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RF-7800H-MP

HF MANPACK RADIO

OPERATION MANUAL



HARRIS

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RF-7800H-MP ADVANCED TACTICAL HF RADIO OPERATION MANUAL

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This manual is based on Firmware Version 1.3

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RF-7800H-MP

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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.
	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.
	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 - 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. RF shock could occur from coming into contact with the antenna while radio is transmitting.
	WARNING - Do not dispose of lithium-ion batteries in uncontrolled trash.

RF-7800H-MP

SAFETY GUIDELINES

	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 - Extended transmit times may cause the surface temperature of the radio to become hot. Allow the radio to cool before handling.
	WARNING - To avoid damage to hearing, check the handset volume before using a handset.
	WARNING - When operating the RF-7800H-MP as part of a recommended vehicular system configuration, ensure that proper caution and procedures are exercised in order to avoid loss of control of the vehicle. Failure to comply could result in personnel 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.
	<p>WARNING - Operating RF transmitting devices such as radios and cellular phones in or around fuel, weapons, or ordinance could cause serious injury or death.</p> <p>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.</p> <p>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.</p>

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MANUAL PURPOSE

1

This operation manual provides information required to support user operation and operator-level maintenance on the RF-7800H-MP Advanced Tactical HF Radio, referred to throughout this manual as the RF-7800H-MP or radio. This manual is part of a set included on the e-Publication CD-ROM, 10515-0413-6000.

- RF-7800H-MP Operator Card, 10515-0413-4000 - For first time user - covers assembly for use, Global Positioning System (GPS)/time sync, call, PTT, preset change, and radio mode.
- RF-7800H-MP Field Reference Guide, 10515-0413-4100 - For operator in field - step-by step operations, general programming steps, no operations theory.
- RF-7800H-MP Operation Manual (This manual), 10515-0413-4200 - This is the detailed manual and includes operational theory as well as fault displays, reference, and operator maintenance.
- Dismount Dipole Adapter Instruction Sheet, 10515-6648 - Shows details for adapting the whip antenna into an Inverted Vee or Dipole configuration for Near Vertical Incidence Skywave (NVIS) applications.

CONVENTIONS

Text conventions used in this manual consist of:

ALL CAPITALS - Acronyms such as CPA.

BOLD CAPITALS - Menu items, items shown on the display, connectors or switches such as **J3** or **PT**.

[BOLD CAPITAL IN BRACKETS] - Front panel button such as **[OPT]** or **[PGM]**.

EQUIPMENT DESCRIPTION

1

The RF-7800H-MP is an advanced High Frequency radio which operates from 1.5 MHz to 59.9999 MHz using Upper Sideband (USB), Lower Sideband (LSB), Continuous Wave (CW), Amplitude Equivalent (AME) with selectable low (1.0 watt), medium (5.0 watts), and high (20.0 watts) output power. The RF-7800H-MP also operates from 1.5 MHz to 59.9999 MHz in FM at 10.0 watts high output power. Communications can take place with manpack, mobile, and fixed-site radio configurations.

For optional accessories, refer to [Accessories, p283](#). Additional accessories may have been added since publication of this manual; contact Harris for more information.

RF-7800H-MP Features

The RF-7800H-MP offers the features highlighted in [Table 1](#).

Table 1. RF-7800H-MP Features

Feature	Description
ALE	Supports Automatic Link Establishment (ALE): STANAG 4538 Fast Link Set Up (FLSU), MIL-STD-188-141B Appendix A, Appendix B (Linking Protection, AL-1)
Frequency Hopping	Serial Tone Electronic Counter-Counter Measure (ECCM) Falcon II Interoperable
Encrypted Data	HF: MIL-STD-188-110C App. D, MIL-STD-188-110B Appendix C, MIL-STD-188-110B Serial Tone, STANAG 4415 (75 bps), STANAG 4285 (C/U) (2400 bps), STANAG 4539 (9600 bps), Wideband Frequency Shift Keying (WBFsk) (16 kbps)
Vocoder	LPC-10-52E: 600 bps (DV6), 2400 bps (DV24) Mixed Excitation Linear Prediction (MELP): 600 bps (ME6), 1200 bps (ME12), 2400 bps (ME24) Continuously Variable Slope Delta (CVSD)
AVS	Supports Analog Voice Security (AVS) operation.
Adaptive Wideband	Supports up to 24 kHz bandwidth and 120 kbps data rate operation in 3G mode.

1 Embedded Encryption

The RF-7800H-MP employs embedded MK-128 encryption to provide secure communications. Citadel II algorithm options consist of the standard Harris proprietary algorithm, Advanced Encryption Standard (AES), and Citadel Algorithm Modification (CAM). Encryption is Over the Air (OTA) voice and data interoperable with Falcon II radios using Citadel I, AES-128, AES-256, or AVS. The RF-7800H-MP provides storage of up to 99 Communications Security (COMSEC) keys and one 64-bit CAM variable.

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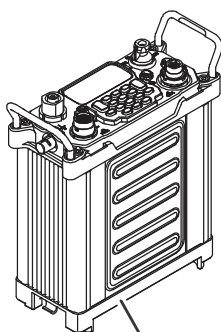
RF-7800H-MP BASIC SETUP

ITEMS INCLUDED

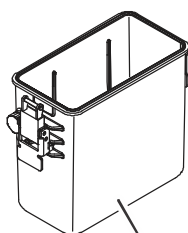
Table 2 provides a list of items included with the RF-7800H-MP. Figure 1 displays all of the items included with the RF-7800H-MP.

Table 2. Items Included with the RF-7800H-MP

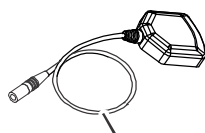
Description	Part Number
HF Radio Assembly	12097-1000-03
Modified H-250 Handset	10075-1399
Ground Stake Kit	10303-1008-01
OE-505 Whip Antenna Kit	10372-0240-02
Base Whip Adapter Assembly	10372-1260-01
Dismount Dipole Adapter	10372-1270-01
RF Hazard Label	12097-3026-01
RF Hazard Label Instruction Sheet	10515-6642
Asynchronous Data Cable Assembly	10535-0775-A006
Global Positioning System (GPS) Antenna Kit, L1 Band	12006-0017-02
Universal Serial Bus (USB) Firmware Programming Cable, 6 Ft	12043-2750-A006
Battery Box	12043-4800-01
Tactical Chat software application	RF-6551H
Operator Card	10515-0413-4000
Field Reference Guide	10515-0413-4100
E-Publication CD-ROM	10515-0413-6000
RF-7800H-MP Communications Planning Application (CPA)	RF-7800H-SW001



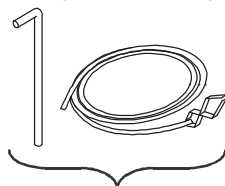
HF RADIO ASSEMBLY
(12097-1000-03)



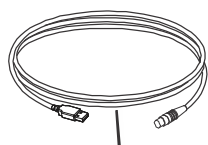
BATTERY BOX
(12043-4800-01)



GPS ANTENNA KIT
(12006-0017-02)



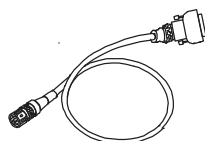
GROUND STAKE KIT
(10303-1008-01)



USB PROGRAMMING CABLE (12043-2750-A006)



MODIFIED H-250/U HANDSET
(10075-1399)



ASYNCHRONOUS DATA CABLE
(10535-0775-A006)



E-PUBLICATIONS CD
(10515-0413-6000)



FIELD REFERENCE GUIDE
(10515-0413-4100)



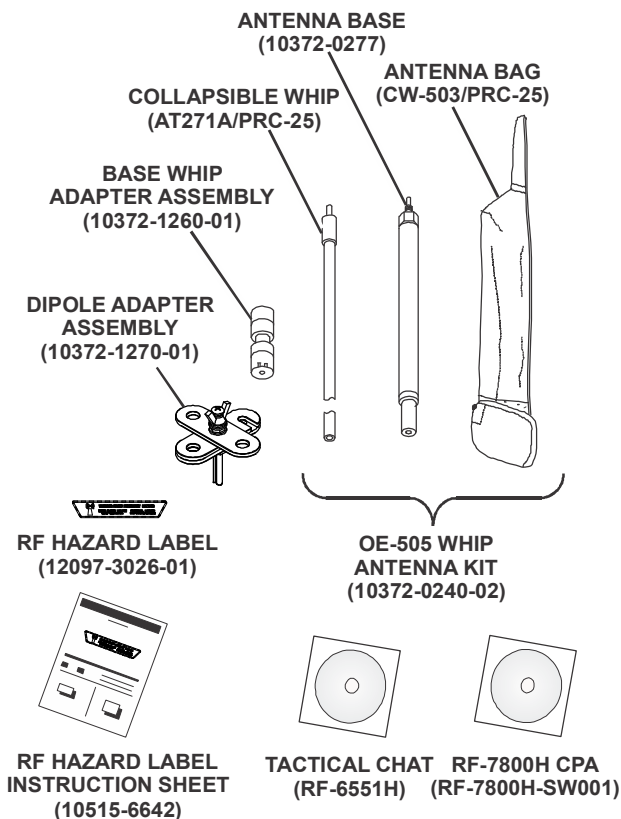
OPERATOR CARD
(10515-0413-4000)

CL-0413-4200-0001D

Figure 1. Items Included with the RF-7800H-MP (Sheet 1 of 2)

RF-7800H-MP BASIC SETUP

2



CL-0413-4200-0066B

Figure 1. Items Included with the RF-7800H-MP (Sheet 2 of 2)

ASSEMBLING THE RADIO

**WARNING**

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

**CAUTION**

Do not overtighten the antenna as damage could result.

The RF-7800H-MP uses one of the following battery types. Also refer to [Table 3](#).

- BB-590/U Nickel Cadmium (Ni-Cd), Rechargeable
- BB-390B/U Nickel Metal Hydride (Ni-MH), Rechargeable
- BB-2590/U or BB-2590/AU Lithium-Ion (Li-ION), Rechargeable
- BA-5590/U Lithium Sulfur Dioxide (Li-SO₂), Primary (non-rechargeable)
- BA-5390/U Lithium Manganese Dioxide (Li-MnO₂), Primary (non-rechargeable)

NOTE

Use of batteries other than those listed may result in equipment malfunction.

See [Figure 2](#) and perform the following:

- a. Look at battery orientation label inside battery box.
- b. Place battery in battery box with connector facing upwards and oriented on side indicated by the label.
- c. Place radio on top of battery aligning rear connector and battery connector.
- d. Latch the side clasps.

RF-7800H-MP

BASIC SETUP

2

- e. Connect antenna to J7 HF/VHF ANT (do not overtighten!). The OE-505 includes whip adapter, base, and collapsible whip that must be first assembled. HF antennas and deployment methods can vary, including:
 - 1. Use dipole adapter (10372-1270-01) with OE-505 Whip Antenna if dipole or inverted vee antenna is desired (refer to adapter Instruction Sheet 10515-6648).
 - 2. OE-505 Whip Antenna by itself
 - 3. Cable from user supplied antenna
- f. Connectors are labeled on front panel. Connect as required:
 - 1. Handset to J1 AUDIO.
 - 2. GPS antenna to J2 GPS.
 - 3. Asynchronous remote/data cable to J3 DATA.
 - 4. USB programming cable to J5 USB.
- g. The RF-7800H-MP can be powered up per [Initial Power-Up, p25](#).
Refer to [Accessories, p283](#) for optional items.

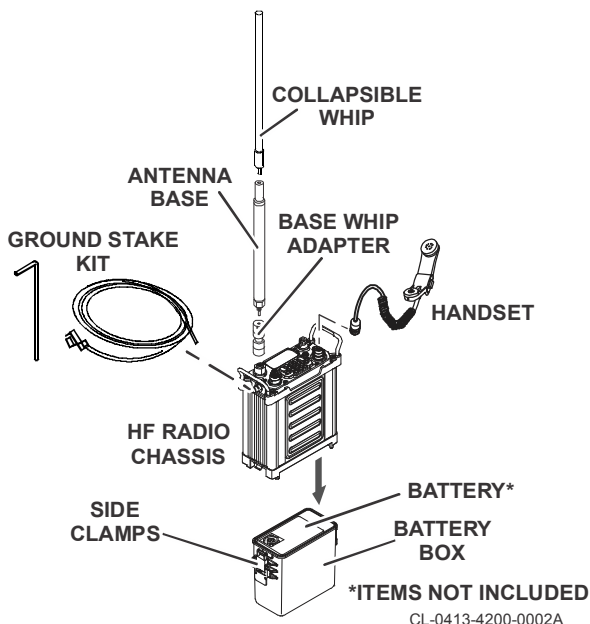


Figure 2. Assemble RF-7800H-MP

INITIAL POWER-UP

To power on the RF-7800H-MP, pull and turn the function switch from **OFF** to the **PT** position. This initializes the radio software and performs a power on self-test. Observe that there are no fault indications. The battery level indicator on the upper left side of the display shows remaining battery life.

Power Up After Shipment or Storage in CLR

If the radio has just been received from Harris or has been in long term storage, it is likely that the function switch is in the CLR position. The CLR position disconnects the Hold-Up Battery (HUB). When the HUB is disconnected for at least 15 minutes, the radio loses its time-of-day and HUB capacity counters. This results in **POST FAILED RUN SELF TEST** and (after pressing [ENT] or [CLR]) **HUB CAPACITY INVALID RESET HUB/SET CLOCK** appearing when switched to PT or CT.

To clear the messages:

- a. Choose **[PGM] > CONFIG > TOD** menu and set the time and date.
- b. Power cycle radio. Messages should not appear.

If the HUB has recently been replaced, reset HUB per [Program Maintenance Reset HUB, p135](#).

BATTERY LIFE

The battery life data in [Table 3](#) assumes a single fully charged battery at +77 °F (+25 °C) with a 10% transmit (High power), 90% receive operating cycle while using Mixed Excitation Linear Prediction (MELP) data. Actual results may vary. Battery life is dependent upon battery age, temperature, charge times, and amount of backlight usage.

To maximize battery life, transmit only when necessary and use the lowest transmit power level required to successfully communicate.

When using a Primary Battery (non-rechargeable) type, transmit power output will cut back as necessary in order to not exceed the battery's ability to supply current.

Table 3. RF-7800H-MP Typical Battery Life

Battery	Type	Battery Life (9:1 RX/TX MELP)
BA-5390/U Li-MnO ₂	Primary	19 hours*
BA-5590B/U Li-SO ₂	Primary	13 hours*
BB-390B/U Ni-MH	Rechargeable	8 hours
BB-590/U Ni-Cd	Rechargeable	3.5 hours
BB-2590/U Li-ION	Rechargeable	11.5 hours
*With reduced transmit power due to battery current limitations.		

STORAGE GUIDELINES

Store the RF-7800H-MP 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.

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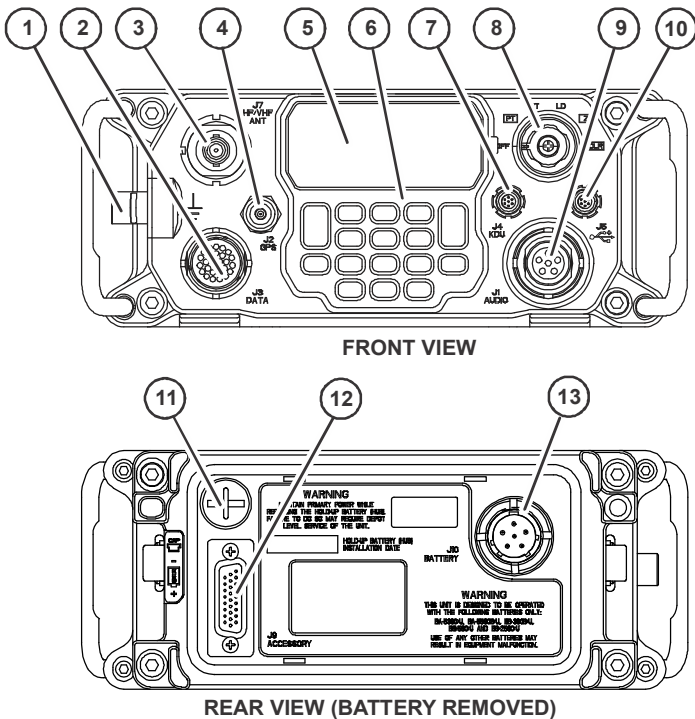
RF-7800H-MP
CONTROLS/ STARTUP

This chapter contains information on controls, indicators, connectors, and startup of the RF-7800H-MP.

RF-7800H-MP CONTROLS

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Figure 3 shows the RF-7800H-MP controls, indicators, and connectors. Table 4 describes the RF-7800H-MP controls, indicators, and connectors.



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Figure 3. RF-7800H-MP Controls, Indicators, and Connectors

Table 4. RF-7800H-MP Controls/Indicators/Connectors





Key	Control/ Indicator	Function
1	Ground Post	Provides a grounding point for connecting an RF ground reference to the RF-7800H-MP.
2	J3 DATA	Provides a connection for Data Terminal Equipment (DTE) data, Point-to-Point (PPP) communication, and auxiliary audio.
3	J7 HF/VHF ANT	Provides a 50-ohm antenna port for either a BNC connector or a whip antenna.
4	J2 GPS	Provides a connection for the remote Global Positioning System (GPS) antenna.
5	LCD	Displays the operational and programming screens.
6	Keypad	Provides user access to operating and programming functions.
		[0] (↻) - Shows alternate screens for a given radio mode.
		[CALL] - Dependent on radio mode selected: <ul style="list-style-type: none"> Fixed Frequency (FIX): initiates a hail. Automatic Link Establishment (ALE): initiates an ALE call. Frequency Hopping (HOP): transmits or sends a response to a Synchronous (SYNC) request. Third Generation HF (3G): initiates a 3G call. 3G+: initiates a 3G or ALE call.
		[LT] - Provides access to the display backlight control menus.
		[MODE] - Allows the operator to set the radio operating mode as FIX, ALE, HOP, 3G or 3G+.

Table 4. RF-7800H-MP Controls/Indicators/Connectors (Continued)













Key	Control/ Indicator	Function
		[SQL] - Toggles programmed squelch on or off for the type of channel modulation currently used.
		[ZERO] - Not used.
		[OPT] - Provides access to the option menus which are mode dependent.
		[PGM] - Provides access to the programming menus.
		[CLR] - Used to cancel an operation, back up through a menu chain, or clear a message displayed on the front panel. This key is also used to terminate a link in ALE and 3G radio modes. In ALE and FIX radio modes, this key also stops and starts scanning.
		[ENT] - Used to accept a choice from a menu. Also used on the preset screens to select items.
		[VOL +/-] - Increases/decreases the volume.
		[PRE +/-] - Scrolls through the presets.

Table 4. RF-7800H-MP Controls/Indicators/Connectors (Continued)

Key	Control/ Indicator	Function
	   	▲, ▼, ◀, ▶ - Scrolls through the menus.
7	J4 KDU	Provides connection for external Keypad Display Unit (KDU).
8	Function Switch	(Function names in boxes require pull-to-turn action.)
	OFF	Turns the RF-7800H-MP OFF.
	PT	Places the radio in Plain Text (PT) (clear voice, digital voice or data) (requires a pull-to-turn action).
	CT	Places the radio in Cipher Text (CT) (digital voice or data).
	LD	Load. Places the radio into menus for installing or uninstalling firmware.
	Z	Zeroize. Zeroizes the radio, including the encryption keys. (Requires a pull-to-turn action.)
	CLR	Clear. (Requires pull to turn) Disconnects Hold-Up Battery (HUB) and zeroizes radio. This also provides improved HUB life while the radio is in storage.
9	J1 AUDIO	Provides a connection for an audio handset which uses a six-pin connector.
10	J5 USB	Provides connection for Universal Serial Bus (USB).
11	HUB	Provides access to the Hold-Up Battery (HUB).
12	J9 ACCESSORY	Provides connection for an external power amplifier.
13	J10 BATTERY	Battery connector.

BEFORE COMMUNICATING

Make sure the RF-7800H-MP nets and encryption keys are programmed. The RF-7800H-MP can be programmed using the front panel or the Communications Planning Application (CPA).

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NOTE

Third Generation (3G) and Adaptive Wideband must be programmed using the CPA.

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INTRODUCTION

This section provides global settings and programming that generally applies to all radio modes. For specific radio mode operations, refer to:

- [FIXED FREQUENCY](#), p139
- [ALE](#), p147
- [3G/3G+](#), p183
- [ADAPTIVE WIDEBAND](#), p225
- [HOPPING](#), p235

OPERATIONAL READINESS TESTS

Tests outlined in this section are suggested to be run prior to operating the radio. See [Figure 4](#).

BIT

To run the radio's Built In Test (BIT):

- Choose **[OPT] > TEST > BIT**.
To check CT functionality, make sure radio is in **CT**.
- Choose **SYSTEM** to test everything, or choose **RF-5382 COUPLER, PREPOST, EXTERNAL PA, KDP, KDU**, or **INTERNAL COUPLER** to test individual parts of a system. If there is a fault, a fault code is displayed. Refer to [Built In Test, p254](#) for troubleshooting information.
- Press **[CLR]** or **[ENT]** to return to the operational screen.

Battery Voltage Check

To check battery voltages:

- Choose **[OPT] > TEST > BATTERY**. The battery voltage and status screen is displayed.
- The voltage will register between 21 VDC and 30 VDC (or 32 VDC with Lithium-Ion [Li-ION] batteries). The RF-7800H-MP will automatically shut down when the voltage goes below 21 volts.

- c. Press **[ENT]** to view Hold-Up Battery (HUB) voltage and status.
- d. Press **[OPT]** or press **[CLR]** repeatedly to return to the preset screen.

VSWR Check

To check Voltage Standing Wave Ratio (VSWR):

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NOTE

VSWR test emits RF energy. The test will not be available if the radio is in Radio Silence mode or if it is scanning.

- a. Choose **[OPT] > TEST > VSWR**. The VSWR frequency screen is displayed.
- b. Using the keypad, enter the frequency to be used for the VSWR measurement.
- c. Press **[ENT]** to start the test. Upon completion of the VSWR test, the transmitted power and VSWR are displayed.
- d. Press **[ENT]** or press **[CLR]** repeatedly to return to the preset screen.

The output power is reduced to protect the RF-7800H-MP circuitry if the VSWR reports a reading of 2:1 or higher. The operator does not receive a warning until the VSWR reaches 3:1. The warning appears when problems arise in the transmission line, antenna system, if a user disables the internal coupler, or when an antenna is not resonant at the frequency being used.

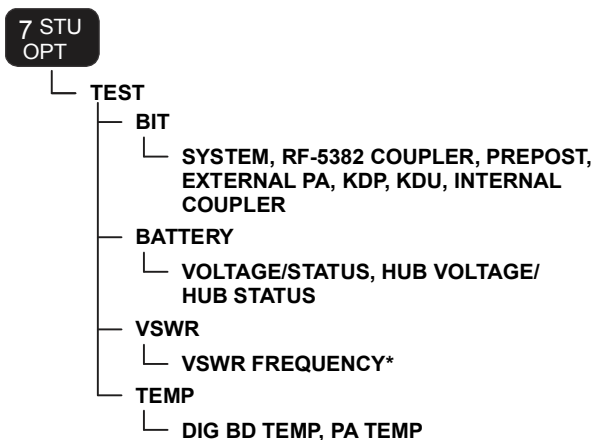
Temperature Check

To check temperature of the digital board and power amplifier board:

- a. Choose **[OPT] > TEST > TEMP**. The Temperature screen is displayed.
- b. Press **[CLR]** repeatedly to return to the preset screen.

NOTE

Transmit power cutback will result if internal temperature is too high.



***NOT ALLOWED WHILE SCANNING**

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Figure 4. Option Tests BIT, Battery, VSWR and Temp

FURTHER TESTS

Tests outlined in the following section can be optionally run at any time to obtain more information about the radio. These tests are global and do not pertain to any individual channel or preset.

NOTE

These tests are generally used for maintenance functions.

Software and Hardware Versions

The software and hardware versions test is used to track the installed version of software and installed revision of hardware, and is not necessary to run on every power-up. This test aids the maintainer in identifying, troubleshooting, and ordering replacement modules. Perform the following procedure to view the radio special options:

- a. Choose **[OPT] > TEST > SPECIAL > VERSION.**
- b. Use ◀ or ▶ to select **SOFTWARE** and press **[ENT]**. The software version screen will be displayed.
- c. Use ▼ or ▲ to scroll through the software module and firmware revision listings. These listings display the version of software installed in the RF-7800H-MP.
- d. Press **[ENT]** or **[CLR]** to return to the **SOFTWARE** and **HARDWARE** menu screen.
- e. Use ◀ or ▶ to select **HARDWARE** and press **[ENT]**. The hardware version screen will be displayed.
- f. Use ▼ or ▲ to scroll through the hardware module and hardware revision listings. These listings display the version of hardware installed in the RF-7800H-MP.
- g. Press **[ENT]** or **[CLR]** to return to the **SOFTWARE/HARDWARE** menu.
- h. To exit, press **[CLR]** several times or press **[OPT]**.

Elapsed Radio Time

The elapsed time indicator is used to determine how long the radio has been in service. This is useful when scheduling preventive maintenance. It is not necessary to run the elapsed radio time test on every power-up. Note that the displayed hours are cumulative and do not reset to zero. It is recommended that the user or maintainer log the information for tracking purposes. To view the elapsed radio time:

- a. Choose **[OPT] > TEST > SPECIAL > RADIO_STATS.** The hours the RF-7800H-MP has been powered up (**HOURS UP**) and the hours the RF-7800H-MP has been transmitting (**HOURS TX**) are displayed.

RF-7800H-MP

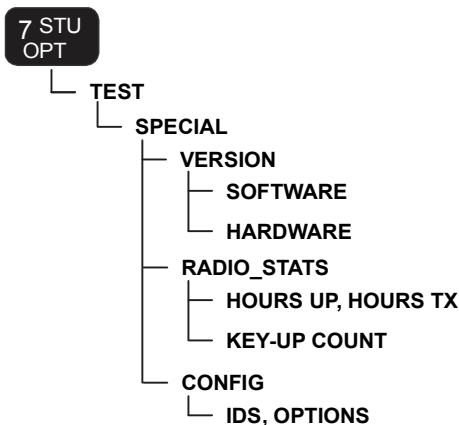
GENERAL OPERATIONS

- b. Press **[ENT]** to view **KEY-UP COUNT** which displays the number of times the radio has been keyed.
- c. To exit, press **[CLR]** several times or press **[OPT]**.

View Configuration Options

It is not necessary to run the following configuration number/serial number test on every power-up.

- a. Choose **[OPT]** > **TEST** > **SPECIAL** > **CONFIG** >.
- b. Use **◀** or **▶** to select **IDS** or **OPTIONS** and press **[ENT]**.
- c. If **IDS** is selected, use **▼** or **▲** to view the radio serial number.
- d. Press **[CLR]** or **[ENT]** to return to the Options menu.
- e. If **OPTIONS** is selected, use **▼** or **▲** to scroll through the list of options installed in the radio. The options list includes features based on the type of radio.
- f. Press **[OPT]** to exit the Options menu, or **[CLR]** or **[ENT]** to return to the menu.



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Figure 5. Option Test Special Menu

ZEROIZE RADIO

A zeroize operation removes all programming such as encryption keys and programmed preset settings. Configuration is set to default values.

NOTE

Accidental use of ZEROIZE may make the radio inoperable for your mission requirements.

- Pull and turn function switch to **Z**. The RF-7800H-MP immediately begins a zeroize of all configured items and **ZEROIZE IN PROGRESS** is displayed.
- When zeroize is complete, **ZEROIZE COMPLETE** is displayed.

NOTE

If the function switch is moved to **Z** while the RF-7800H-MP has no main power source connected (battery disconnected), the zeroize occurs the next time the radio is powered on.

RADIO OPTIONS SETTINGS

The following paragraphs provide information on radio options settings that can be set anytime during operations.

Transmit Power

Power level depends on if external power amplifiers are used and whether the radio is in HF or VHF, as described in [Table 5](#).

See [Figure 6](#). Perform the following procedure to set transmit power level:

- Choose **[OPT] > RADIO > TX POWER**. Current power level is displayed.
- Use ▼ or ▲ to scroll through the settings (**LOW, MED, HIGH**).
- Press **[ENT]** for desired power level and advance to the next screen.

RF-7800H-MP

GENERAL OPERATIONS

- d. To exit, press **[CLR]** several times or press **[OPT]**.

Table 5. Radio Power Levels

PA	Frequency	Modulation	Power Level (Watts)		
			Low	Medium	High
RF-7800H Only	1.5 - 29.9999 MHz	USB, LSB, CW, AME	1	5	20
RF-7800H Only	1.5 - 59.9999 MHz	FM	1	5	10
RF-5833H	1.6 - 29.9999 MHz	USB, LSB, CW, AME	12	60	150
RF-5833H	30 - 59.9999 MHz	FM	12	60	60
RF-5832H	1.6 - 29.9999 MHz	USB, LSB, CW, AME	10	50	125
RF-5834H	1.6 - 29.9999 MHz	USB, LSB, CW, AME	50	200	400

Squelch Level

Squelch level choices consist of **LOW**, **MED**, and **HIGH**. Squelch level of low may cause false squelch breaks to occur while settings of medium or high may not allow the R/T to unsquelch on weak signals.

See [Figure 6](#). Perform the following procedure to set squelch level:

- Choose **[OPT] > RADIO > SQUELCH LEVEL**. Radio's current squelch level is displayed.
- Use **▼** or **▲** to scroll to the desired squelch level and press **[ENT]**.
- To exit, press **[CLR]** several times or press **[OPT]**.

FM Squelch Type

The RF-7800H-MP supports analog tone squelch, analog noise squelch, and digital squelch. Analog tone squelch requires that a 150 Hz tone be transmitted along with the normal radio traffic in order to open the receive

radio's squelch. Analog noise squelch requires a receive signal that is strong enough to open the radio's squelch. Digital squelch is used in Wideband Frequency Shift Keying (WBFsk). Squelch is important for interoperability and should be addressed during mission planning. Tone squelch is commonly used for VHF-FM operations.

See [Figure 6](#). Perform the following procedure to set squelch level:

- a. Choose **[OPT] > RADIO > FM SQUELCH TYPE**. Radio's current squelch type is displayed.
- b. Use ▼ or ▲ to scroll to the desired squelch type and press **[ENT]**.
- c. To exit, press **[CLR]** several times or press **[OPT]**.

Bypass/Enable Internal Coupler

The internal coupler should be enabled to allow a resonant or field-expedient antenna to be used at any frequency. When the coupler is disabled, a broadband antenna should be used for maximum performance and VSWR should be measured, as described in [VSWR Check, p37](#). See [Figure 6](#). To bypass/enable the internal coupler:

- a. Choose **[OPT] > RADIO > COUPLER**. Current coupler setting is displayed.
- b. Use ▼ or ▲ to scroll to the desired enable or bypass setting and press **[ENT]**.
- c. To exit, press **[CLR]** several times or press **[OPT]**.

Radio Silence

The Radio Silence option is available during operation in Automatic Link Establishment (ALE), Third Generation HF ALE (3G), and 3G+ radio modes. This feature allows an operator to disable the RF-7800H-MP from automatically responding to an ALE or 3G call. This option is only enabled in receive and may be overridden if the operator places an ALE or 3G call. Radio Silence is not the same as Receive Only, which can be programmed into any radio mode. See [Figure 6](#).

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GENERAL OPERATIONS

Perform the following procedure to turn Radio Silence on or off:

- Choose **[OPT] > RADIO > RADIO SILENCE**. Current Radio Silence setting is displayed.
- Scroll to the desired **ON** or **OFF** setting and press **[ENT]**.
- To exit the menu, press **[CLR]** several times or press **[OPT]**.

NOTE

If **RADIO SILENCE** is **ON**, the **R** in the upper left corner of the display flashes when the channel preset is viewed (instead of scanning). Also, upon entering Radio Silence, display light intensity is reduced to zero and the volume is decreased to a minimum. (You can still readjust, if desired.)

CTI Autoreject

The RF-7800H-MP Computer Telephony Interface (CTI) autoreject option is used in radios deployed in a CTI capable 3G network. Enabling this feature (via CPA or the radio front panel) automatically rejects any incoming CTI call. The radio will still respond to 3G calls and the operator will be able to place an outgoing CTI call.

The autoreject setting will not appear if:

- Telephony** is not enabled under the 3G network in the Communications Planning Application (CPA) or under **[PGM] > CTI** in the radio.
- The radio is the **Default Gateway** (under 3G telephony settings in CPA or under **[PGM] > CTI** in the radio).

CTI autoreject is automatically set to **ON** if CTI is disabled in the radio. Also, CTI autoreject is automatically set to **OFF** on a basestation radio connected to an RF-6010 Tactical Network Access Hub.

To turn CTI autoreject on or off:

- Choose **[OPT] > RADIO > CTI AUTOREJECT**. Current CTI autoreject setting is displayed.

- b. Scroll to the desired on or off setting and press **[ENT]**.
- c. To exit, press **[CLR]** several times or press **[OPT]**.

Beat Frequency Oscillator (BFO) Offset

See [Figure 6](#). An offset may be required for communications with older radios whose frequencies have drifted. Some operators prefer to change the Beat Frequency Oscillator (BFO) for personal tone preferences during Continuous Wave (CW) operation. Perform the following procedure to set BFO offset:

- a. Choose **[OPT] > RADIO > BFO**. The display will show the current BFO offset.
- b. Use **▼** or **▲** to scroll to the desired BFO frequency and press **[ENT]**. BFO is adjustable ± 4000 Hz in 10 Hz steps.

The radio's BFO setting will change as the frequency is scrolled. This enables the operator to have real time control over the adjustment prior to pressing **[ENT]**.

RX Noise Blanking

Receive (RX) noise blanking is used to filter impulsive RF noise (such as vehicular ignition sparks) that are interfering with the intended receive signal. This filtering (or blanking) also reduces the strength of the intended signal and should only be used if the intended signal is strong enough to overcome the filtering. See [Figure 6](#). To set RX noise blanking:

- a. Choose **[OPT] > RADIO > RX NOISE BLANKING**. Current RX noise blanking setting is displayed.
- b. Scroll to the desired **ON** or **OFF** setting and press **[ENT]**.
- c. To exit, press **[CLR]** several times or press **[OPT]**.

RF-7800H-MP

GENERAL OPERATIONS

Radio Lock

Use this option to lock the keypad and disable external connector voltages such as GPS or J3 data. This allows operations in salt water environments. See [Figure 6](#). To set radio lock:

- a. Choose **[OPT] > RADIO > RADIO LOCK**.
- b. Scroll to the desired **ON** or **OFF** setting and press **[ENT]**. When set to **ON**, the key press sequence **[1], [3], [7], [9]** is required to unlock the radio. This can only be done on the radio keypad and not on a remote Keypad Display Unit (KDU).

Upon entering radio lock:

1. Backlight is turned off.
2. Some pins on the J3 connector are disabled.
3. Keypad is locked.
4. Screen displays lock status to the user when a key is pressed.
5. Radio is set to low power level.
6. Remote KDU is turned off.

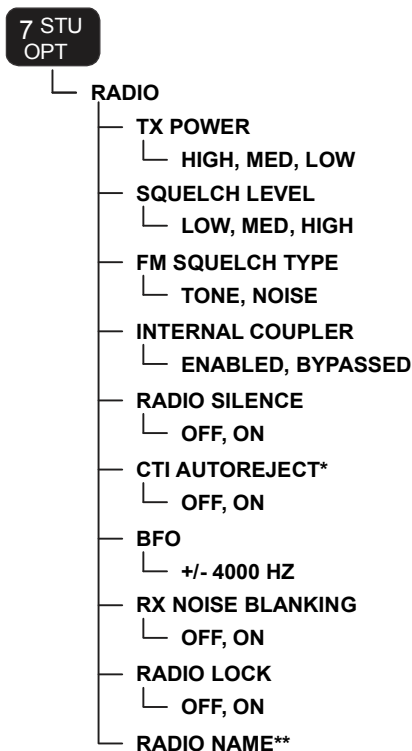
NOTE

Before exposure to water, you should also ensure that a battery box is attached to the radio, plugs are inserted to cover USB port and remote KDU port, and the audio connector has a handset attached.

- c. To exit, press **[CLR]** several times or press **[OPT]**.

Radio Name

Radio name is used to report the radio name of the RF-7800H-MP. This is used in programmed Automatic Repeat reQuest (ARQ) modem presets, and in 3G or 3G+ radio mode. RADIO NAME is not modifiable in the options menu, but can be set during programming.



***MUST BE ENABLED**

**** SET DURING PROGRAMMING**

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Figure 6. Option Radio Tree

RF-7800H-MP

GENERAL OPERATIONS

View GPS TOD

The Global Positioning System (GPS) Time Of Day (TOD) screen allows you to view the current state of the GPS, the current radio time, and if GPS is installed, the current or last known position information.

See [Figure 9](#). Perform the following procedure to view the RF-7800H-MP's TOD and GPS information:

4

- a. Choose **[OPT] > GPS TOD**. The first screen shows the GPS state of **NOT INSTALLED**, **SEARCHING**, or **TRACKING**.

In all cases, the current date/time is shown in the lower right-hand corner. **SEARCHING** means the GPS has not been acquired or has been lost. **TRACKING** means the GPS has acquired a valid signal. When in **SEARCHING** or **TRACKING**, the number of GPS satellites currently being tracked is displayed in the lower left-hand corner.

TOD must be set before attempting to use Hopping (HOP), 3G, scheduled Link Quality Analysis (LQAs), or ALE Linking Protection.

- b. View the individual items by pressing **[ENT]**.

If GPS is not installed, pressing **[ENT]** returns the user to the **[OPT]** menu. Otherwise, if GPS is **SEARCHING**, the next screen displays the last date/time a valid GPS reading was taken. If GPS is **TRACKING**, the screen will be skipped.

Next, the radio's last valid (or current if GPS is tracking) longitude/latitude is displayed, followed by last known/current velocity, and then the last known/current altitude.

- c. Press **[CLR]** or **[ENT]** to return to the option menu.
- d. Press **[OPT]** to return to the preset screen.

If the GPS module has acquired satellite lock, the current position, heading, velocity, and altitude are also displayed. If no GPS module is installed, **GPS NOT INSTALLED** displays.

GPS TOD Synchronization

Radios that obtain and use time information from the Global Positioning System (GPS) module are in GPS synchronization. They are able to communicate with other radios in the net that also have GPS synchronization. When hopping in GPS synchronization, the system automatically updates the synchronization every two hours, as long as the system is within the footprint of the GPS satellites. If the footprint is lost, the station must perform a manual synchronization on the RF-7800H-MP within six hours of the last update or communications may be lost.

NOTE

It is recommended that all radios maintain and use Universal Time Coordinated (UTC), Greenwich Mean Time (GMT) or Zulu for all operations to ensure consistency between radios.

Time accuracy is also required as a base for channel scanning synchronization, S4538 time synchronization, and automatic position reporting.

Retune

This function is used to force a retune of the coupler due to an antenna change or loss of tune condition. See [Figure 7](#). To force a retune of the internal coupler in the radio:

- Choose **[OPT] > RETUNE**. While the coupler is retuning, **COUPLER TUNING IN PROGRESS** is displayed at the bottom of the preset screen. When the coupler has completed tuning, **COUPLER TUNING COMPLETE** is displayed at the bottom of the preset screen.

A retune emits RF energy. The radio cannot retune while scanning in ALE Mode.



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Figure 7. Option Retune Tree

4

BACKLIGHT SETTINGS

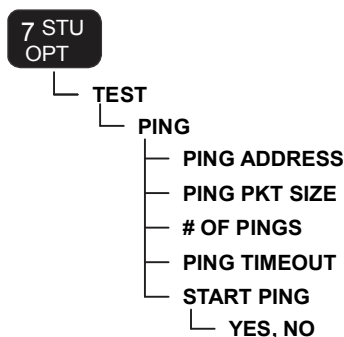
The backlight adjustment is used to adjust the brightness, contrast, and backlight operation of the front panel. An external connected KDU backlight, if used, is adjusted independently from the internal display. Backlight needs to be adjusted on each KDU/display. There are three backlight settings (on, off, momentary). The on setting is only available when the radio is connected to a DC power source other than a battery. When the momentary setting is used, the backlight turns off after 10-20 seconds if there is no key press activity on keypad. Backlight does not turn on during initial power up. Perform the following to adjust backlight settings:

- Press **[LT]**.
- To adjust the brightness, use ▼ or ▲ to scroll through the range, numbered 0-7.
- Use ◀ or ▶ to advance to the **CONTRAST** field. Adjust the contrast using ▼ or ▲ to scroll through the range, 20% to 100% (in 10% increments). Press **[ENT]**.
- Adjust the **LIGHT OPERATION VALUE** using ▼ or ▲ to scroll through the settings (**ON**, **OFF**, **MOMENTARY**).
- Press **[LT]** or **[ENT]** to return to the previous screen.

