PUBLICATION NUMBER:
10515-0474-4200
OCTOBER 2016 Rev. A

RF-7850S-TR SECURE PERSONAL RADIO

OPERATION MANUAL

HARRIS® TECHNOLOGY TO CONNECT, INFORM AND PROTECT™

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RF-7850S-TR SECURE PERSONAL RADIO (SPR) - TEAM RADIO

OPERATION MANUAL

This manual is based on Firmware Version 4.3.0.

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IMPORTANT INFORMATION ABOUT USER LEVELS

Screens and menus that appear in the RF-7850S-TR are dependent on four user/security levels. These levels are described in User Levels.

SAFETY GUIDELINES

	**WARNING** - Do not crush, disassemble, reverse polarity or install incorrectly, incinerate, or mutilate the lithium-ion battery. Do not expose to fire or temperatures above 160 °F (71 °C). The battery can vent, rupture, or explode, releasing toxic material which may cause injury or death to personnel. In case material is released or spilled, evacuate and allow vapors to dissipate. Increase ventilation and do not inhale vapors. Notify safety personnel of release or spills.
	**WARNING** - Use only battery chargers approved by Harris, and never attempt to modify the battery or charger. Doing so may result in damage to the battery, the radio, or cause personal injury to the user.
	**WARNING** - Do not short-circuit, recharge, puncture, incinerate, crush, immerse, force discharge, or expose the Hold-Up Battery (HUB) to temperatures above 85 °C. The battery can vent, rupture, explode, or catch on fire, releasing toxic material which may cause injury or death to personnel. In case material is released or spilled, evacuate and allow vapors to dissipate. Increase ventilation and DO NOT inhale vapors. Notify safety personnel of release and/or spills immediately.
	**WARNING** - RF shock could occur from coming into contact with the antenna while radio is transmitting.
	**WARNING** - The radio could be transmitting without activating the keyline via Push-To-Talk (PTT). This is possible in data communications and Internet Protocol (IP) connections.
	**WARNING** - A damaged lithium-ion battery that is exposed to water could cause a fire or explosion, causing personal injury. Batteries with cracked or damaged cases should be replaced immediately.
	**WARNING** - Do not dispose of batteries in uncontrolled trash.

	**WARNING** - Extended transmit times and/or insufficient air circulation may cause the surface temperature of the radio to become hot enough to possibly cause a burn. Allow the radio to cool before handling.
	**WARNING** - To avoid damage to hearing, ensure that the handset volume is at a comfortable level before using a handset.
	**WARNING** - When operating the radio as part of a recommended vehicular system, ensure that proper caution and procedures are exercised in order to avoid loss of control of the vehicle. Failure to comply could result in personal injury or death.
	**WARNING** - Do not extend antennas or drive vehicles under low hanging power lines. Contact with power lines could result in personnel injury or death.
	**WARNING** - Operating RF transmitting devices such as radios and cellular phones in or around fuel, weapons, or ordinance could cause serious injury or death. Make sure guidelines specified in NAVSEA OP 3565 for Hazard of Electromagnetic Radiation to Ordnance (HERO), Hazard of Electromagnetic Radiation to Fuel (HERF), and Hazard of Electromagnetic Radiation to Personnel (HERP) are followed while operating this radio. The RF system must be turned off within a Safe Separation Distance (SSD) of the HERO Unsafe or Unreliable Ordnance, HERO Susceptible Ordnance, and HERO Safe Ordnance. When in the presence of equipment being refueled, the system must be turned off within an SSD of fueling operations involving motor vehicle gasoline (MOGAS), aviation gasoline (AVGAS), or JP-8 fuel. No SSD needs to be maintained for fueling operations involving JP-5 or diesel fuel.

	**CAUTION** - ACID CONTAMINATES LITHIUM-ION BATTERIES. Every effort must be made to keep lithium-ion batteries isolated from lead-acid batteries because lead-acid batteries contain sulfuric acid. Do not use the same tools and materials such as screwdrivers, wrenches, hydrometers, and gloves for both types of batteries. Any trace of acid or acid fumes will permanently damage lithium-ion batteries on contact.

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INTRODUCTION 1

1

MANUAL PURPOSE

This operation manual provides information required to support operation and operator-level maintenance on the RF-7850S-TR Secure Personal Radio (SPR) Team Radio, referred to throughout this manual as RF-7850S-TR or the radio.

INFORMATION ABOUT USER LEVELS

Screens and menus that appear for the radio are dependent on user security levels. These levels and the default passwords, for each level, are provided in User Levels, p59.

The radio is initially delivered set to User Level 3 for remote Keypad Display Unit (KDU) access. The Web User Interface (UI) always requires a login to the radio before each use. Refer to Login/Logout Information, p61 for information on checking or revising settings for the user interface.

NOTE

Ensure **KEEP LOGIN** is **YES** to retain login levels while radio is off. Select **[PGM] > USER INTERFACES > FRONT PANEL** or **> ASCII REMOTE**.

CONVENTIONS

Conventions used in this manual consist of:

ALL CAPITALS - External radio marking such as connectors or switches.

BOLD CAPITALS - Menu items or items displayed on KDU for example.

[BOLD CAPITAL IN BRACKETS] - KDU button such as **[APPS]** or **[PGM]**.

EQUIPMENT DESCRIPTION

The RF-7850S-TR provides continuous coverage in the 225 to 2000 MHz frequency range at up to 3.2 watts. The Soldier-Time Division Multiple Access (TDMA) Networking Waveform (S-TNW) waveform supports the full range of 225 to 2000 MHz operation.

The radio is interoperable with other radios on two common waveforms and frequencies.

- 25 kHz Frequency Modulation (FM) Fixed Frequency (FF) - 225 MHz to 512 MHz using Frequency Shift Keying (FSK)
- Time Division Multiple Access (TDMA) Networking Waveform (TNW) - 225 MHz to 511.975 MHz

NOTE

Refer to the TNW Operation Guide, 10515-0363-4010, for information on TNW operation and programming. This manual is provided on RF-7850SH-CD001.

The S-TNW waveform is an advanced waveform that extends secure and reliable voice, situational awareness and data networking down to the individual soldier level.

Different external sensors (such as cameras, body sensors, and targeting devices) or edge devices (such as laptops and tablets) are supported with proper configuration and bandwidth considerations.

User Interface

- Push-To-Talk (PTT) - PTT1 and PTT2 allow a radio to communicate on two different talk groups in S-TNW.
- Tactical rotary switch with 13 selectable nets - The radio can be programmed with up to 25 nets that can be assigned to any of the 13 rotary switch positions.
- Audio prompts provide information about radio status and other operator information. Refer to the RF-7850S-TR Quick Reference Guide for audio indicator information.

- Remote Keypad Display Unit (RKDU) - (purchased separately) Allows an operator extended access to the radio's display and keypad.
- Web User Interface - radio configuration and Global Positioning System (GPS) navigation using Force Tracker are standard. Web UI option includes: Tactical Chat (Tac Chat), file browser, custom application interface, soft KDU, diagnostics, and video.

Data Interface

- Direct Connect Universal Serial Bus (USB) Interface - Any supported USB device such as a camera can be connected in the same manner as connecting to a USB port on a computer.
- Data Interface - Accommodates USB/Ethernet.
- Messaging - Tac Chat home screen provides an integrated messaging center (requires remote KDU or Web UI).

Audio Interface

- PTT1, PTT2 support
- Differential mic inputs
- Stereo speaker outputs

IP Networking

- Direct Internet Protocol (IP) Network Connection - can be attached to network with a Dynamic Host Configuration Protocol (DHCP) server can be accessed via any network resource such as a computer that has the radio drivers and communications programmed.
- Local Area Network (LAN) - IPv4 Ethernet.
- Remote Network Driver Interface Specification (RNDIS) for Ethernet over USB connectivity and wireless IP data forwarding.
- Multicast IP Support - Allows configured User Datagram Protocol (UDP) multicast application data to be forwarded from one of the radio's wired IP interfaces to its wireless interface (or

vice versa). The wired interfaces supported on the radio are Ethernet, and RNDIS.

NOTE

The multicast feature does not support Internet Group Management Protocol (IGMP) or Protocol Independent Multicast (PIM) routing protocols. As a result, routers between a radio's wired interface and a multicast client or source device are not supported.

- Session Initiation Protocol (SIP) and RF-6010 Base Station - Allows sending IP data over Ethernet and making phone calls to and from an RF-6010 based system.
- Simple Network Management Protocol (SNMP).

Situational Awareness (SA)

- Internal Global Positioning System (GPS) receiver - Supports position display information, SA reporting, or obtaining position reports from other radios.
- GPS operational modes - Internal, external, IP, or none. GPS is used for time synchronization on TNW and S-TNW.
- Keyhole Markup Language (KML) File Server format - Displays geographic data in a graphical Earth browser. Provides position reporting (Google Earth and other KML-based SA application integration). KML-formatted position data is accessible via the radio's web server or via UDP/IP packets.
- NATO Friendly Force Information (NFFI) GPS support.

Security

- Advanced Encryption Standard (AES) 256 bit encryption security for both Over the Air (OTA) voice and data transmissions.

- Encryption is interoperable with Falcon II radios using AES-256. The radio provides storage of 25 keys using 256-bit Communications Security (COMSEC).

NFFI Position Reporting

North Atlantic Treaty Organization (NATO) Friendly Force Information (NFFI) style position reporting (integrated with NFFI-based SA applications) is supported. NFFI Position Reporting is compliant with STANAG 5527 NFFI-IP2 and NATO Battle Management System applications.

USB DATA

The radio provides a Universal Serial Bus (USB) 2.0 Full Speed compatible interface. This interface supports USB drive capabilities as well as Remote Network Driver Interface Specification (RNDIS) for Ethernet over USB connectivity. Ethernet over USB allows the joining device to act as the RNDIS Host and wireless IP data is forwarded down the RNDIS connection to the host. This forwarding eliminates the need for configuring separate Ethernet/wireless IP addresses.

BASIC SETUP 2

ITEMS INCLUDED

Table 1 provides a list of items included with the radio. Figure 1 displays all of the items included with the radio.

2

Refer to Optional Accessories, p213 for optional items.

Table 1. Items Included with the Radio

Description	Part Number
Radio Assembly, Green (RF-7850S-TR001) Radio Assembly, Black (RF-7850S-TR011) Radio Assembly, Tan (RF-7850S-TR021) **NOTE**: Radio includes Global Positioning System (GPS) Antenna (E75-1500-500).	12164-1000-01 12164-1000-11 12164-1000-21
High Capacity Lithium-Ion (Li-ION) Battery, 6.8 A-Hr Black or Green or Tan	 12041-2400-01 12041-2400-02 12041-2400-03
Low-Band Antenna	12121-2700-01
Communication Planning Application (CPA) for RF-7850S Also includes the following manuals and help: • Quick Reference Guide (10515-0474-4100) • Operation Manual (10515-0474-4200) • TNW Operation Guide (10515-0363-4010) • CPA for RF-7850S Help • TNW for CPA Help	RF-7850SH-CD001

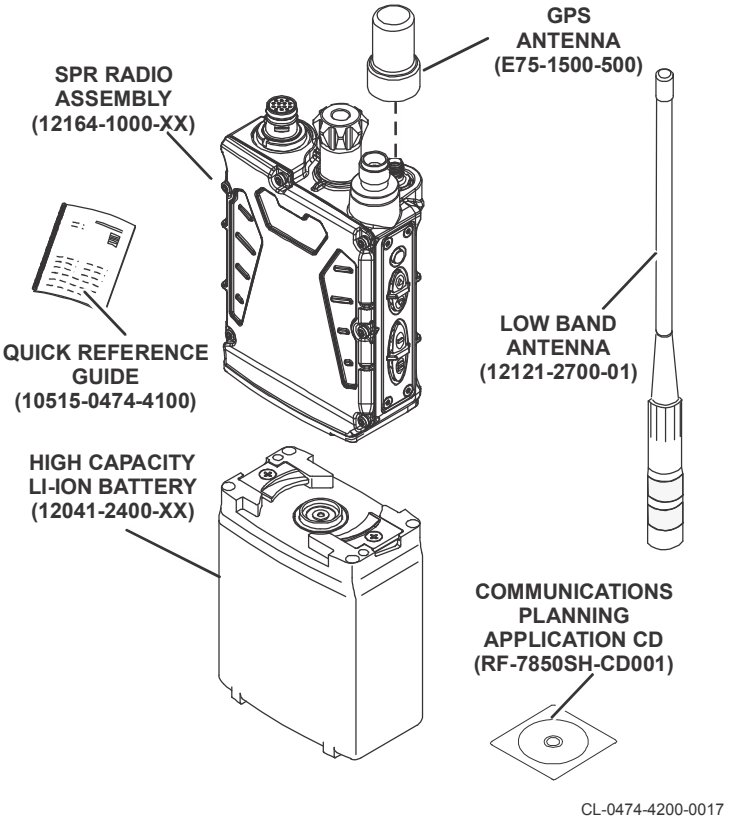


Figure 1. Items Included with the Radio

ASSEMBLE RADIO

See Figure 2 and perform the following:

2

a. Place the battery on the base of the radio, then twist the battery into a fully seated position.

b. Verify the antenna connectors are free of loose metal filings and other debris.

c. Secure the antenna onto the connector on top of the radio.

d. Secure the GPS antenna onto the connector on top of the radio (internal GPS can be disabled or an external device can be used).

e. Connect an appropriate headset to the audio connector. Refer to Optional Accessories, p213.

Refer to Initial Power-Up, p26 for powering on the radio.

Refer to BASIC OPERATIONS, p27 for operations using voice communications.

Refer to ADVANCED OPERATIONS, p57 for operations such as camera connection, LAN connection, and applications menu.

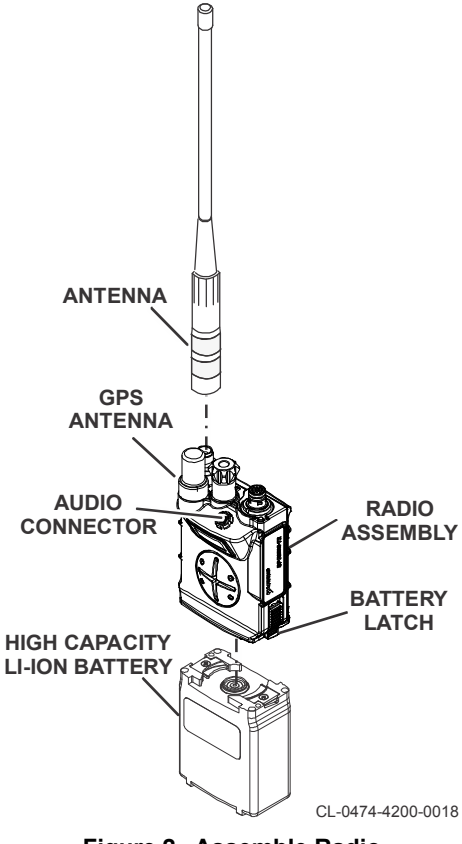


Figure 2. Assemble Radio

INITIAL POWER-UP

Power up the radio as follows.

a. Move the rotary switch to one of the 13 net preset positions.

b. Observe that there are no faults and that the BATTERY LEVEL prompt is at a good percentage (it is not at low battery prompt).

c. Observe that a NET FORMING and/or a NET READY prompt is played.

BATTERY LIFE

Battery life is the approximate amount of time a battery can be used before it needs to be recharged or replaced. The battery life is determined by transmission power and duty cycle. To maximize battery life, transmit only when necessary and use the lowest transmit power level required to communicate.

The battery life of 16 hours is provided as a guideline and is typical at +68 °F (+20 °C) with a 10% transmit, 10% receive, 80% idle (squelched) operating cycle. Actual results may vary. Battery life is dependent upon battery age, temperature, charge times, and amount of back light usage. Battery life will decrease approximately 20-25% at -4 °F (-20 °C).

STORAGE GUIDELINES

Store the radio in a secure location and use local security procedures. Store batteries in a clean, cool (below 70 °F [+21 °C]), dry, and ventilated storage area.

ETHERNET CONNECTION

Ethernet is supported as a default configuration. Connect Ethernet cable 12164-0714-A006. Open a browser using the default zeroized IP address 192.168.1.1 to log into the radio's web UI.

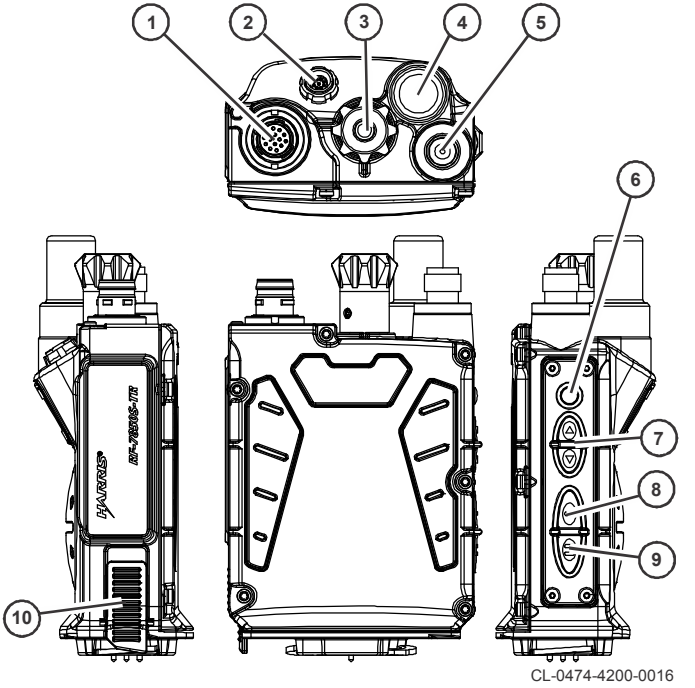
BASIC OPERATIONS 3

This section contains information on common field operations of the radio. Refer to ADVANCED OPERATIONS, p57 for non-voice operations or the application menu.

RADIO CONTROLS

3

Figure 3 shows the radio controls, and connectors. Table 2 describes the controls, and connectors.



CL-0474-4200-0016

Figure 3. Radio Controls, Indicators, and Connectors

Table 2. Radio Controls, Indicators, and Connectors

Key	Control/ Indicator	Function
1	14-Pin Data Connector	Provides interface for various remote data devices.
2	9-Pin Audio Connector	Provides a connection for an optional headset, handset, microphone.
3	Rotary Switch	
	OFF	Pull-to-turn. Turns radio off. (White arrow and dot mark the off position when viewing top of rotary switch.)
	1 - 13	Selects nets 1 through 13. Remote Keypad Display Unit (RKDU) is supported to access additional nets through display panel.
	R	Pull-to-turn to place in Remote (R) position. RKDU is supported.
	Z	Pull-to-turn zeroizes (Z) all programmed variables, including encryption variables and user data.
4	GPS Antenna Connector	Connector for Global Positioning System (GPS) antenna.
5	Transmit/Receive Antenna Connector	Provides a 50-ohm antenna port via the Threaded Neill-Concelman (TNC) connector.
6	OK	Special function button. Can be used with custom on-demand audio reports and can be assigned as a PTT for an assigned Talk Group.
7	Volume Control	▲ increases volume ▼ decreases volume
8	Upper PTT	Push-To-Talk (PTT). For S-TNW, this is an assigned Talk Group.
9	Lower PTT	PTT. For S-TNW, this is an assigned Talk Group.
10	Battery Latch	Slide up to unlock battery for removal.

REMOTE KDU CONTROLS

Figure 4 shows the remote Keypad Display Unit (KDU) controls, indicators, and connectors. The remote KDU and the soft KDU are options.

3 The following is a quick summary of key operations using the KDU.

- Access a highlighted field by pressing **[ENT]**.
- Clear out of a field by pressing **[CLR]**.
- Edit text using the soft key keypad functions: ⟵ or ⟶ to place the cursor over text, ⌫ to delete one letter, or 🗑 to clear the entire field.
- Accept changes by pressing **[ENT]**.
- Change your current user level by pressing **[APPS]** and selecting the **LOGOUT** soft key ⎆ .

NOTE

Refer to [PGM] > USER INTERFACES, p129 for input languages other than English.

- Select the **LOCK** soft key 🔒 to lock the front panel.
- Unlock the front panel by pressing **[CLR]** five times quickly.
- Input a space by pressing the **[0]** button twice quickly.

NOTE

Refer to Symbols, p217 for soft key descriptions.

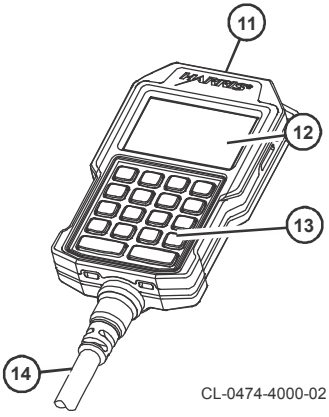


Figure 4. Remote KDU Controls, Indicators, and Connectors

Table 3. Remote KDU Controls, Indicators, and Connectors

Key	Control/ Indicator	Function
11	USB	Extends the USB functions of the data cable to allow a USB device connection.
12	Display	Displays operational and programming screens.
13	Keypad	Used to access radio menus and controls. Contains: • Top row - Soft keys used for functions listed on bottom edge of LCD display. • Remaining three rows - Numbers/letters, up/down, and left/right arrows, **[APPS]**, **[PGM]**, **[SQL]**, **[LT]**, **[⟳] (Circular Arrow / Space Symbol on the "0" button)**, **[CLR]**, and **[ENT]** buttons. **NOTE:** Numeric keypad buttons have multiple uses depending on what is displayed on the screen. Numbers and letters are used when updating an editable field. These keys cycle through the characters on the key with each press (for example: the "8" key cycles through 8, T, U, V with each press. Buttons with only one label (CLR and ENT) are dedicated to a single purpose.
		The **Circular Arrow** / **Space Symbol** on the "0" button switches the display between Tac Chat and Status screens for additional information. The Tac Chat home screen provides the following options; Navigation, Messages, Alerts, and Voice Mail.
	[LT] [3]	Provides access to the Keypad/Display back light control menu. Refer to [LT] Menu, p36.
	[SQL] [1]	Toggles squelch (SQL) on and off.
	[APPS] [7]	Provides access to the applications menus. Refer to [APPS] Menu, p63.
	[PGM] [9]	Provides access to radio programming menus. Refer to [PGM] MENU, p81.

Table 3. Remote KDU Controls, Indicators, and Connectors (Continued)

Key	Control/ Indicator	Function
	[**CLR**]	Returns a field to its previous value, and activates the previous menu or screen.
	[ENT]	ENTER. Selects scroll field choices or locks in entry field data.
	Soft Keys **[•]**	Soft keys are used for functions listed on bottom of screen. These can vary based on configuration. Refer to Symbols, p217.
	◀ and ▶ **[4]** and **[6]**	Allows the operator to move the cursor to the left or right.
	▲ and ▼ **[2]** and **[8]**	Allows the operator to move the cursor up or down.
14	Cable	Connects remote KDU to radio data connector.

BEFORE COMMUNICATING

Make sure that the radio has been set up (refer to Assemble Radio, p24) and programmed prior to use. The radio can be programmed via the Communications Planning Application (CPA), USB port on KDU or by using the Web User Interface (refer to Web User Interface, p164).

DISPLAY FEATURES

Basic display features are identified in Figure 5. The top line provides status information. The bottom line shows soft keys that are associated with the Soft Key **[●]** buttons on the keypad. These keys change depending on what is selected and what function is being used. Refer to Symbols, p217 for a complete symbol reference.

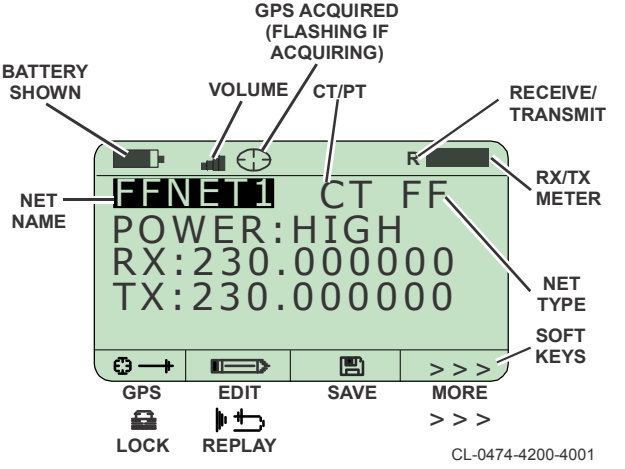


Figure 5. Display Features

CHANGE VALUES ON DISPLAY

Some values can be changed on the main display without entering the programming menu. Use the **EDIT** soft key to open the **NET MANAGER** programming menu for the currently selected net and change other values.

Change values presented on the front panel as follows. See Figure 6.

a. Select either ◀ and ▶ or ▲ and ▼ to highlight a field on the display.
b. Access edit mode for the selected value by pressing **[ENT]**.
c. Select either ▲ and ▼ to change a value from a list (no soft keys) or use the **DEL**, **<-**, **->**, **CLR** soft keys to change values.
d. Apply the value by pressing **[ENT]**.
e. Select the **SAVE** soft key to keep changes through a power cycle.

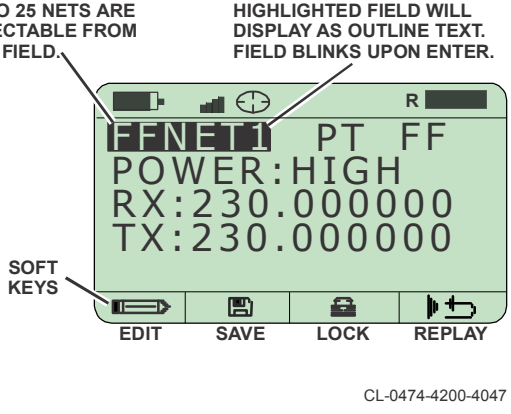
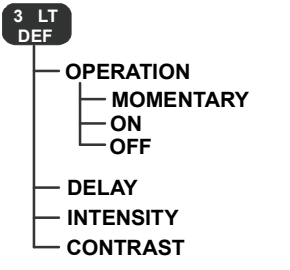


Figure 6. Change Preset Values on Display

[LT] MENU

See Figure 7. Select **[LT]** (button 3) to access the Light menu. Set operation mode and adjust delay, intensity, and contrast for the screen back light. The default values are 5, 7, and 6 respectively. Select **[ENT]** to enter/change a highlighted field or **[CLR]** to back out of the menu.

3



CL-0461-4200-0005

Figure 7. [LT] Menu

REMOTE KDU

A Remote Keypad Display Unit (KDU) allows for full operation of the radio with extended access to the radio's display and keypad. Refer to Optional Accessories, p213 for part number information. Connect the Remote KDU to the radio. See Figure 8. Position the alignment key on the cable into the data connector of the radio (match blue dot to blue dot) for proper connection.

NOTE

The cable connection may be made with the radio either powered on or off.

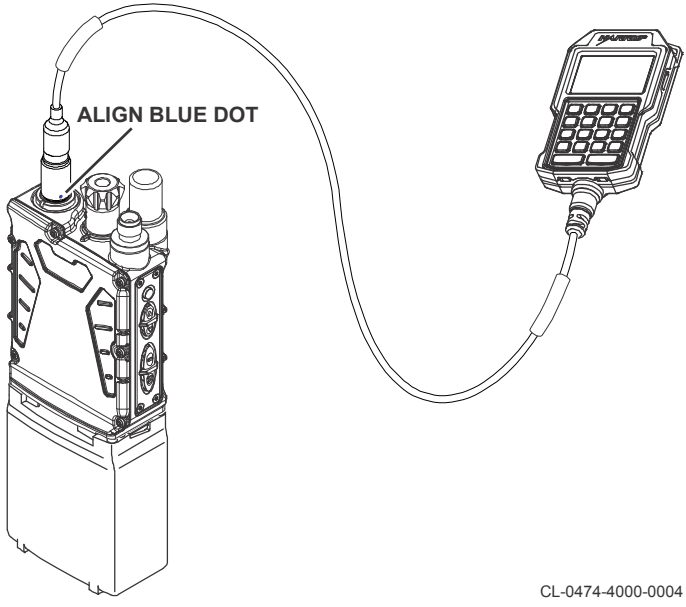


Figure 8. Remote KDU Connection

Remote KDU Operation

The Remote KDU feature is enabled by placing the radio rotary switch into position 1 through 13, or R.

The radio Remote KDU (12113-1000-2x) contains a USB Type-A connector on top of the Remote KDU. This connector can be used for connection of a camera or other device. Refer to ADVANCED OPERATIONS, p57 for further information.

NOTE

If the USB connection on top of the Remote KDU is being used, the cable length should be limited to 16 ft (5 m) to conform to the USB 2.0 Full Speed standard.

FF OPERATIONS 4

FIXED FREQUENCY

The radio operates in a frequency range of 225 MHz to 512 MHz in fixed frequency nets.

The radio is capable of FM fixed frequency analog voice in Plain Text (PT) only or in Cipher Text (CT). Frequency Shift Keying (FSK) is used when in CT.

4

Fixed Frequency Operation

Figure 9 shows a fixed frequency display in PT. Perform basic operations as follows.

a. Place Rotary Switch in a fixed frequency net. Encryption keys must be programmed if operating in CT.

b. Select any net using the net name field (any of up to 25 nets can be configured).

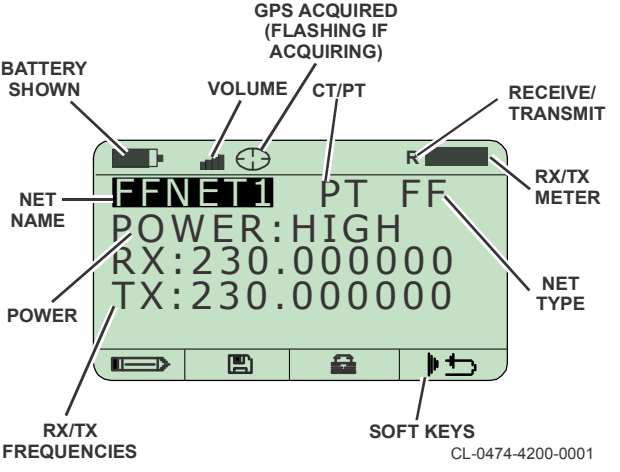


Figure 9. Fixed Frequency Page 1

c. Observe on page 1:
   - **FF** appears for Fixed Frequency
   - **PT** or **CT** is correct
   - **POWER** level is correct
   - Receive (**RX**) frequency and Transmit (**TX**) frequency are correct
   - **R** displays when idle (ready to receive)
   - **T** displays when transmitting

d. Observe that while communicating, the RX/TX meter displays the relative received signal strength and transmit power level (LOW, MED, HIGH). The TX meter also indicates forward/reflected power.

e. Observe that the soft key selections located on the bottom row of the display can vary based on configuration.

f. Select page 2 by pressing **[ ] (0)**.

g. Observe on page 2 (see Figure 10).

- Correct **VOCODER** and **SQUELCH** are used.
- Bits Per Second (**BPS**) is fixed at 16K for this 25 kHz bandwidth net.
- Modulation (**MOD**) is FSK.

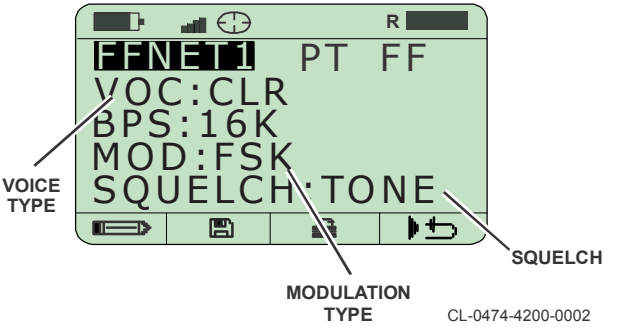


Figure 10. Fixed Frequency Page 2

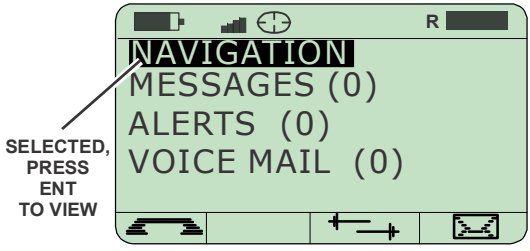
NOTE

Channel Access is NONE for this net and Radio Identification (ID) is not supported.

h. Select the Tac Chat IP screen by pressing **[ ] (0)** (see Figure 11).

NOTE

Messages, Alerts, and Voice Mail are not used in this simple FF net. However, Navigation is available. Refer to Radio Tac Chat Operation, p153 for operation details.



CL-0474-4200-0003

Figure 11. Tac Chat IP Screen

PT OVERRIDE

The radio is capable of receiving PT analog voice on a net programmed for CT digital voice. While demodulating analog FM voice in fixed frequency CT, periodic warning beeps occur. This is known as PT override. If the net is configured for PT, digital voice (CT) signals are not decrypted.

CONFIGURATION REFERENCE (FF)

The following configurations identify some typical FF voice nets.

	PT	CT
BANDWIDTH	25KHZ	25KHZ
CHANNEL ACCESS	NONE	NONE
TRANSEC	FF	FF
CRYPTO MODE	PT	CT*
MODULATION	FSK	FSK
VOCODER	CLR	CVSD
BIT RATE	16K	16K
TX POWER	HIGH	HIGH

*Create an AES key using PGM > KEY MANAGER.

S-TNW OPERATION 5

S-TNW OVERVIEW

The Soldier-Time Division Multiple Access (TDMA) Networking Waveform (S-TNW) is a wideband (WB) waveform. S-TNW operates on the edge where shorter communication ranges, higher node count, priority on voice, and Situational Awareness (SA) reports are essential.

