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# XL CONNECT SERIES PORTABLE RADIO USER'S GUIDE FOR P25

ECP-5137C

Lewis Padgett

# Wall Of Honor



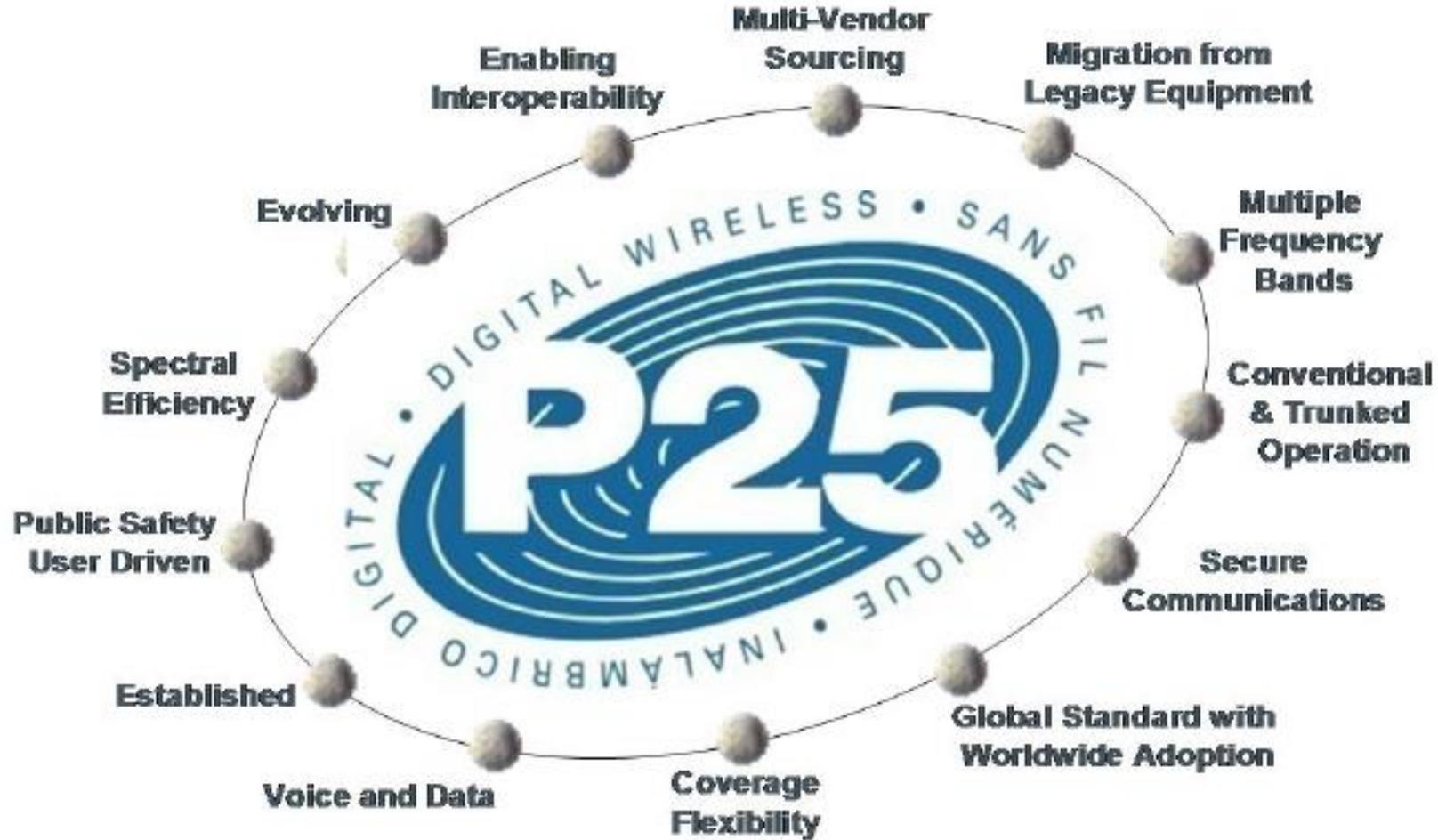
# Project 25



- Interoperable digital radio system standard
- Intended for all public safety LMR bands
- (VHF, UHF, and 700, 800 and 900 MHz)
- Developed Jointly by:
  - TIA- Telecommunications Industry Association
  - Association of Public-Safety Communications Officials (APCO)
  - National Association of State Telecommunications Directors (NASTD)
  - Various agencies of the Federal government (FED) in the early 90's to improve spectral efficiencies
- TIA/EIA Standard in 1999. Under TIA/EIA-102



# Project 25 Benefits



# Safety Items



- **DO NOT**...operate the portable radio near or in an area where blasting is taking place. Anyone using radio-controlled explosives must post signs. If you see a caution sign about blasting in the area, you must turn your radio off. This applies to any radio equipment capable of transmitting: phones, CB's, etc.



- **NOTE:** Substitution of any parts or the use of non-L3 Harris approved accessories may compromise this certification and pose an explosion hazard.

# XL-CONNECT PORTABLE BATTERY OPTIONS



**XK-PA3R/XN-PA3R  
(14002-0214-01)**  
Battery, Li-Ion, 3100 mAh (21WH)



**XK-PA3S/XN-PA3S  
(14002-0199-01)**  
AA Battery, Clamshell Battery Case

# Safety



- To ensure that user 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 a proper antenna.
- Do not hold the radio by the antenna when it is turned on.
- Do not transmit for more than 50% of the total radio use.
- When transmitting, keep the antenna at least 1.2 cm (.5 inches) away from the body and 2.5 cm (1 inch) from the face.
- For optimal portable radio performance, use the radio with the antenna in a vertical position, holding the radio 2 inches from the mouth while transmitting.



# Operating Rules And Regulations



- The Federal Communications Commission sets all rules for two-way radio use. The user of two-way radio equipment should be familiar with these basic rule requirements.
  - It is a violation of FCC rules to interrupt any distress or emergency message.
  - Any use of profane or obscene language is prohibited.
  - It is against the law to send false call letters or a false distress or emergency message.
  - All messages must be brief and limited to the business need.
  - It is a violation of FCC rules to send personal messages, unless in an emergency.

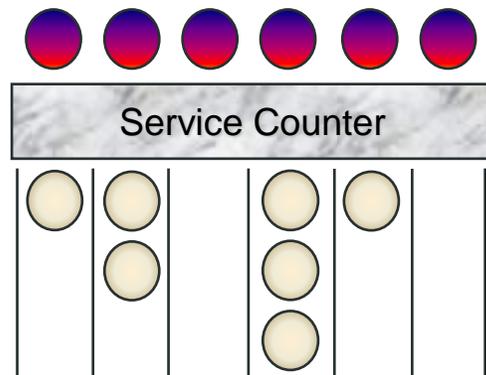


# Conventional vs. Trunked

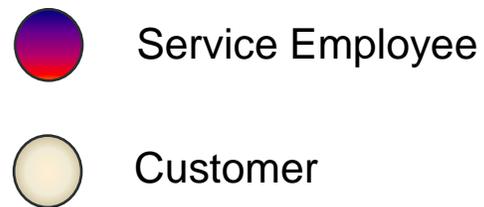
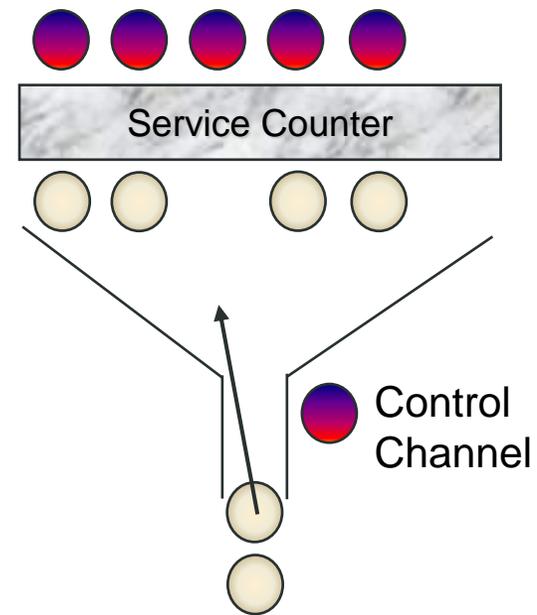


## Computerized Assignment of Channels

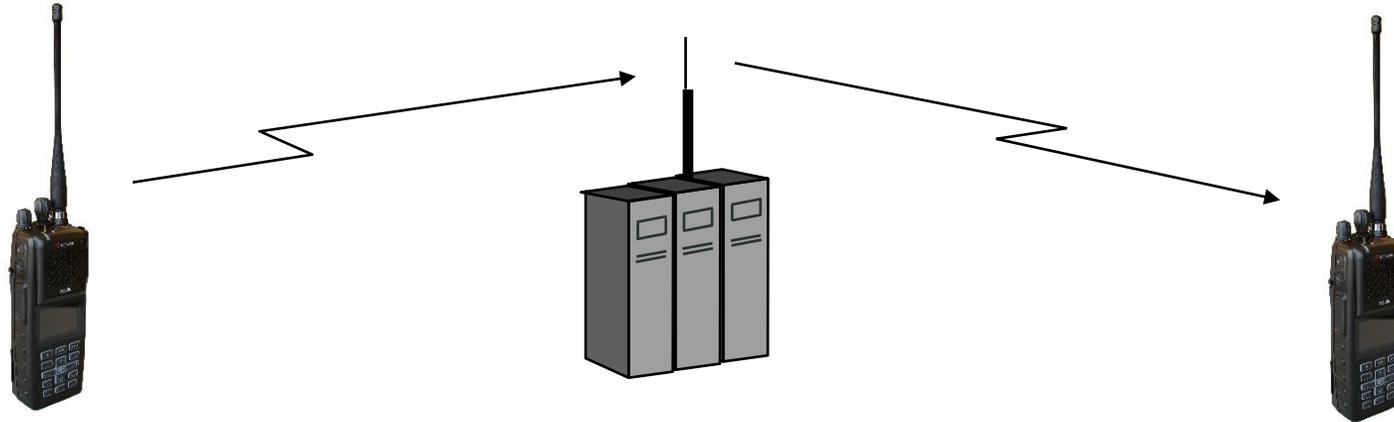
### Conventional



### Trunked



# Why P25 Trunking?



## Trunking:

- Improves spectral efficiency
- Relieves the user from managing the channel
- Encourages cross agency / shared communications
- Establishes communications privacy
- Encourages private communications
- Discourages eavesdropping by scanners
- Establishes “queuing” rather than “waiting”
- Enables priority use during busy times

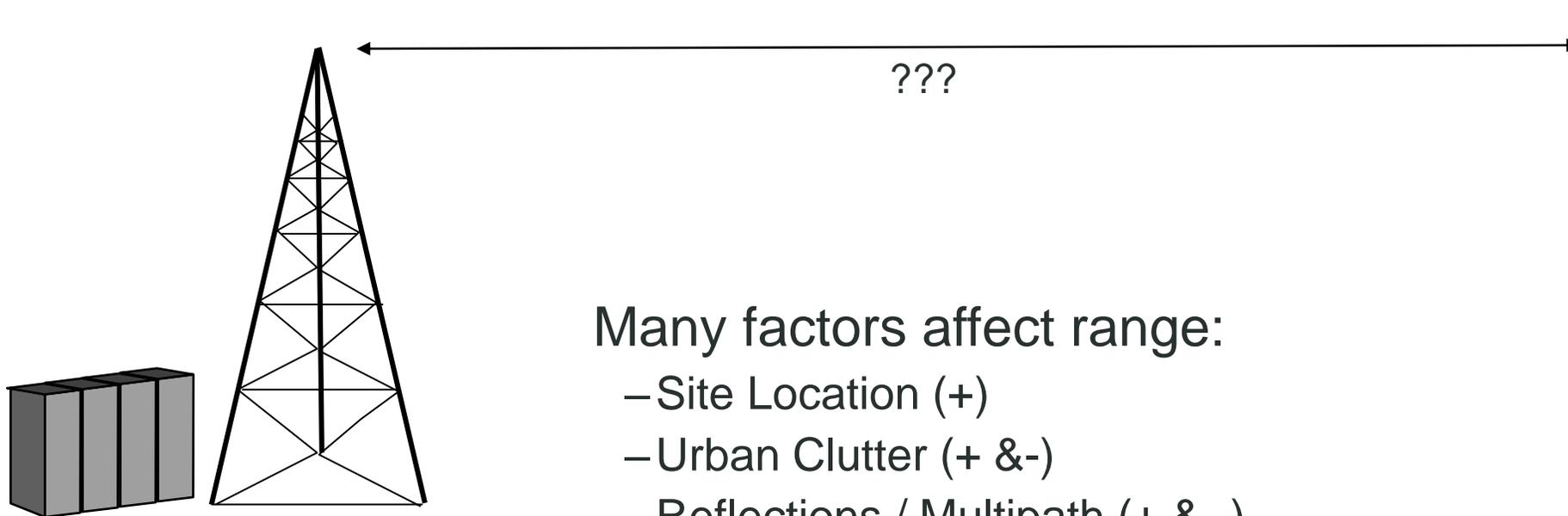
# P25 Trunking System Features



- Digital Control Channel
- Multiple Working Channels
- < 0.5 Second Access
- Group & Individual Voice Calls
- Unit ID for each radio
- Late or Delayed Entry
- Emergency Calls
- Queuing with Priority
- Unit Enable / Disable
- Wide Area Coverage
- And much more...



