MULTI-NET® 98xx SERIES OPERATING MANUAL

Part No. 002-9800-401 April 2001

SAFETY INFORMATION

The FCC has adopted a safety standard for human exposure to RF energy. Proper operation of this radio under normal conditions results in user exposure to RF energy below the Occupational Safety and Health Act and Federal Communication Commission limits.

WARNING

DO NOT allow the antenna to touch or come in very close proximity with the eyes, face, or any exposed body parts while the radio is transmitting.

DO NOT operate the transmitter of a mobile radio when a person outside the vehicle is within one (1) meter (approximately 3 feet) of the antenna.

DO NOT operate the transmitter of a stationary radio (base station or marine radio) when a person is within one (1) meter of the antenna.

DO NOT operate the radio in explosive or flammable atmospheres. The transmitted radio energy could trigger blasting caps or cause an explosion.

DO NOT operate the radio without the proper antenna installed.

DO NOT allow children to operate or play with this radio.

NOTE: The above warning list is not intended to include all hazards that may be encountered when using this radio.

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 modifications 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).

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.

The E.F. Johnson Company, which was founded in 1923, provides wireless communication systems solutions for public safety, government, and commercial customers. The company designs, manufactures, and markets conventional and trunked radio systems, mobile and portable subscriber radios, repeaters, and Project 25 digital radio products.

FCC EXPOSURE LIMITS

This mobile radio transceiver was tested by the manufacturer with an appropriate antenna in order to verify compliance with Maximum Permissible Exposure (MPE) limits set under Section 2.1091 of the FCC Rules and Regulations. The guidelines used in the evaluation are derived from Table 1 (B) titled "Limits For General Population/Uncontrolled Exposure" which is from FCC report OET bulletin #65.

Table 1
FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits For Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) ($mW/cm2^2$)	Averaging Time $\|E\|^2$, $\|H\|^2$, S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits For General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) ($mW/cm2^2$)	Averaging Time $\|E\|^2$, $\|H\|^2$, S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = Frequency in MHz *Plane-wave equivalent power density

Table 2 lists the antenna whips and bases recommended for use in each frequency range. Each model of this radio was tested with the appropriate antenna listed. The antenna was mounted in the center of the roof of a domestically manufactured 4-door passenger sedan. The radio manufacturer has determined that the user and service personnel should remain one (1) meter in distance away from the antenna when transmitting. By maintaining this distance, these individuals are not exposed to radio frequency energy or magnetic fields in excess of the guidelines set forth in Table 1.

NOTE: If the installer or user changes the type or location of the antenna, they should be aware of the MPE guidelines shown in Table 1 and take measures to comply with those guidelines.

Table 2
Recommended Antenna Whips and Bases
(Antenna Manufacturer - Antenna Specialists)

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

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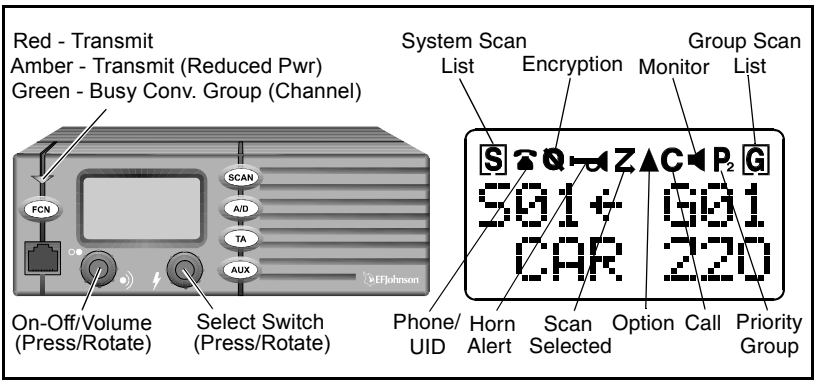
QUICK REFERENCE GUIDE



Power On/Off - Press on-off /volume control.

Set Volume Level - Rotate on-off/volume control.

Change System or Group - Press Select switch to enable system or group select mode (indicated by ←/→or __). Then rotate Select switch to select desired system or group (see page 17).

Select Menu Mode - Press FCN twice then rotate/press Select switch as required to display/select desired parameter (see page 32).

Select Home System/Group - Press FCN then the Select switch.

Scan On/Off - Press SCAN switch. Scan on = Z, Scanning occurring = scrolling underline (see page 35).

Program System or Group Scan List - Press Select switch to enable system or group programming mode (same as when changing system or group), then press A/D switch. System in list = S, Group in list = G (see page 37).

Set Squelch Level (Conv. Only) - Press FCN, then rotate Select switch with conventional system selected (see page 18).

Monitor Before Transmitting (Conv. Only) - Take microphone off-hook to enable monitor mode (indicated by ◄). Channel is busy if indicator is green or someone is talking (see page 42).

General Features

- Up to approximately 100 1-group or 40 16-group systems programmable
- Multi-Net®, LTR®, and conventional operation
- Unique 8-character system and group identification tags
- System and group scan
- User programmable system and group scan lists
- Menu mode to control various functions
- Five programmable option switches
- Up to 16 banks selectable
- Proceed (clear-to-talk) tone
- Call indicator
- Time-out timer
- Horn alert
- Emergency switch
- Companding and Encryption (optional)

Multi-Net Features

- Busy queuing (all calls)
- Roaming (auto-registration)
- Special calls such as unique ID and directed group
- Status messaging (1 of up to 8 messages can be sent)
- Transmit inhibit
- Receive priority calls

LTR Features

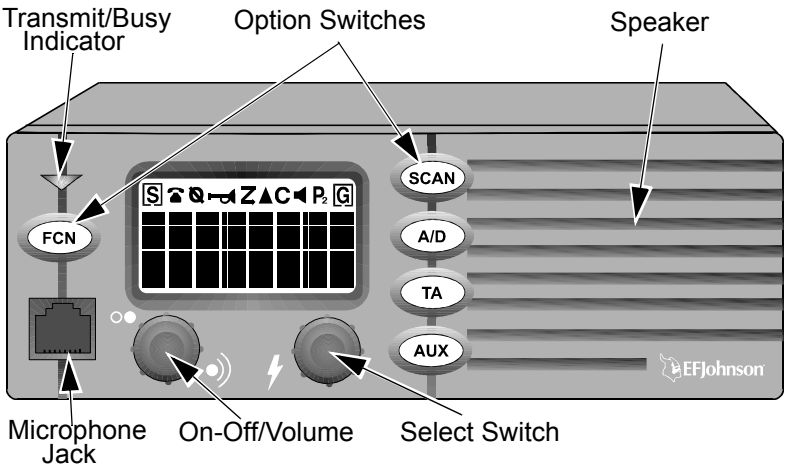
- Busy queuing (telephone calls only)
- System search (telephone calls only)
- Transpond
- Transmit inhibit
- Receive priority calls

Conventional Features

- Busy indicator
- Talk-around
- User-adjustable squelch level
- Call Guard® squelch control
- First and second priority channel sampling
- Monitor mode and Transmit disable on busy
- Receive-only groups

NOTE: Dealer programming determines the availability of many of the preceding features.

CONTROLS AND DISPLAY



Front Panel Controls

On-Off Volume - Pressing this knob turns power on and off. The vehicle ignition switch may also control power as described in "Power Turn-Off Delay" on page 30. Rotating this knob sets the speaker volume (see page 15).

Select Switch - This switch changes the selected system or group and is also used for other functions such as selecting parameters in the menu mode.

To change the system or group, press this knob to switch between the system and group select modes, and then rotate it to increase or decrease the system or group. Refer to "Selecting the System and Group" on page 17 for more information.

This switch also has two alternate functions that are selected by first pressing the FCN switch. Refer to the FCN switch description which follows for more information.

Option Switches - The five front panel option switches can be programmed by your system operator to the functions listed below. Refer to the section indicated for more information on a function. The keycap usually indicates the function controlled by the switch.

A/D - Scan list add/delete (see page 37)
CG - Call Guard squelch disable (see page 52)
EMER - Emergency switch (see page 26)
ENCPT - Encryption on-off (see page 27)
FCN - Function select (see following description)
HORN - Horn alert on-off (see page 28)
MON - Monitor mode on-off (see page 42)
AUX - Option select (see page 29)
PRI - Priority sampling on-off (see page 53)
SCAN - Scan on-off (see page 35)
STLH (AUX) - Stealth mode select (see page 31)
TA - Talk-around on-off (see page 52)
(Blank) - Not used (disabled)

FCN (Function) Switch - This switch (if programmed) selects the following functions:

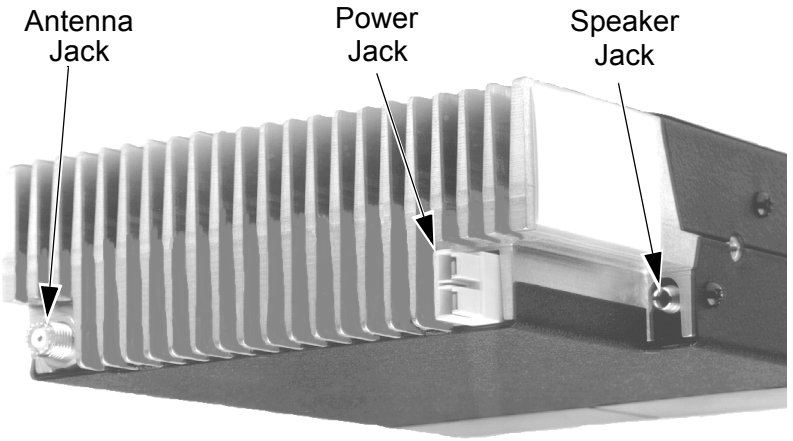
Menu Mode Select - Press FCN twice (see page 32)
Home Sys/Grp Select - FCN/press Select switch (see page 28)
Conv Squelch Set - FCN/rotate Select switch (see page 18)

Transmit/Busy Indicator - Indicates the following conditions:
Red - Transmitter keyed, normal power output
Orange - Transmitter keyed, power reduced because internal temperature is high
Green - Busy conventional group (channel). Refer to "Conventional Operation" on page 41 for more information.