S-TNW features are:

- Up to 48 users (radios) per channel
- Multiple Talk Groups – up to six (6) half duplex Digital Voice (DV) channels or three (3) full duplex DV channels
- 1.2 MHz and 5 MHz channels
- Networked voice and IP data TDMA based Mobile Ad Hoc Mesh waveform
- Network is Self Forming/Self Healing
- Automatic Relay for voice and SA
- Multi-hop voice forwarding (up to five hops)
- Point to point data for nodes in direct contact
- Data rates depend on the maximum users, number of data slots, number of talk groups, and the data rate ID. For example: 4 kbps corresponds to a network with 48 users, 6 talk groups, 12 data slots, and a data rate ID of 2. You could get 1.5 Mbps with 4 users, 1 talk group, 4 data slots and a data rate ID of 10.
- Network Range supports RF up to two (2) km point-to-point, multi-hop RF up to 8 km end-to-end
- Position Location Information (PLI) data reported every three (3) seconds
- Special modes: RX only, Man-Down Alert, On-Demand Audio GPS Report, On-Demand Battery Status, and replay last reception
- Supports Battlefield Management System (BMS) Applications

S-TNW OPERATION

Upon startup, the S-TNW network looks for other members. Radios configured for the same network will attempt to automatically time synchronize amongst themselves so long as their starting time is within ±5 minutes of one another.

Encryption keys must be programmed if operating in CT. S-TNW requires a Transmission Security (TRANSEC) Key and a Network ID.

Perform basic operation using a KDU as follows.

a. Place rotary switch in position with a S-TNW net.

b. Observe S-TNW page 1 screen (see Figure 12).

- **S-TNW** appears as the NET TYPE in the top right.
- CPA configured Network Name appears in the upper left of the screen.
- Encryption mode setting (**PT** or **CT**) is displayed in the top center.
- **POWER** level is presented in line two.
- Frequency is displayed in line three.

c. Select page 2 screen by pressing **[ ] (0)**.

d. Observe S-TNW page 2 screen (see Figure 13).

- Line one is the same as page 1.
- **STATE** can be ACTIVE or SEARCHING based on time synchronization.
- **BW** shows 1.2 MHz or 5.0 MHz.
- **RAD** shows the number of radios in the synchronized group.
- **1-HOP** shows the number of 1-Hop neighbors.
- Time is shown in hours, minutes, and seconds.

e. Select the MORE >>> soft key.

f. Select the USERS ♟♟♟ soft key.

g. Observe the list of MEMBER Network Users (shown as radio MAC address or radio contact name (see Figure 14).

h. Access the status display again by pressing **[CLR]**.

i. Perform voice operation by pressing [PTT1] to communicate with all radios in an assigned talk group (PTT2, headset 1, headset 2, VOX, or OK may also be assigned).

5

j. Select the TacChat IP Screen by pressing **[ ] (0)**.

k. Receive a net-call (refer to VoIP, p54).

Voice traffic is handled by up to 6 half-duplex or 3 full-duplex voice channels.

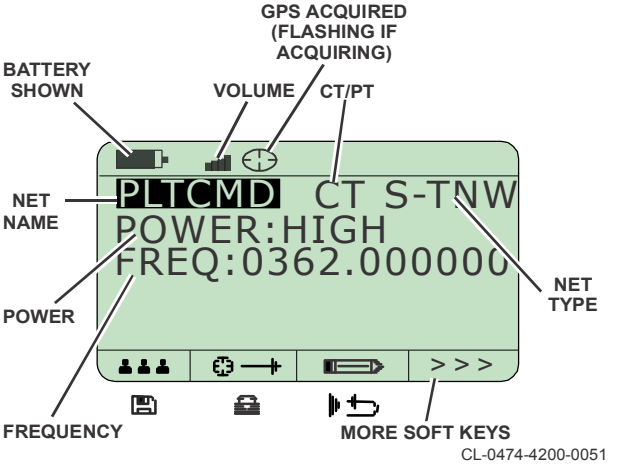


Figure 12. S-TNW Page 1

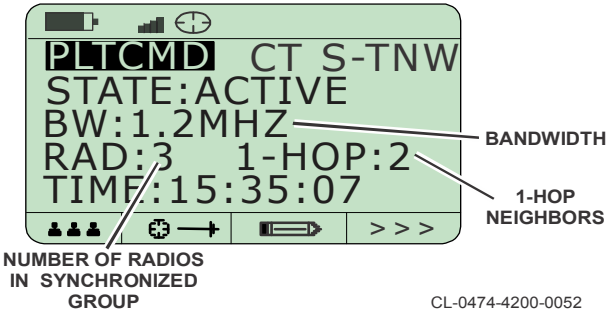


Figure 13. S-TNW Page 2

NOTE

LOCAL USER screen does not include your own radio, only neighbors. The count at the top of the screen will match the 1-hop count on S-TNW page 2 screen.

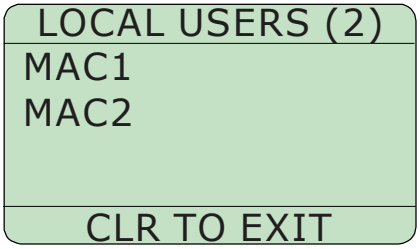


Figure 14. S-TNW User Screen

GENERAL OPERATION

The following sections describe the various capabilities of the S-TNW waveform and the RF-7850S radio.

Time Synchronization

S-TNW requires time synchronization using GPS or Manual Time. Radios must be within ±5 minutes in order to form a Group. If radios are not within the ±5 minute window of one another, they will form separate Groups until their time of day is modified manually (this is done off net and is picked up when switching into the net) or via a GPS system.

Upon entering an S-TNW network, the voice prompt will inform the user that the waveform is initializing via the "NET FORMING" message. Once initialized, the S-TNW waveform will immediately begin searching for other radios and attempting to synchronize. Once the radio(s) has reached a synchronized state, the user is informed that the Group is now operational via the "NET READY" message. Group formation takes approximately 5 to 10 seconds after switching into the S-TNW network.

The S-TNW waveform can use one of three sources for time of day: the system clock, the enabled GPS system, and an elected Time Master radio. On startup, all radios use their internal system clock as the source for the time of day. If the Internal GPS is enabled, or an External GPS is enabled (and can provide a 1PPS signal), the S-TNW waveform will automatically switch over to the GPS time if the GPS receiver is tracking four (4) or more satellites.

When a Group is formed, one radio is selected to be the Time Master for all other radios in the Group; this ensures all radios will always communicate so long as they have RF connectivity. The Time Master will continue to use the internal system clock or GPS system for its time of day. If a radio is not selected to be the Time Master, it will change its time source from the internal system clock or GPS system, to the Time Master Radio. Loss of GPS on the Time Master or loss of connectivity (for any reason) with the Time Master will cause a re-election within the Group. This automatic re-election ensures that Group integrity is maintained in spite of planned or inadvertent loss of the Time Master radio.

NOTE

External GPS devices that do not provide a 1PPS signal will not be used as a time source by S-TNW.

Global Positioning System Services

The radio comes with an embedded GPS Receiver. This module can provide both Time of Day and position reports. The following sections describe the interaction of the GPS module and the all-informed SA messaging system.

Situational Awareness

Both Internal and External GPS systems provide position information using the National Marine Electronics Association (NMEA) 0183 protocol. GPS SA reports are transmitted during the user's assigned beacon frame, rather than in a data frame. GPS position reports are normally generated by the internal GPS device, but the radio may be configured to accept standard GPS NMEA information from an external GPS device. Automatic position reporting options are:

- Timed,
- Distance,
- both Time and Distance (based on which threshold is reached first), or
- Push-To-Talk (PTT).

S-TNW also supports the use of the Forced generated SA reporting options. Forced reports can be generated via the front panel GPS soft key. When configured for Time based or Time and Distance based reporting, S-TNW supports a maximum transmission rate of up to 1 SA report every three (3) seconds.

Position Server Options

Position Reports (or SA) received Over-The-Air (OTA) are stored within a radio's Position Server application. In order to view the information, the user may examine the Navigation screens via the remote KDU, view the Tracking screen on the web interface, or have the radio deliver the SA reports to an external device using IP. The Position Server configuration settings specify whether report forwarding is on or off, the IP address to which reports are forwarded, the format of the reports, and at what interval reports are forwarded. Custom IP format settings are Harris SA, Keyhole Markup Language (KML), and NATO Friendly Force Identifier (NFFI).

Man-Down Alerts

In the event of an emergency, the S-TNW waveform supports a Man Down alert feature. Enable Man Down by pressing the OK key and then pressing another programmable button. A voice prompt is then played stating "MAN DOWN ALERT ON". Disable the Man Down alert by pressing the key combination again and getting the "MAN DOWN ALERT OFF" voice prompt. When the alert is active, a Man Down Alert is set in the SA report being transmitted. A receiving radio will display the man down alert as a part of the received SA status.

NOTE

The Man Down feature is only available when the network is configured for CT mode.

If the radio is not configured to transmit SA reports, SA reporting will be forced on. If the SA reports are scheduled for transmission based on PTT or distance, SA reporting intervals will be changed to Time based transmissions. The default Time interval for SA reports transmitted in Man-Down mode is once every 15 seconds. If the radio is configured for Timed based SA reports, and the configured interval is less than 15 seconds, the Man-Down mode will use the existing intervals rather than slow down the intervals.

Digital Voice

Digital Voice is transmitted OTA as Mixed-Excitation Linear Predictive enhanced (MELPe) 2400 bps compressed audio, which may be encrypted using the Advanced Encryption Standard (AES) encryption module. Digital Voice has two modes of operations: Half-Duplex and Full-Duplex. Half-Duplex operations behave similar to any other half-duplex digital voice over VHF/UHF Line Of Sight (VULOS) waveform with the following additional features.

- Data operations can occur simultaneously
- Voice channels allow for a controlled break-in

Full-Duplex operations (S-TNW only) behave as if every soldier had two VULOS radios wherein each soldier randomly picks which radio to transmit their communications. Again, during Full-Duplex operations, IP data and SA reports occur simultaneously and voice channels allow for a controlled break-in.

S-TNW provides a maximum of six Half-Duplex Talk Groups or three Full-Duplex Talk Groups. Regardless of duplex mode, all voice communications are negotiated. If a Talk Group is unoccupied, keying the radio will cause the voice stream to transmit during the associated Talk Group slot. If the Talk Group is occupied by another transmitting radio, the radio will play back a hold-off tone for up to five (5) seconds to indicate that the Talk Group is busy. After five seconds, the keyed radio will transmit a Break-In message forcing the other transmitter to unkey, and all receiving radios to start listening to the new transmitter.

Break-In behavior is slightly different in the Full-Duplex mode. Since there are two DV channels for a Full-Duplex Talk Group, two radios may be actively transmitting without causing a hold-off tone. Once both channels are occupied, a third radio attempting to transmit will experience a hold-off tone for 5 seconds. If the third radio remains keyed for longer than five seconds, one of the two channels within the Talk Group is randomly selected, and the Break-In message is sent on the associated channel, forcing one of the transmitters to unkey.

VoIP

Voice over Internet Protocol (VoIP) allows calls between a commercial off the shelf (COTS) Session Initiation Protocol (SIP) phone and a talk group is supported. If one radio has an Ethernet connection and is configured appropriately, a user on a phone connected to a SIP call manager can dial a phone number to call a talk group.

After linking to the Ethernet-connected radio, the caller's audio stream is transmitted out on that talk group. Any over-the-air voice receptions on that talk group will also go out over the network to the phone until the call is ended. Two-way audio is supported between the linked call and the talk group. Audio from other talk groups is also mixed in on any receiving radio in the talk group. However, only audio from the talk group called will go to the phone. CPA is used to configure S-TNW with a phone-book of all callable talk groups.

The radio also supports pre-configured VoIP channels. If a radio has an Ethernet connection and is configured appropriately, a user on a device that has a correctly configured VoIP channel can stream audio to one of the radio's talk groups. In this configuration, the radio will also forward all audio received wirelessly to the VoIP channel that is assigned to the given talk group, if one is assigned.

Configurable Voice Hops

The S-TNW network allows an unlimited number of voice relay hops. Voice is relayed three (3) times per TDMA epoch, where a TDMA epoch period can reach approximately 300 ms. As radios are moving away from each other and a radio transmitting audio, the receiving radios may be forced to inject silence each time they pass by the third hop within an epoch. This is necessary to reduce the effects of jitter when moving away from any transmitter.

The S-TNW Voice Playback mode can be set to ONE EPOCH, TWO EPOCHS, or AUTO. The ONE EPOCH setting will force 300 ms of audio silence at the start of a received audio session. TWO EPOCHS has 600 ms of audio silence and AUTO has no silence injected. Using an epoch setting to add silence does incur the penalty of up to 600 ms of playback

latency. AUTO makes the audio prone to jitter and keeps latency to a minimum.

The AUTO mode is best suited for groups of soldiers not likely to spread their ranks across vast distances. The ONE or TWO EPOCHS settings are best suited for long haul repeater scenarios and convoys.

NOTE

In the event of VoIP, if the number of voice hops is less than the number of RF hops required to reach the destination, then the VoIP stream will fail.

Internet Protocol

IP data is transmitted in the data frames. Data operations are dissimilar to other Ad-Hoc IP Networking waveforms in that the data slots are shared and no Layer 3 Routing protocol is used to determine IP packet forwarding, hence S-TNW is an Ad-Hoc Mesh rather than a Mobile Ad-Hoc Network (MANET). S-TNW acts more like a dynamic or mobile switch than a MANET router. Fixed IP Addressing is used and requires configuration of the radio's IP routes via the CPA in order to forward IP coming into or out of the radio.

The data application on an attached host (or network) sends IP packets addressed to a distant host routed through the wireless network, or directly to a radio that is part of the wireless network. The IP routing and encryption is handled by the radio prior to transmission through the waveform. S-TNW encrypts the entire packet to include the IP header using a waveform pre-shared key.

NOTE

IPSec is required for S-TNW when used in conjunction with the BGAN. Refer to **[PGM] > VOIP > RTP LATENCY MODE** for BGAN setting.

SNMP

Simple Network Management Protocol (SNMP) is used to monitor network-attached devices for conditions that warrant administrative attention, such as when reporting radios join or leave the wireless network. This capability is configured using CPA. SNMP exposes management data in the form of variables on the managed systems, which describe the system configuration. SNMPv3 is supported.

Summary

5 S-TNW supports the following.

- Pseudo Ad-Hoc Mesh Networking.
- Up to six talk groups on one frequency.
- Simultaneous Voice, SA, and Data - Voice, SA reports, and IP Data over the network at the same time.
- Conventional Half-Duplex Voice - One station talks as is the case with a conventional digital voice channel.
- Contemporary Full-Duplex Voice - Two stations talk as is the case with conference calling.
- Multiple Data Transmissions - Multiple data exchanges are supported between radios at the same time.
- Transport standard Internet Protocol (IP) packets - Supports IPv4 protocol and any application that sends unicast, broadcast, or multicast traffic over IP such as hC2 Suite of Command and Control (C2) software, or Tactical Chat (TacChat) IP via Ethernet interface.
- Encryption - Voice, IP, and SA encryption using AES based Communications Security (COMSEC).
- Situational Awareness - Embedded SA application sends position reports based on user configuration for location or time/periodic reports.

ADVANCED OPERATIONS 6

This section contains information on advanced operations.

VOICE BREAK-IN

A voice break-in results in the radio transmitting over any other radio currently using the channel. Press **[PTT]** for voice transmission. If the channel is in use, a variable hold-off occurs. This happens while attempting to get channel access. Continue to press **[PTT]** during the hold-off tone (longer than five seconds). A voice break-in occurs. Refer to Digital Voice, p53 for additional information on different break-in behaviors.

CONNECTING CAMERA / USB DRIVE

Universal Serial Bus (USB) on remote KDU must be set to AUTO or HOST (**[PGM]** > USB MODE), and the ancillary connector mode (**[PGM]** > MISC) must be set to AUTO or ON to mount a camera (or physical USB thumb drive) as an external USB drive on the remote KDU. Refer to [PGM] > MISC, p122.

Connect a camera or USB drive using the remote Keypad Display Unit (KDU). Cable depends on camera USB connector.

a. Connect remote KDU between camera and radio.

b. Observe that camera appears on remote KDU as EXTUSBDRIVE1 in file browser ([APPS] > FILE BROWSER, p64).

c. Send files to another radio or Internet Protocol (IP) address (refer to File Transfer Setup).

CONNECTING TO IP NETWORK

Connect to IP network as follows.

a. Set radio IP address of radio. Refer to [PGM] > IP CONFIGURATION, p114.

b. Connect cable between radio and PC/router/hub. Use USB - Ethernet with RJ-45 cable (12164-0714-A006). This cable has internal USB-to-Ethernet converter.

USER LEVELS

User login levels are described in Table 4. Default passwords are shown. Passwords are programmed from **[PGM] > USER INTERFACES** or from the Communication Planning Application (CPA) when the mission plan is downloaded.

Table 4. User Levels

User	Password	Intent	User Level Menus
level 1	HH01	Operator	**[APPS]** • File Browser • Built In Test • IP Config • Versions • Faults • Misc • Date and Time • Power Supply **[PGM]** • Can modify Audio, and User Interfaces items. • View only on most other items • No Key Manager, Transec, USB Mode

Table 4. User Levels (Continued)

User	Password	Intent	User Level Menus
level 2	HH02	COMSEC	Can perform level 1 functions plus: **[PGM]** • Net Manager • Net Assignments • Key Manager • Transec • Navigation • USB Mode • IP Configuration • Miscellaneous • Versions • Audio • Date/Time • User Interfaces • Contacts • VoIP • Voice Mail • CSS • S-TNW
level 3	HH03	Comms Officer	Can perform level 2 functions plus: **[APPS]** • Fill Radio • Program Firmware **[PGM]** • SNMP Agent • TAC CHAT IP • Radio Features

Table 4. User Levels (Continued)

User	Password	Intent	User Level Menus
level 4	*See Note.	Maintenance	Can perform level 3 functions plus: **[APPS]** • Diagnostics - BERT IDLE screen. • BIT Error Rate Test Screen **[PGM]** • BERT • Calibration • WBTEST

***NOTE:** User Level 4 password is an Intermediate Maintenance function. BERT and calibration settings are currently factory operations.

Login/Logout Information

Change user levels by logging out and logging in. To log out/log in:

a. Select the **[APPS]** key to enter the front panel menu.

b. Select the **LOGOUT** soft key.

c. Observe this prompt: “Are You Sure You Want to Logout”?.

d. Select the **YES** soft key to confirm log out or **NO** soft key to cancel logging out and press **[ENT]**.

e. Move to USER LEVEL and press **[ENT]**.

f. Enter a user level and press **[ENT]**.

g. Select ▼ to PASSWORD and press **[ENT]**.

h. Enter password within the text editor and press **[ENT]**.

i. Select the **LOGIN** soft key.

j. Observe display returns to main screen.

NOTE

If login fails, try again making sure to enter the correct user level and password with no spaces.

Select whether or not you remain logged in using **[PGM]** > **USER INTERFACES** > **FRONT PANEL** > **KEEP LOGIN**. If this is set, you remain logged in after a power cycle. If none is set, you must log in upon every power cycle. This is the same as Retain Login in the CPA.

Set up login for the radio's terminal interface using **[PGM]** > **USER INTERFACES** > **ASCII REMOTE**. This is persistent along with the KDU.

Configure the embedded web server and session management using **[PGM]** > **USER INTERFACES** > **WEB INTERFACE**.

6

USER MESSAGES

Information messages and warning messages notify you that a certain action or configuration issue needs attention. These messages appear as shown in Figure 15, for example. Refer to Display Messages, p188 for descriptions of these messages.

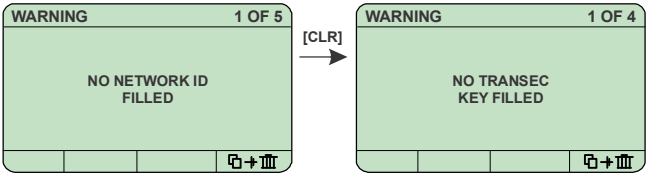


Figure 15. Sample Warning Message

[APPS] MENU

See Figure 16. The Applications (**[APPS]**) menu is used for viewing radio status, running a self-test, or for accessing the radio's internal applications, such as browsing the file system.

NOTE

Change or enter a highlighted field by pressing **[ENT]** or **[CLR]** to back out of a menu.

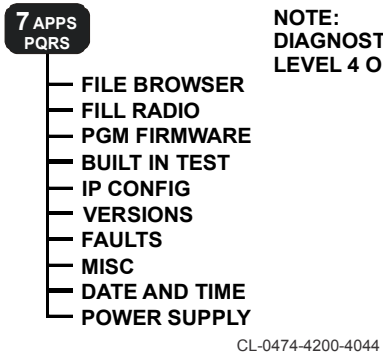


Figure 16. [APPS] Menu

[APPS] > FILE BROWSER

Figure 17 shows the **FILE BROWSER** top level menu. Figure 18 and Figure 19 show the file browser screen when you are inside a user directory or another drive such as EXTUSBDRIVE1. Table 5 describes the functions available on the soft keys from FILE BROWSER. The MOVE and COPY soft key functions are not valid for FILE BROWSER folders. Management Information Bases (MIBS) are files used with SNMP network setup.

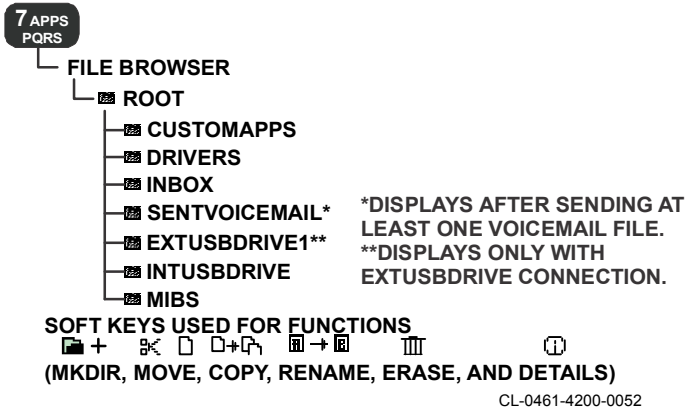
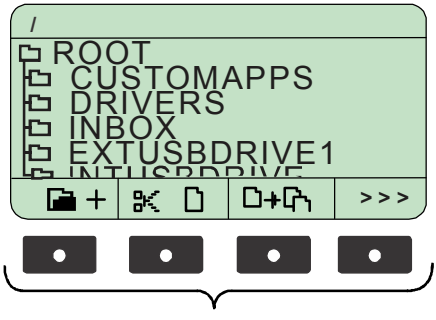


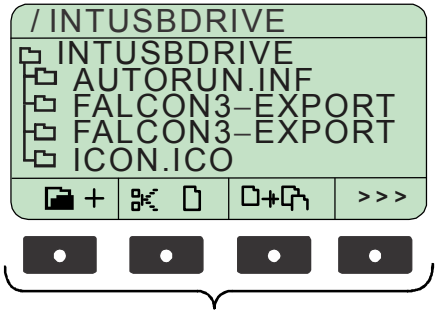
Figure 17. [APPS] FILE BROWSER TOP LEVEL Menu



SOFT KEYS USED FOR FUNCTIONS
LISTED ON BOTTOM OF SCREEN

CL-0461-4200-4070

Figure 18. File Browser Top Level



SOFT KEYS USED FOR FUNCTIONS
LISTED ON BOTTOM OF SCREEN

CL-0461-4200-4071

Figure 19. File Browser Display Inside Directory

Table 5. File Browser Soft Key Functions

Soft Key	Function
MKDIR (MKDIR = Make Directory)	Create directories (folders).
MOVE	Move files (.jpg, .xml, .hcpa, .cpafill, .ruf).
COPY	Copy files (.jpg, .xml, .hcpa, .cpafill, .ruf).
RENAME (Press MORE to access)	Rename child directories and files.
ERASE (Press MORE to access)	Erase (Delete) empty child directories and files.*
DETAILS (Press MORE to access)	View additional detailed information.
*All files must be removed from a directory before deleting the directory.	

[APPS] > FILL RADIO

See Figure 20. **FILL RADIO** launches a file browser that filters out anything that is not a .hcpa/.cpafill file or directory. When you select a corresponding .hcpa/.cpafill file, the radio will load with that fill file.

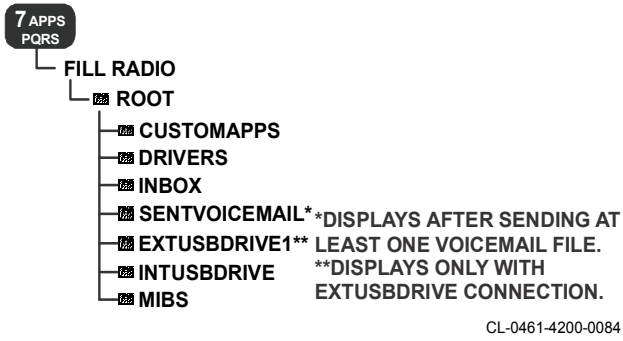


Figure 20. [APPS] > FILL RADIO Menu

Load a mission plan fill using EXTUSBDRIVE1 as an example.

a. Connect an external Universal Serial Bus (USB) flash drive.

b. Mount the drive as EXTUSBDRIVE1.

c. Access **[APPS] > FILL RADIO**.

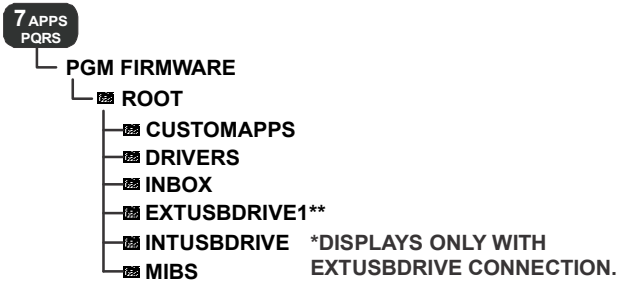
d. Navigate to the fill file and press **[ENT]**.

e. Select YES at the prompt “ARE YOU SURE YOU WANT TO LOAD A NEW CONFIG”.

f. Observe that the plan will load to the radio.

[APPS] > PROGRAM FIRMWARE

See Figure 21. **PROGRAM FIRMWARE** launches a file browser that filters out anything that is not a .ruf file or directory. When you select a corresponding .ruf file, the radio will load with that firmware.



CL-0461-4200-0083

Figure 21. [APPS] > PROGRAM FIRMWARE Menu

Load firmware using a remote KDU.

a. Place the firmware upgrade file (**.ruf** file type) onto a USB drive.

b. Connect the USB drive to a remote KDU and the remote KDU to the radio (by default STORAGE DEVICE is the USB MODE).

c. Select [APPS] > PGM FIRMWARE > EXTUSBDRIVE1.

d. Select the **.ruf** file and confirm (yes softkey) loading of new software.

e. Observe a voice prompt for Firmware Updated.

f. Place the radio in OFF and then back to a preset to power cycle the radio and complete the firmware reset.

g. Select the Clear All soft key to go to the main preset screen.

[APPS] > BUILT IN TEST

See Figure 22. **BUILT IN TEST** is used to run a radio self-test. Refer to Table 6 for descriptions of the menu items.

NOTE

Do not run built in test while operating in a S-TNW net.

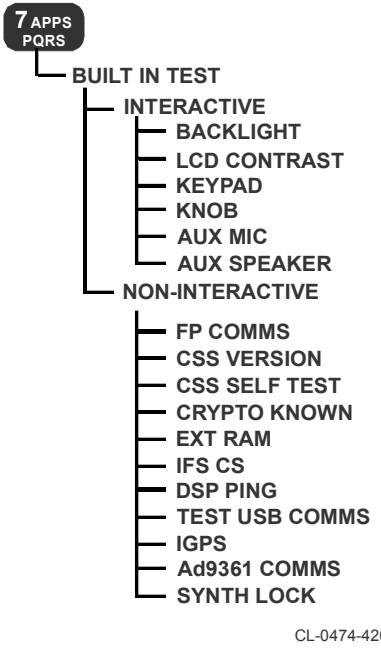


Figure 22. [APPS] > BUILT IN TEST Menu

Table 6. [APPS] > BUILT IN TEST Menu Items

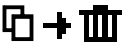
Item	Description
INTERACTIVE> BACKLIGHT	Runs test on LCD for backlight. User observes display for backlight changes.
INTERACTIVE> LCD CONTRAST	Runs test on LCD for contrast. User observes display for contrast changes.
INTERACTIVE> KEYPAD	Runs keypad test. Test displays keys pressed by user.
INTERACTIVE> KNOB	Runs test on radio knob positions. Test displays knob positions (1-13, R and Z) selected by user.
INTERACTIVE > AUX MIC	Runs tests on circuits used for headset microphone.
INTERACTIVE > AUX SPEAKER	Runs tests on circuits used for headset speaker.
NON-INTERACTIVE	Runs non-interactive tests.
RUN ALL 	Run all non-interactive tests and provides details for number passed, failed, tested and percent done.
STOP ALL 	Stops all tests.
RESET RESULTS 	Reset and all test results.
RESULTS 	Displays all test results.
MANUAL > FP COMMS	Tests front panel communications.
MANUAL > CSS VERSION	Tests for proper Cryptographic Subsystem (CSS) version.
MANUAL > CSS SELF TEST	Shows if CSS is tested.
MANUAL > CRYPTO KNOWN	Runs the application crypto test.

Table 6. [APPS] > BUILT IN TEST Menu Items (Continued)

Item	Description
MANUAL > EXT RAM	Runs the external RAM test.
MANUAL > IFS CS	Checks Image File System (IFS) Check Sum (CS).
MANUAL > DSP PING	Checks if the Digital Signal Processor (DSP) can be reached.
MANUAL > TEST USB COMMS	Runs USB port communication test.
MANUAL > IGPS	Checks communication with the internal Global Positioning System (GPS) module.
MANUAL > AD9361 COMMS	Checks communication with the internal AD9361 module.
MANUAL > SYNTH LOCK	Tests for Synthesizer (Synth) out of lock and other synthesizer faults.

[APPS] > IP CONFIGURATION

See Figure 23. **IP CONFIGURATION** displays the IP settings in the radio. Refer to Table 7 for descriptions of the menu items. **ADD**, **DELETE**, and **FLUSH** commands are displayed as soft key options in the **IP CONFIGURATION** menu. Use **ADD** to add routes. Use **DELETE** to remove a route. Use **FLUSH** to remove all user added routes.

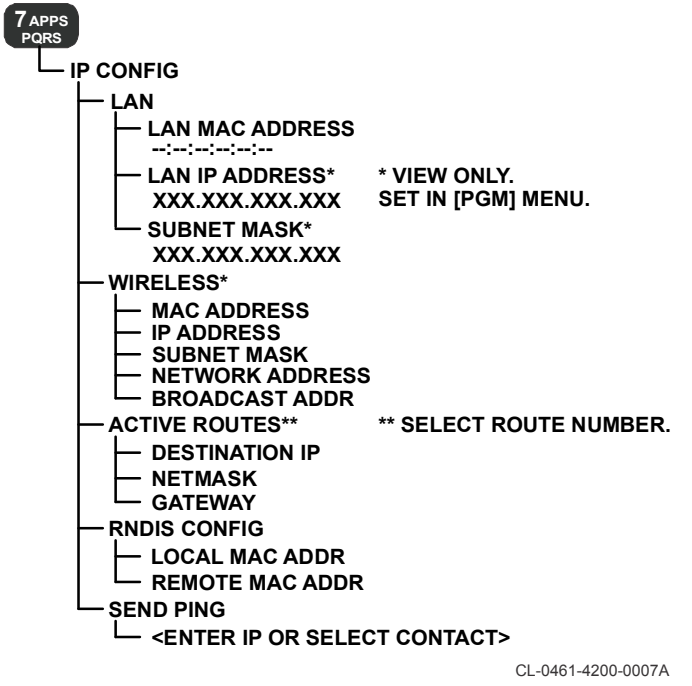


Figure 23. [APPS] > IP CONFIGURATION

Table 7. [APPS] > IP CONFIGURATION Menu Items

Item	Description
LAN > LAN MAC ADDRESS	Radio's current Media Access Control (MAC) address.
LAN > LAN IP ADDRESS	Radio's current wired IP address.
LAN > SUBNET MASK	Radio's current subnet mask.
WIRELESS > MAC ADDRESS	Radio's current wireless MAC address.
WIRELESS > IP ADDRESS	Radio's current wireless IP address.
WIRELESS > SUBNET MASK	Radio's current wireless subnet mask.
WIRELESS > NETWORK ADDRESS	Radio's current wireless network address.
WIRELESS > BROADCAST ADDR	Radio's current wireless broadcast address.
ACTIVE ROUTES	Select from list of Active Routes.
ACTIVE ROUTES > DESTINATION IP	Route's IP destination.
ACTIVE ROUTES > NETMASK	Route's net mask.
ACTIVE ROUTES > GATEWAY	Route's gateway IP address.
RNDIS CONFIG > LOCAL MAC ADDR	Radio's current local MAC address.
RNDIS CONFIG > REMOTE MAC ADDR	Radio's current remote MAC address.
SEND PING	For S-TNW nets only on this radio. Enter destination IP address or select IP address from contact list. Select Start soft key to send ping. Observe ping in progress and ping result displays.

[APPS] > VERSIONS

See Figure 24. **VERSIONS** is used to view firmware versions and software options in the radio. Refer to Table 8 for descriptions of the menu items.

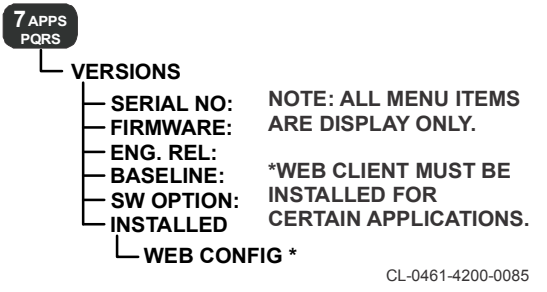


Figure 24. [APPS] > VERSIONS

Table 8. [APPS] > VERSIONS Menu Items

Item	Description
SERIAL NO	Displays the radio's serial number.
FIRMWARE	Displays the radio's firmware version number.
ENG. REL	Displays the radio's engineering release level if installed.
BASELINE	Identifies if the installed version is a baseline version.
SW OPTION	Displays the radio's installed software SW002.
INSTALLED > WEB CONFIG	Displays the radio's installed applications such as WEB CONFIG. By default the radio has WEB_CONFIG and WEB_NAV. The full Web UI includes: WEB_CONFIG, WEB_CUSTOMAPPS, WEB_DIAGNOSTIC, WEB_FILEBROWSER, WEB_KDU, WEB_NAV, WEB_TACCHAT, and WEB_VIDEO.