# Communication Range



## Many factors affect range:

- Site Location (+)
- Urban Clutter (+ & -)
- Reflections / Multipath (+ & -)
- Ducting over Water (+)
- Heavy vegetation (-)
- Frequency (+ & -)
- Earth Curvature (-)



# Multisite - What the Radios Do

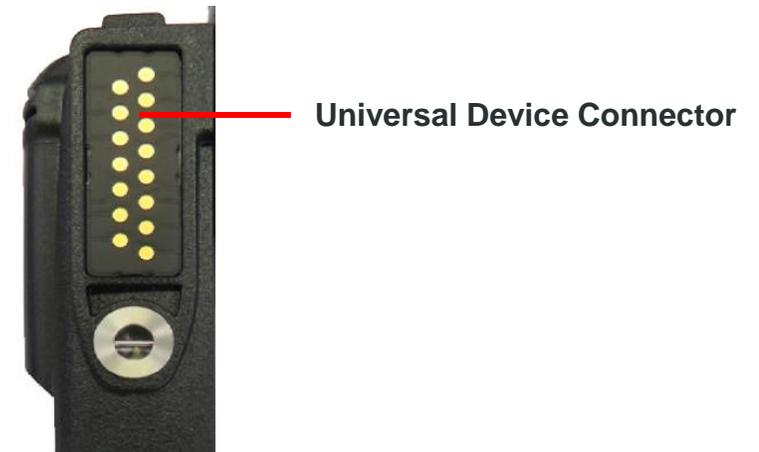


- Units inform the System of their location:
  - Each time the Radio is powered up
  - Each time a System selection is made
  - Each time a Group selection is made
- When Radio detects a high bit error rate on the Control Channel,
  - Radio will look for another site (algorithm pre-programmed in Radio)
  - Automatically switches to the new site when the criteria is met



# XL Connect Series Portable Radio Operation

# XL Connect Series Portable Radio Controls-Top and front/side views



# Radio Icons



	Analog Conventional System		P25 Conventional System		P25 Trunked System
	EDACS System		Zone		User Defined Zone
	(Blue) Trunked Signal Strength		Bluetooth Enabled		Monitor On
	(Red) TX Power		(Blue) Bluetooth Connected		VDOC
	(Green) Receive Signal Strength		Encryption Enabled		Receiving Data
	(No Color) Channel Idle		Global Encryption		Transmitting Data
	(Orange) Transmitting Encrypted		OTAR Disabled		Alert(s) Present
	Battery Fully Charged		OTAR Registered		Vote Scanning
	Battery Level 100% Capacity		OTAR Registering		Scanning Enabled
	Battery Level 75% Capacity		OTAR Rekeying		Emergency

	Battery Level 50% Capacity		Transmit Power Level High		RX Mail
	Battery Level 25% Capacity		Transmit Power Level Low		Noise Cancellation Enabled
	Battery Level 5% Capacity (Low Battery Audio Indicator)		RX Only		Fire Speaker Mic Attached
	Battery Level Battery Exhausted (RX-Only State)		Speaker Muted		Nuisance Channel
	Battery Charging		TX Disabled		Conventional Site Unregistered
	Talkaround Enabled		Tones Disabled		Conventional Site Registered
	Failsoft		PTT Disabled		Type 99 Enabled
	Wi-Fi Signal Strength Indicator		Wi-Fi Network in Process of Connecting		GPS Tracking
	Wi-Fi Network Currently Connected		Add New Wi-Fi Client		Wi-Fi Clients Connected
	A wearable Bluetooth device is attached [e.g., Self-Contained Breathing Apparatus (SCBA)]				

# Status Messages



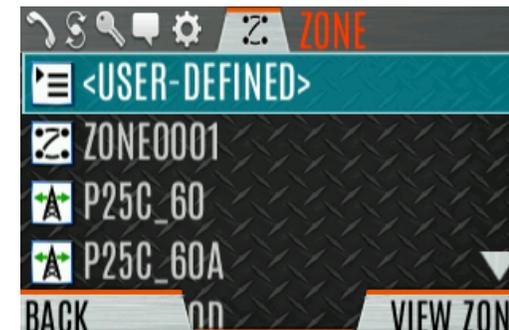
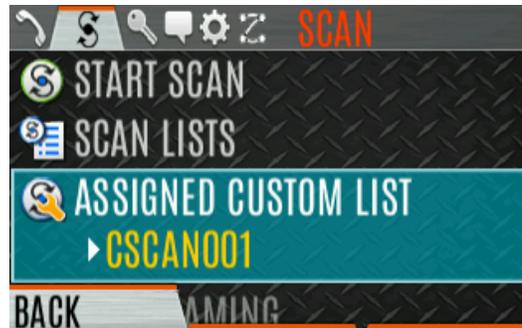
MESSAGE	DESCRIPTION
PTT DENIED	P25 Trunked and EDACS - The radio or talkgroup is not authorized to operate on the selected system and/or talkgroup.
CALL QUEUED	P25 Trunked and EDACS - The system has placed the call in a request queue.
SYSTEM BUSY	P25 Trunked and EDACS - The system is busy, no channels are currently available, the queue is full, or an individual call is being attempted to a radio that is currently transmitting.
SCANNING	The radio is scanning.
TX EMERGENCY	An emergency call is being transmitted.
RX EMERGENCY	An emergency call is being received. The radio displays the unit name or unit ID.
WIDE AREA SCAN	P25 Trunked and EDACS - The radio has entered the Wide Area Scan mode to search for a new system.
INVALID TALKGROUP	P25 Trunked and EDACS - The current talkgroup is not valid for the current system. This could happen if the site denies registration due to an unrecognized talkgroup ID.
INVALID UNIT	P25 Trunked and EDACS - The current unit is not valid for the current system.
REGISTERING	P25 Trunked only - Displayed when the radio is performing a registration/affiliation on a P25 trunking site.
CTRL CHANNEL SCAN	P25 Trunked and EDACS - The control channel is lost and the radio has entered the Control Channel Scan mode to search for the control channel (usually out of range indication).
BAND SCANNING	P25 Trunked - Only displayed if the system is configured for "EnhancedCC" mode of operation. When the radio cannot find a Control Channel in either the trunked frequency set or the list of discovered adjacencies, the radio can perform a full spectrum frequency scan to find a new Control Channel.
MISSED CALL	P25 Modes and EDACS - Another user has tried to call or page this radio. The user can view who the caller was by pressing the up navigation button.
OTAR REKEY COMPLETE	OTAR Rekey operation completed successfully.
USER REGISTRATION FAILED	User Login failed. Change selected system/zone or re-enter credentials.

# Menu Options (may vary based on programming)



Navigation Buttons

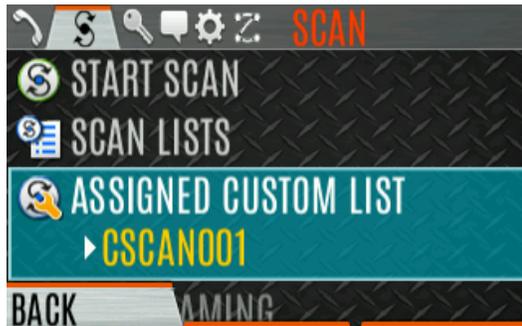
Menu / Select Button



# Menu-Call and Scan



CALL MENU:	
EXIT EMERGENCY MODE	Exits Emergency.
TALKAROUND MODE	Enable/Disable talkaround.
INDIVIDUAL CALL	Allows you to select an individual for an individual call.
CHANGE TLKGRP	Change the selected talkgroup.
PHONE CALL	Allows the user to initiate a telephone interconnect call.
CALL ALERT	Select a group for Call Alert transmission.
CHANNEL GUARD	Select the Transmit and/or Receive Channel Guard tone.
AUDIO PLAYBACK	Replays the last recorded call.
TONE ENCODE	Analog conventional only - Transmits a programmed tone sequence on the current radio system and channel.
T99 TOGGLE	Enable/disable T99.
EMERGENCY TIMER	Enable/disable the Emergency Check In Timer.
ACTIVE EMERG DISPLAY	Allows the radio user to see the units currently in emergency (up to 20) on the radio display.

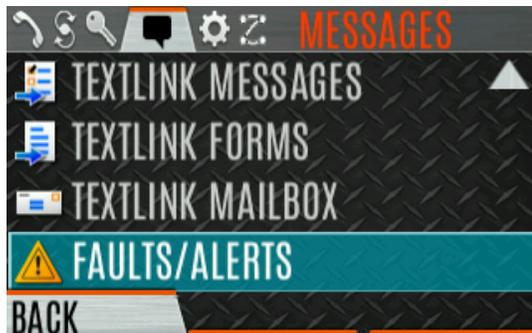


SCAN MENU:	
STAR SCAN/STOP SCAN	Start or stop scan operation.
SCAN LISTS	View/Edit available scan lists.
ASSIGNED CUSTOM LIST	Create, View, and Edit Custom Scan Lists.
SITE ROAMING	Enable/Disable Wide Area System Scan.
SITE ALIAS	Select an available site from this list to lock the radio to; i.e., prevent the radio from roaming. This is also known as Site Lock.

# Menu-Security and Messages

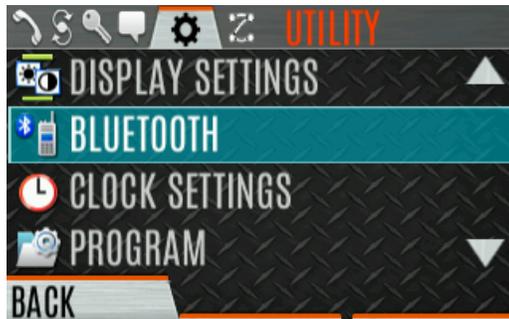


SECURITY MENU:	
ZEROIZE KEYS	Removes all encryption keys from the radio.
ENCRYPTION	Enable/Disable encryption.
GLOBAL ENCRYPTION	Enable/Disable Global Encryption.
GLOBAL KEY	Select the Global Key. Only available if Global Encryption is Enabled.
ACTIVE KEYSSET	Select the Active Keyset.
KEY LIST	View available key lists.
OTAR	Enable/disable Over-the-Air Rekeying (OTAR).
OTAR REKEY	Request that the KMF updates the keys in the radio.
ZEROIZE ALL	Removes all keystores from the radio.



MESSAGES MENU:	
RADIO STATUS	Used to send a status condition to the site without making a voice call.
RADIO MESSAGE	Used to send a message to the site without making a voice call.
TEXTLINK MESSAGES	Allows the user to send a Radio TextLink message.
TEXTLINK FORMS	Allows the user to send a Radio TextLink form.
TEXTLINK MAILBOX	Contains received Radio TextLink messages.
FAULTS/ALERTS	Displays radio faults and alerts.

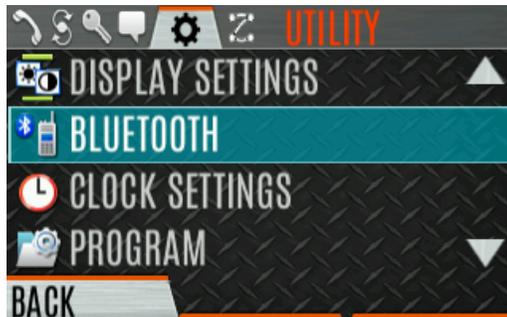
# Menu-Utility



UTILITY MENU:	
AUDIO SETTINGS:	
• SPEAKER	Mute or unmute the speaker audio.
• NOISE CANCELLATION	Enable or disable Noise Cancellation. See Section 4.16.
• PTT	Enable or disable Push-To-Talk (PTT). Disable PTT to prevent accidental keying, such as when radio is in the holster or you are getting into a car.
• TONES	Enable or disable radio side tones.
• KEYPAD TONES	Enable or disable tones that sound when the radio's keypad buttons are pressed.
• VOICE ANNUNCIATION	Enable or disable Voice Annunciation.