Microphone Jack - Connection point for the microphone.

Microphone Push-To-Talk (PTT) Switch (Not Shown) - Push-button on the microphone which is pressed to key the transmitter.

Speaker - The internal speaker is located behind the grille. An optional speaker can be connected to the external speaker jack located on the back (see "Speaker Jack" description which follows).



Rear Panel Jacks and Connectors

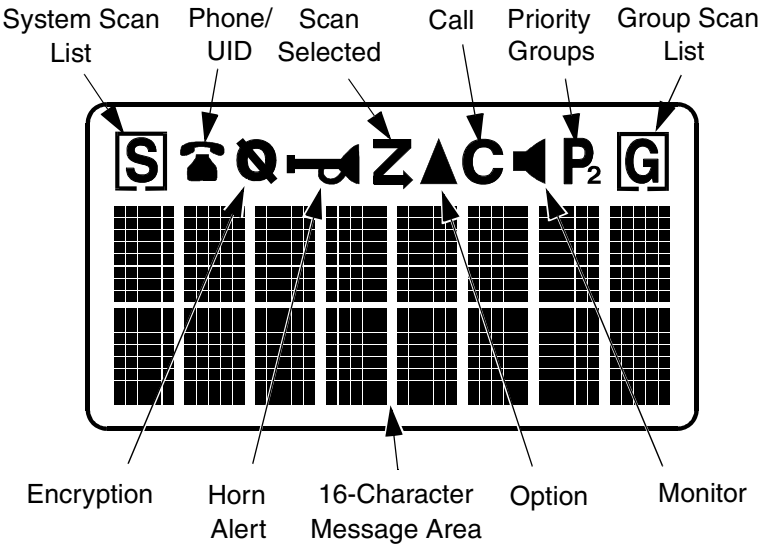
Antenna Jack - Miniature UHF jack for connecting the 50-ohm antenna.

Power Jack - Connection point for the power cable which attaches to the vehicle battery. A nominal 12-volt DC, negative ground power source is required.

Speaker Jack - Connection point for an optional external 4.7-ohm, 5-watt speaker. The internal speaker is automatically disabled when a speaker is plugged into this jack.

Accessory Cable (Not Shown) - This optional cable is used to connect functions such as ignition switch sense and horn alert to the transceiver.

Data Cable (Not Shown) - This optional cable is used to connect data equipment such as modems and data terminals to the transceiver.



Display Description

16-Character Message Area - Indicates the selected system and group (see page 16) and also error conditions and status information.

S - Indicates that the displayed system is in the scan list and scanned normally (see page 37).

G - Indicates that the displayed group is in the scan list and scanned normally (see page 37).

☎ - Indicates that the selected group is programmed for telephone calls. With Multi-Net operation, it also indicates that the group is programmed for unique ID or directed group calls (see page 21).

Ø - Indicates that optional encryption is enabled (see page 27).

- Indicates that the horn alert is enabled (see page 28).

Z - Indicates that scanning is enabled (see page 35).

▲ - Indicates that an option controlled by the AUX switch is enabled (see page 26).

C - Indicates that a call has been received on a group programmed for a call indicator (see page 26). To turn this indication off, press any key.

◀ - Indicates that the monitor mode is enabled. This mode disables Call Guard squelch and other squelch control features so that all messages are heard on conventional systems (see page 50).

P $_2$ - When only **P** is displayed, the selected or displayed group is scanned as a first priority group. When **P** $_2$ is displayed, it is scanned as a second priority group (see page 53).

GENERAL OPERATION

Power-Up Sequence

When power is turned on, the backlight turns on, all segments in the display are momentarily enabled, and the last seven digits of the transceiver part number are very briefly displayed. A beep then sounds (if tones are enabled) and the transceiver is ready to be used.

Determining Volume Level

The relative volume setting can be determined by noting the position of the index on the volume knob. You may also be able to enable a reference tone or background noise for use in setting the volume. Proceed as follows:

- If key press tones are enabled, a short tone sounds when an option switch is pressed or the Select switch is pressed or rotated.

- If a conventional system is selected, take the microphone off-hook and if someone is using the channel, voice is heard. If no one is using the channel, the squelch control can be adjusted counterclockwise as described in “Setting Squelch Control” on page 18 and noise is heard. It is not possible to unsquelch the transceiver in this manner when a Multi-Net or LTR system is selected.

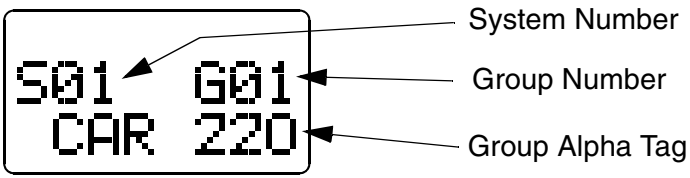
Backlight Operation

The display and keypad backlight can be controlled by the BACK-LIGHT menu parameter (see page 40). The three states that can be selected are Bright, Dim, and Off. If this menu parameter is not selectable, the backlight is fixed in one of these states by programming.

System/Group Display Information

The selected system and group are displayed using either a Numeric or Alpha Tag display mode. The display mode is selectable if the S/G DISPL menu parameter is available (see page 33). Otherwise, it is fixed in one of these modes by programming.

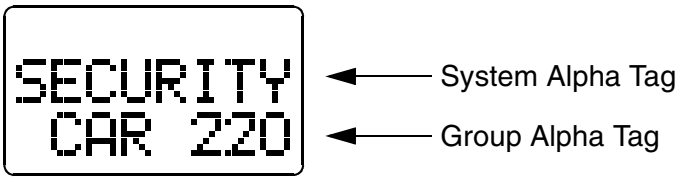
Numeric Mode - In the numeric mode, the selected system and group numbers are displayed on the top line as Sxx and Gxx, and the group alpha tag is displayed on the bottom line. For example, System 1, Group 1 (CAR 220) is displayed as follows. The system alpha tag is not displayed in this mode.



Numeric Display Mode

Alpha Tag Mode - In the alpha tag mode, the system alpha tag is displayed on the top line and the group alpha tag is displayed on the

bottom line. For example, a “SECURITY” system and “CAR 220” group are displayed as follows. The system and group numbers are not displayed in this mode.

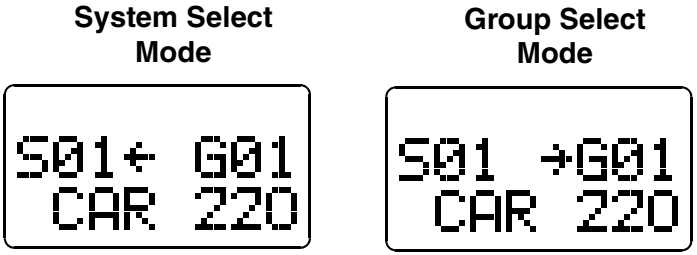


Alpha Tag Display Mode

Selecting the System and Group

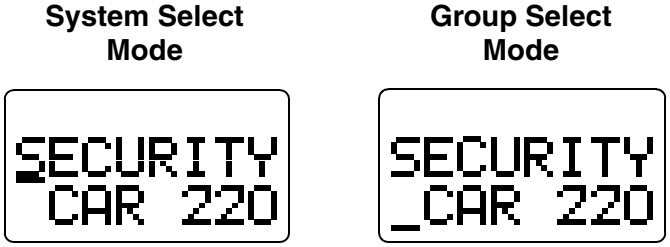
The front panel Select switch is used to change the system and group. Pressing this switch toggles between the system and group select modes, and then rotating it increases or decreases the system or group.

In the Numeric display mode (see preceding description), the system select mode is indicated when the arrow points to “Sxx”, and the group select mode is indicated when it points to “Gxx” (see following diagram).



Select Mode Indication With Numeric Display

In the Alpha Tag display mode, the system select mode is indicated by an underline in the left-most character position of the system alpha tag. Likewise, the group select mode is indicated by an underline in the left-most position of the group alpha tag (see following diagram).



Select Mode Indication With Alpha Tag Display

The transceiver can be programmed so that after a change is made, the current select mode remains enabled or a default mode is selected after a delay of up to 15 seconds. This programming also controls the mode that is selected when power is turned on.

Setting Squelch Control

NOTE: This sets the squelch level used for conventional calls. The squelch level for Multi-Net and LTR calls is preset and not affected by this adjustment. For more information on the various operating modes, refer to page 40.

If conventional systems are programmed, the squelch level can be set if the FCN option switch is enabled. Proceed as follows:

1. Select a conventional system and then a group that is not busy. Take the microphone off-hook to enable monitoring.

2. Press the FCN switch and then rotate the Select switch as you would a normal squelch control. Rotate it counterclockwise until receiver noise is heard and then clockwise slightly past the point where the noise mutes. The squelch adjust mode is indicated by “SQUELCH” on the upper line of the display, and the relative squelch level is indicated by a bar graph on the bottom line.

3. To select the current level and exit this mode, press the Select switch. This also occurs automatically 2 seconds after no change is made or 8 seconds after no activity.

4. If both narrow and wide band channels are used, perform this adjustment on both types because separate settings are maintained.

NOTE: Some readjustment may be required if weak messages are not heard or unsquelching occurs when no messages are present.

