional channels except those belonging to slaved zones), can be temporarily changed by using the SCAN option switch or menu parameters. A scan list selected in this manner is retained through radio power down.

Currently if the user presses and holds the Scan button, the **Scan List Select** feature is activated. This function may be disabled on a per-system basis by programming.

5.10.1.1   Conventional Scan List Select Procedure

The scan list select procedure is as follows:

1   With scanning OFF, press and hold the **SCAN** option switch until a tone sounds (or use menu selection). Scanning is OFF when the rotating ↻ is not indicated in the right

status display for the Standard Control Head or ⚡ is not indicated on the top of the screen for the Lightning Control Head. If required, turn scanning OFF by briefly pressing this switch. If the SCAN option switch is pressed while scanning, Nuisance Channel Delete described in Section 4.12.5 is performed.

2 The currently selected list is then indicated in the display as "LIST x", where "x" is the scan list number. Rotate the Select switch to select the desired list and then exit this mode by pressing the Select or SCAN option switch. A single beep sounds when the Select switch is pressed (if that option is selected).

5.10.2   Transmitting in Scan Mode

Each conventional scan list can be programmed for one of the following modes. These modes determine if priority sampling occurs and also the channel on which transmissions occur while scanning. Refer to the next section for more information on priority sampling.

No Priority - Priority sampling does not occur (all channels are scanned in sequence)

Priority on Selected - The Priority 1 channel is always the selected channel.

Priority on Programmed - The Priority 1 channel is user defined

Talk Group Scan - Monitors a single digital conventional channel. When a call is receivied, the radio searches the scan list for a talkgroup that matches the received talkgroup

Vote Scan - **Analog** - Scan based on received signal strength (analog channels).

Vote Scan - **Digital** - Scan based on received signal strength (digital channels)

Talkback Type - Selected Group - The radio always transmits on the selected group.

Talk Back Type - Active Group - The radio transmits on the last group received until the Scan Hold Timer expires. After the Scan Hold Timer expires the radio transmits on the selected group.

5.10.3   Priority Channel Sampling

The following describes priority sampling when scanning conventional channels.

Note   *Priority sampling when scanning SMARTNET/SmartZone/P25 Trunking channels is described in Section 6.11.1.*

The priority channel sampling feature ensures that when priority scanning, messages on the priority channel are not missed while listening to a message on some other channel. The radio can be programmed as just described so that the priority channel is a fixed channel programmed in the current scan list, the currently selected channel, or not used.

Note   *In addition, the priority channel is not scanned if the active channel is an analog channel on the same frequency as the priority channel and is programmed with CTCSS/DCS squelch control.*

Either a single or dual priority channels can be programmed if desired. With dual priority, a call on the second priority channel is interrupted by a call on the first priority channel but not vice versa. When scanning and the selected channel is a single or first priority channel, "P" is indicated in the left status display next to the zone number (Standard Control Head) while the "P" is indicated on the top of the screen for the Lightning Control Head as follows:

Priority Indicator

This indication is displayed regardless of whether the priority channel is fixed or always the selected channel. When the second priority channel is displayed, "2" is indicated on the Standard Control Head while "P2" is indicated on the Lightning Control Head.

The priority channel sampling frequency is determined by the programmed Priority Lookback Time A (see description which follows). For example, if 2.0 seconds is programmed, the priority channel is sampled every 2.0 seconds when listening to a message on a non-priority channel. When not listening to a message, the priority channels are scanned in the normal scan sequence. With dual priority, the first and second priority channels are alternately sampled at the Loopback Time.

Priority channel sampling occurs only with conventional scanning. It does not occur with radio-wide scanning, when listening to any type of SMARTNET/SmartZone/P25 trunking call, encrypted call, or when transmitting.

The priority sampling times are programmed by the following parameters:

Lookback Time A - This time determines how often the priority channel is checked for activity. Times of 0.25-4.00 seconds in 0.25-second steps can be programmed.

Lookback Time B - This time determines how often the priority channel is checked once an incorrect Call Guard (CTCSS/DCS) or NAC code is detected. Since it takes much longer to detect an incorrect Call Guard signal than a carrier, this time should be relatively long to prevent the interruptions from making a message difficult to understand. Times of 0.5-8.0 seconds can be programmed in 0.5-second steps.

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5.10.3.1   Changing The Priority Channel

If a fixed priority channel is associated with the current scan list, it can be changed to another channel if the Priority option switch, menu function, or soft button function (Lightning Control Head only) is programmed. With dual priority, this changes only the first priority channel. To change both priority channels, use the Scan List Edit function described in Section 4.13.1. Proceed as follows to change a priority channel using the Priority option switch:

1   Make sure that both priority and radio wide scanning are OFF.

2   Select the channel that you want to be the priority channel using the Select switch in the normal manner. A single beep sounds when the channel is changed (if that option is enabled). If the channel is in a different zone, also select the appropriate zone.

3   Press the Priority option switch and "PRIORITY" is briefly displayed to indicate that the selected channel is now the priority channel. Other indications that may occur are as follows:

   - If "NO PRIORTY is displayed, priority sampling may not be enabled on the scan list.

   - If "SEL CHAN" (Standard Control Head) or "Selected Chan" (Lightning Control Head) is displayed, the priority channel is always the selected channel and cannot be changed.

   - If no indication displayed, the scan list may not be user editable or the channel may not be in the scan list.

5.10.4   Talkgroup Scanning

In additional to conventional channel scanning, a list of talkgroups can be scanned on a specific channel. Talkgroup scan monitors a single digital conventional channel. When a call is received, the radio searches the scan list for a talkgroup that matches the received talkgroup. Audio opens up if a match is found.

The radio can be programmed for Talk Group Scan with Active Talk Back type to return calls on the received talkgroup if the user talks back during scan hold time. The Talkgroup Scan with Selected Group Talk Back Type will always return calls on the talkgroup from the selected channel.

The radio can be programmed to display the talkgroup being transmitted at the beginning of a conventional digital call. After the display time has passed, the radio displays the selected channel alias.

Often a user wishes to stay on one specific talkgroup when traveling from site to site. The Talkgroup Lock feature allows users to store the current active talkgroup to memory and the radio will use this talkgroup until the Talkgroup Lock feature has been disabled. The feature can be enabled / disabled with a programmable button, menu item, or soft button item (Lightning Control Head only).

1 The Talkgroup Lock Feature can be enabled / disabled from a programmable button or menu. The radio must be on a P25 Conventional Channel or else the radio will bad beep.

2 Talkgroup Select

   a The current functionality of Talkgroup Select is (TG Lock Disabled)
      - User is able to direct entry a Talkgroup or select a Talkgroup from a list. The selected Talkgroup will permanently replace the selected channel's Talkgroup.
      - If Direct Entry and the Talkgroup does not exist in the radio's profile, the Talkgroup is replaced and the radio will automatically enable the Override Talkgroup Security Settings on the Zone page. The current Override settings will be used for that Talkgroup since it doesn't reside the radio's profile.
      - For Direct Entry, a valid Talkgroup of 1 - 65535 must be entered, otherwise the radio will display Invalid TG and bad beep.

   b If Talkgroup Lock is Enabled, the Talkgroup Select feature will have new functionality.
      - If Talkgroup is entered via Direct Entry and the talkgroup resides in the Armada profile, the radio will store the Talkgroup as the Lock Talkgroup and will exit menu mode.
      - If the Talkgroup is entered via Direct Entry and the Talkgroup does not reside in the Armada profile, the radio will display Invalid TG and bad beep.
      - If the Talkgroup is selected from the list, the radio will store the Talkgroup as the Lock Talkgroup and will exit menu mode.
      - If Talkgroup Lock is enabled, no permanent changes will be made to the selected Talkgroup, only the Lock Talkgroup will be affected.

3 Radio will use the key that is assigned to the active TG unless the Override Talkgroup Security Settings is active. In that case it will use the security parameters that are defined in the Security section on the Channels tab.

4 If Talkgroup Lock is enabled, the radio will only use the Lock Talkgroup for the selected channel. The rest of the channels will use the programmed Talkgroup. If this is not done, then the radio would only be able to monitor a single TG for all scan channels.

5 If Emergency is declared while Talkgroup Lock is active, the radio will use the Emergency Talkgroup first if it is defined. If no emergency Talkgroup is defined, it will use the Lock Talkgroup.

5.11   Standard Conventional Calls

Standard conventional calls can be placed to other radios monitoring the selected channel. The proper coded Call Guard squelch tone or code or P25 NAC may need to be transmitted by your radio for them to receive your call (see Sections 5.4 and 5.13.3).

5.11.1 Placing a Standard Conventional Call

To place a standard conventional call, proceed as follows:

1 Turn power ON and set the volume as described in Section 3.1.1. Select the channel programmed for the radio you want to call (see Section 3.1.7.1).

2 Monitor the channel automatically or manually as described in Section 5.1.

3 Press the PTT switch and if the Busy Channel Lockout feature is programmed on the channel, the transmitter is automatically disabled if the channel is busy (see Section 5.3). Otherwise, busy and out-of-range conditions are not indicated and speaking can begin after monitoring the channel.

4 Press (and hold) the PTT switch to talk and release it to listen. When the call is finished, place the microphone back on-hook.

5.11.2 Receiving a Standard Conventional Call

To receive a standard conventional call, proceed as follows:

1 Select or scan the channel programmed for the call you want to receive (refer to Section 5.10 for more scanning information).

2 After the call is received, take the microphone off-hook and press the PTT switch to talk and release it to listen. If scanning, responses may occur on the priority, selected, or receive channel as described in Section 5.10.2.

3 When the call is finished, place the microphone back on-hook.

5.12 DTMF / ANI Signaling

DTMF (Dual Tone Multi-Frequency) tones can be generated for ANI (Automatic Number Identification) and other purposes on conventional analog channels. One of the following options may be enabled on each channel:

Pre-Tx ANI - A preprogrammed ANI sequence is automatically sent each time the PTT switch is pressed.

Post-Tx ANI - A preprogrammed ANI sequence is automatically sent each time the PTT switch is released.

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When an emergency alarm or call is placed, this ANI signaling is replaced by the Emergency DTMF ID (see Section 5.9). Refer to Section 5.12.5 for information on MDC1200 ANI.

5.12.1   Single Tone Encoder

The radio will transmit and send a single tone as programmed. Single tone ANI provides call-in signaling, but does not provide identification of individual units, i.e. all units use the same single tone. Generally 1050 Hz is used for single tone RTT, but the radios and decoders must be programmable to other tones in the audio range. All tones must have a +/-0.2% frequency stability, and the tone length must be programmable to a pre-determined period of time from 0.5 to 2.5 seconds, in increments of 100 ms or less.

To use the single tone encoder functionality, program the radio with RTT with Single Tone Encoder selected as the type of RTT. The radio transmits and sends a tone of the programmed frequency and duration. When the tone is sent, all other radios on the system will hear the tone transmitted, and need to open audio.

5.12.2   Two Tone Encoder

The Two Tone Encoder operates in the same fashion as the Single Tone Encoder except it sends two tones back to back. The two tone encoder Initial Delay, Modulation, and Inter Digit Delay are programmable, as are the Tone Alias, tone frequencies, and tone durations.

A maximum of 64 tones can be programmed. Each tone will send two tones, each of its own frequency and duration. The tone frequencies are programmable from 288.5 Hz to 3,086.0 Hz in 0.1 Hz increments. Tone durations are programmable from 0.1 seconds to 12 seconds in 0.1 second increments.

The user can activate Two Tone in several manners. The first is to program a button for Two Tone and press it. This will send the current, active Two Tone, which is defaulted to the first tone in the Two Tone list upon profile download.

The second is to program Two Tone to the menu, select it from the menu, scroll to the desired tone in the list, and press PTT or the select button (pressing the rotary knob on the mobile). Pressing PTT or the select button will send the tone and store it as the active Two Tone. The Two Tone List is exited if the Menu Mode Timer expires, if the user presses the exit button (Exit button on the mobile), or if the user presses the button programmed for Two Tone while in the Two Tone List. Exiting the menu will not save the current Two Tone as the active Two Tone.

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The third is pressing and holding a button programmed for Two Tone. This will enter the Two Tone List. Again, from this point, scrolling to the desired tone in the list and pressing PTT or the select button will activate and store the Two Tone. Finally, Two Tone can be activated by using Emergency Analog Signaling, ANI Analog Signaling, or RTT Analog Signaling.

For direct activation (through button press or PTT/Select Button press in the Two Tone List), the "Allow Two Tone Page" function must be enabled in programming. If "Allow Two Tone Page" is not enabled and the user tries to send a Two Tone Page directly the radio will bad beep.

5.12.3   Two Tone Decoder

The Two Tone Decoder allows the radio to be configured to require tones of a particular frequency and pattern to be received before the radio unmutes the speaker to received audio.

If a conventional channel is not configured with a two tone decode list, the radio operates as normal and the radio does not decode two tone codes.

Two tone decode is available on digital mixed mode channels. However, the two tone encoder is disabled unless the transmit type is set to analog.

An option is now available to enable side tones. When the two tone encoder is activated the radio plays the tones on the speaker.

5.12.4   Five Tone Encoder

The radio transmits five tones. The first four tones are the Five Tone ID of the radio. The last tone is based on the radio mode (Normal Call, Emergency Call).

5.12.5   MDC1200 Compatibility

MDC1200 is a signaling protocol designed and implemented by Motorola for analog channels only. The following features of this protocol are supported. Either MDC1200 or standard DTMF ANI/Emergency signaling can be programmed on each conventional system.

MDC1200 ANI - Both pre and post ANI are supported.

MDC1200 Emergency Alert - A retry counter is implemented. Currently, ACKs are not decoded so the radio retries the programmed number of times with each emergency.

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Inhibit/Uninhibit Commands - Command to inhibit (disable) and uninhibit (enable) mobile access to the radio system.

5.12.6   GE Star

GE Star signaling is implemented for transmit functionality. Two programming modes are available:

Standard format (normal ANI for pre- and post- ANI and RTT and emergency).

NYSP format (emergency)

5.13   Project 25 Mode Features

The following features are unique to conventional P25 channels.

5.13.1   Digital Unit ID

Each radio that operates on Project 25 (digital) channels is programmed with an up-to-eight-digit unit ID. This ID is unique for each radio and can be any number from 1-16,777,215. When power is turned on with a Project 25 channel selected, this ID is briefly displayed.

5.13.2   Talkgroup ID

Each Project 25 channel is programmed with a group ID that determines which group of radios will receive the call. A call is received on a channel if a selected or scanned channel is programmed with that ID and the correct NAC is detected (see following). Group IDs can be any number from 1-65,535. Group ID detect can be disabled by the Normal/Selective squelch function described in Section 5.4 and the Monitor Mode described in Section 5.2.

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5.13.3   Network Access Code (NAC)

Project 25 conventional channels also use a NAC (Network Access Code) to control which calls are received on a channel. The NAC can be 1-4095, and each transmit and receive channel can be programmed for a different code. Other operation, such as monitoring before transmitting, is similar to that of analog channels. NAC (and group ID) detect can be disabled by the monitor mode described in Section 5.2.

5.13.4   EFJohnson System Out-of-Range Indicator

If programmed, Out-of-Range (OOR) monitoring and indicators to the user are provided. The radio can be programmed to provide an out-of-range indicator when used on an EFJohnson Infrastructure system. If the radio fails to receive the beacon signal or a voice call from the system, then (if programmed) an out-of-range status will be indicated on the radio by a tone, display, or tone and display.

The out-of-Range function operates on conventional analog and digital channels that have been programmed for the feature. The radio goes out of range if it does not receive transmission from the current site for a specified time. The radio comes back into range if it receives a transmission on and OOR channel.

Scanning Mode - the same as above

Unit and Interconnect Calls - OOR operates in the background. Tone indicators will sound, but the OOR message is not displayed.

PTT Operation - Pressing the PTT does not reset the inactivity timer. If the timer expires while the radio is transmitting, no indication will be provided to the user until they release the PTT. When the PTT is released, the radio will flash "Out of Rng" and beep, if applicable.

If the user is in a fringe area or is entering an area that has poor coverage such as a building and wishes to disable the tone, an Out-of-Range Indication Tone feature can be programmed to the menu or to a button. In the menu, the feature is labeled "OORI Tone", and for the Lightning, the soft menu label is "OORI". The feature will allow the user to disable / enable the Out-of-Range Indication tone from the radio. The Out of Range display messages will not be affected.

If the OORI tone is disabled in programming (No Indication, Display Only), pressing the OORI Tone button results in "Disabled" on the display.

If the OORI Tone is active, pressing the OORI Tone button disables the tone and the display will flash "OOR Tn Off" (Standard Control Head) or "OOR Tone Off" (Lightning Control Head) for one second.

If the OOR tone is not active, pressing the OOR Tone button enables the tone and the display will flash "OOR Tn On" (Standard Control Head) or "OOR Tone On" (Lightning Control Head) for one second.

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Both the Entering OOR and Exiting OOR Tones will be disabled to avoid excess tones from fringe areas where the radio is toggling in and out of coverage.

Tones are restored on power cycle.

5.13.5   EFJohnson System Automatic Registration

When used in a EFJohnson P25 conventional infrastructure radio system, an option on the radio can be programmed to provide additional identifying information to the system upon receipt of a dynamic data registration request. If the "EFJ Affiliation" option is enabled, the radio will transmit its current talkgroup to the system in addition to its unit ID during a dynamic data registration request. EFJohnson also supports conventional standardized IP data context activation registration without the EFJ affiliation enabled.

The radio will attempt a data registration on channel change. If the radio does not receive a registration response after the programmed number of retries it will display "Reg Failed". If the radio is out of range and then returns to within range of a site where it had not yet registered, it will initiate another registration.

5.13.6   P25 Group Calls

P25 Group calls are placed by simply selecting the channel programmed for the desired group, monitoring the channel if required, and transmitting. When a P25 group call is received, the alias (or frequency) of the selected channel is displayed. The radio can be programmed so that the following are also displayed for 0.5-7.0 seconds or continuously during the call.

PTT ID - The unit ID of the radio placing the call is displayed.

P25 Talkgroup - The alias of the talkgroup on which the call is being received is displayed.

User Group ID - If the group ID of the call being received is included in a preprogrammed User Group ID list, the alias programmed in that list for that group is displayed.

Received Key ID - The Key ID (or the alias, if programmed) of the key used to decode the call is displayed.

P25 Talkgroup - The radio displays the number or alias of the talkgroup on which the call is being transmitted. This can be programmed to display for 0.5-7.0 seconds or infinitely.

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5.13.6.1 Changing Talkgroup Assigned To a Channel

If the Talkgroup Select option switch is programmed, the talkgroup assigned to a channel can be changed by the user. The operation can also be selected from the menu as Select TG, or "TGSEL" from the soft button menu (Lightning Control Head only). The new talkgroup continues to be assigned to the channel until it is manually changed again (cycling power or selecting another channel does not reselect a default talkgroup). Change the talkgroup assigned to a channel as follows:

1   Select the channel to be changed and then press the Talkgroup Select option switch.

2   Rotate the Select switch to display the talkgroup to be assigned to that channel. Talkgroups are indicated by a unique identification in the alphanumeric display.

3   To select that talkgroup and return to normal operation, press the Talkgroup Select switch again or press the Select switch. A single beep sounds when the Select switch is pressed (if that option is enabled). If talkgroup selection has been disabled on the channel by programming, the talkgroup does not change, "NO LIST" is displayed, and a tone sounds.

5.13.7 P25 Unit Calls

Unit calls (also called Individual Calls) can be placed to a specific radio on Project 25 channels using the Unit Call option switch (if programmed) or by menu selection. Only the individual ID of the target radio is sent (a talkgroup ID is not sent). The radios that can be called are preprogrammed in the Unit Call list.

To receive a unit call, the RF channel of the call must be selected or scanned and the correct NAC and unit ID must be detected. The ID of the calling radio is then transmitted back. To respond to the call, the radio must be programmed with the Unit Call option switch, and have a Unit Call programmed with the ID of the calling radio.

5.13.7.1 Place and Receive a Unit Call

To place and receive a Unit Call:

1   To transmit a unit call, press the Unit Call option switch, menu option, or soft button option (Lightning Control Head only). The alias (tag) of the last Unit Call is displayed.

Direct entry is allowed using the front buttons of the Digital Keypad Mic.

2   If required, rotate the Select switch to display the desired alias/ID. The alias and ID of the unit calls that have been programmed are alternately displayed.

3   Press and then release the PTT switch. Ringing is then heard and "WAIT" displayed to indicate that the radio is being rung. To disable this ringing but not the call, briefly press the PTT switch again. Ringing occurs for 20 seconds or until the call is answered, whichever occurs first.

4   When a unit ID call is received, three beeps sound every six seconds four times (if tones are enabled), and "CALL RECVD" (Standard Control Head) or "Call Received" (Lightning Control Head) and the alias of the Unit ID are alternately flashed.

5   To respond, select the Unit Call mode by pressing the Unit Call option key.

   -   If the call timer times out (set by programming) or the channel is changed before a response is made, the unit call mode is exited.

5.13.7.2   Direct Channel Entry

The direct Channel entry feature is available if the Channel Select option switch parameter is programmed. This allows channels to be directly selected using the keypad on the Digital Keypad Microphone

For direct selection purposes, channels are numbered sequentially starting with the lowest zone. Each zone can be programmed with up to 16 channels, so Zone 1 channels are numbered 1-16, Zone 2 channels 17-32, and so on as shown below.

For example, Zone 1/Channel 16 is selected by Channel 16, and Zone 2/Channel 16 is selected by Channel 32.

Seq. Ch. No.	Zone	Channel
1 - 16	1	1 - 16
17 - 32	2	1 - 16
33 - 48	3	1 - 16

Proceed as follows to select channels using this mode:

1   Enable the direct Channel Select mode selecting it via the menu, pressing the Channel Select option switch, or pressing the Channel Select soft button (Lightning Control Head only). A single beep sounds when the switch is pressed (if that option is enabled). The alias and sequential number of the current channel are alternately displayed.

2   Select the desired channel using the Up/Down keys or directly enter the three-digit number using the 0-9 keys. (i.e., channel 1 must be entered as 001.) A single beep sounds when the channel is changed (if that option is enabled). If using the 0-9 keys, the radio attempts to display the entered number after the third digit is entered or approximately two seconds after the last key is pressed.

3   To exit this mode and select the entered channel, press the Channel Select switch again. This mode is also exited automatically without changing the channel after approximately one minute of no activity.

Note   *The Channel Select function should probably not be assigned to a number key because pressing that key to select a channel then exits the select mode.*

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5.13.8   P25 Conventional Telephone Calls

Telephone calls can be placed and received on P25 conventional channels with a Network Interface Unit (NIU). EFJohnson also supports telephone calls to be placed and received over other vendor's public telephone. Telephone calls are programmed to operate in one of the following modes:

• Disabled

• Answer-only capability

• List only - Telephone numbers can be selected from a preprogrammed list only (direct entry as follows is not allowed)

• Unlimited - Telephone numbers can be selected from a list and also dialed directly (press and hold) entered using the front panel controls or the keypad on the Digital Keypad Microphone.

All models have the capability to place telephone calls by recalling the number from a list or dialing it using the front panel controls or using the keypad on the Digital Keypad Microphone. More information on how to do this follows.