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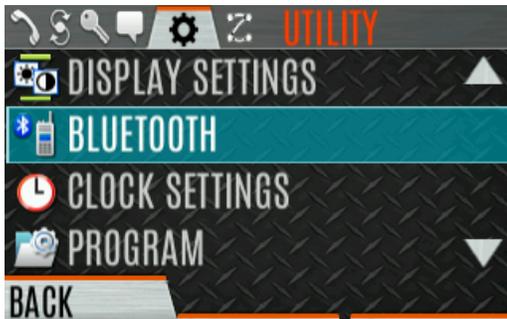
# Menu-Utility (Continued)



UTILITY MENU:	
DISPLAY SETTINGS:	
• COLOR SCHEME	Press the Menu/Select button to toggle the front and top display's COLOR SCHEME for optimum visibility in day or night conditions (NORMAL or INVERTED).
• INDICATOR LED	Press the Menu/Select button to toggle the indicator LED ON or OFF.
• FRONT BACKLIGHT	Press the Menu/Select button to toggle the front display backlighting between ON/OFF/MOMENTARY/MOMENTARY (OFF).
• FRONT BRIGHTNESS	Press the left or right navigation buttons to dim or brighten the display.
• FRONT TIMEOUT	When the FRONT BACKLIGHT setting is MOMENTARY, this value specifies how long the radio needs to be inactive before the front display's backlight turns off. Press the left or right navigation buttons to change the time in 0.5 second increments.
• FRONT DISPLAY OFF	Turns the front display off completely. Press the Menu/Select button to turn the front display back on. When the front display is turned off, the only button functions that are allowed are: <ul style="list-style-type: none"><li>• PTT</li><li>• Emergency</li><li>• Toggle Profile</li><li>• Flashlight</li><li>• Toggle Stealth</li><li>• Channel Up</li><li>• Channel Down</li><li>• Volume Up</li><li>• Volume Down</li></ul>

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# Menu-Utility (Continued)



UTILITY MENU:	
<b>BLUETOOTH:</b> <ul style="list-style-type: none"> <li>• ENABLED</li> <li>• DISCOVERABLE</li> <li>• VOLUME CONTROL</li> <li>• BLUETOOTH SPEAKER</li> <li>• EXTERNAL SPEAKER</li> <li>• PAIRING MGMT</li> </ul>	<p>Enable/disable Bluetooth.</p> <p>YES or NO</p> <p>If YES, the radio knob can be used to adjust Bluetooth speaker volume (if the Bluetooth device supports it).</p> <p>Mute/Unmute Bluetooth Speaker.</p> <p>Mute/Unmute External Speaker.</p> <p>Pair Bluetooth devices with the radio.</p>
<b>CLOCK SETTINGS:</b> <ul style="list-style-type: none"> <li>• TIME FORMAT</li> <li>• TIME ZONE</li> </ul>	<p>Select 12-hour, 12-hour with date toggle, 24-hour, or 24-hour with date toggle time display format.</p> <p>Set time zone relative to Universal Time Coordinated (UTC).</p>
<b>GPS SETTINGS:</b> <ul style="list-style-type: none"> <li>• GPS</li> <li>• POSITION INFO</li> <li>• ANGULAR UNITS</li> <li>• LINEAR UNITS</li> <li>• POSITION FORMAT</li> <li>• SA OVER NETWORK</li> </ul>	<p>Enable/disable GPS.</p> <p>Displays GPS, Latitude, Longitude, and Altitude information. From this menu, click NEXT to access SA INFO.</p> <p>Set unit of measurement of displayed angular units: CARDINAL, DEGREES, or MILS.</p> <p>Set unit of measurement of displayed linear units: STATUTE, METRIC, or NAUTICAL.</p> <p>Set format of displayed position information: Latitude/Longitude Decimal Degrees (LAT LONG DD), Latitude/Longitude Degrees Minutes Seconds (LAT/LONG DMS), LAT/LONG DM, Military Grid Reference System (MGRS), or Universal Transverse Mercator (UTM).</p> <p>When Enabled, the radio sends GPS data to a L3Harris-supplied PC client using RNDIS networking.</p>

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# Menu-Utility (Continued)



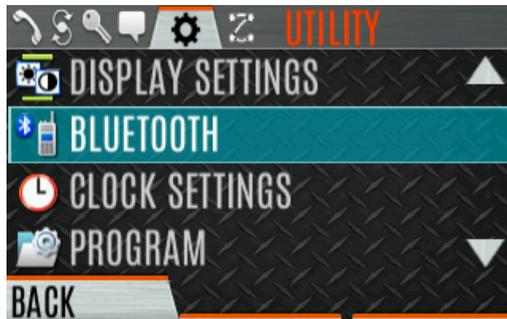
Password Protected

UTILITY MENU:	
PROGRAM: <ul style="list-style-type: none"> <li>• ACTIVATE PLAN</li> <li>• PROFILES</li> </ul>	View/Activate a personality. Change current profile.
MAINTENANCE: <ul style="list-style-type: none"> <li>• BATTERY INFO</li> <li>• RADIO INFO</li> <li>• TESTS</li> <li>• PH2 LC DISPLAY</li> <li>• DISPLAY RSS</li> <li>• TCXO TUNING</li> <li>• FEATURE INFO</li> </ul>	When a smart battery is attached, displays detailed battery status information. When a regular battery is attached, displays battery voltage. Displays radio information, i.e., ESN, software revisions, and firmware revisions. Allows service personnel to run radio tests. For field service use only. When enabled, RSSI is displayed on the RSSI screen and in the bottom of the idle display. -130 dBm is displayed when there is no received signal. For field service personnel only. Improper adjustment will result in loss of communications. Displays what features are enabled on your radio.
WIFI CLIENT: <ul style="list-style-type: none"> <li>• POWER ON</li> <li>• ADD NEW</li> </ul>	Displays the list of available Wi-Fi clients and the status of Wi-Fi Connection (a question mark indicates the Wi-Fi network is in the process of connecting; a check mark indicates the Wi-Fi Network is connected). Turn Wi-Fi on/off. Displays the list of Trusted Wi-Fi Networks and is populated when Wi-Fi is powered on. You can view, add, modify, and remove a Wi-Fi Network.

Passwords for the TCXO and Tests should not be enabled for operators.  
 This is reserved for maintenance personnel.  
**Adjusting these values will make your radio inoperable!**

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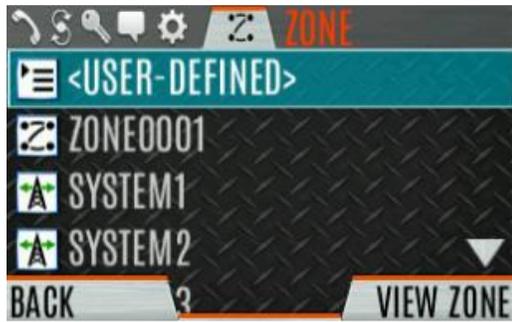
# Menu-Utility (Continued)



UTILITY MENU:	
<b>WIFI ACCESS POINT:</b> <ul style="list-style-type: none"> <li>• POWER</li> <li>• CLIENT COUNT</li> </ul>	Power Wi-Fi On/Off. When the radio is configured as a Wi-Fi access point, displays the number of connected clients. Selecting CLIENT COUNT will display the MAC addresses of connected clients.
ICON GLOSSARY	Defines icons displayed by the radio.
<b>USER LOGIN</b> <ul style="list-style-type: none"> <li>• SYSTEM ID</li> <li>• UNIT ID</li> <li>• PASSWORD</li> </ul>	Enables the radio user to login. Allows the radio user to enter/change the System ID for user login. Allows the radio user to enter/change the User ID for user login. Allows the radio user to enter the login password for user login.
DEVICE MANAGEMENT	Allows the user to check for and install updates from the L3Harris Device Management application over Wi-Fi.
INSTALL GPP SOFTWARE	Select a GPP package to install.
CHANGE LANGUAGE	Press the up or down navigation buttons until the desired language is highlighted and then press Menu/Select button.
CHANGE PIN	Allows you to change your PIN.

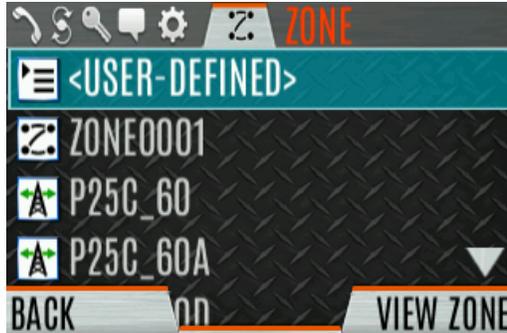
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# Menu - Zone



ZONE MENU:	
ZONE MENU	View or change zones/systems

# Menu-Zone



SYSTEM Icon



(Up to 512 Systems per personality)

ZONE Icon

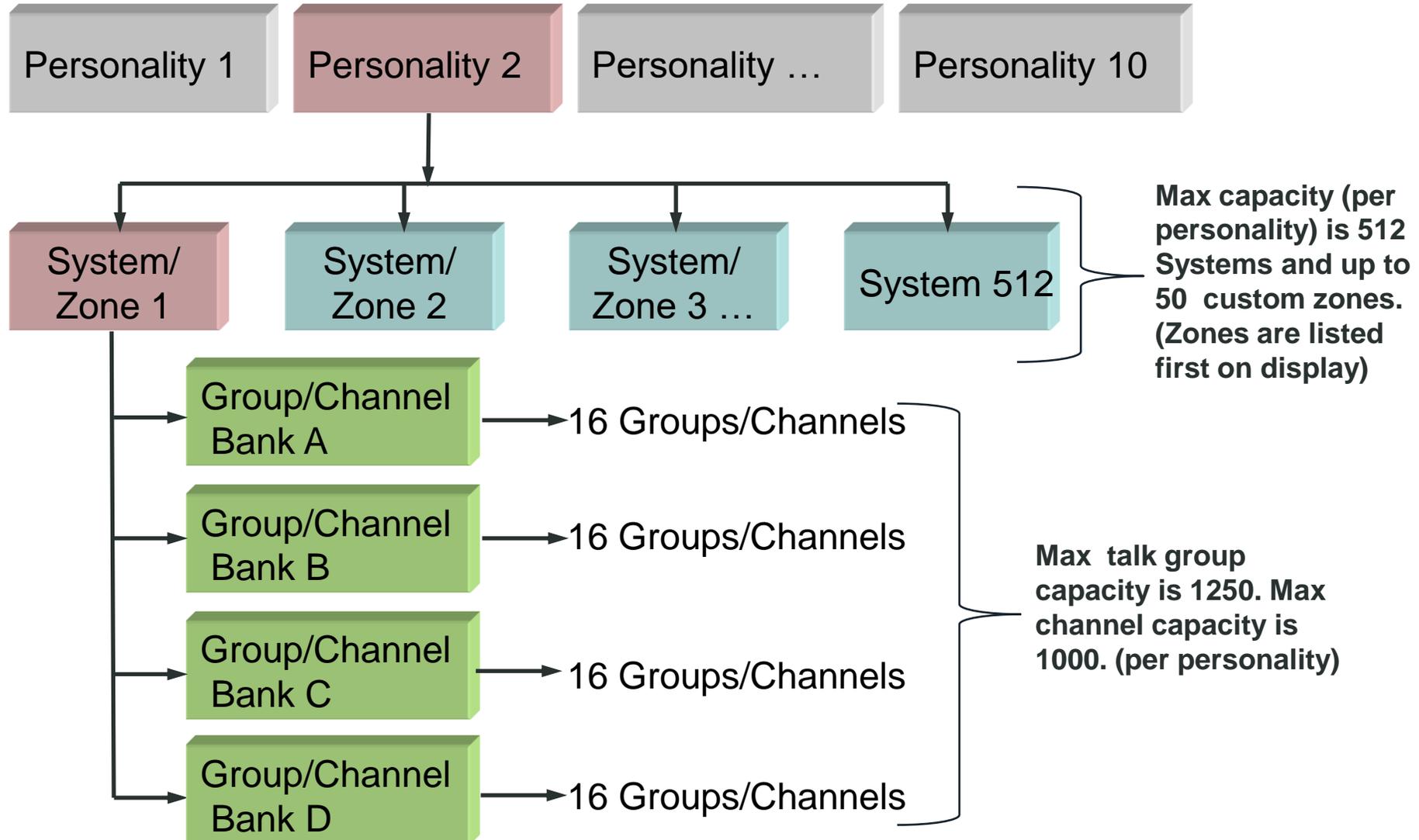


(Up to 50 Zones per personality)

## Systems and Zones

- A P25 Trunked “System” contains talkgroups that are associated with a unique Wide Area Communications Network (WACN). A Conventional “System” will contain channels associated with a specific system.
- Zones are collections of talkgroups and/or channels that are taken out of one or more systems in the radio, and placed into a custom zone(s). Groups or channels that make up zone(s), will always be found in one or more of the systems that are in that radio’s personality.
- Note that the top icon in the example above shows the “User Defined Zone” which may or many not be permitted based on programming. If permitted, the radio user is allowed to create and save their own zone from the available systems.

# Mission Planning



# Keypad Lock, Radio Lock



- There are two levels of locking the radio. Keypad Lock only locks the navigation keys, programmable soft keys, and keypad. Radio Lock disables all physical keys and knobs except:
  - The 3 Position Switch
  - PTT
  - Emergency Button
  - Any User Programmable Button (UPB) programmed for Monitor/Clear (needed in order to clear an emergency if allowed)
- The ABC switch or a button on the radio can be programmed to lock the keypad/radio. If the keypad was locked via a switch, moving the switch to another position will unlock the keypad. If locked via a button, the navigation keys must be used to enter the unlock sequence of Left, Right, Up, Down.