[APPS] > FAULTS

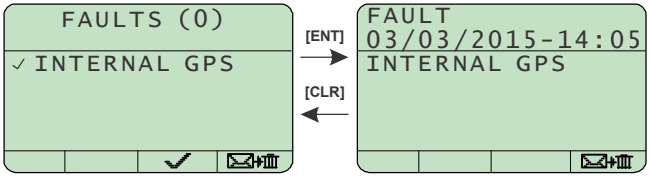
See Figure 25. Faults provide information related to a fault present in the radio. Refer to Table 36 for radio faults and applicable descriptions. See Figure 26 for a sample fault message. If a fault message is displayed, try clearing the fault and power cycle the radio. If fault persists, send the radio to maintenance.

NOTE

Faults will be retained after the radio is power cycled. They must be cleared manually by pressing the Delete Message soft key.

CL-0461-4200-0086

Figure 25. [APPS] > FAULTS



CL-0461-4200-4076

Figure 26. Sample Fault Message (Viewed)

[APPS] > MISC

See Figure 27. Miscellaneous **(MISC)** settings. Refer to Table 9 for descriptions of the menu items.

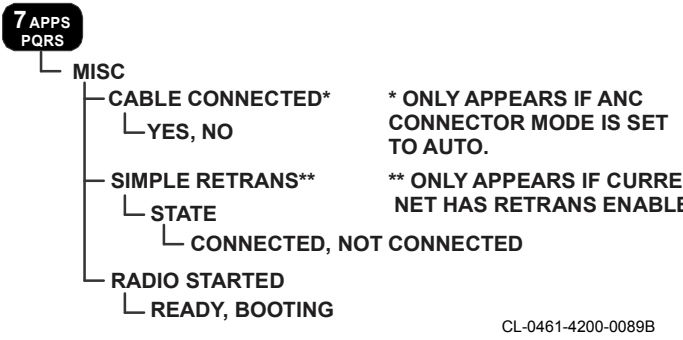


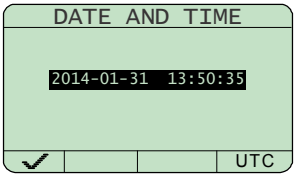
Figure 27. [APPS] > MISC Menu

Table 9. [APPS] > MISC Menu Items

Item	Description
	Radio reset soft key. Select soft key to power cycle the radio.
CABLE CONNECTED	(Display only) YES if cable detected and NO if no cable connection is detected. Dependent on ANC Connector Mode setting to AUTO.
SIMPLE RETRANS > STATE	(Display only) Indicates CONNECTED when radio can communicate with other retransmit site radio; NOT CONNECTED may indicate connection or configuration problem.
RADIO STARTED	(Display only) Indicates the status of the basic radio startup. READY when radio has completed startup. BOOTING indicates radio is not ready for normal operation yet.

[APPS] > DATE AND TIME

See Figure 28. Use to view and edit the radio's date and time settings. Press **[ENT]** to make time and date changes and SET ✓ soft key to confirm change. Press Universal Time Coordinated (UTC) soft key to change settings (time format, offset).

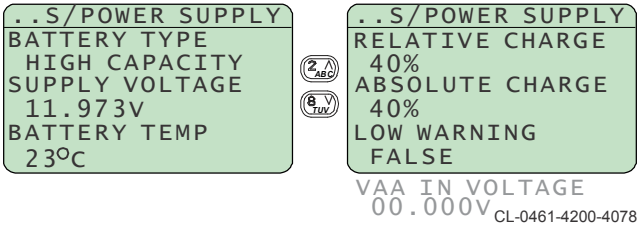


CL-0461-4200-4079

Figure 28. [APPS] > DATE AND TIME

[APPS] > POWER SUPPLY

See Figure 29. Use to view the radio source power status. The display includes the type of battery, current voltage, temperature, relative charge, absolute charge and voltage sourced by a Vehicular Amplifier (if any). A bar graph also shows the current charge status.



CL-0461-4200-4078

Figure 29. [APPS] > POWER SUPPLY

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PROGRAMMING 7

PROGRAMMING OVERVIEW

This section provides information on radio programming. Programming is accomplished using the Communications Planning Application (CPA), a KDU, or by using the Web User Interface.

Some programming functions may not be available because of your User Level. Refer to User Levels, p59 for more information.

Select the **SAVE** soft key to save changes made from the KDU programming functions.

Restore factory defaults by pressing **[APPS]** and selecting the **ZERO** soft key or place the rotary switch in the **Z** position. Refer to Radio Controls, p28 for basic operations.

Program the radio from a CPA mission plan while logged in as user level 3. Use the following methods to transfer the plan.

7

- Connect the USB Field Programming Cable (12164-0710-A006) and use the CPA Programming screen to load the fill file. Disconnect the cable to initiate programming.
- Connect an external Universal Serial Bus (USB) flash drive. Mount the drive as EXTUSBDRIVE1.
- Connect Ethernet cable and use File Transfer Protocol (FTP) to copy the fill to the radio's Autoload directory.
- Upload the plan using the File Browser of the Web User Interface.
- Connect a PC and radio on the same network using direct Ethernet or Remote Network Driver Interface Specification (RNDIS) for USB. Fill the radio directly through the CPA by specifying the IP address.

Fill the radio as follows:

a. Access **[APPS] > FILL RADIO**.

b. Navigate to the fill file and press **[ENT]**.

c. Select YES at the prompt "ARE YOU SURE YOU WANT TO LOAD A NEW CONFIG". The plan will load to the radio.

[PGM] MENU

See Figure 30. Select **[PGM]** to access the program menu. Configure radio functions such as nets, IP address, crypto keys, Global Positioning System (GPS), radio interface, and so forth.

NOTE

Some settings are only visible based on other settings. Refer to Table 11 for supported modes of operation such as modulation, frequency, channel access, and data rates.

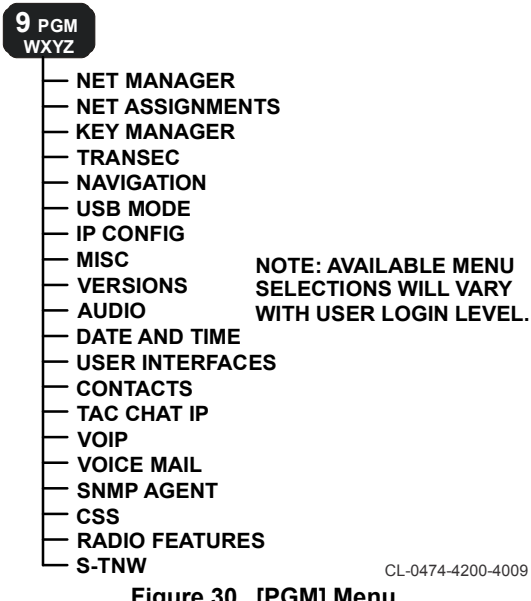


Figure 30. [PGM] Menu

[PGM] > NET MANAGER

Use **NET MANAGER** to program up to 25 nets. Assigned nets are accessible using the rotary switch. Refer to [PGM] > NET ASSIGNMENTS, p99. The predefined nets can be numbered or named using any alphanumeric character up to 20 English characters in length (or 10 Arabic).

See Figure 31 for NET MANAGER programming menu structure for Fixed Frequency (FF) net.

See Figure 32 for the S-TNW nets specific programming menu structure.

See Figure 33 for the APPS portion of the net programming menu structure.

Refer to Table 10 for descriptions of the menu items for each net.

Refer to Table 11 for supported modes of operation such as modulation, frequency, channel access, and data rates.

NOTE

Refer to the TNW Operation Guide, 10515-0363-4010, for information on TNW operation and programming.

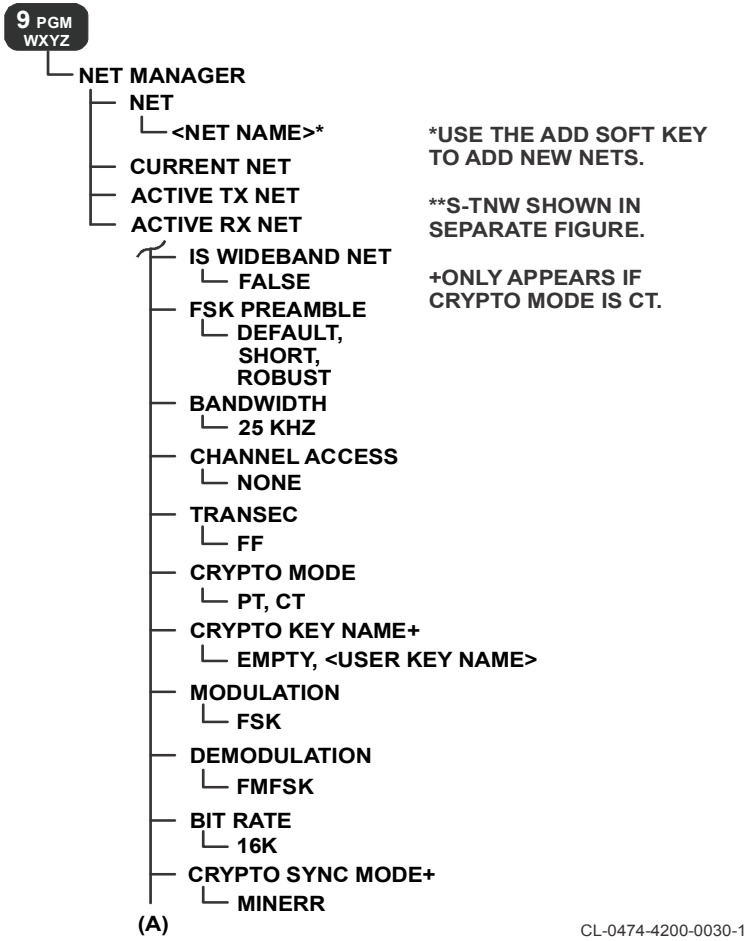
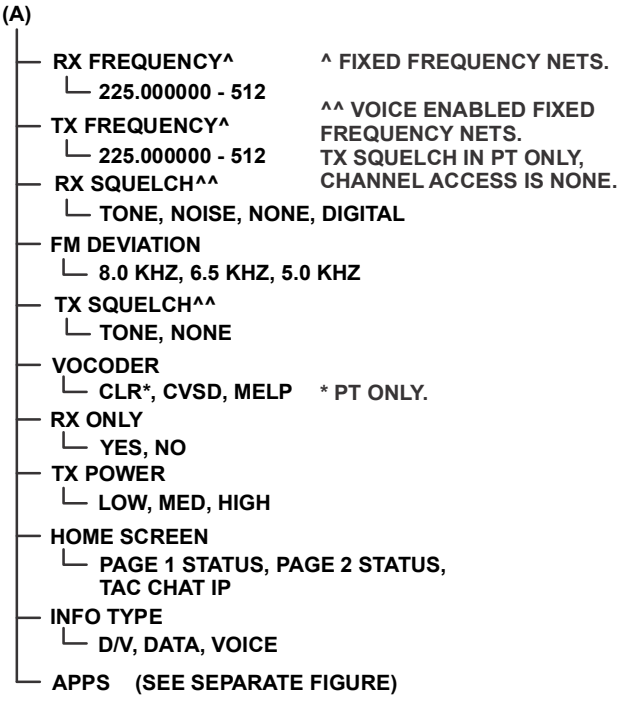


Figure 31. [PGM] > NET MANAGER, FF (Sheet 1 of 2)



CL-0474-4200-0030-2

Figure 31. [PGM] > NET MANAGER, FF (Sheet 2 of 2)

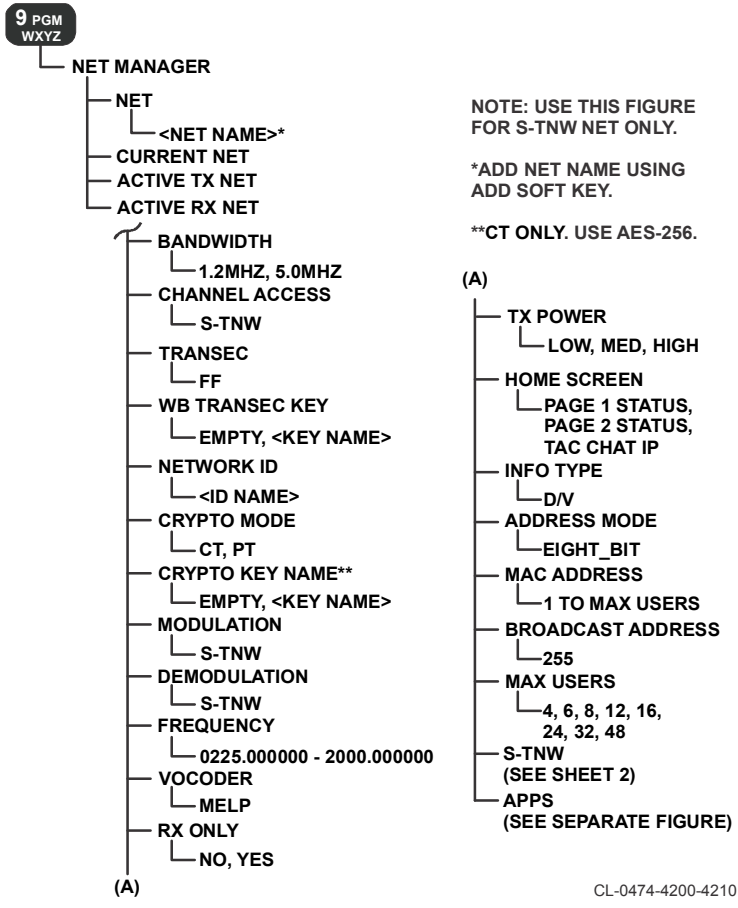


Figure 32. [PGM] > NET MANAGER, S-TNW Menu (Sheet 1 of 2)

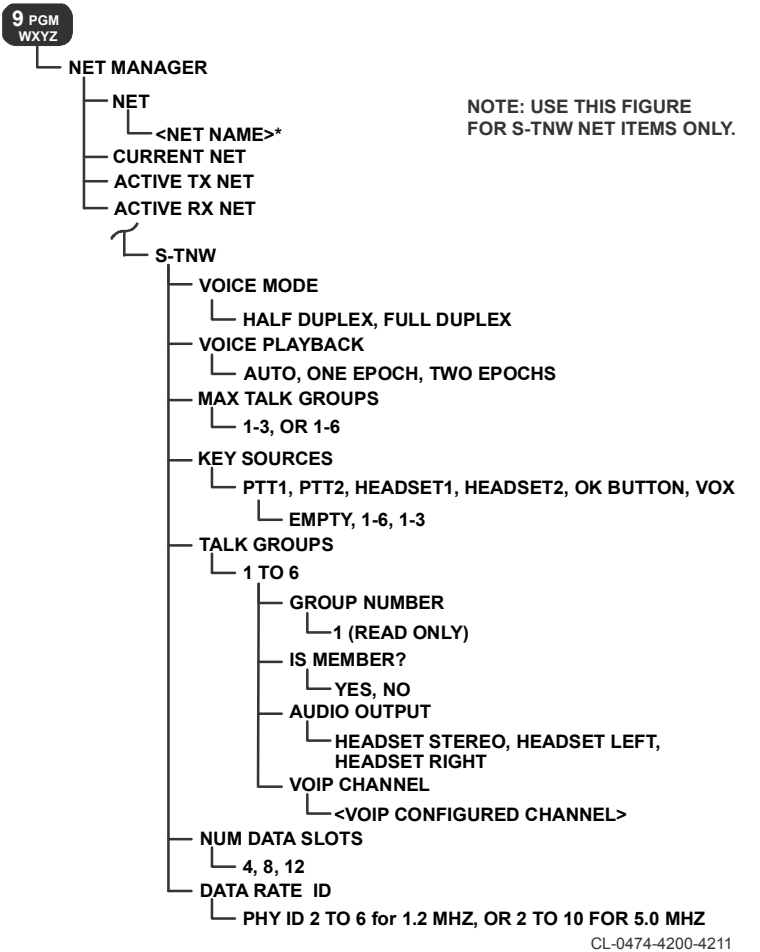


Figure 32. [PGM] > NET MANAGER, S-TNW Menu (Sheet 2 of 2)

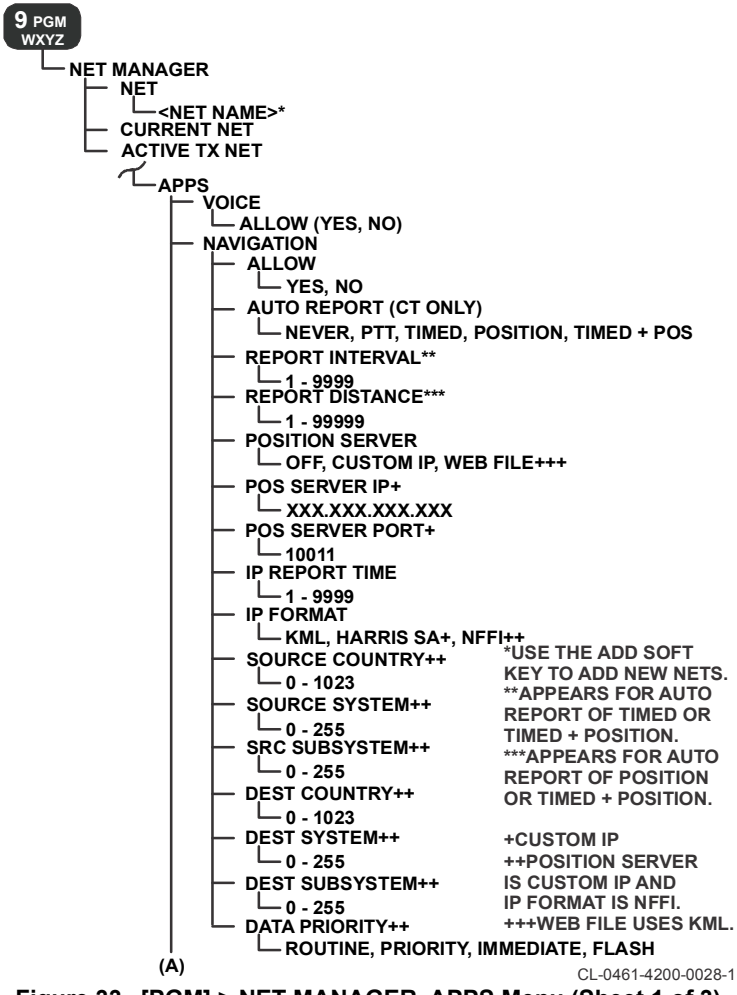


Figure 33. [PGM] > NET MANAGER, APPS Menu (Sheet 1 of 3)

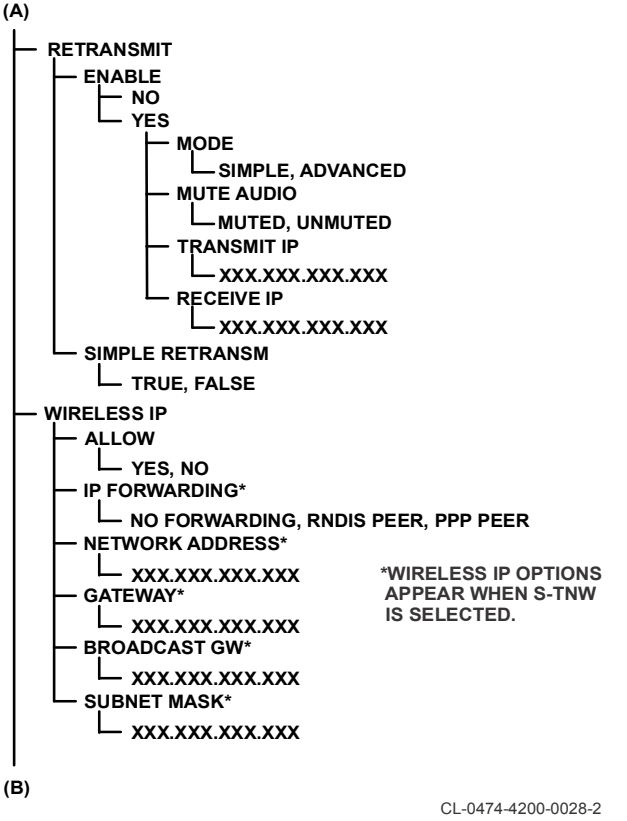


Figure 33. [PGM] > NET MANAGER, APPS Menu (Sheet 2 of 3)

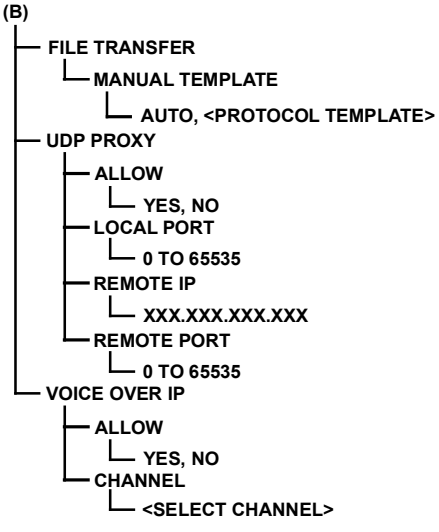


Figure 33. [PGM] > NET MANAGER, APPS Menu (Sheet 3 of 3)

NOTE

Some settings are only visible based on other settings. For example, if the net is set to Cipher Text (CT), then AUTO REPORT is visible (select EDIT then APPS > NAVIGATION).

Refer to Table 11 for supported modes of operation for modulation, frequency, channel access, and data rates.

Table 10. [PGM] > NET MANAGER Menu Items

Item	Description
Net Name (or Number) can be any net, **1** - **25**.	
Net Name **> FSK PREAMBLE**	Select Frequency Shift Keying (FSK) Preamble length depending on channel conditions. Only available on fixed frequency simple nets (CHANNEL ACCESS = NONE). Preamble must be the same in all radios in the net: • **DEFAULT** - Appropriate for all modes except as described for **ROBUST** and **SHORT**. • **ROBUST** - Use for poor channel conditions, when transmitting to a radio that is scanning, or when transmitting through an RF-5800V retransmit site. • **SHORT** - Can be used if power management is disabled and channel conditions are good.
Net Name **> BANDWIDTH**	Select 1.2 MHz or 5.0 MHz bandwidth for S-TNW. Select 25 kHz bandwidth for FF or TNW. This is compatible with legacy radios.
Net Name **> CHANNEL ACCESS**	Select None, TNW, or S-TNW.
Net Name **> TRANSEC**	Select TRANSEC to correspond to type of channel being used. Only Fixed Frequency is supported for FF and S-TNW.
Net Name **> NB TRANSEC KEY NAME**	Select NB TRANSEC KEY to correspond to TRANSEC channel being used for TNW.
Net Name **> WIDEBAND TRANSEC KEY NAME**	Select TRANSEC KEY to correspond to TRANSEC channel being used for S-TNW.
Net Name **> NETWORK ID**	Specify a unique network identifier.
Net Name **> CRYPTO MODE**	Select Plain Text (PT) (unencrypted) or Cipher Text (CT) (encrypted). For S-TNW, use CT for normal operation. PT is also used for Black Repeater operation.

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> CRYPTO KEY NAME**	If crypto is CT, select name for AES-256 key programmed per [PGM] > KEY MANAGER, p102.
Net Name **> MODULATION**	FSK is default. Not user selectable. Refer to Table 11.
Net Name **> DEMODULATION**	FMFSK is default. Not user selectable. Refer to Table 11.
Net Name **> BIT RATE**	Baud rate is 16K bps for FF operation. Refer to Table 11.
Net Name **> CRYPTO SYNC MODE**	If crypto mode is CT, select crypto Synchronization (Sync) mode. • **MINERR** (default mode) - crypto synchronization must take place before an encrypted transmission can be decrypted. Supported on Simple and Wireless Internet Protocol (WIP) nets. • **RESYNC** - allows a CVSD enabled radio on simple voice/data nets to receive an encrypted transmission already in progress. More susceptible to noise than MINERR.
Net Name **> FREQUENCY**	Enter S-TNW frequency of 225 MHz to 2.0 GHz. Precision is 6 (1 kHz) or 0225.000001.
Net Name **> RX FREQUENCY**	Enter receive frequency of 225 MHz to 512 MHz for FF nets.
Net Name **> TX FREQUENCY**	Enter transmit frequency of 225 MHz to 512 MHz for FF nets.
Net Name **> RX SQUELCH**	Select noise, tone, digital or none. All radios in the net must use the same squelch for transmit and receive.
Net Name **> TX SQUELCH**	Select tone or none when in PT and channel access is none.
Net Name **> FM DEVIATION**	Select FM deviation of 5 kHz, 6.5 kHz, or 8 kHz. All radios in the net must use the same deviation.

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> VOCODER**	Select voice encoder/decoder: Continuously Variable Slope Delta (CVSD), Mixed-Excitation Linear Predictive enhanced (MELPe), or analog clear (CLR).
Net Name **> RX ONLY**	Select whether net is receive only or not. Transmission is not allowed on net when set to YES is (for radio silence operations).
Net Name **> TX POWER**	Select transmit power level of LOW, MED, or HIGH.
Net Name **> ADDRESS MODE**	Eight-Bit (read only).
Net Name **> MAC ADDRESS**	Sets the Layer 2 MAC address of the radio used to uniquely identify the radio within the current network. DO NOT set two or more radios to the same MAC Address as this will cause failures. DO NOT set this value before setting the MAX USERS, as you may not be able to assign all MAC Addresses if the MAX USERS is currently less than the number of radios being configured.
Net Name **> MAX USERS**	Sets the maximum number of radios that may be configured for this network. Intervals are 4, 6, 8, 12, 16, 24, 32, and 48. If the number of desired radios is not equal to one of the available intervals, use the next higher interval number.
Net Name **> HOME SCREEN**	Set which screen will be displayed as the first screen shown for the net: PAGE1, PAGE2, or the TAC CHAT home screen. Note that all three can always be accessed by pressing **[ ] (0)**.
Net Name **> INFO_TYPE**	Specifies the type of information to send over the air. Data and Voice (D/V), Data, or Voice.
Net Name **> S-TNW**	Set S-TNW specific parameters.
Net Name **> S-TNW > VOICE MODE**	Selects HALF DUPLEX verses FULL DUPLEX audio operations. The selected duplex mode is applied to all talk groups.

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> S-TNW > VOICE PLAYBACK**	Selects the maximum number of epochs used for voice forwarding. One (1) epoch is equivalent to 300 ms. If AUTO is selected, voice is forwarded without limitation.
Net Name **> S-TNW > MAX TALK GROUPS**	Configures the number of Talk Groups available for the current network. If VOICE MODE is HALF DUPLEX, then the user may configure up to six (6) Talk Groups. If VOICE MODE is FULL DUPLEX, then the user may configure up to three (3) Talk Groups.
Net Name **> S-TNW > KEY SOURCES**	Set S-TNW> KEY SOURCES specific parameters.
Net Name **> S-TNW > KEY SOURCES > PTT1**	Assigns the Push-To-Talk (PTT1) key source to the numerically identified Talk Group. Values range from 1 to 6 if VOICE MODE is FULL DUPLEX, or 1 to 3 if VOICE MODE is HALF DUPLEX, or EMPTY if the PTT1 button is not used.
Net Name **> S-TNW > KEY SOURCES > PTT2**	Assigns the PTT2 key source to the numerically identified Talk Group. Values range from 1 to 6 if VOICE MODE is FULL DUPLEX, or 1 to 3 if VOICE MODE is HALF DUPLEX, or EMPTY if the PTT2 button is not used.
Net Name **> S-TNW > KEY SOURCES > HEADSET1**	Assigns the HEADSET1 key source to the numerically identified Talk Group. Values range from 1 to 6 if VOICE MODE is FULL DUPLEX, or 1 to 3 if VOICE MODE is HALF DUPLEX, or EMPTY if the HEADSET1 button is not used.
Net Name **> S-TNW > KEY SOURCES > HEADSET2**	Assigns the HEADSET2 key source to the numerically identified Talk Group. Values range from 1 to 6 if VOICE MODE is FULL DUPLEX, or 1 to 3 if VOICE MODE is HALF DUPLEX, or EMPTY if the HEADSET2 button is not used.

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> S-TNW > KEY SOURCES > OK BUTTON**	Assigns the OK BUTTON key source to the numerically identified Talk Group. Values range from 1 to 6 if VOICE MODE is FULL DUPLEX, or 1 to 3 if VOICE MODE is HALF DUPLEX, or EMPTY if the OK BUTTON button is not used.
Net Name **> S-TNW > KEY SOURCES > VOX**	Assigns the Voice Operated Transmitter (VOX) key source to the numerically identified Talk Group. Values range from 1 to 6 or 1 if VOICE MODE is FULL DUPLEX, or 1 to 3 if VOICE MODE is HALF DUPLEX, or EMPTY if the VOX button is not used.
Net Name **> S-TNW > TALK GROUPS**	Set S-TNW>TALK GROUPS specific parameters.
Net Name **> S-TNW > TALK GROUPS > #**	Set S-TNW>TALK GROUPS><GROUP #> specific parameters.
Net Name **> S-TNW > TALK GROUPS > # > GROUP NUMBER**	This is a READ ONLY field identifying the talk group being configured by the user.
Net Name **> S-TNW > TALK GROUPS > # > IS MEMBER**	Sets radio's membership to the current Talk Group. If the radio IS a member of the group, a key source may be assigned to the group and all audio received over the air will be played back on the assigned audio output. The radio will also automatically forward all audio traffic if necessary. If the radio IS NOT a member of the group, no key source may be assigned to the group and any received audio will not be played back on any audio output device. However, the radio will automatically forward all audio traffic if necessary in spite of it not being a member.
Net Name **> S-TNW > TALK GROUPS > # > AUDIO OUTPUT**	Attaches an audio output device to the Talk Group. Options are: HEADSET STEREO HEADSET LEFT HEADSET RIGHT

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> S-TNW > TALK GROUPS > # > VOIP CHANNEL**	Select a VoIP channel from the list of configured channels. Refer to [PGM] > VOIP.
Net Name **> S-TNW > TALK GROUPS > # > VOIP CHANNEL SECONDARY**	Select a VoIP secondary channel from the list of configured channels. Refer to [PGM] > VOIP.
Net Name **> S-TNW > NUM DATA SLOTS**	Sets the number of shared data slots in the current network configuration. A user may configure the network to support 4, 8, or 12 data slots.
Net Name **> S-TNW > DATA RATE ID**	Select a minimum data rate ID of 2, 3, 4, 5, or 6 for 1.2 MHz bandwidth, or 2 through 10 for 5.0 MHz bandwidth.
Net Name **> APPS > VOICE > ALLOW**	If YES, voice communications functions are allowed.
Net Name **> APPS > NAVIGATION > ALLOW**	If YES, GPS functions are allowed. If NO, position reporting functions are disabled (GPS device may still be enabled).
Net Name **> APPS > NAVIGATION > AUTO REPORT**	Select the type of GPS reports to send (CT only). Report selections are: NEVER and PTT for FF nets. Additions for S-TNW are: TIMED, POSITION, or TIMED + POSITION.
Net Name **> APPS > NAVIGATION > REPORT FORMAT**	Select NORMAL, or COMPATIBILITY. This item is shown for FF nets.
Net Name **> APPS > NAVIGATION > REPORT INTERVAL**	Send GPS reports (Interval): REPORT INTERVAL applies to TIMED or TIMED + POSITION auto reporting. Values can be 1 - 9999 seconds. Interval restarts after automatic or forced report.
Net Name **> APPS > NAVIGATION > POSITION REPORT DISTANCE**	Send GPS reports (Distance): POS. REPORT DISTANCE applies to POSITION or TIMED + POSITION auto reporting. Values can be 1 - 99,999 meters. Distance restarts after automatic or forced report.

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> APPS > NAVIGATION > POSITION SERVER**	Disable (OFF) or set CUSTOM IP address, or WEB FILE for a position server that gathers the radio positions. WEB FILE is case sensitive: **https://<IP Address of radio>/ SituationalAwareness.kml** Note: If Secure Socket Layer (SSL) is disabled on the PC, use **http://<IP Address of radio>/ SituationalAwareness.kml**
Net Name **> APPS > NAVIGATION > POSITION SERVER IP**	Enter the IP address of the position server to forward reports.
Net Name **> APPS > NAVIGATION > POSITION SERVER PORT**	Enter a 4-digit port number on the position server to access (1001).
Net Name **> APPS > NAVIGATION > IP REPORT TIME**	Enter an interval in seconds between forwarding each report. Default is 30.
Net Name **> APPS > NAVIGATION > IP FORMAT**	Enter the format of the reports that will be sent to the position server. Choices are HARRIS SA, Keyhole Markup language (KML), or North Atlantic Treaty Organization (NATO) Friendly Force Information (NFFI). If NFFI is selected, the following properties become active: Source Country, Source System, Source Subsystem, Destination Country, Destination System, Destination Subsystem, Data Priority. Select the country from the list of all countries. For Source and Destination System/Subsystem, enter a value between 0 and 255. For Data Priority, select Routine, Priority, Immediate, or Flash Data priority.
Net Name **> APPS > NAVIGATION > SOURCE COUNTRY**	For NFFI IP Format only. Enter a value between 0 and 1023 representing the source country. 0, the default, means the source country is unspecified.

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> APPS > NAVIGATION > SOURCE SYSTEM**	For NFFI IP Format only. Enter a value between 0 and 255 to specify the numeric representation of the Force Tracking System(s) sending/receiving tracking data. 0 represents any system and 255 represents all systems.
Net Name **> APPS > NAVIGATION > SOURCE SUBSYSTEM**	For NFFI IP Format only. Enter a value between 0 and 255 to specify the numeric representation of the Force Tracking System(s) sending/receiving tracking data. 0 represents any subsystem and 255 represents all subsystems.
Net Name **> APPS > NAVIGATION > DEST COUNTRY**	For NFFI IP Format only. Enter a value between 0 and 1023 representing the destination country. 0, the default, means the destination country is unspecified.
Net Name **> APPS > NAVIGATION > DEST SYSTEM**	For NFFI IP Format only. Enter a value between 0 and 255 to specify the numeric representation of the Force Tracking System(s) sending/receiving tracking data. 0 represents any system and 255 represents all systems.
Net Name **> APPS > NAVIGATION > DEST SUBSYSTEM**	For NFFI IP Format only. Enter a value between 0 and 255 to specify the numeric representation of the Force Tracking System(s) sending/receiving tracking data. 0 represents any subsystem and 255 represents all subsystems.
Name **> APPS > NAVIGATION > DATA PRIORITY**	For NFFI IP Format only. Select Routine, Priority, Immediate, or Flash Data priority.