5.13.8.1   Access / De-Access Codes

P25 conventional telephone calls use an access code to access the system when placing a telephone call, and a de-access code to terminate the call when it is finished. These codes are preprogrammed in pairs by the Access/De-Access Code list, and up to 255 pairs can be programmed. Each conventional P25 channel can be programmed to automatically select one of these code pairs. They must match the system codes, and the default code is ***1P#** (the P represents a pause).

5.13.8.2   Placing a Telephone Call

To recall from list:

1   Select the conventional channel that is programmed to select the desired access and de-access codes.

2   Momentarily press the PHONE option switch, make the menu selection, or press the PHONE soft button (Lightning Control Head only). The display indicates the last number dialed by alternately displaying "LAST NUM" and the telephone number. In addition, the phone mode is indicated by the 📞 icon (Standard Control Head) and the ☎ for the Lightning Control Head.

3   If required, rotate the Select switch to display the desired number. The alias and telephone number are alternately displayed.

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4 Briefly press the PTT switch to send the access code. A dial tone sound should then be heard. Briefly press the PTT switch again to send the digits. Proceed to Step 5 (in next steps):

For direct entry using front panel controls or the keypad on the Digital Keypad microphone:

1 Select the conventional channel that is programmed to select the desired access and de-access codes.

2 Press and hold the PHONE option switch until a tone sounds (approximately one second). The alias of the last called telephone number is displayed if it is in the phone number list. Otherwise, only the last eight digits are displayed. In addition, the phone mode is indicated by the ✆ icon (Standard Control Head) or ☎ on the Lightning Control head..

3 If using the front panel controls, enter the telephone number by rotating and pressing the Select switch. The 0-9, *, #, and P (pause) characters can be entered (# is displayed as a "+"). Numbers up to sixteen digits (including pauses) can be entered, and the number scrolls to the left in the display so that the eight right-most digits are always displayed. With the Digital Keypad Microphone, enter the number using the DTMF keypad (a pause indicated by "P" is entered by * #).

4 Briefly press the PTT switch to send the access code. A dial tone sound can then be heard. Briefly press the PTT switch again to send the digits.

5 Press the PTT switch to talk and release it to listen. Since the radio operates half duplex, it is not possible to talk and listen at the same time.

6 When the telephone call is finished or if it could not be completed for some reason, end it by pressing the PHONE option switch again and placing the microphone back on-hook. This sends the de-access code which tells the system that the call is finished and that the repeater can be released.

5.13.8.3   Answering a Telephone Call

To answer a telephone call:

1 When a telephone call is received, "ringing" similar to a standard telephone is heard and "PHONE" is displayed.

2 To answer the call, press the Phone option switch and press the PTT switch to talk and release it to listen.

3 When the call is finished, end it as in the preceding Step 6.

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5.13.9   Call Alert

The Call Alert™ feature allows pages to be sent and received on P25 conventional channels. The Call Alert Encode and Decode options must be enabled (by programming) to send or receive an alert. Operation is similar to SMARTNET/SmartZone and P25 Trunking channels.

To answer a page:

1   When a page is received, five beeps sound and "PAGE RCVD" (Standard Control Head) and "Page Receive" (Lightning Control Head) is displayed. The ID of the radio paging you is stored as the last ID received.

2   To clear or ignore the page, press any option switch. If the PTT switch is pressed, a group call is placed on the selected channel.

3   To answer the page as a unit call (see Section 5.13.7), press the Unit Call option switch (or select the option from the menu). The alias of the radio paging you is displayed. Press the PTT switch and respond. One of the following conditions then occur:

   - If the radio being called is on the air, ringing is heard until the called party answers or for 20 seconds, whichever occurs first. If no answer occurs within 20 seconds, a continuous tone sounds and "NO ANSWER" (Standard Control Head) or "No Answer" (Lightning Control Head) is displayed.

   - If the radio being called is not on the air, a continuous tone is heard instead of ringing and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed.

4   When the call is finished or if it could not be completed for some reason, end it by pressing the Unit Call option switch or the <F6> (Exit) key.

To initiate a page:

1   With a P25 conventional channel selected, momentarily press the Call Alert option switch. The alias of the last ID called is displayed. Or press and hold the switch to directly enter the ID of the radio you wish to page.

2   If required, rotate the Select switch to display the desired radio. The alias of each number is displayed.

3   Press the PTT switch and one of the following occur:

   • If five beeps sound, the system received the page and the paged radio is on the air and received it. The page mode is automatically exited.

   • If the system received the page but the called radio is not on the air, a single beep sounds and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning

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Control Head) is displayed six seconds after the PTT switch is pressed. Auto exit then occurs.

5.13.10   Call History

If programmed, the Call History feature stores the IDs of the last five radios that have made talkgroup calls, unit calls, or call alerts to the user's radio. To view the Call History list:

1   Access Call Alert or Unit Call List from the menu. The first call displayed is the most recent call received.

2   Scroll through the list to view up to 5 calls, in order from most recent to least recent.

5.13.11   Messaging

The messaging feature allows preprogrammed messages to be sent to a dispatcher on P25 channels. Up to 255 messages can be preprogrammed, and they are identified by an alias. If a Message option switch is programmed, messages are sent as follows:

1   Momentarily press the Message option switch, menu option, or soft button (Lightning Control Head only). The alias of the last message sent is displayed.

2   If required, rotate the Select switch to display the desired message. Then send the message by momentarily pressing the PTT or Select switch. A single beep sounds when the Select switch is pressed (if that option is enabled). One of the following events then occurs:

- If five beeps sound and "ACK RECVD" (Standard Control Head) or "Ack Received" (Lightning Control Head) is displayed, the message was received and automatically acknowledged by the system.

- If after five tries the message is not acknowledged, a tone sounds and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed.

Note   *A smart console with message receiving capabilities must be used to receive messages.*

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5.13.12   Status Messaging

The status messaging feature allows you to manually or automatically send your current status to your dispatcher on P25 channels. Up to 255 status conditions can be preprogrammed, and they are identified by an alias. If the STATUS option switch is programmed, status conditions are sent as follows:

1   Momentarily press the STATUS option switch, soft button (Lightning Control Head only), or select the option via the menu. The alias of the current status condition is displayed.

2   To change the current status, rotate the Select switch until the desired status is displayed. Then to send the status, momentarily press the PTT switch. One of the following events then occurs:

   -   If five beeps sound and "ACK RECVD" (Standard Control Head) or "Ack Received" (Lightning Control Head) is displayed, the status was received and acknowledged by the system.

   -   If after five tries the message is not acknowledged, a tone sounds and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed.

Note   *A smart console with message receiving capabilities must be used to receive status messages.*

5.13.13   P25 Packet Data

See Section 8 for information on data functions and services.

5.14   Keypad Programming

Since keypad programming is permitted by Federal Government users only, only Federal models of this radio can be programmed with this feature. It is then available only if it has been enabled by factory programming and a conventional mode option switch is programmed for the "Keypad Programming" function.

Note   *The Keypad programming feature is available to Federal Government users only. Users regulated by the Federal Communications Commission (FCC) are not allowed to have this feature. This feature must be factory enabled to be selected.*

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Keypad programming is selected by pressing the Keypad Programming option switch or by selecting the option from the menu (password entry is not required). The keypad programming mode is indicated by "CHNG ZONE" and a triangle (Standard Control Head) or "Change Zone" and the ▦ (Lightning Control Head) in the display as follows:

▲

CHNG ZONE

Keypad programming allows conventional channel parameters such as the transmit and receive frequency, Call Guard squelch code, and encryption key to be changed. In addition, several conventional mode timers can be changed. It cannot be used to reprogram disabled channels or any P25 Trunked, SMARTNET, or SmartZone information.

5.14.1   Menu Structure

A menu system is used to select parameters in the keypad programming mode. To enter the Menu Mode, press and hold the Select button until it beeps and enters the Menu Mode. Rotate and press the Select switch to scroll through and select the available parameters. The available parameters and the section in which each is described are as follows:

• Change Zone (5.14.3)

• Change Channel (5.14.4)

• System Parms (5.14.5)

• Channel Parms (5.14.6)

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Press the Select switch to select the displayed parameter. A single beep sounds when the switch is pressed (if that option is enabled). Press the Keypad Programming option switch from one of the main menus to exit keypad programming or from other menus to exit back one level. A flowchart showing the keypad programming mode menu structure is located Figure 5.1. Refer to the descriptions which follow for more information.

Figure 5.1   Viking Keypad Programming Menu Flowchart
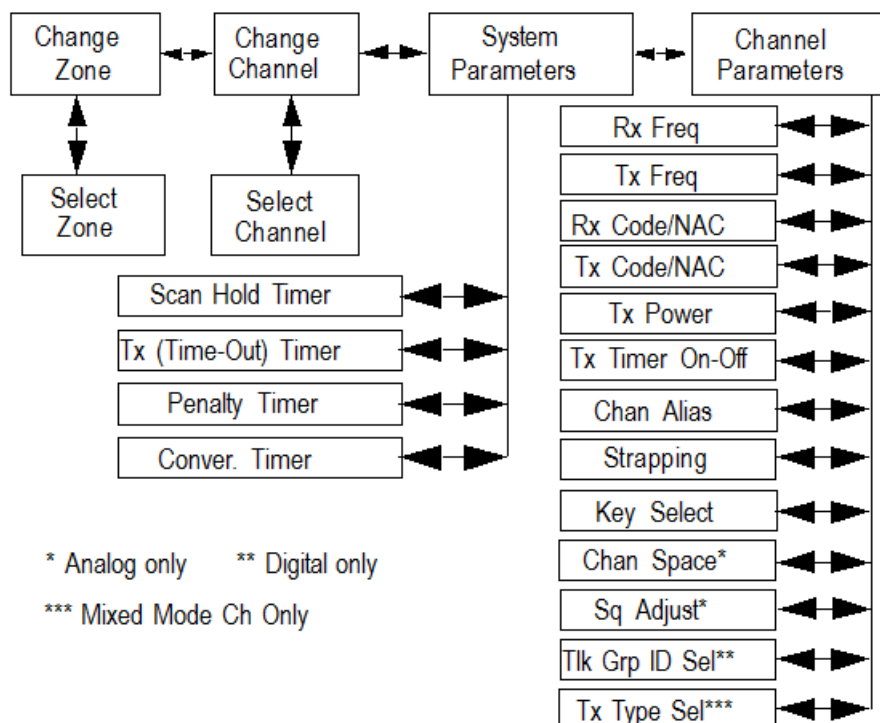
5.14.2   Zone Password

Each zone can be programmed with a password to prevent unauthorized reprogramming of zone by keypad programming. When this password is programmed, it must be entered before system or channel parameters in that zone can be changed by keypad programming. A different password can be programmed for each zone.

Note   *Make sure that the zone passwords are not lost because they cannot be overridden in the field. Armada must be used to add a new password.*

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When an attempt is made to select a system or channel parameter in a password protected zone, "PASSWORD" is flashed. The password is always eight digits long and is entered using the same procedure as used for the power-up password described in Section 3.1.3. After the password is entered, system and channel parameters for that zone can be reprogrammed normally.

5.14.3   Zone Change Parameter

The "CHNGE ZONE" (Standard Control Head) or "Change Zone" (Lightning Control Head) menu parameter selects the zone containing the conventional channel to be reprogrammed. It does not change the zone selected for normal operation.

Press the Select switch to select the Change Zone parameter and then scroll through the programmed zones by rotating that switch. When the desired zone is displayed, select it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

5.14.4   Channel Change Parameter

The "CHNGE CHAN" (Standard Control Head) or "Change Channel" (Lightning Control Head) menu parameter selects the conventional channel to be reprogrammed. Disabled or P25 Trunking/SMARTNET/SmartZone channels cannot be selected. This does not change the channel selected for normal operation.

Press the Select switch to display Change Channel and then scroll through the programmed channels by rotating that switch. When the desired channel is displayed, select it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

5.14.5   System Parameters

The "SYS PARMS" (Standard Control Head) or "System Parms" (Lightning Control Head) menu parameter selects the conventional mode timer to be reprogrammed.

Press the Select switch to select System Parms and then rotate that switch to display the desired parameter. Then press the Select switch again to select it. A single beep sounds when the switch is pressed (if that option is enabled). The following timers can be programmed.

Note   *If "PASSWORD" is briefly displayed when attempting to select a parameter, see Section 5.14.2.*

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SCAN TIMER - Selects the Scan Hold timer. Rotate the Select switch to decrement/increment the timer in 0.5-second steps from 0-7.5 or set it to 0 seconds to disabled it. When the desired value is displayed, store it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

TX TIMER - Selects the transmit time-out timer. Rotate the Select switch to decrement/increment the timer in 15-second steps from 0-225 or disable it by selecting 0 seconds. When the desired value is displayed, store it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

PEN TIMER (SCH)/Penalty Time (LCH) - Selects the penalty timer. Rotate the Select switch to decrement/increment the timer in 15-second steps from 0-225 or disable it by selecting 0 seconds. When the desired value is displayed, store it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

CONV TIMER (SCH)/Conversatn Timer (LCH) - Selects the conversation timer. Rotate the Select switch to decrement/increment the timer in 30-second steps from 0-450 or disable it by selecting 0 seconds. When the desired value is displayed, store it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is enabled).

5.14.6   Channel Parameters

The "CHAN PARMS" (Standard Control Head) or "Channel Parms" (Lightning Control Head) menu parameter selects the following conventional channel parameters that can be reprogrammed. Press Select switch to select the "Channel Parms" parameter and then rotate that switch to display the desired parameter. Then press the Select switch again to select it. A single beep sounds when the switch is pressed (if that option is enabled). The squelch control parameters are unique to the type of conventional channel selected (analog or Project 25).

Note   *If "PASSWORD" is briefly displayed when attempting to select a parameter, see Section 5.14.2.*

Note   *If a mixed mode channel is selected, both the Rx Code (analog) and Rx NAC (P25) which follow can be programmed. In addition, if the Tx Type is Analog, a Tx Code is programmed, and if it is Digital (P25), a Tx NAC is programmed.*

RX FREQ - Programs the receive channel frequency. To select the digit to change or move the cursor to the right, press the F3 button (Standard Control Head) or right on the Navigation Pad (Lightning Control Head). To move the cursor to the left, press the F2 button (Standard Control Head) or left on the Navigation Pad (Lightning Control Head). Then to display the desired digit, rotate the Select switch. The frequency is stored after programming the last digit. If an invalid frequency is entered, a beep sounds, "INVALID" is briefly displayed, and the frequency editing mode continues to be selected.

TX FREQ - Selects the transmit frequency the same the preceding RX FREQ.

RX CODE - Sets the receive Call Guard (CTCSS/DCS) code. The currently selected code is initially displayed. If required, rotate and press the Select switch to select the desired code type (CTCSS analog or DCS digital). If an invalid code is entered, a beep sounds, "INVALID" is briefly displayed, and the editing mode continues to be selected.

TX CODE - Selects the transmit codes the same as RX CODE above.

RX NAC - Selects the receive Network Access Code (NAC) which can be any number from 1-4095. This number is displayed in hexadecimal from 000-FFF. Rotate and press the Select switch to enter the desired code. A single beep sounds when the switch is pressed (if that option is selected). The displayed code is stored after the last digit is programmed. If an invalid code is entered, a beep sounds, "INVALID" is briefly displayed, and the NAC editing mode continues to be selected.

TX NAC - Selects the transmit NAC the same as RX NAC above.

TX POWER - Selects the desired power output level. Rotate the Select switch to scroll through the following choices. When the desired setting is displayed, store it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is selected).

- POWER High - Selects high transmit power.

- POWER Low - Selects low transmit power.

- POWER SW (SCH)/Power Switch (LCH) - Switchable power selectable by the High/Low power switch. This choice is not available if that switch is not programmed.

TX TIMER - Enables or disables the time-out timer on the current channel. Rotate the Select switch to toggle between the ON and OFF mode, and when the desired setting is displayed, store it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is selected).

Channel Alias - Programs the alias for the channel. Up to ten characters (Standard Control Head), up to sixteen characters (Lightning Control Head) from A-Z and 0-9 and spaces can be entered. Press Select switch once to display the current alias and then press it again or rotate it to program a new alias. Rotate the Select switch to display the desired character and then press F3 to move to the next position (Standard Control Head) or right on the Navigation Pad (Lightning Control Head) to move to the next position. A single beep sounds when the switch is pressed and the alias is then stored.

Note   *The next two parameters are programmed only if the radio is programmed for encryption.*

Strapping - Selects the encryption strapping mode for the channel as Clear, Secure, or Switched.

Key Select - Selects the encryption key for the channel if applicable. The key storage location of 0-63 (PID) or 1-64 (SLN) is selected (see Section 7.2.2). If no keys are programmed, "NO KEYS" is displayed.

CHAN SPACE (SCH)/Channel Space (LCH) (Analog Only) - Selects either wide or narrow band channel spacing on analog channels only. Rotate the Select switch to toggle between "WIDE" and "NARROW", and when the desired setting is displayed,

store it by pressing the Select switch. A single beep sounds when the switch is pressed (if that option is selected).

Note   *The channel spacing is not set with P25 channels because it is always narrow, and the squelch cannot be changed because the setting is critical for proper receiver operation.*

SQ ADJUST (SCH)/Squelch Adjust (LCH) (Analog Only) - Changes the preset squelch setting on that channel. The default setting is "0" and values of –7 to +7 can be selected. Increasing this setting toward +7 causes the squelch to open sooner so that weaker signals can be received, and decreasing it toward –7 causes the opposite to occur.

TG ID (P25 Only) - Selects the talkgroup for the selected channel. Rotate the Select switch to display the alias of each preprogrammed talkgroup and then press it to store the desired talkgroup. A single beep sounds when the switch is pressed (if that option is selected).

Transmit Type (P25 Mixed Mode Only) - If the selected channel is a mixed mode, analog and P25 channel, this selects the transmit type. Either Analog or Digital (P25) can be selected. This then determines if a Tx Code or Tx NAC is programmed above.

5.15   Text Messaging

If enabled, mobile radios have text message receiving capability (digital conventional mode only).

Note   *Mobile radios can receive text messages, but cannot transmit them. All received messages are limited to 200 characters.*

5.15.1   Data Setup for Text Messaging

A mobile radio can receive a text message from another radio on a digital conventional channel regardless of whether the channel uses a repeater.

The radio's text message menu contains the item "Set R to R". The default for this setting is enabled, in which the following capabilities are operable:

• A text message can be received from radios on a simplex digital channel

• A text message can be received from radios on a digital channel with a repeater (if repeater talk-around is enabled)

• The repeater in use is programmed for Repeated Data mode (not supported by EFJ 2600 repeaters)

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If "Set R to R" is disabled:

• A text message can be received from radios on a digital channel with a repeater if PCTextMessage is connected to that repeater (all radios must be dynamically registered to the repeater)

• A text message can be received from a radio and PCTextMessage on a digital conventional channel (if PCTextMesssage is connected to that repeater)

5.15.2   Receiving a Text Message

When a text message is received, a short alternating tone is sounded and the display flashes "TEXT MSG" (Standard Control Head) or "Text Message" (Lightning Control Head).

To view the message, press the assigned text message function button. The sender's Unit ID (or alias, if programmed) will be displayed for approximately one second. Following this, the text of the message is shown.

Note   *Mobile radio with the Standard Control Head displays only capital letters, numbers, and the following symbols: period, question mark, apostrophe, forward slash, and backslash. Incoming message text is parsed to meet this requirement (i.e., lower case letters are capitalized, and any character not meeting the requirement is replaced by space).*

If the message is nine characters or less in length, the text will remain stationary on the Standard Control Head. If the message is fifteen characters or less in length, the text will remain stationary on the Lightning Control Head..

If the message is longer than ten characters, the text will scroll across the display.

• To pause scrolling, press the Select knob.

• If desired, adjust the message position by turning the Select knob.

• To resume scrolling, press the Select knob again

Note   *The message displayed is the message most recently received. To view messages received earlier, refer to paragraph 5.15.3.*

5.15.3   Viewing Previously Received Messages

To view previously received messages:

1 Press and hold the text message button, or select the text message menu item, and select "View Msg". The display will show "Message 1", which is the most recent message received.

2 Use the Select knob to move through the list to the desired message.

3 To view the message text, press the Select knob.

Note   *Text messages are retained only while the radio is powered up. If power is removed, all text message data is lost.*

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6

SMARTNET / SmartZone / P25 Trunked Features

The features described in this section are radio features unique to these modes of operation.

6.1   Analog and Digital Operation

Either analog or digital operation can be selected for communication on SmartZone traffic channels. Each talkgroup can be programmed for either type of operation. Digital operation is an optional feature.

6.2   Viewing Unit ID

When power is turned on with a SMARTNET/SmartZone channel selected, the five-digit Unit ID from 1-65,534 is briefly displayed as xxxxx. When a P25 channel is selected, the eight-digit unit ID from 1-16,777,211 is displayed (see Section 5.13.1).

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6.2.1   Radio Info Button

Pressing the Radio Info button (if programmed) or selection of the menu parameter allows the user to display the ID programmed for the currently selected protocol. If the radio is on a digital conventional channel, it shows the digital conventional ID. If the radio is currently on a SmartNet/SmartZone or P25 Trunking channel location, it shows the ID associated with that protocol. This feature also shows the following items:

* Radio Alias
* Radio Tag
* Profile Tag
* Unit ID for active protocol
* Encryption Key location programmed for the currently selected channel
* Over the Air IP Address
* ESN
* SEM
* MAC Address
* Ethernet IP Address
* Wi-Fi Menu
* Band
* Current Software version in the radio

6.3   Standard Group Calls

Standard calls are between you and another mobile, group of mobiles, or a control station (a radio in a fixed location). Most calls are probably this type. Proceed as follows to place and receive group calls.

6.3.1   Placing a Standard Group Call

To place a Standard Group Call:

1 Turn power ON and set the volume as described in Section 3. Select the channel programmed for the talkgroup you want to call (see Section 3.1.7.1).

2 If the talkgroup is programmed for encryption and is not strapped to Clear or Secure, select the desired mode by pressing the Clear/Secure option switch, soft button (Lightning Control Head only), or selecting the menu parameter. The status of that switch is ignored if the talkgroup is strapped to Clear or Secure, or if the "Ignore Clear/ Secure Switch when Strapped" is programmed. When you change to Secure mode, the display will briefly display the Key Alias assigned to this encryption key. Refer to Section 7.3 for more information.

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3 Press the PTT switch and begin talking. An optional talk permit tone may sound to indicate when talking can begin. Other indications that may occur are as follows:

- If in the secure mode and your radio is not programmed with the proper encryption key, "KEYFAIL" is displayed and the call must be made in the clear mode or the proper key must be programmed.

- If the busy tone sounds and "BUSY" is displayed, the system is busy. Release the PTT switch and wait for the call back tone to sound. Then press the PTT switch within three seconds.

- If a continuous tone sounds and "OUT OF RANGE" is displayed, you may be out of range of the site or blocked from it by radio-shielding structures or objects. Drive away from shielding structures or objects and try again. If this does not work, drive closer to the site.

- If your unit ID is denied, the call is being made to an invalid group ID, or group calls are not enabled, "Denied" is displayed and an alert tone sounds.

