51xx Series

PRELIMINARY OPERATING MANUAL

FM Portable Radio

Project 25, Conventional SMARTNET™, SmartZone®

EFJohnson®

LAND MOBILE PRODUCT WARRANTY - The manufacturer's warranty statement for this product is available from your product supplier or from the E.F. Johnson Company, 299 Johnson Avenue, Box 1249, Waseca, MN 56093-0514. Phone (507) 835-6222.

E.F. Johnson Company, which was founded in 1923, designs, manufactures, and markets radio communication products, systems, and services worldwide. E.F. Johnson produces equipment for land mobile radio and mobiletelephone services which include business, industrial, government, public safety, and personal users.

SAFETY TRAINING INFORMATION

WARNING

This radio produces RF electromagnetic energy when transmitting and is designed and classified for "Occupational Use Only". Radio equipment with this classification must be used only during the course of employment by individuals aware of the hazards and the ways to minimize such hazards. This radio is NOT intended for use by the General Population in an uncontrolled environment.

This radio has been tested and complies with FCC RF exposure limits for "Occupational Use Only". In addition, it complies with the following standards and guidelines with regard to RF energy and electromagnetic energy levels and evaluation of such levels for exposure to humans:

- FCC OET Bulletin 65 Edition 01-01 Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

- American National Standards Institute (C95.1-1992), IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

- American National Standards Institute (C95.3 -1992), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave.

CAUTION

To ensure that your exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use, always adhere to the following guidelines:

- DO NOT operate the radio without the proper antenna attached. This may damage the radio and cause FCC RF exposure limits to be exceeded. The proper antenna is the antenna supplied with the radio by the manufacturer or an antenna specifically authorized by the manufacturer for use with this radio.

- DO NOT transmit more than 50% of total radio use time (50% duty cycle). Transmitting for more than 50% of the time can cause FCC RF exposure compliance requirements to be exceeded. This radio is transmitting whenever **Tx** is indicated in the display. Pressing the PTT switch on the side usually causes the radio to transmit.

- DO NOT use any accessories not specifically authorized by the E.F. Johnson Company for use with this radio such as batteries, speaker-microphones, belt clips, and antennas. The use of unauthorized accessories can cause FCC RF exposure compliance requirements to be exceeded.

- ALWAYS keep the antenna and radio at least 2.54 cm (1.0 inch) away from your body when transmitting to ensure FCC RF exposure compliance requirements are not exceeded. The best transmission quality results when the antenna is at least 5 cm (2 inches) away from your mouth and angled slightly to one side.

NOTE: The preceding information is provided to make you aware of RF exposure and what to do to ensure that this radio is operated within FCC RF exposure limits.

Electromagnetic Interference/Usage Compatibility

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 no expressly approved by the E.F. Johnson Company could void the user's authority to operate this equipment (FCC Rules, 47CFR Part 15.19).

DO NOT operate it 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.

Dispose of the nickel metal-hydride 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.

FEATURES

General Features

- Programmable for the following modes of operation:
  - Conventional analog
  - Conventional Project 25 (digital)
  - SMARTNET™/SmartZone® trunked (analog or digital)
- Up to 16 zones with up to 16 channels each programmable (256 channels total)
- Large liquid crystal display (LCD) with backlight
- Nine programmable option switches (full keypad model)
- Standard and radio-wide scan modes
- Time-out timer
- Power-up password access available to prevent unauthorized usage

Conventional Features

- Up to 256 channels or talk groups programmable
- Repeater talk-around
- Monitor mode selected by option switch
- Carrier or Call Guard® controlled squelch on analog channels
- Penalty and conversation timers
- Priority channel sampling when scanning
- Busy channel lockout (transmit disable on busy)
- SecureNet™ or 460 secure communication available on analog channels, DES-OFB on Project 25 channels
- Individual ID calls on Project 25 channels
- User selectable high and low power output
- Emergency switch (P25 channels only)
- Keypad programming

SMARTNET™ II/SmartZone® Features

- Up to 256 talk groups programmable
- Group, Enhanced Private Conversation™, Private Conversation II™, and Telephone Calls
- Emergency alarms to alert 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
- Call Alert™ (send and receive pages)
- Predefined messages (up to 16) can be sent to a dispatcher
- Predefined status conditions (up to 8) can be sent to a dispatcher
- Dynamic regrouping (dispatcher can automatically gather users on a channel to receive a message)
- Roaming (SmartZone only)
- SecureNet™ or 460 secure communication available

NOTE: The availability of many of the preceding features is controlled by system operator programming of your transceiver, installed options, and the capabilities of the radio system being accessed.

NOTES

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OPTION SWITCH FUNCTIONS

The programmable option switches are as follows:

- F1, F2, F3, and F4 keys on the front panel
- Three push-button switches on the side
- Orange push-button switch on the top panel
- Three-position A/B/C switch on top panel

These switches can control one function when a conventional channel is selected and another when a SMARTNET/SmartZone channel is selected. The available functions for each operating mode and the page on which each function is described are listed in the following tables. Consult your system operator to determine what functions are controlled by each switch and then write the switch label next to the applicable function. Refer to page 20 for more option switch information.

CONVENTIONAL MODE		
Switch	**Function**	**See Page**
	Backlight	20
	Clear/Secure	28
	Displayed Information	30
	High/Low Power	34
	Home Zone	22
	Individual ID Call	40
	Keypad Lock	21
	Keypad Programming	40
	Monitor	31
	Normal/Selective	32
	Priority	36
	Radio Wide Scan	24
	Repeater Talk-Around	34
	Scan	24
	Scan Edit	26
	Talk Group Select	39
	Tones On-Off	23
	Zone Select	21

SMARTNET/SMARTZONE MODE		
Switch	**Function**	**See Page**
	Backlight	20
	Call Alert	56
	Call Response	50, 52
	Clear/Secure	28
	Home Zone	22
	Keypad Lock	21
	Message	57
	Phone	53
	Private Call	47, 51
	Radio Wide Scan	24
	Scan	24
	Scan Edit	26
	Site Lock (SmartZone only)	61
	Site Search (SmartZone only)	61
	Status	58
	Tones On-Off	23
	Zone Select	21

CONTROLS AND DISPLAY

Front Panel Controls

Speaker - The transceiver speaker is located behind this grill. When a speaker/microphone is used, this speaker is automatically disabled.

Microphone - The microphone is located in this area. For best results, hold the transceiver 2-3 inches from you mouth and speak at a normal conversational level.

Front Display - This is a dot-matrix graphical LCD (Liquid Crystal Display). The display backlight can be programmed to turn on when any key is pressed or when the Backlight option switch is pressed (see page 20).

DTMF Keypad - The full keypad, 17-key models include the keys required to dial telephone, unit ID, and group ID numbers and also to enter numbers during for keypad programming.

F1 - F4 - These keys are available with both full and limited keypad models, and they can be system operator programmed to control a specific function. The key functions can be different for each operating mode (see page 11). Other programmable option switches are located on the top and side panels (see preceding information).

Top Panel Controls

On-Off/Volume - Turning the knob clockwise turns power on and sets the volume level. Turning it counterclockwise to the detent turns power off.

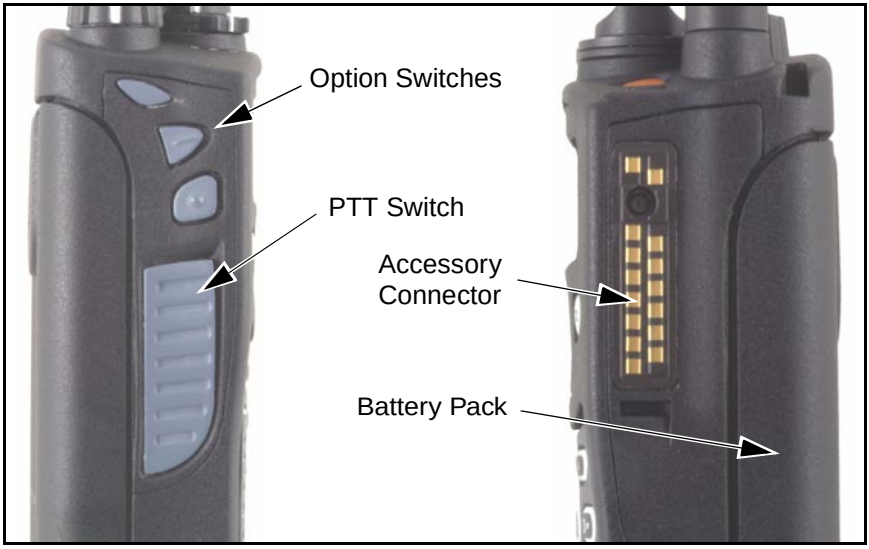
Channel Switch - This 16-position switch allows up to 16 channels to be selected. This switch operates in conjunction with up to 16 programmable zones to allow up to 256 channels to be selected.

Programmable Option Switch - This is a three-position selector switch that can be system operator programmed to control some function (see page 11).

Antenna Connector - Connection point for the antenna. Make sure that the antenna is tight before using the radio.

Emergency Switch - If the radio is programmed for emergency transmissions, pressing this switch alerts a dispatcher, for example, of an emergency condition. Refer to descriptions on pages 35 and 58 for more information.