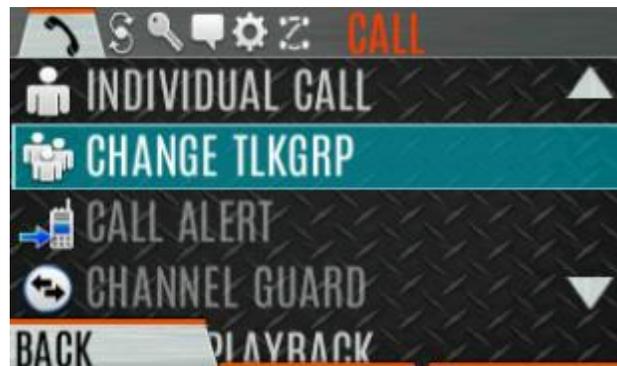


Keypad  
Lock

# Transmit a Group Call



- Turn the Group Select Knob to the desired group, then PTT. Wait for the “Grant Tone.” Once tone is received, speak directly into the mic from a distance of no more than 2-3”. Stop speaking and then release the PTT.
- A button on the radio can be programmed for Direct Channel Entry to allow the user to enter the group number, then PTT to transmit.
- In P25Conv, the group for the selected channel may be overridden as follows:
  - Press the Menu/Select button to access the main menu.
  - Press ◀ or ▶ to display the CALL menu.
  - Press ▲ or ▼ to highlight the “CHANGE TLKGRP” and press the Select button.
  - Press ◀ or ▶ to highlight the desired group and press the Select button. After selecting the new group, the radio returns to the main screen, then PTT to transmit.



# TX Techniques for Effective Communications



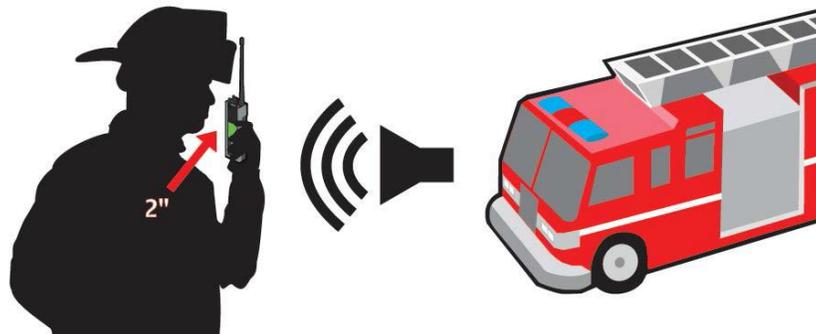
- P25 radios communicate in a digital format. Voices will sound different than when communicating in analog mode. It is essential that the following procedures be followed for effective communications to occur.
- In order to communicate, your radio must be registered on the network. A radio showing “CCSCAN” is NOT registered on the system and is unable to be used on the trunked system. Once the radio is registered successfully, the target group will show on the display screen. Always check to make sure you are targeting the correct group BEFORE you depress the PTT button.
- If you are in a noisy environment, turn on Noise Cancellation.
- When you are ready to transmit, depress the PTT and WAIT for the grant tone. This is the signal that the system is ready to accept your voice. Speaking prior to the grant tone will result in a “clipped” transmission and your group will not hear your first syllables.
- When you hear the grant tone, speak clearly, and forcefully into the primary mic(s) of the radio from a distance of 2-3 inches (5-8 cm) Transmissions should be brief and to-the-point, as many users are sharing the same limited resources.
- After you have spoken your last word, release the PTT.



# Noise Cancellation (NC)



- NC allows clear voice quality in high-noise environments. It can be used in any mode including analog and digital systems.
- The XL Connect Series portable radio has two microphones: 1 located at the top (primary) and one on the back (secondary). When NC is enabled, voice is picked up by the top right mic and noise is picked up by the back mic.
- If a speaker mic is attached, the speaker mic is the primary mic used for voice and the top right is used for noise. The other mics are disabled. If the back mic is blocked (when no speaker mic attached), the radio will function as though NC is turned off.
- When using NC, (if possible) face the noise source and speak clearly and loudly into the mic from a distance of no more than 2 inches (5 cm).



Primary mic (no speaker mic) for NC



NC mic



# Receiving a Group Call

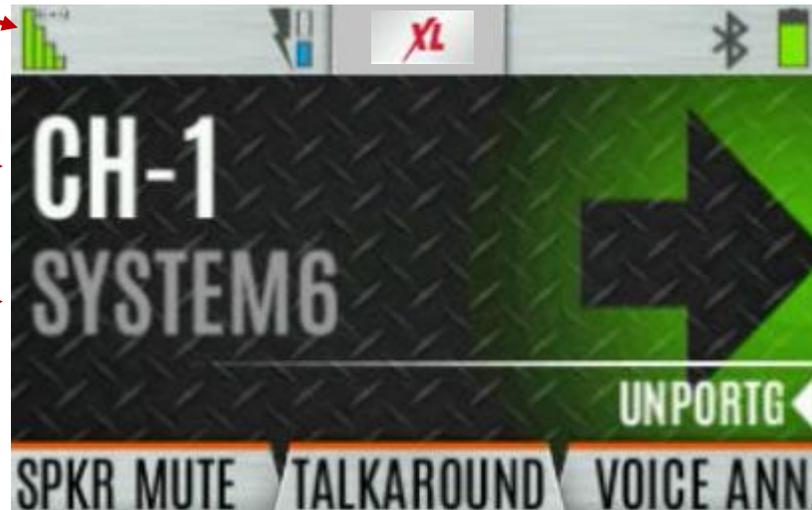


- When receiving a group call, the status area of the idle display toggles between the Unit Name and the Group Name of the transmitting radio. Note that if either of those names is not programmed the corresponding ID number is displayed.

RX Signal Strength  
Green (conv) or  
Blue (trunked)

Talk Group  
or Channel

System



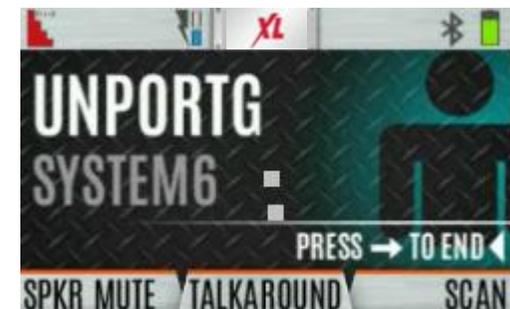
RX Symbol  
and color

Transmitting  
radio ID

# Transmit an Individual Call (I-Call)



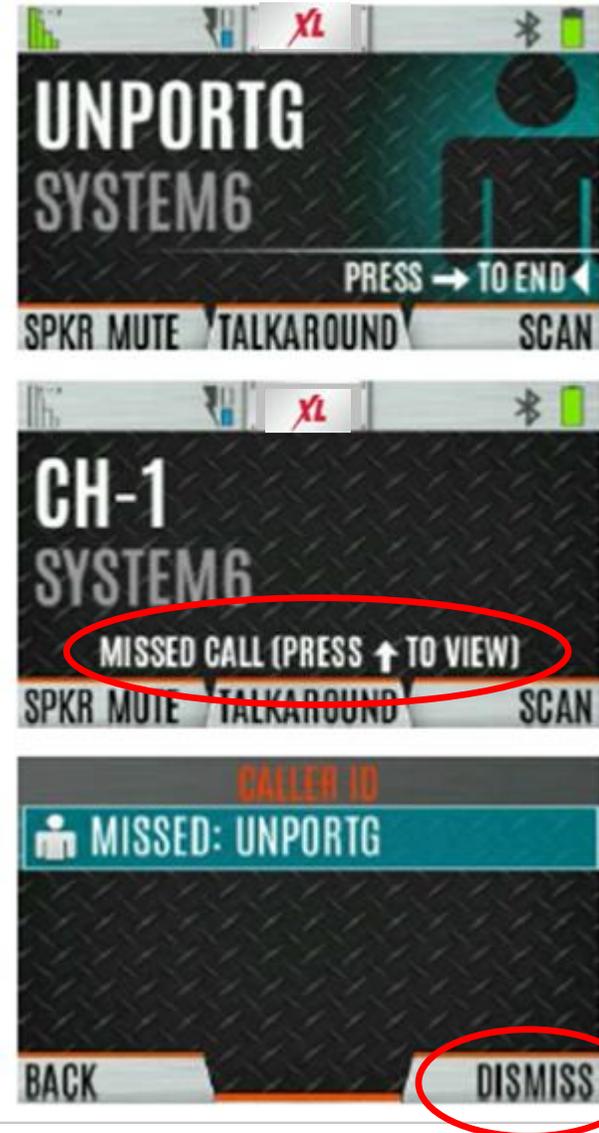
- An I-Call is used to make a call to one radio as opposed to a group of radios. An I-Call can only be made on a digital group system and these calls are typically recorded just like regular group calls.
  - Press the Menu/Select button to access the main menu.
  - Press ◀ or ▶ to display the CALL menu.
  - Press ▲ or ▼ to highlight INDIVIDUAL CALL and press the Menu/Select button.
  - Press ◀ or ▶ to highlight the Unit to call and press the Menu/Select button, or select “KEYPAD” to direct enter the Unit ID.
- PTT to make the call. When TX an I-Call, the radio displays the called radio’s ID. If the radio shows “CALL QUEUED”, the target radio is not yet available, or, the callee has rejected the call.
- After the radio answers, PTT to respond.
- Press ▶ to end call, or simply don’t respond. After a short period of inactivity, the radio will automatically disengage from the I-Call.



# Receiving an I-Call



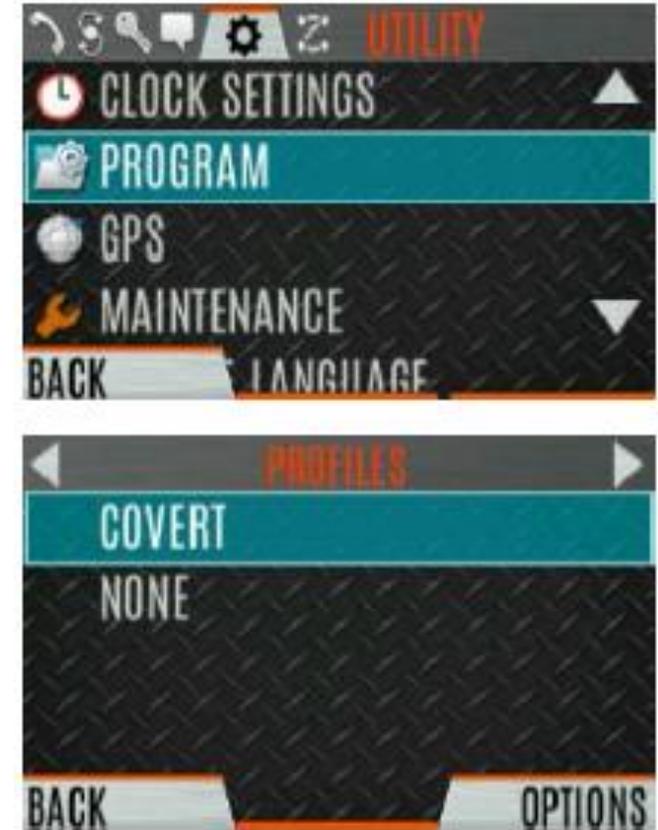
- When receiving an I-Call, the radio displays the calling radio's name or Unit ID. The radio will also display "PRESS ⇌ TO END".
- Press PTT to respond or ▶ to END/REJECT the call. How long the radio remains in the I-Call with no activity depends upon programming.
- The radio rings and indicates a missed call if you do not respond. The ring sounds until you press the PTT, view the missed call menu, change channel/group/system, or power cycle the radio.
- On the missed call screen, press the DISMISS soft key to clear the entry.



# Covert Profile



- This radio supports a Covert profile. To change the currently selected Profile:
  - Press the Menu/Select button to access the main menu.
  - Press ◀ or ▶ to display the UTILITY menu.
  - Press ▲ or ▼ to highlight PROGRAM and press the Menu/Select button.
  - Press ▶ until the PROFILES menu is displayed.
  - Press ▲ or ▼ to select the desired Profile (COVERT or NONE) and press the Menu/Select button.
- When the Covert Profile is selected, the following attributes apply:
  - Speaker enabled
  - All tones disabled
  - Voice Annunciation disabled
  - All lights disabled
  - All other attributes of the radio are unaffected
- Additional profiles can be created for the radio to turn on and off additional options.
- Profiles can also be programmed to a specific key to toggle On & Off.



# Enable/Disable Encryption



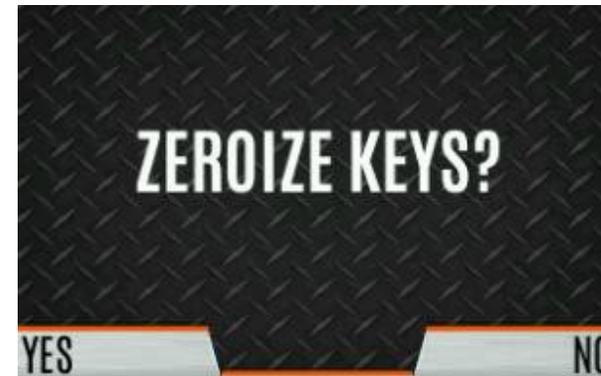
- A switch or button can be programmed to enable/disable encryption, or, encryption can be controlled via the Security Menu.
  - Press the Menu/Select button.
  - Use the ◀ or ▶ button to highlight and select SECURITY.
  - Use the ▲ or ▼ button to highlight ENCRYPTION.
  - Toggle encryption enabled/disabled using the Menu/Select button.
- If a switch is programmed for encryption on/off, this field will be greyed out.
- If the radio's personality has set encryption to "Forced On" NO manual control of encryption will be allowed.
  
- NOTE: When encryption is turned on at the radio, but the group/channel being used is not configured for encryption, the radio will allow PTT and the signal is transmitted unencrypted.
- Global Encryption refers to a single user-defined key being selected for all encrypted calls.