- If an attempt is made to change a channel from the clear to the secure mode and there is no available secure channel, "CLEAR ONLY" is flashed, an error tone sounds, and the call is terminated. (SmartNet Only)

- If the Secure mode is selected by the Clear/Secure option switch, soft button (Lightning Control Head only) or menu parameter and an attempt is made to transmit on a channel strapped as Clear, "CLEAR ONLY" is displayed and the transmitter is disabled. Likewise, if the Clear mode is selected and the channel is strapped as secure, "SECR ONLY" (Standard Control Head) or "Secure Only" (Lightning Control Head) is displayed and the transmitter is disabled.

6.3.2   Receiving a Standard Group Call

Calls are received on only the talkgroup and/or announcement group programmed for the selected channel (with scanning disabled).

When a group call is received, the alias of the selected channel is displayed. The radio can be programmed so that the following are also displayed for 0.5-7.0 seconds or continuously during the call.

PTT ID - The unit ID of the mobile placing the call is displayed.

TG on Rx - The alias of the talkgroup on which the call is being received is displayed (typically for use by technicians).

User Group ID - If the group ID of the call being received is included in a preprogrammed User Group ID list, the alias programmed in that list for that group is displayed.

Receive Key ID - The Key ID (or the alias, if programmed) of the key used to decode the call is displayed.

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6.4   Unit Calls

Unit calls allow calls to be placed to a specific radio. Either the Enhanced or standard modes may be programmed depending on the capabilities of the radio system. One difference between these call types is that the Enhanced type provides an indication that the called mobile is not on the air and the standard version does not. Operation in each of these modes is described in the following information.

The Unit Call option switch is required to place these calls, and either that switch or the Call Response switch is required to answer them. The feature is also selectable via menu parameter or soft button (Lightning Control Head only). Unit calls are programmed to operate in one of the following modes:

• Disabled

• Answer-only capability

• List only - Unit IDs can be selected from a preprogrammed list only (direct entry as follows is not allowed)

• Unlimited - Unit IDs can be selected from a list and also dialed directly using the front panel controls or keypad on the Digital Keypad Mic.

6.4.1   Placing an Enhanced Unit Call

To recall from a list:

1   Momentarily press the Unit Call option switch, soft button (Lightning Control Head only), or select the menu parameter. The alias of the last called mobile is displayed.

2   To select another mobile, rotate the Select switch until the alias for the desired mobile is displayed.

3   Press the PTT switch and one of the following events then occurs:

(Proceed to the bulleted list which follows Item 3 in the next section for events that may occur next.)

To make direct entry from the Menu (scroll down to select direct entry) or by using front panel controls or the keypad on the Digital Keypad microphone:

1   Press and hold the Unit Call option key until a tone sounds (approximately one second). The last ID called is displayed.

2   If using the front panel controls, enter the ID of the radio you are calling (eight digits for Unit Call) by rotating the select switch, pressing F3 to advance the cursor (Standard Control Head) or right on the Navigation pad (Lightning Control Head). The F2 button (Standard Control Head) or left on the Navigation Pad (Lightning Control Head) can be used to move the cursor left to correct an entered number. With the Digital Keypad

microphone, enter the number using the DTMF keypad. To cancel the call, press the Unit Call Option key again.

Note   *If the Unit Call option is programmed to either the F2 or F3 buttons on the Standard Control Head, you must use the F6 button to exit the function.*

3   Press the PTT switch to initiate the call. If the entered number is valid, the display indicates the alias of the ID if it matches an ID in the call list. Otherwise, the ID you entered continues to be displayed.

Events that may then occur are as follows:

- If the mobile being called is on the air, "WAIT" is displayed and ringing is heard until the called party answers or for 20 seconds, whichever occurs first. Pressing the PTT or an option switch stops the ringing but not the call. When the call is answered, the voice of the called party is heard.

- If the called mobile does not answer within 20 seconds, a continuous tone sounds and "NO ANSWER" is displayed.

- If the called mobile is not on the air, a continuous tone sounds instead of the ringing tone and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed.

- If the busy tone sounds and "BUSY" is displayed, the called mobile has answered the call but the system is busy. When the system is no longer busy, the call back tone sounds.

- If your radio or the called radio is inhibited or not programmed to make this type of call or for the requested secure mode, "RSPNS ONLY" (Standard Control Head) or "Response Only" (Lightning Control Head) is displayed and an alert tone sounds.

- If your radio does not have the proper encryption key, "KEYFAIL" is displayed and the call must be made in the clear mode by pressing the Clear/Secure option switch (if encryption is selectable on the channel). Otherwise, the correct key must be loaded.

4   When the call is finished or is not answered, end it by pressing the Unit Call option switch and placing the microphone back on-hook, or by pressing the appropriate exit button.

6.4.2   Placing a Standard Unit Conversation Call

To recall from a list:

1   Momentarily press the Unit Call option switch, soft button, or select the menu parameter. The alias of the last called radio is displayed.

2   To select another mobile, rotate the Select switch until the alias for the desired mobile is displayed.

3   Press the PTT switch to initiate the call.

(Proceed to the bulleted list which follows Item 3 in the next section for events that may occur next.)

To make a direct entry from the menu (scroll down to select direct entry), or by using front panel controls or the keypad on the Digital Keypad microphone:

1   Press and hold the Unit Call option key until a tone sounds (approximately one second). The last ID called is displayed.

2   If using the front panel controls, enter the ID of the radio you are calling (eight digits for Unit Call) by rotating the select switch, pressing F3 (Standard Control Head) or right on the Navigation pad (Lightning Control Head) to advance the cursor. The F2 button (Standard Control Head) or left on the Navigation Pad (Lightning Control Head) can be used to move the cursor back to correct an entered number. With the Digital Keypad microphone, enter the number using the DTMF keypad. To cancel the call, press the Unit Call Option key again.

Note   *If the Unit Call option is programmed to either the F2 or F3 buttons on the Standard Control Head, you must use the F6 button to exit the function.*

3   Press the PTT switch to initiate the call. If the entered number is valid, the display indicates the alias of the ID if it matches an ID in the call list. Otherwise, the ID you entered continues to be displayed.

   Events that may then occur are as follows:

   -   The called party answers the call.

Note   *If programmed, the tone sounds until the called party answers or until the timer expires.*

   -   The called party does not answer. Press the Unit Call option switch to end the call.

   -   If the selected mobile ID is not valid, "INVALID ID" is displayed and an alert tone sounds.

   -   If the radio system is busy, four low tones sound and "BUSY" is displayed. When the system is no longer busy, the call back tone (four beeps) is heard and the channel is automatically acquired. Press the PTT switch to continue the call.

   -   If the call is in the secure mode and your radio does not have the proper encryption key, "KEYFAIL" is displayed and the call must be made in the clear mode by pressing the Clear/Secure option switch (if encryption is selectable on the channel). Otherwise, the correct key must be loaded.

4   When the call is finished or if it is not answered, end it by pressing the Unit Call option switch and placing the microphone on-hook, or by pressing the appropriate exit button.

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6.4.3   Receiving a Unit Call (All Types)

To receive a Unit Call:

1 When an unit call is received, "CALL RECVD" (Standard Control Head) or "Call Received" (Lightning Control Head) is displayed and the call tone sounds once. The unit ID of the calling mobile is displayed. The display toggles between "CALL RECVD" (Standard Control Head) or "Call Received" (Lightning Control Head) and the calling ID. If programmed, the tone sounds until answered or timer expires.

2 To answer the call, select the menu parameter, press the Unit Call soft button (Lightning Control Head only), or option key and then the PTT switch and begin speaking. More information follows:

-   If the PTT switch is pressed before the Unit Call key, the call is transmitted as a group call.

-   If unit calls are not permitted (the Unit Call option key is not programmed), press the Call Response option switch to respond.

-   The call must be answered within 20 seconds or it is automatically terminated.

-   If the system is busy when a response is made, "BUSY" is displayed and the busy tone sounds.

Note   *To ignore a received call (on a P25 Trunking system), the user can press the select knob on the mobile radio after a radio receives the unit call. This sends a unit call answer response to the system, denying the call from the radio. The system will repeat this, and the initiating radio immediately displays "No Answer."*

6.5   Telephone Calls

The telephone call feature allows telephone calls to be placed and received over the public telephone system using your radio. The type of call (secure/clear) is determined by the mode selected by the Clear/Secure option switch or the menu parameter selected. Telephone calling is programmed to operate in one of the following modes:

• Disabled (telephone calls not available).

• Answer-only capability.

• List only - Telephone numbers can be selected from a preprogrammed list only (direct entry as follows is not allowed).

• Unlimited - Telephone numbers can be selected from a list and also dialed directly using the keypad on the Digital Keypad Mic.

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6.5.1 Placing a Telephone Call

To recall from a list:

1   With a SMARTNET/SmartZone/P25 channel selected, momentarily press the Phone option switch, soft button (Lightning Control Head only), or select the menu parameter. The alias of the last called telephone number is displayed.

2   If required, rotate the Select switch to display the desired number. The alias of each number is displayed.

3   Press and then release the PTT switch. Refer to the bulleted list following Step 3 in direct entry instructions below for events that may then occur.

4   When the telephone call is finished or it could not be completed for some reason, end it by pressing the Phone option switch and placing the microphone back on-hook or by pressing the appropriate exit button.

To make a direct entry from the menu (scroll down to select direct entry), or by using front panel controls or the keypad on the Digital Keypad microphone:

1   Select the menu parameter, press the soft button (Lightning Control Head only), or press the PHONE option switch until a tone sounds (approximately one second). The alias of the last called telephone number is displayed if it is in the phone number list. Otherwise, the last ten digits of the last called telephone number are displayed. The phone call mode is indicated by ✆ in the display for the Standard Control Head. This mode is indicated by a ☎ for the Lightning Control Head.

2   If using the front panel controls, enter the telephone number by rotating the select switch, pressing F3 (Standard Control Head) or right on the Navigation pad (Lightning Control Head) to advance the cursor. The F2 button (Standard Control Head) or left on the Navigation Pad (Lightning Control Head) can be used to move the cursor back to correct an entered number. The 0-9, the ∗, #, and P (pause) characters can be entered (# is displayed as a "+"). Numbers up to sixteen digits (including pauses) can be entered, and the number scrolls to the left in the display so that the ten right-most digits are always displayed. With the Digital Keypad microphone, enter the number using the DTMF keypad (a pause indicated by "P" is entered by ∗ #).

3   Press and hold the PTT switch. Events that may occur are as follows:

    - If the access is successful, a dial tone sounds and the dialed number is displayed and sent. Either ringing or a busy signal is then heard as with a standard telephone call. When the called party answers, press the PTT switch to talk and release it to listen (since the radio operates half-duplex, it is not possible to talk and listen at the same time).

       Each time the PTT switch is released, a go-ahead tone is sent to the landside party to indicate when they can respond. To dial a number after the connection is made, press

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the PTT switch and dial the number using the keypad on the Digital Keypad microphone.

o If the selected telephone number is not valid, "INVALID" is displayed and an alert tone sounds. Select a valid number.

o If the system is busy, "BUSY" is displayed and the busy tone sounds. The call automatically proceeds when the system becomes available.

o If you are out-of-range or the radio cannot be accessed for some reason, "NO PHONE" is displayed and an alert tone sounds.

o If the interconnect call you are making or the selected secure mode is not authorized, "REJECT" is displayed and an alert tone sounds.

o If your radio does not have the proper encryption key, "KEYFAIL" is displayed and the call must be made in the clear mode by pressing the Clear/Secure option key (if strapped to switchable). Otherwise, load the correct key.

4 When the telephone call is finished or it could not be completed for some reason, end it by pressing the Phone option switch and placing the microphone back on-hook or by pressing the appropriate exit button.

6.5.2   Receiving A Telephone Call

To receive a telephone call:

1 When a telephone call is received, "ringing" similar to a standard telephone is heard and "PHONE" is displayed.

2 To answer the call, select the menu parameter or press the Phone option switch. Press the PTT switch to talk and release it to listen (since the radio operates half duplex, it is not possible to talk and listen at the same time).

3 When the call is finished, end it by pressing the Phone option switch and placing the microphone back on-hook or by pressing the appropriate exit button.

Note   *If the user would like to ignore a received unit call, after a radio receives a unit call, the user can press the select knob on the mobile radio. This sends a unit call answer response to the system, denying the call from the radio. The system will repeat this, and the initiating radio immediately displays "No Answer."*

6.6   Call Alert

The Call Alert™ feature allows pages to be sent and received.

6.6.1   Answering a Page

To answer a Page:

1   When a page is received, five beeps sound and "PAGE RECVD" (Standard Control Head) or "Page Receive" (Lightning Control Head) is displayed. The ID of the radio paging you is stored as the last ID received.

2   To clear or ignore the page, press any option switch. If the PTT switch is pressed, a group call is placed on the selected channel.

3   To answer the page as a unit call (see Section 6.4), press the Unit Call option switch, soft button (Lightning Control Head), or select the menu parameter. The Call Response button, soft button (Lightning Control Head only), or menu selection can also be used. If the ID of the radio paging you is in the Call list, the display will toggle between the Calling ID and the Alias. If not, only the Calling ID is displayed. Press the PTT switch and respond.

4   When the call is finished or it could not be completed for some reason, end it by pressing the Unit Call option switch and placing the microphone back on-hook, or by pressing the appropriate exit button.

6.6.2   Initiating a Page

To initiate a page by recall from a list:

1   With a SMARTNET/SmartZone or P25 trunking channel selected, momentarily press the CALL ALERT option switch. The tag (alias) of the last ID called is displayed. CALL ALERT also can be selected from the menu and soft buttons (Lightning Control Head only).

2   If required, rotate the Select switch to display the desired mobile. The tag of each number is displayed.

3   Press the PTT switch and one of the following then occur:

    -   If five beeps sound, the system received the page and the paged mobile is on the air and received it. The page mode is automatically exited.

    -   If the system received the page but the called mobile is not on the air, a single beep sounds and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed six seconds after the PTT switch is pressed. Auto exit then occurs.

To make direct entry from the Menu (scroll down to select direct entry) or by using front panel controls or Digital Keypad microphone.

1   Press and hold the Unit Call option key until a tone sounds (approximately one second). The last ID called is displayed.

2 If using the front panel controls, enter the ID of the radio you are calling by rotating the select switch, pressing F3 (Standard Control Head) or right on the Navigation pad (Lightning Control Head) to advance the cursor. The F2 button (Standard Control Head) or left on the Navigation Pad (Lightning Control Head) can be used to move the cursor back to correct an entered number. With the Digital Keypad microphone, enter the number using the DTMF keypad. To cancel the call, press the Unit Call Option key again.

Note *If the Unit Call option is programmed to either the F2 or F3 buttons on the Standard Control Head, you must use the F6 button to exit the function.*

3 Press the PTT switch to initiate the call. If the entered number is valid, the display indicates the alias of the ID if it matches an ID in the call list. Otherwise, the ID you entered continues to be displayed.

Events that may then occur are as follows:

- If the mobile being called is on the air, "WAIT" is displayed and ringing is heard until the called party answers or for 20 seconds, whichever occurs first. Pressing the PTT or an option switch stops the ringing but not the call. When the call is answered, the voice of the called party is heard.

- If the called mobile does not answer within 20 seconds, a continuous tone sounds and "NO ANSWER" is displayed.

- If the called mobile is not on the air, a continuous tone sounds instead of the ringing tone and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed.

- If the busy tone sounds and "BUSY" is displayed, the called mobile has answered the call but the system is busy. When the system is no longer busy, the call back tone sounds.

- If your radio or the called radio is inhibited or not programmed to make this type of call or for the requested secure mode, "RSPNS ONLY" (Standard Control Head) or "Response Only" (Lightning Control Head) is displayed and an alert tone sounds.

- If your radio does not have the proper encryption key, "KEYFAIL" is displayed and the call must be made in the clear mode by pressing the Clear/Secure option switch (if encryption is selectable on the channel). Otherwise, the correct key must be loaded.

4 When the call is finished or is not answered, end it by pressing the Unit Call option switch and placing the microphone back on-hook, or by pressing the appropriate exit button.

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6.7   Messaging

The messaging feature allows preprogrammed messages to be sent to your dispatcher. Up to 255 messages can be preprogrammed, and they are identified by an alias. Messages are sent as follows:

1   Momentarily press the Message option switch, soft button (Lightning Control Head only), or select the menu parameter. The alias of the last message sent is displayed.

2   If required, rotate the Select switch to display the desired message. Then send the message by momentarily pressing the PTT or Select switch. A single beep sounds when the Select switch is pressed (if that option is selected). One of the following then occurs:

-   If five beeps sound and "ACK RECVD" (Standard Control Head) or "Ack Received" (Lightning Control Head) is displayed, the message was received and automatically acknowledged by the system.

-   If after five tries the message is not acknowledged, a tone sounds and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed.

Note   *Only the message number assigned to the alias is sent– not the actual text of the alias. For example, If MSG 1 is assigned to alias "In Service", "MSG 1" is sent– not "In Service".*

6.7.1   P25 Messaging

There is a two menu design with this feature which allows the user to select a Unit ID and then a Message. To exit the menu, the Message button on the radio or the back button can be pressed. However, if the user is in the second menu (selecting the Message to send), the back button will take them back to the menu that allows them to select a Unit ID. From there, one more press of the back button exits the menu.

A P25 Message Alias list may be programmed for this feature. Also a new menu button, soft button (Lightning Control Head only), and an alias for Message may be programmed.

Sending a Message

To send Messages from one radio to another, the user must select a Unit ID and a Message. The Unit ID can either be selected from the Unit Call list programmed, or may be entered by the user. To select a Unit ID from the Unit Call list, press the button or soft button assigned to Message on the radio or select "ID List" from the Message menu. To enter a Unit ID, press and hold the button or soft button assigned to Message on the radio or select "Enter ID" from the Message menu. Once the Unit ID has been selected, the radio takes the user to a list which displays the Messages that have been programmed in the Message List. A selection (which attempts to send the Message from this point) can be

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made by pressing the select button or the PTT. Upon sending the Message, the radio will wait until the Message has been sent, and then display the appropriate message for whether it was received successfully or not. If the Message was not sent successfully, the radio will return back to the Message menu to allow the user to try again or try a different Unit ID or Message.

Receiving a Message

When a radio receives a Message, it will flash the green LED next to the toggle switch, sound a Message Received Tone, and display three flash messages ("Msg Rcvd", Unit ID of sending radio, Message Alias or ID received). The Message is cleared upon any button press when not in the menu. When in the menu, the Message is only cleared by pressing the Back/Clear button.

6.8   Sending Status Conditions

The status feature allows you to send your current status to your dispatcher. Up to 255 status conditions can be preprogrammed, and they are identified by an alias. If the Status option switch is programmed, status conditions are sent as follows:

1   Momentarily press the Status option switch. The alias of the current status condition is displayed. (STATUS can also be selected from the menu.)

2   To change the current status, rotate the Select switch until the desired status is displayed. Then press the Select switch to accept that status. A single beep sounds when the switch is pressed (if that option is selected). One of the following conditions then occurs:

   - If five beeps sound and "ACK RECVD" (Standard Control Head) or "Ack Received" (Lightning Control Head) is displayed, the status was received and acknowledged by the system.

   - If after five tries the message is not acknowledged, a tone sounds and "NO ACK" (Standard Control Head) or "No Acknowledge" (Lightning Control Head) is displayed.

Note   *Only the status number assigned to the alias is sent– not the actual text of the status condition alias itself*

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6.9   Emergency Alarm and Call

Emergency Alarms and Calls are separate functions that can be individually enabled or disabled on each SMARTNET/SmartZone and P25 Trunking system. The Emergency option switch, soft button (Lightning Control Head only), or menu selection is used for these functions.

The user can set an external line by pressing the emergency button. External devices can trigger off of the radio's external line. If the "Ext Emergency" Option is enabled by programming and the user presses the emergency button, the Aux B line on the accessory connect shall be set to low (0V). It remains low until the External Emergency Time has passed or the user exits the emergency. If the user presses emergency during the External Emergency Time, the timer starts over. If the user exits emergency before the External Emergency Time has passed, the output line returns to Vbatt.

Other emergency features are as follows:

• Emergency Alarms are transmitted on the selected talkgroup if emergency calls are disabled, and on the emergency talkgroup if emergency calls are enabled.

• Emergency Call talkgroup selection priority is as follows. For example, if a global emergency channel is not programmed, the emergency talkgroup of the selected channel is used and so on.

  - Global (radio wide) emergency channel

  - Emergency group of the selected channel

  - Talkgroup of the selected channel (tactical)

  - Announcement group of the selected channel

• The emergency programming of the system to which that emergency talkgroup is linked controls the emergency operation.

6.9.1   Emergency Alarms

An emergency alarm is a special transmission that alerts a dispatcher of an emergency situation. It is sent automatically by pressing the Emergency option switch, soft button (Lightning Control Head only), or by selecting the menu parameter. The system to which the emergency channel is linked must have Emergency Alarms enabled. If not, Emergency Alarms are disabled. The alarm is sent on the control channel.

Proceed as follows to send an emergency alarm:

1   Press the Emergency option switch. The radio automatically transmits the emergency alarm if programmed.

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2   When the emergency alarm is acknowledged, "ACK RECVD" (Standard Control Head) or "Ack Received" (Lightning Control Head) is briefly displayed and the emergency acknowledge tone (five beeps) sounds. Silent operation may also be programmed in which case no tone sounds and there is no indication that an acknowledgment occurred.

3   The radio continues to transmit this message until an acknowledgment is received or the programmed number of attempts have been made. The emergency alarm mode is exited when radio power is cycled, or by pressing and holding the Emergency option switch.

6.9.2   Emergency Call Alert

This feature notifies a user when an emergency call is being made on their selected P25 Conventional or P25 Trunking Talkgroup. The radio should also be programmed with an "Emergency Clear" button.

If an emergency call is received by the radio on the selected channel, the emergency alarm ACK tone will sound (five consecutive tones), and the Emergency Received message will display, followed by the unit ID of the emergency radio. If any other emergency calls are made after this initial one using a different radio, the tone will not sound, but the unit ID will be updated to reflect the most recent emergency call. To exit out of this state, press and hold the "Emergency Clear" button. The radio should return to its normal display, and the Emergency Received message should no longer show.

6.9.3   Emergency Calls

An emergency call urgently requests access to a voice channel (an emergency tone usually does not sound at the console unless the call is combined with an Emergency Alarm). An emergency call is placed by pressing the Emergency option button. If the Emergency Hot Mic feature is enabled, the emergency call is automatically transmitted without having to press the PTT switch (see following description). The system to which the emergency channel is linked must have Emergency Calls enabled.

6.9.3.1   Emergency Hot Mic

If Emergency Hot Mic has been enabled for emergency calls, automatic transmitting occurs with microphone audio unmuted without having to manually press the PTT switch. If the Emergency Hot Mic feature or emergency calls are not enabled by programming, automatic transmitting does not occur. This feature is initiated only on the first press of the Emergency switch. Subsequent presses do not trigger automatic transmissions. To reset this function, hold the emergency button or cycle power.

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6.9.3.2   Placing an Emergency Call

To place an Emergency Call:

1   If required, select a channel of a system on which Emergency Calls are enabled and press the Emergency option switch, soft button (Lightning Control Head), or select the menu option. The Emergency Call is then sent as described in Section 5.9.1 if applicable.

2   Emergency tones sound as follows: Emergency Call entry is played upon the pressing of the Emergency button. Console Acknowledgement is played when an acknowledgement is received back from the console for an emergency Call. Emergency Exit is played when you press and hold the emergency button. Below are the tones for Emergency.

