AN/PRC-160(V) WIDEBAND HF/VHF MANPACK RADIO

FIELD REFERENCE GUIDE

HARRIS® TECHNOLOGY TO CONNECT, INFORM AND PROTECT™

AN/PRC-160(V)
WIDEBAND HF/VHF RADIO
FIELD REFERENCE GUIDE

This manual is based on Firmware Version 2.0

HARRIS®

SAFETY GUIDELINES

⚠	**WARNING** - Do not crush, disassemble, reverse polarity, 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 for both types of batteries. Any trace of acid or acid fumes will permanently damage lithium-ion batteries on contact.
⚠	**WARNING** - A damaged lithium-ion battery that is exposed to water could cause a fire or explosion, causing personal injury. Never expose batteries to any amount of water at any time. Replace batteries with cracked or damaged cases immediately.
⚠	**WARNING** - A partially discharged or damaged lithium battery is considered to be hazardous waste that can cause personal injury. Do not dispose of lithium-ion batteries in uncontrolled trash.
⚠	**WARNING** - Use only battery chargers approved by Harris. 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. Do not attempt to recharge a disposable AA battery.
⚠	**WARNING** - RF shock could occur from coming into contact with the antenna while radio is transmitting.
⚠	**WARNING** - The radio could be transmitting even though the Push-To-Talk (PTT) button has not been pressed. This is possible in data communications, Internet Protocol (IP) connections, while performing Third Generation HF protocols (3G) Link Quality Analysis (LQA), or automatic position reports. RF shock could occur from coming into contact with the antenna while radio is transmitting.

⚠	**WARNING** - Do not extend antennas or drive vehicles under low hanging power lines. Contact with power lines could result in personnel injury or death.
⚠	**WARNING** - Operating RF transmitting devices such as radios and cellular phones in or around fuel, weapons, or ordinance could cause serious injury or death.
	Follow all local directives and established safety procedures when operating any RF transmitting devices in these circumstances
	Make sure guidelines specified in NAVSEA OP 3565 for Hazard of Electromagnetic Radiation to Ordnance (HERO), Hazard of Electromagnetic Radiation to Fuel (HERF), and Hazard of Electromagnetic Radiation to Personnel (HERP) are followed while operating this radio.
	The RF system must be turned off within a Safe Separation Distance (SSD) of the HERO Unsafe or Unreliable Ordnance, HERO Susceptible Ordnance, and HERO Safe Ordnance.
	When in the presence of equipment being refueled, the system must be turned off within an SSD of fueling operations involving motor vehicle gasoline (MOGAS), aviation gasoline (AVGAS), or JP-8 fuel. No SSD needs to be maintained for fueling operations involving JP-5 or diesel fuel.

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REFERENCE

INTRODUCTION

This reference guide is intended to support basic field user operations on the HF Manpack Type-1 Receiver/Transmitter (R/T), referred to by its current name, AN/PRC-160(V).

The following assumptions are made about the field user:

- The operator has been trained on the radio and is familiar with its basic features.
- The radio has been Type-1 Initialized and has been programmed.
  - Mission Plan file has been loaded and activated.
  - Type-1 keys are filled from a fill device. Key Fill file used for Type-3 Citadel/AES keys.

The AN/PRC-160(V) frequency range is continuous from 1.5 MHz to 59.9999 MHz. The radio supports Upper Side Band (USB), Lower Side Band (LSB), Amplitude Modulation Equivalent (AME), Continuous Wave (CW) and Frequency Modulation (FM). The HF waveform operates with Fixed Frequency (FIX), Automatic Link Establishment (2G ALE), Third Generation ALE (3G), and ECCM HOP modes.

NOTE

Adaptive Wideband HF is supported in 3G. However, it is not supported in 2G ALE or in a 3G IP configuration.

VHF Line-Of-Sight (VULOS) waveform operation (FM from 30.0000 to 59.9999 MHz) and configuration is supported in addition to the HF waveform for release 2.0.

Refer to AN/PRC-160(V) Operation Manual (10515-0512-4200) for detailed information.

ITEMS INCLUDED

The items shown below are included with the AN/PRC-160(V).

HF MANPACK RADIO
*0N839880-3 (MIL GPS, SAASM)
**0N839880-4 (COMMERCIAL GPS)

AN/PRC-160(V)
COMMUNICATIONS
PLANNING APPLICATION
(AN/PRC-160-CD001)

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

USB PROGRAMMING
CABLE ASSEMBLY
(12043-2850-A006)

FIELD GUIDE REFERENCE
(10515-0512-4100)

ELECTRONIC
PUBLICATION CD
(10515-0512-6000)

RF HAZARD LABEL
(12097-3026-01)

ANTENNA BASE
(10372-0277)

ANTENNA BAG
(CW-503/PRC-25)

COLLAPSIBLE WHIP
(AT271A/PRC-25)

BATTERY BOX
(12043-4800-01)

BASE WHIP
ADAPTER ASSEMBLY
(10372-1260-01)

GPS ANTENNA
*(12006-4240-01)
**(12006-0017-02)

DIPOLE ADAPTER
ASSEMBLY
(10372-1270-01)

OE-505 WHIP
ANTENNA KIT
(10372-0240-02)

GROUND STAKE KIT
(10303-1008-01)

CL-0512-4100-0001

SYSTEM SETUP

Set up your radio for basic communications and operations.

a. Observe battery orientation label inside battery box.

NOTE

Battery meter will not be accurate unless the proper battery is selected using the front control panel. Different batteries have different voltage profiles.

b. Record the battery model.

c. Place battery in battery box with connector facing upwards and oriented on side indicated by the label.

d. Place radio on top of battery aligning rear connector and battery connector.

e. Secure latching side clasps on battery box to radio clips.

f. 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. Configurations can consist of (but not limited to):

- OE-505 Whip Antenna with dipole adapter if dipole or inverted vee antenna is desired
- OE-505 Whip Antenna by itself
- Cable from user supplied antenna

g. Connect connectors labeled on front panel as required:

- Handset to J1 AUDIO
- Global Positioning System (GPS) antenna to J2 GPS
- Universal Serial Bus (USB) programming cable to J5 USB
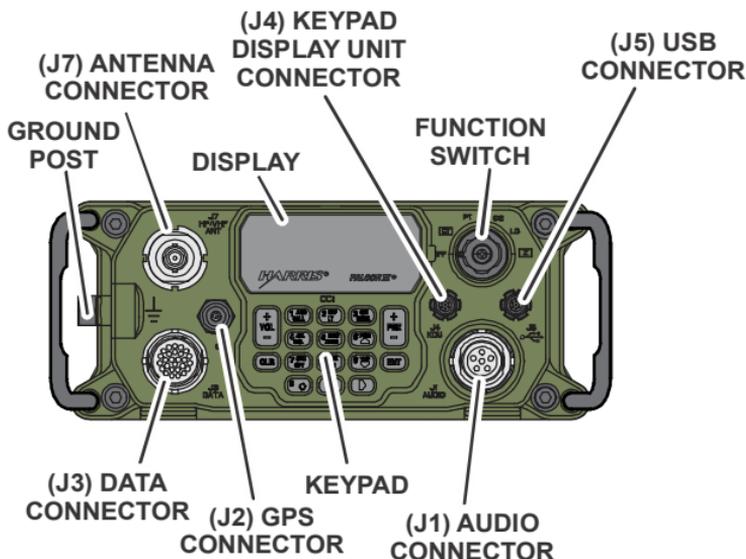
CL-0512-4100-0002

h. Attach ground cable to ground post as required.

i. Turn the function switch (pull to turn action) from **OFF** to the **CT** position to power on the radio.

j. Observe there are no fault indications after radio performs power on self-test.

k. Select **[PGM] > RADIO CONFIG > GENERAL CONFIG > BATTERY CONFIG > BATTERY MODEL** menu.

l. Select the battery model recorded earlier and press **[ENT].**

m. Select **[PGM]** to exit programming mode.

ANTENNA

ANTENNA BASE

HANDSET

BASE WHIP ADAPTER

GROUND POST

HF RADIO CHASSIS

BATTERY*

SIDE CLASPS

BATTERY BOX
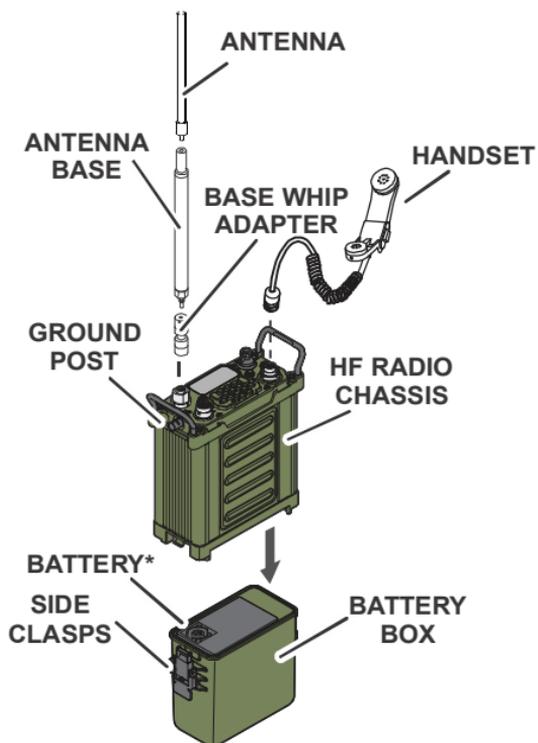
*NOT INCLUDED

CL-0512-4100-0003

SYSTEM TEARDOWN

Perform the following procedure to tear down AN/PRC-160(V).

NOTE

For GPS models, the GPS antenna may remain on the radio because of its small size.

a. Turn function switch to **[Z]** to zeroize the radio and erase all communications information. Refer to Zeroize Functions.

b. Turn function switch to the **OFF** position.

c. Disconnect the handset, headset, or any cabling, if used, from the transceiver.

d. Disconnect the antenna from the antenna connector.

CONTROLS AND INDICATORS

FRONT VIEW
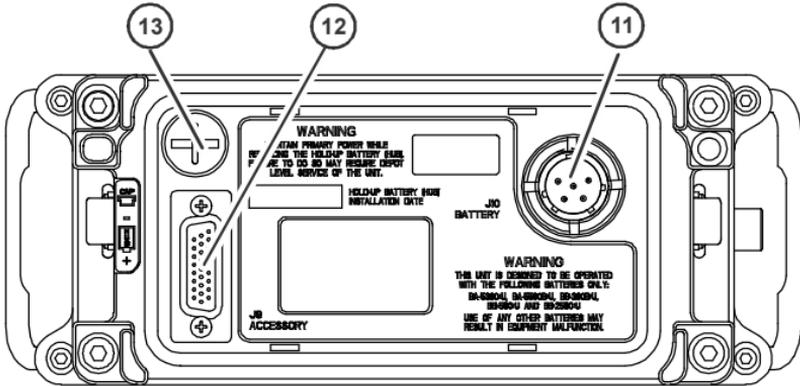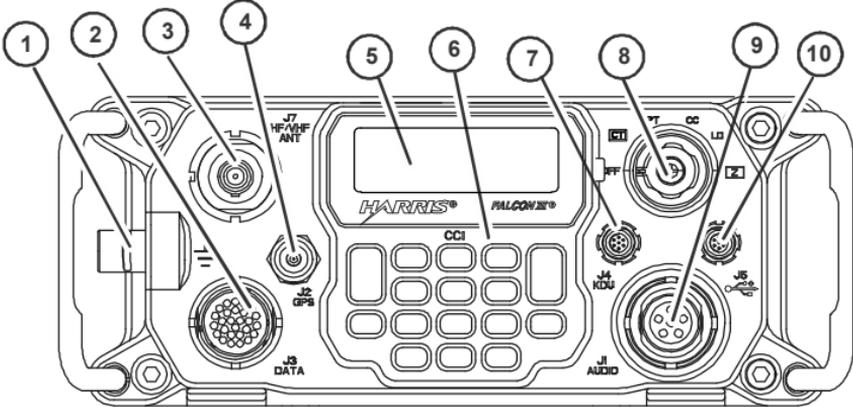
REAR VIEW (BATTERY REMOVED)

CL-0512-4100-0000

Key	Control/Indicator	Function
1	Ground Post	Provides a grounding reference for connecting a grounding source to the radio.
2	J3 DATA	Provides a connection for Data Terminal Equipment (DTE) data 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	Liquid Crystal Display (LCD)	Displays the operational and programming screens.
6	Keypad	
	0 ○ **[NEXT]**	Switches the display to alternate screens for additional information.
	1 ABC CALL **[CALL]**	Dependent on radio operation mode selected: Initiates a 2G or 3G ALE call (Best, Manual, Automatic, Broadcast Sync, Send GPS Report, or Send SMS). Initiates HOP call (Manual Sync Type - Request or Broadcast).
	2 DEF LT **[LT]**	Accesses the Display backlight control menu.
	3 GHI MODE **[MODE]**	Used for OTAR Receive and OTAR Transmit (radio must be in CT).
	4 JKL SQL **[SQL]**	Toggles programmed squelch on or off for the type of channel modulation currently used.
	5 MNO ZERO **[ZERO]**	Accesses the zeroize menus.
	7 STU OPT **[OPT]**	Provides access to the radio and waveform option menus which are mode dependent.
	8 VWX PGM **[PGM]**	Accesses the radio's programming menus.