# Zeroize Keys from Radio



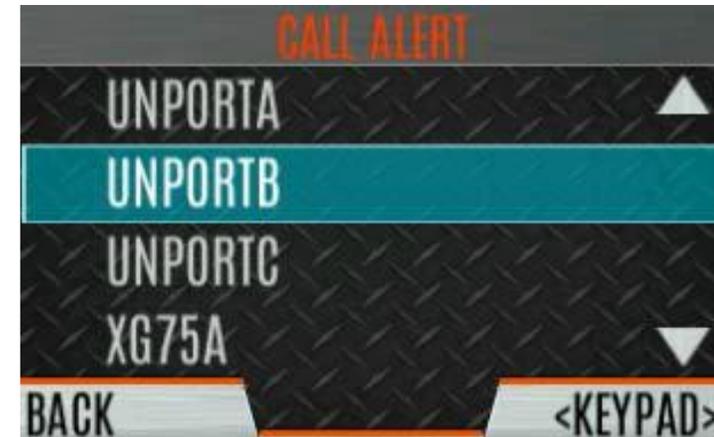
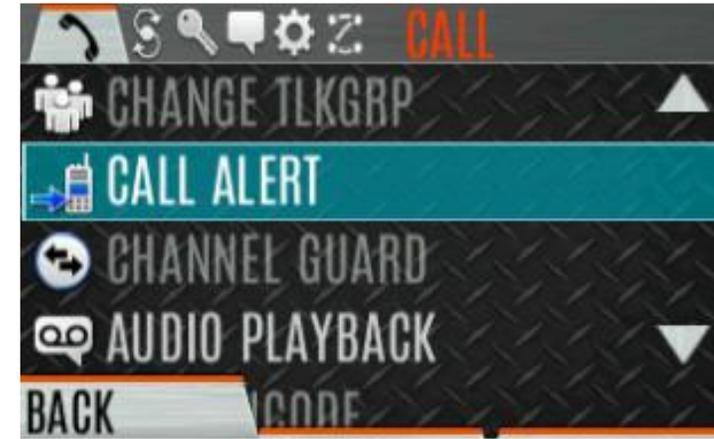
- It may occasionally be necessary to remove all encryption keys from the radio because of compromise or expiration. To zeroize the keys:
  - Press the Menu/Select button to access main menu.
  - Navigate to the SECURITY menu.
  - Scroll to highlight ZEROIZE KEYS and press Menu/Select to trigger.
  - Press the YES soft key to remove all keys and keysets.
- NOTE: Once a radio is zeroized, a crypto-officer will have to load a new unique key encryption key before the radio can rekey over-the-air.



# Call Alert (Paging a Radio)



- Press the Menu/Select button to access the main menu.
  - Press ◀ or ▶ to display Call menu.
  - Press ▲ or ▼ to highlight CALL ALERT and press the Menu/Select button.
  - Press ▲ or ▼ to highlight the Unit to call and press the Menu/Select button, or select “KEYPAD” to enter the Unit ID directly.
  - PTT to send the Page.
- When receiving a Call Alert, the radio displays the radio’s name or Unit ID.
- The radio rings to indicate a missed page. The ring sounds continuously until you press PTT, the CLR MISSED soft key, change group/system, or turn radio off/on.



# Audio Playback



- The Audio Playback feature allows the user to playback a previously recorded call. Recordings are stored in volatile memory and will not remain after the radio is turned off. The radio stores the last five (5) recorded calls, up to 1 minute each.
- A button can be programmed to replay the last recorded call. To replay:
- Press the button for playback. The last call received will be played each time the button is pressed.
- Additional incoming calls will be recorded in the background, but pressing the button will only play the captured call until reset.
- To reset and allow a new call to be captured, press and hold the button until you hear a two-tone chirp. The radio will now capture the next incoming call.
- To playback one of the last five calls received, open the main menu, go to the CALL menu, select AUDIO PLAYBACK and press the Menu/Select button. Select the desired call from the list. (most recent is on top) Press the select button (or the button used for replay) and call will be replayed. If no button on the radio is programmed for playback, you must go back to the menu each time you want to replay a call.
- NOTE: An incoming call will automatically preempt the playback audio.



# Scanning



# Scan Terminology

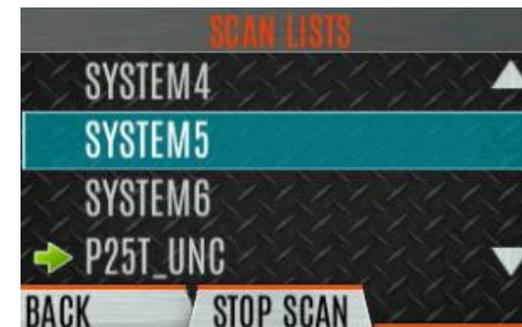
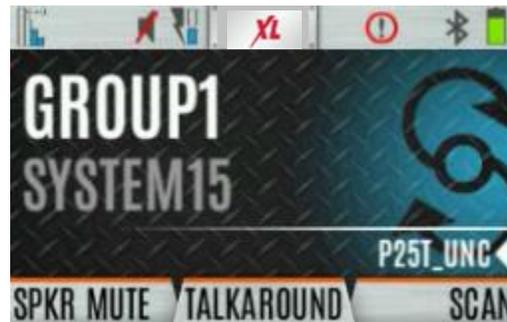
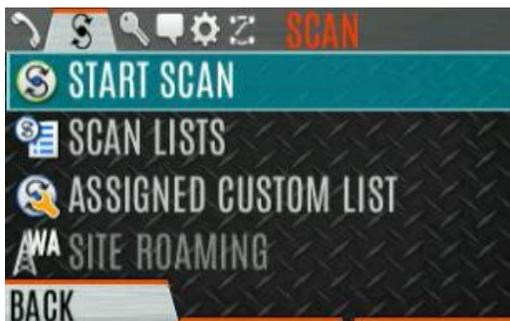


- **Default Channel:** This is the currently selected group/channel on the radio. While scanning, this is the group that will receive the transmission when the PTT is pressed. If desired, the radio can be programmed to respond on a scanned group, provided the user PTTs before a timer expires.
- **Priority 1 (P1) Channel/Group:** This channel will be scanned more often than other channels in the list and will be scanned in between every other channel on the scan list. The radio will ignore other audio (even from the selected group) if there is activity on the P1 group/channel.
- **Priority 2 (P2) Channel/Group:** This channel will be scanned more often than other groups (with the exception of P1). P1 activity preempts all other activity on a radio.
- **Trunked/Conventional Scanning:** This radio is capable of scanning multiple conventional and/or P25 Conventional channels while maintaining P25 Trunked radio operation. The radio will scan a conventional scan list while still connected to a P25 Control Channel and receiving calls.
- **NOTE:** Conv scan lists are set up in programming, but some users may be allowed to edit list manually. Due to the complexity of this operation, it is recommended that no more than 8 conventional channels be scanned.

# Scanning- Start/Stop



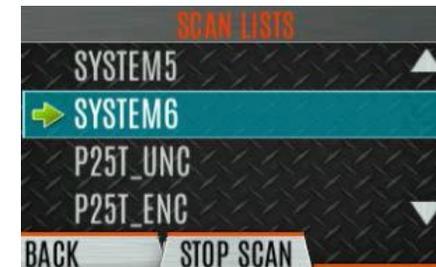
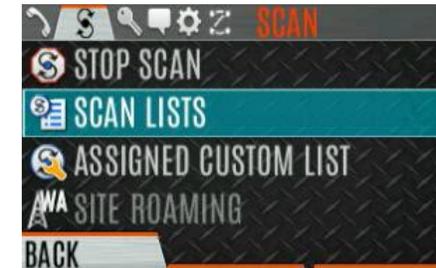
- Start/Stop Scan can be triggered from the menu, from a soft key, or from a dedicated switch depending on programming. If a switch is used, the menu's start/stop control will be disabled. To use the menu when there is a single system:
  - Press the Menu/Select button to access the main menu.
  - Move to the SCAN menu.
  - Press the ◀ or ▶ to highlight START SCAN and press the menu/select button. START SCAN text on the menu will change to STOP SCAN.
  - Press the BACK soft key to exit the scan menu.
- NOTE: Scan icon is now displayed on idle home display.
- For radios with multiple systems (multiple scan lists), go to the main menu and select the scan menu. Go to SCAN LISTS and use the directional arrows to highlight the desired system. Press the START SCAN soft key.



# Edit Scan List



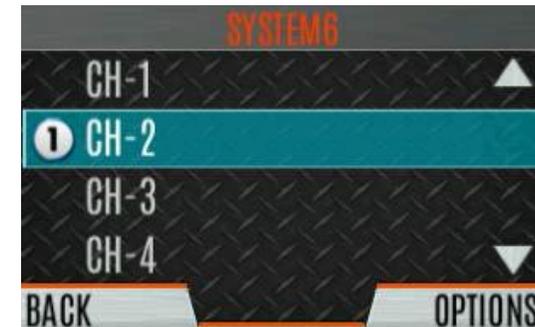
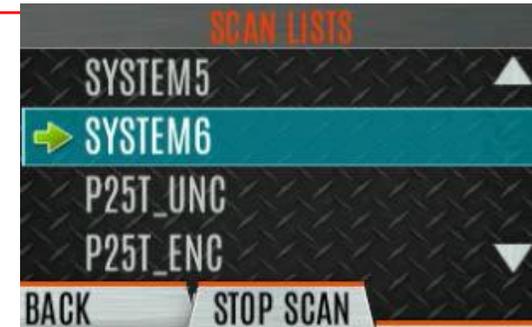
- Depending on programming, the user may be able to edit the scan list(s). If allowed:
  - Press Menu/Select.
  - Navigate to SCAN menu.
  - Navigate to SCAN LISTS.
  - Highlight the desired list and press Menu/Select.
  - Navigate to the desired channel/group.
  - Select OPTIONS and navigate to:
    - ADD CHAN/DELETE CHAN
    - SET PRI1
    - SET PRI2
    - REMOVE PRI
    - NUISANCE/ADD BACK
  - Press Menu/Select to make selection.
- NOTE: When a channel/group is greyed out, it is NOT on the scan list and ADD CHAN appears. If the channel/group is in normal font, it is on the current scan list and DELETE CHAN appears.



# Edit Scan Priority Settings



- Depending on programming, the radio user may, or may not be able to edit the priority levels for scanning.
- If allowed, follow these steps:
  - Press the Menu/Select button.
  - Navigate to the SCAN menu.
  - Navigate to SCAN LISTS and press Menu/Select once the desired system is highlighted.
  - Navigate to the desired group/channel.
  - Select Options and edit priority setting.

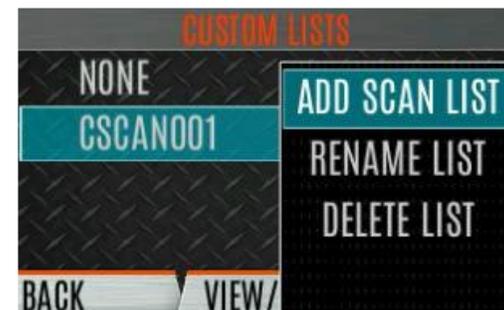
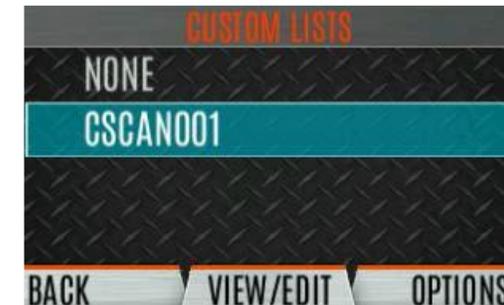
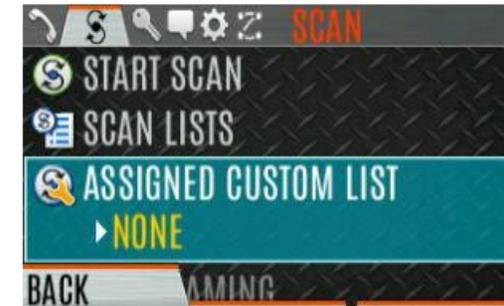


# Mixed Zone (MZ)/Custom Scan (CS) List



- The MZ Scan feature allows the radio to scan across groups from multiple systems including P25, P25 Conventional and Analog. MZ Scan lists must be programmed using RPM2 software. Up to 50 MZ lists can be defined. They cannot be edited by the user.
- If allowed by programming, a custom scan list can be created by the user. The radio can support up to 10 CS lists with up to 100 groups/channels in each.
- To create a CS list:
  - Press the Menu/Select button.
  - Navigate to the SCAN menu.
  - Navigate to highlight ASSIGNED CUSTOM LIST and press Menu/Select.
  - Press the OPTIONS soft key.
  - Select ADD SCAN LIST.
  - Navigate to the newly created scan list and press the VIEW/EDIT soft key.
  - Navigate to the desired system and highlight the target groups/channels. Press the OPTIONS soft key to add/delete/assign priorities.

