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CHAPTER 1

EQUIPMENT DESCRIPTION

1.1 SAFETY PRECAUTIONS

All safety precautions necessary for the protection of personnel and equipment are cross-referenced in the following list. The WARNING or CAUTION is referenced to the paragraph number where it is used in the manual, and a brief subject phrase indicating the content is provided. Read these items in their entirety before performing the referenced procedure.

- WARNING - Paragraph 1.1 - RF shock may be induced if human contact is made with bare metal on the radio case.
- WARNING - Paragraph 2.3 - Do not charge, short circuit, incinerate, or mutilate the BA-5590/U Lithium Battery.
- WARNING - Paragraph 2.3 - If the battery becomes hot, a hissing sound is heard, and an irritating smell occurs; move the equipment to a well-ventilated area. If a battery leak is detected, follow appropriate HAZMAT procedures.
- WARNING - Paragraph 5.3.2 - Do not recharge a BA-5590/U Disposable Lithium Battery.
- WARNING - Paragraph 5.3.3 - Do not dispose of lithium batteries in uncontrolled trash.

WARNING

Field experience has shown that an RF shock may be induced during radio operation, if human contact is made with bare metal on the radio case as a result of scratches or worn paint. Ensure to connect radio to good earth ground whenever possible.

1.2 PURPOSE OF THIS MANUAL

This operation manual provides the user with AN/PRC-150(V)(C) Manpack Radio Receiver/Transmitter (referred to throughout this manual as manpack radio or R/T) operating instructions, as well as technical information required to support Level I Maintenance.

1.3 EQUIPMENT DESCRIPTION

The AN/PRC-150(V)(C) is an advanced High Frequency (HF) R/T which provides reliable tactical communications through enhanced secure voice and data performance, networking, reduced size/weight, and extended battery life.

The R/T provides reliable Line-Of-Sight (LOS) and skywave communications in Upper Sideband (USB), Lower Sideband (LSB), Amplitude Modulation Equivalent (AME), Continuous wave (CW), and Frequency Modulation (FM) modes. Communications can take place with manpack, mobile, and fixed-site radio configurations.

The R/T has an extended frequency range of 1.6 MHz to 29.9999 MHz in skywave modes and 20.0000 MHz to 59.9999 MHz in FM mode, with selectable low (1.0 watt), medium (5.0 watts), and high (20.0 watts [10 watts FM]) output power. Normal R/T operation uses either two BB-390/U Nickel-Metal Hydride (Ni-MH) Rechargeable Batteries, two BB-590/U Nickel-Cadmium (Ni-Cd) Rechargeable Batteries, two BA-5590 Lithium Metal Hydride

(Li-MH) Batteries, or two BB-490/U Lead-Acid Batteries. The radio can operate from a single battery, but it shortens the battery life and, in the case of FM mode, limits the R/T capability.

1.4 FEATURES

The R/T offers the following features:

- Removable Keypad Display Unit (KDU) with Liquid Crystal Display (LCD) that supports adjustable backlight and contrast levels. The KDU enables local remote control and provides greater flexibility for operational mission employment.
- Supports ANDVT KY-99, VINSON KY-57, KG-84C (Redundant and Non-Redundant), and KY-100 embedded Type I COMSEC.
- Supports digital security based on Harris Citadel encryption.

NOTE

The CITADEL COVER (CC) mode is provided to support communications with other coalition forces who may not be authorized for full Type I Cipher Text usage. The CC mode incorporates digital encryption based on the Harris CITADEL information security algorithm and associated circuitry. The CC communication mode provides a high grade of information security, however CC is not a Department of Defense (DOD)-endorsed COMSEC mode. For highest security Type I encryption, the Cipher Text (CT) mode should be the standard mode of operation.

- Operator-adjustable transmit power levels (low, medium, or high).

- Supports MIL-STD-188-141A Automatic Link Establishment (ALE).
- Supports STANAG 4538 Automatic Radio Control System (ARCS) link set-up and data link protocols in the radio's 3G mode.
- Supports Mixed Excitation Linear Prediction (MELP) and LPC-10 digitized voice.
- Supports data link protocol FED-STD-1052 Automatic Repeat reQuest (ARQ).
- Supports Analog Voice Security (AVS) operation.
- Supports enhanced Electronic Counter Counter Measure (ECCM) - frequency hopping in HF mode (narrowband, wideband, and list).
- Supports Continuous Variable Slope Delta (CVSD) FM digital voice operation.
- Provides an external Global Positioning System (GPS) Precision Lightweight GPS Receiver (PLGR) interface for automatic Time-of-Day (TOD) synchronization.
- Utilizes Built-In Test Equipment (BITE) for radio operational test and battery checks.
- Supports simplex and half-duplex operation in SSB FIX frequency mode.
- Supports full remote control RS-232/RS-422 or Point-to-Point Protocol (PPP) from a customer-supplied remote control terminal.
- Supports networking capability using PPP or Ethernet.
- Supports Wireless Internet Protocol (IP) data transfer when operating in STANG 4538 (3G) mode.
- Supports noise, tone, and digital squelch.
- Utilizes internal ARQ, High- or Low- (X) Data Link (XDL), MIL-STD-188-110B, Serial Tone, ANDVT-HF, STANAG 4285, 39-tone, and Frequency Shift Key (FSK) modems.

- Utilizes a 3.5 VDC Hold-Up Battery (HUB) to maintain programmed information when the R/T is powered OFF.

1.4.1 COMSEC-Specific Features

The following are the AN/PRC-150(V)(C) fixed-frequency CT operating capabilities and limitations:

- COMSEC - Communications Security. The AN/PRC-150(V)(C) has embedded COMSEC modes and is considered a Controlled Cryptographic Item (CCI).
- Crypto Ignition Key (CIK) - Key that generates the Crypto algorithm. The KDU is the CIK when Crypto variables are loaded. Loaded COMSEC keys cannot be accessed and are protected when the KDU is removed from the radio. The radio will not operate without originally initialized KDU.
- VINSON - Interoperable with KY-57/KY-58. Supports data (16 kbps Wideband FSK (WBFSK) and digital voice (16 kbps CVSD) in FM.
- ANDVT-HF - Provides interoperability with the ANDVT and KY-99A MINTERM. Supports data (300 to 2400 bps) and digital voice (2400 bps DV24).
- ANDVT-BD - Enables interoperability with KY-100. Supports secure voice (2400, 600 bps) and data (75 to 4800 bps), using the serial tone modem waveform.
- KG-84C Compatible - Enables interoperability with KG-84C. Supports data (75 to 4800 bps sync and async) and digital voice (600, 2400 bps). Redundant and non-redundant modes.
- Traffic Encryption Keys (TEKs) - Encryption keys used to secure voice and data communications.
- Key Encryption Key (KEK) - Encryption key used in Automatic Keying (AK) Over The Air Rekey (OTAR).
- Transfer Key Encryption Key (TrKEK) - A red encryption key required to unwrap black encryption keys.

- COMSEC Fill - TEKs and KEK can be manually filled from the following devices:
  - AN/CYZ-10 Data Transfer Device (DTD) (DS-101) using Fill user application software
  - AN/CYZ-10 DTD (DS-102) using RDS user application software
  - KOI-18 General Purpose Tape Reader (DS-102)
  - KYK-13 Electronic Transfer Device (DS-102)
  - KYX-15 (DS-102) Net Control Device (NCD)
- OTAR - Supports transmit and receive automatic rekey (cooperative and non-cooperative), receive manual rekey (cooperative and non-cooperative), variable generate and variable update.

1.5 SPECIFICATIONS

Table 1-1 lists the R/T specifications.

Table 1-1. R/T Specifications

Function	Specification
GENERAL	
Frequency Range	1.6 MHz to 59.9999 MHz in 100-Hz steps
Modes of Operation	FIX, HOP, ALE, and 3G
Modulation	LSB, USB, AME, CW, and FM
Preset Channels	200
System Presets	75, fully programmable

Table 1-1. R/T Specifications (Continued)

Function	Specification
COMSEC Interoperability	Vinson KY-57, KY-99A, KY-100, and KG-84A/C (Redundant and Non-Redundant Modes)
Self-Test	Full BIT to the module level
RF Input/Output Impedance	50 ohms nominal, unbalanced
Power Input	26 VDC nominal; normal operations from 23 - 30 VDC; when battery voltage reaches 21 VDC, the radio shuts down.
Size	10.5 W x 3.5 H x 13.5 D inches (26.7 W x 8.9 H x 34.29 D cm) with battery box
Weight	9.9 lb (4.5 kg) without batteries
Temp Range	-40° F to +158° F (-40° C to +70° C)
Immersion	35.4 inches (0.9 m) of water
RECEIVER	
Squelch	Front panel adjustable, active squelch selectable
TRANSMITTER	
Power Output	1, 5, 20 watts Peak Envelope Power (PEP)/Average HF, (1, 5, 10 watts FM)
Audio Input	Handset 1.5 mV into 150 ohms or 0 dBm into 600 ohms for full-rated power

Table 1-1. R/T Specifications (Continued)

Function	Specification
Antenna Tuning	OE-505 (3 m) whip, (1.6 MHz to 60 MHz) RF-1936P (AS-2259) NVIS (3.5 MHz to 30 MHz) RF-1940 BNC dipole (3 MHz to 60 MHz) RF-1941 Portable dipole antenna (2-30 MHz) Field expedient dipole and random length wire

1.6 CONFIGURATIONS

For R/T configuration information, refer to Paragraph 2.1.

1.7 COMPATIBLE CABLES AND CONNECTOR KITS

Because of the large number of connections possible with the R/T, refer to Table A-9 for cables and connector kits available.

For replacement connectors and mating connector part numbers, refer to Table A-10.

1.8 OPERATIONAL MODES MATRIX

Table 1-2, Table 1-3, Table 1-4 and Table 1-5 display the modes of operation of the R/T.

Table 1-2. FIX Mode

Mode	Voice/CW	Modem Serial/ 39-Tone	Digital Voice	Digital Data Encryption	Digital Voice Encryption	AVS	Frequency Range
USB	✓	✓	✓	✓	✓	✓	1.6 MHz to 29.9999 MHz
LSB	✓	✓	✓	✓	✓	✓	1.6 MHz to 29.9999 MHz
CW	✓	○	○	○	○	○	1.6 MHz to 29.9999 MHz
AME	✓	○	○	○	○	○	1.6 MHz to 29.9999 MHz
FM	✓	○	✓ (CVSD)	○	○	○	20 MHz to 59.9999 MHz

○ = Not Capable
✓ = Capable

Table 1-3. ALE Mode

Mode	Voice/CW	Modem Serial/ 39-Tone	Digital Voice	Digital Data Encryption	Digital Voice Encryption	AVS	Frequency Range
USB	✓	✓	✓	✓	✓	✓	1.6 MHz to 29.9999 MHz
LSB	✓	✓	✓	✓	✓	✓	1.6 MHz to 29.9999 MHz
CW	○	○	○	○	○	○	1.6 MHz to 29.9999 MHz
AME	✓	○	○	○	○	○	1.6 MHz to 29.9999 MHz
FM	○	○	○	○	○	○	20 MHz to 59.9999 MHz

○ = Not Capable
✓ = Capable

Table 1-4. 3G Mode

Mode	Voice/CW	Modem Serial/ 39-Tone	Digital Voice	Digital Data Encryption	Digital Voice Encryption	AVS	Frequency Range
USB	✓	✓ (Serial)	✓	✓	✓	✓	1.6 MHz to 29.9999 MHz
LSB	○	○	○	○	○	○	1.6 MHz to 29.9999 MHz
CW	○	○	○	○	○	○	1.6 MHz to 29.9999 MHz
AME	○	○	○	○	○	○	1.6 MHz to 29.9999 MHz
FM	○	○	○	○	○	○	20 MHz to 59.9999 MHz

○ = Not Capable
✓ = Capable

Table 1-5. HOP Mode

Mode	Voice/CW	Serial Tone Modem	Digital Voice	Digital Data Encryption	Digital Voice Encryption	AVS	Frequency Range
USB	✓	✓	✓	✓	✓	○	2.0 MHz to 29.995 MHz
LSB	○	○	○	○	○	○	2.0 MHz to 29.995 MHz
CW	○	○	○	○	○	○	2.0 MHz to 29.995 MHz
AME	○	○	○	○	○	○	2.0 MHz to 29.995 MHz
FM	○	○	○	○	○	○	20 MHz to 59.995 MHz

○ = Not Capable
✓ = Capable

1.9 THEORY OF OPERATION

This theory of operation provides detailed information for radio modes and preset programming used in the R/T.

1.9.1 General Preset Overview

The R/T has three types of programming presets. These presets allow the R/T to be preconfigured for easier and consistent operation in the field.

Figure 1-1 shows a system preset along with the basic contents of the associated modem and channel presets.

a. **System** - A grouping of parameters which define the operating configuration for a particular net.

   1. Net name, operating mode, encryption type and key, PT/CT/CC voice mode, and squelch selection
   2. Channel preset
   3. Modem preset

b. **Channel** - Allows configuration of radio frequencies and modes of modulation.

c. **Modem (DATA)** - Allows configuration of modem parameters (data rate, interleave, data bits, parity, etc.).

Figure 1-2 shows an example of a configured system preset with modem and channel information.