Console Acknowledgement	Emergency Alarm Ack	Emergency Alarm Acknowledged Successful	Two 1000 Hz 175 ms tones with 50 ms spacing followed by Three 1000 Hz 175 ms tones with 150 ms spacing
Emergency Call Entry	Emergency Button Press	Emergency button has been Pressed	1000 Hz continuous tone for 175 ms.
Emergency Exit	Emergency Canceled	Emergency is Canceled	1000 Hz continuous tone for 1 sec.

3   If the preceding Emergency Hot Mic feature is enabled, the call is automatically transmitted without pressing the PTT switch. If it is disabled, press the PTT switch and begin speaking as with a standard call.

4   All group calls which follow are then emergency calls (unit, telephone, and call alert calls are not allowed). If the channel is changed, the call is made on the emergency talkgroup programmed for the new channel. If the Surveillance Mode is enabled (see Section 4.10), all indicators, lights, and tones are disabled. If "No Receive Activity During Emergency" is programmed, receive audio, the front panel LED, and receive icons are disabled in the receive mode.

5   To exit this mode, cycle radio power or press and hold the Emergency switch.

6.9.4   Emergency Press and Hold

The Viking mobile radio provides two means of activating emergency mode. With an emergency button programmed, the radio will enter emergency mode upon a press or a press and hold. Pressing and holding the emergency button while in emergency mode will cancel emergency. When enabled, the Emergency Press and Hold feature restricts activation to the press and hold scenario.

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With the emergency press and hold feature enabled, the emergency button must be pressed and held for the duration of the press and hold timer for emergency mode to be activated. If the button is released before the timer has expired a bad beep tone sounds and emergency mode fails to activate. To cancel emergency mode, the emergency button must be pressed and held for the duration of the press and hold timer again.

6.10   Failsoft Operation

If a failure occurs in the SMARTNET/SmartZone or P25 Trunking system so that system traffic cannot be centrally managed, the system directs the radio to automatically enter the failsoft mode. When in this mode, "FAILSOFT" is displayed. A failsoft tone may also be heard, depending on how the repeater is programmed.

When in the failsoft mode, operation is in the conventional mode on the preprogrammed failsoft channel (a different failsoft channel can be programmed on each talkgroup). If a transmission is attempted before a failsoft channel is located, a continuous tones sounds until the PTT switch is released. When the radio system returns to normal operation, this is automatically detected and normal operation resumes.

6.10.1   Programmable Failsoft Connect Tone

On a SMARTNET or SmartZone trunking system(s), a different radio failsoft connect tone can be programmed. This allows the radio to emit a distinct and different tone for failsoft than tones used during other operating modes.

The failsoft connect tone setting will normally be selected to "Default." This means that the connect tone used during failsoft will be the connect tone setting the system sends over the air, or the programmed connect tone if no over the air value is received. If it is known what the connect tone will be during failsoft operation, this can be programmed. If a value other than "Default" is programmed, the radio will always use this connect tone setting during failsoft operation.

6.11   SMARTNET / SmartZone / P25 Trunking Scanning Features

Scanning on a SMARTNET/Smartzone or P25 Trunked system is called Priority Monitor Scan. The following are unique features of this type of scanning. For general scanning information applicable to all operating modes, refer to Sections 4.12 and 4.13.

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- Scanning is turned ON and OFF by the Scan option switch, soft button (Lightning Control Head only), or selecting the menu parameter. Talkgroups (channels) can be programmed so that scanning automatically starts whenever the talkgroup is selected (Autoscan).

- When responding to calls in the scan mode, the programming of the Talkback Scan parameter determines if a response always occurs on the talkgroup of the call (Active Group) or the Selected Group if they are different. Transmissions at other times always occur on the selected talkgroup.

- Up to 255 scan lists or the number that fit in available memory can be programmed. Each list can include the number channels/talkgroups (enabled for your radio) from the same system, one of which can be a priority group as described in the next section.

- If the Scan List Edit option key is programmed (or if the menu parameter is selected), scan lists are user programmable (see Section 6.11.2). In addition, nuisance channels can be temporarily deleted as described in Section 4.12.5.

- Each talkgroup is programmed to select one of the programmed scan lists or "No List" (scanning is disabled). If scanning is enabled and the selected channel does not permit scanning, it is automatically enabled again when a channel is selected that permits scanning.

- The selected scan list can be temporarily changed if the Scan (List) Select option switch is programmed. The procedure is described in Section 6.11.2.

- In addition to calls on channels in the scan list, pages, private/unit calls, and telephone calls are received while scanning. Private and telephone calls are not interrupted by priority messages.

- P25 Trunking allows two Priority talkgroups per list.

Every radio on the system has to register with the Zone or Site Controller so that the system knows where everyone is and if traffic from one site needs to be sent to another site. This is determined by the list of Talkgroups registered with the radio.

When a call needs to be passed to a radio at another site, the traffic from one site to another is then sent out over the control channel to the radios. When a radio is scanning, it is monitoring the call information being sent out over control channel. The radio compares the call information (Talkgroup and voice channel handling the Talkgroup) to the scan list to see if any of the Talkgroups it is scanning are receiving a call. If it finds a match, the radio moves to the voice channel for this call. If no one is registered on that Talkgroup on the Site being scanned, the call information for the call is not sent out by the control channel because the Zone or Site Controller did not see a requirement to pass this information for this call and the call will not be received.

For example: Radio 1 is on a call on talkgroup 1 on Site 1. Radio 2 is on talkgroup 2 on Site 2 and scanning. The call on talkgroup 1 from radio 1 is not heard by radio 2. Then, if radio 3 registers on talkgroup 1 on site 2, the call from radio 1 on Site 1 will go to Site 2. Radio 2, radio 3, and any other radios on site 2 and scanning, will hear the call.

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6.11.1   Priority Talkgroup Sampling

One talkgroup in the scan list can be designated a priority talkgroup by programming or it can be the selected talkgroup. When scanning, messages on a non-priority talkgroup are interrupted by messages on the priority talkgroup. Priority scanning must also be supported at the system level for it to occur as programmed in the radio. P25 Trunking supports dual priority scan, therefore two priority talkgroups can be selected.

The Control Channel handles all traffic for the radios and communicates which talkgroups are using which channels. If the radio "receives" the ID for one of its talkgroups, it can go to that voice channel and hear the talkgroup. When the radio is ON the voice channel, it cannot receive information about which talkgroups are on which channel. The radio will not know about any new talkgroup activity until it finishes the voice channel and returns to the Control Channel.

If a Talkgroup is set as a Priority Monitor talkgroup on the system, the system sends the Talkgroup's call information over the voice channel so it can be detected and move to this priority call. So even if the radio cannot hear the Control Channel, it will receive the call information and switch to the channel with the priority call.

Note   *The Priority Monitor must not be confused with Transmit Priority, which is used when a call is placed in Queue when all the Voice Channels are busy.*

6.11.2   Scan List Editing and Selection

SMARTNET/SmartZone and P25 Trunking scan lists are user programmable if the Scan Edit option switch is programmed (or if the menu parameter is selected). The procedure is described in Section 4.13.1.

With SMARTNET/SmartZone and P25 trunking operation, each channel (talkgroup) can be programmed to select one of the programmed scan lists or so scanning is disabled (No List). In addition, each channel can be programmed so that scanning is automatically enabled (Auto Scan) when it is selected. P25 Trunking supports dual priority scan, therefore two priority talkgroups can be selected.

If the Scan List Select option switch is programmed (or if the menu parameter is selected), the list that is selected by all talkgroups in the current system can be temporarily changed by the user as follows. Also selectable if desired is "Programmed" (default list). The temporary programmed scan list is retained through radio power downs.

Proceed as follows to temporarily change the currently selected scan list:

1   With scanning disabled (the rotating ⧖ icon (Standard Control Head) or ⚡ icon (Lightning Control Head) is not indicated in the display, press the Scan List Select option switch. With scanning disabled, you can also press and hold the Scan button to enter Scan List Select.

2   The currently selected list is displayed as "LIST x", with "x" the currently selected list. To exit without changing the selected list, press the appropriate exit button.

3   To select another list, "PROGRAMMED", or "NO LIST", rotate the Select switch. When the desired list is displayed, select it and exit this mode by pressing the appropriate exit button.

6.12   Dynamic Regrouping

The dynamic regrouping feature allows a dispatcher to change the current talkgroup or switch radios to a predefined regrouping channel to receive a new talkgroup. When the console issues a regroup order, the radio switches to the designated regroup talkgroup.

Note   *For certain SMARTNET/ SmartZone dynamic regrouping operations (such as pre-recorded messages) to function properly, the regroup talkgroup must be defined in the system talkgroup table. Otherwise the radio cannot determine whether the regroup talkgroup is analog or digital.*

If the Cancel Dynamic Regrouping option switch is programmed, it can be pressed to exit the dynamic regrouping mode. The mode can also be exited through the menu.

Otherwise, if the lock mode was not specified, the selected talkgroup can be manually changed and the previous talkgroup is reselected if power is cycled. If a locked regroup command is received, the displayed talkgroup cannot be changed manually or by cycling power. It can be changed only after a clear order is received from the console.

Dynamic regrouping operates as follows:

1   When this command is received, alternating tones sound and the radio automatically changes to the regrouping talkgroup. The display shows the alias entered for the dynamic regroup enabled channel. If the Lock Order was sent with the Dynamic Regrouping Order, the mobile with no user involvement moves to the pre-defined Dynamic Channel.

2   If a pre-defined channel was changed above, go to Step 3. Manually select the channel corresponding to that alias. If this is not done, transmission still occurs on the new channel, but the alternating tones sound each time the PTT switch is pressed. If you did not have a pre-defined channel, the talkgroup of the channel you are on is temporarily changed. If this happens and you change channels, you lose the temporary talkgroup.

3   Talk and listen as usual. When dynamic regrouping is canceled by the dispatcher, a short tone sounds. If a standard channel is not selected after this occurs, transmission is not allowed if the talkgroup is assigned as a dynamic regrouping talkgroup only. If it is assigned as a normal talkgroup, normal transmissions are allowed. When a Cancel order is received, the mobile moves back to your last channel unless the Lock order was received.

6.13   P25 Radio Unit Monitor

This feature allows a dispatcher to remotely monitor a radio from the console. This can be especially useful when a radio is lost, stolen, or in cases of emergency.

The dispatcher may choose to make the user aware of this monitor or not. This is done by toggling a silent mode flag when sending in the request. If silent mode is enabled during the call, the user has no indication of the call occurring. However, any user input to the monitored radio will end the call while in this mode.

To perform Radio Unit Monitor, the radio uses hot mic functionality. This means the radio transmits without the user holding the PTT button. In the case of silent mode, no indication such as display notifications or LEDs display. While in the silent mode state, user input such as PTT or function button input immediately ends the call, affiliate the radio back to the original talkgroup if necessary, and perform the user input action. This implementation places priority on the call being "silent" while not taking any functionality from the user.

Also specified in the Radio Unit Monitor command is the transmit time. The dispatcher may choose any time between 1 and 255 seconds.

Additionally, a group for the radio to transmit is also specified in this request. The radio keys up and transmits on this group for the specified transmit time. If the dispatcher desires this to be a private call, it is recommended that a group is created solely for radio unit monitor. This will keep traffic off this talkgroup and allow the call to be "private" – between the dispatcher and target radio only. Unit-to-unit transmissions are not supported.

If encryption is desired, an algorithm ID and key ID can be specified. Invalid algorithm or key IDs result in the radio ignoring the request. If these parameters are not valid, the user will only be notified if silent mode is not enabled.

6.14   SmartZone and P25 Trunking Unique Features

SmartZone$^®$ and P25 Trunking modes can provide access to single or multi-site systems. The P25 Trunking mode can provide access to a single trunking site or roaming between several trunking sites.

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6.14.1   Busy Override

The busy override feature is enabled at the system level by the system manager and is not a programmable radio feature. It allows a call to be placed even if not all of the sites you are calling have a free traffic channel. The only sites guaranteed to be included are the Critical Sites and the sites where a Critical User is located. This feature operates as follows:

1   Assume that you have attempted to place a call and the system was busy ("BUSY" displayed and busy tone sounded). The regroup group is automatically selected and displayed.

2   Release the PTT switch and then press it for five seconds or more. If a chirp-like tone sounds with the PTT switch pressed, busy override is occurring.

Note   *Remember that not all members of the talkgroup are receiving your message. Missing members will start receiving your message as channels become available.*

6.14.2   Site Trunking

Site trunking occurs when a site can no longer participate in wide area trunking. It is disconnected from other sites and only supports calls with other radios on that site and cannot route audio to other sites. When site trunking is occurring, the radio searches for other sites that may provide wide area coverage.

Site trunking ends when a wide area coverage site is located, the current site is operating again as a wide area coverage site, an out-of-range condition occurs, or the failsoft mode is entered. The radio can be programmed so that "SITE TRUNKING" is displayed and/or an alert tone sounds when site trunking occurs.

SmartZone and P25 trunking systems can be programmed for "Disable Site Trunking Operation". The radio is then not allowed to start or operate on a site trunking site. If a site goes into site trunking, the radio leaves that site's control channel and attempts to find another valid wide area site. If no wide area site is available, the radio displays "OUT-OF-RANGE". If a site adjacent to the current Home Site was in site trunking but then enters wide area trunking, it is evaluated to determine if it should move to that site as a better site.

6.14.3   Determining Current Site and Searching for a New Site

To display the RSSI level of the current site, press the SITE SEARCH option switch. The display then indicates the current site number as "SITE xx" and the RSSI (Receive Signal Strength Indicator) signal level as "RSSI xx". This mode is then automatically exited.

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To scroll through the other programmed sites, press and hold the SITE SEARCH option switch while "SITE xx" or "RSSI xx" is displayed. If site lock is ON when site search is entered (see following), the radio will be locked on the new site when this function is exited.

Note   *If a site failure occurs, the radio will automatically leave the failed site and register on another site (after a predetermined delay). When the failed site recovers, the radio will (after a predetermined delay) return to the site.*

6.14.4   Locking / Unlocking a Site

It is sometimes desirable to stay connected to a specific site. To prevent the radio from searching for a new site, lock it on the current site by pressing the Site Lock option switch. To unlock the site, press the LOCK option switch again and "SITE UNLCK" (Standard Control Head) or "Site Unlock" (Lightning Control Head) is momentarily displayed.

When the user site locks the radio, the   ∟   icon will begin to flash (Lightning Control Head only). The site lock indicator will be hidden while the radio is in menu mode, unit call, or interconnect call.

6.14.5   Auto Site Search

Auto site search automatically searches sites and ranks them in a "Best Sites" list. Press the Auto Site Search option switch to display the current site number or alias and RSSI level of the current site. A "Press and Hold" of the Auto Site Search option switch will cause the radio to automatically move from the current site and select the first/next site from the "Best Sites" list.

6.14.6   P25 Wide Area Scan

This feature is intended to enhance roaming performance, especially when system level steering through radio or talkgroup permissions is used.

To use system channel resources more efficiently, some system operators are using system access permissions to steer certain talkgroups to particular sites. For example, a police department may be allowed to use only Site 1, and a public works department may be allowed to use only Site 2.

A Wide Area Scan can be programmed to minimize the problem just outlined. This feature is programmed on a Talkgroup basis. However, System Site Preference lists can still be used. The Wide Area Scan feature functions as follows:

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1 Assume TG1 is selected. If it is the first time this talkgroup is selected, normal searching for a control channel occurs according to the hunt methods previously described.

2 When another talkgroup is selected, the active valid site for TG1 is stored in memory.

3 The next time TG1 is selected, the following procedure is performed before performing the normal hunt methods previously described.

   a The last valid site ID and its receive and transmit channel numbers are loaded from memory.

   b The dynamic site list is checked to see if any newer receive/transmit channel information is available for the last site ID.

   c The best receive/transmit information is used and the radio checks to see if this control channel is available.

The result of the preceding operation is that the radio has a reasonable chance of finding a valid site, usually on the first try. This greatly reduces access time, even on systems which have highly restricted talkgroup based access.

With this option enabled on a talkgroup, as the talkgroup affiliates with a site that site is saved if the mobile is changed to a new talkgroup. When the radio moves back to the Wide Area Scan talkgroup, it will attempt to affiliate on the saved site before looking for a new site.

6.14.7   Normal P25 and SmartZone Control Channel Hunt

The following control channel search methods are normally used to find a control channel:

Short Hunt - The dynamic array of 8 adjacent sites (SmartZone) or 16 adjacent sites (P25 Trunking) is searched. This list is saved on power down and loaded again at power up. It is erased whenever parameters are downloaded to the radio.

Long Hunt - If no valid control channel is located by the preceding short hunt method, the radio searches the list of control channels programmed into the radio.

Full Spectrum CC Scan - If the two preceding methods do not locate a control channel, every channel available to the radio is searched.

6.14.8   Talkgroup Steering through System Access Permissions

To use system channel resources more efficiently, some system operators are using system access permissions to steer certain talkgroups to particular sites. For example, a police department may be allowed to use only Site 1, and a public works department may be allowed to use only Site 2.

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The problem with this operation is that every time a different talkgroup is selected, the access permission may be different and a different site may need to be accessed. This could result, in a worst case, in a delay of up to 30 seconds in finding a new site. This could occur if there are no valid sites for the new talkgroup in the dynamic site list.

6.14.9   Radio Information

Various radio information can be viewed on the radio display. The "Radio Info" radio button or menu item is selected to view this information. When selected, the information will scroll across the radio display. You can pause, and move the text back and forth using the same controls as you would for text messaging.

This information includes:

- Band - Current operating frequency band.

- Software - Current software version running on the radio.

- Radio Alias - Current radio alias programmed to the radio.

- Radio Tag - Current Radio Tag

- Profile Tag - Current Profile Tag

- Unit ID - Current assigned unit ID number.

- Key - Current assigned encryption key ID number.

- OTA IP - Current IP address assigned to the radio.

- ESN - will display the electronic serial number of the radio.

- SEM - will display the version of software running on the SEM module.

- MAC Address - will display the media access control identifier for the radio.

- ETH IP - will display IP address set for network communications between the radio and a PC.

- Wi-Fi - will enter wireless settings menu on select.

6.14.10   Current Software version in the radio

The current firmware version loaded into the radio is identified. This can be downloaded from programming.

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6.15   P25 Trunking System Single Touch

For the Viking mobile radio, three control heads can use Single Touch. The Standard control head and Lightning control head for the Viking mobile radio operate very similar to the Viking portable radios.

Single Touch on the Viking portable functions the same as sending a status through a menu. The only difference is that a user does not have to go through the menu to send a status with Single Touch. Since Single Touch is not a menu function, it is not in the menu in either the Viking portable or the Viking mobile.

To use Single Touch, press and hold whichever radio button it has been programmed to in Armada. The button press and hold duration is set by the global press and hold duration setting. If the status is enabled through Armada, the radio displays the status which is attempting to be sent for one second. If the status is sent successfully, a Success Tone will sound. If the status fails to be sent, the radio will display the message "Sts Failed" for a duration of one second.

If the button for Single Touch is not pressed and held, the message "PRESS/HOLD" (Standard Control Head) or "Press & Hold" (Lightning Control Head) is displayed for one second.

If the status is disabled or not set correctly in Armada, the message "Disabled" is displayed for one second regardless of whether the button was pressed and held or just pressed.

Since sending a status is not allowed while in Emergency, Single Touch is not allowed in that mode either. The radio will not display anything to the screen if Single Touch is attempted while in Emergency; it will however sound a Bad Tone.

6.16   P25 Messaging

This feature allows a user to send a predefined short Message from one radio to another. This feature is supported in P25 only. There is a two menu design with this feature which allows the user to select a Unit ID and then a Message. To exit the menu, the Message button on the radio or the back button can be pressed. However, if the user is in the second menu (selecting the Message to send), the back button will take them back to the menu that allows them to select a Unit ID. From there, one more press of the back button exits the menu.

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6.16.1   Sending a Message

To send Messages from one radio to another, the user must select a Unit ID and a Message. The Unit ID can either be selected from the Unit Call list programmed in Armada, or may be entered by the user. To select a Unit ID from the Unit Call list, press the button or soft button assigned to Message on the radio or select "ID List" from the Message menu. To enter a Unit ID, press and hold the button or soft button assigned to Message on the radio or select "Enter ID" from the Message menu. Once the Unit ID has been selected, the radio takes the user to a list which displays the Messages that have been programmed in the Message List from Armada. A selection (which attempts to send the Message from this point) can be made by pressing the select button or the PTT. Upon sending the Message, the radio will wait until the Message has been sent, and then display the appropriate message for whether it was received successfully or not. If the Message was not sent successfully, the radio will return back to the Message menu to allow the user to try again or try a different Unit ID or Message.

6.16.2   Receiving a Message

When a radio receives a Message, it will flash the green LED next to the toggle switch, sound a Message Received Tone, and display three flash messages ("Msg Rcvd", Unit ID of sending radio, Message Alias or ID received). The Message is cleared upon any button press when not in the menu. When in the menu, the Message is only cleared by pressing the Back/Clear button.

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7

Secure Communication (Encryption)

This radio may be equipped to provide secure communication on some or all channels. This feature encrypts the voice so that it can be understood only by someone using a radio equipped with a similar encryption device and encryption codes.

If equipped with the Clear/Secure option switch and the current channel is programmed to allow switch selection, secure communication can be manually enabled and disabled by that switch. Otherwise, channels are strapped to Clear or Secure operation (see Section 7.3). Secure communication can be programmed on a per channel or per talkgroup basis to operate in various ways. When a secure call is received, the LED flashes Red and ⬢ (Standard Control Head) or ▧ (Lightning Control Head) is flashed on the display.

7.1   Encryption Algorithms

The following paragraphs describe Encryption algorithms.

7.1.1   Encryption Available With Various Channel Types

Digital Channels - On conventional P25, SmartNet/SmartZone, and P25 Trunking channels, the DES-OFB, AES-OFB, or ARC4 protocol is used.

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7.1.2   AES

An encryption standard called AES (Advanced Encryption Standard) is replacing DES-OFB encryption on digital (P25) channels. It uses a 256-bit encryption key instead of the 64-bit key used with DES. The type of encryption (DES or AES) is determined by the type of encryption key that is loaded (see Section 7.2). AES encryption, like DES encryption, is an optional radio feature that must be purchased and then enabled at the factory (or by a factory-created option file).

7.1.3   ARC4

ARC4 (Alleged Rivest Cipher 4) software encryption uses software keys created in Armada and is compatible with Motorola's ADP encryption. ARC4 software encryption is an optional radio feature that must be purchased and then enabled by the EFJohnson factory (or by a factory-created option file).

7.1.4   Encryption Available with Various Channel Types

Digital Channels - On digital Project 25 and SMARTNET/Smart Zone channels, the DES-OFB, AES-OFB, or ARC4 protocol is used.

7.1.5   FIPS and Non-FIPS Modes

FIPS 140-2 is a Federal Information Processing Standard for encrypted radios used by the Federal Government. This standard specifies Federal security requirements for cryptographic modules for a wide range of applications and environments. All Viking models are FIPS certified.

7.1.6   Authentication without Encryption Options

This feature allows the Authentication features of the radio to be used without the AES or DES options. The radio needs to be configured with the Authentication option to use the Authentication features of the radio. With this feature addition the radio can perform all the Authentication procedures without needing the AES/DES options.