Table 10. [PGM] > NET MANAGER Menu Items (Continued)

Item	Description
Net Name **> APPS > RETRANSMIT**	Enable or disable radio retransmit mode. If Enabled, configure MODE, MUTE AUDIO, TRANSMIT IP, and RECEIVE IP. SIMPLE RETRANS is limited to red retransmit mode. Advanced dynamically transcodes audio on networks with differently configured retransmit radios. Simple provides red/black retransmit on FF nets with retrans configured the same way.
Net Name **> APPS > WIRELESS IP > ALLOW**	If YES, IP functions are allowed.
Net Name **> APPS > WIRELESS IP > IP FORWARDING**	Select No Forwarding, or Remote Network Driver Interface Specification (RNDIS) Peer.
Net Name **> APPS > FILE TRANSFER > MANUAL TEMPLATES**	Set at AUTO. This is read only if no Protocol Template is defined under [PGM] > TACCHAT IP. The protocol for this net when in manual mode is fixed.
Net Name **> APPS > UDP PROXY > ALLOW**	Set to YES when in a TNW net to allow User Datagram Protocol/Internet Protocol (UDP/IP) Proxy. When an application sends an IP packet destined to or through the radio with a user defined UDP port, the UDP Proxy will strip the header, and transmit the data. The receiving radios will recreate the header based on the user defined destination IP address and forward the IP packet. This is enabled in TNW to improve SA performance when only using UDP messaging.
Net Name **> APPS > UDP PROXY > LOCAL PORT**	The UDP port (0-65535) on which to receive data that is to be forwarded across the wireless interface.
Net Name **> APPS > UDP PROXY > REMOTE IP**	Enter destination IP address to forward received data [0.0.0.0 to 255.255.255.255].
Net Name **> APPS > UDP PROXY > REMOTE PORT**	Enter destination UDP port (0-65535) to forward received data.
Net Name **> APPS > VOICE OVER IP**	Select the Real Time Transport Protocol (RTP) channels on which primary and secondary net traffic is forwarded.

Table 11 shows supported modes of operation for the radio. The shaded background areas indicate compatibility with RF-5800M-HH radios (in the 225 to 512 MHz frequency range). FMFSK indicates that the radio will demodulate analog FM or digital FSK signals.

Table 11. Supported Modes of Operation

Bandwidth	Channel Access	TRANSEC	Crypto	Modulation/ Demodulation	Selected Bit Rate (bps)	Vocoder
25 kHz	None	FF	PT	FSK FMFSK	16K	CLR
25 kHz	None	FF	CT	FSK FMFSK	16K	CVSD
25 kHz	None	FF	CT	FSK/ FMFSK	16K	MELP
25 kHz	TNW	TNW	PT/CT	TNW	-	MELP
1.2 MHz	S-TNW	FF	PT/CT	S-TNW	-	MELP
5.0 MHz	S-TNW	FF	PT/CT	S-TNW	-	MELP

[PGM] > NET ASSIGNMENTS

See Figure 34. **NET ASSIGNMENTS** is used to set up the rotary switch on top of the radio. Refer to Table 12 for descriptions of the menu items. Up to 25 nets can be configured and 13 of can be selected using the rotary switch.

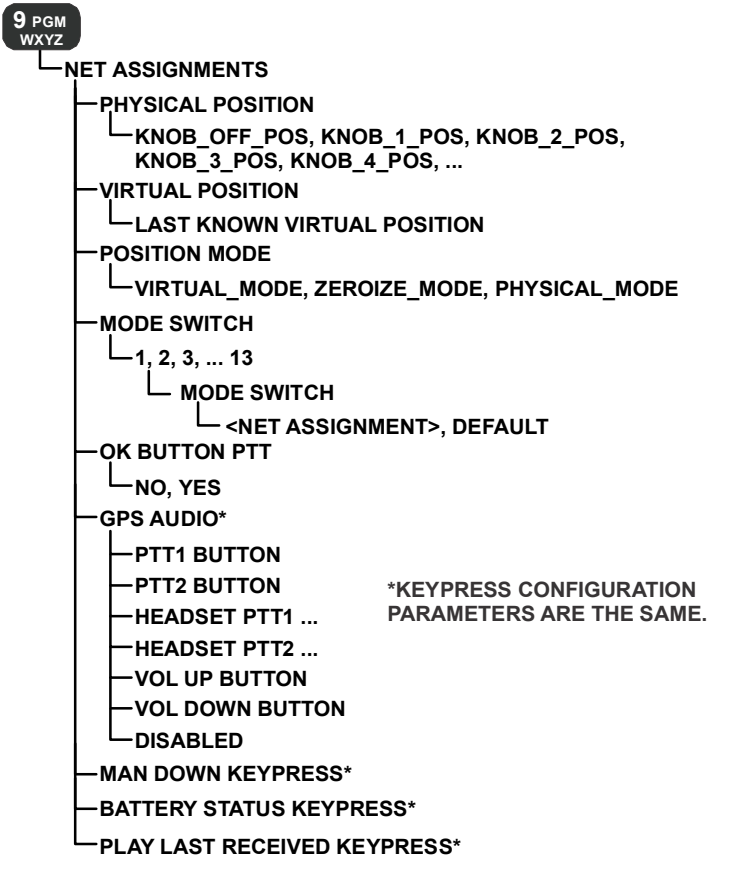


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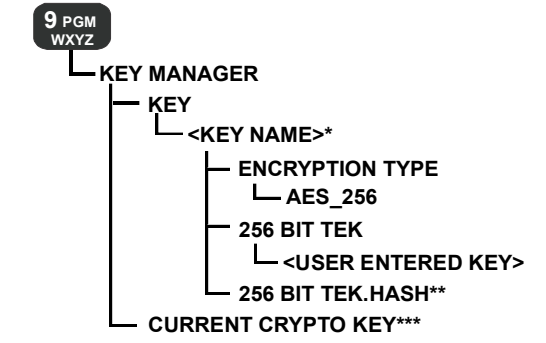
Figure 34. [PGM] > NET ASSIGNMENTS Menu

Table 12. [PGM] > NET ASSIGNMENTS Menu Items

Item	Description
PHYSICAL POSITION	Displays the current physical position of the selector knob.
VIRTUAL POSITION	Enter a Virtual Position value (0 to 12).
POSITION MODE	Displays the position mode as VIRTUAL MODE or PHYSICAL MODE.
MODE SWITCH	Select which of the (up to) 25 nets is assigned to preset 1 - 13. Nets may be named. Select DEFAULT, EMPTY, or any net name.
OK BUTTON PTT	Select if OK is used for PTT: YES, NO.
NOTE: The following special functions are activated by pressing OK twice and then pressing one of the following buttons within two (2) seconds)	
GPS AUDIO	Select the button to announce GPS position. Default is PTT2. Select key press as: PTT1, PTT2, VOL UP, VOL DOWN, HEADSET PTT1, HEADSET PTT2, or DISABLED.
MAN DOWN KEY	Select the button to send a man down alert. Select key press as: PTT1, PTT2, VOL UP, VOL DOWN, HEADSET PTT1, HEADSET PTT2, or DISABLED.
BATTERY STATUS KEY	Select the button to announce battery status. Default is VOL UP. Select key press as: PTT1, PTT2, VOL UP, VOL DOWN, HEADSET PTT1, HEADSET PTT2, or DISABLED.
PLAY LAST RECEIVED	Select the button to play back the last message received. Default is PTT1. Select key press as: PTT1, PTT2, VOL UP, VOL DOWN, HEADSET PTT1, HEADSET PTT2, or DISABLED.

[PGM] > KEY MANAGER

See Figure 35. Use **KEY MANAGER** to program crypto keys. Assign a name to each user-entered key. The Encryption Type determines the length in bits of a user-entered key (AES_256 uses 64 hexadecimal characters). Refer to Table 13 for descriptions of the menu items.



*USE THE ADD ✚ SOFT KEY TO ADD NEW USER KEY NAMES
**DISPLAY ONLY.
***SAME AS <KEY NAME> PATH.

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Figure 35. [PGM] > KEY MANAGER Menu

Table 13. [PGM] > KEY MANAGER Menu Items

Item	Description
KEY	Program keys. Select **ADD**, **DEL**, or **RENAME**.
KEY> Key Name	Use **ADD** to add a key or **DEL** to remove a user named key.
KEY > Key Name > ENCRYPTION TYPE	Encryption type is assigned to user named key as AES_128 or AES_256.
KEY > Key Name > 128 BIT TEK	Use to add/change AES_256 TEK. **NOTE**: This field is displayed as all ******* characters after first entry. Enter the key again to make a change.
KEY > Key Name > 256 BIT TEK	Use to add/change AES_256 TEK. **NOTE**: This field is displayed as all ******* characters after first entry. Enter the key again to make a change.
KEY > Key Name > 128 BIT TEK.HASH or 256 BIT TEK.HASH	This is the SHA1 hash of the key.
CURRENT CRYPTO > ENCRYPTION TYPE	Change encryption type or value of key being currently used. For example, if K1 is assigned AES_128, you can change it here. If the key is not valid for the net, the current crypto is dropped and will need to be assigned.

[PGM] > TRANSEC

See Figure 36. Transmission Security (**TRANSEC)** is used to program TRANSEC keys. Use Electronic Counter-Counter Measures (ECCM) Manager to set up hopset/lockset parameters. Refer to Table 14 for descriptions of the menu items.

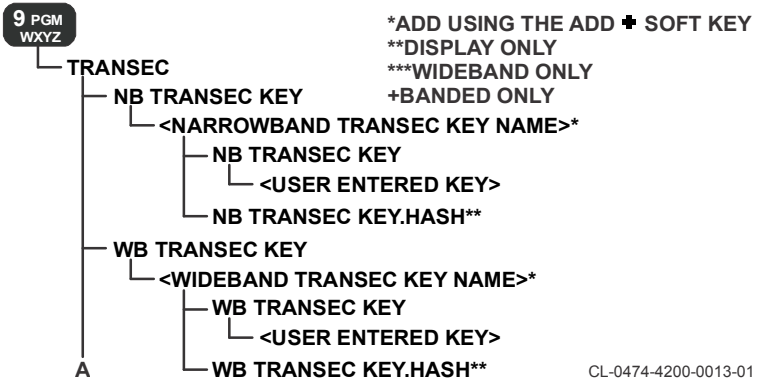

Figure 36. [PGM] > TRANSEC Menu (Sheet 1 of 2)

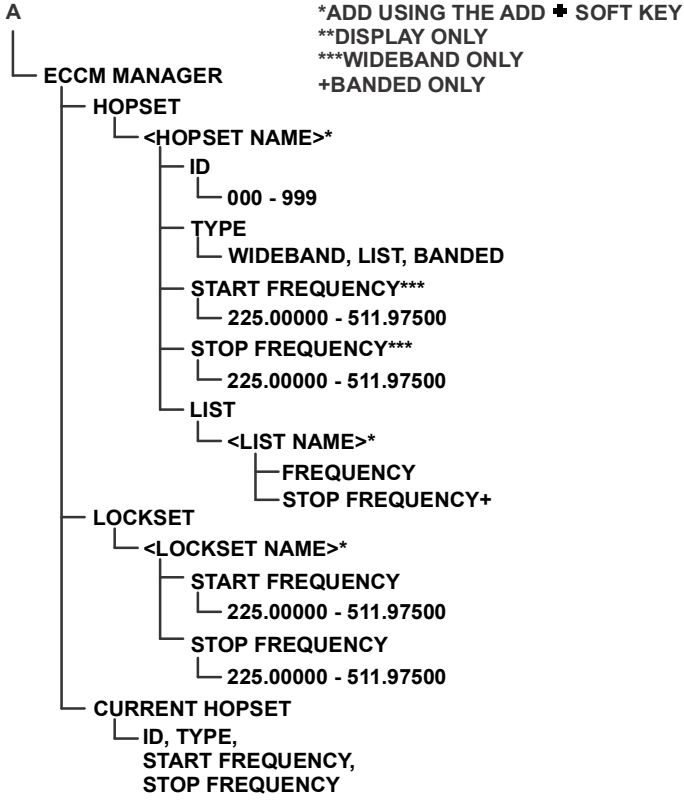

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Figure 36. [PGM] > TRANSEC Menu (Sheet 2 of 2)

Table 14. [PGM] > TRANSEC Menu Items

Item	Description
NB TRANSEC KEY	Program Narrowband TRANSEC keys. Select **ADD**, **DEL**, or **RENAME**.
NB TRANSEC KEY> Key Name	Select a key and press [ENT] to set and view key.
NB TRANSEC KEY > *	Input an eight character hexadecimal key. For example, with 0x already given, enter 1234abcd.
NB TRANSEC KEY > NB TRANSEC KEY.HASH	This is the SHA1 hash of the key.
WB TRANSEC KEY	Program Wideband TRANSEC keys. Select **ADD**, **DEL**, or **RENAME**.
WB TRANSEC KEY> Key Name	Select a key and press [ENT] to set and view key.
WB TRANSEC KEY > *	Input a 64 character hexadecimal key.
WB TRANSEC KEY > WB TRANSEC KEY.HASH	This is the SHA1 hash of the key.
ECCM MANAGER	Use to set up hopping and lockset parameters.
HOPSET	Select **ADD** or **DEL**. Selecting **ADD** causes **ENTER NEW ITEM NAME** to appear, allowing hopset and parameters to be entered.
HOPSET > ID	Enter number that determines pseudo-random hopping algorithm. This number must be identical for all radios in a net.

Table 14. [PGM] > TRANSEC Menu Items (Continued)

Item	Description
HOPSET > TYPE	Select wideband or list hopset type. **Wideband** - In this type of hopset, a starting and ending frequency is defined. Hopping occurs between these frequencies with the frequency order and time duration controlled by the algorithm. **List** - In this type of hopset, a specific list of frequencies are defined. Hopping occurs on the frequencies with the frequency order and time duration controlled by the algorithm. **Banded** - In this type of hopset, a specific list of frequency bands are defined. Hopping occurs between these frequencies with the frequency order and time duration controlled by the algorithm.
HOPSET > START FREQUENCY	(Wideband) Enter the start frequency for the beginning of the hopset.
HOPSET > STOP FREQUENCY	(Wideband) Enter the stop frequency for the end of the hopset.
HOPSET > LIST	(List or Banded) Add list frequencies. These are named via **ADD**, then assigned a frequency.
HOPSET > LIST > [LISTNAME] > FREQUENCY	(List or Banded) Add list frequencies. These are named via **ADD**, then assigned a frequency. **NOTE:** In List, this is the list frequency. In Banded, this is the start of a frequency band.
HOPSET > LIST > [LISTNAME] > STOP FREQUENCY	(Banded) Enter the stop frequency for the end of the frequency band being defined.

Table 14. [PGM] > TRANSEC Menu Items (Continued)

Item	Description
LOCKSET	Select **ADD** or **DEL**. Selecting **ADD** causes **ENTER NEW ITEM NAME** to appear, allowing lockset and parameters to be entered.
LOCKSET > START FREQUENCY	Enter the start frequency for the beginning of the lockset.
LOCKSET > STOP FREQUENCY	Enter the stop frequency for the end of the lockset.
CURRENT HOPSET	Set hopset parameters (ID, TYPE, START FREQUENCY, STOP FREQUENCY) for current net.

[PGM] > NAVIGATION

See Figure 37. **NAVIGATION** is used to set Global Positioning System (GPS) properties such as internal/external, sleep, or position format. Refer to Table 15 for descriptions of the menu items.

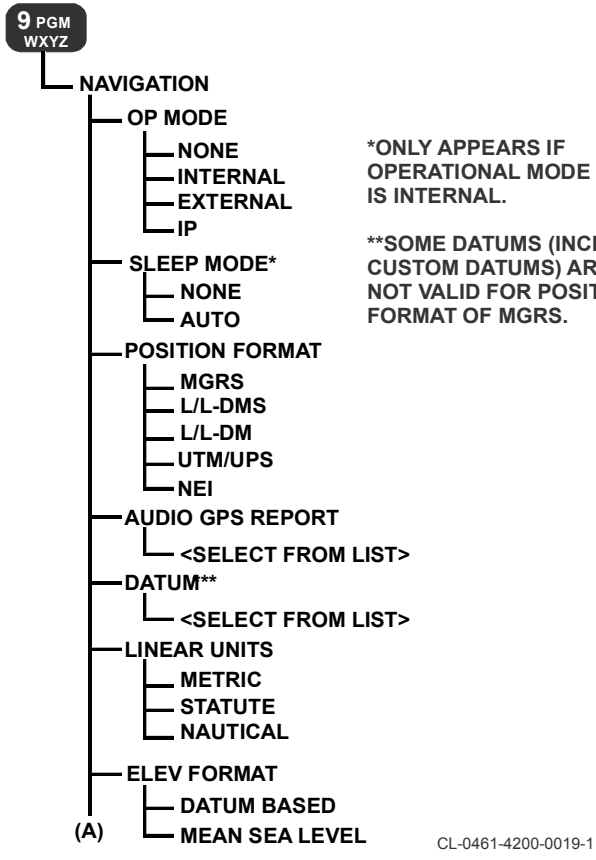
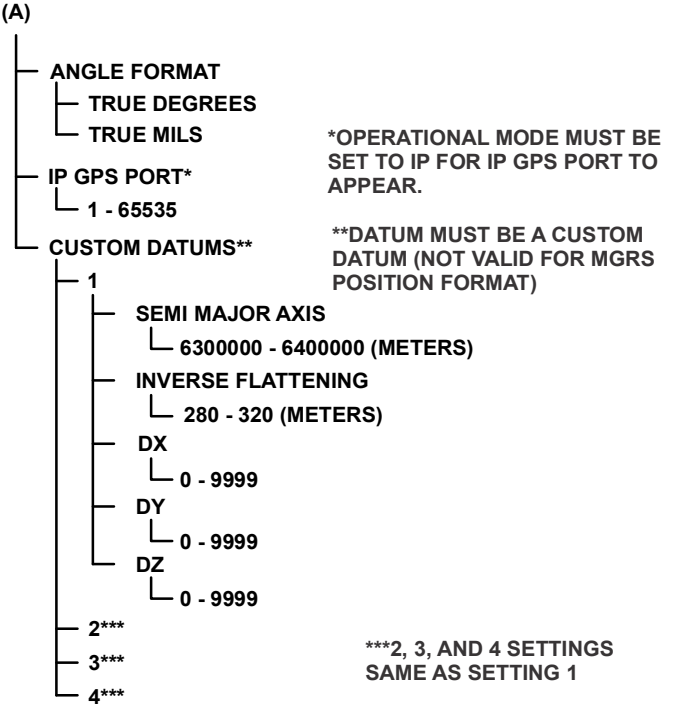


Figure 37. [PGM] > NAVIGATION Menu (Sheet 1 of 2)



CL-0461-4200-0019-2

Figure 37. [PGM] > NAVIGATION Menu (Sheet 2 of 2)

Table 15. [PGM] > NAVIGATION Menu Items

Item	Description
OPERATIONAL MODE	Select GPS input from none, internal GPS, external GPS or IP.
SLEEP MODE	Select AUTO or NONE. Sleep mode is a cycle that conserves power on the radio (Internal Operational mode only). The GPS receiver will enter a low power state for this duration of time. On awakening, a new set of readings will be taken and displayed and the GPS receiver will then go back into low power mode.
POSITION FORMAT	Select GPS position format of: Military Grid Reference System (MGRS), Latitude/Longitude (degrees and minutes or degrees, minutes and seconds), Universal Transverse Mercator (UTM) /Universal Polar Stereographic (UPS) and Netherlands East Indies (NEI).
DATUM	Select GPS datum to correspond with maps being used. World Geodetic System 1984 (WGS 84) Work Group Edition (WGE) choices start at Adindan Ethiopia (ADI-A) and go through Zandej (ZAN).
AUDIO GPS REPORT	Select distance traveled before sending audio GPS report (1M, 10M, 100M, 1000M, 10000M, 100000M).
LINEAR UNITS	Select unit of measurement used by GPS: Metric, Nautical, or Statute units.
ELEVATION FORMAT	Select whether elevation format is based off of datum or mean sea level.
ANGLE FORMAT	Select the GPS angle format in true North mils or degrees.
IP GPS PORT	Select IP GPS port. Range is 1 - 65535. Default is 61000.

Table 15. [PGM] > NAVIGATION Menu Items (Continued)

Item	Description
CUSTOM DATUMS > 1	Create and edit custom datum attributes. Semi Major Axis: Range of 6300000.0000 to 6400000.0000 (meters) with a maximum precision of 4. Inverse Flattening: Range of 280.000000000 to 320.000000000 (meters) with a maximum precision of 9. Delta X, Delta Y, and Delta Z: Range of 0 - 9999 (meters from WGS 84).
CUSTOM DATUMS > 2	Create and edit custom datum 2. Refer to Custom Datum 1.
CUSTOM DATUMS > 3	Create and edit custom datum 3. Refer to Custom Datum 1.
CUSTOM DATUMS > 4	Create and edit custom datum 4. Refer to Custom Datum 1.

[PGM] > USB MODE

See Figure 38. **USB MODE** is used to configure the radio Universal Serial Bus (USB). Refer to Table 16 for descriptions of the menu items.

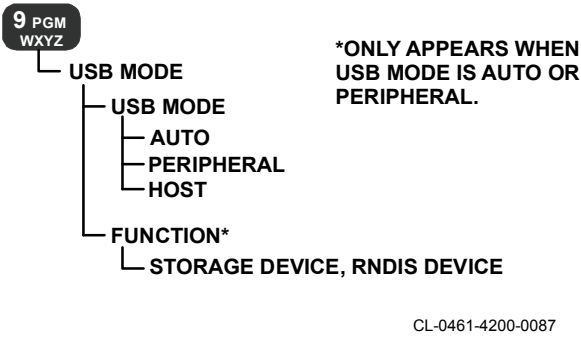


Figure 38. [PGM] > USB MODE MENU

Table 16. [PGM] > USB MODE MENU Items

Item	Description
USB MODE	Select a USB Mode. **AUTO** - This setting allows the radio to query the USB adapter/cable/device and automatically select the appropriate USB mode - Host or Peripheral. This setting is preferred and works with supported auto sensing devices. **PERIPHERAL** - Auto configuration is overridden and Peripheral mode is forced. Peripheral mode allows the radio to be used as a USB device plugged into a host such as PC or tablet. The radio is configured to be a USB mass storage device (thumb drive). It can be mounted/accessed, and files can be copied to/from it. **HOST** - Auto configuration is overridden and Host mode is forced. Host mode configures the radio as a USB host. This mode will automatically mount supported external USB peripherals such as Ethernet adapters, cameras, and flash drives.
FUNCTION	If USB Mode is AUTO or PERIPHERAL, select how the USB device will be used: as a storage device or an RNDIS device.

[PGM] > IP CONFIGURATION

See Figure 39. **IP CONFIGURATION** is used to configure IP address, subnet mask, multicast groups, and whether the radio uses a static or dynamic address. Refer to Table 17 for descriptions of the menu items.

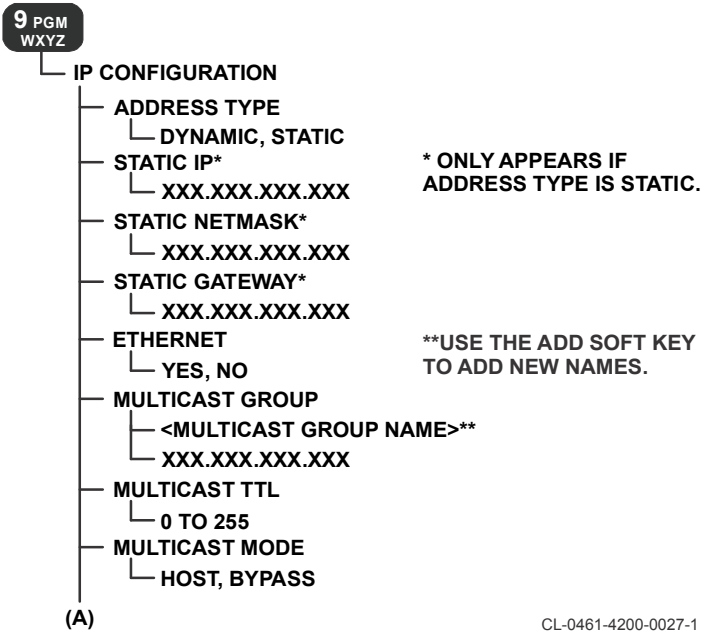


Figure 39. [PGM] > IP CONFIGURATION Menu (Sheet 1 of 5)

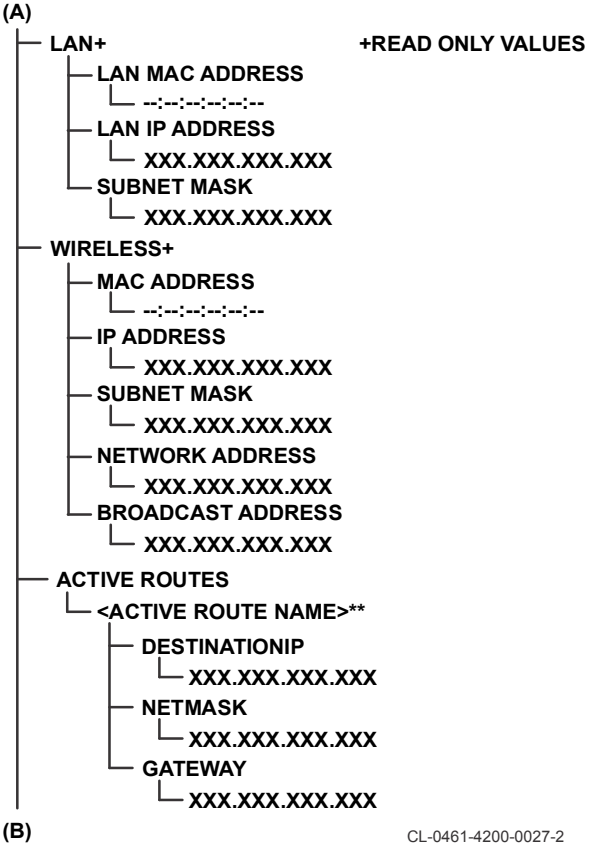


Figure 39. [PGM] > IP CONFIGURATION Menu (Sheet 2 of 5)

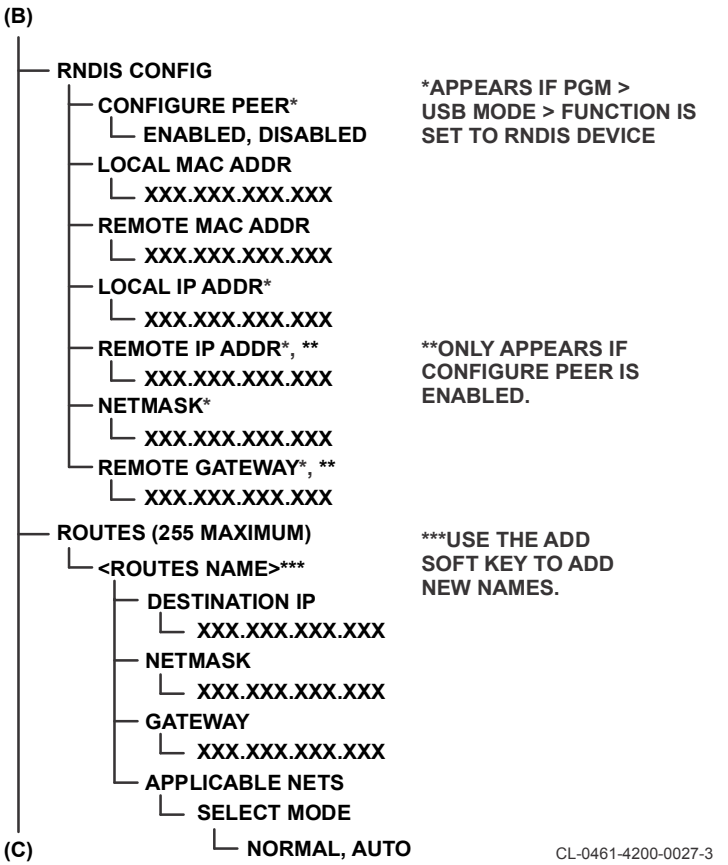


Figure 39. [PGM] > IP CONFIGURATION Menu (Sheet 3 of 5)

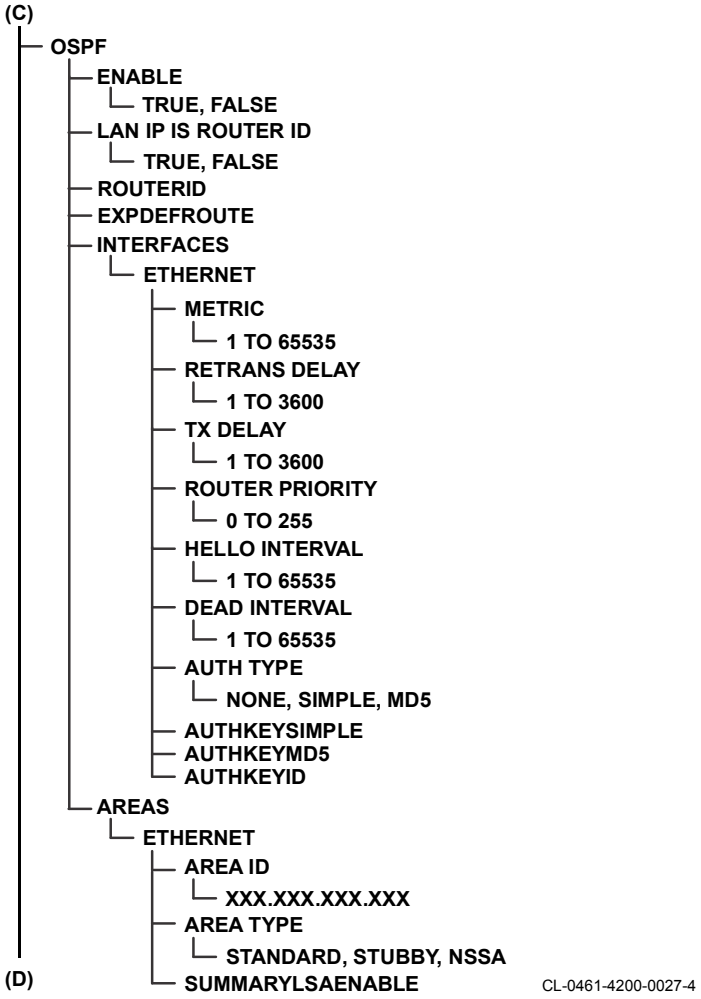


Figure 39. [PGM] > IP CONFIGURATION Menu (Sheet 4 of 5)

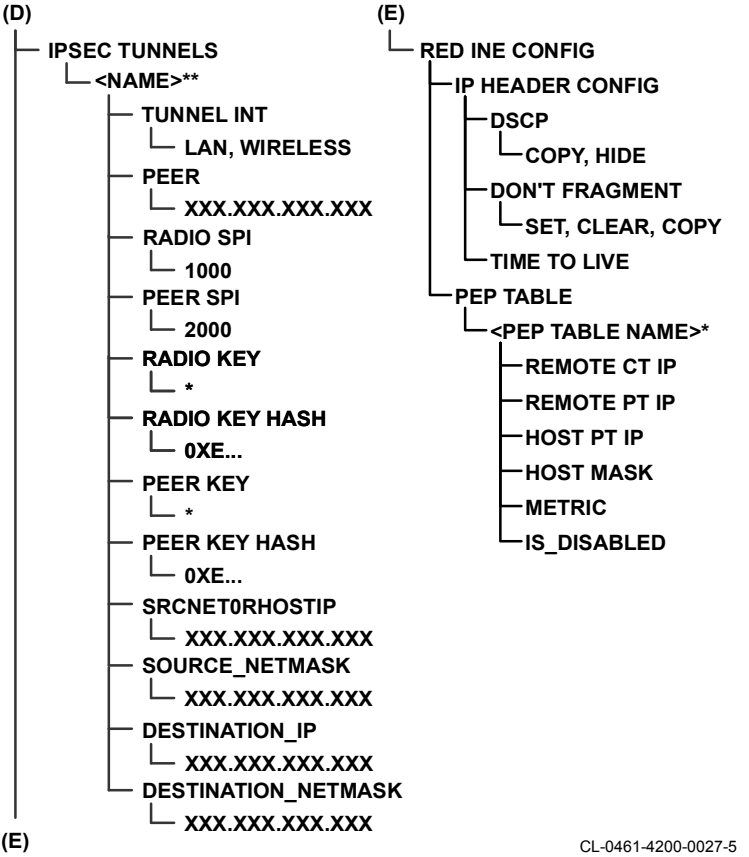


Figure 39. [PGM] > IP CONFIGURATION Menu (Sheet 5 of 5)

Table 17. [PGM] > IP CONFIGURATION Menu Items

Item	Description
ADDRESS TYPE	Select whether static or dynamic address is used. For dynamic, radio must be connected to a Dynamic Host Configuration Protocol (DHCP) server.
STATIC IP	If static Internet Protocol (IP) address type is selected, enter the IP address.
STATIC NET MASK	If static IP address type is selected, enter the net mask.
STATIC GATEWAY	If static IP address type is selected, enter the gateway address.
ETHERNET	Enable (YES) or disable (NO) the radio Ethernet port.
MULTICAST GROUP	Define Multicast Group name(s) and the IP address(es) to be forwarded. If configured to forward multicast data only, one wired interface will be used to forward data. Ethernet and RNDIS are mutually exclusive due to the USB mode each uses. The radio must be configured for wireless IP operation for this feature to function. To forward UDP multicast data for a particular multicast group address, the address must be configured on each radio that bridges the networks between the multicast server and clients. The multicast address configuration is part of the radio's existing IP configuration group.
MULTICAST TTL	Set Multicast Time To Live value (0 - 255 seconds).
LAN	Read only values. Displays the current Local Area network (LAN) IP ADDRESS, LAN Media Access Control (MAC) ADDRESS and SUBNET MASK.
WIRELESS ADDRESS	Read only value. Displays the current Wireless Internet Protocol (WIP) MAC ADDRESS, IP ADDRESS, SUBNET MASK, NETWORK ADDRESS, and BROADCAST ADDRESS.