Side Controls



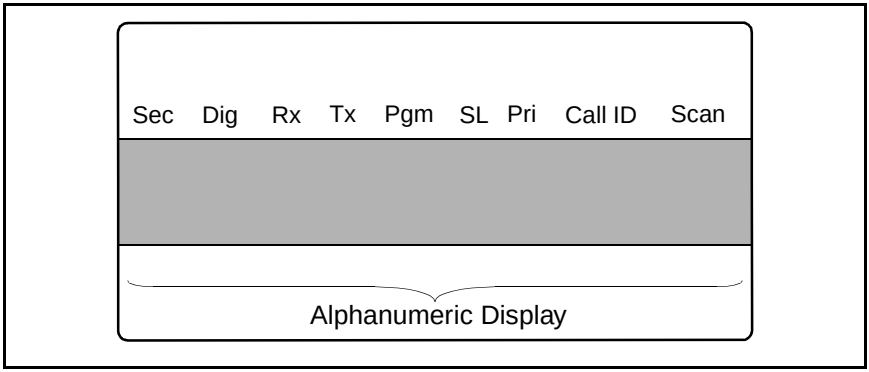
Option Switches - These three switches can be system operator programmed to control a specific function (see page 11).

PTT Switch - This switch is pressed to turn the transmitter on. The indicator on the top panel lights red when the transmitter is keyed.

Accessory Connector - Connection point for optional accessories such as a speaker/microphone.

Battery Pack - To remove the battery, press the release on the bottom toward the front of the transceiver and slide the battery outward.

Display



The front panel display is shown above, and the following information is indicated:

Alphanumeric Characters - This area of the display indicates the selected channel, error conditions, and other information.

Sec - Indicates that transmissions are encrypted (see page 28).

Dig - Indicates that a digital (Project 25) conventional channel is selected.

Rx - Indicates that a carrier is being detected on the selected or scanned channel.

Tx - Indicates the transmitter is keyed.

Pgm - Indicates that the keypad programming mode is selected (see page 40).

SL - Indicates that the displayed channel is in the scan list (see page 25).

Pri - Indicates that the displayed channel is programmed as the current group's priority channel (see page 36).

Call ID - Indicates that the display is showing the ID of the calling party (see page 47).

Scan - Indicates that system scan is activated (see page 23).

GENERAL OPERATION

Introduction

The following section describes features available with both trunked and conventional operation. Features unique to conventional channels are described starting on page 29, and features unique to SMARTNET/ SmartZone channels are described starting on page 46.

Turning Power On and Setting Volume

Power is turned on and off by the On-Off/Volume switch on the top panel. When power is initially turned on, an alert tone sounds and the indicator on the top panel flashes green. If a SMARTNET/SmartZone channel is selected, the zone alias is then displayed followed by the unit ID (see page 46). The selected channel is then indicated.

To turn power off, turn the On-Off/Volume knob counterclockwise until a click occurs. The display may remain on for a few seconds after power is turned off. It is recommended that power not be turned back on again until the display is blank.

The relative volume level can be determined by noting the position of the index on the On-Off/Volume knob. To enable a reference tone for setting the volume, proceed as follows:

- If key press tones are enabled (see page 23), a short tone sounds when front panel keys are pressed.

- If a conventional channel is selected and the Monitor option switch is programmed (see page 31), pressing that switch unsquelches/squelches the receiver and either voice or background noise is heard. If a SMARTNET/SmartZone channel is selected, the receiver cannot be manually unsquelched.

Power-Up Password

General

The power-up password feature prevents unauthorized use of the transceiver. When it is enabled by system operator programming, an eight-digit password must be entered to make the transceiver operational each time power is turned on. Passwords can be entered even if the key-pad is locked (see "Keypad Lock" on page 21). The default password is eight zeros (00000000).

If this feature is enabled, proceed as follows to unlock the radio:

1. Turn radio power on and when "LOCKED" is displayed, enter the eight-digit numeric password using the keypad. As each digit is entered, a dash is displayed. If an incorrect digit is entered, press the **F3** key and re-enter the entire password.

2. When all eight digits have been entered, press the **F4** key. If the password is correct, the display indicates normal zone and then channel information. If an incorrect password is entered, "LOCKED" is again displayed.

Changing Password

The current password can be changed as follows:

1. The locked mode must be selected to change the password, so cycle power if necessary to display "LOCKED".

2. Enter the old eight-digit password and press the **#** key (not **F4**). If the correct password is entered, "NEW PSWD" is displayed.

3. Enter the new password and press **F4**. The password is changed.

Backlight

The backlight for the display and keypad can be manually turned on by pressing the Backlight option switch if it is available. The backlight can also be system operator programmed to automatically turn on when any key is pressed. It then automatically turns off after a programmed delay so that battery drain is minimized.

Option Switches

The programmable option switches are as follows:

- **F1**, **F2**, **F3**, and **F4** on front panel (see illustration on page 13).
- The three push-button switches on the side panel (see illustration on page 16).
- The 3-position selector switch and orange push-button switch on the top panel (see illustration on page 15).

If your radio is programmed with both conventional and SMARTNET/SmartZone channels (see page 29), these option switches can be system operator programmed to control a different set of functions for each channel type. For example, the **F1** switch could select Hi/Lo Power when a conventional channel is selected and Private Calls when a SMARTNET/SmartZone channel is selected. The available functions in each mode are indicated in the tables on pages 11 and 12. If the programmed functions are not indicated in these tables, consult your system operator to determine how your switches have been programmed. If no option switch has been programmed to control a particular function, that function may not be available or may be in a fixed mode.

Keypad Lock

If the Keypad Lock option switch has been programmed, the keypad can be locked (disabled) to prevent keys from being accidentally pressed. To lock the keypad, simply press this switch. Then to unlock it again, press and hold it until a tone sounds. The keypad can also be disabled by system operator programming. It is then permanently disabled and cannot be re-enabled by the user.

Low Battery Indication

When the battery voltage falls below a preset level, the radio can be programmed so that any or all of the following indications occur:

- "Low Battery" flashes in the display every 5 seconds
- A chirp sounds every 5 seconds in the receive mode.
- A chirp sounds every 5 seconds in the transmit mode.

The battery should be recharged as soon as practical after a low battery indication appears. Refer to page 64 for more battery information.

Channel and Zone Selection

Channel Select

To change the current channel, rotate the 16-position channel selector knob on the top panel to the desired position. With SMARTNET/ SmartZone channels, the selected channel is always indicated by alias (name). The alias is also displayed with conventional channels if the Display Mode option switch is not programmed. If this switch is programmed, the channel number or frequency may also be displayed (see "Display Mode Selection" on page 30).

Zone Select

A zone is a group of up to any 16 conventional and SMARTNET/ SmartZone channels defined by system operator programming. Up to 16

zones can be programmed for a total of 16 x 16 channels per zone or 256 channels. One use of zones may be to select groups of channels programmed for operation in different geographical areas or radio systems. If selectable zones have been programmed in your radio, consult your system operator for more information on how they are used. Zones are selected as follows:

1. Press the Zone option switch and the alias (name) of the current zone is flashed in the display.

2. Use the number keys to enter the desired zone number or scroll through the available zones using the Up/Down select switch.

3. When the desired zone is displayed or entered, select it by pressing the **F4** key or waiting 4 seconds.

Home Zone

The radio can be programmed with a home zone. Then when power is turned on, the radio can be programmed so that either the home or last selected zone is automatically selected.

If the Home Zone option switch is programmed, it can be used to quickly select or change the home zone. To select the home zone, simply press this switch. To change the home zone to the currently selected zone, press and hold this switch until a tone sounds (approximately 1 second).

Time-Out Timer

The time-out timer disables the transmitter if it is keyed for longer than the programmed time. It can be programmed on each channel for times of 15 - 225 seconds or it can be disabled (not used). If the transmitter is keyed continuously for longer than the programmed time, the transmitter is disabled and an invalid condition tone sounds. Five seconds before time-out occurs, an alert tone sounds to indicate that time-out is approaching. The timer and tone are reset by releasing the PTT switch.

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. Conventional channels can also be programmed with the Penalty and Conversation timers that are described starting on page 33.

Tone Enable/Disable

The supervisory tones (see page 62) can be enabled and disabled by the Tones On-Off option switch if it is programmed. When tones are enabled by this switch, “TONE ON” is momentarily displayed and a tone sounds. Conversely, when tones are disabled, “TONE OFF” is displayed and no tone sounds. If the Tones On-Off option switch is not programmed, tones are fixed in the on or off mode by system operator programming.

Scanning

Introduction

Scanning cycles through a list of channels called a “scan list”, checking each for messages. When a message is detected that your transceiver is programmed to receive, scanning stops and the message is received. Shortly after the message is complete, scanning resumes (unless it has been disabled).

There are two basic scan modes: Standard and Radio Wide. The Standard mode is unique to the type of channel selected (conventional or SMARTNET/SmartZone), and the Radio Wide mode is the same regardless of the channel type selected. Only one of these scan modes can be enabled at a time. Therefore, if standard scanning is enabled while radio wide scanning is occurring, radio wide scanning is automatically disabled and vice versa. More information on these modes follows.