PING TEST (3G MODE)

See [Figure 8](#). Ping tests send a ping packet to a specified Internet Protocol (IP) address when using wireless IP features. Ping tests are generally only required when troubleshooting IP address problems. Perform the following procedure to run a ping test:

- a. Choose **[OPT] > TEST > PING**.
- b. For **PING ADDRESS**, enter the IP address to send the ping to, and press **[ENT]**.
- c. For **PING PKT SIZE**, enter the size of the ping packet to send. This may be left at the default value and press **[ENT]**.
- d. For **# OF PINGS**, enter the number of pings to perform and press **[ENT]**.
- e. For **PING TIMEOUT**, enter the time to wait for a ping response (milliseconds) and press **[ENT]**. This may be left at the default value, but should be increased if repeated attempts to ping are unsuccessful.
- f. Select **YES** and press **[ENT]** to start the ping. A **PING RESPONSE** screen and status message will display briefly when either the ping response has been successfully received, or the ping has timed out, whichever occurs first. (This may take a few minutes, depending on network.) While waiting for the **PING RESPONSE**, you may access other radio menus. The **PING RESPONSE** screen will temporarily override the currently selected screen to display the ping response status, and will then clear automatically.



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Figure 8. Option Test Ping Tree

GPS REPORTS

See [Figure 9](#). GPS reporting allows an RF-7800H-MP with a GPS module installed to send its GPS location to a remote station. The information is contained in a report that contains location, heading, velocity, and GPS timestamp. GPS information can also be sent to a GPS server as part of a Position Reporting System (Harris RF-6910) that displays the remote stations on a map.

View GPS Reports

GPS reports are stored in the RF-7800H-MP, and the last report from up to 63 stations is retained. The information will be continuously updated from the remote stations as long as the receiving radio is not turned off. Also, an RF-7800H-MP without a GPS module can still receive and view GPS reports. If a receiving station has not recently received a report from a sending station, the report is considered old and '< ... >' brackets will appear around the position on the display. The amount of time when the report is considered old is determined by the periodic GPS reports time interval, or 10 minutes if periodic reports are disabled, or the radio does not have GPS installed. The brackets are removed when a new GPS

report is received from the station. Perform the following procedure to view GPS reports.

- a. Choose **[OPT] > GPS-APR.**
- b. If GPS is not installed, the GPS reports will be displayed at this point. Use ▼ or ▲ to scroll though the of GPS reports received from the remote stations.
- c. Otherwise, use ◀ or ▶ to scroll to **VIEW** and press **[ENT]**. The last GPS report generated will be the first set of information displayed.

The station name and date/time are displayed across the top of the screen and the station's position is displayed across the center portion. The position will be displayed in either latitude/longitude or grid location format, depending on position format setting.

- d. Press **[ENT]** to view the distance and bearing between the radio's current position and the position indicated in the report. ▼ or ▲ can be used to scroll though the list of GPS reports received from other stations.
- e. Press **[ENT]** to view heading and velocity information in the GPS report. The information is generated by the GPS module in the remote station radio and the information indicates the station's direction and speed. ▼ or ▲ can be used to scroll though the list of GPS reports received from other stations.
- f. Press **[ENT]** to view the altitude information in the GPS report. The GPS module in the remote radio provides this information. ▼ or ▲ can be used to scroll though the list of GPS reports received from other stations.
- g. Press **[ENT]** again. The location information screen for the GPS reports is displayed.
- h. Press **[ENT]** to proceed through more screens for that report, or press **[CLR]** to return to the option menu.
- i. Press **[OPT]** to return to the preset screen.

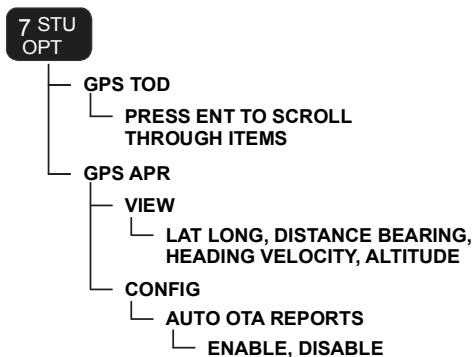
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GENERAL OPERATIONS

OTA GPS Reports

Automatic Over-the-Air (OTA) GPS reports can be disabled to prevent a radio from transmitting its location over the air without operator intervention. Once disabled, no automatic reports will be sent, but manual reports can still be sent. An automatic report waiting to be transmitted is aborted upon disabling OTA.

- a. Choose **[OPT]** > **GPS-APR**.
- b. Use **◀** or **▶** to select **CONFIG** and press **[ENT]**.
- c. Use **▼** or **▲** to select **ENABLE** or **DISABLE AUTO OTA REPORTS** and press **[ENT]**.
- d. Press **[CLR]** to return to the option menu.
- e. Press **[OPT]** to return to the preset screen.



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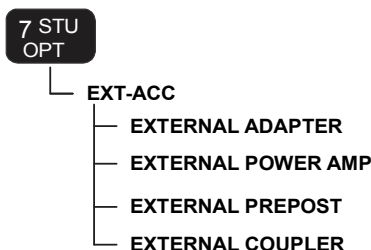
Figure 9. Option GPS Tree

External Accessories

See Figure 10. To view attached external accessories:

- a. Choose **[OPT] > EXT-ACC**.
- b. Press **[ENT]** to scroll through external accessory status. If no accessories are connected, **NOT DETECTED** displays. External accessories that could be used consist of:
 - **EXTERNAL ADAPTER - EXTERNAL PA** displays when a RF-5832H-PA, RF-5833H-PA, or RF-5834H-PA is attached.
 - **EXTERNAL POWER AMP - RF-5832 125W PA, RF-5833 150W PA, or RF-5834 400W PA** displays when the appropriate PA is attached.
 - **EXTERNAL PREPOST - RF-5845** displays when a PA with RF-5845 pre/postselector is attached.
 - **EXTERNAL COUPLER - RF-5382 COUPLER, RF-5382 HIGH-Q, RF-382 COUPLER, or RF-382 HIGH-Q** displays, depending on which device is attached to system.

To exit, press **[CLR]** several times or press **[OPT]**.



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Figure 10. Option External Accessories

VERRIDE SYSTEM PRESET SETTINGS

Many system preset parameters can be temporarily modified. When the system preset is temporarily modified, the preset name is enclosed with brackets: **<name>**. A system preset that has been temporarily changed can be restored to the original setting when you scroll to another preset then scroll back to the one that was changed, or when you power cycle the RF-7800H-MP (power off then power on again). This does not apply to the manual preset.

A system preset is temporarily overridden if the preset was programmed for Plain Text (PT) and the function switch is rotated to Cipher Text (CT) and a key is selected. The same is true for presets programmed for CT and the function switch is rotated to PT.

Select Modem/Data Preset

A programmed modem preset can be selected from the **DATA** field on the system preset screen:

- Use **◀** or **▶** until field under **DATA** is highlighted.
- Use **▼** or **▲** to scroll through the available modem presets.
- Press **[CLR]** to cancel changing the preset selection or press **[ENT]** to select the displayed data preset.

A new selection does not become active until **[ENT]** is pressed.

NOTE

Some modem presets may be incompatible with the current encryption, voice setting, or modulation setting, and may cause programming to change and/or cause an error condition. Refer to [Table 30](#) for compatibility.

Select Voice Setting

The voice setting can be selected from the system preset screen. The RF-7800H-MP provides Clear (CLR) setting to pass an analog signal over the air to support interoperability with other fixed single channel

radio systems. Last Ditch Voice (LDV) setting is a 3G only feature. To select a voice setting:

- a. Use ◀ or ▶ until field under **VOICE** is highlighted.
- b. Use ▼ or ▲ to scroll to the desired voice selection (**CLR, DV24, DV6, ME12, ME24, ME6, CVSD, LDV, AVS, NONE**).

Digital Voice settings are Digital Voice 2400 bps (DV24), Digital Voice 600 bps (DV6), Mixed Excitation Linear Prediction (MELP) 2400 bps (ME24), MELP 1200 bps (ME12), MELP 600 bps (ME6), Continuously Variable Slope Delta (CVSD).

DV6 and ME6 are the only options available in hopping.

- c. Press **[ENT]** to select the setting.

Change Encryption Type

Perform the following to change an encryption type:

NOTE

The radio must be in CT to change encryption type.

- a. Use ◀ or ▶ until encryption type field (CITADEL, AES-128, or AES-256) is highlighted on the front panel.
- b. Use ▼ or ▲ to scroll to the desired encryption type and press **[ENT]**.

Select Encryption Key

Perform the following to select an encryption key:

NOTE

The radio must be in CT to select encryption keys.

- a. Use ◀ or ▶ until field under **KEY** is highlighted on the front panel. If the display shows "-----" in field, no key is currently selected.

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GENERAL OPERATIONS

- b. Use ▼ or ▲ to scroll to the desired key and press **[ENT]**. While scrolling through the encryption keys, the key name, key signature and update count are displayed on the bottom row of the front panel.

Select Different Channel Preset

Temporary changes can be made while operating in Fixed Frequency (FIX) radio mode without reprogramming the RF-7800H-MP. This includes operating frequency, squelch, transmitter power levels, modulation, encryption key, and voice.

Fixed frequency channel preset numbers can be selected from the channel screen, either by scrolling channel numbers, or by entering a channel number via the numeric keypad. Changes made in this manner are temporary and are only active until a different system preset is selected or the RF-7800H-MP power is cycled. Selectable channel range is 000 to 199. To change channel preset:

- a. Use ◀ or ▶ until field under **CHAN** is highlighted.
- b. Press **[ENT]** and enter new channel number from keypad or use ▼ or ▲ to scroll to the desired channel number.
- c. Press **[ENT]** to accept changes.

CHANGE MANUAL CHANNEL 000

Channel number **000** is the manual channel. This is the only channel whose settings can be configured from the channel screen without going into the program menus. Perform the following procedure to change manual channel settings:

- a. From the preset screen, press **[0]** (↺) to display the channel preset screen.
- b. Use ◀ or ▶ until the channel number (**CH###**) is highlighted and press **[ENT]**.
- c. Press **[0][0][0]** to select the manual channel and press **[ENT]**.

- d. Use ◀ or ▶ until the receive frequency (**R**) is highlighted and press **[ENT]**.

NOTE

An alternate method to [Step e](#) is to press **[ENT]** and use ◀ or ▶ to scroll the digit, then enter the digit. Press **[ENT]** when finished.

- e. Enter a new receive frequency using the keypad and press **[ENT]**. The transmit frequency automatically defaults to the receive frequency at this point.
- f. Enter a new transmit frequency (if different from the receive frequency) and press **[ENT]**. To keep the transmit frequency the same as the receive frequency, press **[ENT]** without entering a new transmit frequency.
- g. Use ◀ or ▶ until the modulation (**MOD**) setting is highlighted.
- h. Use ▼ or ▲ to scroll to the desired modulation setting (**USB, LSB, AME, CW, FM**) and press **[ENT]**.
A modulation choice may revert back to the original modulation if change is incompatible with selected encryption or modem preset.
- i. Use ◀ or ▶ until the Automatic Gain Control (AGC) rate is highlighted. Use ▼ or ▲ to scroll to the desired setting (**MED, SLOW, OFF, AUTO, DATA, FAST**) and press **[ENT]**.
- j. Press **[0]** (↺) to return to the system preset screen.

TOGGLE SQUELCH ON OR OFF

From the system preset screen or channel preset screen, press **[SQL]** to toggle squelch on or off.

Digital Voice/ MELP

When any of the digital voice options (DV6, ME6, ME12, DV24, ME24) is selected, the receiving radio can automatically detect and process the digital voice option used at the transmitting radio. For instance, if the radio

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GENERAL OPERATIONS

has DV6 selected and receives digital voice from a transmitting radio that has ME24 selected, the receiving radio detects and correctly processes the incoming ME24 signaling. However, only radio configurations that support Mixed Excitation Linear Prediction (MELP) digital voice can either transmit or receive ME6, ME12, or ME24 digital voice.

4 A receiving radio with voice option set to CLR can automatically detect and process digital voice signaling (DV6, ME6, ME12, DV24, ME24) from a transmitting radio if the receiving radio has a serial tone modem selected.

The DV6, ME6, ME12, DV24, and ME24 options have different requirements for channel quality. The higher rate voice options such as DV24 and ME24 require better channels, and may not be usable on channels where DV6 and ME6 can be used with acceptable reliability and quality.

Operation with DV6, ME6, DV24, and ME24 is interoperable only with RF-7800V-HH, RF-5800H, and AN/PRC-150 radios. ME12 operation is interoperable only with other RF-7800H-MP radios. Operation with any of the digital voice options is not possible with radios supporting only analog voice.

ABOUT COUPLER TUNE AND PTT

When enabled, the internal coupler needs to go through a tune cycle when an operating frequency is used for the first time. Before any first transmission, the operator should momentarily press the Push-to-Talk (PTT) button on the handset and allow the tune cycle to complete. Messages are displayed when the coupler is tuning and when tuning is complete.

Once a channel is tuned, the RF-7800H-MP does not retune unless the channel has been changed. If the antenna has been changed, the operator should manually retune the coupler as described in [Retune, p49](#).

RADIO STORAGE AND HUB LIFE

To maximize HUB life, place the function switch in the **[CLR]** position when storing the RF-7800H-MP. For information on HUB replacement interval and instructions, refer to [Hold-Up Battery, p268](#).

NOTE

Placing the function switch in **[CLR]** will zeroize the radio.

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NOTE

The following sections assume the reader knows how to navigate the menus in the radios using ◀, ▶, ▼, ▲, [ENT], or [CLR].

RADIO PROGRAMMING WITH CPA

It is recommended that the Communications Planning Application (CPA) is used to ensure programming consistency and faster programming of multiple units. Third Generation (3G) and Adaptive Wideband cannot be programmed without the CPA. The CPA uses the serial data Point-to-Point Protocol (PPP) feature of the J3 DATA PORT.

NOTE

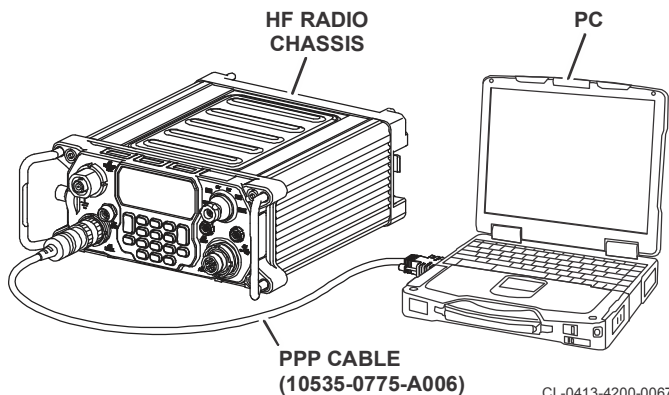
The Network Radio Driver Install (NRDI) application is included on the CPA CD-ROM, and must be installed on the PC to use the radio's PPP connection.

To connect the RF-7800H-MP to a Personal Computer (PC) running the CPA, see [Figure 11](#) and perform this procedure:

- a. Pull to turn function switch to Plain Text (**PT**).
- b. Follow [Configure Network Interface PPP, p99](#) to configure the **PPP PORT** to match the serial port of the PC. Refer to [Program Network Internet Protocol \(IP\) Parameters, p94](#) to set network IP parameters.
- c. Power the RF-7800H-MP **OFF**.
- d. Connect the round end of the **PPP Data Cable Assembly** (10535-0775-A006) to the **DATA** port (**J3**) on the RF-7800H-MP.
- e. Connect the other end of the cable to the appropriate serial COM port on the PC.
- f. Rotate function switch to **PT**.
- g. The RF-7800H-MP is now ready to be programmed by the PC using the Harris CPA. Refer to the CPA Online Help (under the CPA's **Help** menu) for programming information.

NOTE

There are actually two ports on the J3 connector: a synchronous/ asynchronous Data Terminal Equipment (DTE) port, and an asynchronous Point to Point Protocol (PPP) remote port.



5

Figure 11. Typical PC to RF-7800H-MP PPP Port Connection

NOTE

The remainder of this section covers front panel programming. Refer to the CPA online Help for information on how to program a mission plan.

COMSEC PROGRAMMING

Encryption programming allows the RF-7800H-MP to communicate in secure mode after choosing the proper key.

Add Citadel 1 (MK-128), AES-128, or AES-256 Key

See [Figure 12](#), choose **[PGM] > COMSEC > KEYS > ENTER**, then select a key Type (**CITADEL I (MK-128), AES-256, AES-128**).

- Use the alphanumeric keys to enter a desired key name (TEK).
- If the key already exists, you will get an overwrite message.
- Use the alphanumeric keys to enter a 32-digit key for MK-128 or AES-128, or a 64-digit key for AES-256.

You can also enter a 12-digit Analog Voice Security (AVS) key in addition to your MK-128 key.

- The hexadecimal numbering system is used in the key with numbers 0-9 and letters A-F.

Updating a Key

This feature allows you to generate a new key with the same name. After the update completes, the new key (with the same name) is different from the old key. As a result of this, all radios trying to communicate with a particular key must coordinate updates to that key.

See [Figure 12](#) and choose **[PGM] > COMSEC > KEYS > UPDATE > KEY TYPE**. A confirmation screen appears; select **Y** to accept. The maximum number of updates is 99. A message appears if the key update failed.

Erasing a Key

See [Figure 12](#) and choose **[PGM] > COMSEC > KEYS > UPDATE > KEY TYPE > KEY TO ERASE**. Scroll through the key types and keys, then select the key to update. A confirmation screen appears; select **Y** to accept.

If key is erased successfully, the message **ERASE KEY - KEY ERASED** is displayed. If the key is not erased successfully, the message **ERASE KEY - FAILED** is displayed.

Crypto Message Indicator (MI) (Citadel Only)

The Crypto Synchronization Pattern acts as a preamble to the encrypted data.

The length of the **MI** may be changed to **1X** or **3X** manually. In **DEFAULT**, the RF-7800H-MP makes selection automatically. It is desirable for the MI to be as short as possible, but too short of an MI length (and a shorter delay) may sacrifice performance over marginal channels.

If two radios with the same key report crypto sync errors, check the crypto MI setting. See [Figure 12](#) and choose **[PGM] > COMSEC > MI**.

Automatic Key Selection (AKS)

The RF-7800H-MP incorporates an AKS feature to allow the radio to automatically use the appropriate key if it has been assigned to the radio. The AKS feature enables the RF-7800H-MP to automatically select the appropriate key including: Citadel, AES-128, or AES-256.

See [Figure 12](#) and choose **[PGM] > COMSEC > AKS**. Options are **KEY & CRYPTO TYPE** (also known as Automatic Crypto Select [ACS]), **KEY ONLY** (the AKS), and **DISABLED** (shuts feature off).

8 VWX
PGM

COMSEC

CAM

CAM LABEL

ID

KERNEL ID

KEYS

ENTER

KEY TYPE

CITADEL I (MK-128)

AES-256

AES-128

UPDATE

KEY TYPE

CITADEL I (MK-128)

AES-256

AES-128

ERASE

KEY TYPE

CITADEL I (MK-128)

AES-256

AES-128

MI

CRYPTO MI

DEFAULT, 3X, 1X

AKS

AUTO KEY SELECT

KEY AND CRYPTO TYPE, KEY ONLY, DISABLED

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Figure 12. COMSEC Programming Tree

GLOBAL RADIO PROGRAMMING

The following series of menu selections allows the RF-7800H-MP to be configured based on operational missions. The settings are global and not channel specific.

Configure Radio

To program the radio configuration, refer to [Table 6](#), see [Figure 13](#), and choose **[PGM] > CONFIG > RADIO**.

Table 6. Configure Radio Settings

5

Menu Item	Options	Remarks
TX POWER	LOW MEDIUM HIGH	LOW: 1 watt - recommended when signal is optimal. MEDIUM: 5 watts - as signal quality decreases, increase Transmit (TX) power. HIGH: 20 watts, 10 watts only in Frequency Modulation (FM)
SQUELCH	ON OFF	ON: Mutes the receiver unless a signal is received. OFF: Allows all Receive (RX) signals to be monitored.
SQUELCH LEVEL	HIGH MEDIUM LOW	Applies to analog voice only, not relevant to AVS or digital voice. HIGH: Blocks out weaker RX signals allowing only stronger transmissions to be received. MEDIUM & LOW: Allows weaker signals through.
FM SQUELCH TYPE	NOISE TONE	NOISE: In FM, eliminates or blocks out any signal below predetermined level. TONE: In FM, all RX signals will be blocked unless accompanied by a 150 Hz tone; all transmissions will be sent with a 150 Hz tone.

Table 6. Configure Radio Settings (Continued)

Menu Item	Options	Remarks
RADIO SILENCE	OFF ON	OFF: Radio transmits normally. ON: Radio does not transmit automatically in response to Link Quality Analysis (LQA) exchange calls, ALE calls, frequency hopping (HOP) autorespond, etc. Radio silence does not prevent transmissions that are manually initiated by the operator.
COUPLER	ENABLED BYPASSED	ENABLED: Signal goes through internal coupler only. BYPASSED: Direct transmission to non-resonant broadband antennas. NOTE: The internal coupler is bypassed for both TX and RX signals. If an RF-382 external coupler is used, BYPASSED only bypasses the coupler for RX signals, and the coupler is not bypassed in TX.
FM DEVIATION	8.0 kHz, 6.5 kHz, 5.0 kHz	Depending on receiving radio, deviation is selected. 8 kHz is the standard tactical deviation.
CW OFFSET	0 Hz 1000 Hz	Offsets the frequency. 0 Hz - Standard Continuous Wave (CW) 1000 Hz - Modulated Continuous Wave (MCW) with 1000 Hz tone
RX NOISE BLANKING	OFF ON	The RX noise blanking is used to filter unwanted signals that are interfering with the intended receive signal. May affect weak signals.

Table 6. Configure Radio Settings (Continued)

Menu Item	Options	Remarks
COMPRESSION	OFF ON	Removes the peaks from the transmit audio signal while retaining audio quality. This provides for a higher average power to be transmitted. Turn OFF for any type of external analog data device, such as the KL-43 or Digital Message Device Group (DMDG) configured for audio.
RADIO NAME	#####	Select name programmed using the CPA. Gives radio a unique alphanumeric Identification (ID), required for radio modem protocols such as Variable Data Link (XDL) and Automatic Repeat reQuest (ARQ).
ERROR BEEPS	ON OFF	ON: Enables radio to beep for invalid key presses. OFF: Silences Error Beeps (recommended for tactical operation).

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GENERAL PROGRAMMING

8 VWX
PGM

CONFIG

RADIO

TX POWER

LOW, HIGH, MED

SQUELCH

OFF, ON

SQUELCH LEVEL

HIGH, MED, LOW

FM SQUELCH TYPE

NOISE, TONE

RADIO SILENCE*

OFF, ON

*IF RADIO SILENCE
IS ON, 'R' IN UPPER
LEFT CORNER OF
KDU FLASHES

COUPLER

ENABLED, BYPASSED

FM DEVIATION

8.0 KHZ, 6.5 KHZ, 5.0 KHZ

CW OFFSET

1000 HZ, 0 HZ

RX NOISE BLANKING

OFF, ON

COMPRESSION

OFF, ON

RADIO NAME

###

ERROR BEEPS

OFF, ON

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Figure 13. Configure Radio Tree

Configure Data Port

The data port settings are programmed based on the type of data device being connected to that port. The RF-7800H-MP has a front panel connector (J3 DATA) that is utilized for a variety of data operations. Port programming allows this connector to be configured for operation with a particular data device.

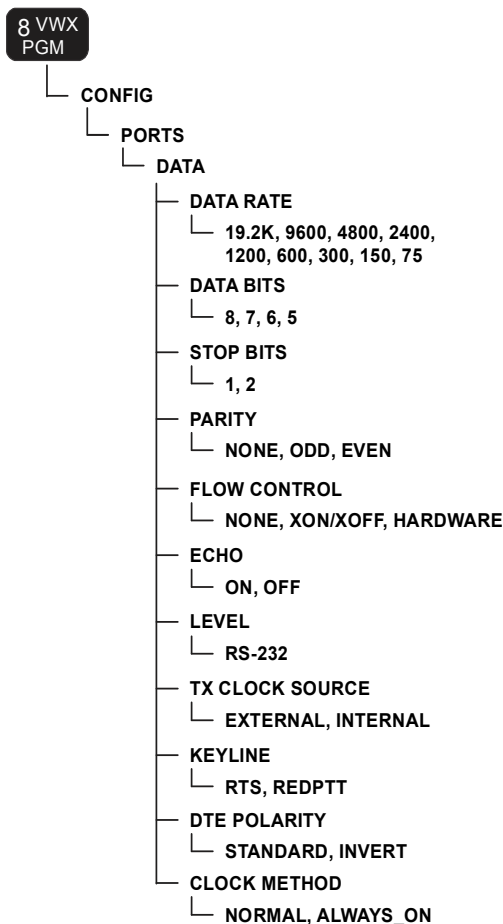
To program the data port, refer to [Table 7](#), see [Figure 14](#), and choose **[PGM] > CONFIG > PORTS > DATA**.

Table 7. Configure Data Port Settings

Menu Item	Options	Remarks
DATA RATE	75, 150, 300, 600, 1200, 2400, 4800, 9600, or 19.2 k	Data Terminal Equipment (DTE) rate for asynchronous modem transfers. Match port speed to DTE speed. (ASYNC modem preset)
DATA BITS	8, 7, 6, 5	The number of bits used to make up a transmitted character. Match DTE setting. (ASYNC modem preset)
STOP BITS	1, 2	Number of stop bits per character. (ASYNC modem preset)
PARITY	NONE ODD EVEN	An error checking scheme used during data transfer, in which bits in a byte are used to determine the parity. (ASYNC modem preset)
FLOW CONTROL	NONE XON/XOFF HARDWARE	A method of controlling the flow of data into the radio modem from the DTE.
ECHO	ON OFF	Input will be echoed back to the DTE.
LEVEL	RS-232	This is fixed at RS-232.

Table 7. Configure Data Port Settings (Continued)

Menu Item	Options	Remarks
TX CLOCK SOURCE	INTERNAL EXTERNAL	INTERNAL: Uses internal clock for synchronization. EXTERNAL: Outside source for synchronization. NOTE: Sync data operation parameter default is INTERNAL .
KEYLINE	REDPTT RTS	Specifies the source of the keyline signal: REDPTT - J3 pin 15 (pulled/pulsed low) RTS - J3 pin 26 (pulled/pulsed high) Both lines require the same pulse to unkey. This setting is for data transmissions only and does not work for voice.
DTE POLARITY	STANDARD INVERT	DTE data polarity invert means sense of the data bits are inverted when they enter and leave the port. This is used for interoperability with external equipment which may be configured for inverted polarity. STANDARD: Default value. INVERT: Supports KY-99 Black Digital interoperability.
CLOCK METHOD	NORMAL ALWAYS_ON	Normal: DTE Clock is present while Clear to Send (CTS) is asserted. Always_On: DTE Clock continuously present while synchronous modem is active.



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Figure 14. Configure Data Port Tree

Configure ASCII Ports

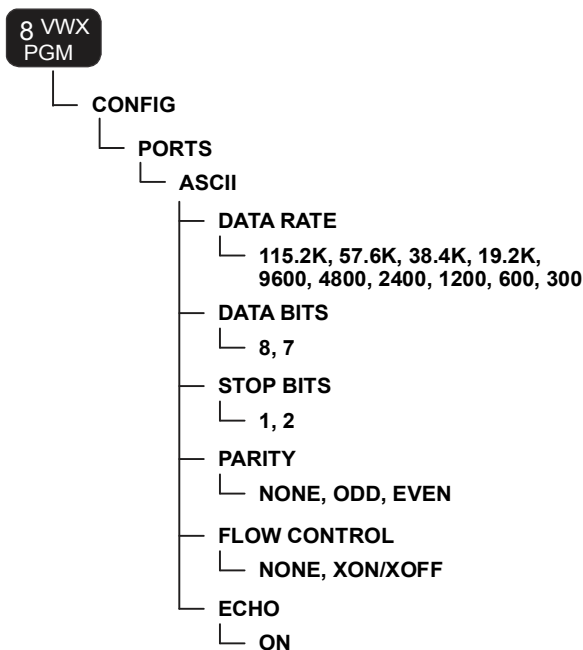
The data port settings are programmed based on the type of data device being connected to that port. The RF-7800H-MP has a front panel connector (**J3 DATA**) that is utilized for a variety of data operations. Port programming allows this connector to be configured for operation with a particular DATA device.

To program the American Standard Code for Information Interchange (ASCII) port, refer to [Table 8](#), see [Figure 15](#), and choose **[PGM] > CONFIG > PORTS > ASCII**.

5

Table 8. Configure ASCII Port Settings

Menu Item	Options	Remarks
DATA RATE	300, 600, 1200, 2400, 4800, 9600, 19.2 k, 38.4 k, 57.6 k, or 115.2 k	Data Terminal Equipment (DTE) rate for asynchronous modem transfers. Match port speed to DTE speed. (ASYNC modem preset)
DATA BITS	8, 7	The number of bits used to make up a transmitted character. Match DTE setting.
STOP BITS	1 2	Number of stop bits per character.
PARITY	NONE ODD EVEN	An error checking scheme used during data transfer, in which bits in a byte are used to determine the parity.
FLOW CONTROL	NONE XON/XOFF	A method of controlling the flow of data into the radio modem from the DTE.
ECHO	ON	Input will be echoed back to the DTE.



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Figure 15. Configure ASCII Port Tree

Configure Audio

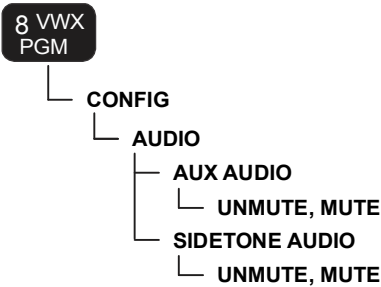
Audio configuration programming consists of **AUX MUTING** and **SIDETONE MUTING**. When **AUX AUDIO** is muted, external audio devices connected to the data port will not work. When **SIDETONE AUDIO** is muted, voice cannot be heard in the handset earpiece while transmitting.

Refer to [Table 9](#), see [Figure 16](#), and choose **[PGM] > CONFIG > AUDIO**.

Table 9. Configure Audio Settings

Menu Item	Options	Remarks
AUX AUDIO	UNMUTE MUTE	UNMUTE: Enables audio from J3 DATA port, which is necessary when using auxiliary audio equipment interface. MUTE: Disables audio from J3 DATA connector.
SIDETONE AUDIO	UNMUTE MUTE	UNMUTE: Voice or modem audio is heard in earpiece. MUTE: Voice or modem audio will not be heard in handset earpiece while transmitting. NOTE: Set to MUTE when using external audio equipment to prevent feedback.

5



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Figure 16. Configure Audio Tree

Configure TOD

The RF-7800H-MP Time-of-Day (TOD), meaning standard calendar day, is used for operation in HOP and 3G radio modes as well as for scheduled LQA and ALE linking protection.

Internal GPS Receiver

The RF-7800H-MP TOD is used for the HOP, ALE, and 3G operations. If Global Positioning System (GPS) has acquired the satellites (five minimum), then the Time of Day (TOD) is controlled by the GPS and need not be set manually. NEW DATE and NEW TOD are not available to the user once the GPS has acquired.

5

Set TOD Manually for Models Without Internal GPS

HOP operation requires the TOD to be set to within ± 90 seconds of actual HOP net time in order to transmit or receive TOD syncs with other radios. 3G operation requires the TOD be set to within ± 7 minutes to receive 3G sync. ALE operation with linking protection requires the TOD to be set to within ± 15 seconds of the actual ALE net time to allow reliable linking operation.

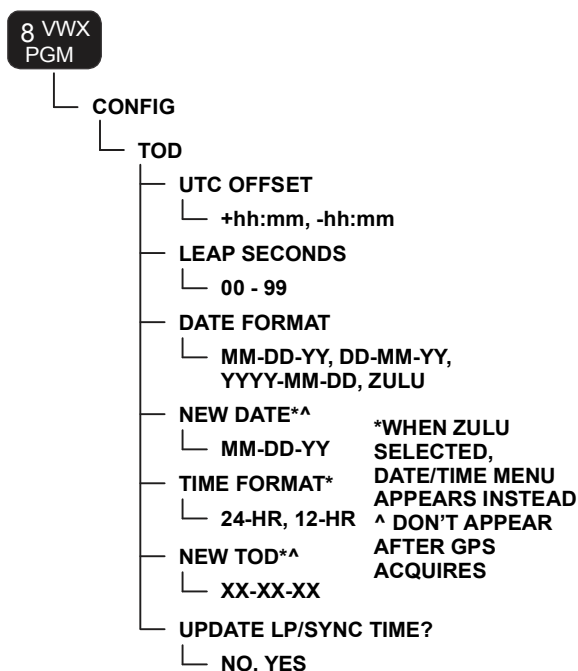
It is recommended that all radios maintain and use Universal Time Coordinated (UTC), Greenwich Mean Time (GMT) or ZULU for all operations to ensure consistency between radios. UTC, GMT, and ZULU all reference the same time.

Refer to [Table 10](#), see [Figure 17](#), and choose **[PGM] > CONFIG > TOD**.

Table 10. Configure TOD Settings

Menu Item	Options	Remarks
UTC OFFSET	+00:00	Offsets the radio's time from GMT/ZULU/UTC time.
LEAP SECONDS	00 - 99 seconds	Adjusts the radio's time for leap seconds (difference between GPS time and UTC time). In modes of operation that require GPS accuracy or operation, radios must use the same leap second value.
DATE FORMAT	MM-DD-YY DD-MM-YY YYYY-MM-DD ZULU	Set the preferred date format.
NEW DATE	MM-DD-YY	Set the date. The display and date entry varies based on the DATE FORMAT selected.
TIME FORMAT	12-HR 24-HR	Configure the format that the radio uses to display time of day. Not available in ZULU.
NEW TOD	XX:XX:XX	Set the Time-of-Day. TOD is not available in ZULU.
UPDATE LP/SYNC TIME?	YES NO	Set the LEAP (LP)/Sync time to update.

If the GPS acquires the satellites while the time is being manually entered, then after the user presses the [ENT] key, the display will show **ERROR: TIME SETTING CONTROLLED BY GPS** for a few seconds. If it acquires while the date is being entered, the display will show **ERROR: DATE SETTING CONTROLLED BY GPS** for a few seconds.



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Figure 17. Configure TOD Tree

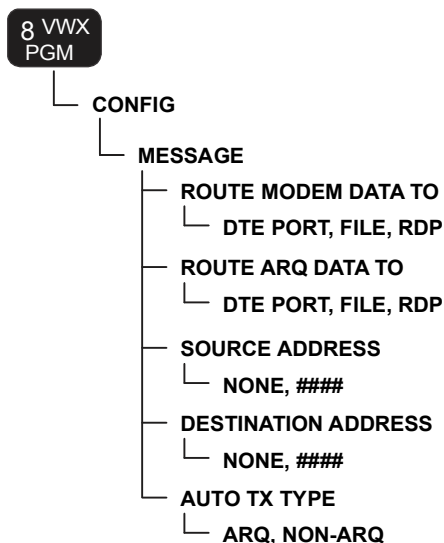
Configure Message (Routing Incoming Data)

This procedure is used to specify the destination to which incoming data is to be routed.

Refer to [Table 11](#), see [Figure 18](#), and choose [PGM] > CONFIG > MESSAGE.

Table 11. Configure Message Settings

Menu Item	Options	Remarks
ROUTE MODEM DATA TO	DTE PORT (default) RDP FILE	DTE PORT - located on the RF-7800H-MP's front panel J3 DATA connector. This port is used to pass data between the RF-7800H-MP and a data terminal using an RS-232 serial data connection. RDP - Remote Data Port (RDP) is located on the RF-7800H-MP's front panel J3 DATA connector. This port is used to pass data between the RF-7800H-MP and a Harris data terminal, such as the RF-6760W WMT or RF-6551H TacChat. Uses asynchronous PPP connection at 19.2 kbps to 115.2 kbps. PPP port speed should be set to the same speed for all radios on the net to avoid interface problems. FILE - a file in the RF-7800H-MP's internal file system. An external device must be used to access the files. The data stored in the RF-7800H-MP is lost when the radio is powered OFF.
ROUTE ARQ DATA TO	DTE PORT RDP (default) FILE	Same as above.
SOURCE ADDRESS	XXXXXXXXXXXXX X	Source address of message to be sent (15 characters alphanumeric, no punctuation, spaces etc.). These are usually ALE or 3G addresses of stations involved in the message transfer.
DESTINATION ADDRESS	XXXXXXXXXXXXX X	Ultimate destination of the message (15 characters alphanumeric, no punctuation, spaces etc.). These are usually ALE or 3G addresses of stations involved in the message transfer.
AUTO TX TYPE	ARQ NON-ARQ	Select automatic error detection and correction.



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Figure 18. Configure Message Tree

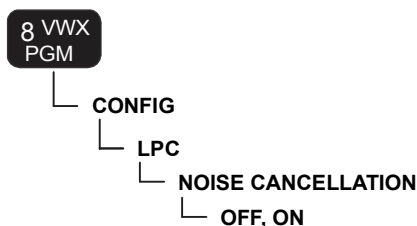
Configure LPC Noise Cancellation (DV6 or DV24)

To configure Linear Predictive Coding (LPC), refer to [Table 12](#), see [Figure 19](#), and choose **[PGM]> CONFIG > LPC**.

Table 12. Configure LPC Settings

Menu Item	Options	Remarks
NOISE CANCELLATION	ON OFF	An algorithm used on transmit audio that reduces noise (for example, electronic ignition noise prior to sending digital voice).

5



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Figure 19. Configure LPC Tree

Configure GPS

To configure GPS options, refer to [Table 13](#), see [Figure 20](#), and choose **[PGM] > CONFIG > GPS**.

Table 13. Configure GPS Settings

Menu Item	Options	Remarks
POSITION FORMAT	L/L-DMS L/L-DM MGRS-NEW MGRS UTM/UPS CUSTOM_UTM NEI	L/L-DMS: Attitude/Longitude Degree/Minutes/Seconds L/L-DM.: Lat/Long - Decimal Minutes MGRS-NEW: Military Grid Reference System MGRS: Military Grid Reference System Mercator/Universal Polar Stereographic (UTM/UPS): Universal Transverse CUSTOM UTM: Custom Universal Transverse Mercator NEI: Netherlands East Indies
CUSTOM_UTM UNITS	FALSE NORTHING +/- 0 to 9999999.99	Used as a basis for relative position. Northward measured distance (y coordinate) in meters from a horizontal datum. CUSTOM_UTM setting only.
CUSTOM_UTM UNITS	FALSE EASTING +/- 0 to 9999999.99	Used as a basis for relative position. Eastward measured distance (x coordinate) in meters from a horizontal datum. CUSTOM_UTM setting only.
CUSTOM_UTM UNITS	POINT OF ORIGIN +/- 0 to 179.99999	Used as a basis for relative position- point of origin (E, W, 000.0000 degrees) CUSTOM_UTM setting only.
CUSTOM_UTM UNITS	SCALE +/- 00.000000 to 99.999999	Used as a basis for relative position- scale factor. CUSTOM_UTM setting only.

Table 13. Configure GPS Settings (Continued)

Menu Item	Options	Remarks
DATUM	DATUM TYPE	<p>Select a datum that identifies where the operator will be located. Datum needs to match user's maps. Two user-defined datums may be programmed into the radio, either through the display or the ASCII Remote Control interface. A datum has the following parameters:</p> <ul style="list-style-type: none"> • Semi-Major Axis: the longer of the two axes of the ellipsoid associated with the datum. The value is in meters, and may be between 6300000 and 6499999 meters. • Inverse flattening: along with the semi-major axis length, this quantity specifies the shape of the ellipse. Valid values are 280.0 to 320.0. • Dx: the offset of the center of the datum's ellipsoid from the center of the World Geodetic System 1984 (WGS-84) ellipsoid. The quantity is in meters, and can range from -90000 to +90000. • Dy: similar to Dx; it is the offset in the "y" direction. • Dz: similar to Dx; it is the offset in the "z" direction.