Key	Control/Indicator	Function
	[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 data or a link in ALE and 3G radio modes. In ALE radio mode, this key also stops and starts scanning.
	[ENT]	Enter - Selects scroll field choices or locks in entry field data.
	[PRE +/-]	Scrolls through the programmed presets. Up (+) scrolls up through the presets, down (-) scrolls down through the presets. On 3G station selection screens, PRE +/- can be used to scroll by prefix.
	[VOL +/-]	Up (+) increases volume, down (-) decreases volume. (Not lockable.) On 3G station selection screens, VOL +/- can be used to page up/down.
	[Left Arrow] [Right Arrow]	Move the cursor to the left (◀) or right (▶), or to select a new menu field.
	[Up Arrow]	Step through a scroll field list up (▲) or down (▼).
	[Down Arrow]	
7	KDU (J4)	Provides connection for external Keypad Display Unit (KDU).
8	Function Switch	
	OFF	Turns radio off. A pull-to-turn action is required to enter or leave this position.
	CT	Requires a pull-to-turn action. Places the radio in the Cipher Text encryption mode (digital voice or data).
	PT	Places radio in plain text non-encrypted mode.
	CC	Places the radio in Coalition Compatible digital encryption mode.

Key	Control/Indicator	Function
	LD	Places the radio off-line for security or installation. In fill mode, the radio is able to load encryption keys. In install mode, the radio is able to load software and mission plans.
	Z	Requires a pull-to-turn action. This zeroizes all programmed variables, including encryption variables.
9	6-Pin AUDIO/Fill Connector (J1)	Provides a connection for an H-250 handset or crypto fill device that uses a 6-pin connector.
10	USB (J5)	Provides connection for Universal Serial Bus (USB).
11	Battery (J10)	Battery connector.
12	Accessory (J9)	Provides connection for an external power amplifier.
13	HUB	Provides access to the Hold-Up Battery (HUB).

Front Panel Display

SQUELCH
INDICATOR
SQL (ON) OR OFF

NEXT INDICATOR TO VIEW
ADDITIONAL SCREENS
USING [0] KEY

HF RADIO MODE
FIX, ALE, 3G/3GIP, HOP,
OR VULOS

CRYPTO TYPE
"–––" - UNKNOWN
"AES", "CITADEL",
"ANDVT-BD", "ANDVT-HF",
"KG84-R", "KG84-NR",
"TSV"

BAT - BATTERY METER
VOL - VOLUME METER DISPLAYS
FOR 4 SECONDS WHEN VOLUME
IS CHANGED

T - TRANSMITTING
R- RECEIVING

CT - CIPHER TEXT
PT- PLAIN TEXT
CC - COALITION
COMPATIBLE

PRESET NUMBER
PRESET NAME

DATA
MODE

VOICE
MODE

COMSEC
KEY
FIELD

CHANNEL

RECEIVED SIGNAL
STRENGTH OR
TRANSMIT POWER
(SYNC METER
WHEN IN 3G)
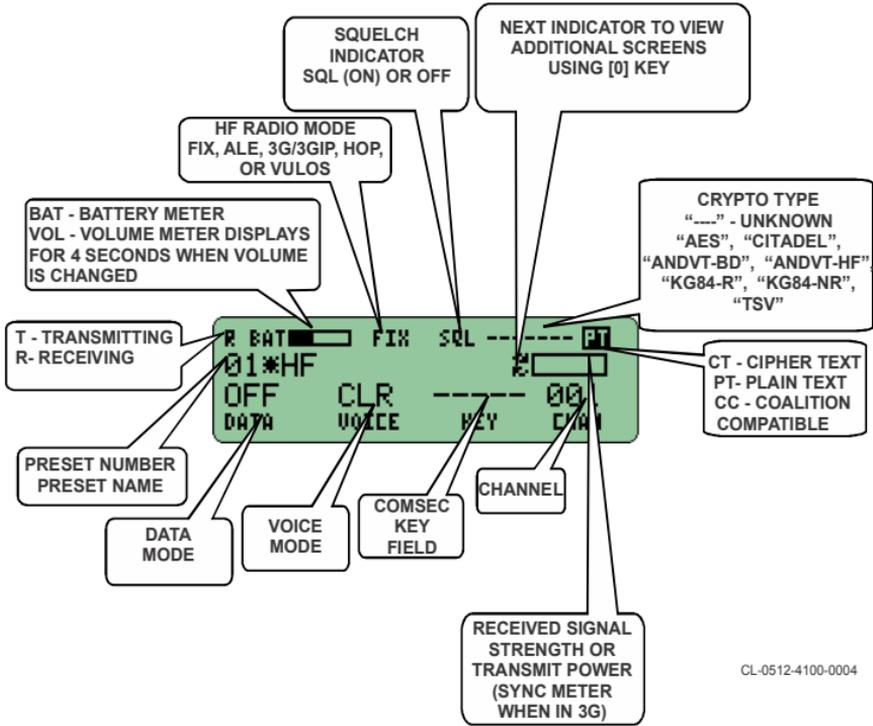
CL-0512-4100-0004

LOADING COMSEC FILLS

Operating the radio in any of the embedded Communications
Security (COMSEC) modes requires loading of COMSEC fill data.
See the following key loading operations and key types examples.

Load COMSEC TEK/KEK using DS-101

NOTE

KEKs and TEKs are required to have the same
classification level.

This procedure is for HF WAVEFORM key loading. GPS key
loading is similar.

a. Turn function switch to **[LD]**.

b. Select **FILL** and press **[ENT]**.

c. Select **WAVEFORM** and press **[ENT]**.

d. Select **HF** from WAVEFORM FOR KEY screen (HF is
default choice) and press **[ENT]**.

e. Select **SKL (PYQ-10)** or other specific DS-101 capable fill
device from FILL DEVICE screen and press **[ENT]**.

f. Select **DS-101** from FILL PORT TYPE screen and press
[ENT].

g. Observe that the radio displays **INITIATE FILL AT FILL
DEVICE**.

h. Connect fill device to AUDIO/FILL connector.

i. Prepare to transmit key information at fill devices using
DS-101 and **Issue** as transmit mode and then initiate the
fill at fill device. Refer to Load Keys using SKL for example.

j.   Select the desired **CRYPTO MODE**, and press **[ENT]**.

- ANDVT
- KG84
- TSV

k.   Select the **KEY TYPE**.

l.   Select the key compartment position number (**01 - 25**) and press **[ENT]**. If a Key Encryption Key (KEK) is selected to be loaded, no key position is shown as only one can be loaded per waveform.

m.   Observe the classification level is temporarily displayed (DS-101 includes this additional tagging and no input is required).

n.   Select **YES** at prompt **LOAD ANOTHER KEY** to enter more fill data.

o.   Select **NO** when the **LOAD ANOTHER KEY** prompt displays and all fill data is entered.

p.   Disconnect fill device from the AUDIO/Fill connector. Follow screen prompts to close session and log out.

q.   Turn function switch from **[LD]** to **[CT]**.

r.   Verify correct fills have been loaded by going to **[OPT] > VIEW KEY INFO**.

s.   Perform a secure communications check using loaded Traffic Encryption Keys (TEKs).

Load COMSEC TEK/KEK using DS-102

This procedure is also for HF WAVEFORM key loading.

a. Turn function switch to **[LD]**.

b. Select **FILL** and press **[ENT]**.

c. Select **WAVEFORM** and press **[ENT]**.

d. Select **HF** from WAVEFORM FOR KEY screen (HF is default choice) and press **[ENT]**.

e. Select **SKL (PYQ-10)** or other specific DS-102 capable fill device from FILL DEVICE screen and press **[ENT]**.

f. Select **DS-102** from FILL PORT TYPE screen for DTD and SKL and press **[ENT]**.

g. Observe that the radio displays **PRESS ENT TO INITIATE FILL**; however, do not press anything until fill device is set up.

h. Connect fill device to AUDIO/FILL connector and send the key.

i. Prepare to transmit key information at fill devices using **DS-102** as transmit mode and then wait at INITIATE prompt. Refer to Load Keys using SKL for example.

j. At the radio, with **PRESS ENT TO INITIATE** still displayed, press **[ENT]**.

k. Observe **TRANSFER COMPLETE** at the fill device.

l. Select Crypto mode at radio and press **[ENT]**.

m. Select slot number for KEK or TEK and press **[ENT]**.

n. Select **CLASSIFICATION** and press **[ENT]**. If this is not completed, the key does not store.

o. Select **YES** at prompt **LOAD ANOTHER KEY** to enter more fill data.

p. Select **NO** at the **LOAD ANOTHER KEY** prompt when all fill data is entered.

q. Disconnect fill device from the AUDIO/Fill connector. Follow screen prompts to close session and log out.

r. Turn function switch from **[LD]** to **[CT]**.

s. Verify correct fills have been loaded by going to **[OPT] > VIEW KEY INFO**.

t. Perform a secure communications check using loaded TEKs.

Load Keys using SKL

a. Turn on SKL, Login, and launch User Application Software (UAS).

b. Select the **Keys** tab from Main Menu.

c. Select a key to load using **File > Transmit > Load Selected Keys** menu (or using the short title and click on load button).

d. Select **Selected Keys** from the SKL Main menu.

e. Select at least one key to load into the radio from the **Key Load Select Keys** menu to proceed.

f. Select **OK** when all required keys have been checked.

g. Observe the **Key Load Settings** menu is displayed.

h. Select either DS-101 or DS-102 Protocol using the drop-down list.

i. Ensure Active Mode is DS-101 or DS-102 and other settings are at their default.

j. Select **OK** (this sends key for DS-101).

k. Observe the **Ready to Send Key** screen (DS-102).

l. Select **OK**.

Loading Citadel/AES Type-3 Keys

Loading Type-3 keys into the radio does not require a COMSEC fill device. Type-3 keys can be loaded into the radio along with the Mission Plan, transferred as a Key Fill File (*.key.tek) from a PC or loaded via CPA. If loading keys from a PC hard drive, connect the PC USB port to the radio using the programming cable.

NOTE

Type-3 keys can also be programmed from the front panel by selecting **[PGM] > RADIO CONFIG > GENERAL CONFIG > CITADEL CONFIG > KEYS**.

Perform the following procedure to load Type-3 keys using USB.

a. Turn the radio on and set for Load **[LD]**. The radio will be offline.

b. Select **FILL**, and press **[ENT]**.

c. Select **PC (MASS STORAGE)** or **FLASH DRIVE (HOST)** to load Type-3 keys from CPA or Key Fill file and press **[ENT]**.

d. Observe the radio will display a list of key files transferred to the radio.

e. Select the proper key file (*.key.tek) from the list and press **[ENT]**. If transferring directly from CPA, the name of the key file will be the same as the CPA mission plan file name, with **(T)** at the end to indicate it is the key file.

f. Select **YES** at the Fill and Reboot screen and press **[ENT]** to continue.

g. Observe the prompt **ERASE STORED KEYS?** is shown if the radio previously contained keys.

h. Select **YES**, if desired, to remove existing keys and press **[ENT]**.

i. Verify **COMPLETE** is displayed and press **[ENT]** to continue.

j. Observe the number of new keys added or replaced is displayed and press **[ENT]** or **[CLR]**.

k. Turn function switch from **[LD]** to desired operating position of **[CC]** or **[PT]**.

l. Disconnect the programming cable from the radio.

m. Verify correct fills have been loaded by going to **[OPT] > VIEW KEY INFO**.

n. Perform a secure communications check using loaded TEKs.

BASIC OPERATIONS

Starting Up the Radio

a. Rotate the function switch to **[CT], [PT]** or **[CC]**. This turns the radio on and begins initialization.

b. Wait about 30 seconds for the radio to initialize. A radio preset screen should display.

c. Select a preset **[PRE +/-]**. Presets 1 - 99 are possible. You can also cursor to the preset number on the screen, type in the Preset number from the keypad and press **[ENT]**.

Locking the Keypad

a. Select **[OPT]**.

b. Navigate using **[Up Arrow]** or **[Down Arrow]** to select **LOCK** and then select **KEYPAD**, and press **[ENT]**.