STANDARD CALLS

Introduction

Most calls you make are probably the standard type described in this section. These calls are between you and another mobile or control station. The main difference between these calls and the other type that can be placed (special calls) is that no number is dialed using a keypad. The following procedure applies to all three types of operation (Multi-Net, LTR, and conventional).

Placing a Standard Call

1. Turn transceiver power on and set the volume as described starting on page 15. With conventional operation, also set the squelch as described on page 18.

2. Select the system and group of the mobile being called as described in "Selecting the System and Group" on page 17.

3. If a conventional call is being placed, monitor the channel manually or automatically as described on page 42.

4. Press (and hold) the microphone PTT (push-to-talk) switch to talk and release it to listen. Operation with Multi-Net, LTR, and conventional systems is as follows:

Multi-Net and LTR Operation

- If the proceed tone is enabled (see page 30), it sounds shortly after the PTT switch is pressed to indicate that the radio system was

successfully accessed. If it is not enabled, no tone sounds when the system is successfully accessed. The proceed and other tones can be disabled as described in "Tone Select" on page 32.

- If the radio system is busy, the busy tone sounds (see page 54) and "BUSY" is indicated on the lower line of the display. If you continue pressing the PTT switch, the system is accessed when it becomes available. With Multi-Net operation, if Busy Queuing is programmed, the call is automatically placed in a queue when the PTT switch is released (see page 43).

- If an out-of-range condition exists, the intercept tone sounds (see page 54) and "OUT-RNGE" is indicated on the lower line of the display. No more access attempts are made once this indication appears. Release the PTT switch and drive closer to the radio system or away from shielding structures and try again. With Multi-Net operation, if Roaming is programmed (see page 44), the transceiver automatically changes sites before an out-of-range condition occurs.

Conventional Operation

- If the channel is busy and the Transmit Disable On Busy feature is programmed, "DSBL BSY" is indicated on the lower line of the display, the busy tone sounds, and the transmitter is disabled (see page 51).

- Otherwise, busy and out-of-range conditions are not indicated and speaking can begin when the PTT switch is pressed after monitoring the channel. If the proceed tone is enabled on conventional systems, it indicates when speaking can begin but does not indicate that the radio system has been successfully accessed.

5. When the call is complete, place the microphone back on-hook.

Receiving a Standard Call

1. Turn transceiver power on and set the volume as described starting on page 15. With conventional operation, also set the squelch as described on page 18.

2. Select or scan the system and group programmed for the call you want to receive (see page 35 for scan information).

3. When the message is received, the display usually changes to the system and group of the call. Take the microphone off-hook and press the PTT switch to talk and release it to listen. If scanning, a response may not automatically occur on the group of the call (see page 39).

TELEPHONE CALLS AND OTHER SPECIAL CALLS

Placing Telephone Calls

NOTE: Telephone calls can be placed and received only if that service is available to you and your transceiver has been programmed appropriately. A microphone equipped with a telephone keypad is required to dial the telephone number.

The telephone calling feature allows you to place and receive telephone calls using your transceiver. The following information describes how these calls are made with Multi-Net and LTR operation. If you can make telephone calls with conventional operation, the procedure may be somewhat different and your system operator will then provide additional information. Proceed as follows:

1. Turn transceiver power on and set the volume as described starting on page 15.

2. Select the system and group programmed for telephone calls. When a telephone or Multi-Net special call group is selected, ☎ is displayed.

3. To obtain the dial tone, briefly press the PTT switch. If the proceed tone is used, press the PTT switch until a beep sounds. If a dial tone is then heard, proceed to step 4.

Busy and Out-Of-Range Conditions

Busy and out-of-range conditions are indicated the same as with Multi-Net and LTR standard calls described on page 19. The following additional features may be available with telephone calls:

Busy - With LTR operation, if Busy Queuing is programmed (see page 48), the call is automatically placed in a queue when the PTT switch is released. The Busy Queuing mode is indicated by "IN QUEUE" in the display.

Out-of-Range - With LTR operation, if the System Search feature is selected (see page 49), that feature is automatically selected when the PTT switch is released. The System Search mode is indicated by "SYS SRCH" in the display.

4. With the dial tone sounding, dial the number using the 0-9 keys on the microphone keypad. If the microphone has a memory, you may also be able to recall the number from memory. The PTT switch does not need to be pressed while you are dialing if the transmitter automatically keys. If too much time elapses between digits, the call is terminated.

5. After the number is dialed, release the PTT switch (if it was pressed). With Multi-Net operation, a short tone then sounds to indicate that the number was accepted by the system. Landside ringing (or a landside busy condition) should then be heard.

6. When the other party answers, press the PTT switch and respond. The PTT switch must be pressed to talk and released to listen (the same as with mobile-to-mobile calls).

7. When the call is finished, it should be terminated. This is usually done by pressing the # key, and termination is indicated by three beeps. Terminating the call in this manner prevents extra billing that may occur while the system automatically detects the end of the call.

Receiving a Telephone Call

1. Turn transceiver power on and set the volume as described starting on page 15.

2. Select or scan the system and group programmed for telephone calls. When a telephone or Multi-Net special call group is selected, ☎ is displayed.

3. When "ringing" is heard, press the PTT switch and respond. The PTT switch must be pressed to talk and released to listen the same as with standard calls.

4. When the call is finished, it should be terminated as in step 7 of the preceding section.

Placing Other Multi-Net Special Calls

Multi-Net special calls include the telephone calls just described and also Unique ID and Directed Group calls. Unique ID calls are to specific mobiles, and Directed Group calls are to specific groups. These calls can be placed to other users assigned to your site or some other site that is part of the same network.

As with telephone calls, a microphone with a telephone keypad is required to dial the number specifying the mobile being called. The numbers dialed are 4-8 digits long, and they will be provided by your system operator. The procedure used to place these calls is as follows:

1. Select the system and group programmed for Unique ID and Directed Group calls. When one of these groups or a telephone group is selected, ☎ is displayed.The group alpha tag displayed on the lower line may also indicate when one of these groups is selected.

2. Briefly press the PTT switch to obtain a dial tone. The procedure is similar to that used with telephone calls, and the Busy Queuing and Roaming features are available if programmed. Refer to step 4 near the bottom of page 19 for more information.

3. Dial the 4-8 digit number using the microphone keypad. Refer to step 4 on page 22 for more information.

4. A tone then sounds to indicate that the call was accepted by the system. If this tone does not sound, an incorrect or unauthorized number may have been dialed. The call then proceeds as follows:

   Unique ID Call - Ringing is heard to indicate that the other transceiver is being rung. If there is no answer, ringing automatically stops after several rings and the call is terminated. When the other party answers, respond as with a standard call.

   Directed Group Call - A second tone sounds to indicate that the path is complete and you should transmit your message. No ringing occurs and the other party does not answer first.

5. When the call is finished, it should be terminated by pressing the # key. Three beeps indicate that the call has been terminated.

Receiving Other Multi-Net Special Calls

When a Unique ID call is received, a ringing tone sounds similar to when a telephone call is received. Unique ID calls are received regardless of which group is selected. All that is required is that a system programmed for that call must be selected. To respond to a unique ID call, you may need to manually select the unique ID group if it is not selected automatically or some other group is displayed when the PTT switch is pressed.

To receive and respond to a Directed Group call, the group programmed with the ID code being sent must be selected. This call is handled the same as the standard call described on page 20. No ringing occurs, and an incoming call is indicated when you hear the voice of the person placing the call.

Landside-Originate Calls

Calls can be placed from a landside telephone to your transceiver if the radio system and transceiver have that capability. With most systems, a mobile can be called directly (each has a unique telephone number). With others, a mobile may be called as follows:

1. Dial the number of the radio system in which the mobile is operating.

2. When the system answers, a short tone sounds to indicate that the number of the mobile should be dialed. This is a 4-8 digit number that is supplied by your system operator, and it must be dialed using a tone-type telephone. If too much time elapses before dialing is started or between dialed digits, the call is terminated.

3. If it is a telephone call, ringing is heard by the landside caller while the mobile is being rung. With other calls, a second tone sounds instead of the ringing tone and the landside caller should then begin talking.

GENERAL FEATURES

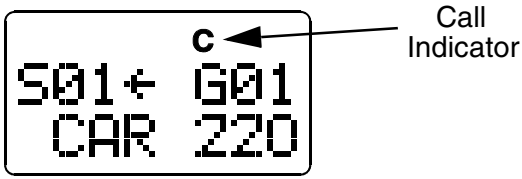
Bank Select

A bank is a collection of selectable systems that have been set up for a specific application. For example, one bank could be programmed for operation in Minneapolis and another for operation in Milwaukee. Each bank is identified by a unique alpha tag, and up to sixteen banks can be programmed.

Banks are selected by the BANK SEL menu parameter (see page 33). Rotate the Select switch to display “BANK SEL” on the top line and the current bank is then displayed on the bottom line. Press the Select switch to change the bank. If this menu parameter is not available, banks are not selectable.

Call Indicator

The call indicator is "**C**" in the upper part of the display as shown in the following illustration. The purpose of this indication is to show that a call was received while you were away from the vehicle. Individual groups can be programmed for this feature and it then turns on when a call is received on one of those groups.



This indicator is turned off by pressing any button or turning transceiver power off and then on. If scanning and the "last received" configuration is programmed (see "Transmitting In The Scan Mode" on page 39), the system and group of the last call are displayed. Otherwise, the currently selected system/group is displayed.

Emergency Switch

If the EMER option switch is programmed (see page 32), it is used to set up or place a high priority call. When this switch is pressed, "EMERGNCY" is displayed on the lower line (unless this message has been disabled by programming).

