KENWOOD

VIKING®

VP5000/VP6000/VP8000 Portable Radio Operating Manual

002-VPX000-100 Rev 11
December 2023

This revision covers Viking Firmware Version 8.40.x and earlier.

Information in this manual is subject to change without notice.

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Table of Contents

List of Figures

List of Figures (continued)

List of Tables

List of Tables (continued)

Table	Page

Safety and Regulatory Requirements

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

Before using your portable 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.

- https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety
- 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 portable 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 product label directing users to specific user awareness information. Your VIKING two-way radio has a RF exposure product label. Also, your VIKING 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 VIKING two-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) for human exposure to radio frequency electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at operating duty factors of up to 50% transmitting and is authorized by the FCC for occupational use only. In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

Note *The approved batteries supplied with this radio are rated for a 5-5-90 duty factor (5% talk-5% listen - 90% standby), even though this radio complies with the FCC occupational RF exposure limits and may operate at duty factors of up to 50% talk.*

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

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR §§ 1.1307, 1.1310, 2.1091 and 2.1093
- 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 your exposure and ensure compliance with the occupational/controlled environment exposure limits, always adhere to the following procedures:

Guidelines

- Do not remove the RF Exposure Label from the device.
- User awareness instructions should accompany the device when it is transferred to other users.
- Do not use this device if the operational requirements described herein are not met.

Operating 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).
- Hold the radio in a vertical position in front of face with the microphone (and the other parts of the radio, including the antenna) at least one inch (2.5 cm) away from the nose. Keeping the radio at the proper distance is important because RF exposures decrease with distance from the antenna. The antenna should be kept away from eyes.
- When worn on the body, always place the radio in an EFJohnson-approved clip, holder, holster, case, or body harness for this product. Using approved body-worn accessories is important because the use of non-approved accessories may result in exposure levels which exceed the FCC's occupational/controlled environment RF exposure limits.
- If you are not using a body-worn accessory and are not using the radio in the intended use position in front of the face, then ensure the antenna and the radio are kept at least one inch (2.5 cm) from the body when transmitting. Keeping the radio at the proper distance is important because RF exposures decrease with increasing distance from the antenna.
- Use only EFJohnson-approved supplied or replacement antennas, batteries, and accessories. Use of non-approved antennas, batteries, and accessories may exceed the FCC RF exposure guidelines.
- For a list of EFJohnson-approved accessories, see the service manual or marketing accessory lists or contact E.F. Johnson Company.

Contact Information

Toll-Free: 1-800-328-3911
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:

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

Battery Disposal

Dispose of the Lithium-Ion (Li-Ion) battery used by this radio in accordance with local regulations. Do NOT dispose of it in fire because it can explode. Also, do not short the terminals because it may become very hot.

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

Warnings

⚠ WARNING

Turn the transceiver power off in the following locations:

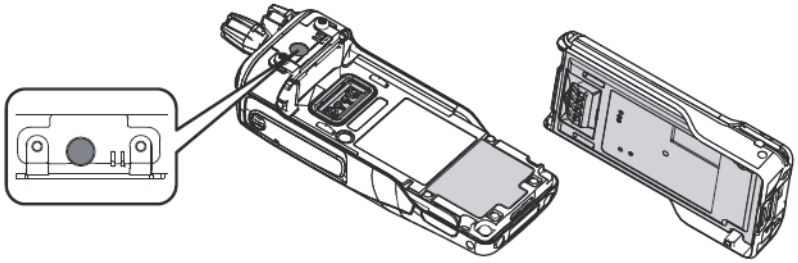
- Near explosives or blasting sites.
- In aircraft. (Any use of the transceiver must follow the instructions and regulations provided by the airline crew.)
- Where restrictions or warnings are posted regarding the use of radio devices, including but not limited to medical facilities.
- Near persons wearing pacemakers.

Turn the transceiver power off in the following locations, unless the model is specifically qualified Intrinsically Safe:

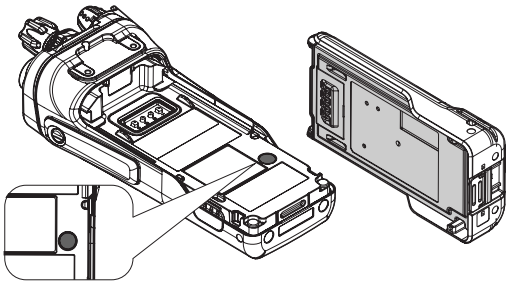
- In explosive atmospheres (inflammable gas, dust particles, metallic powders, grain powders, etc.).
- While taking on fuel or while parked at gasoline service stations.

⚠ WARNING

Do not remove the black sheet from the reverse side of the transceiver. (Refer to the following illustration.) Removal of this sheet decreases the waterproof efficiency of the transceiver and may cause malfunctions if water seeps into the transceiver.



VP5000



VP6000

The orange seal on the reverse side of the transceiver is important with respect to the waterproof efficiency of the transceiver. Do not place stickers or other materials on or around the seal shown in the figure, or on the reverse side of the battery pack. Doing so will impair the waterproof efficiency of the transceiver and may cause it to break down. Additionally, in order to prevent damage to the seal, do not allow it to come in contact with foreign materials.

Cautions

⚠ CAUTION
Do not charge the transceiver and battery pack when they are wet.
Ensure that there are no metallic items located between the transceiver and the battery pack.
Do not use options not specified by EFJohnson.
If the die-cast chassis or other transceiver part is damaged, do not touch the damaged parts.
If a headset or headphone is connected to the transceiver, reduce the transceiver volume. Pay attention to the volume level when turning the squelch off.
Do not place the microphone cable around your neck while near machinery that may catch the cable.
Do not place the transceiver on unstable surfaces.
Ensure that the end of the antenna does not touch your eyes.
When the transceiver is used for transmission for many hours, the radiator and chassis will become hot. Do not touch these locations when replacing the battery pack.
When water gets into the microphone opening or the speaker grill, the voice level may become incoherent or distorted. Lightly shake the transceiver to remove the water from the speaker and/or microphone before operating the transceiver.
Always switch the transceiver power off before installing optional accessories.
Do not disassemble or modify the transceiver for any reason.
Do not place the transceiver on or near airbag equipment while the vehicle is running. When the airbag inflates, the transceiver may be ejected and strike the driver or passengers.
Do not transmit while touching the antenna terminal or if any metallic parts are exposed from the antenna covering. Transmitting at such a time may result in a high-frequency burn.
If an abnormal odor or smoke is detected coming from the transceiver, switch the transceiver power off immediately, remove the battery pack from the transceiver, and contact your KENWOOD dealer.
Use of the transceiver while you are driving may be against traffic laws. Please check and observe the vehicle regulations in your area.
Do not expose the transceiver to extremely hot or cold conditions.
Do not carry the battery pack (or battery case) with metal objects, as they may short the battery terminals.
Danger of explosion if the battery is incorrectly replaced. Replace only with the same type battery.
When attaching a commercial strap to the transceiver, ensure that the strap is durable. In addition, do not swing the transceiver around by the strap; you may inadvertently strike and injure another person with the transceiver.

⚠ CAUTION

If you use a commercially available neck strap, take care not to let the strap get caught on nearby machine.

When operating the transceiver in areas where the air is dry, it is easy to build up an electric charge (static electricity).

When using an earphone accessory in such conditions, it is possible for the transceiver to send an electric shock through the earphone and to your ear. We recommend you use only a speaker/microphone in these conditions, to avoid electric shocks.

Information Concerning the Battery Pack

The battery pack includes flammable objects such as organic solvent. Mishandling may cause the battery to rupture producing flames or extreme heat, deteriorate, or cause other forms of damage to the battery. Please observe the following precautions.

⚠ DANGER

Do not disassemble or reconstruct the battery

The battery pack has a safety function and protection circuit to avoid danger. If they suffer serious damage, the battery may generate heat or smoke, rupture, or burst into flame.

Do not short-circuit the battery

Do not join the + and – terminals using any form of metal (such as a paper clip or wire). Do not carry or store the battery pack in containers holding metal objects (such as wires, chain- necklace or hairpins). If the battery pack is short-circuited, excessive current will flow and the battery may generate heat or smoke, rupture, or burst into flame. It will also cause metal objects to heat up.

Do not incinerate or apply heat to the battery

If the insulator is melted, the gas release vent or safety function is damaged, or the electrolyte is ignited, the battery may generate heat or smoke, rupture, or burst into flame.

Do not leave the battery near fires, stoves, or other heat generators [areas reaching over 176°F (80°C)]

If the polymer separator is melted due to high temperature, an internal short-circuit may occur in the individual cells and the battery may generate heat or smoke, rupture, or burst into flame.

⚠ DANGER

Avoid immersing the battery in water or getting it wet by other means

If the battery becomes wet, wipe it off with a dry towel before use. If the battery's protection circuit is damaged, the battery may charge at extreme current (or voltage) and an abnormal chemical reaction may occur. The battery may generate heat or smoke, rupture, or burst into flame.

Do not charge the battery near fires or under direct sunlight

If the battery's protection circuit is damaged, the battery may charge at extreme current (or voltage) and an abnormal chemical reaction may occur. The battery may generate heat or smoke, rupture, or burst into flame.

Use only the specified charger and observe charging requirements

If the battery is charged in unspecified conditions (under high temperature over the regulated value, excessive high voltage or current over regulated value, or with a remodeled charger), it may overcharge or an abnormal chemical reaction may occur. The battery may generate heat or smoke, rupture, or burst into flame.

Do not pierce the battery with any object, strike it with an instrument, or step on it

This may break or deform the battery, causing a short-circuit. The battery may generate heat or smoke, rupture, or burst into flame.

Do not jar or throw the battery

An impact may cause the battery to leak, generate heat or smoke, rupture, and/or burst into flame. If the battery's protection circuit is damaged, the battery may charge at an abnormal current (or voltage), and an abnormal chemical reaction may occur.

Do not use the battery pack if it is damaged in any way

The battery may generate heat or smoke, rupture, or burst into flame.

Do not solder directly onto the battery

If the insulator is melted or the gas release vent or safety function is damaged, the battery may generate heat or smoke, rupture, or burst into flame.

Do not reverse the battery polarity (or terminals)

When charging a reversed battery, an abnormal chemical reaction may occur. In some cases, an unexpected large amount of current may flow upon discharging. The battery may generate heat or smoke, rupture, or burst into flame.

⚠ DANGER

Do not reverse-charge or reverse-connect the battery

The battery pack has positive and negative poles. If the battery pack does not smoothly connect with a charger or operating equipment, do not force it; check the polarity of the battery. If the battery pack is reverse-connected to the charger, it will be reverse-charged and an abnormal chemical reaction may occur. The battery may generate heat or smoke, rupture, or burst into flame.

Do not touch a ruptured or leaking battery

If the electrolyte liquid from the battery gets into your eyes, wash your eyes out with fresh water as soon as possible, without rubbing your eyes. Go to the hospital immediately. If left untreated, it may cause eye-problems.

Do not charge the battery for longer than the specified time

If the battery pack has not finished charging even after the regulated time has passed, stop it. The battery may generate heat or smoke, rupture, or burst into flame.

Do not place the battery pack into a microwave or high pressure container

The battery may generate heat or smoke, rupture, or burst into flame.

Keep ruptured and leaking battery packs away from fire

If the battery pack is leaking (or the battery emits a bad odor), immediately remove it from flammable areas. Electrolyte leaking from battery can easily catch on fire and may cause the battery to generate smoke or burst into flame.

Do not use an abnormal battery

If the battery pack emits a bad odor, appears to have color changes, is deformed, or seems abnormal for any other reason, remove it from the charger or operating equipment and do not use it. The battery may generate heat or smoke, rupture, or burst into flame.

Notification of Water-Resistant Model

This water-resistant model transceiver conforms to the following standards:

Immersion

The transceiver retains its water resistant capabilities outlined in U.S. Military Standards when submersed in water at a depth of 3.28 feet (1 meter) for 1 hour.

IP67/ IP68

The IP standard is the protection level specified by the international standard IEC 60529. The first numeral indicates the “dust-resistant level” and the second numeral indicates the “water-resistant” level.

Note *Initial water-resistant tests and procedures are performed on products upon being ordered from KENWOOD*

⚠ CAUTION
The applicable standards listed above do not assure that the transceiver can be used in water. The transceiver may be damaged in a situation in which the maximum depth is over 1 meter or the maximum submersion time exceeds 2 hours.
Observe the following precautions to maintain the transceiver’s water-resistant performance: • Do not drop or apply strong physical shocks to the transceiver. • Do not disassemble or attempt to modify the transceiver. (If it is disassembled or modified, its performance is not guaranteed.) • Do not soak the transceiver in water that contains a solvent or surfactant, such as detergent or alcohol.
If it is soaked in muddy water or salt water (including sea water), it may become corroded. Immediately flush with fresh water and then wipe dry with a soft cloth.
If water is splashed onto the microphone, the battery, or the antenna terminal, clean and dry them with a soft cloth before reconnecting to the transceiver.
Use of any option on the transceiver not specified by EFJohnson may reduce or void the water resistant and dust resistant performance.

SECTION

1

Introduction

This manual is the main user document for information on Viking® VP5000, VP6000, and VP8000 portable radios. It contains the following sections:

- Features
- Controls, Display, and Basic Operation
- Radio-Wide Features
- Conventional Mode Features
- P25 / Viking16 Features
- DMR Conventional Mode Features
- Messages
- Secure Communication (Encryption)
- Data Features
- Obtaining Technical Support

SECTION

2

Features

This manual describes Viking® VP5000/VP6000/VP8000 portable radios. The availability of many of the following features is controlled by the model of your radio, installed options, firmware version, and field programming.

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

This section contains information on the following topics:

2.1 General Features

The VP5000 portable radios are available in the following models (Figure 2.1):

- **Standard Key Model** - Front display, option and navigation buttons
- **Full Key Model** - Full feature model with DTMF number keypads

Figure 2.1 VP5000 Available Models

Standard Key Model Full Key Model

The VP6000 portable radios are available in the following models (Figure 2.2):

- **Standard Key Model** - Front display, option and navigation buttons
- **Full Key Model** - Full feature model with DTMF number keypads

Figure 2.2 VP6000 Available Models

Standard Key Model

Full Key Model

The VP8000 portable radios are available in the following models (Figure 2.3):

- **Standard Key Model** - Front display, option and navigation buttons
- **Full Key Model** - Full feature model with DTMF number keypads

Figure 2.3 VP8000 Available Models

Standard Key Model Full Key Model

Depending on the specific model (and options), the VP5000/VP6000/VP8000 radios operate in the following frequency bands:

- VHF (136 to 174 MHz)
- UHF (380 to 470 MHz)
- UHF 380 Extended Frequency Range (380 to 477.4250 MHz)
- UHF (450 to 520 MHz)
- 700/800 (763 to 870 MHz)

Note *For radios using Firmware Version 8.34.x or later, the UHF-380 Extended Frequency Range option allows the Armada Administrator to program channel transmit and receive frequencies up to 477.4250 MHz in conventional UHF-380 systems. The radio must be optioned to enable the UHF-380 Extended Frequency range.*

The following operating modes are programmable:

- Conventional analog
- Conventional Project 25 (digital)
- Trunked Project 25 digital Phase 1 (FDMA) and Phase 2 (TDMA)
- Viking16 trunked (analog or digital)
- DMR Conventional (VP8000 only)

The VP5000/VP6000/VP8000 portable radios have the following features:

- 255 zones with 255 channels are supported. A maximum of 4096 channels total, depending on the option selected, may be enabled.
- Large graphic display with backlight and programmable backlight on receive timer
- 16-position channel select switch. Additional channels can be accessed (if programmed) by removing the switch stop ring, which allows the switch to rotate freely.
- Option switches
  - The VP5000 has a 2-position (A/B) option switch.
  - The VP6000 and VP8000 have a 2-position (○/●) option switch. They also have an additional 4-position (A/B/C/D) option switch.
- Up to 11 programmable option keys/buttons with the Standard Key Model or 23 programmable option keys/buttons with the Full Key Model (DTMF keypad)
- Each option key/button programmable with a different function for each operating mode (Conventional, Trunked P25, Viking16)
- Menu mode
- Encryption
  - AES 256-bit FIPS 140-2 approved encryption available on P25/digital channels. AES 256-bit FIPS 140-3 encryption is pending approval for the VP8000.
  - DES-OFB available on P25/digital channels (Refer to Section 9.)
  - ARC4 Encryption, an encryption method that uses keys (up to 126 for VP5000/VP6000 radios and up to 252 for VP8000 radios) stored in the codeplug. It is compatible with Motorola ADP encryption. Available on P25 and digital channels.
- Emergency calls for high priority system access
- Priority (standard) and Radio Wide scan modes with user programmable scan lists
- User selectable high and low power output
- Surveillance mode
- Time-out timer

- Keypad lock to prevent accidental key presses
- Power up password to prevent unauthorized use
- Programmable and user adjustable tone volume
- Programmable minimum volume level
- Soft power down to prevent accidental power off
- Operates on both wide and narrow band channels
- Over the Air Programming (OTAP) option enables you to program radios without connecting them to a computer for P25 trunking and Conventional P25 only
- Easy radio programming and feature updating for portable radios
- Auto Unmute
- Speaker Microphone Disconnect Alarm
- Visual and Audible low battery alerts and low battery health alerts
- User programmable Channel, Zone, and radio event Voice Announcements
- Fire Ground Mode
- Automatic Volume Control (FDMA only)
- GPS Location Services
- Radio Authentication
- Analog Noise Reduction
- Enhanced Vehicular Repeater System
- Man Down Detection and Alerting
- Bluetooth

The VP8000 portable radios have the following unique features:

- Multi-Band operation with disable options for VHF, UHF, 700/800 MHz
- Large full-color Top Display with programmable display modes
- Enhanced storage with internal memory
- Wi-Fi 2.4 & 5 GHz (802.11a/b/g/n/ac) and configurable Wi-Fi Country Codes
- Over the Internet Programming (OTIP) option enables you to program radios over Wi-Fi.
- Active Noise Reduction
- Customizable boot image for the front display
- Enhanced internal speaker with higher audio output level

- Strong Signal Intermodulation Rejection
- High Speed USB programming cable

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

2.1.1 Conventional Features

- Up to 4096 channels, talkgroups or Unit IDs programmable
- Repeater talk-around
- Carrier or Call Guard® (CTCSS/DCS) controlled squelch on analog channels, NAC and talkgroup IDs on P25 channels
- Normal/selective squelch selectable by option button or menu
- Monitor mode selectable by option button or menu
- Time out timer, penalty and conversation timers
- Dual priority channel sampling when scanning (analog and digital channels)
- Busy channel lockout (transmit disable on busy)
- Unit calls on P25 channels
- Telephone calls on P25 channels with over dialing
- Emergency alarms and calls to alert a dispatcher of an emergency condition
- Single tone encoder controllable by user on analog channels
- Five tone encoder on analog channels
- Automatic Number Identification (ANI) on analog channels
- MDC1200 ANI and Emergency Alarm support
- GE Star Transmissions
- Two Tone Encoder paging on Conventional analog channels
- Two Tone Decode on Conventional analog channels
- P25 Two Tone Encoder paging on Conventional digital channels
- P25 Two Tone Decode on Conventional digital channels
- Call Alert™ on P25 channels (send and receive pages)
- Predefined messages (up to 255) can be sent to a dispatcher (P25 mode)
- Predefined status conditions (up to 255) can be sent to a dispatcher (P25 mode)

- Over-the-Air-Rekeying (OTAR) compatible (P25 channels)
- Text message send and receive (Project 25 digital)
- Single Touch

2.1.2 Project 25 Trunked Features

The following P25 Trunked features are available:

- Up to 4096 talkgroups or Unit IDs programmable (channels select talkgroups)
- Group and Unit Calls
- Telephone calls with over dialing
- Emergency alarms to alert a dispatcher of emergency conditions
- Emergency calls for high priority system access
- Failsoft operation on a predefined conventional channel if trunked system fails
- Priority group calls detected while listening to other group calls when scanning
- Call Alert™ (send and receive pages)
- Predefined status conditions (up to 255) can be sent to a dispatcher and between Units
- Dynamic regrouping (dispatcher can automatically gather users on a channel to receive a message)
- Roaming and Inter-System roaming
- Single Touch
- P25 Messaging to the console and from Unit to Unit
- Emergency Alarm Receive
- Over-the-Air-Rekeying (OTAR) compatible
- P25 Radio Unit Monitor
- P25 Two Tone Encoder paging
- P25 Two Tone Decode

2.1.3 Viking16 Features

The following Viking16 features are available:

- Up to 4096 talkgroups or Unit IDs programmable (channels select talkgroups)
- Group, Enhanced Unit, Standard Unit, and Telephone calls
- Emergency alarms to alert a dispatcher of emergency conditions
- Emergency calls for high priority system access
- Failsoft operation on a predefined conventional channel if trunked system fails
- Priority group calls detected while listening to other group calls when scanning
- Call Alert™ (send and receive pages)
- Predefined messages (up to 255) can be sent to a dispatcher
- Predefined status conditions (up to 255) can be sent to a dispatcher
- Dynamic regrouping (dispatcher can automatically gather users on a channel to receive a message)
- Roaming (V16 Multi Site only)
- Single Touch
- Emergency Alarm Receive

2.1.4 DMR Conventional Features

- Up to 4096 channels, talkgroups or Unit IDs programmable
- Repeater talk-around
- Carrier or Call Guard® (CTCSS/DCS) controlled squelch on analog channels, Color Codes and Contact IDs on DMR conventional channels
- Normal/selective squelch selectable by option button or menu
- Monitor mode selectable by option button or menu
- Time out timer, penalty and conversation timers
- Dual priority channel sampling when scanning (analog and digital channels)
- Busy channel lockout (transmit disable on busy)
- Unit calls on DMR channels
- Emergency alarms and calls to alert a dispatcher of an emergency condition
- Single tone encoder controllable by user on analog channels

- Five tone encoder on analog channels
- Automatic Number Identification (ANI) on analog channels
- MDC1200 ANI and Emergency Alarm support
- GE Star Transmissions
- Two Tone Encoder paging on Conventional analog channels
- Two Tone Decode on Conventional analog channels
- Call Alert™ on DMR channels (send and receive pages)
- Predefined messages (up to 255) can be sent to a dispatcher (DMR mode)
- Predefined status conditions (up to 255) can be sent to a dispatcher (DMR mode)
- Single Touch

2.2 Available Options

This manual describes the operation of all features that are available for the VP5000/VP6000/VP8000 radio. However, many of these features are optional and therefore may not be available in your radio. For example, Project 25 trunked operation is optional and may not be available. Full Key Model radios have the DTMF keypad, but the Standard Key Model radios do not have this feature.

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 features controlled by factory programming are as follows:

P25 Options
- P25 conventional mobile data
- P25 trunking mobile data
- P25 Digital conventional
- P25 Trunking
- P25 Phase 2
- P25 Authentication

V16 Options
- V16 Single Site Trunking
- V16 Multi Site Trunking
- Digital Viking16 Trunking
- V16 800 MHz Rebanding Transition
- V16 Star Roaming

DMR Option
- DMR Conventional

Encryption Options
- P25 DES OFB
- P25 AES OFB
- OTAR P25 conventional
- OTAR P25 trunking
- ARC4 Encryption
- SCM Required (VP5000/VP6000 Only)
- KCM Optional (VP8000 Only)

Feature Options
- Keypad programming (Federal Government users only)
- FIRESafe Commander
- FIRESafe First Responder
- MDC 1200/GE Star
- P25 Conventional and Trunking OTAP
- OTIP (VP8000 only)
- Internal GPS
- Third Party Interface
- Automatic Volume Control
- Audio Recording
- Instant Recording Replay
- Enhanced VRS - Portable
- Bluetooth
- P25 Two Tone
- Man Down
- Bluetooth Low Energy
- Custom TX Power Levels
- Industry Canada Power
- Radio-to-Radio Cloning
- Text Messaging
- Wi-Fi (VP8000 only)
- Broadband Data Services and VPN (VP8000 only)

Channel Options
- 1024, 1536, 2048, or 4096 channels/talkgroups

Band
- -European Standard Tuning
- -UHF 380 Extended Frequency Range
- -Viking16 800 Bandplan Disable
- -Viking16 800 rebanded Bandplan Disable

Feature Disable Options
- Multi-Key Disable
- Wideband Disable

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 can 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 EF Johnson 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”.

SECTION

3

Controls, Display, and Basic Operation

This section provides information about controls for the front and side panels of the VP5000/VP6000/VP8000 portable radio. Also included is information about the display and applicable icons, plus information for the tones used with the radio.

This section contains information on the following topics:

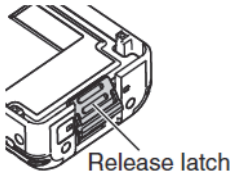
3.1 Preparation

This section contains information on the following topics:

3.1.1 Installing/Removing the Battery Pack

⚠ CAUTION
Do not short the battery terminals or dispose of the battery by fire.
Never attempt to remove the casing from the battery pack.
Do not use options not specified by EFJohnson.
If the die-cast chassis or other transceiver part is damaged, do not touch the damaged parts.
Install the battery pack after cleaning the battery pack contacts and the transceiver terminals.
Before charging a battery pack that is attached to the transceiver, ensure that the safety catch is firmly closed.
If the release latch is tilted and the battery pack is not attached to the transceiver, return the release latch to its original position using your finger, as shown in Figure 3.1.

Figure 3.1 Release Latch Location



1 Match the guides of the battery pack with the corresponding grooves on the upper rear of the transceiver, then firmly press the battery pack to lock it in place.

2 Lock the safety catch to prevent accidentally pressing the release latch and removing the battery pack.

3 To remove the battery pack, lift the safety catch, press the release latch, then pull the battery pack away from the transceiver. Figure 3.2 shows how to do this for a VP5000. Figure 3.3 shows how to do this for a VP6000.

Figure 3.2 Removing VP5000 Battery Pack

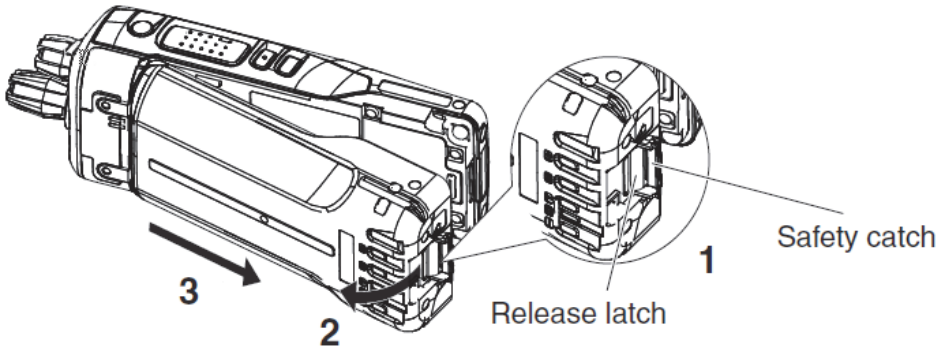
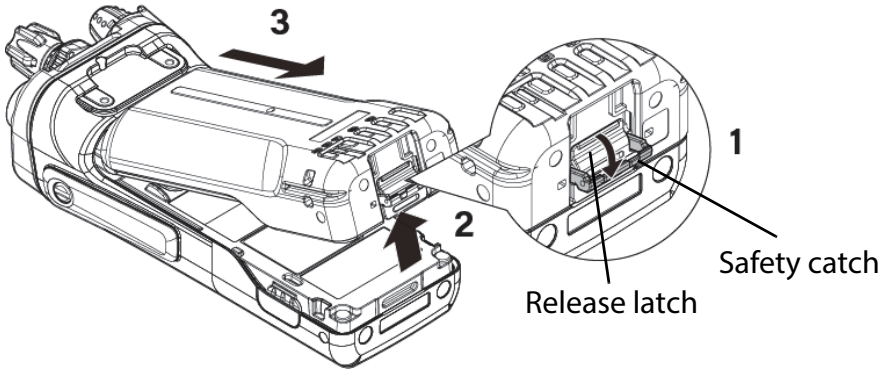


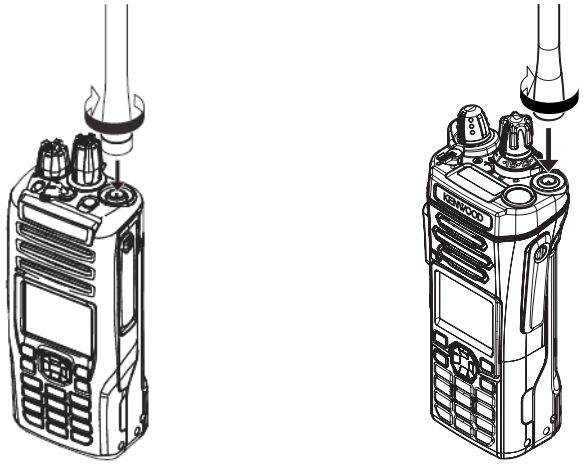
Figure 3.3 Removing VP6000 Battery Pack



3.1.2 Installing the Antenna

Screw the antenna into the connector on the top of the transceiver by holding the antenna at its base and turning it clockwise until secure, as shown in Figure 3.4.

Figure 3.4 Installing the Antenna



VP5000 VP6000

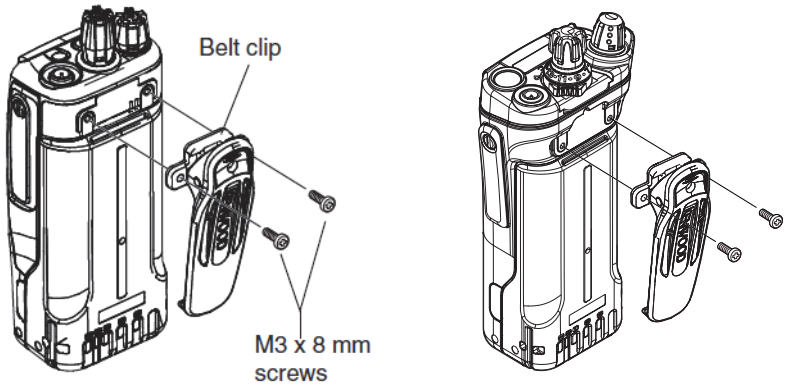
3.1.3 Installing the Belt Clip

If necessary, attach the belt clip using the two supplied M3 x 8 mm binding screws, as shown in Figure 3.5.

Note *If the belt clip is not installed, its mounting location may get hot during continuous transmission or when left sitting in a hot environment.*

CAUTION *Do not use glue which is designed to prevent screw loosening when installing the belt clip, because it may cause damage to the transceiver. Acrylic ester, which these glues contain, may crack the transceiver's back panel.*

Figure 3.5 Installing Belt Clip



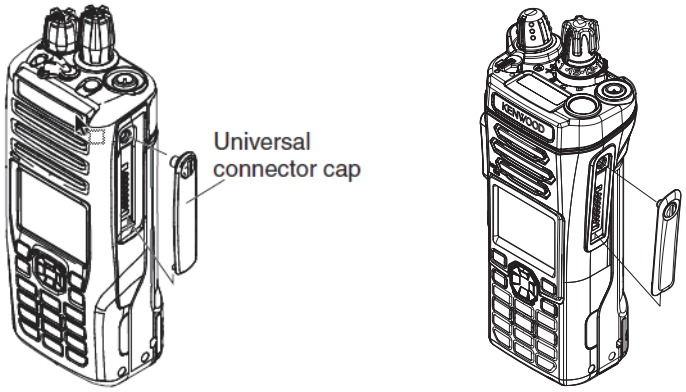
VP5000 VP6000

3.1.4 Installing the Cap over the Universal Connector

If you are not using an optional speaker microphone or headset, install the cap over the universal connector as shown in Figure 3.6.

Secure the cap in place using the dressing screw.

Figure 3.6 Installing Cap over Universal Connector



VP5000 VP6000

3.1.5 Installing the Speaker Microphone or Headset

1 Insert the guide of the speaker/ microphone or headset connector into the groove of the universal connector. Figure 3.7 shows how to do this for a VP5000. Figure 3.8 shows how to do this for a VP6000.

2 Secure the connector in place using the attached screw.

Note *When not using an optional speaker/ microphone or headset, install the cap over the universal connector.*

Figure 3.7 Installing the VP5000 Speaker Microphone

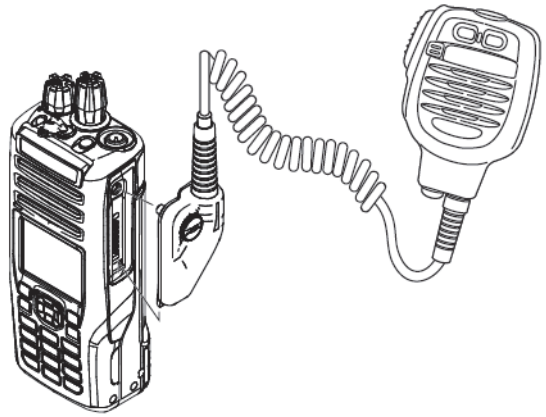
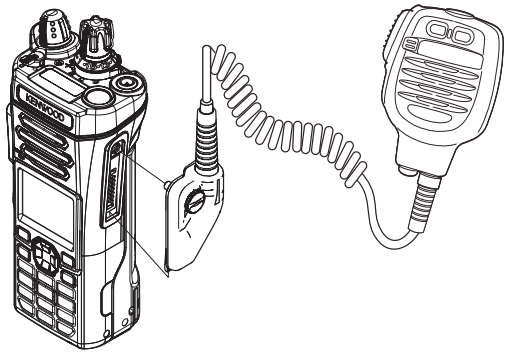


Figure 3.8 Installing the VP6000 Speaker Microphone



3.1.6 Installing the microSD Memory Card

Tip *You will probably not need to perform this procedure, because EFJohnson ships VP5000/VP6000 radios with the microSD memory card already installed [8GB Industrial microSDHC, UHS-I Class 10 (MLC NAND Flash)]. If you need to perform this procedure, contact EFJohnson (Section 11.1) for information on obtaining the correct card.*

Note *The VP8000 uses internal memory instead of a removable microSD memory card. No radio user interaction is required.*

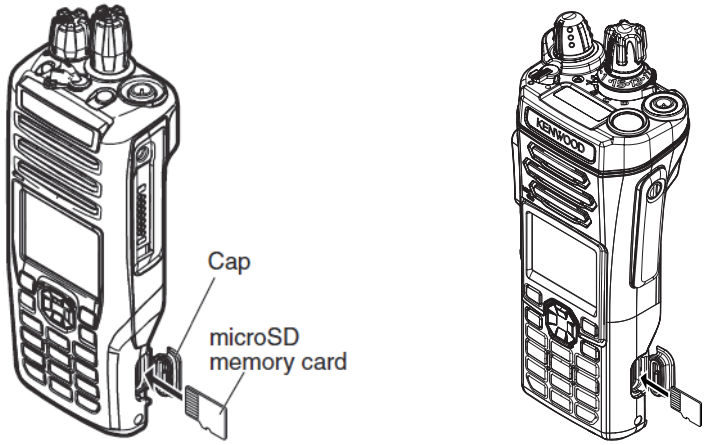
⚠ CAUTION *EFJohnson Technologies, Inc., does not accept liability in respect of the data stored on your microSD memory card, failure to save the data properly, loss of data, and any direct or indirect damages.*

1. Remove the battery pack.
2. Open the cap, as shown in Figure 3.9.
3. Insert the microSD memory card.
4. Insert the microSD memory card with its terminal side facing the same side as the front of the transceiver.
5. Insert the microSD memory card until it clicks into place.

6 To remove the microSD memory card, push the card inwards once, then pull it out straight.

Note
microSD memory cards (Class 2 or higher) and microSDHC memory cards (Class 2 or higher) can be used.
SDXC memory cards cannot be used.
This transceiver is not guaranteed to operate with all microSD memory cards. (Operations are confirmed on memory cards for the following brands: SanDisk, TOSHIBA and Panasonic.)
Use the microSD memory card within the allowable operating temperature.
Do not remove the microSD memory card or turn off this transceiver while the microSD memory card is being accessed.
The waterproof performance is not guaranteed if the microSD memory card slot cap is not fit into place.
Make sure your hands are clean before opening the microSD memory card slot cap.

Figure 3.9 Installing the microSD Memory Card



VP5000 VP6000

3.2 Controls and Indicators

Figure 3.10 shows the VP5000 controls and indicators, and Table 3.1 contains descriptions of them.

Figure 3.11 shows the VP6000 controls and indicators, and Table 3.2 contains descriptions of them.

Figure 3.12 shows the VP8000 controls and indicators, and Table 3.3 contains descriptions of them.

Figure 3.10 Locations of VP5000 Controls and Indicators

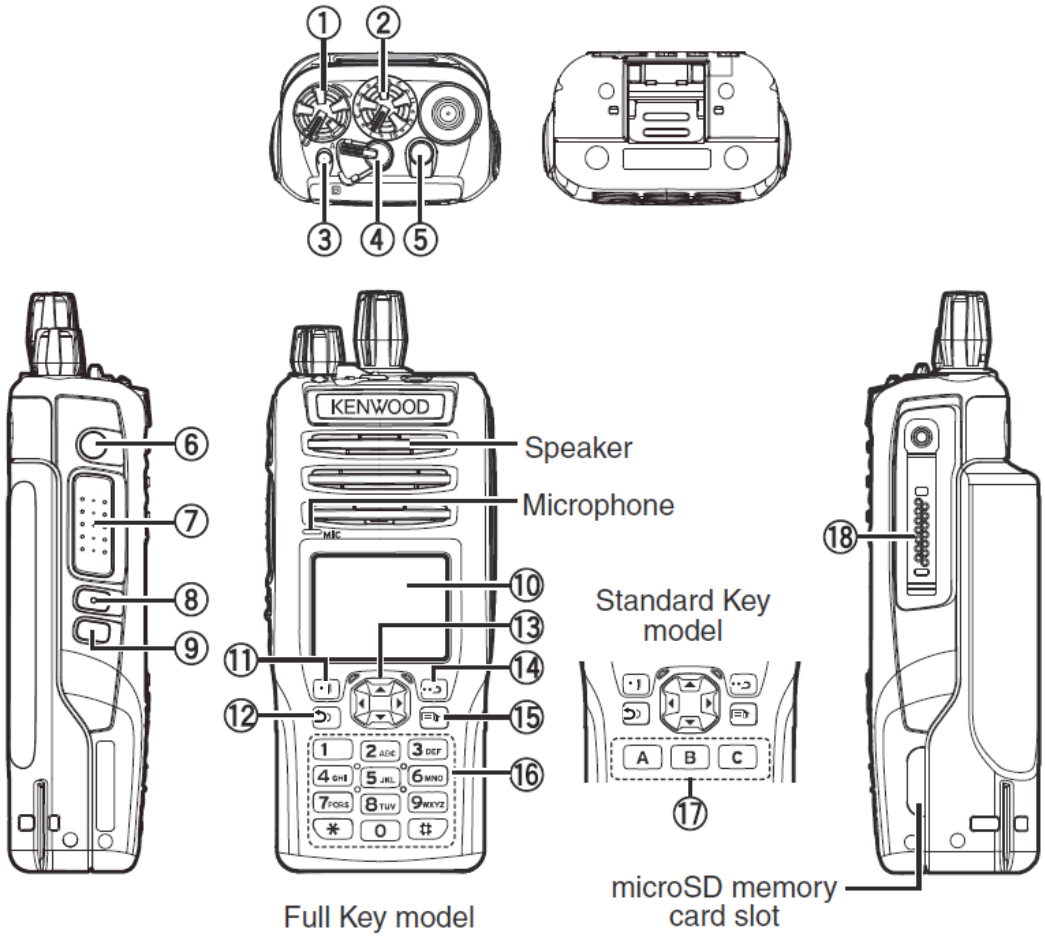


Table 3.1 Descriptions of VP5000 Controls and Indicators

Number	Description	Instructions
1	Power Switch / Volume Control	Turn clockwise to switch the transceiver ON. To switch the transceiver OFF, turn counterclockwise fully. Rotate to adjust the volume level. For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the Armada administrator can configure the radio so that any one of the following applies to the volume knob: • The volume knob gets enabled. • The volume knob gets disabled. • The volume knob gets disabled when an accessory is attached to the radio, then enabled when the accessory gets detached from the radio. In this case, when an accessory is removed, the radio switches to the volume level as set by the volume knob—even if the user changed the volume with buttons while the accessory was attached.
2	Selector Knob	Rotate this control to activate its programmable function. The default setting is Channel Select. For radios that use Firmware Version 8.26.x or later (programmed by Armada 1.26.x and later), this knob may perform in one of the following ways. For more information, ask your Armada administrator. **Default Mode:** Channel knob positions are always at the same position as marked on the knob (For example, Channel 1, Channel 17, etc.). **Free-Spinning Mode:** Channel knob positions don't matter as you turn the knob. The radio immediately wraps around from the last channel to the first channel. (If you use this mode, your radio administrator should remove the wrap-around stopper.) For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the Armada administrator can configure the radio so that the radio displays only programmed channels. **Soft Stop Mode:** There is no wrap-around. The radio sounds an error tone when attempting to move past the first/last channel in the zone.
3	Multi-Function Indicator	Refer to Table 3.4. **Note** *Your dealer can disable this indicator*
4	Lever Switch	Switch the toggle position to activate its programmable function. Switch to Position A or B to turn on the function programmed to it.

Table 3.1 Descriptions of VP5000 Controls and Indicators (Continued)

Number	Description	Instructions
5	Programmable (Orange) Key (Emergency)	Press to activate its programmable function.
6	Side 1 Key	Press to activate its programmable function.
7	Push-To-Talk (PTT) Switch	Press and hold, then speak into the microphone to speak.
8	Side 2 Key	Press to activate its programmable function.
9	Side 3 Key	Press to activate its programmable function.
10	LCD Display	Refer to Section 3.6.
11	Option Key	Selecting this key enables the user to do the operation defined in the tab above it in the soft button menu. (If you use VP5000 Legacy Keypad mode, this is a programmable key.)
12	Option Key	Performs a back or exit action if Menu is enabled and not in VP5000 Legacy Keypad mode. If Menu is not enabled, this is a programmable key. If VP5000 Legacy Keypad mode is enabled, this is a programmable key.
13	4-Way D-Pad	Press to activate its programmable function. ◀ : The default setting is Soft Buttons Left. ▶ : The default setting is Soft Buttons Right. ▲ : The default setting is Zone Up. ▼ : The default setting is Zone Down.
14	Option Key	This key enables the user to do the operation defined in the tab above it in the soft button menu if your radio does not use VP5000 Legacy Keypad mode (default setting). If your radio uses VP5000 Legacy Keypad mode, this is a programmable key.
15	Option Key	Menu (Defined function) when menu is enabled. Use this key to select/accept a selection in a feature. If Menu is not enabled, this is a programmable key. If VP5000 Legacy Keypad is enabled, this is a programmable key. **Note** *If your radio gets programmed by Armada Version 1.18.x or later, you can program any of your radio's button to the Menu function.*
16	Keypad (Full Key Model only)	Press the keys on the keypad to send DTMF tones. The keypad keys can also be programmed with secondary functions if a programmable function keys is programmed as Function.

Table 3.1 Descriptions of VP5000 Controls and Indicators (Continued)

Number	Description	Instructions
17	A / B/ C Key (Standard Key Model only)	Press to activate its programmable function.
18	Universal Connector	Connect the speaker/ microphone here. Otherwise, keep the supplied cap in place. Section 3.4 summarizes the signals at each terminal.