Table 13. Configure GPS Settings (Continued)

Menu Item	Options	Remarks
LINEAR UNITS	METRIC STATUTE NAUTICAL	Select unit of measure.
ELEVATION FORMAT	MEAN SEA LEVEL DATUM BASED	Reference for elevation reading.
ANGLE FORMAT	DEG/TRUE NORTH MIL/TRUE NORTH STRECK/GRID STRECK/TRUE NORTH MIL/GRID DEG/GRID	Select Degrees, Mils, or Streckes, and whether to be referenced to Magnetic North, True North, or a grid. DEG: There are 360 degrees in a circle. MILS: There are 6,400 MILS in a circle. MILS are much more accurate than degrees. One MIL = 1 meter at 100 meters distance. TRUE NORTH: Use directly with maps and charts. MAGNETIC North: When traveling using a compass. STRECK: 1 streck = (1/17.5) degrees
GRID DIGITS	14, 12, 10, 8, 6, 4, 2	Select the number of grid digits to use.

8 VWX
PGM

CONFIG

GPS

POSITION FORMAT

L/L-DM, MGRS-NEW, MGRS, UTM/UPS,
CUSTOM_UTM, NEI, L/L-DMS

DATUM

####

LINEAR UNITS

METRIC, STATUTE, NAUTICAL

ELEVATION FORMAT

MEAN SEA LEVEL, DATUM BASED

ANGLE FORMAT

DEG/GRID, MIL/TRUE NORTH, MIL/GRID,
STRECK/TRUE NORTH, STRECK/GRID,
DEG/TRUE NORTH

GRID DIGITS

14, 12, 10, 8, 6, 4, 2

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Figure 20. Configure GPS Tree

Configure GPS-APR

To configure GPS-Automatic Position Reporting (APR) options, refer to [Table 14](#), see [Figure 21](#) and choose **[PGM] > CONFIG > GPS-APR**.

Table 14. Configure GPS-APR Settings

Menu Item	Options	Remarks
PERIODIC REPORTS	ON OFF	Enables or disables periodic GPS reports that are sent after a specified amount of time has occurred since the last report was sent.
TIME INTERVAL	Numeric Value (600 to 604800)	Specifies the amount of time, in seconds, that must elapse before the next periodic GPS report will be sent. This menu only occurs when PERIODIC REPORTS is set to ON.
DISTANCE REPORTS	ON OFF	Enables or disables GPS distance reports that are sent after a specified distance has been traveled from the location of the last GPS report.
CHANGE IN LOCATION	Numeric Value (200 to 65000 Meters)	Specifies the amount of distance that must be traveled before the next distance GPS report will be sent. This menu is only displayed if DISTANCE REPORTS is set to ON.
SERVER ADDRESS	NONE PPP_PEER CUSTOM_IP	Specifies the destination IP address for UDP packets that are generated when a GPS report is received or transmitted. To disable UDP packet generation, select none. To use the IP address of the host PC when connected via PPP, use PPP_PEER. To manually enter the IP, select CUSTOM_IP.
PT GPS REPORTS	ENABLE DISABLE	Allow or prevent GPS reports from being transmitted over-the-air while the radio is in PT.
IDENTIFICATION	STATION NAME SERIAL NUMBER	Select how the sending radio is to be identified in the report, either by Station Name or by radio Serial Number.

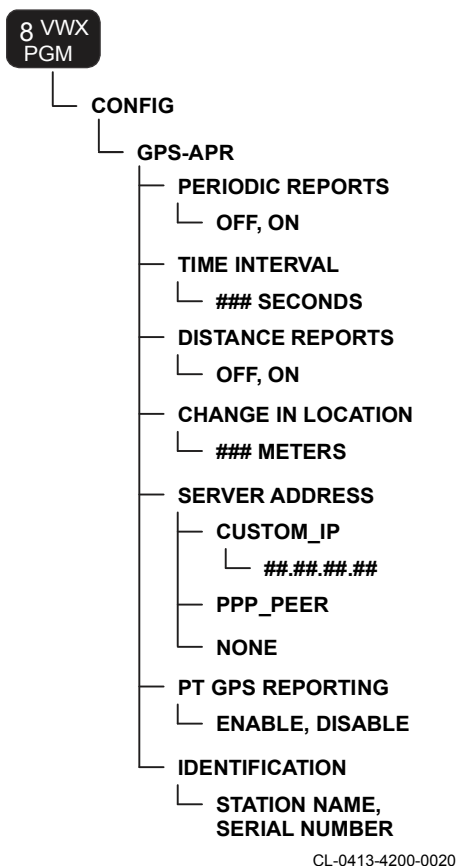


Figure 21. Configure GPS-APR Tree

Configure Accessory (RF-5382, Pre/Post)

Refer to [Table 15](#), see [Figure 22](#), and choose **[PGM] > CONFIG > ACCESSORY**.

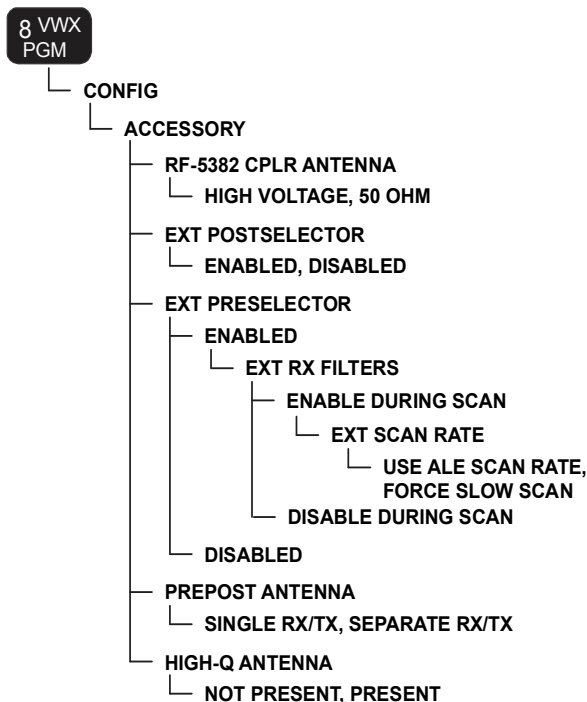
Table 15. Configure Accessory Settings

Menu Item	Options	Remarks
RF-5382 CPLR ANTENNA	HIGH VOLTAGE 50 OHM	Choose HIGH VOLTAGE if the ceramic high voltage port is used. Choose 50-OHM if the 50-Ohm port is used.
EXT POSTSELECTOR	ENABLED DISABLED	Enables postselector (TX filter) for pre/postselector.
EXT PRESELECTOR	ENABLED DISABLED	Enables preselector (RX filter) for pre/postselector.
EXT RX FILTERS	ENABLE DURING SCAN DISABLE DURING SCAN	(Available when EXT PRESELECTOR is ENABLED) Enables or disables RX filters of RF-5845 external pre/postselector while scanning in ALE.
EXT SCAN RATE	FORCE SLOW SCAN USE ALE SCAN RATE	(Available only when EXT RX FILTERS are Enabled [available only when the EXTERNAL PRESELECTOR is Enabled]) Selects scan rate of ALE, either 2 channels per second or FAST.
PREPOST ANTENNA	SINGLE RX/TX SEPARATE RX/TX	(Future implementation, not currently supported.) Selects between single (same) antenna for RX and TX, or different antennas for RX and TX. Only applicable when using an external pre/postselector.

Table 15. Configure Accessory Settings (Continued)

Menu Item	Options	Remarks
HIGH-Q ANTENNA	NOT PRESENT (Default) PRESENT	<p>RF-3134AT antenna requires use of external power amplifier. Selects whether RF-3134AT Full Loop antenna is present or not present. Configures the radio for proper frequency range, tuning tolerance, and power level.</p> <p>CAUTION</p> <p>RF-3134AT antenna must be configured correctly prior to any transmission of RF energy to prevent damage to the antenna. R/T must be power cycled prior to operating this system. Failure to do so could result in antenna damage.</p> <p>NOTE: HOP mode is not available (when the MODE button pressed) if RF-3134AT antenna is configured as an accessory.</p>

5



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Figure 22. Configure Accessory Tree

Program Network Internet Protocol (IP) Parameters

It is suggested that only the RF-7800H-MP IP address be set from the front panel and all other programming be done from the Communications Planning Application (CPA).

NOTE

The information contained in this manual is general guidance only. There are several tutorials and application notes available from Harris along with knowledgeable personnel to assist in network planning.

NOTE

Due to the complexity of configuring IP parameters, it is recommended that only the RF-7800H-MP Point-to-Point Protocol (PPP) address, subnet mask, and gateway address be set from the front panel; the CPA should be used for all other IP programming.

NOTE

Private network IP address using 10.X.X.X should be used with caution as a conflict could occur with other applications running on your PC.

Basic Definitions

The following provides brief IP networking definitions:

- IP Address - A number made of four 8-bit binary numbers that uniquely identifies a computer on a net.
- Subnet Mask - A number made of four 8-bit binary numbers that identifies a series of computers by masking part of the IP addresses in the subnet (using 255).
- Gateway Address - Also known as a default gateway, this address is used for routing addresses not known to a subnet to a location outside the subnet (another subnet or host).

- Peer IP Address - An address sent from the radio to the computer as part of a dynamic address negotiation scheme (as opposed to static [never changing]). This is either a custom number or a WIRELESS setting and is required for changing 3G nets.

Basic Rules for Addresses

The following must be observed when creating addresses:

- The first and last 8-bit binary numbers (octets) cannot be zero (000).
- None of the four 8-bit binary numbers can be all zeros or 255 (reserved for broadcast).
- Two computers (or radios) on a network cannot have the same address.

5

IP Network Example

Figure 23 shows an example of an IP network with four stations. One station uses a gateway. All stations used use a peer IP address and the computers connected must be configured to obtain an IP automatically. The example does not cover the wireless scheme and third generation HF protocol (3G) changing networks. Table 16 shows the programmed parameters and Table 17 shows the programmed routes for each radio in the network.

To avoid loss of packets, gateway addresses are required to define the next hop when no path exists to route packets incoming on a particular interface. For example, when a packet arrives at a station from over the air and the radio cannot identify the destination address, the radio routes the packet to the address specified by the wireless gateway. Each radio interface, wireless or PPP, may have its own gateway address defined.

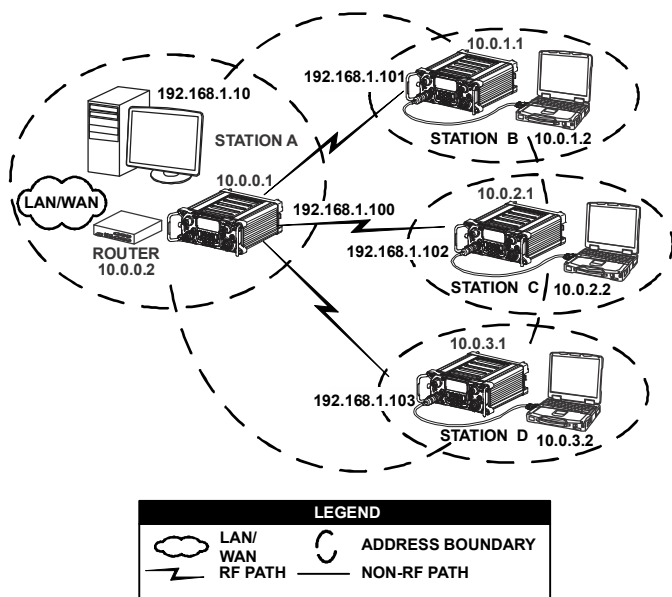
In the example, station A is the IP gateway for the wireless network. All other stations should send IP packets they receive over PPP that they don't know how to route to station A. This is why stations B, C, and D have their PPP gateway set to be 192.168.1.100 (the wireless IP address of

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GENERAL PROGRAMMING

station A). Any IP packets that stations B, C, and D receive over wireless that they don't know how to route should be deleted because these radios don't send the packets back out the wireless interface and potentially get into a situation where the IP packet is sent and received back and forth between two stations. This is why the wireless gateways for stations B, C, and D are set to 0.0.0.0. Since station A is the IP gateway for the wireless network, and this station can't send any packets it receives via PPP that it doesn't know how to route to itself. The station A PPP gateway is set to 0.0.0.0 to indicate that these packets should be deleted.

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Figure 23. IP Network Example

NOTE

There is an address limitation to read only the lowest seven bits of the last octet in the Wireless IP address. To avoid having the system think there are duplicate addresses, ensure the lower seven bits of the last octet in the address are different.

Table 16. IP Network Example Parameters (Routing Mode)

Parameters	Station A	Station B	Station C	Station D
Wireless IP	192.168.1.100	192.168.1.101	192.168.1.102	192.168.1.103
Wireless subnet mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
Wireless gateway	10.0.0.2	0.0.0.0	0.0.0.0	0.0.0.0
Wireless broadcast IP gateway	10.0.0.2	10.0.1.2	10.0.2.2	10.0.3.2
PPP IP	10.0.0.1	10.0.1.1	10.0.2.1	10.0.3.1
PPP subnet mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
PPP gateway	0.0.0.0	192.168.1.100	192.168.1.100	192.168.1.100
PPP peer IP	10.0.0.2	10.0.1.2	10.0.2.2	10.0.3.2

Table 17. IP Network Example Routes

Station	Destination	Mask	Next Hop	Interface
Station A	0.0.0.0	0.0.0.0	10.0.0.2	PPP
Station A	10.0.1.2	255.255.255.255	192.168.1.101	Wireless
Station A	10.0.2.2	255.255.255.255	192.168.1.102	Wireless
Station A	10.0.3.2	255.255.255.255	192.168.1.103	Wireless
Station B	0.0.0.0	0.0.0.0	192.168.1.100	Wireless
Station C	0.0.0.0	0.0.0.0	192.168.1.100	Wireless
Station D	0.0.0.0	0.0.0.0	192.168.1.100	Wireless

Overview - IP Menu

Table 18 outlines the top-level IP menus.

Table 18. Top-Level IP Menu

Menu Item	Options	Remarks
CONFIG	NETWORK	The setup of parameters that support using the RF-7800H-MP with standard computer networks.
NETWORK	INTERFACE PROTOCOL ROUTES	<ul style="list-style-type: none"> The RF-7800H-MP port to be configured. The communications protocol the network uses. Setup of network communications pathways. Enable or disable IP Firewall Security.
INTERFACE	PPP WIRELESS	Select the desired interface whose parameters you want to view or program.

Table 18. Top-Level IP Menu (Continued)

Menu Item	Options	Remarks
PROTOCOL	SNMP	Simple Network Management Protocol (SNMP)
ROUTES	ALL INDIVIDUAL	<ul style="list-style-type: none">• Clears all IP routes.• Access individual IP routes.

NOTE

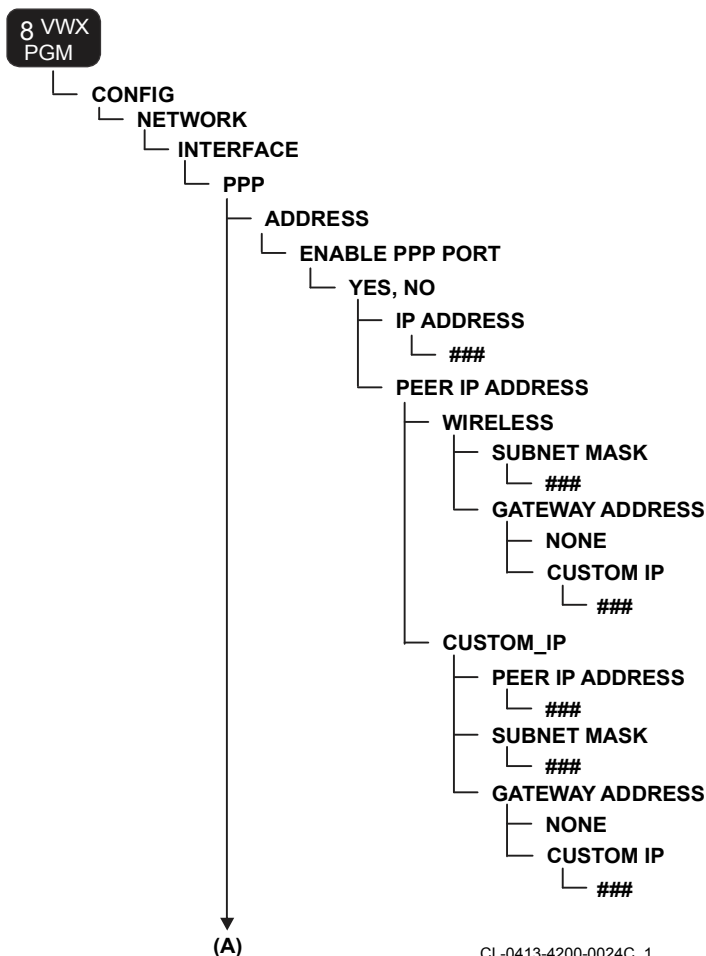
Many of the IP programming menus wrap from the bottom menu item back up to the top of the menu. Press **[CLR]** to exit or move up one level in the IP programming tree.

Configure Network Interface PPP

To read or set the PPP IP address of the RF-7800H-MP before you program it with the CPA, refer to [Table 19](#), see [Figure 24](#), and choose **[PGM] > CONFIG > NETWORK > INTERFACE > PPP**.

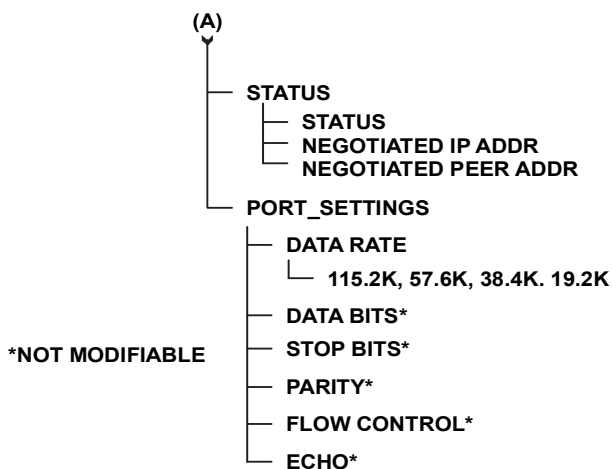
Table 19. Configure Network Interface PPP Address Settings

Menu Item	Options	Remarks
INTERFACE	PPP WIRELESS	<ul style="list-style-type: none"> PPP Port
PPP	ADDRESS STATUS PORT SETTINGS	<ul style="list-style-type: none"> Select to change PPP addresses. Select to display PPP port status. Select to change PPP port settings.
ADDRESS	ENABLE PPP PORT IP ADDRESS PEER IP ADDRESS SUBNET MASK GATEWAY ADDRESS	These parameters are setup to configure the RF-7800H-MP PPP interface. Parameter values must also be programmed into whatever PC-based software application (e.g., CPA) is communicating with the RF-7800H-MP over this interface.
STATUS	STATUS NEGOTIATED IP ADDR NEGOTIATED PEER IP	<ul style="list-style-type: none"> ENABLED-ONLINE (only when connected to peer), ENABLED-OFFLINE IP Address for this radio. IP address of the computer (peer) communicating with the RF-7800H-MP.
PORT SETTINGS	DATA RATE DATA BITS STOP BITS PARITY FLOW CONTROL ECHO	19.2 k, 38.4 k, 57.6 k or 115.2 k 8 bits (not programmable) 1 bit (not programmable) NONE (not programmable) NONE (not programmable) OFF (not programmable)



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Figure 24. Configure Network Interface PPP (Sheet 1 of 2)



CL-0413-4200-0024C_2

Figure 24. Configure Network Interface PPP (Sheet 2 of 2)

Configure Network Interface Wireless

With the wireless network interface, relevant IP parameters are represented in the outgoing RF modulated signal. To program network wireless interface, refer to [Table 20](#), see [Figure 25](#), and choose **[PGM] > CONFIG > NETWORK > INTERFACE > WIRELESS**.

Table 20. Configure Network Interface Wireless Settings

Menu Item	Options	Remarks
INTERFACE	PPP WIRELESS	Select wireless IP for setup parameters of OTA networking.
WIRELESS	ADDRESS STATUS	Select ADDRESS to view or edit setup parameters.
ADDRESS	ENABLE WIRELESS PORT WIRELESS IP ADDRESS WIRELESS SUBNET MASK GATEWAY ADDRESS BROADCAST IP ADDR	Enable (Yes/No) the wireless port Relevant IP parameters of the RF-7800H-MP wireless signaling, represented in the outgoing RF modulated signal over the J7 antenna port.
STATUS	STATUS	Only ENABLED-ONLINE is available for Wireless IP.

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PGM

CONFIG

NETWORK

INTERFACE

WIRELESS*

ADDRESS

ENABLE WIRELESS PORT

YES, NO

WIRELESS IP ADDRESS

###

WIRELESS SUBNET MASK

###

GATEWAY ADDRESS

CUSTOM IP

GATEWAY ADDRESS

###

NONE

PPP PEER

BROADCAST IP ADDR

CUSTOM IP

BROADCAST IP ADDR

###

NONE

PPP PEER

STATUS

STATUS

***3G ONLY**

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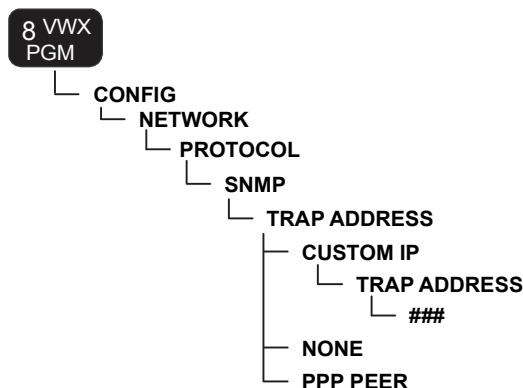
Figure 25. Configure Network Interface Wireless Tree

Configure Network Protocol

To read or set the IP Protocol parameter of the RF-7800H-MP, refer to [Table 21](#), see [Figure 26](#), and choose **[PGM] > CONFIG > NETWORK > PROTOCOL**.

Table 21. Configure Network Protocol Settings

Menu Item	Options	Remarks
PROTOCOL	SNMP	Simple Network Management Protocol
SNMP	TRAP ADDRESS	Where radio status messages are sent. (Use NONE or 000.000.000.000 to disable sending status messages.)



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Figure 26. Configure Network Protocol Tree

Configure Network Routes

To support IP message routing, the RF-7800H-MP maintains a programmable routing table. To read or set the IP ROUTES parameter of the RF-7800H-MP, refer to [Table 22](#), see [Figure 27](#), and choose **[PGM] > CONFIG > NETWORK > ROUTES**.

NOTE

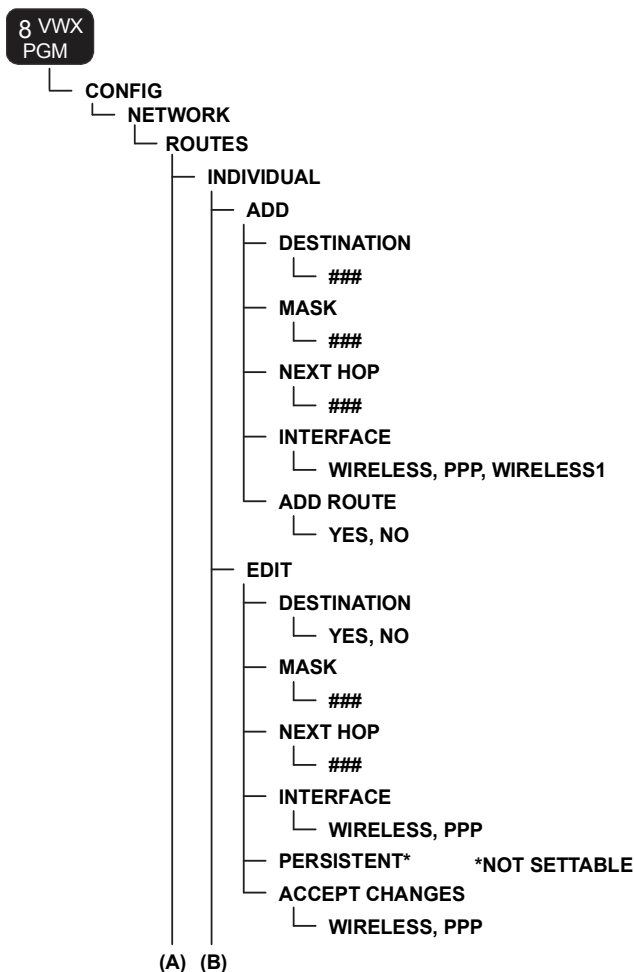
Selecting **ALL** allows the entire network setting matrix to be zeroized.

Table 22. Configure Network Routes Settings

Menu Item	Options	Remarks
ROUTES	ALL INDIVIDUAL	- Clears all IP routes. - Allows adding, editing, deleting, or reviewing of individual IP routes.
ALL	CLEAR ALL ROUTES	Clears all IP routes.
INDIVIDUAL	ADD EDIT REVIEW DELETE	- Add an individual IP route. - Edit an individual IP route. - Review an individual IP route. - Delete an individual IP route.
ADD	DESTINATION MASK NEXT HOP INTERFACE ADD ROUTE?	- These three are in the form XXX.XXX.XXX.XXX - PPP, Wireless (routing service) - No routing information will be saved until [YES] and [ENT] are selected.
EDIT	DESTINATION MASK NEXT HOP INTERFACE PERSISTENT ACCEPT CHANGES?	- These three are in the form XXX.XXX.XXX.XXX - PPP, Wireless - YES is always selected

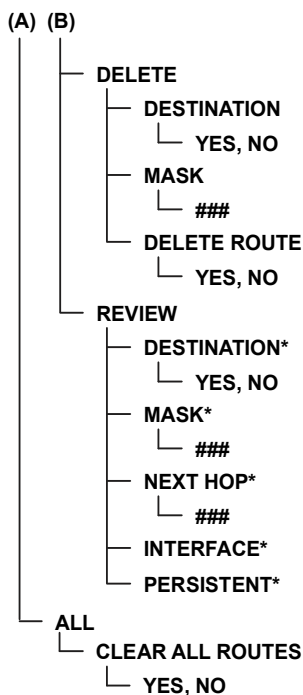
Table 22. Configure Network Routes Settings (Continued)

Menu Item	Options	Remarks
REVIEW	DESTINATION MASK NEXT HOP INTERFACE PERSISTENT	- Review IP routes that have been programmed.
DELETE	DESTINATION MASK DELETE ROUTE?	- A status message will be displayed if an error occurs while deleting a route.



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Figure 27. Configure Network Routes Tree (Sheet 1 of 2)



*NOT SETTABLE

CL-0413-4200-0027A-2

Figure 27. Configure Network Routes Tree (Sheet 2 of 2)

Configure ARQ

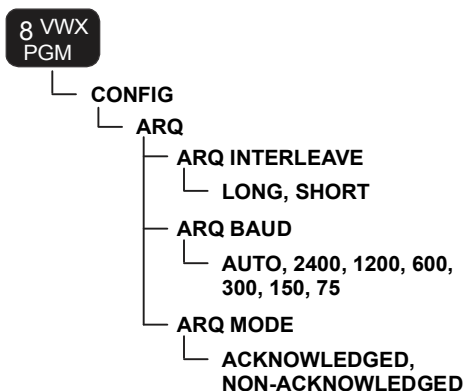
To program ARQ parameters, refer to [Table 23](#), see [Figure 28](#), and choose **[PGM] > CONFIG > ARQ**.

NOTE

Leave the Automatic Repeat reQuest (ARQ) configuration parameters at their default settings for best performance, unless the user has a detailed understanding of ARQ operations. The ARQ modem is recommended for use with the RF-6760 Wireless Messaging Terminal (WMT) and RF-6551H Tactical Chat.

Table 23. Configure ARQ Settings

Menu Item	Options	Remarks
ARQ INTERLEAVE	LONG SHORT	Interleave determines the run length for error correction. Longer interleaves give higher levels of correction and lower throughput and should be used in poor conditions. Short interleaves have higher throughput but should be reserved for high quality transmission conditions.
ARQ BAUD	AUTO 2400 1200 600 300 150 75	AUTO will give the optimal data transfer rate and will change as conditions change. Operator may select a fixed rate.
ARQ MODE	ACKNOWLEDGE D, NON- ACKNOWLEDGE D	ACKNOWLEDGED: Receiver requests retransmission of data that was received in error. NON-ACKNOWLEDGED: The transmission is sent once with no response from the receiving stations.



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Figure 28. Configure ARQ Tree

Configure LDV

Last Ditch Voice (LDV) allows the radio to deliver a short emergency message using digital voice using preconfigured parameters that work in the poorest of conditions. The availability of ARQ allows a guaranteed delivery of the message.

Maximum message length is 1 minute, 50 seconds. The radio will automatically send and unkey. The operator will hear a sidetone before the message is sent.

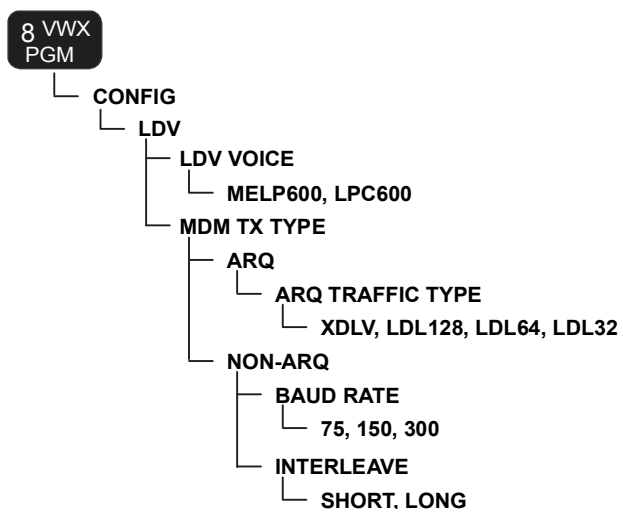
To program LDV parameters, refer to [Table 24](#) and see [Figure 29](#), and choose **[PGM] > CONFIG > LDV**.

NOTE

XDLV is recommended because it automatically uses channel conditions and message length in its determination of traffic type.

Table 24. Configure LDV Settings

Menu Item	Options	Remarks
LDV VOICE	MELP600 LPC600	Selects the vocoder type used to send LDV messages.
MDM TX TYPE	ARQ NON-ARQ	Select whether automatic error detection and correction is used for deliver of LDV messages.
ARQ TRAFFIC TYPE	XDLV LDL128 LDL64 LDL32	Setting is not used if MDM TX TYPE is set to NON-ARQ.
BAUD RATE	75 150 300	Setting is not used if MDM TX TYPE is set to ARQ.
INTERLEAVE	SHORT LONG	LONG provides increased error correction capability for improved reliability under poor channel conditions, but increases the time required to deliver each message. SHORT provides less delay, but delivery is less reliable. Setting is not used if MDM TX TYPE is set to ARQ.



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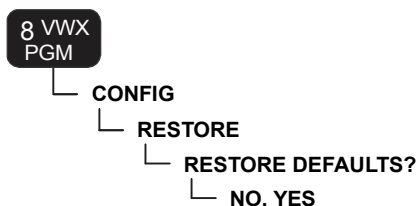
Figure 29. Configure LDV Tree

Configure Restore

The restore function reverts all radio settings to their factory defaults. The restoration includes settings normally cleared by the radio's zeroize function as well as settings stored in Electrically Erasable Programmable Read Only Memory (EEPROM) which are not normally cleared or reverted by a zeroize. The IP address parameters are restored to factory defaults to allow the radio to be returned to a known state to facilitate connection to the radio for reprogramming with the CPA. Restore is not necessary to program with the CPA, but allows the radio to be easily returned to a known state if the radio has been customized for use in a wireless network.

See [Figure 30](#) and choose **[PGM] > CONFIG > RESTORE. RESTORE DEFAULTS?** is displayed.

5

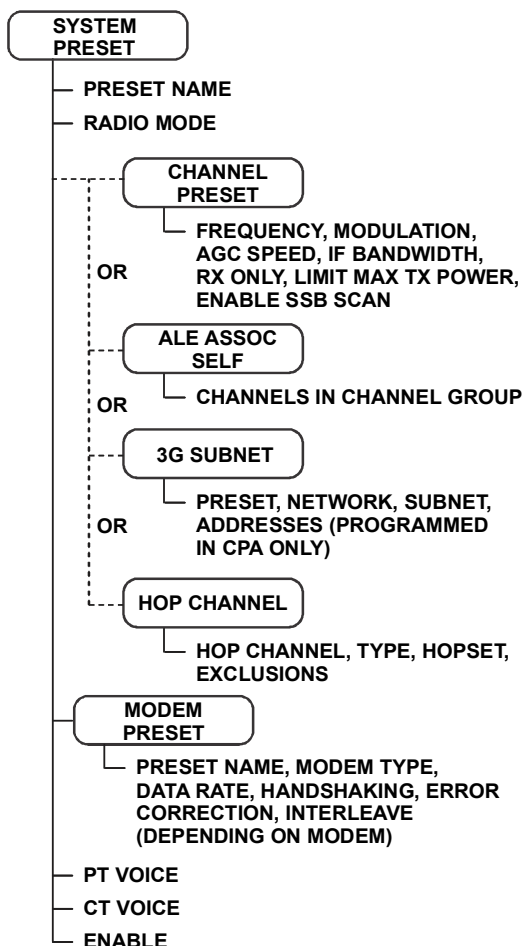


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Figure 30. Configure Restore Tree

ABOUT PRESETS

See [Figure 31](#). A system preset associates a radio mode, encryption key, voice settings, and data settings to a channel, Automatic Link Establishment (ALE) associated self address, third generation HF communication protocol (3G) net, or hopnet. This hierarchy lessens the amount of manually programmed parameters in the radio. For instance, an operator may use several modems or encryptions for a particular channel or use several channels for a particular modem or encryption. All this information can be preprogrammed into the radio and stored as a system preset for simple access.



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Figure 31. Preset Hierarchy

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PROGRAM PRESET CHANNEL

Channel presets are used in FIX, ALE and 3G. ALE can only be programmed with channels 000-099. Hailing can only be performed from channels 001-010. **FIX**, **SSB** and **SCAN** use channels 000-199. 3G uses channels 100-162.

All 3G network programming must be accomplished through the CPA. For information on setting up and programming a 3G network into the RF-7800H-MP, refer to the HF CPA help.

- 5** To program channel presets, see [Figure 32](#) and choose **[PGM] > MODE > PRESET > CHANNEL**.

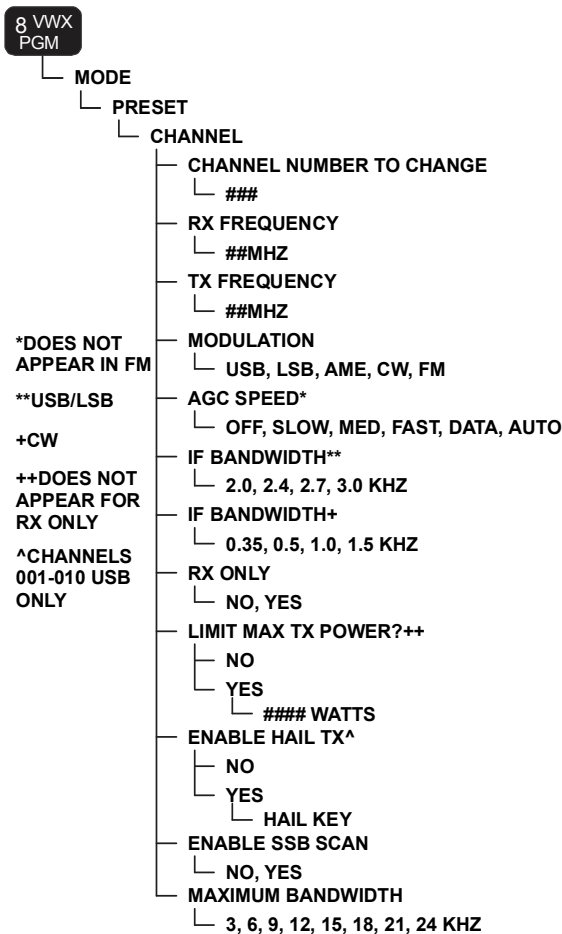
The **ENABLE HAIL TX** screen is only available for channels 001-010 and only when **USB** is selected. Select frequencies for these channels appropriately, if using **HOP** radio mode and Hail capability is desired. Also use the same hail key for all radios using the same hopping channel.

Limit Maximum Power

This feature assures that the radio output power will not exceed the level specified for this channel. For example, if the RF-7800H-MP was used with an RF-5834H-PA 400-Watt Power Amplifier and the **MAX POWER** level for the channel had been set to 200 W, the radio would automatically limit power to 200 W, whenever that channel was selected. If MAX POWER output is set above the level of the system configuration, the system output power is limited to the maximum power output of the power amplifier.

NOTE

Entering **00000** causes the RF-7800H-MP to automatically select the maximum transmit power based on the configuration.



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Figure 32. Program Preset Channel Tree

RF-7800H-MP

GENERAL PROGRAMMING

PROGRAM PRESET MODEM

To Program modem presets, refer to [Table 25](#), see [Figure 33](#), and choose **[PGM] > MODE > PRESET > MODEM**.

Immediately after the RF-7800H-MP is zeroized, the modem presets are given default names of **MDM1** to **MDM20**.

Voice/Data Compatibility

Each radio mode has different requirements for voice, modulation, and data. Refer to the respective radio mode section for voice/data compatibility:

- Fixed - [Table 30](#)
- ALE - [Table 32](#)
- 3G/3G+ - [Table 37](#)
- Hopping - [Table 43](#)

Interleave determines the run length for error correction. Longer interleaves give higher levels of correction and introduces longer latency (delays). Longer interleaves should be used in poor conditions. Short interleaves should be reserved for high quality transmission conditions.

Table 25. Program Preset Modem Setting

Menu Item	Description
MODEM	The modem menu.
MODEM PRESET TO CHANGE	Selects modem preset MDM1 through MDM20. MDM20 is reserved for use by the CPA for 3G.
PRESET NAME	Selects the factory preset name or rename to custom preset name.
MODEM TYPE	Allows selection of one of the following types:

Table 25. Program Preset Modem Setting (Continued)

Menu Item	Description
SERIAL	In FIX, Automatic Link Establishment (ALE) and third generation HF communication protocol (3G) radio modes, specifies MIL-STD-188-110A serial tone waveform. The 75 bits per second (bps) data rate is also interoperable with STANAG 4415. In HOP radio mode, SERIAL waveform is HARRIS Proprietary.
ARQ	Serial tone/ARQ
SERIAL	Serial tone
WBFSK	Wideband Frequency Shift Keying (WBFSK) for VHF channels
HFNET	Must be selected to use the wireless IP capability of the radio. Automatically changes to XDL if selected.
WBHF	Wideband HF, used in FIX and 3G radio modes only.
STANAG-4285-C	STANAG 4285-C - coded waveform.
STANAG-4285-U	STANAG 4285-U - uncoded waveform.
MIL-110B	In FIX, ALE and 3G radio modes, specifies MIL-STD-188-110B serial tone waveform. The 75 bps data rate is also interoperable with STANAG 4415. In HOP radio mode, MIL-110B waveform is HARRIS Proprietary.
XDL	A robust burst modem waveform for error-free on-air data (ARQ-based) in 3G.