Locking the keypad does not disable [NEXT]. This allows viewing of main screens.

Unlocking the Keypad

When a button press displays that the "Keypad is Locked", press button sequence **[1], [3], [7], [9]** to unlock the keypad. If there is more than a five second delay between button presses, the sequence will time out and you must start over.

OTAR Operation

To receive and transmit Over-The-Air Rekeying (OTAR), both the receiving radio and the Net Controller Device must have the same KEK. The KEK must be previously loaded into the receiving radio by an external fill device.

The radio can transmit Automatic Keying (AK) OTAR by uploading a TEK/KEK to temporary memory prior to transmitting the OTAR. The radio cannot be turned off or the TEK/KEK will be lost. If the radio will be used for transmitting keying data (TX OTAR), perform the following procedure.

NOTE

The radio only supports OTAR with KG84-R or KG84-NR encryption type. KEKs and TEKs are required to have the same classification level.

a. Move the function switch to **[LD]** and select **LOAD OTAR KEY(S)** to load OTAR information from another device and press **[ENT]** to continue.

b. Initiate the AK Transmit procedure on the Net Controller Device.

c. Select the classification of the TEK being loaded: **CONFIDENTIAL**, **SECRET**, **TOP SECRET**, or **UNCLASSIFIED** and press **[ENT]** to continue.

d. Observe when loaded, a screen will display the number of TEKs and KEKs loaded from the OTAR fill. The SWITCH TO CT screen is displayed after the OTAR fill procedure has been completed successfully.

OTAR Transmit Operation

a. Move function switch to **[CT]** after loading OTAR TEK.

b. Select **[MODE]**. The radio must not be actively transmitting.

c. Select **OTAR TRANSMIT** and press **[ENT]** to continue or **[CLR]** to return to the main screen.

d. Observe that after OTAR TRANSMIT is selected, a screen is displayed with the following message "**START PTT OR DATA TX, BEGIN OTAR AK"**.

NOTE

The user must PTT or key DTE data prior to initiating the OTAR TX.

e. Wait while the OTAR fill set is being transmitted by the radio.

f. Stop transmitting by pressing **[CLR]** and go to the OTAR TX Abort screen.

g. Observe the radio has finished transmitting the OTAR fill set without errors.

h. Observe that once the OTAR operation is complete, the OTAR transmit successful screen will be displayed.

i. Return to the Mode Menu by pressing **[ENT]** or **[CLR]**.

OTAR Receive Operation

a. Move function switch to **[CT]**.

b. Select **[MODE]**. The radio must not be actively transmitting.

c. Select **OTAR RECEIVE** and press **[ENT]** or **[CLR]** to return to the main screen.

d. Select **RECEIVE AK** and press **[ENT]**. The corresponding OTAR in-progress screens will appear. Receive AK must be selected if receiving from another AN/PRC-160(V).

e. Navigate to abort OTAR operations by pressing **[CLR]**. Once the OTAR operation is complete, the OTAR Received screen will be displayed.

f. Verify the key has been received and press **[ENT]** to display the crypto mode screen.

g. Select TEK slot: **01** through **25**. The help text on the bottom of the screen will indicate whether or not the slot is already filled. When the slot choice is selected, press **[ENT]**. Status will display. If the Automatic Keying (AK) OTAR was successfully received, the updated KEK count will be displayed.

Zeroize Functions
Select **[ZERO]**.

- **Zeroize All** - Erases all Radio and Crypto configuration. Digital Signal Standard (DSS) Public Key and Type 1 Initialization are not affected. The operator can choose to configure the radio so that Mission Plan files are erased during zeroization. If this option is not selected, the current mission plan file is deactivated, however, all loaded mission plans remain in the radio memory.

- **Deactivate Mission Plan** - Deactivates current plan.

- **Selective Zeroize** - Deletes individual COMSEC Fill items. This operation requires a maintenance password.

- **Erase Mission Plans** - Removes all loaded Mission Plans from the radio.

Panic Zeroize
Rotate the function switch to **[Z]**.

- All crypto fill information (TEKs, KEK, etc.) is deleted from the radio.

- All radio presets are reset to factory defaults. Mission plans are not erased by default.

NOTE

If the function switch is moved to Z position while the radio has no power source connected (battery disconnected), zeroize will occur the next time the radio is powered on.

Activating a Mission Plan

a. Select **[OPT]**.

b. Select **MISSION PLAN** and press **[ENT]**.

    c.   Select **ACTIVATE MISSION PLAN** and press **[ENT]**.

    d.   Select the appropriate **PLAN FILE** from the list (HF_SIMPLE.MSFF) and press **[ENT]**.

    e.   Select Station for .MSFF (if Multi-Station Fill File selected from list) and press **[ENT]**.

    f.   Select **YES** to ACTIVATE PLAN and press **[ENT]**.

    g.   Observe radio displays **PLAN IN PROGRESS** while radio's settings are reconfigured.

    h.   Verify radio displays PLAN COMPLETE when finished and press **[ENT]**.

    i.   Radio is ready for operation.

Display Light Menu

    a.   Select **[LT]**.

    b.   Select **LIGHT MODE** and set for **MOMENTARY** or **NONE** and press **[ENT]**.

    c.   Select **LIGHT INTENSITY** and adjust brightness and press **[ENT]**.

    d.   Select **SCREEN CONTRAST** and adjust display for best viewing and press **[ENT]**.

Options Menu

Use the Options menu to view and set radio options and make programming changes to the currently used net preset. While in the Options menu, the radio remains online and able to function in operating nets. Select **[OPT]** to access the following menus:

- **ALE**- When ALE preset is selected, options for TX Message and RX Message are available.

- **3G** - When 3G preset is selected, options for TOD, TOD Role, and Unsync are available.

- **COUPLER OPTIONS** - RETUNE, VSWR, CONFIG options.

- **GPS OPTIONS** - View GPS STATUS and GPS KEY INFO.

- **HF OPTIONS** - SQUELCH LEVEL, SQUELCH TYPE, BFO, RX NOISE BLANKING, ROUTE MODEM DATA TO.

- **HOP** - When HOP preset is selected, option for Copy TOD is available.

- **LOCK > KEYPAD** - Use to lock keypad.

- **LOCK > DIVE MODE** - Turn off electrical interfaces and lock keypad.

- **LQA** - EXCHANGE, SOUND, SCORES (ALE, 3G only).

- **MESSAGING** - GPSAPR, LDV, SMS message options.

- **MISSION PLAN** - Activates Mission Plan and shows currently loaded plan history.

- **NETWORK OPTIONS** - SEND PING, INTERFACES VOIP CONFIG options.

- **RADIO INFORMATION** - Shows SYSTEM CLOCK, BATTERY INFORMATION.

- **RADIO OPTIONS** - Sets RADIO SILENCE, PRESET AUTOSAVE, RF FAULTS PERSIST, PA FAILSAFE OVR, REMOTE KDU.

- **SYSTEM INFORMATION** - Displays VERSIONS, SERIAL NUMBER, PART NUMBER, Software (SW) OPTIONS, ELAPSED TIME, Temperature Compensated Crystal Oscillator (TCXO) TUNING, EXTERNAL DEVICE.
- **TEST OPTIONS** - Runs Self Test and other radio tests.
- **TX POWER OPTIONS** - Sets Transmit Power Level.
- **VIEW KEY INFO** - Displays information about installed COMSEC keys (Waveform, ECU KEK, DSS Public Key).
- **VULOS CONFIG** - When VULOS preset is selected, options for COMSEC, SQUELCH are available.

FIXED FREQUENCY OPERATION

Fix frequency radio mode provides manually changed channelized communications. Select **[0]** (⟳) to scroll through the main operating displays of the selected preset.

Fixed Frequency Preset

a. Select a FIX system preset by pressing **[PRE +/-]**. Keys must be programmed if operating in CT or CC.

b. Observe:

- **FIX** appears.
- Correct encryption (**CT, PT,** or **CC**),**DATA** (Modem Preset), **VOICE**, **KEY** (**CT** only), and squelch (**SQL**) (if desired) are displayed.
- **T** appears when transmitting.
- **R** appears when receiving or when ready to receive.
- Relative transmit power or receive signal is displayed in bar on right side of display.
- **BAT** appears with battery level unless volume is being adjusted.

c. Select **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted.

d. Select **[NEXT]** (0 ⟳) to move through the set of screens with the last being the large font screen.

e. Select **[NEXT]** again to return to the first main screen.

**FIX
MODE**

**SYSTEM
PRESET
NUMBER/NAME**

R BAT▆▆▆▆ FIX SQL ------- PT
11-WBHF-120K 2▭▭▭
WB120 ME6 ----- 001
DATA VOICE KEY CHAN

**MODEM
PRESET** **VOICE
TYPE** **ENCRYPTION
KEY** **CHANNEL**

CL-0512-4100-0005-1

0 ↻

CHANNEL

R BAT▆▆▆▆ FIX SQL ------- PT
CH001 R 2.1000 2▭▭▭
USB T 2.1000 AUTO
MOD FREQUENCY (MHZ) AGC

MODULATION **RX/TX
FREQUENCY** **AUTOMATIC
GAIN CONTROL**

CL-0512-4100-0005-2

Modify Preset

Select ► to highlight items that can be modified with the system preset screen displayed. Modifiable items will be indicated by a dark background. Select the ▼ or ▲ to change value of the selected item.

34

CURRENT BANDWIDTH

ADJUSTED FREQUENCY

```
R BAT■■■■  FIX  SQL ------- PT
CUR 24 F 2.0895%▯▯▯▯
MAX 24 R 120K  SHORT
BW (KHZ) ADJ.FREQ/RATE INTRLV
```

MAXIMUM ALLOCATED BANDWIDTH

F- FREQUENCY R - RATE (DATA)

CURRENT DATA RATE

INTERLEAVER SETTING

CL-0512-4100-0011


```
R BAT■■■■  FIX  SQL ------- PT
11-WBHF-120K
```

CL-0512-4100-0012

Operational Overrides

With the main system preset screen displayed, press the **[Right Arrow]** key to find items that can be modified. Modifiable items will be indicated by a dark background. Use the arrow buttons to change value of the selected item. The display indicates the status:

- Dash (-) indicates the system preset is unchanged.
- Asterisk (*) indicates the system preset is temporarily changed (only shown if the Preset Autosave feature is Off).

Fix Voice/Data Capability

Type-1/Type-3 Encryption for Data Mode is shown below.

NOTE

CC denotes Coalition Compatible encryption.

Data Mode	Data Rate (bps)	CC	ANDVT-HF	ANDVT-BD	KG-84	TSV
Serial 110A/B	75 to 12800	X		X	X	X
ANDVT-HF	300 to 2400		X			
WBHF 110C	75 to 120000	X			X	X

Type-1/Type-3 Encryption for Voice Mode is shown below.

Voice Mode	Data Rate (bps)	CC	ANDVT-HF	ANDVT-BD	KG-84	TSV
MELP 600	600	X		X	X	X
LPC (DV) 600	600	X		X	X	
MELP 1200	1200	X			X	X
MELP 2400	2400	X		X	X	X
LPC (DV) 2400	2400	X	X	X	X	

PT and Type-3 Encryption are shown below.

Encryption	USB	LSB	AME	CW	FM	Data Mode	Voice Mode	Frequency Range (MHz)
PT	x	x	x	x	-	OFF	CLR	1.5- 29.9999
	x	x	-	-	-	Serial 110A/110B	DV6 [1] ME6 [2], ME12 [4] DV24 [3], ME24 [5]	1.5- 29.9999
	x	-	-	-		Wideband High Frequency (WBHF)	NONE	1.5- 29.9999
	-	-	-	-	x	OFF	CLR, Continuously Variable Slope Delta (CVSD)	30- 59.9999
Citadel/ Advanced Encryption Standard (AES)	x	x	-	-	-	Serial 110A/B	DV6, ME6, ME12, DV24, ME24	1.5- 29.9999
	x	-	-	-	-	WBHF	NONE	1.5- 29.9999
	-	-	-	-	x	OFF	CVSD	30- 59.9999

NOTES:

[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).

FIX Mode using WBHF

In FIX radio mode, WBHF is selectable as a modem type, however, it is not Adaptive Wideband. Unlike 3G mode, FIX mode WBHF does not perform any bandwidth, offset, or data rate negotiation. It is based on the user configuration of the modem preset. WBHF is only used for data transmission and is not available for voice.

If two radios are to connect using WBHF in FIX Mode, they both must be configured for wideband parameters.

a. Select **[PGM] > HF CONFIG > MODEM > MODEM PRESET > PRESET NAME> MODEM TYPE>** and select **WBHF**. Continue with additional settings below.