With Multi-Net systems, either automatic or manual operation can be programmed; with LTR and conventional systems, only manual operation can be programmed. Operation in these modes is as follows. Your system operator may provide more information on how this switch should be used.

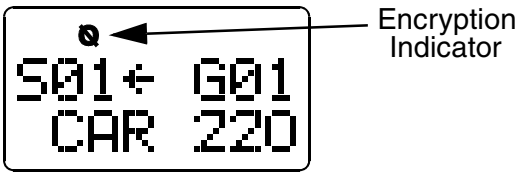
Manual Operation - A specific system/group is automatically selected and the transceiver goes into a high-priority access mode. However, no call is placed until the PTT switch is manually pressed. This access mode minimizes, as much as possible, the chance that the system will be busy when the call is placed.

Automatic Operation - The transmitter automatically transmits an emergency message on the emergency system/group. The message is transmitted without pressing the PTT switch and at the highest priority. Emergency transmissions continue until an acknowledgment is received from the dispatcher.

Encryption

Voice encryption is an optional feature that prevents conversations from being monitored by casual eavesdropping and analog scanners. It does this by encrypting your voice so that it can be understood only by someone using a transceiver equipped with similar encryption device.

Each group can be programmed so that when it is selected, encryption is automatically enabled. When encryption is enabled, is indicated in the display as shown below.



If you have the ENCRYPT menu parameter or ENCPT option switch, the encryption group programming can be temporarily overridden. Selecting another system or group causes encryption to revert to the status programmed for that group.

Encrypted calls are received even if encryption is not enabled. However, encryption must be enabled to transmit an encrypted call. When transmitting an encrypted call, wait approximately 1 second before speaking. This gives the receiving encryption device time to establish synchronization which ensures that all of the first word is received. If the proceed tone is used (see page 30), speaking can begin as soon as it sounds because it is delayed for the required time.

Function (FCN) Switch

If an option switch is programmed for FCN (function), it performs the following functions. If this switch is not programmed, these functions are not available. When the function select mode is active, "FCN" is displayed on the lower line of the display. The function mode is automatically exited after 8 seconds of no activity.

Menu Mode Select - Pressing FCN twice selects the menu mode as described on page 33.

Home System/Group Select - Pressing FCN and then the Select switch selects the home system/group as described in the next section.

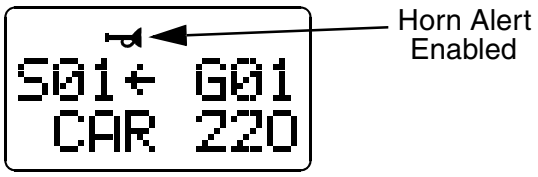
Squelch Adjust - Pressing FCN and then rotating the Select switch with a conventional system selected sets the squelch level as described on page 18.

Home System/Group Select

To select the preprogrammed Home system/group, simply press the FCN switch and then the Select switch. The Home system/group is then displayed and it becomes the selected system/group. If no home group has been programmed, the last selected group of the home system is selected. If you do not have a FCN switch, or no Home system is programmed, this feature is not available.

Horn Alert

If this feature has been installed by your system operator, it activates an external alert such as the vehicle horn or lights when a call is received on a group programmed for horn alert. When the horn alert is enabled, is displayed as shown in the following illustration.



When enabled, the horn alert pulses on and off for 1-8 cycles and then goes back to the disabled state. To change the currently selected horn alert mode, the HORN option switch or HRN ALRT menu parameter can be used if available (see page 32).

The horn alert is programmed to operate in the manual or automatic mode (see descriptions which follow). If the ignition switch does not control transceiver power, only the front panel power switch affects operation when applicable. Refer to "Power Turn-Off Delay" on page 30 for more information.

Manual Off/On Mode

The horn alert mode does not change when power is turned on and off by either the ignition switch or power switch. Therefore, the horn alert is entirely controlled by either the HORN option switch or menu parameter.

Auto Off/On Mode

Ignition Switch - The horn alert always turns off when the ignition switch is turned on, and always turns on when the ignition switch is turned off (if there is a turn-off delay).

Power Switch - The horn alert always reverts to the off condition when power is turned on by the power switch.

NOTE: The preceding automatic operation overrides any mode that may have been selected by the HORN option switch or HRN ALRT menu parameter.

Option Select

The AUX switch or OPTION menu parameter can be used to control an accessory that may have been installed by your system operator. If the switch is used, the enabled condition is indicated by ▲ in the display.

Power Turn-Off Delay

Your transceiver may have been installed so that the vehicle ignition switch as well as the front-panel power switch control transceiver power. If this is the case, both the ignition switch and the front panel power switch must be on for transceiver power to turn on.

When the ignition switch controls power, turn-off delays of Immediate, 10, 20, 30, 40, or 50 minutes, 1, 2, 4, 8, 10, 12, or 16 hours or Forever can be programmed. The delay can be overridden at any time by turning power off using the front-panel power switch or turning the ignition switch back on.

A power turn-off delay allows features such as the horn alert and call indicator to remain active for a time after the ignition switch is turned off. At the same time, advantages of ignition switch control are utilized such as preventing battery discharge that may occur if the transceiver is accidentally left on for an extended period (see page 62).

Proceed (Clear-To-Talk) Tone

This is a short tone that sounds shortly after the PTT switch is pressed to indicate that the radio system has been accessed and speaking can begin. This tone can be programmed so that it sounds on Multi-Net and LTR systems but not conventional systems. In addition, this and other tones can be disabled on all systems by the TONES menu parameter (see "Tone Select" on page 32) or system operator programming, and either a standard or loud (two-pitch) tone can be programmed.

On Multi-Net and LTR systems, if the radio system is busy when making a call, the busy tone sounds instead of the proceed tone and "BUSY" is indicated on the bottom line of the display. If the PTT switch is held down, the system is accessed and the proceed tone sounds when it is no longer busy. If an out-of-range condition occurs, the intercept tone sounds and "OUT-RNGE" is indicated in the display. The PTT switch must be released to make another call attempt. Refer to page 54 for more information on the busy and intercept tones.

On conventional systems, the Transmit Disable On Busy feature can be used to automatically perform monitoring (see page 51). The proceed tone then does not sound if the channel is busy. Otherwise, the proceed tone (if enabled) sounds on conventional systems even if the channel is busy.

With all operating modes, if encryption is used, a 0.9-second delay occurs before this tone sounds and two beeps are heard instead of one. A short delay may also occur with conventional calls. These delays ensure that the radio path is complete before you begin talking so that part of your first word is not lost.

Stealth Mode

The stealth mode disables the following tones and indicators so that they do not reveal that you are transmitting or otherwise indicate your presence. The speaker audio and display remain enabled in this mode.

- All tones (see “Tone Select” on page 32)
- The front panel transmit/busy indicator (see page 16)
- Display backlight

The stealth mode can be selected by an option switch or the STEALTH menu parameter (see page 33), or is fixed in the on or off mode by programming. There is no special indication that this mode is selected except “On” is displayed under “STEALTH” in the menu mode.

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 0.5 - 5.0 minutes or disabled entirely. If the transmitter is keyed continuously for longer than the programmed time, the transmitter is disabled, “TIMEOUT” is indicated on the lower line of the display, and the intercept tone sounds. The timer and tone are reset by releasing the PTT switch. Ten seconds before time-out occurs, a beep sounds to indicate that time-out is approaching. There is also a timer that can be programmed to prevent transmitting for up to one minute after time-out occurs.

One use of the time-out timer feature is to prevent a repeater from being kept busy for an extended period by an accidentally keyed transmitter. It can also prevent possible damage to the transmitter caused by transmitting for an excessively long period.

Tone Select

If the TONES menu parameter is selectable, the tones that sound can be selected. Otherwise, the tones that sound are fixed by programming. The following choices are available. Refer to page 33 for more information on using the menu mode.

Silent - All tones are disabled.
Key Beep - Only the Select switch and key press tones are enabled.
Alert - All tones except the preceding Key Beep tones are enabled.
All Tones - Both the Key Beep and Alert tones are enabled.

Transmitter Thermal Foldback

If the transmitter temperature increases to the point where damage to the transceiver could result, power is automatically cut back. When this happens, the transmit indicator on the front panel is orange instead of red when the transmitter is keyed. After sufficient cooling occurs, power output returns to the normal level and the indicator changes back to red. One time when this indication could occur is if you transmit for an extended period.

OPTION SWITCHES AND MENU MODE

Option Switches

All five option switches on the front panel are programmable by your system operator. The available option switch and menu mode functions are shown in the table on page 34. Those which can be assigned to an option switch are indicated by an entry in the “Option Switch”

column. Refer to the page listed in this table for a description of the function. If a function is controlled by an option switch, it cannot be controlled by the menu mode and vice versa. Some switches may not be used and are then disabled.

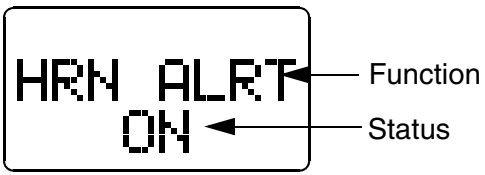
Menu Mode Introduction

The menu mode is selected by pressing the FCN switch twice. If this switch is not programmed, the menu mode is not available. Functions which can be controlled by the menu mode are indicated by an entry in the "Menu Items" column of the table on page 34. Refer to the page listed in the table for a description of the function. Some functions may not be used, may be in a fixed state, or may be controlled by an option switch. The menu parameter that controls that function is then not displayed.

Using Menu Mode

To use the menu mode, proceed as follows:

1. To select the menu mode, press FCN FCN (the FCN switch twice). The menu display is shown below. The top line indicates the function being edited, and the bottom line indicates the current status of that function



2. To display the various functions that are controllable by the menu mode (top line indication), rotate the Select switch. The currently selected status of that function is displayed on the bottom line.