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7.2   Encryption Keys

An encryption key is a cryptographic variable that is required by the encryption algorithm to encrypt and decrypt voice or data. To maintain system security, these keys must be protected from disclosure and also periodically replaced or updated.

With the AES and DES hardware encryption and ARC4 software encryption used by EFJohnson Technologies radios (see Section 7.1), the same encryption key is used by both the encrypting (sending) and decrypting (receiving) radio. AES encryption keys are generated from a string of 64 hexadecimal characters, and DES keys are generated from a string of 16 hexadecimal characters. Another four hexadecimal characters are used to specify the key ID. Multiple keys can be loaded into a radio using OTAR or manual loading. ARC4 software encryption keys are generated from a string of 10 hexadecimal characters. Multiple keys can be loaded into a radio using Armada.

If an attempt is made to transmit a secure message without loading the corresponding key, "KEYFAIL" is displayed. The message must then be transmitted in the clear mode (this is possible only if the channel is strapped to "switchable") or the key must be loaded.

7.2.1   Key and Algorithm IDs

Each encryption key is programmed with a Key ID (also called Logical ID). This ID plus the algorithm ID (ALGID) is transmitted in the message on digital channels. The radio receiving the message must have a key with the same IDs in order to decrypt it.

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7.2.2   PID / SLN Key Management Modes

The channels, talkgroups, and other calls that use encryption are linked to a specific Physical ID (PID) when the radio is programmed. For example, Zone 1, channel 1 could be programmed to select the key in PID 1 and Zone 1, channel 2 could select the key in PID 3. The PID ranges are 0-125 when the PID mode is selected, and 1-126 when the SLN mode is selected (see Figure 7.1).

Figure 7.1   Key Selection Example

	PID	Keys Table	Keyset 1	Keyset 2
			Keyset 1	**Keyset 2**
			Keyset Name (Opt)	Keyset Name (Opt)
Zone 1, Chan 2	1	SLN 21	Key #21: Key ID 54	Key #21: Key ID 94
Zone 2, Chan 4	2	SLN 22	Key #22: Key ID 65	Key #22: Key ID 98
Zone 2, Chan 5	3	SLN 23	Key #23: Key ID 67	Key #23: Key ID 99
Zone 3, Chan 1	4	SLN 24	Key #24: Key ID 69	Key #24: Key ID 91
Zone 3, Chan 2	5	SLN 25	Key #25: Key ID 73	Key #25: Key ID 90
			Algorithm ID	Algorithm ID
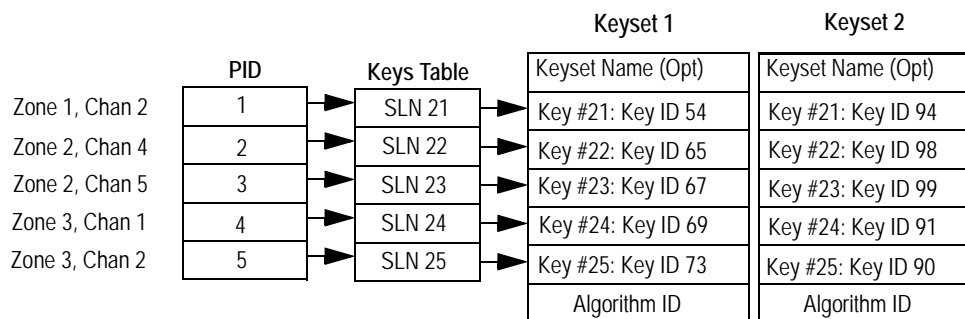
PID or SLN key management modes can be programmed on the **Global** programming screen. More information on these modes follows.

PID Mode - When this mode is selected, keys are loaded directly into a PID of 0-125 that corresponds to the PID programmed for each channel (if applicable). Since the EFJohnson Technologies System Management Assistant (SMA) does not support PID mode: PID mode can be used only when keys are loaded using the Motorola KVL-3000 or KVL-3000 Plus keyloader.

SLN Mode - The SLN mode must be selected if either Over-The-Air-Rekeying (OTAR) or the EFJohnson Technologies System Management Assistant (PDA keyloader) is used. It can also be used if OTAR is not used. SLN mode is digital encryption, and can also be used with the Motorola KVL-3000, KVL-3000 Plus, and KVL-4000. With this mode, keys are loaded into a SLN (Storage Location Number), typically from 0-4095. A Keys Table must then be programmed to link channel PIDs to a specific SLN.

The use of this type of indirect linking allows keysets and key IDs to be changed through OTAR while keeping the mapping from the channel or talkgroup the same. For example, as shown in Figure 7.1, PID 4 selects SLN 24 which selects key slot 24 in both keysets. This slot contains Key ID 69 in Keyset 1 and Key ID 91 in Keyset 2. Only one keyset is active at a time. The actual key chosen between these two to transmit with will depend on which keyset is active, Keyset 1 or Keyset2.

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7.2.3   Maintaining Keys in Memory

The radio may need to be connected to a constant power source to preserve the encryption keys in memory. The programming of the Infinite Key Retention parameter determines if keys are permanently stored in memory or erased soon after power is removed.

When Infinite Key Retention is enabled, keys are stored in memory and are not lost when power is removed.

With Viking Series mobile models, the keys are maintained for approximately 24 hours with this feature disabled. However, a tamper switch causes immediate key erasure when the radio cover over the logic board is removed.

7.2.4   Encryption Key Select

When multiple encryption keys are programmed (see preceding information), the Key Select option switch can be programmed to allow selection of another key for the current channel. This feature changes the PID (hardware location) of the key on the channel for Conventional Digital and P25 Trunking Talkgroups, and the change is permanent (cycling power or selecting a different channel does not reselect the original key). Therefore, to switch back to the original key, it must be manually reselected. Proceed as follows to select a key:

Note   *This feature is available on conventional channels or on P25 Trunking channels.*

1   Press the Key Select option switch and HW KEY (or SW KEY, if optioned/ programmed for software keys) will be displayed.

2   Rotate the Select switch to display the desired key and then press the Select switch to select it. Press the Key Select option switch again to return the display to normal operation.

7.2.5   Encryption Key Erase

An Erase Keys option switch can be programmed that allows the user to permanently erase all stored keys. If OTAR TEK and KEK keys are stored, all keys of both types are erased. This function can be used to ensure that unauthorized encrypted calls can no longer be placed or received by a radio.

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7.2.6   Encryption Icon Operation

The encryption icon ⬤ (Standard Control Head) or ◙ (Lightning Control Head) flashes whenever a secure call is received or transmitted. Other operation is as follows:

• The icon is always displayed when the radio is in secure mode and receives a clear call on a digital and P25 trunking channel.

• An option can be programmed to sound a beep whenever a secure call is received on a clear channel.

7.3   Clear / Secure Strapping

Certain options are available when transmitting and receiving when encryption is selected.

7.3.1   Transmit Mode Options

The following transmit options are available when encryption is selected:

Clear - All calls are in the clear mode.

Secure - All calls are made in the selected secure mode.

Switched - The mode is selected by the Clear/Secure switch. When the clear mode is selected by this switch and a secure call is received, or vice versa, you will hear a beep. Press the programmed option button to change to the appropriate mode. When the clear mode is selected by this switch, "CLEAR" is flashed, and when the secure mode is selected, "SECURE" is flashed.

If the channel has been strapped "Clear" and the option switch selects the "Secure" mode on power up and a transmission is attempted, "CLEAR ONLY" is displayed and transmitting is disabled. Likewise, if the channel is strapped "Secure" and the option switch selects the "Clear" mode on power up and a transmission is attempted, "SECURE ONLY" is displayed and the transmitter is disabled.

The radio can be programmed to ignore the "Clear" or "Secure" switch setting. The preceding indications then do not occur and transmissions always occur in the strapped mode.

Note   *If all channels/talkgroups are strapped clear or secure and no Clear/Secure option switch is programmed, this parameter must always be selected (see following).*

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If the Clear/Secure switch is not programmed, the radio is always in the last known state (usually Clear) and there is no way to change it. For example, if the last known state is Clear and this parameter is not selected, it is never possible to transmit a Secure message on a channel strapped Secure because all that happens is transmitting is disabled, an error tone sounds, and "SEC ONLY" (Standard Control Head) or "Secure Only" (Lightning Control Head) is displayed.

7.4   Security Settings Override

The default security settings that determine how encryption keys are used for talkgroups and channels can be changed for different operating modes.

7.4.1   P25 Conventional and Trunking Talkgroup Security Override

Conventional digital (P25), Smartnet/Smartzone and P25 Trunking encryption strapping is programmed on a "per talkgroup" basis. However conventional digital and P25 trunking talkgroup encryption strapping can be overridden on a "per channel" basis.Therefore, if desired on Conventional Digital and P25 Trunking channels, encryption can be programmed differently for each channel.

7.4.2   Secure Call Behavior

7.4.2.1   Failsoft, Group Regroup or Dynamic Regroup Call

If the radio is in failsoft or is dynamically regrouped, the radio will behave as it always has. That is, the radio will use any key to decrypt a received call and will transmit using switched strapping and the key PID specified as originally programmed.

If the radio is group regrouped, most functionality is retained. The radio will continue to use the key PID specified (as programmed) or use any key to decrypt a received call. The radio will use the keys based on programming values for Failsoft, Patch, Unit Call, Interconnect, and Dynamic TG: when the radio is in these modes, the radio will not use the strapping of the current channel. This means that if the channel has the override feature enabled, the strapping specified in this section will be used for the channel. If the override feature is not enabled, then the strapping of the currently selected talkgroup will be used.

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7.4.2.2   Channel with Talkgroup Specified

If the override security settings feature is enabled, then the override parameters will be used. If the override feature is not enabled, then the talkgroup parameters will be used. If the **Any Key** option is disabled and a secure talkgroup call is received that uses a different key than the one specified, the radio will not unmute but will display the received call information.

7.4.2.3   Channel with Announcement Group Specified

If a secure component talkgroup call is received, the first check will be for the any key option as specified on the announcement group list. If the any key option is enabled, all secure traffic (both component talkgroups and the announcement group) will unmute provided the proper key is stored in the radio. If the any key option is disabled, then the radio will determine the key that the talkgroup is supposed to use by reading the programmed key PID from the talkgroup list. If the received key matches the expected key, then the component talkgroup call will unmute. If the keys do not match, then the radio will not unmute but will display the component talkgroup call information.

7.4.2.4   Announcement Group Call

The settings specified on the announcement group list will be used. If the any key option is disabled and a secure announcement group call is received that uses a different key than the one specified, the radio will not unmute but will display the received call information.

7.4.2.5   Emergency Calls on Emergency Groups

Emergency talkgroup calls will not utilize the override settings, but will be subject to the any key rules specified above.

7.5   Over-the-Air Rekeying (OTAR)

OTAR stands for "Over-the-Air-Rekeying". This is the process of sending encryption keys and related key management messages over-the-air to specific radios. The advantage of OTAR is that it allows these keys to be quickly and conveniently updated when necessary. It is no longer necessary to periodically travel to the radio location or bring the radio into a maintenance facility to load new keys.

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The actual OTAR rekeying functions are performed by a Key Management Facility (KMF) that sends Key Management Messages (KMM) to the RSI (Radio Set Identifier) assigned to a specific radio or radios. These messages are themselves encrypted using a unique key called the UKEK (Unique Key Encryption Key). Radios must be OTAR-compatible, programmed for OTAR, and the UKEK loaded for OTAR for this type of rekeying to occur.

Note   *The RSI is enabled in the KMF and must be assigned to the radio by programming.*

OTAR is available only on P25 conventional and trunking channels, and only to program DES-OFB and AES-OFB keys. It is not used on SMARTNET/SmartZone channels.

7.6   Radio Setup for Encryption

The following radio setup is required for encryption regardless of whether OTAR is used:

Options Enabled - The desired encryption type must have been enabled at the factory (DES-OFB, AES-OFB, ARC4 software encryption).

The following are set through programming:

PID/SLN Mode - If the SLN mode is used, the Hardware Keys Table must be programmed also. If Software Keys are used, the Software Keys Table must also be programmed.

Infinite Key Retention - This parameter enables the option to store keys permanently in memory (see Section 7.2.3).

Erase Old Keyset on OTAR Changeover - This parameter erases keys on an OTAR changeover if the SLN mode is selected, it does not erase keys on a manual keyset changeover.

Talkgroup PIDs/Software Keys - This information is programmed in the talkgroup list selected on the Systems - Lists tab. In addition, with conventional digital and P25 Trunking calls, the group programming can be overridden on the Channels tab (see Section 7.2). Additional PIDs/software keys for special calls can also be specified on the Systems - General - Options 2 tab for digital and trunking calls.

Note   *Key Loss Key (KLK), offered by Motorola, does not erase the UKEK which allows the radio to be rekeyed by the KMF remotely. By not erasing the UKEK, the KLK does not meet TIA standards and is no longer FIPS 140-2 certified.*

The current EFJohnson Technologies Viking Series mobile radios support OTAR. However, an RSI, UKEK and other information must be programmed as described in the next section.

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7.6.1 Programming by Keyloader

The following are the minimum parameters that need to be programmed in the radio to perform OTAR. It is not necessary to program a TEK but it is necessary that a UKEK be manually programmed to perform OTAR. If the radio does not contain a TEK, the KMF initiates a warm start-up sequence in which a temporary TEK is transferred to the radio to perform the key transfer.

UKEK - This key normally has SLN (CKR) 61440 for DES protocol, SLN (CKR) 61442 for AES protocol, and Key ID 62880 (F5A0 hex).

Unit RSI - This is normally initially the same as the P25 Unit ID and is set by programming.

KMF RSI - This RSI is normally 9,999,999 and should not need to be loaded since it defaults to this number.

Verify that the above information was properly stored in the radio by viewing it using the keyloader.

7.6.2 Radio OTAR Capabilities

The Over-the-Air-Rekeying (OTAR) capabilities of the SEM-equipped Viking Series mobile are as follows.

Keysets

• Up to three keysets are used and it is assumed all three are always present. Keyset IDs 1 and 2 are for TEKs and only one is active at a time. Keyset ID 255 is for KEKs and is considered active all the time.

• Each keyset can have up to 126 keys. However, 16 or less are normally used.

7.6.3 OTAR Option Switches

The following additional option switches can be programmed with the Viking mobile to control OTAR functions.

Change Keyset - Toggles the active keyset between Keyset 1 and Keyset 2. The new active keyset is briefly displayed and then normal operation resumes. To change to the other keyset, highlight it and press the Select Knob.

Clear/Secure - This enables and disables encryption regardless of whether OTAR is used. Refer to Section 7.3 for more information.

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Erase Keys - Erases all TEK and KEK keys contained in the radio.

Key Select - This allows a different key to be selected for the current channel or group (Conventional Digital and P25 Trunking channels only). Refer to Section 7.2.4 for more information.

OTAR Rekey Request - Sends a message which tells the KMF that the radio is on the air and requests rekeying. The following status messages are displayed which indicate the progress of this function.

Rekeying - A radio-initiated rekeying session is in process.

No Ack (Standard Control Head)/No Acknowledge (Lightning Control Head) - No response was received from the KMF in response to an Identify request before time out occurred (approximately 30 seconds).

Ack Recvd (Standard Control Head)/Ack Received (Lightning Control Head) - An acknowledgement was received in response to an Identify request.

No Service - A "No Service" reply was received from the KMF. No rekeying will take place.

Rekey Fail - Either the rekey command failed or timed out (after approximately 30 seconds). This message could indicate that the rekey request message was not received by the KMF. However, depending on the KMF configuration and channel traffic, it is possible that the message was received and a response is still pending.

Rekeyed - The rekey session initiated by the radio was successful.

7.6.4   P25 Trunking Icons

For a Standard Control Head, there are two different P25-data related icons which indicate if the radio is on a trunking system. One indicates whether or not you are on a data channel, and one indicates whether or not you have successfully data registered (i.e., whether or not you were granted an SNDCP data context by the system). The icons appear to identical, except for their position on the display.

Under <F3> Button, this icon indicates P25 Data Context Activated – Radio is ready for data operations.

Under <F4> Button, this icon indicates Radio is operating on a data channel

There are three different P25-data related icons for the Lightning Control Head which indicate if the radio is on a trunking system.

This icon indicates P25 Data Context Activated - Radio is ready for data operations.

This icon indicates Radio is operating on a data channel.

This icon indicates Radio is registered with the Data Registration Server - Radio is ready for OTAP operations.

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Every time the radio goes to a data channel, the data channel icon will come ON, and stay ON, until the radio leaves the data channel. The radio goes to the data channel to do P25-data related tasks, such as data register, OTAR register, send/receive OTAR data, and send/receive OTAP data.

You must have successfully data registered before you can successfully initiate an OTAR session. The usual sequence when the radio is attempting to data register will be:

- The data channel icon comes ON.

- The data context icon comes ON (once we successfully data register).

- The data channel icon goes out (once the radio returns to a control channel), but the data context icon stays ON.

- The Data Registration Server icon comes ON once successfully registered with the DRS (Lightning Control Head only).

If the data context icon is not ON, you do not have an SNDCP context (i.e., you are not data registered). If the data registration icon is not ON, you are not DRS registered (Lightning Control Head only).

Once the radio has a data context, if it is configured for OTAR and has a UKEK, it will attempt to OTAR register. Depending on timing, the radio may stay on the data channel for a longer period of time (the second step above) while it OTAR registers, an action which can kick off an OTAR update procedure. Eventually the radio will leave the data channel. The radio will be told by the system when it should the data channel.

A sign that the radio has not successfully OTAR registered is that the radio's data context icon will be ON, but the radio will periodically keep going back to the data channel (the data channel icon will periodically come ON and then OFF). The number of times the radio will attempt to OTAR register and the amount of time it will wait between events is set by programming.

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8

Data Features

Advances in digital communications allows for new data features and services using the radio link. This section describes the data features and services available for the Viking mobile radio.

8.1   P25 Packet Data

P25 packet data transmission capability is available with Viking mobile radios. A Data option switch can be programmed to toggle the data mode ON and OFF (or the menu option can be used).

The P25 Packet Data mode allows a radio to act as a packet data modem for a remote application connected to the radio through an RS-232 or Serial Line Internet Protocol (SLIP) connection. The SLIP connection requires an Ethernet port.

Three P25-compliant conventional data operating modes are supported:

* **Direct Radio to Radio mode** - In this mode the radio will transmit data directly to another radio without any involvement of fixed network equipment.

* **Repeater mode** - In this mode, the radio will transmit data on the inbound channel of a repeater. The repeater will retransmit the data on the outbound to another radio listening on the outbound channel.

* **FNE data mode** – In this mode, the mobile radio transmits data to a fixed network computer connected to the FNE.

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8.2   P25 Trunking Data Services

P25 Trunking supports data service on a P25 Trunking system using an EFJohnson Technologies radio and a portable computer. The radio communicates with the computer over the P25 Mobile Data Peripheral (MDP) Interface, which uses an RS232 hardware interface at 9600 bits/s. The following protocols are supported across the interface:

* Point To Point Protocol (PPP)

* Internet Protocol (IP)

* Universal Datagram Protocol (UDP)

* Transmission Control Protocol (TCP)

8.2.1   Radio Configuration

The radio must be programmed for data operations on the Trunked IV & D system. The following parameters apply:

Data Registration On/Off - Enables/disables data registration.

ICMP Echo - Enables the radio to send back an ICMP response once an ICMP request has been received.

CAI Data Max Tx Attempts - Selects the maximum number of times the radio attempts to send a CAI data packet. Attempts to send the data packet continue until the radio receives an acknowledgment confirming the successful receipt of the packet, or until the radio exceeds the selected amount of transmit attempts.

Response Timer - Selects the period of time the radio waits for an acknowledgment that a CAI transmission is successful before it tries the transmission again.

SNDCP Activation Wait Timer - Controls the time that a radio waits for the KMF to respond to a SNDCP context activation request.

Rx Voice Interrupts Data - Enables/disables whether a voice call can interrupt data.

Subscriber IP Address - The IP Address assigned to the subscriber for a PPP connection.

Mobile Computer IP Address - IP address assigned to the mobile computer for a PPP connection.

Tx Limited Patience - Selects the amount of time radio attempts to transmit a common air interface packet. Once time expires, radio ceases transmission. Times are 1 to 255 seconds, infinite in increments of 1. The default is infinite.

Min Response Timer - Selects the minimum amount of time that the radio waits for an acknowledgement of a successful CAI to be sent across the channel. Times are 50 to 2000 milliseconds, in increments of 50 milliseconds. The default is 700 milliseconds.

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Frame Sync Seek Period - Selects the amount of time the radio listens for a frame sync sequence before a packet is transmitted. Times are 0 to 5000 milliseconds, in increments of 50 milliseconds. The default is 750 milliseconds.

Tx Short Random Range - Selects the maximum amount of time the radio waits to transmit once the first qualified FS is received indicating the channel is clear. Times are 50 to 500 milliseconds, in increments of 50 milliseconds. The default is 50 milliseconds.

Tx Long Random Range - Selects the upper range of the random range. When the radio detects a busy, the radio uses a random time within this range (Back off delay) to determine when to retransmit the packet. Times are 50 to 5000 milliseconds, in increments of 50 milliseconds. The default is 2000 milliseconds.

Tx Response Random Range - Selects amount of time radio waits before rechecking a channel's status once a busy channel status symbol has been received. Only applies to ACKs. Times are 50 to 1000 milliseconds, in increments of 50 milliseconds. The default is 1000 milliseconds.

8.2.2   Interface Connection

The radio connects from its MDP Interface to the RS232 COM port of the computer using the P25 Mobile Data Peripheral (MDP) Interface cable.

8.2.3   Context Activation

For the radio to access data service on a trunking system, it must be a valid user on the system and it must be affiliated to an RF site. Once this is accomplished, the radio must request data services from the trunked system through the process of context activation; a data registration of the radio with the system. Context activation is initiated from the radio.

In an EFJohnson Technologies mobile radio, context activation is automatically initiated when the user selects a P25 trunking system with either data registration enabled or OTAR enabled. During a context activation, the mobile radio attempts to access a packet data channel (PDCH) at the site and send it its request for data services. If the context activation is successful, the mobile radio will receive a response containing a IP address. This IP address will be used by the mobile radio as a source IP address for all inbound data messages sent, and is used by the host application as the destination IP address for all outbound data messages.

If for some reason the context activation fails, the mobile radio will not be allowed to use data services on the trunked system. If a PPP link is established between the portable computer and mobile radio without the radio context activated, any data transmitted by the computer to the radio is ignored.

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8.2.4   PPP Link Establishment

To begin data transmissions from an application running on a portable computer, a data connection must first be established between the mobile computer and the radio (with data capability enabled). This is accomplished by creating a new connection using the Microsoft Windows Operating System.

Note   *The following screen shots are derived from Windows XP.*

The network connection screen can be accessed through the control panel. Click the create a new connection link.