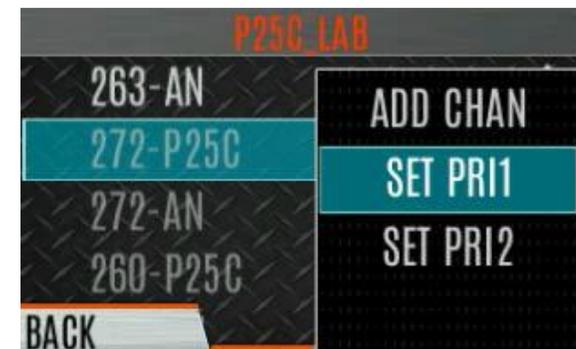
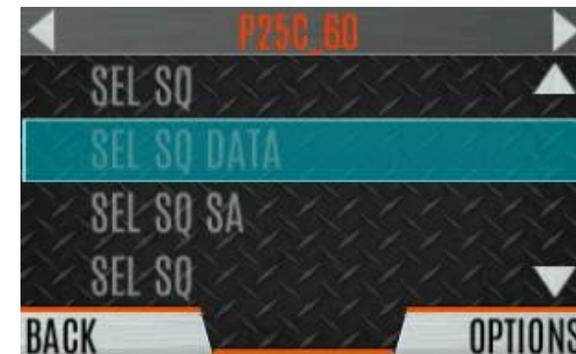
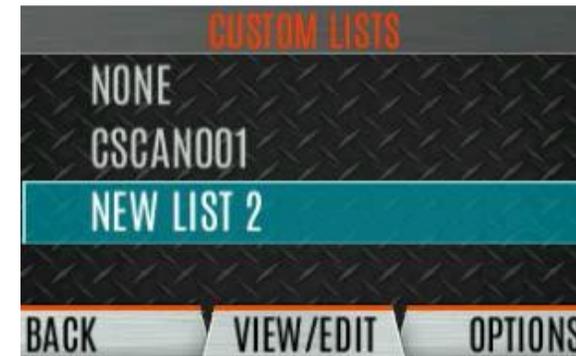
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# Mixed Zone (MZ)/Custom Scan (CS) List



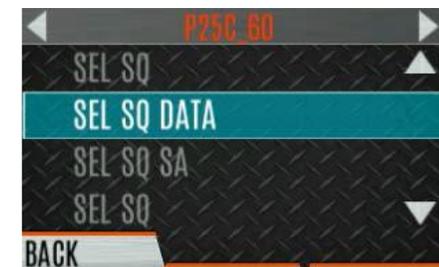
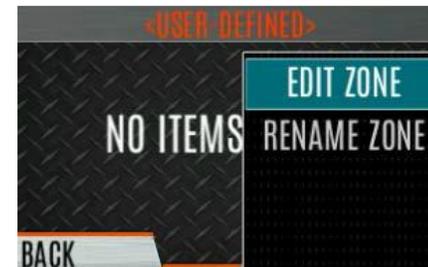
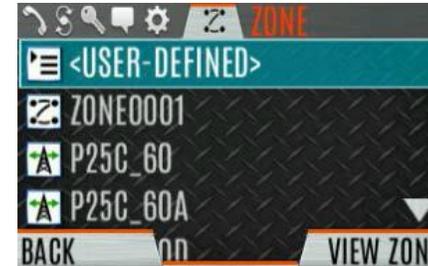
- (continued)
  - Navigate to the newly created scan list and press the VIEW/EDIT soft key.
  - Navigate to the desired system and highlight the target groups/channels. Press the OPTIONS soft key to add/delete/assign priorities.
- NOTE: When a CS list is selected, that list is scanned any time scanning is enabled. To scan only the groups/channels assigned to a particular system, CS must be turned off.



# User Defined-Command Tactical Zone (CTZ)



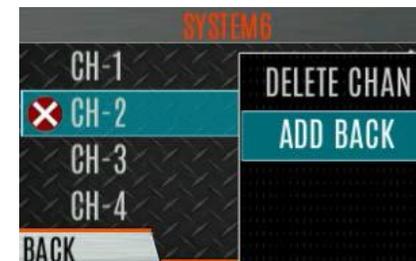
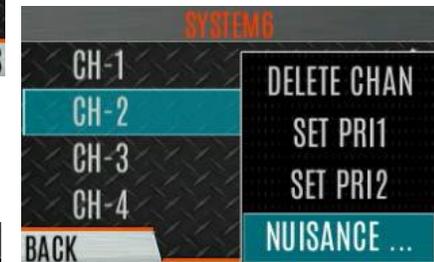
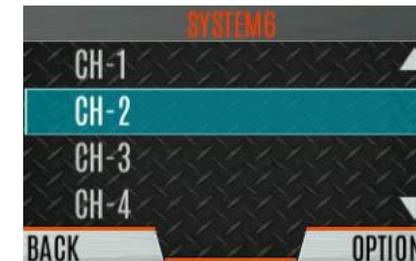
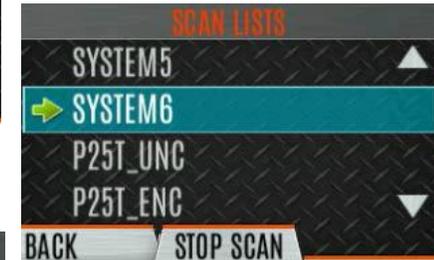
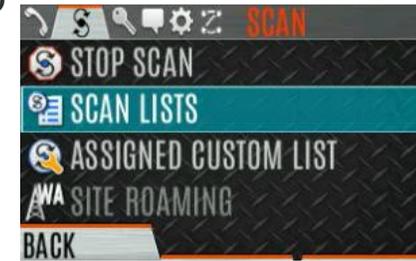
- A Command Tactical Zone (CTZ) is created by the user and is made up of groups/channels that are contained in other zones within the radio. Create a CTZ by:
  - Press the Menu/Select button to access the main menu.
  - Navigate to ZONE menu.
  - Scroll to highlight USER-DEFINED and press the VIEW ZONE soft key.
  - Press the OPTIONS soft key.
  - Scroll to select EDIT ZONE to create a zone or RENAME ZONE to rename the CTZ (up to 16 characters allowed).
  - Navigate to scroll through existing systems and scroll to highlight the desired group/channel.
  - Press the Menu/Select button to add or remove group/channel.
  - After adding all desired groups, press the BACK soft key.
  - Activate the CTZ by selecting the SET ACTIVE soft key on the USER DEFINED screen, or by pressing the Menu/Select button when USER DEFINED is highlighted on the Zone menu.
  - After creating a CTZ select OPTIONS to edit the CTZ, delete groups, clear the zone or rename.



# Nuisance Delete



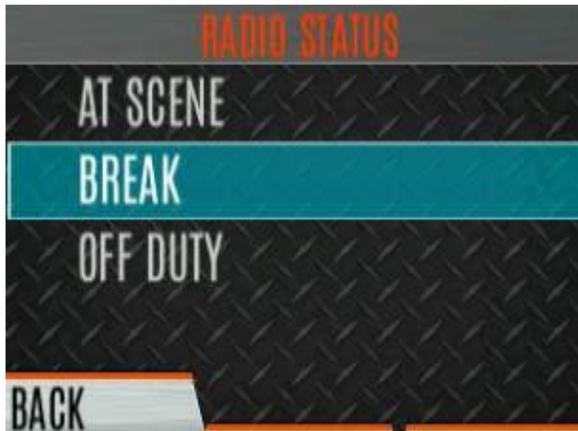
- Nuisance Delete allows the user to mute audio from a “nuisance” group that is actively being scanned. Priority 1 and 2 groups cannot be nuisance deleted. A button or switch on the radio may be programmed for nuisance delete.
- To perform a nuisance delete from the menu:
  - Press the Menu/Select button to access main menu.
  - Navigate to the SCAN menu.
  - Scroll to highlight SCAN LISTS and press the Menu/Select button.
  - Scroll to highlight the desired scan list and press Menu/Select.
  - When scanning is on, → indicates the active scan list.
  - When scanning is off, 📶 indicates the current scan list.
  - Scroll to the nuisance group.
  - Press the OPTIONS soft key.
  - Select NUISANCE and press Menu/Select.
  - The ❌ icon appears next to the group and it will not be scanned.
- Highlight a nuisance group, press OPTIONS and select ADD BACK to return the group to the scan list. Turning the radio off/on will also add back the nuisance groups.



# Radio Status/Radio Message features



- The radio status/message features are used to send status or message updates without making a voice call. There can be up to 10 status conditions and 10 radio messages programmed into the radio. A button can be programmed to send a radio status or message, or, the user can use the Radio Status and MESSAGE menus as described below.
  - Press the Menu/Select button to access the main menu.
  - Navigate to the MESSAGES menu.
  - Navigate to highlight RADIO STATUS or RADIO MESSAGE and press Menu/Select.
  - Navigate to highlight the desired status update or message and press the Menu/Select button to send status or message.



# Radio TextLink



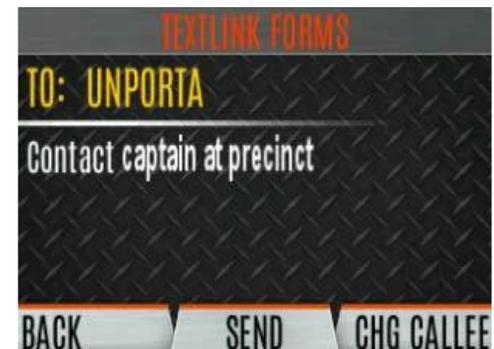
- Radio TextLink provides short text messaging for radios. Predefined “canned messages” and predefined replies can be stored in the radio. To customize text messages, forms can be stored in the radio. A form contains up to 4 text prompts, with the user filling in the blanks prior to sending.
  - Press Menu/Select to access main menu.
  - Navigate to MESSAGES menu.
  - Navigate to highlight TEXTLINK MESSAGES and press the Menu/Select button.
  - Use directional pads to select the desired message and press the Menu/Select to send message.
  - Select CHG CALLEE to change the destination for the message.
  - Select TOD QUERY to get the time of day.



# Radio TextLink-Forms



- Form messages are displayed and stored in the radio as a message in which each field to be filled is indicated by a question mark (?) followed by a number of asterisks (\*). The number of asterisks indicates the maximum number of characters allowed for that field.
  - Press the Menu/Select button to access the main menu.
  - Navigate to the MESSAGES menu.
  - Highlight TEXTLINK FORMS and press Menu/Select.
  - Navigate to the desired message and press Menu/Select.
  - Enter text into the blank fields and press the NEXT soft key.
  - Press the SEND soft key to send the message. Select CHG CALLEE to change the destination for the message. Select TOD QUERY to get the time of day.



# Radio TextLink-View Messages



- When the  icon appears on the home display, there is a TextLink message waiting to be read.
- To read:
  - Press the Menu/Select button to access the main menu.
  - Navigate to the MESSAGES menu.
  - Scroll to TEXTLINK MAILBOX and press the Menu/Select button.
  - From the mailbox, select OPTIONS to delete messages, view details of messages and reply.



# Faults/Alerts



- Faults/Alerts are messages generated by the radio to inform the user of a condition that may impact the functionality of the radio.
- The  icon shows on the home display when there is a fault.
- To view/clear faults/alerts:
  - Press the Menu/Select button to access the main menu.
  - Navigate to the MESSAGES menu.
  - Scroll to the FAULTS/ALERTS menu and press Menu/Select.
  - Highlight the desired fault/alert.
  - Press the DETAILS soft key to view details.
  - Press the OPTIONS soft key to delete selected fault.
- Possible faults/alerts include:
  - BATTERY FAULT - Replace battery
  - EEPROM FAULT - Contact L3 Harris
  - RF FAULT - Contact L3 Harris
  - OVERCURRENT - Check antenna and antenna connection. Try replacing antenna
  - INVALID SYSTEM - Feature not installed
  - CHANNEL FAULT - Channel frequency programmed not valid for radio.
- NOTE: The  icon will disappear once fault is viewed





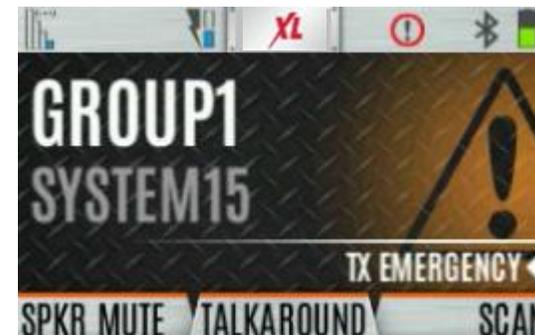
# Emergencies



# Declaring an Emergency



- Emergency settings are determined by programming. It is essential that users understand the emergency features of their radios.
- To declare an emergency:
  - Press and hold the emergency button on the radio or speaker mic. The total time the button must be held down is set in programming.
  - The emergency icon is displayed with text “TX EMERGENCY”
- The radio may (depending on programming) enter a “Hot Mic” period during which the radio is automatically transmitting. At any time during, or after any “Hot Mic” period, the user can transmit using the PTT.
- If allowed in programming, an emergency may be cleared from the radio by pressing the Monitor/Clear button, followed immediately by pressing the Emergency button.
- NOTE: In most P25 Systems, dispatchers are the only operators who can clear emergencies.



# Receiving an Emergency/Stealth Emergency



## Receiving an Emergency:

- When receiving an Emergency Call, an alert beep sounds (if tones enabled) and an emergency indication is displayed along with the text “RX EMER”.
- The Unit ID and/or unit name of the unit in emergency is displayed.
- While the emergency display is active, press the PTT to respond on the group involved in the emergency.