   1. Select **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**.

   2. Select **DATA RATE**. Choices are **75** to **120K** bits per second **(**bps).

   3. Select **INTERLEAVE**. Choices are **LONG**, **MEDIUM**, **SHORT**, and **ULTRASHORT**.

   4. Select **MODE**. Choice is **SYNC**.

   5. Select **PREAMBLE**. Choices are **ULTRASHORT**, **SHORT**, and **LONG**.

   6. Select **CONSTRAINT LENGTH**. Select the Forward Error Correction (FEC) length as either **7** or **9**.

      • **7** is same as used in MIL-STD-110B.

      • **9** may allow better performance.

NOTE

If a modem preset has a bandwidth greater than the Max Channel Bandwidth setting, the data rate will be limited to the highest rate available for the channel bandwidth.

VULOS OPERATION

VULOS operation provides fixed frequency Line Of Sight communications over the VHF frequency band (VHF Low Band – 30.0000 MHz to 59.9999 MHz).

Select **[0]** (⟳) to scroll through the main operating displays of the selected preset.

VULOS Preset

a. Select a VULOS system preset by pressing **[PRE +/-]**. Keys must be programmed if operating in CT.

b. Observe:

- **VULOS** appears.

- Correct encryption (**CT, PT,** or **CC**).

- Modulation Type **(MOD)**, Crypto KEY (CT only) **KEY**, and Squelch Type are displayed.

- Traffic Mode **(TRF)**; Data (**DAT**) or Voice (**VOC)**

- **T** appears when transmitting.

- **R** appears when receiving or when ready to receive.

- Relative transmit power or receive signal is displayed in bar on right side of display.

- **BAT** appears with battery level unless volume is being adjusted.

c. Select **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted.

d. Select **[NEXT]** (⁰) to move through the set of screens with the last being the large font screen.

e. Select **[NEXT]** again to return to the first main screen.

VULOS Main Screens
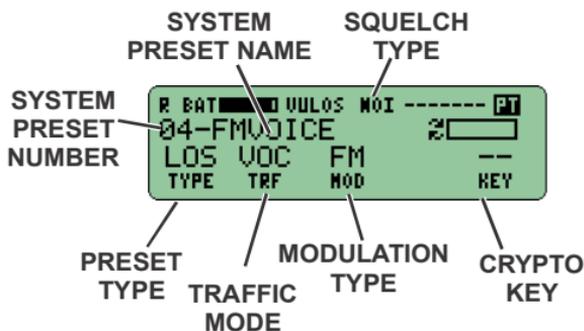
SYSTEM PRESET NAME
SQUELCH TYPE
SYSTEM PRESET NUMBER

R BAT████0 VULOS NOI ------ PT
04-FMVOICE   2▯
LOS VOC FM   --
TYPE TRF MOD   KEY

PRESET TYPE
TRAFFIC MODE
MODULATION TYPE
CRYPTO KEY

CL-0512-4100-0030

⁰

R BAT████0 VULOS NOI ------ PT
R: 30.0000   2▯
T: 30.0000
   FREQUENCY

TX FREQUENCY
RX FREQUENCY

CL-0512-4100-0031

BANDWIDTH
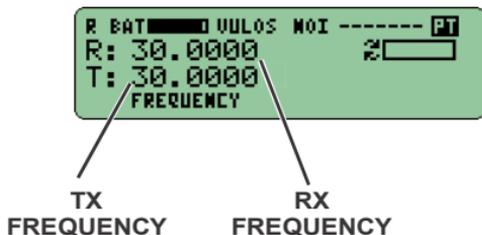
OPTION CODE
DATA MODE
VOICE MODE
INTERLEAVE DEPTH
FORWARD ERROR CORRECTION
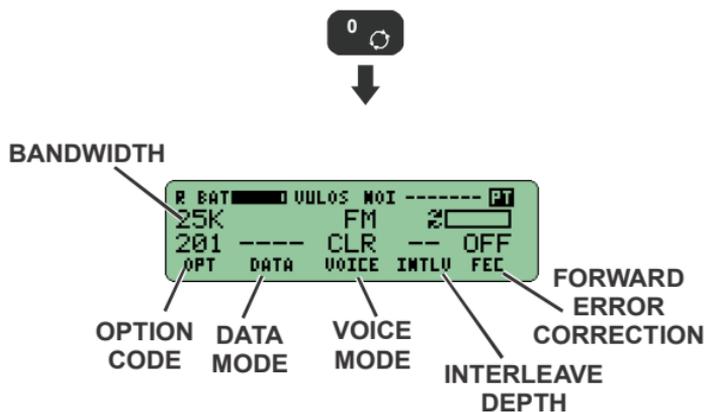
CL-0512-4100-0032

CL-0512-4100-0033

VULOS Options

The VULOS Option menus allow the operator to quickly make a change to the COMSEC or Squelch parameters of a VULOS preset without accessing the Programming menus.

Press **[OPT]** > **VULOS CONFIG** to access this menu. Selections are COMSEC, SQUELCH.

ALE OPERATION

Automatic Link Establishment (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.

ALE Scanning

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. Select an ALE system preset by pressing **[PRE +/-]**. Keys must be programmed if operating in CT or CC.

   b. Observe:

   - **SCANNING** appears.

   - Scanning indicator "**/**" (spinning) is displayed.

   - **ALE** appears.

   - **R** appears when receiving or when ready to receive.

   - **BAT** appears with battery level unless volume is being adjusted.

   c. Select **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted.
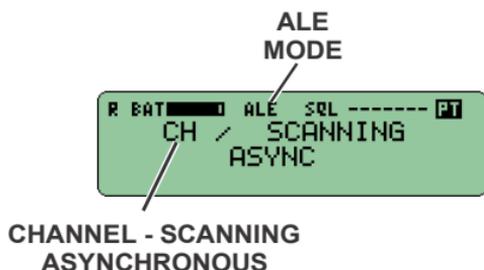
CL-0512-4100-0006

ALE Individual Call

   a. Select **[CALL]** to display **CALL TYPE** of **AUTOMATIC** or **MANUAL**.

   b. Select **AUTOMATIC** and press **[ENT]**.

   c. Select **INDIVIDUAL** and press **[ENT]**.

   d. Select the individual address using ▼ or ▲ and press **[ENT]**.

SYSTEM PRESET NUMBER/NAME

MODEM PRESET · **VOICE TYPE** · **ENCRYPTION KEY** · **CHANNEL**

CL-0512-4100-0007

CHANNEL

MODULATION · **RX/TX FREQUENCY** · **AUTOMATIC GAIN CONTROL**
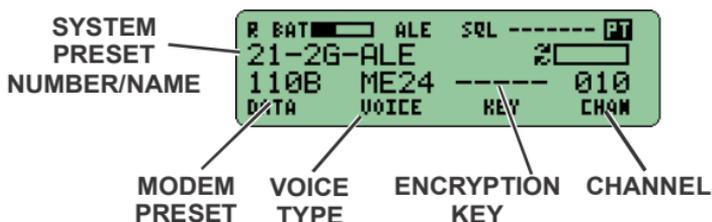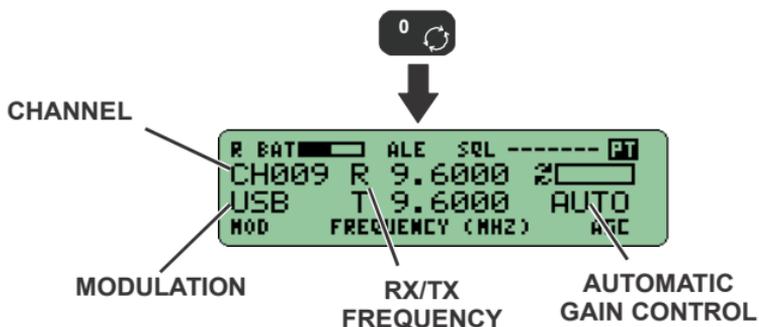
CL-0512-4100-0005-2

ALE Net Call

a. Select **[CALL]** to display call type of **AUTOMATIC** or **MANUAL**.

b. Select **AUTOMATIC** and press **[ENT]**.

c. Select **NET** and press **[ENT]**.

d. Select the net address using ▼ or ▲ and press **[ENT]**.

ALE ANY, ALL, or Group Call

These calls are placed in the same manner as ALE Individual Call, p44. Refer to the AN/PRC-160(V) Operation Manual (10515-0512-4200) for description of these address types.

Terminate ALE Link

a. Disconnect the ALE Link by pressing **[CLR]** from the preset screen. The radio displays the **TERMINATE LINK** menu.

b. Select **YES** and press **[ENT]** to terminate the ALE link.

ALE Call Custom Call to a Non-Programmed Net

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 custom call to a non-programmed net:

a. Select **[CALL]** to display **CALL TYPE** of **AUTOMATIC** or **MANUAL**.

b. Select **MANUAL** and press **[ENT]**.

c. Select **CUSTOM** and press **[ENT]**.

d. Enter the desired ADDRESS to call and press **[ENT]**.

e. Enter the desired CALL ON CHANNEL and press **[ENT]**.

f. Observe the radio begins transmitting to the selected address.

As the radio scans and listens for calls and sounds, it acquires Link Quality Analysis (LQA) information for station addresses outside the programmed net. These non-programmed net station addresses are referred to as OTHER addresses.

Once the radio acquires an OTHER address, menus are made

visible to allow calls to be placed to them and viewing of their channel LQA scores. OTHER address information is lost when the radio is power cycled, unless they are added to the programmed net.

Perform LQA Exchange

In an LQA exchange, selected station or net transmits back to initiating station.

    a.   Select **[OPT]**> **LQA > EXCHANGE**.

    b.   Select ▼ 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.

Perform LQA Sound

In an LQA sound, only the sending station transmits.

    a.   Select **[OPT]**> **LQA > SOUND**.

    b.   Select ▼ or ▲ to scroll through the self addresses and press **[ENT]**.

NOTE

    Be aware of which self address was associated with the individuals or net addresses during programming.

View LQA Scores

    a.   Select **[OPT]** > **LQA > SCORES > REVIEW**.

    b.   Select ▼ or ▲ to scroll through the individual or other addresses and press **[ENT]**.

   c. Select ▼ or ▲ to scroll through the channels and available scores.

   d. Restore ALE scanning by pressing **[CLR]** repeatedly or select **[OPT]** to return to ALE scanning.

Zeroize LQA Scores

Select **[OPT]** > **LQA > SCORES > ZEROIZE 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.

   a. Select **[OPT]** > **ALE > TX_MSG > TX MESSAGE TO SEND**.

   b. Select ▼ or ▲ to scroll through the preprogrammed Automatic Message Display (AMD) messages and press **[ENT]**.

    For **SEND TX MESSAGE?**, select ▼ or ▲ to select **YES** and press **[ENT]**.

    For **CALL TYPE**, select ▼ or ▲ to select either **AUTOMATIC** or **MANUAL** and press **[ENT]**.

    For **ADDRESS TYPE**, select **INDIVIDUAL** or **OTHER** and press **[ENT]**.

   c. Enter Individual Addresses that are not preprogrammed by pressing **[0]** (↻) instead of **[ENT]**.

d. Select ▼ 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

a. Select **[OPT]** > **ALE > RX_MSG**.

b. Select the message number by pressing ▼ or ▲ to scroll through the received AMD messages and press **[ENT]** to continue. The display will auto-scroll the entire AMD message on the front panel.

c. Restore ALE scanning by pressing **[CLR]** repeatedly.

ALE AMD In-Link Calls

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.

a. Select **[OPT]** > **ALE > TX_MSG**. The current **TX MESSAGE TO SEND** setting appears.

b. Select ▼ or ▲ to scroll through the preprogrammed AMD messages and press **[ENT]**.

For **SEND TX MESSAGE?,** select ▼ or ▲ to select **YES** and press **[ENT].**

For **CALL TYPE**, select ▼ or ▲ to select either **AUTOMATIC** or **MANUAL** and press **[ENT]**.

For **ADDRESS TYPE**, select **INLINK** and press **[ENT]**. The radio will begin to transmit the AMD.

c. Observe the radio displays a **LINKED TO** screen once the transmission is complete.

ALE Voice/Data Capability

Type-1/Type-3 Encryption for Data and Voice Modes are shown below.

Data Mode	Data Rate (bps)	CC	ANDVT-HF	ANDVT-BD	KG-84	TSV
Serial 110A/B	75 to 12800	X		X	X	X
ANDVT-HF	300 to 2400		X			

NOTE

CC denotes Coalition Compatible encryption.

Voice Mode	Data Rate (bps)	CC	ANDVT-HF	ANDVT-BD	KG-84	TSV
MELP 600	600	X		X	X	X
LPC (DV) 600	600	X		X	X	
MELP 1200	1200	X			X	X
MELP 2400	2400	X		X	X	X
LPC (DV) 2400	2400	X	X	X	X	

PT and Type-3 Encryption are shown below.