Figure 3.11 Locations of VP6000 Controls and Indicators

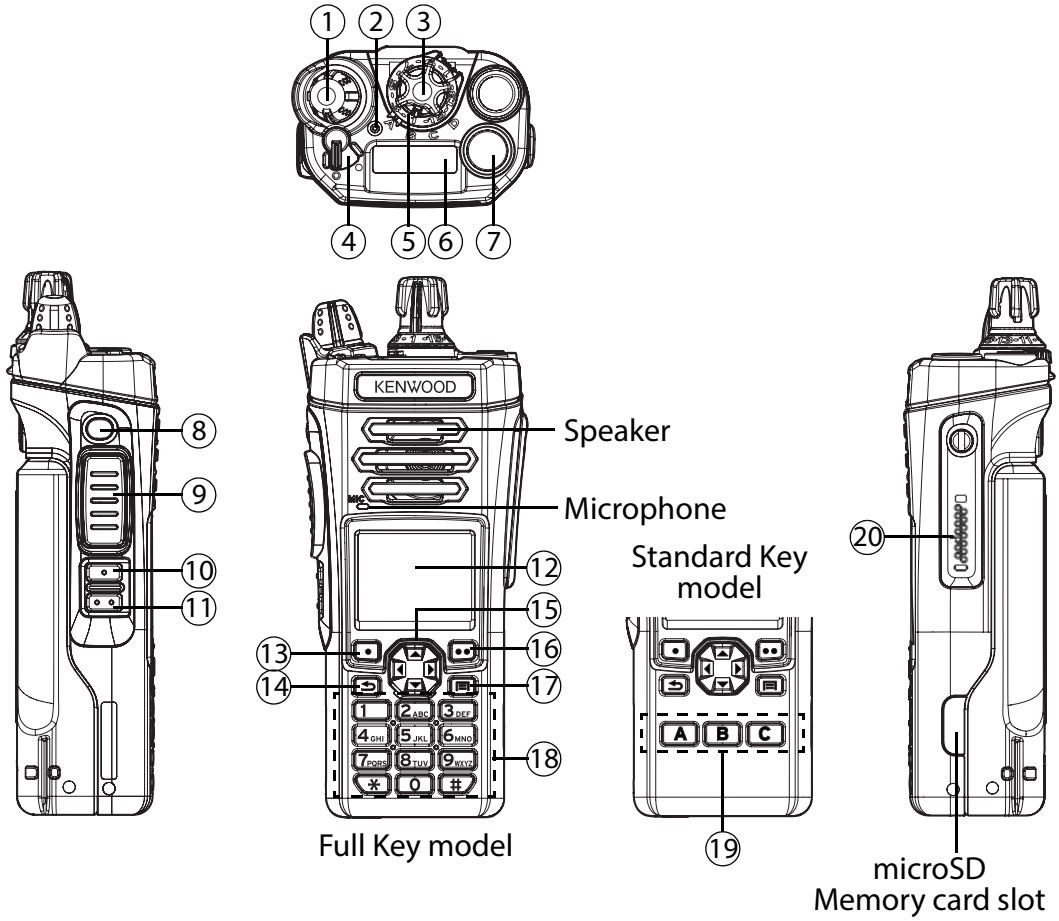


Table 3.2 Descriptions of VP6000 Controls and Indicators

Number	Description	Instructions
1	Power Switch / Volume Control	Turn clockwise to switch the transceiver ON. To switch the transceiver OFF, turn counterclockwise fully. Rotate to adjust the volume level. For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the Armada administrator can configure the radio so that any one of the following applies to the volume knob: • The volume knob gets enabled. • The volume knob gets disabled. • The volume knob gets disabled when an accessory is attached to the radio, then enabled when the accessory gets detached from the radio. In this case, when an accessory is removed, the radio switches to the volume level as set by the volume knob—even if the user changed the volume with buttons while the accessory was attached.
2	Multi-Function Indicator	Refer to Table 3.4. **Note** *Your dealer can disable this indicator*
3	Selector Knob	Rotate this control to activate its programmable function. The default setting is Channel Select. **Note** *The selector knob on the High Visibility (green) model is the larger "Fire Knob".* For radios that use Firmware Version 8.26.x or later (programmed by Armada 1.26.x and later), this knob may perform in one of the following ways. For more information, ask your Armada administrator. **Default Mode:** Channel knob positions are always at the same position as marked on the knob (For example, Channel 1, Channel 17, etc.). **Free-Spinning Mode:** Channel knob positions don't matter as you turn the knob. The radio immediately wraps around from the last channel to the first channel. (If you use this mode, your radio administrator should remove the wrap-around stopper.) For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the Armada administrator can configure the radio so that the radio displays only programmed channels. **Soft Stop Mode:** There is no wrap-around. The radio sounds an error tone when attempting to move past the first/last channel in the zone.

Table 3.2 Descriptions of VP6000 Controls and Indicators (Continued)

Number	Description	Instructions
4	Lever Switch	Switch the toggle position to activate its programmable function. Switch to Position O or ● to turn on the function programmed to it.
5	ABCD Toggle Switch	Switch the toggle position to go to the programmed zone if programmed for Custom Zone Select. Switch to Position A, B, C, or D to select the desired zone as programmed. **Note** *For radios using Firmware Version 8.30.x or later, individual functions can be programmed to each individual A, B, C, or D position.*
6	Top LCD Display	Armada can program this to display Channel, Zone, Signal Strength, Battery Strength, Time, and Date. If the radio backlight is on, Color Event Indication gets activated. This makes the display change color to indicate status changes (which corresponds to the radio's event messages). • Green: Good (For example, sending a status successfully) • Red: Alert (For example, pressing an unprogrammed button) • Orange: Emergency (For example, receiving an emergency call)
7	Programmable (Orange) Key (Emergency)	Press to activate its programmable function.
8	Side 1 Key	Press to activate its programmable function.
9	Push-To-Talk (PTT) Switch	Press and hold, then speak into the microphone to speak.
10	Side 2 Key	Press to activate its programmable function.
11	Side 3 Key	Press to activate its programmable function.
12	Front LCD Display	Refer to Section 3.6.
13	Option Key	Selecting this key enables the user to do the operation defined in the tab above it in the soft button menu.
14	Option Key	Performs a back or exit action if Menu is enabled. If Menu is not enabled, this is a programmable key.
15	4-Way D-Pad	Press to activate its programmable function. ◀ : The default setting is Soft Buttons Left. ▶ : The default setting is Soft Buttons Right. ▲ : The default setting is Zone Up. ▼ : The default setting is Zone Down.
16	Option Key	This is a programmable key.

Table 3.2 Descriptions of VP6000 Controls and Indicators (Continued)

Number	Description	Instructions
17	Option Key	Use this key to select/accept a selection in a feature. This is a programmable key. Its default function is Menu. **Note** *You can program any of your radio's button to the Menu function.*
18	Keypad (Full Key Model only)	Press the keys on the keypad to send DTMF tones. The keypad keys can also be programmed with secondary functions if a programmable function keys is programmed as Function.
19	A / B / C Key (Standard Key Model only)	Press to activate its programmable function.
20	Universal Connector	Connect the speaker/ microphone here. Otherwise, keep the supplied cap in place. Section 3.4 summarizes the signals at each terminal.

Figure 3.12 Locations of VP8000 Controls and Indicators

Table 3.3 Descriptions of VP8000 Controls and Indicators

Number	Description	Instructions
1	Power Switch / Volume Control	Turn clockwise to switch the transceiver ON. To switch the transceiver OFF, turn counterclockwise fully. Rotate to adjust the volume level. For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the Armada administrator can configure the radio so that any one of the following applies to the volume knob: • The volume knob gets enabled. • The volume knob gets disabled. • The volume knob gets disabled when an accessory is attached to the radio, then enabled when the accessory gets detached from the radio. In this case, when an accessory is removed, the radio switches to the volume level as set by the volume knob—even if the user changed the volume with buttons while the accessory was attached.
2	Multi-Function Indicator	Refer to Table 3.4. **Note** *Your dealer can disable this indicator*
3	Selector Knob	Rotate this control to activate its programmable function. The default setting is Channel Select. **Note** *The selector knob on the High Visibility (green) model is the larger "Fire Knob".* For radios that use Firmware Version 8.26.x or later (programmed by Armada 1.26.x and later), this knob may perform in one of the following ways. For more information, ask your Armada administrator. **Default Mode:** Channel knob positions are always at the same position as marked on the knob (For example, Channel 1, Channel 17, etc.). **Free-Spinning Mode:** Channel knob positions don't matter as you turn the knob. The radio immediately wraps around from the last channel to the first channel. (If you use this mode, your radio administrator should remove the wrap-around stopper.) For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the Armada administrator can configure the radio so that the radio displays only programmed channels. **Soft Stop Mode:** There is no wrap-around. The radio sounds an error tone when attempting to move past the first/last channel in the zone.

Table 3.3 Descriptions of VP8000 Controls and Indicators (Continued)

Number	Description	Instructions
4	Lever Switch	Switch the toggle position to activate its programmable function. Switch to Position O or ● to turn on the function programmed to it.
5	ABCD Toggle Switch	Switch the toggle position to go to the programmed zone if programmed for Custom Zone Select. Switch to Position A, B, C, or D to select the desired zone as programmed. **Note** *For radios using Firmware Version 8.30.x or later, individual functions can be programmed to each individual A, B, C, or D position.*
6	Top LCD Display	Armada can program this to display Channel, Zone, Signal Strength, Battery Strength, Time, and Date. The Top LCD Display mirrors the features that can be enabled on the Front LCD Display, including the status bar, portable icons, and messages.
7	Programmable (Orange) Key (Emergency)	Press to activate its programmable function.
8	Side 1 Key	Press to activate its programmable function.
9	Push-To-Talk (PTT) Switch	Press and hold, then speak into the microphone to speak.
10	Side 2 Key	Press to activate its programmable function.
11	Side 3 Key	Press to activate its programmable function.
12	Front LCD Display	Refer to Section 3.6.
13	Option Key	Selecting this key enables the user to do the operation defined in the tab above it in the soft button menu.
14	Option Key	Performs a back or exit action if Menu is enabled. If Menu is not enabled, this is a programmable key.
15	4-Way D-Pad	Press to activate its programmable function. ◀ : The default setting is Soft Buttons Left. ▶ : The default setting is Soft Buttons Right. ▲ : The default setting is Zone Up. ▼ : The default setting is Zone Down.
16	Option Key	This is a programmable key.
17	Option Key	Use this key to select/accept a selection in a feature. This is a programmable key. Its default function is Menu. **Note** *You can program any of your radio's button to the Menu function.*
18	Keypad (Full Key Model only)	Press the keys on the keypad to send DTMF tones. The keypad keys can also be programmed with secondary functions if a programmable function keys is programmed as Function.

Table 3.3 Descriptions of VP8000 Controls and Indicators (Continued)

Number	Description	Instructions
19	A / B / C Key (Standard Key Model only)	Press to activate its programmable function.
20	Universal Connector	Connect the speaker/ microphone here. Otherwise, keep the supplied cap in place. Section 3.4 summarizes the signals at each terminal.

Multi-Function Indicator - Indicates the following conditions:

Table 3.4 LED Indicators

LED Color	LED Duration	Description
Red	ON	Transmit: clear
Red	125 ms ON 125 ms OFF	Transmit: CLEAR with low battery Transmit: trunking system busy
Red	125 ms ON 125 ms OFF 125 ms ON 750 ms OFF	Receive: Secure Group
Red	750 ms ON 125 ms OFF	Receive: Secure individual call
Green	ON	Receive: clear conventional or trunking
Green	750 ms ON 125 ms OFF	Receive: clear individual call
Orange	Continuous until Self Test complete	Self Test state
Orange	ON	Transmit: Secure
Orange	125 ms ON 125 ms OFF	Transmit: SECURE with low battery
Orange	Blinking (1 to 16 times)	Startup Failure. See Table 8.2.

Note *This indicator is disabled if the Surveillance mode is programmed. (Refer to Section 4.13.)*

Certain failures encountered during radio startup are indicated by blinking of the Orange LED. The Type of failure is indicated by the number of times the LED blinks (1 to 16) as described in Table 8.2.

3.3 Basic Operations

This section contains information on the following topics:

3.3.1 Switching Power On/ Off

Turn the **Power** switch/ **Volume** control clockwise to switch the transceiver power ON.

Turn the **Power** switch/ **Volume** control counterclockwise to switch the transceiver power OFF.

3.3.2 Adjusting the Volume

Rotate the **Power** switch**/ Volume** control to adjust the volume.

3.3.3 Selecting a Zone and Channel

Zone and Channel selection buttons are configured by the radio's Armada configuration. By default, the Selector knob changes channels and the Up/Down buttons on the D-pad changes zones.

3.3.4 Transmitting

1 Select the desired zone and channel using the **Selector** knob and the **[Zone Up]**/ **[Zone Down]** or **[Channel Up]**/ **[Channel Down]** keys.

2 Press the **PTT** switch and speak into the microphone. Release the **PTT** switch to receive.

- The LED indicator lights red while transmitting and green while receiving a signal. This indicator can also be disabled by your dealer.
- For best sound quality at the receiving station, hold the microphone approximately 1.5 inches (3 cm to 4 cm) from your mouth.

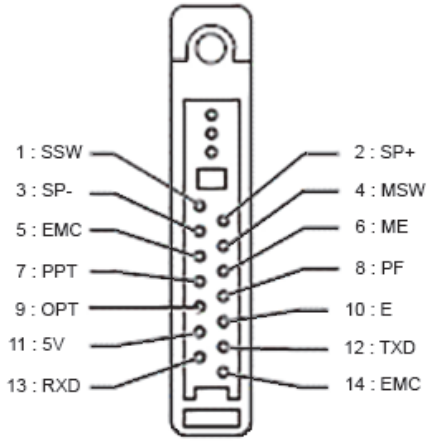
3.3.5 Receiving

Select the desired zone and channel. If signaling has been programmed on the selected channel, you will hear a call only if the received signal matches your transceiver settings.

3.4 Universal Connector Terminal Descriptions

Figure 3.13 shows the universal connector terminal pin numbers. Table 3.5 describes the signals at each terminal of the universal connector.

Figure 3.13 Universal Connector Terminal Pin Numbers



Tip *You can use a resin-based cover for the universal connector.*

Table 3.5 Universal Connector Terminal Descriptions

Pin Number	Name	Input or Output	Description	Specification
1	SSW	Input	External/Internal Speaker Switch Input	Hi: INT Low: EXT
2	SP+	Output	BTL Output + for External Speaker	Standard load 8 Ω
3	SP-	Output	BTL Output – for External Speaker	Standard load 8 Ω
4	MSW	Input	External/Internal MIC Switch Input	Hi: INT Low: EXT
5	EMC	Input	External MIC Input	Impedance: 1.8 kΩ
6	ME	–	External MIC GND	–
7	PTT	Input	External PTT Input	Low: PTT ON

Table 3.5 Universal Connector Terminal Descriptions

Pin Number	Name	Input or Output	Description	Specification
8	PF	Input	Programmable Function Key Input	Input voltage: 0 V - 3.3 V
9	OPT	Input / Output	Aux I/O Port (for EXT Option)	I: 0 V - 3.3 V O: Standard load 25 kΩ
10	E	–	GND	GND
11	5V	Output	5 V	5 V power supply output Max output current: 140 mA
12	TXD	Output	Serial Data Output	Baud rate: 115200 bps max
13	RXD	Input	Serial Data Input	Baud rate: 115200 bps max
14	EMC	Input	External MIC input	Impedance: 1.8 kΩ

3.5 Antenna Terminal Impedance

The antenna terminal impedance is 50 Ω.

3.6 Displays

This section contains information on the following topics:

- Front Display
- Top Display
- Portable Icons
- RSSI Threshold Indications
- Squelch Code on Status Bar

3.6.1 Front Display

The front display format depends on which features the user has enabled. The following can be programmed:

- Time
- Date
- Signal Strength
- Battery
- Volume
- Zone
- Channel
- Site
- TX Squelch Code
- RX Squelch Code

Note *Twelve characters can be programmed for zone and channel alias and will scroll across the display (16 characters if the Armada administrator programmed the radio using a template).*

Note *Radios are capable of displaying messages in English, French, or Spanish depending upon the language programmed for the radio.*

The front display provides 3 or 4 rows of 12 characters of text:

- The top row is a status bar.
- The second row contains icons.
- The third and fourth rows contain Zone, Channel, and event messages.
  - Radios using Firmware Version 8.34.x or later programmed by Armada 1.34.x and later:
    - If the operator changes zone, the channel appears in smaller text.
    - If the operator changes channel, the zone appears in smaller text.
- The bottom row shows the soft buttons programmed.

Note *By default, the boot image on the front display is the Viking head logo. For VP8000 radios, the Armada administrator can program a custom image to appear on boot.*

Figure 3.14 VP5000/VP6000/VP8000 Front Display

Front Display - Viking Night Theme

Front Display - Viking Night Theme
VP5000: Legacy Keypad Enabled (Soft Buttons Disabled)

3.6.2 Top Display

The VP6000/VP8000 radios feature a top display (Figure 3.15). The top display format depends on the information available on the front display. The following can be programmed:

- Time
- Date
- Signal Strength
- Battery
- Volume
- Zone
- Channel
- Site
- TX Squelch Code
- RX Squelch Code

The VP6000 top display provides 1 or 2 rows of 12 characters of text:

- The top row is a status bar.
- The bottom row cycles through messages from the front display using a single line of text based on priority.
    - If the radio is in menu mode, the channel appears.
    - If the operator changes zone, the zone appears.

The VP8000 top display provides 1 to 4 rows of 12 characters of text:

- The top row is a status bar.
- The second row contains icons.
- The bottom rows contain messages from the front display using single or dual lines of text based on priority.
    - If the operator changes zone, the zone appears on the first line and the channel appears on the second line in smaller text.
    - If the operator receives a message, the “Text Received” message appears on a single line in larger text.

Note *By default, the top display faces towards the front of the radio. If programmed, the user can select the Flip Top Display option button or menu parameter to have the top display face towards the back of the radio.*

Figure 3.15 VP6000 Top Display (Left) and VP8000 Top Display (Right)

VP6000 Top Display - Status Bar Enabled

VP8000 Top Display - Status Bar & Display Icons Enabled

3.6.3 Portable Icons

The layout of the front panel display is shown in Figure 3.14. The layout of the top panel display is shown in Figure 3.15. Icons are typically shown in the upper part of the display and text messages in the lower part.

LED indicators may be disabled by programming. If so programmed, the radio’s LED will not light for transmit/receive/error code conditions. During transmit, the Transmit icon will be displayed to provide some indication to the user that the radio is transmitting.

Table 3.6 shows the display icons that indicate the various operating modes and status, and contains descriptions of them. Table 3.7 shows the status bar symbols and text, and contains descriptions of them. Section 3.6.4 shows the received signal strength indicator (RSSI) icons and contains descriptions of them.

Table 3.6 Display/Status Icons

Icon	Name	Protocols	Description
	BUSY	Conventional/ DMR	Indicates the current transmit channel is busy.
	PRIORITY	Conventional/ P25/V16/DMR	Indicates the current channel is the priority channel in the current scan list.
	PRIORITY_2	Conventional/ P25/V16/DMR	Indicates the current channel is the priority 2 channel in the current scan list.
	SCAN_LIST	Conventional/ P25/V16/DMR	Indicates the current channel is in the current scan list. ON: Scanning FLASHING: In scan hold time
	EDIT_MODE	Conventional/ P25/V16/DMR	Indicates the user has entered a feature requiring user input.
	MONITOR	Conventional/ DMR	Indicates the radio is monitoring the receive channel or monitoring the transmit channel.
	PHONE	Conventional/ P25/V16	Indicates the radio is in interconnecting mode or transmit channel.
	UNIT_CALL	Conventional/ P25/V16/DMR	Indicates the radio is in unit call mode or has received a unit call.
	REPEATER_TALK_AROUND	Conventional/ DMR	Indicates the radio is in repeater talk around mode.
	SCAN	Conventional/ P25/V16/DMR	Indicates the radio is scanning.
	SECURITY	Conventional/ P25/V16/DMR	Indicates the radio does not have a valid encryption key.
	SECURITY DES	Conventional/ P25/V16/DMR	Indicates the radio is using DES encryption or decryption.
	SECURITY AES	Conventional/ P25/V16/DMR	Indicates the radio is using AES encryption or decryption.
	SECURITY ARC4	Conventional/ P25/V16/DMR	Indicates the radio is using ARC4 encryption or decryption.
	TRANSMIT_PHASE_1	Conventional/ P25/V16/DMR	Indicates transmit when the radio is in surveillance mode or the LED indicator is disabled. With “Show Tx/ Rx Icon” enabled indicates that the radio is making a Phase 1 (FDMA) call.
	RECEIVE_PHASE_1	Conventional/ P25/V16/DMR	With “Show Tx/Rx Icon” enabled indicates that the radio is receiving a Phase 1 (FDMA) call.

Table 3.6 Display/Status Icons (Continued)

Icon	Name	Protocols	Description
	TRANSMIT_PHASE_2	Conventional/ P25/V16/DMR	With “Show Tx/Rx Icon” enabled indicates that the radio is making a Phase 2 (TDMA) call.
	RECEIVE_PHASE_2	Conventional/ P25/V16/DMR	With “Show Tx/Rx Icon” enabled indicates that the radio is receiving a Phase 2 (TDMA) call.
	TRANSMIT_FAILSOFT_CALL	Conventional/ P25/V16/DMR	With “Show Tx/Rx Icon” enabled indicates that the radio is making a Failsoft call.
	RECEIVE_FAILSOFT_CALL	Conventional/ P25/V16/DMR	With “Show Tx/Rx Icon” enabled indicates that the radio is receiving a Failsoft call.
	P25_TRUNKING_HANGTIME	P25	With “Show Tx/Rx Icon” enabled indicates that the repeater hangtime is active. (Radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later.)
	DATA_CONTEXT_ ACTIVATED	Conventional/P25	Indicates the radio is registered for data.
	P25_DATA_CHANNEL_ GRANT	Conventional/P25	Indicates the radio is on a data channel.
	P25_REGISTERED_WITH _DRS	Conventional/P25	Indicates that the radio is registered with the Data Registration Server.
	SITE_LOCKED	P25/V16	Indicates the radio is locked to a site. This icon flashes.
	TALKGROUP_LOCK_MODE_ENABLED	P25/V16	Indicates Talkgroup is locked. This icon flashes.
	CALL_HISTORY	Conventional/ DMR	Indicates the user is viewing an ID from the radio's call history.
	GPS	Conventional/ P25/V16/DMR	Indicates the radio has acquired GPS sync.
	GPS_LOW_POWER	Conventional/ P25/V16/DMR	Indicates GPS is on and in low power mode due to poor signal conditions.
	RADIO_WIDE_SCAN	Conventional/ P25/V16/DMR	Indicates the radio is radio wide scanning. ON: Scanning FLASHING: In scan hold time
	TEXT_MESSAGE	Conventional/P25	Indicates the radio is using the text message feature.
	LOCK_OUT	Conventional/ P25/V16/DMR	Indicates the radio has keypad lockout enabled.
	SURVEILLANCE	Conventional/ P25/V16/DMR	Indicates the radio has surveillance mode enabled.
	DECIMAL ENTRY	Conventional/ P25/V16/DMR	Indicates the radio is in decimal entry mode.
	HEX ENTRY	Conventional/ DMR	Indicates the radio is in hexadecimal entry mode.

Table 3.6 Display/Status Icons (Continued)

Icon	Name	Protocols	Description
	MAN DOWN	Conventional/ P25/V16/DMR	Indicates the man down feature is active.
(X)	NOT IN SCAN LIST	Conventional/ P25/V16/DMR	Indicates the channel is not in the scan list.
(N)	NUISANCE DELETE	Conventional/ P25/V16/DMR	Indicates the channel is nuisance deleted.
	BLUETOOTH ACTIVE	Conventional/ P25/V16/DMR	Bluetooth is turned on.
	BLUETOOTH CONNECTED	Conventional/ P25/V16/DMR	The radio is connected to a Bluetooth device.
A	TRUNKING_AFFILIATION	P25	Indicates the radio is affiliated with a trunking system.
	MUTED	Conventional/ P25/V16/DMR	Indicates the radio is muted. (Radios using Firmware Version 8.32.x or later programmed by Armada 1.32.x and later)
	MUTED_BY_SIGNALING	Conventional/ P25/V16/DMR	Indicates the radio is muted on an active call due to mismatched call parameters. Analog: Radio's CTCSS/DCS settings do not match the active call. Digital: Radio's programmed talkgroup and NAC differs from the active call. DMR: Radio's programmed talkgroup and Color code differs from the active call. (Radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later)
Wi-Fi	WIFI CONNECTION	Conventional/ P25/ V16/DMR	ON: The radio is connected to a Wi-Fi network. For radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later: FLASHING: The radio is attempting to connect to a Wi-Fi network.
R Wi-Fi	WIFI CONNECTED DRS REGISTERED	Conventional/ P25/ V16/DMR	Indicates the radio is connected to Wi-Fi and registered with the DRS over the broadband connection (no VPN is required). Broadband Data Services are available. (Radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later)

Table 3.6 Display/Status Icons (Continued)

Icon	Name	Protocols	Description
	WIFI CONNECTED VPN ESTABLISHED	Conventional/ P25/ V16/DMR	Indicates the radio is connected to Wi-Fi and the VPN is established, but not yet registered with the DRS. The radio is attempting to contact the DRS. (Radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later)
	WIFI CONNECTED VPN CONNECTION FAILED	Conventional/ P25/ V16/DMR	Indicates the radio is connected to Wi-Fi but the VPN connection failed. No further attempts will be made to connect. (Radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later)
	WIFI CONNECTED DRS REGISTERED VPN ESTABLISHED	Conventional/ P25/ V16/DMR	Indicates the radio is connected to Wi-Fi, the VPN is established, and the radio is registered with the DRS over the broadband connection. Broadband Data Services are available. (Radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later)

Table 3.7 Status Bar Symbols and Text

Icon	Name	Protocols	Description
[text]	TIME	Conventional/ P25/V16/DMR	Current time
[text]	DATE	Conventional/ P25/V16/DMR	Current Date
	SIGNAL_STRENGTH_0	Conventional/ P25/V16/DMR	Indicates the received signal strength is between 0 and the Acceptable threshold.[1]
	SIGNAL_STRENGTH_1	Conventional/ P25/V16/DMR	Conventional: Indicates the received signal strength is between the Out of Range and Fair thresholds.[1] P25, V16: Indicates the received signal strength is between the Acceptable and Fair thresholds.[1] DMR: Indicates the received signal strength is between Poor and Fair thresholds.
	SIGNAL_STRENGTH_2	Conventional/ P25/V16/DMR	Conventional, DMR: Indicates the received signal strength is between the Fair and Good thresholds.[1] P25, V16: Indicates the received signal strength is between the Fair and Very Good thresholds.[1]

Table 3.7 Status Bar Symbols and Text (Continued)

Icon	Name	Protocols	Description
	SIGNAL_STRENGTH_3	Conventional/ P25/V16/DMR	Conventional, DMR: Indicates the received signal strength is between the Good and Excellent thresholds.[1] P25, V16: Indicates the received signal strength is between the Very Good and Excellent thresholds.[1]
	SIGNAL_STRENGTH_4	Conventional/ P25/V16/DMR	Conventional: Indicates the received signal strength is above the Excellent threshold.[1] P25, V16, DMR: Indicates the received signal strength is at or above the Excellent threshold.[1]
	SIGNAL_STRENGTH_OOR	Conventional/ P25/V16/DMR	Conventional: Indicates the received signal strength is at or below the Out of Range threshold.[1] P25, V16, DMR: Indicates the radio is out of range.[1]
	BATTERY_LOW	Conventional/ P25/V16/DMR	Indicates the battery is low.
	BATTERY_0	Conventional/ P25/V16/DMR	Indicates the battery is between a low state and 20% of its capacity.
	BATTERY_1	Conventional/ P25/V16/DMR	Indicates the battery is between and 20% and 40% of its capacity.
	BATTERY_2	Conventional/ P25/V16/DMR	Indicates the battery is between 40% and 60% of its capacity.
	BATTERY_3	Conventional/ P25/V16/DMR	Indicates the battery is between 60% and 80% of its capacity.
	BATTERY_4	Conventional/ P25/V16/DMR	Indicates the battery is between 80% and 100% of its capacity.
	VOLUME	Conventional/ P25/V16/DMR	Indicates the volume of the radio
[text]	ZONE	Conventional/ P25/V16/DMR	Indicates the zone of the radio
[text]	CHANNEL	Conventional/ P25/V16/DMR	Indicates the channel of the radio
[text]	TX SQUELCH CODE	Conventional/ P25/V16/DMR	Indicates the transmit squelch code of the radio

Table 3.7 Status Bar Symbols and Text (Continued)

Icon	Name	Protocols	Description
[text]	RX SQUELCH CODE	Conventional/ P25/V16/DMR	Indicates the receive squelch code of the radio
[text]	SITE	P25	Indicates the current site of a radio in a P25 trunking system. The site gets displayed in one of the following ways: • Site Alias (if available) - Displays as many letters of the alias as can fit in the display space. This ranges from 1 to 11 characters. • Site ID - Displayed in the form “St” followed by the site ID (for example, “St150” for a site ID of 150)

1. For radios using Firmware Version 8.32.x or later programmed by Armada 1.32.x and later, the antenna symbol on this icon gets replaced by the letter **R** when the radio roams on an acceptable site in a foreign system. The icon appears similar to this example:

3.6.4 RSSI Threshold Indications

In conventional mode and only if programmed, the user can see the signal strength of the last call displayed as a signal strength indicator icon as shown in Table 3.8. At the start of every call, the radio will take an RSSI measurement and set a corresponding signal strength indicator icon. The call must be long enough for a full measurement (40 milliseconds) or the measurement will be ignored. The signal strength indicator icon from the last call will stay displayed until a new call is received. The icon signifies the strength of the last received call not the current signal strength. If the radio goes out of range because it did not receive a beacon within the Inactivity Duration, it will automatically set the signal strength indicator to Out Of Range.

Table 3.8 RSSI Threshold Indicators

RSSI Range	Portable Icon
No Measurement Taken	
< Out of Range	
Out of Range > Fair	
Fair > Good	
Good > Excellent	
> Excellent	

For conventional channels, the signal strength indicator only appears during active receive. After the signal drops, the icon disappears, instead of being displayed indefinitely.

- This behavior does not apply if the conventional channel is configured as an "Out of Range Channel". In that case, the radio continues to display the signal strength of the previous received signal. This is the expected behavior for customers who receive periodic beacons on their conventional systems.

3.6.5 Squelch Code on Status Bar

When on a conventional channel, the radio can be configured to display the Rx and/or Tx CTCSS/DCS squelch codes on the status bar (the front display top row).

When on a conventional channel, the status bar—through Armada programming—displays the assigned squelch code (such as 67.0). If a squelch code is selected from the system list through the OST function button, the status bar displays the alias (up to 5 characters). If the alias is blank, the squelch code displays numerically.

On a digital channel, an Rx squelch code is only displayed if the channel is mixed-mode. A Tx squelch code is only displayed if the mixed-mode transmit type is set to Analog.

In Talk-Around mode, the "Tx Squelch" status bar slot displays the Rx squelch code.

3.7 Accessories

Table 3.9 lists accessories that can be used with the VP5000/VP6000/VP8000.

Note *For radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later, the Armada administrator can disable accessories' buttons—excluding the PTT button. (By default, accessories' buttons work normally.)*

Table 3.9 VP5000/VP6000/VP8000 Accessories

Accessory Type	KENWOOD Model Number	Description	Configured in Armada as This
Aid Vest	--	Datasoft/Select Engineering (Requires Firmware Version 8.26.x or later)	BLE Devices > AID Vest
Battery	KNB-L1M	Li-ion 2000mAh (Compact Slim)	[No Armada configuration required]
	KNB-L2M	Li-ion 2600mAh (Standard)	
	KNB-L3M	Li-ion 3400mAh (High Capacity)	
	KNB-LS5CU	Li-ion 2000mAh (Intrinsically Safe)	
	KNB-LS7	Li-ion 3800mAh (High Capacity, Intrinsically Safe)	
	KNB-LS7-IS	Li-ion 3800mAh (High Capacity, Intrinsically Safe Labeled)	
	KNB-L11M	Li-ion 3900 mAh (High Capacity) Requires KSC-52AK single-bay charger or KSC-526K six-bay charger equipped with KSC-52PAW A-Pocket charger insert.	
Battery Case	KBP-8	Battery case Holds 12 AA batteries	[No Armada configuration required]

Table 3.9 VP5000/VP6000/VP8000 Accessories (Continued)

Accessory Type	KENWOOD Model Number	Description	Configured in Armada as This
Battery Charger	KSC-Y32K	Rapid rate single unit charger	[No Armada configuration required]
	KSC-32	Rapid rate single unit charger	
	KSC-326AK	Rapid rate six-unit charger	
	KSC-52AK	Rapid rate single unit charger with A-Pocket charger insert for KNB-11M battery.	
	KSC-52BK	Rapid rate single unit charger with B-Pocket charger insert for KNB-L2/L3/ LS5/LS7 Batteries.	
	KSC-526K	Rapid rate six-unit charger (Battery Charger Pockets required)	
	KSC-52PAW	Charger Pocket type A compatible with KNB-11M battery for use with KSC-526K 6-bay charger or as replacement pocket for KSC-52AK charger.	
	KSC-52PBW	Charger Pocket type B compatible with KNB-L2/L3/LS5/LS7 Batteries for use with KSC-526K 6-bay charger or as replacement pocket for KSC-52BK charger.	
	KVC-15	Rapid rate DC vehicular charger adapter for the KSC-32	
	KVC-23V	Rapid rate single unit vehicular charger for KNB-L2/L3/LS7 Batteries.	

Table 3.9 VP5000/VP6000/VP8000 Accessories (Continued)

Accessory Type	KENWOOD Model Number	Description	Configured in Armada as This
Antenna	KRA-47MB	Multiband Whip antenna 136-870 MHz	[No Armada configuration required]
	KRA-32K	700/800 MHz Whip antenna	
	KRA-36	700/800 MHz Stubby antenna	
	KRA-27M	UHF whip antenna 440-490 MHz	
	KRA-27M2	UHF whip antenna 470-520 MHz	
	KRA-27M3	UHF whip antenna 400-450 MHz	
	KRA-23M	UHF Low-profile helical antenna 450-490 MHz	
	KRA-23M2	UHF Low-profile helical antenna 470-512 MHz	
	KRA-23M3	UHF Low-profile helical antenna 403-430 MHz	
	KRA-29	UHF whip antenna 380-430 MHZ	
	KRA-26M	VHF helical antenna 146-162 MHz	
	KRA-26M2	VHF helical antenna 162-174 MHz	
	KRA-26M3	VHF helical antenna 136-150 MHz	
	KRA-22M	VHF Low-profile helical antenna 148-162 MHz	
	KRA-22M2	VHF Low-profile helical antenna 162-174 MHz	
	KRA-22M3	VHF Low-profile helical antenna 136-150 MHz	
	KRA-25	VHF High-gain helically loaded whip antenna 148-162 MHz	
	KRA-28	VHF Wideband whip antenna 140-170 MHz	
Cable	KPG-36XM	Programming cable. Compatible with VP5000/VP6000.	
	KPG-236UM	Programming cable. Compatible with VP5000/VP6000/VP8000.	
	E30-3325-05	Cloning cable	
Headset	KHS-14	Light weight single muff headset with boom microphone and in-line PTT	[No Armada configuration required]
	KHS-15D-BH	Heavy-duty noise reduction behind-the-headset with noise cancelling boom microphone & PTT	
	KHS-15D-OH	Heavy-duty noise reduction over-the-headset with noise cancelling boom microphone & PTT	

Table 3.9 VP5000/VP6000/VP8000 Accessories (Continued)

Accessory Type	KENWOOD Model Number	Description	Configured in Armada as This
Headset, Bluetooth	--	Interspiro SpiroCom (Requires Firmware Version 8.22.x or later)	Bluetooth (Other)
	--	MSA G1 SCBA (Requires Firmware Version 8.22.x or later)	
	--	PRYME BTH-300 (Requires Firmware Version 8.22.x or later)	BTH300
	--	PRYME BTH-900 (Requires Firmware Version 8.22.x or later)	BTH900
	--	Savox BTR-155[1] (Requires Firmware Version 8.22.x or later)	Bluetooth (Other)
	--	3M Scott EPIC 3 RDI Amp[1] (Requires Firmware Version 8.22.x or later)	
	--	3M Scott Vision C6 (Requires Firmware Version 8.22.x or later)	
	--	Sensear SM1x (Requires Firmware Version 8.22.x or later)	
	--	AINA PTT Voice Responder[1] (Requires Firmware Version 8.28.x or later)	AINA BT PTT VR
	--	OTTO Revo NC2 (Requires Firmware Version 8.30.x or later)	OTTO BT Revo NC2

Table 3.9 VP5000/VP6000/VP8000 Accessories (Continued)

Accessory Type	KENWOOD Model Number	Description	Configured in Armada as This
Speaker Microphone	KMC-70	MIL-SPEC, IP67 (Immersion), Programmable 3-button Speaker microphone Available in Black (KMC-70M) and Hi-Viz Green (KMC-70GR)	KMC-70/72 (Requires Radio Firmware Version 8.26.x or later, programmed by Armada 1.26.x and later)
	KMC-72	2-button microphone	
	KMC-54WDM	MIL-SPEC, IP67 (Immersion) Noise-canceling Speaker Microphone	Two Button Mic
	KMC-49	MIL-SPEC, Speaker Microphone with Antenna Connector	KMC-49 Mic
	KCT-51	Hirose 6-pin Adapter (adapts third party audio accessories, and keyloaders to portable connector, and keyloaders)	Connector Options > HRS Adapter (Independent of microphone setting)
	KHS-11BL	2-wire palm microphone with earphone, universal connector (Black)	[No Armada configuration required]
	KHS-12BL	3-wire mini lapel microphone with earphone, universal connector (Black)	
	SM8	3-button microphone	SM8
	KEP-1	3.5mm earphone kit for KMC-41/42W/54W/70M Speaker Mics	[Configured with the Speaker Mic]
	KEP-2	2.5mm earphone kit for KMC-49 Speaker Mic	

Table 3.9 VP5000/VP6000/VP8000 Accessories (Continued)

Accessory Type	KENWOOD Model Number	Description	Configured in Armada as This
Carrying Accessory	KBH-11	Spring action belt clip (2.5")	[No Armada configuration required]
	KW9130-LF	Leather Case, Fire service shoulder strap D-rings. Compatible with larger batteries: KNB-L3, KNB-LS7, and KNB-L11.	
	KW9140-LF	Leather Case, Fire service shoulder strap D-rings. Compatible with smaller batteries: KNB-L2 and KNB-LS5.	
	KW9130-LP	Leather Case, Police style D-Swivel. Compatible with larger batteries: KNB-L3, KNB-LS7, and KNB-L11.	
	KW9140-LP	Leather Case, Police style D-Swivel. Compatible with smaller batteries: KNB-L2 and KNB-LS5.	
	KW9130-NP	Nylon Case, Police style D-Swivel. Compatible with larger batteries: KNB-L3, KNB-LS7, and KNB-L11.	
	KW9140-NP	Nylon Case, Police style D-Swivel. Compatible with smaller batteries: KNB-L2 and KNB-LS5.	
	R50843LF3001	Leather Case, L3 battery, VP6000 Fire.	
	R50843LP3001	Leather Case, L3 battery, VP6000 Police.	
	R50843NP3001	Nylon Case, L3 battery, VP6000 Police.	
	KW9110-LF	Leather Case Fire, LS7 Model, VP6000	
	KW9110-LP	Leather Case Police, LS7 Model, D-Swivel, VP6000	
	KW9110-NP	Nylon Case Police, LS7 Model, D-Swivel, VP6000	
	R50840000L20	2" Belt Loop for Leather Cases R50843Lx3001	
	R50840000N20	2" Belt Loop for Nylon Cases R50843Nx3001	
	R50840000L30	3" Belt Loop for Leather Cases R50843Lx3001	
	KBH-8DS	Leather Belt Loop with D-swivel	
	KLH-6SW	Leather swivel belt loop / detachable swivel D-Ring back for KLH-200K3	
	KLH-137ST	Firefighter's Heavy-Duty Leather Shoulder Strap for a Heavy-Duty Leather Case	
	KLH-200K3	Heavy duty leather carrying case for VP5000 series with KNB-L2/L3/LS5CU batteries (for both keypad models)	
	KLH-201K3	Nylon carrying case for VP5000 series with KNB-L2/L3/LS5CU battery (for both keypad models)	
	835VP5000YH	Yellow Housing, VP5000, Model 2, Factory Installed	

1. This device has been observed to have potential connectivity issues to Viking radios under certain conditions. Carefully evaluate Bluetooth connected devices under test conditions before using them in critical communications situations.

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

3.8 Signaling Tones

Information is communicated to users of the VP5000/VP6000/VP8000 radio using signal tones and alerts and by LED signaling. Table 3.10 shows the information and signaling tones supported by the VP5000/VP6000/VP8000 radio.