1   Using the Control Panel, access the Network Connection screen (Figure 8.1).

Figure 8.1   Network Connection Screen
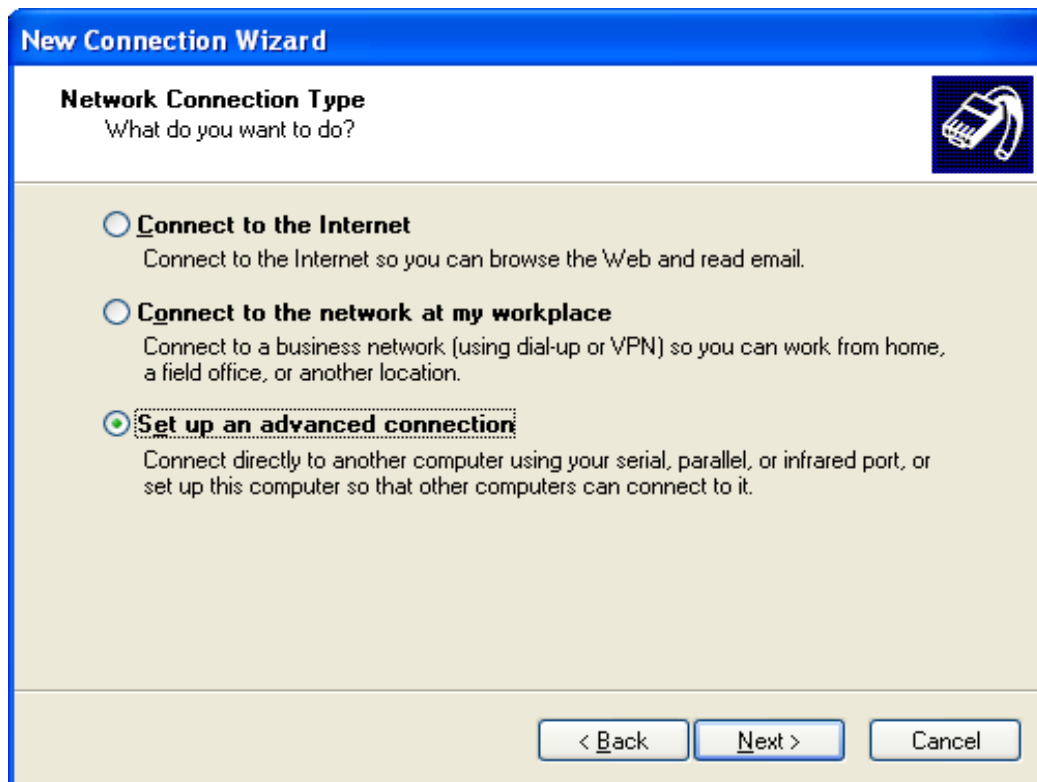
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2 Click *Create a new connection link*.The New Connection Wizard screen appears (Figure 8.2).

Figure 8.2 New Connection Wizard Screen
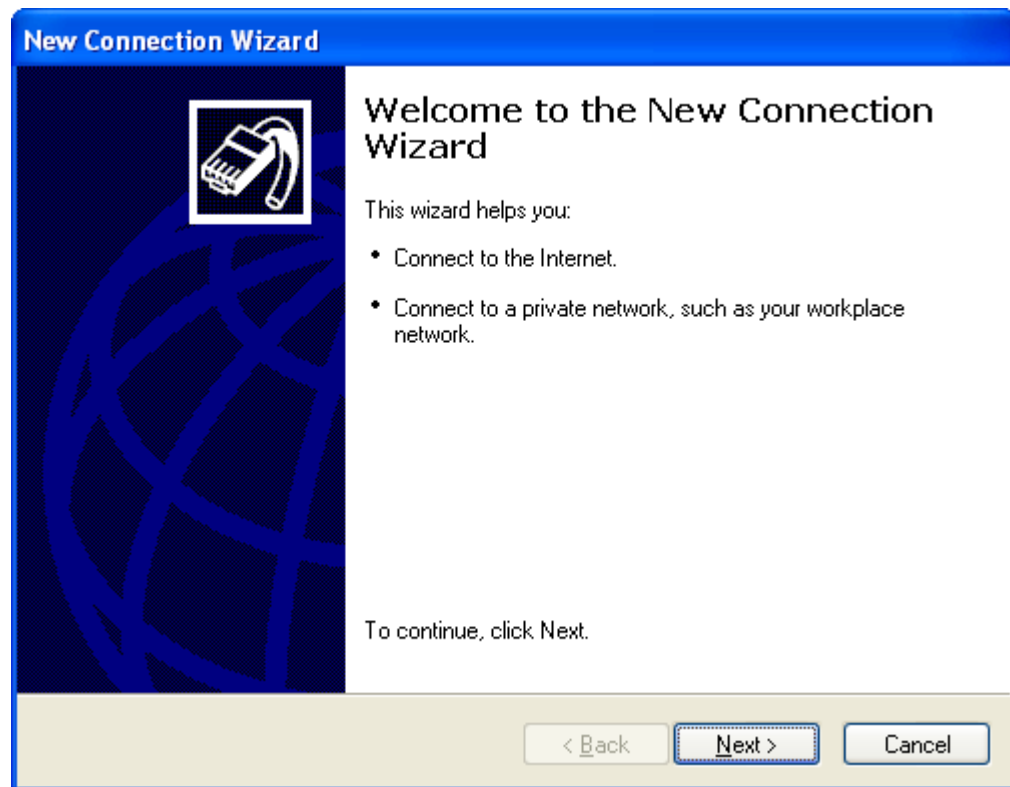
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3   Click *Next*. The Network Connection Type screen appears (Figure 8.3).

Figure 8.3   Network Connection Type Screen
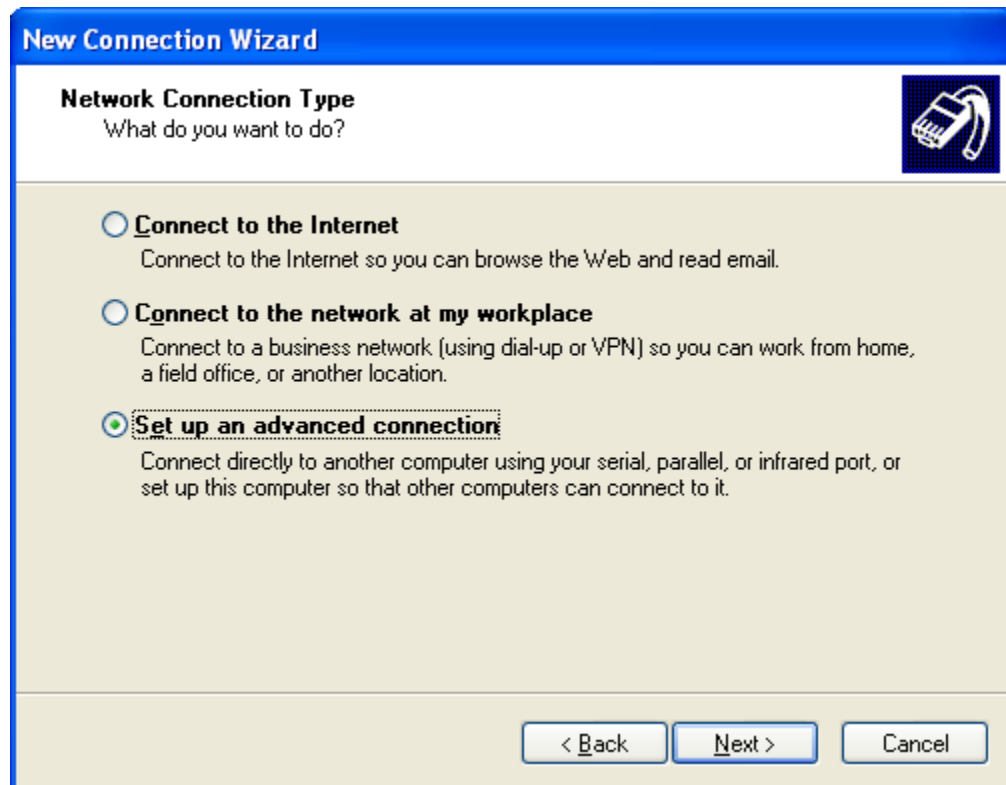
4 Select *Set up an advanced connection*, then click *Next*. The Advanced Connection Options screen appears (Figure 8.4)

Figure 8.4   Advanced Connection Options Screen
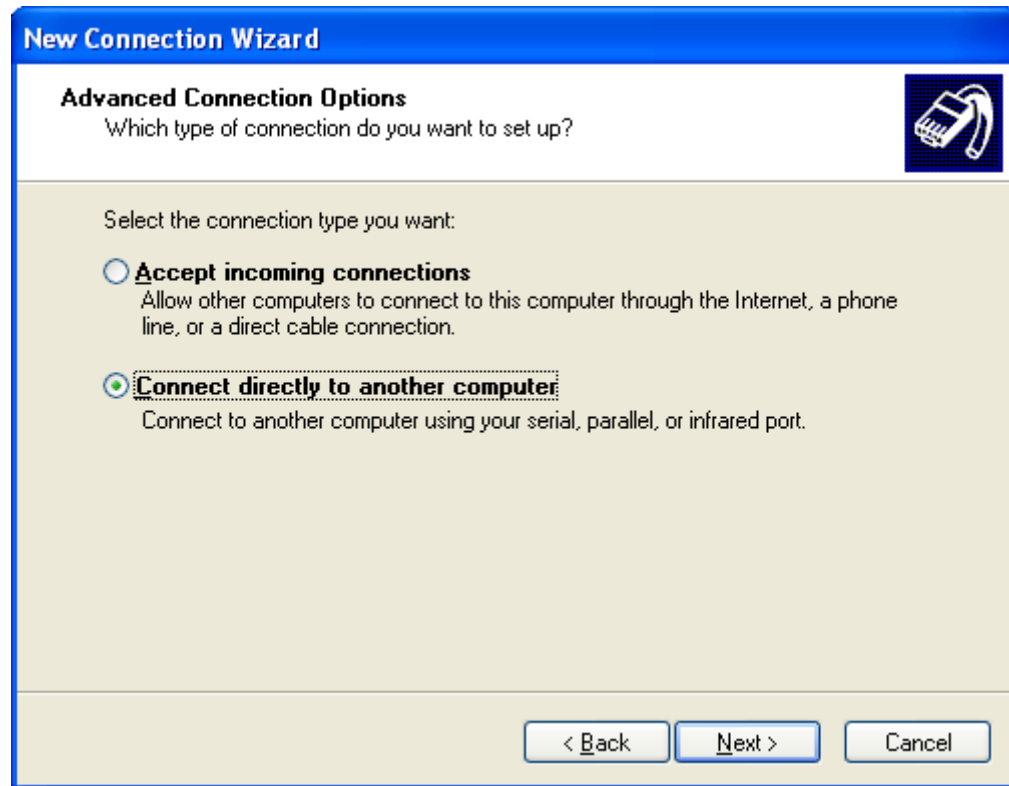
5 Select *Connect directly to another computer*, then click *Next*. The Host or Guest screen appears (Figure 8.5).

6 Select *Guest*, then click *Next*. The Connection Name screen appears (Figure 8.6).
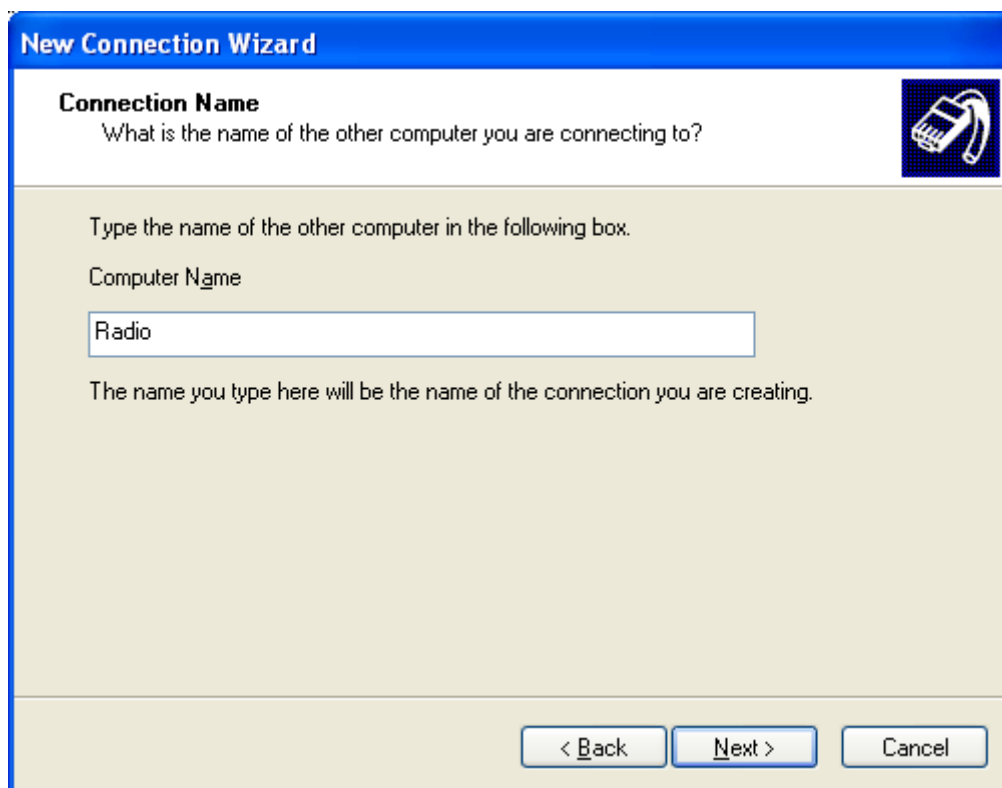
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Figure 8.5   Host or Guest Screen
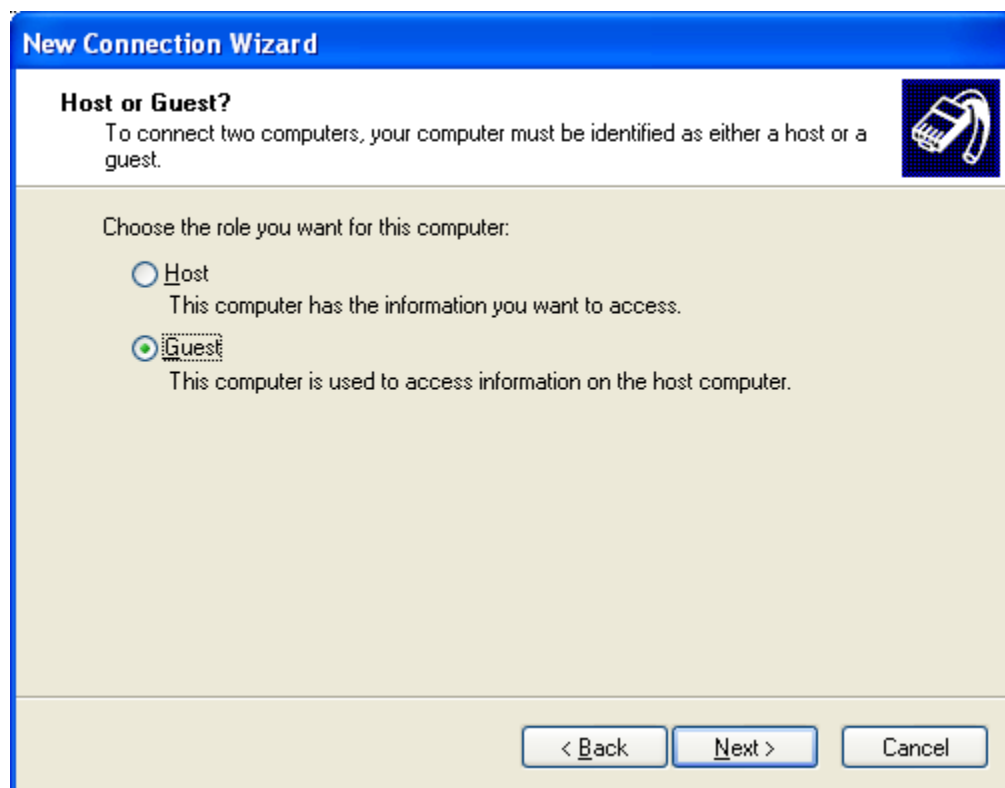
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Figure 8.6   Connection Name Screen

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7   In the *Computer Name* frame, type the name for the connection. Then click *Next*. The
Select a Device screen appears (Figure 8.7).

Figure 8.7   Select a Device Screen
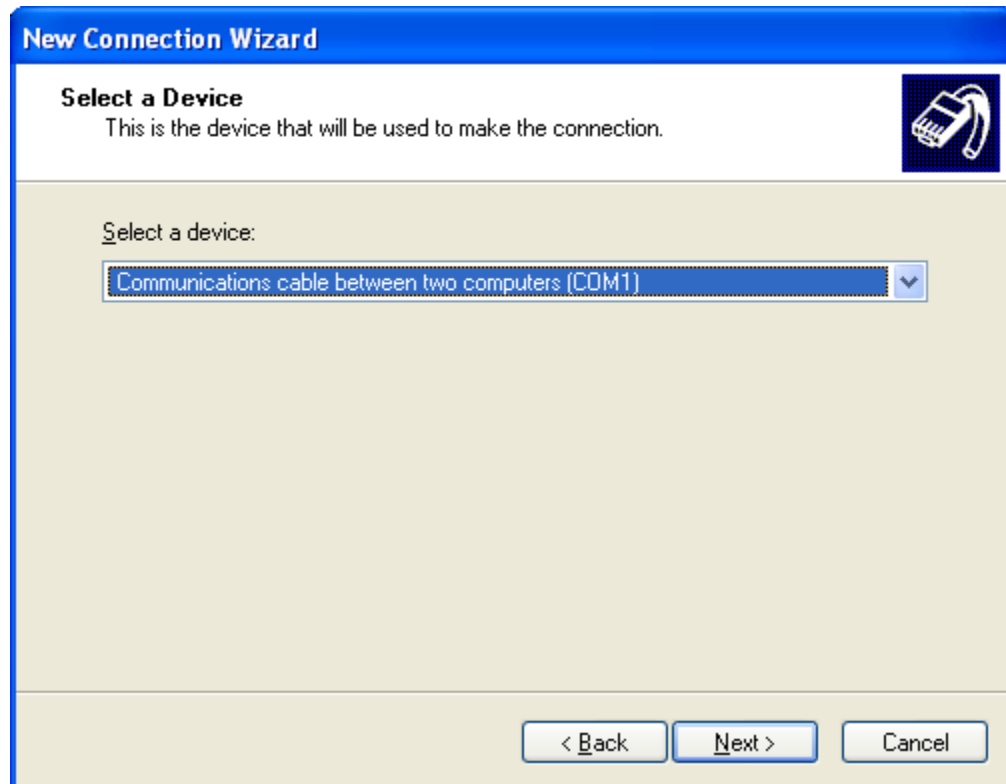
8   From the *Select a device* pull-down list, select the communications port to use to
connect the cable from the radio to the computer. Then click *Next*. The *Connection
Availability* screen appears (Figure 8.8).

9   Under the *Create this connection for* options, select *Anyone's use*.Then click *Next*. The
Completing New Connection Wizard screen appears (Figure 8.9).

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Figure 8.8   Connection Availability
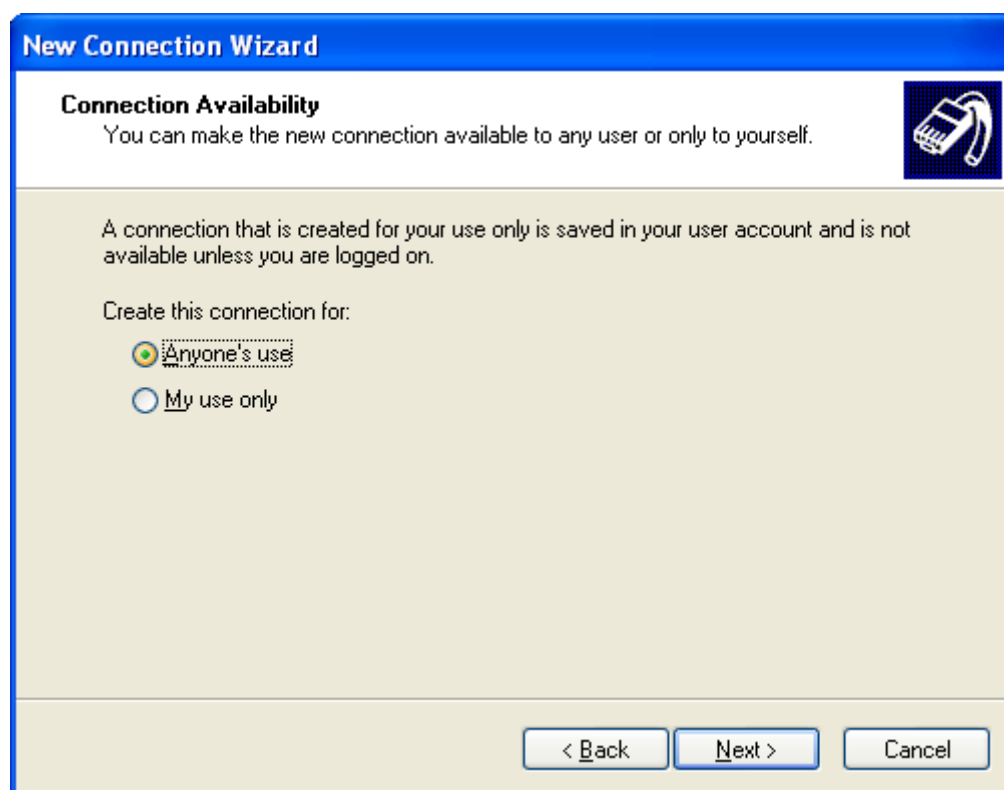
Figure 8.9   Completing New Connection Wizard Screen
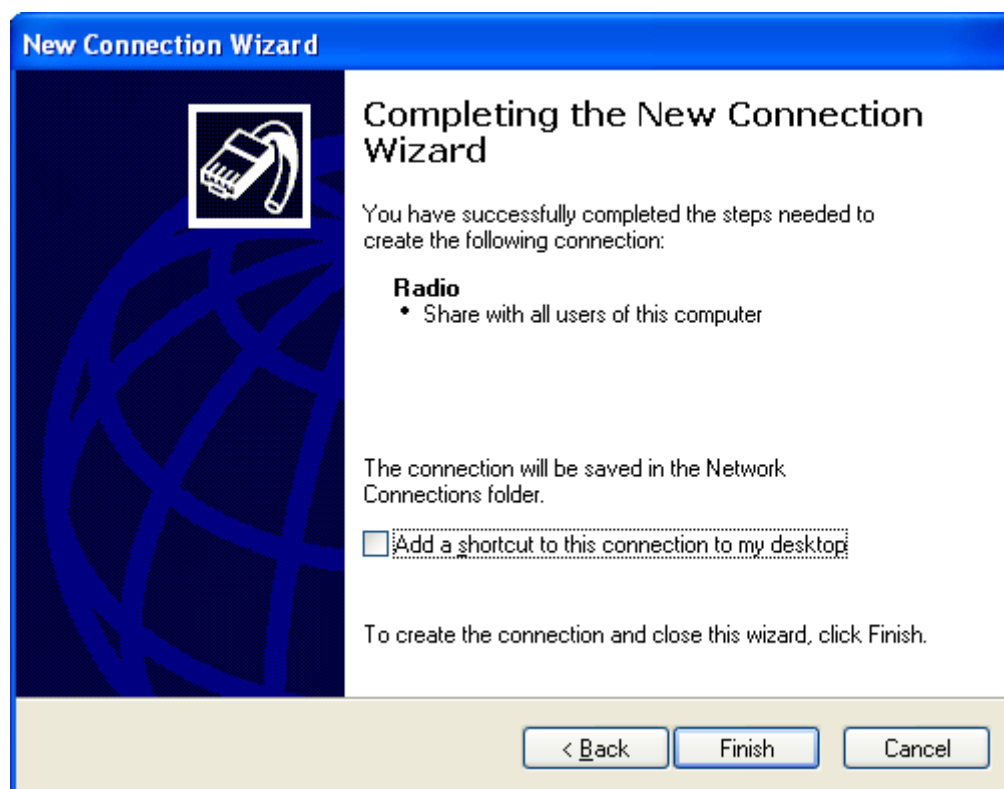
10 Click *Finish*. The new connection is established (and should be in the network connection folder). The Connect Radio screen appears (Figure 8.10).