Standard Scanning

Standard scanning monitors only channels that are the same type as that currently selected. Therefore, if a conventional channel is selected, only conventional channels are scanned, and if a SMARTNET channel is selected, only SMARTNET channels are scanned. Standard scanning is turned on and off by the Scan option switch as follows. If this switch is not programmed, standard scanning is not available.

- To turn standard scanning on, press the Scan option switch. Scanning is enabled when the "**Scan**" icon is indicated in the upper right corner of the front panel display and "SCAN ON" is briefly displayed.

- To turn scanning off, press the Scan option switch again. The "**Scan**" icon is then no longer indicated and "SCAN OFF" is briefly displayed.

- If the zone or channel is changed while scanning is selected, scanning continues on the same or a different scan list (see scan list information which follows).

Radio Wide Scanning

Radio wide scanning monitors the channels in the preprogrammed radio wide scan list (see page 25). This list may contain up to 16 channels of any type (conventional or SMARTNET/SmartZone) assigned to any zone. Radio wide scanning is turned on and off by the Radio Wide Scan option switch as follows. If this switch is not programmed, radio wide scanning is not available.

- To turn radio wide scanning on, press the Radio Wide Scan option switch. Scanning is enabled when "**Scan**" is indicated in the upper right corner of the front panel display and "SCAN ON" is briefly displayed.

- To turn radio wide scanning off, press the Radio Wide Scan option switch again. The "**Scan**" icon is then no longer indicated and "SCAN OFF" is briefly displayed.

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

Scan Resume Delay

When a message is received or transmitted while scanning, there is a system operator programmable delay before scanning resumes. The delay after receiving a call prevents another message from being received before you can make a response, and the delay after transmitting a call ensures that you hear a response to your call instead of another message occurring on some other channel.

Standard Mode Scan List

NOTE: The selected channel is always scanned.

With conventional operation, up to three scan lists can be programmed. The list that is scanned is selected by the Scan option switch as described on page 35. Selecting another conventional channel does not change the current scan list. The scan lists are user programmable if the Scan Edit option switch is programmed (see page 26).

With SMARTNET/SmartZone operation, each channel can be programmed so that one of up to three different scan lists is automatically selected or scanning is disabled. The scan list assigned to the current channel is not user selectable, but it is user programmable if the Scan Edit option switch is programmed (see page 26).

Radio Wide Mode Scan List

With radio wide scanning, there is only one preprogrammed scan list available regardless of the type of channel selected, and it is not user programmable.

Determining Which Channels are in Scan List

Channels in the standard SMARTNET/SmartZone and radio wide lists are not indicated. With conventional channels, the selected channel

is in the current scan list if "**SL**" (Scan List) is indicated in the upper part of the display.

Nuisance Channel Delete

With standard scanning, channels can be temporarily deleted from the scan list, for example, if messages on a channel become annoying. This feature is not available with radio wide scanning. Proceed as follows:

NOTE: The selected channel and conventional priority channels cannot be deleted from the scan list.

1. While receiving a message on the channel to be deleted, press and hold the Scan option switch until the alert tone sounds (about 1 second).

2. The channel is then deleted and scanning of the remaining channels in the scan list resumes.

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

   - Scanning is turned off and then on again using the Scan switch.
   - Transceiver power is turned off and then on again.
   - The scan list is reselected by pressing the number key corresponding to the list number (conventional) or by selecting another channel (SMARTNET/SmartZone).
   - Another channel is selected by the top panel channel switch.

Programming a Scan List

When full keypad (17-key) models, conventional and SMARTNET/ SmartZone standard scan lists are user programmable if the Scan Edit option switch is programmed and user programming of the list is allowed. Scan list programming is not available with limited keypad (5-key) models. Proceed as follows to program a scan list:

Preliminary

1. With conventional channels, select the list to be edited (1-3) by pressing the key corresponding to the desired list number with scanning enabled (see page 35). If a list is not selected, the last active scan list is automatically edited. With SMARTNET/SmartZone channels, the scan list for the selected channel is fixed and cannot be changed. Scanning may also be disabled on some channels.

2. If scanning is enabled, turn it off by pressing the Scan option switch.

3. Press the Scan Edit option switch. The alias of the first channel in the scan list is displayed. If scan list programming or scanning is disabled on the selected list or channel, "NO LIST" is momentarily displayed and scan list programming is not available. Proceed as follows to delete or add a channel:

To Delete a Channel:

4. Select the channel you want to delete by pressing Up/Down select switch.

5. With conventional channels, to delete the displayed channel and exit this mode, press the **F3** key. With SMARTNET/SmartZone channels, press the "**2**" key and then **F4**.

   NOTE: The priority channel cannot be deleted (see "Priority Channel Sampling" description which follows).

To Add a Channel:

1. Press the Scan Edit option switch. The alias of the first channel in the scan list is displayed.

2. Enter the two-digit zone and channel number of the channel you want to add. For example, to add Zone 1/Channel 5, enter "0105". Refer to page 21 for more information on zones and channels.

3. With conventional channels, to add the channel to the scan list and exit this mode, press the **F4**. With SMARTNET/SmartZone channels, press the "**1**" key and then **F4**.

Secure Communication

This transceiver may be optionally equipped to provide secure communication on some or all channels. This feature encrypts your voice so that it can be understood only by someone using a transceiver equipped with a similar encryption device and encryption codes.

When a secure call is received or transmitted, "**Sec**" is indicated in the upper part of the display. Secure communication can be programmed on a per channel basis to operate in various ways. If equipped with the Clear/Secure option switch and the current channel is programmed to allow switch selection, secure communication can be manually enabled and disabled by that switch. In the receive mode, secure calls may be autodetected or only calls coded like the transmit signal may be received. If your transceiver has this feature, consult your system operator for more information on how it functions in your application.

Transceiver Operating Modes

Each selectable channel can be programmed for either the conventional or SMARTNET/SmartZone operating mode. For example, Zone 1/Channel 1 could be a conventional channel, Zone 1/Channel 2 a SMARTNET channel, and so on. Consult your system operator to determine the type or types of operation programmed in your transceiver. More information on these modes follows.

Conventional - This is a non-trunked operating mode which accesses independent radio channels (there is no automatic access to several channels). Monitoring before transmitting may not be automatic in this mode, so you may need to manually monitor the channel before transmitting to make sure that it is not in use. Either analog or digital (Project 25) signaling may be used. When a digital channel is selected, "DIG" is indicated in the upper part of the display. Channel monitoring and other operating features unique to conventional channels are described starting on page 29.

SMARTNET™/SmartZone® -This is a trunked operating mode that uses ID codes to select what mobiles are being called and what calls are received. Monitoring is performed automatically and special messages and tones indicate busy and out-of-range conditions. Enhanced features include roaming (SmartZone only), telephone, private, and emergency calls, Call Alert™, and messaging. Either analog or digital signaling may be used. When a digital channel is selected, "**Dig**" is indicated in the upper part of the display. Operating features unique to SMARTNET/ SmartZone channels are described starting on page 46.

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

The control channel transmits and receives system information to and from all radios registered on the system. Therefore, once a control channel is found, it is continuously monitored for incoming call information and is used to make call requests. The radio automatically changes to a traffic channel to place and receive calls and then returns to the control channel when the call is complete.

CONVENTIONAL FEATURES

Introduction

The following information describes features unique to the conventional operating mode (see brief description on preceding page). Refer to the preceding "General Operation" section for information on features common to all operating modes, and to the SMARTNET/SmartZone section starting page 46 for information on features unique to that mode.

Display Mode Selection

If the Displayed Information option switch is programmed, it is usually the three-position toggle switch on the top panel. This switch selects the following conventional channel display modes. If this switch is not programmed or a SMARTNET/SmartZone channel is selected, the Alias mode is always used.

Alias - The preprogrammed alphanumeric tag for the channel is displayed.

Number - The channel number from 1-16 is displayed as "CHAN xx".

Frequency - The frequency of the selected channel is displayed in megahertz. The transmit frequency is displayed in the transmit mode and the receive frequency is displayed in the receive mode.

NOTE: The channel number can also be determined by noting the number (1-16) indicated by the index on the channel selector knob.

Monitoring Before Transmitting

With conventional operation, you may need to manually monitor the channel before transmitting to make sure that it is not being used by someone else. If you were to transmit while someone else was using the channel, you would probably disrupt their conversation. Channels are monitored automatically or manually as follows:

Automatic Channel Monitoring

If the selected channel is programmed for Busy Channel Lockout feature (consult your system operator), monitoring is performed automatically. Refer to the description of this feature on page 32 for more information.

Manual Channel Monitoring

The automatic monitoring just described may not be programmed or it may occasionally disable the transmitter even if the channel is not in use. In this case, the channel must be monitored manually as follows:

Rx Indicator - With scanning disabled, note if the "**Rx**"indicator in the display is indicated. If it is not, the channel is not being used and you can transmit your call. If it is indicated, the channel may be busy and you should not place your call (see next paragraph).

Monitor Mode - There may be times when the busy indication is displayed even though no one is using the channel. Monitoring should then be performed by disabling Call Guard squelch using the Normal/ Selective option switch as described on page 32 or the monitor mode described next.

Monitor Mode

The monitor mode temporarily disables squelch control features (such as Call Guard® squelch) so that all messages are heard on the selected channel. It also overrides the Busy Channel Lockout feature (see next section) and temporarily halts scanning.