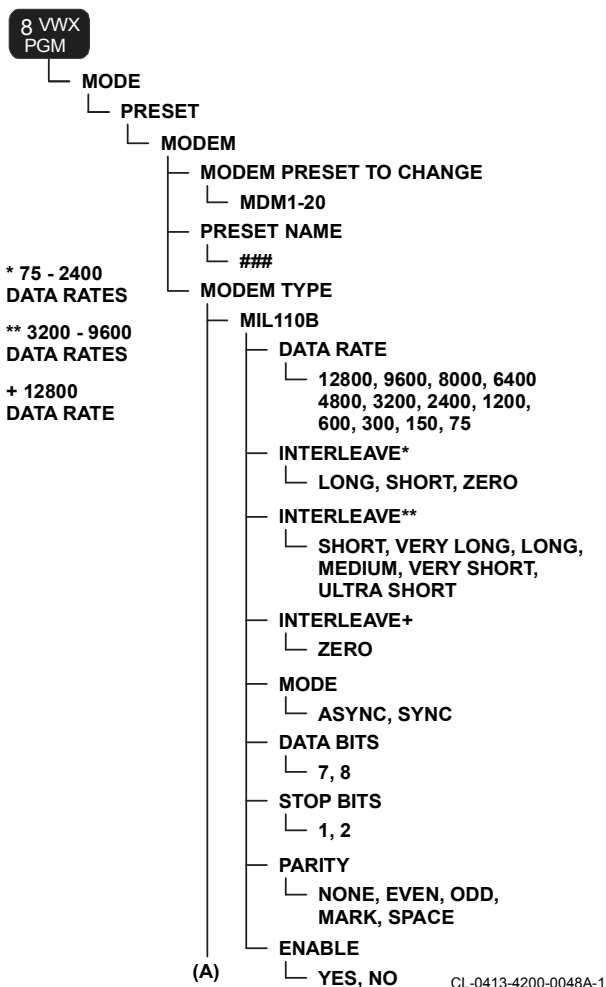
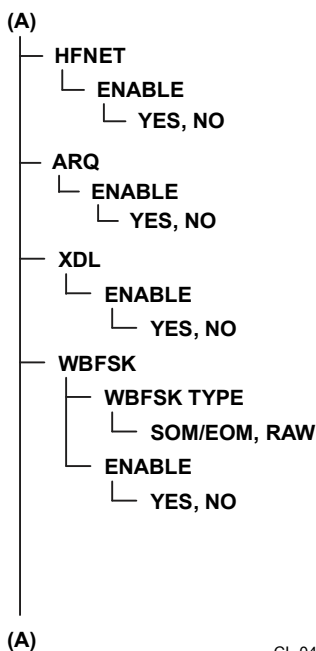
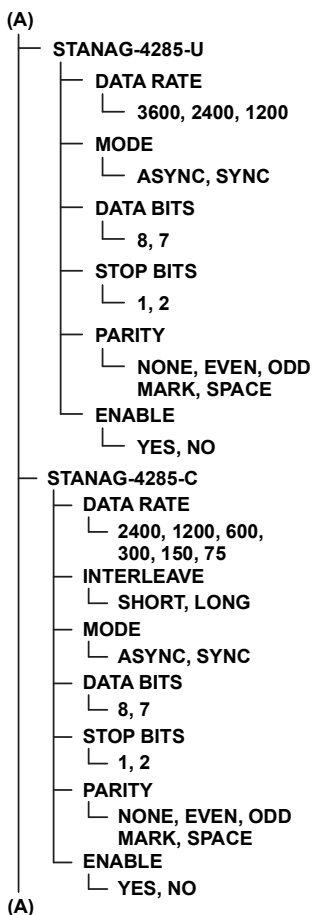


Figure 33. Program Preset Modem Tree (Sheet 1 of 5)



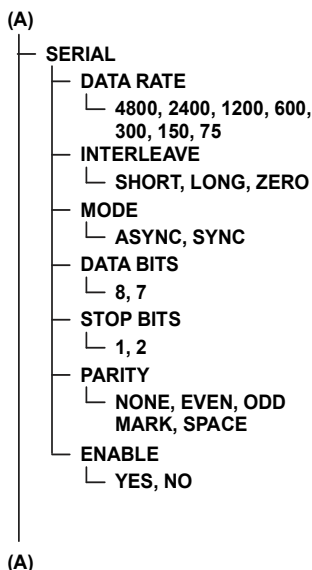
CL-0413-4200-0048A-2

Figure 33. Program Preset Modem Tree (Sheet 2 of 5)



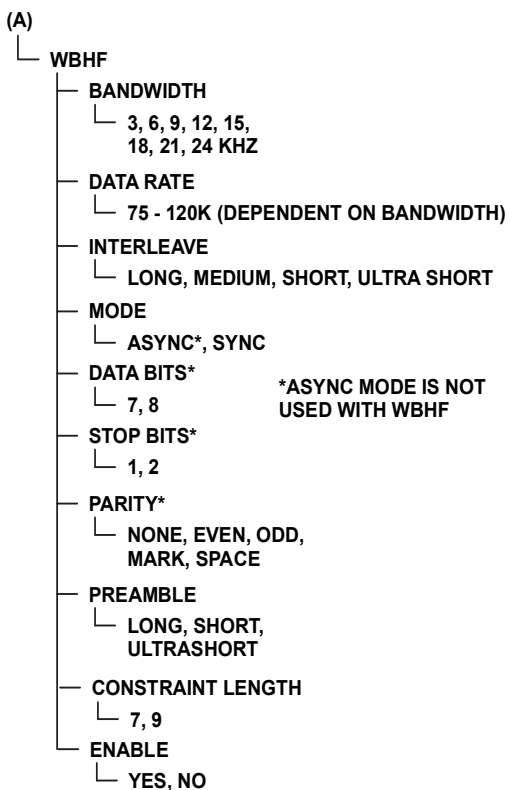
CL-0413-4200-0048A-3

Figure 33. Program Preset Modem Tree (Sheet 3 of 5)



CL-0413-4200-0048A-4

Figure 33. Program Preset Modem Tree (Sheet 4 of 5)



CL-0413-4200-0048A-5

Figure 34. Program Preset Modem Tree (Sheet 5 of 5)

Table 26. Modem Waveform Application Examples

MODEM WAVEFORM APPLICATION EXAMPLES		
Application	Recommended Waveform	Remarks
HF e-mail, WMT (long distance)	WBHF, Variable Data Link (XDL) or ARQ	Guarantees error-free data transfer. Automatically adapts data rate as necessary.
TAC CHAT	Variable Data Link (XDL) or ARQ	Guarantees error-free data transfer. Automatically adapts data rate as necessary.
Point to Point	MIL110B SERIAL STANAG 4285 (C/U)	600 - 9600 bps 600 - 4800 bps 600 - 2400 bps
Digital Imagery and Video (Harris Universal Image Transmission Software [HUITSS])	MIL110B SERIAL STANAG 4285 (C/U)	600 - 9600 bps 600 - 4800 bps 600 - 2400 bps 600 - 120 kbps
Wireless IP	HFNET	Use of ARQ is recommended.
Short Message Service (SMS)	ARQ	Use of ARQ is recommended.
Automatic Position Reporting (APR)	HFNET	Use of ARQ is recommended.

PROGRAM SYSTEM PRESET

A system preset ties a radio mode, encryption, voice settings, and data settings to a channel, ALE associated self address, or hopnet. It is advised to program encryption prior to programming system presets as to have keys available to assign to the presets.

To program system presets, refer to [Table 27](#), see [Figure 35](#), and choose **[PGM] > MODE > PRESET > SYSTEM**.

RF-7800H-MP GENERAL PROGRAMMING

Immediately after the RF-7800H-MP is zeroized, the system presets are given default names of **SYSPRE1** to **SYSPRE75**.

NOTE

Setting modem preset to OFF restricts use of the system preset to voice only (no data).

NOTE

Encryption keys need to be programmed first in order to program the system preset correctly.

Table 27. Program Preset System Settings

Menu Item	Options	Remarks
SYSTEM PRESET TO CHANGE	SYSPRE1 - 75	Select one of 75 presets.
PRESET NAME	XXXXXXXXXX	Customize preset name. 9-digit alphanumeric name.
RADIO MODE	FIX ALE 3G HOP	Select radio mode of operation.
(Fix) CHANNEL NUMBER	000-199	Select desired channel. Same channels used in ALE radio mode. Reserve 000 for scratchpad use, and reserve channels 100 - 162 for 3G programming with the CPA. Only channels 01 - 10 can be used for hailing operation in conjunction with HOP radio mode.
(ALE) ASSOC SELF	XXXXXXXXXXXX	NOTE: Calls made to this Self Address and calls made to an Individual Address from this associated self, will activate this preset upon linking.
(Hop) HOP CHANNEL	00-19	Select one of twenty available HOP channels.
MODEM PRESET	OFF, MDM1 - MDM20	Select one of 20 modem presets, or OFF.

Table 27. Program Preset System Settings (Continued)

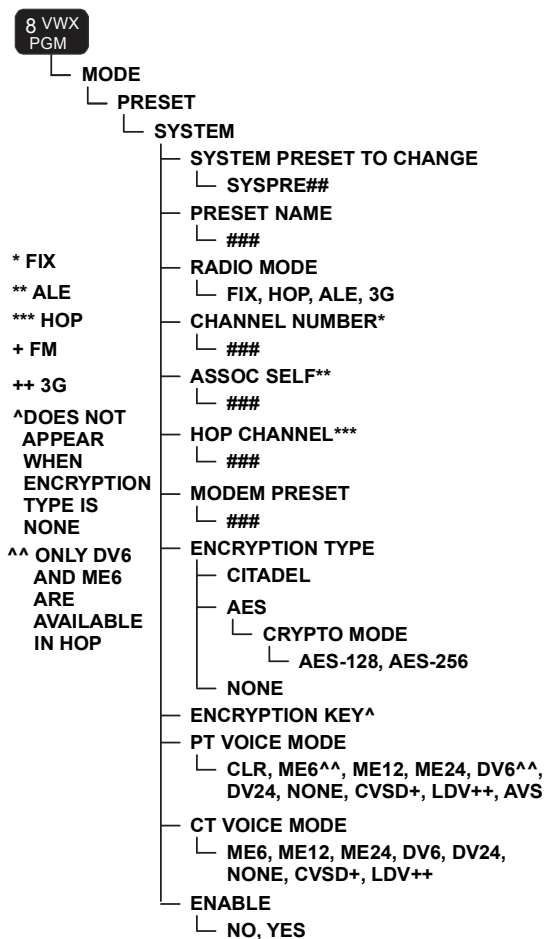
Menu Item	Options	Remarks
ENCRYPTION TYPE	CITADEL AES NONE	Select the desired encryption type. When AES is selected, a pop appears for selection of AES128 or AES256.
ENCRYPTION KEY	CITADEL AES128 or AES256	(Only appears if ENCRYPTION TYPE is not NONE.) An encryption key must be entered for Citadel or Advanced Encryption Standard (AES).
PT VOICE MODE	NONE CLR CVSD AVS DV24 DV6 ME24 ME12 ME6 LDV (3G ONLY)	<p>CLR: - Analog Voice CVSD: - Digital Voice for FM AVS: - Analog Voice Security DV24: - Digital Voice 2400 bps (DV24) DV6: - Digital Voice 600 bps (DV6) ME24: - Mixed Excitation Linear Prediction (MELP) 2400 bps (ME24) ME12: - MELP 1200 bps (ME12) ME6: - MELP 600 bps (ME6)</p> <p>NOTE: The radio autoselects on DV and ME settings. For example, Radio 1 is calling Radio 2 at DV6, but Radio 2 is set for ME24. Radio 2 will autoselect to DV6, allowing communications to take place.</p> <p>For HOP, DV6 or ME6 are the only options available. ME12 is only available in the RF-7800H-MP.</p>

Table 27. Program Preset System Settings (Continued)

Menu Item	Options	Remarks
CT VOICE MODE	NONE DV6 DV24 ME6 ME12 ME24 CVSD LDV (3G ONLY)	Choose one of possible cipher text voice. This requires an encryption key to be programmed. For HOP DV6 or ME6 are the only options available.
ENABLE	YES NO	YES: Current preset will be saved and enabled for use. NO: Current preset will be saved but will not be enabled for use.

PROGRAM MANUAL PRESET

A manual preset is similar to a system preset except only one manual preset is programmed compared to the 75 system presets. Refer to [Program System Preset, p125](#) for system preset parameters as most of these also apply to manual presets. A manual preset has an unmodifiable preset name of **MANUAL** that can be selected using **[PRE +/-]**. See [Figure 36](#) for the manual preset programming tree.



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Figure 35. Program Preset System Tree

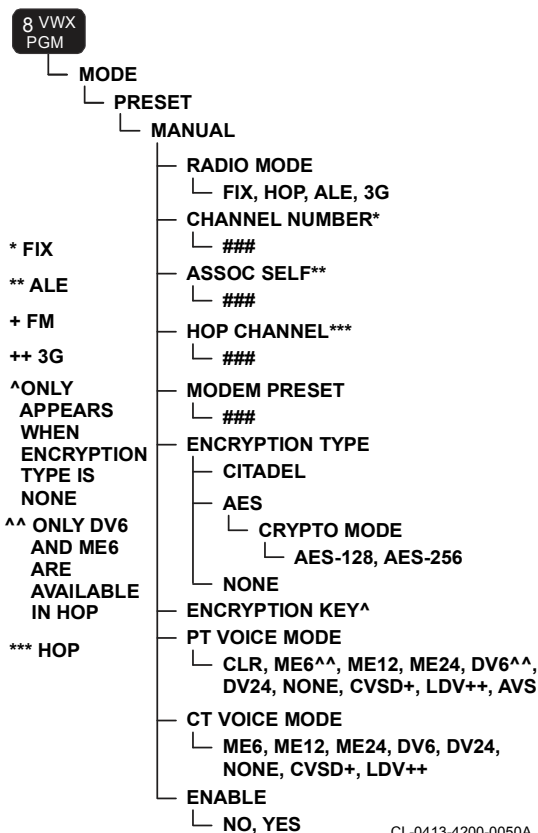


Figure 36. Program Preset Manual Tree

PROGRAM ARQ

To program ARQ parameters, refer to [Table 28](#), see [Figure 37](#), and choose **[PGM] > MODE > ARQ**.

NOTE

Leave the ARQ configuration parameters at their default settings for best performance, unless you have a detailed understanding of ARQ operations.

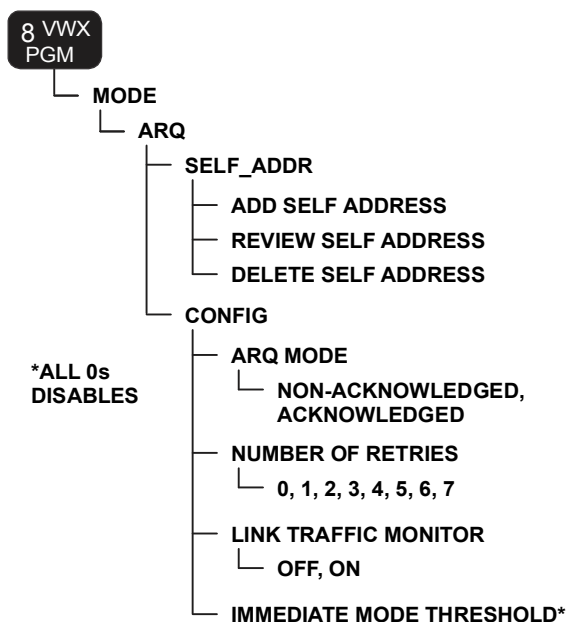
Table 28. Program ARQ Settings

Menu Item	Options	Remarks
SELF ADDR	XXXXXXXXXXXX XXXX	A 15-character address by which other radios identify this radio during an ARQ transmission.
CONFIG	ARQ MODE	ACKNOWLEDGED: Receiver requests retransmission of data that was received in error. NON-ACKNOWLEDGED: The transmission is sent once with no response from the receiving stations.
NUMBER OF RETRIES	0-7	Number of times that a message is retransmitted before the transmitter terminates the data transfer.
LINK TRAFFIC MONITOR	ON, OFF	ON: Listens and identifies the source and destination of an ARQ transmission not addressed to this radio. OFF: Listens only for transmissions addressed to this radio.

Table 28. Program ARQ Settings (Continued)

Menu Item	Options	Remarks
IMMEDIATE MODE THRESHOLD	0-2097150	<p>The maximum number of data bytes that will be sent “immediately” with the initial ARQ header. If the number of data bytes exceeds the threshold setting, the initial ARQ header will be sent and acknowledged separately, before any data is transmitted.</p> <p>0: Disable immediate mode (always send the initial ARQ header separately).</p> <p>2097150: Enable immediate mode (always send data with the initial ARQ header).</p> <p>NOTE: The actual setting is usually between the minimum and maximum values and based on predetermined knowledge of message content. The default setting is 1000 (bytes).</p>

5



CL-0413-4200-0046

Figure 37. Program ARQ Tree

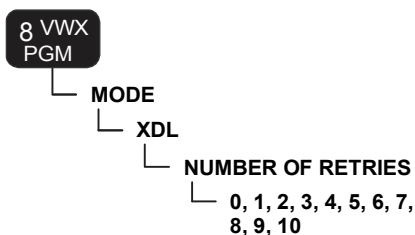
PROGRAM XDL

To program XDL parameters, refer to [Table 29](#), see [Figure 38](#), and choose **[PGM] > MODE > XDL**.

Table 29. Program XDL Settings

Menu Item	Options	Remarks
NUMBER OF RETRIES	0-10	Number of times that a message is retransmitted before the transmitter terminates the data transfer.

5

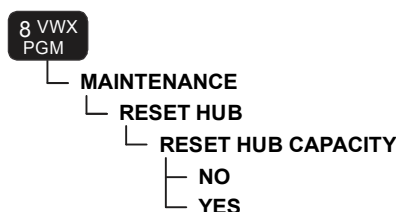


CL-0413-4200-0047

Figure 38. Program XDL Tree

PROGRAM MAINTENANCE RESET HUB

When the Hold-Up Battery (HUB) is replaced, the HUB capacity needs to be reset. Failure to reset the HUB capacity when the battery is replaced, or performing a reset long after battery replacement, results in inaccurate HUB capacity displays. See [Figure 39](#) for the HUB reset tree.

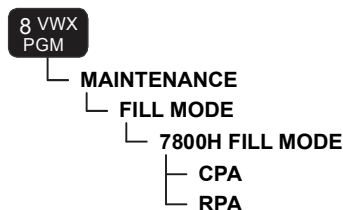


CL-0413-4200-0068

Figure 39. Program Maintenance Reset HUB Tree

PROGRAM MAINTENANCE FILL MODE

See [Figure 40](#) for the fill mode tree. This menu is for factory use and special applications only. Fill Mode should normally use **CPA** (default setting).



CL-0413-4200-0072

Figure 40. Program Maintenance Fill Mode Tree

CHANGE ADMINISTRATOR PASSWORD

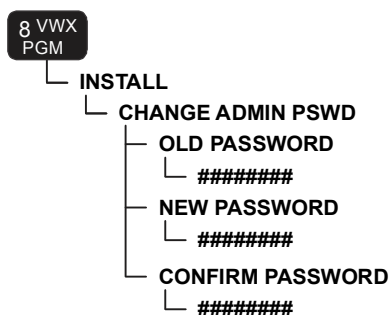
To change the administrator password, see [Figure 41](#). Administrator Password is required for installing radio firmware and installing/uninstalling waveforms/options.

NOTE

The factory default password is RF7800H. Placing the function switch in zeroize (**Z**) or clear (**CLR**) removes all programmed information, including administrator password.

5

When the administrator password is at its default, you will be prompted to change the password on entry into the install menu.



CL-0413-4200-0069

Figure 41. Program Install Change Administrator Password Tree

LOAD INSTALL MENU

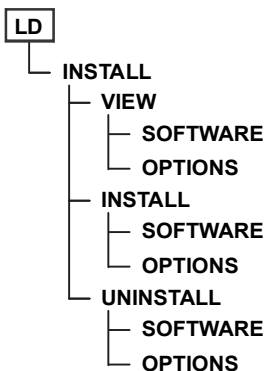
The installation menus are used for installing radio firmware and for installing or uninstalling waveforms and options. See [Figure 42](#) for installation menu tree.



CAUTION

The menu is for maintenance personnel or factory use. Uninstalling software will render radio useless for communications. In the load menu, you will be prompted for the administrator password.

5



CL-0413-4200-0070

Figure 42. Load Install Menu Tree

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Section	Page
Fixed Frequency Overview	140
Fixed Frequency Preset.	141
SSB Scan.	142
Program Fix	144
FIX Mode using WBHF	144

RF-7800H-MP

FIXED FREQUENCY

FIXED FREQUENCY OVERVIEW

Table 30 lists the voice and data capabilities of the RF-7800H-MP in fixed frequency radio mode.

Table 30. Fixed Frequency Voice/Data Compatibility

Encryption	USB	LSB	AME	CW	FM	Data	Voice	Frequency Range (MHz)
PT	x	x	x	x	-	OFF	CLR	1.5-29.9999
	x	x	-	-	-	SERIAL, MIL110B	DV6 ⁽¹⁾ , ME6 ⁽²⁾ , ME12 ⁽⁴⁾ , DV24 ⁽³⁾ , ME24 ⁽⁵⁾ , AVS ⁽⁶⁾	1.5-29.9999
	x	x	-	-	-	Automatic Repeat reQuest (ARQ), 4285C/U	CLR, AVS	1.5-29.9999
	-	-	-	-	x	Wideband Frequency Shift Keying (WBFSK)	NONE	20-59.9999
	x	-	-	-	-	Wideband High Frequency (WBHF)	CLR, DV6, ME6, ME12, DV24, ME24	1.5-29.9999
	-	-	-	-	x	OFF	CLR, Continuously Variable Slope Delta (CVSD)	20-59.9999
Citadel/ Advanced Encryption Standard (AES)	x	x	-	-	-	SERIAL, MIL110B	DV6, ME6, ME12, DV24, ME24	1.5-29.9999
	x	x	-	-	-	ARQ, 4285C/U	NONE	1.5-29.9999
	-	-	-	-	x	WBFSK	NONE	20-59.9999
	x	-	-	-	-	WBHF	NONE	1.5-29.9999
	-	-	-	-	x	OFF	CVSD	20-59.9999

(1) Digital Voice 600 bps (DV6) using Linear Predictive Coding (LPC).

(2) Mixed Excitation Linear Prediction (MELP) 600 bps (ME6).

(3) Digital Voice 2400 bps (DV24).

(4) MELP 1200 bps (ME12).

(5) MELP 2400 bps (ME24).

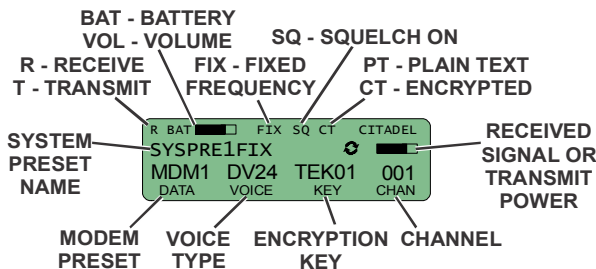
(6) Analog Voice Security (AVS).

FIXED FREQUENCY PRESET

Figure 43 shows a fixed frequency display. A system preset ties together programmed parameters such as radio mode (Automatic Link Establishment [ALE], FIX, third generation HF communication protocol [3G] etc.), encryption, channel, or net information, voice/data settings, and modems.

For basic fixed frequency operation:

- a. Press **[MODE]** until **FIX** appears on display, then press **[ENT]**.
- b. Use **[PRE +/-]** to select a system preset. Keys must be programmed if operating in CT.
- c. Observe:
 - **FIX** appears.
 - Correct encryption (**PT** or **CT**), **DATA** (Modem Preset), **VOICE**, **KEY** (**CT** only), and squelch (**SQ**) (if desired) are displayed.
 - **T** appears when transmitting
 - **R** appears when receiving or when ready to receive.
 - Bar graph (S-meter) indicating transmit power level or receive signal strength is displayed on right side of display. **S 3 6 9 +** gauges relative signal strength.
 - **BAT** appears with battery level unless volume is being adjusted.
- d. Use **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted.



CL-0413-4200-0004A

Figure 43. Fixed Frequency Example Screen

SSB SCAN

Single Sideband (SSB) Scan is used to scan multiple fixed frequency channels that have been programmed into the RF-7800H-MP. Each channel must be individually enabled to allow inclusion in the SSB scan list. SSB scan stops scanning when an incoming signal is strong enough to break the programmed squelch level in the RF-7800H-MP. SSB Scan limitations consist of the following:

- SSB scan is only functional in Plain Text (PT).
- All channels (0-199, inclusive) can be programmed for SSB scan.
- The frequency range for SSB scan channels varies as shown in [Table 31](#).
- Valid modulations for SSB scan are USB, LSB, and FM.
- To scan both HF and VHF frequency ranges in the same scan setup, a 1.5 MHz to 59.9999 MHz antenna would be required. A 150 watt vehicular system would require two separate antennas for the RF-5833H Power Amplifier (PA): 1.6 - 30 MHz and 30 - 60 MHz. The RF-5832H and RF-5834H PA systems are only operable within 1.6 -30 MHz.

- Channels are scanned in ascending order by channel number, and will display on the channel screen.

Table 31. Frequency Ranges for SSB Channels

Configuration	Frequency Range (MHz)
With no external Power Amplifier (PA)	1.5000 to 59.9999, inclusive
With external 150 W PA (2 antennas)	1.6000 to 29.9999, inclusive 30.0000 to 59.9999, inclusive
With external 125 W or 400 W PA	1.6000 to 29.9999, inclusive

In order to use SSB scan, channels must be enabled for scan during programming of the channel preset. Refer to [Program Preset Channel](#), p116.

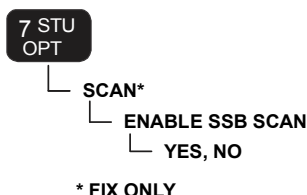
Enable SSB Scan

See [Figure 44](#). To enable/disable SSB scan:

- Choose **[OPT] > SCAN > ENABLE SSB SCAN**. Current SSB Scan setting is displayed.
- Use ▼ or ▲ to scroll to the desired on or off setting and press **[ENT]**.
- To exit, press **[CLR]** several times or press **[OPT]**.

Start/Stop SSB Scan

Press **[CLR]** to start or stop SSB scan. If no channels have been SSB scan enabled, the radio cannot start an SSB scan.



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Figure 44. Option Scan Tree

6 PROGRAM FIX

For fixed frequency, presets must be programmed in the order shown:

- Program Preset Channel, p116
- Program Preset Modem, p118
- Program ARQ, p131 or Program XDL, p134, if used
- Program System Preset, p125

FIX MODE USING WBHF

In FIX Radio Mode, WBHF is selectable as a modem type, however, it does not engage the Adaptive Wideband process. Bandwidth will not automatically adapt to channel conditions, since spectral sensing is not performed in WB FIX. WB can be selected for data, and all legacy voice modes are available for use (such as CLR, AVS, ME, and DV).

If two radios are to connect using WBHF in FIX Mode, they both must be configured for the following wideband parameters. Data rate and interleaver are embedded in the preamble of the WBHF transmission, allowing the receiving radio to automatically configure itself for the incoming transmission.

- Go to menu **[PGM] > MODE > PRESET > MODEM > MODEM TYPE** and select **WBHF**.

- b. Go to menu **[PGM] > MODE > PRESET > MODEM > BANDWIDTH**. Select the highest bandwidth allowed for this channel based on current frequency allocation. Choices are **3, 6, 9, 12, 15, 18, 21, or 24 KHz**.
- c. Go to menu **[PGM] > MODE > PRESET > MODEM > DATA RATE**. Choices are **75 to 120 k baud**.
- d. Go to menu **[PGM] > MODE > PRESET > MODEM > INTERLEAVE**. Choices are **LONG, MEDIUM, and SHORT**. The user should determine the optimal interleave length for the channel conditions and to obtain the best throughput.
- e. Go to menu **[PGM] > MODE > PRESET > MODEM > PREAMBLE**. Choices are **ULTRASHORT, SHORT, and LONG**.
- f. Go to menu **[PGM] > MODE > PRESET > MODEM > CONSTRAINT LENGTH**. Select the Forward Error Correction (FEC) length as either **7** or **9**.
 - **7** is same as used in MIL-STD-110B.
 - **9** allows better performance.

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Section	Page
ALE Radio Mode Overview	148
ALE Operations	152
ALE Options Operations	156
Program ALE	162

ALE RADIO MODE OVERVIEW

The paragraphs that follow provide information on Automatic Link Establishment (ALE) address, linking, voice compatibility, and data compatibility.

ALE Addresses and Linking

ALE permits HF stations to call and link on the best HF channel. Each radio in a network is assigned one or more unique addresses. Each address can be up to 15 alphanumeric characters. When not transmitting or linked, the radio constantly scans through its assigned frequencies listening for calls. Each address is assigned to a group of channels called a Channel Group. Addresses consist of:

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- Self Address - This is a radio's address. There may be several, up to 20. One 1 - 3 character self-address must be programmed.
- Individual Address - These are self addresses of other radios and are used for individual calls. Up to 200 may be programmed.
- Net Address - These are addresses assigned to a group of radios and are used for net calls in which the group of radios can all be called at the same time. Up to 20 may be programmed.
- ALL (Not Programmed) - Calling radio's 1 - 3 character self address appears on called radios. Called radios do not respond. (Channel group 0 must be programmed.)
- ANY (Not Programmed) - Called radios respond to calling radio with their 1 - 3 character self addresses. The 1 - 3 character self address appears on the calling radio. (Channel group 0 must be programmed.)
- Other Address - These are radio addresses (from a call or LQA sound) heard over-the-air and not in preprogrammed communication plans. This address is added to a list of observed addresses for quick selection.

- **Group Call** - Allows you to call more than one individual address. As opposed to a preprogrammed net address, you can choose the stations you want to call at the same time. Group calls are limited to a maximum of 12 stations.

A calling radio calls an individual or net address on a channel with the highest Link Quality Analysis (LQA) score (refer to [LQA Operations, p149](#)), if present. If scores are not available, the calls begin with the channel of the highest frequency. If no response is received, it tries a channel with the next lower score or next lower frequency. A called station (or group) that hears the call stops scanning and transmits a response to which the initiating radio will transmit an acknowledgement, establishing the link. This is for all call types, except for ALL calls. Both operators are notified that the link has been established and can begin passing traffic.

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LQA Operations

Channel scores are used by the radio to determine the best channels to use when placing automatic calls. These channel scores, based on link quality information, develop over time due to LQA Exchanges/Sounds, call successes and observed traffic.

A call may not link on the best channel if propagation conditions have changed since the last LQA. In order to link on the best channel, periodic LQAs should be performed throughout the day.

Net LQA

In net exchange LQAs, the receiving units transmit response messages in time slotted order. This may be a lengthy process for large nets. The response messages contain the scores measured by the net members during reception of the initial call message. The net LQA initiator measures signal quality during reception of the slotted responses and updates each member's score accordingly. No scores are sent in the acknowledgement message portion of a net LQA.

ALE Link Protection

ALE Level 1 linking protection is provided to prevent undesired disruption of ALE links. Linking protection scrambles ALE handshake signaling with the specified link protection key (14 character hexadecimal key) so that only a receiving station with the same link protection key can successfully interpret the signal. Refer to [Program ALE Configuration, p174](#) for information on creating link protection keys.

The default setting is off where linking protection is disabled. All stations using linking protection must share a common Time Of Day (TOD) reference. A Universal Time Coordinated (UTC) reference is recommended which can be acquired using Global Positioning System (GPS) or manually entered by the operator.

- 7** When using Level 1 link protection, failure to properly configure the link protection key and TOD will result in a failure to link. Stations with linking protection enabled will also be unable to interoperate with stations configured with linking protection disabled.

ALE Voice/Data Compatibility

Table 32 lists the voice and data capabilities of the RF-7800H-MP in ALE radio mode.

Table 32. ALE Voice/Data Compatibility

Encryption	USB	LSB	AME	Data	Voice	Frequency Range (MHz)
PT	x	x	x	OFF	CLR	1.5-29.9999
	x	x	-	SERIAL, MIL110B	DV6 ⁽¹⁾ , ME6 ⁽²⁾ , DV24 ⁽³⁾ , ME12 ⁽⁴⁾ , ME24 ⁽⁵⁾ , AVS ⁽⁶⁾	1.5-29.9999
	x	x	-	ARQ, 4285C/U	CLR, AVS	1.5-29.9999
Citadel/AES	x	x	-	SERIAL, MIL110B	DV6, ME6, ME12, DV24, ME24	1.5-29.9999
	x	x	-	ARQ, 4285C/U	NONE	1.5-29.9999

(1) Digital Voice 600 bps (DV6) using Linear Predictive Coding (LPC).

(2) Mixed Excitation Linear Prediction (MELP) 600 bps (ME6).

(3) Digital Voice 2400 bps (DV24).

(4) MELP 1200 bps (ME12).

(5) MELP 2400 bps (ME24).

(6) Analog Voice Security (AVS).

ALE OPERATIONS

ALE can automate selection of the best HF channel between two stations or a group of stations. Refer to [ALE Addresses and Linking, p148](#) for information on ALE addresses and how ALE determines the best channel.

To use ALE, you need to:

- [Select ALE Radio Mode, p152](#)
- [Place ALE Individual Call, p153](#)
- [Place ALE Net Call, p154](#)
- [Terminate an ALE Link, p155](#)
- [Placing an ALE Call to a Non-Programmed Station, p155](#) as needed

Select ALE Radio Mode

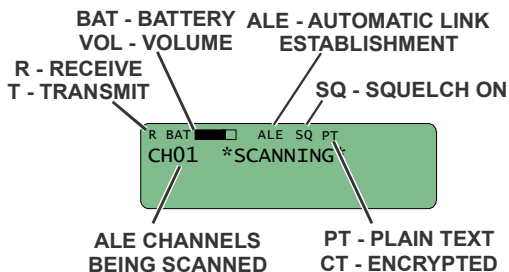
[Figure 45](#) shows an ALE scanning display. A system preset ties together programmed parameters such as radio mode (ALE), encryption, channel, or net information, voice/data settings, and modems. To select ALE radio mode:

NOTE

If **[CLR]** key is pressed during ALE scanning, the radio stops scanning and will not receive an ALE call on another channel. Press **[CLR]** again to resume scanning.

- a. Press **[MODE]** until **ALE** appears on display, then press **[ENT]**.
- b. Observe:
 - **SCANNING** appears.
 - Each ALE channel appears briefly on the left.
 - **ALE** appears.
 - **R** appears when receiving or when ready to receive.

- **BAT** appears with battery level unless volume is being adjusted.
- c. Use **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted.



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Figure 45. ALE Scanning Screen**Place ALE Individual Call**

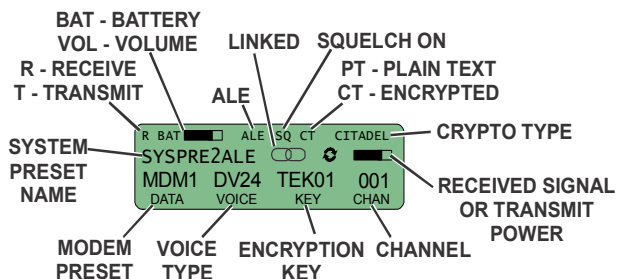
An individual call is used to establish communications (connection) between two stations. An individual call may be placed to any programmed individual address:

- Press **[CALL]** to display **CALL TYPE** of **AUTOMATIC** or **MANUAL**.
- Use **▼** or **▲** to select **AUTOMATIC** and press **[ENT]**.

AUTOMATIC allows the radio to attempt the call on all channels in the channel group according to LQA scores or from the highest frequency to lowest frequency if no LQA score data exists.

If **MANUAL** is selected, you must select the channel to be used. The ALE call will be attempted on this channel, and if the called station is not reachable, the call ends.

- c. Use ▼ or ▲ to select **INDIVIDUAL** and press [ENT].
- d. Use ▼ or ▲ to select the individual address and press [ENT].
When an ALE link is established, several short beeps occur as the screen shown in [Figure 46](#) appears. The programmed system preset for the self address can then be used.
- e. The link can be terminated per [Terminate an ALE Link, p155](#).



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Figure 46. ALE Linked Screen

Place ALE Net Call

A net call is used to establish communications between several stations:

- a. Press [CALL] to display call type of **AUTOMATIC** or **MANUAL**.
- b. Use ▼ or ▲ to select **AUTOMATIC** and press [ENT].

AUTOMATIC allows the radio to attempt the call on all channels in the channel group according to LQA scores or from the highest frequency to lowest frequency if no LQA score data exists.

If **MANUAL** is selected, you must select the channel to be used. The ALE call will be attempted on this channel, and if the called stations are not reachable, the call ends.

- c. Use ▼ or ▲ to select **NET** and press [ENT].
- d. Use ▼ or ▲ to select the net address and press [ENT].

RESPONSE FROM <address> appears as each net member responds to the call. When an ALE link is established, the screen shown in [Figure 46](#) appears. The programmed system preset for the self address can then be used.

- e. The link can be terminated per [Terminate an ALE Link, p155](#).

Place ALE ANY, ALL, or Group Call

These calls are placed in the same manner as [Place ALE Individual Call, p153](#). Refer to [ALE Addresses and Linking, p148](#) for description of these address types.

Terminate an ALE Link

Perform the following procedure to terminate an ALE link:

- a. To terminate the ALE link, press [CLR] from the preset screen.
- b. The R/T will display the **TERMINATE LINK** menu. To terminate the link, scroll to **YES** and press [ENT].

After the link has been terminated, the RF-7800H begins scanning ALE channels again.

Placing an ALE Call to a Non-Programmed Station

An individual call can be used to establish a connection between two stations in unrelated nets. The individual call may be placed to any individual address that is in the theater communication plan and not in the calling station's individual address list. The limitation is that the calling radio can only perform a manual call. The calling station must call on one manual channel at a time that is being scanned by the receiving station. This is a hit and miss technique, but can be very effective in calling

outside the immediate net hierarchy. To place an ALE call to a non-programmed station:

- a. Press **[CALL]** to display **CALL TYPE** of **AUTOMATIC** or **MANUAL**.
- b. Use ▼ or ▲ to select **MANUAL** and press **[ENT]**.
- c. Use ▼ or ▲ to select **INDIVIDUAL** and press **[ENT]**.
- d. Press **[0]** (↻) and type in the desired individual address to call and press **[ENT]**.
- e. Enter the desired channel to call and press **[ENT]**.
- f. The RF-7800H begins transmitting to the selected address.

7 An other address being visible in the menus depends on whether or not the radio communicated with a radio with an other address from a call or Link Quality Analysis (LQA) sound. If the radio is power cycled after communications with the other address, the address will no longer be visible.

ALE OPTIONS OPERATIONS

The paragraphs that follow provide instructions on more ALE options.

NOTE

To access the **ALE** menu under **[OPT]**, you must be in ALE radio mode.

Perform LQA Exchange

In an exchange LQA, the selected station(s) also transmit data so the station initiating the exchange also receives LQAs. You may want to consider a sound LQA ([Perform LQA Sound, p157](#)). See [Figure 47](#). To start an exchange LQA:

- a. Choose **[OPT] > ALE > LQA > EXCHANGE**.
- b. Use ▼ or ▲ to scroll through the individual, net, or other addresses and press **[ENT]**.

The radio tries to exchange with the selected station(s) on all frequencies in the channel group associated with the address.

- c. After the LQA is completed, the radio returns to scanning. (Refer to [View LQA Scores, p157.](#))

Perform LQA Sound

In a sound LQA, the initiating station does not receive the LQA. The receiving stations do not transmit so radio silence can be observed. See [Figure 47](#). Perform the following procedure to select sound:

- a. Choose **[OPT] > ALE > LQA > SOUND.**
- b. Use ▼ or ▲ to scroll through the self addresses and press **[ENT]**. (You need to be aware of which self address was associated with the individuals or net addresses during programming.)

The radio initiated the sound transmits a one-way sounding signal on all channels in the channel group for that self address.

The RF-7800H-MP transmits a sound transmission on each channel in the current channel plan. Other net members receiving the sound transmission automatically update their scores for the station transmitting the sound on each channel in which the sound was received.

After the LQA is completed, the radio returns to scanning. (Refer to [View LQA Scores, p157.](#))

View LQA Scores

Viewing scores generated during an LQA allows the operator to make decisions on manual frequency selection or for diagnosing ALE problems. To view LQA scores:

- a. Choose **[OPT] > ALE > SCORES > REVIEW.**
- b. Use ▼ or ▲ to scroll through the individual or other addresses and press **[ENT]**.

- c. Use ▼ or ▲ to scroll through the channels and available scores.
- d. Press **[CLR]** repeatedly or **[OPT]** to return to ALE scanning.

Zeroize LQA Scores

Pre-deployment radio checks can generate channel scores that do not reflect the conditions that will be seen during deployment. Use of these channel scores can lead to less than optimal channel selection once the radios are deployed. To ensure calls are placed on only the appropriate channels, use the Zeroize Score option after pre-deployment checks are complete and before using the deployed radios.

Perform the following to zeroize channel scores:

- 7**
- a. Choose **[OPT] > ALE > SCORES > ZERO_SCORES** and press **[ENT]**. The radio briefly responds with **ALE LQA SCORES ZEROIZED** to confirm that the scores have been zeroized.

Transmit Preprogrammed AMD Message

NOTE

Automatic Message Display (AMD) messages use a maximum of 90 characters and are not encrypted.

To transmit preprogrammed AMD messages:


- a. Choose **[OPT] > ALE > TX_MSG > TX MESSAGE TO SEND**.
- b. Use ▼ or ▲ to scroll through the preprogrammed Automatic Message Display (AMD) messages and press **[ENT]**.

If a message was not programmed, **NO TX MESSAGES** is displayed. Refer to [Program ALE AMD, p180](#) for information on programming AMDs.

- c. For **SEND TX MESSAGE?**, use ▼ or ▲ to select **YES** and press **[ENT]**.
- d. For **CALL TYPE**, use ▼ or ▲ to select either **AUTOMATIC** or **MANUAL** and press **[ENT]**.

If **AUTOMATIC** is selected, the radio uses the LQA scores to automatically determine which channel to use when transmitting the AMD message. If **MANUAL** is selected, you can specify which channel to use when transmitting the AMD message.

- e. For **ADDRESS TYPE**, select **INDIVIDUAL**, **OTHER**, **NET**, **GROUP**, **ALL** or **ANY**, and press **[ENT]**.

Press **[0]** () instead of **[ENT]** to enter Individual Addresses that are not preprogrammed.

- f. Use ▼ or ▲ to scroll through the programmed individual addresses and press **[ENT]**. The AMD message will then be transmitted to that individual address.