Table 3.10 Tones for the VP5000/VP6000/VP8000 Radios

Message Name	Usage Description	Audible Description
Action Performed	Indicates an action has been performed.	1500 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms, 0 Hz for 50 ms, 1500 Hz for 50 ms
Alert	Transmits timeout warnings and failsoft alert notification.	1500 Hz for 50 ms
Alert Site Trunking	Notifies the user that they have entered site trunking.	1500 Hz for 50 ms
Alert Tone Keypress	Indicates the tone volume during tone volume adjustment.	1000 Hz for 100 ms
Bad	Indicates a problem with the user's input.	300 Hz for 100 ms
Bad Condition	Indicates loss of sync in roaming diagnostic mode.	300 Hz for 150 ms, 0 Hz for 50 ms (played 3 times)
Callback	Notifies a user waiting in a busy state that their call has started.	1500 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms, 0 Hz for 50 ms, 1500 Hz for 50 ms
Channel Busy	Indicates the channel the user was attempting to transmit on is busy.	300 Hz for 150 ms, 0 Hz for 150 ms, 300 Hz for 150 ms, 0 Hz for 150 ms, 300 Hz for 150 ms, 0 Hz for 150 ms, 300 Hz for 150 ms, 0 Hz for 150 ms (played every 1200 ms)
Clear Alert	Warns the user that they are transmitting or receiving a clear call.	700 Hz for 50 ms
Click	Indicates the soft buttons menu has been moved left or right.	1500 Hz for 3 ms, 200 Hz for 5 ms
Double Click	Indicates the soft buttons menu has been moved to its start or end.	1500 Hz for 3 ms, 200 Hz for 5 ms, 0 Hz for 75 ms, 1500 Hz for 3 ms, 200 Hz for 5 ms
DTMF	Played during button presses for DTMF features (Overdial and Keypad DTMF).	1000 Hz for 100 ms
Dynamic Regroup	Notifies the user that their radio has been dynamically regrouped.	765 Hz for 25 ms, 0 Hz for 25 ms (played 6 times)
Emergency	Plays when the user enters emergency (and doesn't have the radio programmed for silent emergency).	1000 Hz for 175 ms

Table 3.10 Tones for the VP5000/VP6000/VP8000 Radios (Continued)

Message Name	Usage Description	Audible Description
Emergency Alarm RX	Indicates that an emergency alarm has been received.	750 Hz for 500 ms, 1000 Hz for 500 ms (played 2 times)
Emergency Cancel	Plays when the user cancels emergency mode (and doesn't have the radio programmed for silent emergency).	1000 Hz for 1000 ms
Emergency Status Echo	Notifies the user that their emergency alarm was received by the system. Also notifies the user that they have received an emergency call.	1000 Hz for 175 ms, 0 Hz for 50 ms, 1000 Hz for 175 ms, 0 Hz for 150 ms, 1000 Hz for 175 ms, 0 Hz for 150 ms, 1000 Hz for 175 ms, 0 Hz for 150 ms, 1000 Hz for 175 ms
Enter Mode	A mode (such as Call Alert) has been entered.	1000 Hz for 50 ms, 0 Hz for 50 ms, 1500 Hz for 50 ms
Error	Indicates the radio is currently in an error condition.	300 Hz for 100 ms (played forever)
Evac Alert	Notifies the user that an evacuation command has been received.	932 Hz for 150 ms, 784 Hz for 150 ms (played forever)
Exit Mode	A mode (such as Call Alert) has been exited.	1500 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms
Failsoft	Notification that the radio is in Failsoft.	1000 Hz for 50 ms, 0 Hz for 50 ms (played 2 times)
Feature Off	A feature (such as Secure Mode) has been turned off.	1000 Hz for 50 ms, 0 Hz for 50 ms, 500 Hz for 50 ms
Good	OTAR: Hello ack received. Roaming Diagnostic Mode: Found control channel.	1500 Hz for 50 ms
Key Fail	Signals an encryption key failure.	1000 Hz for 125 ms, 0 Hz for 75 ms (played 6 times)
Key Fail PTT	Indicates denied PTT due to a key failure.	1000 Hz for 125 ms, 0 Hz for 75 ms (repeats forever)
Keypress	Played after a keypress.	1000 Hz for 100 ms
Low Battery	Indicates a low battery.	1000 Hz for 50 ms, 0 Hz for 50 ms (played 2 times)
Normal Condition	Indicates the following conditions: • Conventional penalty timer expired • Conventional exit OOR • DMR Conventional penalty timer expired • DMR Conventional exit OOR • P25 cancel dynamic regrouping • P25 cancel selector lock • V16S cancel dynamic regrouping • V16S cancel selector lock • Radio temperature return to normal	1000 Hz for 50 ms, 0 Hz for 50 ms, 1500 Hz for 50 ms
Not Good Condition	Indicates the Keyloader attach failed.	300 Hz for 150 ms, 0 Hz for 150 ms (played 2 times)
Out Of Range	Indicates the radio has gone out of range.	300 Hz for 1500 ms

Table 3.10 Tones for the VP5000/VP6000/VP8000 Radios (Continued)

Message Name	Usage Description	Audible Description
Page Ack Received	Indicates a call alert transmit ack has been received.	1000 Hz for 50 ms, 0 Hz for 50 ms (played 6 times)
Page Received	Indicates a call alert has been received.	1000 Hz for 50 ms, 0 Hz for 50 ms (played 6 times every 6000 ms forever)
Priority Call Received	Priority call alert call received.	600 Hz for 50 ms, 0 Hz for 50 ms (played 2 times)
Ring	Interconnect incoming call or outgoing Unit call.	1129 Hz for 25 ms, 1477 Hz for 25 ms (played every 1200 ms forever)
RSSI Above Fair Level	RSSI measurement is above the Fair threshold.	1000 Hz for 100 ms, 0 Hz for 100 ms, 1000 Hz for 100 ms, 0 Hz for 100 ms
RSSI Above OOR Level	RSSI measurement is above the Out of Range threshold.	1000 Hz for 100 ms, 0 Hz for 100 ms (played 4 times)
Short Unit Call	Conventional and DMR Conventional: Indicates a unit call is being received. P25 and V16 Trunking: Indicates a non-enhanced unit call is being received.	1000 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms, 0 Hz for 50 ms
Side Tone	Indicates a single tone encoder tone is being transmitted by the radio.	800 Hz for 100 ms (played forever)
Startup	Indicates the radio is powered up and ready for use.	1000 Hz for 50 ms, 0 Hz for 50 ms, 1500 for 50 ms
Status Message Echo	Conventional and DMR Conventional: Successful Digital RTT, Message, Status P25 Trunking: Successful Message V16M Trunking: Successful Message, Status	1000 Hz for 50 ms, 0 Hz for 50 ms (played 6 times)
System Call RX Tone	Indicates a P25 Trunking all-call from the system (talkgroup 0xFFFF).	600 Hz for 50 ms, 0 Hz for 50 ms, 1200 Hz for 50 ms
System Retry	P25, V16 Trunking: Warns the user that retries are happening after the second retry if the user is still holding down the PTT.	300 Hz for 100 ms (played forever)
Talk Permit	Notifies the user that they may begin talking.	1000 Hz for 50 ms, 0 Hz for 25 ms (played 3 times)
Temp Change	Indicates the radio temperature is above the normal range.	1000 Hz for 50 ms, 0 Hz for 50 ms (played 2 times)
Text Message Received	Indicates a text message has been received.	800 Hz for 50 ms, 0 Hz for 50 ms, 500 Hz for 50 ms, 0 Hz for 50 ms (played 2 times)
Unit Call	Indicates the radio is receiving an enhanced unit call (P25 and V16 Trunking).	1000 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms, 0 Hz for 50 ms (played every 6000 ms 4 times)
Unit Call Forever	Indicates the radio is receiving an enhanced unit call (P25 and V16 Trunking). This tone will be used if the call settings are set to ring forever on unit calls.	1000 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms, 0 Hz for 50 ms, 1000 Hz for 50 ms, 0 Hz for 50 ms (played every 6000 ms forever)
Unprogrammed Channel	Indicates an unprogrammed channel.	300 Hz for 100 ms (played forever)

Table 3.10 Tones for the VP5000/VP6000/VP8000 Radios (Continued)

Message Name	Usage Description	Audible Description
Volume Boundary	Indicates the radio is at a volume boundary.	1000 Hz for 50 ms, 0 Hz for 50 ms (played 2 times)
Volume Tick	Indicates that you have changed the volume with a volume change button.	1000 Hz for 100 ms
250 Hz	Used in the Test/Tune Mode Tone Test.	250 Hz for 100 ms (played forever)
500 Hz	Used in the Test/Tune Mode Tone Test.	500 Hz for 100 ms (played forever)
750 Hz	Used in the Test/Tune Mode Tone Test.	750 Hz for 100 ms (played forever)
1000 Hz	Used in the Test/Tune Mode Tone Test.	1000 Hz for 100 ms (played forever)
1250 Hz	Used in the Test/Tune Mode Tone Test.	1250 Hz for 100 ms (played forever)
1500 Hz	Used in the Test/Tune Mode Tone Test.	1500 Hz for 100 ms (played forever)
1750 Hz	Used in the Test/Tune Mode Tone Test.	1750 Hz for 100 ms (played forever)
2000 Hz	Used in the Test/Tune Mode Tone Test.	2000 Hz for 100 ms (played forever)
2250 Hz	Used in the Test/Tune Mode Tone Test.	2250 Hz for 100 ms (played forever)
2500 Hz	Used in the Test/Tune Mode Tone Test.	2500 Hz for 100 ms (played forever)
2750 Hz	Used in the Test/Tune Mode Tone Test.	2750 Hz for 100 ms (played forever)
3000 Hz	Used in the Test/Tune Mode Tone Test.	3000 Hz for 100 ms (played forever)

An alert tone may be programmed to notify the user they reached the first zone in the zone list, or the first channel in a zone. When enabled, this feature emits an audible tone (1500 Hz for 50 ms) when the first zone in the zone list, or first channel in a zone, is reached. This feature only occurs with button presses.

The alert tone will only sound when Channel Select or Zone Select are programmed to the Navigation Pad, or when a function button has been programmed for Zone Up or Zone Down. The tone will only sound on the first Zone when changing zones, even if the channel is currently set to the first channel in the zone on each zone change.

3.9 Manual Trace Creation

When troubleshooting with the assistance of KENWOOD technical support or engineering personnel, gathering debug trace information for their review might be helpful. Viking Trace Lite is a software tool that can be provided by KENWOOD technical support or engineering personnel to assist with troubleshooting. However, in some cases Viking Trace Lite is not immediately available.

For radios using Firmware Version 8.32.x or later programmed by Armada 1.32.x and later, when an engineer needs to gather a trace out in the field, the user can press ◀, ▶, ◀, ▶ on the Four-Way Navigation Pad, followed by the ☰ (Menu) Button within four seconds. Then when the user gets access to Viking Trace Lite, the trace data can be pulled off the radio.

4

Radio-Wide Features

This section contains information on the following topics:

- Enhanced Vehicular Repeater System
- Man Down Detection and Alerting
- Bluetooth
- Audio Recording
- Instant Recording Replay
- Text Messaging
- Temperature Protection
- Wi-Fi
- Over the Internet Programming (OTIP)

4.1 Viewing Radio Information

The VP5000/VP6000/VP8000 portable radio has a function button for "Radio Info". When this button is pressed, the following information items get displayed. As the user cycles through these items, they scroll across the display. The user can pause and/or move text back and forth using the 4-Way D-Pad (Table 3.1 and Table 3.2) to scroll through these items.

Note *To view battery information, click **Battery** when it appears in this display. The battery parameters listed below appear in a submenu. Then, use the 4-Way D-Pad to return to the main radio information display.*

- Band
- Software Version
- Radio Alias
- Radio Tag
- Profile Tag
- Unit ID (*which is associated with the current active system*)
- Key (*Encryption Key Information*)
- USB IP Address
- OTA IP (*Over the Air IP Address*)
- ESN
- Encryption Module
- Battery
  - Capacity (%)
  - Cycle Count
  - Full Charge Capacity (*mAh*)
  - Health (*Excellent, Good, Fair, Poor*)
  - S/N (*Battery serial number. Available for Elite model batteries.*)
- OTAR Reg (*P25 channels only*)
- KMF IP (*P25 channels only*)
- ESK Only (*P25 channels only*)
- Wi-Fi *(VP8000 only)*
- Third Party Interface Version

Note *Please note that the features/operations may vary depending on the model of your VP5000/ VP6000/VP8000 radio. Standard Key Model radios do not have a DTMF keypad. Messages and status icons appear on the front display.*

4.2 Option Keys / Buttons

Most of the keys/buttons on this radio are programmable as follows. Refer to Table 4.1, Table 3.1, and Figure 3.10:

- On the side panel, the button above and 2 buttons below the PTT switch
- On the front panel, buttons • and ••, if soft buttons are disabled, and all DTMF buttons
- On the top panel, the two-position toggle switch and the orange button

The functions that can be controlled by option buttons are shown in Table 4.1. Each option button can be programmed to control a different function in each of the three operating modes. For example, ⮌ (Clear) can control one function when a conventional channel is selected, another when a Viking16 channel is selected, and still another when a Project 25 trunking channel is selected.

Table 4.1 Programmable Option Button and Menu Mode Functions

Function	X = Available in Mode:				Menu Display Defaults	Soft Button Alias
	Conventional	Project 25 Trunking	V16 Single & Multi Site	Conventional DMR		
Accessory Select	X	X	X	X	Accessory Select	ACS
Active Noise Reduction (VP8000 only)	X	X	X	X	Active NR	ANR
Admin				X	Admin	ADMIN
Alert Tones	X	X	X	X	Tones	TONE
Analog Noise Reduction	X		X		Analog NR	ANR
Analog Two Tone List	X			X	Analog 2T List	ANA2T
Apply Update	X	X	X	X	Apply Update	UPDT
Authentication Keyload		X			Auth Keyload	AUTH
Auto Site Search		X	X[1]		Auto Site	SITE
Shaded features support the secondary press-and-hold function on the portable radios						

Table 4.1 Programmable Option Button and Menu Mode Functions (Continued)

Function	X = Available in Mode:				Menu Display Defaults	Soft Button Alias
	Conventional	Project 25 Trunking	V16 Single & Multi Site	Conventional DMR		
Automatic Volume Control	X	X	X	X	Auto Volume	AVC
Backlight	X	X	X	X	Backlight	BKLHT
Bluetooth	X	X	X	X	Bluetooth	BT
Bluetooth Rx Audio	X	X	X	X	BT Rx Audio	BT RX
Call Alert Select (Paging)	X	X	X	X	Call Alert	ALERT
Call Response	X	X	X		Call Response	RESP
Cancel Dynamic Regroup		X	X		Cancel DR	CANDR
Change Keyset	X	X	X	X	Change Keyset	KYSET
Change Theme	X	X	X	X	Change Theme	THEME
Change User Password	X	X	X	X	Password	PSWD
Channel Announcement	X	X	X	X	Chan Announce	ANNCH
Channel Down	X	X	X	X	Channel Down	CH DN
Channel Rx OST	X			X	Channel Rx OST	RXOST
Channel Select	X	X	X	X	Channel Select	CHAN
Channel Tx OST	X			X	Channel Tx OST	TXOST
Channel Up	X	X	X	X	Channel Up	CH UP
Clear/Secure Encryption Select	X	X	X	X	Security	SECR
Clock	X	X	X	X	Clock	CLOCK
Clock Source	X	X	X	X	Clock Source	CLKSR
Cloning	X				Cloning	
Disable Call Guard	X				Disable CG	DISCG
Display GPS	X	X	X	X	Display GPS	GPSDP
Display Information	X			X	Display	DISP
Display RSSI	X			X	Display RSSI	RSSI
Emergency	X	X	X	X	Emergency	

Shaded features support the secondary press-and-hold function on the portable radios

Table 4.1 Programmable Option Button and Menu Mode Functions (Continued)

Function	X = Available in Mode:				Menu Display Defaults	Soft Button Alias
	Conventional	Project 25 Trunking	V16 Single & Multi Site	Conventional DMR		
Emergency Clear	X	X	X	X	Emergency Clear	EMCLR
Erase Keys	X	X	X	X	Erase Keys	KYCLR
Fire Commander 1	X	X	X		Fire Comm 1	CDR 1
Fire Commander 2	X	X	X		Fire Comm 2	CDR 2
Fire Commander 3	X	X	X		Fire Comm 3	CDR 3
Fire Commander 4	X	X	X		Fire Comm 4	CDR 4
Fire Evac Alert	X				Fire Evac	FEVAC
First Responder 1	X	X	X		Fire Resp 1	RSP 1
First Responder 2	X	X	X		Fire Resp 2	RSP 2
First Responder 3	X	X	X		Fire Resp 3	RSP 3
First Responder 4	X	X	X		Fire Resp 4	RSP 4
Flip Top Display	X	X	X	X	Flip LCD	FLIP
Function Recall	X	X	X	X	Func Recall	FRCAL
GPS	X	X	X	X	GPS	GPS
GPS/BT Reset (VP5000/6000 only)	X	X	X		GPS/BT Reset	BTRST
Hi/Lo Power	X	X	X	X	Tx Power	TXPWR
Home	X	X	X	X	Home	HOME
Home 2	X	X	X	X	Home 2	HOME2
Home 3	X	X	X	X	Home 3	HOME3
Home 4	X	X	X	X	Home 4	HOME4
Home 5	X	X	X	X	Home 5	HOME5
Instant Recording Replay	X	X	X	X	IRR	IRR
Key Select	X	X		X	Key Select	KYSEL
Keypad Lockout	X	X	X	X	Lock Kypad	KPDLK
Keypad Programming	X				Keypad Program	KPPRG
Man Down	X	X	X	X	Man Down	MNDWN
Man Down Clear	X	X	X	X	Man Dn Clear	MDCLR
Menu	X	X	X	X	Menu	MENU
Message	X	X	X		Message	MSG
Monitor	X			X	Monitor	MON
Monitor Rx	X			X	Monitor Rx	RXMON

Shaded features support the secondary press-and-hold function on the portable radios

Table 4.1 Programmable Option Button and Menu Mode Functions (Continued)

Function	X = Available in Mode:				Menu Display Defaults	Soft Button Alias
	Conventional	Project 25 Trunking	V16 Single & Multi Site	Conventional DMR		
Mute/Unmute	X	X	X	X	Audio Mute	MUTE
Normal/Selective Squelch Select	X			X	Squelch	SQUEL
Nuisance Delete	X	X	X	X	Nuisance Del	NUDEL
OORI Tone	X				OORI Tone	OORI
P25 Packet Data	X	X			P25 Data	DATA
P25 Two Tone List	X	X			P25 2T List	P252T
P25 Two Tone Unmute	X	X			P252T Unmute	P2TUM
Phone	X	X	X		Phone	PHONE
Priority	X				Priority	PRI
RWS List Edit	X	X	X	X	RWS Edit	RWSED
RWS List Select	X	X	X	X	RWS Select	RWSLS
Radio Info	X	X	X	X	Radio Info	INFO
Radio Wide Scan	X	X	X	X	RW Scan	RWS
Rekey Request	X	X			OTAR Rekey	OTAR
Repeater TA	X			X	Talk Around	RTA
Request to Talk	X			X	RTT	RTT
Responder Comm Check	X				Comm Check	COM C
Scan	X	X	X	X	Scan	SCAN
Scan Edit	X	X	X	X	Scan Edit	SCNED
Scan List Select	X	X	X	X	Scan Select	SCSEL
Single Tone Encoder	X			X	Single Tone Enc	SNGTN
Single Touch 1	X	X	X	X	Single Touch 1	STCH1
Single Touch 2	X	X	X	X	Single Touch 2	STCH2
Single Touch 3	X	X	X	X	Single Touch 3	STCH3
Single Touch 4	X	X	X	X	Single Touch 4	STCH4
Single Touch 5	X	X	X	X	Single Touch 5	STCH5
Single Touch 6	X	X	X	X	Single Touch 6	STCH6

Shaded features support the secondary press-and-hold function on the portable radios

Table 4.1 Programmable Option Button and Menu Mode Functions (Continued)

Function	X = Available in Mode:				Menu Display Defaults	Soft Button Alias
	Conventional	Project 25 Trunking	V16 Single & Multi Site	Conventional DMR		
Single Touch 7	X	X	X	X	Single Touch 7	STCH7
Single Touch 8	X	X	X	X	Single Touch 8	STCH8
Site Lock		X	X[1]		Site Lock	LOCK
Site Search		X	X[1]		Site Srch	SSRCH
Speaker Attenuation On/Off	X	X	X	X	Spkr Att Off (or) Spkr Att On	SPKAT
Squelch Adjust	X				Squelch Adj	SQLAD
Status	X	X	X		Status	STS
Surveillance Mode	X	X	X	X	Surv Mode	SURV
System Squelch Code	X			X	System SQC	SYSSQ
Talkgroup Lock	X				TG Lock	TG LK
Talkgroup Select	X				Select TG	TGSEL
Text Message	X	X			Text Message	TEXT
Toggle Theme Mode	X	X	X	X	Theme Mode	TMODE
Tone Vol Edit - Alert	X	X	X	X	Alert Volume	AVOL
Tone Vol Edit - Keypress	X	X	X	X	Keypress Vol	KVOL
Two Tone Encoder	X	X		X	Two Tone Enc	TWOTN
Two Tone Unmute	X			X	2T Unmute	2TUNM
Tx Contact Select				X	Tx Contact Select	TXCONT
Unit Call	X	X	X	X	Unit Call	UCALL
Unprogrammed (**Note** *The button is not used.*)	X	X	X	X		
Voice Announcements	X	X	X	X	Announcements	ANOUC
Volume Down	X	X	X	X	Volume Down	VOLDN
Volume Up	X	X	X	X	Volume Up	VOLUP
Wi-Fi (VP8000 Only)	X	X	X	X	Wi-Fi	WIFI
Zone Down	X	X	X	X	Zone Down	ZONDN

Shaded features support the secondary press-and-hold function on the portable radios

Table 4.1 Programmable Option Button and Menu Mode Functions (Continued)

Function	X = Available in Mode:				Menu Display Defaults	Soft Button Alias
	Conventional	Project 25 Trunking	V16 Single & Multi Site	Conventional DMR		
Zone Edit	X	X	X	X	Zone Edit	ZONEE
Zone Select	X	X	X	X	Zone Selct	ZONE
Zone Up	X	X	X	X	Zone Up	ZONUP
Shaded features support the secondary press-and-hold function on the portable radios						

1. Available in V16 Multi Site Mode only.

For radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later, the Armada administrator can program the minimum amount of time an applicable button must be pressed to execute its primary short press function and/or be pressed and held to execute its secondary long press and hold function. The primary function minimum press duration is controlled by the Short Press and Hold Duration setting, which is set to 0 seconds by default. The secondary function minimum press duration is controlled by the Button Press and Hold Duration setting, which is set to 1 second by default.

The Short Press and Hold Duration only affects buttons on the main screen and does not take effect within menus. This setting affects buttons differently depending on their capabilities. Buttons with only Primary short press functions execute their function immediately after the Short Press and Hold Duration has elapsed. Buttons with Primary short and Secondary long press functions behave in the following manner:

- If the button is released before the Short Press and Hold Duration, nothing will be executed.
- If the button is released after the Short Press and Hold Duration but before the Button Press and Hold Duration, the Primary short press function will be executed.
- If the button is held for the Button Press and Hold Duration, the Secondary long press function will be executed.

4.3 Feature Enable / Disable

One of the function buttons may be programmed to enable/disable certain features. These features have binary ON/OFF states, and the programmed button toggles the feature to the alternate state. Table 4.2 identifies features that may be enabled or disabled using the programmed button. One short beep indicates the feature is ON; two short beeps indicate the feature is OFF.

Table 4.2 Features That Can Be Enabled using the Function Button

Function	Conventional	P25 Trunking	Viking16	Conventional DMR
Alert Tones	x	x	x	x
Analog Noise Reduction	x		x	
Backlight[1]	x	x	x	x
Bluetooth	x	x	x	x
Clear / Secure	x	x	x	x
High / Low Power	x	x	x	x
Keypad Lock	x	x	x	x
Man Down	x	x	x	x
Monitor	x			x
Mute / Unmute	x	x	x	x
Radio Wide Scan	x	x	x	x
Repeater Talk Around	x			x
Scan	x	x	x	x
Selective Squelch (ON) / Normal Squelch (OFF)	x			x
Site Lock		x	x	
Surveillance Mode	x	x	x	x
Automatic Volume Control (AVC)	x	x	x	x
Zone Lock	x	x	x	

1. Depending on Armada programming, the radio user might have to press and hold the function button to turn the backlight off.

Enter the feature you wish to use with function buttons or the menu. Features are exited using function buttons or the (Clear) and (Menu) buttons. Function button and (Clear) button exit the feature without saving. The (Menu) button exits the feature and saves changes. Use the Left and Right buttons in ways that make sense for the specific function.

4.4 Menu Mode

Most functions that can be controlled by an option button can also be controlled by the menu mode. The functions that can be controlled by the menu mode are shown in Table 4.1. Functions can be controlled by both an option button and a menu parameter if desired.

When the menu mode is used, the (Clear) and (Menu) buttons become dedicated menu mode control switches (Figure 4.1). The (Clear) button is Back/Clear, and the (Menu) button is Menu Select/Enter. If the menu mode is disabled, these buttons can be programmed for other functions.

Figure 4.1 Menu Mode Buttons

Only the enabled menu items which apply to the selected channel type are displayed. For example, if a conventional channel is selected, only the enabled functions for conventional channels are displayed.

If “Load Menu From Last Selection” is enabled in programming, the last used menu item will be in focus when selecting menu mode.

When in the menu mode, messages continue to be received on the selected channel. However, the display does not indicate who is calling. Pressing the PTT switch exits the menu mode and keys the transmitter.

The menu mode operates as follows:

1 To select the menu mode, press the (Menu) button.

2 To scroll up or down through the menu parameter list, press the Up/Down buttons. The selected parameter is indicated by a highlighted bar.

3 To display the available modes for a highlighted parameter, press the (Menu) button. The currently selected mode is indicated by an indicator or highlighted.

4 Press the Up/Down buttons to highlight the desired mode. Then press the (Menu) button to select that mode.

5 To step back to the previous level or exit the menu mode, press the (Clear) button.

4.5 Function Recall

A function recall button or menu item can be programmed so that if the user presses this button or activates its menu item, the radio enters Function Recall mode, and the display flashes "Recall On". Pressing any button displays the function assigned to that button for a specified period. If that same button is pressed again during the specified period, the radio performs the function assigned to that button and then exits Function Recall mode.

Function Recall mode can also be exited by pressing the Function Recall button once (without pressing another function button).

Note *If the user presses a function button programmed for Emergency while Function Recall is activated, Function Recall is aborted. The radio will proceed to perform the programmed Emergency function.*

4.6 Time-Out Timer

The time-out timer disables the transmitter if it is keyed continuously for longer than the programmed time. It can be programmed for 0 to 225 seconds or it can be disabled by programming 0 seconds.

If the transmitter is keyed 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 Time Out Alert can be enabled or disabled on each conventional channel. With conventional channels, a penalty time may also be programmed that prevents transmissions for a certain time after the transmitter is disabled (Section 5.6).

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.

4.7 Home Channel Select

If the Home option button is programmed, pressing it selects the programmed Home channel. This provides a quick way of returning to a frequently used channel. Pressing and holding this button until a tone sounds makes the currently selected channel the new Home. (The radio can be programmed to ignore this press-and-hold function). A Home 2, Home 3, Home 4, and Home 5 Zone/Channel can also be programmed. If enabled by Armada programing, pressing the button again while still on the programmed home channel will cause the radio to revert to the channel the radio was on prior to the first press of the home button.

If a radio is programmed to use the “Selected” channel as a Home channel, then the “Selected” setting is not overwritten by a Home button Press and Hold.

Note *The radio can be optionally programmed so that pressing and holding the Home option button 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 both be set to “Selected” simultaneously. The same applies for Home Zone/Channel 2, 3, 4, and 5. If any of the Home Zones are set to “Selected”, then Home Channels, respectively, will populate with channels 1 to 256.

If the user programs any of the home channels to a channel that is unprogrammed in the “Selected” zone, the display will show “Unprogrammed” and the unprogrammed channel tone will be heard. The radio is not in a locked state. Changing the channel or zone to a valid channel will allow normal radio operation.

4.8 Zone Edit

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

The Zone Edit feature is intended to allow a user to create a "favorite channels" zone. The Zone Edit feature can be programmed as a button or menu function as long as an editable zone exists. It can be toggled on or off on a per-zone basis using Armada. When enabled, it allows you to copy and delete existing channels from a zone, as long as that zone is programmed as editable using Armada.

⚠ CAUTION *Only program empty zones as Zone Editable. Otherwise, you can lose channels.*

Any channel in the radio can be copied but only channels within an Editable Zone can be deleted or overwritten.

- Zone Edit mode can be entered by pressing a button or through the menu.
- A momentary button press performs *channel copy*.
- A press-and-hold performs *channel delete*.

To copy a channel:

1. Navigate to the desired channel and select "Channel Copy" or momentarily press **Zone Edit** button. The channel is now stored in memory and the user must pick a destination for the stored channel.
2. Select the destination, first the zone and then the channel. Only zones programmed as editable get displayed. To select these, use either the navigation pad or direct entry.
3. If the destination channel exists, it gets overwritten without warning. If the destination channel is unprogrammed, the channel gets copied to the unprogrammed channel location.

When deleting a channel, first select a zone and then select 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.)

⚠ CAUTION *Any changes using Zone Edit will be permanent. Your system administrator can reverse these changes using Armada programming software.*

Table 4.3 shows conditions in which copy and delete functions are allowed.

Table 4.3 Channel Conditions for Copy and Delete Functions

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

4.9 Power Output Select

Each conventional channel, P25 Trunked, and Viking16 system can be programmed for high, low, or switchable power. If the High/Low Power option button or menu parameter is programmed and selectable power is programmed on the current channel or system, high and low transmitter power can be selected. All models support high and low power. The low power level is typically 1 watt and the rated power output level of the radio at the high power level is typically 3 - 5 watts, depending on frequency band.

The new level is flashed in the display as either “High Power” or “Low Power”. If selectable power is not permitted on the current channel, “Fixed Low” or “Fixed High” is flashed and no change occurs. The selected power level for a channel or system is permanent until it is manually changed again. The low power mode may be automatically selected during a low battery condition.

Radios using Firmware Version 8.34.x or later that have the custom power option set support custom high- and low-power levels. The Armada administrator can configure these custom power levels on a per-system basis. For more details, refer to the Armada help topics *Conventional Power Levels*, *P25 Trunking Power Levels*, and *V16 Power Levels*.

4.10 Alert Tone Select

The various alert tones that sound are described in Section 3.8. These tones can be turned ON and OFF if the Alert Tone option button or Tones menu parameter is programmed. When all tones are OFF "Tone Off" is momentarily displayed, and when all tones are on, "Tone On" is momentarily displayed. If this button or menu parameter is not programmed, tones are fixed in the on or off mode by programming. If the Surveillance mode is programmed (Section 4.13), 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 Tone Volume Adjust option button or menu parameter is programmed. Relative levels of -100 to +100 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.

4.11 Custom Tone Assignment

Custom tones can be assigned to some tone types and can be programmed to play for certain events. The tone and event types that are available for Tone Assignment programming differ by system type, but include Emergency Ack, Talk Permit, P25 Two Tone, Interconnect, Two Tone, Unit Call, Call Alert, Text Message, Status, and Talkgroup (DMR Conventional only).

For radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later, the following tone and event types are available for custom tone assignments in addition to those mentioned above:

- Priority Call Alert in Conventional, P25, and DMR Conventional systems. The Priority Call Alert setting must be enabled to program the tone assignment for Priority Call Alert.
- Busy Tone and Denied Tones in P25 Trunking systems.

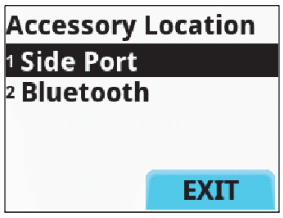
For details on custom tone configuration, refer to the Armada help topic *Customizable Tones*.

4.12 Accessory Switching

For radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later, the Armada administrator can program multiple accessory profiles, each containing a pair of audio profiles, an accessory button profile, and an accessory type. The user is then able to select different accessory profiles at will if the Accessory Select function button or menu item is programmed. Proceed as follows to select an accessory profile:

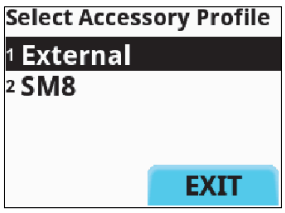
1 Press the Accessory select button or select that menu parameter. The Accessory Location menu is displayed (Figure 4.2).

Figure 4.2 Accessory Location Menu



2 Press the Up/Down buttons to display the connection location of the desired accessory profile and press the (Menu) button to select it. The Select Accessory Profile menu appears (Figure 4.3).

Figure 4.3 Select Accessory Profile Menu



3 Press the Up/Down buttons to display the desired accessory profile and press the (Menu) button to select it. If an accessory location does not have a configured accessory profile, a temporary “No Accessories Programmed” message will be displayed (Figure 4.4). Exit this mode by pressing the Accessory Select option button again or (Menu) button.

Figure 4.4 No Accessory Programmed Message

4.13 Surveillance Mode

Surveillance mode is a programmable option that can be used to totally disable the backlight, all alert tones, and front panel LED indicator in all operating modes. The radio can be fixed in this mode by programming or it can be turned on and off by the user if the Surveillance Mode option button or menu parameter is programmed. The user selected mode permanently overrides the programmed mode if applicable.

The transmit/receive LED indicator, display and keypad backlight, and all alert tones can be programmed to be disabled. When "Enabled on Startup" 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 button.

4.14 Scanning

Scanning can be performed in the Priority Scan Mode or the Radio Wide Scan Mode. Scanning monitors the channels in the scan list for traffic that the radio is programmed to receive. When traffic is detected, scanning stops and the message is received. Shortly after traffic is complete, scanning resumes.

If programmed, auto scanning and auto radio wide scanning can be enabled on a per channel setting. If enabled for a channel, the radio begins to scan automatically after changing to that channel.

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 times out after seven seconds of inactivity. If the scan edit mode times out, or the user exits the mode using the exit button or the scan list edit function button, the radio shall save the changes to the scan list and restart scan.

Note *If your radio gets programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally entering scan list edit mode.*

There are two basic scan modes available: Priority (Standard) and Radio Wide. The operation of the priority type is unique to the type of channel selected, and the operation of Radio Wide type is the same regardless of the type of channel selected. Only one type can be enabled at a time. For example, if priority scanning is enabled and radio wide scanning is selected, priority scanning is automatically disabled and vice versa. More information on these types of scanning follows.

4.14.1 Priority Scanning

Priority scanning (also referred to as standard scan) 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 Project 25 Trunked Viking16, and DMR Conventional channels.

More information on how priority scanning operates in the Conventional Mode is located in Section 5.11, for DMR Conventional Mode in Section 7.12, and for the other modes in Section 6.11. Priority scanning is turned on and off by the Scan option button or menu parameter as follows. If this button or menu parameter is not programmed, Priority scanning is not available.

- Enable scanning using the Scan option button or menu parameter. Scanning is enabled when "Scan On" is briefly displayed and the  icon is indicated.
- To turn scanning off, press the Scan option button again or select "Off" in the scan menu. Scanning is disabled when "Scan Off" is briefly displayed and the  icon is no longer indicated.

Note *If your radio gets programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally turning off priority scanning.*

- If the zone or channel is changed while scanning is selected, scanning continues on the same or a different scan list. Refer to Section 4.14.5.1.2.

Note *Each Conventional, P25 Trunked, and Viking16 channel can be programmed so that scanning or radio wide scanning is automatically enabled when the channel is selected.*

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

Conventional and DMR Conventional Operation - Transmissions can be programmed to always occur on the selected or active channel (if applicable). Refer to Section 5.11 for more information.

P25 Trunked/Viking16 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.

4.14.2 Radio Wide Scanning

Radio wide scanning monitors the channels in the programmed radio-wide scan list. This scan list can include up to 255 channels of any type and assigned to any zone. Refer to Section 4.14.5.2. Radio wide scanning is turned on and off by the Radio Wide Scan option button or menu parameter as follows:

- Enable Radio Wide Scanning using the Radio Wide Scan option button or menu parameter. Radio wide scanning is enabled when “RW Scan On” is briefly displayed and the icon is indicated.
- To turn radio wide scanning off, press the Radio Wide Scan option button again or select “Off” in the menu. Scanning is disabled when “RW Scan Off” is briefly displayed and the icon is no longer indicated.

Note *If your radio gets programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally turning off radio wide scanning.*

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

Priority sampling is not available when using Radio Wide Scan.

Note *Use radio wide scanning only if two different channel types need to be scanned at the same time such as conventional and Viking16. Otherwise, use the more efficient “Priority Scan” feature, which has less chance of missed scanned traffic. Each Conventional, P25 Trunked, and Viking16 channel can be programmed so that scanning or radio wide scanning is automatically enabled when the channel is selected.*

The radio can be programmed to transmit on the selected or active channel similar to P25 trunked and Viking16 operation just described.

4.14.3 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 ensures that a response is heard instead of 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 2-7.5 seconds are programmable in 0.5-second steps. With priority scanning, delays of 0-7.5 seconds are programmable in 0.5-second steps in Conventional. With P25 Trunked and Viking16 scanning, scan delays of 0-8 seconds can be programmed in 0.5-second steps.

If your radio uses Firmware Version 8.18.x or later, if the radio is in scan hold time, the scan icon appears and is flashing. After the radio goes back to scanning channels, the scan icon is on continuously.

4.14.4 Nuisance Channel Delete

With priority scanning, channels can be temporarily deleted from the scan list, for example, if messages become annoying. Channels can also be permanently added or deleted from a scan list as described in the next sections. Use the following steps to temporarily delete a nuisance channel:

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

Note *If your radio uses Firmware Version 8.30.x or later, programmed by Armada 1.30.x and later, Radio Wide Scan Nuisance Delete is available.*
If your radio uses Firmware Version 8.32.x or later, programmed by Armada 1.32.x and later, Force Auto Scan Nuisance Delete is available.

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

Note *If your radio is programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally turning off nuisance channel delete.*

2 Deleted channels are added back into the scan list based on Armada programming and specific user actions:

- The selected channel is changed (Nuisance Delete Mode = Reset on Channel Change)
- The selected zone is changed (Nuisance Delete Mode = Reset on Zone Change)
- Radio power is turned off and then on again (Nuisance Delete Mode = Reset on Power)
- Scan or Radio Wide Scan is turned off and then on again (Nuisance Delete Mode = Nuisance Delete Mode = Reset on Scan Toggle)
- For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the radio user can use the left and right navigation pad buttons to add deleted channels back into the scan list.

4.14.5 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. "Reset Lists" will be displayed. Pressing the select key will reset the lists and "Lists Reset" will be temporarily displayed before returning the user to the main display. 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 won't be implemented though a menu item.*

Note *If your radio gets programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally entering scan list edit mode.*

4.14.5.1 Group / Priority Scan Lists

A scan list is 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 scan list can include up to 255 channels/talkgroups. More information on selecting and editing priority scan lists follows.

Note *The selected channel is always scanned.*

4.14.5.1.1 Determining Channels in Priority Scan List

The channels in conventional priority scan lists are indicated by selecting the scan mode as follows. Channels in P25 Trunked/Viking16 priority scan lists are indicated only when editing a scan list (see "Editing a Priority Scan List" which follows).

1. Enable priority scanning using the Scan button or menu parameter. 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 channel switch. When the displayed channel is in the scan list (scanned normally), the [S] icon is displayed.

4.14.5.1.2 Selecting a Priority Scan List

Conventional systems can be programmed with a scan list that is normally selected by all channels in that system.

The default scan list can be temporarily changed by using the Scan List Select option button or the menu parameter. A scan list selected in this manner is retained through radio power down.

Note *If your radio gets programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally using **Scan List Select**.*

Conventional, Project 25 Trunked, and Viking16 Channels - Each channel (talkgroup) can be programmed so that one of the programmed lists is selected or scanning is disabled (No List). In addition, channels can be programmed so that scanning or radio wide scanning is automatically enabled (Auto Scan) when they are selected.

If the Scan (List) Select option button or menu parameter is programmed, the list that is selected by all talk and announcement groups in the current system can be temporarily changed by the user as follows. “None” (scanning disabled) or “Programmed” (default list) can also be selected if desired. The temporary programmed scan list is retained through radio power down.

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 5.11.1 for more information. To change the currently selected scan list (all channel types), proceed as follows:

1 With scanning disabled, icon not displayed, press the Scan List option button or select the Scan Selct menu parameter.

2 The currently selected list is displayed as “List x”, where “x” is the currently selected list. To exit without changing the selected list, press the Scan List option button again or the (Clear) button.

3 To select another list, press the Up/Down buttons. When the desired list is displayed, press (Menu) to select it and (Clear) to exit this mode.

Note *If your radio gets programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally using **Scan List Select**.*

4.14.5.1.3 Editing a Priority Scan List

If the Scan Edit option button or menu parameter is programmed, conventional, P25 Trunked, and Viking16 priority (standard) scan lists can be user programmed if programmed as User Editable. 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 (and icons not displayed). Select a conventional or P25 Trunked/Viking16 channel corresponding to the scan list being programmed.

2 Select the scan edit mode using the Scan Edit option button or menu parameter. This mode is indicated by in the display.

3 If applicable, select the list to be edited by pressing the Up/Down buttons. Select the desired list by pressing the (Menu) button. The selected list is indicated as “List x”. If user programming is disabled on a list, (conventional only) “No Edit” is momentarily displayed and it cannot be edited.

4 Select the channel you want to add or delete by pressing the Left or Right buttons. 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. If an attempt is made to add more than that, “List Full” is displayed and a channel must be deleted before another can be added.

- For conventional and P25 Trunking radios using Firmware Version 8.34.x or later, the operator can do the following:
  - Press and hold the ▲ button to select the first channel of the next zone.
  - Press and hold the ▼ button to select the last channel of the previous zone.
  - Press the Select button to skip to the next channel in the scan list. [Select no longer saves and exits from the menu.

Note *Priority channels can be modified if your radio’s programming allows it.*

5 If the selected channel is in the scan list (scanned), the S icon is displayed. To change the status of the displayed channel, press (Menu) to save the changes to the scan list

If the selected scan list is programmed with fixed priority channels, the next press of the Right button makes the current channel the priority channel indicated by P. If dual priority channels are used, pressing the Right button again makes it the second priority channel indicated by P2. Then pressing the Right button again takes the channel out of the scan list. A priority channel will be enforced for “Priority on Programmed” scan lists. For radios using Firmware Version 8.18.x or later, the user can remove a priority channel for a “Priority on Programmed” scan list if the Armada administrator programmed the radio to do so. This allows the removal of a priority channel on a "Priority on Programmed" scan list so that the list can be emptied through scan edit. It now also forces a priority channel. If the user begins with an empty "Priority on Programmed" list, the first channel added will be forced to Priority 1. If that list is not editable for the priority channel, the priority channel can’t be changed except through Armada.

Refer to Section 5.11.3 and Section 6.11.1 for more information on priority channel sampling.

6 To exit this mode and save the changes, press the (Menu) button.

- For conventional and P25 Trunking radios using Firmware Version 8.34.x or later programmed by Armada 1.34.x and later, the SAVE soft button appears only after a change has been made to the scan list. In this case, The SAVE soft button takes the place of the EXIT soft button. The operator must press SAVE to save changes. A banner temporarily displays the message, “Saving,” to confirm this. After the user presses SAVE, the soft button gets replaced by EXIT. Pressing EXIT exits the menu as before. (The operator can exit without saving by pressing the BACK soft button.)

4.14.5.2 Radio Wide Scan Lists

With radio wide scanning, up to 255 scan lists can be programmed. 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.

4.14.5.2.1 Determining Channels in Radio Wide Scan List

The channels in radio wide scan lists are determined by selecting the scan list edit mode (see “Editing Radio Wide Scan List” which follows). When the displayed channel is in the radio wide scan list (scanned normally), the icon is displayed.

4.14.5.2.2 Editing a Radio Wide Scan List

If the RWS Edit option button or menu parameter 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. You can edit Scan Lists and utilize Scan List Select while Scanning is enabled. The radio app will "pause" the scan or radio wide scan feature and resume it upon exiting the menu. The radio will not actively scan while in scan edit or scan list select menus. If you attempt to edit a Radio Wide Scan list in this example, it will "pause" the Radio Wide Scanning and allow you to edit the lists (and vice versa for Scan Lists with Scan Mode).

2. Select the scan edit mode using the RWS Edit option button or menu parameter. This mode is indicated by the  (Edit) icon in the display.

3 Select the channel you want to add or delete by pressing the Left/Right buttons. 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.

- For conventional and P25 Trunking radios using Firmware Version 8.34.x or later programmed by Armada 1.34.x and later, the operator can do the following:
  - Press and hold the ▲ button to select the first channel of the next zone.
  - Press and hold the ▼ button to select the last channel of the previous zone.
  - Press the Select button to skip to the next channel in the scan list. [Select no longer saves and exits from the menu. The operator must press SAVE to save changes. SAVE does not appear until the operator makes a change. SAVE does not exit the menu. After the operator presses SAVE, the button changes back to EXIT, which functions as expected. (If the operator presses Select when the list is empty, a "List Empty" error banner appears.)]

4 If the selected channel is in the scan list (scanned), the icon is displayed. To change the status of the displayed channel, press the Left or Right button.

5 To exit this mode and save the changes, press the (Menu) button.

- For conventional and P25 Trunking radios using Firmware Version 8.34.x or later programmed by Armada 1.34.x and later, the SAVE soft button appears only after a change has been made to the scan list. In this case, The SAVE soft button takes the place of the EXIT soft button. The operator must press SAVE to save changes. A banner temporarily displays the message, "Saving," to confirm this. After the user presses SAVE, the soft button gets replaced by EXIT. Pressing EXIT exits the menu as before. (The operator can exit without saving by pressing the BACK soft button.)

4.15 Location Services

In Conventional P25 and P25 Trunking systems, Location Services refers to a set of functions that 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.

A radio with a GPS receiver is required. 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 the "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). KENWOOD 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. Messages sent from the radio to the LSHS can be either confirmed or unconfirmed.

For radios using Firmware Version 8.34.x or later, the Armada administrator can program the radio to send triggers as either confirmed or unconfirmed data. Sending triggers as unconfirmed data can reduce the use of system resources and prevent hindering the shutdown process. (Radios with earlier firmware always send confirmed data.)