To monitor the selected channel, select the monitor mode by briefly pressing or pressing and holding the Monitor option switch (if available). The receiver unsquelches and a rushing noise or voice is heard when the monitor mode is enabled. To disable the monitor mode and return to normal operation, release the Monitor switch or press it a second time.

If scanning is enabled, pressing and holding the Monitor option switch monitors the current scanned channel instead of the selected channel if applicable.

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 a busy condition is detected by this feature, the transmitter is disabled, “BUSY” is indicated in the display, and a tone similar to a standard telephone busy tone sounds until the PTT switch is released. The transceiver can be programmed to operate in one of the following modes on each channel:

Off - The transmitter keys even if the channel is busy.
Noise - The transmitter is disabled if any signal is detected on the channel.
Tone - The transmitter is disabled if the detected squelch coding is not correct.

If busy override is permitted by programming, it is possible to transmit even when the transmitter is disabled by this feature. Simply release the PTT switch and then quickly press it again.

Call Guard Squelch

General

Call Guard® squelch (also called CTCSS/DCS signaling) may be programmed on conventional analog channels. This feature eliminates distracting messages intended for others using the channel by using a subaudible tone or digital code to control the squelch. This tone or code is unique to a user or talk group on that channel. It is transmitted by the mobile placing a call, and if Call Guard squelch is programmed in the mobile receiving the call, it must detect the correct tone or code to receive the call.

Call Guard Squelch Enable/Disable

To disable Call Guard (Selective) squelch so that all messages on the selected or scanned channels are heard, press the Normal/Selective option

switch (if available) so that “NORMAL is flashed in the display. Then to re-enable Call Guard squelch, press the Normal/Selective switch again so that “SELECTIV” is flashed. The mode selected by this switch does not change when other channels are selected or power is cycled. Call Guard squelch can also be disabled by the monitor mode described on page 31.

Keypad Selectable Call Guard Code (CTCSS/DCS)

If you have the full keypad (17-key) model and the ability to change Call Guard codes has been enabled by programming, the transmit and receive codes from one channel can be temporarily or permanently reassigned to all channels of the current zone. Proceed as follows:

1. Using the number keys, enter the number of the channel that is programmed with the code you want to reassign to all channels (only channels 1-9 can be selected). See “Display Mode Selection” on page 30 for information on displaying channel numbers.

2. The display then briefly indicates “CODE x”, where “x” is the key you pressed. The codes assigned to that channel are then reassigned to all the other channels in the current zone. The reassignments remain in effect even after power is cycled.

3. To restore all Call Guard codes in the current zone to the original settings, press the “0” key.

NOTE: Keypad programming described starting on page 40 can be used to change the Call Guard code of individual channels.

Penalty Timer

A penalty timer may be programmed on conventional channels to prevent transmissions for 15 - 225 seconds after the time-out timer described on page 22 disables the transmitter. The penalty timer starts when the PTT switch is released after the transmitter has been disabled. If the PTT switch is pressed during the penalty time, the time-out indication occurs again. A beep sounds when the penalty timer expires and the transmitter can then be keyed.

Conversation Timer

A conversation timer can be programmed on conventional channels to limit the total length of a conversation rather than just the length of each transmission as with the time-out timer. This timer can be programmed for 0.5 - 7.5 minutes, and it is reset when the time between transmissions exceeds the penalty time just described. A warning tone sounds 5 seconds before the conversation timer expires. When it expires, the transmitter is disabled and a warning tone sounds. The transmitter remains disabled for the length of the penalty time, and a beep sounds when it can be keyed again.

Repeater Talk-Around

Normally, all your transmissions go through a repeater which usually increases range. However, if you are out of range of the repeater, you cannot talk to anyone else on that channel even though the mobile you are calling may be only a short distance away. To allow communication when this situation occurs, repeater talk-around can be used to allow direct communication with a mobile without going through a repeater.

Repeater talk-around can be selected if the Repeater Talk-Around option switch (if available). When talk-around is enabled by this switch, “RTA ON” is flashed in the display. Then when it is disabled by pressing the switch again, “RTA OFF” is flashed. Changing channels or turning power off does not change the selected talk-around mode.

Power Output Select

If the High/Low Power option switch is programmed and power selection is permitted on the current channel, either high or low transmitter power can be selected. Generally, the high power setting allows you to transmit longer distances but uses more battery power, and the opposite occurs with the low power setting.

Pressing the High/Low Power switch toggles the power setting. The new level is flashed in the display when this switch is pressed as “HI POWER” or “LO POWER”. If power selection is not permitted on the

channel, the fixed power level is flashed and no power change occurs. Turning power off or changing channels does not change the power setting selected for a channel.

Emergency Mode (Conventional)

On conventional Project 25 channels, an emergency mode may be programmed to be selectable by the orange Emergency switch located on the top panel (see illustration on page 15). Scanning is automatically disabled in this mode, so transmissions occur on the selected channel.

Pressing this switch with a Project 25 channel selected enables the emergency mode and if the PTT switch is pressed, an emergency status is sent. Radio power must be turned off to cancel the emergency mode on a Project 25 channel.

If this switch is pressed with an analog channel selected, an emergency condition is not transmitted. However, if a Project 25 channel is selected before power is turned off, the emergency condition is transmitted on the Project 25 channel as just described.

NOTE: If your radio is programmed to transmit emergency conditions, consult your system operator for more information on the specific operation in your application.

Conventional Mode Scanning

General

The following information describes scanning features unique to conventional operation. Scan operation common to all modes is described starting on page 23, and scan operation unique to SMARTNET/ SmartZone operation is described starting on page 60.

Selecting a Scan List

With full keypad (17-key) models, one of up to three scan lists can be selected when scanning with a conventional channel selected. These

lists can be system operator or user programmed as described in the information which follows. With limited keypad (5-key) models, only one scan list is available and it cannot be user programmed. However, nuisance channels can still be temporarily deleted as described on page 26.

Proceed as follows to select a scan list with full keypad models:

1. If required, enable scanning by pressing the Scan option switch.

2. To select a list, press the number key corresponding to the number of the desired list (1-3). The selected list is then briefly displayed as "Scan x" where "x" is the list number. The selected scan list is stored in memory and does not change until this procedure is repeated.

Transmitting in Scan Mode

When the transmitter is keyed with scanning enabled, the radio can be programmed so that the transmission always occurs on one of the following channels:

- Priority channel (see following description)
- Selected channel
- Channel of a call if the response is made before scanning resumes

Priority Channel Sampling

General

The priority channel sampling feature ensures that when standard scanning is occurring, messages on the priority channel are not missed while listening to a message on some other channel. Your transceiver can be programmed so that the priority channel is a fixed channel associated with the current scan list, the currently selected channel, or not used. When the selected channel is a priority channel, **"Pri"** is indicated in the upper part of the display.

Priority channel sampling occurs only with Standard conventional scanning. It does not occur with Radio Wide scanning, when listening to any type of SMARTNET/SmartZone call, or when transmitting. A series of "ticks" may be heard and the indicator on the top panel flashes green when the priority channel is sampled while listening to a message on some other channel.

Changing The Priority Channel

If a specific priority channel is associated with the current scan list, it can be changed if the Priority option switch is programmed. Proceed as follows:

1. Select the scan list number to be edited as described in page 35. If a list is not selected, the last active scan list is automatically edited.

1. Make sure that both radio-wide and standard scanning are off ("**Scan**" is not indicated in display).

2. Select the channel that you want to be the priority channel using the channel selector switch on the top panel. If the channel is in a different zone, also select the appropriate zone.

3. Press the Priority option switch and the "**Pri**" is displayed to indicate that the selected channel is now the priority channel.

Placing and Receiving Standard Conventional Calls

Standard conventional calls are calls to or from other mobile units on the selected channel. The proper coded Call Guard signaling (see page 32) may need to be transmitted for them to receive your call and also for you to receive their calls. Proceed as follows to place and receive these calls:

Placing a Standard Conventional Call

1. Turn power on and set the volume as described on page 18. Select the channel programmed for the mobile you want to call (see "Channel and Zone Selection" on page 21).

2. Monitor the channel automatically or manually as described on page 30.

3. Press the PTT switch and the call proceeds as follows:

   - If the Busy Channel Lockout feature is programmed on the channel, the transmitter is automatically disabled if the channel is busy (see description on page 32).
   - Otherwise, busy and out-of-range conditions are not indicated and speaking can begin after monitoring the channel as described on page 30.

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

Receiving a Standard Conventional Call

1. Select or scan the channel programmed for the call you want to receive (refer to pages 23 and 35 for more scanning information).

2. When the call is received, press the PTT switch to talk and release it to listen. If scanning, you may have to respond before scanning resumes to ensure that the response occurs on the channel of the call.

DTMF/ANI Signaling

DTMF (Dual Tone Multi-Frequency) tones can be generated manually or automatically for ANI (Automatic Number Identification) and other purposes. The following options may be enabled by system operator programming for each conventional channel:

DTMF Keypad - Pressing 0-9, *, or # on the keypad while holding the PTT switch transmits the corresponding tone until the key is released.

Pre-Tx ANI - A preprogrammed ANI sequence is automatically sent when you press the PTT switch.

Post-TX ANI - A preprogrammed ANI sequence is automatically sent each time you release the PTT switch.

Disabled - All DTMF signaling is disabled.