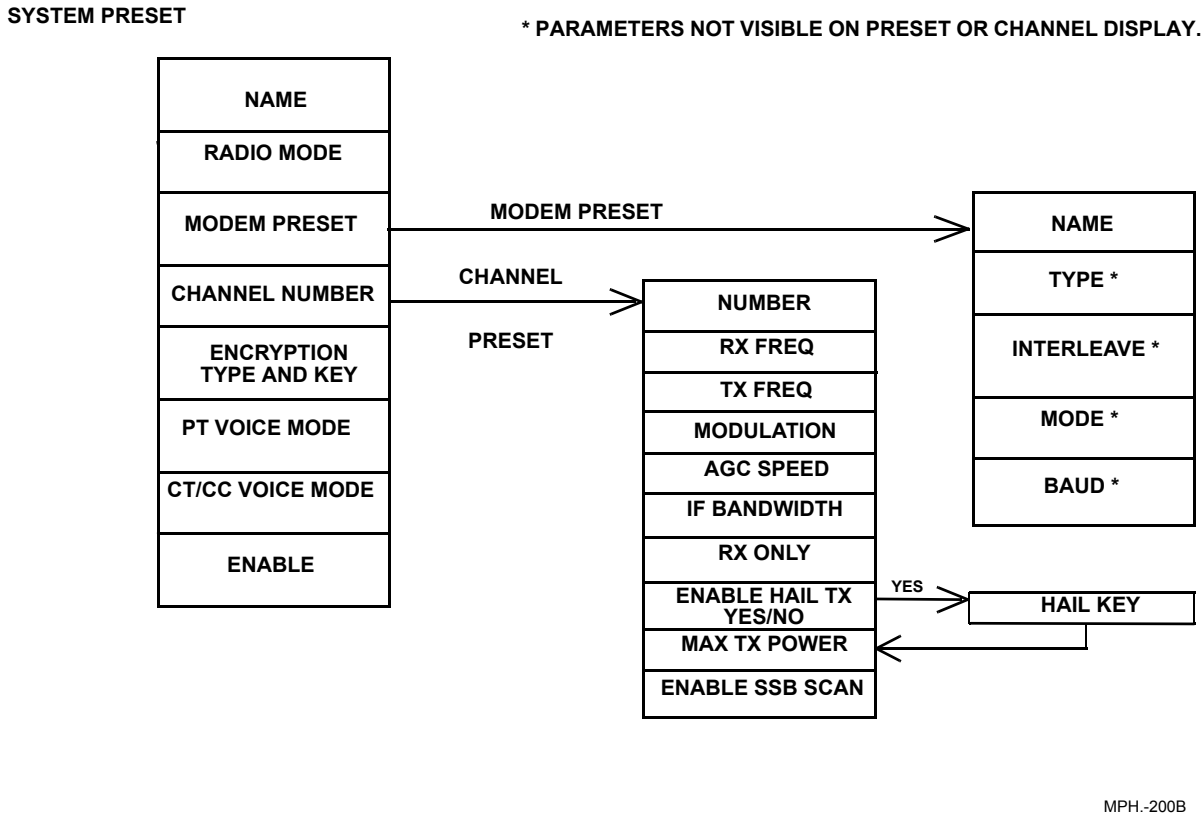

Figure 1-1. General System Preset Contents

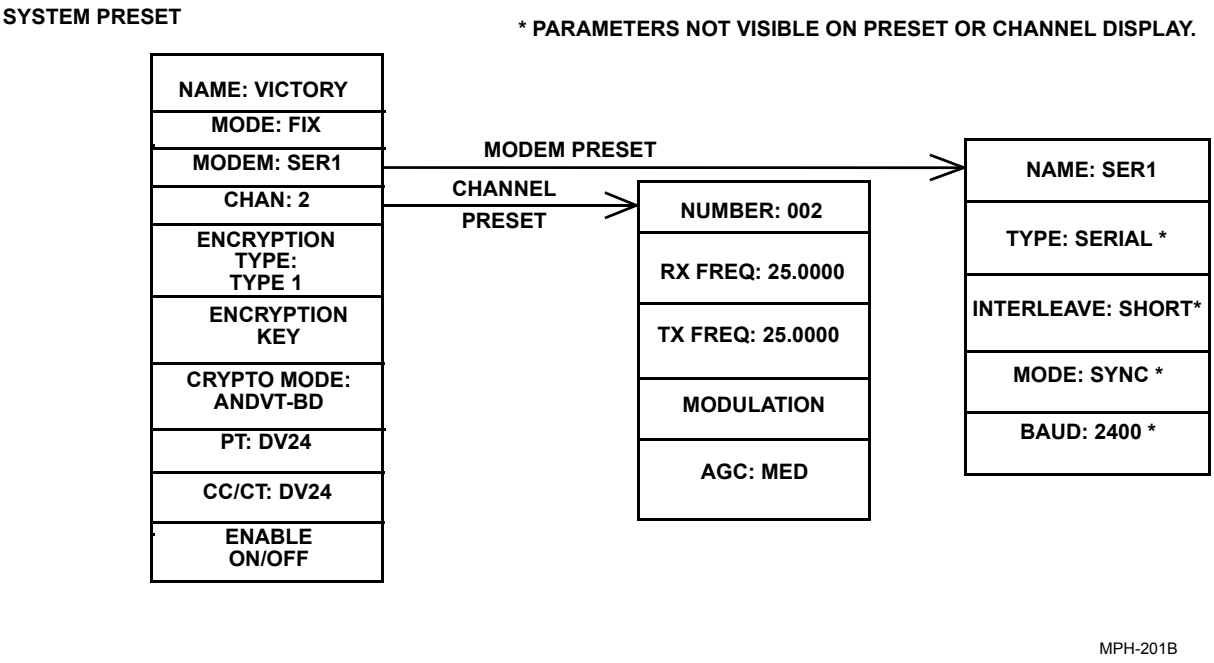

Figure 1-2. Configured AN/PRC-150 System Preset Example

1.9.2 Operational Overrides

Any system preset parameter can be modified at any time. This causes the system preset to become temporarily changed. When the system preset is temporarily changed, the preset name is enclosed with the symbol "< >".

A system preset that has been temporarily changed will be restored to the original setting when the system presets are scrolled with the PRE +/- key, or the R/T is power cycled (ON/OFF/ON).

1.9.2.1 Manual (Scratchpad) Overrides

The manual override capability allows parameter changes to be permanently changed as soon as they are inputted. The changes remain intact through radio power cycling.

Unless the R/T is in programming mode, channel parameters may only be changed on channel 000, the manual (scratchpad) channel.

1.9.3 FIX Mode

Normal single channel voice or data operations use the FIX mode. The desired operational frequency and mode must be programmed into the channel. When FIX mode is selected, the three letter designator (FIX) will be displayed on the top row of the KDU display in the preset screen. See Figure 1-3 for an example.

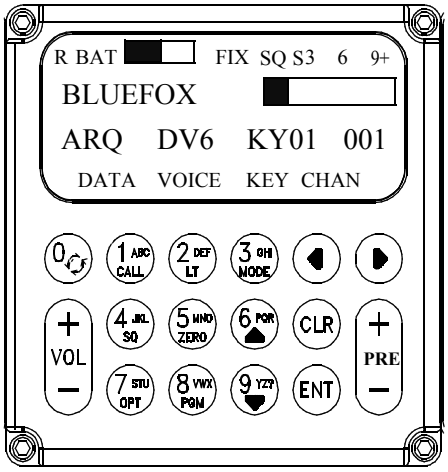

Figure 1-3. KDU

NOTE

Some versions of the KDU may contain a **NET +/-** key instead of a **PRE +/-** key.

1.9.3.1 Hailing Operation

Hailing permits a station in FIX mode to alert other net stations that are in HOP mode that a FIX station wishes to communicate. This is a signaling technique used to alert the operator that is in HOP mode that you want to communicate. Channels can be programmed that allow a non-hopping radio to communicate with a hopping radio. Up to ten (10) FIX channels can be designated for hail operation as to match operational frequency range of HOP

nets, which permits a spread of frequencies on the propagation range for planned links. While in the HOP mode, the radio monitors the preprogrammed hailing frequencies for any radios in FIX mode that want to communicate.

When a radio in HOP mode receives a hail, a HAILED status displays on the channel and system preset on which the hail is occurring. The hailed station must then leave the HOP mode and select the FIX mode of operation using the same hailing preset on which the hail took place. At this time, the two stations can coordinate wristwatch TOD, if needed, and coordinate net entry.

1.9.3.2 Digital Voice Operation

The R/T can be operated in digital voice mode to give it greatly improved voice operation capability when other analog SSB radios are unable to conduct communications. Digital voice mode benefits from the robustness of the serial tone modem to accomplish this. Digital voice has two possible methods, each operating at two possible baud rates: DV2400, DV600 MELP2400 and MELP600. A transmitting radio is able to select from the four digital voice modes. Providing that the serial modem is selected, the receiving radio configured for clear (CLR) will auto detect to the proper digital voice mode and rate. Digital Voice is only interoperable with other AN/PRC-150(V)(C) or RF-5800H radios and cannot be used if other analog type radios exist in planned radio nets. Digital voice compatibility with Harris RF-5000 and AN/PRC-138 radios is provided by configuring a preset with a 39-Tone modem and a voice setting of DV24.

1.9.3.3 FM CVSD Operation

The R/T can be operated in FM mode utilizing the CVSD modulation method. When using this feature, the operator needs to choose a frequency between 20 MHz and 59.995 MHz. In FM mode, ensure that the modem is not selected (DATA field should be OFF). When both CVSD and VINSON (CT) encryption are selected, the R/T will interoperate with the KY57, the AN/PRC-117F and other radios/cryptos which support VINSON operation. The R/T is compatible with the RF-5800H CVSD only in **PT** mode.

1.9.4 ALE Mode

The R/T provides MIL-STD ALE to greatly increase reliability and reduce operator workload. ALE automatically selects the best programmed channel and establishes the link between two or more radios.

All radios are assigned their own unique “address” (call sign). The initiating radio transmits the target address on one of the channels. If no response is received, it tries again on another channel. When the called station hears the address, it stops scanning on the channel and transmits a response. The initiating radio then transmits an acknowledgement and the link is established. Both operators are notified that the link has been established and can begin passing traffic.

There are three basic types of addresses:

- Self Address - This is each radio’s personal address.
- Individual Address - In a given radio, these are the addresses of the other net members.
- Net Address - The common address, shared by all net members. When this address is transmitted, all net members will respond.

1.9.4.1 Automatic ALE Call

To place an automatic individual call to a specified target, select the desired address from the pick list on the R/T. The R/T selects the best channel on which to link. This selection is based on the current score data stored in the Link Quality Analysis (LQA) matrix (refer to Paragraph 1.9.4.3). The score data is the result of the most recent sounding or exchange LQA process with the specified station. If communications cannot be established on the best channel, the initiating station attempts a call on the next best channel. If the channel scores are the same or there are no scores present, the higher-frequency channels have precedence while placing an automatic call. An attempt is made on all channels assigned to an individual address until a link is established. If a link cannot be established with any of the channels attempted, the initiating station’s KDU displays a NO RESPONSE message and returns to ALE scan.

1.9.4.2 Manual ALE Call

A manual ALE call can be placed from the R/T front panel on the operator selectable channel. A manual ALE call follows a three-step process:

a. The initiating station begins the process by transmitting a call message to the target station on a manually-selected channel. The length of the call message is determined by the MAX SCAN CHANNELS system parameter. The target station stops scanning on a channel when ALE signaling is present. If the target station determines that the call is addressed to it and that the call is on a valid channel (that is, on its channel list), it stays on the channel and continues to receive the call message.

b. Once the call message has been received, target station sends a response message to the initiating station.

c. Upon receipt of this response message, initiating station sends an acknowledgement message confirming receipt of the response message.

Once the acknowledgement message transmission is complete, the initiating station changes to the linked state and updates the front panel display. When the target station completes reception of the acknowledgement message, it changes to the linked state and updates the display with called station's address, and enables its call alert beep tones. Both systems are now ready to exchange voice or data information. For the two systems to link, it is necessary that all three portions of the message exchange (call, response, and acknowledgement) are received correctly.

1.9.4.3 LQA

The R/T uses LQA to predict the quality of the radio channels shared with the other radios in the nets of which they are members.

The ALE module automatically selects the optimal frequency to be used for a communications link with one or more remotely-located stations (outstations). The optimal frequency choice depends upon a number of factors which include:

- Distance between the local station and outstation
- Time-of-day
- Noise or radio interference on one or more of the frequencies being evaluated
- Existing friendly communications

During an LQA sequence, signal quality is measured at a number of frequencies between pairs of HF radio stations. The measurements are stored, ranked according to link quality, then used to select the optimum channel for link establishment.

Each channel score is a weighted average of Signal + Noise + Distortion to Noise + Distortion ratio (SINAD) and Bit Error Rate (BER) accumulated over the entire signaling interval. The scores range from 0 to 100, where 100 is the best attainable score.

The controller is capable of passing the measured signal quality to one or more of the outstations. The station at each end of the path stores the LQA score.

The ALE module uses either the sounding LQA method or the exchange LQA method.

1.9.4.4 Sounding LQA Method Description

A sounding LQA is a passive sequence of short, unidirectional messages sent at regular intervals by the calling unit on all the channels programmed for its self addresses. The calling unit uses the self address to identify itself to the receiving radio(s). The receiving radio(s) detects the signal, temporarily stops scanning, measures and stores the received signal quality as a score, and resumes scanning.

1.9.4.5 Exchange LQA Method Description

An exchange LQA uses a three-way message exchange during which two or more stations measure and exchange received signal-quality information. This differs from a sounding LQA in that the calling and receiving stations exchange link quality information during the LQA. An exchange LQA may be performed between individual stations, a net member station and other individual members of the same net, or a net member and all other members of the net.

1.9.4.6 Net LQA Method Description

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

1.9.5 3G Mode

In addition to MIL-STD ALE, the R/T also provides STANAG 4538 Third Generation (3G) ALE, which offers the following advantages over MIL-STD ALE:

- Faster link time
- Ability to link at lower Signal-to-Noise ratios (SNR)
- Improved network channel efficiency
- ALE and data use the same family of waveforms
- Higher throughput for short and long data messages
- Reduced operator workload (increased automation by integration of linking and data transfer mechanisms)

These performance improvements were accomplished by incorporating the following changes:

- Synchronous scanning of calling channels by all radios in the network (which requires that all radios in the network be in TOD synchronization).

NOTE

TOD synchronization is necessary to operate in 3G mode. TOD synch maybe obtained by an automatic download from an external GPS PLGR unit connected to the R/T, otherwise manual synch entry from wristwatch time is needed.

- Burst Phase Shift Keying (PSK) waveforms
- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) channel access procedure

1.9.6 Frequency Hopping (HOP)

The most commonly used TRANSEC technique is frequency hopping (also known as ECCM). This frequency hopping capability provides advanced anti-jam protection for communications. In HOP mode, the transmitter frequency changes so rapidly that it is difficult to intercept or jam the signal. For additional security, hopping data and digital voice data can be encrypted. An important aspect of hopping is synchronization. Synchronization is the process of aligning HOP signals to within a very narrow time sequence. This can be accomplished either manually or with the use of GPS. The R/T uses three frequency hopping techniques discussed in the following paragraphs.

NOTE

The frequency hopping used in the R/T is incompatible with the HOP mode in the RF-5000H and AN/PRC-138.

1.9.6.1 Wideband Hopping

Wideband hopping covers a frequency band that is bounded by a lower and upper frequency specified in multiples of 100 Hz. Frequency exclusion bands may also be programmed and the R/T will use all non-excluded frequencies between the upper and lower boundaries. The minimum bandwidth allowed is 15 kHz with an individual frequency bandwidth of 2 kHz. The maximum hopping bandwidth is 28.0 MHz. These frequencies define the band in which the transceiver hops. If the usable bandwidth is less than 15 kHz, the hopset cannot be used. In this case, the coupler must be disabled and a wideband antenna used.

1.9.6.2 Narrowband Hopping

Narrowband hopping uses frequencies within a defined bandwidth of the center frequency (F_c) (multiples of 5 kHz). Refer to Table 1-6. In most cases, the F_c is in the middle of the band (3 MHz F_c uses 7.5 kHz on each side for example). Refer to Paragraph 1.9.6.3 for the exception to this rule.

Table 1-6. Bandwidth/Center Frequencies

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

NOTE

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

1.9.6.3 Special Center Frequency Cases

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

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

1.9.6.4 List Hopping

List hopping allows the user to specify frequencies to be used during hopping. A minimum of five frequencies must be selected with a maximum of 50 frequencies in multiples of 100 Hz. List frequencies can be specified over the 2 - 30 Mhz band, with a minimum separation of 2 kHz between each. The coupler must be disabled and a wideband antenna used in this mode.

1.9.7 Synchronization

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

1.9.7.1 GPS TOD Synchronization

The Precise Positioning System (PPS) describes a class of GPS service that is available to the U.S. military and selected allies. The AN/PRC-150(V)(C) HF radio software supports the external time/position fill from a standard PLGR device for TOD setting. Time accuracy is required for channel scanning synchronization, frequency hopping synchronization and S4538 time synchronization.

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

NOTE

It is strongly suggested that all radios maintain and use Coordinated Universal Time (UTC, GMT or Zulu) for all operations.

The PRC-150(V)(C) HF radio software supports the external time/position fill from a standard PLGR device for TOD setting. Time accuracy is also required as a base for channel scanning synchronization, frequency hopping synchronization, S4538 time synchronization and, in the future, automatic position reporting.

1.9.7.2 Manual Synchronization

Manual synchronization is a method of synchronizing radios in a net without using GPS synchronization. A synch request is send to the NCS, requesting a special synchronization transmission. The NCS responds by transmitting timing information (sync response) on the channel (preset) that all radios will use to synchronize their clocks. When hopping on a channel with manual synchronization, the operator must update the synchronization every six hours on the RF5800-MP

1.9.7.3 Broadcast Synchronization (Passive Sync)

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

1.9.7.4 Synchronization (Sync) Request

A sync request is a method of requesting entry into a HOP net using Over-The-Air (OTA) signaling. The user sends a sync request from the front panel of the R/T. When the NCS radio receives the sync request, the operator is notified and the system automatically sends a sync response, if the radio is programmed to automatically respond. Upon successful reception of the sync response, the requestor's radio notifies the operator that a Manual Time-of-Day (MTOD) is now available and that time may be used for communicating in the net.