Encryption	USB	LSB	AME	Data	Voice	Frequency Range (MHz)
PT	x	x	x	OFF	CLR	1.5- 29.9999
	x	x	-	Serial 110A/B	DV6 [1] ME6 [2] ME12 [4] DV24 [3], ME24 [5] CLR	1.5- 29.9999
	x	x	-	-	CLR	1.5- 29.9999
Citadel/AES	x	x	-	Serial 110A/B	DV6, ME6, ME12, DV24, ME24	1.5- 29.9999
	x	x	-	-	NONE	1.5- 29.9999

NOTES:

[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).

3G OPERATION

Third generation HF communication protocol (3G) provides a subset of the capabilities and protocols defined by STANAG-4538 and includes improvements such as:

- 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 short and long data messages
- Use of different channel plans for frequency security and close propagation matching
- Pre-tuning of channels to reduce tune times in linking
- Support for 124 stations and 20 channels per frequency plan

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

- Synchronous channel scanning
- Uses Short Message Service (SMS) instead of Automatic Message Displays (AMDs)
- 3G requires TOD server manual time synchronization 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 can use Adaptive Wide Band High Frequency (WBHF) modem for higher data throughputs.
- 3GIP provides the capability to transmit and receive IP data using Wideband or Narrowband configuration modes.
- 3G can send GPS position reports

3G Scanning

a. Select a 3G system preset by pressing **[PRE +/-]**. Keys must be programmed if operating in CT or CC.

NOTE

A 3G system preset can also be configured for IP Configuration (Wideband or Narrowband). Refer to 3GIP Configuration for additional information.

b. Observe:

- **SCANNING** appears.
- Each 3G channel appears briefly on the left.
- **3G** (or **3GIP**) 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. Select **[VOL +/-]** to set volume. **VOL** appears along with relative level while volume is adjusted. 3G scanning and data/voice screens shown below.

RECEIVE/TRANSMIT — BATTERY/VOLUME — 3G MODE — ENCRYPTION

CH100 SCANNING
45/38DAY
CHANNEL PLAN   AUTO   SYNC

CHANNELS BEING SCANNED — CHANNEL PLAN — SYNC GRAPH AND STATUS
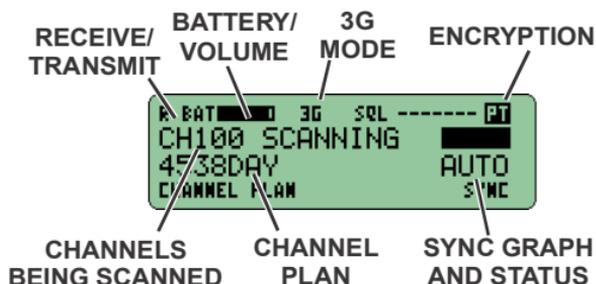
CL-0512-4100-0008

d. Observe when there is an active Ethernet connection via the J5 interface. The Ethernet connectivity icon will be displayed. When it is not active, it will not be displayed.

SYSTEM PRESET NUMBER/NAME NAME
31-3G-ALE
XDL   ME6   -----
DATA   VOICE   KEY   RED

MODEM PRESET — VOICE TYPE — ENCRYPTION KEY — ETHERNET CONNECTIVITY ICON
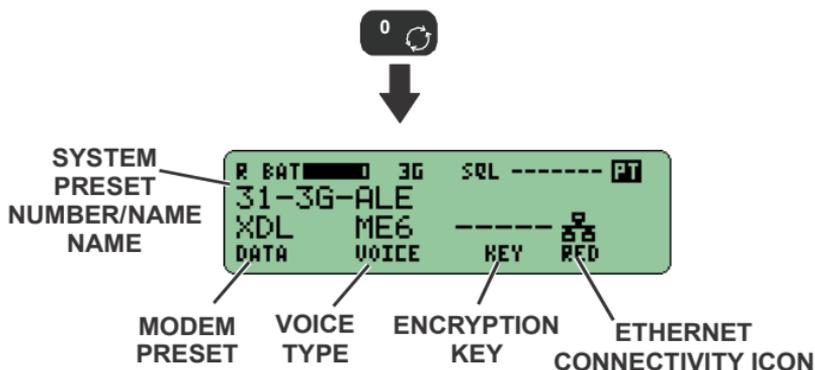
CL-0512-4100-0020

3GIP Operation

The 3G Internet Protocol (IP) feature allows the radio to deliver IP packets to a remote radio station based on routing information programmed into the radio. Once the radio has been programmed with a configuration that supports sending IP data via the CPA, it is placed in the 3G radio mode and synchronized.

Wideband HF channels allow for faster data transfer. When 3G IP is configured for 3GWBIP, IP data can be sent over Wideband HF channels between 3 and 24 kHz. In this mode, the modem will adapt the bandwidth and data rate based on observed channel conditions in order to deliver error-free data as fast as possible.

Regardless of the 3G IP configuration, the radio will automatically support interoperability with radios that do not support 3GWBIP, by using Narrowband IP. If the sending station determines that the remote station does not support 3GWBIP, it will automatically switch to XDL for the transfer. The radio will also be able to receive XDL or 3GWBIP traffic regardless of configuration.

3GIP Configuration

Program 3GIP configuration as follows:

    a. Select **[PGM] > HF CONFIG > MODE > 3G > IP CONFIG > CONFIGURATION** and press **[ENT]**.

    b. Select **WIDEBAND** or **NARROWBAND** (selecting OFF disables 3GIP configuration) and press **[ENT]** to continue.

    c. Select **IP ADDRESS** <XXX.XXX.XXX.X> (Read Only).

    d. Select **SUBNET MASK** <XXX.XXX.XXX.X> (Read Only).

    e. Select **RX BROADCAST GATEWAY** > (Enter RX Broadcast Gateway address).

    f. Press **[CLR]** repeatedly or press **[PGM]** to exit.

NOTE

Both radios are required to be configured for 3G
with IP Mode (set to Wideband or Narrowband).

3GIP Preset View

When 3G is configured for IP, the mode label on the screen will
switch from 3G to 3GIP. If there is not an active Ethernet connection
via the J5 interface, the label will flash indicating a connectivity
issue.
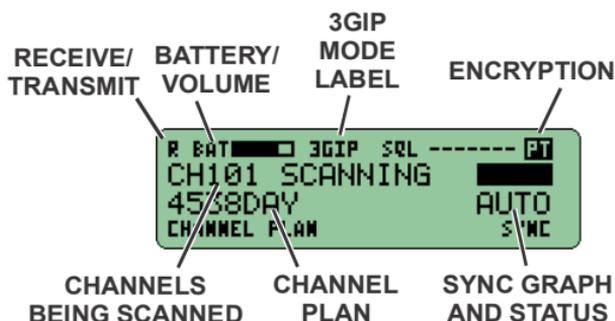
CL-0512-4100-0022

When there is an active Ethernet connection via the J5 interface, the Ethernet icon will be present. When it is not active, it will not be displayed.

The IP configuration shows what type of IP that 3G is configured for (Narrowband/XDL) or (Wideband/3GWBIP). This indicates the desired IP configuration to use when initiating IP transfers. The IP configuration field can be modified by the user.
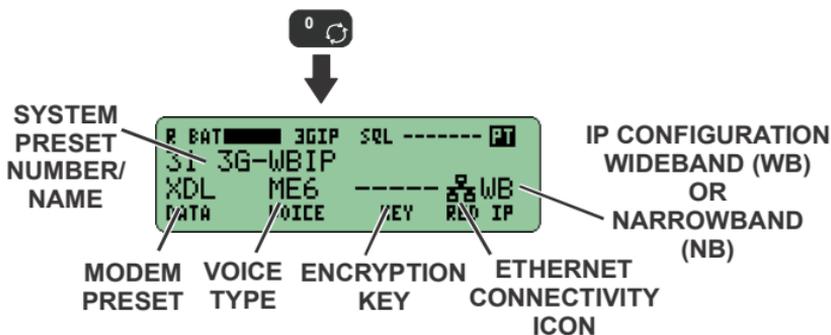
CL-0512-4100-0023

When the radio is actively in an IP transfer, the top screen will display a label on the bottom line indicating whether the transfer is Narrowband or Wideband.
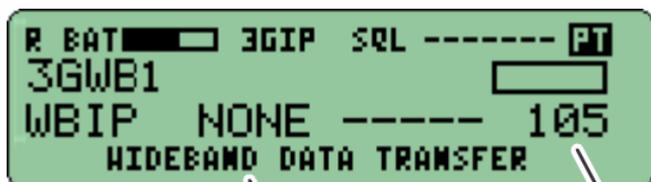
DATA TRANSFER TYPE

CHANNEL NUMBER

CL-0512-4100-0021

The second linked screen will show information on the current channel.

CHANNEL

MODULATION TYPE

RECEIVE/TRANSFER FREQUENCY (MHZ)

AUTO GAIN CONTROL SETTING

CL-0512-4100-0027

The third screen will display information on the TX and RX data rates, active Modem type, Bandwidth, Signal-to-Noise Ratio (SNR). These values will continuously update throughout a transfer as channel conditions change and the modem adjusts.

TX/RX DATA RATES (KBPS)

ACTIVE MODEM TYPE

BANDWIDTH (KHZ)

SIGNAL TO NOISE RATIO (DB)
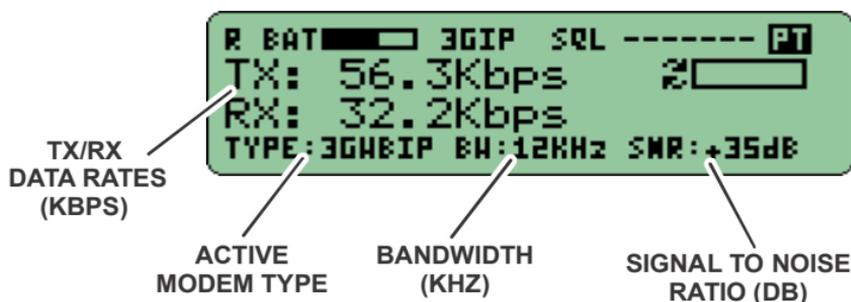
CL-0512-4100-0028

3GIP Limitations

When 3G is configured for IP, the following restrictions apply to 3G operations:

- WMT and Tac Chat RDP are not supported
- Frequency Plan type is limited to 4538 only
- IP traffic is limited to UDP and ICMP only
- Tactical Chat IP and hC2 are the only supported IP applications
- 3GWBIP transfers are limited to Point to Point only.
- Point to Multi-Point IP transfers are limited to Narrowband (Serial modem)
- Multicast is not supported

NOTE

Contact Harris for detailed information on 3GIP operation and application notes.

Select TOD Server

⚠ CAUTION

Communication failures may result if two or more stations attempt to function simultaneously as TOD servers.

a. Select **[OPT] > 3G**.

b. Select **TOD ROLE** and press **[ENT]**. Current TOD server appears. If no TOD server has been observed, **-------** is displayed.

c. Observe the TOD role is **BASE** or **OUTSTATION** when pressing **[ENT]**.

d. Select ▼ or ▲ to change the role.

e. Observe a prompt appears asking you to verify the TOD role change when pressing **[ENT]**.

f. Select **YES** and press **[ENT]**.

Perform Automatic GPS TOD Synchronization

a. Turn (pull to turn action) function switch to **OFF** to power off the radio.

b. Connect GPS antenna to J2 GPS on the front of the radio.

c. Turn (pull to turn action) function switch to the **CT**, **PT**, or **CC** position depending on desired operation.

NOTE

First perform a 3G UNSYNC even if the sync state is NONE. Otherwise, you may receive a warning "GPS IS AVAILABLE. UNSYNC TO USE".

The internal GPS initiates a search for GPS satellites. The radio continues to search until at least four GPS satellites are acquired. The radio 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).

NOTE

The Sync Meter for the TOD Server only shows the local drift of the TOD server radio and not 3G network worst case drift. Furthermore, this will make the sync meter consistent across all scenarios (outstation and server).

Perform Manual TOD Synchronization

Manual TOD synchronization may be used instead of GPS TOD synchronization when conditions indicate GPS may be unavailable or intermittent. In a manually synchronized network, the TOD server maintains the network time reference and distributes it to all the outstations to ensure network synchronization for reliable communications.

a. Select **[OPT] > 3G**.

b. Select **TOD** and press **[ENT]**.

c. Enter wristwatch time and press **[ENT]**.

NOTE

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

d. Enter a new date if required and press **[ENT]**. If the date is already correct, just press **[ENT]**.

e. Select **[OPT]** to close the options menu and return to the operation screen.