Project 25 Mode Features

Viewing Individual ID

Each transceiver which operates on Project 25 (digital) channels is assigned an eight-digit individual ID. When power is turned on with a Project 25 channel selected, the individual ID of your radio is briefly displayed.

Talk Group Codes

Each Project 25 channel is programmed with a talk group code that determines the group of mobiles which will receive your call on that channel and also which calls you can receive.

Coded Squelch

Project 25 conventional channels use a NAC (Network Access Code) instead of Call Guard squelch (see page 32) to control which calls are received on a channel. Both the correct group ID and NAC must be detected to receive a call. However, other operation, such as monitoring, is similar to when Call Guard squelch is used.

Changing Talk Group Assigned To A Channel

If the Talk Group Select option switch is programmed and user talk group programming is permitted on the channel, the talk group assigned to a channel can be changed. This change is permanent (cycling power does not reselect the old talk group). Proceed as follows:

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

2. Display the talk group to be assigned to that channel by pressing Up/ Down select switch. Talk groups are indicated by an alias (unique alphanumeric identification).

3. To select that talk group and return to normal operation, press the Talk Group select switch again. If talk group selection has been disabled on the channel by programming, the talk group does not change and an error tone sounds.

Individual Calls

If the Individual Call option switch is programmed and the radio is a full keypad (17-key) mode., individual calls can be placed to a specific mobile radio on Project 25 channels. This call differs from standard group calls in that only one mobile instead of entire groups of mobiles may receive the call. To respond to an individual call, simply press the PTT switch and begin talking before a call timer expires. Proceed as follows to place this call:

1. Press the Individual Call option switch and the identification of the last individual call placed is displayed as IDxxxxxx.

2. If required, enter the ID of the mobile being called using the keypad.

3. Press the PTT switch and begin talking.

When individual calls are received, the transceiver may be programmed to display the selected talk group, the talk group of the call, or the ID of the calling radio.

Keypad Programming

Introduction

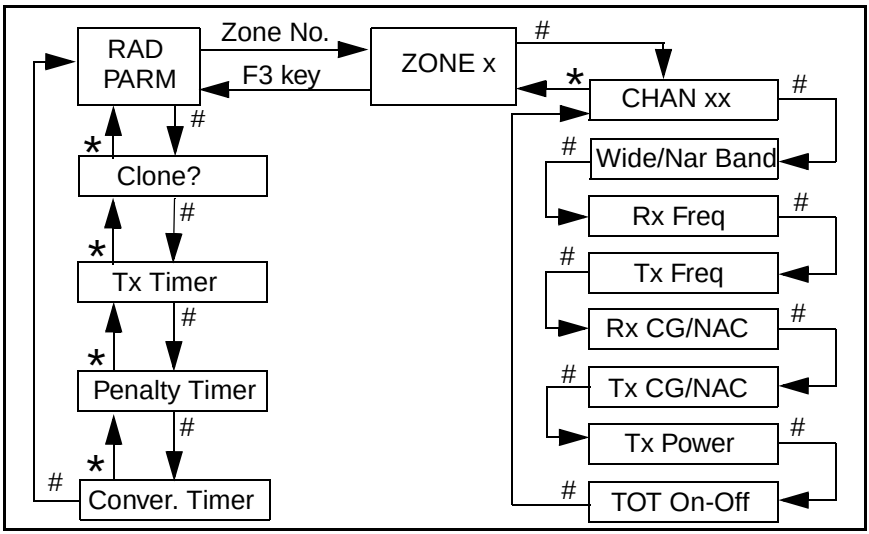
Keypad programming is available with full keypad (17-key) models if the Keypad Programming option switch is programmed. It is then selected by pressing this switch and entering the programming password. This password is a series of eight digits selected by your system operator,

and it prevents unauthorized changing of radio programming. The default password is eight zeros, and the **F4** key must be pressed after the digits are entered. This password is not user reprogrammable.

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

Menu Structure

When the Keypad Programming mode is selected by pressing the option switch and entering the password, "**Pgm**" is displayed along with the first menu parameter "RAD PARM". The following flowchart shows the keypad programming mode menu structure for this radio.



51xx Portable Keypad Programming Flowchart

The information which follows describes how the various parameters are programmed. When programming is complete, exit the keypad

programming mode by turning power off. Do not turn power on again for a short time so that the radio has time to copy the settings to memory.

Cloning

The cloning mode is used to program one transceiver with another with identical information. A special cloning cable is required to connect the transceivers together. To enter this mode, on the master (sending) radio, press the **#** (pound) key with "RAD PARM" displayed. The clone mode is then indicated by "CLONE?". To return to "RAD PARM" without cloning, press the ∗ key. To clone a radio, connect the cloning cable, power up the slave (receiving) radio, and press the **F4** key on the master (sending) radio. When cloning is successfully completed, "RAD PARM" is again displayed. Encryption keys are not transferred.

Timer Programming

The menus to program the following timers are accessed by repeatedly pressing the **#** key with "RAD PARM" displayed. To return to the previous adjustment, press the ∗ key.

TX TMR - Programs the transmit time-out timer (see page 22). Press the Up/Down select switch to decrement/increment the timer in 15-second steps ("0" disables it). When the desired value is displayed, store it by pressing the **F4** key.

PEN TMR - Programs the penalty timer (see page 33). Press the Up/Down select switch to decrement/increment the timer in 15-second steps ("0" disables it). When the desired value is displayed, store it by pressing the **F4** key.

CONV TMR - Programs the conversation timer (see page 33). Press the Up/Down select switch to decrement/increment the timer in 30-second steps ("0" disables it). When the desired value is displayed, store it by pressing the **F4** key.

Channel Parameter Programming

Zone Selection

The zone containing the channel to be programmed must be selected if applicable. To do this, with “RAD PARM” displayed press the key corresponding to the zone containing the channel. Alternatively, press the Up/Down select switch to scroll through the programmed zones and the “RAD PARM” selection. The zone selection mode is indicated by “ZONE x”. To return to “RAD PARM”, press the **F3** key. To proceed to channel parameter programming described in the next section, press the **#** key.

Channel Selection

The channel to be programmed must be selected. To do this, press the # key with “ZONE x” displayed as described in the preceding section. The display then indicates “CHAN xx”. Then to select the desired channel, press the Up/Down select switch to scroll through the programmed channels or enter the channel number directly using the number keys. Disabled or SMARTNET/SmartZone channels cannot be selected.

To exit back to the “ZONE x” display, press the * key with “CHAN xx” displayed. To save the selection and proceed with the channel parameter programming described in the next section, press the **F4** or **#** key.

Channel Parameter Programming

After selecting the channel to be programmed as described in the preceding section, the following channel parameters can be programmed. To scroll through these parameters, press the **F4** or **#** key with “CHAN xx” displayed. To go back to the previous field, press the * key. The squelch control parameters are unique to the type of conventional channel selected (analog or Project 25).

Channel Spacing - Selects either “WIDE” or “NARROW” band channel spacing on analog channels only. Press the Up/Down select switch to

toggle between “WIDE” and “NARROW”, and when the desired setting is displayed, save it and proceed to the next parameter by pressing the **F4** or **#** key.

Receive Frequency - When the **Rx** icon is indicated to the left of **Pgm** and a frequency or eight zeros is displayed, the receive channel frequency can be programmed. Press the **F3** key to clear the current frequency and then type in the new frequency. When the desired frequency is displayed, save it and proceed to the next parameter by pressing the **F4** or **#** key.

Transmit Frequency - When the **Tx** icon is indicated to the left of **Pgm** and a frequency or eight zeros is displayed, the transmit frequency is programmed the same as the Receive Frequency above.

Squelch Control (Analog Channels)

Receive CTCSS/DCS - When “TN xxxx” or “DIG xxx” is displayed with the **Rx** icon indicated to the left of **Pgm**, the receive Call Guard (CTCSS/DCS) code can be programmed. Press the **F3** key to clear the current code and toggle between the CTCSS (tone) and DCS (digital) modes. Press the Up/Down select switch to scroll through the available codes. When the desired code is displayed, save it and proceed to the next parameter by pressing the **F4** or **#** key.

Transmit CTCSS/DCS - When “TN xxxx” or “DIG xxx” is displayed with the **Tx** icon indicated to the left of **Pgm**, the transmit Call Guard (CTCSS/DCS) code can be programmed the same as the Receive CTCSS/DCS above.

Squelch Control (Project 25 Channels)

Receive NAC - When “NAC xxx” is displayed with the **Rx** icon indicated to the left of **Pgm**, the receive Network Access Code (NAC) can be programmed. This can be any number from 0-4095. Press the **F3** key to clear the current code and then enter the desired code using the number keys. When the desired code is displayed, save it and proceed to the next parameter by pressing the **F4** or **#** key.

Transmit NAC - When "NAC xxx" is displayed with the **Tx** icon indicated to the left of **Pgm**, the receive NAC can be programmed the same as the Receive NAC described above.

Transmit Power Level - When any of the following indications are displayed, the power output level for the channel can be programmed. Press the Up/Down select switch to scroll through the choices. When the desired setting is displayed, save it and proceed to the next parameter by pressing the **F4** or **#** key.

- POWER HI - High transmit power
- POWER LO - Low transmit power
- POWER SW - Switchable power selectable by the High/Low power switch. This choice is not available if that switch is not programmed.