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

1.9.7.5 Synchronization Response

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

1.9.8 Sending Internet Protocol (IP) Data

The R/T offers a wireless IP capability that allows radio operators to make use of IP-based PC software applications. With the Harris Wireless Messaging Technology (WMT), the radio can be fully integrated into a local- or wide-area network using the radio's Ethernet interface. When configured for IP data transfer, the radio will deliver IP data packets to a remote radio station based on the routing information programmed into the radio. Radio packet processing uses conglomeration and compression of individual IP data packets to improve the efficiency of the data transfer. Applications should be tolerant of higher packet delivery latencies that occur as a result of difficult HF channels.

Once the R/T has been programmed with a configuration that supports sending IP data (refer to Paragraph 4.2), the radio is placed in 3G mode and synchronized. After synchronization, any IP data entering the radio via the Ethernet or PPP interface is processed and may be automatically routed to a remote station depending upon the destination address and the current state of the channel. If the channel(s), destination station and/or local station is busy, the radio will queue outgoing data packets. Once the radio determines that the channel is available, it will attempt to use the channel to send the queued packets, provided the packets have not expired.

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

IP data may be delivered using either an ARQ (acknowledged) or non-ARQ (unacknowledged) mode. The operator can specify this mode by selecting a system preset capable of the intended mode of transfer.

NOTE

For security purposes, IP data entering the radio via the Ethernet interface while the radio is in CT mode will not be routed. Alternatively, data incoming on the PPP interface will be routed based on the radio's routing table for all three cipher modes (PT, CT and CC).

NOTE

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

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CHAPTER 2

SYSTEM SETUP AND TEARDOWN

2.1 SYSTEM CONFIGURATION

See Figure 2-1. The manpack radio consists of the following equipment:

- RT-1694D(P)(C)/U Receiver/Transmitter (R/T) Assembly (0N672486-01)
- H-250/U Handset (10075-1399)
- Ground Stake Kit (10303-1008-01)
- OE-505, 10’ Whip Antenna (10372-0240-01)
- Keypad Display Unit (KDU) Extension Cable (10511-0704-012)
- Battery Box, Wide (10513-4800-02)
- Radio Programming Application (RPA) Software (10518-8564-01)

Not shown in Figure 2-1, but model specific are:

- “Y” Adapter Assembly (10372-1230) (Not shown) (refer to **NOTE** below)
- Manpack Backpack (10530-0460-01) (refer to **NOTE** below)
- Async Data Cable Assembly (10535-0770-A006) (refer to **NOTE** below)
- CW Leg Key (919-5004-03) (refer to **NOTE** below)

NOTE

These items are contained in the AN/PRC-150(V)1(C) Manpack Radio System. The AN/PRC-150(V)2(C) Manpack Radio System does not contain these items.

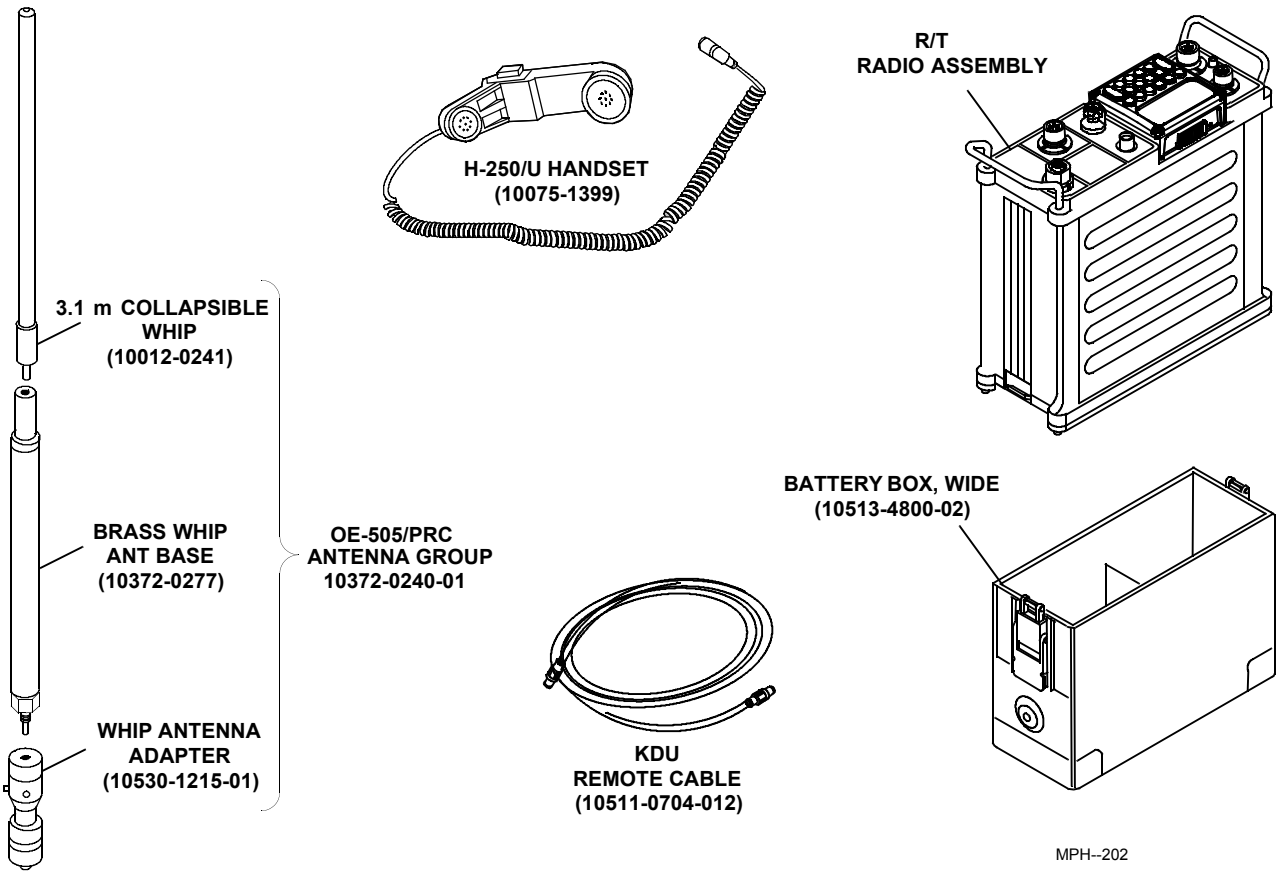

Figure 2-1. R/T Components

2.2 ANTENNA DESCRIPTION

The OE-505 manpack whip antenna kit provided with the manpack radio is 3.1 meters long consisting of six collapsible sections. When the antenna is fully extended, it is operational over the entire 1.6 MHz to 59.9999 MHz frequency range of the R/T. It has a removable antenna base with a spring-loaded binding post adapter for the attachment of single wire antennas.

2.3 SYSTEM SETUP PROCEDURES

See Figure 2-4. Perform the following procedure to set up the manpack radio:

a. Attach battery box with batteries to R/T assembly. Refer to Paragraph 5.3 for information on battery life, recharging batteries, and proper disposing of batteries.

   The R/T has a battery meter and the word “battery” flashes when the voltage drops critically low. When this happens, replace the batteries with freshly charged ones.

   The R/T will operate reliably throughout a wide range of battery voltages. However, between 23 VDC and 21 VDC, R/T performance, especially in the transmit function, decreases. See Figure 2-2.

WARNING

Do not charge, short circuit, incinerate, or mutilate the BA-5590/U Lithium Battery. Do not expose to fire or temperatures above 160°F (71°C); otherwise battery may vent or rupture, releasing toxic material.

WARNING

If the battery becomes hot, a hissing sound is heard, and an irritating smell occurs; power the radio OFF, disconnect the batteries from the radio and move the equipment to a well-ventilated area. If a battery leak is detected, follow appropriate Hazardous Materials (HAZMAT) procedures.

NOTE

When using BA-5590/U Lithium batteries, it is recommended that the user consult MIL-B-49430 (ER), MIL-SPEC, batteries, non-rechargeable, Lithium Sulfur Dioxide, and MIL-B-49430/3D (ER), MIL-SPEC, batteries, nonrechargeable, Lithium Sulfur Dioxide BA-5590/U.

NOTE

It is recommended that the batteries be changed in pairs. New, unconditioned, lithium batteries may not be able to deliver the current required to allow the R/T to transmit in high power. To condition the lithium batteries after they have been installed, set the R/T to low power with clockwise (CW) modulation and key the transmitter for 15 to 20 seconds, then set the R/T to medium power and again key the transmitter for 15 to 20 seconds. The batteries should now be conditioned and capable of supplying sufficient current to allow the R/T to transmit in the high power mode.

NOTE

See Figure 2-3. If only one battery is available, install it on the J11 BATT 2 connector. Power applied to the J10 BATT 1 connector signals the radio that either two batteries are installed, or the radio is connected to vehicular power. As a result, the radio does not attempt to conserve power. To maximize battery life with only one battery installed, install the battery on J11 BATT 2 connector.

NOTE

If a Lithium battery is placed on the J10 BATT 1 connector, when the radio powers-up, the KDU will indicate "INVALID POWER CONFIGURATION" and the radio will go into power cutback when transmitting in high power.

b. Connect handset to R/T front panel **J1 AUDIO** connector.

NOTE

The AN/PRC-150(V)1(C) Manpack Radio System includes a CW key and a “Y” adapter cable. To connect both the handset and the CW key to the R/T at the same time, connect the “Y” adapter cable to the J1 AUDIO connector. The supplied CW key uses pin “C” for keying on J1 AUDIO connector.

c. Connect the OE-505 whip antenna to the **J7 FRONT ANTENNA** connector on the front panel of the R/T. If a dipole or other type of antenna with a coax transmission line is used, attach it using a BNC plug (UG-88) or adapter-connector (UG-349 for a RG-213 coax and N-series plug) to the nested BNC jack

inside the J7 antenna connector. If a single wire antenna is used, remove the whip base adapter from the whip and use it to attach the single wire to the R/T. Ensure that uninsulated portions of the antenna wire do not come in contact with the R/T body or ground binding post.

d. If in an outside manpack configuration, use the ground stake kit to connect the R/T to earth ground from the ground binding post at the right side of the front panel. Ensure ground strap lead does not come in contact with antenna connector or whip.

e. If desired, remote the KDU from the R/T chassis by performing the following procedure:

   1. Power R/T OFF.

   2. Slide KDU lock to the left.

   3. Remove KDU from R/T chassis.

   4. Connect KDU remote cable to KDU and R/T chassis, aligning white dots on cable with white dots on connectors. The KDU has a separate connector just for the cable on the left side of the KDU. Place the rubber dust cover located near end of KDU extension cable on the jack in the rear of the KDU to protect it while the KDU is not installed on the R/T body.

   5. Power R/T ON by placing the function switch in either the Plain Text (PT), Citadel Cover (CC), or Cipher Text (CT) position.

f. Use the Async Data Cable Assembly to connect a PC to the R/T when using the RPA to program channel data into the radio. See Harris Software User's Guide or Help Files for the RF-6550H RPA for configuration and use of the RPA.

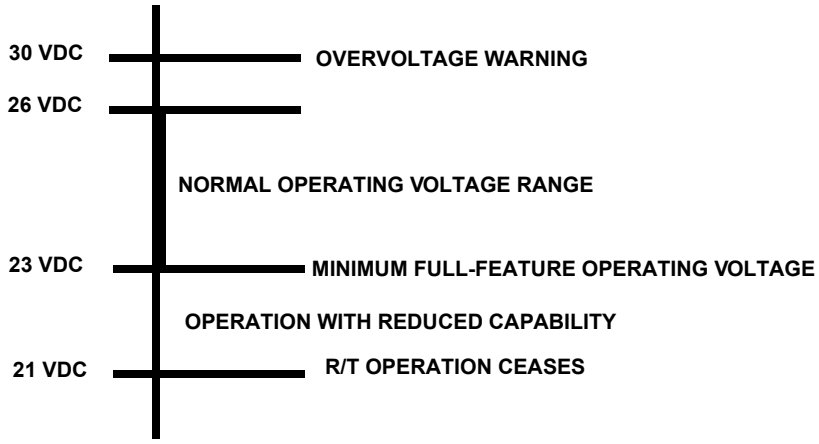

Figure 2-2. R/T Battery Voltage Operating Range

2.4 KDU CRYPTO IGNITION KEY (CIK) FUNCTION

The KDU has a CIK function that protects the loaded COMSEC keys in the R/T. This CIK function is initialized upon loading of the first COMSEC Traffic Encryption Key (TEK) after the radio has been cleared. After this initialization, only the correct KDU can be used with the R/T to operate the radio in CT mode. When the KDU is removed, no other user can access the radio in CT mode. The radio will operate in PT. If the original KDU is lost or misplaced, a different KDU can be used, but the radio will need to be zeroized, all programming replaced, and new COMSEC fills reloaded. Refer to Paragraph 3.4.13 for more information about zeroizing the radio.

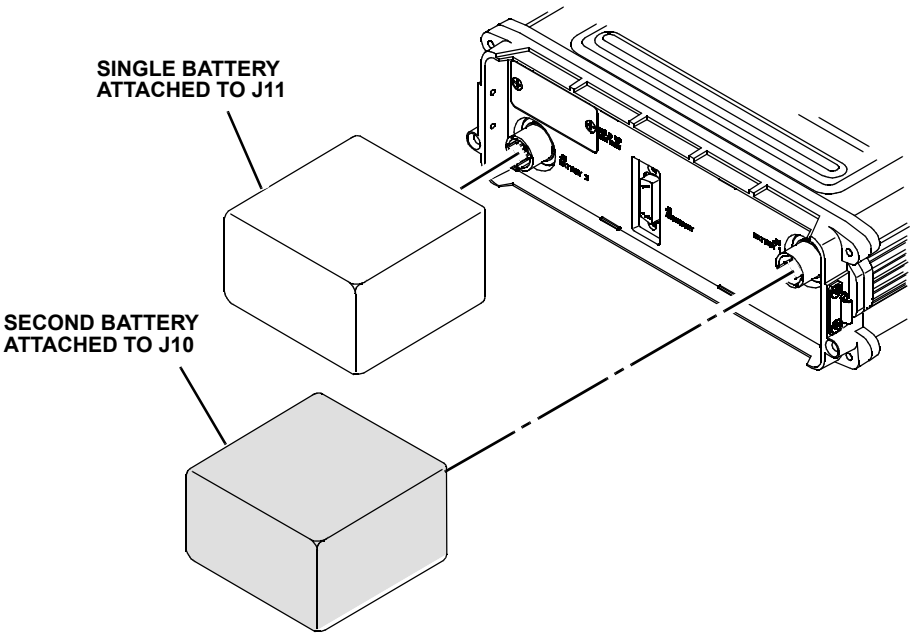

Figure 2-3. Single Battery Connection

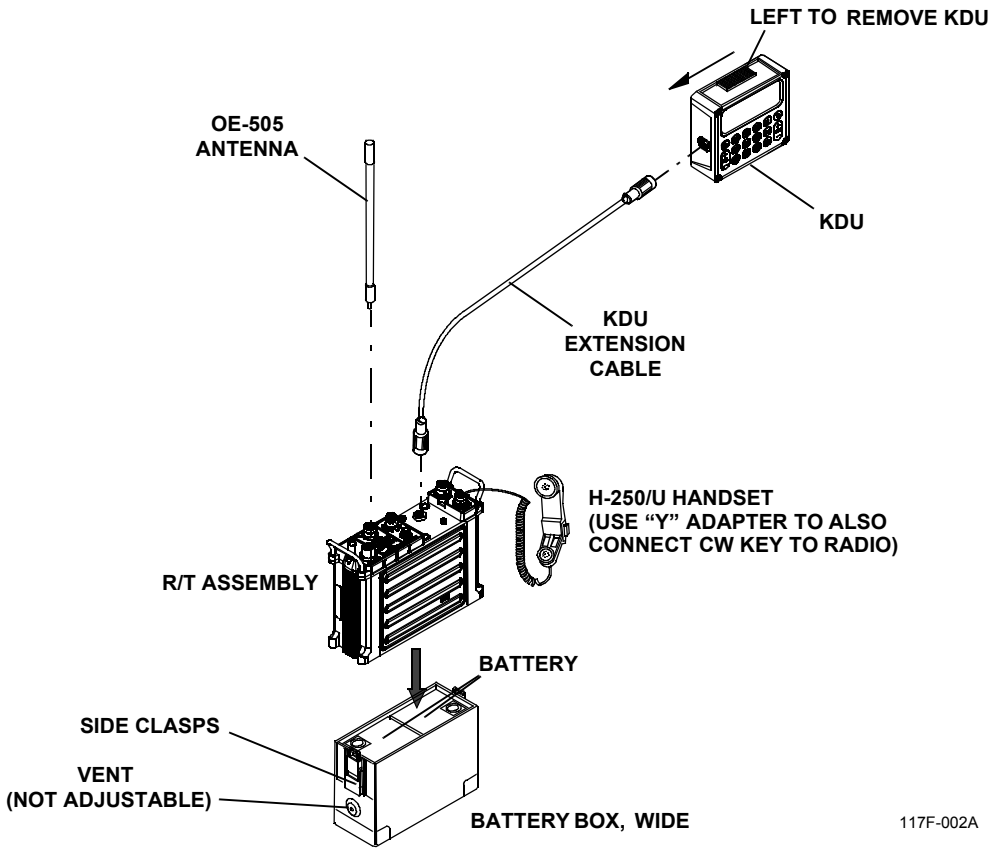

Figure 2-4. System Setup and Teardown

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CHAPTER 3

OPERATION

3.1 INTRODUCTION

This chapter discusses the operational capabilities and limitations of the Receiver/Transmitter (R/T), and provides instructions on how to perform those operations.