Table 17. [PGM] > IP CONFIGURATION Menu Items (Continued)

Item	Description
ACTIVE ROUTES	Active Route Name - read only value. Displays the currently active routes. Enter the DESTINATION IP address, NETMASK, GATEWAY.
RNDIS CONFIGURATION	RNDIS allows the use of existing software with the radio's drop-in connectivity and networking using wireless IP bridging or a DHCP server. RNDIS is supported over USB as a peripheral device. A RNDIS driver is required to be installed on the computer. RNDIS is also used with the RF-7400E-VP001 Tactical Video Processor (TVP), a streaming video processor. Enter the LOCAL ADDRESS, and NETMASK of the local interface when CONFIGURE PEER is Disabled. Enter the REMOTE ADDRESS and the REMOTE GATEWAY (PC) when using DHCP server. NOTE: If the remote gateway address is set to 0.0.0.0, then no change is made to the remote gateway address.
ROUTES	Select **ADD**, **DEL**, or **RENAME** IP config routes. Route names are selected using arrow keys. Enter the DESTINATION IP address, NETMASK, GATEWAY, and APPLICABLE NETS for the route.

Table 17. [PGM] > IP CONFIGURATION Menu Items (Continued)

Item	Description
OSPF	Set as TRUE or FALSE. Enter the following when TRUE: LAN IP IS ROUTER ID, INTERFACES, and AREAS. Ethernet settings for Interfaces are: METRIC, RETRANS DELAY, TX DELAY, ROUTER PRIORITY, HELLO INTERVAL, and DEAD INTERVAL. Areas settings are: AREA ID, AREA TYPE (which can be set as STANDARD, STUBBY, or NSSA) and SUMMARYLSAENABLE.
IPSEC TUNNELS	Select **ADD**, **DEL**, or **RENAME** IP Security Tunnels. Names are selected using arrow keys. Enter the TUNNEL INTerface (LAN of WIRELESS), PEER IP Address, RADIO SPI, PEER SPI, RADIO KEY, RADIO KEY HASH, PEER KEY, PEER KEY HASH, SRCNETORHOSTIP, SOURCE_NETMASK, DESTINATION_IP, and DEST_NETMASK.

[PGM] > MISC

See Figure 40. Miscellaneous (**MISC**) is used for setting ancillary connector mode, auxiliary power, and radio name. Refer to Table 18 for descriptions of the menu items.

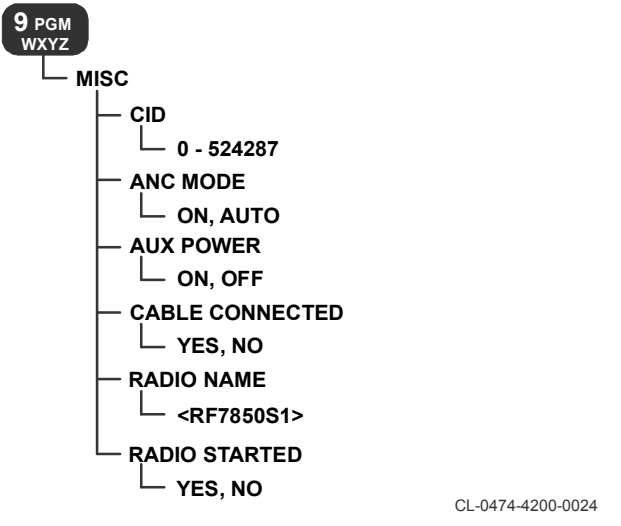


Figure 40. [PGM] > MISC Menu

Table 18. [PGM] > MISC Menu Items

Item	Description
CID	Enter a numeric ID of 0 to 524287.
ANC MODE	Set data connector settings to on, off, or automatic: • **ON** - Data connector is fully enabled. • **AUTO** - Data connector is fully enabled when a cable is detected; otherwise, data connector is disabled.
AUX POWER	Enable or disable radio auxiliary power.
CABLE CONNECTED	Indicates YES or NO to show state of cable connection when ANC MODE is AUTO.
RADIO NAME	Enter the radio's name (up to 20 characters).
RADIO STARTED	Indicates if radio is READY for operation.

[PGM] > VERSIONS

See Figure 41. **VERSIONS** is used to view the serial number along with software and hardware module versions in the radio. Refer to Table 19 for descriptions of the menu items.

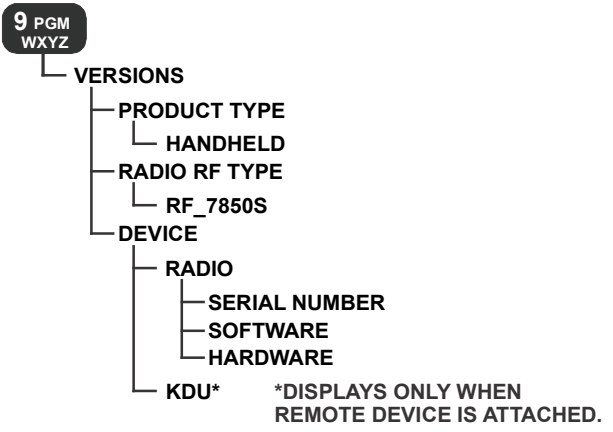


Figure 41. [PGM] > VERSIONS Menu

Table 19. [PGM] > VERSIONS Menu Items

Item	Description
PRODUCT TYPE	(Display only) Handheld for this device.
RADIO RF TYPE	(Display only) RF-7850S.
DEVICE > RADIO > SERIAL NUMBER	Displays the radio's serial number.
DEVICE > RADIO > SOFTWARE	Displays the radio's software MODULE information. Typical modules are: APPLICATIONGPP, U-IPL, INTERNALGPS, and VOICE_PROMPTS. Typical information includes: PART NUMBER, and VERSION.

Table 19. [PGM] > VERSIONS Menu Items (Continued)

Item	Description
DEVICE > RADIO > HARDWARE	Displays the radio's hardware MODULE information. Typical modules are: DIGITALBOARD, and INTERNALGPS. Typical information includes: PART NUMBER, and BOARD SER NUM.
DEVICE > RADIO > INSTALLED FEATURES	Displays the part number of the installed feature.
DEVICE > KDU	View the serial number of the optional remote Keypad Display Unit (KDU) as well as the SOFTWARE and HARDWARE information.

[PGM] > AUDIO

See Figure 42. **AUDIO** is used to configure the audio circuitry. Refer to Table 20 for descriptions of the menu items.

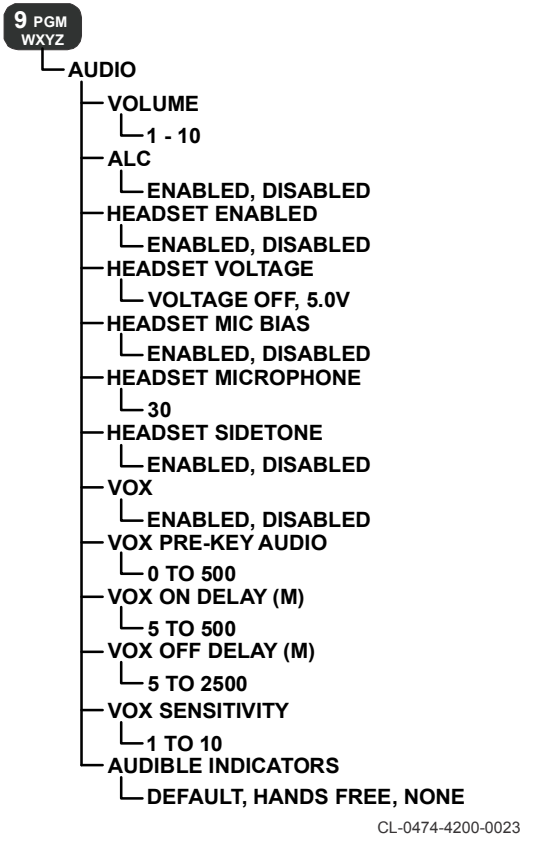


Figure 42. [PGM] > AUDIO Menu

Table 20. [PGM] > AUDIO Menu Items

Item	Description
VOLUME	Set audio level.
ALC	Select whether or not Automatic Level Control (ALC) is used in the audio. ALC applies to TX Audio, also known as whisper mode.
HEADSET ENABLED	Select whether or not audio can be heard on a headset.
HEADSET VOLTAGE	Select voltage characteristic of headset (voltage off, or 5.0 VDC).
HEADSET MIC BIAS	Select whether or not microphone bias is enabled on the radio.
HEADSET MICROPHONE	Set headset type connected to the radio.
HEADSET SIDETONE	Select whether or not sidetone can be heard in a headset connected to the radio.
VOX	Enable or disable VOX.
VOX PRE-KEY AUDIO	Sets how much audio to send out that was recorded prior to voice-operated transmit commencing (keyline). Enter a value from 0 to 500 ms as the amount of audio to transmit.
VOX ON DELAY	Set value as 5 to 500 msec in 5 ms intervals. Specifies how long the audio level should be above the VOX Threshold (automatically determined by the radio) before VOX is activated.
VOX OFF DELAY	Set value as 5 to 2500 msec in 5 ms intervals. Specifies how long the audio level should be below the VOX Threshold (automatically determined by the radio) before VOX is deactivated.
VOX SENSITIVITY	Set value as 1 to 10.
AUDIBLE INDICATORS	Select whether or not audio indicators are set. Select **DEFAULT**, **HANDS FREE**, or **NONE**.

[PGM] > DATE/TIME

See Figure 43. **DATE/TIME** is used to set the actual time and date as well as the date format and time offset from Universal Time Coordinated (UTC). Refer to Table 21 for descriptions of the menu items.

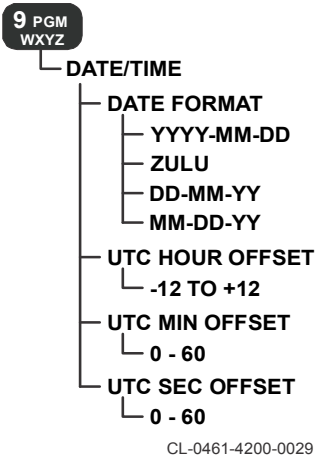


Figure 43. [PGM] > DATE/TIME Menu

Table 21. [PGM] > DATE/TIME Menu Items

Item	Description
DATE FORMAT	Select date format. Choose Year-Month-Day (**YYYY-MM-DD**), **ZULU**, Month-Day-Year (**MM-DD-YY**), Day-Month-Year (**DD-MM-YY**).
UTC HOUR OFFSET	Enter local time difference from UTC.
UTC MIN OFFSET	Enter local time difference from UTC.
UTC SEC OFFSET	Enter local time difference from UTC.

[PGM] > USER INTERFACES

USER INTERFACES is used for ASCII remote, front panel, web interface, and user level password settings. See Figure 44 for menu tree. Refer to Table 22 for descriptions of the menu items. Refer to User Levels, p59 for user level descriptions. Refer to Login/Logout Information, p61 for instructions on login and logout.

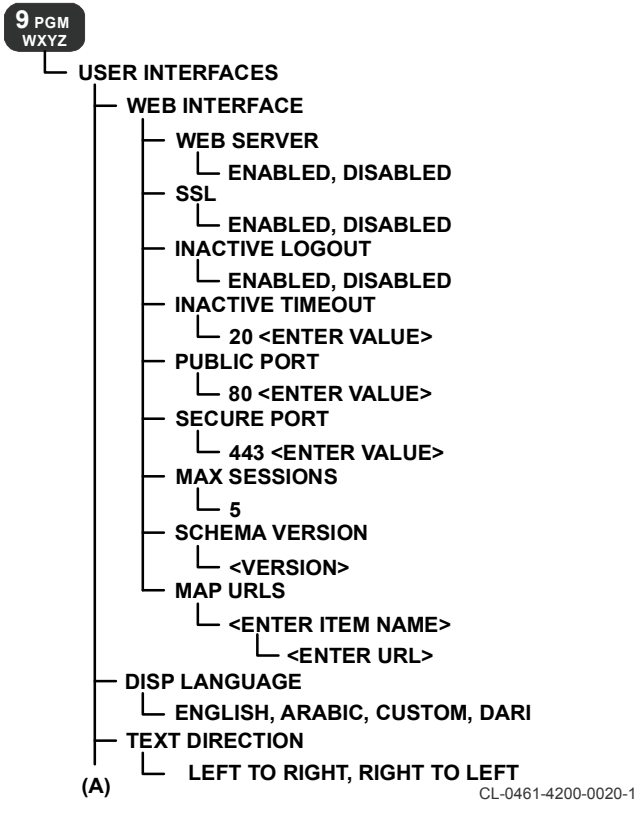


Figure 44. [PGM] > USER INTERFACES Menu (Sheet 1 of 2)

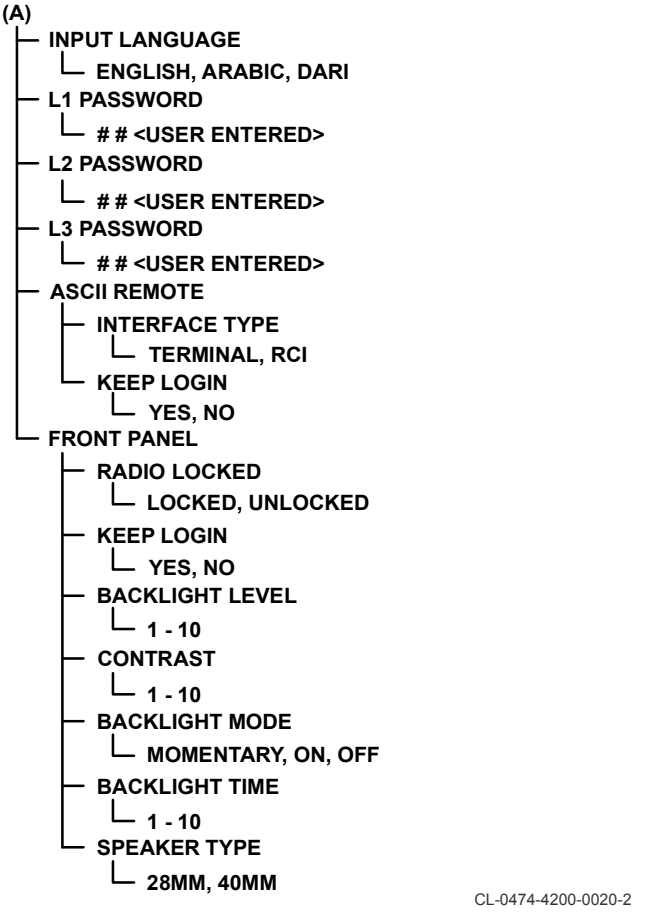


Figure 44. [PGM] > USER INTERFACES Menu (Sheet 2 of 2)

Table 22. [PGM] > USER INTERFACES Menu Items

Item	Description
WEB INTERFACE > WEB SERVER	Select whether or not web server is enabled.
WEB INTERFACE > SSL	Select whether or not Secure Socket Layer (SSL) web security protocol is enabled.
WEB INTERFACE > INACTIVE LOGOUT	Select whether or not inactive logout is enabled.
WEB INTERFACE > INACTIVE TIMEOUT	Enter a value for the web server session timeout. Default is 20 seconds.
WEB INTERFACE > PUBLIC PORT	Enter a value for the public port. Default is 80.
WEB INTERFACE > SECURE PORT	Enter a value for the secure port. Default is 443.
WEB INTERFACE > MAX SESSIONS	Read only value is 5.
WEB INTERFACE > SCHEMA VERSION	Specifies the web schema version.
WEB INTERFACE > MAP URL TEMPLATE	Add URL Template and configure URL.
DISP LANGUAGE	Select ENGLISH, ARABIC, DARI, or CUSTOM as the display language. Custom firmware is required for custom translation.
TEXT DIRECTION	LEFT TO RIGHT is standard for English. Select RIGHT TO LEFT as required.
INPUT LANGUAGE	Select ENGLISH, ARABIC, or DARI.
LEVEL 1 PASSWORD	Enter password* for user level 1.
LEVEL 2 PASSWORD	Enter password* for user level 2.
LEVEL 3 PASSWORD	Enter password* for user level 3. Not available when logged in below level 3.

* Passwords up to 22 characters.

Table 22. [PGM] > USER INTERFACES Menu Items (Continued)

Item	Description
ASCII REMOTE > INTERFACE TYPE	Determines which interface ASCII remote is using. Select TERMINAL interface or Remote Control Interface (RCI). RCI is used for RF-7800I remote control.
ASCII REMOTE > KEEP LOGIN	Select whether or not you remain logged in using ASCII remote during radio boot.
NOTE: FRONT PANEL is also used for KDU display in the following parameters.	
FRONT PANEL > RADIO LOCKED	Shows LOCKED, UNLOCKED status of radio.
FRONT PANEL > KEEP LOGIN	Select whether or not you remain logged in using front panel. If keep is set, you remain logged in after a power cycle. If none is set, you must log in upon every power up or power cycle.
FRONT PANEL >BACKLIGHT LEVEL	Enter backlight level for front panel.
FRONT PANEL > CONTRAST	Enter contrast for front panel.
FRONT PANEL > BACKLIGHT MODE	Select backlight mode for front panel: off, on, or momentary.
FRONT PANEL > BACKLIGHT TIME	Enter backlight time for front panel. This is time backlight remains on when momentary.
FRONT PANEL > SPEAKER TYPE	This is not used for this radio.

[PGM] > CONTACTS

See Figure 45. **CONTACTS** is used to set up contacts for the radio, phone, and computer. Refer to Table 23 for descriptions of the menu items.

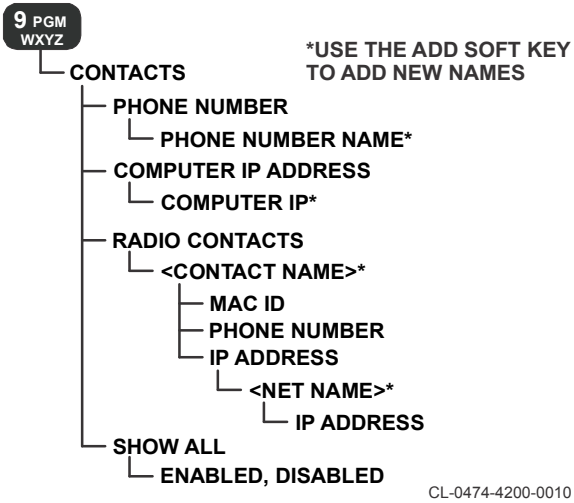


Figure 45. [PGM] > CONTACTS Menu

Table 23. [PGM] > CONTACTS Menu Items

Item	Description
PHONE NUMBER	Select **ADD**, **DEL**, or **RENAME** for phone contact (up to 25 maximum). Enter a phone name and number for each phone contact.
COMPUTER IP ADDRESS	Select **ADD**, **DEL**, or **RENAME** for computer IP address (up to 25 maximum). Enter a name and an address for each computer IP address.
RADIO CONTACTS	Select **ADD**, **DEL**, or **RENAME** for radio contact net (up to 254 maximum). Enter a name and the following for each RADIO CONTACT. • Media Access Control Identification (**MAC ID**) - The Station ID corresponding to this radio on this net. • **PHONE NUMBER** - The phone number corresponding to this radio contact. • **IP ADDRESS** - The Wireless IP address corresponding to this radio on the selected net.
SHOW ALL CONTACTS	Enable or disable show all contacts.

[PGM] > TAC CHAT IP

See Figure 46. **TAC CHAT IP** sets file transfer properties such as protocol and identification. Tac Chat IP is used to send files and text messages to another radio. Refer to Table 24 for descriptions of the menu items.

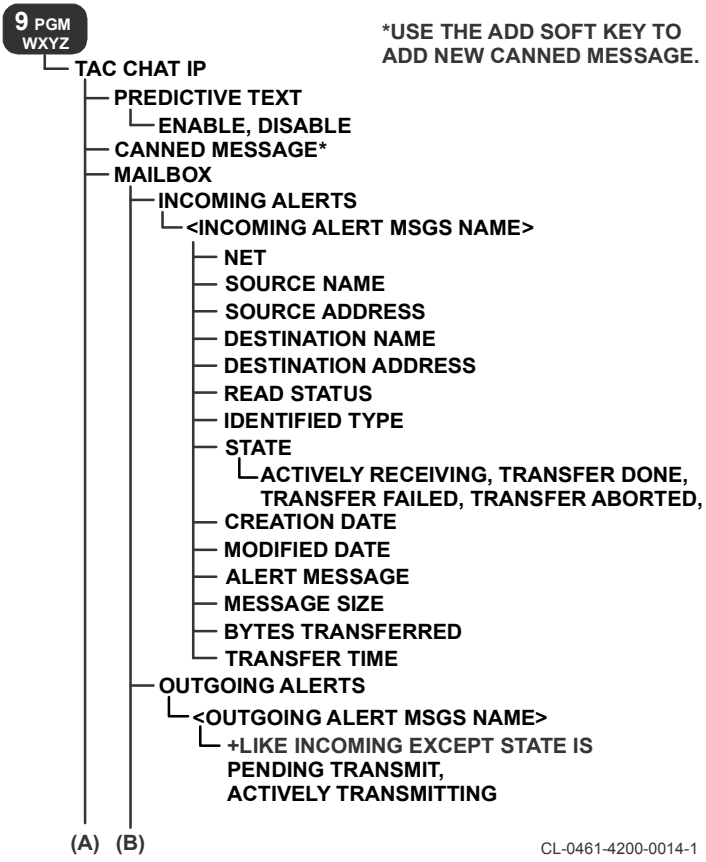


Figure 46. [PGM] > TAC CHAT IP Menu (Sheet 1of 2)

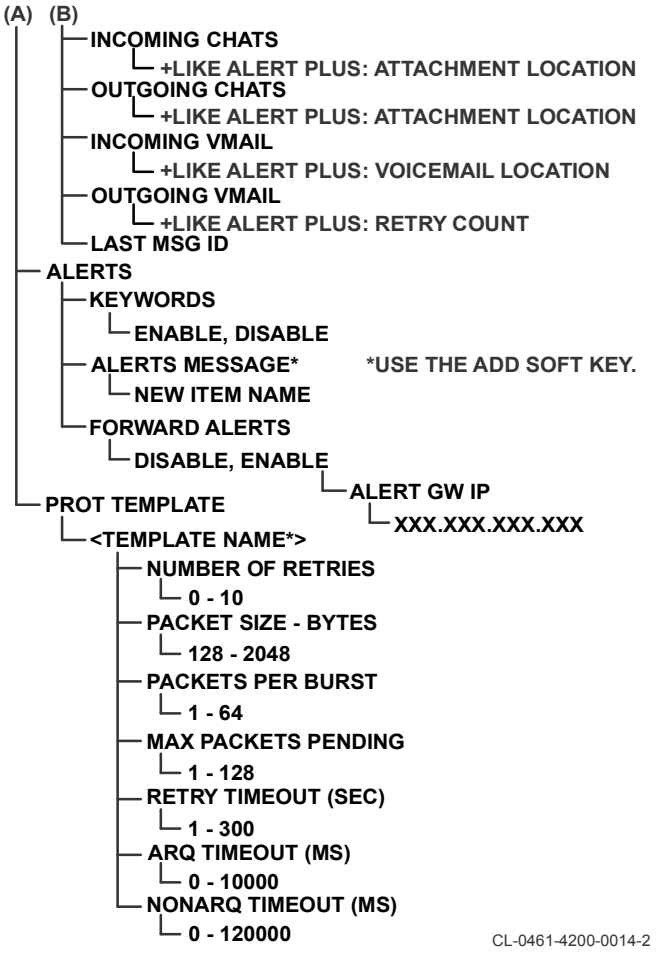


Figure 46. PGM] > TAC CHAT IP Menu (Sheet 2 of 2)

Table 24. [PGM] > TAC CHAT IP Menu Items

Item	Description
PREDICTIVE TEXT	Enable or disable predictive text.
CANNED MESSAGE	Enter a new canned message or edit one of your existing messages. Define both message name and content.
MAILBOX	View information about incoming and outgoing messages for alerts, chats, and voicemail. Information provided includes the following: NET, SOURCE NAME, SOURCE ADDRESS, DEST NAME, DEST ADDR, READ STATUS, IDENTIFIED TYPE, STATE, CREATION DATE, MODIFIED DATE, MESSAGE SIZE, BYTES TX, TRANSFER TIME, PENDING TX, ACTIVELY TXING, ATTACHMENT LOC, VOICEMAIL LOC, and RETRY COUNT.
ALERTS > KEYWORDS	Enable or disable keywords.
ALERTS > ALERT MESSAGE	Enter a new alert message or edit one of your existing messages. Define both message name and content.
ALERTS > FORWARD ALERTS	Set to Enable or Disable whether or not to forward received Alert messages.
ALERTS > ALERT GW IP	Gateway destination IP of forwarded alert.
PROT TEMPLATE	Select to create a new template for manual configuration of file transfers.
NUMBER OF RETRIES	Enter a number,1 to 10, for number of file transfer retries.
PACKET SIZE - BYTE	Enter a number, 128 to 2048 bytes, for file transfer packet size.
PACKETS PER BURST	Enter a number, 1 to 64, for packets sent per transmission burst.
MAX PACKETS PENDING	Enter a number, 1 to 128, that represents the size of the transmission window. This is the maximum number of sent packets that have not been fully acknowledged.

Table 24. [PGM] > TAC CHAT IP Menu Items (Continued)

Item	Description
RETRY TIMEOUT (SEC)	Enter a number, 1 to 300 seconds, for the time before a retry occurs.
ARQ TIMEOUT (MS)	Enter a number, 1 to 10000 milliseconds, for the time between Automatic Repeat reQuest (ARQ) bursts.
NONARQ TIMEOUT (MS)	Enter a number, 1 to 120000, for the Non-ARQ timeout in ms. This is the time between Non-ARQ bursts. Non-ARQ bursts are used for sending files to a broadcast address from the radio to another device running the Tac Chat IP protocol (another radio, computer, or PDA).

[PGM] > VOIP

See Figure 47. Voice over IP (VoIP) is used to set up Session Initiation Protocol (SIP) gateway address, IP and MAC address entries, and Real Time Transfer Protocol (RTP) packet information for delivering audio/video over IP networks. Refer to Table 25 for descriptions of the menu items. Phone calls to and from IP base phones are supported when connected to an Asterisk or Cisco Call Manager using a VoIP Private Branch Exchange (PBX) system.

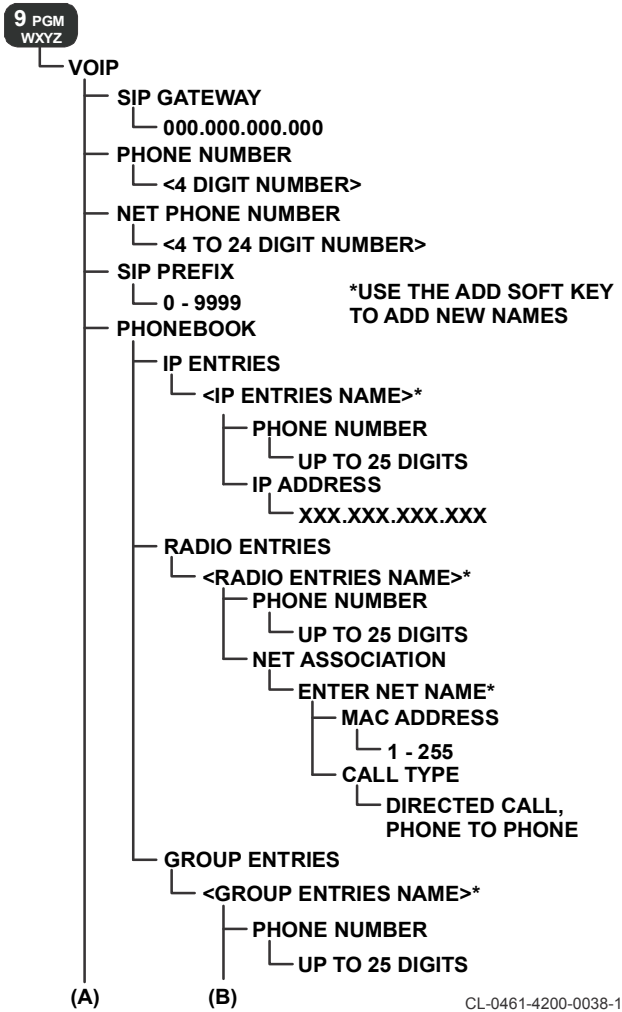


Figure 47. [PGM] > VOIP Menu (Sheet 1 of 2)

7

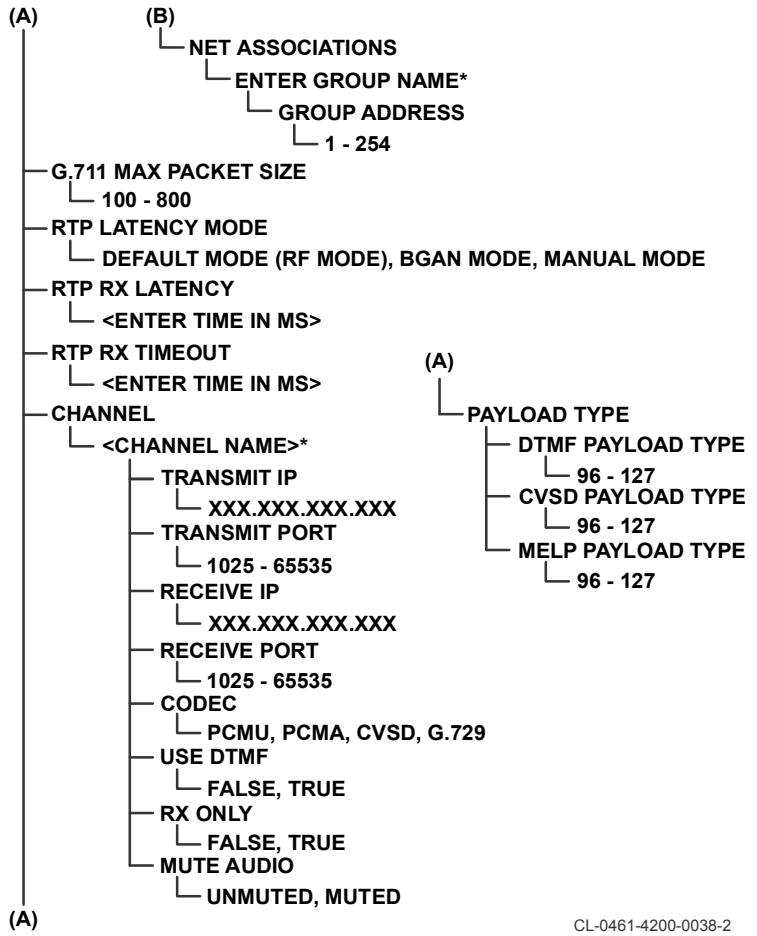


Figure 47. [PGM] > VOIP Menu (Sheet 2 of 2)

Table 25. [PGM] > VOIP Menu Items

Item	Description
SIP GATEWAY	Enter the SIP gateway address. This is the default IP address for routing phone numbers.
NET PHONE NUMBER	Enter the 4-24 digit phone number associated with this particular net.
SIP PREFIX	Enter the four-digit SIP prefix.
PHONEBOOK > IP ENTRIES	Select **ADD**, **DEL**, or **RENAME** for IP entries. Maximum of 255. Phone number can have up to 25 digits.
PHONEBOOK > RADIO ENTRIES	Select **ADD**, **DEL**, or **RENAME** for radio entries. Maximum of 255 radio entry names with 1 net association each. Set Phone Number and Net Association.
PHONEBOOK > GROUP ENTRIES	Select **ADD**, **DEL**, or **RENAME** for group entries. Maximum of 255 group entry names with 1 net association each. Set Phone Number and Net Association.
G.711 MAX PACKET	Real Time Transfer Protocol (RTP) is used to set up the maximum amount in bytes of RTP data to send at once. Default value is 160. Possible values are 100 - 800.
RTP LATENCY MODE	Set to DEFAULT MODE (RF MODE), BGAN MODE, or MANUAL MODE.
RTP RX LATENCY [ms]	An Rx RTP stream is held off until this much data is buffered (in ms). The value is 300 for Default (RF) mode, 1500 for BGAN Mode, and is configurable in Manual Mode.
RTP RX TIMEOUT [ms]	An Rx RTP stream times out if no packets are received in this much time (in ms). The value is 700 for Default (RF) mode, 5000 for BGAN Mode, and is configurable in Manual Mode.
CHANNEL > Channel Name > TRANSMIT IP	Enter the destination IP address for single-radio retransmit or an IP multicast address for multi-radio retransmit.

Table 25. [PGM] > VOIP Menu Items (Continued)

Item	Description
CHANNEL > Channel Name > TRANSMIT PORT	Enter a valid IP port on which to transmit audio. Valid values are even numbers greater than 1024 and less than 65536. The default is 5000.
CHANNEL > Channel Name > RECEIVE IP	Enter a valid IP multicast address on which to receive audio.
CHANNEL > Channel Name > RECEIVE PORT	Enter a valid IP port on which to receive audio. Valid values are even numbers greater than 1024 and less than 65536. The default is 5000.
CHANNEL > Channel Name > CODEC	Select the codec to use when transmitting on the channel: Pulse-Coded Modulation Alaw (PCMA), Pulse-Coded Modulation Ulaw (PCMU), CVSD, or G.729. A-Law is common in most of the world except North America and Japan where mu-Law is used.
CHANNEL > Channel Name > USE DTMF	Enable Dual-Tone Multi-Frequency (DTMF) signaling to control full-duplex calls, using "*" for key events and "#" for unkey events.
CHANNEL > Channel Name > RX ONLY	Select whether the channel is receive only or not. Transmission is not allowed on this channel when RX only is selected.
CHANNEL > Channel Name > MUTE AUDIO	Select whether or not audio can be heard on the radio speaker/headset/auxiliary port. When audio is muted, it will not be heard on the speaker, but will continue to be rebroadcast.
PAYLOAD TYPE	Select an RTP payload type for encoding: DTMF (default value 96), or CVSD (default value 98). Possible values are 96 - 127.