The radio 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.

Switching from Manual to GPS TOD Synchronization

When it becomes necessary to change from using a non-GPS time reference (Manual sync) to using a GPS time reference (auto sync), a 3G **UNSYNC** must be performed in order to force the radio sync state to **NONE**. The radio automatically transitions from **NONE** to auto sync once the GPS reports tracking.

a. Ensure GPS antenna is still connected to the radio unless you do not want to use a GPS time reference.

b. Select **[OPT] > 3G**.

c. Select **UNSYNC** and press **[ENT]**.

NOTE

UNSYNC can also be performed by pressing **[CLR]** on the main 3G preset screen. Select NO or YES when prompted at GPS TOD UNSYNC?

Request TOD Sync from a TOD Server

a. Select **[CALL]**.

b. Select **SYNC REQUEST** and press **[ENT]**.

Manually Send a GPS Report

The AN/PRC-160 can send a manual GPS report while the radio is in 3G, idle, and Internal GPS is tracking. Manual reports can be transmitted even if automatic reports have been disabled. 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. Select **[CALL]**.

    b. Select **SEND GPS REPORT** and press **[ENT]**.

    c. Select **SEND TO STATION** or **NET** and press **[ENT]**.

    d. Select **STATION ADDRESS** or **NET ADDRESS** and press **[ENT]** to send.

Set Up Automatic GPS Report

Perform the following procedure to set up automatic GPS reporting:

    a. Select **[PGM] > HF CONFIG > GPSAPR > PERIODIC REPORTS** and press **[ENT]**.

    b. Select **PERIODIC REPORTS** (ENABLED or DISABLED) and press **[ENT]**.

    c. Select **TIME INTERVAL** (HRS: MIN: SEC:) and press **[ENT]**.

    d. Select **DISTANCE REPORTS** (ENABLED or DISABLED) and press **[ENT]**.

    e. Select **DISTANCE UNITS** (KILOMETERS or METERS) if DISTANCE REPORTS is set to ENABLED and press **[ENT]**.

    f. Select **CHANGE IN LOCATION** (200 - 6500 METERS) and press **[ENT]**.

g.   Select **SHOW REPORT POPUPS** (ENABLED or DISABLED) and press **[ENT]**.

h.   Enter the **SERVER ADDRESS** and press **[ENT]**.

i.   Select **PACKET FORMAT** (HARRIS, INTERNATIONAL, CURSORS ON TARGET) and press **[ENT]**.

j.   Select **UDP PORT** (USE PACKET DEFAULT, EDIT CUSTOM VALUE and press **[ENT]**.

k.   Enter the **SERVER UDP PORT** if EDIT CUSTOM VALUE was selected and press **[ENT]**.

l.   Select **CIPHER MODE** (CT ONLY or ALL) and press **[ENT]**.

m.   Select **APR DESTINATION** (NONE, HFMP2, HFMP3, 3G1) and press **[ENT]** to return to the PGM HF menu.

n.   Select **[CLR]** repeatedly to exit.

3G Point-To-Point Call

a.   Select **[CALL]**.

b.   Select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**.

c.   Select address type **STATION** and press **[ENT]** or scroll by selecting **STATION** by name and press **[ENT]**.

d.   Select the station name you wish to call and press **[ENT]**.

3G Net Call

a.   Select **[CALL]**.

b.   Select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**.

    c. Select address type **NET** and press **[ENT]** or select address type **NET-> STATION** where you select the NET, then select the station within the NET and press **[ENT]**.

    d. Select the net name **NET-> STATION** you wish to call, then select the stations within that net to reduce the number of stations to scroll through and press **[ENT]**.

Terminate 3G Link

    a. Disconnect the link by pressing **[CLR]** from TOD server or outstation. 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. Select **YES** and press **[ENT]**. The terminating screen is displayed momentarily then the radio returns to scanning.

Transmit a 3G TOD Broadcast Sync

    a. Select **[CALL]**.

    b. Select one of the following and press **[ENT]**.

    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.

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 would be immediately after deployment when GPS synchronization is unavailable.

Select 3G Channel Plan

a. Select ◄ or ► while in the scanning screen until the field **CHANNEL PLAN** is highlighted.

b. Select ▼ or ▲ to scroll to the desired channel plan.

c. Select the setting by pressing **[ENT]**.

NOTE

The AN/PRC-160(V) momentarily tunes the internal or external antenna coupler (if enabled) on each channel of the channel group corresponding to the mission plan.

NOTE

The radio displays the name of the selected channel plan and begins scanning the frequencies of the selected plan. Errors may occur from selecting a frequency plan. For example, if you select a HCMAC frequency plan when 3GIP is enabled, you will receive a warning.

Perform 3G Sound LQA

In an LQA sound, only the sending station transmits. Radios must be synchronized in order to perform a sound.

   a. Select **[OPT]** > **LQA > SOUND**.

   b. Select applicable keys to scroll through the self addresses and press **[ENT]**.

   The radio 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

In an LQA exchange, the selected station transmits back to the initiating station.

   a. Select **[OPT]** > **LQA > EXCHANGE**.

   b. Select **NET > STATION** to select a net, and then the stations within that net to reduce the number of stations to scroll through (individual 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.

NOTE

LQA exchanges are recommended prior to communicating with a station in 3G, as well as on a periodic basis.

Review 3G LQA Scores

    a. Select **[OPT]** > **LQA> SCORES > REVIEW > INDIVIDUAL ADDRESS**.

    b. Select station for scores. Only stations with scores will be displayed (not necessarily all stations in the mission plan).

NOTE

Only channels with scores will be displayed (not necessarily all channels in the channel plan). Only stations with scores will be displayed in the station select list, not all programmed 3G stations.

    c. Select **[OPT]** or press **[CLR]** repeatedly to exit.

3G Zeroize Scores

    a. Select **[OPT]** > **LQA > SCORES > ZERO SCORES**.

    b. Observe the radio responds with **ZEROIZE ALL SCORES?** (NO/YES).

    c. Select **YES** and press **[ENT]** to confirm that the scores have been zeroized.

    d. Observe **ALE LQA SCORES ZEROIZED** displays and press **[CLR]** or **[ENT]** to continue.

Schedule a Broadcast Sync

NOTE

The radio used must be designated as a basestation before you schedule a broadcast sync.

    a. Select **[PGM]** > **HF CONFIG > SCHEDULE > 3G BROADCAST SYNC > ADD**.

b. Enter START 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. Enter REPEAT 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.)

d. Select **EDIT** or **DELETE** (instead of **ADD**) to edit or delete a previously scheduled broadcast.

NOTE

A new option is available for Auto Convert to GPS. Select [**PGM] > HF CONFIG > SCHEDULE > 3G BROADCAST SYNC >AUTO CONVERT TO GPS**. If it is enabled (ON), the radio will automatically switch to GPS time if the radio is in MAN sync but the GPS is tracking with valid time when the scheduled broadcast is transmitted. If the value is disabled (OFF), the radio will not automatically switch to GPS time even if GPS time is available. This setting is useful if the deployment is relying on wristwatch time.

3G Voice/Data Capability

Type-1/Type-3 Encryption for Data/Voice Modes are shown below.

Data Mode	Data Rate (bps)	CC	ANDVT-HF	ANDVT-BD	KG-84	TSV
Serial 110A/B	75 to 12800	X		X	X	X
XDL	NB ARQ	X		X	X	X
Adaptive WB	75 to 120000	X			X	X
WBIP	WB ARQ	X			X	X

NOTE

CC denotes Coalition Compatible encryption.
ANDVT-HF not supported in 3G.

Voice Mode	Data Rate (bps)	CC	ANDVT-HF	ANDVT-BD	KG-84	TSV
MELP 600	600	X		X	X	X
LPC (DV) 600	600	X		X	X	
MELP 1200	1200	X			X	X
MELP 2400	2400	X		X	X	X
LPC (DV) 2400	2400	X		X	X	
LDV	75 to 12800	X		X	X	X

PT and Type-3 Encryption are shown below.

Encryption	USB	Data	Voice, LDV	Frequency Range (MHz)
PT	X	Not Applicable (N/A)	DV6 [1] ME6 [2], ME12 [4] DV24 [3], ME24 [5] LDV	1.5- 29.9999
	X	N/A	CLR	1.5- 29.9999
	X	Serial 110A/B, Variable Data Link (XDL), WBHF, WBIP	N/A [6]	1.5- 29.9999
Citadel/AES	X	N/A	DV6, ME6, DV24, ME12, ME24, LDV	1.5- 29.9999
	X	Serial 110A/B, XDL, WBHF, WBIP	N/A [6]	1.5- 29.9999

NOTES:

[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] Restriction is only in a link. A radio can operate in WBHF or WBIP and Voice, but just not on the same link.

NOTE: WBHF is not supported when 3G is configured for IP.

3G Adaptive Wideband

Adaptive Wideband (WB) operation offers the following features:

- Operable in 3G mode.

- HF data on bandwidths from 3 kHz to 24 kHz per MIL-STD-188-110C Appendix D, allowing data rates up to 120,000 bps.

- High speed HF E-mail using the WMT.

- Adjustment of bandwidth and data rate is completely automated, requiring no operator intervention.

Adaptive Wideband is a feature that uses a data-specific 3G link created by the RF-6760 WMT application (version 2.0 or higher supports AN/PRC-160(V) radio). While in 3G mode, the radio will be able to link in 3G Wideband data. Voice is not supported on an Adaptive WB link. 3G Narrowband (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. WMT will support WB data transfer to the radio over synchronous data. Actual bandwidths, data rate and interleaver will be shown in the radio display.

Configure Adaptive WB Parameters

The Adaptive WB functionality is intended to be accessible only via the WMT controlling the radio, and programming is normally performed via CPA. Thus, the Adaptive WB display is limited to status messages on the radio front panel. There are, however, a limited set of configuration options accessible via the programming menu screens. 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.

Local regulatory authorities may restrict bandwidth availability to less than 24 kHz. Consult your communications manager before configuring wideband channels.

NOTE

Refer to AN/PRC-160(V) Operation Manual (10515-0512-4200) for details on configuration and operation of Adaptive Wideband.

LAST DITCH VOICE

Last Ditch Voice (LDV) transmission or reception of messages over-the-air can only be done in a 3G voice link. However, LDV playback (view, play and/or delete) is available in FIX, ALE, 3G, and HOP modes. Upon receiving LDV, a warning tone will be heard in the handset. LDV transmissions are saved and can be played back at a later time. Up to ten LDV messages can be stored and will be retained when the radio is turned off. The default settings are used for most applications and it is recommended to retain these settings.

NOTE

If the radio is busy when an LDV message is attempted, "**PLAYING LDV MESSAGE <index> ABORTED**" is displayed.

Send LDV Message

To send an LDV message:

a. Establish a 3G link.

b. Select **VOICE** field from the 3G preset screen.

c. Select **LDV**.

d. Perform a key operation of the handset and talk. A warning tone will be heard in the handset before the maximum time of 1 minute, 50 seconds is up.

e. Perform an unkey operation and the message is automatically sent, but may have a delay due to channel conditions.

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 01-20). The radio stores up to 10 messages. If the stored list is full at 10, a new incoming LDV message will overwrite the oldest received message (oldest message will be deleted).

NOTE

The indicator may show from M01 - M99, as this indicates the total number of LDV/SMS messages and GPS Auto Position Reports waiting to be read.

a. Select ◄ or ► until **Mxx** is highlighted then press **[ENT]**.

   • If no unread messages exist, the **Mxx** indicator will not be displayed.

   • If there are a combination of LDV/SMS messages and GPS APRs waiting to be read, selecting Mxx will display a pop up that has UNREAD MESSAGES and scrolls between SMS(x) and LDV(y) where X and Y are the number of unread SMS and LDV, respectively.

   • If only an LDV message is waiting, the menu takes you directly to the LDV Browse screen. Proceed to the next step.

b. Select **LDV** and press **[ENT]** to display the browse screen for the message.

c. Select ▼ or ▲ to scroll through the list. When message is highlighted, select message and press **[ENT]**. The LDV PLAY/MARK READ/DELETE screen displays.

d. Select **PLAY** or **DELETE** and press **[ENT]**.

- When **PLAY** is selected, the LDV message will be replayed. Note that LDV playback is not allowed when squelch is Off/Disabled. Enable squelch to playback LDV messages.