View a Received AMD Message

The message scrolls across the front panel when it is being received. Automatic display of messages are one by default but can be disabled ([Program ALE Configuration, p174](#)). To view received AMD messages:

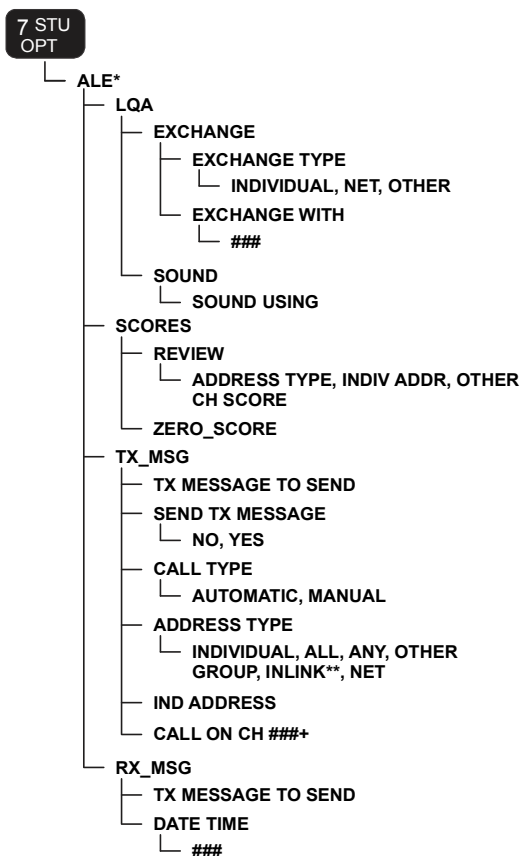
- a. Choose **[OPT] > ALE > RX_MSG**.
- b. Use ▼ or ▲ to scroll through the received AMD messages and press **[ENT]**.
- c. Use ▼ or ▲ to view an entire AMD message that is too long to view on the front panel at one time.
- d. Press **[CLR]** repeatedly to return to the ALE scanning screen.

ALE AMD In-Link Calls

See [Figure 47](#). The ALE AMD In-Link Call allows a radio to broadcast an AMD message to all radios with which it is currently linked. The In-Link Call simplifies the sending of AMD messages within an ALE link because there is no need to specify the destination address when placing the call. In-Link calls cannot be initiated or received when the radio is not linked.

Perform the following to place an In-Link AMD Call:

- a. Choose **[OPT] > ALE > TX_MSG**. The current **TX MESSAGE TO SEND** setting appears.
- b. Use ▼ or ▲ to scroll through the preprogrammed AMD messages and press **[ENT]**.
- c. For **SEND TX MESSAGE?**, use ▼ or ▲ to select **YES** and press **[ENT]**.
- d. For **CALL TYPE**, use ▼ or ▲ to select either **AUTOMATIC** or **MANUAL** and press **[ENT]**.
- e. For **ADDRESS TYPE**, select **INLINK** and press **[ENT]**. The radio will begin to transmit the AMD.
- f. Once the transmission is complete, the radio displays a **LINKED TO** screen.



*RADIO MUST BE IN ALE

**RADIO MUST BE LINKED IN ALE

+MANUAL CALL

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Figure 47. ALE Option Menu Tree

PROGRAM ALE

The paragraphs that follow provide information on programming ALE. Presets must be programmed in the order shown:

- Program Preset Channel, p116
- Program Preset Modem, p118
- Program ARQ, p131 or Program XDL, p134, if used
- Program System Preset, p125

ALE Tips

Although ALE takes much of the guesswork out of using HF, a little knowledge of HF propagation goes a long way to ensure efficient ALE linking and reduce unnecessary on-the-air time. Some tips for ALE include:

- Keep channel groups to a nominal size of about 10.
- Do not use max channels to scan value much higher than the greatest number of channels in any channel group.
- You may want to use daytime and nighttime plans to use fewer channels.
- Do not use channels that may not work for your time of day, communications range, or sunspot number.
- Use a basestation for sounding LQA several times a day.

Program ALE Channel Group - Add Channel Group

Channel groups are restricted to 20 channels if programming radio with the Communications Planning Application (CPA). To add a channel group, see [Figure 48](#) and choose **[PGM] > MODE > ALE > CHAN_GROUP**.

Program ALE Channel Group - Review or Modify Channel Group

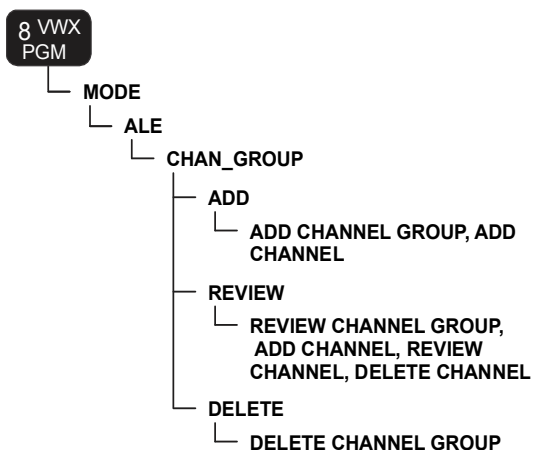
No channels or channel groups are present if not previously added. To add, review, or modify a channel group, see [Figure 48](#) and choose **[PGM] > MODE > ALE > CHAN_GROUP**.

Program ALE Channel Group - Review Channel Group - Delete Channel

To delete a channel from a channel group, see [Figure 48](#) and choose **[PGM] > MODE > ALE > CHAN_GROUP**.

Program ALE Channel Group - Delete Channel Group

No channels or channel groups are preset if not previously added. To delete a channel group, see [Figure 48](#) and choose **[PGM] > MODE > ALE > CHAN_GROUP**.



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Figure 48. Program ALE Channel Group Tree

ALE Address Programming

Each address can be up to 15 alphanumeric characters, but after faster performance, can be obtained by using less characters (typically three or less). Channel groups need to be defined prior to programming of the self addresses. Addresses are defined by the following:

- **Self Address** - This is a radio's address. There may be several. One must be 1 - 3 characters. Additional self addresses may be up to 15 characters long. Up to 20 can be programmed.
- **Individual Address** - These are self addresses of other radios and are used for individual calls. Individual addresses can only be programmed after at least one self address has been programmed. Up to 200 can be programmed.
- **Other Address** - These are radio addresses heard over-the-air and not in pre-programmed communication plans. This address is added to a list of observed addresses for quick selection. Upon receiving a call or LQA Sound from an ALE address, the radio checks to see if the sound or call came from an address in its individual address table. If the address is not in the individual address table, the radio temporarily stores this address in the other address list, along with its LQA information. The self address of the radio that performed the call or sound is stored as an other address in the radio that received the call or sound. The radio can store up to 50 other addresses. Other addresses are not stored in Non-Volatile Random Access Memory (NVRAM), and will be lost upon radio power cycle. Other addresses cannot be assigned a self address or assigned as a member in a Net or Group address.
- **Net Address** - These are addresses assigned to a group of radios and are used for net calls in which the group of radios can all be called at the same time. Each radio in a net address is a net member. Net addresses can only be selected after at least one individual address has been programmed. Up to 20 can be programmed.

Longer addresses will take longer to transmit. Addresses are transmitted in three character groups, so that a four character address takes as long to transmit as a six character address, not as long as a seven character address, and longer than a three character address. Each address must be assigned a channel group, but two or more addresses may use the same channel group.

Program ALE Address - Add Self Address

Channel groups should be defined prior to programming of the self addresses. Each station is permitted to have up to 20 different self addresses. Self addresses should be programmed before individual address. A 1-3 character address must be programmed, especially if the desired self address is longer than three characters. To add a self address, see [Figure 49](#) and choose **[PGM] > MODE > ALE > ADDRESS**.

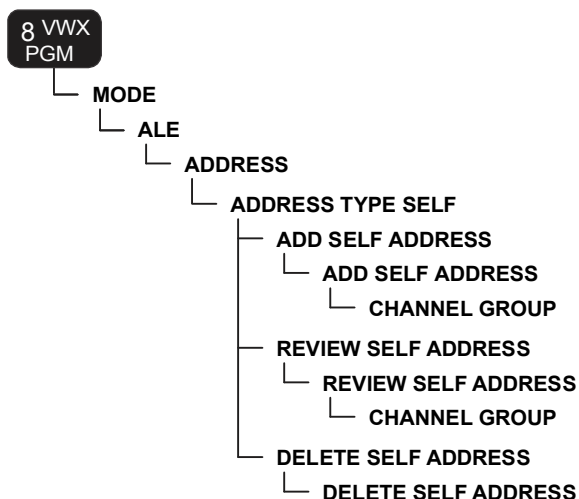
7

Program ALE Address - Review Self Address

To review an existing self address, see [Figure 49](#) and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Delete Self Address

To delete a self address, see [Figure 49](#) and choose **[PGM] > MODE > ALE > ADDRESS**.



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Figure 49. Program ALE Address - Self Address Tree

Program ALE Address - Add Individual Address

A self address must be programmed for the individual address menus to appear. To add an individual address, refer to [Table 33](#), see [Figure 50](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Review Individual Address

To review an individual address, refer to [Table 33](#), see [Figure 50](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

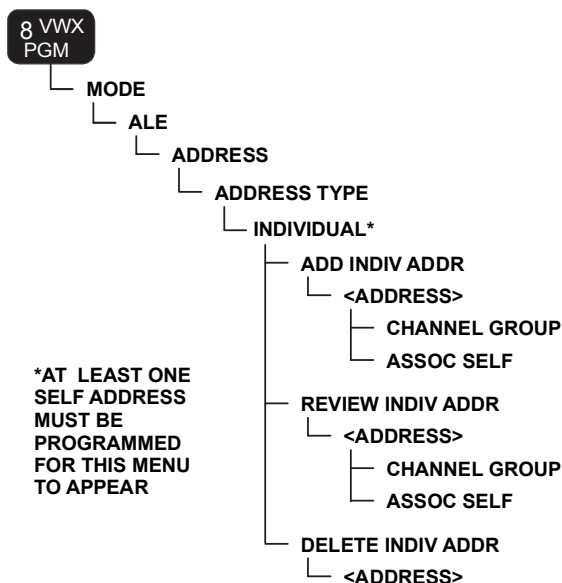
Program ALE Address - Delete Individual Address

To delete an individual address, refer to [Table 33](#), see [Figure 50](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Table 33. Program ALE Address - Individual Address Settings

Menu Item	Options	Remarks
ADD	XXXXXXXXXXXXX XXX	Individual address can be up to 15 characters in length. NOTE: ALE converts addresses into three-character bundles. Because of this, an address that is four characters long takes as long to transmit as an address that is six characters long.
DELETE	XXXXXXXXXXXXX XXX	Delete a programmed Individual address. Press [ENT] to delete, or [CLR] to exit without deleting. NOTE: If Individual addresses are deleted or re-added out of sequence, ALE may not operate or may appear to operate sporadically.
REVIEW	XXXXXXXXXXXXX XXX	Review a previously-programmed Individual Address and its associated Self Address and Channel Group.
CHANNEL GROUP	00-49	Assign a pre-programmed Channel Group to this Individual address.
ASSOC SELF	XXXXXXXXXXXXX XXX	Assign a pre-programmed Self Address to this Individual address. This is the address you identify yourself with when you call the individual address.

7



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Figure 50. Program ALE Address - Individual Address Tree

Program ALE Address - Review Other Address

An Other address is a radio address from a call or LQA sound heard over-the-air and not in preprogrammed communication plans. This address is added to a list of observed addresses for quick selection. To review an Other address, refer to [Table 34](#), see [Figure 51](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Transfer Other Address

To transfer an Other address to a permanently stored Individual address, refer to [Table 34](#), see [Figure 51](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Delete Other Address

To delete an Other address, refer to [Table 34](#), see [Figure 51](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Table 34. Program ALE Address - Other Address Settings

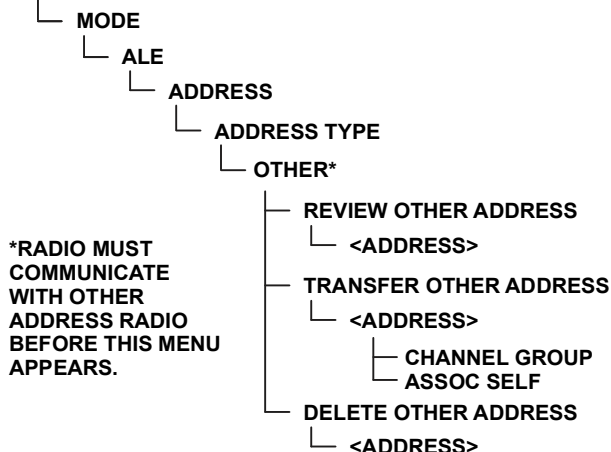
Menu Item	Options	Remarks
REVIEW	XXXXXXXXXXXX XXX	Radio must communicate with Other address radio before this menu appears. Review list of Other addresses communicated with and associated Self Address.
TRANSFER	Transfer option only available for Other Address settings.	Transfer Other address. <ul style="list-style-type: none"> Other Address is converted (transferred) to a permanently stored Individual address. Assign the newly created Individual address, a Self address, and Channel group. The address can be reviewed/used under the Individual address list and will be automatically deleted from the Other address list. NOTE: Other addresses cannot be assigned a Self address, or assigned as a member in a Net or Group address.

Table 34. Program ALE Address - Other Address Settings (Contin-

Menu Item	Options	Remarks
DELETE	XXXXXXXXXXXX XXX	Delete an Other address.
CHANNEL GROUP	0-49	Assign a preprogrammed Channel Group to the newly created Individual Address.
SELF	XXXXXXXXXXXX XXX	Assign a pre-programmed Self Address to the newly created Individual Address.

7

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PGM



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Figure 51. Program ALE Address - Other Address Tree

Program ALE Address - Add Net Address

To add an ALE net address, refer to [Table 35](#), see [Figure 52](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Change Channel Group of a Net Address

To change the channel group of a net address, refer to [Table 35](#), see [Figure 52](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Change Associated Self Address

To change the associated self address of a net address, refer to [Table 35](#), see [Figure 52](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Add Net Member

To add a net member, refer to [Table 35](#), see [Figure 52](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

7

When all available addresses have been added to the net, dashes are displayed. Net address requires all stations be programmed identically. The order of net members **must be the same in all radios on the net** to allow for proper communication. Review address in all radios by scrolling the list in the same direction. Use of the CPA ensures the proper order in all radios.

Program ALE Address - Review Net Member

To review a net member, refer to [Table 35](#), see [Figure 52](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Delete Net Address

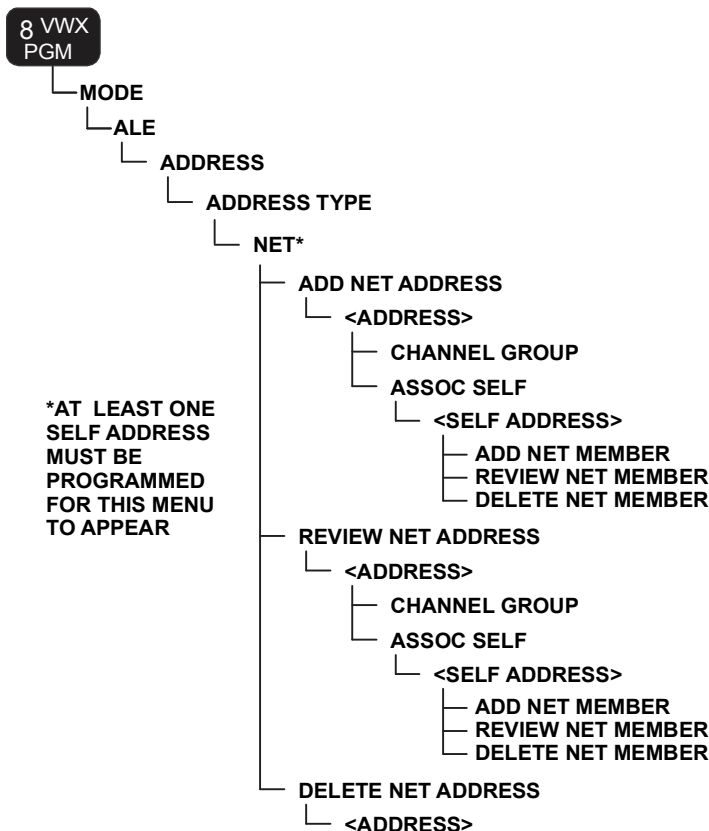
To delete a net address, refer to [Table 35](#), see [Figure 52](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Program ALE Address - Delete Net Member

To delete a net member, refer to [Table 35](#), see [Figure 52](#), and choose **[PGM] > MODE > ALE > ADDRESS**.

Table 35. Program ALE Address - Net Address Settings

Menu Item	Options	Remarks
NET ADDRESS		
CHANNEL GROUP	0-49	Assign a pre-programmed Channel Group to this Net address.
ASSOC SELF	XXXXXXXXXXXXXXX	Assign a pre-programmed Self Address to this Net address.
ADD	XXXXXXXXXXXXXXX	Net addresses can be up to 15 characters in length. NOTE: ALE converts addresses into three-character bundles. Because of this, an address that is four characters long takes as long to transmit as an address that is six characters long.
DELETE	XXXXXXXXXXXXXXX	Delete a programmed Net address.
REVIEW	XXXXXXXXXXXXXXX	Review a previously-programmed Net Address and its associated Self Address, Channel Group, and Net Members.
NET MEMBER		
ADD	XXXXXXXXXXXXXXX	Assign a preprogrammed address to this net member. NOTE: One Self Address must be associated with a net; the remaining associated addresses are selected from the pre-programmed Individual addresses.
DELETE	XXXXXXXXXXXXXXX	Delete a programmed Net member.
REVIEW	XXXXXXXXXXXXXXX	Review a previously-programmed Net Member and its associated Self Address, Channel Group, and Net Address.



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Figure 52. Program ALE Address - Net Address Tree

Program ALE Configuration

To configure the ALE parameters, refer to [Table 36](#), see [Figure 53](#), and choose **[PGM] > MODE > ALE > CONFIG**.



CAUTION

Link to Any/All allows an unknown person to connect to the radio without knowing if that person is friend or foe.

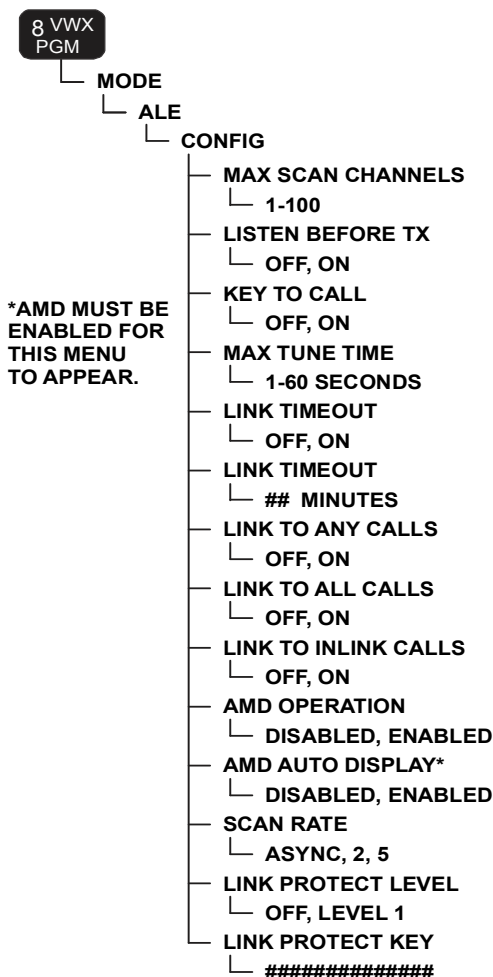
The **SCAN RATE** setting should be the same for all radios in the net.

Table 36. Program ALE Configuration Settings

Menu Item	CONFIG (ALE)
MAX SCAN CHANNELS	Tells the calling radio station how long to call so that the receiving station(s) have time to complete scan cycle. Number should be maximum number of channels scanned by any radio that the current radio may want to call.
LISTEN BEFORE TX	This function forces the radio to monitor for ALE traffic on the selected channel before it makes an ALE call.
KEY TO CALL	This function allows the operator to simply key the handset to place an ALE call to the last address called.
MAX TUNE TIME	This parameter sets the length of time the calling station waits for the target to tune its antenna coupler, power amplifier, etc., and respond to a call.
LINK TIMEOUT	When set to ON , this feature returns the radio from linked to scan if the radio has not been keyed or has not received an ALE signal for this specified period of time. When set to OFF , the operator must return the radio to scan manually.
LINK TIMEOUT MINUTES	Appears when link timeout is enabled. Set time before link timeout occurs between 1 and 60 minutes.

Table 36. Program ALE Configuration Settings (Continued)

Menu Item	CONFIG (ALE)
LINK TO ANY CALLS	This function enables or disables link to ANY call in receive. Operator can still place ANY call.
LINK TO ALL CALLS	This function enables or disables link to ALL call in receive. Operator can still place ALL call.
LINK TO INLINK CALLS	This function enables or disables link to INLINK call in receive. Operator can still place INLINK call.
AMD OPERATION	Enables or disables AMD function.
AMD AUTO DISPLAY	Enables or disables automatic scrolling display of received messages on the front panel. When disabled, you can still use the menus to manually view the messages.
SCAN RATE	This function sets the rate that the frequencies will be scanned. 2: Scans at two channels per second. 5: Scans at five channels per second. ASYN: Scans at least seven channels per second or faster. NOTE: The scan rate setting is also affected by the power source (battery or vehicle power) and external equipment.
LINK PROTECT LEVEL	Enables or disables ALE Level 1 Linking Protection (OFF = disable, Level 1 = enable).
LINK PROTECT KEY	Configures the Link Protection key, a 14-digit hexadecimal number.



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Figure 53. Program ALE Configuration Tree

Program ALE LQA

The Receiver/Transmitter (R/T) uses LQA to predict the quality of the radio channels. Each channel score is a weighted average of Signal + Noise + Distortion to Noise + Distortion Ratio (SINAD) and Bit Error Rate (BER) accumulation over the entire signaling interval. The score ranges from zero (0) to 100, where 100 is the best score. LQAs consist of exchange and sound. Exchanges are bi-directional. Each station transmits so both (or all in a net) can measure the link quality. Sounds are one-way transmissions and allow the receiving station to measure the link quality. The transmitting station will not receive LQA scores. The score received by the LQA slowly decreases by 10% every 15 minutes. The following paragraphs describe programming of LQAs.



WARNING

RF shock could occur from coming into contact with the antenna while radio is transmitting. Radio could transmit without any key presses during operations such as 3G, Voltage Standing Wave Ratio (VSWR) test, IP, data operations, LQAs, etc.

7

Program ALE LQA - Add LQA Sound

To add an LQA sound, see [Figure 54](#) and choose [PGM] > MODE > ALE > LQA.

NOTE

A repeat interval of 00:00 causes only one sound to be performed at the offset time.

Program ALE LQA - Review LQA Sound

To review an LQA sound, see [Figure 54](#) and choose [PGM] > MODE > ALE > LQA.

Program ALE LQA - Delete LQA Sound

To delete an LQA sound, see [Figure 54](#) and choose [PGM] > MODE > ALE > LQA.

Program ALE LQA - Add LQA Exchange with Individual Address

To add an LQA exchange with an individual address, see [Figure 54](#) and choose **[PGM] > MODE > ALE > LQA**.

NOTE

A repeat interval of 00:00 causes the exchange to be invalid as one sound is to be performed at the offset time.

Program ALE LQA - Review LQA Exchange with Individual Address

To review an individual LQA exchange, see [Figure 54](#) and choose **[PGM] > MODE > ALE > LQA**.

7

Program ALE LQA - Delete LQA Exchange with Individual Address

To delete an LQA exchange with an individual address, see [Figure 54](#) and choose **[PGM] > MODE > ALE > LQA**.

Program ALE LQA - Add LQA Exchange with Net Address

To add a net LQA exchange, see [Figure 54](#) and choose **[PGM] > MODE > ALE > LQA**.

A repeat interval of 0 causes only one exchange to be performed at the start time.

Program ALE LQA - Review LQA Exchange with Net Address

To review a net LQA exchange, see [Figure 54](#) and choose **[PGM] > MODE > ALE > LQA**.

NOTE

A repeat interval of 00:00 causes the exchange to be invalid as one sound is to be performed at the offset time.

Program ALE LQA - Delete LQA Exchange with Net Address

To delete a LQA exchange with net address, see [Figure 54](#) and choose **[PGM] > MODE > ALE > LQA**.

8 VWX
PGM

MODE

ALE

LQA*

LQA TYPE

SOUND

ADD SOUND USING

<ADDRESS>

OFFSET TIME
REPEAT INTERVAL

REVIEW SOUND USING

<ADDRESS>

OFFSET TIME
REPEAT INTERVAL

DELETE SOUND USING

<ADDRESS>

EXCHANGE

EXCHANGE TYPE

INDIVIDUAL, NET

ADD EXCHANGE WITH

EXCHANGE TYPE

INDIVIDUAL, NET

<ADDRESS>

OFFSET TIME
REPEAT INTERVAL

REVIEW EXCHANGE WITH

<ADDRESS>

OFFSET TIME
REPEAT INTERVAL

DELETE EXCHANGE WITH

<ADDRESS>

*LQA CAUSES
RADIO TO KEY
WITHOUT USER
ACTION

7

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Figure 54. Program ALE LQA Tree

Program ALE AMD

The RF-7800H-MP has ten slots for **TX AMD** messages and ten slots for **RX AMD** messages. Each message can be up to ninety characters in length. An AMD message is saved in the RF-7800H-MP until the message is deleted or the RF-7800H-MP is zeroized.

NOTE

AMD messages are not encrypted over the air.

NOTE

Receive AMD messages are lost if more than ten are received. The oldest ones are overwritten.

7

Program ALE AMD - Create a Transmit AMD Message

To program an AMD message for transmission, see [Figure 55](#) and choose **[PGM] > MODE > ALE > AMD > TX_MSG > EDIT**.

Edit operation and index of the TX message (0 through 9) appear in the top line of the display as the messages are being scrolled.

NOTE

When creating and editing a message, the following special keystrokes are available. Press **►** twice to add a space character after the last character entered. Press **[0]** several times to insert zero, space, or punctuation characters. The sequence of 0 key characters is as follows: **0 <space> , . ' " / \ _ : ; * & ! ? @ # \$ % + - = < > ^ () []**

Program ALE AMD - Edit a Transmit AMD Message

To edit an AMD message for transmission, see [Figure 55](#) and choose **[PGM] > MODE > ALE > AMD > TX_MSG > EDIT**.

Program ALE AMD - Review a Transmit AMD Message

To review an AMD message for transmission, see [Figure 55](#) and choose **[PGM] > MODE > ALE > AMD > TX_MSG > REVIEW**.

Program ALE AMD - Delete a Transmit AMD Message

To delete an AMD message, see [Figure 55](#) and choose **[PGM] > MODE > ALE > AMD > TX_MSG > DELETE**.

Program ALE AMD - Review a Received AMD Message

To review a received AMD message, see [Figure 55](#) and choose **[PGM] > MODE > ALE > AMD > RX_MSG > REVIEW**.

NO RX MESSAGE is displayed if there are no receive messages available to review.

7

Program ALE AMD - Copy a Received Message for Transmission

Use this operation to create a transmit message from a received message.

To copy a received AMD message for transmission, see [Figure 55](#) and choose **[PGM] > MODE > ALE > AMD > RX_MSG > COPY**.

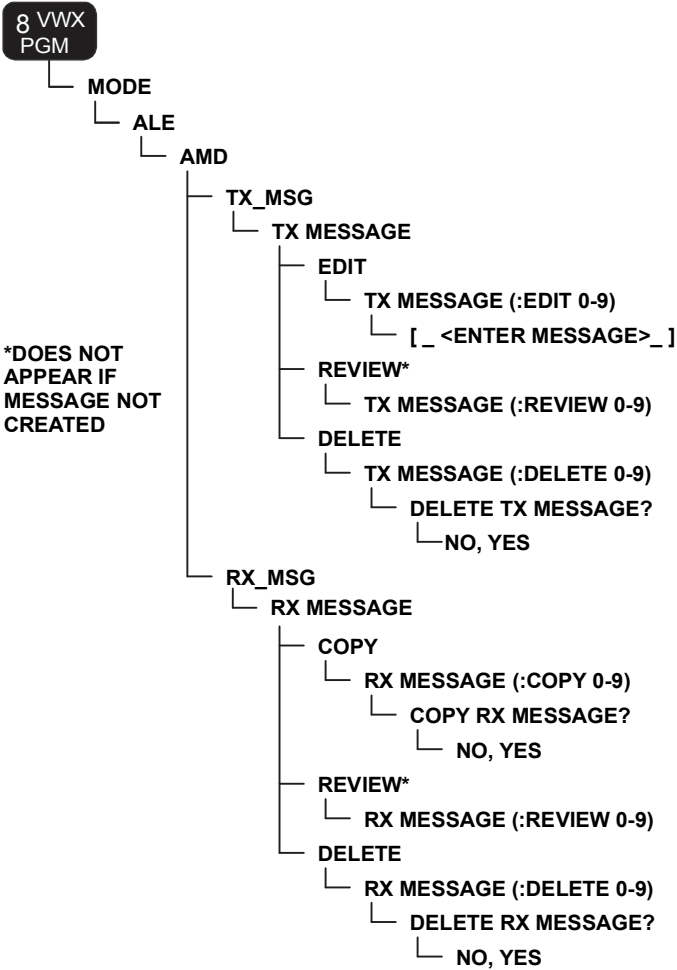
NOTE

Copy operation and the index of the RX message appear on the top line of the display.

Program ALE AMD - Delete a Received AMD Message

To delete a received AMD message, see [Figure 55](#) and choose **[PGM] > MODE > ALE > AMD > RX_MSG > DELETE**.

7



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Figure 55. Program ALE AMD Tree

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3G/3G+ RADIO MODE OVERVIEW

The RF-7800H-MP's third generation HF communication protocol (3G) radio mode provides a subset of the capabilities and protocols defined by STANAG-4538.

3G Compared to ALE

Some of the 3G radio mode improvements are:

- Faster link setup
- Linking at lower Signal-to-Noise Ratios (SNR)
- Improved network channel efficiency
- Link setup signaling and data traffic use the same family of high-performance serial waveforms
- Higher throughput for data messages
- Use of different channel plans for frequency security and close propagation matching
- Pretuning of channels to reduce tune times in linking

Compared to ALE, 3G differences consist of the following:

- Synchronous channel scanning
- Uses Short Message Service (SMS) instead of Automatic Message Displays (AMDs)
- No associated self addresses
- No 1-3 character self address
- No ALL or ANY wildcards
- No maximum channels to scan
- ALE uses channels 000 through 099; 3G uses 62 indexed channels numbered 100 and higher.
- 3G requires TOD server time sync broadcast or Global Positioning System (GPS).

- 3G has Last Ditch Voice (LDV) feature that allows the radio to deliver digital voice across a channel that normally would not support digital voice error free.

3G Synchronization

The current synchronization state is displayed at the far right above SYNC. The front panel shows AUTO sync when the internal GPS receiver obtains current GPS time from the GPS satellites. If the radio's GPS antenna is disconnected or the radio ceases to receive the GPS time signals, the radio continues to show AUTO sync with the Synchronization (SYNC) meter bar gradually getting smaller as the SYNC quality fades.

If an outstation radio without GPS time obtains SYNC (over-the-air) from a Time Of Day (TOD) server radio with a current GPS time reference, the radio displays MAN. The radio's SYNC meter bar also gets smaller as the SYNC quality fades.

After acquiring synchronization, the outstation radio has a definite period of time that can be relied upon to remain in synchronization, even if it does not receive any TOD updates during this time period. Specifically, an RF-7800H-MP without GPS remains synchronized for approximately 20 minutes while it is powered off, and more than 48 hours while it is powered on.

NOTE

The 20 minute synchronization is the worst case minimum rating. Actual (Power Off) synchronization may be retained for significantly longer periods of time than the 20 minute minimum, however, this period depends on the radio hardware version and whether or not the radio is configured to be a TOD server.

The width of the bar in the sync meter display indicates what fraction of this time remains before the radio can no longer be assumed to be in sync. Immediately after the RF-7800H-MP is synchronized, the bar occupies the full width of the sync meter display. When the bar

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3G/3G+

disappears, the RF-7800H-MP is no longer reliably synchronized and communications linking times will be increased. Frequent 3G calls to the TOD server keeps the time sync at 100%.

NOTE

A radio that has lost sync can still place an async 3G call and communicate.

TOD Server

TOD characteristics consist of the following:

- One designated station per net
- Time gained manually or by GPS - ZULU Universal Time Coordinated (UTC) should be used
- Answers automatically to sync requests from 3G net members - if not calling
- All outstation radios must be ± 7 minutes of TOD server, if not calling or in an active link
- TOD server role - base - all others are designated as TOD Role - outstation
- Can be programmed to periodically send TOD sync on a scheduled interval

NOTE

TOD synchronization is not required to communicate during emergency operations, but if TOD sync is not maintained, linking time will be increased.

About Auto Tune and Auto Sync Request

These parameters permit you to allow or prevent the RF-7800H-MP to automatically transmit as a part of the normal 3G control.

AUTO TUNE is performed whenever the radio is powered up in 3G radio mode or whenever 3G radio mode is exited and re-entered. When AUTO

TUNE/SYNC is disabled, the radio does not automatically tune on entry into 3G. Instead, the last line displays !!!!!TUNE REQUIRED!!!!!! If you do not manually tune the radio using the OPT key prior to attempting to use the radio for outgoing communications, you are prompted: TUNE REQ: TUNE NOW? If you select YES, a tune is performed before the next normal screen for the type of operation being requested. If you select NO, the next screen is displayed without performing the TUNE and operation at this point may be impaired.

AUTO SYNC REQUEST is performed on any TOD outstation radio whenever its SYNC quality goes to 0% (SYNC METER is empty). If AUTO TUNE/SYNC is enabled when this occurs, the radio automatically places a SYNC REQUEST to the TOD server. If the SYNC REQUEST is successful, the SYNC METER is restored to FULL. If the SYNC REQUEST fails, the radio attempts another AUTO SYNC REQUEST once every 15 minutes until it succeeds. If AUTO TUNE/SYNC is disabled, the radio does not try to regain SYNC on its own. You must initiate a manual SYNC REQUEST or the radio must receive a SYNC BCAST from the TOD server.

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Broadcast Sync

BROADCAST SYNC is used to transmit the current time reference from the TOD server to the outstations in the 3G net so the RF-7800H-MP radios in the net can become synchronized. Points to remember:

- Only sent from the TOD server
- Cannot be sent from a radio in the outstation role
- Brings all outstations who receive the message back to full sync
- Aligns TOD in outstations to the TOD server - the outstations must be within ± 7 minutes of the server time to hear the broadcast
- Sends on one channel
- Very robust signal used for reliability

RF-7800H-MP

3G/3G+

- Less reliable than BROADCAST SYNC-ALL since the single channel used may not be propagating well to all stations

Points to remember for BROADCAST SYNC - ALL consist of the following:

- Sends on all the channels in the channel plan
- Best method for initial startup of a 3G net
- Best method for syncing stations at varying distances beyond the limit of ground-wave propagation

Points to remember for Scheduled BROADCAST SYNC consist of the following:

- Only allowed in the TOD Server Radio of the 3G net
- Handles the chore of keeping the net in sync automatically
- Good backup to GPS use
- Method to use if no GPS exist or just one for the base
- Use a logical easily remembered time interval for outstations
- Brings all outstations back to full sync

Automatic broadcast can be scheduled by going to SCHED during programming - This is not active in an OUTSTATION radio.

HCMAC and FLSU 3G Protocols

High Capacity Media Access Control (HCMAC) is a link setup protocol similar to Fast Link Set Up (FLSU) of STANAG 4538. Both protocols are supported by the RF-7800H-MP in 3G. STANAG 4538 FLSU provides a robust linking capacity suitable for long-haul skywave propagation as well as during less demanding propagation conditions. HCMAC provides a slightly reduced robustness, but faster scan and faster linking. Limitations of HCMAC include:

- HCMAC requires 4 - 5 dB higher SNR - requires more favorable channel conditions for reliable operation than FLSU does. HCMAC operation should be reliable under the conditions

where Digital Voice 600 bps (DV6), Mixed Excitation Linear Prediction (MELP) 600 bps (ME6), and MELP 1200 bps (ME12) voice settings are reliable.

- HCMAC requires a propagation delay of less than 10 milliseconds - stations must be less than 1243 miles (2000 km) apart.
- A station programmed for HCMAC cannot communicate with a station programmed for FLSU. However, a station programmed with both FLSU and HCMAC can communicate in both plans if the appropriate one is selected.
- In HCMAC operation, the time period before sync is lost (sync meter bar goes to zero) is less than in operation using FLSU.

The operator determines whether FLSU or HCMAC is used by selecting a channel plan of type 4538 (FLSU) or HCMAC. The channel plan type (4538 or HCMAC) is specified as part of the channel plan when programming using the Communications Planning Application (CPA). For example, a channel plan using FLSU could be named DAY_4538 and a channel plan using HCMAC could be named DAY_HCMAC. The channel plan can then be selected as described in [Select 3G Channel Plan, p204](#).

8

Voice Call Break-In

While a data transfer is occurring between radios in 3G mode, the data transfer can be preempted to allow a voice call. The exception is if the radio is keyed with a serial modem (such as SER, MIL110B, or WBHF), it cannot be interrupted.

A front panel feature with 3G radio mode is that the call and option screens remain displayed even when status messages are being processed by the front panel. In 3G radio mode, a status message is displayed on the bottom line. In all other radio modes, the status messages are not currently displayed.

Sending IP Data

The RF-7800H-MP offers a wireless Internet Protocol (IP) capability that allows radio operators to make use of IP-based PC software applications. With the Harris Wireless Messaging Terminal (WMT), the radio can be fully integrated into a local or wide area network. When configured for IP data transfer, the radio delivers IP data packets to a remote radio station based on the routing information programmed into the radio. Applications should be tolerant of higher packet delivery latencies that occur as a result of difficult HF channels.

Once the RF-7800H-MP has been programmed with a configuration that supports sending IP data, the radio is placed in 3G radio mode and synchronized. After synchronization, any IP data entering the radio via the Point-to-Point Protocol (PPP) interface is processed and may be automatically routed to a remote station depending upon the destination address and the current state of the channel. If the channel, destination station or local station is busy, the radio queues outgoing data packets. Once the channel is determined to be available, the radio attempts to use the channel to send the queued packets, provided the packets have not expired.

Packets received by the radio are routed according to the routes specified in the radio's routing table. Packets received that cannot be routed according to data in the routing table are discarded so that they do not continue to propagate throughout the communications system.

IP data may be delivered using either an Automatic Repeat Request (ARQ) (acknowledged) or non-ARQ (unacknowledged) transfer. You can specify by selecting a system preset programmed for one of these two methods.

Sending IP data requires use of 3G. The Variable Data Link (XDL) modem is recommended unless multicast/broadcast is desired. The CPA is required for programming the RF-7800H-MP.

NOTE

Data incoming on the PPP interface is routed based on the radio's routing table for both Plain Text (PT) and Cipher Text (CT).

Because of HF's limited bandwidth, sending data traffic over an HF channel can be extremely time consuming, and can tie up an HF channel for an extended period. It is the responsibility of the network planner and radio operator to limit the amount of IP data traffic that is propagated via the wireless HF network.

3G Voice/Data Compatibility

Table 37 lists the voice and data capabilities of the RF-7800H-MP in 3G and 3G+ radio modes.

Table 37. 3G Voice/Data Compatibility

Encryption	Data (3G)	Voice (3G, 3G+)
PT	MIL-110B, SERIAL, Variable Data Link (XDL), WBHF	DV6, ME6, DV24, ME12, ME24, AVS, CLR
Citadel/AES	MIL-110B, SERIAL, XDL, WBHF	DV6, ME6, DV24, ME12, ME24

3G+ Overview

3G+ allows the radio to receive and place ALE calls while operating in 3G mode. While scanning in 3G+, the radio monitors each channel for both ALE and 3G signals. This is useful for interoperability with radios that support ALE calling but do not support 3G (STANAG 4538) calls. When a radio is enabled for 3G+ operation, the valid channel range for 3G and 3G+ operating modes shifts from 100-162 to 1-62. This channel range shift is required to support operation within the valid ALE range of channels. ALE does not allow channel group assignments above channel 99. The radio scratch pad channel (0) is excluded from use as a selectable 3G+ channel since the on-the-fly reprogramability of the scratch pad channel makes its use unreliable for 3G+.