3.2 CONTROLS, INDICATORS, AND CONNECTORS

Figure 3-1 shows the R/T controls, indicators, and connectors. Table 3-1 describes the controls, indicators, and connectors.

Several data encryption types are available in the R/T. The type and common name are related in Table 3-2. All encryption types are not available in all R/T operating modes. Available encryption types are related to operating modes in Table 3-3. One of the factors upon which secure communications depends is matching encryption types. Other members of the Harris R/T family do not share all encryption types. Table 3-4 relates Harris R/T model to encryption types. One of the factors upon which secure communications depends is matching network types. Other members of the Harris R/T family do not share all network types. Table 3-5 relates Harris R/T model to network types.

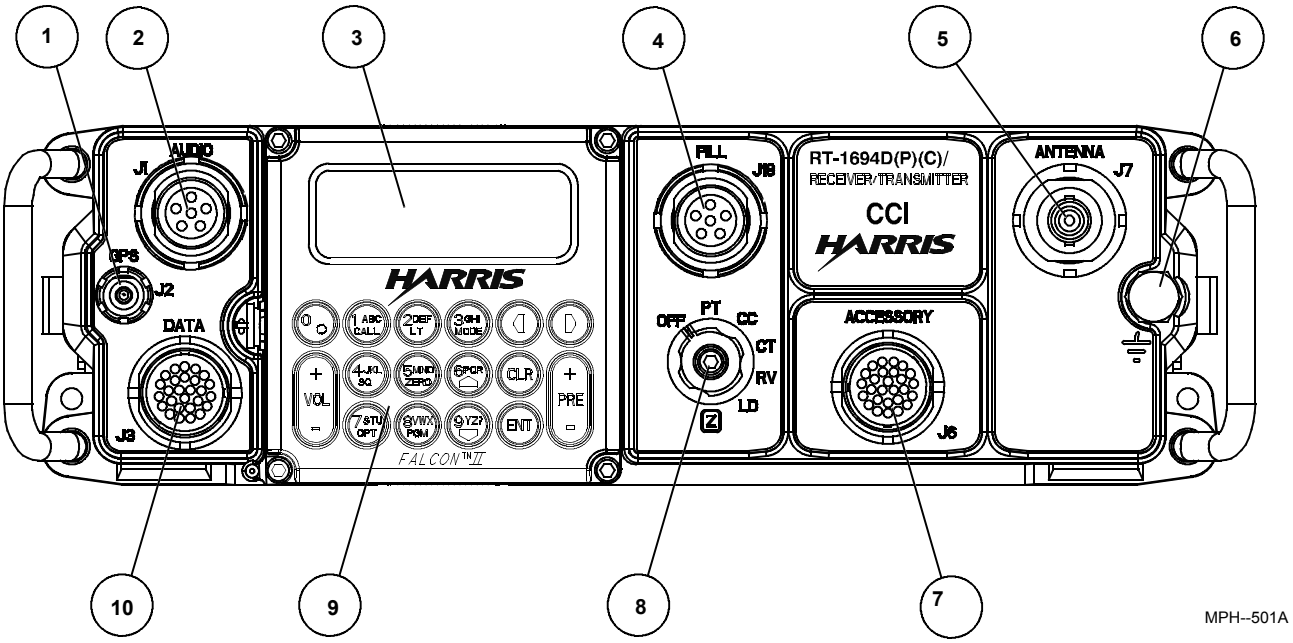


Figure 3-1. AN/PRC-150 Controls, Indicators, and Connectors

NOTE

Some versions of the Keypad Display Unit (KDU) contain a NET key instead of the PRE key shown above.

Table 3-1. AN/PRC-150 Operator Controls, Indicators, and Connectors

Key (Figure 3-1)	Control/Indicator	Function
1	Global Positioning System (GPS) Connector **J2**	Provides a serial connection (data and control) for an external GPS unit, such as the Precision Lightweight GPS Receiver (PLGR).
2	AUDIO Connector **J1**	Provides a connection for an audio handset.
3	Liquid Crystal Display (LCD)	Displays the operational and programming information.
4	FILL **J18**	Used to connect Type I encryption fill devices, such as the AN/CYZ-10 (DS-101), KOI-18, KYX-15, KYK-13 (DS-102). **NOTE:** Citadel keys must be loaded via remote control or manually from the KDU.
5	ANTENNA Connector **J7**	Provides a 50-ohm antenna port for either a BNC connector or a whip antenna.
6	Ground Post	Provides a grounding device for connecting a grounding source to the R/T.
7	ACCESSORY Connector **J6**	Provides a connection for power amplifiers, control signals, external keyline, external power, R/T On/Off, frequency hopping clock, and remote control data. A blue dot identifies the cable and radio connector.
8	Function Switch	
	OFF	Turns R/T OFF.
	PT	Places the R/T in Plain Text (**PT**) mode (voice or data).

Table 3-1. AN/PRC-150 Operator Controls, Indicators, and Connectors (Continued)

Key (Figure 3-1)	Control/Indicator	Function
	CT	Places the R/T in Cipher Text (**CT**) secure mode for US Type I Department of Defense (DOD) encryption (digital voice or data). Refer to Table 3-2.
	CC	Places the R/T into Citadel encryption (Citadel Cover) (**CC**) mode. Use of this mode is controlled by depot level access. Refer to Table 3-2.
	RV	Receive Variable. Permits transmission and reception of Type I COMSEC over-the-air rekeys using Over-the-Air Rekey (OTAR).
	LD	Load. Used to load Type I crypto variables. **NOTE:** Citadel keys must be loaded via remote control or manually using the KDU.
	Z	Zeroize. Zeroizes all R/T preset and channel programming, including the encryption keys (requires a pull-to-turn action).
9	**KDU**	
		The circular arrow key shows alternate displays for a given operating mode.
	CALL	Has distinctive uses in each of the three radio modes: FIX: initiate a hail. ALE: initiate an Automatic Link Establishment (ALE) call. 3G: initiate a Third Generation ALE (3G) call. HOP: transmit or send a response to a sync request.

Table 3-1. AN/PRC-150 Operator Controls, Indicators, and Connectors (Continued)

Key (Figure 3-1)	Control/Indicator	Function
	LT	Provides access to the KDU backlight control menu options.
	MODE	Allows the operator to change the operating mode to FIX, ALE, 3G, or HOP.
	SQ	Used to enable or disable squelch.
	ZERO	Not used.
	OPT	Provides access to the R/T's OPTION main menus, which are mode dependent.
	PGM	Provides access to the programming menus. Radio is offline from communication modes while in programming mode.
	CLR	Used as an ABORT key to cancel an operation, to back up through a menu chain, or to clear a message displayed on the front panel. This key has two additional uses: to toggle scanning ON/OFF (ALE), and to terminate a link (ALE and 3G).
	ENT	Enter. Used to accept a choice from a menu. Also used on the channel screen to initiate editing of frequencies.
	VOL +/-	Increases/decreases the received audio volume.
	NET or PRE +/-	Scrolls the operator through the preprogrammed system presets.
10	DATA Connector **J3**	Provides a connection for a data device (RS-232 or Point-to-Point Protocol (PPP)). A red dot identifies the cable and radio connector.

Table 3-1. AN/PRC-150 Operator Controls, Indicators, and Connectors (Continued)

Key (Figure 3-1)	Control/Indicator	Function
Not shown (located on rear panel)	Battery Connector **J10** and **J11**	Battery connectors for two (2) each BB-390, BB-490, BB-590 or BA-5590 type batteries. See Figure 2-3 for instructions on the usage of only one operating battery.
Not Shown (Located on rear panel)	ACCESSORY Connector **J9**	A D-type connector that provides external power amplifier control signals, frequency hopping clock, external R/T On/Off, external accessory power, and advanced network interfacing using the Ethernet protocol.

Table 3-2. Compatible Encryption Types

Encryption Type	Common Name
KY-99	ANDVT-HF
KY-100	ANDVT-BD
KY-57	VINSON
KG-84 redundant	KG-84R
KG-84 non-redundant	KG-84NR

Table 3-3. Radio Mode and Encryption Type Combinations

Mode	Type 1	CITADEL	AVS
3G	Y	Y	Y
ALE	Y	Y	Y
HOP	Y	Y	N
FIX	Y	Y	Y

Table 3-4. Radio Type and Encryption Type Combinations

R/T	Type 1 (DOD Approved)	CITADEL	AVS	DATOTEK
AN/PRC-150(V)(C)	Y	Y	Y	N
RF-5800H-MP	N	Y	Y	Y with Datotek option
RF-5022	N	N	Y	Y
AN/PRC-138	?	N	Y	Y

Table 3-5. Radio Type and Net Type Combinations

R/T	FIX	ALE	3G	HOP
AN/PRC-150(V)(C)	Y	Y	Y	Y
RF-5800H-MP	Y	Y	Y	Y
RF-5022	Y	Y	N	N
AN/PRC-138	Y	Y	N	N

3.2.1 KDU

The KDU contains 16 buttons or keys as shown in Figure 3-2. One key is dedicated for volume selection and one key is dedicated for system preset selection. The ◀, ▶, **[ENT]**, and **[CLR]** keys perform only one function. However, the remaining ten keys can perform one of the three following functions:

- **OPERATION** keys represent a particular operation such as program or test.
- **NUMERIC** keys represent the numbers 0 to 9.
- **ALPHANUMERIC** keys represent the letters A to Z as well as the numbers 0 to 9.

Many of the keys on the keypad have multiple functions. For instance, the second key from the left in the top row of the keypad is labeled ‘1’, but also ‘ABC’ and ‘CALL’. Pressing this key when the preset screen or the channel screen is displayed causes a call, a hail, or a sync request to be transmitted, in keeping with the ‘CALL’ label. When a numeric entry field is displayed, pressing this key enters a ‘1’ into the current position of the field (indicated by the cursor). When an alphanumeric entry field is displayed:

- Pressing the key once enters a ‘1’ into the current position of the field.
- Pressing the key twice enters an ‘A’.
- Pressing the key three times enters a ‘B’.
- Pressing the key four times enters a ‘C’.

If the next character to be entered is on a different key, pressing this key automatically moves the cursor to the next character position. If the next character is on the same key (in this example, is ‘1’, ‘A’, ‘B’, or ‘C’), use the ▶ key to move the cursor to the next character position. The sequence of key presses used to enter the word “ADD” would be:

[1][1] (the ‘1’ key is pressed twice to enter ‘A’)

[2][2] (the ‘2’ key is pressed twice to enter ‘D’)

▶ (move to next character position, since just pressing ‘2’ again will change the ‘D’ to an ‘E’)

[2][2] (the ‘2’ key is pressed twice to enter the second ‘D’)

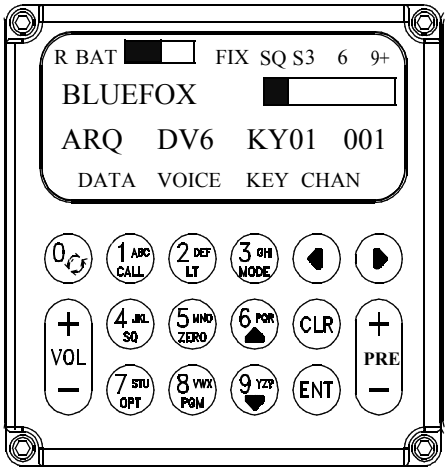


Figure 3-2. KDU

3.2.2 LCD Displays

The following descriptions detail the four possible display screens as they appear on the front panel LCD.

While the R/T is being operated, the system preset screen (refer to Paragraph 1.9.1) is displayed as shown in Figure 3-3. The channel preset screen displays information on the current operating channel. See Figure 3-4.

3.2.2.1 System Preset Screen

See Figure 3-3. The system preset screen is the display that the operator normally operates from. Use this screen to check current preset information, verify signal strength, and view temporary changes to the preprogrammed settings (presets). From the system preset screen, the operator can:

- Toggle between the system preset and the channel preset screen with the  key.
- Toggle between the operational displays and the options menu screen with the **[OPT]** key.

NOTE

The battery meter is temporarily replaced with the volume level indicator when the **[VOL]** key is pressed. The receive signal strength meter (S-Meter) indicator changes to a power level (P-Meter) meter indicator when the R/T is transmitting.

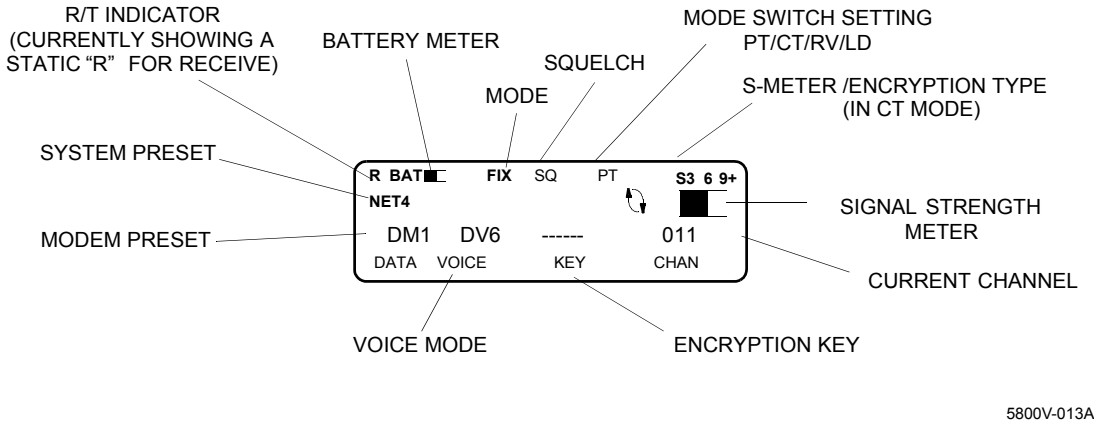


Figure 3-3. System Preset Screen

3.2.2.2 Channel Screen

See Figure 3-4. The channel screen displays information on the current operating channel. Return to the system preset screen with the 0 key.