## Stealth Emergency:

- The radio can be programmed for “Stealth Emergency” with the following options:
  - No audio indication when declaring emergency.
  - Or, no visual indication when declaring emergency.
  - Or, no audio and no visual indication when declaring emergency.
- NOTE: During stealth mode, the radio will not receive any type of call. Once the user presses the PTT button, the radio display and audio returns to normal.

# Declaring an Emergency



- Emergency settings are determined by programming. It is essential that users understand the emergency features of their radios.
- To declare an emergency:
  - Press and hold the emergency button on the radio or speaker mic. The total time the button must be held down is set in programming.
  - The emergency icon is displayed with text “TX EMERGENCY”
- The radio may (depending on programming) enter a “Hot Mic” period during which the radio is automatically transmitting. At any time during, or after any “Hot Mic” period, the user can transmit using the PTT.
- If allowed in programming, an emergency may be cleared from the radio by pressing the Monitor/Clear button, followed immediately by pressing the Emergency button.
- NOTE: In most P25 Systems, dispatchers are the only operators who can clear emergencies.



# Emergency check-in timer



The Emergency Check In Timer is an added safety feature for a radio user who may be in a dangerous environment. If this timer expires before being cancelled by the radio operator, an emergency is declared. This is a programmable option in RPM2

To enable the Emergency-Check In Timer via the radio menu:

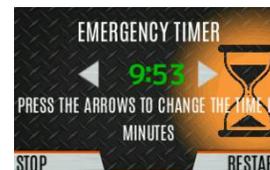
1. Press the Menu/Select button to access the main menu.
2. Press the left or right navigation buttons to display the **CALL** menu.
3. Press the up or down navigation buttons to highlight **EMERGENCY TIMER** and press the Menu/Select button.



4. Set the Emergency Check-In Timer using the left or right navigation buttons. The minimum and maximum allowable values are programmed via RPM2. Default is 10 minutes.



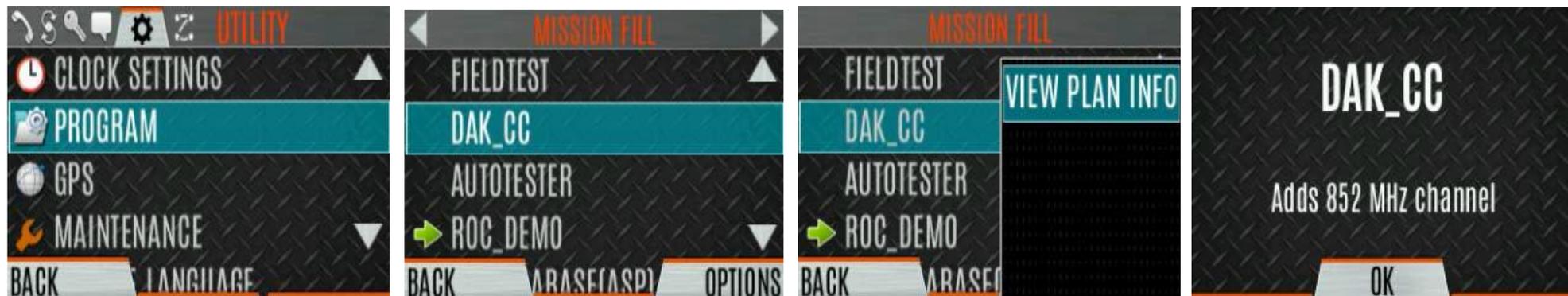
5. Press **RESTART** to restart the timer or **STOP** to stop the timer and return to the **CALL** menu. If enabled via RPM2, pressing the PTT button will also restart the timer



# View Personality



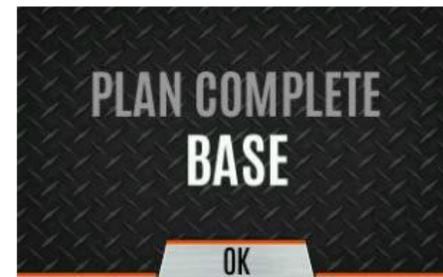
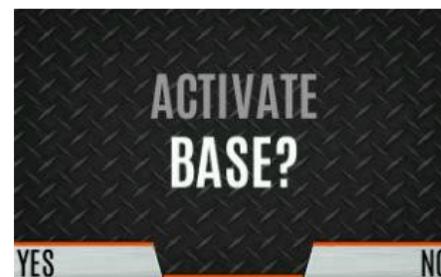
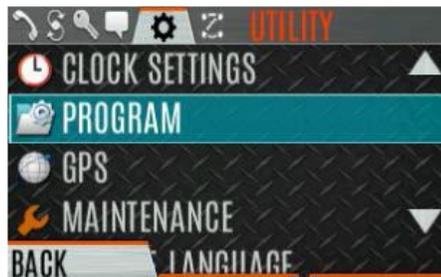
- Personalities contain radio programming information such as frequencies, channels, talk groups etc. Up to 10 different personalities can be stored in the radio, but only one can be active at a time.
- To view a personality:
  - Press Menu/Select to access the main menu
  - Navigate to the UTILITY menu
  - Scroll to highlight PROGRAM and press the Menu/Select button. An arrow will indicate the active personality
  - Press the OPTIONS soft key
  - Select VIEW PLAN INFO
- The radio will display the plan's filename and additional information depending on what was entered during the creation of the personality.



# Change Personality



- To change the active personality:
  - Press the Menu/Select button to access the main menu.
  - Navigate to the UTILITY menu.
  - Scroll to highlight PROGRAM and press the Menu/Select button.
  - Scroll to highlight the desired personality and press the Menu/Select button.
  - The → icon indicates the currently active personality.
  - Press the YES soft key to confirm personality activation.
  - Depending on programming, you may be prompted for a PIN code before activation continues.
  - The IN PROGRESS screen is displayed while activation is in progress
  - If the personality is activated, the radio displays “PLAN COMPLETE, followed by the name of the personality. Press the OK soft key.
- NOTE: You cannot activate a personality when the radio is transmitting an emergency. A FAILED message may be displayed for errors encountered.



# L3Harris Device Management



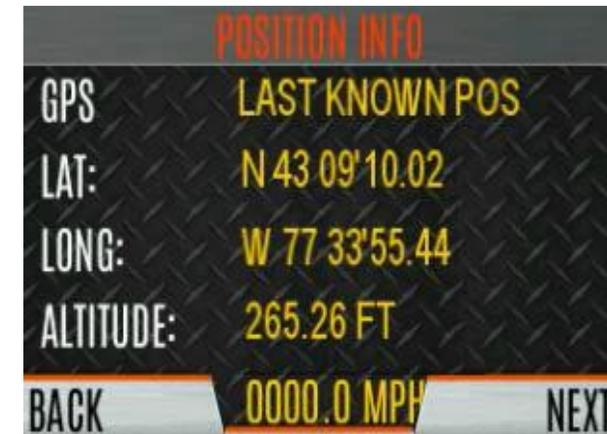
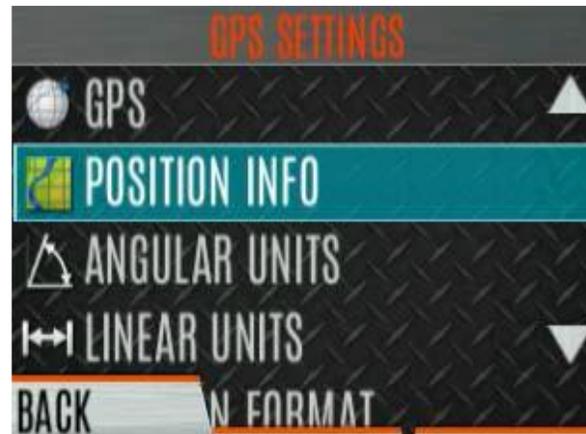
- L3Harris Device Management is a web-based application that allows the user to collect basic status and version information, read and program personalities, and program firmware in XL radios over secure Wi-Fi. Refer to L3Harris Device Management User's Manual 14221-2100-2010 for information about using the application.
- To initiate Device Management Actions from the radio:
- The radio only communicates with L3Harris Device Management when initiated by the user as shown in the following steps:
  1. From the radio menu select **UTILITY** → **DEVICE MANAGEMENT**.
  2. Verify the **CONNECTION STATUS** is **CONNECTED**. Must be connected to a Wi-Fi network.
  3. Highlight and select **DM ACTIONS** to check for available updates.
  4. The **DM ACTIONS** menu displays **CHECKING** while searching for updates. This will change to **UPDATE AVAILABLE** if there are available updates.



# Situational Awareness (SA)



- This feature is currently only available for P25 Conventional channels.
- SA can be used to track and locate other radios configured to send location information. The SA display shows the positions of other radios relative to the displaying radio.
  - Press the Menu/Select button to access the main menu
  - Navigate to the UTILITY menu
  - Scroll to select GPS and press the Menu/Select button
  - Scroll to select POSITION INFO and press the Menu/Select button
  - Press the NEXT soft key (continued on next page)



# Situational Awareness (SA)



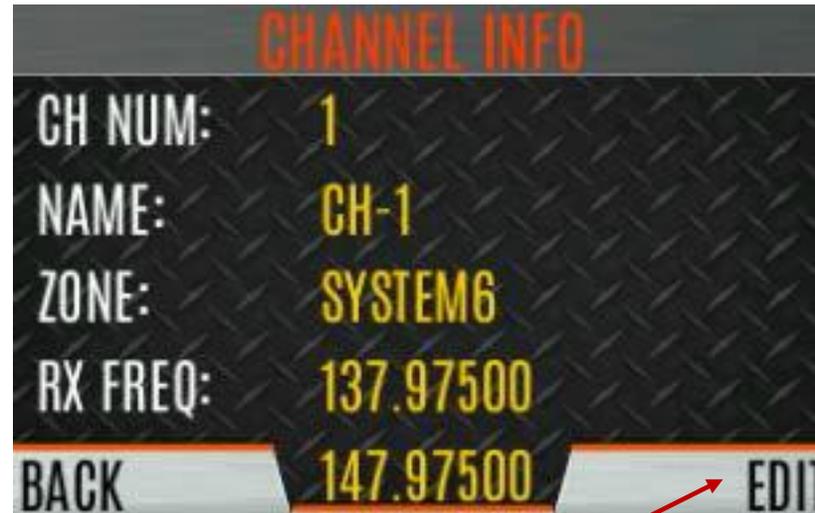
- Use directional pad to view the location of each unit on display.
- The color of each unit indicates its status as follows:
  - Grey-Unselected, no status
  - Red-Unselected, In Emergency
  - Orange-Unselected, Low Battery
  - Blue-Unselected, Scanning
  - Green-Unselected, Scanning
  - Green-Selected, no status
  - Green/Red-Selected, In Emergency
- GPS status of the displaying radio is shown by the center dot:
  - Green-Tracking
  - Orange-Last known position
  - Red-Searching
- Press ▲ or ▼ to zoom display distance of current unit. (.05 mi to 20 mi). Press the OPTIONS soft key, then select UNIT INFO to display details about the selected unit. Select REFRESH to update information or EXIT



# Channel Info Menu



- The Channel information (CH INFO) menu displays information about the currently selected channel. The information displayed varies between conventional and trunked systems.\
- Press ◀ while on the idle display.
- Press ◀ or ▶ to scroll through the programmed channels.



- If allowed by programming, the “EDIT” soft key will produce a password prompt. Once the correct password is entered, the channel edit controls will be available.