Table 4.4 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	Send Type
Immediate-Location-Request	Sent from the LSHS to the radio. The radio responds with data or an error.	n/a
Immediate-Location-Report	Sent from the radio to the LSHS in response to the Immediate-Location-Request.	Unconfirmed
Triggered-Location-Request	Sent from the LSHS to the radio. Radio determines if it can do the specified trigger and responds.	n/a
Triggered-Location-Answer	Sent from the radio to the LSHS in response to the Triggered-Location-Request. Contains information about whether the radio can support the requested trigger.	Confirmed
Triggered-Location-Report	Sent from the radio to the LSHS when an LSHS requested trigger happens.	Armada Configured
Triggered-Location-Stop-Request	Sent from the LSHS to the radio to tell it to stop doing a previously specified trigger.	n/a
Triggered-Location-Stop-Answer	Sent from the radio to the LSHS to acknowledge the Triggered-Location-Stop-Request.	Confirmed

Table 4.4 Supported LRRP Messages (Continued)

Message	Description	Send Type
Unsolicited-Location-Report	Sent from the radio to the LSHS when the user sends data using the "Display GPS" function or when an Armada programmed trigger is activated.	Mixed[1]
Location-Protocol-Request	Sent from the LSHS to determine the LRRP protocol version for the radio. Sent from the radio to the LSHS for tier 2 location services registration.	Mixed[2]
Location-Protocol-Report	Sent from the LSHS or the radio in response to the Location-Protocol-Request.	Confirmed
Notes	*[1]All Unsolicited-Location-Reports follow the Armada configuration apart from the Power Off Trigger which is always Unconfirmed to prevent hindering the shutdown process.* *[2]Location-Protocol-Requests sent from the radio are Confirmed during registration and Unconfirmed during de-registration.*	

Triggers are divided into two types: One Shot triggers happen once and then are done. Periodic triggers happen periodically and keep happening. 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 in Armada. Triggers marked with an asterisk (*) in Table 4.5 are programmable in Armada.

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 Armada.

For radios using Firmware Version 8.34.x or later, the Armada administrator can program the radio to triggered location reports on power on and power off. The power on trigger gets sent the first time the radio receives IP context and valid GPS data. The power off trigger gets sent during the shutdown process if the radio has IP context and valid GPS data.

Table 4.5 shows the triggers supported by the VP Radios. 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.
One Shot Status	This trigger happens after a Status Message gets sent. Refer to Section 4.17.4.

* Programmable in Armada.

Table 4.5 Supported Triggers (Continued)

Trigger	Description
One Shot Power On*	This trigger happens once the radio receives an IP context and valid GPS data after power on. This trigger is only programmable in Armada and cannot be activated through LSHS request.
One Shot Power Off*	This trigger happens on power down if the radio has an IP context and valid GPS data. This trigger cannot be activated through LSHS request.
Periodic*	This trigger happens every period specified by the Triggered-Location-Request.
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.
Periodic Low Battery*	This trigger will begin when the radio's battery level is low and will continue to activate every 30 seconds. This trigger is only programmable in Armada and cannot be activated through LSHS request.
Periodic Status*	This trigger happens every time the user sends a status to the system. This location report will also contain a Status ID. This trigger is only programmable in Armada and cannot be activated through LSHS request.

* Programmable in Armada.

This section contains information on the following topics:

- Location Services Registration
- Radio-to-Radio Location Data Forwarding

4.15.1 Location Services Registration

The Location Services Host System (LSHS) sends and receives LRRP messages. Messages going from the LSHS to subscribers are used to request data or set up triggers. Messages going from subscribers to the LSHS are used to report location data that can be stored or displayed by the LSHS.

The radio communicates with the LSHS when Tier 2 Location Service is activated or deactivated. This allows the LSHS to learn the IP address of the radio and/or verify the radio is authorized to use the service. (For more details regarding the exact procedure and protocol, refer to the TIA-102.BAJC document.)

Note *For anyone implementing an LSHS that will interface with EFJohnson radios, EFJohnson strongly suggests that they use the open source EXIP library. EFJohnson can supply a library that provides EXIP and an interface that allows users to decode and encode messages.*

The Armada administrator can configure the radio to register with the LSHS.

This section contains information on the following topics:

4.15.1.1 Register Procedure

Whenever the radio enters either a conventional digital or P25 trunking system with data registration enabled, location services enabled, and location services registration enabled, the tier 2 location services registration process will begin. The radio will send a location-protocol-request (LPQ) to the LSHS containing the ASCII string “524547”, meaning “REG”. Upon receiving the LPQ, the LSHS will determine if the radio is authorized to register to the service.

If the radio is authorized, the LSHS will send a location-protocol-report or LPR to the radio containing the ASCII string “xx484F555253”, where 484F555253 means “HOURS”, and xx being replaced with hexadecimal values “31” through “39” representing numbers 1 through 9. The radio is considered successfully registered for the number of hours specified in this LPR.

If the radio was not authorized to use the service, the LSHS will send a location-service-response to the radio with the result-code set to “UNKNOWN SUBSCRIBER”. The radio will stop trying to register with the system.

4.15.1.2 Re-Register Procedure

When the registration period expires, the subscriber starts to try and register again with the system. The radio will send an LPQ to the LSHS containing the ASCII string “5245524547”, meaning “REREG”. Upon receiving the LPQ, the LSHS will first check if the radio is already registered, then respond with an LPR identical to the register procedure in 6.1.1 if the radio is no longer registered.

4.15.1.3 De-Register Procedure

If the radio is successfully registered with the LSHS, it will attempt to de-register when leaving the system, either on a channel change or power-down. The radio will send an LPQ to the LSHS containing the ASCII string “4445524547”, meaning “DEREG”. Upon receiving the LPQ, the LSHS will no longer consider the radio to be registered. The LSHS does not respond to the LPQ.

4.15.2 Radio-to-Radio Location Data Forwarding

Radios using Firmware Version 8.40.x or later support location data forwarding. This allows location data to be sent between an LSHS and one or more radios with the use of a “central” radio connected to the LSHS through Precise Point Positioning (PPP). This functionality is only supported on digital conventional channels.

To forward location data, the radios must have IP context. A static IP context is considered valid if the Data Registration Type is set to Static, and either the Data Peripheral Mode or the Location Services Bearer is set to Direct or Repeated. The Common Air Interface (CAI) IP Address configured in the Data Services page will act as the subscriber’s static IP address.

To relay data between the LSHS and the other radios through PPP, the central radio must set the Data Peripheral Mode to either Direct or Repeated. This radio must also either disable Location Services or use a Location Server port that is unique from the radios that location data is being received from.

Radios intended to send in location data must set their Location Services Bearer to either Direct or Repeated. Next, the Location Server Address must be set to be the central radio’s CAI IP address. Upon receiving this location data, the central radio forwards these packets to the LSHS through PPP.

4.16 Global Positioning System (GPS)

If this feature is enabled, GPS data can be viewed using P25 Trunked, Conventional, and Viking16 Systems. GPS data can be received from satellites. This is possible with the radio's embedded GPS, Internal GPS feature enabled, and Internal GPS programmed as the GPS data source. The radio can send the data as P25 data on properly configured digital conventional and digital P25 trunking systems.

4.16.1 Viewing GPS Data

To use the GPS feature (on a properly configured radio):

1 Turn on GPS.

2 Wait until the GPS receiver acquires enough satellites to obtain a valid position fix. This will be indicated by the appearance of the satellite icon on the display.

Note *It may take up to ten minutes, depending upon signal conditions, for the GPS receiver to obtain a position fix. Flashing bars on the GPS icon indicate that the receiver has yet to obtain a position fix.*

3 When the satellite icon's bars stop flashing, press the assigned Display GPS button (or select Display GPS from the menu). One of the following GPS data items will then be displayed:

- Latitude (for example, 40° 55.32'N)
- Longitude (for example, 90° 23.41'W)
- Lat/Long Acc in feet or meters (for example, 390.2)
- Altitude in feet or meters (for example, 390.2)
- Ground Speed (for example, 55.5 MPH)
- Vert Speed (for example, 55.5 MPH)
- Course (for example, 183.4°)
- Time (for example, 14:23:15)
- Date (for example, 2011/11/26)
- Number of satellites that the receiver is currently receiving

4 You can cycle through the data items using the "Up" and "Down" buttons. If data is not available for an item, the display shows a - (dash).

Note *The GPS viewing mode remains active indefinitely unless Exit GPS Display on PTT is programmed and the user PTTs.*

5 To exit GPS viewing, press the assigned Display GPS button or press the ⮌ (Clear) button.

4.16.2 Sending GPS Data

GPS data can be sent to a properly configured repeater (digital conventional and digital P25 trunking only). It can be sent manually, automatically, or on system request, depending upon the options enabled. Refer to trigger information in Section 4.15

4.16.2.1 Manually Sending GPS Data

If so configured, the radio will send GPS data (to a properly configured repeater) when the assigned Display GPS button is pressed and held, or when Send is selected from the Display GPS menu item.

4.16.2.2 Automatically Sending GPS Data

The radio can send GPS information automatically. Refer to Table 4.5

4.16.2.3 Sending GPS Data in Response to System Request

If so configured, the radio accepts P25 data requests for GPS data, and responds (over the air) with the current GPS data. Refer to trigger information in Section 4.15.

4.16.3 Built-In GPS Receiver

The VP5000/VP6000/VP8000 models use a built-in GPS receiver. Read the following warnings before using these models' built-in GPS receiver.

For VP5000/6000 radios, the following frequency ranges are known to create interference in GPS satellite acquisition and/or operation:

- 391.21 MHz~396.5 MHz
- 793.00 MHz~795.00 MHz
- 142.74 MHz~143.70 MHz
- 146.90 MHz~147.10 MHz (Rx)
- 157.00 MHz~158.09 MHz

Using GPS while operating the radio within these frequency ranges is not recommended. When the GPS receiver is used along with radio operation in these frequencies, the GPS receiver may not position normally as follows.

- When using the GPS:

  Frequency interference in the GPS receiving frequency range may prevent the GPS receiver from operating normally.

  If the GPS receiver positions during transmission:

  - The GPS receiver may be unable to position if the transmit spurious emission of the radio interferes within the GPS receive frequency range.
  - The interference to the GPS receiver changes depending on the transmission power of the radio. Greater transmission power results in a higher probability of being unable to position.

  If the GPS receiver positions during reception:

  - The GPS receiver may be unable to position if the harmonics of the radio's oscillator interfere within the GPS receive frequency range.

  Effects of other interfering frequencies (such as other radios transmitting):

  - The GPS receiver may be unable to position if frequencies emitted from other radios and electronic equipment interfere within the GPS receive frequency range.

- Because the GPS receiver unit consumes more power when powered on compared to when powered off, the battery life of the radio becomes shorter compared to when the built-in GPS receiver unit is powered off.

4.17 Radio Service

If the radio is not responding to any button/key presses, the keypad may be locked.

If "Unprogrammed" is displayed, the cause could 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. Reprogram the radio.

If no characters appear in the display, the battery may be discharged or defective. Try another battery. 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. If it still does not operate correctly, return it 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.*

4.18 Fire Ground Mode

The Fire Ground Mode allows any radio optioned for Fire Ground Commander Mode to operate in Fire Commander Mode, and any subscriber optioned for Fire Ground First Responder mode to run in Fire Responder Mode. A radio can be programmed for both modes; however, the radio can only operate in one of the modes at a time. The user must exit the current mode to enter the opposite mode. Fire Ground First Responder is available on P25 Trunking and Viking16 channels. The Fire Commander Mode is limited to the Conventional System. If the Fire Ground Channel is not a Conventional channel and the user tries to enter Commander Mode on that channel, the radio will bad beep. The only Fire Mode feature currently offered on the P25Trunking and Viking16 protocols is the Lock Keypad/Volume option.

The intended set up is to have one radio running in Fire Commander Mode, and remain outside the emergency site. The remaining radios operating at, and inside, the emergency site should operate in Fire Responder Mode. The Fire Commander can issue Evacuation Alerts to notify the First Responders they must evacuate. The Fire First Responders can perform a Communication Check to determine their signal strength to ensure they are in range of the Fire Commander.

Each radio can be programmed for up to four Fire Commander buttons (Fire Commander 1 through Fire Commander 4), and up to four Fire First Responder buttons (Fire Responder 1 through Fire Responder 4). Each Fire Mode can be selectively programmed for specific Fire Commander and Fire Responder options. Each Fire Mode can also be programmed to operate on a designated channel or the current selected channel. If a designated channel is chosen, the radio will automatically switch to the designated channel when that Fire Mode is entered.

There are times when P25 digital voice is better than analog voice. Under these circumstances it is best to operate in the P25 digital voice mode. If programmed, the radio will change its transmit mode, based on signal strength, from analog to P25 Digital. If the radio receives carrier with a RSSI below the Fair RSSI threshold, the radio will automatically switch its transmit type from analog to P25 Digital. This will be evident as the received audio should sound suddenly clear without background static as heard on an analog channel.

Locked Radio Option - The user can choose to have different radio controls locked while in Fire Mode and is set by programming. If this option is enabled, the radio will lock the top and side buttons. Additionally, the radio can be programmed to lock the Channel Selector, Volume Knob, Front Only Keypad, and Toggle switch. No matter the keypad lockout options programmed, in Fire Mode the subscriber will always allow the buttons for Emergency, Comm Check, Evac Alert, and the button programmed to initiate Fire Mode, as it will be used to cancel Fire Mode. The radio will not power down while in Fire Mode. Fire Mode must manually be exited for power down to occur.

Out of Range - When programmed, the Fire Commander will send out a beacon at the programmed beacon time interval. If the Fire Responder does not receive a carrier event, with an RSSI above the OOR threshold, within its programmed OOR Inactivity Duration time, it will go OOR to notify the user they are no longer in receiving range of the Fire Commander radio.

An Out of Range Beacon can be programmed for the Fire Commander in five second intervals from 5 to 80 seconds. When programmed, the Fire Commander will send out a beacon at the programmed interval. An Out of Range Indicator can be programmed for the First Responder in five second intervals from 7 to 82 seconds. When programmed, if the First Responder fails to receive a beacon from the Commander for the programmed duration, the First Responder will emit an OOR tone and display “Out of Range” on the display until a carrier event with an RSSI level above the OOR RSSI threshold is received.

Note *The slight offset between timers is necessary to avoid the radio momentarily going out of range and then back in range.*

Communications Check can be programmed to any radio, but is intended for, and only works with Fire Mode radios. Only radios that are optioned for Fire Ground First Responder, and currently in Fire Responder mode, can issue a "Responder Comm Check." When pressed, the responder will sound one of several tones to indicate the RSSI range the Responder radio is currently in. This feature will only work on digital channels and can only be programmed as a function button.

When the "Responder Comm Check" button is pressed on a Responder radio, the Responder requests the current RSSI level from the Commander radio. If in range, the Commander radio will respond with the RSSI level. If the RSSI level is Excellent or Good, the Responder will sound a Talk Permit Tone. If the RSSI level is Fair, the Responder radio will sound two beeps. If the RSSI level is Poor or OOR, the Responder radio will sound four beeps. Please refer to the Conventional RSSI Guide for a list of RSSI thresholds to use when programming this feature.

This feature makes use of the P25 Signaling Retry Attempts and Retry Response Timer settings defined for the radio. If the Comm Check retries to completion and the Responder Out of Range Indicator feature is enabled, the radio will go Out of Range. If not enabled it will display No Ack for two seconds.

Responder Comm Check works in either simplex mode or through a repeater configured for data repeat mode, both of which require a Responder and Commander radio. Currently the EFJohnson system infrastructure does not support the process of Comm Checks so a Commander radio is required.

Evacuation Alert can be programmed to any radio, but is intended for, and only works with Fire Mode radios. The Evac Alert is sent by the Fire Commander radio and received by the Fire First Responder. The Fire First Responder radio will warn the user with an Evac Alert tone and message to notify the user to evacuate. This feature will only work on digital channels and can only be programmed as a function button.

Any radio can program a Fire Evac Alert button; however, only subscribers that are optioned for Fire Ground Commander, and currently in Fire Commander Mode, can issue a Fire Evac Alert. A press and hold is required for activation. If an Evacuation Alert message is received by the Fire Responder radio, the subscriber will flash "Evac Alert" on the display and sound the Evacuation Alert tone.

Any button press will silence the Evac Alert tone but only a PTT press will cancel the Evac Alert display message and exit the Evac Alert state. A Fire Responder subscriber will only process one Evac Alert message every 60 seconds to avoid multiple Evac Alert tones sounding. This feature makes use of the P25 Signaling Retry Attempts and Retry Response Timer settings defined for the radio.

Evac Alert works in either simplex mode or through a repeater configured for data repeat mode, both of which require a Responder and Commander radio. Currently the EFJohnson system infrastructure does not support the sending of Evac Alert messages so a Commander radio is required.

The **Audible RSSI** can be programmed to provide the Fire First Responder an audible indication when the RSSI drops below certain thresholds indicating a poor coverage area. When enabled, the First Responder radio will measure RSSI at the beginning of a call and may provide tone notifications after the call is over. Table 4.6 summarizes the tones heard in each RSSI range.

Table 4.6 RSSI Tones (Fire Ground Mode)

RSSI Level	RSSI Indicator Bars	Tone Heard
Above Good	3 or 4 bars	No tone
Above Fair, Below Good	2 bars	2 beeps
Above OOR, Below Fair	1 bar	4 beeps
Below OOR	"X"	4 beeps

4.19 Over the Air Programming

OTAP is an "Over the Air" programming feature for the radio parameter (code plug) files that may be purchased from EFJohnson Technologies. OTAP allows administrators to perform several of Armada's functions, including

- Reading codeplugs
- Writing codeplugs
- Writing options
- Setting the radio's clock
- Reading radio information
- Identifying the radio
- Reading the audit log
- Setting the radio's security policies, wirelessly using a P25 Trunked or Conventional system.

This feature can make management of radios simpler because radios do not have to be brought to a centralized point to be reconfigured. Instead the radio can be reconfigured while it is in the field.

4.19.1 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: “Update on Reboot” or “Activate Immediately”.

Update on Reboot

- The new parameters are not automatically written to the EEPROM upon successful download. The radio needs to be reset manually, power switch off back to on again, to successfully complete the download.

Activate Immediately

- The new parameters are automatically written to the EEPROM upon a successful download. The radio is reset upon completion of the download.

4.19.2 OTAP Transfer Times

⚠ CAUTION
Larger files tie up the radio for a long time. Files larger than 1 MB after compression will not transfer using the OTAP procedure. A user event such as a channel change or zone change can cause the radio to deregister with the Data Registration Service, which will cause the OTAP procedure to fail and return an error.
Low signal conditions may cause OTAP operations to fail.

4.19.3 Retries after Unsuccessful Operation

For radios programmed by Armada 1.34.x and later, if the first attempt at an OTAP operation is unsuccessful, OTAP tries the operation again a maximum of 2 times.

Note *This includes read and write of codeplugs and security policies. OTAP does not retry option writes.*

1. The first retry happens one hour after the initial failure (±10 minutes as you select).
2. The second retry happens 4 hours after the first retry fails (±10 minutes as you select).

4.20 Software Update Flexibility

Radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later have flexibility in the ways they receive their software updates.

This section introduces the following topics:

- Preauthorized Reads and Writes
- Managed Software Activation

4.20.1 Preauthorized Reads and Writes

For radios using Firmware Version 8.34.x and earlier, read and write authorization was delayed until the radio was connected and its state could be read and verified. Starting in Firmware Version 8.36.x, all writes (boot image, codeplug, security policy, options and firmware) get authorized when they are scheduled. All checks assume all scheduled writes will take place. When the write occurs, if multiple writes are pending for a given radio, all get transferred and applied at the same time.

For more details on Preauthorized Reads and Writes, refer to “Preauthorized Reads and Writes” in the Armada help topic *Write Radio*.

4.20.2 Managed Software Activation

For radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later (and OTAP server 1.36.x and later), software writes can be activated on the radio at a later time and with radio operator permission. This allows the write transfer to take place as soon as possible, but not interrupt the radio operator if they are performing a critical task or to synchronize a fleet update at a given time.

For more details, refer to the Armada help topic *Managed Software Activation*.

4.21 Radio Security

Enhanced security (Radio Security) gives radio administrators greater control over the content of their VP5000/VP6000/VP8000 radios. A radio holds a security policy and Armada administers and configures this policy. Security policies hold a set of rules that control certain actions related to a radio, such as requiring a download password or only allowing enhanced system keys (ESKs) for trunking systems. Radio Security Devices (RSDs) or passwords are used to gain authorization to a security policy. RSDs are secure USB dongles with unique information. RSDs also hold enhanced system keys.

To change a security policy or apply a security policy to a radio, the user must gain authorization using a RSD or password. This ensures only allowed parties may change the security of a radio. RSDs are physical devices that cannot be reproduced and thus provide increased security over passwords.

Radio Security Devices (RSDs) are only available from EFJohnson. An RSD may have an organization name. This organization acts as the key to unlock a security policy and apply it to a radio. RSDs are available in either parent or child configurations. Only parent RSDs may be used to authorize a security policy. Users may assign organization names to child RSDs. Additional security options are available when a policy is locked with an RSD.

RSDs may be given an alias by the user. This is to better help them keep track of which RSD is which.The RSDs themselves may be locked using a password. Armada prompts the user for this password before allowing the RSD to be used.

4.22 Auto Unmute

If the user has the radio muted, the Auto Unmute feature will automatically unmute the radio if a Call Alert, Unit Call, and/or Emergency Call is received. This is useful when a user wants to mute the radio at night. When receiving a Call Alert, Unit Call, and/or Emergency Call the radio will automatically unmute and notify the user of the event. This applies across the P25 Trunking, Conventional, and Viking16 systems.

4.23 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 Conventional, P25, Viking16, and DMR Conventional systems. On Viking16 systems the Emergency Alarm can only be received on a radio with the same Talkgroup as the sending radio. On P25 and DMR Conventional systems the Emergency Alarm can be received by any radio on the same system. On Conventional systems, the emergency alarm can only be received on a radio with the same channel as the sending radio.

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, in Scan Mode, 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.

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.

4.24 Emergency Keep Alive

For radios using Firmware Version 8.34.x or later, the Armada administrator can configure the radio to prevent it from shutting down while an emergency is active. If the power switch is still off when emergency exit occurs, the radio shuts down. Soft power down overrides this, allowing the user to initiate soft power down while the emergency is still active.

4.25 Speaker Microphone Disconnect Alarm

If programmed, an alarm will notify users if their speaker microphone becomes disconnected from their VP5000/VP6000/VP8000 radios. The entire alarm will play even if the microphone regains connection to alert the user that there was an intermittent connection.

4.26 AVC Automatic Volume Control

When enabled, Automatic Volume Control (AVC) will automatically adjust the radio's volume to compensate for outside ambient noise. The feature can be enabled using a button or the radio menu. This feature is controlled by the **Enable Automatic Volume Control by default** option on the **Global Audio** tab. This feature can be enabled/disabled using a button or the radio menu.

4.27 Analog Noise Reduction

When enabled, Analog Noise Reduction filters out background noise during transmission. This feature is controlled by the **Enable Analog Noise Reduction by default** option on the **Global Audio** tab. This feature can be enabled/disabled using a button or the radio menu.

4.28 Active Noise Reduction

Active Noise reduction is a feature on VP8000 radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later. Active Noise Reduction can be programmed in Armada to improve the intelligibility of the voice by removing background noise picked up from the microphone. The desired noise reduction configuration will depend on the type of microphone used and the user environment.

Various presets can be selected, ranging from standard to more aggressive options. Alternatively, a custom configuration can be set by adjusting the following items:

- **Noise Attenuation** - The reduction amount is relaxed in the positive direction, and the reduction amount is strengthened in the negative direction. Note that the stronger the noise reduction effect, the more likely it is that audio will be lost along with the noise.
- **Low Noise Level Adjustment** - If it is determined that the noise is low and the need for noise cancellation is low, the noise cancellation processing is relaxed to prevent deterioration of sound quality.
- **Siren** - Used to detect and suppress siren sounds.
- **Vibration** - Used to detect and suppress periodic vibration sounds.
- **Analog Enhancement** - Some further noise reduction is performed when transmitting on analog channels.

The radio can be programmed with the “Active Noise Reduction” menu item or function button. If “Off” is selected, all noise reduction features for all microphone audio profiles are disabled. If “On” is selected, the noise reduction features selected in the profiles are re-enabled.

4.29 Strong Signal Intermodulation Rejection

Strong Signal Intermodulation Rejection is a feature on VP8000 radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later. The VP8000 radios contain hardware that can be enabled to reduce intermodulation issues caused by strong signals. This is primarily to interference on LMR channels in the 700/800 MHz band caused by LTE. Strong Signal Intermodulation Rejection can be programmed by the Armada administrator using the RF AGC setting. For P25 Trunking and Viking16 systems, this feature is configured on a system-wide basis. For Conventional and DMR Conventional systems, this feature is configured on a per-channel basis.

4.30 Voice Announcements

Certain features of the radio are only accessible in specific modes of operation. Transitions between these modes are called events. Armada allows users to assign audio files for designated events. Examples of these designated events are tuning the radio to a specific zone and/or channel, turning Emergency mode, Monitor, Mute, Scan mode, Radio Wide Scan mode, etc. On and Off. When an event occurs the assigned Audio File (Voice Announcement) will play.

4.31 Radio Authentication

Each radio has an individual authentication key that is shared with the system. Therefore the system will have a key configured for every radio that can access that system. A radio can have multiple authentication keys: One for each system that it has configured. Authentication keys are loaded using a keyloader. Table 4.7 summarizes how the radio performs with various combinations of radio options and authentication keys.

Authentication requires no Armada configuration. However, the radio must be optioned with the P25 Authentication Option.

VP5000/VP6000/VP8000 radios use the VK5000 keyloader, Motorola KVL 4000, or Motorola KVL 5000 for authentication keyloading.

Table 4.7 Authentication Keys and Radio Behavior

Radio Option	Radio Contains Valid Key	System Configured for Authentication	Radio Behavior
OFF	N/A	YES	Radio is denied system access. Error message is displayed.
N/A	N/A	NO	Radio will be allowed system access without being authenticated.
ON	YES	YES	Radio will pass authentication and be allowed system access.
ON	NO	YES	Radio is denied system access. Error message is displayed.

4.32 Enhanced Vehicular Repeater System

The enhanced vehicular repeater system (Pyramid SVR-P255 vehicular repeater) provides coverage extension of VMx00 or VMx000 radios to VP5000/VP6000/VP8000 radios (for VMx00 radios using Software Version 8.20.x or later and VMx000 radios using Software Version 8.22.x or later). Both mobile and portable radios must be optioned to enable the mobile Enhanced VRS system on networks designed for mobile coverage. Users communicate through the Viking Mobile radio while in the vehicle and enable the vehicular repeater system to allow communications with the VP5000/VP6000/VP8000 through the vehicular repeater/mobile combination. Portable users are connected to their dedicated vehicular repeater on a simplex digital conventional channel. Features available through the enhanced system include the following:

- Single PTT Calls
- Talk Permit Tone
- Busy Indication
- Deny Indication
- Emergency Notification
- Out-of-Range Notification
- Signal Strength Indicator
- Unique Unit ID
- Conventional Channel Support
- Viking16 Support
- TDMA Support for P25 Trunking
- Portable Data Registration Turned Off Automatically on EVRS Enabled Channels
- Scan Turns Off And On Automatically on EVRS Activation and Deactivation
- Conventional Out of Range Reported from Mobile to Portable
- Door Switch Support
- Busy Channel Lockout for Conventional
- Special Talk Permit Tone for EVRS Out of Range State

The remote access function must be programmed to a button or menu in the VMx00 or VMx000. Enabling this function powers on the Pyramid SVR-P255 vehicular repeater.

4.33 Man Down Detection and Alerting

VP5000/VP6000/VP8000 radios include a man-down feature that uses the radio's built-in accelerometer to detect horizontal and stationary radio positioning. The radio enters emergency mode when the trigger setting is detected. The two programmable trigger settings are the following:

- Horizontal—The radio is in a tilted position of 35° or less for a set period of time
- Horizontal and Stationary—The radio is in a tilted position of 35° or less and little to no acceleration is detected for a set period of time

When the Man Down condition is first detected, an Alert Timer begins. If the Man Down condition is not cleared before the Alert Timer expires, then the radio flashes "Man Down" on the display and plays a warning tone. An Activation Timer is then started. If the Man Down condition is cleared by pressing the Man Down Clear programmed function button, then the tone will cease, the display warning will be cleared, and the timer will be canceled. If instead the Activation Timer expires, then the radio enters Emergency mode. An emergency list can be configured for silent emergency, in which case the Man Down display warning and tone do not occur.

4.34 Bluetooth

VP5000/VP6000/VP8000 radios include a Bluetooth option that is compatible with a set of wireless speakers/headphones, microphones, and PTT devices. Bluetooth can be turned on or off by pressing the Bluetooth soft button (Figure 4.5) or by selecting the Bluetooth menu On/Off option (Figure 4.6).

Table 3.9 identifies Bluetooth devices that work with VP5000/VP6000/VP8000 radios.

Note *VP5000/VP6000 radios support Bluetooth 4.2 devices and VP8000 radios support Bluetooth 5.0 devices.*

Figure 4.5 Bluetooth Soft Button On/Off

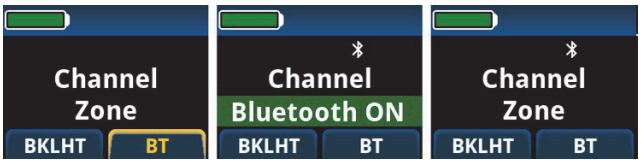
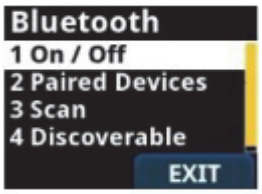


Figure 4.6 Bluetooth Menu Option On/Off

Additional Bluetooth menu options include the following (Figure 4.7):

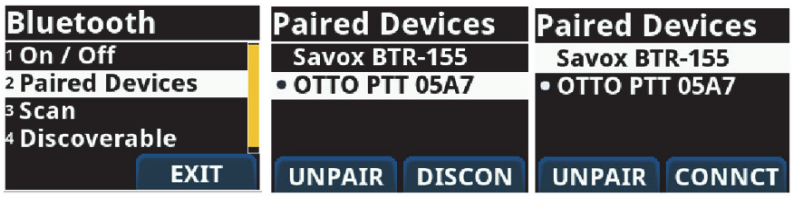
- Paired Devices—View a list of paired devices and unpair or disconnect/connect paired devices
- Scan—View a list of devices available for pairing
- Discoverable—Make a radio discoverable by other Bluetooth devices
- Disc Timeout—Set the length of time the device remains discoverable
- Beacon Mode—Allow beacon mode to toggled on or off
- Recv Audio—Allow the receive audio setting to be toggled between Bluetooth and radio speaker
- Info—View Bluetooth information for the radio

Figure 4.7 Bluetooth Menu Options



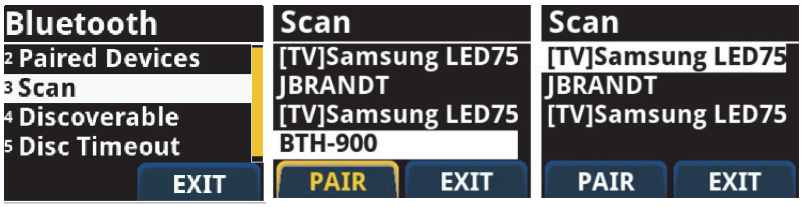
A list of paired devices can be viewed by accessing the Paired Devices menu option (Figure 4.8). Paired devices can be unpaired and connected or disconnected, depending on current connection status.

Figure 4.8 Paired Devices Menu Option



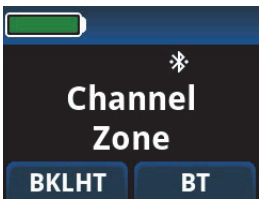
To scan for available Bluetooth devices, select the Scan menu option (Figure 4.9). Select a device name and press the Pair soft button to pair the device with the radio.

Figure 4.9 Scan Menu Option



Once a radio is connected to a device, the radio shows a Bluetooth Connected icon (Figure 4.10).

Figure 4.10 Bluetooth Connected Icon



To make the radio discoverable by other Bluetooth devices, select the Discoverable menu option and select On (Figure 4.11).

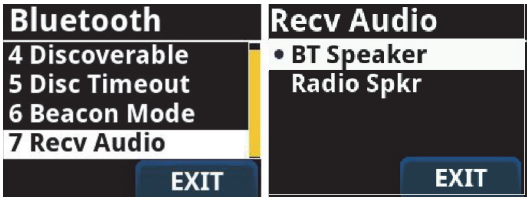
Figure 4.11 Discoverable Menu Option

The Discoverable Timeout menu option allows users to choose how long their radio will remain discoverable (Figure 4.12).

Figure 4.12 Discoverable Timeout Menu Option

The Recv Audio menu option (Figure 4.13) allows users to toggle the **Recv Audio** setting. When the user selects **BT Speaker**, audio gets routed to the Bluetooth speaker. When the user selects Radio Spkr, audio gets routed to the radio speaker.

Figure 4.13 Recv Audio Menu Option

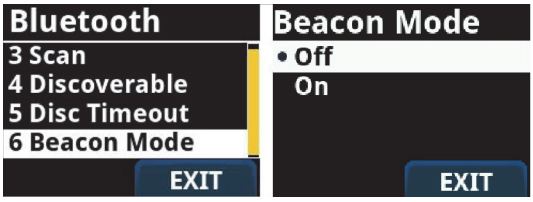


Beacon Mode can be used by VP5000/VP6000/VP8000 radios if they run Firmware Version 8.26.x or later, programmed by Armada 1.26.x and later. Beacon Mode supports the broadcasting of iBeacon advertisements.

Note *When Beacon Mode gets enabled, the radio broadcasts Bluetooth Low Energy advertisements in the iBeacon format. This allows any device listening to read the reported RSSI value and advertisement data. While advertising, all other Bluetooth functionality gets disabled.*

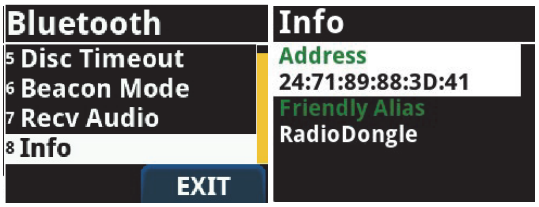
Figure 4.14 shows how users toggle Beacon Mode on and off.

Figure 4.14 Bluetooth Menu Beacon Mode



Use the Info menu option (Figure 4.15) to see information about your radio.

Figure 4.15 Info Menu Option



Bluetooth protocol supports automatic reconnecting of previously paired devices. Paired and connected devices will disconnect from the radio when they are turned off and then reconnect when they are powered back on. Reconnect also occurs if the device remains powered on during the radio power cycle. The radio remains connected to the currently connected device even if another paired device powers up and becomes available.

Note *Auto reconnect does not work for device power up on Interspiro devices.*

Note *Bluetooth operation can shorten the radio's battery life.*

4.35 Audio Recording

The Audio Recording feature allows VP5000/VP6000/VP8000 received and transmitted audio to be logged for future retrieval in Armada.

The radio can be configured in Armada to save either Rx Audio only or Rx+Tx Audio. When optioned and enabled, call audio will be saved automatically to the radio's internal memory. No radio user interaction is required.

Note *You must use Armada to retrieve the audio files.*

After the Audio Recording storage limit is reached, old calls will be deleted (as necessary) to allow the new audio to be saved.

4.36 Instant Recording Replay

Instant Recording Replay (IRR) is a feature that allows the radio user to playback recent audio. Although this feature uses the same internal mechanism as Audio Recording to save audio for future playback, IRR is optioned and enabled separately from Audio Recording, and so Audio Recording does not need to be optioned or enabled for IRR to function. The amount of audio to be played back is configurable, and can be specified in number of seconds or number of calls.

Call audio will be automatically recorded for future playback. The IRR function can be invoked using a button press or the menu. When invoked, the audio that IRR plays back is determined by several settings:

- IRR Mode: If set to Rx Audio, only the most recent Rx Audio will be replayed. If set to Rx+Tx Audio, both recent Rx and recent Tx audio can be replayed.
- Playback Type: If set to Timed, audio will be replayed up to Playback Time setting in seconds. If set to Number of Calls, all audio from the last Playback Num Calls calls will be replayed, regardless of length.
- Playback Time: The length of audio to be played back (if Playback Type is set to Timed).
- Playback Num Calls: The number of calls to be played back (if Playback Type is set to Number of Calls).
- Play Last Call First: If enabled, the last call will be played first, followed by the oldest call in the internal IRR list, the next to oldest call, etc., until the last call is played again. If not checked, playback starts with the oldest call in the IRR list.
- Play End Tone: If enabled, a short tone sounds after every recording.

Pressing the function button during playback skips the remaining audio for the currently playing call. A press-and-hold of the function button during playback exits playback mode. IRR will automatically exit if a call is received during playback, or if the user presses PTT.

For radios using Firmware Version 8.34.x or later, IRR call information gets displayed on the main display as well as in the IRR menu. The following lines get displayed on loop for 1.5 seconds each for the length of each call:

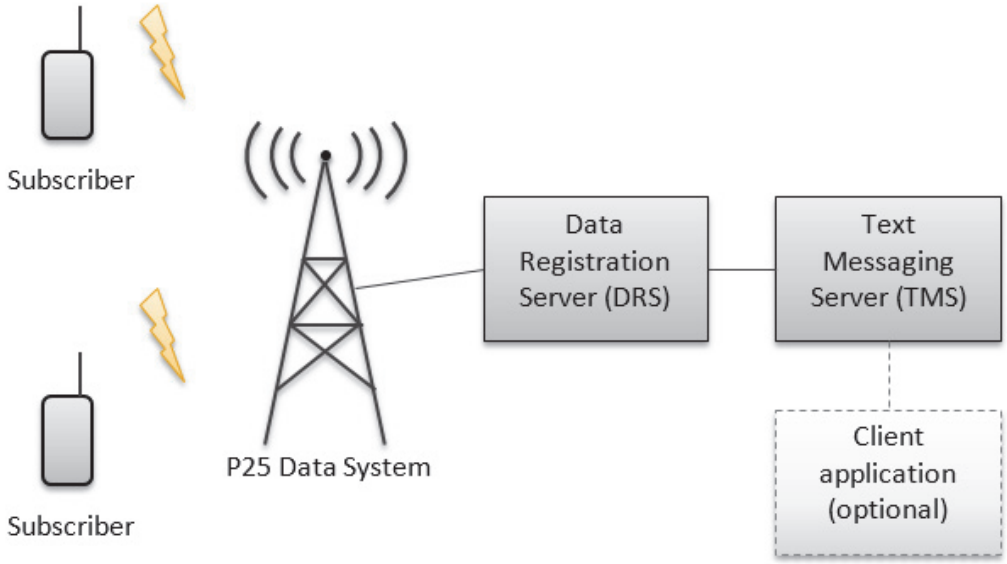
- Source ID (if receiving) or Destination ID (if transmitting)
- Call Type
- Timestamp

4.37 Text Messaging

Text messaging on VP5000/VP6000/VP8000 radios provides a simple and clear method to share textual information in the field. The implementation is made up of four components (Figure 4.16):

- Text Messaging Server (TMS)
- Data Registration Server (DRS)
- P25 Conventional or Trunking Data System
- Viking Subscriber

Figure 4.16 Text Messaging Components

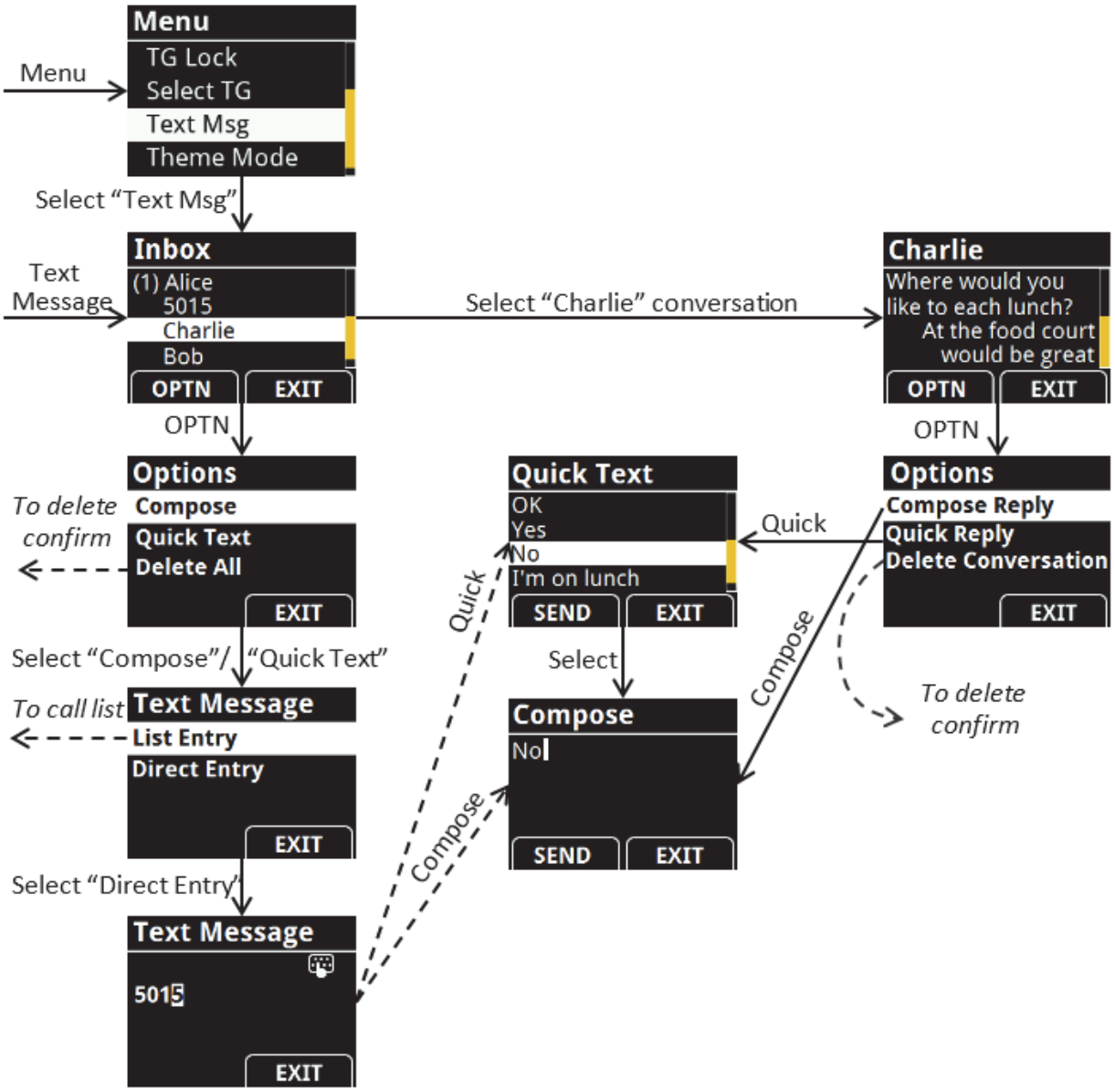


This section contains information on the following topics:

4.37.1 Text Message Menu System

Text messages are organized in a way that is similar to the way a mobile phone manages messages. They are grouped by receiver and displayed in a chat or conversation format. The text messaging menu (Figure 4.17) diagrams the menu flow of the text messaging system. The details of each screen are covered in the following paragraphs. Pressing the back button at any time takes you to the previous screen. Pressing the **EXIT** soft button at any time takes you out of the text messaging menu system.

Figure 4.17 VP5000/VP6000/VP8000 Text Messaging Menu

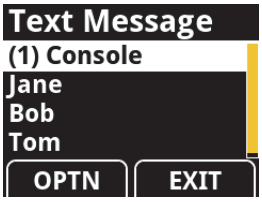


This section contains information on the following topics:

4.37.1.1 Inbox

The Inbox is the landing page for text messaging in the VP5000/VP6000/VP8000 (Figure 4.18). A list of all conversations is displayed using the recipient's alias (if available) or unit ID. The number of unread messages for each conversation is displayed next to it. Conversations are sorted by most recent activity. Use the direction pad to select up and down.