[PGM] > VOICEMAIL

See Figure 48. **VOICEMAIL** is used for Voice Mail number of retries and retry timeout. Refer to Table 26 for descriptions of the menu items.

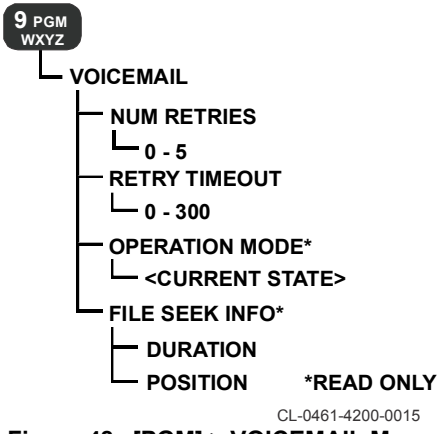


Figure 48. [PGM] > VOICEMAIL Menu

Table 26. [PGM] > VOICEMAIL Menu Items

Item	Description
NUMBER OF RETRIES	Enter a value (0 - 5) for the number of retries that the radio will attempt to send a voicemail message to its destination before it reports a failure to the sender.
RETRY TIMEOUT	Set the retry timeout value (0 - 300 seconds) that the radio will wait between a failed transmission and the next attempt.
OP_MODE	Read only - Indicates the current state of the voice mail application (for example: Recording Active, Recording Paused, Recording Review).
FILE_SEEK_INFO	Read only - Indicates the duration of a voice mail message and the current position within the message during recording, review, or playback.

[PGM] > SNMP AGENT

See Figure 49. Simple Network Management Protocol (SNMP) Agent screen displays SNMP settings. Refer to Table 27 for descriptions of the menu items.

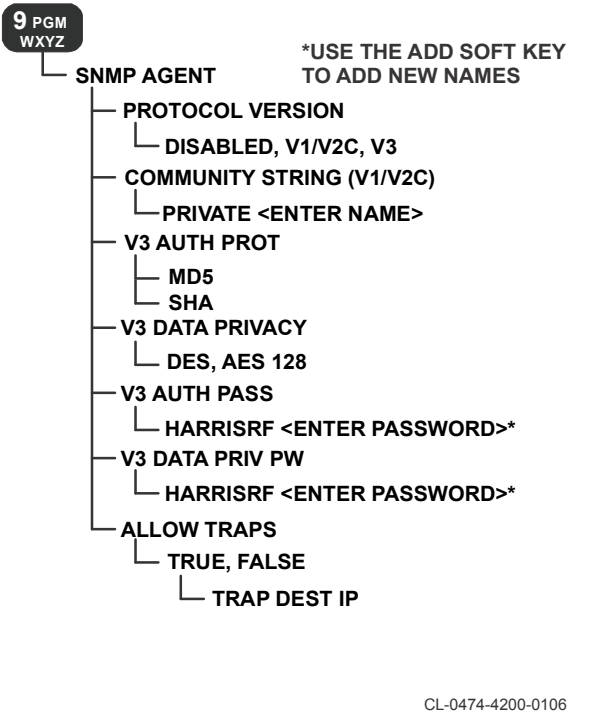


Figure 49. [PGM] > SNMP AGENT Menu

Table 27. [PGM] > SNMP AGENT Menu Items

Item	Description
PROTOCOL VERSION	Select SNMP protocol version: **DISABLED, V1/V2C** or **V3**.
COMMUNITY STRING	Enter the SNMP V1/V2C Community String name (defaults to **PRIVATE**).
V3 AUTH PROTOCOL	Select whether the SNMP V3 authentication privacy is **MD5** or **SHA**.
V3 DATA PRIVACY PROTOCOL	Select whether the SNMP V3 data privacy is **DES** or **AES 128**.
V3 AUTH PASS	Enter the SNMP V3 authentication password (defaults to **HARRISRF**)
V3 DATA PRIV PW	Enter the SNMP V3 data privacy password (defaults to **HARRISRF**).
ALLOW TRAPS	Select whether to allow traps to be sent is set to **FALSE** or **TRUE**.
TRAP DESTINATION IP	The IP address of the Trap Destination address.

[PGM] > CSS

See Figure 50. Cryptographic Subsystem (CSS) displays the settings of secure field programming.

Refer to Table 28 for descriptions of the menu items.

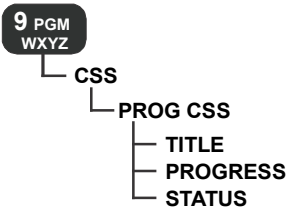


Figure 50. [PGM] > CSS Menu

Table 28. [PGM] > CSS Menu Items

Item	Description
PROG CSS	Entry point into CSS program status.
TITLE	FIRMWARE
PROGRESS	0 to 100
STATUS	UNKNOWN, or other status up to 64 characters

[PGM] > RADIO FEATURES

See Figure 51. **Radio Features** displays FIPS settings and 7850 capabilities.

Refer to Table 29 for descriptions of the menu items.

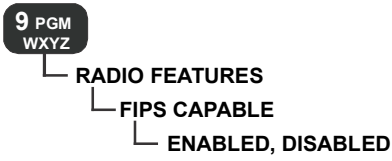


Figure 51. [PGM] > Radio Features Menu

Table 29. [PGM] > Radio Features Menu Items

Item	Description
FIPS CAPABLE	ENABLED, DISABLED (read only value). If enabled, radio supports FIPS 197 and FIPS 140-2 Level 3 security.

PGM] > S-TNW

See Figure 52. **S-TNW** displays for forward information and connection graphic Bit Occupancy Vector (BOV) information as well as network time and status are not enabled from the front panel or KDU in this release. Use the Web UI CONFIG Application to view this status information.

Refer to Table 30 for descriptions of the menu items.

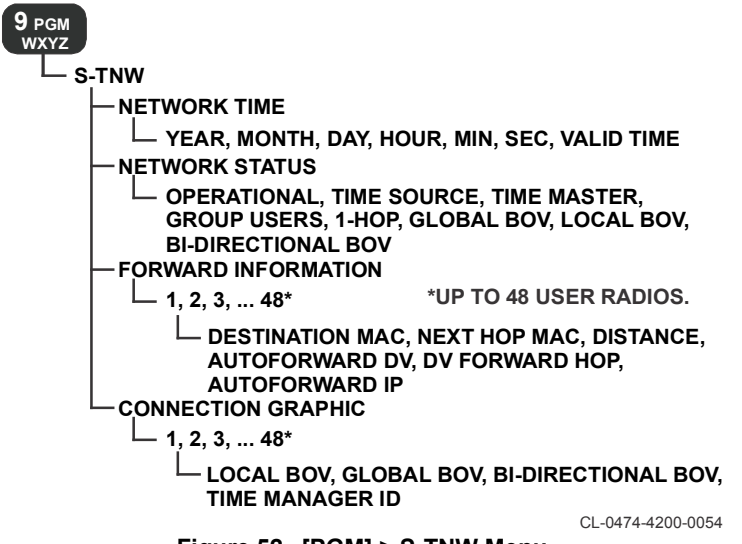


Figure 52. [PGM] > S-TNW Menu

Table 30. [PGM] > S-TNW Menu Items

Item	Description
NETWORK TIME	Displays current network time. YEAR, MONTH, DAY, HOUR, MINUTE, SECOND, and VALID TIME.
NETWORK STATUS	Displays current network status. • OPERATIONAL status of network. • TIME SOURCE of this node. • MAC address of TIME MASTER node. • Total number of GROUP USERS in the network. • Number of network users within 1-HOP of this node. • GLOBAL BOV of all nodes in the network. • LOCAL BOV of all nodes within one hop of this node. • BI-DIRECTIONAL BOV of all nodes that have 2-way communications with this node.
FORWARD INFORMATION	Displays forward information on user radios 1 - 48. Items include the following. • DESTINATION MAC: Destination Station MAC Address. • NEXT HOP MAC: Next Hop MAC Address. • DISTANCE: Number of hops to destination. • AUTOFORWARD DV: Indication if local node should auto forward DV messages for this station. • DV FORWARD HOP: Hop local node should auto forward DV frames for this station. • AUTOFORWARD IP: Hop local node should auto forward broadcast messages for this station. This is only used for Broadcast and Multicast IP.
CONNECTION GRAPHIC	Displays connection graphic information on user radios 1 - 48. This is an asynchronous snapshot of all BOV data from all known nodes. LOCAL BOV, GLOBAL BOV, BI-DIRECTIONAL BOV, TIME MANAGER ID (The node's Time Manager's MAC address, which may be different from the local station's TM MAC).

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TAC CHAT AND MESSAGES 8

TAC CHAT IP

The following Tac Chat features are provided.

- Tac Chat home screen for access to Messages, Navigation, Alerts, and Voice Mail
- Short Message Service (SMS) interoperability with compatible radios
- Tac Chat IP messages interoperability with Harris Tac Chat IP software running on Windows
- Station table/contact list
- Messages (file and/or text)
- Alerts
- Voice mail
- Message entry screens and destination settings

RADIO TAC CHAT HOME SCREEN

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See Figure 53. The radio Tac Chat home screen is used to access related applications and to view user messages.

Select [⟳] (**0**) to access/exit the Tac Chat home screen. Refer to Table 31 for descriptions of the related applications. Also refer to Radio Tac Chat Operation, p153.

CL-0461-4200-0040

Figure 53. Tac Chat Home Screen Tree

Table 31. Tac Chat Home Screen Applications

Application	Description
NAVIGATION	View navigation reports (a Global Positioning System [GPS] position report). This screen displays LOCAL Navigation data: status (DISABLED/ENABLED/SLEEPING), number of satellites (SAT), heading (HDG), velocity (VEL), altitude (ALT), datum, MGRS, Date, and Time based on your current Position Format under [PGM] Navigation. Select the (**0**) to display the Situational Awareness (SA) reports screen which also includes your distance and bearing from each SA report. Select the (**0**) again to return to the previous screen (LOCAL).
MESSAGES	View SMS messages, Tac Chat IP chat and/or file messages. Also reply, forward, and delete messages.
ALERTS	Use Alerts to view, reply, forward, and delete alerts.
VOICE MAIL	Use Voice Mail to listen to, reply, forward, and delete voice mails.

RADIO TAC CHAT OPERATION

See Figure 54 for the Tac Chat home screen. The home screen summarizes received messages into mailboxes for browsing and viewing. The number in parenthesis indicates the number of items that have not been viewed. No count is provided in parenthesis for navigation.

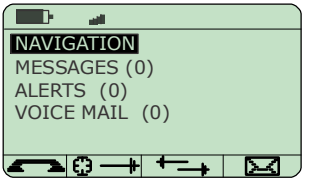


Figure 54. Tac Chat Home Screen

Select an application and press **[ENT]** to go to the application. Refer to Table 32 for descriptions of the soft key actions.

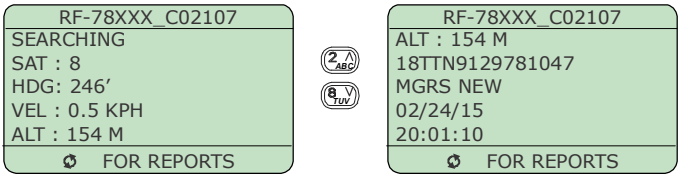
Table 32. Radio Tac Chat Home Screen Soft Keys

Soft Key	Description
	Place a directed call. Refer to Call Wizard, p160.
	Send a GPS report. This is only available if GPS is enabled, GPS is tracking, and the current net is CT.
	Verify file transfer progress and status. Perform ABORT, DEL, or RETRY for selected transfers. Refer to Status Display, p162.
	Send a message using a New Message Wizard, p157.

8

NAVIGATION

Select NAVIGATION from the radio Tac Chat home screen and press **[ENT]**. See Figure 55 for an example of the local Navigation screen. Select [ ] **(0)** to toggle between Situational Awareness (SA) reports screen and Local. Select the up and down arrow buttons to view additional lines.



CL-0461-4200-0107A

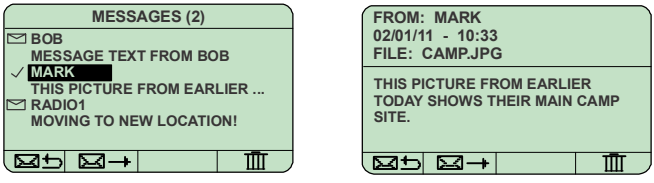
Figure 55. Navigation

MESSAGES INBOX

Select MESSAGES from the radio Tac Chat home screen and press **[ENT]**. See Figure 56. View received text messages and attachments.

Messages are displayed by their source address and are ordered by time and date of reception. Unread messages are indicated by an envelope icon to the left of the source address. Select a message and press **[ENT]** to get more detailed information (the first part of the message is shown below the address). Details include the source address, date and time of reception, file attachments (if any), and the message's content. Soft keys for replying, forwarding, and deleting the message are provided. Figure 56 also shows a sample message that was received with a file attachment.

For outgoing messages, refer to New Message Wizard, p157.

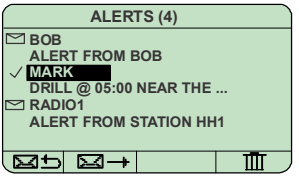


CL-0461-4200-0063A CL-0461-4200-0064A

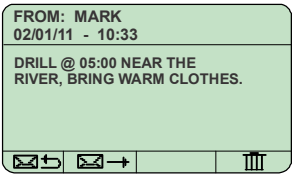
Figure 56. Messages

ALERTS INBOX

Select ALERTS from the radio Tac Chat home screen and press **[ENT]**. See Figure 57. Alerts are broadcast text messages received over IP. Select an alert and press **[ENT]** to view the message. **[CLR]** returns to the Alert inbox from the message. For outgoing alerts, refer to New Message Wizard, p157.



CL-0461-4200-0061A



CL-0461-4200-0062A

Figure 57. Alerts

VOICE MAIL INBOX

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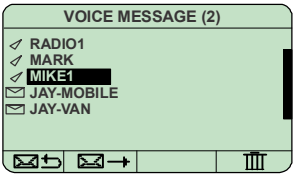
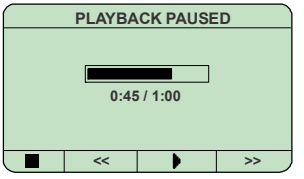
Select VOICE MAIL from the radio Tac Chat home screen and press **[ENT]**. See Figure 58. This screen allows you to review and listen to received audio messages, of up to one (1) minute in duration. Select a voice message and press **[ENT]** to go to the voice mail details screen. **[CLR]** returns to voice mail inbox. While in the voice mail details view, use the soft keys to play/stop the message. For outgoing voice messages, refer to New Message Wizard, p157.



CL-0461-4200-0067A



CL-0461-4200-0068A

Figure 58. Voice Mail

NEW MESSAGE WIZARD

Select the **MSG** soft key from the radio Tac Chat home screen. The New Message Wizard, Figure 59 for example, guides you through the process of creating an alert, message, or a voice mail message by showing only those parameters related to your selections.

Send an Alert Message

a. Select ALERT and press **[ENT]**. See Figure 59.

b. Select an alert message for broadcast over the subnet.

c. Select the **SEND** soft key.

d. Observe that ALERT TRANSFER COMPLETE is displayed.

Alerts are a set of common text messages that can be quickly sent to all radios on the current wireless IP subnet.

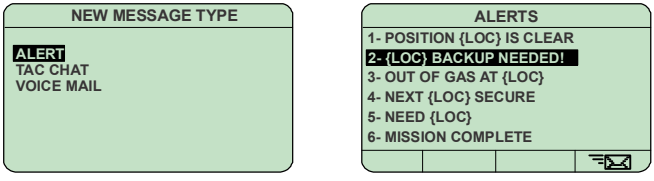


Figure 59. New Message Wizard (Alert)

Send a Tac Chat Message

a. Select TAC CHAT and press **[ENT]**. See Figure 60.

b. Select ATTACH FILE to attach a file (optional).

c. Select EDIT TEXT to create a message. Refer to Edit Text, p158.

d. Select the **SEND** soft key.

e. Enter an IP Address of the radio to be contacted and press **[ENT]**.

f. Observe TEXT FILE MESSAGE COMPLETE is displayed.

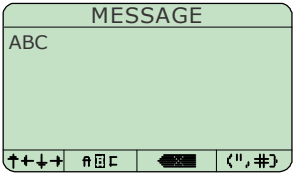
CL-0461-4200-0113

Figure 60. New Message Wizard (Message)

Edit Text

The text editor, Figure 61, includes an enhanced interface for text input with non-alphanumeric character support. In addition, text prediction and text keywords are supported for use in composing text messages. Refer to Enhanced Text Editing, p161. Also refer to Keywords, p162.

8



CL-0461-4200-4090

Figure 61. Edit Text Message

Send a Voice Mail

a. Select VOICE MAIL and press **[ENT]**. See Figure 62.

b. Record a message by pressing **[PTT]** to record and releasing to stop.

c. Check the voice message using the soft keys (optional). Soft key << goes back 10 seconds, >> goes forward 10 seconds, PLAY ◗ reviews the audio, and ERASE clears the recorded message.

d. Send the message by pressing **[ENT]**.

e. Enter an IP Address of the radio to be contacted and press **[ENT]**.

f. Observe VOICE MAIL TRANSFER STARTED is displayed.

g. Observe VOICE MAIL MESSAGE COMPLETE is displayed.

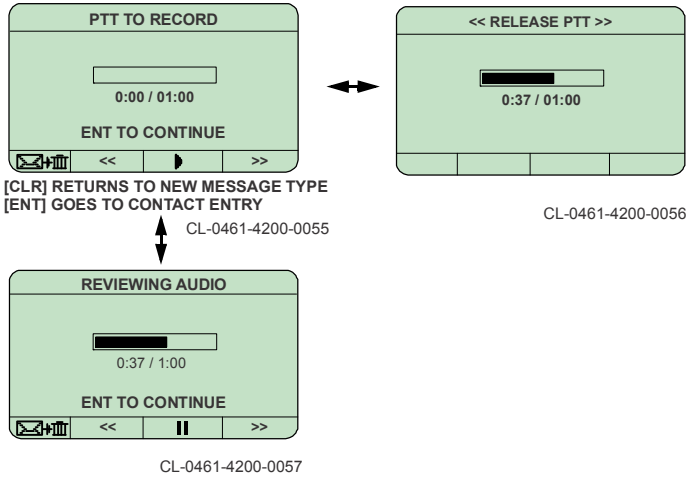
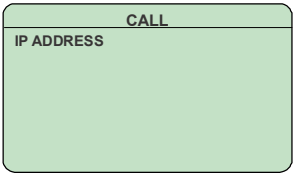


Figure 62. Edit Voice Message

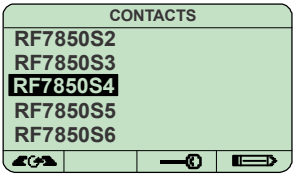
CALL WIZARD

Select **CALL** from the radio Tac Chat home screen. The CALL Wizard guides you through the process of selecting a destination type and address. Figure 63 shows a destination type call list. Figure 64 shows contact selection. TYPE allows manual address entry. LAST takes you to the last selected address as shown in Figure 65. Appears if SHOW ALL ENTRIES is configured under [PGM] > CONTACTS.



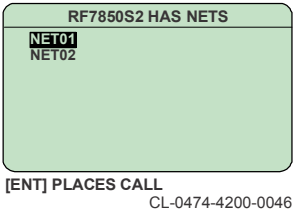
CL-0474-4200-0049

Figure 63. CALL Wizard Destination Types



CL-0474-4200-0165

Figure 64. CALL Wizard Contacts

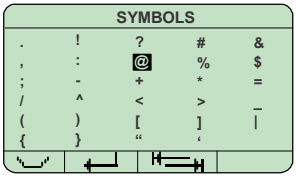


CL-0474-4200-0046

Figure 65. CALL Wizard Detailed / Manual Address Entry

ENHANCED TEXT EDITING

Enhanced text editing extends text entry to include punctuation and all other special characters. From a total of 68 printable characters, 36 alphanumeric and white space (press the **[0]** button twice quickly) are entered through the keypad. The remaining 31 symbols are selectable from a shortcut menu accessed via the Symbol (",#) soft key. The symbols screen includes space, line feed, and tab soft keys. See Figure 66.



CL-0461-4200-0045

Figure 66. Symbol Insertion Menu

In order to support vertical navigation, multi-line text fields have a navigation mode and an editing mode. When in navigation mode, use the arrow keys to move up, down, back, and forward. When in editing mode, the traditional alphanumeric entry keypad is active for character insertion.

Text prediction is another feature of the enhanced text editing. When active, this feature will attempt to make intelligent predictions about which of the available characters to cycle through first. For example, when the letters “MA” are entered followed by pressing 6 on the keypad, the options are: M, N, O, or 6. If the word “MAN” was previously used, text prediction would first put “N” in place, repetitive presses to 6 would cycle through the remaining options. Only text entered with the feature turned on will affect the predictions performance.

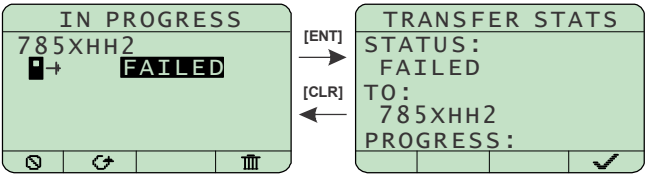
KEYWORDS

Alert messages have the capability of including keywords at any point in the message. Actual insertion of this dynamic information is done after the command to send the message and before the message is sent. Keyword substitution is configurable. Substituting multiple keywords in one message is supported. If the substituted text is larger than the keyword, the overall message may be truncated if it would otherwise exceed the maximum message size. Keywords are:

- {LOC} = Radio's current GPS location (CT nets only). PT nets are sent {LOC}. If the radio has no GPS fix, "UNKNOWN" is sent. If the radio's GPS position is not current, then the location string is preceded by the words "LAST KNOWN".
- {NAME} = Radio's name.

STATUS DISPLAY

The Status display is a send-in-progress screen that includes an ABORT soft key to stop a message from being sent and a RETRY soft key to retry a failed or aborted transfer. The DEL soft key removes the selected transfer from the list if it is not currently in progress. Select **[ENT]** to view the Transfer Status screen where you can scroll through message Status, To, Progress, Transferred, and Elapsed Time information.



CL-0461-4200-4092

Figure 67. Status Display

WEB USER INTERFACE 9

WEB USER INTERFACE

Harris **RF-7850AP-SW101** is a purchasable option that provides the user with a Web-based User Interface (Web UI). The option is loaded on the radio as a .RUF file. Access to the interface is via your local IP network. Connect your radio using either direct ethernet, Remote Network Driver Interface Specification (RNDIS), or to a local network. Either Dynamic Host Configuration Protocol (DHCP) or Static addressing is used to the local network. A browser supporting HTML5 can be used:

- Google Chrome (latest version)
- Mozilla Firefox (latest version)
- Internet Explorer (IE11 or higher)

You may need to adjust your browser settings for Trusted Sites. The Web UI can automatically adapt to and take advantage of device-specific properties such as screen size, graphics capabilities, and touch screen support.

NOTE

For voicemail playback support, an audio plugin (such as QuickTime) is required.

The applications available on the Web UI mimic some of the APPs in the radio's menu structure. The following applications are available with the Web UI. Ground Force Tracker and Configuration come standard with the radio while the others require the **RF-7850AP-SW101** option.

- **GPS Force Tracker** - view local position, along with any received Situational Awareness (SA) reports. Allows you to place friendly forces on a map.
- **Configuration** - Access radio configuration features. User level password restrictions apply to the Web UI the same as for front panel programming.
- **RF-7850AP-SW101** option provides access to TacChat, file system browsing, custom applications, soft KDU, diagnostics, and video.

USER INTERFACE SETUP

The Web UI uses a Secure Socket Layer (SSL) protocol which is turned on by default. The Web UI requires correct operator authentication with a security level and password before allowing a management session. The Web UI has four security levels with different amounts of access. The following examples show User Level 4, which is the highest level. Lower levels may not show all features and functions. Refer to Table 4 for security level information. Set up the Ethernet connection as follows:

a. Connect your computer to the radio data connector using either an Ethernet cable (12164-0714-A006) to make a Local Area Network (LAN) connection or via RNDIS using a USB connection (12164-0710-A006).

NOTE

The PC and radio must be on the same subnet to communicate with each other.

b. Configure the PC for an IP address within same subnet as the radio. Refer to [PGM] > IP CONFIGURATION, p114 for information.

c. Configure the USB Mode on the radio to AUTO ([PGM] > USB MODE > AUTO).

9

USER INTERFACE LOGIN

Log into the Web Interface as follows:

a. Open a web browser on the PC.

b. Enter the IP address of the radio using a secure format (**https://xxx.xxx.xxx.xxx**). For Ethernet, use https://192.168.1.1 or for RNDIS (requires set up), use https://10.0.1.1 or use the RNDIS IP assigned using CPA.

c. Observe that a login screen is displayed. See Figure 68.

NOTE

If wrong password or level is entered, an error message is displayed.

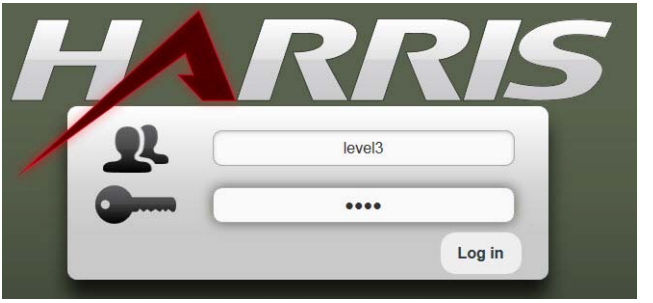


Figure 68. Web User Interface Login

d. Enter your login information (use lower case).

e. Observe the Web Interface Home screen will display. See Figure 69 for an example of one of the demo mode screens shown when the Web UI option is not enabled.

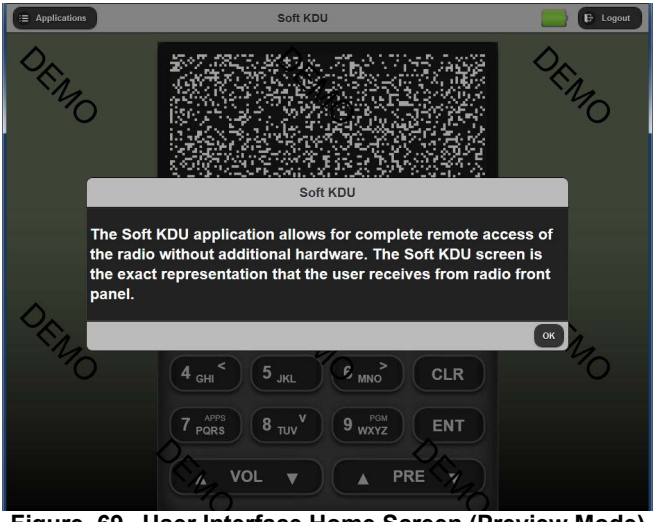


Figure 69. User Interface Home Screen (Preview Mode)

APPLICATIONS

The applications button of the enabled Web UI has linked application icons. See Figure 70. The Log Out link (padlock) terminates the current web interface management session and returns you to the login screen.

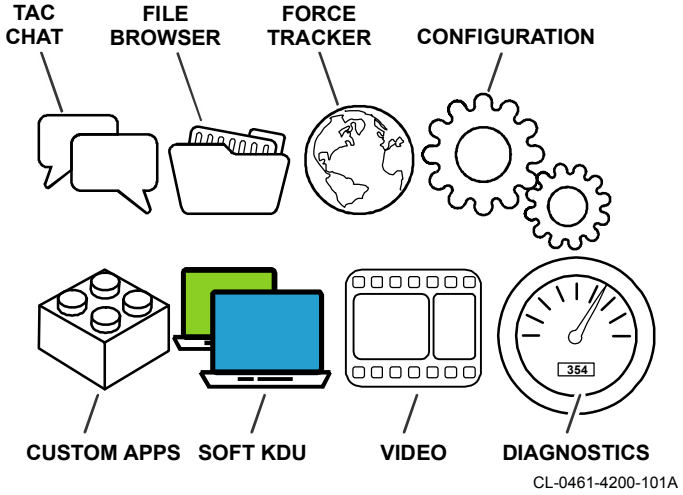


Figure 70. Application Icons

The applications accessible from the Web Interface are described below.

NOTE

The Web Interface will force a logout and return to the login screen if it is inactive for 20 minutes (default). From the Web UI, select **Config > User Interfaces > Web Interface** and set **Session inactivity timeout**.

Tac Chat Application

The Tactical Chat application can be operated directly from the radio as described in Radio Tac Chat Operation, p153, or it may be run from the Web Interface for more versatility. Select the Tac Chat icon to open the application. See Figure 71.

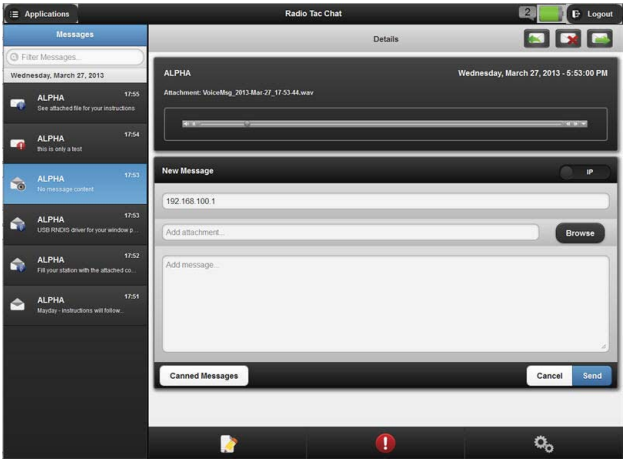


Figure 71. Tac Chat Screen - View Voice Message

From the Tac Chat main screen, all operations are started for the application.

- Received messages are shown on the left of the main screen. Use the list for browsing and viewing. Filter messages by entering keywords at the **Filter Messages...** prompt.
- A summary of the selected message is shown in the right pane. The complete message is displayed when opened.
- Send an Alert message using the lower center icon to view a stored list. Select from the stored list of Alert messages. Select send to issue the alert message as a subnet broadcast.

- Select the lower right icon to open the radio configuration application. This opens your current net configuration (this is similar to [PGM] > NET MANAGER > CURRENT NET).
- The battery icon in the upper right corner indicates the radio battery charge level.
- Select the lower left icon to create and send a new message. See Figure 72. Add canned messages and attachments to the new message as required. Send SMS messages by selecting the switch in the upper right corner of the New Message field. It will change from IP to SMS.

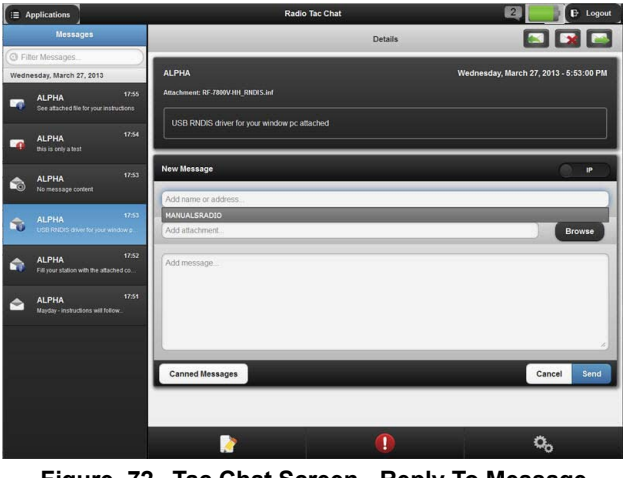


Figure 72. Tac Chat Screen - Reply To Message

Force Tracker

Select the Navigation icon (globe) to open the Force Tracker application. See Figure 73. Force Tracker is used to check position information from the GPS. Controls and tools include zoom in, zoom out, view full screen, draw a polyline, edit and delete layers, and show me where I am.

- Provides status of current radio such as location as formatted based on your navigation configuration; heading, velocity, altitude and acquired satellites. Information can be sent to other radios using SEND on applicable CT nets. Distance circles visualize distance and bearing to other known radios.
- Displays position information received from GPS reports of other radios.

  Reports can be saved on the PC for up to 48 radios maximum, however, they are discarded when the browser closes. Only the last report for each station is saved on the radio. SA Reports are not stored across radio power cycles and are deleted after they exceed 24 hour period.
- Allows you to configure GPS parameters of attached radio. Settings are similar to radio settings in [PGM] > NAVIGATION, p109.

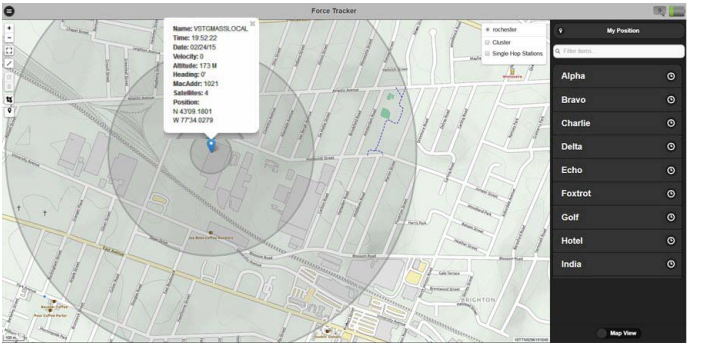


Figure 73. Radio Navigation Screen - Local Position

File Browser Application

Select the File Browser (folder) icon to open the application. See Figure 74. The File Browser provides a convenient way to manage and access files stored in the radio. Functions include: move, copy, rename, add and delete files. See Figure 75. All files must be removed from a folder before deleting that folder. Upload and download file screens are shown in Figure 76 and Figure 77.