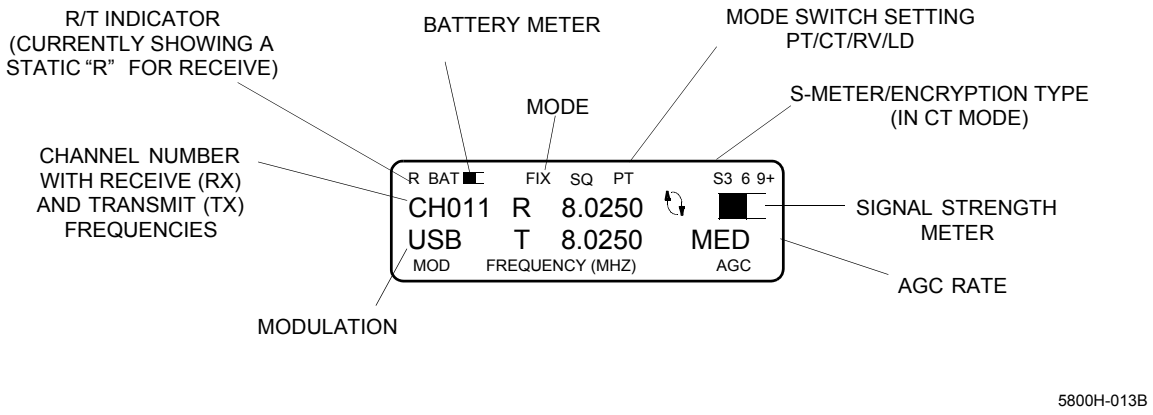


Figure 3-4. Channel Screen

3.2.2.3 Options Menu

See Figure 3-5. The options menu can be displayed during **FIX**, **ALE**, **3G** or **HOP** modes of operation.

- Use the options menu to perform functions such as radio self tests, setting radio parameters and tuning the coupler.
- This menu is called up from either the system preset screen or the channel preset screen by pressing the **[OPT]** key.
- Moves the highlighted cursor among the fields with the [◀][▶] keys.
- Return to the original screen by pressing the **[OPT]** key.

NOTE

This option window is displayed while in ALE mode.

Figure 3-5. Sample Option Screen

3.2.2.4 Programming Menu Screen

Figure 3-6 shows a typical programming menu screen. For more information on radio programming, refer to Chapter 4.

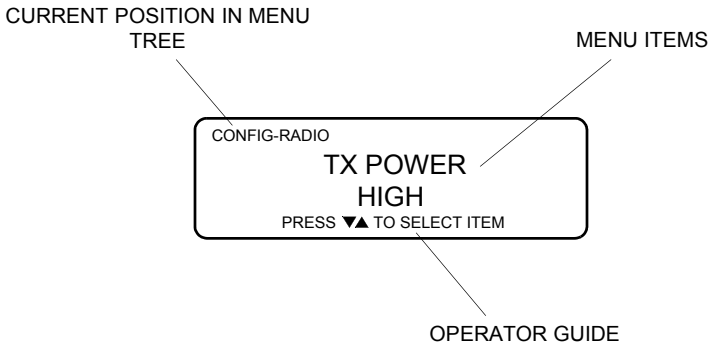


Figure 3-6. Programming Menu Screen

3.3 PRELIMINARY OPTION TESTS AND SETTINGS

A few of the basic as well as advanced operations described in this manual require use of the **OPTION** menus. Display the **OPTION** menu by pressing the **[OPT]** key from the preset screen (or the channel screen), then press additional keys to navigate within the **OPTION** menu tree. In each **OPTION** menu, the top line of the screen displays radio status information similar to that which is displayed in the preset screen, including the receive/transmit indicator, battery meter, operating mode indicator, and **PT/CT/CC/LD** indicator.

The second and third lines of the display are used to display menu items, information fields, prompts, and entry fields. The bottom line of each **OPTION** menu screen is often used to display prompt text (**PRESS ◀▶ TO SELECT ITEM** in the example) as guides to choosing which keys will be useful when the current screen is displayed. See Figure 3-5.

3.3.1 Performing Radio Tests

Multiple tests can be performed from the front panel of the R/T without the use of test equipment. The following paragraphs describe the R/T test option. These procedures assume that the R/T has already been correctly programmed and configured for deployment. These test options are accessed by pressing the **[OPT**] key from the system preset screen. Figure 3-7 shows the R/T **OPTION** menu tree.

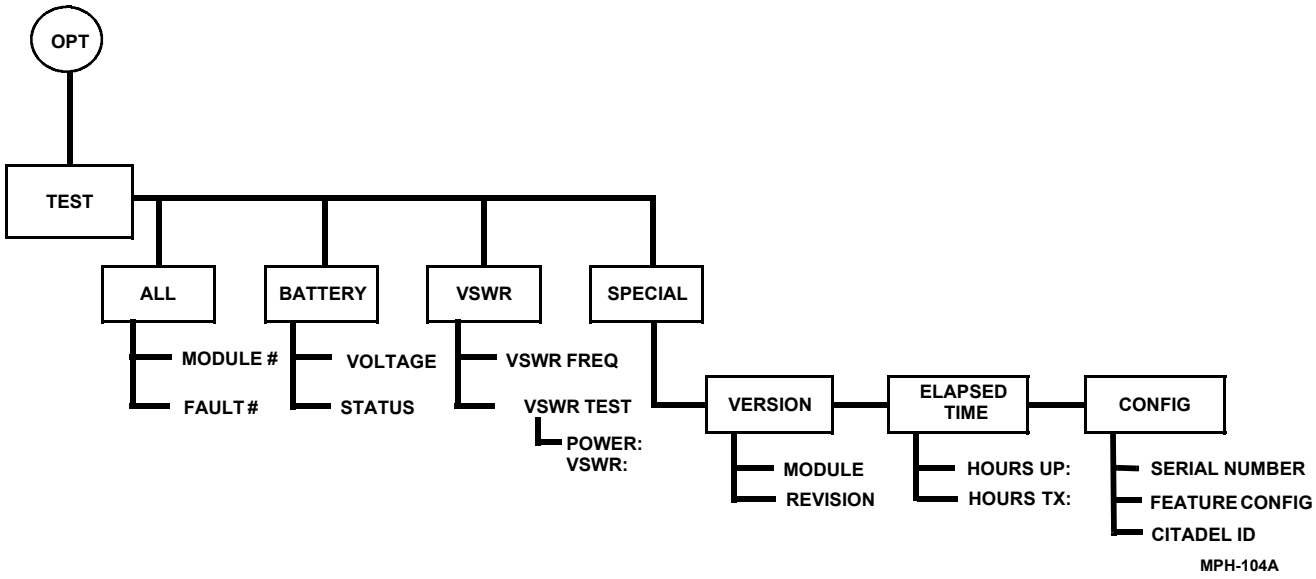


Figure 3-7. Test Option Menu Tree

3.3.1.1 Radio Self-Test

To place the R/T in self-test operation:

a. Press the **[OPT]** key.

b. Use the ◀▶ keys to select **TEST** and press **[ENT]**.

c. To initiate a BITE test, select **ALL** and press **[ENT]**. If the R/T displays a fault code, refer to Paragraph 5.2.1.

d. Press **[CLR] [CLR] [CLR]** to return to the preset screen.

3.3.1.2 Battery Testing

To place the R/T in battery test operation:

a. Press **[OPT]**.

b. Use the ◀▶ keys to select **TEST** and press **[ENT]**.

c. To initiate a battery test, use the ◀▶ keys to select **BATTERY** and press **[ENT]**. The battery status screen will be displayed.

d. The voltage will register between 21 VDC and 30 VDC. The R/T will automatically shut down when the voltage goes below 21 volts.

e. Press **[OPT]** to return to the preset screen.

3.3.1.3 Voltage Standing Wave Ratio (VSWR) Measurement

To place the R/T in VSWR test operation:

a. Press **[OPT]**.

b. Use the ◀▶ keys to select **TEST** and press **[ENT]**.

c. To initiate a VSWR test, use the ◀▶ keys to select **VSWR** and press **[ENT]**. The VSWR frequency screen will be displayed.

d. Using the KDU, enter the frequency to be used for the VSWR measurement.

e. Press **[ENT]** to start the test.

f. Upon completion of the VSWR test, the transmitted power and VSWR are displayed.

g. Press **[CLR]** to return to the **TEST** menu.

h. Press **[OPT]** to return to the preset screen.

NOTE

The output power reduces to protect the R/T circuitry if the VSWR reports a reading of 2:1 or higher. The operator does not receive a warning until the VSWR reaches 3:1. High VSWR is usually indicated for problems with the transmission line, antenna system or disabling the automatic tuning coupler when a resonant antenna is being used.

NOTE

Do not perform VSWR test if tactical situation does not warrant emission of RF signals.

3.3.1.4 Special Test (Software Versions)

The software versions option is used to track what the current version of software and current revision of hardware is. This aids the maintainer in identifying, troubleshooting, and ordering replacement modules. To view the radio special options:

a. Press **[OPT]**.

b. Use the ◀▶ keys to select **TEST** and press **[ENT]**.

c. Use the ◀▶ keys to select **SPECIAL** and press **[ENT]**.

d. Use the ◀▶ keys to select **VERSION** and press **[ENT]**. The software version screen will be displayed.

e. Use the ▲▼ keys to scroll through the module and revision listings. These module and revision listings tell what version of software and hardware is in the R/T.

f. Press **[CLR]** to return to the **SPECIAL** menu.

g. Press **[CLR]** to return to the **TEST** menu.

h. Press **[OPT]** to return to the preset screen.

3.3.1.5 Elapsed Radio Time

To view the elapsed radio time option:

a. Press **[OPT]**.

b. Use the ◀▶ keys to select **TEST** and press **[ENT]**.

c. Use the ◀▶ keys to select **SPECIAL** and press **[ENT]**.

d. To initiate the elapsed R/T time option, use the ◀▶ keys to select **ELAPSED TIME** and press **[ENT]**. The elapsed time screen will be displayed showing **HOURS UP** time and **HOURS TX** time for the R/T.

e. Press **[OPT]** to return to the preset screen.

3.3.1.6 Configuration Number/Serial Number

To view the configuration number/serial number:

a. Press the **[OPT]** key.

b. Use the ◆▶ keys to select **TEST** and press **[ENT]**.

c. Use the ◆▶ keys to select **SPECIAL** and press **[ENT]**.

d. Use the ◆▶ keys to select **CONFIG** and press **[ENT]**.

e. Use the ◆▶ keys to select **SERIAL NUMBER** and press **[ENT]**. Serial number appears.

f. Press **[ENT]** again. **CONFIG** menu appears.

g. Use the ◆▶ keys to select **CITADEL ID** and press **[ENT]**. Citadel ID appears.

h. Press **[OPT]** to return to the preset screen.

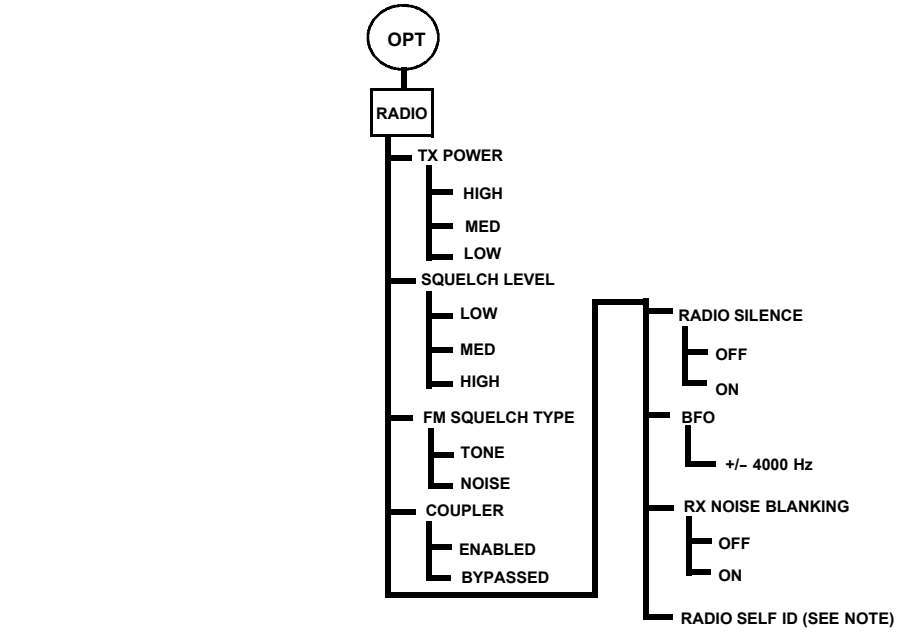
3.4 SETTING RADIO CONFIGURATION OPTIONS

These options are global and do not pertain to any individual channel, but to the entire range of channels and presets. Changing these options permits the operator to make necessary changes while operating and remaining online, rather than entering the programming mode that makes the radio go offline and off radio nets.

To place the R/T in the **OPTIONS** menu:

a. Press **[OPT]**.

b. Use the ◆▶ keys to select **RADIO** and press **[ENT]**. See Figure 3-8.



NOTE: UNDER THE OPT MENU, THIS SETTING IS VISIBLE BUT IS NOT PROGRAMMABLE.

MPH-203A

Figure 3-8. Radio Option Menu Tree

3.4.1 Transmit Power Adjust

In HF mode, the power levels are low - 1 watt, medium - 5 watts, high - 20 watts. When the R/T is being used in VHF-FM mode, the power levels are low - 1 watt, medium - 5 watts, high - 10 watts.

a. Use the ▲▼ keys to scroll through the **TX POWER** settings (**LOW, MED, HIGH**).

b. Press **[ENT]** for desired power level and advance to the next screen.

3.4.2 Beat Frequency Oscillator (BFO) Adjust

Use the ▲▼ keys to scroll through the desired **BFO** frequency (+/- 4 kHz in 10 Hz steps) and press **[ENT]**.

NOTE

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

3.4.3 Squelch Level Adjust

Use the ▲▼ keys to scroll through the **SQUELCH LEVEL** options (**LOW, MED, HIGH**) and press **[ENT]**.

3.4.4 FM Squelch Type

The R/T supports analog tone squelch, analog noise squelch, and digital squelch. Analog tone squelch requires that a 150 Hz tone be transmitted along with the normal radio traffic in order to open the receive radio's squelch. Analog noise squelch requires a signal that is strong enough to open the R/T's squelch being received on the R/T's receive frequency. This is important for interoperability and should be addressed during mission planning. Be advised that

almost ALL other US military FM radios sharing the VHF-FM operational range of the AN/PRC-150(V)(C) use tone squelch. This option is part of the channel preset programming.

Use the ▲▼ keys to scroll through the desired **FM SQUELCH TYPE** (**TONE, NOISE**) and press **[ENT]**.

3.4.5 Radio Silence

The R/T silence option is used during ALE mode of operation. This feature enables the operator to disable the R/T from automatically responding to an ALE call. This is only enabled in the receive mode and may be overridden if the operator places an ALE call. Radio Silence is not the same as Receive Only, which can be programmed into any mode.

Use the ▲▼ keys to scroll through the desired **RADIO SILENCE** option (**ON, OFF**) and press **[ENT]**.

NOTE

If **RADIO SILENCE** is turned **ON**, the "R" in the upper left corner of the KDU flashes.

3.4.6 Internal Coupler

The internal coupler is bypassed during wideband and list frequency hopping. If the internal coupler is not bypassed during wideband or list frequency hopping, a hopping error may occur. The coupler is enabled for resonant antennas such as dipole and whip antennas.

Use the ▲▼ keys to scroll through the **INTERNAL COUPLER** options (**ENABLED** [coupler on], **BYPASSED** [coupler off]) and press **[ENT]**.

3.4.7 RX Noise Blanking

The Receive (RX) noise blanking is used to filter signals that are interfering with the intended receive signal. This filtering or blanking will also reduce the strength of the intended signal and should only be used if the intended signal is strong enough to overcome the filtering.

Use the ▲▼ keys to scroll through the **RX NOISE BLANKING** options (**ON or OFF)** and press **[ENT]**.