3. To change the selected status, press the Select switch. The selections displayed for each menu function are shown on page 60.

4. To display another menu function, rotate the Select switch. Then change the status if desired as described in the preceding step.

Menu Mode and Option Switch Functions

Function	Menu Items	Option Switch	See Descrip. on Page
Add/delete (scan list prg)	---	A/D	37
Backlight adjust	BACKLGHT	---	16
Bank select	BANK SEL	---	25
Caller ID [1]	CALL ID	--	46
Call Guard Sq. disable	---	CG	52
Emergency	---	EMER	26
Encryption on-off	ENCRYPT	ENCPT	27
Function select	---	FCN	28
Home sys/grp select	---	FCN then press Sel Sw	28
Horn Alert on-off	HRN ALRT	HORN	28
LTR system search	SYS SRCH	---	49
Menu mode select	---	FCN (twice)	33
Monitor mode select	---	MON	50
Option select	OPTION	AUX	29
Priority sampling on-off	PRIORITY	PRI	53
Roaming on-off [1]	ROAMING	---	44
Scan on-off	---	SCAN	35
Scan Method Select	SCAN SEL	---	
Scan type select	SCN TYPE	---	35
Scan continue on-off	SCN CONT	---	38
Scan list save mode	SCN SAVE	---	37
Status message select [1]	STATUS	STAT	45
Stealth mode select	STEALTH	STLH	31
Squelch adjust	---	FCN then rotate Sel Sw	18
System/group display mode	S/G DISPL	---	16
Talk-around on-off	TALKARND	TA	52
Tone type select	TONES	---	32

NOTE: Parameters left blank are not available.
[1] Available with Multi-Net operation only.

5. The selected status conditions for the various functions are saved when the menu mode is exited in one of the following ways:

   - Pressing the FCN switch again
   - Pressing the PTT switch
   - Automatically when time-out occurs 2 seconds after a change is made or 8 seconds after no changes are made.

NOTE: Calls cannot be received or transmitted while the menu mode is selected.

SYSTEM AND GROUP SCAN

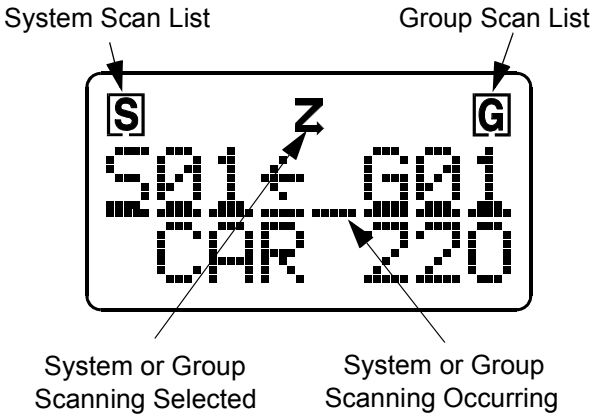
Introduction

The scan feature monitors, in sequence, the programmed systems and/or groups in the scan list. When a message is detected that the 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).

System Scanning - System scanning detects calls on all systems that are in the system scan list. When system scanning is not used, calls are detected on only the currently selected system.

Group Scanning - Group scanning detects calls on all selectable groups in the current or scanned systems that are in the group scan list. When group scanning is not used, calls are detected on only the currently selected group or if system scanning, on the last selected group of each system.

System and/or group scanning are turned on and off by the SCAN option switch. When system and/or group scanning is enabled by this switch, Z is indicated in the display (see following illustration). Then when system or group scanning is actually occurring, a scrolling underline is displayed under each character in the upper line of the display. The microphone must be on-hook for scanning to occur (unless off-hook detection has been disabled by programming).



The type of scanning selected is determined by the menu mode SCN TYPE parameter (see page 33). If that parameter is not selectable, the type of scanning is fixed by programming. The available scan types are as follows. Single and multiple site scan may also be selectable (see page 37).

SYS-GRP - Both system and group
GRP ONLY - Group scanning only
OFF - Both types disabled (SCAN switch non-functional)

If the SCAN option switch is not programmed, the selected mode is always enabled. If the switch is enabled but the menu SCN TYPE parameter is not selectable, the scan type is fixed by programming.

Group scanning can be selectively disabled on systems by programming. It then does not occur on those systems even if enabled as just described. The selected system and group can be changed while scanning using the Select switch in the normal manner. Scanning resumes shortly after the change is made.

When a call is received in the scan mode, the display changes to the system and group of the call. Programming determines if this change is temporary (until scanning resumes) or permanent, and if a response occurs on the system/group of the call or the selected system/group. Refer to “Transmitting In The Scan Mode” on page 39 for more information.

Single and Multiple Site Scan

Single and Multiple site scanning (see descriptions which follow) are selectable if the SCAN SEL menu parameter if it is available. If this parameter is not available, scanning is fixed in one of these states by programming. If you can select this parameter, your system operator may provide more information on which type to use.

Single Site Scan - This type scans only Multi-Net systems that access the site of the current system, and it usually must be selected with a Multi-Net system displayed. If an LTR or conventional system is displayed and it cannot be selected, an error tone sounds and "NOT MULTI" is displayed.

Multiple Site Scan - This type scans all systems in the scan list, and it must be used to scan LTR and conventional systems.

Scan List Programming

General

NOTE: The selected (displayed) system and group are always scanned, even if they are deleted from the scan list.

The system and group scan lists are programmed using the A/D (add/delete) option switch. Pressing this switch changes the status of the displayed system or group. The displayed system is in the scan list and scanned normally when **S** is displayed. Likewise, the displayed group is in the scan list and scanned normally when **G** is displayed (see preceding illustration).

The system/group select mode described on page 17 also controls if the system or group scan list is changed when the A/D switch is pressed. For example, to change the scan list status of the displayed system, press the Select switch if necessary so that the system select mode is indicated and then press the A/D switch.

Deleting a system only temporarily deletes the groups associated with that system. When a system is added back into the scan list, the orig-

inal group scan list is again active. Systems and groups can be deleted from the scan list while listening to a message on the system or group by pressing the A/D switch in the normal manner. Scanning resumes shortly after the system or group is deleted.

Scan list programming is not available if the A/D switch is disabled. In addition, the group scan list is not programmable if the group scanning is disabled on the current system. If an attempt is made to program the group scan list on one of these systems, a beep sounds, “GSCN DIS” is flashed in the display, and no change occurs in the scan list.

Saving Scan List

If the menu mode SCN SAVE parameter is available, you can select if scan list changes are saved. If “On” is selected, changes are saved as they are made and the scan list is the same when power is turned on. If “Off” is selected, they are no longer saved. Therefore, to store a list, select “On”, program the list, then select “Off”. Then when power is turned on, the scan list returns to the state that existed when “Off” was selected.

If the menu SCN SAVE parameter is not selectable, the scan list save mode is fixed by programming. If “On” is programmed, all changes are saved and no change occurs in the scan lists when power is cycled. If “Off” is programmed, they are not saved and the scan list reverts to the default status when power is cycled.

Scan Delay and Continue Timers

When a message is received or transmitted while scanning, there is a short delay before scanning resumes. The delay after receiving a call prevents another message from being received before a response can be made. Likewise, the delay after transmitting a call ensures that you hear a response to your call instead of another message occurring on some other system or group. Note that scanning does not resume if it has been disabled, such as by taking the microphone off-hook.

There is also a scan continue timer that may be programmed. This timer controls the maximum time that a call is received before scanning resumes. Times up to 60 seconds can be programmed. This prevents scanning from being delayed for long periods by lengthy calls. If the menu SCN CONT parameter is selectable (see page 33), this feature can be turned on and off.

Transmitting In The Scan Mode

General

When a message is received in the scan mode, programming determines if the selected system/group does not change or changes permanently or temporarily to that of the call. This then affects the system/group on which a response to the message occurs and also the system/group that is selected when the scan mode is exited by pressing the SCAN switch. The three programmable configurations are as follows:

Last Selected - Transmissions always occur on the system/group that was last selected by the Select switch. Therefore, the display may not indicate the system/group on which a response will occur. To respond to a call not on the selected system/group, one of the following methods can be used:

- Select the system/group of the call manually using the Select switch.
- Before scanning resumes, exit the scan mode by pressing the SCAN switch. The system/group of the call then becomes the selected system/group and it is not necessary to change it manually.

Last Received - The selected system/group changes to the system/group of a call. Therefore, you can always respond to a call without having to manually change the system/group. To return to the previously selected system/group, manually select it using the Select switch.

Temporary Last Received - The system/group changes to the system/group of a call for only the duration of the scan delay period (see page 38.) Then when the delay expires and scanning resumes (if it is not

disabled), the selected system/group is again displayed. Therefore, you can respond to a call without changing the selected system/group as long as you do so before scanning resumes.

Fixed System/Group Transmit in Scan

Each bank can be programmed so that transmissions in the scan mode that are made while scanning is occurring are on a preprogrammed system/group. Note that scanning must be occurring (scrolling underline displayed) when the transmitter is keyed. Since taking the microphone off-hook normally disables scanning (unless off-hook detection is disabled), the transmitter usually must be keyed with the microphone on-hook.

If a transmission occurs under these conditions, the selected system/group also changes. If the transmitter is keyed with scanning halted, the programming described in the preceding section takes precedence.

MULTI-NET, LTR, AND CONVENTIONAL MODES

General

Each selectable system can be programmed for Multi-Net, LTR, or conventional operation by your system operator. The type or types of operation that are programmed in your transceiver are determined by the type of radio equipment being used in your radio system. The differences in operation are described in the following information and elsewhere in this manual as required.