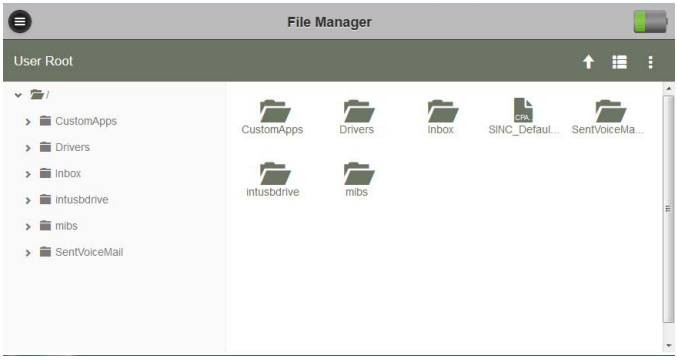


Figure 74. File Browser Screen - Fill File

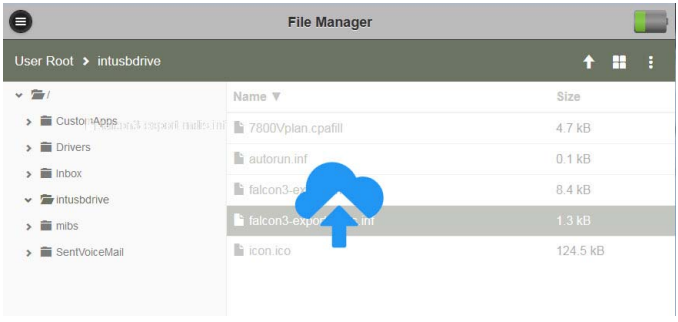


Figure 75. File Browser Screen - Move File

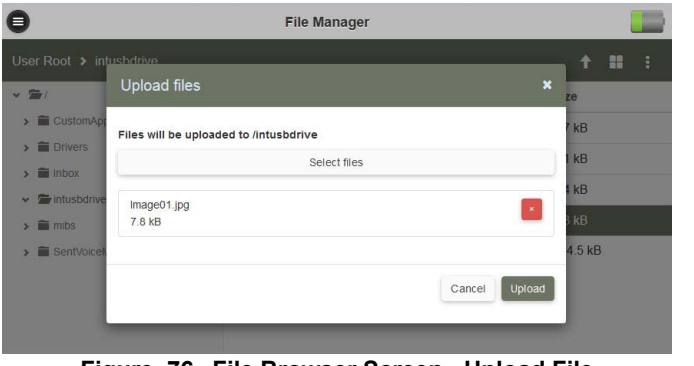


Figure 76. File Browser Screen - Upload File

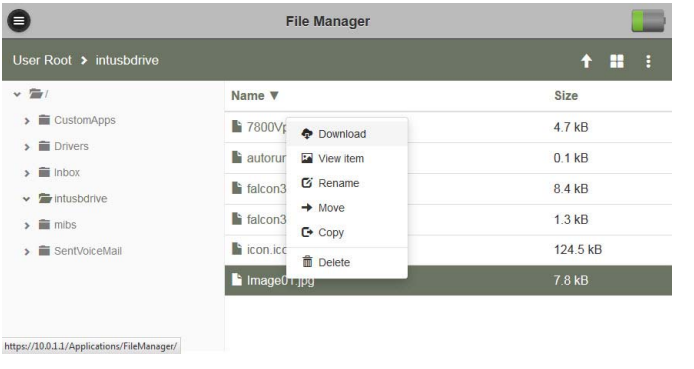


Figure 77. File Browser Screen - Download File

Soft KDU Application

See Figure 78. The Soft KDU application provides a way to operate the radio through the web interface. This is useful in a classroom, when configuring the radio, or when needing to remotely control the radio. Field operation is provided using the Remote KDU.

Figure 78. Soft KDU

Video Application

Video Control must be set to remote when the Web UI video player is being used. This is the only requirement. No other settings are used for maximization. See Figure 79.

Enter a Video URL using the IP address of the Tactical Video Processor (TVP), for example, in place of X. Typically this might be 192.168.1.2.

rtsp://XXX.XXX.XXX.XXX:554/livevideo

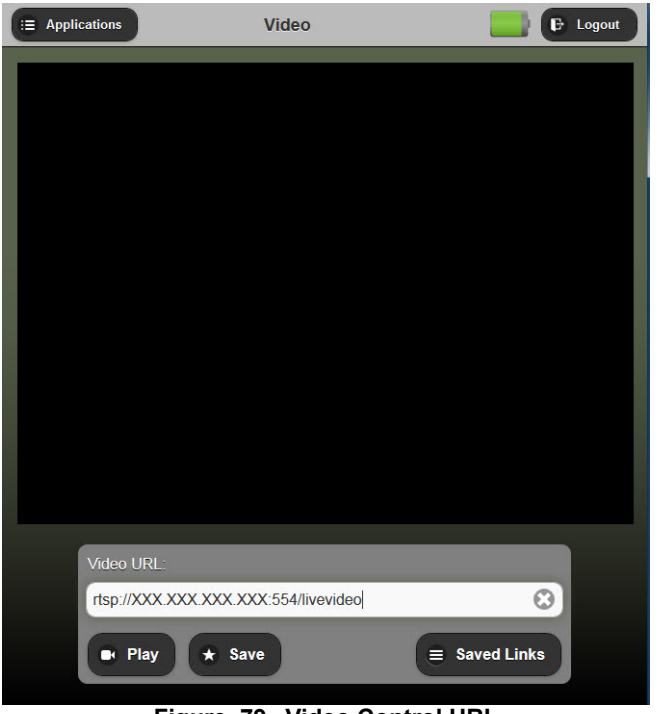


Figure 79. Video Control URL

Custom Applications

The custom applications interface provides a tool for constructing and invoking custom applications or commands. See Figure 80. The help icon provides a sample demonstration. Contact Harris for additional help on using this application.

Figure 80. Custom Applications

Diagnostics Application

Select the Diagnostics icon to open the application. Tx Signal Strength and Rx Signal Strength are displayed at the Diagnostics screen. Select Manual to access manual built in tests on the radio. See Figure 81. These can be run individually or ALL as a group. The ability to stop tests individually or ALL as a group is also provided. Select Results to view test information. Clear the results by selecting the red X.

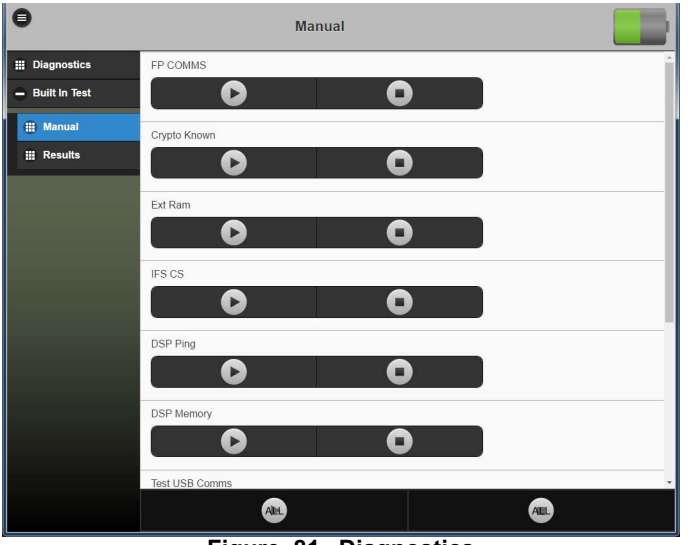


Figure 81. Diagnostics

PROGRAMMING FIRMWARE UPGRADES

Radio firmware can be upgraded easily by installing the firmware file using the Web Interface File Browser.

NOTE

The firmware upgrade process will reset the radio to factory default settings. Any custom applications or settings (such as IP addresses), crypto keys, and network plans will need to be re-installed.

a. Obtain the firmware upgrade file from Harris (**.ruf** file type).

b. Connect the radio and open the Web Interface File Browser.

c. Drag and drop the **.ruf** file into any folder.

d. Select the file.

e. Select the Program icon 

(binary digits) at the bottom right of the file browser. Installation will prompt “Are you sure you want to load new firmware”.

f. Select **YES** soft key at radio, or at the Web Interface.

g. Observe that firmware is updated and press **[CLR]**.

h. Place the radio in OFF and then back to a preset to power cycle the radio and complete the firmware reset.

i. Select the Clear All soft key to go to the main preset screen.

LOADING CPA FILES

Load Communications Planning Application (CPA) fill files using the File Browser Application. The process is the same as loading firmware updates. See Figure 74.

a. Obtain the correct CPA programming file (**.cpafill** file type).

b. Connect the radio and open the Web Interface File Browser.

c. Place (drag and drop) the .cpafill file into the file browser.

d. Select the file.

e. Select the configuration icon. 

f. Select **YES** (both on the radio and at the Web UI) at the installation will prompt “Are you sure you want to load a new config”.

g. The radio will begin to install the file. If the fill file has multiple stations, the Web Interface will prompt you for a station name to fill.

h. Observe that the radio will announce an audible indication if loaded properly: “Fill Updated”. This may take a few seconds.

i. Select the **[CLR]** button to complete the action.

j. Verify radio communications and proceed with normal operation.

RADIO CONFIGURATION APPLICATION

Select the Configuration (gear) icon from the Web Interface main screen to open the application. See Figure 82. Radio Configuration provides a convenient way to add, delete, or edit radio presets in the radio. These functions can also performed from the remote KDU or via the CPA. All changes made from the Web Interface can be saved in the radio.

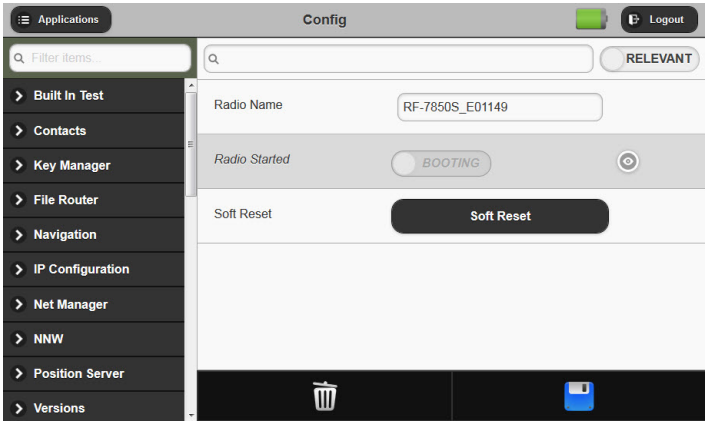


Figure 82. Radio Configuration Screen

The Radio Configuration screen mimics the programming menu structure in the radio. Configuration categories are listed on the left pane, and individual categories are displayed by clicking the (+) to open each pull-down menu. See Figure 83.

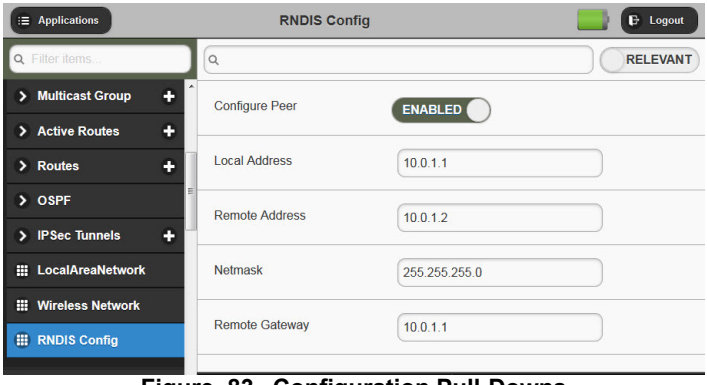


Figure 83. Configuration Pull-Downs

When the Radio Configuration screen is opened, it shows the current configuration of the attached radio. Changes can be made in any order. However, some changes will affect how other parameters become available or relevant. With the switch (top right corner) in the RELEVANT position, only the applicable choices are made available. Clicking on the switch will change to SHOW ALL, and all parameters are shown, whether they are applicable to the configuration or not.

Find a specific setting by typing a keyword in the Search box at the top of the column. This will filter your choices. For example, type **IP** to see all parameters that affect the radio's Internet Protocol configuration.

See Figure 84. Select these control icons to make changes.

- Use the (+) icon to ADD an item.
- Use the (-) icon to DELETE an item.
- Use the PENCIL icon to EDIT an item.

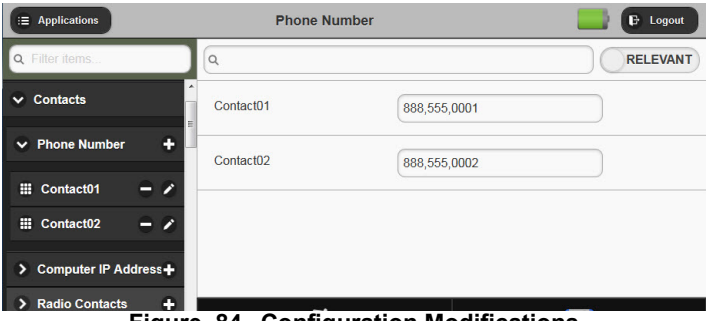


Figure 84. Configuration Modifications

The right pane shows the individual parameters for the category chosen on the left.

Select in any field to make changes.

Filter choices in this specific category by typing a keyword (or just letters) in the Search box at the top.

SAVING CONFIGURATION CHANGES

Any updates to configuration settings are performed immediately. However, they will not be saved through a power cycle. Save places configuration changes in flash memory so they remain across power cycles of the radio. Perform a save as follows.

- Select the **Save** (floppy disk) icon at the bottom of the Configuration screen.
- Select **CTRL+S** on the keyboard.

ZEROIZE

Select the Zeroize (trash can) icon at the bottom of the Configuration screen to zeroize the radio. When the radio is zeroized, all custom settings, nets, and crypto keys are erased.

You may lose Web Interface access after a radio zeroize.

TROUBLESHOOTING

Problem	Action
Radio is connected but no information is displayed in the Web Interface panes.	Manually clear the web browsers cache: • Firefox: Tools > Options > Advanced > Network > Cached Web Content > Clear Now • Chrome: Customize ('wrench icon') > Settings > 'Show advanced settings…' > Clear browsing data… Alternatively, use the 'private' browsing mode in the browser. This will prevent any data from being persistently cached across sessions, and clear the browser when it is closed.
Radio does not connect to PC.	• Verify radio's USB Mode is set to HOST or AUTO. • Verify radio's LAN IP Address is in the same subnet as PC. • Check Ethernet cable connection. • Check browser version.

OPERATOR MAINTENANCE 10

BUILT IN TEST

BUILT IN TEST is run by the user, and is used to run interactive tests of the Keypad Display Unit (KDU), Liquid Crystal Display (LCD), and keypad, for example. Non-interactive tests check battery, audio, and internal circuits of the radio. Refer to [APPS] > BUILT IN TEST, p69 for more information.

PREVENTIVE MAINTENANCE

Preventive maintenance is of primary importance in order to avoid equipment failures. Preventive maintenance is the systematic, scheduled care and inspection of equipment to prevent equipment failure and to reduce downtime. Preventive maintenance consists of keeping the equipment clean, dry, and dust-free. Use a soft brush, a moist sponge, and a cloth to keep equipment clean.

Table 33 contains the checks and services that should be performed either on a daily basis when the equipment is in use, or on a weekly basis when the equipment is in standby condition. Table 34 contains the checks and services that should be performed on a weekly basis with the equipment in use. Table 35 contains preventive maintenance procedures and cleaning after salt water operations.

Table 33. Daily Preventive Maintenance Checks and Services

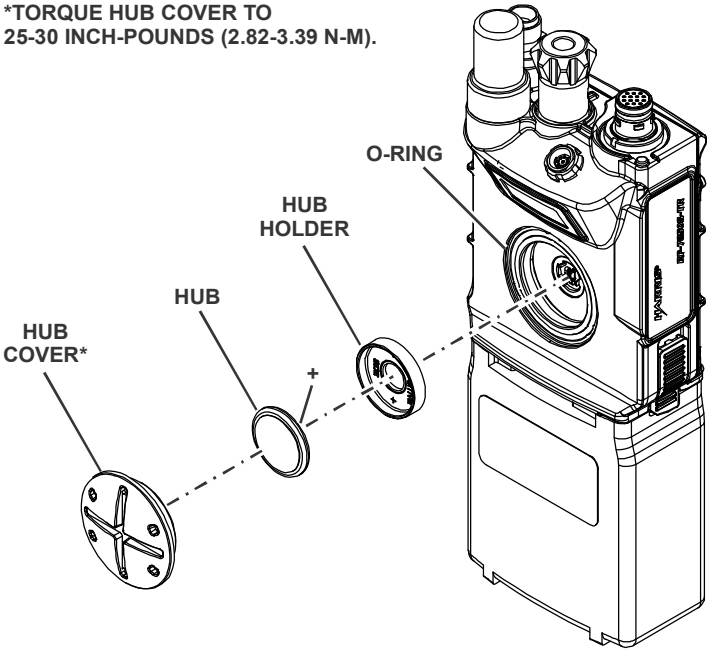
Check No.	Item to Be Inspected	Procedure
1	Operation	Perform Self Test per [APPS] > BUILT IN TEST, p69.

Table 34. Weekly Preventive Maintenance Checks and Services

Check No.	Item to Be Inspected	Procedure
1	Antenna	Check for breaks or strains; repair or replace as required.
2	Connectors	Inspect for dirt, corrosion, or damage.
3	Protective Caps	Ensure protective caps are in place if connectors are not in use.

Table 35. Preventive Maintenance Checks and Services

Check No.	Item to Be Inspected	Procedure
1	Battery (as needed)	1. Disconnect battery from the radio after exposure to fresh or salt water. 2. Remove dirt/salt by rinsing battery with fresh, clean water and thoroughly dry with a soft cloth to prevent corrosion (do not use heat to dry battery). 3. Ensure the battery terminals are clean by using a Nylon Mesh Abrasive Pad (3M Scotchbrite 7447 or equivalent) if corrosion does occur.
2	Hold-Up Battery (HUB) (annually)	1. Obtain replacement HUB, B41-0019-018 (Panasonic BR2330). 2. Ensure a charged main battery is connected during HUB replacement. **NOTE:** HUB can be changed with power on or off. Unit Real Time Clock (RTC) will be lost if HUB is removed for more than 15 minutes with power not applied. Unit programming will be retained until overwritten or zeroized. 3. Remove HUB cover as shown in Figure 85. 4. Remove old HUB and install replacement, ensuring correct polarity. 5. Replace HUB cover and torque to 25-30 inch-pounds (2.82-3.39 N-M).
3	Knob, Pull to Turn (as needed)	1. Obtain replacement knob (12153-6560-02). 2. Loosen set screw (above R) using a 0.05-inch hex key. 3. Replace knob. 4. Tighten set screw to 3.5-5.5 inch-pounds (0.39-0.62 N-M).



CL-0474-4200-0019

Figure 85. HUB Replacement

CORRECTIVE MAINTENANCE

The radio may require Level III maintenance if you observe the following:

- The operator has run the Built In Test application and a fault has been identified by the radio.
- A run-time fault message is displayed by the radio.
- The operator has observed degraded operation that suggests the system is faulty.

DISPLAY MESSAGES

This section describes message indications which may display during run-time when an optional KDU is used. Message types are:

- **Fault** - Table 36 provides information due to a fault present in one or more of the radio's circuits. Faults will be retained after the radio is power cycled. They must be cleared manually by pressing the **CLEAR** soft key. Refer to [APPS] > FAULTS, p75.
- **Information** - Table 37 provides information such as when a save is complete.
- **Warning** - Table 38 provides information on operational errors such as no crypto keys or low battery.

Table 36. Fault Messages

Message	Action/Description
*** EEPROM ITEM ** INVALID**	Problem getting a data item from the Electrically Erasable Programmable Read-Only Memory (EEPROM) lookup table. * is which EEPROM should have been accessed. ** is 0 for PA, 1 for Receiver/Exciter/Synthesizer (RES), 2 for DIGITAL. Requires Level III maintenance.
*** EEPROM LOOKUP TABLE INVALID**	Problem getting data from EEPROM; Empty lookup table. * is which EEPROM should have been accessed. Requires Level III maintenance.

Table 36. Fault Messages (Continued)

Message	Action/Description
24 VOLT REGULATOR VOLTAGE * (MV) ABOVE ** (MV)	RX 24-Volt RX regulator is out of safe operating range. * indicates current regulator voltage. ** indicates maximum regulator voltage. Requires Level III maintenance.
24 VOLT REGULATOR VOLTAGE * (MV) BELOW ** (MV)	RX 24-Volt RX regulator is out of safe operating range. * indicates current regulator voltage. ** indicates minimum regulator voltage. Requires Level III maintenance.
85 VOLT REGULATOR * (MV) ABOVE ** (MV)	85-Volt regulator is out of safe operating range. * indicates current regulator voltage. ** indicates maximum regulator voltage. Requires Level III maintenance.
85 VOLT REGULATOR * (MV) BELOW ** (MV)	85-Volt regulator is out of safe operating range. * indicates current regulator voltage. ** indicates minimum regulator voltage. Requires Level III maintenance.
CODEC THERMAL LIMIT EXCEEDED	CODEC temperature is too high for safe radio operation. User should power off immediately.
CRYPTO KNOWN ANSWER TEST FAILED	During initialization, the CITADEL failed its encryption/decryption known answer test. Requires Level III maintenance.
DDR2 TEMPERATURE TOO HIGH TO OPERATE SAFELY	RAM temperature is too hot for safe radio operation, user should power off immediately.
DDR2 TEMPERATURE TOO LOW TO OPERATE SAFELY	RAM temperature is too COLD for safe radio operation, user should power off immediately.
DETECTED UN-RELEASED U-IPL	The currently running firmware is not supported. Load the latest firmware.
DIGITAL BOARD EEPROM CHECKSUM FAILURE	There was a problem getting data from digital board EEPROM. Requires Level III maintenance.
DIGITAL BOARD RCM DATA INVALID	Problem occurred getting software version data from EEPROM. Requires Level III maintenance.

Table 36. Fault Messages (Continued)

Message	Action/Description
FAILED TO COMMUNICATE WITH INTERNAL ADC	Communication with internal Analog to Digital Converter (ADC) failed. Requires Level III maintenance.
FPGA CONFIGURATION	Initialization of the Field Programmable Gate Array (FPGA) has failed. Requires Level III maintenance.
FPP TEMPERATURE INVALID: *C	Temperature reported by KDU is invalid.
GPP TEMPERATURE TOO HIGH TO OPERATE SAFELY	Processor temperature is too hot for safe radio operation. User should power off immediately.
I2C * FAILURE - **	Problem accessing device over I2C interface. '*' is the I2C bus number. '**' is the I2C device name. Try recovering by power cycling. Level III maintenance required if condition persists.
INTERNAL GPS	Could not communicate with internal GPS module - try cycling power to the radio.
MISC CONFIG DATA INVALID	There was a problem loading radio configuration from EEPROM. Try recovering by power cycling. Level III maintenance required if problem persists.
NET SWITCH	Rotary Switch position fault encountered. Power cycle the radio.
PA TEMP TOO HIGH TX DISABLED	Transmit was terminated due to excessive heat. Allow radio to cool down and retry.
RADIO SERIAL NUMBER INVALID	There was a problem getting serial number from EEPROM. Requires Level III maintenance.
RADIO UNKEYED TX SYNTH 1 OUT OF LOCK	Synth out of lock fault condition was detected during TX, causing radio to unkey. Try recovering by power cycling. Requires Level III maintenance.

Table 36. Fault Messages (Continued)

Message	Action/Description
RADIO UNKEYED TX SYNTH 2 OUT OF LOCK	Synth out of lock fault condition was detected during TX, causing radio to unkey. Try recovering by power cycling. Requires Level III maintenance.
SYNTH 1 OUT OF LOCK	Synthesizer (Synth) out of lock fault condition was detected. Try recovering by power cycling. Requires Level III maintenance.
SYNTH 2 OUT OF LOCK	Synthesizer (Synth) out of lock fault condition was detected. Try recovering by power cycling. Requires Level III maintenance.
TAMPER DETECTED	Radio tamper was detected while in FIPS mode.
TX SYNTH 1 OUT OF LOCK	Attempting to key up the radio failed because synthesizer 1 was out of lock. Try recovering by power cycling. Requires Level III maintenance.
TX SYNTH 2 OUT OF LOCK	Attempting to key up the radio failed because synthesizer 2 was out of lock. Try recovering by power cycling. Requires Level III maintenance.
U-IPL VERSION MISMATCH	The currently running firmware is not supported. Load the latest firmware.
UNABLE TO START AUDIO HARDWARE	Communication with audio codec driver failed. Requires Level III maintenance.
WIDEBAND DSP REPORTED TRANSCEIVER FAULT -	DSP has reported an error. Try recovering by power cycling. Level III maintenance required if problem persists.

Table 37. Information Messages

Message	Action/Description
*** EXECUTED**	The user attempted to execute an application, and the radio successfully executed it. "*" indicates which application executed.
ADD COMMAND FAILED	Displays when an add command has failed.
ALREADY KEYED.	Voice transmit was attempted when a previous voice transmit was still in progress.
ALREADY RUNNING ALL	Run all Built-In Tests was attempted while test was running.
ALREADY RUNNING DIG BOARD	Level III maintenance only: Run digital board Built-In Tests was attempted while test was running.
ALREADY RUNNING TEST [*]	Selected Built-In Test is currently running.
AN ELEMENT WITH NAME [*] ALREADY EXISTS IN YOUR CURRENT DIRECTORY	The chosen file or directory name already exists.
AN INTERACTIVE TEST IS ALREADY RUNNING.	An interactive Built-In Test was attempted while another was running.
BUILT IN TEST STOPPED RUN ALL	Built In Test has been successfully stopped.
CALL FAILED	Displays when the call has failed.
CALL FAILED NOT IN GROUP	The call could not be connected because the station is not a member of the group being called.
CALL TERMINATED	The call completed and was terminated normally by one caller.
CALL TERMINATED BUSY	The call did not connect because the receiving station was already in a call.
CALL TERMINATED ERROR	The call did not connect due to some unexpected reason.
CALL TERMINATED NO SWITCH	The call did not connect because the base station was not able to be reached or was unable to determine where to send the call.

Table 37. Information Messages (Continued)

Message	Action/Description
CALL TERMINATED TIMED OUT	The call did not connect because the receiving station did not respond in time. This may be because the station was offline.
CALL TERMINATED UNREACHABLE	The call did not connect because the receiving station cannot be reached at the destination attempted.
CALLS NOT SUPPORTED ON THIS CONFIGURATION	Calls not supported on this net.
CANCELED: ZIP *	Zip archive creation was canceled.
CANNOT SEND GPS REPORT OLDER THAN * MIN	This indicates that the user attempted to force a GPS report to the network while the last generated GPS report is too old. An old GPS report indicates the radio has not been in contact with GPS for some time and at this point, the report would be unreliable. "*" will indicate the maximum age of a GPS report in minutes that can be reported to the network.
CANNOT SEND GPS REPORT: TNW TIME BEHIND GPS TIME	User initiated GPS position report could not be sent. TNW network time is significantly behind the TOD in the latest GPS report. Try again later.
CONFIGURATION CLEARED	The radio configuration checksum does not match; the configuration is zeroized.
CONNECTED TO *	Displays name of radio contact or talk group that the radio has connected to in a directed call.
COULD NOT EXECUTE *	The user attempted to execute an application, and even though the radio successfully found the application, it failed to execute. "*" will indicate which application failed.
DDR2 TEMPERATURE RETURNED TO SAFE RANGE	RAM temperature has returned to a safe range to resume radio operation.
DELETE NOT AVAILABLE FOR A COMPLETE TRANSFER	The mailbox message delete operation is not allowed.

Table 37. Information Messages (Continued)

Message	Action/Description
DELETE NOT AVAILABLE FOR AN ACTIVE TRANSFER	The mailbox message delete operation is not allowed.
DELETION OF * FAILED	Indicates that the item selected by the user could not be deleted from the list.
EMI TEST COMPLETE	EMI test complete.
EMPTY RECORDING	User tried to play an empty voice mail message.
ERROR SENDING GPS REPORT	There was an error sending the user initiated GPS position report.
FAILED: ZIP *	Failed: ZIP *.
FILL FAILED	FILL operation has failed, possibly due to file corruption or a transmission error. Verify fill file and try again.
FILL FILE DECRYPTION FAILED - CHECK KEY FILL KEY	Fill file could not be decrypted. Verify fill file and/or key.
GPS REPORT SENT	User initiated GPS position report has been sent.
INCOMING FILE TOO LARGE	Displays when File Transfer incoming file has exceeded size limit.
INVALID FORMAT	When entering data into the front panel, certain formatting is required based on the type of data being entered. For instance, an IP address must consist of four, three-digit integers separated by periods. This warning indicates that the most recently entered data has violated its intended formatting.
LOGIN TO RUN TESTS	User must be logged in to perform interactive Built-In Tests.
MAX NUMBER OF ETHERNET ADAPTERS ALREADY IN USE (*), IGNORING THIS DEVICE: VID=0X, PID=0X***, BUSNUM=****, INSTANCENUM=*******	The user added a USB hub to the radio and attached more than one USB Ethernet adapter. A maximum of one is supported.

Table 37. Information Messages (Continued)

Message	Action/Description
MESSAGES NOT SUPPORTED ON THIS CONFIGURATION	Messages not supported on this net.
NEED TO ENTER A VALID NAME	Displays when attempting to ADD a group without specifying a group name.
NET FORMING	Transmission of a data packet failed because the net is in a pre-operational forming mode. Allow time for the net to become operational.
NO CURRENT POSITION FIX	Displays when attempting to manually send a Global Positioning System (GPS) report before a location fix has been obtained.
NOT IN CT MODE	Displays when radio is not in CT mode when attempting to manually send a GPS report.
NOTHING SELECTED TO DELETE	Delete is attempted with nothing selected.
NOTHING SELECTED TO RENAME	Attempt to rename with nothing selected.
POSITION TIMESTAMP INVALID	The GPS position report time stamp is invalid.
PRESS CLR 5 TIMES WITHIN 1 SECOND INTERVALS	Displays to prompt user to unlock the radio if they press a button other than [**CLR**].
RECOMMEND KEY RELOAD	Recommend key reload.
REPEATER BREAK-IN DISABLED	Repeater break-in disabled.
RETRANSMIT: DESTINATION RADIO NOT FOUND	Problem with connection between retransmit site radios.
RETRY NOT AVAILABLE FOR THIS TRANSFER	The transfer is not in a state where the message can be retried.
SAVE COMPLETE	The save operation has completed.

Table 37. Information Messages (Continued)

Message	Action/Description
SENT TO *	Indicates that something has been sent to a radio contact from the contact list.
SET DATE AND TIME SUCCESSFUL	The radio successfully set the time and date that the user provided.
START IGNORED - TX DISABLED	Radio configuration currently disables transmit. Verify radio configuration.
SUCCESS: COPY DIRECTORY	Directory was successfully copied.
SUCCESS: COPY FILE	File was successfully copied.
SUCCESS: DELETE DIRECTORY	Directory was successfully deleted.
SUCCESS: DELETE FILE	File was successfully deleted.
SUCCESS: MAKE DIRECTORY	Directory was successfully created.
SUCCESS: MOVE DIRECTORY	Directory was successfully moved.
SUCCESS: MOVE FILE	File was successfully moved.
SUCCESS: RENAME	Directory/File was successfully renamed.
SUCCESS: UNZIP *	Zip archive was successfully extracted.
SUCCESS: ZIP *	Zip archive was successfully created.
TERMINATE FAILED	Displays upon call terminate operation failure.
TEXT TRANSFER COMPLETE	The text message was successfully sent to the desired destination.
TEXT TRANSFER FAILED	The text message failed to be sent to the desired destination.
THERE ARE NO TAC CHAT FILES OR MESSAGES TO BE RESENT.	There are no tactical chat files or messages to be resent.
TRANSFER NO LONGER ACTIVE	The user attempted to abort a transfer that is no longer active.

Table 37. Information Messages (Continued)

Message	Action/Description
TRANSMIT DISABLED	Transmit was attempted when not allowed. Transmit is disabled if you do not have Bit Error Rate Test (BERT) enabled for the current net.
VERIFYING IMAGE, PLEASE WAIT FOR PROGRAMMING	Wait briefly before attempting to download new firmware. Occurs when attempting to download new firmware early in boot.
VOICE PROMPTS UPDATED	Voice prompts have been successfully installed on the Radio.
VOICE UNKEYED NET FORMING	Voice was unkeyed while the network is forming. Try again later.
YOU CANNOT CHANGE THE BASE FOLDER	You cannot change the base folder.
ZEROIZE COMPLETE	Zeroize operation is complete.

Table 38. Warning Messages

Message	Action/Description
*** IS REVISION R**.***, BUT RADIO EXPECTED R%U.X. LANGUAGE FILE %S INSTALL FAILED!**	Incompatible version of language file installed. Install correct revision.
A SUBNET CONFLICT EXISTS BETWEEN WIP AND LAN INTERFACES. PLEASE RECONFIGURE TO AVOID UNEXPECTED BEHAVIOR.	There is an IP address conflict between the LAN and Wireless IP (WIP) interfaces. Modify radio configuration so networks do not overlap.
BOOT FILL RADIO FAILED	Failed to fill radio using a boot-fill CPA file.
CANNOT RUN BIT IN A WIDEBAND NET	Built-In Test not supported in 1.2 MHz or 5.0 MHz BW net. Recommend running in default net.
CORRUPT RUF FILE	The .RUF file being loaded is not valid.
COULD NOT FILL - FILL FILE TOO BIG	Displays to inform user that fill operation could not be completed because fill file size is too large.