Time-Out Timer - When "TOT ON" or "TOT OFF" is displayed, the time-out timer can be enabled or disabled on the current channel. Press the Up/Down select switch to toggle between the on and off mode. To return to the "CHAN xx" display, press the **F4** or **#** key.

Programming Additional Channels and Exiting Programming Mode

- To program another channel in the current zone, press the **F4** or **#** key to redisplay "CHAN xx" and then repeat starting with "Channel Selection" on page 43.

- To program channels in another zone, press the ∗ key with "CHAN xx" displayed to display "ZONE x" and repeat this procedure starting with "Zone Selection" on page 43.

- If programming is complete, exit the keypad programming mode by turning power off. Do not turn power on again for a short time to allow the radio time to copy the settings into memory.

SMARTNET/SMARTZONE FEATURES

Introduction

The following information describes features unique to the SMARTNET and SmartZone operating mode (see brief description on page 29). Refer to the preceding “Conventional Features” section for information on features common to that operating mode, and to the “General Information” section starting on page 18 for information on features common to all operating modes.

Viewing Unit ID

Each radio in a SMARTNET system is identified with a six-digit system ID and Unit ID. To display these IDs, make sure that a SMARTNET channel is selected and then turn power off and then on again. The system ID is briefly displayed as SYxxxxxx followed by the Unit ID as EDxxxxxx.

Standard Group Calls

Standard group calls are between you and another mobile, group of mobiles, or a control station (a radio at a fixed location). Most calls you make will probably be this type.

Placing a Standard Group Call

1. Turn power on and set the volume as described on page 18. Select the channel programmed for the talk group you want to call (see page 21). A regular or announcement talk group can be selected.

2. If encryption is used, it may be automatically selected. If not, select the secure mode if desired by pressing the Clear/Secure option switch. Refer to “Secure Communication” on page 28 for more information.

3. Press the PTT switch and when the alert tone sounds, begin talking. Other indications that may occur are as follows:

- If in the secure mode and your transceiver does not have the proper encryption key, “KEYFAIL” is displayed and the call must be made in the clear mode (selected by the Clear/Secure option switch if enabled on the channel).

- 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 3 seconds and begin talking.

- If a continuous tone sounds while pressing the PTT switch and “NO SYS” is displayed, you may be out-of-range. Drive closer or away from shielding objects and try again.

- If your unit ID is invalid, the call is being made to an invalid group ID, or group calls are not allowed, “REJECT” is displayed and an alert tone sounds.

- If an attempt is made to select the secure mode and there is no available secure channel, “NO SEC” is flashed and the call continues in the clear mode.

- If an attempt is made to change from the secure to the clear mode and this is not permitted, “SEC ONLY” is displayed and the call continues in the secure mode.

Receiving a Standard Call

Group calls are automatically received if a SMARTNET/SmartZone channel is selected. The display alternately indicates the unit ID and talk group when a call is received (if enabled by programming).

Enhanced Private Conversation Calls

General

Private calls allow you to place a call to a specific mobile unit. Either the Enhanced Private Conversation™ or Private Conversation II™ modes may be programmed depending on the capabilities of the radio

system. The Enhanced Private Conversation mode is described in the following information, and the Private Conversation II mode is described starting on page 51.

The Private Call option switch is required to place these calls, and either that switch or the Call Response option switch is required to receive them. Proceed as follows.

Placing an Enhanced Private Conversation Call

This call can be initiated by selecting the unit ID from a call list (list entry) or by directly entering it using the keypad (direct entry). Direct entry is available with full keypad (17-key) models only. Proceed as follows:

List Entry Method

1. With a SMARTNET/SmartZone channel selected, momentarily press the Private Call option switch. The tag (alias) of the last ID called is displayed if it matches an ID in your call list. Otherwise, the last ID called is displayed.

2. Enter the two-digit index of the desired ID if you know it or scroll through the list using the Up/Down switch until you find the desired ID. Press the F3 key to cancel the call.

3. Press the PTT switch to initiate the call. The display then indicates the alias of the destination radio. If the entered digits do not correspond to a valid list entry, “INVALID” is displayed and an error tone sounds. Proceed to the bulleted list following the next method for other conditions that may occur next.

Direct Entry Method (Full Keypad Models Only)

1. With a SMARTNET/SmartZone channel selected, press and hold the Private Call option switch until a tone sounds (approximately 1 second). The last ID called is displayed.

2. Using the 0-9 keys, enter the ID (all six digits) of the mobile unit you are calling. To erase the last digit, press the Down switch, and to cancel the call, press the **F3** key.

3. Press the PTT switch to initiate the call. If the entered ID did not contain six digits, “INVALID” is momentarily displayed, an error tone sounds, and the call is not initiated. If the entered ID is valid, the display indicates the alias of the ID if it matches an ID in your call list. Otherwise, the ID you entered continues to be displayed. Any of the following conditions may then occur:

   - If the radio you are calling is on the air, “WAIT” is displayed and telephone type “ringing” is heard for 20 seconds or until the called party answers.

   - If the called party answers and the call is successful, the person’s voice is heard and the call is carried on the same as a group call. To end the call at any time, press the **F3** key.

   - If the called party does not answer within 20 seconds, “NO ANS” is displayed and a continuous tone sounds. End the call by pressing the **F3** key.

   - If the called radio is not in service, no ringing is heard, “NO ACK” is displayed, and a continuous tone sounds. End the call by pressing the **F3** key.

   - If neither your radio nor the radio being called is authorized to make unit-to-unit calls, “REJECT” is displayed and a continuous tone sounds. End the call by pressing the **F3** key.

   - If the called party answers but the radio system is busy, four low tones sound and “BUSY” is displayed. When the system is no longer busy, the call back tone sounds.

   - If in the secure mode and your transceiver does not have the proper encryption key, “KEYFAIL” is displayed and the call must be made

in the clear mode (selected by the Clear/Secure option switch if enabled on the channel).

- If an out-of-range condition exists or the radio system is not in service, “LOST CALL” is displayed and a continuous tone sounds. End the call by pressing the **F3** key.

Receiving an Enhanced Private Conversation Call

These calls are automatically received if a SMARTNET/SmartZone channel is selected. Proceed as follows:

1. When a call is received, a recurring unit call tone (three beeps) sounds for up to 20 seconds and “CALL” is displayed.

2. To answer the call, press the Private Call option switch and then the PTT switch and begin talking. The alias of the incoming call is displayed if the ID is in your call list. Otherwise, the unit ID is displayed. *NOTE: If the Private Call option switch is not pressed before the PTT switch, a group call is transmitted on the selected group.*

   - To end the call when the conversation is complete or at any other time, press the **F3** key.

   - If unit-to-unit (private) calls are not permitted (Private Call switch not programmed), press the Call Response option switch, if available, to answer the call.

   - If the call is not answered within 20 seconds, it is automatically terminated.

   - 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 your radio automatically starts transmitting. Press the PTT switch to continue the call.

Private Conversation II Calls

General

Private calls allow you to place a call to a specific mobile unit. Either the Enhanced Private Conversation™ or Private Conversation II™ modes may be programmed depending on the capabilities of the radio system. Operation in the Enhanced Private Conversation mode was described starting on page 47, and operation in the Private Conversation II mode is described in the following information.

The Private Call option switch is required to place these calls, and either that switch or the Call Response option switch is required to receive them. Proceed as follows.

Placing a Private Conversation II Call

This call can be initiated by selecting the unit ID from a call list (list entry) or by directly entering it using the keypad (direct entry). Direct entry is available with full keypad (17-key) models only. Proceed as follows:

List Entry Method

1. With a SMARTNET/SmartZone channel selected, momentarily press the Private Call option switch. The tag (alias) of the last ID called is displayed if it matches an ID in your call list. Otherwise, the last ID called is displayed.

2. Enter the two-digit index of the desired ID if you know it or scroll through the list using the Up/Down switch until you find the desired ID. Press the **F3** key to cancel the call.

3. Press the PTT switch to initiate the call. The display then indicates the alias of the destination radio. Wait approximately 1 second and then begin talking. Proceed to the bulleted list which follows the next method for conditions that may then occur.

Direct Entry Method (Full Keypad Models Only)

1. With a SMARTNET/SmartZone channel selected, press and hold the Private Call option switch until a tone sounds (approximately 1 second). The last ID called is displayed.

2. Using the 0-9 keys, enter the ID (all six digits) of the mobile unit you are calling. To erase the last digit, press the Down switch, and to cancel the call, press the **F3** key.

3. Press the PTT switch to initiate the call. If the entered ID did not contain six digits, "INVALID" is momentarily displayed, an error tone sounds, and the call is not initiated. If the entered ID is valid, the display indicates the alias of the ID if it matches an ID in your call list. Otherwise, the ID you entered continues to be displayed. Any of the following conditions may then occur.

   - If in the secure mode and your transceiver does not have the proper encryption key, "KEYFAIL" is displayed and the call must be made in the clear mode (selected by the Clear/Secure option switch if enabled on the channel).

   - If the called party answers and the call is successful, the person's voice is heard and the call is carried on the same as a group call. To end the call at any time, press the **F3** key.