Figure 4.18 Inbox with Text Messages



If there are no messages, the screen displays "No Message", as shown in Figure 4.19.

Figure 4.19 Empty Text Message Inbox

Enter the Inbox by pressing the "Text Message" function in the main menu, button or soft button.

Using the select/enter button takes you to the selected conversation. Pressing the "OPTN" soft button takes you to the Options for All Messages.

4.37.1.2 Options for All Messages

The "Options" menu for all messages has all the general text message actions that may be taken. These include:

- Quick Text
- Compose
- Delete
- Drafts

Note *For options related to a single conversation (Conversation Options), refer to Section 4.37.1.7.*

To enter "Quick Text", the Recipient Usage must be set to **Respond Only**, **List Only**, or **Unlimited**. There must be at least one quick text programmed in Armada also.

To enter "Compose", the Recipient Usage must be set to **Respond Only**, **List Only**, or **Unlimited** and there must be a keypad.

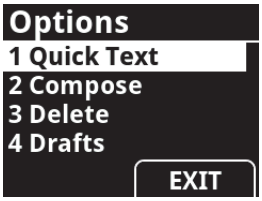
To enter "Drafts", the Recipient Usage must be set to **Respond Only**, **List Only**, or **Unlimited** and there must be a keypad.

There will be a temp message describing the error if the preceding requirements are not met.

Typing in the number on the left in **Options** and **Delete** selects the corresponding item.

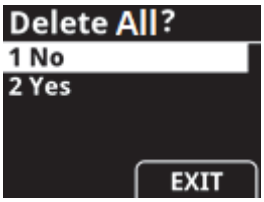
This **Options** menu is reached by pressing the "OPTN" soft button from the Inbox (Figure 4.20).

Figure 4.20 Text Messaging Options Menu



Choosing “Compose” or “Quick Text” takes you to the **Receiver Selection** menu. Choosing “Delete” takes you to a confirmation allowing you to confirm or back out of the delete action (Figure 4.21),

Figure 4.21 Text Messaging Delete Confirmation



After you make a choice, the Inbox appears again. The **Delete** option deletes all conversations for the selected alias/unit ID. Choosing **Drafts** (Figure 4.22) opens up the last message typed after pressing the BACK button or interrupted.

Figure 4.22 Choosing Text Messaging Draft Selection

4.37.1.3 Receiver Selection

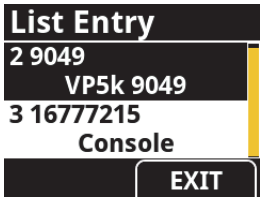
The receiver selection menus are used to pick the text message recipient. In the **Recipient** menu (Figure 4.23), the user can choose either “ID List” or “Enter ID”. Typing in the number on the left in the **Recipient** and List Entry menus selects the corresponding item

Note *If the conditions described below are not met, a message appears that describes the error.*

Figure 4.23 Text Messaging Recipient Menu

Radios listed in the system's Call List can be chosen on the **List Entry** menu (Figure 4.24). To enter **List Entry**, the **Recipient Usage** must be set to **List Only** or **Unlimited**.

Figure 4.24 Text Messaging List Entry Menu



The radio user can enter Unit IDs manually on the **Direct Entry** menu (Figure 4.25). To enter **Direct Entry**, the **Recipient Usage** must be set to **Unlimited**.

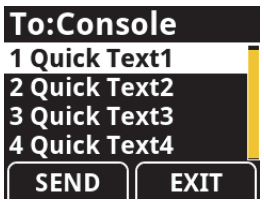
Figure 4.25 Text Messaging Direct Entry Menu

After the user chooses a receiver, either the **Quick Text** or **Compose** menu appears, based on the user's choice on the **Options for All Messages** menu.

4.37.1.4 Quick Text

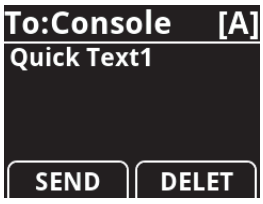
The **Quick Text** menu contains a list of predefined text messages (Figure 4.26). These messages are configured on the System's Text Messages list in Armada. The quick text menu is entered from either options menu (via the receiver selection menu in the general case or directly in the conversation case). Typing in the number on the left in the **Quick Text** menu selects the corresponding item.

Figure 4.26 Quick Text Menu



Long text messages will scroll. The quick text can be modified by pressing **Enter** (Figure 4.27). The radio must have a keypad to be able to modify the quick text.

Figure 4.27 Modifying Quick Text



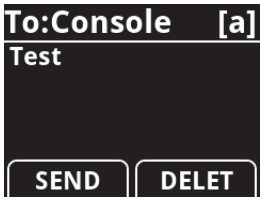
Pressing the **SEND** soft button sends the quick text immediately and takes you back to normal operation. Pressing the **Select/Enter** button takes you to the **Compose** menu with the quick text already entered.

4.37.1.5 Compose

Custom text messages are entered on the **Compose** menu (Figure 4.28)

Note *To use the **Compose** menu, the radio user must have a keypad.*

Figure 4.28 Text Messaging Compose Menu



Typing characters on the keypad keys creates text as follows:

* - Alternates between capital letters, lowercase letters, and numbers. Shown by [A], [a], and [1] in the top right corner of the screen

- is a space. If it is pressed multiple times it will add a period if needed and change the next character to upper case

2 through 9 – Alternates between the letters and number on the key

1 – Alternates between ".", "@", ",", ":", "?", "-", "!", "'", "/", "1"

0 – Alternates between "+", "=", "<", ">", "$", "%", "&", "0"

The delete soft button deletes the character to the left of the cursor. If it is held down it deletes everything.

The nav up and down buttons– moves the cursor up and down

The nav left and right buttons– moves the cursor left and right

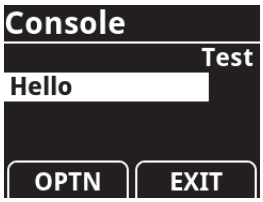
Pressing the "SEND" soft button (F4 on mobile) sends the text immediately and take the user back to normal operation.

Pressing **Emergency**, pressing PTT, or pressing the back button saves the current text message to the text draft.

4.37.1.6 Conversation

The **Conversation** menu lists all messages sent and received from a particular radio (Figure 4.29). All text gets wrapped and the direction pad is used to scroll up and down.

Figure 4.29 Text Messaging Conversation Menu



Message status also gets displayed on this menu. Possible statuses are:

- Pending
- Queued
- Error
- Text Failed

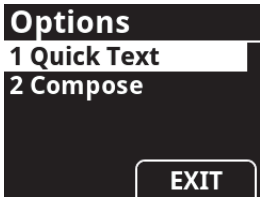
Pressing the **OPTN** soft button takes the user to the **Conversation Options** menu.

4.37.1.7 Conversation Options

The **Conversation Options** menu mirrors the general options by applying them to the selected conversation (Figure 4.30). These options include:

- Quick Text
- Compose

Figure 4.30 Text Messaging Conversation Options Menu



Quick Text and **Compose** take the user to the **Quick Text** and **Compose** menus respectively.

Typing in the number on the left in the **Conversation Options** menu selects the corresponding item.

4.37.2 Restrictions

This section contains information on the following topics:

4.37.2.1 General Restrictions

Radios that do not have a keypad cannot send custom text messages.

A maximum of 224 bytes may be sent if encryption is used, 255 bytes if encryption is not used. This is equivalent to 224 (or 255) ASCII characters, but fewer for international characters. The default TMS message size must be increased to sending messages longer than 200 bytes (after encryption).

Up to 5000 messages get stored on the radio. While they may be deleted manually, the oldest message is deleted when the 5000th message gets stored. There will be delays in loading and viewing text messages if there is a large amount stored. For best operation, the user should delete old messages manually.

Server Version 1.14.x and later can be configured to forward messages back and forth between conventional systems and P25 trunking systems.

4.37.2.2 Conventional Systems

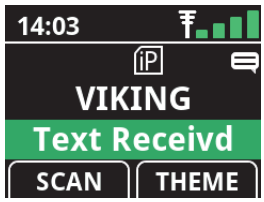
Conventional text messages do not have a WACN and System ID and are stored in the same place. That means they cannot be filtered by system as P25 trunking does. Conventional text messaging requires Text Message Server Version 1.12.x or later text message server.

4.37.3 Receive Behavior

When a message gets received, the following occurs:

- A brief message appears saying “Text Received” (Figure 4.31)
- A tone plays
- A mail icon appears in the status bar
- An Alert tone can be customized in Armada

Figure 4.31 “Text Received” Message



If a message with a bad encoding gets received, “Text Received” appears with an alert background. A bad tone will also sound.

4.37.4 Buttons

There is a single “Text Message” function that can be programmed to a button, soft button or menu. Activating the function takes the user to the Text Message Inbox.

4.38 Temperature Protection

Radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later operate as follows in high-temperature environments:

If the radio is already hot when the operator presses the PTT button, the operator gets a warning immediately.

If the radio gets hot while transmitting, the operator gets a transmit warning when the temperature crosses the warning threshold. When the radio gets too hot, it automatically reduces transmit power so its temperature should fall. When the temperature falls enough, the radio switches back to high power. Then, if the radio overheats again the operator gets another transmit warning.

4.39 Wi-Fi

VP8000 radios have an internal Wi-Fi chip that is capable of 2.4 GHz/ 5 GHz. Radios without Wi-Fi configured cannot connect to Wi-Fi networks. If programmed, Wi-Fi on a radio may be turned on or off by the user via a button press or menu command.

Note *Unencrypted and WPA2 (IEEE 802.11i-2004) networks are supported. WEP is not supported.*

This section contains information on the following topics:

4.39.1 Wi-Fi Country Code Configuration

Wi-Fi Country Codes are programmable for VP8000 radios in Armada to ensure that the radio abides by the local regulations and uses the best settings allowed for operation in a given region. Supported regulatory domains include the United States (US), Canada (CA), and Australia (AU).

4.39.2 Operator Defined Wi-Fi Networks

Operator Defined Networks (ODNs) are added, edited, and removed through the Wi-Fi menu. Radio operators are able to configure all the same parameters that are available for programming Wi-Fi networks in Armada.The Wi-Fi Menu and sub-menus can be accessed by pressing and holding the Wi-Fi button if programmed. The Wi-Fi Menu consists of three separate sub-menus including On/Off, Networks and Info (Figure 4.32). The On/Off menu can also be accessed through the radio's main menu system. The "Wi-Fi Info" can also be accessed through the Radio Info menu.

Figure 4.32 Wi-Fi Menu Options

Note *Operator-Defined Networks must be checked in Armada to enable the operator to add, edit, and remove ODNs on the radio. Any ODNs on the radio will be remembered, but the radio will not display them in the "Networks" menu or connect to them. By default, this setting is disabled.*

This section contains information on the following topics:

- Operator Defined Networks Lifetime
- Operator Defined Network Validation
- Network Connection

4.39.2.1 Operator Defined Networks Lifetime

Operator Defined Networks are permanent until the operator removes them using the Wi-Fi menu. A codeplug write or firmware update will not remove ODNs. There is one exception to this rule. If a codeplug that re-defines an existing ODN is written to the radio, the ODN is removed from the radio and the network defined in the codeplug is used. For example, the radio operator adds a network with SSID set to "Fire Engine LTE". At a later time, the fleet administrator adds a network with the same SSID to the fleet-wide codeplug. When the radio is updated with the new codeplug, the ODN is dropped, and the parameters defined in the codeplug are used.

4.39.2.2 Operator Defined Network Validation

After writing a new codeplug to the radio, the ODNs must be validated. This means checking the broadband systems defined in the ODNs still exist on the radio. If a system was removed, the ODN becomes invalid. For the convenience of the radio operator, invalid networks are not deleted but are marked as invalid. The radio will not connect to a network that has been marked as invalid. The operator can use the “Network Edit” menu to correct the broadband system references and the auto-connect functionality will be restored.

4.39.2.3 Network Connection

Viking radios do not support the user selecting a specific Wi-Fi network to connect to. The radio will scan for available networks and select which to connect to based on the qualities of the network. Operator defined networks do not change this functionality. So, when an ODN is added to the radio, there is no guarantee this network will be chosen over another network that is defined on the radio.

4.39.3 Operator Defined Network Configuration

The "Networks" menu is the entry point for all new menu function related to managing networks on the radio (Figure 4.33). This menu displays all networks currently known to the radio.

Figure 4.33 Networks Menu

To view information about a network, select a network from the Networks list and press the (Menu) button. This will open the "Network Info" menu (Figure 4.34).

Figure 4.34 Network Info Menu

The following items in the Network Info Menu are read-only and cannot be edited by the user:

- **SSID** - The network SSID.
- **Password** - The PSK used to authenticate on the network. The Password field is replaced by "*********" if there is a valid password set. Otherwise, the Password field displays "<NONE>".
- **Hidden** - If set to “Yes” the radio will actively scan for the network if it detects hidden networks.
- **Broadband Data** - The system to get the broadband data and VPN configuration from. If set to “Disabled” this is the same as not checking the “Broadband Data” checkbox in Armada.
- **Use VPN** - If set to “Yes” the radio will try to connect the VPN using the configuration in the “Broadband Data” system.

This section contains information on the following topics:

4.39.3.1 Adding a New Network

The radio operator can add a new Wi-Fi network through the "Networks" menu by pressing the "NEW" soft button. This will open the "Select SSID" menu where the radio will display nearby Wi-Fi networks. The operator can select a network from this list (Figure 4.35) or press the "OTHER" soft button to manually enter an SSID (Figure 4.36).

If the operator selects a network that is already configured, the radio will bad bonk and display an error message. If the user manually enters an SSID that is already configured, the radio will return back to the "Networks" menu and highlight the network that the user entered.

Once a valid SSID has been selected or entered, the radio displays the "Add Network" menu. This menu will have all the same fields as the "Network Info" menu. Each field in the "Add Network" menu can be edited by pressing the (Menu) button. Once the operator finished configuring the new network fields. They must press the "SAVE" soft button to add the network to the radio. If the user presses "Back" or "EXIT", the network is discarded.

Figure 4.35 Selecting an SSID

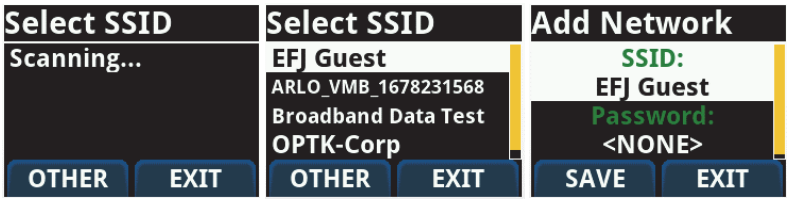
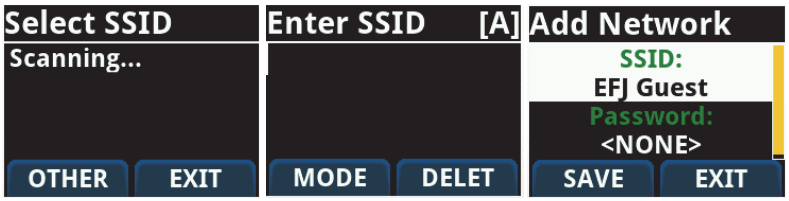


Figure 4.36 Manually entering an SSID



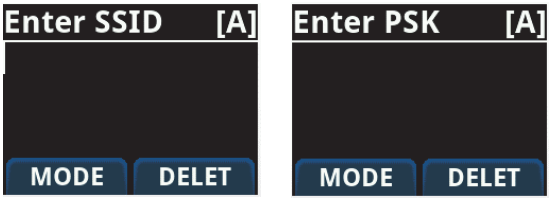
The following network fields in the “Add Network” menu can be configured:

- SSID and Password
- Hidden
- Broadband System
- Use VPN

4.39.3.1.1 SSID and Password

The SSID and Password fields are edited in user entry sub-menus, see Figure 4.37. In these menus the user can directly enter the SSID and Password using the keypad (when available) or the navigation buttons (up, down, left, right). The entry mode (upper case, lower case, or numeric) is set using the “MODE” soft button or by holding the “Right” button. Pressing the (Menu) button will complete the entry and the radio will return to the “Add Network” menu.

Figure 4.37 SSID Entry Menu (Left) and PSK Entry Menu (Right)



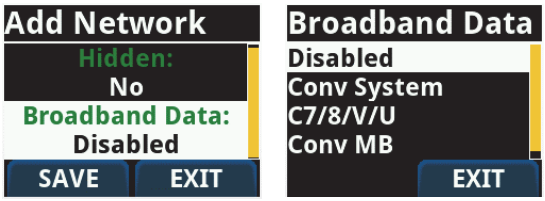
4.39.3.1.2 Hidden

The hidden field is toggled between “Yes” and “No” when the operator presses the (Menu) button. This field is usually set to “No” and should only be set to “Yes” when the SSID is not broadcast by the wireless access point.

4.39.3.1.3 Broadband System

The "Broadband Data" field is edited in the "Broadband Data" sub-menu. This field is not visible on radios that do not support broadband data. If Broadband Data is not optioned on the radio, the field will always be set to "Disabled".

Figure 4.38 Setting Broadband System



4.39.3.1.4 Use VPN

The "Use VPN" field is toggled between "Yes" and "No" by pressing the (Menu) button. When set to "Yes", the radio will attempt to connect to the VPN defined by the "Broadband System" when connected to this network. This field is not visible on radios that do not support broadband data. Note that if the Broadband System is set to "Disabled" this field is not used.

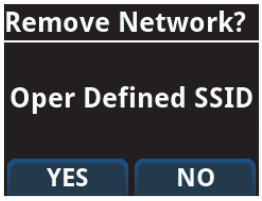
4.39.3.2 Editing An Existing Network

Radio operators can edit existing networks through the "Networks" menu. Only networks added by the operator through the Wi-Fi menu can be edited. Networks defined in the codeplug (Armada) cannot be edited. Networks are selected for editing by pressing the (Menu) button. This will launch the "Network Edit" menu. This menu is identical to the "Add Network" menu. The user must press the "SAVE" soft button to keep any edits made.

4.39.3.3 Removing Networks

Radio operators can remove existing networks through the "Networks" menu, see Figure 4.39. Only networks added by the operator through the Wi-Fi menu can be removed. Networks defined in the codeplug (Armada) cannot be removed. Networks are removed by pressing the "DELET" soft button in the "Networks" menu. The radio will prompt the operator for confirmation (Figure 4.39).

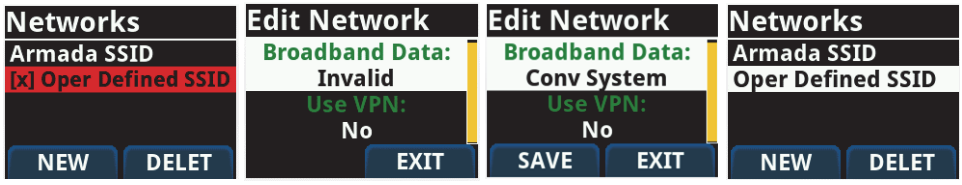
Figure 4.39 Remove Network Prompt



4.39.3.4 Correcting Invalid Networks

Networks that have been invalidated by the removal of a system are remember by the radio so they can be recovered quickly without the user having to re-enter SSID and Password. Networks that have been marked as invalid will appear in the Networks list with a "[x]" marker and red lettering. The radio will not auto connect to an invalid network until a valid system is selected or broadband data is "Disabled". This is done using the "Network Edit" menu (Figure 4.40).

Figure 4.40 Correcting Invalidated Network using Network Edit Menu



4.40 Over the Internet Programming (OTIP)

Over the Internet Programming (OTIP) enables you to program VP8000 radios remotely using IP-based network services. OTIP is currently the only application supported by the VP8000 Wi-Fi module. The OTIP option must be enabled to use this feature.

4.40.1 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 VP8000 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.

4.40.2 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.

4.40.3 Encryption

Industry-standard (SSH) encrypted transfers are supported when using USB or Wi-Fi network connections. If Wi-Fi is configured, you must use WPA2 PreShared Key (PSK).

4.40.4 Limitations

This section contains information on the following topics:

- Disconnection Events
- Concurrent Transfers

4.40.4.1 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.
- Miscellaneous unexpected network events occur.

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

4.40.4.2 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 radios without running cables.

SECTION

5

Conventional Mode Features

The following information describes the features unique to analog and digital (Project 25) conventional operation.

Note *Please note that the features and operations may vary depending on the model of your VP5000/VP6000/VP8000 radio. Standard Key Model radios do not have a DTMF keypad. Messages and status icons are shown on the front display.*

This section contains information on the following topics:

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 transmit while someone else is using the channel, you will disrupt their conversation. With P25 Trunked and Viking16 operation, monitoring is performed automatically. You can monitor conventional channels automatically or manually.

5.1.1 Automatic Channel Monitoring

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

5.1.2 Manual Channel Monitoring

The automatic monitoring 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 automatic monitoring, but monitor the channel manually as follows:

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

Monitor Mode - There may be times when a busy condition is indicated even though no one is using the channel. Monitoring should then be performed by disabling Call Guard squelch (or talkgroup ID detect on Project 25 channels). This is usually done by selecting the Monitor Mode (Section 5.2) or by the Normal/Selective option button or menu parameter(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 talkgroup ID detect are disabled on P25 (conventional) channels.
- Signaling-dependent Busy Channel Lockout options for Tone/NAC and P25 status are overridden (see next section). (Noise option is not overridden: Monitor mode disables the protocol-signaling 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 button or select the Monitor menu "Tx Channel" parameter. The  icon is then displayed to indicate the monitor mode. The receiver unsquelches and noise is heard even if carrier not present.
2. To monitor the receive frequency instead, press and hold the Monitor or Monitor Rx option button until a tone sounds (based on 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 button again, select the Monitor menu "Off" parameter, or simply release the Monitor Rx button.

The Normal/Selective function disables Call Guard squelch and P25 group ID detect but not scanning and P25 NAC detect (Section 5.4.1).

5.3 Busy Channel Lockout

The Busy Channel Lockout feature (also called Transmit Disable on Busy) 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.

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.

5.4.1 Call Guard Squelch Enable / Disable

The Normal/Selective option button (if programmed) or menu parameter can be used to disable receive Call Guard squelch on analog channels or talkgroup ID code detection on P25 channels. When selective squelch is disabled, “Squ Normal” is flashed in the display, and when it is enabled, “Sql Select” is flashed.

When “Normal” is selected, the receiver unsquelches only if a carrier is detected. Scanning and Project 25 NAC detection are not disabled with this mode selected. The selected mode is in effect until it is manually changed again. 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” 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.

If the user would like to hear the squelch tail, then the reverse burst transmission can be disabled by programming.

5.4.3 Digital Call Guard Squelch

Digitally Coded Squelch (DCS) uses digital data instead of subaudible tones to control the squelch. When the push-to-talk switch is released, a turn-off code is transmitted which eliminates the squelch tail similar to the reverse burst.

5.4.4 Call Guard Disable

A programmed option lets the radio disregard any CTCSS/DCS or NAC/Talkgroup information on the current channel. This 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 or the AB toggle switch, and the menu. The mode will stay active through 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 if a menu item or function button is 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.

The squelch adjust value range is based on the radio type. These values, including the default squelch adjust value, are shown below in Table 5.1.

Table 5.1 Radio Type Squelch Adjustment Values

Radio Type	Squelch Adjust Value Range (inclusive)	Default Squelch Adjust Value
5/6/7000	-7 to +7	0
8000	1 to 9	5

Using the up and down buttons on the portable, the user can adjust the squelch setting to a desired level. Decreasing the value causes the squelch to open sooner for weaker signals, while increasing the value has the opposite effect. The radio operator can also choose a **Default** option. Selecting the **Default** listed option changes the user’s squelch adjustment value back to the default set by Armada. Pressing the select button will store the new squelch setting and return the user to the main display.

Selecting a value sets the user's value while not affecting the default value set by Armada. The new setting overrides the default value until it is set to another by the operator or reprogrammed in Armada. The user's selection will be remembered after reboot.

On units with keypad programming enabled, the operator can set the default squelch adjustment otherwise only set in Armada. The operator must navigate to the Keypad Programming menu, either through the radio menu, or by using a button assigned to the Keypad Programming menu function. From there, the operator must select **Chan Parms** from that list, then choose **Squelch Adjust** from the new list of options. The menu will have the same appearance as the Squelch Adjustment menu but will display the Armada programmed default, not the user setting. Additionally, the **Default** option is not displayed in the list. Changing the value in this menu modifies the Armada programmed default and change the user's setting to this new default. The new default value gets remembered on reboot and gets read in by Armada when copying from the radio's codeplug.

5.4.6 System Squelch Code

This feature allows the normal transmit and receive Call Guard (CTCSS/DCS/NAC) programming to be temporarily overridden with a code selected from a programmed list. It is available if the System Squelch Code option button or menu parameter and a CTCSS/NAC code list have been programmed.

Note *Call Guard codes can be permanently reprogrammed by keypad programming described in Section 5.15.*

In addition, conventional systems can be programmed for the System Keypad CTCSS/DCS 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, press the "3" key. No other conventional mode functions can then be assigned to these keys.

The CTCSS/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 a NAC code for use with P25 operation.

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.

Proceed as follows to select a code using the System Squelch Code option button or menu parameter:

1. Press the System Squelch Code option button or select the System Squelch Code menu mode parameter. Then press the Up/Down buttons to select the desired code. The display indicates "SQxx" where, "xx" is the selected code from 1 to 255. The code number and actual code are alternately displayed (NACs are displayed in hexadecimal). For radios using Firmware Version 8.18.x or later, if the Armada administrator did not configure CTCSS/DCS for your selected code, then "CSQ" displays instead of a code number.
2. To select the displayed code and return to the normal display, press the (Menu) button.
3. To check which code is selected, press the System Squelch Code button 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 Channel- and Direction-Specific Operator Selectable Tones

For radios using Firmware Version 8.26.x or later (programmed by Armada 1.26.x or later), the radio operator can select CTCSS/DCS tones (OST/IST) on a per-channel and per-direction (TX or RX) basis.

Two related functions are available for programming on conventional systems:

- Channel Rx OST
- Channel Tx OST

These are available on analog channels and digital mixed-mode channels.

The CTCSS/NAC system list must be set up to use these functions. Channel Rx OST lists the Rx tones, and Channel Tx OST lists the Tx tones. (NACs in the "CTCSS/NAC" list can be ignored).

Each conventional channel can control whether OSTs are allowed, and in which direction (Tx, Rx, Both, None).

When a new tone is selected with one of these functions, the selected channel's settings get overwritten. The function can also be used to return to original settings.

For clarity, several functions and parameters were renamed in Firmware 8.26.x/Armada 1.26.x as compared with previous versions (Table 5.2). Each of these functions/parameters works as they did before.

Table 5.2 OST/IST-Related Renamed Functions

Armada Window	Name before Firmware 8.26.x/ Armada 1.26.x	Name for Firmware 8.26.x/ Armada 1.26.x and Later
Button/Menu (Conventional) > Buttons > Button Assignments	Squelch List Select	System Squelch Code
Systems (Conventional) > General Options 2 > Other	Keypad CTCSS/DC	System Keypad CTCSS/DCS
Channels (Conventional) > Channel Options > Other	Ignore Keypad CTCSS	Ignore System Squelch Code

5.6 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 (Section 4.6). 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.

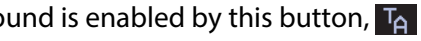
5.7 Conversation Timer

A conversation timer can be programmed on conventional systems in addition to the time-out timer (Section 4.6). This timer limits the 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).

5.8 Repeater Talkaround

Normally, all transmissions go through a repeater which usually increases range. However, there may be times when a user is out of range of the repeater and therefore unable to talk to anyone even though the user 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 talkaround can be selected if the TA option button or “Talk Arnd” menu parameter is programmed. When talk-around is enabled by this button,  is displayed. This feature remains enabled during scanning, and changing channels or turning power off does not change the selected condition. Talkaround is available on conventional channels only.

A function button can be programmed to the “Repeater Talkaround” function. With a button programmed as “Repeater Talkaround”, the user can press this button while on any conventional frequency, shifting the radio from operation through a repeater, to simplex operation on the repeater transmit frequency.

With a “Repeater Talkaround” button enabled, there is no restriction as to which channels the user can transmit (in simplex mode) on the repeater transmit frequency. A user can switch to talkaround mode on a busy dispatch channel, and his transmissions could prevent nearby users from hearing the repeater transmissions.

Note *Channels configured for simplex operation display the Talkaround icon. For radios using Firmware Version 8.36.x or later, the Talkaround Icon may be disabled on conventional simplex channels by programming. This option is available on a per-system basis.*

5.9 Displaying Transmit / Receive Frequency

If the Display Information option button or menu parameter is programmed (Section 4.2), it can be used to display the channel frequency in megahertz. Pressing this button toggles between displaying the standard channel alias and the channel frequency. The receive frequency is displayed when receiving and the transmit frequency is displayed when transmitting. This feature is available on conventional channels only.

5.10 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 button or menu parameter is required for these functions. Emergency Alarms and Calls are transmitted on the global (radio wide) emergency zone/channel if one is programmed. 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. Up to 255 Emergency Lists may be programmed. A specific list may be selected for each channel.

5.10.1 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 button or selecting the Emergency menu parameter. The system to which the emergency channel is linked must have Emergency Alarms enabled.

In the P25 conventional mode, a special P25 emergency data transmission is sent, and in the conventional analog mode, an analog signaling packet is sent. Refer to Section 5.13.3 for information on MDC1200 Emergency Alarm.

For an Emergency Alarm:

- The DTMF Emergency ID is sent.
- The MDC Emergency ID is sent with the emergency bit set.
- The Five Tone ID is sent with the fifth tone being status type emergency.
- GE Star ANI is sent.
- Two Tone Encoder is sent.
- No special action is done with the single tone.

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 button or select that menu parameter. The radio automatically transmits the emergency alarm.

2. Either Normal or Silent operation can be programmed. With Normal operation, the red LED lights, the emergency tone sounds, and "EMERGENCY" flashes in the display. "EMERGENCY" continues to flash until the alarm ends. If "Silent" is 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. (MDC1200 only) When the emergency alarm is acknowledged by the dispatcher, "Ack Rcvd" is briefly displayed and the emergency acknowledge tone (two beeps) sounds. This alert tone can be disabled if desired, and does not occur if Silent operation is programmed.

   Retries will occur automatically for conventional analog and non-MDC signaling types. No emergency acknowledgment is expected from the system. Retries will continue until a programmed count of retries is reached.

4. The emergency alarm mode is exited when radio power is cycled or by pressing and holding the Emergency option button. If "Silent" is programmed, a tone sounds when the operator exits Silent Emergency (for radios using Firmware Version 8.26.x or later programmed by Armada 1.26.x and later).

5.10.2 Emergency Call Alert

This feature notifies a user when an emergency call is being made on their selected P25 Conventional Talkgroup.

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 "Emerg Rcvd" 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 this state, press the button programmed for "Emergency Clear". The radio should return to its normal display, and the Emergency Received message should no longer show.

5.10.3 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 or selecting the Emergency menu parameter. 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. If it is sent on an analog channel, the DTMF Emergency ID is sent in place of the ANI DTMF PTT ID if applicable.

For radios that use Firmware Version 8.26.x or later programmed by Armada 1.26.x and later, if emergency call ANIs are enabled and the conventional channel is configured with post-TX ANI, then the emergency call ANI gets sent post-TX. If the conventional channel is configured with pre-TX ANI or no ANI, but emergency call ANIs are enabled, then the emergency call ANI gets sent pre-TX.

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

MDC, Five Tone Signaling, Single Tone Signaling, Two Tone Encoding or GE Star are sent for Analog Emergency Calls, depending on programming.

5.10.3.1 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. The automatic transmit period is programmed for 10 to 120 seconds in 10-second increments. The radio can be configured to re-enter emergency hot mic transmit after a set receive time has elapsed. The radio continues cycling in and out of emergency hot mic transmit until the programmed number of cycles have taken place, until PTT is asserted by the user (if configured), or until the user takes the radio out of emergency mode. If this 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 button. Subsequent presses do not trigger automatic transmissions. To reset this function, cycle power or press and hold the Emergency button.

5.10.3.2 Placing an Emergency Call

1. If required, select a channel of a system on which Emergency Calls are enabled and press the Emergency option button or select that menu parameter. The Emergency Call is then sent as described in Section 5.10.3 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 (Section 4.13), 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 button.

5.10.4 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 programmed, the Emergency Talkgroup has priority. Please refer to Section 5.14.7.1 for more information about this feature.

5.11 Conventional Mode Scanning

Channel scanning features common to all operating modes are described in Section 4.14 and Section 4.14.5. The following information describes features unique to conventional operation.

5.11.1 Selecting a Scan List

Conventional systems are programmed with a default scan list that is normally selected by all channels in that system.

The default scan list (which is to be used by all conventional channels), 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.

If the user presses and holds the Scan button, the **Scan List Select** feature is activated.

Note *If your radio gets programmed by Armada Version 1.18.x or later, your Armada administrator can prevent you from accidentally using **Scan List Select**.*

5.11.2 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.

Priority on Programmed - Priority sampling occurs and the priority channel or channels are those programmed in the selected scan list. The radio transmits on the selected channel—within the scan hold time—if selected group is chosen as the talkback type. The radio transmits on the received channel if active group is chosen as the talkback type.

Talkgroup - 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. Returns calls on the selected talkgroup if selected group is chosen as talkback type and returns calls on the received talkgroup—within the scan hold time—if active group is chosen as talkback type.

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

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

5.11.2.1 Data Transmission During Conventional Scan

Radios using Firmware Version 8.32.x or later can send P25 data on a conventional channel with the scan function enabled. All scan modes are supported except vote scan. The default setting for sending data is confirmed mode.

If data needs to be transmitted when scan is enabled, the radio pauses scan until all data gets transmitted and acknowledged by the FNE. When all data finishes getting transmitted, scan resumes.

The data gets queued on the following conditions:

- When data needs to be transmitted and a voice call is active, the data gets queued until the call ends (including scan hold time). When the call ends, the radio transmits any queued data and resumes scan.
- Data also gets queued when the radio is transmitting a voice call. All queued data gets sent when the voice transmission ends.
- If the Push-To-Talk (PTT) button gets pushed when the radio is transmitting a data packet or waiting for an "ack" from the FNE, the data transaction aborts, but the data packet remains in the queue.

There are changes to the sequence of packet data registration/deregistration and DRS registration/deregistration:

- When the radio sends a packet data registration (channel change or scan mode) and is previously packet-data-registered on the system, a DRS registration does not get sent if the IP address received matches the previously-received IP address. (Previous releases always sent the DRS registration.
- Packet data deregistration and DRS deregistration get sent upon channel change when the new channel is on a different system.

5.11.3 Priority Channel Sampling

The following describes priority sampling when scanning conventional channels.

Note *Priority sampling when scanning P25 Trunked/Viking16 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 *Priority channel sampling is not available when receiving unit calls. 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 display. This indication is displayed regardless of whether the priority channel is fixed or always the selected channel. When it is a second priority channel, P_2 is displayed.

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 Lookback Time.

The priority sampling times are set by programming.

5.11.3.1 Changing the Priority Channel

If a fixed priority channel is associated with the current scan list, it can be changed if the Priority option button or menu parameter is programmed. With dual priority, this function changes only the first priority channel. To change both priority channels, use the Scan List Edit function described in Section 4.14.5.1.3.

Proceed as follows to change the priority channel using the Priority option button/ menu parameter:

1. Make sure the desired scan list is selected (Section 4.14.5.1.2).
2. Select the channel you want to be the priority channel and then press the Priority option button or select that menu parameter. “Priority” is then flashed to indicate that the current channel is now the priority channel when scanning that list. Other indications that may occur are as follows:
   - If “No Priority” is displayed, priority sampling may not be enabled on the scan list.
   - If “Sel Chan” is displayed, the priority channel is always the selected channel and cannot be changed.
   - If “No Edit” is displayed, the scan list is either not user editable or priority channel user editable. If no indication is displayed, the channel may not be in the scan list.

5.12 Standard Conventional Calls

Standard conventional calls are placed to other radio units 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 a call (Section 5.4 and Section 5.14.3).

5.12.1 Placing a Standard Conventional Call

1 Turn power on and set the volume as described in Section 3.3.1 and Section 3.3.2. Select the channel programmed for the radio you want to call as described in Section 3.3.3.

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 (Section 5.3), the transmitter is automatically disabled if the channel is busy. Otherwise, busy and out-of-range conditions are not indicated.

4 Press (and hold) the PTT switch to talk and release it to listen.

5.12.2 Receiving a Standard Conventional Call

1 Select or scan the channel programmed for the call you want to receive (refer to Section 4.14 and Section 4.14.5 for more scanning information).

2 When the call is received, press the PTT switch to talk and release it to listen. If scanning, responses may occur on the selected or receive channel as described in Section 5.11.2.

5.13 ANI Signaling Options

The following types of analog signaling are offered:

- Single Tone Encoding
- Five Tone Encoding
- DTMF
- MDC
- GE Star
- Two Tone Encoding
- Two Tone Decoding

Three features use analog signaling:

- Pre and Post ANI
- Emergency Alarm
- RTT

5.13.1 DTMF / ANI Signaling

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

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

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

When an emergency alarm or call is placed, this ANI signaling is replaced by the Emergency DTMF ID (Section 5.10). Refer to Section 5.13.3 for information on MDC1200 ANI.

5.13.2 Single Tone Encoder

This feature allows the user to transmit a single tone by pressing the Single Tone Encoder option button or selecting that menu parameter. Each conventional system can be programmed for a tone of 500 to 2500 Hz in 1 Hz increments with a duration of 0.5 to 2.5 seconds in 0.1 second increments.

This feature can be activated with a button press or can be used for Pre and Post ANI, Emergency Alarm, or RTT.

5.13.3 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 Decode - MDC1200 decode functionality is supported so that the radio can handle the following MDC1200 features:

- Process the system acknowledgment of emergency transmissions – so that the user knows that the emergency has been received
- PTT ID Decode - Display the ID / Alias of a calling radio on all other radios
- Selective Radio Inhibit – Allow the dispatcher to inhibit a radio
  - *For radios in conventional systems using Firmware Version 8.34.x or later, the Armada administrator can program the radio to block incoming inhibit requests. If the user disables inhibits and the radio receives an inhibit request, the message BLOCKED RADIO INHIBIT appears on the radio.*
- Call Alert – Alerts the user to call the dispatcher
- Radio Check – Verify that the unit is within the operating area

MDC Mute - When the feature is enabled, the radio mutes the speaker upon receiving the MDC tone. This causes a short audible chirp on the radio before the radio can mute. The radio unmutes the speaker after MDC has faded and a programmable delay has expired.

MDC Side Tone - Allows the radio to be programmed with an MDC Side Tone as an alternative to the normal talk permit tone. Four settings are available:

- None - No side tone
- PTT-ID - The radio plays a side tone while the MDC ID gets transmitted
- PTT-ID Short - The radio plays a brief side tone after the MDC ID gets transmitted
- Both - Both tones get played

MDC1200 Emergency Alarm - The radio continues trying its emergency transmission until the emergency is acknowledged by the system or the retry attempts expire. (System programming determines the number of retry attempts.)

5.13.4 Five-Tone Signaling

A single transmission consists of five separate tones transmitted sequentially with an optional inter-tone pause between tones. If Five-Tone is selected as the RTT type, then Five-tone shall also be used as the signaling type for conventional analog emergencies. The first four tones are used for unit identification and the fifth tone is used for status.

No two adjacent tones shall be the same frequency. When two identical digits follow each other, the second shall be transmitted as the “Repeat” tone.

Five Tone signaling can also be used for Pre Post ANI and Emergency Alarm Signaling. Fifth Tone Status values are:

Tone 1 – Normal Call

Tone 9 – Emergency Call

Tone 2 – Normal Secure Call

Tone 8 – Emergency Secure Call

5.13.5 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)

5.13.6 Two Tone Encoding

The Two Tone Encoder operates the same as the Single Tone Encoder except that it sends two tones back-to-back. A maximum of 255 tones can be programmed. Each tone will send two tones, each of its own frequency and duration (unless the Single Tone option is selected for the Tone entry in Armada programming).

The user can activate Two Tone in several manners. The first is to program a button for Two Tone and press it. This will give the user the option to choose the desired tone in the list.

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 (Menu) button. Pressing PTT or the (Menu) 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, (Clear), 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.

The third is pressing and holding a button programmed for Two Tone. This will send the current, active Two Tone, which is defaulted to the first tone in the Two Tone list upon profile download.

Two Tone can be activated by using Emergency Analog Signaling, ANI Analog Signaling, or RTT Analog Signaling. Direct activation (through button press or PTT/ Menu Button press in the Two Tone List) must be programmed. If not programmed and the user tries to send a Two Tone Page directly, the subscriber will bad beep. Also, the radio cannot be in Scan mode. If the user tries to activate Two Tone Page while in Scan mode, the radio bad beeps and shows disabled.

5.13.7 Two Tone Decoding

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.

For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, the Armada administrator can prevent the radio user from changing the Two Tone Decoder list.

5.14 Project 25 Mode Features

This section contains information on the following features, which are unique to conventional P25 channels:

- Digital Unit ID
- Talkgroup ID
- Network Access Code
- Out of Range (EFJohnson Conventional) Indication
- Automatic (EFJohnson Conventional) Registration
- P25 Group Calls
- Talkgroup Scan
- P25 Unit Calls
- P25 Conventional Telephone Calls
- Call Alert
- Call History
- Messaging
- Status Messaging
- P25 Packet Data
- Secure Call Indication with Invalid Key
- P25 Trunking Two Tone Decoding
- P25 Trunking Two Tone Encoding

5.14.1 Digital Unit ID

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

5.14.2 Talkgroup ID

Each Project 25 channel is programmed with a talkgroup 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). Talkgroup IDs can be any number from 0 to 65,535. Talkgroup ID detect can be disabled by the Normal/Selective squelch function described in Section 5.4.1 or the monitor mode described in Section 5.2.

5.14.3 Network Access Code

Project 25 conventional channels also use a Network Access Code (NAC) to control which calls are received on a channel. The NAC can be 0 to 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 talkgroup ID) detect can be disabled by the monitor mode described in Section 5.2.

5.14.4 Out of Range (EFJohnson Conventional) Indication

In an EFJohnson P25 conventional infrastructure radio system, a predefined beacon can be programmed for transmission from the system at preset intervals. If the radio remains idle and does not receive the beacon or a voice call from the system within a specified time period (as programmed) an “Out of Rng” indication is displayed to inform the radio user of the condition. If the beacon is received, the timer is automatically restarted, and no out-of range condition is indicated. If an Out of Range condition exists, the user can still transmit and receive, but the condition will not exit until the beacon is received.

Note *This Out-of-Range indication applies only to EFJohnson P25 conventional infrastructure systems.*

If programmed, Out-of-Range (OOR) monitoring and indicators to the user are provided. The out-of-Range function operates on conventional analog and digital channels that have been programmed for the feature. This feature is supported only on EFJ Infrastructure.

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”. 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, 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” 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” for one second.

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.

5.14.5 Automatic (EFJohnson Conventional) Registration

When used in an 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. EF Johnson Technologies also supports conventional standardized IP data context activation registration without the EFJ affiliation checked.

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.

Note *This Automatic registration applies only to EFJohnson P25 conventional infrastructure systems.*

5.14.6 P25 Group Calls

P25 group calls are placed by selecting the channel programmed for the desired group, monitoring the channel if required, and transmitting.

The radio can be programmed so that the following are also displayed for 0.5 to 7.0 seconds or continuously during the call.

On Rx Options:

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 programmed 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 encryption key used to decode the call is displayed.

- For radios using Firmware Version 8.34.x or later, the configured Rx Info gets displayed for the time set in Armada regardless of when the call ends. If cycle is selected in Armada, the messages in that cycle appear at least once. If the Armada administrator selects infinite, the RX info appears for a minimum of 1 second.