Figure 8.10   Connect Radio Screen

11 Click *Properties*. The Radio Properties screen is displayed (Figure 8.11).

12 Under the *General* tab, click *Configure*. Verify that the communications port selected in Step 8 is selected in the *Select a device* pull-down list.

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Figure 8.11   Radio Properties Screen: General Tab
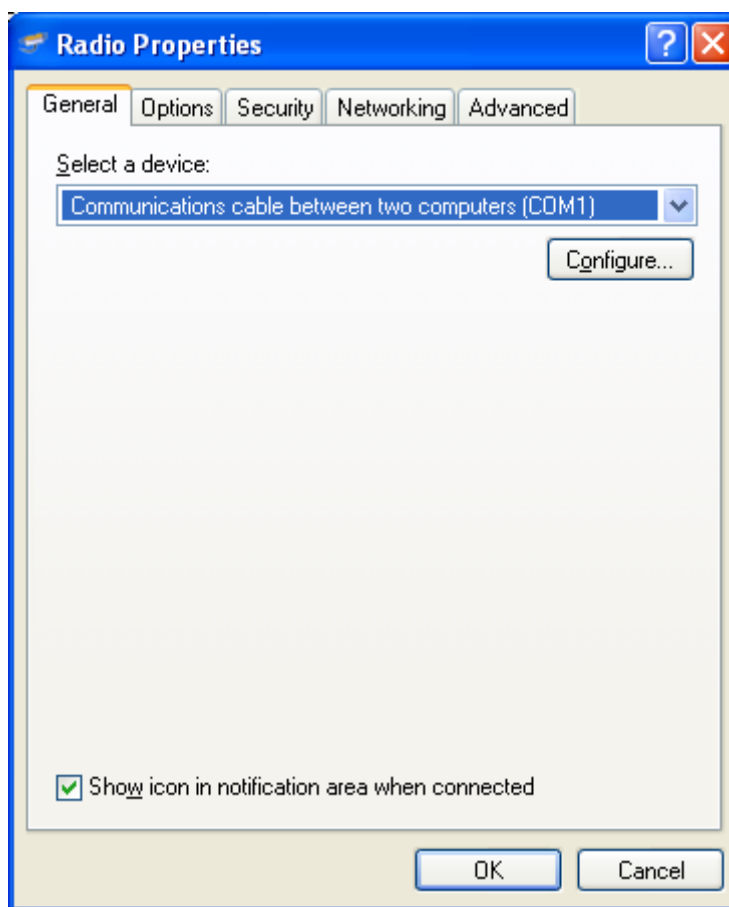
13 Click *OK*. The *Modem Configuration* screen appears (Figure 8.12).

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Figure 8.12 Modem Configuration Screen
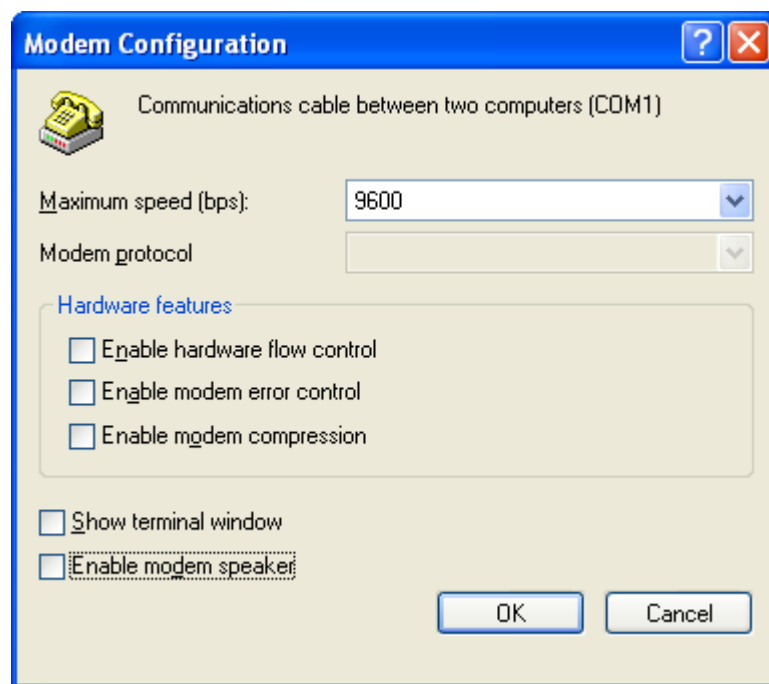
14 From the *Maximum Speed* pull-down list, select *9600*. Leave all other options unchecked, and click *OK*. The Radio Properties screen returns (Figure 8.13).

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Figure 8.13 Radio Properties Screen: Options Tab
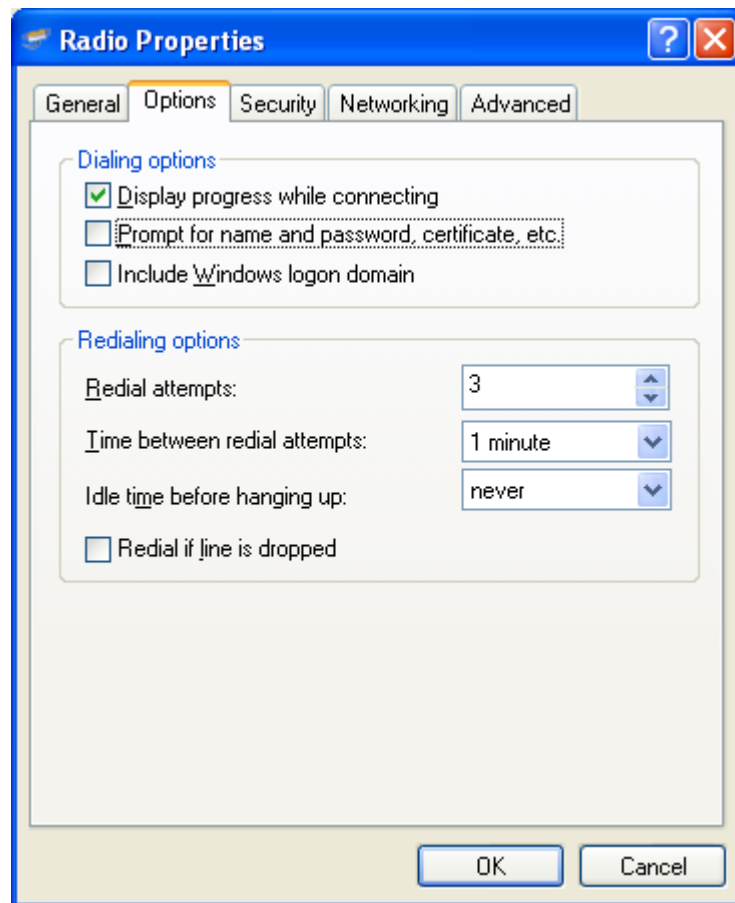
15 Under the *Options* tab, ensure that the box for *Prompt for name and password certificate, etc.* is unchecked. Then select the *Networking* tab (Figure 8.14).

16 Under the *Networking* tab, ensure that the following boxes are unchecked:

- *File and printer sharing for Microsoft Networks*
- *Intel Wireless Connection Agent*
- *Deterministic Network Enhancer*
- *Client for Microsoft Networks*

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Figure 8.14   Radio Properties Screen: Networking Tab
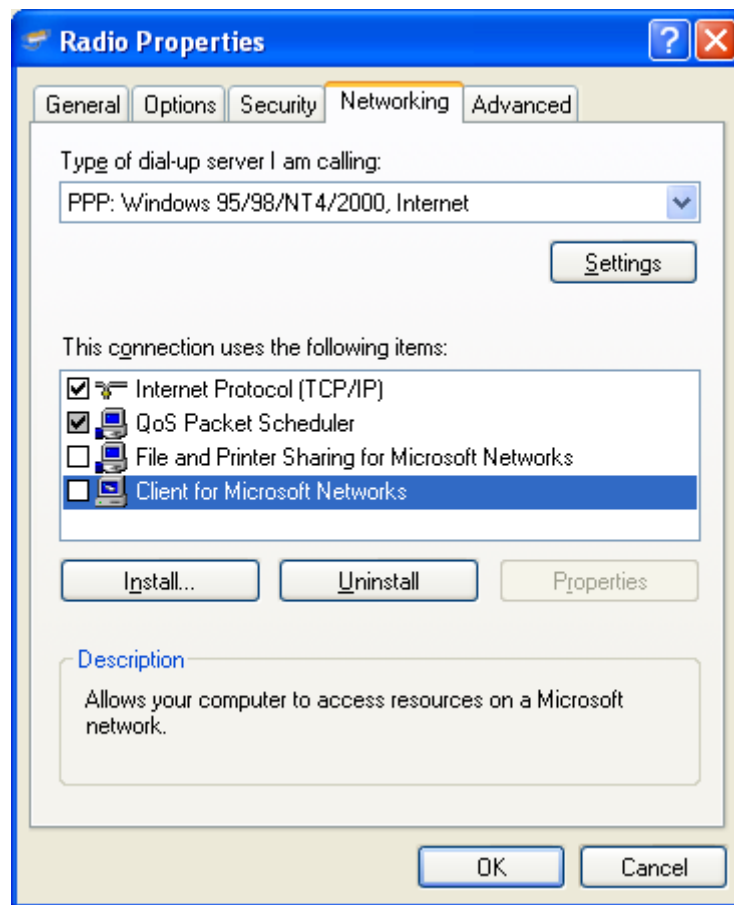
17 Ensure that the box for *Internet Protocol (TCP/IP)* is checked. Then click
Properties.The Internet Protocol (TCP/IP) Properties screen appears (Figure 8.15).

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Internet Protocol (TCP/IP) Properties Screen
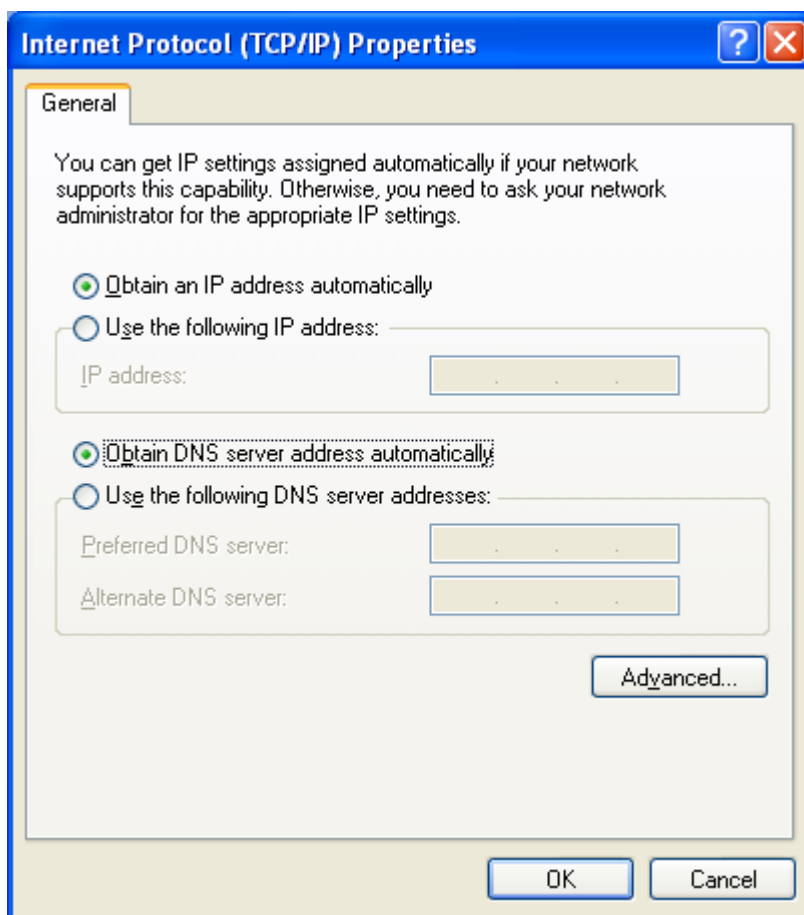
18 Select *Obtain an IP address automatically*, then click *Advanced*. The Advanced TCP/
IP Settings screen appears (Figure 8.16).

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Figure 8.16   Advanced TCP/IP Settings Screen
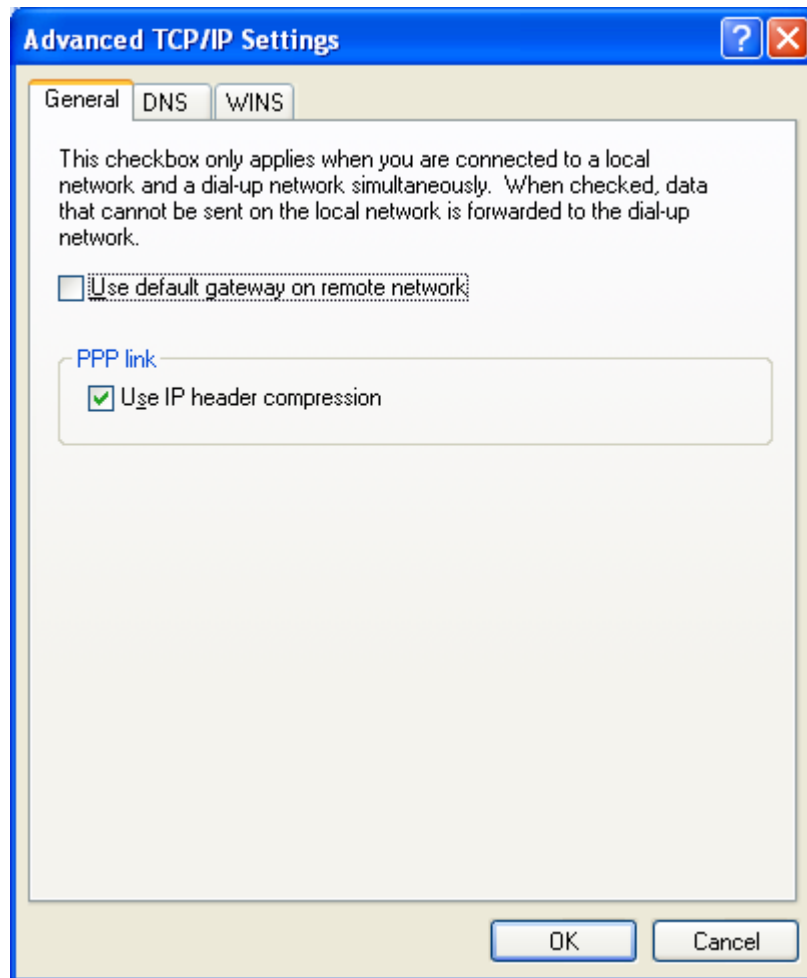
19 Ensure that the box for *Use default gateway on remote network* is unchecked. Then
click *OK*. The Internet Protocol (TCP/IP) Properties screen returns (Figure 8.17).

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Figure 8.17   Internet Protocol (TCP/IP) Properties Screen
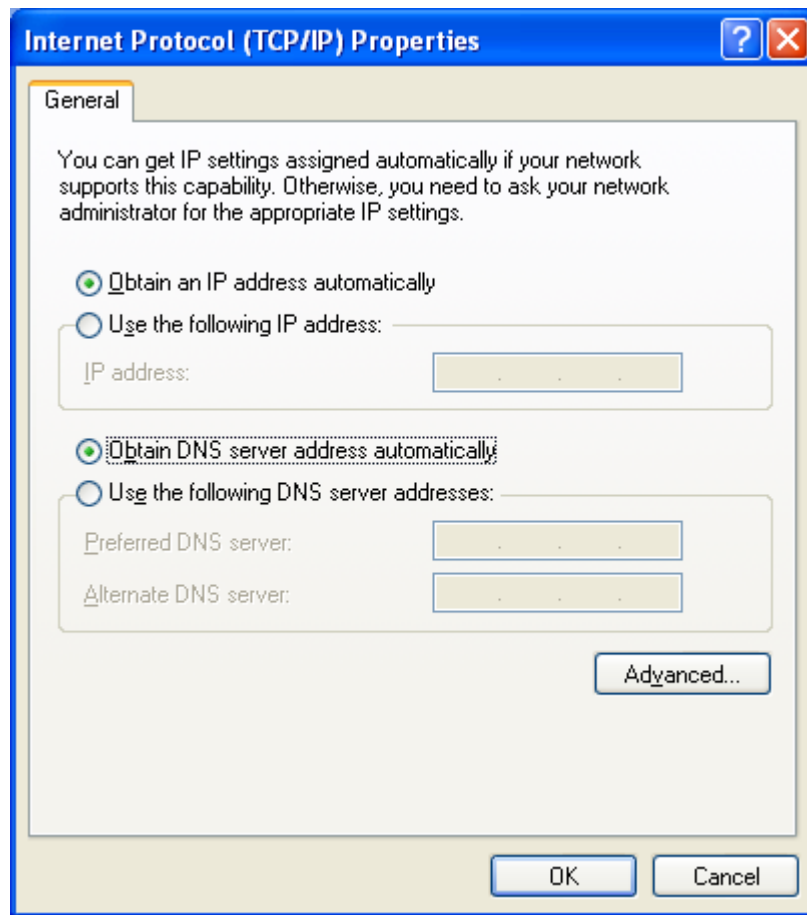
20 Click OK. The Radio Properties screen returns (Figure 8.18).

21 Click Cancel. The configuration of the connection between the radio and the portable computer is complete.

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Figure 8.18 Radio Properties Screen: Networking Tab
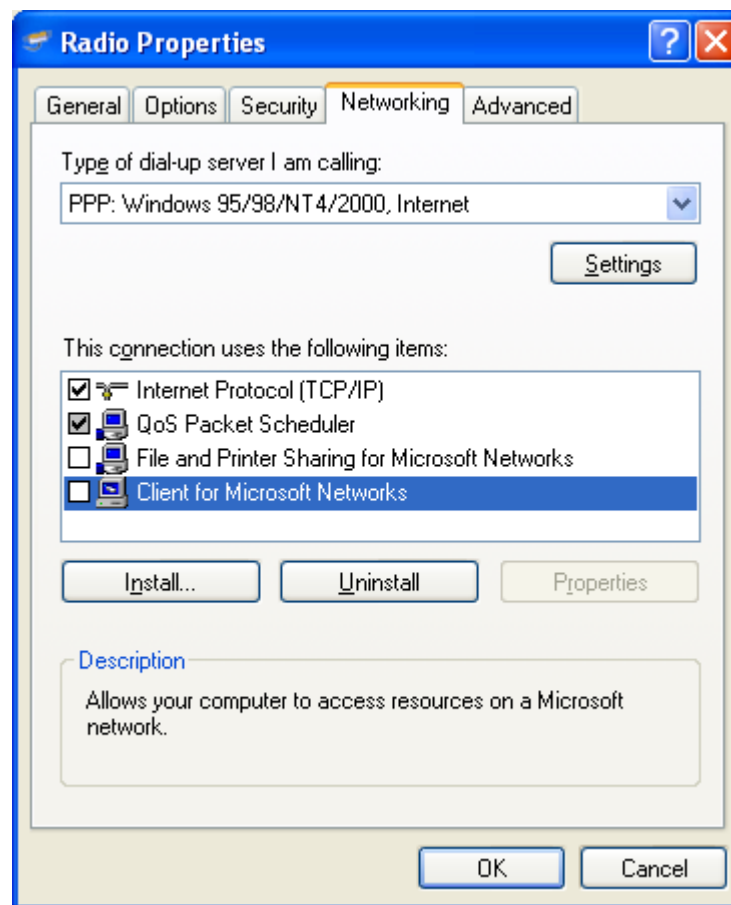
8.2.4.1   Connection and Testing

To connect the computer and radio and test the connection perform the instructions in the following paragraphs.

8.2.4.1.1   Connection

To connect the computer and radio, right click on the network icon. The Connecting Radio window (Figure 8.19) appears, and remains until the connection is made.

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Figure 8.19   Radio Connection Window
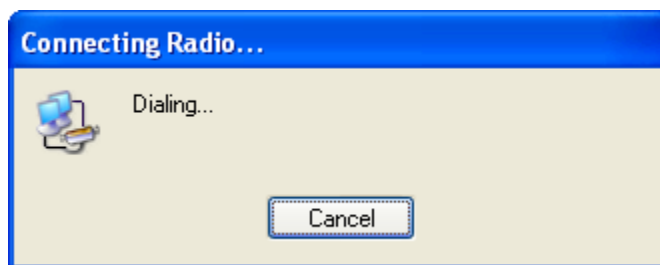
8.2.4.1.2   PPP Link Test

Further verification that the link is working correctly an be made by "pinging" the subscriber radio from the mobile computer:

1   Activate the Command Prompt screen from the Accessories pull-down list of the Start menu (see Figure 8.20).
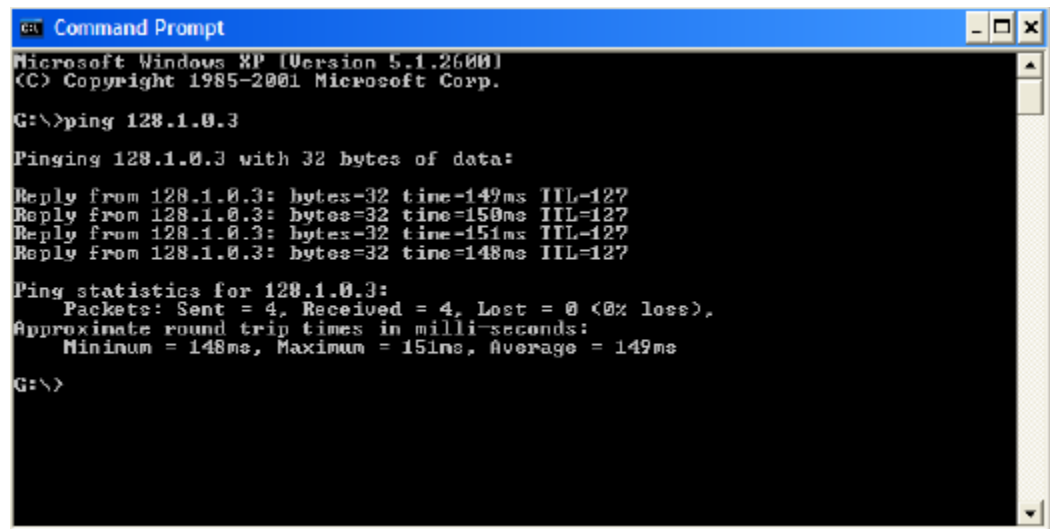
Figure 8.20   Command Prompt Screen: Sending "Ping"
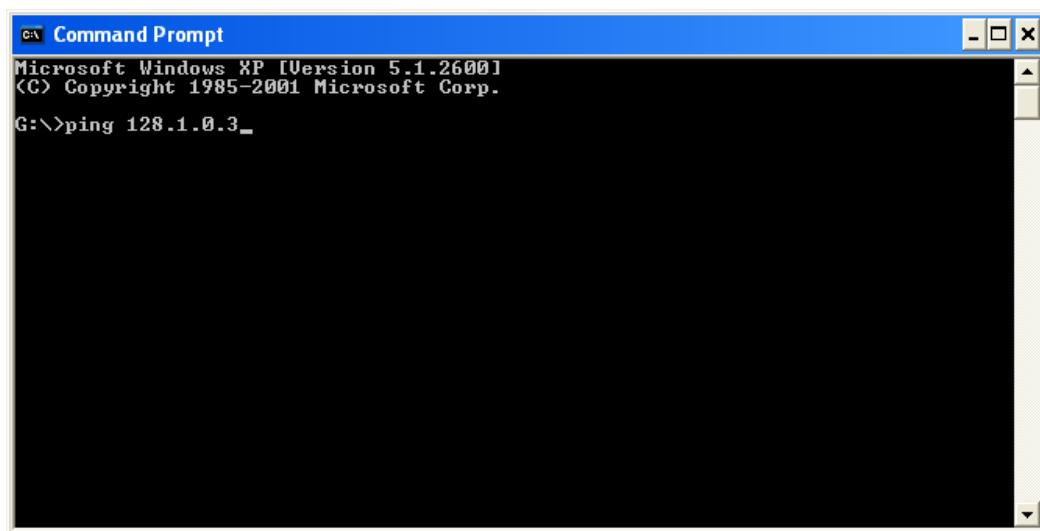
2   At the prompt, type *ping* followed by the IP address of the radio. In the above example the IP address 128.1.0.3 s used, and the complete entry is *ping 128.1.0.3*.