3G/3G+ OPERATIONS

3G quickly establishes its links by use of synchronized channel scanning. Linking can occur at lower Signal-To-Noise Ratios (SNR) than ALE. LQAs can also be performed to determine optimum operating frequency. Refer to [3G/3G+ Radio Mode Overview, p184](#) for a 3G/3G+ overview.



WARNING

RF shock could occur from coming into contact with the antenna while radio is transmitting; this could cause injury or death. Radio could transmit without any key presses.

NOTE

3G+ can only be used for voice communications.

8

To use 3G:

- [Select 3G/3G+ Radio Mode, p193](#)
- [Select TOD Server, p194](#)
- [Perform Automatic GPS TOD Synchronization, p195](#)
- [Perform Manual TOD Synchronization, p195](#)
- [Force Sync State to None, p196](#)
- [Place 3G Point-To-Point Call, p198](#)
- [Place 3G Net Call, p200](#)
- [Place 3G+ Point-To-Point ALE Call, p201](#)
- [Place 3G+ Net Call, p202](#)
- [Terminate 3G/3G+ Link, p203](#)
- [Transmit a 3G/3G+ TOD Broadcast Sync, p203](#)
- [3G/3G+ Options Operations, p204](#) as needed

Select 3G/3G+ Radio Mode

Figure 56 shows a 3G scanning display. A system preset ties together programmed parameters such as radio mode (ALE, FIX, 3G etc.), encryption, channel, or net information, voice/data settings, and modems. To select 3G radio mode:

- a. Press **[MODE]** until **3G** or **3G+** appears on display, then press **[ENT]**.
- b. Observe:
 - **SCANNING** appears
 - Each 3G channel appears briefly on the left:
 - 3G: Channels 100 - 162
 - 3G+: Channels 001 - 062
 - **3G** or **3G+** appears
 - **R** appears when receiving or when ready to receive
 - **BAT** appears with battery level unless volume is being adjusted
 - **SYNC** status on right side of screen:
 - **AUTO** - TOD synchronization based on GPS time from internal GPS receiver
 - **MAN** - TOD synchronization received over the air if radio is TOD outstation or internal clock if radio is TOD server
 - **NONE** - No TOD synchronization from any source
 - Bar indicates time remaining before radio is no longer in sync
- c. Use **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted.

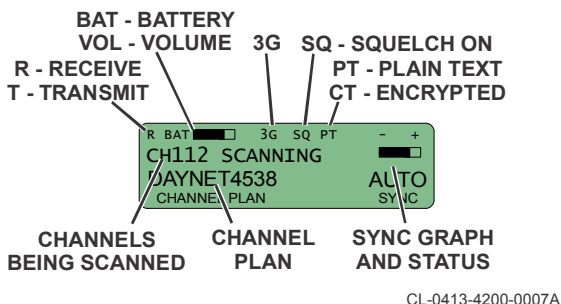


Figure 56. 3G Scanning Screen

8 Select TOD Server

When not using GPS as a time source for your net, one station in a net must act as a TOD server while all others must be TOD outstations. An outstation can automatically determine which radio is the TOD server by receiving a sync broadcast or a response to a sync request. To determine the current TOD role or change the current TOD role:

- Press **[OPT]** to display the **Option Menu**.
- Use **◀** or **▶** to select **3G** and press **[ENT]**.
- Use **▼** or **▲** to select **TODROLE** and press **[ENT]**. Current TOD server appears. If no TOD server has been observed, --- is displayed.
- Press **[ENT]** to see the TOD role is **BASE** or **OUTSTATION**.
- Use **▼** or **▲** to change the role.
- Press **[ENT]**. A prompt appears asking you to verify the TOD role change.
- Use **▼** or **▲** to select **YES** and press **[ENT]**.

Perform Automatic GPS TOD Synchronization

Both the TOD server and the outstation must be using GPS to perform an automatic TOD synchronization:

- Power off RF-7800H-MP by rotating the function switch to **OFF**.
- Connect GPS antenna to J2 GPS on the front of the RF-7800H-MP.
- Place radio in **PT** or **CT**, depending on desired operation.

The internal GPS initiates a search for GPS satellites. The RF-7800H-MP continues to search until at least four GPS satellites are acquired. The RF-7800H-MP uses information from the satellites to generate a GPS time reference. Once generated, **AUTO** is displayed above **SYNC** and the sync meter shows a full bar (100% sync).

Another TOD Synchronization configuration is to have all the outstations sync to a TOD server that uses the GPS as a time source. In this situation, the outstations do not require access to GPS.

8

Perform Manual TOD Synchronization

It is assumed that sync status of **NONE** is displayed. To perform a manual TOD synchronization:

- Press the **[OPT]** to display the **Option Menu**.
- Use **◀** or **▶** to select **3G** and press **[ENT]**.
- Use **▼** or **▲** to select **TOD** and press **[ENT]**.
- Enter wristwatch time and press **[ENT]**.

NOTE

Outstation time must be within ± 7 minutes of TOD server time.

NOTE

It is recommended to maintain and use UTC (also known as Greenwich Mean Time [GMT] or ZULU) for all operations to ensure consistency between radios.

- e. Enter a new date if required and press **[ENT]**. If the date is already correct, just press **[ENT]**.
- f. Press **[OPT]** to close the options menu and return to the operation screen.

The RF-7800H-MP scans while continuing to display a sync state of **NONE**. When a TOD sync broadcast or a response to a sync request is received, the sync state changes to **MAN**, and the sync meter display indicates full (100%) synchronization. The length of time required depends on how frequently TOD sync broadcasts are transmitted from a TOD server station and 3G protocol used ([HMAC and FLSU 3G Protocols, p188](#)).

Force Sync State to None

Forcing Sync State to NONE is necessary only when it is desired to change from using a non-GPS to a GPS time reference. One example could be a TOD server that is acquiring a GPS-derived TOD and needs to pass the TOD to the outstations. Another example could be a TOD outstation that was synchronized to a non-GPS-derived TOD and the TOD needs to be reset to a GPS reference.

The RF-7800H-MP will derive the TOD from GPS if the GPS antenna is connected and the radio is receiving GPS time signals when the following is performed:

- a. Leave the GPS antenna connected to the RF-7800H-MP unless you do not want to use a GPS time reference.
- b. Press **[OPT]** to display the options menu.
- c. Use **◀** or **▶** to select **3G** and press **[ENT]**.
- d. Use **◀** or **▶** to select **UNSYNC** and press **[ENT]**.

If the GPS antenna is connected, and GPS time was received from satellites, the sync state immediately changes to **AUTO**. If GPS is not available or the antenna is not connected, The RF-7800H-MP displays a sync state of **NONE**.

Behavior of the radio after manual TOD synchronization without disconnecting the GPS antenna depends on whether or not the sync state is **AUTO**.

If sync state is initially **AUTO** and GPS time is received from satellites, sync state will remain **AUTO**. GPS time, when available, is sufficient for 3G operation. Entering **UNSYNC** does not cause the GPS synchronization to be discarded and is not allowed if the operator selects **UNSYNC**.

If sync state is not initially **AUTO** but GPS time is received from satellites, sync state immediately changes to **AUTO**. Again, GPS time, when available, is adequate for 3G operation. If GPS synchronization is not desired, disconnect the GPS antenna.

8

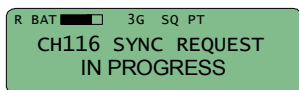
Request TOD Sync from a TOD Server

Only outstations can request a TOD sync from a TOD server. To verify whether a station is an outstation or a basestation, refer to [Select TOD Server, p194](#). To force the RF-7800H-MP to request TOD sync from a primary TOD base (server) station:

- Press **[CALL]**.
- Use ▼ or ▲ to select **SYNC REQUEST** and press **[ENT]**.

See [Figure 57](#). RF-7800H-MP will go through the current channel plan and request TOD sync on each channel until a valid sync response is received from the TOD server assigned to the 3G net.

If TOD sync was successful, the sync meter indicates 100% sync. If unsuccessful, the sync meter will be at the same location as before the sync request. A sync progress also briefly appears at the bottom of screen during the sync request.



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Figure 57. Sync in Progress Screen

Place 3G Point-To-Point Call

Perform the following to make a point-to-point call:

- a. Press [CALL].
- b. Use ▼ or ▲ to select call type:

8

1. **AUTOMATIC** - Selects the channels on which call attempts are placed with the goal of minimizing linking time. An **AUTOMATIC** call might choose a second-best channel that will not have as much delay over the best channel that is later in the scan rotation. If the first call attempt fails, the second call attempt is placed on another channel with the same goal of minimizing linking time. Generally, an **AUTOMATIC** call is the most efficient way to make a connection.
2. **MANUAL** - Establishes a link with another radio on a specified channel (could take longer to link than an **AUTOMATIC** call). The radio will attempt the call three times before it is considered to fail.
3. **BEST** - Always places the first call attempt on the channel with the best observed quality. This could take longer to link than an **AUTOMATIC** call, as there may be a substantial wait for this channel to arrive in the channel scan rotation. If the first call attempt fails, the second call attempt uses the channel with the second best observed quality, and so on.

AUTOMATIC and **BEST** will attempt to call all channels once before it is considered to fail.

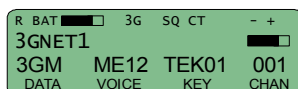
- c. Press **[ENT]**.
- d. Use ▼ or ▲ to select address type **STATION** and press **[ENT]**.
- e. Use ▼ or ▲ to select the station name you wish to call and press **[ENT]**.

If the call type is **MANUAL**, you are prompted for the channel number to place the call on.

Calling and receiving status are displayed.

When 3G link setup is successful, a tone is heard in the handsets of transmitting and receiving radios. Linked screen is displayed as shown in [Figure 58](#).

8



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Figure 58. Linked Screen

Place 3G Net Call

A 3G Net Call calls the members of a 3G net. When a net member radio receives the call, it transmits a response in its own time slot following transmission of the call. This permits the operator of the calling radio to determine which net member radios were successfully included in the link. Perform the following to make a Net call:

- a. Press **[CALL]**.
- b. Use ▼ or ▲ to select call type:
 1. **AUTOMATIC** - Selects the channels on which call attempts are placed with the goal of minimizing linking time. An **AUTOMATIC** call might choose a second-best channel that will not have as much delay over the best channel that is later in the scan rotation. If the first call attempt fails, the second call attempt is placed on another channel with the same goal of minimizing linking time. Generally, an **AUTOMATIC** call is the most efficient way to make a connection.
 2. **MANUAL** - Establishes a link with one or more other radios on a specified channel (could take longer to link than an **AUTOMATIC** call). The radio will attempt the call three times before it is considered to fail.
 3. **BEST** - Always places the first call attempt on the channel with the best observed quality. This could take longer to link than an **AUTOMATIC** call, as there may be a substantial wait for this channel to arrive in the channel scan rotation. If the first call attempt fails, the second call attempt uses the channel with the second best observed quality, and so on. **AUTOMATIC** and **BEST** will attempt to call all channels once before it is considered to fail.
- c. Press **[ENT]**.
- d. Use ▼ or ▲ to select address type **NET** and press **[ENT]**.

- e. Use ▼ or ▲ to select the net name you wish to call and press [ENT].

If the call type is **MANUAL**, you are prompted for the channel number to place the call on.

Calling and receiving status are displayed. When a response to the call is received from another net member, **RESPONSE FROM** and the name of the responding station will be displayed on the bottom line of the display.

When 3G link setup is successful, a tone is heard in the handsets of transmitting and receiving radios. Linked screen is displayed as shown in [Figure 58](#).

Place 3G+ Point-To-Point ALE Call

Perform the following to make a 3G+ point-to-point ALE call:

- a. Press [CALL].
- b. Use ▼ or ▲ to select call type:
 1. **ALE AUTOMATIC** - Selects the channels on which call attempts are placed with the goal of minimizing linking time. When the ALE link is established, an **ALE AUTOMATIC** call might choose a second best channel that will not have as much delay over the best channel that is later in the scan rotation. If the first call attempt fails, the second call attempt is placed on another channel with the same goal of minimizing linking time. Generally, an **ALE AUTOMATIC** call is the most efficient way to make a connection.
 2. **ALE MANUAL** - establishes a link with one or more other radios on a specified channel (could take longer to link than an **ALE AUTOMATIC** call).
- c. Press [ENT].
- d. Use ▼ or ▲ to select ALE address type **INDIVIDUAL** and press [ENT].

- e. Use ▼ or ▲ to select the address you wish to call and press [ENT].

If the call type is **MANUAL**, you are prompted for the channel number to place the call on.

Calling and receiving status are displayed.

When 3G+ link setup is successful, a tone is heard in the handsets of transmitting and receiving radios. Linked screen is displayed as shown in [Figure 58](#).

Place 3G+ Net Call

Perform the following to make a 3G+ ALE net call:

- a. Press [CALL].
- b. Use ▼ or ▲ to select call type:
1. **ALE AUTOMATIC** - Selects the channels on which call attempts are placed with the goal of minimizing linking time. When the ALE link is established, an **ALE AUTOMATIC** call might choose a second best channel that will not have as much delay over the best channel that is later in the scan rotation. If the first call attempt fails, the second call attempt is placed on another channel with the same goal of minimizing linking time. Generally, an **ALE AUTOMATIC** call is the most efficient way to make a connection.
 2. **ALE MANUAL** - establishes a link with one or more other radios on a specified channel (could take longer to link than an **ALE AUTOMATIC** call).
- c. Press [ENT].
- d. Use ▼ or ▲ to select ALE address type **NET** and press [ENT].
- e. Use ▼ or ▲ to select the address you wish to call and press [ENT].

If the call type is **MANUAL**, you are prompted for the channel number to place the call on.

Calling and receiving status are displayed.

When 3G+ link setup is successful, a tone is heard in the handsets of transmitting and receiving radios. Linked screen is displayed as shown in [Figure 58](#).

Terminate 3G/3G+ Link

Terminate a 3G link per the following:

- a. From TOD server or outstation, press **[CLR]** or **[PGM]** to terminate the link. The following could be displayed:

TERMINATE DATA? - Sending and receiving data but no call is pending.

TERMINATE LINK? - Voice link present but no call or data in progress.

TERMINATE CALL? - Call pending or call is in progress but no data transfer is active.

- b. Use ▼ or ▲ to select **YES** and press **[ENT]**. The terminating screen is displayed momentarily then the RF-7800H-MP returns to scanning. (See [Figure 56](#).)

Transmit a 3G/3G+ TOD Broadcast Sync

Broadcast sync is used to transmit the current time reference from the TOD server to the outstations in the 3G net so the RF-7800H-MP radios in the net can become synchronized. To transmit a broadcast sync at the TOD server:

- a. Press **[CALL]**.
- b. Use ▼ or ▲ to select:

BROADCAST SYNC - TOD server transmits a single TOD sync broadcast.

BROADCAST SYNC-ALL - TOD server transmits a TOD sync broadcast on each channel in the current frequency plan.

- c. Press **[ENT]**.

NOTE

A **BROADCAST SYNC-ALL** may require more than a minute to complete. You may want to only use when synchronizing an entire radio network. An example if immediately after deployment when GPS synchronization is unavailable.

3G/3G+ OPTIONS OPERATIONS

The paragraphs that follow provide instructions on more advanced third generation (3G) options.

NOTE

To access the **3G** menu under **[OPT]**, you must be in 3G radio mode.

8

Select 3G Channel Plan

3G channel plans can only be selected when the RF-7800H-MP is in 3G radio mode. To make channel plan selections:

- a. While in the scanning screen, use ◀ or ▶ until field under **CHANNEL PLAN** is highlighted.
- b. Use ▼ or ▲ to scroll to the desired channel plan.
- c. Press **[ENT]** to select the setting.

The RF-7800H-MP momentarily tunes the internal or external antenna coupler (if enabled) on each channel of the channel group corresponding to the channel plan.

- d. The RF-7800H-MP displays the name of the selected channel plan and begins scanning the frequencies of the selected plan.

Perform 3G Sound LQA

See [Figure 59](#). Radios must be synced in order to perform a LQA sound. To transmit a LQA sound:

- a. Choose **[OPT] > 3G > LQA > SOUND**.

The RF-7800H-MP transmits a sound transmission on each channel in the current channel plan. Other net members receiving the sound transmission automatically update their scores for the station transmitting the sound on each channel in which the sound was received.

Perform 3G Exchange LQA

See [Figure 59](#). Perform the following procedure for a 3G Exchange LQA:

- a. Choose **[OPT] > 3G > LQA > EXCHANGE**.

An exchange will be performed with the selected station on each channel in the current channel plan. Both stations update their scores for each other on the channels that they received the exchanges on.

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Review 3G LQA Scores

Channel scores are used by the radio to determine the best channels to use when placing **AUTOMATIC** or **BEST** calls. These channel scores develop over time due to LQA Exchanges/Sounds, call successes and observed traffic. Perform the following procedure to view a list of channels in the current channel plan, ranked by their channel scores:

- a. Choose **[OPT] > 3G > SCORES > REVIEW > IND ADDR**.
- b. Scroll and select station for scores.

The RF-7800H-MP displays the channel number of the channel having the highest channel score, and the value of its channel score. Values range from 0 (worst) to 100 (best). The better the channel score, the better the quality that has been observed for that particular channel. Other channels within the channel plan and their scores can be displayed by pressing ▼ or ▲.

NOTE

Only channels with scores will be displayed (not necessarily all channels in the channel plan).

- c. Press **[CLR]** repeatedly or **[OPT]** to exit.

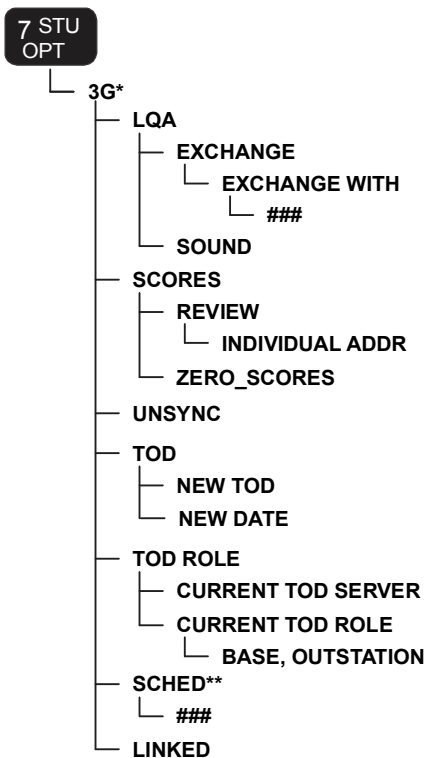
3G Zeroize Scores

Pre-deployment radio checks that involve the use of 3G LQA Exchanges/Sounds or 3G calls can generate channel scores that do not reflect the conditions that will be seen during deployment. Use of these channel scores can lead to less than optimal 3G channel selection once the radios are deployed.

To ensure 3G automatic calls are placed on only the appropriate channels, use the 3G Zeroize Score option after pre-deployment checks are complete and before using the deployed radios. To zeroize 3G channel scores:

- a. Choose **[OPT] > 3G > SCORES > ZERO_SCORES**.

The radio briefly responds with **ALE3G LQA SCORES ZEROIZED** to confirm that the scores have been zeroized.



*RADIO MUST BE IN 3G

**RADIO MUST TOD BASE/SERVER
READ-ONLY LIST, SET IN CPA

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Figure 59. 3G Operations Tree

Transmit and Receive 3G Data Messages

Data messages can be exchanged among all radios that are:

- Members of the same 3G net
- TOD synchronized
- Currently scanning the same CHANNEL PLAN in 3G radio mode
- Using Harris RF-6710, RF-6750, RF-6760, or TAC CHAT software
- Connected to the PC using a PPP cable

In the PACKET TX and PACKET RX screens, average throughput is displayed on the bottom of the screen.

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3G Voice Communications

Voice communications can be made by RF-7800H-MP radios that are all:

- Members of the same 3G net
- TOD synchronized
- Currently scanning the same CHANNEL PLAN in 3G radio mode
- Not currently active in data or voice communication

Show Linked Stations

Perform the following procedure to display the addresses of other linked radios:

- a. Choose **[OPT] > 3G > LINKED**.
- b. Use ▼ or ▲ to scroll through the list of addresses of linked radios.

This procedure is most useful following a 3G net call.

Place 3G Net Broadcast Call

A 3G net broadcast calls all the members of a 3G net. Called stations link without transmitting responses to the call.

Perform the following procedure to place a 3G Net Broadcast call:

- Press **[CALL]** to display **CALL TYPE** of **AUTOMATIC**, **MANUAL**, or **BEST**.
- Use ▼ or ▲ to select **AUTOMATIC** or **MANUAL** and press **[ENT]**.
- Use ▼ or ▲ to select **NET BROADCAST** and press **[ENT]**.
- Use ▼ or ▲ to select the net address you wish to call and press **[ENT]**.

If the call type is **MANUAL**, the RF-7800H-MP prompts the user for the channel number to place the call on.

Call status is displayed.

When 3G radio mode link setup is successful, a tone is heard in the handsets of transmitting and receiving RF-7800H-MP radios. Linked Screen status is displayed.

Voice Call Break-In

To break into a data transfer for voice communication:

- Press **[CALL]**.
- Make the appropriate selections for the voice call to be initiated.

If the data transfer is still in progress, the radio will prompt the user as to whether he wants to abort the current data traffic.

If **YES** is selected, the data transfer is aborted and voice call proceeds.

If **NO** is selected or if **[CLR]** is pressed, the voice call is aborted and the data transfer continues unaffected.

3G Link Timeout

By default, there is a link timeout for both data and voice links after a period of no data or voice activity. These times can be configured using the Communications Planning Application (CPA). Default time for IP packet data is 15 seconds, voice is 60 seconds and 0 (link terminated immediately on message delivery completion) for the Harris Tactical Chat Application.

Schedule a Broadcast Sync

To schedule periodic TOD Broadcast Sync at the primary TOD server:

- a. Choose **[PGM] > SCHED > ADD**.
- b. On the offset time screen, use enter time offset of the transmission schedule relative to midnight, Universal Time Coordinated (UTC) (0000 Zulu), in hours and minutes (24-hour format) and press **[ENT]**.
- c. On the interval time screen, use enter time interval between successive TOD sync broadcast transmissions in hours and minutes and press **[ENT]**.

For example, if the operator enters an offset time of 00:15 and an interval time of 00:30, the first TOD sync broadcast will occur on each new UTC day at 0015 UTC; subsequent TOD sync broadcast transmissions will occur every thirty minutes. (00:45, 01:15, 01:45, 02:15, 02:45, etc.)

By selecting **EDIT** or **DELETE** instead of **ADD**, the operator can edit or delete a previously scheduled broadcast.

LAST DITCH VOICE (LDV)

LDV is only available in 3G radio mode. The availability of the ARQ transmission allows a guaranteed error free delivery of the message. When receiving an LDV message, the majority of the message is queued before it is played back. Since there is little indication as to when the reception of the message is going to finish, the message is saved so it can be replayed at a later time if the message is missed on receipt. Only one message can be stored and it is the last one received. The default settings should not be changed in the majority of cases.

Send an LDV Message

To send an LDV message:

- From the 3G preset screen, use ◀ or ▶ to scroll to the **VOICE** field.
- Use ▼ or ▲ to select **LDV**.
- Key the handset and talk for up to 1 minute, 50 seconds. The message is automatically sent, but may have a delay due to channel conditions.

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Retrieve a Saved LDV Message

When an LDV message has been received, a warning tone will be heard in the receiving handset and **Mxx** will appear on the display next to the sync or signal meter (where xx is a number in the range 01-11). The radio only stores one LDV message, so a new incoming LDV will overwrite any previous message.

NOTE

The indicator may show from M01 - M11, as this indicates the total number of LDV and SMS messages waiting to be read.

- Use ◀ or ▶ until **Mxx** is highlighted then press [ENT].

- If there are both LDV and SMS messages waiting to be read, selecting Mxx will take you to the menu that shows **LDV*** and **SMS***. Select **LDV** and proceed to the next step.
 - If only an LDV message is waiting, the menu takes you directly to the LDV PLAY menu. **LDV MESSAGE ACTION REPLAY/DELETE** is displayed. Proceed to the next step.
- b. Use ▼ or ▲ to select **REPLAY** or **DELETE** and press [ENT]. If **REPLAY** is selected, **REPLAYING LDV MESSAGE** is displayed.
- c. When message replay is complete, a message appears confirming deletion of the LDV message. Use ▼ or ▲ to select **YES** or **NO** and press [ENT]. If **DELETE** is selected, the message will be deleted.

NOTE: If the radio is busy when an LDV message is attempted, **CAN'T REPLAY MESSAGE IN PROGRESS** is displayed.

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SHORT MESSAGE SERVICE (SMS)

SMS is available in both 3G and 3G+ radio modes and provides text-based messaging capabilities. The radio can send and receive short text messages entered and displayed on the front panel. SMS functionality provides communications when voice is not possible or desirable, and can be configured to receive messages during periods of unattended operation. SMS usage can also be configured to operate in **PT** or **CT**, or **CT only**. By default, the radio is set for **CT only**.

Canned Messages

SMS has the Canned Messages feature which allows the user to enter and save text messages for future use. The Canned Messages feature allows up to 10 SMS messages to be stored and can be downloaded remotely. The Canned Messages feature is useful to enable mission plan messages and instructions to be selected and sent quickly to single or multiple radios in a net.

Because canned messages are shared between SMS AMD's (ALE messaging), the length of canned messages can only be 90 characters.

SMS messages can be 160 characters. SMS allows you to add to the canned message before sending. The RF-7800H-MP saves **LAST SENT SMS** and **LAST ENTERED SMS** messages. These only differ if there is an interruption during formation of the message. The Receive buffer holds up to 10 received SMS messages. When full, new messages overwrite old messages, beginning with the oldest.

Available through **PGM > CONFIG > SMS > SETTINGS**, the configurable SMS text messaging parameters include the Text Entry feature that allows the user to insert text or overwrite text when entering SMS text messages. The user has options to enable or disable the message Auto Display, Auto Backlight, and message Tone Alert features. Enabling or disabling these settings determines how messages are displayed and how the user is notified when messages are received. In addition, the radio is programmed to automatically store received messages that can be viewed, resent, or forwarded at user discretion.

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SMS settings allow the user to configure traffic and text settings for the RF-7800H-MP. For example, the ARQ text messaging parameters are set here. The user also has options to set or save default SMS settings, available through radio settings or the CPA.

Text Prediction

The Text Prediction feature (also referred to as Predictive Text), when enabled, assists the user by inserting characters during typing on the keypad, based on text entry/use patterns. Text insertion predictions are based on algorithm patterns of use. The Predictive Text algorithm 'learns' based on the sequence of characters present in sent or received messages.

Sending New SMS Messages

To send an SMS message from the radio front panel:

- Press **[OPT]**.
- Use ◀ or ▶ to select **MSG** and press **[ENT]**.
- Use ◀ or ▶ to select **SMS** and press **[ENT]**.

- d. Use ◀ or ▶ to select **NEW** and press **[ENT]**.
- e. From **MESSAGE TYPE**, use ▼ or ▲ to select either: **NEW MSG**, **CANNED MSG**, **LAST SENT MSG**, or **LAST ENTERED MSG**. If no messages have been sent select either: **NEW MSG**, or **CANNED MSG** (if applicable).
- f. If this is a new Message (MSG), use the keypad to enter/edit the message text. To access special text symbols and characters when entering text messages, press **[0]** (☎).

Optionally, the user can press **[0]** (☎) a second time to select **TEXT ENTRY MODE**. Use ▼ or ▲ to select **Insert 'I'** or **Overwrite 'O'**. Pressing the same key a third time selects **TEXT PREDICTION** to turn on or off. Use ▼ or ▲ to turn text prediction **ON 'P'** or **OFF**.

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- g. Press **[ENT]** to send the message.
- h. Use ▼ or ▲ to select the desired **SEND TO** destination either, **STATION** or **NET**. Press **[ENT]**.
- i. Use ▼ or ▲ to select the **STATION ADDRESS** or the **NET ADDRESS** where the message will be sent. Press **[ENT]**.
- j. "**CHxxx SENDING TO xxxxxxxx**" is displayed while message is being sent.
- k. Press **[CLR]** if you want to stop the transmission. **TERMINATE DATA?** will be displayed. Select **YES** or **NO** to stop transmission.

Retrieve a Saved SMS Message

When an SMS message has been received, a warning tone will be heard in the receiving handset and **Mxx** will appear on the display next to the sync or signal meter (where xx is a number in the range 01-11). The radio only stores 10 SMS messages. If SMS buffer is full at 10, a new incoming SMS message will delete the first received message.

NOTE

The indicator may show from M01 - M11, as this indicates the total number of LDV and SMS messages waiting to be read.

When a new SMS message is waiting to be read:

- a. Press the **[OPT]** button.
- b. Use ◀ or ▶ to select **MSG**, then press **[ENT]**.
- c. Use ◀ or ▶ to select **SMS**, then press **[ENT]**. The menu will allow you to select **LDV*** or **SMS*** (where the * indicates there are unread messages). Select **SMS** to continue and read the SMS message.
- d. Use ▼ or ▲ to browse through the received messages. The top message is the most recent. Highlight the desired message and press **[ENT]**.
- e. When message replay is complete, a message appears confirming deletion of the message.
- f. Use ▼ or ▲ to select the appropriate **YES** or **NO** and press **[ENT]**. If **DELETED** is selected, the message will be deleted.

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Forwarding SMS Messages

This procedure describes how to forward a received SMS message to another station.

- a. Press **[OPT]**.
- b. Use ◀ or ▶ to select **MSG** and press **[ENT]**.
- c. Use ◀ or ▶ to select **SMS** and press **[ENT]**.
- d. Use ◀ or ▶ to choose **SELECT**, then use ▼ or ▲ to browse to the received message that will be forwarded. Press **[ENT]**.
- e. Use ◀ or ▶ to select **FORWARD** and press **[ENT]**.
- f. The message text may be edited or left as displayed. When the message is ready, press **[ENT]** to send.

- g. Use ▼ or ▲ to select the desired **SEND TO** destination either, **STATION** or **NET**. Press [ENT].
- h. Use ▼ or ▲ to select the **STATION ADDRESS** or **NET ADDRESS** where the message will be forwarded to and press [ENT].

Resend Last Sent SMS Message

This procedure describes how to forward a received SMS message to another station.

- a. Press [OPT].
- b. Use ◀ or ▶ to select **MSG** and press [ENT].
- c. Use ◀ or ▶ to select **SMS** and press [ENT].
- d. Use ◀ or ▶ to select **NEW**, then press [ENT].
- e. Use ▼ or ▲ to browse through **MESSAGE TYPE** and select **LAST SENT MSG**. Press [ENT].
- f. The message text may be edited or left as displayed. When ready, select the desired message and press [ENT] to send.
- g. Use ▼ or ▲ to select the desired **SEND TO** destination either, **STATION** or **NET**. Press [ENT].
- h. Use ▼ or ▲ to select the **STATION ADDRESS** or **NET ADDRESS** where the message will be forwarded to and press [ENT].

Deleting SMS Messages

This procedure describes how to delete a single SMS message or delete all SMS messages from radio memory.

- a. Press [OPT].
- b. Use ◀ or ▶ to select **MSG** and press [ENT].
- c. Use ◀ or ▶ to select **SMS** and press [ENT].

- d. To delete a single message:
 - Use ◀ or ▶ to choose **SELECT** and use ▼ or ▲ to browse to the message to be deleted. Press **[ENT]**.
 - Use ◀ or ▶ to select **DELETE** and press **[ENT]**.
 - Select **YES** to delete the message.
- e. To delete all saved messages:
 - Use ◀ or ▶ to select **DELETE_ALL** and press **[ENT]**.
 - Use ▼ or ▲ to browse the Delete selections, select Delete, **ALL RCVD MSGS** and press **[ENT]**.

Manually Send a GPS Report

The RF-7800H-MP can send a manual GPS report at any time while the radio is in 3G and Internal GPS is tracking. Manual reports can be transmitted even if automatic reports have been disabled or radio silence is enabled. The destination can be the default Automatic Position Reporting (APR) 3G address, or any other 3G individual or net address programmed into the radio.

A manual report can also include an alert indication for certain software installed at a GPS server. Perform the following procedure to send a manual GPS report:

- a. Press **[CALL]**.
- b. Use ▼ or ▲ to select **SEND GPS REPORTS** and press **[ENT]**.
- c. Use ▼ or ▲ to select the default APR address, or **STATION**, or **NET**, and press **[ENT]**.
- d. Use ▼ or ▲ to select the destination address and press **[ENT]**.
- e. Use ▼ or ▲ to select **YES** or **NO** (in response to sending an alert) and press **[ENT]**. GPS report is then sent.

Configure SMS Canned Messages

To access SMS canned messages, see [Figure 60](#) and choose **[PGM] > CONFIG > SMS > CANNED_MSG** menu choices and press **[ENT]**.

Text Entry Mode can be either **OVERWRITE** or **INSERT**. This is set under **[PGM] > CONFIG > SMS > SETTINGS > TEXT ENTRY MODE**.

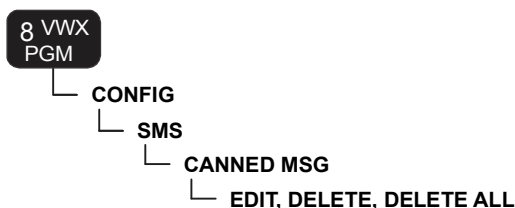


Figure 60. Configure SMS Canned Messages Tree

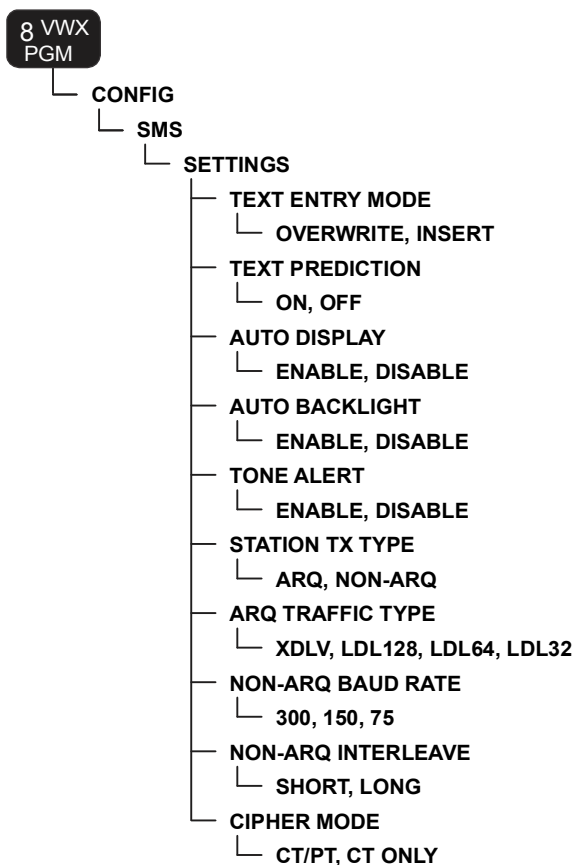
Configure SMS

Short Message Service (SMS) settings allow the user to configure traffic and text settings for the RF-7800H-MP. For example, the ARQ text messaging parameters are set here. ARQ is a data-communications system in which the recipient (radio), upon detecting an error in the received message, automatically transmits a request to the originator to re-send the flawed parts of the message.

SMS operation is available in 3G. To use SMS, all radios in a net must be in 3G sync and TOD on all radios must match. To assign SMS message settings, refer to [Table 38](#), see [Figure 61](#), and choose **[PGM] > CONFIG > SMS > SETTINGS** menu choices and press **[ENT]**.

Table 38. Configure SMS Settings

Menu Item	Options	Remarks
TEXT ENTRY MODE	OVERWRITE INSERT	Option to overwrite existing text when entering SMS messages. OVERWRITE is the default setting. Option to insert text when entering SMS messages.
TEXT PREDICTION	ON/OFF	Option to turn on or off the text prediction algorithm feature in the radio. TEXT PREDICTION default is set to ON.
AUTO DISPLAY	ENABLED/ DISABLED	Option to enable or disable the automatic text message display. AUTO DISPLAY default is set to ENABLED.
AUTO BACKLIGHT	ENABLED/ DISABLED	Option to enable or disable the automatic backlight feature for text message display. Disable when operating in situations where concealment is important. AUTO BACKLIGHT default is set to ENABLED.
TONE ALERT	ENABLED/ DISABLED	Option to enable or disable the tone alert for SMS text messages. TONE ALERT default is set to ENABLED.
STATION TX TYPE	ARQ NON-ARQ	Transmission options for station type include ARQ or NON-ARQ. ARQ is the default setting.
ARQ TRAFFIC TYPE	XDLV LDL128 LDL64 LDL32	Four user defined options for message automatic repeat requests. ARQ TRAFFIC TYPE default is set to LDL32.
NON-ARQ BAUD RATE	75 150 300	User defined NON-ARQ baud rate options. NON-ARQ BAUD RATE default is set to 150.
NON-ARQ INTERLEAVE	SHORT LONG	NON-ARQ INTERLEAVE options include SHORT or LONG. LONG is the default setting.
CIPHER MODE	CT/PT CT ONLY	Options to set the station cipher mode to Cipher Text (CT)/ Plain Text (PT) or cipher text only. CIPHER MODE default is set to CT ONLY.



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Figure 61. Configure SMS Settings Tree

PROGRAM 3G/3G+

NOTE

Due to the complexity of configuring the radio for use in 3G, 3G+, or 3G SMS radio mode, all 3G network programming must be accomplished initially through the CPA. A limited set of 3G network programming functions are available via the front panel.

Preset information can be referenced from:

- [Program Preset Channel, p116](#)
- [Program Preset Modem, p118](#)
- [Program ARQ, p131](#) or [Program XDL, p134](#) (if used)
- [Program System Preset, p125](#)

HCMAC and FLSU Programming

The selection of HCMAC or FLSU (4538) is established when 3G parameters are set for 3G or 3G+ communications plan within the CPA. Refer to [HCMAC and FLSU 3G Protocols, p188](#) for operational overview of HCMAC and FLSU.

Program 3G Net COMSEC Keys

A crypto mode and encryption key can be assigned to each programmed 3G net. This crypto mode and key are asserted each time a link is established to that 3G net. Operation in 3G or 3G+ radio mode requires each station to be a member of at least one 3G net. When a 3G point-to-point link is established, the 3G crypto mode and key used is the one assigned to the 3G net for which both stations are a member.

NOTE

If the radio cannot activate any Communications Security (COMSEC) key while operating in CT cipher mode, a KEY NOT SELECTED error is reported and the radio is unable to pass digital voice or data traffic.

Assign COMSEC Key for a 3G NET

Refer to [Table 39](#) and see [Figure 62](#). To assign a crypto mode and encryption key for a 3G NET:

- a. Choose **[PGM] > MODE > 3G > ASSIGN KEYS** menu choices and press **[ENT]**.

If no 3G nets have been programmed, a warning message is displayed and you are not allowed to proceed.

- b. Use ▼ or ▲ to scroll through the current programmed 3G nets until the desired net is displayed and press **[ENT]**.
- c. The menu displays the encryption key information currently associated to the selected 3G net. Press **[ENT]**.
- d. Use ▼ or ▲ to select **CITADEL** or **AES** and press **[ENT]**.

- e. Use ▼ or ▲ to scroll through the keys currently loaded into the radio.

If no encryption keys for the crypto mode are loaded into the radio, dashes (-----) is displayed. If the **[ENT]** key is pressed, the warning message NO KEYS AVAILABLE is displayed.

- f. Press **[ENT]** to assign the crypto mode and encryption key name to the 3G net.

Review COMSEC Key for a 3G NET

Refer to [Table 39](#) and see [Figure 62](#). To review an encryption key for a 3G net:

- a. Choose **[PGM] > MODE > 3G > ASSIGN KEYS** menu choices and press **[ENT]**.

If no 3G nets have been programmed, a warning message is displayed and you are not allowed to proceed.

- b. Use ▼ or ▲ to scroll through the current programmed 3G nets until the desired net is displayed and press **[ENT]**.

- c. The menu displays the encryption key information currently associated to the selected 3G net. Press **[CLR]** several times to return to the 3G menu.

Clear COMSEC Key Assigned to a 3G Net

Refer to [Table 39](#) and see [Figure 62](#). Perform the following procedure to clear the encryption key assigned to a 3G net:

- a. Choose **[PGM] > MODE > 3G > ASSIGN KEYS** menu choices and press **[ENT]**.

If no 3G nets have been programmed, a warning message is displayed and you are not allowed to proceed.

- b. Use ▼ or ▲ to scroll through the current programmed 3G nets until the desired net is displayed and press **[ENT]**.

- c. The menu displays the encryption key information currently associated to the selected 3G net. Press **[ENT]**.

- d. Use ▼ or ▲ to select **NONE** and press **[ENT]**.

If no encryption keys for the crypto mode are loaded into the radio, dashes (----) are displayed. If the **[ENT]** key is pressed, the warning message NO KEYS AVAILABLE is displayed.