Table 38. Warning Messages (Continued)

Message	Action/Description
DC VOLTAGE HIGH	The voltage is too high; a regulator may need repair or replacement. Requires Level III maintenance.
DDR2 TEMPERATURE RANGE INVALID	The RAM has reported a temperature range that can't be interpreted so the user should use their best judgment to decide if it is safe to continue using the radio risking hardware damage.
FAILED: BATTERY IS TOO LOW TO UPDATE FIRMWARE.	Because the battery level is low, firmware update has been disabled for safety; the radio must not lose power during a firmware update. Change the battery.
FAILED: COPY "*", DOES NOT EXIST	Copy operation failed; directory/file does not exist.
FAILED: COPY DIRECTORY	Copy operation failed; check if the directory still exists.
FAILED: COPY FILE	Copy operation failed; check if the file still exists.
FAILED: DELETE "*", DOES NOT EXIST	Delete operation failed; directory/file does not exist.
FAILED: DELETE DIRECTORY	Delete operation failed; check if the directory still exists.
FAILED: DELETE FILE	Delete operation failed; check if the file still exists.
FAILED: MAKE DIRECTORY	Create directory operation failed.
FAILED: MOVE "*", DOES NOT EXIST	Move operation failed; directory/file does not exist.
FAILED: MOVE DIRECTORY	Move operation failed; check to see if the directory still exists in its previous location.
FAILED: MOVE FILE	Move operation failed; check to see if the file still exists in its previous location.
FAILED: RENAME	Rename operation failed; check if the directory/file still exists.
FAILED: UNZIP *	Extract zip archive operation failed.

Table 38. Warning Messages (Continued)

Message	Action/Description
FILL FAILED: VALID CONFIGURATION NOT FOUND	Informs user that version of Communications Planning Application (CPA) being used is not supported. Verify fill file.
FILL RADIO FAILED	FILL operation has failed. Reprogram fill file and retry.
FILLING WITH PREVIOUS VERSION OF THE CPA MAY RESULT IN A PARTIALLY CONFIGURED RADIO...	If the CPA version does not match the radio version then the radio may not be filled accurately.
FULL DUPLEX TALK GROUPS MUST HAVE TWO VOIP CHANNELS CONFIGURED, WAVE DISABLED FOR GROUP *	Full duplex talk groups must have two VoIP channels configured; wave disabled for group *. Correct radio configuration.
HIGH CURRENT - TX POWER REDUCED	Current draw from radio's power source exceeded maximum, so Tx power has been reduced. Check power connections to radio and reboot to restore selected power level.
HIGH PA TEMP - TX POWER REDUCED	Internal Power Amplifier temperature is too high, so Tx power has been reduced until temperature decreases. Cool down the radio.
HIGH RAM TEMP - TX POWER REDUCED	Internal RAM has reached a high temperature, so Tx power has been reduced to extend safe radio operation time. Cool down the radio.
INCOMPATIBLE RUF FILE	The RUF file being loaded is not compatible with this platform.
INVALID CONFIGURATION: IP = * NETMASK = ** DEFAULT STATIC GATEWAY = * DEFAULT STATIC GATEWAY IS NOT ON THE SAME SUBNET AS RADIO'S STATIC IP ADDRESS**	The IP address of the static gateway must be on the same subnet as the radio's static IP address. Verify radio configuration.

Table 38. Warning Messages (Continued)

Message	Action/Description
INVALID FORMAT	When entering data, certain formatting is required based on the type of data being entered. For instance, an IP address must consist of four, three-digit integers separated by periods. This warning indicates that the most recently entered data has violated its intended formatting.
INVALID IP ADDRESS	The user entered a value which was not in the correct format for an IPv4 address.
INVALID POSITION MODE	This occurs when the user attempts to change the net assigned to the current net switch position when the current net switch position is not able to be changed. This could mean that the rotary knob is physically in a position that cannot be reassigned, for instance, the Zeroize position. Or, it can mean that the rotary knob has been set to the remote position, and the current virtual position of the radio is not allowed to be changed.
INVALID STATIC NETMASK = *	Static Netmask is not a valid IPv4 address.
LANGUAGE FILE * INSTALL FAILED!	Not enough storage. Remove user files or factory reset to make room.
LANGUAGE FILE(S) INSTALL FAILED!	Not enough storage. Remove user files or factory reset to make room.
LOW BATTERY	Battery voltage is low and should be replaced soon. Replace with known good battery.
LOW BATTERY - TEMPERATURE	Radio is cold and should be warmed if possible; battery life may be reduced.
LOW VOLTAGE - TX POWER REDUCED	Supply voltage dropped too low to operate at selected power level, so Tx power has been reduced. Check power connections to radio and reboot to restore selected power level.
LOW VOLTAGE - TX POWER = HIGH	Supply voltage dropped too low to operate at High+ power level, so Tx power has been reduced to High. Check power connections to radio and reboot to restore High+ power level.

Table 38. Warning Messages (Continued)

Message	Action/Description
LOW VOLTAGE - TX POWER = MED	Supply voltage dropped too low to operate at High power level, so Tx power has been reduced to Medium. Check power connections to radio and reboot to restore High power level.
NO FILL RADIOS ARE COMPATIBLE	None of the radio configurations found on the FILL file are compatible with the radio. Verify fill file.
NO NETWORK ID FILLED	Network ID was not configured on a net that requires one.
NO TALK GROUP FOR KEYSOURCE: *	User attempted to key the radio using a keysource (PTT1, PTT2, HEADSET-PTT1, HEADSET-PTT2, etc.) that was not configured correctly.
NO TEK FILLED	Cipher Text (CT) net has no encryption key. Reprogram plan adding CT keys.
NO TNW HOPSET FILLED	This indicates that the current net requires a hopset and one has not been assigned to it.
NO TRANSEC KEY FILLED	Net with no Transmission Security (TRANSEC) KEY selected.
NOT A MEMBER OF TALKGROUP: *	An attempt was made to transmit on a S-TNW talk group that the radio is not configured to be a member. Check user configuration.
PERFORMING FACTORY RESET	Displays to inform user that a Factory Reset is being performed on the radio.
POSITION SERVER DISABLED DUE TO IP PORT CONFIG CONFLICT	Position Server and Position Reporter are configured to send to the same address and port, so Position Server is being disabled. Verify radio configuration.
PRESET DOWN DISABLED. TURN SWITCH TO R	Preset down button only works when rotary switch is in 'R' position.
PRESET UP DISABLED. TURN SWITCH TO R	Preset up button only works when rotary switch is in 'R' position.
RUF FILE PERMISSION DENIED	The RUF file may have a serial/part number exclusion which is not compatible with the radio.

Table 38. Warning Messages (Continued)

Message	Action/Description
RUF FILE PROGRAMMING FAILED	The RUF file could not be loaded. The Radio may have been disconnected during RUF file load.
SET DATE AND TIME FAILED	The Date/Time supplied to the radio could not be set. Ensure date/time are valid and try again.
SMS SEND FAILED	Displays to inform user that Short Message Service (SMS) message failed to be sent.
START IGNORED - ALREADY KEYED	Start is ignored if you attempted to start BERT while it is still keyed due to a prior start call.
TAC CHAT MESSAGE IS BEING TRUNCATED TO (*) CHARACTERS	TAC CHAT message is being truncated to (*) characters.
THIS NET DOES NOT CONTAIN ANY TALK GROUPS.	No talk groups filled for the current net.
TRANSEC NOT READY KEY IGNORED	Transmit attempt while net is not operational. Verify net configuration.
UNABLE TO READ SYSTEM VOLTAGE	There was a problem reading the battery voltage; current status is unknown. Replace with known good battery.
UNSUPPORTED FILE TYPE IGNORED	File type is ignored - not supported.
UNSUPPORTED FILE TYPE IGNORED: *	File type * is the file extension that was ignored - not supported.
VOICE MAIL MESSAGE FULL	Voice mail recording was cut off at the maximum message time limit of 1 minute.

SPECIFICATIONS/ REFERENCES 11

SPECIFICATIONS

Table 39 lists the specifications for the RF-7850S-TR.

Table 39. Specifications

Function	Specification
GENERAL	
Frequency Range	225 MHz - 2000 MHz (2.0 GHz)
Net Presets	25 (13 selectable from rotary switch positions)
Transmission Mode	• FM Analog Voice • Frequency Shift Keying (FSK) 16 kbps Mixed-Excitation Linear Predictive enhanced (MELPe) • FSK 16 kbps Continuously Variable Slope Delta (CVSD) Voice • Internet Protocol (IP)
RF Input/Output Impedance	50 ohms
Co-location	9% frequency and 1.5 m antenna separation
Color/Finish	• Green (RF-7850S-TR001) • Black (RF-7850S-TR011) with Chemical Agent Resistant Coating (CARC) Finish
TRANSMITTER SPECIFICATIONS	
Output Power	Low: 0.25, Medium: 1.0, High: 3.2 Watts
Frequency Stability	+/-1 parts per million (ppm)

Table 39. Specifications (Continued)

Function	Specification
Narrowband, Harmonic Suppression	• The transmit harmonic output for the 1st-10th harmonics <= -45 dBc, in FM High+ Power Mode. • The transmit harmonic output for the 1st-8th harmonics <= -50 dBc, for the 9th-10th harmonics <= -45 dBc in FM High Power Mode. • The transmit harmonic output for the 1st-10th harmonics <= -46 dBc in FM Medium Power Mode. • The transmit harmonic output for the 1st-10th harmonics <= -37 dBc in FM Low Power Mode.
Narrowband, Transmitter Spurious Emissions	At least 95% of conducted spurious emissions less than -50 dBc at frequencies greater than three (3) times the authorized bandwidth from the carrier. Harmonics of the carrier frequency are excluded from this measurement. The authorized bandwidth is defined as: • Bandwidth is the authorized bandwidth derived as 2*(FM Deviation +maximum audio). • Attenuation (dB) is percentage of Channels. • Displacement Frequency is the offset from the carrier frequency.

Table 39. Specifications (Continued)

Function	Specification
RECEIVER SPECIFICATIONS	
Receiver Sensitivity	FM with LNA Disabled: -112 dBm @ 12 dB (Signal + Noise + Distortion)/Noise + Distortion (SINAD) FM with LNA Enabled: -118 dBm @ 12 dB SINAD
Narrowband, Adjacent Channel Rejection	25 kHz bandwidth operating modes: the rejection of an interfering signal, applied at +25 kHz or -25 kHz from the desired signal, is at least 37 dB.
Narrowband, Next Adjacent Rejection	25 kHz bandwidth operating modes: the rejection of an interfering signal, applied at +50 kHz or -50 kHz from the desired signal, is at least 50 dB.
Squelch	Selectable: off/noise/tone/digital
Intermediate Frequency (IF) Rejection	>70 dB (80 dB typical)
ENVIRONMENTAL (PER MIL-STD-810)	
Operating Temperature	-22 °F to 131 °F (-30 °C to +55 °C)
Immersion	6 feet (2 meters)
Humidity	95% per MIL-STD-810
FEATURES	
Data Operations	Simultaneous voice, GPS position reporting and IP data up to 1 Mbps
Bandwidth	Narrowband Mode: 25 kHz Wideband Mode: 1.2 MHz, 5.0 MHz
Communications Security (COMSEC)	256-bit Advanced Encryption Standard (AES)
Vocoder (CVSD)	Interoperable with MIL-STD-188-113 compliant CVSD equipment, and is capable of the following. 16 kbps CVSD: PT/CT simple fixed frequency.
GPS	Internal Global Positioning System (GPS).
Data Interface	Universal Serial Bus (USB) 2.0, Synchronous, and Asynchronous

Table 39. Specifications (Continued)

Function	Specification
LAN	Direct Connection to Local Area Network (LAN) and USB Devices.
SNMP	Support for V1, 2, and 3 Simple Network Management Protocol (SNMP).
Digital Data	Frequency Shift Keying (FSK) in PT and Cipher Text (CT) fixed frequency.
MECHANICAL	
Dimensions with battery	8.3 H x 3.1 W x 2.0 D in. (21.0 H x 8.0 W x 5.0 D cm)
Weight	1.21 lbs (0.545 kg) without battery 1.71 lbs (0.775 kg) with battery

CONNECTOR PINOUT DATA

Table 40 and Table 41 provide pinout data for the interface connectors mounted on the RF-7850S chassis. See Figure 86 for connector pinouts.

Table 40. 9-Pin Audio Connector Specifications

Pin	Signal	Direction	Description	Specification
1	ADF_A_HS_GND	In	Ground	Ground return for the speakers, PTT (and microphone if used in single-ended mode).
2	HS_PTT2	In	Push-To-Talk (PTT) PTT2 In	Ground closure active low. Normally open. Input impedance 10 Kohm pull-up to 1.8 V with a blocking series diode. Required switch impedance to activate < 1 Kohm. Eoc 1.5 V, Isc 0.15 mA.
3	ADF_C_HS_PTT	In	PTT1 In	Same as pin 2.
4	ADF_MIC_N	In	Microphone Input	Low-noise NEG input, 1 Kohm, for differential microphone operation. Not used if single-ended microphone operation selected.
5	ADF_D_HS_MICP	In	Microphone Input	Low-noise POS input, 1 Kohm, for differential or single-ended operation. Gain applied to Microphone signal input is automatically adjusted for best performance. Full Scale 65.8 mVpp. Automatic Level Control (ALC) maintains a constant speech level for inputs between 2 mVrms and Full Scale via radio software. Input impedance 2 Kohm (differential) Bias voltage 3.3 V (2 Kohm). Bias enabled by software configuration.
6	ADF_F_HS_PWR	Out	Power	Audio accessory power, 5.0 V (+/- 5%), 500 mA. Current limit 500 mA nominal. Short-circuit protected. Supply enabled by software configuration.

Table 40. 9-Pin Audio Connector Specifications (Continued)

Pin	Signal	Direction	Description	Specification
7	HS_SPKR_R	Out	Headset Audio, Right	Stereo (Right) ear-piece drive. No-connect if Mono headset required. Absolute Maximum Stereo Headset drive level: No load 10.0 Vpp 150 ohm 10.0 Vpp 83 + 83 mW 68 ohm 5.44 Vpp 54 + 54 mW 33 ohm 2.64 Vpp 26 + 26 mW If a Mono Headset is used, more power is available (refer to pin 8).
8	ADF_B_HS_SPKR_L	Out	Headset Audio, Left	Stereo (Left) or mono ear-piece drive. Full scales drive level 10.0Vpp. Absolute Maximum Mono Headset drive level: No load 10.0 Vpp 150 ohm 10.0 Vpp 83 mW 68 ohm 5.44 Vpp 54 mW 33 ohm 2.64 Vpp 26 mW
9	ADF_E_HS_RXMT	I/O	Single Wire Control	Maxim / Dallas 1-Wire interface or RETRANS signal. The line may be pulled to ground by either an externally connected device or by the radio. Input impedance 1.0 Kohm pull-up to 5.0V. Eoc 5.0 V, Isc 5.0 mA
Shield	-	N/A	Chassis Ground	Headset Connector / SPR Chassis connection. The Headset cable screen is connected to this point.

Table 41. Data Connector Specifications

Pin	Signal Name	Direc -tion	Description	Max Current
1	GND	N/A	Digital Ground, 0VDC	0.5 Amps
2	USB_OTG_DP	I/O	USB 2.0 D+ Host or Device data Port. 3.3 V	0.5 Amps
3	USB_OTG_DM	I/O	USB 2.0 D- Host or Device data Port. 3.3 V	0.5 Amps
4	USB_OTG_ID	I/O	USB Host/Device ID port selection. Short to GND to enable USB Host mode port. Leave open to enable USB Device mode port.	0.5 Amps
5	Reserved	I/O	Reserved for secondary serial port	0.5 Amps
6	RS-232_#1_TXD	I/O	RS-232 TXD for Serial Port	0.5 Amps
7	EXT_GPS_1PPS	I	External GPS 1 PPS Input to Radio, Up to 5V	0.5 Amps
8	AUX_POWER	O	Aux Power Output, Battery Voltage Range (8VDC - 17 VDC)	0.5 Amps
9	DATA_ACCESSO RY_DETECT	I/O	Harris Data Accessory Auto Detection, Voltage from 2 VDC to Ground	0.5 Amps
10	Reserved	NA	Reserved for future composite video input	
11	USB_OTG_VBUS	I/O	USB Power 5.0 V (+/- 5%). Short-circuit protected	0.5 Amps
12	Reserved	I/O	Reserved for secondary serial port	0.5 Amps
13	RS-232_#1_RXD	O	RS-232 RXD for Serial Port	0.5 Amps
14	Reserved	NA	Reserved for future composite video input	
Shi eld		N/A	Chassis Ground Chassis connection for cable screen/shield.	0.5Amps

MATING CONNECTORS

Table 42 provides part numbers for the cable connectors that mate to the radio. Figure 86 shows connector pins for 9-pin audio connector. Figure 87 shows connector pins for 14-pin data connector.

Table 42. Connectors and Mating Connector Part Numbers

Chassis Connector	Mating Connector Part Number
9-Pin Audio	Fischer SS 102 A059-4
14-Pin Data	J29-0036-220

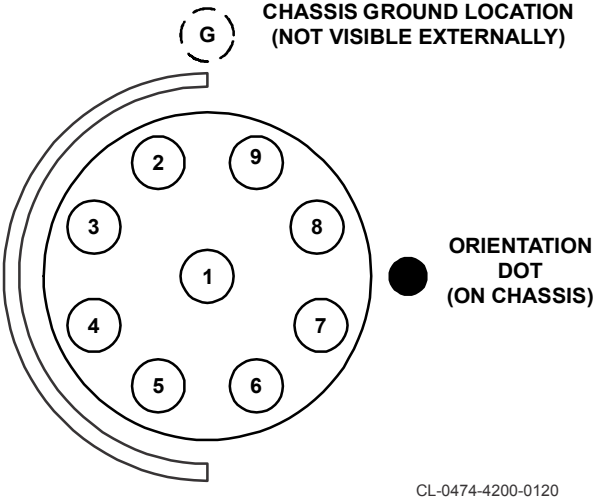


Figure 86. Connector Pins, Audio Interface

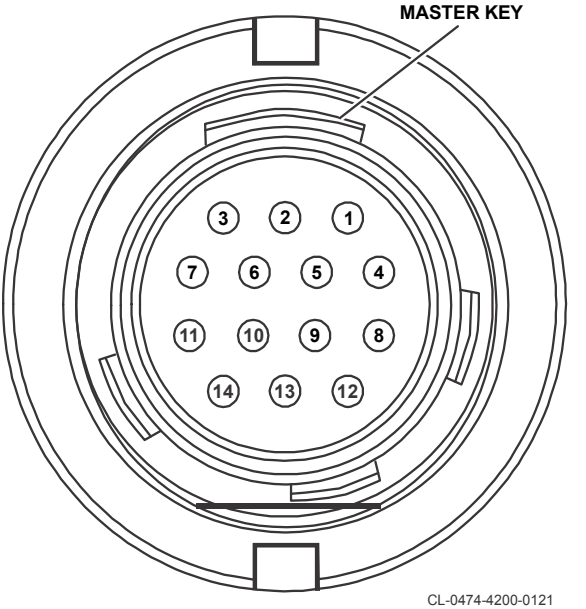


Figure 87. Connector Pins, Data

OPTIONAL ACCESSORIES

The following optional items are available for the radio.

RF-7850S-PK001, Programming Kit for RF-7850S (includes Remote KDU, 12113-1000-22 and Cable Assembly, 12164-0710-A006)

Remote Keypad Display Unit (KDU) Devices

- Handheld radio Remote KDU, Green (12113-1000-21)
- Handheld radio Remote KDU, Black (12113-1000-22)
- Handheld radio Remote KDU, Tan (12113-1000-23)

Headsets/Handsets (refer to catalog for additional items)

- RF-3038-HS001, Ranger Lightweight Headset
- RF-3030-HS001, Basic Tactical Headset
- RF-3050-SM003, Dual PTT Speaker Microphone

Data Cables

- 12164-0710-A006, Cable Assembly, 14 Pin To Standing USB Type A
- 12164-0711-A006, Cable Assembly, 14 Pin To USB Micro B
- 12164-0713-A006, Cable Assembly, 14 Pin To USB Micro B / HOST
- 12164-0714-A006, Cable Assembly, 14 Pin To USB to Ethernet
- 12164-0715-A006, Cable Assembly, 14 14 Pin to PLGR/DAGR
- 12164-0717-A006, Cable Assembly, 14 Pin to USB B, PLGR/DAGR
- 12164-0718-A006, Cable Assembly, 14 Pin to Tablet
- 12164-0719-A006, Cable Assembly, 14 PIN to USB A, PLGR/DAGR
- 12164-0720-A006, Cable Assembly, 14 Pin to USB To Ethernet Cross Band Retransmission (RF-7850S to RF-7850M or RF-7800V)

- 12164-0721-A006, Cable Assembly, 14 Pin to 14 Pin Retransmission (RF-7850S to RF-7850S)
- 12164-2211-A004, Cable Assembly, 14 Pin to Tactical Video Processor (TVP)
- 12164-0725-A1, Cable Assembly, 9 Pin Fischer to 6 Pin Audio Adapter (ADF)

Antennas

- Low-Band Antenna, 12121-2700-01
- High-Band Antenna, 12121-2710-01
- Tri-Band Antenna, 12121-2730-01

Battery Chargers (x = 0 for US, 2 for EU, and 3 for UK)

- RF-5853-CH1x1, Single-Bay Li-ION charger
- RF-5853-CH1x2, Two-Bay Li-ION charger
- RF-5853-CH1x6, Six-bay Li-ION charger

Holsters: Green (RF-5953-CA001), Coyote (RF-5953-CA002), Traditional Digital Camouflage (RF-5953-CA003), Tan Digital Camouflage (RF-5953-CA004), Black (RF-5953-CA005), Multi-cam (RF-5953-CA006)

Optional Software

- Web User Interface (RF-7850AP-SW101)

LOAD RNDIS DRIVER

RNDIS driver files are located in a folder on the connected radio. Perform the following procedure to load the drivers on your PC. A typical use case for RNDIS is to support the Tactical Video Processor interface.

Setup USB Mode to Storage Device

These steps are performed from a KDU and can be skipped for zeroized or brand new radios.

a. Select **[PGM]**.

b. Navigate to **USB MODE** and press **[ENT]**.

c. Configure **USB MODE** as AUTO and **FUNCTION** as STORAGE DEVICE and select **[PGM]** to exit the menu.

d. Disconnect the remote KDU if it is being used.

Transfer .inf File using USB Cable

You can use a remote KDU and a USB flash drive to copy the inf file to the PC or the Web User Interface to skip these steps.

a. Connect the radio to the computer as USB peripheral storage using cable (12164-0710-A006).

b. Open up My Computer on the PC and locate the removable disk drive that appeared. Its name will be RF-7850SExxxxx <drive letter>, where xxxxx is the serial number of the radio, and <drive letter> is the file system drive designator (such as D:).

c. Browse inside that drive and you will see an **falcon3-export-rndis.inf** file.

d. Place (copy) this file to your desktop.

e. Disconnect the USB cable from the computer.

Setup USB Mode for RNDIS Device from KDU

a. Select **[PGM]**.

b. Navigate to **USB MODE** and press **[ENT]**.

c. Configure **USB MODE** as AUTO and **FUNCTION** as RNDIS DEVICE and press **[ENT]** to set the value. Use PERIPHERAL only if cable connection is not auto sensing.

d. Select **[PGM]** to exit out of programming.

Install RNDIS Driver

a. Connect the USB cable.

b. Select the “No, not this time” radio button at the Found New Hardware Wizard on the PC.

c. Select **Next**.

d. Select Install from a list or specific location (Advanced) on the next screen that appears.

e. Select **Next**.

f. Select Search for the best driver in these locations on the next screen.

g. Select “Include this location in the search”.

h. Select **Browse** to specify a location.

i. Navigate to the file you previously copied to the desktop and choose it. Ignore any driver warnings that may appear.

Configure RNDIS IP Address

11

The radio Internet Protocol (IP) address is 10.0.1.1 and the PC IP address is 10.0.1.2 for RNDIS. The PC gateway is set to 10.0.1.1 by default. Refer to RNDIS CONFIGURATION in the programming section.

a. Select **[PGM]** > **IP CONFIG** and press **[ENT]**.

b. Select **RNDIS CONFIG** and press **[ENT]**.

c. Select the value for **Remote Gateway** and press **[ENT]**.

d. Change the value to **0.0.0.0** and press **[ENT]**.

e. Select **[PGM]** to exit.

SYMBOLS

The following symbols represent the functions identified in Table 43.

Table 43. Symbol Cross Reference

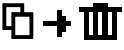
Function	Symbol
Abort, Cancel, No	
Add	
All, Select All	
Auto	
Call	
Canned Message	
Cancel, Abort, No	
Configure	
Clear, Erase	
Clear All	
Copy	
Control the cursor position	
Cursor Left	

Table 43. Symbol Cross Reference (Continued)

Function	Symbol
Cursor Right	
Delete, Backspace	
Delete, Message	
Deselect All (Clear)	
Done, Set, Yes	
Edit, Type	
End	
Erase, Clear	
Forward Message	
GPS	
Information, Details	
Insert Mode	
Last (Redial)	
If, Line Feed	

Table 43. Symbol Cross Reference (Continued)

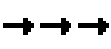
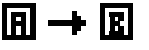
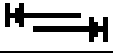
Function	Symbol
Lock	
Login	
Logout	
Manual Selection	
Make Directory (MKDIR)	
More	
Move	
Message, msg	
No, Abort, Cancel	
Overwrite Mode	
Pause	
Play, Start	
PTT	PTT
Registration	

Table 43. Symbol Cross Reference (Continued)

Function	Symbol
Rename	
Reply	
Replay Last Message	
Reset Radio	
Retry	
Run All Bite	
Run Digital Bite	
Save	
Scan	
Select, Paste for Copy/Move	
Send	
Set, Done, Yes	
Space	
Speaker On	

11

Table 43. Symbol Cross Reference (Continued)

Function	Symbol
Speaker Off	
Start	
Status, Show information about transfer progress	
Stop	
Symbol	
Tab	
Time	
Type, Edit	
Unlock	
Users	
UTC	UTC
Yes, Done, Set	
Zero, Zeroize	

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-Menus/Controls-

[APPS]	Application menu
[CLR]	Clear
[ENT]	Enter
[LT]	Light
[PGM]	Programming menu
[SQL]	Squelch

-A-

A	Amps
ADDR	Address
ADF	Audio Fill Adapter
ADI-A	Adindan Ethiopia
AES	Advanced Encryption Standard
ALC	Automatic Level Control
ANC	Ancillary
App, APPS	Application(s)
ARQ	Automatic Repeat reQuest
ASCII	American Standard Code for Information Interchange
Async	Asynchronous
Auto, AUTO	Automatic
AUX	Auxiliary
AVG	Average
AVGAS	Aviation Gasoline

-B-

BER	Bit Error Rate
BERT	Bit Error Rate Test
BIT	Binary Digit, or Built-In Test
BMS	Battlefield Management System
BOV	Bit Occupancy Vector
bps, BPS	Bits per second
BW	Bandwidth

-C-

C	Celsius
CARC	Chemical Agent Resistant Coating
CD	Compact Disk
CFG	Configuration
CLR	Clear
cm	Centimeter or 1 x 10^{-2} meter
COMSEC	Communications Security
CONFIG	Configuration - The process of setting parameter values that define the current hardware setup and/or operational modes. Also, a collection of all such values.
CPA	Communications Planning Application
CRC	Cyclic Redundancy Check
CS	Check Sum
CSS	Cryptographic Subsystem
CT	Cipher Text, encrypted voice or data
CTS	Clear-to-Send
CVSD	Continuously Variable Slope Delta. A method of digitizing typically encrypted voice.

-D-

D	Depth
D/V	Data and Voice
dB	Decibel
dBc	Decibels relative to carrier
dBm	Decibel level referenced to 1 milliwatt (0.001 watt) power level
DC	Direct Current
DD-MM-YY	Day-Month-Year calendar
DEL	Delete
DHCP	Dynamic Host Configuration Protocol
dpot	Digital Potentiometer
DSP	Digital Signal Processor
DTMF	Dual-Tone-Multi-Frequency

-E-

ECCM	Electronic Counter-Counter Measures
EEPROM	Electrically Erasable Programmable Read-Only Memory
ENT	Enter

-F-

F	Fahrenheit
FF	Fixed Frequency
FM	Frequency Modulation. Varying the frequency of the RF carrier in proportion to the modulating signal.
FPGA	Field Programmable Gate Array
FSK	Frequency Shift Keying
ft	Feet
FTP	File Transfer Protocol
FW	Firmware
FWD	Forward

-G-

GND	Ground
GPS	Global Positioning System. A system using satellites to provide position location, system clock.

-H-

H	Height
HERF	Hazard of Electromagnetic Radiation to Fuel
HERO	Hazard of Electromagnetic Radiation to Ordnance
HERP	Hazard of Electromagnetic Radiation to Personnel
HH	Handheld (radio)
HOP	Hopping
HTTP(S)	HyperText Transfer Protocol, (S) signifies Secure

-I-

I	Internal (I GPS)
I/O	Input/Output
ID	Identification
IF	Intermediate Frequency
IFS	Image File System
IGMP	Internet Group Management Protocol (
in.	Inches
IP	Internet Protocol
IPL	Initial Program Loader
ITAR	International Traffic In Arms Regulations

-J-

-K-

k	kilo or 1 x 10^3
kbps	kilobits per second
KDU	Keypad Display Unit
kg	Kilogram or 1 x 10^3 gram
kHz	Kilohertz
KML	Keyhole Markup Language

-L-

L	Length
LAN	Local Area Network
lbs	Pounds
LCD	Liquid Crystal Display
LF	Line Feed
Li-ION	Lithium-Ion rechargeable battery
LOC	Location
LT	Light

-M-

m	Meter
mA	Milliampere
MAC	Media Access Control
MAX	Maximum
MED	Medium
MELPe	Mixed-Excitation Linear Predictive enhanced

MGRS	Military Grid Reference System
MHz, MHZ	Abbreviation for megahertz, or millions of cycles per second.
MIBS	Management Information Bases
Mic	Microphone
MIL	Military
MIL-STD	Military Standard
MISC	Miscellaneous
MKDIR	Make Directory
MM-DD-YY	Month-Day-Year (calendar)
MOD	Modulation Type
MOGAS	Motor Vehicle Gasoline
ms	Milli-Second
MSG	Message
mV	Millivolt
mVrms	Millivolt root-mean-square

-N-

N/A	Not Applicable
NATO	North Atlantic Treaty Organization
NAVSEA	Naval Sea Systems Command
NEI	Netherlands East Indies
Net	A group of radios that share common communications parameters, such as frequencies.
NFFI	NATO Friendly Force Information

-O-

OTA	Over The Air
OTG	On The Go

-P-

PA	Power Amplifier
PBX	Private Branch Exchange
PC	Personal Computer
PCM	Pulse-Coded Modulation
PCMA	Pulse-Coded Modulation G.711 Alaw
PCMU	Pulse-Coded Modulation G.711 Ulaw
PDA	Personal Digital Assistant
PGM, PROG	Program

PIM	Protocol Independent Multicast
PLI	Position Location Information
ppm	Part per million
PS	Power Supply
PT	Plain Text
PTT	Push-to-Talk

-Q-

-R-

R	Receive or Remote
RAM	Random Access Memory
RCI	Remote Control Interface
RCM	Radio Configuration Module
RES	Receiver/Exciter/Synthesizer
RF	Radio Frequency
RKDU	Remote Keypad Display Unit
RNDIS	Remote Network Driver Interface Specification
ROM	Read Only Memory
RPLY	Reply
RTC	Real Time Clock
RTP	Real Time Transport Protocol
RTS	Request-To-Send
R, RCV, RX	Receive
RXMT	Retransmit

-S-

S-TNW	Soldier-Time Division Multiple Access (TDMA) Networking Waveform
SA	Situational Awareness
SEC, sec	Second
SINAD	(Signal + Noise +Distortion)/(Noise +Distortion)
SIP	Session Initiation Protocol
SMS	Short Message Service
SNMP	Simple Network Management Protocol
SP	Space
SQL	Squelch

Squelch	The ability to mute the receive audio until the radio receives the appropriate signal. Can be either digital squelch, tone squelch, or noise squelch.
SSD	Safe Separation Distance
SSL	Secure Socket Layer - web security protocol
STAT	Status
STD	Standard
SVD	Simultaneous Voice and Data
SW	Software
SYM	Symbol
Sync	Synchronous, synchronization
Synth	Synthesizer

-T-

TAC CHAT	Tactical Chat
TCXO	Temperature Compensated Crystal Oscillator
TDMA	Time Division Multiple Access
TEK	Transmission Encryption Key
TM	Time Master
TNC	Threaded N-Connector
TNW	Time Division Multiple Access (TDMA) Networking Waveform
TOD	Time Of Day
TRANSEC	Transmission Security
TVP	Tactical Video Processor
TX, T	Transmit

-U-

UDP	User Datagram Protocol
UI	User Interface
UN	User Nodes
U.S.	United States
USA	United States of America
USB	Universal Serial Bus
UTC	Universal Time Coordinated or Universal Coordinated Time, same as time zone ZULU or GMT
UTM/UPS	Universal Transverse Mercator/Universal Polar Stereographic (coordinate systems)

-V-

V	Volts
VBUS	Voltage pin connection on a USB interface
VHF	Very High Frequency
Vocoder	A circuit that converts analog voice to digital
VoIP	Voice over IP
VOX	Voice Operated Transmitter
VR	Voice Repeater
Vrms	Volts root mean square

-W-

W	Width
Web UI	A user interface designed to connect via HTTP(S)
WGE	Work Group Edition
WGS 84	World Geodetic System (WGS 84 is the reference coordinate system used by the Global Positioning System)
WIP	Wireless Internet Protocol

-X-

XML	Extensible Markup Language
XMT	Transmit
XOFF	Transmitter Off
XON	Transmitter On

-Y-

YYYY-MM-DD	Year-Month-Day (calendar)

-Z-

Z, Zero, Zeroize	A command sequence which erases all programmed channel parameters, option settings, frequency hopping data and COMSEC keys.
ZAN	Zandej

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jQuery Easing v1.3 - http://gsgd.co.uk/sandbox/jquery/easing/

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