On Tx Options:

P25 Talkgroup - The radio displays the number or alias of the talkgroup on which the call is being transmitted.

5.14.6.1 Changing a Channel Talkgroup

If the Digital Talk Group Select option button or Select TG menu parameter is programmed, the talkgroup assigned to a channel can be changed by the user. The new talkgroup continues to be assigned to the channel until it is manually changed again (cycling radio 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.

2 To select the talkgroup from the list of programmed talkgroups, briefly press the Talk Group Select option button or select the **Select TG** → **ID List** menu parameter. Then press the Up/Down buttons until the alias of the desired talkgroup is displayed. If talkgroup selection has been disabled on the channel by programming, "No Edit" is displayed, a tone sounds, and no change occurs. Press the (Menu) button to select the talkgroup and return to normal operation.

3 To enter a new talkgroup number from 1 to 65,535, press and hold the Talk Group Select option button or select the **Select TG** → **Enter ID** menu parameter. Enter the desired talkgroup directly using the keypad. If less than five digits are entered, press the (Menu) button to select the talkgroup and return to normal operation. The talkgroup entered using the keypad must be listed in the talkgroups list, otherwise the display will flash "Invalid TG".

5.14.7 Talkgroup Scan

This feature allows users to scan for a list of talkgroups on a single P25 Conventional frequency. When a call is received on the frequency, the radio searches the scan list for a talkgroup that matches the received talkgroup, and opens audio if a match is found.

The Talkgroup Scan, with talkback type set to active group option (if programmed), will return calls on the received talkgroup if the user talks back during scan hold time. The Talkgroup Scan, with talkback type set to selected group option (if programmed), 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.

5.14.7.1 Talkgroup Lock

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 or menu item.

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 Feature Entry/Exit:

The Talkgroup Lock Feature can be enabled / disabled from a programmable function button or from the menu.

- Pressing the function button or selecting the “Lock” option under the “TG Lock” menu item will lock the talkgroup.
  - If the radio is already locked, the bad beep tone will sound. If the radio is not already locked the feature entry tone will sound and the radio will be locked to the current talkgroup. In either case the radio will display “TG Locked” for one second followed by the alias of the lock talkgroup (or the talkgroup number if no alias is defined) for one second.
- Pressing and holding the function button or selecting the “Unlock” option under the “TG Lock” menu item will unlock the talkgroup.
  - If the radio is already unlocked, the bad beep tone will sound. If the radio is not already unlocked the feature exit tone will sound and the radio will unlock and return to the programmed talkgroup. In either case the radio will display “TG Unlocked” for one second followed by the alias of the programmed talkgroup (or the talkgroup number if no alias is defined) for one second.
- The menu will display “Lock” and “Unlock” options. The current state will be marked with a square indicator.

3 Talkgroup Select

If Talkgroup Lock is enabled, the Talkgroup Select feature will have the following new functionality:

- If a Talkgroup is entered through Direct Entry and the Talkgroup resides in the talkgroup list of the radio profile, the radio will store the Talkgroup as the Lock Talkgroup and will exit menu mode.
- If a Talkgroup is entered through Direct Entry and the Talkgroup does not reside in the talkgroup list of the radio 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.
    - Talkgroup Lock will be retained through power down. Downloading a profile through Armada will erase all Talkgroup Lock settings.

Talkgroup select feature exit will operate as follows:

- The (Clear) button will cause the feature to exit without saving any talkgroup changes.
- The (Menu) button will cause the feature to exit after saving the new talkgroup.

4 Talkgroup Strapping

Talkgroup strapping will have priority over talkgroup lock. This means that a channel with a strapped talkgroup will use its programmed talkgroup even if talkgroup lock is turned on. Locking the talkgroup on a channel with a strapped talkgroup will set the strapped talkgroup as the lock talkgroup.

5 Encryption

The radio will use the key that is assigned to the active Talkgroup 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** page.

6 Scan

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. This is necessary so that the radio will not only monitor a single TG for all scan channels.

7 Emergency

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

5.14.8 P25 Unit Calls

Unit Calls (also called Individual Calls) can be placed to a specific radio on a Project 25 channel if the Unit Call option button or menu parameter is programmed. Only the individual ID of the target radio is sent (a talkgroup ID is not sent). The radios that can be called are programmed 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 ID option button or menu parameter, and have a Unit Call programmed for the ID of the calling radio.

Place and receive a Unit Call as follows:

1 To transmit a Unit Call, press the Unit Call option button or select the Unit Call menu parameter. The alias (tag) of the last Unit Call is displayed.

2 If required, press the Up/Down buttons to display the desired alias/ID. The alias and ID of the calls that have been programmed are alternately displayed.

3 Press and release the PTT switch. The display indicates the Unit Call ID. If no answer, the system times out after 20 seconds.

4 When a Unit Call is received, “Call Recvd” and the alias of the unit ID are alternately flashed.

5 To respond, select the Unit Call mode by pressing the Unit Call option button, Call Response option button, or selecting the corresponding menu parameters.

If the call timer times out (set by programming) then “Timeout” is displayed and error tone sounds. If the channel is changed before a response is made, the unit call mode is exited.

5.14.9 P25 Conventional Telephone Calls

Telephone calls can be placed and received on P25 conventional channels. For P25 Trunked/Conventional/Viking16 Telephone Calls, the Land Mobile Radio System must be connected to a telephone system. Users should check with the System Administrator to see if Telephone Calls are allowed on their system. 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 programmed list only (direct entry using the keypad is not allowed).
- Unlimited - Telephone numbers can be selected from a list and also dialed directly using the keypad.

VP5000/VP6000/VP8000 radios can place telephone calls by recalling the telephone number from a programmed list. However, only Full Key Model radios (DTMF keypad) can directly dial telephone numbers using the keypad.

5.14.9.1 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 programmed in pairs, 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).

For radios using Firmware Version 8.34.x or later, the Armada administrator can program the radio to send no access /de-access code when it enters/exits conventional interconnect. This firmware supports single touch conventional interconnect calls and conventional encrypted interconnect calls.

5.14.9.2 Placing a Telephone Call

To recall from a list:

1. Select the conventional channel that is programmed to select the desired access and de-access codes.
2. Momentarily press the Phone option button or select the **Phone > Num List** menu parameter. 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.
3. If required, press the Up/Down buttons to display the desired number. The alias is displayed below the telephone number.
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. Proceed to Step 5.

To make a direct entry using DTMF keypad (Full Key Model Only):

1. Select the conventional channel that is programmed to select the desired access and de-access codes.
2. Press and hold the Phone option button until a tone sounds or select the **Phone > Enter Num** menu parameter. 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.
3. Enter the telephone number using the 0 to 9, *, and # keys. To enter a pause (indicated by "P"), press * #. The number scrolls to the left in the display so that the eight right-most digits are always displayed. Numbers up to sixteen digits (including pauses) can be entered.
4. Briefly press the PTT switch to send the access code. A dial tone sound can 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 button or ⮌ (Clear) button. This sends the de-access code which tells the system that the call is finished and that the repeater can be released.

5.14.9.3 Answering a Telephone Call

1 When a telephone call is received, “ringing” similar to a standard telephone is heard and “Phone” is displayed. For radios using Firmware Version 8.18.x or later, the calling phone number appears if it is available.

2 To answer the call, press the Phone option button or select that menu parameter and press the PTT switch to talk and release it to listen.

3 When the telephone call is finished or if it could not be completed for some reason, end it by pressing the Phone option button or ⮌ (Clear) button. This sends the de-access code which tells the system that the call is finished and that the repeater can be released.

5.14.10 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 to send or receive an alert. Operation is similar to P25 Trunked and Viking16 channels.

Note *For radios using Firmware Version 8.34.x or later, analog conventional channels also support Single Touch Call Alert.*

To answer a page:

1 When a page is received, five beeps sound and “Page Receive” 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 button. If the PTT switch is pressed, a group call is placed on the selected channel.

3 To answer the page as a unit call, press the Unit Call option button or select that menu parameter and 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.
- If the radio being called is not on the air, “No Ack” is displayed.

4 When the call is finished, end it by pressing the Unit Call option button or the ⮌ (Clear) button.

To initiate a page:

1 With a P25 conventional channel selected, momentarily press the Call Alert option button or select that menu parameter. The alias of the last ID called is displayed.

2 If required, press the Up/Down buttons to display the desired radio. The alias of each number is displayed.

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

- If five beeps sound and "Ack Received" is displayed, 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" is displayed after six attempts after the PTT switch is pressed.

5.14.11 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 History from the menu. The first call displayed is the most recent call received. Call History entries are indicated by an "**M**" icon.

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

5.14.12 Messaging

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

1. Momentarily press the Message option button or select that menu parameter. The alias of the last message sent is displayed.
2. If required, press the Up/Down buttons to display the desired message. Then send the message by pressing the (Menu) button or momentarily pressing the PTT switch. One of the following events then occurs:
   - If five beeps sound and "Ack Received" 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 "Msg Failed" is displayed.

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

5.14.13 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 programmed, and they are identified by an alias. If the Status option button or menu parameter is programmed, status conditions are sent as follows:

1. Momentarily press the Status option button or select that menu parameter. The alias of the current status condition is displayed.
2. To change the current status, press the Up/Down buttons until the desired status is displayed. Then to send the status, press the (Menu) button or momentarily press the PTT switch. One of the following events then occurs:
   - If five beeps sound and “Ack Received” is displayed, the status was received and acknowledged by the system.
   - If after five tries the message is not acknowledged, a tone sounds and “Status Fail” is displayed.

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

5.14.14 P25 Packet Data

P25 packet data transmission capability is available with VP5000/VP6000/VP8000 radios. A P25 Packet Data option button (if programmed) or menu parameter can be used to toggle the data mode on and off. See Section 10 for details.

The P25 Packet Data mode allows a subscriber unit to act as a packet data modem for a remote application connected to the subscriber unit through RS-232. The standard programming cable provides the RS-232 port (female DB9 connector) for connecting the external data equipment to a VP5000/VP6000/VP8000.

5.14.15 Secure Call Indication with Invalid Key

In P25 conventional systems, if the radio receives an encrypted call but does not have the key, the radio indicates that the call is secure instead of clear. This does not apply to a scanned channel.

In this case, the radio indicates the following:

- The LED indicates the call is secure (Table 3.4).
- The security icon blinks (Table 3.6).
- The message “INVALID KEY” gets displayed 2 seconds (Section 8).

5.14.16 P25 Trunking Two Tone Decoding

P25 Trunking channels can be configured with a Two Tone Decode list. The radio can be configured to require that a two tone page be received before unmuting to received audio. A P25 Trunking channel with a P25 Two Tone Decoder list decodes tones after moving to the traffic channel. If the Unmute Type is set to "Talkgroup," the radio will unmute when receiving traffic from an appropriate talkgroup, regardless of whether a two tone page was received. If the Unmute Type is set to "Talkgroup and Signaling," the radio must receive traffic from an appropriate talkgroup and a valid two tone pattern that matches the decoder list setting.

Regardless of the Unmute Type, once the radio decodes a valid two tone page, it will emit an alert tone and turn on the Selective LED (if enabled). After the call ends, the Auto-Reset Timer will begin (if enabled). If the Auto-Reset LED option is enabled, the Selective Call LED will be turned off when the timer expires. If the Auto-Reset Monitor option is enabled and the timer expires, the radio will be required to receive another valid two tone page in order to unmute to received audio. If the Auto-Reset Continuous Alert Tone is enabled, it will be turned off when the timer expires (or for radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later, the radio can be programmed not to play this tone). The Auto-Reset Monitor option is only functional when the Unmute Type is set to "Talkgroup and Signaling".

If enabled, the LED on the radio will blink orange and green after decoding a valid two tone code and a carrier is present. Once the carrier is no longer detected, the LED will blink orange for a length of time corresponding to the Auto-Reset Timer.

After receiving a call with a valid two tone page, the radio will begin the auto-reset timer once the carrier is no longer detected. When the timer expires, the radio will check the LED, Monitor, and Continuous Alert Tone options. The Timer can be configured from 0 to 300 seconds. Setting the timer to 0 disables the timer (effectively infinite). If enabled, the Selective Call Alert LED, Monitor, and Continuous Alert Tone will be canceled when the auto-reset timer expires. If this option is enabled and the auto-reset timer expires, the radio must receive another valid two tone code before the radio will open to received audio.

Radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later can use the following P25 Trunking Two Tone Decoder enhancements

- A P25 Two Tone List Select feature has been added. This allows the user to select a different decode list for the selected channel at any time. “No List” can also be selected to disable Two Tone Decoder. The Armada administrator can program it to a button or the menu. (This feature is also available for conventional analog.)
- DSP enhancements have been added to allow the radio to decode Phase 1 Quick Call II pages from other manufacturers’ radios.
- The Armada administrator can configure the radio to do the following:
  - Each P25 Two Tone Decode list can now contain up to 64 tone decode patterns, where the frequencies are explicitly specified. (The previous design of using A/B/C/D tone formats has been removed.) Each tone decode pattern can have an alias, which gets displayed when the tones are decoded. Each can also be assigned a unique custom tone in the Tone Assignments list.
  - Prevent the radio user from changing the Two Tone Decoder list.

5.14.17 P25 Trunking Two Tone Encoding

P25 Trunking Two Tone Encoding is similar to analog Two Tone Encoding (Section 5.13.6). The user can scroll through the list of tones programmed in Armada. Pressing PTT sends the selected Two Tone sequence, after which the radio transmits voice as normal. Alternatively, the user can perform a “Press-and-Hold” of the Two Tone button, which sends the last selected Two Tone sequence and then immediately stops transmitting.

Note *The “Press-and-Hold” operation fails if the radio is performing data operations.*

On mixed-mode channels, the Two Tone Encoder function performs analog or digital encode corresponding to how the mixed-mode “Transmit Type” is programmed.

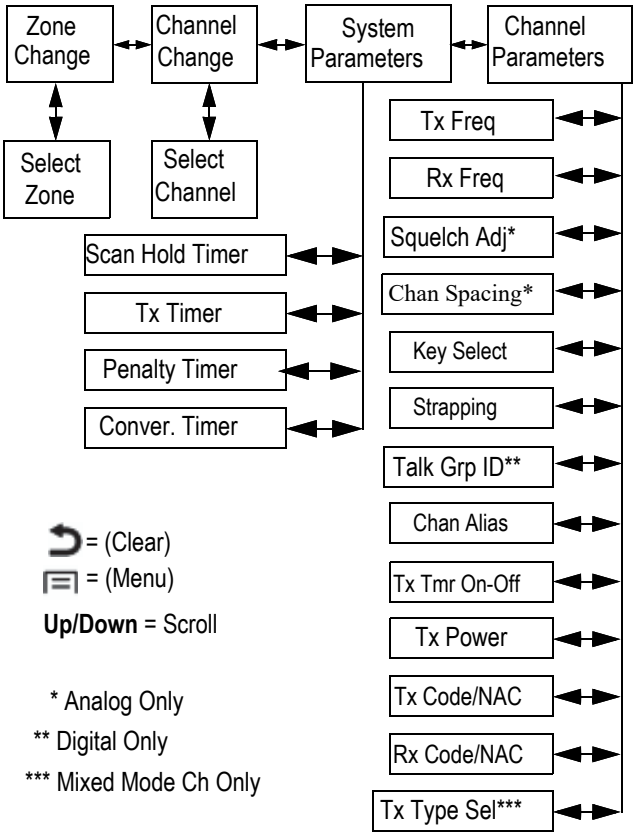
5.15 Keypad Programming

Keypad programming can be enabled only if it has been enabled at the factory and a conventional mode option button or menu parameter is programmed for the Keypad Programming function. The keypad programming mode is indicated by "Change Zone" and in the display.

Note *The Keypad programming feature is available to Federal Government users only. Users regulated by the Federal Communications Commission are not allowed to have this feature.*

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/Viking16 information.

Figure 5.1 Keypad Programming Menu Flowchart



5.15.1 Menu Description

A menu system is used to select parameters in the keypad programming mode. Figure 5.1 is a flowchart showing the keypad programming mode menu structure. When the keypad programming mode is selected by the Keypad Programming option button or menu parameter, the first menu parameter "Change Zone" is displayed as just described. Press the Up/Down buttons to scroll through the available parameters which are as follows.

- CHANGE ZONE
- CHANGE CHAN
- SYSTEM PARMS
- CHAN PARMS

Press the (Menu) *button* to select a highlighted parameter, and press the (Clear) *button* from one of the main menus to exit keypad programming. Pressing it in the other menus returns to the previous menu. The Up/Down buttons are also used in several menus to scroll through available selections. Additional information on this parameter is located in the following sections.

5.15.2 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. The zone password is programmed. A different password can be programmed for each zone.

Note *Ensure that the zone passwords are not lost because they cannot be overridden in the field.*

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

The password can be 1 to 8 digits in length, and consists of digits 0 to 9. It is entered as follows: If an incorrect password is entered, "Incorrect" is displayed and it must be re-entered. A password of 0 deactivates the feature.

5.15.3 Zone Change Parameter

The “Change Zone” menu parameter selects the zone containing the conventional channel to be reprogrammed. It does not change the zone selected for normal operation.

Press the (Menu) button to select the “Change Zone” parameter and then scroll through the programmed zones by pressing the Up/Down buttons. When the desired zone is displayed, select it by pressing the (Menu) button.

5.15.4 Channel Change Parameter

The “Change Chan” menu parameter selects the conventional channel to be reprogrammed. Disabled or P25 Trunked/Viking16 channels cannot be selected. This does not change the channel selected for normal operation.

Press the Select switch to select the “Change Chan” parameter and then scroll through the programmed channels by pressing the Up/Down buttons. When the desired channel is displayed, select it by pressing the (Menu) button.

5.15.5 System Parameters

The “System Parms” menu parameter selects the conventional mode timers to be reprogrammed (see following). Press the (Menu) button to select the “System Parms” parameter and then press the Up/Down buttons to display the desired parameter. Then press the (Menu) button again to select it.

Note *If “Password” is briefly displayed when attempting to select a parameter, see Section 5.15.2.*

Scan Timer - Selects the Scan Hold timer. Press the Up/Down buttons to increment/decrement the timer in 0.5-second increments from 0 to 7.5 or set it to 0 seconds to disable it. When the desired value is displayed, store it by pressing the (Menu) button.

Tx Timer - Selects the transmit time-out timer. Press the Up/Down buttons to increment/decrement the timer in 5-second increments from 0 to 225 or disable it by selecting 0 seconds. When the desired value is displayed, store it by pressing the (Menu) button.

Penalty Time - Selects the penalty timer. Press the Up/Down buttons to increment/decrement the timer in 15-second increments from 0 to 225 or disable it by selecting 0 seconds. When the desired value is displayed, store it by pressing the (Menu) button.

Conv Timer - Selects the conversation timer. Press the Up/Down buttons to increment/decrement the timer in 30-second increments from 0 to 450 or disable it by selecting 0 seconds. When the desired value is displayed, store it by pressing the (Menu) button.

5.15.6 Channel Parameters

The "Chan Parms" menu parameter selects the following conventional channel parameters that can be reprogrammed. Press (Menu) to select the "Chan Parms" parameter and then press the Up/Down buttons to display the desired parameter. Then press the (Menu) button to select it. 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 5.15.2.*

Note *If a mixed mode channel is selected, both the Rx Code (analog) and Rx NAC (P25) 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.*

Tx Freq - Programs the transmit channel frequency. The digit being changed flashes, and press the Up/Down buttons to select the desired number for that digit or enter it using the keypad (Full Key Model only). Then press the Right button to move to the next digit if applicable. If an invalid frequency is entered, a beep sounds, "Invalid" is briefly displayed, and the number must be re-entered.

Rx Freq - Programs the receive frequency the same as the preceding Tx Freq.

Squelch Adj (Analog Only) - Changes the preset squelch setting on that channel. The default setting and value range is based on radio type. Decreasing the value causes the squelch to open sooner so that weaker signals can be received, and increasing it causes the opposite to occur. Refer to Section 5.4.5 for more information.

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.*

Chan Space (Analog Only) - Selects either wide or narrow band channel spacing on analog channels only. Press the Up/Down buttons to select "Wide" or "Narrow", and when the desired setting is displayed, store it by pressing the (Menu) button.

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

Key Select - Selects the encryption key for the channel if applicable. The key storage location of 0 to 125 or 1 to 126 is displayed. If no keys are programmed, "No Keys" is displayed. Refer to Section 9.2 for more information.

Strapping - Selects the encryption strapping mode for the channel as Clear, Secure, or Switched. Refer to Section 9.3 for more information.

TG ID (P25 Only) - Selects the talkgroup for the selected channel. Press (Menu) to display the current talkgroup ID and then press (Menu) again to enter a different ID from 0 to 65,535. This number must be entered directly using the DTMF keypad (Full Key Model Only).

Channel Alias - Programs the alias for the channel (Full Key Model radios only). Up to twelve characters can be entered. Press (Menu) once to display the current alias and then press it again to program a new alias. Alphanumeric characters are programmed using the 0 to 9 keys. Pressing a key once enters the first letter on the key and then pressing it successive times enters the letters and the number on the key. For example, press the "2" key twice to enter "B". Press the Right button to move to the next position or press it twice to enter a space.

Tx Timer - Enables or disables the time-out timer on the current channel. Press the (Menu) button to select the on and off mode.

Tx Power - Selects the desired power output level. Press the Up/Down buttons to scroll through the following choices. When the desired setting is displayed, store it by pressing the (Menu) button.

- Power High - Select High transmit power.
- Power Low - Select Low transmit power.
- Power Switch - Switchable power selectable by the High/Low power button. This choice is not available if that button is not programmed.

5.15.6.1 CTCSS / DCS Squelch Control (Analog Channel)

Tx Code - Programs the transmit Call Guard (CTCSS/DCS) code. The currently selected code and is initially displayed. Press the Up/Down buttons to select the desired code type (CTCSS analog or DCS digital). Then press (Menu) to select it and enter the code number similar to programming a channel frequency. For radios using Firmware Version 8.26.x or later programmed by Armada 1.26.x and later, setting the CTCSS/DCS code to 0 resets the channel back to carrier squelch instead of displaying "Invalid".

Rx Code - Selects the receive codes the same as Tx Code above.

5.15.6.2 NAC Squelch Control (Project 25 Channel)

TX NAC - Programs the transmit Network Access Code (NAC) which can be any number in hexadecimal from 000-FFF. The procedure is similar to programming a TX FREQ just described. If an invalid code is entered, a beep sounds, "Invalid" is briefly displayed, and the code must be re-entered.

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

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.

5.16 Fire Ground Mode

Fire Ground Mode allows any radio optioned for Fire Ground Commander Mode to operate in Fire Commander Mode, and any subscriber optioned for Fire Ground First Responder mode to run in Fire Responder Mode. A radio can be programmed for both modes; however, the radio can only operate in one of the modes at a time. The user must exit the current mode to enter the opposite mode. Limited Fire Ground First Responder options are available on P25 Trunking and Viking16 channels. The Fire Commander Mode is limited to the Conventional System. If the Fire Ground Channel is not a Conventional channel and the user tries to enter Commander Mode on that channel, the radio will bad beep. The only Fire Mode feature currently offered on the P25Trunking and Viking16 protocols is the Lock Keypad/Volume option.

The intended set up is to have one radio running in Fire Commander Mode, and remain outside the emergency site. The remaining radios operating at, and inside, the emergency site should operate in Fire Responder Mode. The Fire Commander can issue Evacuation Alerts to notify the First Responders they must evacuate. The Fire First Responders can perform a Communication Check to determine their signal strength to ensure they are in range of the Fire Commander.

Each radio can be programmed for up to four Fire Commander buttons (Fire Commander 1 through Fire Commander 4), and up to four Fire First Responder buttons (Fire Responder 1 through Fire Responder 4). Each Fire Mode can be selectively programmed for specific Fire Commander and Fire Responder options. Each Fire Mode can also be programmed to operate on a designated channel or the current selected channel. If a designated channel is chosen, the radio will automatically switch to the designated channel when that Fire Mode is entered.

There are times when P25 digital voice is better than analog voice. Under these circumstances it is best to operate in the P25 digital voice mode. If programmed, the radio will change its transmit mode, based on signal strength, from analog to P25 Digital. If the radio receives carrier with a RSSI below the Fair RSSI threshold, the radio will automatically switch its transmit type from analog to P25 Digital. This will be evident as the received audio should sound suddenly clear without background static as heard on an analog channel.

Locked Radio Option - The user can choose to have different radio controls locked while in Fire Mode and is set by programming. If this option is enabled, the radio will lock the front and side buttons. Additionally, the radio can be programmed to lock the Channel Selector, Volume Knob, Front Only Keypad, and Toggle switch. No matter the keypad lockout options programmed, in Fire Mode the subscriber will always allow the buttons for Emergency, Comm Check, Evac Alert, and the button programmed to initiate Fire Mode, as it will be used to cancel Fire Mode. The radio will not power down while in Fire Mode. Fire Mode must manually be exited for power down to occur.

Out of Range - When programmed, the Fire Commander will send out a beacon at the programmed beacon time interval. If the Fire Responder does not receive a carrier event, with an RSSI above the OOR threshold, within its programmed OOR Inactivity Duration time, it will go OOR to notify the user they are no longer in receiving range of the Fire Commander radio.

An Out of Range Beacon can be programmed for the Fire Commander in five second intervals from 5 to 80 seconds. When programmed, the Fire Commander will send out a beacon at the programmed interval. An Out of Range Indicator can be programmed for the First Responder in five second intervals from 7 to 82 seconds. When programmed, if the First Responder fails to receive a beacon from the Commander for the programmed duration, the First Responder will emit an OOR tone and display “Out of Range” on the display until a carrier event with an RSSI level above the OOR RSSI threshold is received.

Note *The slight offset between timers is necessary to avoid the radio momentarily going out of range and then back in range.*

Communications Check can be programmed to any radio, but is intended for, and only works with Fire Mode radios. Only radios that are optioned for Fire Ground First Responder, and currently in Fire Responder mode, can issue a “Comm Check.” When pressed, the responder will sound one of several tones to indicate the RSSI range the Responder radio is currently in. This feature will only work on digital channels and can only be programmed as a function button.

When the “Comm Check” button is pressed on a Responder radio, the Responder requests the current RSSI level from the Commander radio. If in range, the Commander radio will respond with the RSSI level. If the RSSI level is Excellent or Good, the Responder will sound a Talk Permit Tone. If the RSSI level is Fair, the Responder radio will sound two beeps. If the RSSI level is Poor or OOR, the Responder radio will sound four beeps. Please refer to the Conventional RSSI Guide for a list of RSSI thresholds to use when programming this feature.

This feature makes use of the P25 Signaling Retry Attempts and Retry Response Timer settings defined for the radio. If the Comm Check retries to completion and the Responder Out of Range Indicator feature is enabled, the radio will go Out of Range. If not enabled it will display No Ack for two seconds.

Comm Check works in either simplex mode or through a repeater configured for data repeat mode, both of which require a Responder and Commander radio. Currently the EFJohnson system infrastructure does not support the process of Comm Checks so a Commander radio is required.

Evacuation Alert can be programmed to any radio, but is intended for, and only works with Fire Mode radios. The Evac Alert is sent by the Fire Commander radio and received by the Fire First Responder. The Fire First Responder radio will warn the user with an Evac Alert tone and message to notify the user to evacuate. This feature will only work on digital channels and can only be programmed as a function button.

Any radio can program an Evac Alert button; however, only subscribers that are optioned for Fire Ground Commander, and currently in Fire Commander Mode, can issue an Evac Alert. A press and hold is required for activation. If an Evacuation Alert message is received by the Fire Responder radio, the subscriber will flash “Evac Alert” on the display and sound the Evacuation Alert tone.

Any button press will silence the Evac Alert tone but only a PTT press will cancel the Evac Alert display message and exit the Evac Alert state. A Fire Responder subscriber will only process one Evac Alert message every 60 seconds to avoid multiple Evac Alert tones sounding. This feature makes use of the P25 Signaling Retry Attempts and Retry Response Timer settings defined for the radio.

Evac Alert works in either simplex mode or through a repeater configured for data repeat mode, both of which require a Responder and Commander radio. Currently the EFJohnson system infrastructure does not support the sending of Evac Alert messages so a Commander radio is required.

The **Audible RSSI** can be programmed to provide the Fire First Responder an audible indication when the RSSI drops below certain thresholds indicating a poor coverage area. When enabled, the First Responder radio will measure RSSI at the beginning of a call and may provide tone notifications after the call is over. Table 5.3 summarizes the tones heard in each RSSI range.

Table 5.3 RSSI Tones (Fire Ground Mode)

RSSI Level	RSSI Indicator Bars	Tone Heard
Above Good	3 or 4 bars	No tone
Above Fair, Below Good	2 bars	2 beeps
Above OOR, Below Fair	1 bar	4 beeps
Below OOR	“X”	4 beeps

5.17 Request to Talk

The Request to Talk (RTT) option, when set in Armada, is used to alert the OCC operator that a unit is requesting to speak with the operator. In some cases Automatic Number Identification (ANI) is used to permit OCC operator identification of unit calling. Each base, mobile and portable radio transmits an encoded signal which is decoded into a unit identification and is displayed at the operator's console position. Priority capabilities permit a member to signal an emergency condition to the commenter by pushing one button.

5.18 Conventional RSSI Display

A conventional RSSI Display function is available for radios using Firmware Version 8.34.x or later. When enabled, the radio continuously displays the Receive Signal Strength Indicator (RSSI) [in dBm] during calls. Because this is primarily a test feature, the RSSI display overrides other display information, such as PTT ID or other display options. The feature is always off on boot. After the operator turns the feature on, the feature remains on until the feature gets turned off or the radio gets power-cycled.

The radio displays a red "alert" banner if the RSSI falls to a level corresponding to 0 bars on the signal strength indicator. Otherwise, a green banner displays.

The hardware on the radio is limited to measuring RSSI up to around -70 dBm for VP5000/VP6000 radios and up to around -4 dBm for VP8000 radios (depending on the band).

SECTION

6

P25 / Viking16 Features

The following information describes the features unique to P25 Trunked, and Viking16 operating modes. Refer to Section 4 for information on features common to all operating modes.

Note *Please note that the features and operations may vary depending on the model of your VP5000/VP6000/VP8000 radio. Standard Key Model radios do not have a DTMF keypad. Messages and status icons are shown on the front display.*

This section contains information on the following topics:

6.1 Analog and Digital Operation

Either analog or digital operation can be selected for communication on V16 Multi Site traffic channels. Operation for each talkgroup is based on system programming. Digital operation is an optional feature. Viking16 can be either analog or digital operation, P25 Trunked operation is digital.

6.2 Standard Group Calls

Standard group calls may be placed to another radio, group of radios, or a dispatcher, depending on programming. Most calls are probably this type. Proceed as follows to place and receive group calls.

6.2.1 Placing a Standard Group Call

To place a Standard Group call:

1. Turn power on and set the volume as described in Section 3.3.1 and Section 3.3.2. Select the channel programmed for the talkgroup you want to call (Section 3.3.3).

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 button or selecting that menu parameter. The status cannot be changed if the talkgroup is strapped to Clear or Secure. When you change to Secure mode, the display will briefly display the Key Alias assigned to this encryption key. Refer to Section 9.3 for more information.

3 Press the PTT switch and begin talking. An optional talk permit tone may sound to indicate when talking can begin. Events that may occur are as follows:

- If in the secure mode and your radio is not programmed with the proper encryption key, “Key Fail” is displayed and the call must be made in the clear mode or the proper key must be programmed.

  The user hears the key fail tone, and will not be allowed to transmit until secure mode is disabled or the proper key is loaded to the radio.

- 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 Rng” is displayed, you may be out-of-range. Drive closer or away from shielding objects and try again.

- If your unit ID is denied, the radio will not affiliate and is denied system access. The Unit ID is not programmed on the system.

- If the secure mode is selected by the Secure/Clear option button or menu parameter and an attempt is made to transmit on a channel strapped as clear, “Clear Only” is displayed and the transmission is denied. Likewise, if the clear mode is selected and the channel is strapped as secure, “Secure Only” is displayed and the transmission is denied.

6.2.2 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 the selected channel is programmed with Talk or Announcement groups, only the Talk or Announcement group IDs is detected. Other IDs in the Announcement group are detected only if no talkgroup is programmed.

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 to 7.0 seconds or continuously during the call.

PTT ID- The unit ID of the radio 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 programmed 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 encryption key used to decode the call is displayed.

- For radios using Firmware Version 8.34.x or later, the configured Rx Info gets displayed for the time set in Armada regardless of when the call ends. If cycle is selected in Armada, the messages in that cycle appear at least once. If the Armada administrator selects infinite, the RX info appears for a minimum of 1 second.

6.3 Unit Calls

Unit calls allow calls to be placed to a specific radio unit. 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 radio 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 button is required to place these calls, and either that key or the Call Response option button is required to receive them. Unit calls are programmed to operate in one of the following modes:

- Disabled.
- Response-only capability.
- List only - Unit IDs can be selected from a programmed list only (direct entry using the keypad is not allowed).
- Unlimited - Unit IDs can be selected from a list and also dialed directly using the keypad. (For radios using Firmware Version 8.18.x or later, invalid Unit IDs dialed using the keypad get deleted.)

6.3.1 Placing an Enhanced Unit Call

To recall from a list:

1 Momentarily press the Unit Call option button or select that menu parameter and the alias of the last called radio is displayed. The unit call mode is indicated by in the display.

2 If required, select another radio by pressing the Up/Down buttons until the alias of the desired radio 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 using the DTMF keypad (Full Key Model only):

1 Press and hold the Unit Call option button until a tone sounds. The last ID called is displayed, and the unit call mode is indicated by in the display.

2 Using the 0-9 keys, dial the ID of the radio you are calling (eight digits for Unit calls). To erase the last digit, press the Left Nav button, and to cancel the call, press the (Clear) button.

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 then may occur are as follows:

- If the radio being called is on the air, “Wait” is displayed and ringing is heard until the called party answers or until the system terminates the call, whichever occurs first. When the call is answered, the voice of the called party is heard.
- If the called radio does not answer, a continuous tone sounds and “No Answer” is displayed.
- If the called radio is not on the air, a continuous tone sounds instead of the ringing tone and “Deny” is displayed.
- If the busy tone sounds and “Busy” is displayed, the called radio 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, “Resp Only” is displayed and an alert tone sounds.
- If your radio does not have the proper encryption key, “Key Fail” is displayed and the call must be made in the clear mode by pressing the Clear/Secure option button. Otherwise, load the correct key.

4 When the call is finished or is not answered, end it by pressing the Unit Call option button or the (Clear) button.

6.3.2 Placing a Standard Unit Call

To recall from a list:

1 Momentarily press the Unit Call option button or select that menu parameter. The alias of the last called radio is displayed, and the unit call mode is indicated by in the display.

2 If required, select another radio by pressing the Up/Down buttons until the alias of the desired radio 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 using DTMF keypad (Full Key Model only):

1 Press and hold the Unit Call option button until a tone sounds (approximately one second). The last ID called is displayed, and the unit call mode is indicated by in the display.

2 Using the 0-9 keys, dial the ID of the radio you are calling (eight digits for Unit calls). To erase the last digit, press the Left Nav button, and to cancel the call, press the (Clear) button.

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 then may occur are as follows:

- The called party answers the call.
- The called party does not answer. Press the (Clear) button to end the call.
- If the selected radio 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 the radio does not have the proper encryption key, “Key Fail” is displayed and the call must be made in the clear mode by pressing the Clear/Secure option button or selecting that menu parameter. Otherwise, load the correct key.

4 When the call is finished or if it is not answered, end it by pressing the (Clear) button.

6.3.3 Receiving a Unit Call (All Types)

When a unit call is received, “Call Recvd” is displayed and/or the call tone sounds once.

To answer the call, press the Unit Call option button or select that menu parameter and then press the PTT switch and begin speaking. The unit ID of the calling radio is displayed. More information follows:

- If the PTT switch is pressed before the Unit Call option button, the call is transmitted as a group call.
- If unit calls are not permitted (the Unit Call option button/menu parameter is not programmed), press the Call Response option button or select that menu parameter to answer the call.
- Ring times for both Tx and Rx radios are programmable in P25 Trunking, which sets the maximum ring time of the target radio when receiving phone and unit-to-unit calls. When this time expires, the call is automatically discontinued. Times of 61 to 120 seconds can be programmed.
- The Unit Call Initiate Ring parameter sets the maximum time the initiating radio rings when placing a unit call (phone calls not included). Ringing stops if the target radio answers before this timer expires. Times of 1 to 255 seconds can be programmed.
- If the system is busy when a response is made, the busy tone sounds.

6.4 Telephone Calls

The telephone call feature allows telephone calls to be placed and received over the public telephone system using your radio. For P25 Trunked/Conventional/Viking16 Telephone Calls, the Land Mobile Radio System must be connected to a telephone system. Users should check with the System Administrator to see if Telephone Calls are allowed on their system. 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 programmed list only (direct entry using the keypad is not allowed).
- Unlimited - Telephone numbers can be selected from a list and also dialed directly using the keypad.

VP5000/VP6000/VP8000 radios can place telephone calls by recalling the telephone number from a programmed list. However, only Full Key Model radios (DTMF keypad) can directly dial telephone numbers using the keypad.

6.4.1 Placing a Telephone Call

To recall from a list:

1 Momentarily press the Phone option key or select that menu parameter. The alias of the last called telephone number is displayed. The interconnect call mode is indicated by in the display.

2 If required, press the Up/Down buttons to display the desired number. The alias of each number is displayed.

3 Press and release the PTT switch and "Dialing" is displayed. Refer to the bulleted list following Step 3 below for events that may then occur.

To make direct entry using DTMF keypad (Full Key Model only):

1 Select the menu parameter or press and hold the Phone option button until a tone sounds. The alias of the last called telephone number is displayed if it is in the phone number list. Otherwise, the last eight digits of the last called telephone number are displayed. The interconnect call mode is indicated by in the display.

2 Enter the telephone number using the 0 to 9, *, and # keys. To enter a pause (indicated by "P"), press * and then #. To erase the last digit, press the Left Nav button. The number scrolls to the left in the display so that the eight right-most digits are always displayed. Numbers up to 16 digits (including pauses) can be entered. Press the (Clear) button to cancel the call.

3 Press and release the PTT switch and "Dialing" is displayed. Or you can also dial a number after the connection is made, enter the number using the keypad then press and release the PTT to send the digits. 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 is 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 land side party to indicate when they can respond. To dial a number after the connection is made, press the PTT switch and dial the number using the microphone keypad.
- If the selected telephone number is not valid, "Invalid" is displayed and an alert tone sounds. Select a valid number.

4 When the telephone call is finished or if it could not be completed, end it by pressing the Phone option button or (Clear) button.

6.4.2 Answering a Telephone Call

To answer a telephone call:

1 When a telephone call is received, “ringing” similar to a standard telephone is heard. What is displayed on an incoming call depends on the protocol you are in and if the number came over the air and if phone number aliases are defined in the codeplug.

2 To answer the call, press the Phone option button or select that menu parameter and 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 button or (Clear) button.

6.5 Call Alert

The Call Alert™ feature allows pages to be sent and received.

6.5.1 Answering a Page

To answer a page:

1 When a page is received, five beeps sound and “Page Receive” 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 button. If the PTT switch is pressed, a group call is placed on the selected channel.

3 To answer the page as an unit call (see Section 6.3), press the Unit Call option button or select that menu parameter. 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. One of the conditions that follow may also occur:

6.5.1.1 Enhanced Mode

- If the radio being called is on the air, ringing is heard until the called party answers or until the system terminates the call; whichever occurs first.
- If the radio being called is not on, a “No Ack” message is displayed on the radio. If the radio being called does not answer, a “No Answer” message is displayed on the radio. This lets you know if the radio is on the System or not so that you do not waste repeater air time.

6.5.1.2 Standard Mode

- If the radio being called is not on the air or does not answer, you will not hear a response.
- When the call is finished or it could not be completed for some reason, end it by pressing the (Clear) button.

6.5.2 Initiating a Page

To initiate a page:

1 With a P25 Trunked or Viking16 channel selected, momentarily press the Call Alert option button or select that menu parameter. The alias of the last ID called is displayed.

2 If required, press the Up/Down buttons 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” is displayed six seconds after the PTT switch is pressed. Auto exit then occurs.

6.6 Messaging

The messaging feature allows programmed messages to be sent to a dispatcher. Up to 255 messages, identified by an alias, can be programmed. If a Message option button or menu parameter is programmed, messages are sent as follows:

1 Momentarily press the Message option button or select that menu parameter. The alias of the last message sent is displayed.

2 If required, press the Up/Down buttons to display the desired message. Then send the message by pressing the (Menu) button or momentarily pressing the PTT switch. One of the following events then occurs:

- If five beeps sound and "Ack Received" 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 "Msg Failed" 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".*

6.6.1 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, and an alias for Message may be programmed.

6.6.1.1 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, or may be entered by the user. (For radios using Firmware Version 8.18.x or later, invalid Unit IDs entered by the user get deleted.) 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 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.

6.6.1.2 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.

6.7 Sending Status Conditions

The status feature allows the user to send his/her current status to the dispatcher or another unit. Up to 255 status conditions, identified by an alias, can be programmed. If the Status option button or menu parameter is programmed, status conditions are sent as follows:

1. Momentarily press the Status option button or select that menu parameter. Select either the RCM Address for the dispatcher or a Unit ID from the call list. If attempting to send a status to a Unit not in a call list, press and Hold the Status button for direct entry of the Unit ID. (For radios using Firmware Version 8.18.x or later, invalid Unit IDs entered by the user get deleted.)

2. After selecting the Dispatcher or other Unit to send the Status to, the alias of the current status condition is displayed.

3. To change the current status, press the Up/Down buttons until the desired status is displayed. Then to send the status, press the (Menu) button or momentarily press the PTT switch. One of the following events then occurs:

   - If five beeps sound and "Ack Received" is displayed, the status was received and acknowledged by the system.

   - If after five tries the message is not acknowledged, a tone sounds and "Status Fail" is displayed.

Note *Only the status number assigned to the alias is sent – not the actual text of the status condition alias itself.*

6.8 Emergency Alarm and Call

Emergency Alarms and Calls are separate functions that can be individually enabled or disabled on each P25 Trunked and Viking16 system. The Emergency option button (or menu parameter) is required for these functions. 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.
  - Global (radio wide) emergency channel
  - Emergency group of the selected channel
  - Talkgroup of the selected channel
  - Announcement group of the selected channel

For radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later, when entering emergency, the radio will do one of the following according to its programming:

- Remain on its current channel with its current talkgroup
- Remain on its current channel but enter a special emergency talkgroup
- Change to a specified emergency channel

Note *The radio only displays the Secure icon when the Emergency Call gets sent encrypted.*

Up to 255 Emergency Lists may be programmed. A specific list may be selected for each channel.

6.8.1 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 button or selecting the Emergency menu parameter. The system to which the emergency channel is linked must have Emergency Alarms enabled. The alarm is sent on the control channel.

Proceed as follows to send an emergency alarm:

1 If required, press the Emergency option button or select that menu parameter. 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). If silent is programmed or the Surveillance mode is selected (Section 4.13), none of these indications occur. If "No Rx 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, "Ack Received" 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.

4 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 button. If "Silent" is programmed, a tone sounds when the operator exits Silent Emergency (for radios using Firmware Version 8.26.x or later programmed by Armada 1.26.x and later).

6.8.2 Emergency Call Alert

This feature notifies a user when an emergency call is being made on their selected P25 Trunking Talkgroup.

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 "Emerg Rcvd" message is displayed, 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 this state, press the button programmed for "Emergency Clear". The radio returns to its normal display, and the "Emerg Rcvd" message no longer displays.