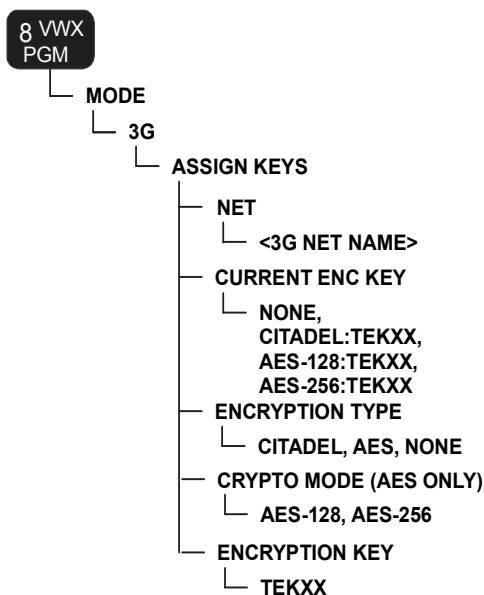
Table 39. Program 3GMenu Settings

Menu Item	Options	Remarks
NET	XXXXXXXXXXXXX XXX	3G NET address to assign an encryption key. 3G NET address can be up to 15 characters in length.
CURRENT ENCR KEY	NONE, CITADEL, AES-128, AES- 256	Displays the encryption key currently associated to the 3G NET. If no encryption key is assigned to the 3G NET, then NONE is displayed.

Table 39. Program 3GMenu Settings

Menu Item	Options	Remarks
ENCRYPTION TYPE	CITADEL, AES, NONE	Assign the encryption type for the 3G NET.
CRYPTO MODE	AES-128, AES-256	Assign the AES encryption key for the 3G NET. Displays only AES keys that are currently loaded in the radio.
ENCRYPTION KEY	TEKXX	Assign the encryption key for the 3G NET. Displays only keys that are currently loaded in the radio.

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Figure 62. Program 3G Menu

Section	Page
Adaptive Wideband Overview	226
Adaptive Wideband Operation	226
Configure Adaptive WB Parameters	227
Operational/Status Displays	228
Adaptive Wideband System Setup .	232

ADAPTIVE WIDEBAND OVERVIEW

The RF-7800H-MP's Adaptive Wideband (WB) feature provides a subset of the capabilities and protocols defined by MIL-STD-188-110C.

Adaptive Wideband Features

Adaptive Wideband offers the following features:

- Operable in 3G radio mode.
- Data Rate adaptive using S5066, resident in Wireless Message Terminal (WMT).
- Interoperable with Falcon II S4538 in narrowband.
- HF data on bandwidths from 3 kHz to 24 kHz per MILSTD-188-110C Appendix D, allowing data rates up to 120,000 bps.
- High speed HF E-mail using WMT.
- Adjustment of bandwidth and data rate is completely automated, requiring no operator intervention.
- Vastly improved data throughput under fair-to-excellent channel conditions, and much higher reliability under poor conditions.
- WB data includes PT and CT. CT uses CITADEL & AES encryption keys.

ADAPTIVE WIDEBAND OPERATION

Adaptive Wideband is a feature that uses a data-specific 3G link created by the RF-6760 WMT (version 1.5 or higher) application. While in 3G mode, the radio will be able to link in 3G Wideband (WB) data. Voice is not supported on an Adaptive WB link. 3G NB support is fully available from 3G scanning when not using the WBHF modem.

Channel selection is made by the radio. The 3G score, in combination with WB spectrum sensing information, is used to select the best channel for WB data. Channel selection for WB call attempts is based on spectrum occupancy, available SNR, estimated bandwidth, and the WMT's estimate of the amount of data to be transferred.

Automated data rate, bandwidth, and interleaver selections are accomplished using handshakes. Data rate adjustments are made by the WMT as transmission progresses. WMT will support WB synchronous data transfer to the radio over DTE. Actual bandwidths, data rate and interleaver will be shown in the radio display.

The radio performs spectrum sensing to determine channel characteristics and to adapt to available bandwidth. Once the bandwidth and offset have been determined, they will be used for the duration of the 3G link. When a new link is established, the process is repeated.

The WMTs proceed to deliver the message(s) using the STANAG 5066 protocol with the adapted data rate based on the history of packet errors. The WMT will issue commands to the radio to accomplish the adjustment.

NOTE

The WMTs and radios support point-to-point message delivery using Adaptive WB. Multicast/broadcast delivery is not available. The WMT will support only HF E-mail delivery using Adaptive WB. IP is not available.

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The WMT will issue commands to the radio using PPP and Simple Network Management Protocol (SNMP). STANAG 5066 payload data will be transferred to and from the radio via the radio's synchronous serial data interface as in other WMT system configurations.

Users can transfer messages and data as E-mail attachments. Harris Imager software has been incorporated into the WMT, providing image editing.

CONFIGURE ADAPTIVE WB PARAMETERS

Adaptive WB functionality is intended to operate only with the WMT. Radio programming is performed with the CPA. Thus, front panel Adaptive WB displays are limited mostly to status messages, however there is also a limited set of configuration screens accessible in the programming menu.

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ADAPTIVE WIDEBAND

To configure Adaptive WB parameters, select an appropriate 3G channel that has already been configured using CPA. Optionally, the following settings may be adjusted directly from the radio front panel. See [Figure 63](#).



CAUTION

FCC regulations and local considerations may restrict bandwidth availability to less than 24 kHz. Consult your communications manager before configuring wideband channels.

- a. Go to menu **[PGM] > MODE > PRESET > CHANNEL > MAXIMUM BANDWIDTH**. Select the highest bandwidth allowed for this channel based on frequency allocations. Choices are **3, 6, 9, 12, 15, 18, 21, or 24 kHz**.



Figure 63. Maximum Allocated Bandwidth



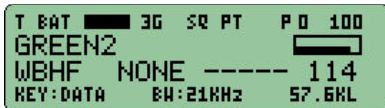
OPERATIONAL/STATUS DISPLAYS

When an Adaptive Wideband link is established, most of the action takes place in 3G calling screens. During 3G scanning and after the 3G link is established, the WBHF modem performs spectrum sensing and an on-air handshake operation to establish what part of the channel's allocated bandwidth is usable.

Refer to [Table 40](#). When a 3G call is made for data, the front panel displays "SENDING TO..." until the link is established. For Adaptive WB, this is followed by a popup indicating that the wideband handshake is occurring. The handshake duration is about two (2) seconds. After the

handshake, the familiar 3G linked (preset) screen is shown. In addition, the negotiated bandwidth and offset in use on a data link are viewable on the bottom line along with the suggested data rate and interleaver.

Table 40. Adaptive WB Calling Sequence

1. Establishing 3G link	
2. Doing Wideband Handshake	
3. Beginning Data Transfer	

The linked radios agree on the bandwidth and the optimized bandwidth is used for the duration of the link.

Interleaver determines the run length for error correction. Longer interleaves give higher levels of correction, but increase the transmission latency. With Adaptive Wideband, the radio will always select LONG interleaver initially. The WMT will automatically adjust the interleaver for the user.

Refer to [Table 41](#) for the sequence of status screens in wideband operation.

The first two screens are based on the status screens available during a 3G link. The first screen is "Preset View", and the second is "Channel

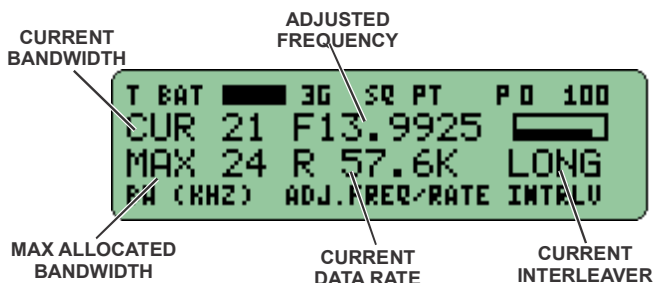
View". Note that the frequency displayed on the Channel View (14.0000 MHz) is the **programmed** frequency (also known as Radio Display Frequency) of the link channel. This is not affected by bandwidth negotiation.

The **negotiated** bandwidth parameters are displayed in the third status screen. Note in this example that the adjusted (negotiated) frequency (13.9925 MHz) is different than the programmed frequency. Also, the maximum (**MAX**) bandwidth programmed for the channel is 24 kHz, but after interference detection, the current (**CUR**) usable bandwidth is now 21 kHz.

Table 41. Adaptive WB Status Sequence

Preset View	
<div><div>T BAT 3G SQ PT P D 100</div><div>GREEN2</div><div>WBHF NONE 114</div><div>KEY:DATA BW:21KHz 57.6KL</div></div>	
<div>0</div>	
Channel View	
<div><div>T BAT 3G SQ PT P D 100</div><div>CH114 R14.0000</div><div>USB T14.0000 AUTO</div><div>KEY:DATA BW:21KHz 57.6KL</div></div>	
<div>0</div>	
Negotiated Channel View	
<div><div>T BAT 3G SQ PT P D 100</div><div>CUR 21 F13.9925</div><div>MAX 24 R 57.6K LONG</div><div>BW (KHz) ADJ.FREQ/RATE INTRLV</div></div>	
<div>0</div>	
Returns to Preset View	

See [Figure 64](#) for a description of the Adaptive WB status fields.



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Figure 64. Adaptive WB Display Fields

See [Figure 65](#) for wideband handshaking displays. These are momentary status popup screens that are shown during the handshake phase of adaptive wideband link establishment.



Figure 65. Negotiation Screens

See [Figure 66](#) for Wideband Call Completion displays. Success or failure of the wideband call is displayed similar to 3G call completion, as shown in the bottom line status messages.

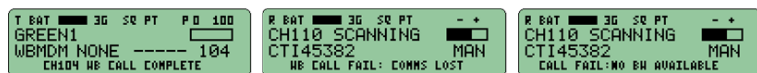


Figure 66. Call Completion Screens

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ADAPTIVE WIDEBAND

See [Figure 67](#) for Wideband Call Error displays. Error messages are displayed for approximately 2 seconds when an invalid call is attempted. After that time, the screen returns to the one shown previously.

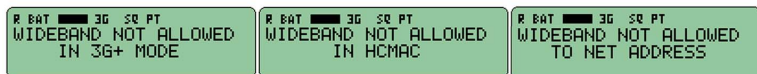


Figure 67. Error Screens

ADAPTIVE WIDEBAND SYSTEM SETUP

This section covers installation of software and connection of hardware necessary for Adaptive WB operation.

NOTE

Refer to RF-6760W WMT System Manual (10515-0316-4100) for cable part numbers and connection details.

Items Required

- RF-7800H-MP radios with version 1.3 or newer firmware installed.
- PC with at least one free USB host port or serial port.
- RF-6760W Wireless Messaging Terminal (WMT) software version 1.5 or newer.
- Network Radio Driver Install (NRDI), software version 1.6 or newer.
- PC to radio interface cable for Adaptive WB.

Setup Procedure

- a. Make sure that WMT (version 1.5 or newer) and NRDI (version 1.6 or newer) is installed on the PC. Refer to the documentation and online Help provided with these applications for operating information.

- b. Connect the radio to the PC using the interface cable.
- c. Power up the radio and direct Windows to find the USB driver automatically.
- d. Launch NRD1 and install the Harris radio connection. Test the connection from within NRD1, and close NRD1.
- e. Launch WMT. Configure WMT network and local station.
- f. WMT is ready to operate with the radio.

Send/Receive a WMT Message

Use this checklist to prepare to transfer a WMT message from one Adaptive WB-enabled RF-7800H-MP to another.

- Both radios are programmed by CPA with valid 3G fill, and include WB channels. Refer to CPA Online Help for complete CPA usage.
- Both radios have established Manual or Auto 3G sync.
- Both radios are connected to PCs running WMT with valid configuration.
- Both WMTs are online and idle.
- Both radios are scanning 4538 FLSU.
- An LQA exchange has been performed.

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WMT Operation Sequence

1. Operator A composes and sends a new message from WMT A.
2. Radio A initiates 3G 4538 FLSU call to Radio B, WB Data traffic type.
3. Radios A and B establish a 3G link.
4. Radios perform a WB handshake.
5. 5066 transfer proceeds to completion.
6. WMT B makes received message available to Operator B.

7. WMT A terminates link once 5066 physical link drops.
8. Radios A and B return to scan.
 - Both WMTs at idle.
 - Received message is available at WMT B.

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HOPPING OVERVIEW

Frequency hopping (also known as Electronic Counter-Counter Measures [ECCM]) provides advanced anti-jam protection for communications. In HOP radio mode, the transmitter frequency changes so rapidly that it is difficult to intercept or jam the signal. For additional security, hopping data and digital voice data can be encrypted. An important aspect of hopping is synchronization. Synchronization is the process of aligning HOP signals within a very narrow time sequence. This can be accomplished either manually or with the use of GPS.

NOTE

HOP mode is not available (when the MODE button is pressed), if High-Q Antenna is configured and detected as an accessory.

The RF-7800H-MP uses three frequency hopping types discussed in the paragraphs that follow.

NOTE

The frequency hopping used in the RF-7800H-MP is incompatible with hopping used in the AN/PRC-138 and RF-5000/RF-5200 series radios.

Wideband Hopping

Wideband hopping covers a frequency band that is bounded by a lower and upper frequency specified in multiples of 100 Hz. Frequency exclusion bands may also be programmed and the RF-7800H-MP uses all non-excluded frequencies between the upper and lower boundaries. The minimum bandwidth allowed is 15 kHz, with an individual frequency bandwidth of 2 kHz. The minimum frequency is 2 MHz. These frequencies define the band in which the radio hops. If the usable bandwidth is less than 15 kHz, the hopset cannot be used. In wideband hopping, the radio's internal coupler, as well as the optional RF-5382, are automatically bypassed. A wideband antenna is required in this radio mode.

Narrowband Hopping

Narrowband hopping uses frequencies within a defined bandwidth of the center frequency (F_c). The F_c must be a multiple of 5 kHz. Refer to Table 42. In most cases, the F_c is in the middle of the band (3 MHz F_c uses 7.5 kHz on each side for example).

Table 42. Bandwidth/Center Frequencies

Center Frequency/MHz	Bandwidth
2.0 MHz $\leq F_c < 3.495$ MHz	15 kHz
3.5 MHz $\leq F_c < 4.995$ MHz	42 kHz
5.0 MHz $\leq F_c < 9.995$ MHz	81 kHz
10 MHz $\leq F_c < 14.995$ MHz	120 kHz
15 MHz $\leq F_c < 19.995$ MHz	201 kHz
20 MHz $\leq F_c < 24.995$ MHz	252 kHz
25 MHz $\leq F_c < 29.845$ MHz	303 kHz
29.850 MHz $\leq F_c < 29.995$ MHz	300-156 kHz

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NOTE

Center frequencies are required to be multiples of 5 kHz. Due to the fact that the lowest carrier frequency used is 2.0 MHz and the highest carrier frequency allowed is 29.995 MHz, center frequencies near the boundaries result in non-symmetrical hopsets.

Special Center Frequency Cases

Since transmitted frequencies below 2.0 MHz or above 29.997 MHz are not allowed, the RF-7800H-MP makes adjustments to the hopping bandwidth when the center frequencies are close to these limits. Center frequencies above 29.850 MHz or below 2.015 MHz cause reduction in the total bandwidth.

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The highest frequency can be found by adding the bandwidth to the lowest frequency in the hopset. If the upper frequency exceeds 29.999 MHz, the bandwidth is decreased so that the highest frequency used is not greater than 29.999 MHz. For example, if the center frequency is 29.995 MHz, the hopset consists of frequencies from 29.845 MHz to 29.998 MHz (52 distinct carrier frequencies), for a total bandwidth of 156 kHz.

List Hopping

List hopping allows the user to specify frequencies to be used during hopping. A minimum of five frequencies must be selected with a maximum of 50 frequencies in multiples of 100 Hz. List frequencies can be specified over the 2 - 30 MHz band, with a maximum bandwidth of 2 kHz. This equates to a maximum separation between the minimum and maximum frequency of 2 MHz. In List hopping, the radio's internal coupler, as well as the optional RF-5382, are automatically bypassed. A wideband antenna is required in this radio mode to avoid creating a high Voltage Standing Wave Ratio (VSWR) situation into a resonant antenna.

10

Synchronization

For two or more radio stations in a net to communicate in hopping (HOP), they must be time synchronized. This ensures that all radios are using the same frequency at the same time interval. Initially, all radios must have a Time Of Day (TOD) that is within ± 1.5 minutes of the Net Control Station's (NCS) in order for the sync to be successful.

Manual Synchronization

Manual synchronization is a method of synchronizing radios in a net without using GPS synchronization. A sync request-to-send is sent to the NCS, requesting a special synchronization transmission. The NCS responds by transmitting timing information (sync response) on the channel (preset) that all radios use to synchronize their clocks. When hopping on a channel with manual synchronization, the operator must update the synchronization every six hours on the RF-7800H-MP.

Broadcast Synchronization (Passive Sync)

Broadcast synchronization is an alternate method of manual synchronization. A single radio (usually the NCS) transmits both the sync request and sync response and allows the other radios in the net to achieve manual synchronization.

Synchronization (Sync) Request

A sync request is a method of requesting entry into a HOP net using Over-The-Air (OTA) signaling. The user sends a sync request from the front panel of the RF-7800H-MP. When the NCS radio receives the sync request, the operator is notified and the system automatically sends a sync response, if the radio is programmed to automatically respond. Upon successful reception of the sync response, the requestor's radio notifies the operator that a Manual Time-Of-Day (MTOD) is now available and that time may be used for communicating in the net.

When sending the sync request, the requestor selects a HOP preset and the system automatically selects four random frequencies from the current hopset to send the request to the NCS. If this sync request fails, you must manually command the system to send another sync request.

10

Synchronization Response

Synchronization response is normally performed by the NCS. When the NCS receives a sync request from a member station, the radio automatically sends a sync response (if programmed to do so). The NCS or a designated radio should be the only radio in the net programmed to respond to sync requests.

Hailing

Hailing permits a station in FIX radio mode to alert other net stations that are in HOP radio mode that a FIX station wishes to communicate. Channels can be programmed to allow a non-hopping radio to communicate with a hopping radio. Up to ten (10) FIX channels (001 - 010) can be designated for hail operation as to match operational frequency range of HOP nets, which permits a spread of frequencies on the propagation range for planned links. While in the HOP radio mode,

RF-7800H-MP HOPPING

the radio monitors the preprogrammed hailing frequencies for any radios in FIX radio mode that want to communicate.

A hail key is one of 100 values (00-99) and is paired with a hail channel. The value is shared with all members of the net so that they all have this unique frequency/hail key pairing (per ten channels). The value determines which of the 100 different sequences is transmitted on a particular hail channel, and it may be different per channel. The receive radio looks for that particular sequence on that particular frequency, ignoring the 99 others.

Hop Voice/Data Compatibility

Table 43 displays the voice and data capabilities of the RF-7800H-MP in hopping radio mode.

Table 43. Hop Voice/Data Compatibility

Encryption	SSB	Data	Voice	Frequency Range (MHz)
PT	X	SERIAL, ARQ	*DV6, ME6**	1.5 - 29.9999
Citadel/AES	X	SERIAL, ARQ	DV6, ME6	1.5 - 29.9999
*Digital Voice 600 bps (DV6) using Linear Predictive Coding (LPC). **Mixed Excitation Linear Prediction (MELP) 600 bps (ME6).				

HOPPING OPERATIONS

From the system preset screen or channel preset screen, press **[SQL]** to toggle squelch on or off. Refer to [Digital Voice/ MELP, p59](#) for overview information.

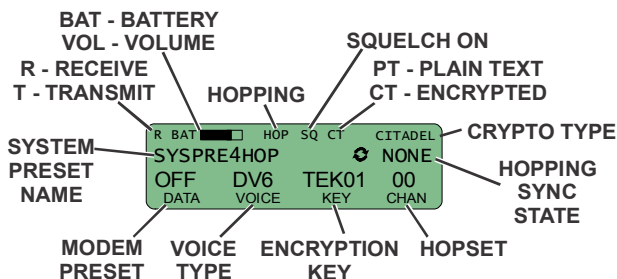
To use hopping, you need to:

- [Select Hopping Radio Mode and Select Preset, p241](#)
- [Send Synchronization Request, p242](#)

Select Hopping Radio Mode and Select Preset

Figure 68 shows a frequency hopping display. A system preset ties together programmed parameters such as radio mode, encryption, channel, or net information, voice/data settings, and modems. To select frequency hopping radio mode:

- a. Press **[MODE]** until **HOP** appears on display, then press **[ENT]**.
- b. Use **[PRE +/-]** to select a system preset. Keys must be programmed if operating in CT.
- c. Observe:
 - **HOP** appears.
 - Correct encryption (**PT** or **CT**), **DATA** (Modem Preset), **VOICE**, **KEY** (**CT** only), and **SQ** (if desired) are displayed.
 - **T** appears when transmitting.
 - **R** appears when receiving or when ready to receive.
 - **BAT** appears with battery level unless volume is being adjusted.
 - **SYNC** status on right side of screen:
 - **AUTO** - Synchronization is made using GPS satellite time.
 - **MAN** - Single radio transmits synchronization request and response to allow other radios in the net to achieve synchronization.
 - **NONE** - Radio is not synchronized.
- d. Use **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted.



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Figure 68. Frequency Hopping Example Screens

Send Synchronization Request

To send a synchronization request:

- Press **[CALL]**.
- Use **▼** or **▲** to select manual sync type **REQUEST** and press **[ENT]**.

After the RF-7800H-MP sends a sync request, the RF-7800H-MP waits for a response. For **BROADCAST**, the RF-7800H-MP sending the sync request automatically transmits the sync response, if configured. If not configured, user intervention is required. Upon receiving a sync response, the **MAN** appears to indicate a manual sync.

HOPPING OPTIONS OPERATIONS

The paragraphs that follow provide instructions on more frequency hopping options.

Hail a Hopnet

When a radio in HOP mode receives a hail, a HAILED status displays on the channel and system preset on which the hail is occurring. When the user presses **[ENT]** to acknowledge the hail, the hailed radio leaves the HOP radio mode and selects the FIX radio mode of operation using the same hailing channel on which the hail took place. At this time, the two stations can coordinate wristwatch TOD, if needed, and coordinate net entry. Hailing permits a station to alert other net stations that may be in HOP radio mode, that a station in FIX radio mode wishes to communicate.

NOTE

Hail TX must be enabled during channel programming.
Only channels 001 to 010 can be set to be used as hailing channels.

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To hail a Hopnet:

- a. Ensure the RF-7800H-MP is in FIX radio mode, and that the channel has been set to **YES** under the **HAIL TX** programming menu.
- b. Select the designated hailing radio preset using **[PRE +/-]**. Normally a frequency is selected that is near the frequencies of operation of the hopping net that will be hailed.
- c. Press **[CALL]**. The RF-7800H-MP displays **SEND HAIL**.
- d. Use **▼** or **▲** to scroll to the desired yes or no setting. Select **YES** and press **[ENT]** for confirmation to send hail.
- e. The RF-7800H-MP will display **HAIL IN PROGRESS**, and then **HAIL COMPLETE** when the hail has been sent. Press **[ENT]** to return to the preset screen.

At the receiving radio, you need to press **[ENT]** to respond to the hail. Once the hail has been responded to, the receiving radio switches to FIX. You need to switch back to HOP to continue frequency hopping operation.

When someone from the hopping net contacts your station, coordinate to receive a time sync in order to enter the hopping net. Ensure radio TOD is within ± 90 seconds of the station sending the time sync.

Change Hop Sync Type

GPS sync is used if GPS signals are present and the GPS antenna is connected. If you connect an antenna while in a net using manual sync, you could set the TOD to be different from other radios in the net. If you do this and change the hop sync type, then you might lose sync with the net. Attaching a GPS antenna will not cause the radio to change TOD status from MAN to AUTO. A manual UNSYNC must be performed in order to change to AUTO. Typically, only the TOD server will change the sync type.

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To change the sync type of a HOP channel:

- a. Connect a GPS antenna to the radio.
- b. To change the specific HOP channel sync type, press the **[PRE+/-]** key until the desired channel is displayed.
- c. Press **[CLR]**.
- d. Use the **▼** keys to select **UNSYNC ON CURRENT CHANNEL** or **ALL CHANNELS**, and press **[ENT]**.

PROGRAM HOP

The following paragraphs provide information on programming HOP net. Presets must be programmed in the order shown:

- Program narrowband, wideband or list hop net:
 - [Program Hop Channel - Add Narrowband HOP Channel, p245](#)

- Program Hop Channel - Add Wideband HOP Channel, p245
- Program Hop Channel - Add/Review/Delete List Members, p245
- Program Preset Modem, p118
- Program ARQ, p131 or Program XDL, p134, if used
- Program System Preset, p125

Program Hop Channel - Add Narrowband HOP Channel

To add a narrowband HOP channel, refer to Table 44, see Figure 69, and choose **[PGM] > MODE > HOP > CHANNEL > ADD > HOP CHANNEL** (Select Channel) > **NARROW**.

Program Hop Channel - Add Wideband HOP Channel

To add a wideband HOP channel, refer to Table 44, see Figure 69, and choose **[PGM] > MODE > HOP > CHANNEL > ADD > HOP CHANNEL** (Select Channel) > **WIDE**.

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Program Hop Channel - Add/Review/Delete List Members

To add, review, or delete list frequencies, refer to Table 44, see Figure 69, and choose **[PGM] > MODE > HOP > CHANNEL > ADD > HOP CHANNEL** (Select Channel) > **LIST**.

Table 44. Program Hop Channel Settings

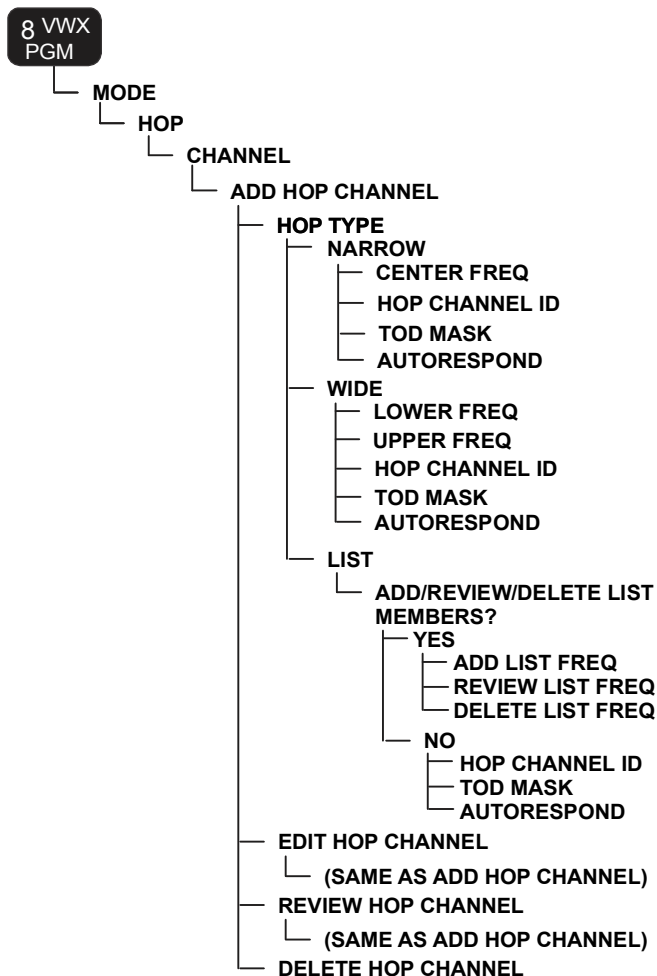
Menu Item	Options	Remarks
HOP CHANNEL	00-19	Channel to be used for frequency hopping.
HOP TYPE	NARROW, WIDE, LIST	Method of hopping on the selected channel.
HOP CHANNEL ID	XXXXXXXX	An 8-digit number that is used as the identifier for the net. All radios in the net must have the same hop channel identification (ID).

Table 44. Program Hop Channel Settings (Continued)

Menu Item	Options	Remarks
TOD MASK	[]	An optional 1-to-8 digit alphanumeric that is used to identify a net. If used, all radios in the net must have the same TOD MASK.
AUTORESPOND	YES, NO	YES: automatically respond to a sync request without operator intervention. NO: operator must initiate the response to a sync request.
NARROWBAND	2.0 MHz to 29.999 MHz (in multiples of 5 kHz)	Program the center frequency of the hopping bandwidth; choice of center frequency (freq) affects the bandwidth as follows: Center Freq (MHz)* Bandwidth (kHz) 2.0-3.495 15 3.5-4.995 42 5.0-9.995 81 10.0-14.995 120 15.0-19.995 201 20.0-24.995 252 25.0-29.845 303 29.850-29.995 300-156 *Center frequencies near the upper and lower boundaries result in non-symmetrical hopsets.

Table 44. Program Hop Channel Settings (Continued)

Menu Item	Options	Remarks
WIDEBAND	2.0 MHz to 29.999 MHz	Program the upper and lower frequencies of the hopping bandwidth. NOTE: If exclusion bands are programmed, the usable bandwidth is decreased; the usable bandwidth must be at least 15 kHz.
LIST	2.0 MHz to 29.999 MHz (in multiples of 100 Hz) 5 to 50 frequencies per list maximum bandwidth:2.0 MHz	Program the desired hop frequencies.



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Figure 69. Program Hop Channel Tree

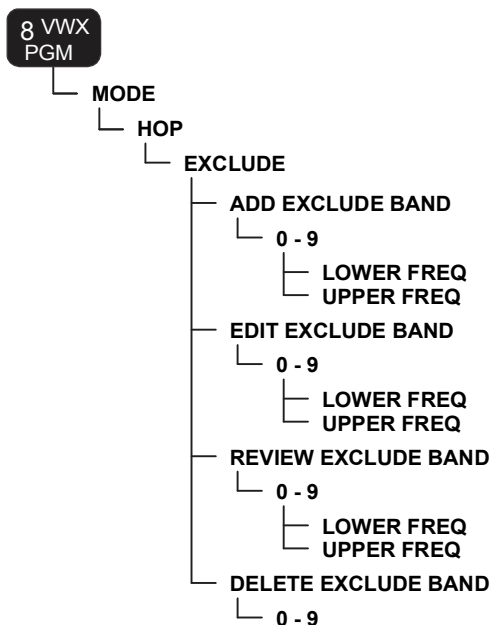
Program Hop Exclusion Band

Each exclusion band is a range of frequencies that are not to be used in wideband hopping. There can be up to 10 exclusion bands, numbered 0 - 9. When the hopset is generated for each wideband hopping net, the frequencies in the hopset are selected to ensure that no frequency in the hopset occurs within any of the defined exclusion bands.

To add, review, or delete list frequencies, refer to [Table 45](#), see [Figure 70](#), and choose **[PGM] > MODE > HOP > EXCLUDE > EXCLUDE BAND**.

Table 45. Program Hop Exclusion Band Settings

Menu Item	Options	Remarks
ADD/EDIT/ REVIEW/DELET E BAND	LOWER FREQ 2.0 MHz to 29.999 MHz	Lower boundary of a bandwidth to be excluded from the hopping bandwidth.
	UPPER FREQ 2.0 MHz to 29.999 MHz	Upper boundary of a bandwidth to be excluded from the hopping bandwidth.



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Figure 70. Program Hop Exclusion Band Tree

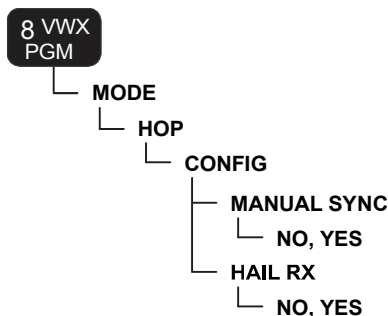
Program Hop Configure

To program the hopping configuration, refer to [Table 46](#), see [Figure 71](#), and choose **[PGM] > MODE > HOP > CONFIG**.

Table 46. Program Hop Configure Settings

Menu Item	Options	Remarks
MANUAL SYNC	YES, NO	A way of synchronizing radios in the net without using GPS sync. YES: Allow operator to initiate a manual sync request. NO: Prevent operator from initiating a manual sync request.
HAIL RX	YES, NO	Configures whether or not the radio will accept a hail from a transmitting station while in HOP radio mode. YES: Accept hail. NO: Do not accept hail.

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Figure 71. Program Hop Configure Tree

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RF-7800H-MP FAULT DISPLAYS

This section provides user notifications that include Built-In Test (BIT) faults, run-time faults, and user observed faults.

BUILT IN TEST

BUILT IN TEST is run by the user, and is used to test the keypad, front panel display, battery, audio, and internal circuits of the RF-7800H-MP. Refer to [BIT, p36](#) for more information and see [Figure 72](#) for a sample of fault displays.

RUN-TIME FAULT EXAMPLE

A green rectangular display box with rounded corners containing the following text:

** HUB LOW **
DAYS REMAINING: 3
PRESS CLR/ENT TO EXIT

OPERATOR INITIATED BIT FAULT EXAMPLE

A green rectangular display box with rounded corners containing the following text:

MODULE: GPS
FAULT: 21

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Figure 72. Sample Fault Displays

OPERATOR-INITIATED BIT FAULTS

BIT faults are displayed following an operator-initiated BIT. For information on running BIT (refer to [BIT, p36](#)). When a fault message is displayed, record all fault code information and report the fault to a Level II or Level III maintainer.

RUN-TIME FAULTS

Run-Time faults occur outside of operator initiated BIT and are listed in [Table 47](#). Sometimes hardware failures can cause run-time failures. Send the radio to a level II or III repair facility for hardware failures.

Table 47. Run-Time Faults and Corrective Action

Displayed Message	Description/Corrective Action
NO KEY AVAILABLE	Traffic Key not available for selected preset. Make sure radio was filled properly.
CRYPTO SYNC FAILED	Crypto Synchronization Failed - message will not be received/decrypted. This can sometimes occur over HF. If problem continues with good channel conditions, make sure radio was filled properly.
INVALID CRYPTO OPERATION	This is a firmware error. Send radio to intermediate/level III maintenance.
UNSUPPORTED MODE	Operator attempted to utilize a radio mode not supported for a particular configuration. Send radio to intermediate/level III maintenance.
INFOSEC HW FAILURE	There has been a catastrophic Information Security (INFOSEC) hardware failure. Send radio to intermediate/level III maintenance.
ALARM PRESENT	Communications Security (COMSEC) Alarm is present. Make sure radio was filled properly.
INVALID KEY DATA	Traffic Key data is not valid. Make sure radio was filled properly.
UNKNOWN COMMAND	Firmware error. Send radio to intermediate/level III maintenance.
STATE ERROR	Firmware error. Send radio to intermediate/level III maintenance.
PARAM ERROR	Firmware error. Send radio to intermediate/level III maintenance.

Table 47. Run-Time Faults and Corrective Action (Continued)

Displayed Message	Description/Corrective Action
CRYPTO DETECTED IN PT RADIO	Firmware error. Send radio to intermediate/level III maintenance.
RV INVALID INTERNAL STATE	Firmware error. Send radio to intermediate/level III maintenance.
RV KM COMMAND FAILED	Firmware error. Send radio to intermediate/level III maintenance.
RV KEY SELECT FAILED	Firmware error. Send radio to intermediate/level III maintenance.
KEYLINE INHIBIT: ACTIVE	Keyline has been inhibited. If condition persists, refer to system level documentation.
READ FAILURE - FACTORY CM INFORMATION	Firmware error. Send radio to intermediate/level III maintenance.
WRITE FAILURE - FACTORY CM INFORMATION	Firmware error. Send radio to intermediate/level III maintenance.
CRYPTO UNDEFINED ERROR	Firmware error. Send radio to intermediate/level III maintenance.
GPS ERROR	Internal communications with internal Global Positioning System (GPS) failed. Send radio to intermediate/level III maintenance.
GPS IS DISABLED	GPS is disabled on internal GPS model. Send radio to level III maintenance.
KEY NOT AVAILABLE	Firmware error in Voice Data Processor (VDP) or COMSEC Controller Module (CSEC) error. Send radio to intermediate/level III maintenance.
ERROR DETECTED BY CSEC - OPERATION ABORTED	Firmware error. Send radio to intermediate/level III maintenance.
KEY NOT SELECTED	Key is not valid. Make sure radio was filled properly.

Table 47. Run-Time Faults and Corrective Action (Continued)

Displayed Message	Description/Corrective Action
SYSTEM NOT READY	One or more system elements are preventing normal radio operation. Shutdown system, then power up.
SYSTEM CLOCK INVALID	System clock failed. Send radio to intermediate/level III maintenance.
NVRAM CORRUPTED - USER LOCKOUTS ERASED	Non-volatile Random-Access Memory (RAM) has been corrupted. If new firmware has been loaded, send radio to intermediate/level III maintenance.
HOP CONFIGURATION ERROR: NO HOPSET PROGRAMMED	No hopset was programmed. Check HOP programming or fill.
HOP CONFIGURATION ERROR: NO CHANNEL ID PROGRAMMED	No channel Identification (ID) was programmed. Check HOP programming or fill.
HOP CONFIGURATION ERROR: INVALID BANDWIDTH SETTING (MINIMUM BANDWIDTH IS 15 KHZ)	Programming is invalid for bandwidth requirements. Check HOP programming or fill.
HOP CONFIGURATION ERROR: INVALID EXCLUSION BAND SETTING(S) (CHECK PROGRAMMING)	Incorrect exclusion band settings were programmed. Check HOP programming or fill.
HOP CONFIGURATION ERROR: HOPLIST TOO SMALL (MINIMUM HOPLIST SIZE IS 5)	Programmed hopset is too small. Check HOP programming or fill.
HOP CONFIGURATION ERROR: INVALID HOPLIST HOPSET	Invalid hoplist was programmed. Check HOP programming or fill.
NOT IN SYNC	Radios are not synced. Sync radios.
INVALID POWER INPUT CONFIG	Power input invalid to Power Amplifier (PA). Send radio to intermediate/level III maintenance.
FREQUENCY OUT OF RANGE	Frequency is invalid in Fix mode. Radio ignoring.

Table 47. Run-Time Faults and Corrective Action (Continued)

Displayed Message	Description/Corrective Action
CAN'T KEY - CHANNEL IS RX ONLY	Channel was programmed as receive only. Reprogram if frequency plan allows.
BATTERY VOLTAGE TOO LOW	Battery voltage is too low. Replace.
POWER AMPLIFIER TOO HOT	External power amplifier is too hot. Refer to system level documentation for instructions on cleaning cooling fins and further troubleshooting that may be required.
TRANSCEIVER: CONFIGURATION ERROR	Firmware error. Send radio to intermediate/level III maintenance.
UNSUPPORTED RF HARDWARE CONFIGURATION	Firmware error. Send radio to intermediate/level III maintenance.
TX FREQ OUT OF RANGE	Transmit frequency entered is beyond radio's frequency range.
HUB VOLTAGE LOW	HUB voltage is low. Replace.
RX FREQ OUT OF RANGE	Receive frequency entered is beyond radio's frequency range.
CAN'T KEY - RX PROTECTION IS ACTIVE	Radio cannot key because receive protection is active. Remove strong signal causing receive protection.
COMMUNICATION ERROR WITH EXTERNAL POWER AMPLIFIER	Refer to system level documentation for isolating to a PA or RF-7800H-MP failure.
COMMUNICATION ERROR WITH EXTERNAL PREPOST SELECTOR 1	Refer to system level documentation for isolating to a pre/postselector or RF-7800H-MP failure.
COMMUNICATION ERROR WITH EXTERNAL PREPOST SELECTOR 2	Refer to system level documentation for isolating to a pre/postselector or RF-7800H-MP failure.

Table 47. Run-Time Faults and Corrective Action (Continued)

Displayed Message	Description/Corrective Action
AGC ERROR	An error occurred in the Automatic Gain control (AGC). If problem persists, send radio to intermediate/level III maintenance.
TARGET ADDRESS ERROR	Error occurred in communicating with target address. Try again. Channel conditions may be poor.
TARGET CHARACTER COUNT ERROR	Error occurred in communicating with target address. Try again. Channel conditions may be poor.
KEY ERROR	Error occurred in keyline in system. If problem persists, refer to system level documentation.
UNKEY ERROR	Error occurred in keyline in system. If problem persists, refer to system level documentation.
KEY FAULT	This is a 3G call completion failure and does not indicate a radio failure. It means the radio was unable to key the PTT in time to establish a synchronous call. In general, it is due to changing conditions that cause the coupler to do a complete learn tune instead of the memory tune. If this fault message displays, the user should just try the call again.
NO CHANNELS FOR TARGET ADDRESS	Target address does not have channels associated with it.
LQA REQUEST ABORTED - RADIO SILENCE IS ON	Link Quality Analysis (LQA) request was aborted because radio silence is on. Turn off radio silence if conditions warrant.
INCOMPLETE ALE CONFIGURATION	Automatic Link Establishment (ALE) configuration is incomplete. Check fill or programming.
NO CONTACT	Call failed to make contact.
CALL ABORTED	Call was operator aborted.