   - If the radio system is busy, four low tones sound and the "BUSY" is displayed. When the system is no longer busy, the call back tone (four beeps) is heard and a channel is automatically acquired. Press the PTT switch to continue the call.

Receiving a Private Conversation II Call

Unit-to-unit calls are automatically received if a SMARTNET/SmartZone channel is selected. Proceed as follows:

1. When a call is received, an alert tone sounds and the caller's voice is heard. While voice is heard, "CALL" is displayed.

2. To answer the call, press the Private Call option switch and then the PTT switch and begin talking. The alias of the incoming call is displayed if the ID is in your call list. Otherwise, the unit ID is displayed. *NOTE: If the Private Call option switch is not pressed before the PTT switch, a group call is transmitted on the selected group.*

- To end the call when the conversation is complete or at any other time, press the **F3** key. If the call is not answered within 20 seconds, it is automatically terminated.
- If private calls are not permitted (Private Call switch not programmed), press the Call Response option switch, if available, to answer the call.

Telephone Calls

General

Telephone calls allow you to place and receive calls over the public telephone system using your transceiver. If your transceiver is programmed for telephone calls (Phone option switch programmed), they are placed and received as follows:

Placing a Telephone Call

Telephone calls can be placed by selecting the number from a preprogrammed phone number list (list entry) or by directly entering it using the keypad (direct entry). Direct entry is available with full keypad (17-key) models only. Proceed as follows:

<u>List Entry Method</u>

1. With a SMARTNET/SmartZone channel selected, momentarily press the Phone option switch. The display indicates the alias of the last called telephone number if it is in your phone number list. Otherwise, the last eight digits of the last called telephone number are displayed.

2. Enter the index of the desired telephone number if you know it or scroll through the list using the Up/Down switch until you find the desired number. Press the **F3** key to cancel the call.

3. Press the PTT switch to initiate the call. The display indicates "WAIT" while the connection to the phone system is occurring. Once connected, the normal dial tone is heard and the alias of the number being called is displayed. The radio then automatically dials the telephone number and the normal ringing or busy tone is heard. Proceed to the bulleted list which follows the next method for conditions that may then occur.

Direct Entry Method (Full Keypad Models Only)

1. With a SMARTNET/SmartZone channel selected, press and hold the Phone option switch until a tone sounds (approximately 1 second). The display indicates the alias of the last called telephone number if it is in your phone number list. Otherwise, the last eight digits of the last called telephone number are displayed.

2. Enter the number using the **0-9,** * , and **#** keys. To enter a pause (indicated by "P"), press * and then #. To erase the last digit, press the Down switch. 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 **F3** key to cancel the call.

3. Press the PTT switch or the **F4** key to initiate the call. The display indicates "WAIT" while the connection to the phone system is occurring. Once connected, the normal dial tone is heard and the alias of the number being called is displayed. The radio then automatically dials the telephone number and the normal ringing or busy tone is heard. Any of the following conditions may then occur.

- After the called party answers, press the PTT switch to talk and release it to listen. You cannot talk and listen at the same time because the radio cannot transmit and receive at the same time. Each time the PTT switch is released, a tone is heard by the other party that indicates when a response can be made. To end the call when the conversation is complete or at any other time, press the **F3** key.

- If the selected number is not valid, “INVALID” is momentarily displayed, an error tone sounds, and the call is not initiated. Select a valid number.

- If enabled by system operator programming, a number can be dialed during a call by simply holding down the PTT switch and dialing the number.

- If an out-of-range condition exists or the radio system is not in service, “NO PHONE” is displayed and a continuous tone sounds. End the call by pressing the **F3** key.

- If you are not authorized to make telephone calls, “REJECT” is displayed and a continuous tone sounds. End the call by pressing the **F3** key.

- If the radio system is busy, “BUSY” is displayed and a busy tone sounds. The call automatically proceeds when the radio system becomes available. If the call is ended before it proceeds, your position in queue is lost.

- If in the secure mode and your transceiver does not have the proper encryption key, “KEYFAIL” is displayed and the call must be made in the clear mode (selected by the Clear/Secure option switch if enabled on the channel).

Answering a Telephone Call

Telephone calls are automatically received if a SMARTNET/ SmartZone channel is selected. Proceed as follows:

1. When a telephone call is received, “ringing” similar to a standard telephone is heard and the display indicates “PHONE”.

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

3. To end the call when the conversation is complete or at any other time, press the **F3** key. Also press the **F3** key to ignore an incoming call and end it without answering.

Call Alert

The Call Alert™ feature allows pages to be sent and received. Proceed as follows:

Sending a Page

Pages can be placed by selecting the unit ID from a preprogrammed list (list entry) or by directly entering it using the keypad (direct entry). Direct entry is available with full keypad (17-key) models only.

List Entry Method

1. With a SMARTNET/SmartZone channel selected, momentarily press the Call Alert option switch. The tag (alias) of the last ID called is displayed if it matches an ID in your call list. Otherwise, the last ID called is displayed.

2. Enter the index of the desired ID if you know it or scroll through the list using the Up/Down switch until you find the desired ID. Press the **F3** key to cancel the call.

3. Press the PTT switch to send the page. The display then indicates the alias of the radio being paged. Proceed to the bulleted list which follows the next method for conditions that may then occur.

Direct Entry Method (Full Keypad Models Only)

1. With a SMARTNET/SmartZone channel selected, press and hold the Call Alert option switch until a tone sounds (approximately 1 second). The last ID called or paged is displayed.

2. Using the **0-9** keys, enter the 6-digit ID of the unit you are calling. To erase the last digit, press the Down switch or press the **F3** key to cancel the page.

3. Press the PTT switch to send the page. If the entered ID is invalid, "INVALID" is momentarily displayed and the page is not sent. If the entered ID is valid, the display indicates the alias of the ID if it matches an ID in your call list. Otherwise, the ID you entered continues to be displayed. The page is then sent and any of the following conditions may then occur.

- If the radio you are paging is on the air and received your page, a signaling success tone (six beeps) sounds. The alias of the selected channel is then displayed continuously.

- If the radio you are paging is not in service, a tone sounds and "NO ACK" is displayed after trying for 6 seconds. Press the **F3** key to cancel the page or try again.

Answering a Page

1. When a page is received, the display indicates "PAGE" and a recurring received page tone sounds (five beeps) sounds.

2. To clear and ignore the page, press the **F3** key. *NOTE: If the F3 key is programmed for the Private Call function, it will not clear the page.*

3. Answering a page is the same as placing a private call. Therefore, press the Private Call option switch and follow the instructions for placing a private call on page 48 or page 51, whichever is applicable.

Messaging

The messaging feature allows preprogrammed messages to be sent to your dispatcher. Up to 16 messages can be preprogrammed, and they are identified by a tag (alias). If a Message option switch is programmed, messages are sent as follows:

1. Momentarily press the Message option switch. The alias of the last message sent is displayed.

2. Enter the index of the desired message if you know it or scroll through the list using the Up/Down switch until you find the desired message. Press the **F3** key to cancel the message.

3. Press the PTT switch to send the message. When the message is received and acknowledged by the dispatcher, a signaling success tone (six beeps) sounds and the display returns to the normal channel indication. If there is no acknowledgment after 6 seconds, a tone sounds and "NO ACK" is displayed. Press the **F3** key to return to normal operation.

Sending Status Conditions

The status feature allows you to send your current status to your dispatcher. Up to eight status conditions can be preprogrammed, and they are identified by an alias (name). If the Status option switch is programmed, status conditions are sent as follows:

1. Momentarily press the Status option switch. The alias of the last status sent is displayed.

2. To change the displayed status, enter the index of the desired status if you know it or scroll through the list using the Up/Down switch until you find the desired status. Press the **F3** key to cancel this function.

3. Press the PTT switch to send the status. When the message is received and acknowledged by the dispatcher, a signaling success tone (six beeps) sounds and the display returns to the normal channel indication. If there is no acknowledgment after 6 seconds, a tone sounds and "NO ACK" is displayed. Press the **F3** key to return to normal operation.

Emergency Alarm and Emergency Call

Emergency alarms and emergency calls are separate functions that can be individually programmed on SMARTNET/SmartZone channels. The Emergency switch is pressed to initiate these features. This switch is the orange button located next to the antenna connector.

An emergency alarm is a special data transmission to alert your dispatcher of an emergency situation, and an emergency call is an urgent request for access to a voice channel. The emergency alarm and call are transmitted on the emergency talk group or announcement group that has been preprogrammed by your system operator on the currently selected channel. Proceed as follows:

1. To transmit an emergency alarm, select a SMARTNET/SmartZone channel that has that feature enabled and then press the Emergency option switch.

2. The emergency alarm is then transmitted and “EMERGNCY” is indicated in the display for a short time. Transmitting continues until an acknowledgment is received (indicated by two beeps) or the programmed number of attempts have occurred. Silent operation may also be programmed in which case no audio or visual indication of the alarm condition occurs.

3. To transmit an emergency call, press the Emergency option switch with a SMARTNET/SmartZone channel selected that has that feature enabled. Then manually press the PTT switch and begin speaking as with a standard call. All calls that follow are then emergency calls and they occur on the emergency talk group.

4. To exit the emergency mode, power must be turned off and then on again.

Failsoft Operation

If a failure occurs in the SMARTNET/SmartZone system so that it cannot be used, the transceiver automatically enters the failsoft mode. When this mode is selected, the display alternately indicates “FAIL-SOFT” and the alias of the selected channel.