3   Check for one or more replies to the "ping" as in the example of Figure 8.21. This indicates that the connection is working correctly.

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Figure 8.21   Command Prompt Screen: Replies to Successful "Ping"

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9

Tones & Error Messages

9.1   Supervisory Tones

Supervisory Tones are described as follows:

Single Beep (Alert Tone)

*   Power was turned ON and a successful power-up sequence occurred (see Section 3.1.1).

*   The time-out timer is about to expire or the penalty timer has expired (Section 4.3).

*   The conversation timer is about to expire (Section 5.6).

*   The system received your page but the paged radio is not on the air (Section 6.6).

*   Telephone interconnect is not operational (Section 6.5).

Continuous Tone (Invalid Condition)

*   A transmission is being attempted on a conventional channel programmed as receive-only.

*   The transmitter is disabled by the transmit disable on busy feature (Section 5.3).

*   The transmitter has been disabled by the time-out timer feature (Section 4.3).

*   The transmitter has been disabled by the conversation timer (Section 5.6).

*   An out-of-range condition exists (SMARTNET/SmartZone only).

*   A transmission is being attempted before the penalty timer has expired (Section 4.3).

• Dynamic regrouping has been exited but the dynamic regrouping channel is still selected (Section 6.12).

Single Short Medium-Pitch Tone

• A valid key has been pressed.

Single Short Low-Pitch Tone

• An invalid key has been pressed.

Medium Tone (No Acknowledge)

• The paged radio did not acknowledge the page (Section 6.6).

• The message that was sent has not been acknowledged (Section 6.7).

• The status condition that was sent has not been acknowledged (Section 6.8).

Five Beeps (Recurring)

• The page was received (Section 6.6).

Two Short Tones

• A unit-to-unit call was received (Section 6.6).

Five Beeps

• The paged radio received the page and acknowledged it (Section 6.6).

• The message that was sent has been received and acknowledged (Section 6.7).

• The status condition that was sent has been received and acknowledged (Section 6.8).

Four Beeps

• The emergency alarm condition was acknowledged (Section 6.9).

• Four low beeps indicate the call back mode (the system is no longer busy).

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Alternating Tone

- Dynamic regrouping has occurred (Section 6.12).

- Dynamic regrouping has occurred but the regrouping channel is not selected (Section 6.12).

Busy Signal

- The radio system is busy or a busy condition exists when making a telephone call.

Three Medium Pitch Tones

- A channel is available after a busy condition occurred (SMARTNET/SmartZone only).

9.2 Error Messages

The following are definitions of the various error messages that may be displayed.

Message Enumerations	Portable/SCH/LCH Strings	Description
AFFILIATION_DENY	"Aff Deny" "AFF DENY" "Affiliation Deny"	This error indicates that a group affiliation attempt has received a DENIED response from the system. The precise reason for a DENIED response is manufacturer dependent. One common cause is that the group is disallowed on the site/RFSS that the radio is attempting to affiliate on.
AFFILIATION_FAILED	"Aff Failed" "AFF FAILED" "Affiliatn Failed"	This error indicates that a group affiliation attempt has received a FAILED response from the system. The precise reason for a FAILED response is manufacturer dependent
AFFILATION_REFUSED	"Aff Refused" "AFF REFUSE" "Affilatn Refused"	This error indicates that a group affiliation attempt has received a REFUSED response from the system. The precise reason for a REFUSED response is manufacturer dependent.
ANALOG	"Analog" "ANALOG" "Analog"	This error indicates than an operation was attempted that is not allowed on analog channels.
ANSWER_ONLY	"Answer Only" "ANSWR ONLY" "Answer Only"	This error indicates that the user has attempted to initiate a unit call or interconnect call and the feature is programmed for answer only.

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Message Enumerations	Portable/SCH/LCH Strings	Description
ATTACH_GPS	"Attach GPS" "ATTACH GPS" "Attach GPS"	This error indicates that the user has tried to enter GPS mode without attaching the GPS receiver to the radio.
AUTHENTICATION_FAILED	"Auth Failed" "AUTH FAILD" "Authent Failed"	This error indicates the radio failed P25 Trunking Authentication, which occurs during Unit Registration on supported systems.
BAD_BAND	"Bad Band" "BAD BAND" "Bad Band"	The radio band in the parameter file does not match the radio band in the tuning parameters. You will see this message if a parameter file for the wrong band is downloaded to the radio. This error is also indicated with 4 orange blinks of the LED.
BAD_ESN	"Bad ESN" "BAD ESN" "Bad ESN"	This error indicates that the ESN of the radio is not valid. This error is usually only seen in the factory when first programming brand new logic boards. This error is also indicated with 12 orange blinks of the LED.
BAD_FILE_FORMAT	"Bad File Fmt" "BAD FF" "Bad File Format"	The parameter file has a newer file format version than what matches the software in the radio. This error is indicated with 2 orange blinks of the LED.
BUSY	"Busy" "BUSY" "Busy"	This error indicates that a call has been attempted and the system has responded that no channels are available for assignment.
BUSY_TIMEOUT	"Busy Timeout" "BUSY TMOUT" "Busy Timeout"	This error indicates that the radio previously received a busy response from the system and it has not received a channel grant before the busy timeout timer has expired.
CLEAR_ONLY	"Clear Only" "CLEAR ONLY" "Clear Only"	This error indicates that the selected channel or group is strapped clear only and that a secure call cannot be made.
COLD_BATTERY	"Cold Battery" N/A N/A	The portable's battery has dropped below the "cold" temperature threshold. Transmit is not allowed in this condition.
CONTROL_HEAD_CONFLICT	N/A "CH ADDRESS CONFLICT" "CH ADDRESS CONFLICT"	There are two control heads connected to the mobile that are assigned the same address.
CORRUPT_PARMS	"Corrupt Parm" "CORPT PARM" "Corrupt Parm"	The parameters checksum or other data is corrupted. This error will also be indicated with 5 orange blinks of the LED.
CYCLE_POWER	"Cycle Power" "CYCLE POWR" "Cycle Power"	There is a communication failure between the DSP and the back end ADC on the RF deck. This error will also be indicated with 8 orange blinks of the LED.
DATA_DENIED	"Data Denied" "DATA DENY" "Data Denied"	The Radio received a "Deny" response when trying to acquire packet data service.

Message Enumerations	Portable/SCH/LCH Strings	Description
DENIED	"Denied" "DENIED" "Denied"	This error indicates that a group call attempt has received a DENIED response from the system.
DENY	"Deny" "DENY" "Deny"	This error indicates that a unit or interconnect call attempt has received a DENIED response from the system.
DISABLED	"Disabled" "DISABLED" "Disabled"	This error indicates that the feature that the user is attempting to use has been disabled on the radio either by programming or by factory options.
DSP_FAILED	"DSP Failed" "DSP FAILED" "DSP Failed"	This error indicates that the DSP failed to complete its startup procedure at powerup. This is also indicated with 7 orange blinks of the LED.
ENCRYPTION_FAIL	"Encrypt Bad" "ENCRYP BAD" "Encryption Bad"	This error indicates that the main processor and the encryption module have failed to complete their startup procedure at powerup. This error is also indicated with 11 orange blinks of the LED.
FIXED_AUTO	"Fixed Auto" "FIXED AUTO" "Fixed Auto"	This error indicates that the selected channel or group is strapped to auto power and thus high/low power cannot be selected.
FIXED_HIGH	"Fixed High" "FIXED HIGH" "Fixed High"	This error indicates that the selected channel or group is strapped to high power and thus low power cannot be selected.
FIXED_LOW	"Fixed Low" "FIXED LOW" "Fixed Low"	This error indicates that the selected channel or group is strapped to low power and thus high power cannot be selected.
HC08_FAILURE	"HC08 Failure" "HC08 FAIL" "HC08 Failure"	The HCO8 was not initialized correctly and cannot be accessed for flash reads and writes, etc. This error will also be indicated with 9 orange blinks of the LED.
INVALID_USER	"Invalid User" "INVLD USR" "Invalid User"	This error indicates that the user's radio ID was rejected by the system. This message is primarily related to data registrations.
KEY_FAIL	"Key Fail" "KEY FAIL" "Key Fail"	This error indicates that the encryption key required by the current selected group / channel is not valid or does not exist.
KEYPAD_LOCKED	"Kypd Locked" "KYPD LCKED" "Keypad Locked"	This error indicates that the keypad lock function is active and key presses are not accepted in this mode.
KEYSET_FAIL	"Kset Fail" "KSET FAIL" "Keyset Fail"	This error indicates that the radio was not able to activate the encryption keyset chosen by the user.
LIST_FULL	"List Full" "LIST FULL" "List Full"	This error occurs during Scan Edit when a user attempts to add too many channels to the scan list.

Message Enumerations	Portable/SCH/LCH Strings	Description
LIST_ONLY	"List Only" "LIST ONLY" "List Only"	This error occurs when the user attempts to do direct entry of a unit ID/phone number for Call Alert/Unit Calls/Interconnect Calls but the call setting is set for list only.
LOCKED	"Locked" "LOCKED" "Locked"	This error indicates that the dynamic regrouping selector lock command has been received and zone and channel changes are not accepted.
LOSS_OF_SIGNAL	"Signal Loss" "SIGNL LOSS" "Signal Loss"	This error indicates that signal from the infrastructure has been lost during an interconnect call or a P25 Trunking unit call.
MESSAGE_FAILED	"Msg Failed" "MSG FAILED" "Message Failed"	This error indicates that the message the user was trying to send failed. This applies to conventional messaging.
NEVER_SITE	"Never Site" "NEVER SITE" "Never Site"	This error indicates that the user tried to site lock to a site which was assigned a preference of "Never".
NO_ANSWER	"No Answer" "NO ANSWER" "No Answer"	This error occurs when the user initiates a trunking unit call/interconnect call but the call was not answered before being canceled by the system.
NO_GPS_DATA	"No GPS Data" "NO GPS DAT" "No GPS Data"	This error occurs when the user attempts to use the GPS feature but the radio is not receiving GPS data.
NO_EDIT	"No Edit" "NO EDIT" "No Edit"	This error indicates that the current list is not able to be edited. Applies to conventional and radio wide scan edit.
NO_ENCRYPT	"No Encrypt" "NO ENCRYPT" "No Encrypt"	This error occurs when attempting to use or load keys but the radio is not optioned for encryption.
NO_IP_REG	"No IP Reg" "NO IP REG" "No IP Reg"	This error occurs when the user attempts to send GPS data without being IP registered.
NO_ITEMS	"Menu Empty" "MENU EMPTY" "Menu Empty"	The menu the user tried to access does not have any items.
NO_KEYS	"No Keys" "NO KEYS" "No Keys"	This error indicates that no keys are available for the key select function.
NO_LIST	"No List" "NO LIST" "No List"	This error indicates that no list is programmed for the selected feature.
NO_MESSAGE	"No Message" "NO MESSAGE" "No Message"	This error occurs when attempting to activate the Message feature but no messages are programmed.

Message Enumerations	Portable/SCH/LCH Strings	Description
NO_PRIORITY	"No Priorty" "NO PRIORTY" "No Priorty"	This error occurs when attempting to use the conventional Priority feature on a non-priority scan list.
NO_SERVICE	"No Service" "NO SERVICE" "No Service"	This error indicates that OTAR service is not available.
NO_SITE	"No Site" "NO SITE" "No Site"	This error indicates that no site with a verified ID is yet on the dynamic site list. This applies to the Site Lock feature.
NO_UKEKS	"No UKEK" "NO UKEK" "No UKEK"	This error occurs when attempting to rekey with no UKEK.
NUM_CHNL_FAIL	"Channl Limit" "CHANL LIMT" "Channel Limit"	If seen upon startup, this error indicates that the radio has been programmed with more channels than what it is optioned for. This error is also indicated with 10 orange blinks of the LED.
OUT_OF_RANGE	"Out Of Range" "OUT OF RNG" "Out Of Range"	This error indicates no control channel has been found for trunking operation.
PARMS_FAILED	"Parms Fail" "PARMS FAIL" "Parms Fail"	There is no parameter file in the radio. This error will also be indicated with 3 orange blinks of the LED.
RECEIVE_ONLY	"Rx Only" "RX ONLY" "Receive Only"	This error indicates that the selected channel is Rx only. This can occur if transmit disabled is selected or a conventional channel is configured with talkgroup 0.
REGISTRATION_DENY	"Reg Deny" "REG DENY" "Reg Deny"	This error indicates that a unit registration attempt has received a DENY response from the system. The precise reason for a DENY response is manufacturer dependent. One common cause is that the unit ID is disallowed on the site/ RFSS that the radio is attempting to register on.
REGISTRATION_FAILED	"Reg Failed" "REG FAILED" "Reg Failed"	This error indicates that a unit registration attempt has received a FAILED response from the system. The precise reason for a FAILED response is manufacturer dependent.
REGISTRATION_REFUSED	"Reg Refused" "REG REFUSD" "Reg Refused"	This error indicates that a unit registration attempt has received a REFUSED response from the system. The precise reason for a REFUSED response is manufacturer dependent.
REKEY_FAIL	"Rekey Failed" "REKEY FAIL" "Rekey Failed"	This error indicates a failure in a rekeying process.
RESPONSE_ONLY	"Resp Only" "RSPNS ONLY" "Response Only"	This error indicates that the Unit Call/Call Alert setting to set to Response Only.

Message Enumerations	Portable/SCH/LCH Strings	Description
SECURE_ONLY	"Secure Only" "SECR ONLY" "Secure Only"	The user is attempting to transmit Clear on a Strapped Secure channel.
SLAVE_SCAN	"Slave Scan" "SLAVE SCAN" "Slave Scan"	If a conventional scan list is slaved to the current zone, this error will occur if the user attempts to select or edit another conventional scan list.
STATUS_FAILED	"Status Fail" "STS FAILED" "Status Fail"	This error indicates that no acknowledgement was received while sending a status report.
TEMP_HOT	"Hot" "HOT" "Hot"	This error indicates that the mobile has passed the hot temperature threshold. If the user transmits in this condition, the radio will display "Hot" and "Low Power". Transmit power will be forced low.
TEMP_TOO_HOT	"Too Hot" "TOO HOT" "Too Hot"	This error indicates that the mobile has passed the TOO HOT temperature threshold. Under these conditions the radio will not allow transmit.
TX_TIMEOUT	"Tx Timeout" "TX TIMEOUT" "Tx Timeout"	This error indicates that the transmit timeout timer has expired and transmit has been terminated.
VOLTAGE_HIGH	N/A "VOLT HIGH" "Voltage High"	The mobile's voltage source is too high. Transmit is not allowed in this condition.
VOLTAGE_LOW	N/A "VOLT LOW" "Voltage Low"	The mobile's voltage source is too low. Transmit is not allowed in the condition.
ZONE_FAIL	"Zone Fail" "ZONE FAIL" "Zone Fail"	If Site Trunking and Display Site Trunking are enabled, this will be displayed if the zone controller goes down.

9.3   Viking LED Failure Codes

Orange LED Blinks	Startup Failure	Description
2	Bad File Format	The parameter file has a newer file format version than what matches the software in the radio.
3	Parms Fail	There is no parameter file in the radio.
4	Bad Band	The radio band in the parameter file does not match the radio band in the tuning parameters. You will see this message if a parameter file for the wrong band is downloaded to the radio.

Orange LED Blinks	Startup Failure	Description
5	Corrupt Parms	The parameters checksum or other data is corrupted.
6	Unused	
7	DSP Fail	This error indicates that the DSP failed to complete its startup procedure at powerup.
8	RX Backend Fail	There is a communication failure between the DSP and the back end ADC on the RF deck.
9	HC08 Init Fail	The HCO8 was not initialized correctly and cannot be accessed for flash reads and writes, etc.
10	Channel Fail	The radio has been programmed with more channels than it optioned for.
11	Encryption Fail	This error indicates that the main processor and the encryption module have failed to complete their startup procedure at powerup.
12	Bad ESN	This error indicates that the ESN of the radio is not valid. This error is usually only seen in the factory when first programming brand new logic boards.

9.4   SZ System Reject Messages

The following messages are defined in the radio. Other messages will be displayed as a number. Contact EFJ engineering for more information on a "numbered" reject message.

Error String	Description
"ID Invalid"	The ID of the subscriber is invalid.
"Target Invalid"	The ID of the target is invalid.
"ID Disabled"	The ID of the substriber is disabled or not allowed to access the system.
"Target Disabled"	The target ID is disabled or not allowed to access the system.
"Invalid Group"	The takgroup is not valid.
"Disabled Group"	The talkgroup is disabled or not allowed on the system.
"Feature Disabled"	The attempted feature is not allowed on the system.
"Clear Only"	Secure calls are not allowed for the target ID or are not allowed for the current group.
"Secure Only"	Clear calls are not allowed for the target ID or are not allowed for the current group.
"Over Budget"	Interconnect dollar limit exceeded by user.
"Not Allowed Site"	The subscriber's ID is not allowed or the current talkgroup is not allowed on the site.
"Override Invalid"	There is not call busy override.

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Error String	Description
"Analog ID"	The user tried to use a radio with an analog ID on a digital talkgroup.
"Trespass Denied"	A site has rejected the subscribers request to trespass.

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Service Information

This section describes how to obtain authorized service for the Viking mobile radio.

10.1   Product Warranty

The warranty statement for this equipment is available from your product supplier or from:

> Warranty Department
> EFJohnson Technologies
> 1440 Corporate Drive
> Irving, TX 75038-2401

This information may also be requested from the Warranty Department by phone at the numbers listed in Section 10.2. The Warranty Department may also be contacted for warranty service reports, claim forms, or any other questions concerning warranties or warranty service.

10.1.1   Online Registration

EFJohnson Technologies offers greater convenience through online product warranty registration. Registering EFJohnson Technologies products online allows customers to receive warranty service and field service notices more quickly.

To register EFJohnson Technologies products online, visit *www.EFJohnsonTechnologies.com*. Click the link for *Service & Support,* then follow the instructions for Warranty Registration.

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10.2   Telephone Technical Support

Technical support personnel can help resolve many issues over the telephone, such as display, volume, software, programming. The Customer Service Department can be reached using the following telephone numbers:

Toll-Free: (800) 328-3911
Fax: (972) 819-0639
E-Mail: customerservice@efji.com

10.2.1   BEFORE Contacting Technical Support

It will be more efficient if you have critical information on hand before contacting customer support. Be sure to have the following:

- Any necessary equipment model numbers and configuration options.
- Description of the problem/symptoms
- Description of any troubleshooting actions performed.

10.3   Factory Customer Service

The EFJohnson Technologies Customer Service Department provides customer assistance on technical problems and the availability of local and factory repair facilities. Regular customer service hours are 8:00 a.m. - 5:00 p.m. Central Time, Monday- Friday. A technical support subscription service is available or support can be purchased on an as-needed basis. The Customer Service Department can be reached using the following telephone numbers:

Toll-Free: (800) 328-3911
Fax: (972) 819-0639
E-Mail: customerservice@efji.com

When your call is answered at EFJohnson Technologies, you will hear a brief message informing you of numbers that can be entered to reach various departments. This number may be entered during or after the message using a tone-type telephone. If you have a pulse-type telephone, wait until the message is finished and an operator will come on the line to assist you. When you enter some numbers, another number is requested to further categorize the type of information you need.

You may also contact the Customer Service Department by mail. Please include all information that may be helpful in solving your problem. The mailing address is as follows:

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Customer Service Department
EFJohnson Technologies
1440 Corporate Drive
Irving, TX 75038-2401

10.4   Returns for Repairs

Before returning equipment for repair, contact the EFJohnson Technologies Customer Service Department as described in the preceding section. They may be able to suggest a solution to the problem, making return of the equipment unnecessary.

Repair service is normally available through local authorized EFJohnson Technologies land mobile radio service centers. If local service is not available, the equipment can be returned to the EFJohnson Technologies repair depot for repair. However, before returning equipment, contact the Customer Service Department Repair Depot for the correct Ship To" address.

Be sure to fill out a Factory Repair Request Form #271 for each unit to be repaired, whether it is in or out of warranty. You can obtain it in any of three ways:

- Download it from the EFJohnson Technologies Web site's Service & Support" section.

- Call the EFJohnson Technologies Customer Service Department and request it.

- Request it when you send a unit in for repair.

Clearly describe the difficulty experienced in the space provided and also note any prior physical damage to the equipment. Include this form in the shipping container with each unit. Your telephone number and contact name are important as there are times when the technicians may have specific questions that need to be answered to completely identify and repair a problem.

When returning equipment for repair, it is also recommended that you use a PO number or some other reference number on your paperwork in case you need to call the repair lab about your unit. These numbers are referenced on the repair order and make it easier and faster to locate your unit in the lab.

Return Authorization (RA) numbers are not necessary unless you have been given one by the Field Service Department. RA numbers are required for exchange units or if the Field Service Department wants to be aware of a specific problem. If you have been given an RA number, reference this number on the Factory Repair Request Form sent with the unit. The repair lab will then contact the Field Service Department when the unit arrives. For additional information on factory service, the Depot Service Department can be contacted at the following e-mail address:

depotrepair@efji.com

10.5   Replacement Parts

Replacement parts can be ordered directly from the Service Parts Department. To order parts by phone, dial the toll-free number as described in Section 10.3. When ordering, please supply the part number and quantity of each part ordered. EFJohnson Technologies dealers also need to give their account number. If there is uncertainty about the part number, include the designator (C512, for example) and the model number of the equipment the part is from.

You may also send your order by mail or fax. The mailing address is as follows and the fax number is shown in Section 10.2.

Service Parts Department
EFJohnson Technologies
1440 Corporate Drive
Irving, TX 75038-2401

10.6   Internet Home Page

EFJohnson Technologies has a site on the World Wide Web that can be accessed for information on the company about such things as products, systems, and regulations. The address is

http://www.EFJohnsonTechnologies.com

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