Table 47. Run-Time Faults and Corrective Action (Continued)

Displayed Message	Description/Corrective Action
SELF ADDRESS ERROR	Self address is incorrect. Check fill or programming.
REQUEST IGNORED IN CURRENT ALE STATE	Request was ignored in current ALE state. Keypress may have been invalid.
ALE IS DISABLED	Firmware error. Send radio to intermediate/level III maintenance.
AMD PROCESSING IS DISABLED	Firmware error. Send radio to intermediate/level III maintenance.
REQUEST IGNORED WHEN RADIO SILENCE ON	Request was ignored because radio silence is on. Turn off radio silence if conditions warrant.
RF-5382 COUPLER CONFIG ERROR: NO 50-OHM PORT IS PRESENT	50 ohm port selection was attempted on RF-5382H-CU050 which does not have a 50 ohm port.
CONFIGURATION VERIFICATION: CONFIG FILE NOT LOADED	Firmware error. Send radio to intermediate/level III maintenance.
CONFIGURATION VERIFICATION: FIRMWARE REVISION MISMATCH	Firmware error. Send radio to intermediate/level III maintenance.
CONFIGURATION VERIFICATION: HARDWARE MISMATCH	Firmware error. Send radio to intermediate/level III maintenance.
CONFIGURATION VERIFICATION: INSTALLED OPTION MISMATCH	Firmware error. Send radio to intermediate/level III maintenance.
CTI GATEWAY INVALID PPP BAUD	The radio's Point-to Point (PPP) connection is not configured for 115.2 kbps. Reconfigure.
CPLR OVER VOLTAGE OR PA OVER CURRENT	Antenna has not been properly setup. Reinstall/redeploy.
NO RF OUT DETECTED	Normally occurs during a transient condition such as a spike in drive to the PA resulting in no RF output.

Table 47. Run-Time Faults and Corrective Action (Continued)

Displayed Message	Description/Corrective Action
*****FAULT***** RECEIVER PROTECTION	Move RF-7800H-MP away from source of strong RF signal.
FW VERSION MISMATCH	Send RF-7800H-MP to intermediate/level III maintenance facility as soon as possible.
HW VERSION MISMATCH	Send RF-7800H-MP to intermediate/level III maintenance facility as soon as possible.
CPLR CUTBACK	This cutback is based on load during tuning.
VSWR CUTBACK	This cutback is based on load during key.
TEMP CUTBACK	This cutback is based on the radio temperature.
DEFAULT PASSWORD DETECTED	Radio was put in Z or CLR. Refer to Change Administrator Password, p136 .

NON-BIT FAULTS

Non-BIT faults are operator-observed failures, or cases of degraded operation. Locate the observation in the first column of [Table 48](#) and follow the recommended action. If the recommended action is unsuccessful, report the fault to a Level III maintainer.

Table 48. Non-BIT Troubleshooting

Observation	Action
RF-7800H-MP does not power on.	Check battery.
No Receive (RX)/ Transmit (TX) audio; RF-7800H-MP will not Push-To-Talk (PTT) key.	Use a different handset.
Intermittent RX audio.	Clean handset connectors. Replace handset.

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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 49 contains the checks and services that should be performed either on a daily basis when the RF-7800H-MP is in use or on a weekly basis when the equipment is in a standby condition. Table 50 contains the checks and services that should be performed on a weekly basis.

Table 51 contains the checks and services that should be performed on an semi-annual basis. Table 52 contains the checks and services that should be performed on an annual basis.

Table 49. Preventive Maintenance Checks and Services - Daily

Check No.	Item to be Inspected	Procedure
1	Operation	Run operator initiated Built-In-Test (BIT).
2	Battery Box Vent	Check that battery case is securely attached and that pressure vent is clear. Vent valve should allow any gas to escape and prevent any water from entering the battery box.
3	Intercabling and Connectors	Check that the interconnecting cables and connectors are tight on the RF-7800H-MP and throughout the antenna system.

Table 50. Preventive Maintenance Checks and Services - Weekly

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

Table 51. Preventive Maintenance Checks and Services - 24 Months

Check No.	Item to be Inspected	Procedure
1	Hold-Up Battery (HUB)	Replace HUB every 24 months* or prior to deployment. Refer to Hold-Up Battery, p268 .

NOTE

*Time interval given for Harris B41-0010-004. If using Harris B41-0010-003 or Saft LS 14250, replace Hold-Up Battery (HUB) twice as often (every 12 months).

Table 52. Preventive Maintenance Checks and Services - 12 Months

Check No.	Item to be Inspected	Procedure
1	Radio performance	Refer to intermediate/level III maintenance for annual radio performance checks.

RF-7800H-MP

OPERATOR MAINTENANCE

REPLACEMENT PARTS

Table 2 lists items included with the RF-7800H-MP. Additionally, the OE-505 Whip Antenna Kit, shown in Figure 1, can be broken down into the following spare parts:

- Collapsible Whip - AT271A/PRC-25
- Antenna Base with Label - 10372-0277
- Base Whip Adapter - 10372-1260-01

CORRECTIVE MAINTENANCE

The RF-7800H-MP may require Level III maintenance if you observe the following:

- The operator has run Self Test and a fault has been identified by the RF-7800H-MP.
- A run-time fault message is displayed by the RF-7800H-MP.
- The operator has observed degraded operation that suggests the system is faulty

TROUBLESHOOTING

Faults can be detected by the Built-In Test (BIT) or visual observation. Self-test faults are displayed on the front panel. Refer to [Built In Test, p254](#), [Operator-Initiated BIT Faults, p254](#), [Run-Time Faults, p255](#), and [Non-BIT Faults, p262](#) for troubleshooting information.

BATTERIES

The RF-7800H-MP is supplied with Battery Box 12043-4800-01. Use one of the following batteries:

- BB-590/U Nickel Cadmium (Ni-Cd) rechargeable
- BB-2590/U or BB-2590/AU Lithium-Ion (Li-ION) rechargeable
- BB-390B/U Nickel Metal Hydride (Ni-MH) rechargeable
- BA-5590/U Lithium Sulfur Dioxide (Li-SO₂) non-rechargeable

- BA-5390/U Lithium Manganese Dioxide (Li-MnO₂) non-rechargeable

A PRIMARY BATTERY IN USE message appears at startup when a non-rechargeable battery is connected.

Battery Life

The most significant factor in determining battery life is transmission output power level and duty cycle. To maximize battery life, keep radio off when not needed, minimize transmissions, and use the lowest transmit power level required to successfully communicate.

Rechargeable Battery Packs



WARNING

Do not overcharge, short circuit, incinerate, or mutilate rechargeable batteries. Charge batteries per manufacturer's instructions. Failure to comply could cause personal injury or death.

Optional battery chargers are available to provide fully automatic battery charging and fault detection. Models are available for single or multiple battery charging, and display the status of each connected battery during operation. Contact Harris for particular applications.

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Disposing of Lithium Batteries



WARNING

For batteries containing Lithium, do not crush, puncture, disassemble, mutilate, short circuit, incinerate, or immerse in water, or expose to temperatures above 130 °F (54 °C); otherwise, battery may vent or rupture, releasing toxic material which may cause injury or death to personnel.



WARNING

Do not dispose of batteries in uncontrolled trash, as batteries may contain hazardous materials. Check with local directives for proper disposal. Failure to comply could cause injury or death to personnel.



WARNING

Store multicell lithium sulfur dioxide batteries in a well ventilated area away from personnel. Do not activate the Complete Discharge Device (CDD) of a damaged battery. Damaged multicell lithium sulfur dioxide batteries must be processed as hazardous waste and should not be thrown into a local dumpster. Otherwise, personal injury or death may result.



CAUTION

Lithium batteries, whether discharged or partially discharged, should only be disposed of per local directives. Adhere to applicable laws and your unit's guidelines for additional information on lithium batteries. Do not place lithium batteries in trash compactors.

Hold-Up Battery

The HUB retains programmed parameters, data, and encryption keys in memory when the radio has its main battery removed. The RF-7800H-MP should be stored with the function switch in the **[CLR]** position.

It is recommended that the HUB (Harris B41-0010-003 or Saft LS 14250, NSN 6135-01-461-5322) is replaced every 12 months. A Harris B41-0010-004 or Saft LS 14250C with higher capacity can also be used. Some tactical users may choose to replace the HUB prior to any foreseen long-term high priority missions. See [Figure 73](#). If the radio does not hold programmed parameters and fill data after removing and replacing main

battery, check and replace the HUB. To check HUB, refer to [Hold-Up Battery, p268](#).



WARNING

Do not dispose of lithium batteries in uncontrolled trash, as batteries may contain hazardous materials. Check with local directives for proper disposal. Failure to comply may cause injury or death to personnel.

Most of these batteries have a date code in the format of C.YY.DDD.F which is deciphered as follows:

- C - Country of manufacture
- YY - Year of manufacture
- DDD - Day in year of manufacture
- F - Internal manufacturer code

For example, a date code F. 03. 253. F means:

- F - France
- 03 - Year 2003
- 253 - 253rd day or Aug 11

Use a coin or flat-tip screwdriver as shown in [Figure 73](#) to remove the HUB. Immediately after replacing, reset HUB life per [Reset HUB Capacity, p270](#).

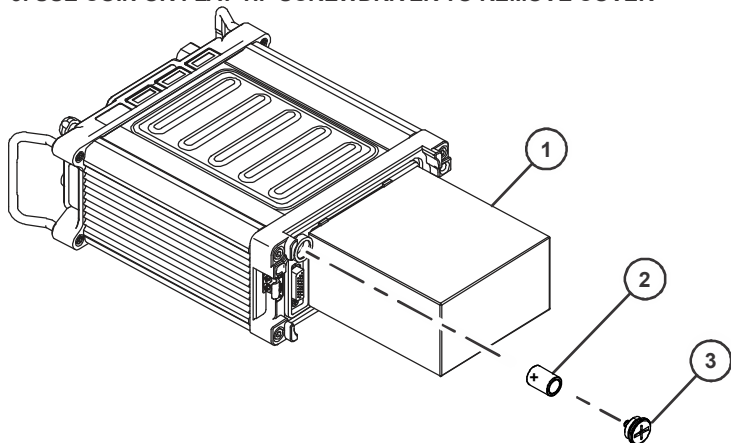
NOTE

Radio may reset (appear to power off then power back on) after a HUB replacement.

RF-7800H-MP

OPERATOR MAINTENANCE

1. LEAVE BATTERY ATTACHED
2. USE B41-0010-003 (SAFT LS 14250) OR B41-0010-004 (SAFT LS 14250C)
3. USE COIN OR FLAT-TIP SCREWDRIVER TO REMOVE COVER



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Figure 73. HUB Replacement

Reset HUB Capacity

When the Hold-Up Battery has been replaced, you need to reset the HUB capacity by choosing **[PGM] > MAINTENANCE > RESET HUB** menu and selecting **YES**.

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RF-7800H-MP SPECIFICATIONS/ REFERENCE

SPECIFICATIONS

Table 53 lists the specifications for the RF-7800H-MP.

Table 53. RF-7800H-MP Specifications

Function	Specification
GENERAL	
Frequency Range	1.5-59.9999 MHz
Net Presets	75, fully programmable
Frequency Stability	$\pm 1 \times 10^{-6}$
Emission Modes	J3E (single sideband, upper or lower, suppressed carrier telephony) H3E (compatible AM single side- band plus full carrier) A1A, J2A (compatible CW), selectable; F3E (FM)
RF Input/Output Impedance	50 ohm nominal, unbalanced
Power Input	26 VDC (21.5 - 32 VDC)
Data Interface	Universal Serial Bus (USB), synchronous or asynchronous (RS-232C)
Dimensions	3.3 H x 7.9 W x 9.2 D inches (8.3 H x 20 W x 23.4 D) cm
Radio Weight	8.7 lbs (3.9 kg) without batteries
RECEIVER	
Sensitivity	1.5 - 29.9999 MHz Single Sideband (SSB): -113 dBm (0.5 μ V) for 10 dB Signal + Noise + Distortion to Noise + Distortion Ratio (SINAD)
Audio Output	12 mW at 100 ohms to external handset
Squelch	Front panel adjustable, active squelch selectable
Intermediate Frequency (IF) Rejection	Greater than 80 dB
Image Rejection	Greater than 80 dB (First IF image)
AGC	Mode dependent, automatically selected

Table 53. RF-7800H-MP Specifications (Continued)

Function	Specification
Intermodulation Distortion	-80 dB or better for two -30 dBm signals separated 30 kHz or more
Overload Protection	Receiver protected to 32 Volts, Root Mean Square (VRMS)
TRANSMITTER	
Power Output	1.5 - 29.9999 MHz: 1, 5, 20 Watts Peak Envelope Power (PEP), -1 dB/+1 dB 30 - 59.9999 MHz: 1, 5, 10 Watts FM
Audio Input	1.5 mV at 150 ohms or 0 dBm at 600 ohms for full rated output
Carrier Suppression	Greater than 60 dB below PEP output (J3E mode)
Undesired Sideband Suppression	Greater than 60 dB below PEP output
Antenna Tuning Capability	OE-505 10-foot (3 m) whip (2 - 60 MHz), RF-1940-AT001/RF-1941 dipole
ENVIRONMENTAL	
Test Method	Per MIL-STD-810G
Vibration	Ground tactical
Immersion	3 ft (0.9 m) of water
Operating Temperature	- 40°F to +160°F (- 40°C to +71°C)

RF-7800H-MP SPECIFICATIONS/ REFERENCE

CONNECTOR PINOUT DATA

Table 54 through Table 60 provide pinout data for the external connectors mounted on the RF-7800H-MP chassis. See Figure 74 for connector pinout details. J9 ACCESSORY connector is only for factory use and power amplifier interface.

Table 54. Front Panel J1 AUDIO Connector

Pin #	Dir	Description	Specifications	Notes/Modes
A	N/A	Ground	Ground	Audio
B	Out (O)	Variable Audio Out	≥ 3.0 Vrms (9.5 dBm) into 1K load	Audio
C	In (I)	Handset Push-To-Talk (PTT)	+4.5 V through 10K ohms. Open = unkey, Ground = key	Audio
D	I	Microphone Audio In	1.5 millivolts, Root Mean Square (mVrms), Z in=150 Ohms	Audio
E	O	Keyline Out	Open drain, active low	Audio
F	O	Audio Mic bias	+4.5 V, 20 mA max (with 220 ohm limiting series resistor)	Audio

Table 55. Front Panel J2 GPS Antenna Connector

Pin #	Dir	Description	Specs	Notes/Modes
Shield		Antenna Coax	Ground	
Center	I/O	RF Input/Preamplifier bias out	+3.0 VDC, 9 mA min, 60 mA max	

Table 56. Front Panel J3 DATA Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	O	Clear-to-Send (CTS)	RS-232E Compatible	
2	O	Data Carrier Detect (DCD)	RS-232E Compatible	
3	O	Receive Data (RXD) Clock	RS-232E Compatible	
4	N/A	Ground		
5	N/A	Ground		
6	O	RX Data	RS-232E Compatible	
7	N/A			
8	I	Remote Control Transmit Data (TXD)	RS-232E Compatible	
9	O	Remote Control Data Carrier Detect	RS-232E Compatible	
10	O	Console RX Data	RS-232E Compatible	Console/Control
11	O	Red Fixed Level Audio Out	0 dBm nominal (0.775 Vrms)	600 ohm
12	I	Red Fixed Level Audio In	0 dBm nominal (0.775 Vrms)	600 ohm Clip at 11.8 dBm
13	N/A	Ground		
14	O	DC Power Output	+19.5 V to +33 VDC. 500 mA max.	Power for external device.
15	I	Red Push To Talk	Open = unkey, Ground = key	Internally pulled up to +3.3V thru 15K ohms.
16	I	Data Terminal Ready (DTR)	RS-232E Compatible	

Table 56. Front Panel J3 DATA Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
17	N/A			
18	I/O	Transmit Data Clock	RS-232E Compatible	Clock can be sourced by either the radio or the DTE
19	I	TX Data	RS-232E Compatible	
20	N/A			
21	O	Remote Control Receive Data	RS-232E Compatible	
22	I	Remote Control Data Terminal Ready	RS-232E Compatible	
23	O	Retransmit Keyline Out	Open collector	+18 VDC, 200 mA Max. External pull-up required.
24	O	Data Set Ready	RS-232E Compatible	
25	I	Console TX Data	RS-232E Compatible	Console/Control
26	I	Request-To-Send (RTS)	RS-232E Compatible	
27	I	Aux Power Control	Ground = On Open = Off	Controls pin 14 AUX PWR output.

Table 57. Front Panel J4 Keypad Display Unit (KDU) Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	I/O	Data from Keypad/Display	RS-422	
2	I	Data from Keypad/Display	RS-422	
3	I	Detect presence of RS-485 KDU	44.2 ohms (nominal) to ground	44.2 ohm connection to ground indicates a Falcon II KDU is connected.
4	I	Ground		Also power return
5	I/O	Data to Keypad/Display	RS-422	
6	I/O	Data to Keypad/Display	RS-422	
7	O	DC Power to Keypad Display Unit (KDU)	+19.5 to +33 VDC 120 mA max.	

J4 Connector shown for RS-485 Falcon II style KDU.

Table 58. Front Panel J5 USB Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	I/O	USB Data +	USB 2.0	
2				
3	I	USB Identification (ID)	USB 2.0	
4	N/A	Ground		
5	I/O	USB Data -	USB 2.0	

Table 58. Front Panel J5 USB Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
6				
7	O	USB VBUS	USB 2.0 G	+5.0 V \pm 200 mV, 120 mA max.

Table 59. Rear Panel J10 Connector (Battery)

Pin #	Dir	Description	Specifications	Notes/Modes
1	O	CELL 1A RTN-DC Return (Cell A)		DC Power return. The GND connection for the radio.
2	N/A	CELL 1B RTN-DC Return (Cell B)		Internally connected to pin 4 to connect Cell A in series with Cell B.
3	I	BATT TYPE Battery Type Indicator	Ground = Rechargeable Open = Non-Rechargeable	
4	I	CELL 1A+ DC Input Voltage (Cell A)		Internally connected to pin 2 to connect Cell A in series with Cell B.
5	I	CELL 1B+ DC Input Voltage (Cell B)		DC Power input
6	I/O	1-WIRE Interface	Bi-directional serial	Reserved for future use

Table 60. Rear Panel J10 Connector (For External Power Supply)

Pin #	Dir	Description	Specifications	Notes/Modes
1	O	DC Return (V-)		DC Power return. The GND connection for the radio.
2	N/A			
3	N/A			
4	N/A			
5	I	DC Input (V+)		DC Power input
6	I/O	1-WIRE Interface	Bi-directional serial	Reserved for future use

RF-7800H-MP SPECIFICATIONS/ REFERENCE

CABLE AND CONNECTOR KITS

Because of the large number of connections possible with the RF-7800H-MP, [Table 61](#) shows the variety of cables and connector kits available.

Table 61. Compatible Cables and Connector Kits

Interface	Cable Part Number	Description
Microphone Y Adapter	10372-1230	Provides duplicate audio interfaces of the RF-7800H-MP handset connector
PA/Remote	10535-0730-A1/A2	PA-RF-7800H-MP Control Y-cable, ASCII remote
Data	10535-0780-A006	Synchronous RS-232 Data Terminal Equipment (DTE) Data (DB-25) Provides the same data function as the 10518-1694-A006 cable without the Point-to-Point Protocol (PPP) function.
USB	12043-2750-A006	Firmware updates, general USB interface
KDU	10511-0704-012	KDU extension, six feet
PPP (Communications Planning Application [CPA] Cable)	10535-0775-A006	Async RS-232 control (DB-9)
Power	12027-0205-A020	Cable Assembly, DC Power Adapter, RF-5851-AD001 Vehicular
RF-6710W/ RF-6750W/ RF-6760	10518-1694-A006	Async RS-232 control/data (DB-9/DB-25)*
ANC KIT, RF-7800H-MP	12097-0900-02	RF-7800H-MP Ancillary Kit
NOTE: *May require additional equipment such as synchronous card.		

MATING CONNECTORS

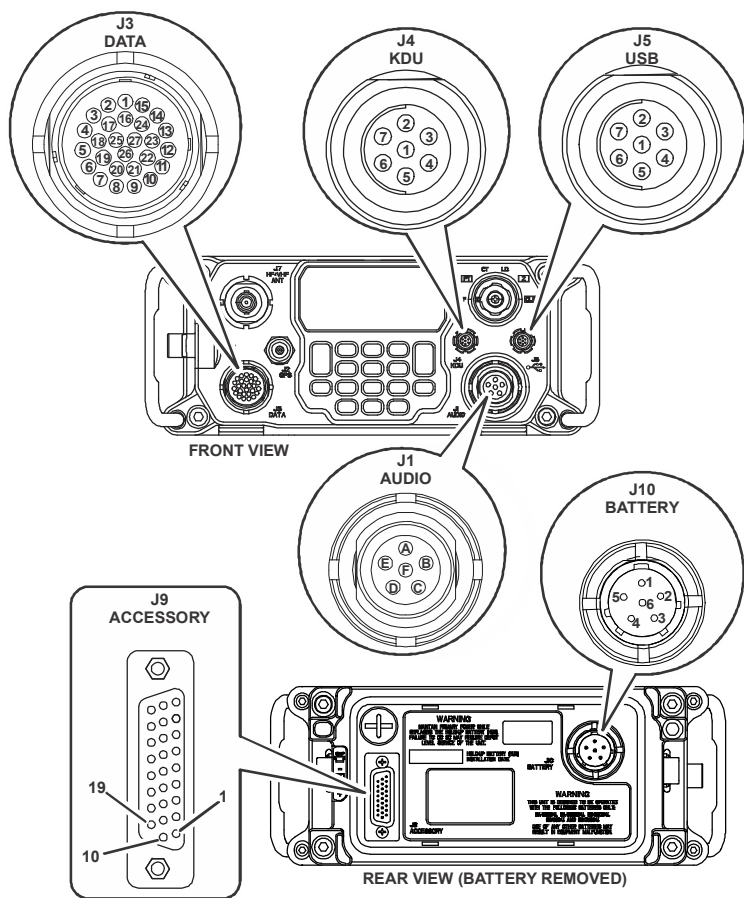
Table 62 provides part numbers for the cable connectors that mate to the RF-7800H-MP.

Table 62. Connectors and Mating Connector Part Numbers

Chassis Connector	Mating Connector Part Number
J1 AUDIO	J69-0001-623
J2 GPS Antenna Connector	P-0104 (For RG316 cable with gold plated sub-Miniature B (SMB) Female Connector)
J3 DATA	J69-0016-001 with J09-0039-001 backshell
J7 ANTENNA	UG-88C/U
J4 KDU	10075-5001-01
J5 USB	10075-5001-01

RF-7800H-MP

SPECIFICATIONS/ REFERENCE



CL-0413-4200-0064B

Figure 74. RF-7800H-MP Connector Pins

SUPPORT KITS

Contact Harris for assistance.

ACCESSORIES

The following items are available for the RF-7800H-MP.

Table 63. RF-7800H-MP Accessories

Accessory	Connection	Part Number	Notes
Falcon II Remote Keypad Display Unit (KDU) Kit	J4	12097-0100-01	Includes KDU (10511-1300-03), extension cable (10511-0704-012), and RF5931-CA001 carrying pouch/wrist strap
Modified H-250/U Handset	Audio / J1 port for audio connection	10075-1399	Standard 5/6 pin audio handset or headset.

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3G	Third generation HF communication protocols defined by STANAG 4538, characterized by faster linking and the ability to operate successfully in lower signal-to-noise ratio situations.
3G+	Radio Mode that allows the radio to receive and place ALE (MIL-STD-188-141A/B) calls while operating in 3G mode.
3G SMS	Third generation Short Message System (SMS). 3G SMS capable radios can send and receive short text messages.

-A-

ACK	Acknowledgement positive.
ACS	Automatic Crypto Select
Adaptive Wideband	A 3G operating feature that allows the radio to negotiate extended bandwidths for data transmissions.
ADF	Audio Data Fill Connector (J1)
AES	Advanced Encryption Standard
AGC	Automatic Gain Control -Circuit employed to vary gain in proportion to the input signal for the output to remain at a constant level.
AIC	Analog Interface Chip
AKS	Automatic Key Selection
ALE	Automatic Link Establishment - The process of making a point-to-point radio connection without operator involvement using data automatically collected by the system in accordance with a pre-established protocol.
ALE Net Call	A type of ALE call-answer protocol where the caller requests connection to all other radios in the net and the radios respond in a specific sequence so as not to interfere with each other.
ALE Net Address	15-character identifier used to describe the net in the radio to allow the radio to perform an ALE net call.

-A-(Continued)

ALL Call	ALE call made to all stations scanning on a given channel in which no responses are required from the target stations.
AMD	Automatic Message Display - A data mode only used in ALE that uses the ALE modem to transmit and receive short text messages with a very robust ARQ method.
AM	Amplitude Modulation
AME	Amplitude Modulation Equivalent. A efficient type of AM where one sideband is removed and the carrier suppressed to improve transmission.
ANT	Antenna
ANY Call	ALE call made to all stations scanning on a given channel in which responses are required from the target stations.
APR	Automatic Position Reporting
ARCS	Automatic Radio Control System
ARQ	Automatic Repeat reQuest - A data transmission system in which the receive terminal upon detecting a transmission error in a message automatically transmits a request to the originator to re-send the flawed parts of the message. Also, refer to ACK and NACK.
ASCII	American Standard Code for Information Interchange
Associated Self	ALE self address used in programming a Net.
ASYNCR	Asynchronous.
Automatic Call	In ALE, the channel with the best score will be selected. In 3G, the next usable channel will be selected. In 3G, BEST call will select the channel with the best score.
AUX	Auxiliary
AVS	Analog Voice Security
AVGAS	Aviation Gasoline

-B-

Bandwidth	A range of frequencies occupied by a given signal.
BAT	Battery
Baud	A unit of transmission speed, expressed as the number of code elements transmitted over a serial communications device in one second. For an RS-232 port, this may be interpreted as bits per second, including start bits, stop bits, and parity bits.
BER	Bit Error Rate
BFO	Beat Frequency Oscillator
Bit Error Rate (BER)	An evaluation of the ability of a channel to pass error-free data information.
bit	A binary digit that can have a value of 0 or 1
BIT	Built-In Test
BNC	Bayonet Neill Concelman
bps	Bits Per Second

-C-

°C	Celsius
CD	Compact Disk
Calling Station	The station initiating a call to a target station.
CAM	Citadel Algorithm Modification
CDD	Complete Discharge Device
Channel (CH, CHAN)	A programmed combination of frequency and mode of transmission, bandwidth, and AGC value.
Channel Score	ALE rating of overall channel quality
CLR	Clear
cm	Centimeter
Coalition Operations	Combined military operations involving US and other countries. Communication systems interoperability is a major factor in coordinating all operations.
Collocation	Placing or arranging systems in close proximity of each other.
COMSEC	Communication Security

-C- (Continued)

Comma-Delimited	A file format that uses a comma to separate data (for example, .CSV - Comma Separated Values). Widely accessible across database systems to import/export data.
Command	A single instruction to a computer program (including the operating system) from a user.
Communications Plan	A definition of up to 75 system presets in the operating modes including FIX, ALE, 3G, 3G+, and HOP for data specific to those nets and data common among all the nets. Also referred to as COMM PLAN.
Compression (data)	Reducing the size of ASCII text messages through an algorithm that eliminates redundant information. The data compression algorithm allows significant reductions in transmission time of a message.
Configuration	The process of setting parameter values which define the current hardware setup and/or operational modes. Also, a collection of all such values at any given time.
CPA	Communications Planning Application
CSEC	COMSEC Controller Module
CT	Cipher Text. Function switch position that enables the encryption programmed for the system preset.
CTI	Computer Telephony Interface - A type of 3G call that allows communications between a radio and a phone system via a Harris RF-6010 Tactical Network Access Hub.
CTS	Clear-To-Send
CVSD	Continuously Variable Slope Delta - Digitalization process for analog voice.
CW	Continuous Wave - Method of sending or receiving Morse Code.

-D-

D	Depth
Data Presets	A named, pre-defined set of modem parameters that allows the radio to be setup using only the name. Also referred to as modem presets.
dB	Decibel
dBm	Decibel per milliseconds
DC	Direct Current.
DCD	Data Carrier Detect
DD	Two digit day format
Default Settings	Transmission parameters established during the setup of the network configuration that remain in effect unless they are explicitly changed.
DIG	Digital, Digit
DMDG	Digital Message Device Group
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
DV	Digital Voice - Analog voice that has been converted into digital data.

-E-

ECCM	Electronic Counter Counter Measures - Techniques used to prevent signal detection or jamming of the transmission path.
ECCM Frequency Exclusion	A specific type of exclusion band that applies only to wide band ECCM mode and is given directly to the radio.
ECCM Channel Type	ECCM can operate in one of three modes: wideband, narrowband and list.
EEPROM	Electrically Erasable Programmable Read-Only Memory
ENT	Enter
e-Publication Exchange	Electronic Publications CD ALE LQA technique which involves two-way messages sent between two stations. Channel rankings are established based on received signal quality.

-E- (Continued)

Exclusion Band

A range of frequency values, stated as a lower and upper exclusive frequency, which must be omitted from all frequency lists in the appropriate scope.

-F-

°F

Fahrenheit

F_c

Center frequency. The frequency around which HOPPING occurs.

False Easting

Custom UTM setting used as a basis for relative position. Eastward measured distance (x coordinate) in meters from a horizontal datum.

False Northing

Custom UTM setting used as a basis for relative position. Northward measured distance (y coordinate) in meters from a horizontal datum.

Fix Frequency

A single frequency operating mode.

FLSU

Fast Link Set Up

FM

Frequency Modulation

-G-

Gateway Address

Also known as a default gateway, this address is used for routing addresses not known to a subnet to a location outside the subnet (i.e. another net or subnet).

GEOTRANS

Geographic Translator

GMT

Greenwich Mean Time

GND

Ground

GPS

Global Positioning System - A system that uses satellites to provide Time-Of-Day used with frequency hopping and 3G synchronization.

GPS-APR

GPS Automatic Position Reporting

-H-

H	Height
Hailing	A method by which a station that is not operating in ECCM mode can signal radios in an ECCM net. Hailing consists of transmitting a special signal on a single frequency from SSB mode. The members of the ECCM net are programmed with a list of hail frequencies which the ECCM radios periodically check for hail signaling. When a radio in ECCM mode detects a hail transmission, its operator is notified so that he may choose to change to FIX mode and contact the hailing station.
HCMAC	High Capacity Media Access Control
HDL	High-throughput Data Link protocol defined by NATO STANAG 4538.
HERF	Electromagnetic Radiation to Fuel
HERO	Electromagnetic Radiation to Ordnance
HERP	Electromagnetic Radiation to Personnel
HF	High Frequency
HFNET	High Frequency Network
HIGH-Q	High Q-factor antenna. Q-factor is basically an indication of the effective bandwidth of the tuned antenna. A High-Q antenna provides a superior output but at a small bandwidth. To use full loop High-Q antennas (RF-3134-AT003 and -AT005), the radio needs to be configured to avoid high VSWR situations.
HOP	Same definition as ECCM. Hop is also a term used to describe the next IP address in an IP route.
Hopnet	Defines the set of ECCM frequencies or hopping characteristics that the radio is allowed to use.
HUB	Hold-Up Battery. Maintains the radio configuration programming and loaded COMSEC fills when the radio's main battery is depleted or removed.
HUITS	Harris Universal Image Transmission Software
Hz	Hertz

-I-

I	In
ID	Identification
IDS	Menu selection used to display radio serial number and part number.
IF	Intermediate Frequency
Individual Address	A maximum 15 character ALE name which one radio uses to refer to another radio (also referred to as a call sign).
Individual Call	ALE call placed to a single target station using an individual address. Each station must be programmed with the address and channel list of the other station before initiating the call.
INFOSEC	Information Security
Interface	A boundary between two systems, a device which connects two systems, or a specification for connecting two systems.
Interleaving	A form of forward error correction designed to overcome fading and impulse noise.
IP	Internet Protocol.
IP Address	A number made of four 8-bit binary numbers that uniquely identifies a computer on a network.
IP Address - Subnet Mask	A number made of four 8-bit binary numbers that identifies a series of computers by masking part or all of the IP addresses in the subnet.
IP Firewall	A programmable network option to enable or disable Internet Protocols for secure data communications.
ITAR	International Traffic in Arms Regulations

-J-

-K-

k	kilo
kbps	kilobits per second
KDU	Keypad Display Unit
kg	kilogram
kHz	kilo-hertz
km (kilo-meter)	1000 meters

-L-

L/L-DMS	Latitude/Longitude - Degree/Minutes/Seconds
LAN	Local Area Network
lb	pound
LCD	Liquid Crystal Display
LDV	Last Ditch Voice
LDL	Low-latency Data Link protocol defined by NATO STANAG 4538
Li-ION	Lithium Ion
Li-MnO₂	Lithium Manganese Dioxide
Li-SO₂	Lithium Sulfur Dioxide
LP	Leap Seconds
LPC	Linear Predictive Coding - Used to produce Digital Voice.
LQA	Link Quality Analysis - The process of determining the quality of a channel by measuring various parameters of the received signal such as signal-to-noise ratio and bit error rate. Typically, LQA information is stored and then used in the ALE and 3G processes.
LSB	Lower Sideband
LT	Light

- M -

m	meter(s)
mA	Milli-Amperes or 10^{-3} Amps.
Manual Call	A call in which the channel is selected by the user.
Manual Synchronization	A way of synchronizing radios in the net without using GPS Sync. With all radios in wristwatch sync, a signal is sent to the net control station, requesting a special synchronization transmission. The net control station responds by transmitting timing information on the channel that all radios use to synchronize their clocks. The over-the-air timing information must be accepted by the operator before it is put into use by the radio.
Max	Maximum
Max Scan Channels	The largest value of the number of ALE channels scanned by each radio in a net. The number of channels scanned by a radio is the sum of all the ALE channels in all the nets the radio is a member of.
MCW	Modulated Continuous Wave
MELP	Mixed Excitation Linear Prediction - A method of digitizing analog voice signals. Speech is more recognizable and works well in poor signals strengths.
MGRS	Military Grid Reference System
MHz	Abbreviation for megahertz, or millions of cycles per second.
MI	Message Indicator
MIL-STD	Military Standard
Min	Minimum
MM	Two digit Month format
MOD	Modulation
Mode	The HF signaling method being employed which include SSB/FIX, ALE, 3G and HOP.

-M- (Continued)

Modem	Acronym for MODulator/DEModulator. This is a type of data communications equipment which converts digital signals into an analog format (modulation) suitable for transmission through various media and reconverts received signals into a digital format (demodulation).
MOGAS	Motor Vehicle Gasoline
MP	Manpack
msec	minutes per second
MSG	Message
MTOD	Manual Time-of-Day
mV	millivolt
mVrms	milli-Volts, Root Mean Square
mW	milliwatt or 1×10^{-3} Watt

-N-

N/A	Not Applicable
NACK	Negative ACKnowledgement - In an ARQ system, a-request from the receiving station that a message block in which errors were detected be retransmitted.
NATO	North Atlantic Treaty Organization
NCS	Net Control Station - The station in the radio net that has radio control over net members.
NEI	Netherlands East Indies (GPS position format)
Net Configuration	Data describing a net including name, description, radio members and their ALE addresses, etc. Nets can exist in multiple plans, but have distinct configurations in each plan.
Net	A group of radios that share common communications parameters, such as frequencies, ALE information, encryption mode and key, etc.
Ni-Cd	Nickel-Cadmium
Ni-MH	Nickel-Metal Hydride

-N- (Continued)

Non-ARQ Mode

A form of message transmission that does not require the destination to confirm the receipt of a message. The message may be directed to one or more stations.

NRDI

Network Radio Driver Install

NVIS

Near Vertical Incidence Skywave

NVRAM

Non-Volatile Random Access Memory

-O-

O

out

OPT

Option

OTA

Over-the-Air

Other address

Upon receiving a call or LQA Sound from an ALE address, the radio checks to see if the sound or call came from an address in its individual address table. If the address is not in the individual address table, the radio temporarily stores this address in the OTHER address list, along with its LQA information.

-P-

PA

Power Amplifier

Parameter

Data provided to a program to alter its function in some manner defined by that program.

Parameters may be either optional or required. The actual value selected by the user is called a parameter value.

PC

Personal Computer

Peer IP Address

An IP address sent from the radio to the computer as part of a dynamic address negotiation scheme (as opposed to static [never changing]). This is either a custom IP address, or a WIRELESS setting, and is required for changing 3G nets. Peer IP addresses that are determined via shared communications between the radio and the computer are referred to as negotiated peer IP addresses.

-P- (Continued)

PEP	Peak Envelope Power
PRE	Preset
PGM	Program
PKT	Packet, as in data packets
PPP	Point to Point Protocol
PT	Plain Text
PTT	Push (or Press)-to-Talk - The button on the handset you press to activate the transmitter for voice transmission.
PWR	Power

-Q-

-R-

RAM	Random Access Memory
Radio Presets	A named, predefined set of radio parameters.
Radio Silence	A feature which prevents automatic response to incoming calls or LQA requests in ALE/3G/3G+.
RCV/RX	Receive
RDP	Remote Data Port
RF	Radio Frequency
RS-232	A standard specification for the design of serial ports. An RS-232 port is a serial port that conforms to the RS-232 EIA standard.
RF-7800H-MP	Receiver/Transmitter - the Radio
R/T	Receiver/Transmitter
RTS	Request-To-Send
RX	Receive, receiver
RXD	Transceiver Receive Data

-S-

S 3 6 9 +	S-meter used to gauge signal strength on display.
Score	A rating of overall channel quality in ALE and 3G modes determined by link quality analysis.
Self Address	An address used to identify a calling station. A station may have more than one self address. The same character string is used as the individual address when receiving calls as a target station.
Serial Port	A communications device which transfers data over a data line one bit at a time. The serial ports on a PC-compatible conform to the RS-232 standard.
Sounding	An LQA technique which involves sending a one-way message on all channels programmed for a self address. Target stations establish channel rankings based on received signal quality by receiving the sounding signal and do not have to transmit back a response ensuring security of location.
SINAD	Signal + Noise + Distortion to Noise + Distortion Ratio.
SMB	Sub-Miniature B (connector)
SMS	Short Message Service
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
SQ	Squelch - Noise limiting function that requires the incoming signal strength to be above a set threshold level in order to be received.
SQL	Squelch
SPCM	Signal Processing and Control Module
SSB	Single Sideband
SSD	Safe Separation Distance
STANAG	Standard, North Atlantic Treaty Organization (NATO) Agreement
Start Bit	An extra bit written at the beginning of each byte in serial communications.

-S- (Continued)

Stop Bit

An extra bit written at the end of each byte in serial communications. This helps to keep the two ends of the line synchronized and improve reliability.

SYNC

Synchronous. A data transmission method using a clock signal between the DTE and DCE for proper synchronization. Does not require the stop and start bits in the data stream as asynchronous requires.

-T-

Target Station

A station called by a calling station.

TEK

Traffic Encryption Key - A Key used to encrypt normal radio traffic.

TOD

Time of Day - The time used to synchronize station to calibrate the hopping sequence.

T/R

Transmit/Receive

TX

Transmit

-U-

UDP

User Datagram Protocol

US

United States

USB

Upper Sideband, Universal Serial Bus

UTC

Universal Time Coordinated

UTM/UPS

Universal Transverse Mercator/Universal Polar Stereographic

uV

Micro-Volts or 10^{-6} Volts

-V-

V

Volt

VDC

Volts, Direct Current

VDP

Voice Data Processor

VHF

Very High Frequency

VOL

Volume

VRMS

Volts, Root Mean Square

-V- (Continued)

VSWR Voltage Standing Wave Ratio - An indication of the impedance match between the source (radio) and the load (antenna). A perfect VSWR would be 1.0:1.

-W-

W Width
WAN Wide Area Network
WBFSK Wideband Frequency Shift Keying - a modem waveform
WGS World Geodetic System 1984 - defines a reference frame for the Earth
WMT Wireless Messaging Terminal - The Harris RF-6760 messaging interface that capitalizes on the ARQ modem preset to ensure reliable data communications.

-X-

XDL High-throughput Data Link protocol (HDL) or Low-latency Data Link protocol (LDL). Together, they are referred to as XDL, where "X" is a variable.
XMT Transmit

-Y-

YYYY Four-digit Year format

-Z-

Z, Zeroize A command sequence which erases all programmed channel parameters, presets, loaded COMSEC variables and option settings.

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