Multi-Net and LTR Operation

The Multi-Net mode provides the most operating features. Features available only in the Multi-Net mode include roaming (auto-registration), status messages, and special calls. The two types of calls that can be placed with Multi-Net operation are Standard and Special. Special calls

include telephone, unique ID, and directed group. Multi-Net features are described starting on page 43.

LTR operation is similar to Multi-Net operation. The main difference is that the preceding features are not available. The two types of calls that can be placed with LTR operation are Standard and Telephone. LTR features are described starting on page 48.

Both the Multi-Net and LTR modes provide automatic channel selection (trunking) and monitoring before transmitting. In addition, special tones and display messages indicate busy and out-of-range conditions. Selecting a system selects a collection of groups and other information such as fixed priority receive ID codes. Selecting a group selects a transmit and receive ID code and other information which controls the mobile or mobiles being called and what calls are received.

Conventional Operation

In the conventional mode, selecting a system selects a collection of channels and other information unique to those channels. Selecting a group selects the specific channel and also squelch coding (if any) used on that channel. Conventional features are described starting on page 50.

There are no tones or messages to indicate busy or out-of-range conditions in this mode. A busy channel (group) is detected manually or automatically as described in the following information. An out-of-range condition cannot be detected automatically but may exist if you cannot get a response to any of your messages. Refer to “Operation At Extended Range” on page 61 for more information.

To properly receive calls in the conventional mode, the squelch control must be set as described in page 18. If this control is not set properly, weak messages could be missed or noise could be heard when no message is present. In the Multi-Net and LTR modes, the squelch level is fixed and setting this control has no affect.

Monitoring Conventional Channels Before Transmitting

Regulations require that the channel be monitored before transmitting to make sure that it is not being used by someone else. If you were to transmit when someone else is talking, you would probably disrupt their conversation. As previously stated, monitoring is performed automatically in the Multi-Net and LTR modes. In the conventional mode, it must be performed automatically or manually as follows.

Automatic Channel Monitoring

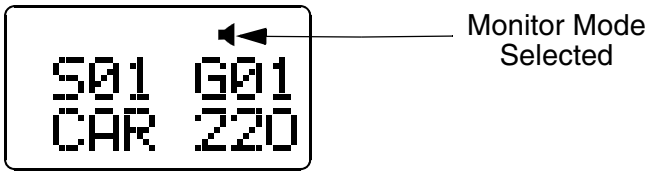
If the selected group is programmed for the Transmit Disable On Busy feature, monitoring is performed automatically. Refer to page 51 for more information on this feature.

Manual Channel Monitoring

If the Transmit Disable On Busy feature is not used, monitoring must be performed manually as follows:

Busy Indicator - With scanning disabled and the squelch control adjusted as described on page 18, note if the indicator on the front panel is green. If it is, a signal has been detected on the selected system (channel) and you should not transmit a message until it turns off.

Monitor Mode - There may be times when the busy indication is on even though no one is using the channel. Monitoring should then be performed using the monitor mode. This mode is enabled by taking the microphone off-hook (unless off-hook detection has been disabled by programming). The monitor mode temporarily disables Call Guard squelch (see description on page 52) and scanning so that all messages on the channel are heard. The monitor mode is indicated by ◀ in the display as shown in the following illustration. The monitor mode can also be enabled by the MON or CG option switch if it is programmed. Refer to the monitor mode description on page 50 for more information.



MULTI-NET FEATURES

Standard and Special Calls

Standard calls are between two mobiles or between a mobile and a control station, and special calls include telephone, unique ID, and directed group. Standard calls are described starting on page 19, telephone calls starting on page 21, and unique ID and directed group calls starting on page 23.

Busy Queuing (Multi-Net)

The Multi-Net Busy Queuing feature places the call in a queue if a busy condition occurs when the PTT switch is pressed. Then when the radio system is no longer busy, a tone sounds and the call can be placed if desired. This feature is enabled on individual Multi-Net systems by dealer programming, and it is then available with all types of calls on that system. This feature operates as follows:

If a busy condition exists, the busy tone sounds and the Busy Queuing mode is entered automatically when the PTT switch is released. The busy tone then stops sounding and “IN QUEUE” is displayed as shown in the following illustration. When the transceiver successfully accesses the system, either a beep or dial tone sounds. The beep sounds

with all calls except telephone, and the dial tone sounds with telephone calls. The call can then be placed in the normal manner.

When in the queue mode, calls are received normally. A response can be made to a call and Busy Queuing resumes shortly after the call is finished (if it was not on the selected group). If group scanning is enabled, it continues. However, system scanning is temporarily disabled, so calls are not received on other systems.

If a call is not placed soon after this tone sounds, the queue mode is automatically exited and normal operation resumes. The queue mode is also exited if any of the following occur:

- Pressing the PTT switch (except when responding to a call as described above)
- A call is received on the selected group
- Pressing any front panel switch
- Turning power off and then on

Roaming (Auto-Registration)

Several Multi-Net sites can be linked together to provide wide-area coverage. Mobiles can then roam from site to site and the radio system tracks their location and calls are automatically routed to the correct site. Telephone and unique ID calls are always routed to other sites, and standard calls may be routed.

To utilize the Roaming feature, all of the following requirements must be met:

- The scan mode must be selected by the SCAN switch.
- The transceiver must be programmed for Roaming and it must be available in your radio system.
- If the menu mode “ROAMING” function is available, “On” must be selected.

Roaming functions as follows: When you move out of range of the current site, the transceiver begins searching for the sites programmed in

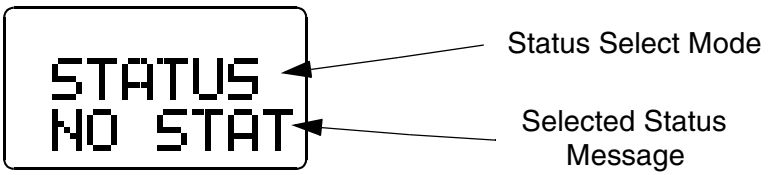
other selectable systems. While searching is occurring, “ROAMING” is indicated on the lower line of the display as shown below. When a new site is located, this message is no longer displayed, and the system and group of the new site is displayed.

The new system is the first higher system with a different site that could be accessed (wrap-around occurs after the highest system is accessed). The new group is either the same group that was displayed before roaming occurred or the last selected group of that system (programming determines which is selected).

Transmitting Status Messages

Preprogrammed status messages can be transmitted whenever the transmitter is keyed with a Multi-Net system selected. If this feature is available, the STATUS menu parameter (see page 33) is programmed to allow the desired message to be selected.

Selecting the STATUS menu parameter enables the status message select mode. This mode is indicated by “STATUS” on the top line of the display and the bottom line indicates the currently selected status message (see following illustration).



To change the current message, press the Select switch. When “NO STAT” is selected, no message is transmitted. To select the current

message and exit this mode, press the FCN option switch again. This also occurs automatically 2 seconds after a change is made or 8 seconds after no changes are made.

Up to eight status conditions such as “AT SITE”, “LEAVING”, and “LOADING” may be preprogrammed by your system operator. The selected status condition along with the unique ID of your transceiver is then displayed on the dispatcher’s console whenever the transmitter is keyed.

Caller Identification

The caller identification feature displays the four-digit unique ID of the calling mobile. It is displayed on the bottom line as “UI XXXX” alternately with the group alpha tag.

This feature can be turned on and off by the CALL ID menu parameter (see page 33). If this menu parameter is not available, the caller ID feature is fixed in the on or off mode by programming. This feature is also programmed on individual groups by your system operator. If it is disabled on a group, the unique ID code is not displayed even if this feature is enabled.

Calls on Priority and Block ID Codes

Two fixed priority and a block of receive ID codes can be programmed. These codes are in addition to the receive and transmit ID code selected by the group select function. Calls on the fixed priority and block ID codes are received regardless of which group is selected or group scanning. All that is required is that the system programmed with those codes be selected or scanned.

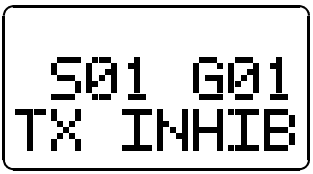
Calls on the fixed priority ID codes have a higher priority than calls being received on other ID codes. If a call with a higher priority is detected while receiving a call, the current call is immediately dropped and the higher priority call received. Telephone calls are not interrupted by priority calls.

If a call is received on one of the fixed priority ID codes, either "PRIORTY1" or "PRIORTY2" is displayed on the bottom line. The selectable groups are then checked to see if any have the same ID code. If a match is found, the transceiver changes to that group. If no match is found, the group does not change and a response cannot be made on that ID code. The "Transmitting in the Scan Mode" programming described on page 39 determines if a change is temporary or permanent.

When block ID codes are used, calls are detected on entire blocks of ID codes. When a call is received on a block ID code, "BLK CALL" is displayed and the selected group does not change.

Transmit Inhibit

The Transmit Inhibit feature prevents the transmitter from keying if the mobile you are calling is busy with another call. When the transmitter is disabled by this feature, the intercept tone sounds and "TX INHIB" is displayed (see following illustration). To make another call attempt, the



PTT switch must be released and pressed again. However, you may want to wait a few seconds before making another attempt so that the other call can finish.

One use of this feature is to prevent the accidental interruption of a call in progress. This could happen when the other party unkeys or if a higher priority ID is transmitted. It may also be used to provide an indication that the mobile you are calling is busy with another call. A similar Transmit Disable On Busy feature is available on conventional systems (see page 51).

LTR FEATURES

Standard and Telephone Calls

Standard calls are between two mobiles or between a mobile and a control station. Telephone calls allow you to place and receive calls over the public telephone system using your transceiver. Standard calls are described starting on page 19, and telephone calls are described starting on page 21.