When in the failsoft mode, operation is in the conventional mode on a preprogrammed failsoft channel. If a transmission is attempted before a failsoft channel is located, a continuous tone sounds until the PTT switch

is released. When the radio system returns to normal operation, this condition is automatically detected and normal operation resumes.

SMARTNET/SmartZone Scanning

Scanning on a SMARTNET/Smartzone channel is similar to the standard and radio wide scanning described starting on page 23. Each channel can be programmed with a different scan list that includes up to 16 channels, one of which can be a priority channel. These scan lists are user programmable if the Scan Edit option switch is programmed, and nuisance channels can be temporarily deleted (see page 26).

Scanning is enabled/disabled by the Scan option switch. In addition, channels can be programmed so that scanning automatically starts whenever the channel is selected. Scanning is temporarily disabled and "**Scan**" turns off if a channel is selected that has scanning disabled. Then when a channel is selected again that permits scanning, it is automatically re-enabled.

In addition to calls on channels in the scan list, pages, private calls, and telephone calls are received while scanning. Messages on the priority channel are received while listening to lower priority messages. However, private and telephone calls are not interrupted by calls on the priority channel.

Dynamic Regrouping

The dynamic regrouping feature allows a dispatcher to switch users to a dynamically defined channel to receive an important message. Dynamic regrouping operates as follows:

1. When this command is received, the alternating dynamic regrouping tone sounds, the transceiver automatically changes to the regrouping channel, and the display alternately indicates "REGROUP" and the alias of the selected channel. All transmitting and receiving then occurs on this channel.

2. To reset all talk and announcement groups to normal so that only the designated regrouping channel is on the dynamic group, manually select the designated regrouping channel if you know it. If this channel is not selected or there is no designated regrouping channel, all transmissions occur on the dynamically assigned group regardless of which channel is selected, and the regrouping tone sounds each time the PTT switch is pressed.

3. When regrouping is canceled by the dispatcher, transceiver operation returns to normal.

SmartZone Features

Introduction

As described starting on page 28, the SmartZone® mode provides wide area coverage by allowing roaming between SMARTNET and conventional sites. SmartZone operation is the same as SMARTNET with the following additional features.

Determining Current Site

To determine the current radio site, momentarily press the Site Search option switch (if programmed). If currently registered on a site, “SITE x” is displayed, where “x” is the site number. The display then indicates the RSSI (Receive Signal Strength Indicator) value of the current site as “RSSI x” and then returns to displaying the channel alias.

Searching For a New Site

To search for a new site, press the Site Search option switch (if programmed) to toggle through the available sites. “RSSI x” is displayed as just described and the channel alias is then displayed.

Locking/Unlocking a Site

It is sometimes desirable to stay on the current site regardless of signal level. To lock the radio on the current site so that it does not search

for another, press the Site Lock option switch (if programmed). The display then momentarily indicates “LOCK x” to indicate that the current site is locked (“x” is the current site number). To unlock the site, press the Lock switch again and “UNLOCK” is momentarily displayed.

When locked on a site, it is still possible to search for a different site using the site search function described in the preceding section. When a new site is found, the radio is then locked on that site.

MISCELLANEOUS

Supervisory Tones

Single Beep (Alert Tone)

- Power was turned on and a successful power-up sequence occurred (see page 18).
- The time-out timer is about to expire or the penalty timer has expired (page 22 and page 33).
- The conversation timer is about to expire (page 34).
- The system received your page but the paged mobile is not on the air (page 56).
- Telephone interconnect is not operational (page 53).

Continuous Tone (Invalid or No Acknowledge Condition)

- A transmission is being attempted on an unprogrammed channel or a conventional channel programmed as receive-only.
- The transmitter is disabled by the busy channel lockout feature (page 32).
- The transmitter has been disabled by the time-out timer feature (page 22).
- The transmitter has been disabled by the conversation timer (page 34).
- An out-of-range condition exists (SMARTNET/SmartZone only).
- A transmission is being attempted before the penalty timer has expired (page 33).

- Dynamic regrouping has been exited but the dynamic regrouping channel is still selected (page 60).
- The paged mobile did not acknowledge the page (page 56).
- The message that was sent has not been acknowledged (page 57).
- The status condition that was sent has not been acknowledged (page 58).

Single Short Medium-Pitch Tone

- A valid key has been pressed.

Single Short Low-Pitch Tone

- An invalid key has been pressed.

Six Beeps (Recurring)

- The page was received (page 56).

Three Beeps (Recurring)

- A unit-to-unit call was received (page 47).

Six Beeps

- The paged radio received the page and acknowledged it (page 56).
- The message that was sent has been received and acknowledged (page 57).
- The status condition that was sent has been received and acknowledged (page 58).

Two Beeps

- The emergency alarm condition was acknowledged (page 58).

Gurgle-Like Tone

- Dynamic regrouping has occurred (page 60).

- Dynamic regrouping has occurred but the regrouping channel is not selected (page 60).

Four Low Tones (Busy Signal)

- The radio system is busy or a busy condition exists when making a telephone call.

Four Alternating High and Low Tones

- A channel is available after a busy condition occurred (SMARTNET/ SmartZone only).

Rechargeable Battery Pack

WARNING

Do not dispose of the battery pack in fire because it may explode. The nickel metal-hydride (NiMH) battery pack used by this radio must be disposed of in accordance with local regulations. Do not short the terminals because the battery may become very hot.

Battery Life

With proper care, the nickel metal-hydride (NiMH) battery pack used by this radio should provide excellent service. When the pack no longer holds a charge or provides only a very short operating time, it must be replaced with a new unit.

Typical operating time before recharging is required is approximately 13 hours with the standard 3000 mAH battery. This assumes that the transceiver is transmitting at high power 5% of the time, receiving and producing audio 5% of the time, and in the standby mode (receive with audio muted) 90% of the time. If the low-power mode is selected or different times are spent in these modes, operating time varies accordingly. The charge of the battery and ambient temperature also affect operating time.

NOTE: Be sure to turn transceiver power off before removing the battery pack. Failure to do so may result in the current settings not being saved in memory.

Recharging

Recharging is required when the green indicator on the top panel flashes when not receiving a signal, or when the red indicator flashes when transmitting. In addition, a chirp may sound when transmitting and receiving. Refer to “Low Battery Indication” on page 21 for more information.

The pack can be recharged while still on the transceiver or it can be charged separately. To remove the battery pack from the transceiver, press the spring-loaded release button on the end outward and slide the battery off. A new battery pack must be charged before use.

Battery Care

One cause of shortened battery life is repeated deep discharge. Therefore, it is recommended that the battery be recharged as soon as practical after the low-battery indication appears (see preceding information). Do not continue using the transceiver until the battery is completely discharged. Another cause of reduced battery life is operation at temperature extremes. It is also good practice not to regularly leave a pack in the charger for extended periods after it is completely charged.

It is possible that the pack could develop a characteristic called “memory” although these packs are designed to minimize that problem. When a pack has this problem, it acts as if it is totally discharged even though it has greater capacity. This can be caused by discharging a pack only slightly before recharging, charging at too high a temperature, or extended storage. If a pack develops this problem, it can usually be corrected by performing three discharge/charge cycles.

System Operator Programming

As noted several times in this manual, programming determines the availability and specific operation of many features. This usually refers to the programming performed by your system operator when the radio was set up, not to any programming that you can perform. If a feature is controlled by a front panel option switch and that switch is not available, it is probably not available or in a fixed condition. Contact your system operator for more information on how programmable functions have been set for your application. If the Keypad Programming option switch is available, you can reprogram some conventional channel parameters. Refer to “Keypad Programming” on page 40 for more information.

Speaking Into Microphone

For best results, hold the speaker grille about 1-2 inches from your mouth and speak at a normal conversational level. Do not shout since it distorts your voice and does not increase range. Make sure that the PTT (push-to-talk) switch is pressed before you begin to speak and released as soon as the message is complete.

Operation At Extended Range

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

Licensing

A government license is usually required to operate this transceiver on the air. Your system operator will normally handle the licensing requirements.

Transceiver Service

If the transceiver begins operating improperly, try turning power off and then on again to reset the logic. Also make sure that the battery is fully charged and in good condition. Some other possible causes of improper operation are as follows. If the transceiver still does not operate properly, return it to your system operator for service.

The expected signal is not being received:

- Repeater talk-around may be selected (see page 34).
- The correct channel but wrong zone may be selected (see page 21).
- Keypad modified Call Guard coding may be selected. Press the "0" key to see if operation returns to normal (see page 32).
- If scanning, the correct scan list may not be selected or the channel may have been deleted from the scan list (see page 35).

The radio does not transmit on the selected channel:

- The channel may be busy (green indicator lighted) and the transmitter disabled by the busy channel lockout feature (see page 32).
- If the transmitter was just keyed for an extended time, it may have been disabled by the time-out timer and penalty timers (see pages 22 and 33).

The receive audio signal is garbled:

- The correct encryption key may not be loaded (see page 28). Contact your system operator for assistance.

NOTE: There are no user-serviceable components inside this transceiver. Altering internal adjustments can cause illegal emissions, void the warranty, and result in improper operation that can seriously damage the transceiver.

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