3.4.8 Radio Self ID

Under the Option menu, RADIO SELF ID is informational in nature to report to the user the self ID for use in any programmed ARQ modem presets and in 3G mode, and is not modifiable. See Paragraph 4.1.1 for information about programming the Radio Self ID.

3.4.9 Coupler Retune

This function is used to force a retune of the coupler due to an antenna change or loss of tune condition. To place the R/T in the OPTIONS menu:

a. Press **[OPT]**.

b. Use the ◄► keys to select **RETUNE** and press **[ENT]**. See Figure 3-9.

While the coupler is retuning, "**IN PROGRESS**" is displayed. When the coupler has completed tuning, "**COUPLER RETUNE COMPLETE**" is displayed. The screen defaults to the preset screen.

3.4.10 Viewing the TOD and GPS Information

To view the R/T's Time-of-Day (**TOD)** and **GPS** information:

a. Press the **[OPT]** key.

b. Use the ◀▶ keys to select **GPS-TOD** and press **[ENT]**. The most recent status from the external PLGR, the TOD and date are shown.If an external PLGR were not connected to the R/T, the internal TOD is shown.

c. To modify the TOD, follow the procedure outlined in Paragraph 4.1.5.

NOTE

When automatic TOD is being received from the external PLGR (TOD locked to the GPS) only the Universal Time Coordinated (UTC) can be changed manually).

d. Press **[CLR]** or **[ENT]** to return to the **OPTION** menu**.**

e. Press **[OPT]** to return to the preset screen. See Figure 3-9.

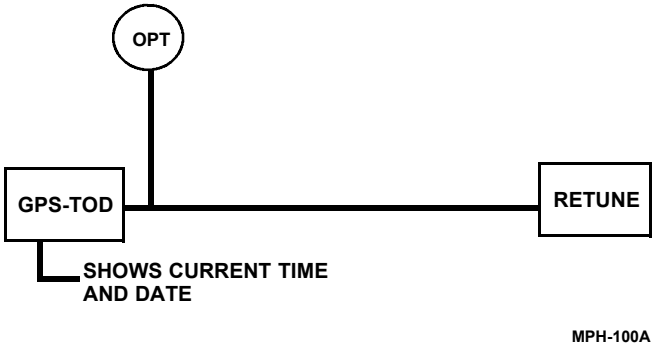


Figure 3-9. GPS and Retune Option Menu Tree

3.4.11 Backlight Adjustment and Light Operation

The backlight adjustment is used to adjust the brightness, contrast, and backlight operation of the LCD. There are three ranges (**ON, OFF, MOMENTARY**). When the backlight operation is **ON**, the LCD is lit continuously. This option produces a constant drain on the power source. **MOMENTARY** option keeps the LCD lit as long as the KDU is being used and turns off after five seconds if there is no activity.

a. To initiate the light function press **[LT]**.

b. To adjust the brightness, use the ▲▼ keys to scroll through the ranges. They are numbered 0-7.

c. Press the ▶ key to advance to the **CONTRAST** field. Adjust the contrast using the ▲▼ keys to scroll through the ranges. They range from 20% to 100% in 5% increments. Press **[ENT]**.

d. Adjust the **LIGHT OPERATION VALUE** using the ▲▼ keys to scroll through the ranges (**ON, OFF, MOMENTARY**). The **ON** option is only available when the R/T is connected to a DC power source other than batteries. This can also happen when the R/T is powered by a single battery that has been inadvertently connected to J10 rather than J11. See Figure 2-3.

e. Press **[LT]** to return to the previous screen.

3.4.12 Volume Adjust

The handset volume can be adjusted up or down with the **[VOL +/-]** key. The VOL indicator will be displayed momentarily in place of the **BAT** indicator. The preset screen then reverts back to the BAT indicator. The volume cannot be adjusted while the R/T is in program mode.

3.4.13 ZEROIZING the Radio

ZEROIZE removes all encryption keys. It also deletes all system presets and configuration settings to default values. Cipher text operation will not be possible until encryption keys are reloaded.

a. Pull on the function switch knob and turn to the **Z** position. The R/T will immediately begin to zeroize all COMSEC information and radio settings. The radio settings will return to the default positions. **ZEROIZE IN PROGRESS** will be displayed during this process.

b. When the zeroize of the R/T is complete, the **ZEROIZE COMPLETE** and **CYCLE POWER** message is displayed. Move the function switch to the **OFF** position, then rotate the function switch to **PT**.

NOTE

If the function switch is moved to the **Z** position while the R/T has no power source connected (batteries disconnected), the R/T will zeroize the next time it is powered on.

3.5 RADIO OPERATIONS SETUP

Before operating the R/T, several procedures must be performed to ensure that the unit is ready for operation.

3.5.1 Power On/Self-Test

To power on the R/T, rotate the function switch to the **PT** position. This initializes the radio software and performs a power on self-test. When the test is complete, the normal operating menu is displayed.

3.5.2 Initial Checks

Prior to operating the R/T, several procedures should be performed to ensure that the unit is ready for operation. These tests are available via the **[OPT]** key, **TEST** operational mode. Refer to Paragraph 3.3.1 for details of these tests.

3.5.3 Programming the R/T

Prior to operating the R/T, the nets must be programmed according to the communications plan. Refer to Paragraph 4.1.

3.6 RADIO OPERATIONS

The R/T is ready for operations once all setups have been performed.

3.6.1 Selecting a System Preset

System presets are selected by using the **[PRE +/-]** key. Refer to Paragraph 1.9.1 for additional information.

- MANUAL is the default for all modes.

- The R/T changes presets as they are scrolled in FIX and HOP modes.
- ALE and 3G modes use the programmed system presets after linking occurs.
- Only the system presets that are configured and enabled for the current operating mode (FIX, ALE, 3G or HOP) will be selectable.

3.6.2 Selecting a Modem Preset

A stored modem preset can be selected from the system preset screen. Changes to system presets can be made as needed. Changes are only active until a different system preset is selected, or the R/T is turned off. The stored system preset values are not changed. The brackets < > surrounding the system preset name on the preset screen show that the R/T is operating in a different configuration from that of the stored system preset.

a. Press the ▶ key until the data preset field is highlighted.

b. Use the ▲▼ keys to scroll through the available **Modem Presets**. Press **[CLR]** to cancel changing the preset selection or press **[ENT]** to select the displayed data preset. A new selection does not become active until **[ENT]** is pressed.

   Be advised that some modem presets may be incompatible to currently selected COMSEC mode or channel modulation. Selecting an improper configuration may cause programming to change and/or cause an error condition.

3.6.3 Selecting Voice Mode

The voice mode can be selected from the system preset screen. Changes are only active until a different system preset is selected, the R/T is put into program mode or is turned off. The stored system preset values are not changed. The brackets < > surrounding the system preset name on the preset screen shows that the R/T is operating in a different configuration from that of the stored system preset.

Analog voice (CLR) is provided as a means to pass PT Upper Sideband (USB)/Lower Sideband (LSB)/ Frequency Modulation (FM) audio over fixed frequency channels. The R/T provides CLR analog voice to support interoperability with other fixed single channel radio systems. Analog Voice Security (AVS) is a PT voice mode which includes an analog scrambling signalling interoperable with legacy Harris radios.

The R/T provides ME600 or DV600 in HOP mode. ME2400, ME600, DV2400 and DV600 are all available in ALE and FIX mode. FIX mode includes all four digital voice modes above, as well as Continuous Variable Slope Delta (CVSD) and AVS. CLR is available in all modes except HOP and when the radio is in CC or CT operation. In all digital voice modes, the receiver will switch automatically to match the speed of the transmitter.

To select a voice mode:

a. Press the ▶ key until **VOICE** is highlighted on the preset screen.

b. Use the ▲▼ keys to scroll through the available **Voice Mode** selections (**CLR, DV6, DV24, ME6, ME24, CVSD, AVS**). Press **[ENT]** to select the desired voice mode.

3.6.4 Selecting the Operating Channel (FIX mode only)

Fixed frequency channel preset numbers can be selected from the channel screen, either by scrolling channel numbers, or by entering a channel number via the numeric keypad. Changes made in this manner are temporary and are only active until a different system preset is selected or the R/T is turned off. Selectable channel range is 000 to 199.

3.6.4.1 Scrolling Channel Presets

Perform the following procedure to scroll channel presets:

a. From the preset screen, press to display the channel preset screen.

b. Press ▶ until the channel number is highlighted then use the ▲▼ keys to scroll through the available **Channel Preset Numbers**. The R/T changes channels as they are scrolled, or press **[ENT]** once the channel number is highlighted.

c. Press **[ENT]** to select the desired channel.

3.6.4.2 Entering a Channel Preset Number in FIX, ALE or HOP Mode

Perform the following procedure to enter a channel preset number:

a. From the preset screen, press to display the channel screen.

b. Press ▶ until the channel number is highlighted.

c. Enter the three digit number (**00 - 99**) of the desired channel preset and press **[ENT**].

3.6.5 Change Manual Channel Settings (FIX mode only)

Channel number **000** is the manual channel. This is the only channel whose settings can be changed from the channel screen without going into the program mode.

a. From the preset screen, press to display the channel preset screen.

b. Press ▶ until the channel number is highlighted and press **[ENT]**.

c. Press **[0][0][0]** to select the manual channel and press **[ENT]**.

d. Press ▶ until the receive frequency is highlighted and press **[ENT]**.

e. Enter a new receive frequency using the keypad and press **[ENT]**. The transmit frequency automatically defaults to the receive frequency at this point. Operational range is 1.6000 MHz to 59.9999 MHz.

f. Enter a new transmit frequency (if different from the receive frequency) using the keypad and press **[ENT]**.

g. Press ▶ until the modulation setting is highlighted. Using the ▲▼ keys, scroll to the desired setting (**USB, LSB, AME, CW, FM**) and press **[ENT]**. Some modulation choices will be unavailable if incompatible with selected COMSEC mode and or MODEM preset.

h. Press ▶ until the Automatic Gain Control (AGC) rate is highlighted. Use the ▲▼ keys to scroll to the desired setting (**MED, SLOW, OFF, AUTO, DATA, FAST**) and press **[ENT]**.

i. Press (0) to return to the system preset screen.

3.6.6 Selecting Squelch

Perform the following procedure to select squelch:

a. Press **[SQ]** to select the squelch menu from the channel preset screen.

b. Use the ▲▼ keys to scroll to the desired setting (**ON** or **OFF**) and press **[ENT]**; or from the preset screen press **[SQ]** to toggle between **ON** and **OFF**.

3.6.7 Coupler Tune

Upon selection of an operating channel for the first time and if the internal automatic coupler is being used, the radio will need to be tuned to the antenna for the frequency of operation. Before any first transmission, the operator should press the Push-To-Talk (PTT) switch and allow time for the tune cycle to complete.

3.6.8 Selecting Operating Mode

The R/T has four operating modes (**FIX, ALE, 3G, HOP**). The modes are selected by pressing **[MODE]** until the desired mode is displayed. The radio will then automatically enter the mode selected.

3.6.8.1 Plain Text Operation

Perform the following procedure to operate the R/T in the FIX frequency plain text mode:

a. Rotate the function switch to the **PT** position.

b. After the power on test is completed, press **[MODE]** and select **FIX**.

c. Press **[ENT]**.

d. Select the desired **FIX** frequency system preset by pressing **[PRE +/-]** repeatedly until the desired system preset is displayed.

e. Press PTT on handset to initiate the internal automatic tuning coupler.

3.6.8.2 Cipher Text Operation

The R/T is ready for operation once all setup steps have been performed.

Perform the following procedure to operate the R/T in the **FIX** frequency encryption mode:

a. Rotate the function switch to the **CT** position, or **CC** if Citadel Cover is intended.

NOTE

For users requiring Type 1 encryption, CC mode can be locked out.

NOTE

There are some subtle differences between CT and CC operation. For instance, in CT, if a key load is unsuccessful, no other keys are actively loaded. In CC, however, if a key load is unsuccessful, the last key successfully loaded and programmed into the system presets will remain active.

Also, if an encrypted message is received during CC operations, the radio will automatically select the correct key (if loaded) to decrypt the message. In CT, however, the radio will not automatically select a key.

b. After the power on test is completed, press **[MODE]**.

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

d. Select the desired FIX frequency system preset by pressing **[PRE +/-]**.

e. Begin R/T operations.

NOTE

If a key is not loaded into the radio, the message **KEY NOT SELECTED** is displayed on the KDU. If the radio is keyed, the message **KEY NOT AVAILABLE** is displayed.

3.6.9 Select Encryption Key and Encryption Mode, US Type I

Perform the following procedure to select an encryption key and COMSEC mode:

a. From the system preset, press ▶ until the encryption key field is highlighted on the LCD. When the display shows **"-----"** in the KEY field, this indicates that no key is currently selected. Normally TEK## will be seen with ## indicating a number from 01-25.

b. Use the ▲▼ keys, to scroll to the desired key. The loaded TEKs for each COMSEC mode will scroll. On the lower line below the TEK number, the exact COMSEC mode will display for each type of loaded TEK. ANDVT TEKs have the option to be set to either ANDVT-HF or ANDVT-BD. KG-84 TEKs have the option to be set to use KG-84R (REDUNDANT) or KG-84NR (NON-REDUNDANT).

c. Press **[ENT]** to set the desired TEK and COMSEC mode. When the COMSEC mode is changed from what was previously used, the radio will display "**CHANGE COMSEC MODE**?, **NO** or **YES**". If the user selects **YES**, the COMSEC mode will change to the selected mode. Be advised that some MODEM presets, channel modulation, and/or operating mode may be incompatible with the selected COMSEC mode and the radio will change them without notice to the operator.

3.6.10 Temporary Overrides

Changes can be made while operating in FIX frequency mode without reprogramming the R/T. This includes operating frequency, squelch, transmitter power levels, modulation mode, encryption key, and voice mode. See Figure 3-10 and Figure 3-11.

NOTE

Whenever the preprogrammed parameter changes, the radio places a < > around the system preset name on the LCD.

Normal single channel operations can be performed from FIX mode. Channels which have not been programmed will contain a default setting that will display 1.6 MHz. When FIX mode is selected, the three letter designator (**FIX**) will be displayed on the top row of the LCD in the preset screen. See Figure 3-10 and Figure 3-11 for displays.