- When **DELETE** is selected, a screen displays a prompt to **DELETE MESASAGE?** Select **YES** or **NO** and then press **[ENT]** to continue.

e. Select ◄ or ► at the LDV Browse screen to highlight **DELETE ALL** and press **[ENT]**.

f. Observe when DELETE ALL is selected, a screen displays a prompt to **DELETE ALL?**

g. Select **YES** or **NO** accordingly to delete all LDV messages and then press **[ENT]**.

h. Observe that when MARK READ is selected, a screen displays a prompt to **MARK MESASAGE READ?**

i. Select **YES** or **NO** accordingly to mark LDV message read and then press **[ENT].**

j. Select **MARK ALL READ** at the LDV Browse screen and press **[ENT].**

k. Observe when MARK ALL READ is selected, a screen displays a prompt to **MARK ALL READ**.

l. Select **YES** or **NO** accordingly to mark all LDV messages read and then press **[ENT]**.

SHORT MESSAGE SERVICE

Short Message Service (SMS) is available in 3G radio mode and provides text-based messaging capabilities. SMS usage can be configured to operate in (CT only, CT/CC, or ALL). By default, the radio is set for **CT only**.

SMS messages can be 160 characters. The Receive buffer holds up to 10 received SMS messages. When full, new messages overwrite old messages, beginning with the oldest.

NOTE

The TX MESSAGE option will not appear until 3G cipher matches the SMS Config (select [**PGM] >HF CONFIG > SMS > CONFIG> CIPHER MODE >ALL)**.

Send New SMS Messages (Via CALL Button)

To send an SMS message via [CALL] button:

    a. Select **[CALL] > CALL TYPE > SEND SMS** and press **[ENT]**.

    b. Select **TX MESSAGE TYPE**.

    c. Select choices of CANNED, LAST SENT, LAST ENTERED, or NEW and press **[ENT]**.

    d. Enter message type to be sent and press **[ENT]**.

Send New SMS Messages (Via OPT Menu)

To send an SMS message from the radio front panel:

    a. Select **[OPT] > MESSAGING > SMS** and press **[ENT]**.

    b. Select **TX MESSAGE > NEW** and press **[ENT]**.

    c. Select **MESSAGE TYPE**: NEW, CANNED, LAST SENT MSG, or LAST ENTERED**.**

If no messages have been sent select either: **NEW** or **CANNED** (if applicable).

If this is a new Message, 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.** Select **Insert 'I'** or **Overwrite 'O'**. Pressing the same key a third time selects **TEXT PREDICTION** to turn on or off. Select ▼ or ▲ to turn text prediction **ON 'P'** or **OFF**.

d. Send the message and press **[ENT]**.

NOTE

To exit the Edit screen without having to delete the entire SMS text, press **[0]** to switch the screen to special characters. Select ◄ or ► to scroll screen until EXIT is highlighted in the bottom right corner and press **[ENT]** to exit the Edit screen.

e. Select the desired **SEND TO** destination of **STATION** or **NET** and press **[ENT]**.

f. Select the **STATION ADDRESS** or the **NET ADDRESS** where the message will be sent and press **[ENT]**.

CHxxx SENDING TO xxxxxxx is displayed while message is being sent.

g. Select to stop the transmission by pressing **[ENT]**. **TERMINATE DATA?** will be displayed.

h. 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 01-20). 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. The user also has the ability to reply to a received SMS message.

NOTE

> The indicator may show from M01 - M99, as this indicates the total number of LDV/SMS messages and GPS APRs waiting to be read.

When a new SMS message is waiting to be read:

a. Select ◄ or ► until **Mxx** is highlighted and press **[ENT]**.

b. Observe a pop up that has UNREAD MESSAGES and scrolls between SMS(x) and LDV(y) where X and Y are the number of unread SMS, LDV and GPS APRs, respectively.

c. Select▼ or ▲ to browse through the received messages. The top message is the most recent. Select the desired message and press **[ENT]**.

> When message replay is complete, a message appears confirming deletion of the message.

d. Select **YES** or **NO** and press **[ENT]**. If **DELETED** is selected, the message will be deleted.

Forwarding SMS Messages

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

   a. Select **[OPT] > MESSAGING > SMS** and press **[ENT]**.

   b. Select **RX MESSAGE** and press **[ENT]**.

   c. Implement **SELECT** and then use ▼ or ▲ to browse to the received message that will be forwarded and press **[ENT]**.

   d. Select **FORWARD** and press **[ENT]**.

   The message text may be edited or left as displayed. When the message is ready, press **[ENT]** to send.

   e. Select the desired **SEND TO** destination of **STATION** or **NET** and press **[ENT]**.

   f. 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 resend a received SMS message to another station.

   a. Select **[OPT] > MESSAGING > SMS** and press **[ENT]**.

   b. Select **RX MESSAGE** and press **[ENT]**.

   c. Select **NEW** and press **[ENT]**.

   d. Select **LAST SENT MSG** by browsing through **MESSAGE TYPE** and press **[ENT]**.

   The message text may be edited or left as displayed. When ready, select the desired message and press **[ENT]** to send.

    e. Select the desired **SEND TO** destination of **STATION** or **NET** and press **[ENT]**.

    f. 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 SMS messages from radio memory.

    a. Select **[OPT] > MESSAGING > SMS** and press **[ENT]**.

    b. Select **DELETE LAST ENTERED** and press **[ENT]**.

                   NOTE

    You can also select DELETE LAST SENT and any new received messages with this option.

    c. Observe DELETE MESSAGE? screen and select **YES** or **NO** and press **[ENT]**.

    d. Select **DELETE LAST SENT** and press **[ENT]**.

    e. Observe DELETE MESSAGE? screen and select **YES** or **NO** and press **[ENT]**.

Canned Messages

The Canned Messages feature for SMS allows the user to enter and save text messages for future use. This feature allows up to 10 SMS messages to be stored. Because canned messages are shared between SMS AMD's (ALE messaging), the length of canned messages is 160 characters.

Viewing and Sending Canned Messages

View and send SMS canned messages using the CANNED message option described below.

a. Select **[OPT]** > **MESSAGING > SMS >TX MESSAGE > CANNED MESSAGE** and press **[ENT]** to view canned SMS message items.

b. Select **CANNED** and press **[ENT]** to go to the Browse Canned SMS Message Menu.

c. Select ▼ or ▲ to browse and select a Canned SMS Index. The Edit screen displays allowing the operator to edit the message prior to sending.

NOTE

To exit the Edit screen without having to delete the entire SMS text, press **[0]** to switch the screen to special characters. Select ◄ or ► to scroll screen until "EXIT" is highlighted in the bottom right corner and press **[ENT]** to exit the Edit screen.

d. Select **STATION** or **NET** and press **[ENT]** to continue.

e. Select **STATION ADDRESS** or **NET ADDRESS** and press **[ENT**].

f. Send message and press **[ENT**] to continue. A message displays to confirm message is being sent to station or net and press **[CLR]** to stop sending message.

g. Select **YES** to terminate data or **NO** to continue sending message and press **[CLR]** and select **[OPT]** to exit.

Configure SMS

SMS settings allow the user to configure traffic and text settings for the radio. 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.

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

SMS Configuration settings are summarized as follows:

- Text Entry Mode (Overwrite/Insert)
- Text Prediction (Enabled/Disabled)
- Auto Display (Enabled/Disabled)
- Auto Backlight (Enabled/Disabled)
- Tone Alert (Enabled/Disabled)
- ARQ Traffic Type (XDLV, LDL128, LDL64, LDL32)
- Cipher Mode (CT/CC, CT Only, All)

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.

SMS TX Messages

a. Select **[PGM] > HF CONFIG > SMS > TX MESSAGE** and press **[ENT]**.

b. Observe the DEFAULT CANNED MESSAGE screen displays.

c. Select ◄ or ► to scroll screen for SELECT or select DELETE ALL and press **[ENT]**.

d. Observe if SELECT was chosen (BACK, EDIT or DELETE) are available selections.

e. Observe if DELETE ALL was chosen, the DELETE ALL? screen displays.

f. Select **YES** or **NO** and press **[ENT]**.

SESSIONLESS AUDIO

Sessionless Audio permits the radio to make VoIP calls without using Session Initiation Protocol (SIP) for negotiation. Use of Sessionless Audio allows the radio to connect to an RF-7800I Intercom Ethernet port instead of the analog audio port. Use the Communications Planning Application (CPA) to enable Sessionless Audio.

Interoperability

VoIP in the AN/PRC-160(V) is interoperable with the RF-7800V-HH and RF-7800I products. Due to the complexity of the VoIP system, configuration of interoperability with other Harris products must be performed using the CPA.

HOPPING OPERATION

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.

Hopping Preset

a. Select **[PRE +/-]** to select a HOP system preset. Keys must be programmed if operating in CT or CC.

b. Observe:

1. **HOP** appears.

2. Correct encryption (**PT, CC,** or **CT**), **DATA** (Modem Preset), **VOICE**, **KEY** (**CT** and **CC**), and **SQL** (if desired) are displayed.

3. **T** appears when transmitting.

4. **R** appears when receiving or when ready to receive.

5. **BAT** appears with battery level unless volume is being adjusted.

6. **SYNC** status on right side of screen:

    (a) **AUTO** - Synchronization is made using GPS satellite time.

    (b) **MAN** - Single radio transmits synchronization request and response to allow other radios in the net to achieve synchronization.

    (c) **NONE** - Radio is not synchronized.

7. Select **[VOL +/-]** to set volume. VOL appears along with relative level while volume is adjusted.
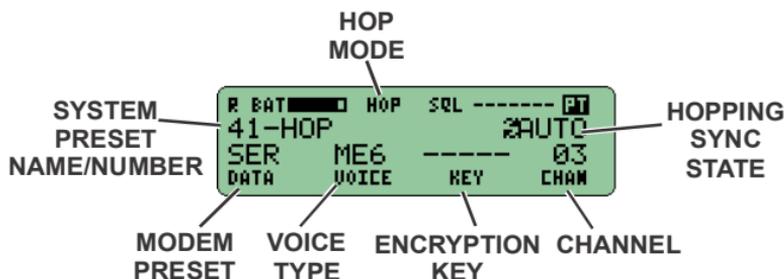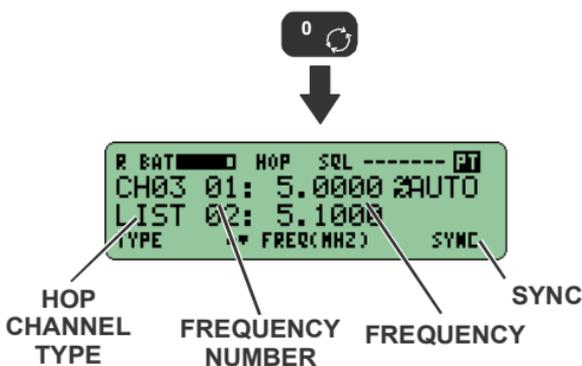
CL-0512-4100-0025

CL-0512-4100-0026

HOP Programming

The hop channel, hop type and any exclusion frequencies can be programmed as follows.

a. Select **[PGM] > HF CONFIG > MODE > HOP** and press **[ENT]**.

b. Select **CHANNEL** and press **[ENT]**.

c. Observe the EDIT HOP CHANNEL screen displays.

- d. Select a Hop Channel number and press **[ENT]**.
- e. Observe the **HOP TYPE** screen displays.
- f. Select NARROW, LIST, or WIDE and press **[ENT]**.
- g. Observe that if **NARROW** is selected:
  1. Enter the CENTER FREQ (MHZ) and press **[ENT]**.
  2. Enter the HOP CHANNEL ID and press **[ENT]**.
  3. Enter the TOD MASK and press **[ENT]**.
  4. Select **YES** or **NO** for AUTORESPOND and press **[ENT]**.
- h. Observe that if **LIST** is selected:
  1. Select **YES** or **NO** to MODIFY THE LIST and press **[ENT]**.
  2. Select ACTION (ADD, DELETE, REVIEW/EDIT) accordingly for Channel List entries.
- i. Observe that if **WIDE** is selected:
  1. Enter the LOWER FREQ (MHZ) and press **[ENT]**.
  2. Enter the UPPER FREQ (MHZ) and press **[ENT]**.
  3. Enter the HOP CHANNEL ID and press **[ENT]**.
  4. Enter the TOD MASK and press **[ENT]**.
  5. Select **YES** or **NO** for AUTORESPOND and press **[ENT]**.
- j. Select **EXCLUDE** and press **[ENT]**.
- k. Select **ACTION** (ADD, DELETE, REVIEW/EDIT, DELETE ALL) accordingly for Exclusion Bands (up to 10 bands).
- l. Select **CONFIG** and press **[ENT]**.
- m. Observe the MANUAL SYNC screen displays.
- n. Select **YES** or **NO** and press **[ENT]**.

Send Synchronization Request

    a. Select **[CALL]**.

    b. Select Manual Sync Type **REQUEST** using ▼ or ▲ and press **[ENT]**.

       After the radio sends a sync request, it waits for a response from the receiving radio. When a radio is receiving a sync request, the user on the receiving radio needs to manually respond, or if auto respond is enabled, the receive radio will automatically respond.