# Audio Settings



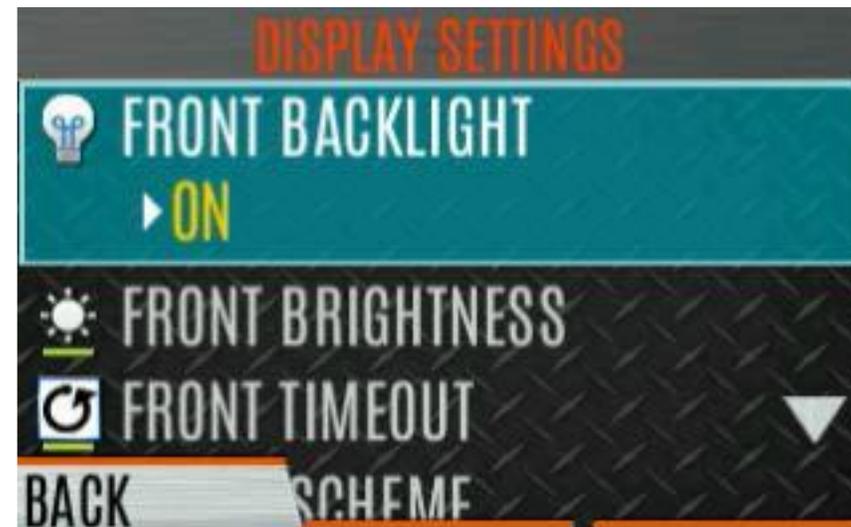
- Press the Menu/Select to access the main menu.
  - Navigate to the UTILITY menu.
  - Scroll until AUDIO SETTINGS is highlighted and press the Menu/Select button.
- Scroll through the following options and SELECT the desired control:
  - Speaker
  - Noise Cancellation
  - PTT
  - Tones
  - Keypad Tones
- Press the BACK soft key to exit menu



# Display Settings



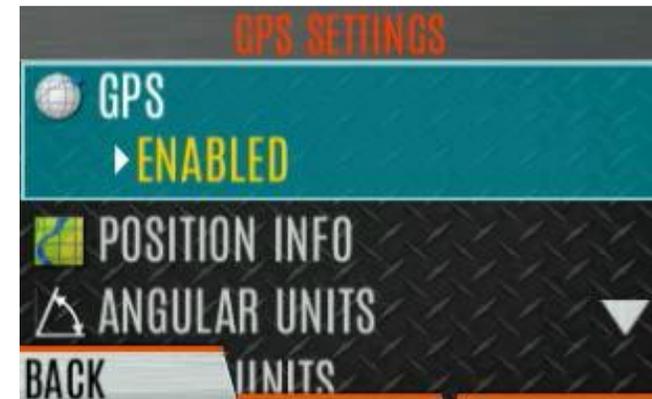
- Press the Menu/Select to access the main menu.
- Navigate to the UTILITY menu.
- Scroll until DISPLAY SETTINGS is highlighted and press the Menu/Select button.
- Scroll through the following options and SELECT the desired control:
  - COLOR SCHEME - Change colors of top and/or front displays.
  - FRONT BACKLIGHT - On / Off / Momentary
  - FRONT TIMEOUT - Inactivity for this duration will turn front display backlight off.
  - TOP BACKLIGHT - On / Off / Momentary
  - TOP BRIGHTNESS - Setting of “0” turns off top display and TX/RX LED indicator.
  - TOP TIMEOUT - Inactivity for this duration will turn top display backlight off.
  - TOP ORIENTATION - Front / Back / Auto
  - INDICATOR LED - On / Off
- Press the BACK soft key to exit the menu



# GPS Settings



- This will only appear if enabled in RPM2.
- Press the Menu/Select button to access the main menu.
- Navigate to display the UTILITY menu.
- Scroll to GPS SETTINGS and press the Menu/Select button.
- Scroll to the desired control and adjust:
  - GPS - Enable / Disable
  - POSITION INFO - Displays the radio's location information (if available).
  - LINEAR UNITS - Statute, Metric, or Nautical
  - ANGULAR UNITS - Cardinal, Degrees, or MILS
  - POSITION FORMAT - LAT/LONG DMS, LAT/LONG DM, MGRS, or UTM
- Press the BACK soft key to exit the menu



# XL Connect Series Portable Radio Wi-Fi Capabilities Overview



- BeOn
  - Via Connected Wi-Fi
- Device Management
  - Via Connected Wi-Fi
- Radio Programming
  - Using RPM2 Via Wi-Fi



# XL Connect Series Portable Radio - PTT over Wi-Fi



- Integrated LMR functionality
  - Group Call
  - Individual Call
  - Emergency
  - Encryption
  - Patch/Simulselect
- Enhanced push-to-talk capabilities
  - User Presence/Status
  - User Location



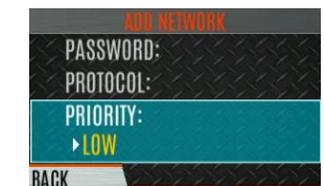
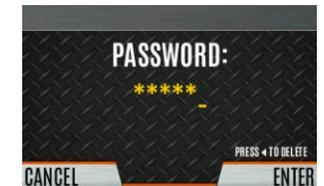
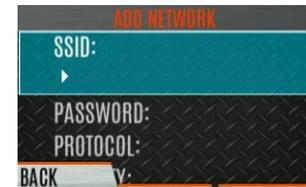
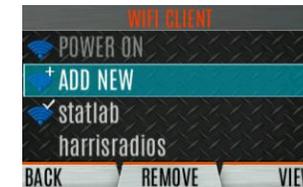
BeOn



# Wi-Fi Client Selection



- XL portable radios support up to 24 different Wi-Fi networks configurable via programming, with an option to select one of the configured networks as default.
- The radio will always join the network configured as the highest priority in the personality when multiple Trusted Wi-Fi Networks (TWiNs) are available.
- To change the selected Wi-Fi network:
  1. From the UTILITY menu, select **Wi-Fi Client**.
  2. From here, select a network from the list, add a network, view details about the selected network, or remove the selected network
  3. Select ADD NEW to add a new network.
  4. Highlight and select SSID. Use the keypad on the radio to enter the SSID and press the **ENTER** softkey.
  5. Highlight and select PASSWORD. Use the keypad on the radio to enter the password
  6. Press the Menu/Select button to cycle through available Protocol selections (None, WPA, or WPA2-PSK).
  7. Press the Menu/Select button to cycle through available Priority selections (Low, Medium, or High).



# Programming Over Wi-Fi



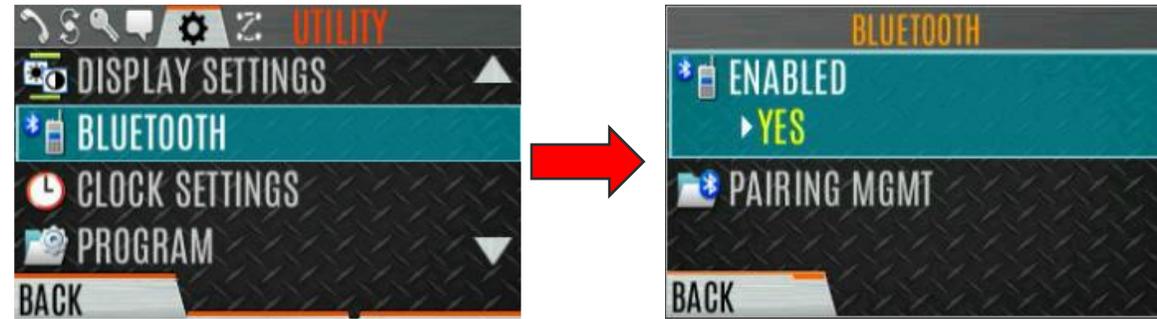
**NOTE:** Wi-Fi network configuration is beyond the scope of this training. For additional information, See Appendix A of the XL-95P or XL-45P Operator Manual.

- Programmers can use Wi-Fi to program the radio if desired.

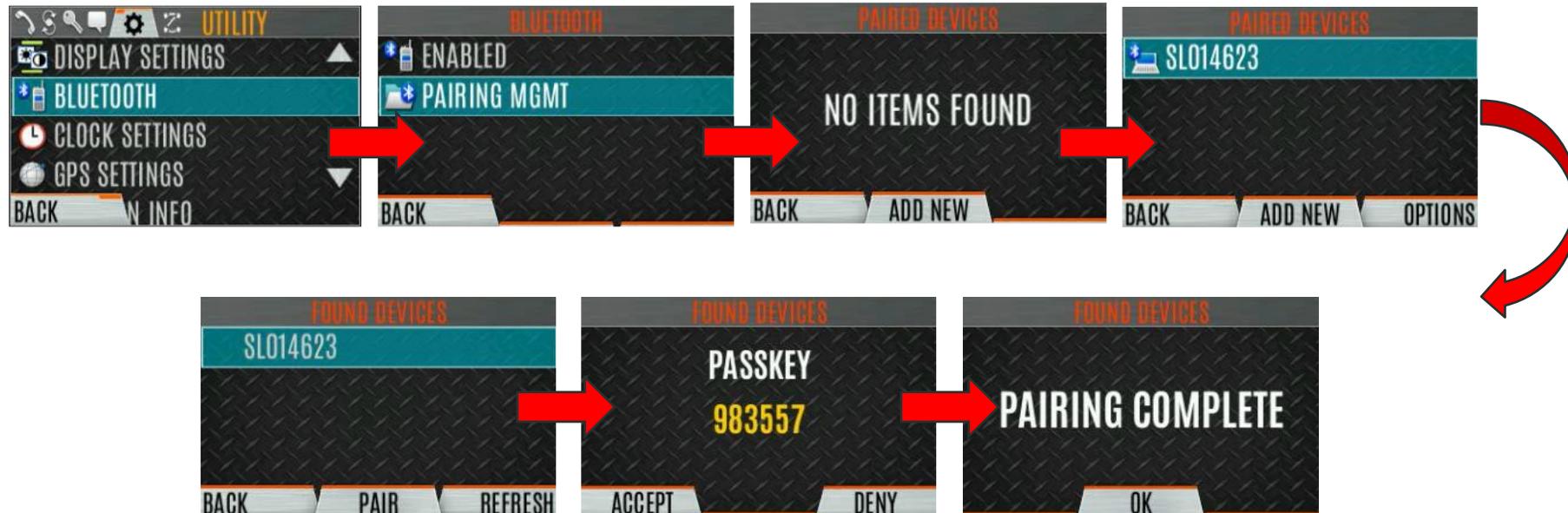
# Bluetooth



- Navigate to UTILITY menu, scroll to BLUETOOTH and press Menu/Select.
- Scroll to highlight ENABLED and press Menu/Select to toggle YES/NO.



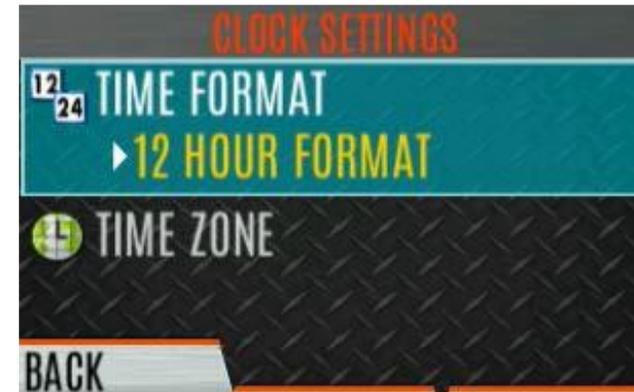
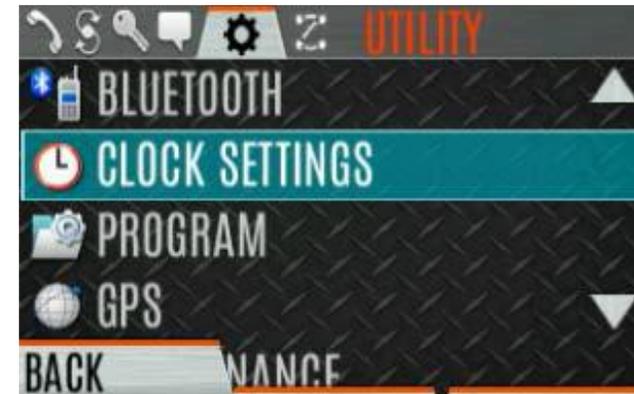
## Pair Device(s)



# Clock Settings



- Press Menu/Select to access main menu.
- Navigate to the UTILITY menu.
- Scroll to CLOCK SETTINGS.
- Scroll to TIME FORMAT to set 12 hour or 24 hour display.
- Scroll to TIME ZONE to set time zone relative to Universal Time Coordinated (UTC).
- Press the BACK soft key to exit.



# Battery Settings/Language Settings



## Battery Settings

- Press Menu/Select to access main menu.
- Navigate to the UTILITY menu.
- Scroll to the MAINTENANCE menu and select.
- Scroll to BATTERY INFO and select.
- Battery information displayed includes:
  - State
  - Voltage
  - Capacity
  - Chemistry
  - Cycle Count
  - Part Number
  - Revision Number
  - Date Code
  - Serial Number
- Press BACK to exit menu



## Select Language

- Press Menu/Select to access the main menu.
- Navigate to the UTILITY menu.
- Scroll to CHANGE LANGUAGE and press Menu / Select.
- Available Languages:
  - English
  - Portuguese
  - French
  - Hebrew
  - Spanish
- Scroll to highlight the desired language and press select.
- Press BACK to exit menu.



# Radio Assembly and Battery Details



- Charge battery with L3 Harris charger.
- To attach belt clip, remove the tab from back of radio. Slide the belt clip into the groove.
- Lift the belt clip (if installed) and slide the battery into the top of the battery compartment on rear of radio.
- Press down on bottom side of battery until it snaps into place.
- To remove battery, press and hold the two tabs at the bottom sides of battery and pull battery up and out.



WARNING

Only use a Harris charger approved for the battery chemistry. Injury could occur from improper charger use.



CAUTION

Do not over-tighten the antenna as damage could result.

# Care and Cleaning



Periodically clean the radio using the following procedure:

- Remove dust and dirt using a damp clean cloth. Warm water and a mild detergent soap may be used if necessary.
- Wipe dry with a clean cloth
- Remove battery and wipe battery and radio contacts with a soft dry cloth to remove any contaminants. Clean contacts will assist in efficient power transfer from the battery to the radio.
- Remove any accessories and clean the UDC contacts using a dry clean cloth. If no accessories are connected, cover UDC with protective dust cap.
- For extremely dirty radios, use a soft-bristle, non-metallic brush to remove debris.

Do not use chemical cleaners, spray, or petroleum-based products. They may damage the radio housing. We recommend using Chemtronics® Electro-Wash® PR (ES-1603) or equivalent.

Do not spray cleaning solution directly on radio. To clean the radio in the speaker and microphone areas, carefully wipe these areas but prevent the cleaning solution from entering the speaker or microphone openings.

# Course Evaluation

- Your feedback is important to us. Could you please take a couple minutes to complete the online class evaluation.
- Class Dates: **June 27, 2024**
- Course Number: **7R**
- Instructor: **Lewis Padgett**



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