6.8.3 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 PTT switch after pressing the Emergency option button or selecting the Emergency menu parameter. If the Emergency Hot Mic feature is enabled, the emergency call is automatically transmitted without having to press the PTT switch (see following description).

6.8.3.1 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. The automatic transmit period is programmed for 0 to 120 seconds in 10-second intervals. The radio can be configured to re-enter emergency hot mic transmit after a set receive time has elapsed. The radio continues cycling in and out of emergency hot mic transmit until the programmed number of cycles have taken place, until PTT is asserted by the user (if configured), or until the user takes the radio out of emergency mode. If this 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 button. Subsequent presses do not trigger automatic transmissions. To reset this function, cycle power or press and hold the Emergency button.

6.8.3.2 Placing an Emergency Call

1 If required, select a channel of a system on which Emergency Calls are enabled and press the Emergency option button or select that menu parameter. The Emergency Alarm is then sent as described in Section 5.10.1 if applicable.

2 Emergency Alarm entry is displayed when the Emergency button is pressed. Console Ack is displayed when an acknowledgment is received back from the console for an Emergency Alarm, indicating that the dispatcher acknowledges the emergency. Emergency Exit is displayed when the user presses and holds the emergency button. Table 6.1 below shows the Alarm Tones for Emergency Events.

Table 6.1 Emergency Events & Alarm Tones

Event Type	Event Trigger	Tone Played
Emergency Alarm Entry	Emergency button has been Pressed.	1000 Hz continuous tone for 175 ms.
Console Acknowledgment	Emergency Alarm has been successfully Acknowledged.	Two 1000 Hz 175 ms tones with 50 ms spacing followed by Three 1000 Hz 175 ms tones with 150 ms spacing.
Emergency Exit	Emergency button has been Pressed and Held (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 (Section 4.13), the radio will behave in accordance to the individual surveillance mode options. If “No Rx Activity During Emergency” is programmed, receive audio and the front panel LED are disabled in the receive mode.

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

6.8.4 Emergency Alarm Rx Indicator

When programmed, the user receives an Emergency Alarm display and/or Alert on the radio when another radio on the same system sends out an Emergency.

6.9 Failsoft Operation

If a failure occurs in the P25 Trunked or Viking16 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 pre-programmed 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.

6.9.1 Failsoft Connect Tone

When using this radio with Viking16 trunking systems, a different connect tone during failsoft operation can be programmed. 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, the connect tone during failsoft operation can be programmed. If a value other than “Default” is programmed, the radio will always use this connect tone setting during failsoft operation.

6.10 Status Indications

Status Indications can be programmed in Armada to control the display of alert messages and tones on a subscriber. There are three Status Indication settings available: System Access Failure Indication, Data Failure Indication and Site Trunking Indication. System Access Failure Indication reflects the status of various failures to register to sites or Talkgroups and is only available for P25 systems. Data Failure Indication reflects the status of the IP registration and is only available for P25 systems. Site Trunking Indication reflects the status of the single site trunking registration and is available for P25 systems and Viking16 systems.

These Status Indications are optionally configured to display ongoing flash messages and/or tones using four options: NONE, TONE, DISPLAY, and TONE AND DISPLAY. By default, the option is set to NONE for all Status Indication settings.

6.10.1 System Access Failure Indication

System Access Failure Indication occurs in six cases and results in different display messages as follows:

- If the System Registration is refused, the display message “Reg Refused” will be shown.
- If the Location Registration is refused, the display message “Reg Refused” will be shown.
- If the Affiliation is refused, the display message “Aff Refused” / “Affilatn Refused” will be shown.
- If the Affiliation is denied, the display message “Aff Deny” / “Affilatn Deny” will be shown.
- If the Authorization has failed, the display message “Auth Failed” / “Authent Failed” will be shown.
- If the TDMA Only [Talkgroup] Join has failed, the display message “TDMA Only” will be shown.

The System Access Failure Indication tone and message, depending on the chosen option, are as follows:

- When TONE or TONE AND DISPLAY are chosen, a long error tone will play periodically until the issue is resolved, the subscriber changes systems, or the subscriber reboots.
- When DISPLAY or TONE AND DISPLAY are chosen, the subscriber will continuously flash the appropriate display message until the issue is resolved, the subscriber changes systems, or the subscriber reboots.
- When NONE is chosen, a single tone will be played once and the subscriber will flash the appropriate display message once, unless the home system requirement disables it.

Continuous flashing of the display message and playing of the tone may only be enabled when the unit is on a home system. Table 6.2 shows the System Access Failure Indication cases with Home System Requirement Exceptions.

Table 6.2 System Access Failure Home System Requirement Exceptions

Failure	Home System Requirement
System Registration Refused	Only continuously indicates when on a home system
Location Registration Refused	
Affiliation Refused	Indicates only when on a home system
Affiliation Deny	
Authorization Failed	
TDMA Only [Talkgroup] Join Failed	Indicates only when on a home system

For radios with firmware 8.16.x or earlier, System Access Failure is not available. For radios with firmware 8.18.x to 8.32.x, System Access Failure Indication has the same functionality described here with the addition of control over display messages and tones for Data Failure Indication, and from 8.28.x to 8.32.x, the display of the Affiliation icon on the subscriber is controlled by System Access Failure Indication. An exception is the “Data Denied” indication which was not controlled by any setting until 8.34.x.

6.10.2 Data Failure Indication

Data Failure Indication occurs in two cases and results in different display messages as follows:

- If the subscriber fails to send IP registration packets or receive a response to its registration, the display message “IP Reg Failed” will be shown.
- If the subscriber is denied data services by the system, the display message “Data Denied” will be shown.

The Data Failure Indication tone and message, depending on the chosen option, are as follows:

- When TONE or TONE AND DISPLAY are chosen, a bad bonk will be played once.
- When DISPLAY or TONE AND DISPLAY are chosen, the subscriber will flash the appropriate display message once.
- When NONE is chosen, neither indication will be given regardless of the status of data registration.

For units with firmware versions 8.32.x and earlier, the Data Failure Indication setting will be flagged if the chosen option does not match System Access Failure. For these earlier versions, System Access Failure controls the messages and tones that Data Failure Indication enables except for the “Data Denied” message, which was not controlled by any setting before 8.34.x.

6.10.3 Site Trunking Indication

Site Trunking indication occurs when the unit has recognized or registers to a system that is in single site trunking.

A system is in site trunking when it has only a single site. When a subscriber is on a system in site trunking mode, the Site Trunking Indication tone and message, depending on the chosen option, are as follows:

- When TONE or TONE AND DISPLAY are chosen, a chirp will be played once when the radio recognizes the site is in that mode.
- When DISPLAY or TONE AND DISPLAY are chosen, the subscriber will continuously flash the message “Site Trunking” until the radio has left that site.
- When NONE is chosen, neither indication will be given regardless of site status.

For units with firmware versions 8.32x and earlier, the Site Trunking Indication was controlled by two checkbox settings, Site Trunking Display and Site Trunking Alert, controlling the display message and error tone respectively. They have been combined into a single combo box with four options in versions 8.34.x and later.

6.11 P25 Trunked / Viking16 Scanning Features

Scanning on P25 Trunked and Viking16 systems 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 Section 4.14 and Section 4.14.5.

- Scanning is turned on and off by the Scan option button or menu parameter. Talkgroups (channels) can be programmed so that scanning automatically starts when the talkgroup is selected (Autoscan).
- When responding to calls in the scan mode, the programming of the Talkback Type 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.
- Each talkgroup can be 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.
- Up to 255 scan lists, each with up to 255 talkgroups from the same system can be programmed. The selected scan list can be temporarily changed and edited as described in Section 4.14.5.1.3.
- In addition to calls on channels in the scan list, pages, unit calls, and telephone calls are received while scanning. Unit and telephone calls are not interrupted by priority messages.

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 associated with the radio.

When a call needs to be passed to a radio at another site, the traffic from one site to another is sent out over the control channel to the radios. When a radio is scanning, it is monitoring the call information being sent out over the 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 a 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 the 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.

6.11.1 Priority Talkgroup Sampling

The VP5000/VP6000/VP8000 portable radio supports Dual Priority talkgroups in P25 Trunking and conventional formats.

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 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 a 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.*

6.12 Dynamic Regrouping

The dynamic regrouping feature allows a dispatcher to change the current talkgroup or button 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 Viking16 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 button or menu parameter is programmed, it can be used to exit the dynamic regrouping mode if desired.

Otherwise, if the lock mode was not specified, the selected talkgroup can be manually changed and the previous talkgroup is reselected. 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, a 765 Hz tone sounds every 25 ms for 300 ms and the radio automatically changes to the regrouping channel. “Dyn Regrp” is displayed.

2. 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.

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 P25 Trunking and V16 Multi Site Unique Features

P25 Trunked and V16 Multi Site modes can provide access to single or multi-site systems. The P25 Trunked mode can provide access to a single trunked site or roaming between several trunked sites.

This section contains information on the following topics:

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 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 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 Trnking" is displayed and/or an alert tone sounds when site trunking occurs.

P25 trunked and V16 Multi Site 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 will continue searching for another wide area control channel or check for failsoft if failsoft is enabled. Otherwise, the radio will display "Out-of-Rng". 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.

For radios using Radio Firmware Version 8.36.x or later programmed by Armada 1.36.x and later, if the currently active site and all adjacent sites have sufficiently weak signal strength, the Armada administrator can program the radio to perform Non-Adjacent Site Search. This enables the radio to check the control channel list for a stronger site.

The only reason this feature should be used is if sites are not able to broadcast adjacent site information, or if a user needs to roam between systems and they do not broadcast adjacent site information. In this situation, this feature allows the radio to roam more quickly to a better site, without needing to go out of range on the current site first. The control channel list gets scanned every two minutes if these conditions are met and while the radio is idle.

Note *There is a major drawback to using Non-Adjacent Site Search. The user should be aware that the radio will not be able to receive calls for a potentially long period of time, depending on the length of the control channel list.*

6.14.3 Determining Current Site and Searching for New Site

To display the RSSI level of the current site, press the Site Search option button or select that menu parameter. The display then indicates the current site number as "Site x-x" and the RSSI level as "RSSI xx". This mode is then automatically exited.

To scroll through the other programmed sites, press and hold the Site Search option button. "Site x-x" and "RSSI xx" appear. Then, press the navigation pad up/down buttons to cycle through available sites, then press the Menu button to confirm

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 on a site. To prevent the radio from searching for a new site, lock it on the current site by pressing the Site Lock option button or selecting that menu parameter. The display shows the flashing icon to indicate that the site is locked. To unlock the site, press the Site Lock button again until "Site Unlock" is momentarily displayed.

6.14.5 Auto Site Search

Auto site search automatically searches sites and ranks them in a "Best Sites" list. The list is made up of all sites in the site list that share the highest site rank or have a site rank of less than the highest site rank. Sites are sorted by RFSS ID/Zone and then by Site ID.

Auto Site search is selected by the Auto Site Search option button or by menu selection.

1. Press the Auto Site Search option button (or select the menu parameter) to display the current site number and RSSI level of the current site.
2. Press and hold the Auto Site Search option button (or use the menu) to move from the current site and scroll through the "Best Sites" list.

If menu selection is used, two items can be displayed:

- "Site Disp" displays the current site number or alias and RSSI indicator.
- "Auto Site" moves from the current site to the next (or first) site in the Best Sites list.

Note *Sites on the "Best Sites" list are constantly re-ranked by the roaming algorithm, so changes to the list are not uncommon.*

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.

With this option enabled on a talkgroup, as the talkgroup affiliates with a site, that site is saved if the radio 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.

The Wide Area Scan can be programmed to minimize the problem just outlined. The Wide Area Scan feature functions as follows:

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 radio 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.

6.14.6.1 Normal P25 and V16 Multi Site Control Channel Hunt

The following control channel search methods are normally used to find a control channel:

Short Hunt - The dynamic array of 7 (or 15) adjacent sites 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 (V16 Multi Site) or channels are searched based on the programmed channel ID table followed by every channel available to the radio (P25 Trunking). Use of the channel ID table in P25 Trunking speeds full spectrum CC acquisition.

6.14.6.2 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.

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.

6.14.7 Viking16 Reduced Bandwidth Filter

This feature uses a reduced bandwidth filter on Viking16 control channels. This filter can improve performance in areas of extreme interference. Selecting this feature changes the filter used by the receiver. The reduced bandwidth filters show a slight improvement in heavy interference. This filter reduces the receiver's displacement bandwidth. This decreases performance on mistuned radios or systems. Reduced bandwidth filters are only available for Viking16 systems.

6.15 Zone Password

A zone password can be programmed with the VP5000/VP6000/VP8000 portable radio. It prevents unauthorized reprogramming of zones by keypad programming. When this password is used, it must be entered before system or channel parameters in that zone can be changed.

Note *The programming and usage of this password is independent from the preceding passwords.*

A different password can be programmed for each zone. When a password protected zone is selected during keypad programming, "Password" is flashed the first time an attempt is made to select a system or channel parameter in that zone. Each digit of the password is then entered as previously described. The password is always eight digits long, and after the eighth digit is entered, system and channel parameters for that zone can be reprogrammed normally.

6.16 P25 Trunking Keypad DTMF

For radios using Firmware Version 8.30.x or later programmed by Armada 1.30.x and later, if the Armada administrator enabled Keypad DTMF for a P25 Trunking channel, the radio user can send DTMF tones by holding the Push-To-Talk (PTT) button and pressing the keypad buttons.

6.17 P25 Busy Mode: PTT / Talkgroup / Priority Group

The following P25 Busy Mode enhancements apply to radios using Firmware Version 8.40.x or later:

- PTT'ing while in busy mode causes the radio to request the call again. (In earlier firmware versions, these PTTs were ignored.)
- While in busy mode, the radio unmutes for calls that are taking place on the selected talkgroup. (This is also true for Motorola Supergroups.)
- While in busy mode, the radio unmutes for calls that are taking place on a priority group if scan is enabled. (This is also true for Motorola Supergroups that are associated with a priority group.)

6.18 Cancel P25 Deregistration Retries on PTT

For radios on a P25 Trunking channel using Firmware Version 8.34.x or later, if deregistration retries are occurring, the user can press or hold the PTT button to skip remaining deregistration attempts. This applies to unit deregistration, DRS deregistration, and context deactivation. This does not apply to deregistration on power down.

6.19 Trunking Terms and Definitions

The following is a list of common terms and definitions related to trunking operation:

Busy Bonk – A tone that sounds on P25 trunking systems when multiple radios attempt to key up at the same time on the same talkgroup. Only one radio occupies the channel at a time. Any other radio attempting to key up receives a busy bonk or bad bonk indicating that the talkgroup is busy. The radios are not in queue since they are on the same talkgroup that is occupying the channel. The only radios that are queued are radios on a different talkgroup when there is not an available channel.

Channel – The pair of frequencies (input and output) used by an LMR device. Each channel is assigned a talkgroup, which is designated by the Channel Alias shown on the radio front and top displays.

P25 Trunking System– A land mobile radio (LMR) system that includes an access control channel and voice channels for audio communications. At power up, the radio registers the Radio ID and affiliates the talkgroup for communications.

PTT Tone – The push-to-talk (PTT) tone is a double-beep permit tone that sounds when the radio is connected to the voice channel.

Talkgroup – LMR system users who are organized into different groups so they can communicate between group members without interfering with other groups.

Zone – Typically a block of 16 channels.

SECTION

7

DMR Conventional Mode Features

The following information describes the features unique to Mixed mode analog and DMR conventional operation. Refer to Section 4 for information on features common to all operating modes.

Note *Please note that the features and operations may vary depending on the model of your VP5000/VP6000/VP8000 radio. Standard Key Model radios do not have a DTMF keypad. Messages and status icons are shown on the front display.*

This section contains information on the following topics:

7.1 Monitoring Before Transmitting

With DMR 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 transmit while someone else is using the channel, you will disrupt their conversation. With P25 Trunked and Viking16 operation, monitoring is performed automatically. You can monitor DMR conventional channels automatically or manually.

7.1.1 Automatic Channel Monitoring

In DMR conventional operation, monitoring is automatic if the selected channel is programmed for Tx Admit and Tx In Call Admit (see Section 7.16.7). In Mixed mode analog operation, monitoring is automatic if the selected channel is programmed for Analog Busy Channel Lockout (see Section 7.3).Manual Channel Monitoring

The automatic monitoring 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 automatic monitoring, but monitor the channel manually as follows:

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

Monitor Mode - There may be times when a busy condition is indicated even though no one is using the channel. Monitoring should then be performed by disabling Color Code and Contact ID (or disabling Call Guard squelch in Mixed Mode analog operation). This is usually done by selecting the Monitor Mode (Section 7.2) or by the Normal/Selective option button or menu parameter (Section 7.4.1).

7.2 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:

- In DMR conventional operation, Color Code and Contact ID (Talkgroup or Individual) detect are disabled. In Mixed Mode analog operation, Call Guard (CTCSS/DCS) squelch is disabled.
- Signaling-dependent options for the Tx Admit and Analog Busy Channel Lockout features are overridden. Carrier event dependent options are not overridden.
  - In DMR conventional operation, if the Tx Admit feature is programmed for Polite to Own Color Code, it is overridden. If programmed for Polite to All, it is not overridden
  - In Mixed Mode analog operation, if the Analog Busy Channel Lockout feature is programmed for Tone, it is overridden. If programmed for Noise, it is not overridden.
- Scanning temporarily halts.

The Monitor Mode operates as follows:

1. To monitor the receive frequency instead, press and hold the Monitor or Monitor Rx option button until a tone sounds (based on programming). This can be used, for example, to improve reception if intermittent squelching is making a weak message difficult to understand.
2. To disable the monitor mode and return to normal operation, press the Monitor option button again, select the Monitor menu “Off” parameter, or simply release the Monitor Rx button.

The Normal/Selective function disables Call Guard squelch in Mixed Mode analog operation but not scanning (see Section 7.4.1).

7.3 Analog Busy Channel Lockout

Mixed Mode Analog operation only.

The Analog Busy Channel Lockout feature (also called Transmit Disable on Busy) 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 Analog Busy Channel Lockout feature and 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” - If an incorrect Call Guard (CTCSS/DCS) (see Section 7.4.1) 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

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).

Note *In DMR conventional operation, the Tx Admit / Tx In Call Admit feature can be programmed to perform a similar function. Refer to Section 7.16.7 for more details.*

7.4 Call Guard Squelch

Mixed Mode Analog operation only.

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.

Note *In DMR Conventional operation, the Color Code and Contact ID can be programmed to perform a similar function. Refer to Section 7.16.4 and Section 7.16.13 for more details.*

7.4.1 Call Guard Squelch Enable / Disable

The Normal/Selective option button (if programmed) or menu parameter can be used to disable receive Call Guard squelch on analog channels. When selective squelch is disabled, “Squ Normal” is flashed in the display, and when it is enabled, “Sql Select” is flashed.

When “Normal” is selected, the receiver unsquelches only if a carrier is detected. Scanning is not disabled with this mode selected. The selected mode is in effect until it is manually changed again. 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” mode is selected.

7.4.2 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.

If the user would like to hear the squelch tail, then the reverse burst transmission can be disabled by programming.

7.4.3 Digital Call Guard Squelch

Digitally Coded Squelch (DCS) uses digital data instead of subaudible tones to control the squelch. When the push-to-talk switch is released, a turn-off code is transmitted which eliminates the squelch tail similar to the reverse burst.

7.4.4 System Squelch Code

This feature allows the normal transmit and receive Call Guard (CTCSS/DCS) programming to be temporarily overridden with a code selected from a programmed list. It is available if the System Squelch Code option button or menu parameter and a CTCSS/NAC code list have been programmed. (NAC in the “CTCSS/NAC” list can be ignored.)

In addition, the System Keypad CTCSS/DCS feature can be programmed. 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, press the “3” key. No other functions can then be assigned to these keys.

The CTCSS/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.

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 DMR channels can be selected or scanned, the CTCSS/DCS code for the selected position is used for analog channels and the Color Code and Contact ID for the selected position is used for DMR 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.

Proceed as follows to select a code using the System Squelch Code option button or menu parameter:

1. Press the System Squelch Code option button or select the System Squelch Code menu mode parameter. Then press the Up/Down buttons to select the desired code. The display indicates “SQxx” where, “xx” is the selected code from 1 to 255. The code number and actual code are alternately displayed. If the Armada administrator did not configure CTCSS/DCS for your selected code, then “CSQ” displays instead of a code number.

2. To select the displayed code and return to the normal display, press the (Menu) button.

3. To check which code is selected, press the System Squelch Code button 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.

7.5 Channel- and Direction-Specific Operator Selectable Tones

Mixed Mode Analog operation only.

The radio operator can select CTCSS/DCS tones (OST/IST) on a per-channel and per-direction (TX or RX) basis.

Two related functions are available for programming on conventional systems:

- Channel Rx OST
- Channel Tx OST

The CTCSS/NAC system list must be set up to use these functions. Channel Rx OST lists the Rx tones, and Channel Tx OST lists the Tx tones. (NAC in the "CTCSS/NAC" list can be ignored).

Each channel can control whether OSTs are allowed, and in which direction (Tx, Rx, Both, None).

When a new tone is selected with one of these functions, the selected channel's settings get overwritten. The function can also be used to return to original settings.

For clarity, several OST/IST related functions and their locations in Armada are shown in Table 7.1.

Table 7.1 OST/IST-Related Functions

Armada Window	Function
Button/Menu (DMR Conventional) > Buttons > Button Assignments	System Squelch Code
Systems (DMR Conventional) > General Options 2 > Other	System Keypad CTCSS/DCS
Channels (DMR Conventional) > Channel Options > Other	Ignore System Squelch Code

7.6 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 (Section 4.6). 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.

7.7 Conversation Timer

A conversation timer can be programmed on conventional systems in addition to the time-out timer (Section 4.6). This timer limits the 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).

7.8 Repeater Mode

The DMR repeater mode allows radios to communicate through a repeater. Repeater Mode is used when a radio is programmed with different receive and transmit frequencies. Repeater mode allows two transmissions (Calls) on a 12.5 kHz channel. Transmissions take place during a Time Slot. A repeater mode channel has a statically programmed Time Slot as described in Section 7.16.5.

DMR repeaters have two types of hangtime as follows:

- Call Hangtime - This occurs at the end of a transmission. If PTT is pressed during this time, the radio will automatically transmit using the call ID of the previous transmission regardless of the selected TX contact name.
- Channel Hangtime - When the call hangtime expires, the radio can place a new call with any ID. When the channel hangtime expires, the repeater deactivates and no longer transmits on the outbound channel. Note that channel hangtime applies to both slots.

7.8.1 Base Station Activation

Base station activation occurs when a radio does not detect activity on the outbound channel. When operating with a base station (repeater mode), a radio must synchronize to the outbound channel and base the timing of its inbound transmission on the outbound. Base station activation provides a mechanism for a radio to send a burst asynchronously to the base station to enable it. When the base station receives the activation packet, it will begin transmitting on the outbound channel and enters channel hangtime.

There are two configurable parameters for this feature as follows:

Tx Wakeup Time - Specifies the amount of time a radio waits for outbound activity until it resends the base station activation packet.

Tx Wakeup Message Limit - Specifies how many times a radio will resend base station activation packets before sending a deny indication to the user.

7.9 Repeater Talkaround

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

Repeater talkaround is activated when the programmed receive and transmit frequencies on a channel are identical. Repeater talkaround can also be selected if the TA option button or “Talk Arnd” menu parameter is programmed. When talk-around is enabled by this button,  is displayed. This feature remains enabled during scanning, and changing channels or turning power off does not change the selected condition. The programmed Time Slot has no effect on direct mode channels. When PTT is activated, the radio will transmit asynchronously. The programmable Talkaround Hangtime will be used for direct mode calls. Talkaround is available on conventional channels only.

A function button can be programmed to the “Repeater Talkaround” function. With a button programmed as “Repeater Talkaround”, the user can press this button while on any conventional frequency, shifting the radio from operation through a repeater, to simplex operation on the repeater transmit frequency.

With a “Repeater Talkaround” button enabled, there is no restriction as to which channels the user can transmit (in simplex mode) on the repeater transmit frequency. A user can switch to talkaround mode on a busy dispatch channel, and his/her transmissions could prevent nearby users from hearing the repeater transmissions.

Note *Channels configured for simplex operation display the Talkaround icon.*

7.9.1 Talkaround Hangtime

Talkaround Hangtime is a system wide control for how long a radio will maintain the previous talkaround or direct mode call's information for talkback and talking party identification purposes. This period begins after both receiving from and transmitting to a contact. During the hangtime, if the radio operator PTT's, the radio will continue the previous call with the individual or group instead of starting a new call with m programmed Tx Contact. The hangtime period is programmed separately for Individual and Group calls.

7.9.2 RSSI Priority Call Detection

RSSI Priority Call Detection allows a channel to be programmed to make use of RSSI detection when that channel is a Priority 1 or a Priority 2 channel in a Priority Scan List. RSSI Priority Call Detection improves the reliability of priority checks to direct mode channels while the radio is in a lower priority call when the RSSI threshold is set appropriately for the operating environment.

7.10 Displaying Transmit / Receive Frequency

If the Display Information option button or menu parameter is programmed (Section 4.2), it can be used to display the channel frequency in megahertz. Pressing this button toggles between displaying the standard channel alias and the channel frequency. The receive frequency is displayed when receiving and the transmit frequency is displayed when transmitting.

This feature is available on conventional channels only.

7.11 Emergency Alarm and Call

Emergency Alarms and Calls are separate functions that can be individually enabled or disabled on each analog and DMR conventional system. The Emergency option button or menu parameter is required for these functions. Emergency Alarms and Calls are transmitted on the global (radio wide) emergency zone/channel if one is programmed. 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. Up to 255 Emergency Lists may be programmed. A specific list may be selected for each channel.

7.11.1 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 button or selecting the Emergency menu parameter. The system to which the emergency channel is linked must have Emergency Alarms enabled.

In the DMR conventional mode, a special DMR emergency data transmission is sent, and in the conventional analog mode, an analog signaling packet is sent. Refer to Section 7.14.3 for information on MDC1200 Emergency Alarm.

For an Emergency Alarm:

- The DTMF Emergency ID is sent.
- The MDC Emergency ID is sent with the emergency bit set.
- The Five Tone ID is sent with the fifth tone being status type emergency.
- GE Star ANI is sent.
- Two Tone Encoder is sent.
- No special action is done with the single tone.

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 button or select that menu parameter. The radio automatically transmits the emergency alarm.

2 Either Normal or Silent operation can be programmed. With Normal operation, the red LED lights, the emergency tone sounds, and “EMERGENCY” flashes in the display. “EMERGENCY” continues to flash until the alarm ends. If “Silent” is 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 (MDC1200 only) If "Emergency Alarm Ack Enabled" is programmed, when the emergency alarm is acknowledged by the dispatcher, "Ack Rcvd" is briefly displayed and the emergency acknowledge tone (two beeps) sounds. This alert tone can be disabled if desired, and does not occur if Silent operation is programmed.

Retries will occur automatically for conventional analog and non-MDC signaling types. No emergency acknowledgment is expected from the system. Retries will continue until a programmed count of retries is reached.

4 The emergency alarm mode is exited when radio power is cycled or by pressing and holding the Emergency option button. If "Silent" is programmed, a tone sounds when the operator exits Silent Emergency.

7.11.2 Emergency Call Alert

This feature notifies a user when an emergency call is being made on their selected DMR Conventional Talkgroup.

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 "Emerg Rcvd" 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 this state, press the button programmed for "Emergency Clear". The radio should return to its normal display, and the Emergency Received message should no longer show.

7.11.3 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 or selecting the Emergency menu parameter. 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 DMR calls can be individually enabled.

If the emergency call is sent on a DMR 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.

If emergency call ANIs are enabled and the conventional channel is configured with post-TX ANI, then the emergency call ANI gets sent post-TX. If the conventional channel is configured with pre-TX ANI or no ANI, but emergency call ANIs are enabled, then the emergency call ANI gets sent pre-TX.

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

MDC, Five Tone Signaling, Single Tone Signaling, Two Tone Encoding or GE Star are sent for Analog Emergency Calls, depending on programming.

7.11.3.1 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. The automatic transmit period is programmed for 10 to 120 seconds in 10-second increments. The radio can be configured to re-enter emergency hot mic transmit after a set receive time has elapsed. The radio continues cycling in and out of emergency hot mic transmit until the programmed number of cycles have taken place, until PTT is asserted by the user (if configured), or until the user takes the radio out of emergency mode. If this 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 button. Subsequent presses do not trigger automatic transmissions. To reset this function, cycle power or press and hold the Emergency button.

7.11.3.2 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 button or select that menu parameter. The Emergency Call is then sent as described in Section 7.11.3 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 (Section 4.13), 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 button.

7.11.4 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 canceled when the Emergency Cancel Timer expires.

7.11.5 Emergency Contact

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

7.12 DMR Conventional Mode Scanning

Channel scanning features common to all operating modes are described in Section 4.14 and Section 4.14.5. The following information describes features unique to DMR conventional operation.

7.12.1 Selecting a Scan List

Conventional systems are programmed with a default scan list that is normally selected by all channels in that system.

The default scan list (which is to be used by all conventional channels), 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.

If the user presses and holds the Scan button, the **Scan List Select** feature is activated.

Note *The Armada administrator can prevent you from accidentally using **Scan List Select**.*

7.12.1.1 DMR Conventional Scan List Select Procedure

The scan list select procedure is as follows:

1. You can edit Scan Lists and utilize Scan List Select while Scanning is enabled, but not Radio Wide Scan (and vice versa). The radio app will “pause” scan or radio wide scan feature and resume it upon exiting the menu. The radio will not actively scan while in scan edit or scan list select menus. If Radio Wide Scan is enabled and you attempt to edit a Scan List, the radio will bonk and display “Disabled” (and vice versa). If you attempt to edit a Radio Wide Scan list in this example, it will “pause” the Radio Wide Scanning and allow you to edit the lists (and vice versa for Scan Lists with Scan Mode).

2. The currently selected list is then indicated in the display as “List x”, where “x” is the scan list number. Press the Up/Down buttons to show the desired list then press the (Menu) button to select. Exit this mode by pressing press the (Clear) or SCAN option button. A single beep sounds when the SCAN option button is pressed.

7.12.2 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.

Priority on Programmed - Priority sampling occurs and the priority channel or channels are those programmed in the selected scan list. The radio transmits on the selected channel—within the scan hold time—if selected group is chosen as the talkback type. The radio transmits on the received channel if active group is chosen as the talkback type.

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.

7.12.3 Priority Channel Sampling

The following describes priority sampling when scanning conventional channels.

Note *Priority sampling when scanning P25 Trunked/Viking16 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 *Priority channel sampling is not available when receiving unit calls. 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 display. This indication is displayed regardless of whether the priority channel is fixed or always the selected channel. When it is a second priority channel, P_2 is displayed.

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 Lookback Time.

The priority sampling times programmed by the following parameters:

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

Priority 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 to 8.0 seconds can be programmed in 0.5-second steps.

7.12.3.1 Changing the Priority Channel

If a fixed priority channel is associated with the current scan list, it can be changed if the Priority option button or menu parameter is programmed. With dual priority, this function changes only the first priority channel. To change both priority channels, use the Scan List Edit function described in Section 4.14.5.1.3.

Proceed as follows to change the priority channel using the Priority option button/ menu parameter:

1. Make sure the desired scan list is selected (Section 4.14.5.1.2).
2. Select the channel you want to be the priority channel and then press the Priority option button or select that menu parameter. “Priority” is then flashed to indicate that the current channel is now the priority channel when scanning that list. Other indications that may occur are as follows:
   - If “No Priority” is displayed, priority sampling may not be enabled on the scan list.
   - If “Sel Chan” is displayed, the priority channel is always the selected channel and cannot be changed.
   - If “No Edit” is displayed, the scan list is either not user editable or priority channel user editable.
   - If no indication is displayed, the scan list may not be user editable or the channel may not be in the scan list.

7.13 Standard DMR Conventional Calls

Standard DMR conventional calls are placed to other radio units monitoring the selected channel. The proper coded Color Code, Contact ID, and Slot Timing (Repeater only) as described in Section 7.16.4, Section 7.16.13, and Section 7.16.5 (or Call Guard squelch tone or code in Mixed Mode analog operation as described in Section 7.4) may need to be transmitted by your radio for them to receive a call.

7.13.1 Placing a Standard DMR Conventional Call

To place a standard DMR conventional call, proceed as follows:

1. Turn power on and set the volume as described in Section 3.3.1 and Section 3.3.2. Select the channel programmed for the radio you want to call as described in Section 3.3.3.
2. Monitor the channel automatically or manually as described in Section 7.1.
3. Press the PTT switch and if the Tx Admit feature (or Analog Busy Channel Lockout feature for Mixed Mode analog operation) is programmed on the channel (see Section 7.16.7 and Section 7.3), the transmitter is automatically disabled if the channel is busy. Otherwise, busy and out-of-range conditions are not indicated.
4. Press (and hold) the PTT switch to talk and release it to listen.

7.13.2 Receiving a Standard DMR Conventional Call

To receive a standard DMR conventional call, proceed as follows:

1. Select or scan the channel programmed for the call you want to receive (refer to Section 4.14 and Section 4.14.5 for more scanning information).
2. When the call is received, press the PTT switch to talk and release it to listen. If scanning, responses may occur on the selected or receive channel as described in Section 7.12.2.

7.14 DTMF/ ANI Signaling Options

Mixed Mode Analog operation only.

The following types of analog signaling are offered:

- Single Tone Encoding
- Five Tone Encoding
- DTMF
- MDC
- GE Star
- Two Tone Encoding
- Two Tone Decoding

Three features use analog signaling:

- Pre and Post ANI
- Emergency Alarm
- RTT

7.14.1 DTMF / ANI Signaling

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

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

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

When an emergency alarm or call is placed, this ANI signaling is replaced by the Emergency DTMF ID (Section 7.11). Refer to Section 7.14.3 for information on MDC1200 ANI.

7.14.2 Single Tone Encoder

This feature allows the user to transmit a single tone by pressing the Single Tone Encoder option button or selecting that menu parameter. Each conventional system can be programmed for a tone of 500 to 2500 Hz in 1 Hz increments with a duration of 0.5 to 2.5 seconds in 0.1 second increments.

This feature can be activated with a button press or can be used for Pre and Post ANI, Emergency Alarm, or RTT.

7.14.3 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 Decode - MDC1200 decode functionality is supported so that the radio can handle the following MDC1200 features:

- Process the system acknowledgment of emergency transmissions – so that the user knows that the emergency has been received
- PTT ID Decode - Display the ID / Alias of a calling radio on all other radios
- Selective Radio Inhibit – Allow the dispatcher to inhibit a radio
  - *The Armada administrator can program the radio to block incoming inhibit requests. If the user disables inhibits and the radio receives an inhibit request, the message BLOCKED RADIO INHIBIT appears on the radio.*
- Call Alert – Alerts the user to call the dispatcher
- Radio Check – Verify that the unit is within the operating area

MDC Mute - When the feature is enabled, the radio mutes the speaker upon receiving the MDC tone. This causes a short audible chirp on the radio before the radio can mute. The radio unmutes the speaker after MDC has faded and a programmable delay has expired.

MDC Side Tone - Allows the radio to be programmed with an MDC Side Tone as an alternative to the normal talk permit tone. Four settings are available:

- None - No side tone
- PTT-ID - The radio plays a side tone while the MDC ID gets transmitted
- PTT-ID Short - The radio plays a brief side tone after the MDC ID gets transmitted
- Both - Both tones get played

MDC1200 Emergency Alarm - The radio continues trying its emergency transmission until the emergency is acknowledged by the system or the retry attempts expire. (System programming determines the number of retry attempts.)

7.14.4 Five-Tone Signaling

A single transmission consists of five separate tones transmitted sequentially with an optional inter-tone pause between tones. If Five-Tone is selected as the RTT type, then Five-tone shall also be used as the signaling type for conventional analog emergencies. The first four tones are used for unit identification and the fifth tone is used for status.

No two adjacent tones shall be the same frequency. When two identical digits follow each other, the second shall be transmitted as the “Repeat” tone.

Five Tone signaling can also be used for Pre Post ANI and Emergency Alarm Signaling. Fifth Tone Status values are:

Tone 1 – Normal Call

Tone 9 – Emergency Call

Tone 2 – Normal Secure Call

Tone 8 – Emergency Secure Call

7.14.5 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)

7.14.6 Two Tone Encoding

The Two Tone Encoder operates the same as the Single Tone Encoder except that it sends two tones back-to-back. A maximum of 255 tones can be programmed. Each tone will send two tones, each of its own frequency and duration (unless the Single Tone option is selected for the Tone entry in Armada programming).

The user can activate Two Tone in several manners. The first is to program a button for Two Tone and press it. This will give the user the option to choose the desired tone in the list.

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 (Menu) button. Pressing PTT or the (Menu) 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, (Clear), 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.

The third is pressing and holding a button programmed for Two Tone. This will send the current, active Two Tone, which is defaulted to the first tone in the Two Tone list upon profile download.

Two Tone can be activated by using Emergency Analog Signaling, ANI Analog Signaling, or RTT Analog Signaling. Direct activation (through button press or PTT/ Menu Button press in the Two Tone List) must be programmed. If not programmed and the user tries to send a Two Tone Page directly, the subscriber will bad beep. Also, the radio cannot be in Scan mode. If the user tries to activate Two Tone Page while in Scan mode, the radio bad beeps and shows disabled.

7.14.7 Two Tone Decoding

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.

The Armada administrator can prevent the radio user from changing the Two Tone Decoder list.

7.15 Admin Control

The Admin Menu (Figure 7.1) contains three functions for checking, inhibiting, and uninhibiting radios using DMR. These functions are intentionally placed in the admin menu to allow Administrators to choose which radios are allowed to send these commands to other radios in the fleet. If programmed, the admin menu can be accessed using a button or menu function.

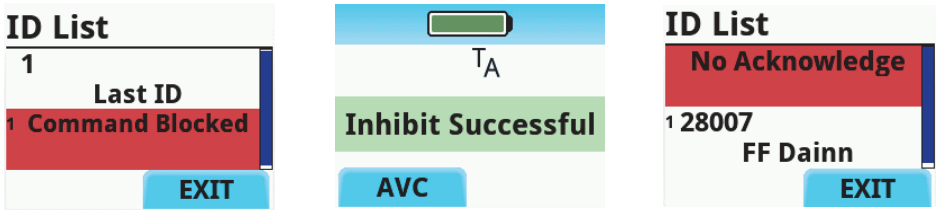
Figure 7.1 Admin Menu

The functionality of each entry in the admin menu is described below.

- **Inhibit** - Inhibit functions identically to our other communication protocols with the exception it can now be triggered from a subscriber as well as a system. When the user selects inhibit, they will be prompted to enter or choose a target radio to inhibit. Once they have chosen a target, the subscriber will send the inhibit command to the targeted subscriber. When the targeted subscriber receives this communication, it will acknowledge the inhibit command and inhibit all functionality until an uninhibit command is received. If some subscribers should ignore inhibit attempts there is a check box in Systems > General Options 2 > Other > Allow Conventional Inhibit Command that if unchecked will prevent the radio from inhibiting, even if they receive an inhibit command. The admin menu will show the results of the inhibit attempt once it has heard back from the targeted radio. The potential responses are shown in Figure 7.2.
- **Uninhibit** - The uninhibit command clears any previous inhibit commands that have been sent to a subscriber. The user is prompted to enter or choose a target for the uninhibit command. When the targeted subscriber receives the uninhibit command it will uninhibit if it was previously inhibited and acknowledge the command. The admin menu will show the results of the command using the same messages as the inhibit command shown in Figure 7.2.

- **Radio Check** - Radio Check allows the admin to check if another radio is within range of communication. When the radio check is chosen, the user will be prompted to pick a contact from their contact list or enter a radio ID. Once this is done the radio transmits a packet and will either show "Ack Received" if the targeted radio responds, or "No Acknowledge" if the target radio was unable to be reached.

Figure 7.2 Admin Command Responses



7.16 DMR Mode Features

This section contains information on the following features, which are unique to DMR conventional channels:

- Digital Unit ID
- Talkgroup ID
- Talking Party Identification
- Color Code
- Slot Selection
- Out of Range (EFJohnson DMR Conventional) Indication
- Tx Admit / Tx In Call Admit
- DMR Conventional Group Calls
- All Call
- Unaddressed Call
- Broadcast Call
- Open Voice Channel Mode (OVCM)
- Tx Contact per Channel
- Group ID Scan
- DMR Unit Calls (Standard and Enhanced)
- Call Alert
- Secure Call Indication with Invalid Key

7.16.1 Digital Unit ID

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

7.16.2 Talkgroup ID

Each DMR Conventional channel is programmed with a talkgroup 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 Color Code is detected (see Section 7.16.4). Talkgroup IDs can be any number from 0 to 65,535. Talkgroup ID detect can be disabled by the monitor mode described in Section 7.2.

7.16.3 Talking Party Identification

Talking Party Identification shows the user what individual unit the radio is receiving from, and when applicable, what talkgroup the radio is receiving the call on. This informs the operator what individual or group contact will be responded to when the radio transmits. The group or individual is displayed throughout a call.

When an Individual Call is first received, Talking Party Identification operates as follows:

1 The radio will display all programmed receive indications for the specified durations, except the PTT ID indication which is displayed permanently for Individual Calls. While receiving an Individual Call, the radio will display the Unit Call Icon, the caller's DMR Unit ID, and the caller's Call List alias, if one is programmed for that unit in the Call List.

2 While transmitting, the radio will display the Unit Call Icon, the caller's DMR Unit ID, and the caller's Call List alias, if one is programmed for that unit in the Call List.

3 The unit call display will be cleared after call hangtime finishes on the repeater, or after a period equal to the Talkaround Individual Call Hangtime duration has passed since the last call activity while in Direct mode or while talkaround is enabled.

When a Group Call is first received, Talking Party Identification operates as follows:

1 The radio will display all programmed receive indications for the specified durations. While receiving a Group Call, the radio will display the Talkgroup Alias or Talkgroup ID if there is no alias.

2 While transmitting, the radio will display the Talkgroup Alias or Talkgroup ID if there is no alias.

3 The group call display will be cleared after call hangtime finishes on the repeater, or after a period equal to the Talkaround Group Call Hangtime duration has passed since the last call activity while in Direct mode or while talkaround is enabled.

7.16.4 Color Code

Color Codes are used in DMR mode operation to identify a system. Different channels in a radio can be programmed to have different color codes ranging from 0 to 15. When a color code is selected on a channel, the radio will receive only if the color code matches the programmed color code and slot. Other operation, such as monitoring before transmitting, is similar to that of analog channels. Color Code and Contact ID detect can be disabled by the monitor mode described in Section 7.2.

7.16.5 Slot Selection

DMR is a 2 slot TDMA solution which allows for 2 calls on a 12.5 kHz repeater mode channel. As a result, both the frequency and the time slot are assigned on a per channel basis. A radio that is configured for time slot 1 or 2 will always and receive and transmit on the assigned slot. Slot Selection only affects repeater channels when Talkaround is not enabled.

7.16.6 Out of Range (EFJohnson DMR Conventional) Indication

In an EFJohnson DMR conventional infrastructure radio system, a predefined beacon can be programmed for transmission from the system at preset intervals. If the radio remains idle and does not receive the beacon or a voice call from the system within a specified time period (as programmed) an “Out of Rng” indication is displayed to inform the radio user of the condition. If the beacon is received, the timer is automatically restarted, and no out-of range condition is indicated. If an Out of Range condition exists, the user can still transmit and receive, but the condition will not exit until the beacon is received.

Note *This Out-of-Range indication applies only to EFJohnson DMR conventional infrastructure systems.*

If programmed, Out-of-Range (OOR) monitoring and indicators to the user are provided. The out-of-Range function operates on conventional analog and digital channels that have been programmed for the feature. This feature is supported only on EFJ Infrastructure.

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”. 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, 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” 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” for one second.