       For **BROADCAST**, when a Broadcast Sync is requested, the transmitting radio will send the sync request and response. The receive radio requires no action to be taken. The radio sending the sync request automatically transmits the sync response, if configured. If not configured, user intervention is required. Upon receiving a sync response, **MAN** appears to indicate a manual sync.

GPS Sync

    a. Connect a GPS antenna to the radio.

    b. Observe that if current sync is **NONE**, the sync type updates to **AUTO** when GPS time is successfully acquired. If current sync is **MAN**, and GPS time is successfully acquired, the sync state remains in **MAN**.

NOTE

    If the radio that sent the sync response is using GPS time, the radio will auto update from **MAN** -> **AUTO**.

Unsync

    a.   Observe that when you have **MAN** sync, you can Unsync by pressing the **[CLR]** button on current/all channels.

    b.   Observe that when GPS time has been acquired, the radios sync type goes to **AUTO**. Otherwise, the sync type goes to **NONE**.

Hopping Data/Voice Capability

Type-1/Type-3 Encryption for Data/Voice Modes are shown below.

Encryption	USB	Data	Voice	Frequency Range (MHz)
KG-84R	X	SERIAL	DV6, ME6	1.5 - 29.9999
KG-84	X	SERIAL	DV6, ME6	1.5 - 29.9999
TSV	X	SERIAL	DV6, ME6	1.5 - 29.9999
PT	X	SERIAL	DV6, ME6	1.5 - 29.9999
Citadel/AES	X	SERIAL	DV6, ME6	1.5 - 29.9999

RADIO CHECKS

Start your radios as described in Basic Operations and check radios as described below. Your mission plan should be loaded into the radios.

Test Your Network - Voice

Key your handset and conduct a radio check with all other stations.

- Verifies that you have working handsets.
- Verifies you have the correct key loaded.

NOTE

If you cannot receive or transmit voice, refer to Troubleshooting.

RADIO PROGRAMMING

This section provides limited front panel programming information.
Complete programming structures and descriptions are described
in AN/PRC-160(V) Operation Manual (10515-0512-4200).

HF Configuration

NOTE

Fill Type-1 keys and load/program Type-3 Keys as
required prior to performing programming steps.

Press **[ENT]** after each step.

a. Select **[PGM] > HF CONFIG** and press **[ENT]**.
b. Select from standard options of GLOBAL, CHANNEL,
    MODEM, MODE, LDV, GPSAPR, SCHEDULE, SMS.
c. Select additional MODE options for ALE:
    (CHANNEL GROUP, ADDRESS, CONFIG, LQA, AMD).
d. Select additional MODE options for 3G:
    (ASSIGN KEYS; CT or CC MODE, NET
    IP CONFIG; OFF, WIDEBAND, NARROWBAND,
    IP ADDRESS, RX BROADCAST GATEWAY).
e. Select additional MODE options for HOP:
    (CHANNEL EXCLUDE, CONFIG).

Configuring System Presets

Press **[ENT]** after each step.

a. Select **[PGM]** > **SYSTEM PRESETS** >**SYSTEM PRESET
    CONFIG** and press **[ENT]**.
b. Enter a number **01** - **99** using the keypad at SYSTEM
    PRESET NUMBER screen.
c. Enter a description that defines the preset at PRESET
    DESCRIPTION screen.

d. Select **HF** for waveform type at PRESET WAVEFORM screen.

e. Configure other items in the PRESETS-CFG menu for GENERAL CONFIG, COMSEC, VOICE CONFIG.

f. Select **EXIT** to return to System Presets menu or select **[PGM]** to exit Program Mode and go to main screen.

Change Maintenance Password

[PGM] > RADIO CONFIG > CHANGE MAINTENANCE PASSWORD> - Change the radio maintenance password. When the radio is shipped from the factory, it is Type-1 Initialized and contains the default password **H2445830**.

General Configuration

[PGM] > RADIO CONFIG > GENERAL CONFIG >

- **AUDIO CONFIG** - Set sidetone, voice key-up timeout.
- **AUTOSAVE CONFIG** - Used to set the Preset Autosave feature ON or OFF.
- **BATTERY CONFIG** - Set battery model being used.
- **CITADEL CONFIG** - Configure Citadel with Auto Key Select (AKS), KERNEL ID and KEYS options for Citadel and AES keys.
- **CT OVERRIDE CONFIG** - Set automatic PT to CT when switching to CT preset.
- **DATA PORT CONFIG** - Configure operation of Data port (General Hardware and Sync configuration settings).
- **EXTERNAL DEVICE -** Configuration of optional external devices (Prepost, Antenna, Remote KDU options).
- **EXTERNAL KEYLINE -** Configuration of option External Keyline.
- **GPS CONFIG** - Set GPS options.
- **NETWORK CONFIG** - Set IPV4 and Red Ethernet.

- • **PORT CONFIG** - Set J3 ASCII/Console, Red USB settings.

System Clock
[PGM] > RADIO CONFIG > SYSTEM CLOCK - Change the radio date and time as well as configure the clock display parameters.

Maintenance
[PGM] > RADIO CONFIG > MAINTENANCE- Reset HUB Capacity, Reset Factory Defaults, Erase Mission Plans on Zeroize. Maintenance password required for Reset functions.

USB CONFIGURATION
This section provides information on USB configuration. Refer to AN/PRC-160(V) Operation Manual (10515-0512-4200) for detailed information.

Configuration for Direct USB
The AN/PRC-160(V) uses USB Data/Programming Cable (12043-2850-A006) to allow the radio to exchange data and control with a PC over the USB interface on the front panel (J5, USB Connector).

By default, the radio will be configured for Direct USB. The Ethernet port type is set to **COMPOSITE DEVICE** for Direct USB.The default IP address of the radio will be set to 192.168.0.2.

Configuration for USB to Ethernet
In order to physically have Ethernet, the radio must be equipped with a USB to Ethernet cable (12083-0707-A003). The Ethernet port type must be selected as **HOST** for USB TO ETHERNET. Select [**PGM] > RADIO CONFIG > GENERAL CONFIG > PORT CONFIG > RED USB > HOST**.

Windows applications using the Harris USB Remote Network Driver Interface Specification (RNDIS) Network Device will respond to a USB interruption in the same way it would respond to any other Ethernet interface becoming unavailable.

The USB connection can be interrupted in several ways:

- Disconnecting the USB data/programming cable or disconnecting a hub to which the USB data/programming cable is attached
- Switching the radio into or out of LD mode
- Running BIT on the radio
- Rebooting or power-cycling the radio
- Turning off the radio
- CPA programming (the radio will be rebooted afterwards)

Windows application response to a USB interruption will be application specific. In most cases, this usually results in packets being dropped until the interface is present again. If re-connecting the USB data/programming cable does not re-establish communication, it may be necessary to terminate all programs using the Harris USB RNDIS Network Device and re-launch the application(s).

PREVENTIVE MAINTENANCE

[OPT] > TEST OPTIONS > SELF TEST - Daily check of general system Built-In Test (BIT). While in CT, have an ANDVT or KG-84 key loaded.

Antenna, connectors, protective caps - check weekly for damage.

Batteries

- Use non-rechargeable Lithium-Ion battery.

- Main battery should operate for approximately 8 hours.

- Store the radio with a charged main battery attached. When a charged main battery is connected, memory is held up through it, and the Hold-Up Battery (HUB) is automatically disconnected to extend its life.

- Do not replace the HUB unless the main battery is attached.

- After exposure to water, detach battery from the radio. Clean battery with fresh, clean soft cloth and thoroughly dry with another soft cloth. Do not use heat to dry battery. Clean corrosion using a nylon mesh abrasive pad.

TROUBLESHOOTING

Observation	Action
Radio does not power-up; completely dead.	Replace battery with a known good one. Clean battery connector. If radio still does not power-up, Level III Maintenance is required.
Hold Up Battery Low message	Radio requires HUB change. Refer AN/PRC-160(V) Operation Manual (10515-0512-4200). Radio is operable, but will lose programming if main battery dies or is removed.
No Receive/Transmit audio.	Check volume level. Check squelch level. If using a handset, clean connectors or replace handset.
Intermittent RX audio.	Check antenna connections. Check squelch level. If using a handset, clean connectors or replace handset.
Radio stays at HARRIS logo before going to a power up failed screen.	Level III Maintenance required.
Radio stuck in ALARM at power-up.	Level III Maintenance required.
Passive Zeroization message after power-up when zeroize was not initiated by operator.	Replace HUB battery. Remove main battery for five minutes. Reattach main battery and power-up radio. If Passive Zeroization message is displayed again, Level III Maintenance is required.
Crypto Fill interface failures	Verify operation of Fill Device and Fill Interface Cable.
GPS Failure	Inspect condition of GPS antenna and connection. If GPS antenna is being used, ensure upright orientation. Verify clear path to satellite.
32-pin J3 Connector ports not operational	Clean connections. Replace cable. Verify data port configuration is set properly. If problem still occurs, Level III Maintenance is required.

ACCESSORIES

The following items are available for the AN/PRC-160(V).

Accessory	Connection	Part Number	Notes
Falcon II Remote Keypad Display Unit (KDU) Kit	J4 KDU	12097-0100-01	Includes KDU (10511-1300-03), extension cable (10511-0704-012), and RF-5931-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.
USB to Ethernet Cable Assembly	J5 USB	12083-0707-A003	Includes USB to Ethernet adapter and cable.
CW Kit, HF Radio	-	12200-0901-01	Includes Cable Assembly, Y Adapter (10372-1230) and RF-3016-04 CW Key, Base (919-5005-03)

Support Kits

Contact Harris for assistance.

GLOSSARY

-Numbers-

3G	Third generation HF communication protocols (STANAG 4538)
3GIP	3G mode that provides the capability to transmit and receive IP data using a Wideband or Narrowband configuration.

-A-

AES	Advanced Encryption Standard
AK	Automatic Key
AKS	Automatic Key Selection
ALE	Automatic Link Establishment
AM	Amplitude Modulation
AMD	Automatic Message Display
AME	Amplitude Modulation Equivalent.
ANDVT	Advanced Narrowband Digital Voice Terminal
ANT	Antenna
APR	Automatic Position Reporting

-B-

BAT	Battery
BIT	Built-In Test
BNC	Bayonet Neill-Concelman
BPS	Bits per second

-C-

C	Celsius
CC	Coalition Compatible
CLR	Clear
COMSEC	Communications Security
CPA	Communications Planning Application
CT	Cipher Text, encrypted voice or data
CW	Continuous Wave

-D-

DSS	Digital Signature Standard
DTD	Data Transfer Device
DTE	Data Terminal Equipment

-E-

ECCM	Electronic Counter Counter Measures **-** Techniques used to prevent signal detection or jamming of the transmission path.
ENT	Enter

-F-

F	Fahrenheit
FEC	Forward Error Correction
FIX	Fixed Frequency (single frequency operating mode)
FM	Frequency Modulation

-G-

GMT	Greenwich Mean Time
GPS	Global Positioning System

-H-

HUB	Hold-Up Battery

-I-

ID	Identification
IP	Internet Protocol
ITAR	International Traffic in Arms Regulations

-J-

-K-

KDU	Keypad Display Unit
KEK	Key Encryption Key
kHz	Kilohertz

-L-

LCD	Liquid Crystal Display
LD	Load
LDV	Last Ditch Voice
LQA	Link Quality Analysis
LSB	Lower Side Band
LT	Light

-M-

MAX	Maximum
MELP	Mixed-Excitation Linear Predictive
MHz	Abbreviation for megahertz

-N-

NB	Narrowband

-O-

OPT	Option
OTAR	Over The Air Rekey

-P-

PA	Power Amplifier
PC	Personal Computer
PGM	Program
PRE	Preset
PT	Plain Text
PTT	Push-To-Talk

-R-

R	Receive (Indicator)
R/T	Receiver-Transmitter
RF	Radio Frequency
RX	Receive

-S-

SKL	Simple Key Loader
SMS	Short Message Service
SNR	Signal to Noise Ratio
SQL	Squelch
SW	Software
SYNC	Synchronous

-T-

T	Transmit (Indicator)
TCXO	Temperature Compensated Crystal Oscillator
TEK	Traffic Encryption Key
TOD	Time-of-Day
TSV	Tactical Secure Voice
TX	Transmit

-U-

USB	Universal Serial Bus, also Upper Side Band (modulation)
UTC	Coordinated Universal Time

-V-

VHF	Very High Frequency

VOL   Volume

-W-

WB   Wideband
WBHF   Wideband High Frequency

-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.

-Y-

-Z-

Z, ZERO   Zeroize - erases all presets, programing, and COMSEC