Busy Queuing (LTR)

The LTR busy queuing feature places a telephone call in a queue if the radio system is busy when it is placed. Then when the system becomes available, the call is automatically placed. Standard (mobile-to-mobile) calls are not queued by this feature. If queuing is programmed and a busy condition is encountered, the queue mode is entered automatically when the PTT switch is released. The queue mode is indicated by "IN QUEUE" on the bottom line of the display as shown below.

When the radio system becomes available, it is automatically accessed. A beep then sounds and a dial tone is heard. The call can then be placed if desired. The queue mode is exited before the call is placed if any of the following occur (exit is indicated when "IN QUEUE" is no longer displayed).

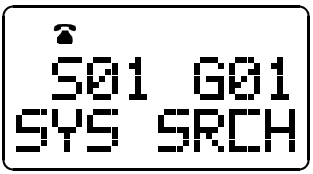
- The PTT switch is pressed
- Any call is received
- Any front panel option switch is pressed
- Power is turned off

Calls are received normally in the queue mode. However, receiving any call causes the mode to be exited as indicated above. Group scanning

remains enabled while in the queue mode, but system scanning is temporarily disabled. This feature is enabled on individual LTR systems by dealer programming, and it is then available with all telephone calls on that system.

System Search

If an out-of-range condition exists when attempting an LTR telephone call, the system search feature can be used to automatically search for a system within range. If enabled, the system search mode is automatically entered when the PTT switch is released. This mode is indicated by a short tone and "SYS SRCH" on the bottom line of the display (see following illustration).



The transceiver then attempts to access, in succession, other systems that have a group programmed for telephone calls. As each system is accessed, a beep sounds. If a system is accessed, the new system/group is selected and a dial tone sounds. The telephone call must then be placed within a few seconds or normal operation resumes. If no system could be accessed, the intercept tone sounds, "NO PHONE" is displayed, the system/group does not change, and the feature deactivates.

This mode can also be canceled at any time by pressing any front panel option switch. If the menu mode SYS SRCH parameter is selectable (see page 32), this feature can be turned on and off. Otherwise, it is either enabled or disabled on all LTR systems by programming.

Transpond

The transpond feature indicates if the mobile being called is in service. To be available, it must be programmed in the transceiver you are calling. Each selectable LTR group can be programmed for this feature. If

a call is received on one of these groups, the transceiver automatically transmits a response. This causes the transceiver placing the call to briefly unsquelch and the call indicator to turn on (if it is programmed on the selected group).

Priority and Block ID Codes

LTR priority and block ID codes function nearly the same with both LTR and Multi-Net operation. Therefore, refer to the Multi-Net description on page 46.

Transmit Inhibit

The Transmit Inhibit function operates the same with both LTR and Multi-Net operation. Therefore, refer to the Multi-Net description on page 47.

CONVENTIONAL FEATURES

Monitor Mode

The monitor mode is used to monitor a channel before transmitting. When this mode is selected, it temporarily disables Call Guard squelch or other squelch control techniques and also scanning so that all messages occurring on the selected group (channel) are heard. The monitor mode is enabled by taking the microphone off-hook (unless off-hook detection is disabled by programming) or pressing the MON option switch. The monitor mode is indicated by ◀ in the display.

A conventional system must be selected to enable monitoring. If the microphone is taken off-hook with a Multi-Net or LTR system selected, scanning halts (unless off-hook detection is disabled) but monitoring is not selected. The MON option switch is not detected when scanning is enabled, and if it is pressed with a Multi-Net or LTR system selected, NOT CONV is displayed and monitoring is not selected. This switch must be pressed again to disable the monitor mode.

A CG (Call Guard disable) option switch may also be programmed. This switch disables both receive and transmit squelch control on the selected group only (the monitor mode disables only receive squelch control). When squelch control is disabled by the CG switch, "CG OFF" is momentarily displayed. To re-enable squelch control and momentarily display "CG ON", press the CG switch again, select another system/group, or cycle transceiver power.

If the Transmit Disable On Busy feature is used (see description which follows), monitoring is performed automatically and the monitor mode may not need to be used. Refer to "Monitoring Conventional Channels Before Transmitting" on page 42 for more information.

Transmit Disable On Busy

The Transmit Disable On Busy feature automatically disables the transmitter if the selected group (channel) is busy when the PTT switch is pressed. When the transmitter is disabled by this feature, the busy tone sounds briefly and "DSBL BSY" is indicated on the lower line of the display. The monitor mode (see preceding section) is enabled while the PTT switch is pressed so that activity on the channel can be monitored. However, it is not possible to access a channel by holding down the PTT switch (it must be released to make another attempt).

Occasionally, a busy condition may be detected even though no one is talking. To key the transmitter in this case, release the PTT switch and then immediately press it again. There is also a programmable option with this feature to allow transmitting with a busy channel if the correct Call Guard signal is detected. The Transmit Disable On Busy feature is enabled or disabled on each conventional group by dealer programming.

Receive-Only Groups

Conventional groups can be programmed for monitoring only (transmitting is disabled). If the PTT switch is pressed with one of these groups selected, the intercept tone sounds and "TX DSBL" is displayed.

Talk-Around

Normally, all transmissions go through a repeater. Therefore, if you are out of radio range of the repeater, you cannot talk to anyone, even if you are only a short distance away from the mobile you are calling. To allow communication if this occurs, the talk-around feature can be used to enable direct mobile-to-mobile communication without going through a repeater.

Each selectable group can be programmed for talk-around. It is then automatically selected when the group is selected. There is no special talk-around indicator although the group alpha tag on the lower line of the display may be used to indicate this feature.

Talk-around can also be selected by the TALKARND menu parameter (see page 33) or T/A option switch. When talk-around is selected by this switch, "TA ON" is flashed on the lower line of the display. Then when it is disabled, "TA OFF" is flashed. Changing the selected system or group, enabling scanning, or turning power off causes talk-around to revert to the default condition programmed for the selected group.

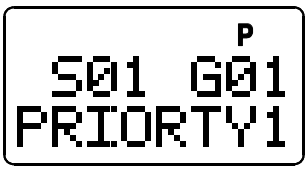
Conventional systems can be programmed so that talk-around cannot be selected. If an attempt is then made to enable talk-around with the switch, "NO TALK" is flashed on the lower line of the display. Groups may also be programmed so that talk-around cannot be turned off. If the option switch is then pressed, neither "TA OFF" nor "TA ON" is displayed. If the menu mode is used in these cases, the current mode cannot be changed.

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. It is transmitted with the voice signal but is not heard because it is in the subaudible range and attenuated by a filter. Call Guard squelch can be programmed on each conventional group. LTR operation uses ID codes to perform a similar function.

Priority Group Sampling

The priority group sampling feature ensures that messages on priority conventional groups are not missed while listening to a message on a non-priority conventional group. A fixed first and second priority group can be designated by programming or either priority group can be the selected group. When a first priority group is selected, P is displayed, and when a second priority group is selected, P_2 is displayed (see following illustration). When scanning, this symbol is displayed only while a call is being received on the particular priority group.



When a message is detected on a first priority group while listening to a non-priority message, a tone sounds, “PRIORTY1” is flashed on the lower line of the display, and the transceiver changes to that system/group to receive the message. Likewise, if a message is received on a second priority group, “PRIORTY2” is displayed. When the priority message is complete, the transceiver returns to the previous system/group. If a message is still present, it is received.

When a priority system/group is sampled while listening to a message on some other system/group, a series of “ticks” may be heard. These ticks are brief interruptions of the audio signal that occur when sampling takes place.

If the menu mode PRIORITY parameter (see page 33) or the PRI option switch is available, priority sampling can be turned on and off. When it is enabled by the switch, “PRI ON” is flashed, and if it is disabled, “PRI OFF” is flashed. If this menu parameter or switch is not available, priority sampling is either enabled or disabled by programming.

NOTE: Priority sampling occurs only on conventional systems and only when scanning is enabled by the SCAN switch. It does not occur when listening to a Multi-Net or LTR call or when transmitting.

MISCELLANEOUS

Supervisory Tones

The following tones are heard at various times when operating this transceiver. Some or all of these tones can be disabled by the TONES menu parameter or programming. Refer to "Tone Select" on page 32 for more information.

Busy Tone - This tone is similar to the standard telephone busy tone, and it indicates that the radio system is currently busy. It sounds with all Multi-Net and LTR calls, but not conventional calls. Repeated access attempts are made while the PTT switch is pressed with this tone sounding. Therefore, the PTT switch does not need to be released to access the system. The display indicates "BUSY" while this tone is sounding.

Intercept Tone - This is a siren-like tone (alternating high and low tones) which indicates the following out-of-range and error conditions:

- Out-Of-Range - If this tone sounds shortly after pressing the PTT switch and "OUT RNGE" is displayed, the transceiver was unable to contact a repeater. The usual cause for this is an out-of-range condition (see "Operation At Extended Range" on page 61). Once this tone sounds, no more access attempts are made until the PTT switch is released and then pressed again. This condition is not indicated with conventional operation.

- Time-Out Timer - If this tone sounds after the transmitter has been keyed for an extended period and "TIMEOUT" is displayed, the transmitter has been disabled by the Time-Out Timer feature (see page 31). This tone sounds with Multi-Net, LTR, and conventional operation. Ten

seconds before this tone sounds, a single beep sounds to indicate that time-out will soon occur.

- Transmit Inhibit - If this tone sounds as soon as the PTT switch is pressed with a Multi-Net or LTR system selected and "TX INHIB" is displayed, the transmitter has been disabled by the Transmit Inhibit feature (see page 47).