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.

7.16.7 Tx Admit / Tx In Call Admit

The Tx Admit and Tx In Call Admit features automatically disables the transmitter if the color code is in use 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 Tx Admit feature determines if a transmission is permitted on the channel. Upon activation of PTT, the Tx Admit settings operate as follows:

“Impolite” - the radio will always transmit on the channel regardless of the color code.

“Polite to All” - the radio will check for an idle channel before allowing transmission.

“Polite to own CC” (Color Code)- the radio will check if the programmed color code is not in use before allowing transmission. If the color code does not match, the radio will allow transmission. If the color code matches, the radio will not allow transmission and the display will show “Busy”.

The Tx In Call Admit feature determines if a transmission is permitted on the channel while in a call. Upon activation of PTT, the Tx In Call Admit settings operate as follows:

“Impolite” - the radio will always transmit on the channel.

“Follow Admit” - the radio will use the Tx Admit setting.

7.16.8 DMR Conventional Group Calls

DMR Conventional group calls are placed by selecting the channel programmed for the desired group, monitoring the channel if required, and transmitting. When a DMR Conventional group call is received, the alias (or frequency) of the selected channel is displayed. Refer to Section 7.16.3 for more information.

Note *The Armada administrator can program a Custom Tone Assignment for Talkgroup in DMR Conventional systems to play a tone when a specific talkgroup is received. Refer to Section 4.11 for more information on this feature.The radio can be programmed so that the following are also displayed for 0.5 to 7.0 seconds or continuously during the call.*

On Rx Options:

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

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 programmed 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 encryption key used to decode the call is displayed.

- The configured Rx Info gets displayed for the time set in Armada regardless of when the call ends. If cycle is selected in Armada, the messages in that cycle appear at least once. If the Armada administrator selects infinite, the RX info appears for a minimum of 1 second.

On Tx Options:

Tx Contact- The radio displays the number or alias of the talkgroup on which the call is being transmitted.

7.16.9 All Call

The All Call Voice service provides a one-way voice call from any user to all users within the same system. Due to the large target audience, All Calls do not have hangtime. This effectively ends the call at the end of the transmission. An All Call is placed when the user PTTs on a channel with the All Call Talkgroup selected as the Tx Contact. The user may also make an All Call by using Tx Contact Select to set an operator selected Tx Contact that has All Call enabled then transmitting as before.

The radio will display an "All Call" message (Figure 7.3) at least once while the radio is transmitting or receiving an All Call. If the system is programmed to show Rx Display messages infinitely or cycle multiple Rx Display messages infinitely, it will also display the "All Call" message infinitely, cycling between the other set messages. If the Tx Talkgroup Display message is set to display infinitely, the "All Call" message will cycle with it infinitely.

Figure 7.3 All Call message

7.16.10 Unaddressed Call

Unaddressed Call is a group voice call that uses one of the 16 pre-defined Unaddressed Talkgroups. Only one Unaddressed Talkgroup can be programmed per system. An Unaddressed Call is placed when the user PTTs on a channel with an Unaddressed Talkgroup selected as the Tx Contact. The user may also make an Unaddressed Talkgroup call by using Tx Contact Select to select the Unaddressed Talkgroup entry then transmitting.

If the Talkgroup Tx/Rx banners are enabled, the radio will display an "Unaddressed Call" message (Figure 7.4) instead of the TG Alias when an Unaddressed Call is transmitted or received. A tone will also sound when an Unaddressed Call is received.

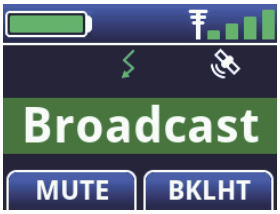
Figure 7.4 Unaddressed Call message

7.16.11 Broadcast Call

A broadcast call is a one-way group call, which has no hangtime and allows the user to select a specific group of users to call. It is supported for an emergency group call. If PTT is pressed while receiving a broadcast call, the radio displays a deny indication.

The radio will display a "Broadcast" message (Figure 7.5) at least once while the radio is transmitting or receiving a Broadcast call. If the system is programmed to show Rx Display messages infinitely or cycle multiple Rx Display messages infinitely, it will also display the "Broadcast" message infinitely, cycling between the other set messages. If the Tx Talkgroup Display message is set to display infinitely, the "Broadcast" message will cycle with it infinitely.

Figure 7.5 Broadcast Call message



7.16.12 Open Voice Channel Mode (OVCM)

Open Voice Channel Mode (OVCM) is a call modifier that allows radios to join in on Group Calls and Unit Calls where the modifier is present regardless of the Talkgroup ID or Unit ID, respectively. Radios may be programmed to start OVCM calls and may be programmed to receive them.

The radio will transmit with the OVCM modifier if any of the following requirements are met:

- If the radio transmits on a channel with a programmed Tx Contact that has the OVCM modifier enabled.
- If the radio transmits on a channel that has an operator selected Tx Contact that has the OVCM modifier. Refer to Section 7.16.13.2 for more information on operator selected Tx Contacts.
- If the radio transmits in normal mode on a channel that has Tx Contact Override enabled and the OVCM override checkbox is checked.
- If the radio transmits while in Unit Call menu mode and has selected an OVCM Call List entry. The radio will always use the OVCM setting of the Call List entry, regardless of the initiating call's OVCM flag or any future response's flag.
- If the radio transmits in normal mode and is responding to a received OVCM Group Call or Unit Call.

The radio will receive calls with the OVCM Modifier if any of the following requirements are met:

- If the radio receives any Group Call or Unit Call with the OVCM modifier when it is on a channel that is programmed to receive OVCM calls.
- If the radio receives a response to an OVCM call it initiated even if the radio is on a channel not programmed to receive OVCM calls.
- If the radio receives an OVCM Group Call that has a matching Talkgroup ID to the radio's Tx Contact or a Talkgroup ID from its Rx Group List, even if the radio is on a channel not programmed to receive OVCM calls.
- If the radio receives an OVCM Unit Call addressed to the radio's Unit ID, even if the radio is on a channel not programmed to receive OVCM calls.

If the radio is in Unit Call mode and receives an OVCM Unit Call addressed to the unit ID selected for the call, even if the radio is on a channel not programmed to receive OVCM calls.

The OVCM modifier does not apply to All Calls or Unaddressed Calls.

The radio will display an "OVCM" message (Figure 7.6) at least once while the radio is transmitting or receiving an OVCM call. If the system is programmed to show Rx Display messages infinitely or cycle multiple Rx Display messages infinitely, it will also display the "OVCM" message infinitely, cycling between the other set messages. If the Tx Talkgroup Display message is set to display infinitely, the "OVCM" message will cycle with it infinitely.

Figure 7.6 OVCM Call message

7.16.13 Tx Contact per Channel

Channels are each programmed with a transmit contact. Contacts may be individual units from the system's Call List or Talkgroups from the system's Talkgroup List. Each Talkgroup contact and Call List contact is programmed with a separate OVCM setting. Talkgroups also have a Broadcast setting that is programmed per Talkgroup. The radio will unmute to calls that match its Tx Contact talkgroup or are from the contact's Call List entry Unit ID. When the radio is idle on the channel and is not part of another call, it will start a new call with the programmed contact with the associated settings.

7.16.13.1 Tx Contact Override

Tx Contact Override is a per channel setting to override the Tx Contact's programmed OVCM and Broadcast settings. This setting does not affect calls made from the radio's Unit Call menu. When Tx Contact Override is enabled, it overrides the settings of the Tx Contact which are programmed in the TG list and call lists. The Broadcast override setting is only programmable when the Tx Contact is a Talkgroup.

7.16.13.2 Tx Contact Select

The Tx Contact Select feature allows operators to dynamically change the Tx Contact of the selected channel. The feature also allows the operator to reset the Tx Contact to the Armada programmed value. The operator selected value will persist until it is manually reset or until the radio is rewritten to by Armada. Tx Contact Select function is enabled on a per channel basis and can be programmed as a button or menu function.

If Tx Contact Select is disabled on the channel by the programming, attempting to enter the function's menu via any means will cause the radio to play the deny tone and display the "Disabled" error message. The Tx Contact Select function may not be utilized if the radio is in Emergency, is Conventional Wide Scanning, or is Radio Wide Scanning. Attempting to enter the function's menu via any means will cause the radio to display the corresponding “Emergency” or “Scanning” error message and play a deny tone.

An operator may enter the Tx Contact Select menu by navigating to it from the main menu or by using a programmed button or soft button to directly enter the list menu. The Tx Contact Select list displays up to four distinct entry types:

1. The first entry in list is always a special entry labeled "Programmed", which when selected will reset the Tx Contact to the Armada programmed value, forgetting the operator selected contact.

2. The second entry in the list is always a special entry for the unit id of the last Subscriber the radio interacted with. It displays as "Last ID:#" where '#' is the Subscriber's alias or Unit ID if the Subscriber has no programmed alias. If the radio has not yet interacted with another Subscriber, it instead displays "Last ID: --------" and does not allow the operator to select the entry.

3. The list will then show all programmed talkgroups.

4. The list will then show all programmed Call List entries. If the channel's Unit Call Settings List is programmed with Unit Call Usage 'Disabled,' the Call List entries will not display.

Selecting the radio's own ID from the Call List entries will cause the radio to play an error tone and display the "Invalid ID" error message. A radio may only select its own ID if that Call List entry or Last ID entry is OVCM. Selecting any valid entry will exit the menu and reload the current channel with the operator selected Tx Contact active. A "Action Performed" tone will play.

When programmed to a button or soft button, an operator may press and hold the Tx Contact Select button to reset the Tx Contact to the Armada programmed value. Upon doing so, the radio will play an "Action Performed" tone and display a message "Tx Contact Reset."

The operator selected Tx Contact will persist until it is reset by the operator or if the codeplug is rewritten by Armada. The radio will behave as though the operator selected Tx Contact is its programmed Tx Contact, affecting transmitting, unmuting, strapping mode, and encryption key. The radio will act as described in Section 7.16.13 while using the operator selected Tx Contact. The exceptions to this are that while in any Conventional Wide and Priority scan modes, the operator selected Tx Contact will only affect the selected channel. Unselected component and priority channels will use their programmed Tx Contact. Radio Wide Scanning is more limited and does not use the operator selected Tx Contact for any channel while scanning, including the selected one.

Tx Contact Select only changes the Tx Contact for the channel and therefore the channel is still subject to any overrides, including Emergency Group ID settings, Security Override, and Tx Contact Override settings. Additionally, the channel's Rx Group is still checked for incoming calls, OVCM calls will still be heard if receiving OVCM calls is enabled, and Unit Calls to the operator's radio will still be heard (Call Settings List permitting). Descriptions for Tx Contact Override settings, Security Override settings, Rx Groups, and OVCM, may be found within this document in their respective sections. DMR specific information for Call Settings may be found in Section 7.16.15.

7.16.14 Group ID Scan

The Group ID scan feature allows scanning of multiple talk groups on the selected DMR channel. Any group available in the talk group list can be added to the Rx Groups list. Configuring of multiple Rx Group list are allowed. The Rx Group List is selected on a per channel basis.

When a Rx Groups List is selected on a DMR channel, the radio will receive on the Tx contact and any group in the Rx Group list. If PTT is activated while receiving on an Rx Group, the radio transmits on the active group. When the call ends and PTT is activated, the SU transmits on the selected ID (Tx Contact).

7.16.15 DMR Unit Calls (Standard and Enhanced)

Unit Calls (also called Individual Calls) can be placed to a specific radio on a DMR conventional channel if the Unit Call option button or menu parameter is programmed. A unit call can also be placed by activating PTT with a unit ID programmed as the TX contact name. Only the individual ID of the target radio is sent (a talkgroup ID is not sent). The radios that can be called are programmed in the Unit Call list. Unit Calls can be programmed to operate in one of the following modes:

Standard - Makes the call immediately without checking if the intended recipient is tuned to the channel.

Enhanced - The caller will first verify the target radio is present by performing a quick handshake with it over the channel. Enhanced Individual Calls can be used to reduce channel traffic by preventing calls from starting when the recipient is not present.

To receive a Unit Call, the RF channel of the call must be selected or scanned and the correct Color Code 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 ID option button or menu parameter, and have a Unit Call programmed for the ID of the calling radio.

7.16.15.1 Place and Receive a Standard or Enhanced Unit Call

Place a Standard or Enhanced Unit Call as follows:

1 To transmit a Unit Call, press the Unit Call option button, select the Unit Call menu parameter, or press the PTT with a unit ID programmed as the TX contact name. The alias (tag) of the last Unit Call or programmed unit ID is displayed.

2 If required, press the Up/Down buttons to display the desired alias/ID. The alias and ID of the calls that have been programmed are alternately displayed.

3 Press and release the PTT switch.

- If the channel's programmed politeness setting is not met or the color code does not match the system's, the unit cannot transmit and the radio displays a "DENIED" message.
- If the politeness and color code requirements are met then a radio programmed to use the Standard Individual Call immediately transmits. The display indicates the Unit Call ID.
  - If no answer, the system times out after 20 seconds.
- If the politeness and color code requirements are met then a radio programmed to use the Enhanced Individual Call attempts to perform a data handshake with the intended recipient unit before transmitting audio.
  - If the target unit replies, the caller proceeds to transmit voice on the channel. The display indicates the Unit Call ID.
  - If no answer, the caller radio retries the data transmission as many times as is programmed in Armada. If the caller unit has exhausted its retries without a reply, then the radio displays a "No Acknowledge" message.

Receive a Standard or Enhanced Unit Call as follows:

1 When a Unit Call is received, "Call Recvd" and the alias of the unit ID are alternately flashed.

2 To respond, select the Unit Call mode by pressing the Unit Call option button, Call Response option button, or selecting the corresponding menu parameters.

- If the call timer times out (set by programming) then "Timeout" is displayed and error tone sounds.
- If the channel is changed before a response is made, the unit call mode is exited.

7.16.15.2 Direct Channel Entry

The direct Channel entry feature is available if the Channel Select option button 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, and each zone can be programmed with up to 255 channels. For example, if Zones 1, 2, and 3 are programmed with 16 channels each, Zone 1 channels are numbered 1 through 16, Zone 2 channels 17 through 32, and so on. Zone 1/Channel 16 is selected by Channel 16, and Zone 2/Channel 16 is selected by Channel 32, as shown below.

Table 7.2 Channel Numbering

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 by selecting it through the menu or by pressing the Channel Select soft button. A single beep sounds when the switch is pressed. The alias and sequential number of the current channel are alternately displayed.

2 Select the desired channel using the Up/Down buttons or directly enter the four-digit number using the 0 to 9 buttons. A single beep sounds when the channel is changed. If using the 0 to 9 buttons, the radio attempts to display the entered number after the third digit is entered or approximately two seconds after the last button is pressed.

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

7.16.16 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 to send or receive an alert. Operation is similar to P25 Trunked and Viking16 channels.

Note *For radios using Firmware Version 8.34.x or later, analog conventional channels also support Single Touch Call Alert.*

To answer a page:

1 When a page is received, five beeps sound and "Page Receive" is displayed. The ID of the radio paging you is stored as the last ID received.

- Conventional calls trigger the Call Alert message & tone only once. Then, the message & tone wait to play again until after the last transmission in the call has ended.
- The Armada administrator can configure a longer minimum time period between Call Alert tones. This prevents rapid carrier loss and gain from playing the tone multiple times a second if there are issues with the tone playing multiple times in a call.

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

3 To answer the page as a unit call, press the Unit Call option button or select that menu parameter and 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.
- If the radio being called is not on the air, "No Ack" is displayed.

4 When the call is finished, end it by pressing the Unit Call option button or the ⮌ (Clear) button.

To initiate a page:

1 With a DMR conventional channel selected, momentarily press the Call Alert option button or select that menu parameter. The alias of the last ID called is displayed.

2 If required, press the Up/Down buttons to display the desired radio. The alias of each number is displayed.

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

- If five beeps sound and "Ack Received" is displayed, 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" is displayed after six attempts after the PTT switch is pressed.

7.16.17 Secure Call Indication with Invalid Key

In DMR conventional systems, if the radio receives an encrypted call but does not have the key, the radio indicates that the call is secure instead of clear. This does not apply to a scanned channel.

In this case, the radio indicates the following:

- The LED indicates the call is secure (Table 3.4).
- The security icon blinks (Table 3.6).
- The message “INVALID KEY” gets displayed 2 seconds (Section 8).

7.17 Request to Talk

The Request to Talk (RTT) option, when set in Armada, is used to alert the OCC operator that a unit is requesting to speak with the operator. In some cases Automatic Number Identification (ANI) is used to permit OCC operator identification of unit calling. Each base, mobile and portable radio transmits an encoded signal which is decoded into a unit identification and is displayed at the operator’s console position. Priority capabilities permit a member to signal an emergency condition to the commenter by pushing one button.

7.18 Conventional RSSI Display

A DMR conventional RSSI Display function is available to continuously display the Receive Signal Strength Indicator (RSSI) [in dBm] during calls. Because this is primarily a test feature, the RSSI display overrides other display information, such as PTT ID or other display options. The feature is always off on boot. After the operator turns the feature on, the feature remains on until the feature gets turned off or the radio gets power-cycled.

The radio displays a red “alert” banner if the RSSI falls to a level corresponding to 0 bars on the signal strength indicator. Otherwise, a green banner displays.

The hardware on the radio is limited to measuring RSSI up to around -70 dBm for VP5000/VP6000 radios and up to around -4 dBm for VP8000 radios (depending on the band).

SECTION

8

Messages

The following are definitions of the various error messages that the VP5000/VP6000/VP8000 radio uses:

Aff 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.

Aff 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.

Analog - This error indicates than an operation was attempted that is not allowed on analog channels.

Aff 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.

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.

Auth Failed - This error indicates that the radio failed to authenticate with the system.

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 - 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 Fmt - 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.

Bad Firmware - This error indicates that the firmware running on the radio is intended for a specific ESN and that the radio's ESN does not match it. This error will also be indicated with 13 orange blinks of the LED.

Busy - This error indicates that a call has been attempted and the system has responded that no channels are available for assignment.

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 time-out timer has expired.

Channl 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.

Chk Band Opt - This error indicates that the codeplug contains a system for a band that has been disabled in its options. This error will also be indicated with 15 orange blinks of the LED.

Clear Only - This error indicates that the selected channel or group is strapped clear only and that a secure call cannot be made.

Conv Timeout - Conventional Conversation Timer Expired. The user was transmitting in a conversation for longer than the timeout time.

Corrupt Parm - The parameters checksum or other data is corrupted. This error will also be indicated with 5 orange blinks of the LED.

Data Denied - This error indicates that a "Deny" response was received from the system when trying to acquire packet data service.

Denied - This error indicates that a group, unit, or interconnect call attempt has received a DENIED response from the system.

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 - This error indicates that the DSP failed to complete its startup procedure at power up. This is also indicated with 7 orange blinks of the LED.

Encrypt Bad - This error indicates that the main processor and the encryption module have failed to complete their startup procedure at power up. This error is also indicated with 11 orange blinks of the LED.

Empty Zone - The radio's current zone has no channel at position 0, resulting in an empty zone error.

Error Verify Fail - SD Card Test Failed, unable to read data off the SD Card. This can happen during SD card testing in Test/Tune Mode.

EU Tune Bad - This error indicates that the radio is optioned for EU sensitivity tuning but doesn't have the necessary tuning parameters. This option should only be set on VP5300 and VP6330 models used in European markets. This error will also be indicated with 18 orange blinks of the LED.

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 - This error indicates that the selected channel or group is strapped to high power and thus low power cannot be selected.

Fixed Low - This error indicates that the selected channel or group is strapped to low power and thus high power cannot be selected.

Health Low - The health of the current battery is low. Users should consider replacing their battery.

Hot - This error indicates that the radio has passed the hot temperature threshold. Under these conditions the radio will only transmit in low power.

Invalid - This error indicates that the received input from the user does not fit the criteria necessary for the feature.

Invalid Chan - This error indicates that the channel entered by the user in keypad programming is not valid.

Invalid ID - This error indicates that the ID entered by the user (for example, for a Unit Call) is not valid.

Invalid Key - This error occurs when the user attempts to select an invalid key or transmit is aborted due to an invalid key.

Invalid TG - This error indicates that the talkgroup entered into the radio during Talkgroup Select or Keypad Programming is invalid.

Invalid User - This error indicates that the user's radio ID was rejected by the system. This message is primarily related to data registrations.

IP Reg Fail - IP Context Activation has failed. The radio was unable to get an IP address. This was due to rejection by the system or due to the subscriber's inability to communicate with the system.

Key Fail - This error indicates that the encryption key required by the current selected group / channel is not valid or does not exist.

Kypd Locked - This error indicates that the keypad lock function is active and key presses are not accepted in this mode.

Kset Fail - This error indicates that the radio was not able to activate the encryption keyset chosen by the user.

Locked - This error indicates that the dynamic regrouping selector lock command has been received and zone and channel changes are not accepted.

List Full - This error occurs during Scan Edit when a user attempts to add too many channels to the scan list.

List Only - This error occurs when the user attempts to do direct entry of a unit ID/ phone number for Call Alert/Units Calls/ or Interconnect but the call setting is set for list only.

Menu Empty - The menu the user tried to access does not have any items.

Msg Failed - This error indicates that the message the user was trying to send failed. This applies to conventional messaging.

KMM No Service - This error indicates that OTAR service is not available.

Never Site - This error indicates that the user tried to site lock to a site which was assigned a preference of “Never”.

No Ack - This error indicates that the radio did not receive an ACK for the current signaling attempt, such as trunking units calls.

No Answer - This error occurs when the user initiates a trunking unit/interconnect call but the call was not answered before being canceled by the system.

No Audio - Instant Recording Replay is not available because there are no audio recordings to play.

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 - This error occurs when attempting to use or load keys but the radio is not optioned for encryption.

No GPS Data - This error occurs when the user attempts to use the GPS feature but the radio is not receiving GPS data.

No IP Reg - This error occurs when the user attempts to send GPS data without being IP registered.

No Keys - This error indicates that no keys are available for the key select function.

No List - This error indicates that no list is available for the selected feature.

No Message - This error occurs when attempting to activate the Message feature but no messages are programmed.

No Priorty - This error occurs when attempting to use the conventional Priority feature on a non-priority scan list.

No Site - This error indicates that no site with a verified ID is yet on the dynamic site list.

No SD Card - This error indicates that no SD Card is detected in the radio. This error will also be indicated with 14 orange blinks of the LED.

No Support - RF Testing or BER Testing is not supported for this radio band.

No UKEK - This error occurs when attempting to rekey with no UKEK.

Not Configured - Wi-Fi has not been setup. Configure Wi-Fi settings in the code plug.

Out of Range - This error indicates no control channel has been found for trunking operation.

Option Fail - This error indicates that the radio's option file has options set that are not recognized by the radio's firmware. This error will also be indicated with 16 orange blinks of the LED.

Parms Fail - There is no parameter file in the radio. This error will also be indicated with 3 orange blinks of the LED.

Rx 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.

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.

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.

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 Failed - This error indicates a failure in a rekeying process.

Resp Only - This error indicates that the Unit Call/Call Alert setting is set to Response Only.

Recovering Tuning - This error indicates that the radio does not have any tuning files. This can happen if the radio has gone through the file system recovery process. This error may be corrected automatically if there was a tuning backup. This error will not appear on VP8000. This error will also be indicated with 19 orange blinks of the LED.

Secure Only - The user is attempting to transmit Clear on a Strapped Secure channel.

Signal Loss - This error indicates that signal from the infrastructure has been lost during an interconnect call or a P25 Trunking unit call.

Status Fail - This error indicates that no acknowledgment was received while sending a status report.

Sync Loss - The Subscriber has lost bit sync on the control channel.

TDMA Only - This failure indicates when a radio that is not optioned for TDMA attempts to affiliate onto a Talkgroup that is available only in TDMA mode.

Timeout - Unit Call Timeout.

Tx Timeout - This error indicates that the Tx timeout timer has expired and Tx has been terminated.

Text Failed- Delivery of a text message failed.

Too Hot - This error indicates that the radio has passed the TOO HOT temperature threshold. Under these conditions the radio will not allow transmit.

Zone Fail - If Site Trunking and Display Site Trunking are enabled, this will be displayed if the zone controller goes down.

Table 8.1 lists messages that are defined in the radio. Table 8.2 lists messages that are displayed as a quantity of LED blinks. (Table 4.4 lists supported Location Request/ Response Protocol (LRRP) messages.) Contact EFJ Customer Service for more information about a numbered reject message.

Table 8.1 V16M System Reject Messages

Message	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 subscriber 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 talkgroup 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.
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.

Table 8.2 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.
5	Corrupt Parms	The parameters checksum or other data is corrupted.
7	DSP Fail	This error indicates that the DSP failed to complete its startup procedure at power up.

Table 8.2 Viking LED Failure Codes (Continued)

Orange LED Blinks	Startup Failure	Description
10	Channel Fail	The radio has been programmed with more channels than it is optioned.
11	Encryption Fail	This error indicates that the main processor and the encryption module have failed to complete their startup procedure at power up.
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.
13	Bad Firmware	This error indicates that the firmware on the radio was not meant for this specific radio's ESN.
14	No SD Card	This error indicates that no SD Card is detected in the radio.
15	Band Option Violation	This error indicates that it is programmed for a band that has been disabled in its options.
16	Option Failure	This error indicates that the radios option file has options set that are not recognized by the radios firmware. The user needs to either install the correct firmware version or be issued a valid option file for their firmware version.
18	EU Tune Bad	This error indicates that the radio is optioned for EU sensitivity tuning but doesn't have the necessary tuning parameters. This option should only be set on VP5300 and VP6330 models used in European markets.
19	Recovering Tuning	This error indicates that the radio does not have any tuning files. This can happen if the radio has gone through the file system recovery process. This error may be corrected automatically if there was a tuning backup. This error will not appear on VP8000.
28	Invalid Firmware	This error indicates that the firmware running on the radio does not support the radio's tuning parameters. This error will not appear on VP5000/VP6000. The following error message will be shown: "This firmware does not support this radio's hardware revision. Update to latest firmware or contact Kenwood Support."
29	Invalid Tuning	This error indicates that one or more tuning files are missing from the radio. This error will not appear on VP5000/ VP6000. The following error message will be shown: "This radio has invalid tuning. Contact Kenwood Support."

SECTION

9

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.

When a secure call is received, the LED flashes Red. If equipped with the Clear/Secure option button and the current channel is programmed to allow button selection, secure communication can be manually enabled and disabled by that button. Otherwise, channels are strapped to Clear or Secure operation (Section 9.3). Secure communication can be programmed on a per channel or per talkgroup basis to operate in various ways.

This section contains information on the following topics:

9.1 Encryption Algorithms

This section provides information about encryption options for the VP5000/VP6000/ VP8000 portable radio.

9.1.1 Encryption Available with Various Channel Types

Analog Channels - No encryption is available.

Digital Channels - On conventional (P25 and DMR), Viking16, and P25 Trunking channels, the DES-OFB, AES-OFB or ARC4 Encryption is used.

9.1.2 Advanced Encryption Standard (AES)

The encryption standard “AES” is replacing DES-OFB encryption on digital (P25 and DMR) channels. It uses a 128-, 192-, or 256-bit encryption key instead of the 64-bit key used with DES. KENWOOD radios currently do not support the 128 or 192-bit AES encryption keys. KENWOOD radios currently support only 256-bit AES encryption keys. The type of encryption (DES or AES) is determined by the type of encryption key that is loaded. 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).

9.1.3 FIPS Modes

FIPS 140 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.

9.1.4 ARC4 Encryption

ARC4 encryption is compatible with Motorola ADP encryption. See the Armada online help for more information on using software encryption. This is an optional radio feature that must be purchased and then enabled at the JVCKENWOOD EFJohnson factory (or by a factory-created option file).

Radios using Firmware Version 8.36.x or later programmed by Armada 1.36.x and later can load ARC4 keys by using a keyloader. These ARC4 keys loaded by keyloader are referred to as ARC4 Hardware Keys and are handled separately from ARC4 Software Keys. This feature addition allows the Armada programmer to change between allowing ARC4 Software Keys and allowing ARC4 Hardware Keys. Only one type of ARC4 key may be enabled at a time. By default, the Software Keys are disabled and the Hardware Keys are enabled.

9.2 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.

This section contains information on the following topics:

9.2.1 Hardware Keys

With the AES and DES encryption used by KENWOOD radios (Section 9.1), 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.

When an encrypted message is transmitted, the encryption Algorithm ID (ALID) and key ID (KID) are usually included in the message. This tells the receiving radio which key and algorithm must be used to decrypt the message.

If an attempt is made to transmit a secure message without loading the corresponding key, “Key Fail” 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.

9.2.2 Software Keys

Software Keys are created in Armada with a programmed value of up to 10 hexadecimal characters. The Logical Identifier (LID), also referred to as a key ID, is an ID for the Software Key that is sent by the transmitting radio to specify which key is to be used by the receiving radio. See more about programming software encryption keys in the Armada online help.

9.2.3 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 to decrypt it.

⚠ CAUTION *Load only unique Key IDs into the radio.*

9.2.4 SLN Key Management Mode

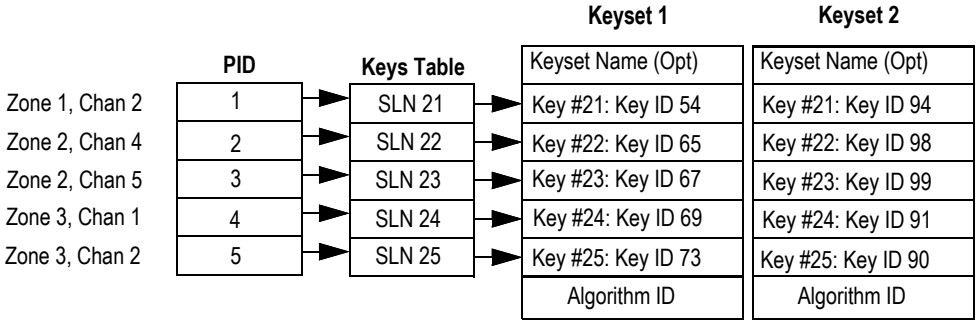
Note *The term "SLN" from the Project 25 specification is equivalent to "CKR" (Common Key Reference) also used to define this parameter.*

When SLN mode is selected, keys are loaded using one of the following:

- VK5000 (Viking Keyloader)
- Subscriber Management Assistant (SMA)
- Motorola KVL-3000
- Motorola KVL-3000 Plus optioned for Astro 25
- Motorola KVL-4000
- Motorola KVL-5000

OTAR can then be achieved by loading the corresponding UKEKs. The PID range 1-126 in the Keys Table must then be programmed to link channel PIDs to a specific Storage Location Number (SLN) or Common Key Reference (CKR). The range for SLNs is 1-4095 (Figure 9.1). The VP5000/VP6000/VP8000 supports two keysets, allowing for a total of 252 keys in two keysets.

Figure 9.1 Key Selection Example



The SLN mode must be selected when one of the following is used:

- Over-The-Air-Rekeying (OTAR)
- VK5000
- SMA

It can also be used if OTAR is not used. SLN mode is digital encryption, and can also be used with the following:

- Motorola KVL-3000
- Motorola KVL-3000 Plus (if optioned for Astro 25)
- Motorola KVL-4000
- Motorola KVL-5000

With this mode, keys are loaded into a Storage Location Number (SLN), typically from 1 to 4095. The 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 9.1, 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.

CAUTION *If you use SLNs that use 2 keysets, ensure that each SLN has a unique Key ID in each keyset.*

With Software Keys the PID numbering changes according to the Encryption Mode setting but can be used with either setting.

For radios using Firmware Version 8.40.x or later programmed by Armada 1.40.x and later, users are no longer required to program the keys table to map the PIDs to SLNs. SLN mode is the only supported key management mode. On upgrade, when radios are in SLN mode, all key references (e.g. on a channel) have their PID replaced with the SLN that was specified at that PID. The same is true for Software Keys' Key IDs. On downgrade, PIDs are recreated as needed to support the old firmware.

9.2.5 Maintaining Keys in Memory

The radio may need to be connected to a constant power source to preserve the encryption keys in memory. The radio may be programmed to determine if keys are permanently stored in memory or erased soon after power is removed.

If programmed for infinite key retention, keys are stored in memory and are not lost when power is removed. If it is disabled, they are maintained only until the storage capacitance discharges. Estimated time for losing keys with infinite key retention unchecked is 30 seconds.

Software keys will remain on the radio after power loss with or without Inifnite Key retention.

⚠ CAUTION *Unchecking Infinite Key Retention on the radio and writing the radio triggers a tamper event and instantly erases any stored keys.*

9.2.6 Removing Software Keys on Inhibit

If programmed to do so, all software keys get wiped from the radio if it is inhibited by the System Administrator.

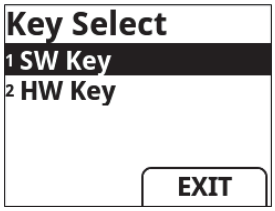
9.2.7 Encryption Key Select

Note *This feature is available on P25 trunking and conventional channels.*

When multiple encryption keys are programmed (see preceding information), the Key Select option button can be programmed to allow selection of another key for the current channel. This feature changes the SLN (or PID) hardware location of the key, and the change is permanent (cycling power or selecting a different channel does not reselect the original key), or can change the selected Key to a software key. Therefore, to switch back to the original key, it must be manually reselected. Proceed as follows to select a key:

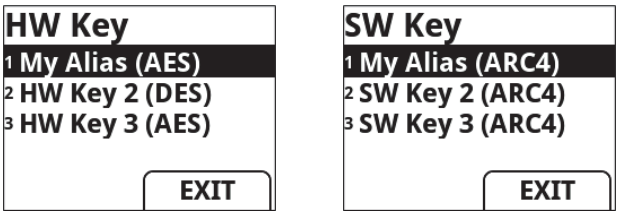
1 Press the Key Select button or select that menu parameter. The Key Select Menu is displayed (Figure 9.2). Press the Up/Down buttons to highlight HW Key (or SW Key, if optioned/programmed for software keys) and press the (Menu) button to select it.

Figure 9.2 Key Select Menu



2 Press the Up/Down buttons to display the desired HW or SW key (Figure 9.3) and then press the (Menu) button to select it and exit out of Key Select mode.

Figure 9.3 HW Key Select Menu (Left) and SW Key Select Menu (Right)



Some radios also offer front panel programming, which allows a user to setup conventional channels without using Armada. Digital conventional channels can be configured with encryption keys using this method.

Additional key management features available on the radio include the ability to change keysets, and initiate OTAR rekey requests. The change keyset feature allows the user to switch between the two traffic key keysets on the radio. Usually, keysets are changed by the KMF via OTAR, but there could be instances where the user needs to initiate the keyset changeover manually, either to start using a new set of keys, or to revert back to using an older set of keys. The Change Keyset and Rekey Request features can be selected from a programmable function button or menu item. Figure 9.4 shows the Change Keyset Menu and Figure 9.5 shows the Rekey Request Menu.

Figure 9.4 Change Keyset Menu

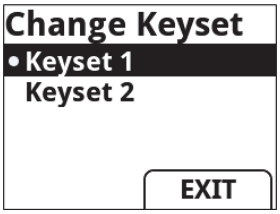
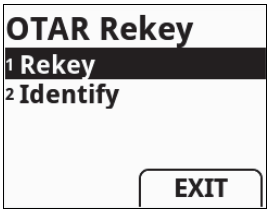


Figure 9.5 Rekey Request Menu

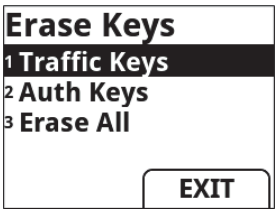


9.2.8 Encryption Key Erase

An Erase Key menu item can be programmed that allows the user to permanently erase some or all stored keys. On VP5000/VP6000 radios, users can only erase all keys. On VP8000 radios, users can choose to erase only the traffic keys used for voice, packet data, and OTAR, or the authentication keys used only for P25 link layer authentication (Figure 9.6). 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. If the radio receives an encrypted call but does not have the key, the radio indicates the call is secure instead of clear. Additionally, the encryption icon blinks, and the “Invalid Key” message is displayed for two seconds. This applies to P25 Conventional mode only.

CAUTION *When the Erase Keys command comes from a keyloader (such as a VK5000S), only hardware keys get erased. However, when the Erase Keys command comes from the radio, all keys get erased--both hardware keys and software keys.*

Figure 9.6 Erase Keys Menu (VP8000)



9.2.9 Per-System ESK-Only Setting

For radios using Firmware Version 8.28.x or later programmed by Armada 1.28.x and later, individual P25 trunking systems may be marked as Enhanced System Keys-only (ESK-only). This allows a radio to use soft keys for some systems and requires hard keys for others.

A parent hard key for that system must be present to change this setting. This setting may not be checked if no key has been assigned. If a system is marked ESK only, its system key may not be changed.

The radio keeps track of these hard-key-only systems. If a hard-key-only system is ever changed to not be hard-key-only (or if there are multiple systems with the same key where one is not ESK only), the radio deletes that system's authentication key. If a system does not use authentication keys, there is no enforcement mechanism outside of the radio security policy.

You cannot write to radios using Firmware Version 8.26.x or earlier when any of their systems are marked to be ESK only

Note *To downgrade a radio to Firmware Version 8.26.x or earlier, all hard-key-only systems with authentication keys must be removed from that radio.*

When viewing the radio information menu on a radio (Section 4.1), P25 trunking systems will list whether they are hard-key only.

9.3 Clear / Secure Strapping

This section contains information on the following topics:

9.3.1 Transmit Mode Options

The following transmit options are available when encryption is selected:

"Clear" - All calls are in the clear mode unless responding to a secure call. If the response is then made within the delay time, it occurs in the secure mode.

"Secure" - All calls are made in the selected secure mode.

"Switched" - The mode is selected by the Clear/Secure button. When the clear mode is selected by this button 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.

If the channel has been strapped "Clear" and the option button selects the "Secure" mode on power up and a transmission is attempted, transmitting is disabled. Likewise, if the channel is strapped "Secure" and the option button selects the "Clear" mode on power up and a transmission is attempted, the transmitter is disabled.

The radio can be programmed to ignore the "Clear" or "Secure" button setting. These 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 button or menu parameter is programmed, this parameter must always be selected (see following).*

If the Clear/Secure button or menu parameter 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. An error tone sounds.

9.3.2 Talkgroup Encryption Override

Conventional digital (P25 and DMR), Viking16, 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.

9.3.3 P25 Trunking Any Key

P25 Trunking Talkgroups have an Any Key programming option located in the Talkgroup List section. When the option is enabled and the radio receives a secure call, it allows any key in the radio to be used to decrypt the traffic. If the option is disabled, the radio uses only the key assigned to the talkgroup/announcement group/channel to decrypt traffic. If the radio receives a call using another key than the specified key, the radio's display shows the call parameters that are programmed, but the LED will not illuminate nor will the speaker open. The behavior for Viking16 and P25 Conventional talkgroups is Any Key enabled.

9.4 Over-the-Air Rekeying (OTAR)

Over-The Air-Rekeying (OTAR) 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.

The actual OTAR rekeying functions are performed by a Key Management Facility (KMF) that sends Key Management Messages (KMM) to the radios. These messages are themselves encrypted using an encryption key. Radios must be OTAR-compatible and programmed 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 trunked channels, and only to program DES-OFB and AES keys. It is not used on Viking16 channels.

9.4.1 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 to perform OTAR. If the radio does not contain a TEK, the KMF initiates a warm start sequence in which a temporary TEK is transferred to the radio to perform the key transfer.

UKEK - DES UKEKs typically use SLN (CKR) 61440 and Key ID 62880 (F5A0 hex). Create a key (either AES or DES type as required) and download it to the radio. AES UKEKs typically use an SLN of 61442 and a Key ID of 62880 (0xF5A0).

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.

MNP (Message Number Period) - Load the proper message number period into the radio (typically 1000).

Verify that the above information was properly stored in the radio by viewing it using the keyloader.

9.5 Radio OTAR Capabilities

The OTAR capabilities of the SCM equipped VP5000/VP6000/VP8000 portable radio 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.

9.5.1 OTAR Option Buttons

The following additional option buttons can be programmed with the VP5000/VP6000/VP8000 portable radio to control OTAR functions. They are also available as menu parameters unless noted otherwise.

Change Keyset - Toggles the active keyset between Keyset 1 and Keyset 2. The new active keyset is briefly displayed and then normal operation resumes. When the menu is used, the current active keyset is indicated by an indicator icon. To change to the other keyset, highlight it and press the (Menu) button.

Clear/Secure Select - This enables and disables encryption regardless of whether OTAR is used. Refer to Section 9.3 for more information.

Erase Keys - Erases all TEK, KEK, and authentication keys contained in the radio.

Key Select - This allows a different key to be selected for the current channel or group (Conventional and P25 Trunking channels only). Refer to Section 9.2.7 for more information.

SECTION

10

Data Features

Advances in digital communication allow for new data features and services using the radio link. This section discusses data features and services available for the VP5000/ VP6000/VP8000 portable radio.

10.1 P25 Trunking Features

P25 Trunking supports data service on a P25 Trunking system using a KENWOOD radio and a 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)

The radio must be programmed for data operations on the Trunked IV & D system.

10.1.1 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. The radio Accessory Connector (side port) functions as the MDP Interface connection point.

10.1.2 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 a KENWOOD 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 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 radio will receive a response containing a IP address. This IP address will be used by the 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 radio will not be allowed to use data services on the trunked system. If a PPP link is established between the portable computer and radio without the radio context activated, any data transmitted by the computer to the radio is ignored.

SECTION

11

Obtaining Technical Support

This section describes how to obtain authorized support and service for the VP5000/VP6000/VP8000 portable radio, in accordance with your existing support agreement.

11.1 Contacting EFJohnson

If EFJohnson technical personnel are not on site, and are needed for assistance, contact the EFJohnson representative for your site. Check with your site engineer or site manager for contact information.

11.1.1 Gather Information before Calling EFJohnson

When contacting EFJohnson for technical support, collect and have available all pertinent information such as specific site identification, equipment models, and any other relevant information that may be needed by technical support.

11.1.2 Contact Information

The EFJohnson 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 am–5:00 pm US Central Time, Monday–Friday.

Note *A technical support subscription service is available or support can be purchased on an as-needed basis. Contact warranty@efji.com for more information.*

The Customer Service Department can be reached as described in Table 11.1.

Table 11.1 Customer Service Contact Information

To get assistance with this...	...Call (800) 328-3911 and select this option...	...Or send an e-mail message to this address
Orders and parts	1	orders@efji.com
Technical support	3	techsupport@efji.com
Repair depot support	4	depot@efji.com
Warranty support	5	warranty@efji.com
Sales	6	sales@efji.com

You may also contact the Customer Service Department by mail. Please include all information that may be helpful in solving your problem.

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

11.2 Product Warranty

The warranty statement for EFJohnson equipment is available from your product supplier or from:

Warranty Department
EFJohnson Technologies
1440 Corporate Drive
Irving, TX 75038-2401
(800) 328-3911 Extension 5
warranty@efji.com

This information may also be requested from the Warranty Department by phone (Refer to Table 11.1.). The Warranty Department may be contacted for warranty service reports, claim forms, or any other questions concerning warranties or warranty service.

11.3 Returns for Repairs

Before returning equipment for repair, contact the EFJohnson Technologies Customer Service Department at the appropriate number shown in the preceding table. 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 service centers. If local service is not available, the equipment can be returned to the EFJohnson Repair Depot. However, before returning equipment, contact the Customer Service Department Repair Depot for the correct “Ship To” address.

11.4 Replacement Parts

Replacement parts can be ordered directly from the Orders & Parts Department. To order parts by phone, dial the toll-free number and select the Orders and Parts extension specified in the preceding table. 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.

11.5 Internet Home Page

EFJohnson Technologies has an Internet site that you can access for current company information on products, systems, and regulations. The address is

www.efjohnson.com