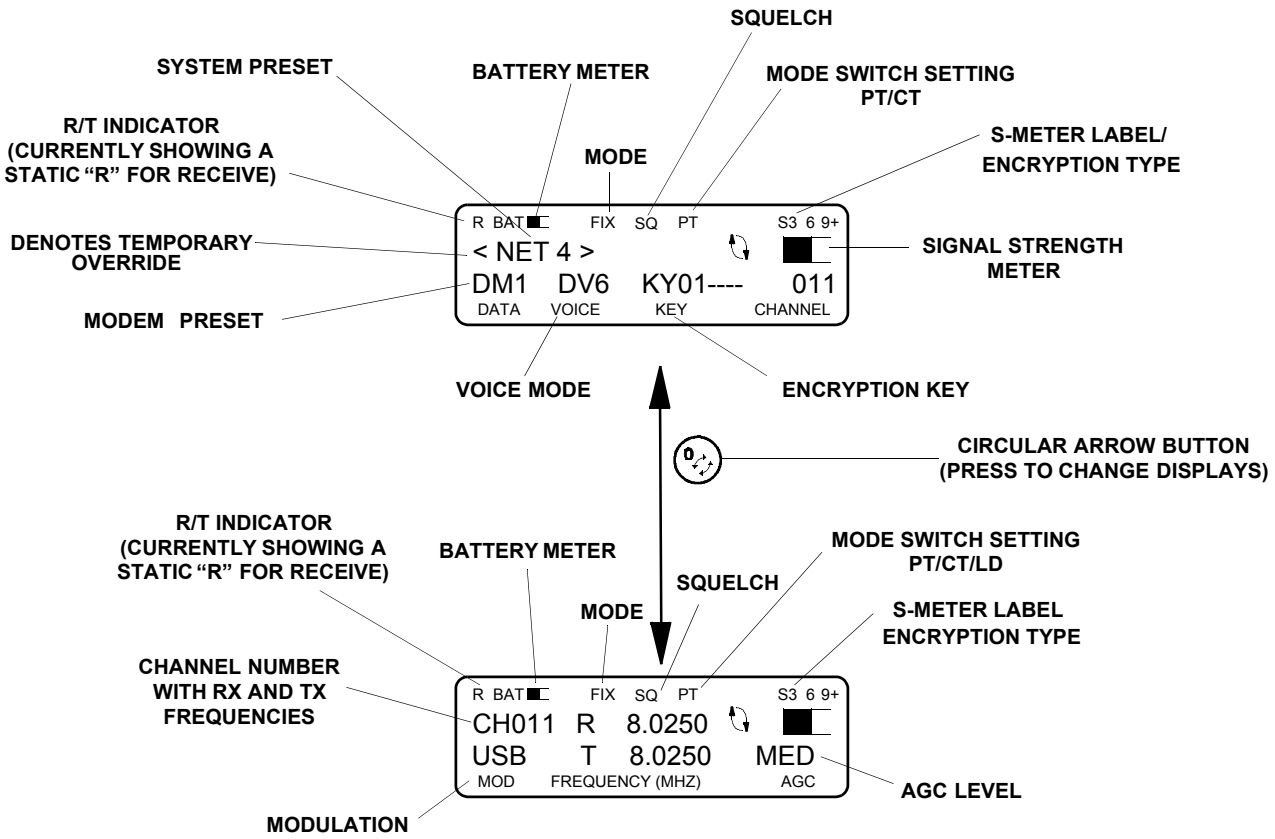
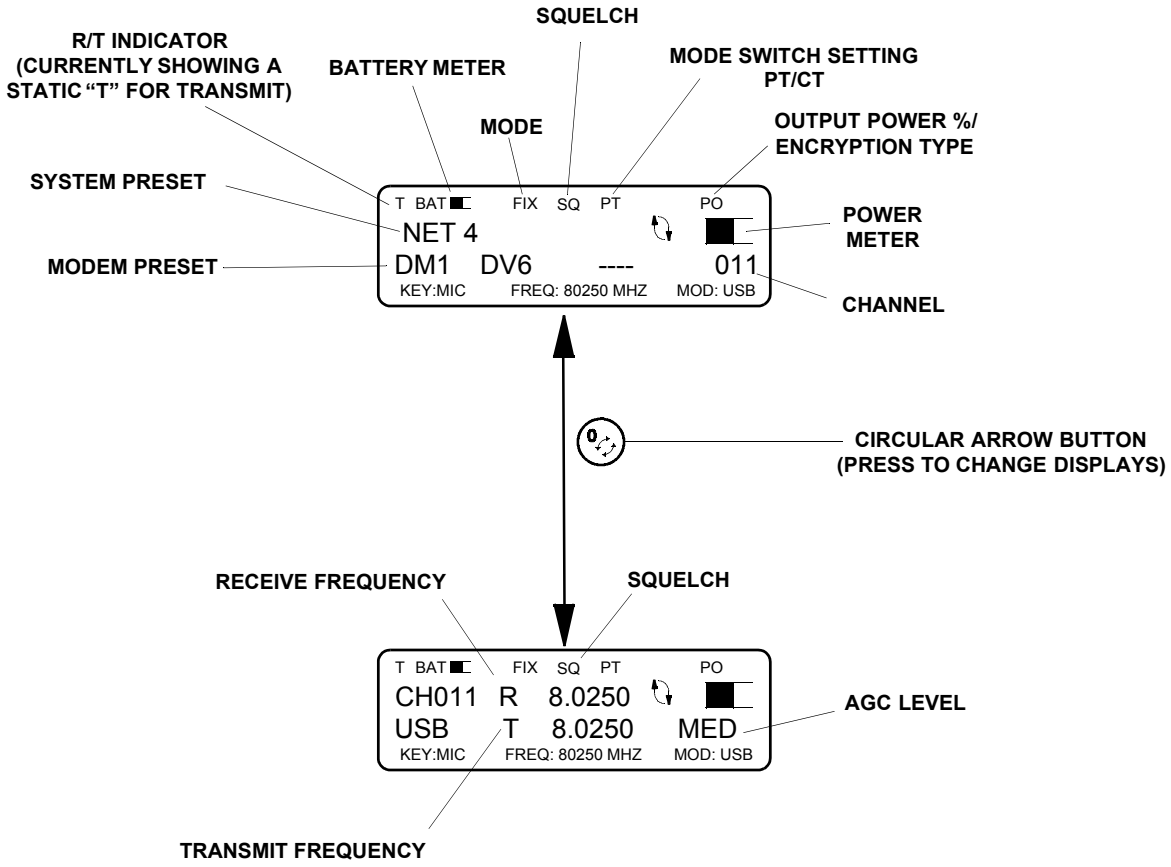


Figure 3-10. FIX FREQUENCY Mode Displays (Receive)



MPH

Figure 3-11. FIX FREQUENCY Mode Displays (Transmit)

3.6.11 Hailing Operation

Hailing permits a station to alert other net stations, that may be in HOP mode, that a station in FIX mode wishes to communicate. Refer to Paragraph 1.9.3.1 for additional information.

NOTE

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

a. To perform a hail, ensure the R/T is in FIX mode, and that the channel has been set to **YES** under the **HAIL TX** programming menu. See Figure 4-13 and refer to Paragraph 4.3.1.1.

b. Select the designated hailing radio preset using the ▲▼ keys to scroll through the options using the **[PRE]** key. Press **[ENT]**. Normally a frequency is selected that is near the frequencies of operation of the hopping net that will be hailed.

c. Press **[CALL]**. The R/T will display a "**SEND HAIL**" message.

d. Using the ▲▼ keys to scroll through the options **(YES, NO),** select **YES** and press **[ENT]** for confirmation to send hail.

e. The R/T will display **HAIL COMPLETE** when the hail has been sent. Press **[ENT]** to return to the preset screen.

f. Wait until someone from the hopping net contacts your station or hail again if no response is encountered.

g. Coordinate with any station answering the hail to receive a time sync in order to enter the hopping net. Ensure radio TOD is within +/- 90 seconds of the station sending the time sync.

3.7 SCAN Mode

Scan mode is used to scan multiple FIX channels that have been programmed into the R/T. Each channel must be individually enabled to allow inclusion in the SSB SCAN list. Unlike ALE scan, this scan mode is not activated by a call address, but rather by a squelch tone or noise level strong enough to break the programmed squelch level in the R/T, which forces it to stop scanning and listen for any incoming signal.

The SSB SCAN feature allows channel scanning in FIXed mode of operation. What follows are general SCAN mode operating notes:

- All channels (0-199, inclusive) can be programmed for SSB SCAN.
- The radio can scan as many as two hundred channels.
- The channel screen will be visible while the radio is scanning; the channel numbers will visibly change while scanning.
- The frequency range for SSB scan channels varies as shown in Table 3-6.
- Valid modulation modes for SSB SCAN are USB, LSB, and FM.
- Channels are scanned in ascending order by channel number.
- From the front panel, press CLR to toggle the scan state.

The **OPT** menu shown in Figure 3-12 controls whether or not **SSB SCAN** can be activated from the front panel.

a. Place the radio in **FIX** mode.

b. Press **[OPT]** and use the ▶ key until the **SCAN** field is highlighted and press **[ENT]**.

c. Use the ▲▼ keys to scroll through **ENABLE SSB SCAN** options (YES, NO) and press **[ENT]**.

d. Press **[OPT]** to return to the preset screen.

e. Press **[CLR]** to start/stop scanning.

Table 3-6. Frequency Ranges for SSB Channels

Configuration	Frequency Range (MHz)
With no external equipment	2.000000 to 59.999999, inclusive
With external 20 W PA	2.000000 to 59.999999, inclusive
With external 125 W PA	2.000000 to 29.999999, inclusive
With external 150 W PA	2.000000 to 59.999999, inclusive
With external 400 W PA	2.000000 to 29.999999, inclusive

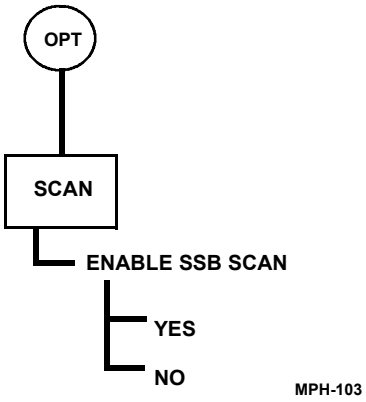


Figure 3-12. Scan Option Menu Tree

3.8 ALE MODE OPERATION

The R/T uses ALE calls to get two or more radio stations on the same frequency at the same time in preparation for voice or data communications.

When a call is successful, the R/T provides a linked status indication on the LCD of the radio.

When ALE mode is selected, the three letter designator (ALE) will be displayed on the top row of the LCD in the preset screen.

ALE is a technique that permits HF stations to call and link on the best HF channel automatically without operator assistance. Each radio in a network is assigned a unique address. When not transmitting, the R/T is constantly scanning through its assigned frequencies, listening for calls addressed to its unique address.

3.8.1 Plain Text Operation

Perform the following procedure to operate the R/T in the ALE plain text mode:

a. Rotate the function switch to the **PT** position.

b. After the power on test is completed, press **[MODE]**.

c. Select **ALE**.

NOTE

The radio cannot be placed in ALE mode until ALE programming has taken place. Refer to Paragraph 4.4 for ALE programming information.

d. The R/T automatically begins to scan, listening for its unique self address to be called.

3.8.2 Encryption Operation

Perform the following procedure to operate the R/T in the ALE encryption mode:

a. Power on the radio.

NOTE

There are some subtle differences between CT and CC operation. In CC, however, if a key load is unsuccessful, the last key successfully loaded and programmed into the system presets will remain active.

Also, if an encrypted message is received during CC operations, the radio will automatically select the correct key (if loaded) to decrypt the message. In CT, however, the radio will not automatically select a key.

b. After the power on test is completed, press **[MODE]**.

c. Select **ALE**.

d. The R/T automatically begins to scan, listening for its unique address to be called.

3.8.3 ALE Scan Operation

The R/T will begin scanning when ALE mode is selected. The displayed channel number will change as the R/T scans through the list of ALE channels. Refer to Paragraph 1.9.4 for additional information.

To stop scanning, press **[CLR]**. The R/T will stop scanning and display the channel screen for the last channel scanned.

Press **[CLR]** to begin scanning again.

NOTE

In ALE operation, it is imperative that the radio is kept scanning. The ALE mode only works satisfactorily when the calling station can depend upon all other stations in the ALE net scanning all their programmed channels.

3.8.4 Placing an ALE Call

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

a. Press **[CALL]** to display the CALL TYPE menu choices **(MANUAL, AUTOMATIC)**.

b. Use the ▲▼ keys to scroll through the options. Select **AUTOMATIC** and press **[ENT]**. **AUTOMATIC** allows the radio to attempt the call on all channels in the channel group according to LQA scores or from the highest frequency to lowest frequency if no LQA score data exists.

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

d. The **ADDRESS TYPE** menu is then displayed. Using the ▲▼ keys, select the desired address type **(INDIVIDUAL, NET, ANY, ALL)** and press **[ENT]**.

e. Use the ▲▼ keys to select the desired address and press **[ENT]**.

f. The R/T will begin transmitting to the selected address. After the call, the R/T will wait for the response.

g. When a response has been received, the R/T will indicate **LINKED** on the LCD. The radio will then make available the programmed system preset items programmed to the linked self address.

h. Press **[CLR]** to return to the system preset screen.

3.8.5 Terminating an ALE Link

Perform the following procedure to terminate an ALE link:

a. To terminate the ALE link, press **[CLR]** from the preset screen.

b. The R/T will display the **TERMINATE LINK** menu. To terminate the link, scroll to **YES** and press **[ENT]**.

c. After the link has been terminated, the R/T will begin scanning ALE channels again.

3.8.6 Setting Automatic Link Establishment (ALE) Options

These options are only viewable if the R/T is in ALE mode. Refer to Paragraph 3.6.8 to place the radio into ALE mode. To select the ALE OPTIONS menu, press **[OPT]**. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

See Figure 3-13 for the following paragraphs.

NOTE

The radio cannot be placed in ALE mode until ALE programming has taken place. Refer to Paragraph 4.4 for ALE programming information.

For ALE operations information, refer to Paragraph 3.8.

3.8.6.1 Link Quality Analysis (LQA) Options

A R/T uses LQA to predict the quality of the radio channels it shares with stations in the nets to which it belongs. When performing ALE calls, individual stations first initiate a call on frequencies that are expected to have the highest quality communication. Stations gather LQA information for each channel they share with each individual and net address from two kinds of sources: normal ALE call exchanges and explicit LQA exchanges.

Each channel score is a weighted average of Signal + Noise + Distortion to Noise + Distortion Ratio (SINAD) and Bit Error Rate (BER) accumulation over the entire signalling interval. The score ranges from 0 to 100, where 100 is the best score.

NOTE

The score received by the LQA process decrements by 10% every 15 minutes.

As part of the normal call/response/acknowledge signalling that occurs when calling another radio station, the radios measure and exchange link quality information. Thus, an installation has link quality information for those stations which it has called. The more recently they have been called, the more current is the link quality information. The radio station operator may perform one or both of the periodic deliberate LQA activities: exchange and sound. Exchanges are bidirectional; each station transmits so that the other can measure the link quality. This results in both stations knowing the quality of both their inbound and outbound links. Sounds are passive, one-way transmissions. They allow the receiving station to measure the quality of its inbound path, but reveal nothing about its outbound path. They reveal no link quality information at all to the transmitting installation.

The R/T will perform an LQA exchange or sound with the selected address on each of the channels in the preset channel group.

3.8.6.1.1 Exchange LQA

See Figure 3-13. Perform the following procedure to select exchange:

a. To initiate the LQA option, use the ◆▶ keys to select **EXCHANGE** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through the exchange types (individual or net), select **INDIVIDUAL** or **NET** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the individual or net addresses and press **[ENT]**.

d. The R/T will try to exchange with the selected station on all frequencies.

e. After the LQA is completed, the R/T will return to scanning.

3.8.6.1.2 Sound LQA

See Figure 3-13. Perform the following procedure to select sound:

a. Use the ◆▶ keys to select **SOUND** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through the **SOUND USING** and press **[ENT]**.

c. The R/T will transmit a one-way sounding signal on all channels in the channel group for that self address.

d. After the LQA is completed, the R/T will return to scanning.

3.8.6.1.3 Viewing LQA Scores

Viewing scores that were created during the LQA allows the operator to ascertain information on frequency selection. During a manual call, use this information to select the highest scored channel to place the call or use that channel in fixed mode with increased reliability.

a. To initiate the scores option, use the ◆▶ keys to select **SCORES** from the ALE menu and press **[ENT]**.

b. Use the ▲▼ keys to scroll through the individual addresses and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the channels and available scores.

d. Press **[CLR] [CLR]** and then **[OPT]** to return to the preset screen.

3.8.6.2 Transmitting an Automatic Message Display (AMD) Message

NOTE

AMD messages uses 90 characters and are not secure.

Perform the following procedure to transmit preprogrammed AMD messages:

a. Use the ◆▶ keys to select **TX_MSG** from the ALE menu and press **[ENT]**.

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

NOTE

Refer to Paragraph 4.4.2.6 for information on programming AMD messages.

c. For **SEND TX MESSAGE?**, use the ▲▼ keys to select **YES** and press **[ENT]**.

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

NOTE

If **AUTOMATIC** is selected, the R/T will use the LQA scores to automatically determine which channel to use when transmitting the AMD message. If **MANUAL** is selected, the operator has the opportunity to specify which channel to use when transmitting the AMD message.