- Transmit Disable On Busy - If this tone sounds as soon as the push-to-talk switch is pressed with a conventional system selected and "DSBL BSY" is displayed, the channel is busy and the transmitter was disabled by the Transmit Disable On Busy feature (see page 51).

- Receive-Only Channel - If this tone sounds as soon as the push-to-talk switch is pressed with a conventional system selected and "TX DSBL" is displayed, the channel is receive-only (see page 51).

- Tx While Receiving Call - If the push-to-talk switch is pressed while receiving a Multi-Net or LTR call, this tone sounds and "DSBL BSY" is displayed.

Proceed (Clear-To-Talk) Tone - This is a short tone which sounds after the push-to-talk switch is pressed to indicate when talking can begin (see page 30). A loud (two-pitch) tone may also be programmed.

Key Press Tone - This is a short tone that indicates when an option switch is pressed (all modes).

Priority Call Tone - This is a short tone that sounds when a call is received on a conventional first or second priority channel (see page 53).

Wrap-Around Tone - This is a two-pitch tone that indicates that the highest or lowest channel was displayed and that wrap-around has occurred.

Error Tone - This is a two-pitch tone that indicates that an error condition has occurred.

Multi-Net Telephone Call Tones

The following tones are generated by the Multi-Net equipment and are heard when making a telephone, unique ID, or directed group special call on a Multi-Net system.

Confirmation Tone - This is a short tone that sounds when the number just dialed has been accepted by the system.

Call Proceed Tone - With Multi-Net directed group calls (see page 23), ringing does not occur after the number is dialed. Instead, another short tone sounds after the confirmation tone to indicate that the audio path is complete and speaking can begin.

End Call Tone - Three beeps which indicate that the end of the call has been detected by the system.

Proceed Dialing Tone - When placing a landside-to-mobile telephone call (see page 25), the landside caller may enter a special number which specifies the mobile being called. This tone indicates when that number should be dialed.

LTR Telephone Call Tones

The following tones are generated by LTR interconnect equipment and are heard when making LTR telephone calls. Therefore, if some other type of interconnect equipment is being used, these tones may vary.

Reorder Tone - Three beeps which indicate that the call has been terminated by the system.

Return Time Warning Tone - Two beeps which warn that you have not transmitted for an extended period. If you do not transmit within 5 seconds, the call is automatically terminated by the system. The time between transmissions is one of the parameters used by the system to detect the end of a call when the # character is not sent.

Conversation Time-Out Tone - Calls are limited to a certain length by the system. Thirty seconds before this time is reached, a "tick" begins sounding each second. When the 30-second time expires, the call is automatically terminated by the system.

Turn-Around Tone - This is a single beep which may be used to indicate to the landside party when to respond to your transmission. It sounds when you release the PTT switch, and you may partially hear this tone.

Proceed Tone - This tone consists of two beeps and it tells the landside caller when to enter the five-digit number specifying the mobile being called. Dialing of this number must be started within 5 seconds of hearing this tone, and a tone-type telephone must be used.

Display Messages

The following messages appear on the upper or lower line of the display to indicate various operating modes and error conditions. The group alpha tag appears in this area during normal operation.

ALL CALL - Indicates that a Multi-Net "All Call" special call is being received. This is a high-priority call to all mobiles assigned to a site. If another call is being received, it is dropped to receive this call.

BLK CALL - Indicates that the call is being received on a Multi-Net or LTR block ID code (see "Calls on Priority and Block ID Codes" on page 46).

BUSY - Indicates that the Multi-Net or LTR radio system is currently busy (see "Busy Tone" on page 54).

CG ON or OFF - Indicates that Call Guard squelch was just enabled or disabled by the CG option switch (see "Monitor Mode" on page 50).

DSBL BSY - Indicates that the transmitter is disabled by the conventional Transmit Disable On Busy feature (see page 51). It also indicates that the transmitter was keyed while receiving a Multi-Net or LTR call.

EMERGNCY - Indicates that the emergency switch has been pressed (see “Emergency Switch” on page 26).

FCN - Indicates that the function select mode is selected by the FCN option switch (see page 28).

GSCN DIS - Indicates that an attempt was made to delete a group from the scan list with group scanning disabled (see “Scan List Programming” on page 37).

IN QUEUE - Indicates that the call has been placed in queue by the Multi-Net or LTR Busy Queuing feature (see “Busy Queuing” on pages 43 and 48).

Model - The last seven digits of the transceiver part number are indicated very briefly on the top line of the display when transceiver power is turned on. This number indicates such things as frequency band, power output, and tier of the transceiver. The eighth digit is reserved and always “0”.

NO MULT - Indicates that an attempt was made to enable a Multi-Net feature on an LTR or conventional system.

NO POWER - Indicates that the transmitter temperature or supply voltage is excessive and that the transmitter has been automatically shut down. Release the PTT switch and allow the transmitter to cool. If the problem persists, contact your system operator for service.

NO PHONE - Indicates that the LTR system search mode could not locate any systems programmed for telephone calls (see page 49).

NO TALK - Indicates that talk-around has been disabled on the selected conventional system by programming (see “Talk-Around” on page 52).

NOT CONV - Indicates that an attempt was made to enable a conventional mode feature on a Multi-Net or LTR system.

OUT-LOCK - Indicates that the synthesizer is unlocked. Refer to “Transceiver Service” on page 62 for more information.

OUT-RNGE - Indicates that the transceiver was unable to contact a repeater. Once this indication appears, no more access attempts are made until the PTT switch is released and then pressed again. Refer to "Operation At Extended Range" on page 61 for more information.

PRI ON or OFF - Indicates that priority sampling was just enabled or disabled by the PRI option switch (see page 53).

PRIORTY1 or 2 - Indicates that a Multi-Net, LTR, or conventional call is being received on one of the priority ID codes or groups (see pages 46 and 53).

PROG ERR - Indicates an EEPROM read error. Refer to "Transceiver Service" on page 62 for more information.

ROAMING - Indicates that the transceiver is in the process of registering on another system (see "Roaming (Auto-Registration)" on page 44).

SQUELCH - Indicates that the conventional squelch adjust mode is selected (see "Setting Squelch Control" on page 18).

SYS SRCH - Indicates that the LTR System Search mode has been enabled (see page 49).

TA ON or OFF - Indicates that talk-around was just enabled or disabled by the TA option switch (see "Talk-Around" on page 52).

TIMEOUT - Indicates that the transmitter has been disabled by the Time-Out Timer (see page 31).

TX DSBL - Indicates that the selected conventional system is programmed for monitoring only (see "Receive-Only Groups" on page 51).

TX INHIB - Indicates that the transmitter has been disabled by the Transmit Inhibit feature (see page 47).

UI xxxx - This is the unique ID of the mobile transmitting the message you are receiving (See "Caller Identification" on page 46.)

Menu Mode Messages

The following messages are displayed in the menu mode that is described starting on page 32. “ON” is displayed to indicate enabled or yes, and “OFF” is displayed to indicate disabled or no.

BCKLHGT - Backlight control
- BRIGHT
- DIM
- OFF

BANK SEL - Bank select
- Bank alpha tag

CALL ID - Display unique ID
- ON or OFF

ENCRYPT - Encryption on-off
- ON or OFF

HRN ALRT - Horn alert on-off
- ON or OFF

OPTION - Option on-off
- ON or OFF

PRIORITY - Conventional priority group sampling
- ON or OFF

ROAMING - Roaming (auto-registration) on-off
- ON or OFF

SCN CONT - Scan continue on-off
- ON or OFF

SCN SAVE - Scan list save
- ON = save, OFF = not saved

SCN SEL - Single/multiple site scan select
- SGL SITE
- MLT SITE

SCN TYPE - Selects type of scanning
- SYS-GRP - Both system and group
- GRP ONLY - Group scanning only
- OFF - All scanning disabled

S/G DISPL - System/group display mode
- ALPHATAG
- NUMERIC

STATUS - Status message select
- NO STATUS - No status message transmitted
- Programmed status messages

STEALTH - Stealth mode select
- ON or OFF

SYS SRCH - LTR system search
- ON or OFF

TALKARND - Conventional talk-around on-off
- ON or OFF

TONES - Beep tones select
- SILENT - All tones disabled
- KEY BEEP - Only Select switch and key press tones sound
- ALERT - All tones sound except preceding Key Beeps sound
- ALL TONE - All the preceding tones sound

System Operator Programming

As noted several times in this manual, programming determines the availability and specific operation of many features. This 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 not controlled by a front panel option switch, it is fixed in the mode set by programming or not available. If you require additional information on the operation of a feature, contact your system operator.

Speaking Into Microphone

For best results, hold the microphone about 1-2 inches from your mouth and speak at a normal conversational level. Do not shout since it distorts your voice and does not increase range. 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. If the proceed tone is used, wait for that tone to sound before speaking (see description on page 30).

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 back-

ground 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.

Preventing Battery Discharge

In the standby mode (power on, not transmitting), transceiver power consumption is relatively low. Therefore, you can probably leave the transceiver on for one or two days without operating the vehicle and the battery should not become seriously discharged. However, if the outdoor temperature is low enough to significantly decrease battery capacity, the transceiver should be turned off when not in use.

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

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 your transceiver is not operating properly, “OUT-LOCK” or “PROG ERR” may be displayed. To attempt to clear this condition, turn power off and then on again to reset the control logic. Another indication that could be displayed is “NO POWER”. This indicates that transmitter temperature or supply voltage may be excessive. Release the PTT switch and allow the transceiver to cool, and make sure that the vehicle battery voltage is within the normal range.

Also make sure that the controls are properly set and that the power, external speaker (if used), and accessory (if used), cables are securely plugged into the back of the transceiver. If the transceiver still does not operate properly, return it to your system operator for service.

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