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

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

3.8.6.3 Viewing a Received AMD Message

Perform the following procedure to view received AMD messages:

a. Use the ◄► keys to select **RX_MSG** from the ALE menu and press **[ENT]**.

b. Use the ▲▼ keys to scroll through the received AMD messages and press **[ENT]**.

c. Use the ▲▼ keys to view an entire AMD message that is too long to view on the LCD at one time.

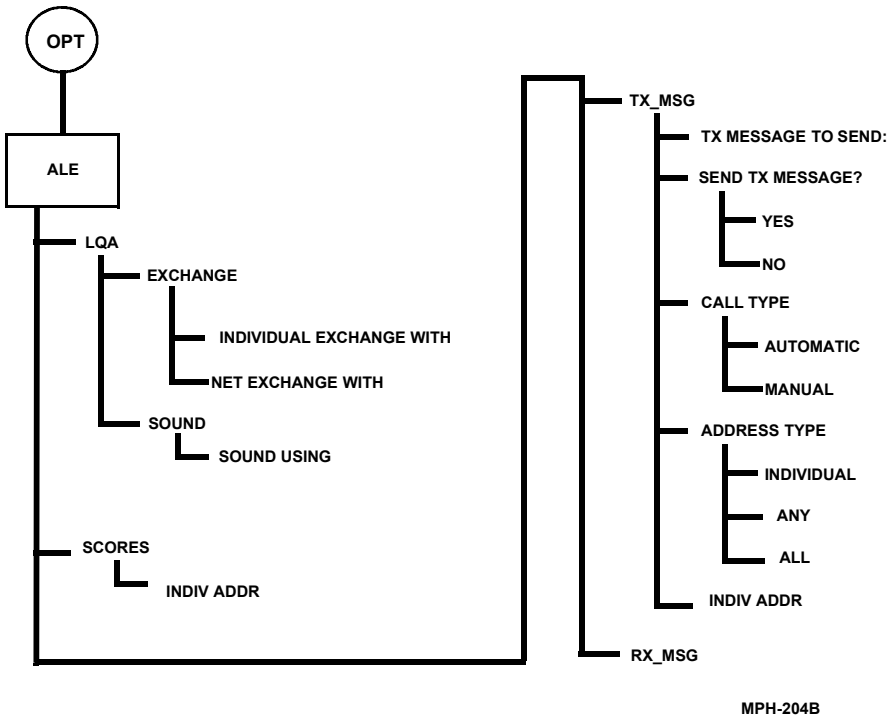


Figure 3-13. ALE Option Menu Tree

3.9 3G MODE

3.9.1 Introduction

The R/T's 3G Mode provides a subset of the capabilities and protocols defined by the NATO standard STANAG 4538: Technical Standards for an Automatic Radio Control System for HF Communications Links.

The new 3G Mode capability of the R/T provides many advantages over the current (second generation) ALE and data link capabilities. Some of the major 3G Mode improvements are:

- Faster Link Time
- Linking at lower Signal-to-Noise Ratios (SNR)
- Improved network channel efficiency
- 3G, ALE and data traffic use the same family of high-performance serial waveforms
- Higher throughput for short and long data messages

These improvements in performance were accomplished in 3G Mode by incorporating several advanced signalling techniques, including:

- Synchronous scanning of calling channels
- Burst Phase Shift Keying (PSK) waveforms
- Carrier sense multiple access with collision avoidance (CSMA/CA) channel access procedure

3.9.2 3G Programming

Unlike current (second generation) ALE network programming, all 3G Mode network programming must be accomplished through the RF-6550H HF Radio Programming Application (RPA). For information on setting up and programming a 3G Network into the R/T, refer to RF-6550H HF Radio Programming Application Software User's Guide, Publication Number: 10518-4230-01. Refer to Paragraph 4.5.

For information about connecting a PC to the R/T's PPP Port (J3), refer to Paragraph 4.1.3.

If programming fails to load properly, the "Incomplete 3G Fill screen" will be displayed on the KDU. See Figure 3-14.

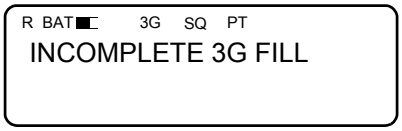


Figure 3-14. Incomplete 3G Fill Screen

3.9.3 Operation

The following subparagraphs cover 3G Mode operation from the front panel of the KDU. These procedures assume that a valid 3G Communications Plan has been programmed into the R/T as indicated in Paragraph 3.9.2.

3.9.3.1 General

The principal differences between the KDU screens displayed in 3G Mode operation and the screens displayed in the other modes appear on the top-level screens. To enter 3G Mode mode, press the **[MODE]** key on the KDU until 3G is displayed then press **[ENT]**. The R/T will now enter into 3G Mode and the 3G scanning screen will be displayed. Figure 3-15 depicts the 3G scanning screen. The items displayed on this screen are as follows:

- The words “CH### SCANNING” (where ### equals a channel number) on the second line indicate that the radio is operating in 3G Mode and is scanning.
- The text in the third line, in this case “DAY 4538”, indicates the CHANNEL PLAN currently being scanned. The operator can highlight this field by pressing the left/right arrow keys to change the CHANNEL PLAN selection. Refer to Paragraph 3.9.3.2.6.
- The Transmit/Receive (T/R) indicator at the extreme left of the top line indicates whether the radio is transmitting or receiving, as in other modes.
- The battery indicator located in the left-center portion of the top line has the same significance as in other modes.
- 3G on the top line indicates that the radio is being operated in its 3G Mode.
- The Squelch (SQ) and PT/CT/CC indicators on the top line have the same significance as in other modes.

- The current synchronization state is displayed at the far right of the third line above the word “SYNC”. The LCD will show AUTO sync when an external PLGR is connected and the radio obtains accurate time/date from the PLGR. When the PLGR is disconnected from the radio, the radio will continue to show AUTO sync with the SYNC meter bar gradually getting smaller as the SYNC quality fades.

  If a radio without a PLGR obtains SYNC (over the air) from a radio with a PLGR, the non-PLGR radio will display MAN. The radio’s SYNC meter bar will also fade as described above.

  The values that can be displayed in this field are:

  1. “**AUTO**”: The radio has a TOD synchronization based on a GPS time from its external GPS receiver.

  2. “**MAN**”: The radio has TOD synchronization not based on GPS time from its external PLGR. Instead, its synchronization is based on a TOD received over-the-air (if the R/T is a TOD client), or its own local clock time (if the radio is a TOD server).

  3. “**NONE**”: The R/T does not have TOD synchronization from any source.

- The far-right portion of the second line is used to display a sync meter directly below the text “- +”. After acquiring synchronization, the radio has a definite period of time which it can be relied upon to remain in synchronization, even if it does not receive any TOD updates during this time period. Specifically, an R/T without GPS remains synchronized for a minimum of 20 minutes while it is powered off, and more than 48 hours while it is powered on. The width of the bar in the sync meter display indicates what fraction of this time remains before the radio can no longer be assumed to be in sync. Immediately after the R/T is synchronized, the bar occupies the full width of the sync meter display. When the bar disappears, the R/T is no longer reliably synchronized. The bar width shown in Figure 3-15 indicates that roughly 60% of the sync reliability interval remains. This is how the display would appear if the R/T was synchronized, powered off

for eight (8) minutes, then powered back on, since 20 minutes minus eight (8) minutes equals 12 minutes, and 12 minutes is 60% of 20 minutes.

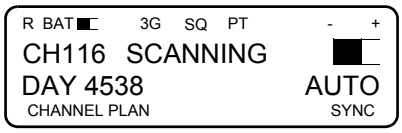


Figure 3-15. 3G Scanning Screen

3.9.3.2 TOD Synchronization

TOD Synchronization is necessary to operate in 3G Mode. When the R/T is powered on, the KDU displays "CH### SCANNING" and the "SYNC" will be indicated as no visible bar on the sync meter if the radio is not in sync. There are two methods of getting TOD synchronization. Use automatic TOD synchronization when GPS is available (refer to Paragraph 3.9.3.2.1). Use manual TOD synchronization when GPS is not available (refer to Paragraph 3.9.3.2.3).

3.9.3.2.1 Automatic GPS TOD Synchronization

Perform the following procedure to perform an automatic TOD synchronization:

a. Power OFF R/T.

b. Using connecting cable (P/N 12005-0730), connect PLGR GPS receiver to J2 on the front of the R/T.

c. To configure an external PLGR for operation with the AN/PRC-150:

   1. Enter the SETUP menu on the PLGR.

   2. Scroll through the various SETU menus to the SERIAL I/O screen.

   3. Select STANDARD serial mode.

   4. Return to the SETUP menus to the MODE screen.

   5. Select CONTINUOUS position and velocity updates. These are the optimal settings for your AN/PRC-150(V)(C).

   6. Verify the PLGR GPS receiver indicates Time Figure Of Merit (TFOM) value with the range 1 - 6. The radio will not transfer the TOD information from the PLGR until the TFOM is less than or equal to 6.

d. Rotate the function switch to the **PT, CC** or **CT** position depending on mode of operation. The GPS PLGR initiates a search for GPS satellites.

e. The PLGR continues to search until at least four GPS satellites are acquired.

f. The R/T uses information from the PLGR to generate a GPS time reference. Once generated, the KDU displays “AUTO” above the word “SYNC” on the KDU and the sync meter will show 100% sync (full bar).

The R/T is now ready to communicate in 3G mode on any programmed 3G Channel Plan. For more information about the PLGR, refer to Paragraph 3.10.2.1.

NOTE

It is strongly recommended to maintain and use Coordinated Universal Time (UTC, GMT or ZULU) for all operations.

3.9.3.2.2 3G Configuration Autotune/Sync Enable

This item controls two functions, **AUTO TUNE** and **AUTO SYNC REQUEST**. Setup of these parameters permit the operator to allow (or prevent) the R/T to automatically transmit, as a part of the normal 3G control.

AUTO TUNE is performed when ever the radio is powered up in 3G mode, or whenever 3G mode is exited and re-entered. When **AUTO TUNE/SYNC** is disabled, the radio will not automatically tune on entry into 3G. Instead, the last line of the KDU will display **!!!!!! TUNE REQUIRED !!!!!!** If the operator does not manually tune the radio (via the **OPT** key) prior to attempting to use the radio for outgoing communications, the operator will be prompted: **TUNE REQD: TUNE NOW?** If **YES,** a tune will be performed before the next normal screen for the type of operation being requested. If **NO**, the next screen will be displayed without performing the **TUNE**. Note that operation at this point may be impaired.

AUTO SYNC REQUEST is performed on any TOD Client radio whenever it’s **SYNC** quality goes to 0% (**SYNC METER** is empty). If **AUTO TUNE/SYNC** is enabled when this occurs, the radio will automatically place a **SYNC REQUEST** to the TOD server. If the **SYNC REQUEST** is successful, the **SYNC METER** will be restored to FULL. If the **SYNC REQUEST** fails, the radio will attempt another **AUTO SYNC REQUEST** once every 15 minutes until it succeeds. If **AUTO TUNE/SYNC** is disabled, the radio will not try to regain **SYNC** on it’s own.

The operator must initiate a manual **SYNC REQUEST**, or the radio must receive an **SYNC BCAST** from the TOD server.

3.9.3.2.3 Manual TOD Synchronization

Perform the following procedures to perform a manual TOD synchronization of an R/T:

a. Place the R/T in 3G Mode, displaying CH### SCANNING and a sync status of NONE. It may be necessary to manually synchronize a radio whose sync state is AUTO or MAN. (A TOD server radio may have acquired GPS sync after transmitting a non-GPS derived TOD, an R/T without GPS may have synchronized to the non-GPS time from the TOD server and might need to unsync in order to become synchronized to the new GPS time.) To do this, start by executing the procedure given in Paragraph 3.9.3.2.5 to force the R/T sync state to NONE.

b. Press **[OPT]**.

c. Use ◀▶ keys to select **[3G]** and press **[ENT]**.

d. Use ◀▶ keys to select **[TOD]** and press **[ENT]**.

e. Enter wristwatch time and press **ENT**.

NOTE

The time must be accurate to within +/- seven (7) minutes of UTC time for the TOD client operation. Alternately, if the radio will be operated as a TOD server, it is especially important that the R/T's time reference be established to within +/- fifteen (15) seconds of UTC for proper net timing to be established.

f. Press **[CLR][CLR]** to return to the operating screen. The R/T KDU displays CH### SCANNING screen.

g. The R/T scans, continuing to display a sync state of NONE, until it receives a TOD sync broadcast from the primary TOD server. The length of time required depends on how frequently TOD sync broadcasts are transmitted by the primary TOD server. When it receives a TOD sync broadcast, the sync state changes to MAN or AUTO, and the sync meter display indicates full (100%) synchronization.

Refer to Paragraph 3.9.3.2.14.1 for the procedures to transmit or schedule Broadcast sync transmissions at the primary TOD server.

3.9.3.2.4 TOD Server Selection

When **TOD AUTODETECT** is enabled on an R/T, an outstation R/T can automatically determine the TOD server. An outstation R/T can also assume the role of a TOD server using the front panel. Also, a TOD server can take on the role of an Outstation.

To determine the current TOD Role or change the current TOD Role:

a. Press the **[OPT]** key to display the **Option Menu**.

b. Select **3G**.

c. If **TOD AUTODETECT** is enabled, the **TODROLE** option will be displayed on the **3G Option Menu**. Select this menu item.

d. The first screen shows the current TOD server. If no TOD server has been observed, this value will display **-------**.

e. Press **[ENT]** to see the TOD Role for this R/T. If the role is **BASE**, then it is a TOD server. If the Role is **OUTSTATION**, this is a TOD client. This value can be changed by pressing the ▲▼ keys.

f. If the TOD Role has not been changed, pressing the **[ENT]** key will return to the 3G Option Menu. If the TOD Role has changed, a verification screen will be displayed to confirm the change. Using the the ▲▼ keys, select the appropriate answer.

g. Press the **[ENT]** key to activate the selection.

h. If **YES** is selected, the new TOD Role will be selected and the option menu will be exited. The R/T will retune and activate the new role. If **NO** is selected, the **3G Option Menu** will be displayed.

NOTE

There can only be one TOD server in a net.

3.9.3.2.5 Forcing Sync State to None

Forcing Sync State to NONE is necessary only when it is desired to create a SYNC REQUEST. For a TOD Server, it could be acquiring a GPS-derived TOD and wishing to pass it on to the deployment. For a TOD Client, it could be that the client was synchronized to a non-GPS-derived TOD and the TOD needs to be reset to a GPS reference.

The R/T will derive the TOD from GPS if the cable to the external PLGR is connected. GPS TOD derivation will override a **SYNC BROADCAST**.

To force the R/T to a SYNC state of NONE:

a. Leave the cable from external PLGR to the R/T connected unless you do not want your local PLGR to supply the TOD reference.

b. Press **[OPT]**.

c. Use the ◀▶ keys to select **3G** Mode and press **[ENT]**.

d. Use the ◀▶ keys to select **UNSYNC** and press **[ENT]**.

On completion of this procedure, R/T should display CH### SCANNING and a sync state of NONE.

NOTE

If the Manual TOD synchronization procedure was performed without disconnecting the cable to external PLGR from R/T the following things may occur:

- If R/T sync state is initially AUTO, and the R/T is currently receiving GPS time from satellites, R/T sync state will remain AUTO. GPS time is presumed to be sufficient for 3G operation when it is available. Entering UNSYNC does not cause the GPS synchronization to be discarded.
- If R/T sync state is not initially AUTO, but R/T is receiving GPS time from satellites, R/T sync state immediately changes to AUTO. Again, GPS time is presumed to be adequate for 3G operation when it is available. If GPS synchronization is not desired, be sure to disconnect the cable to external PLGR.

3.9.3.2.5.1 Requesting a Sync from a TOD Server

To force the R/T to request TOD sync from a primary TOD server station, perform the following procedure:

a. Press **CALL**.

b. Use the ▲▼ keys to select **SYNC REQUEST** and press **[ENT]**.

c. CH### SYNC REQUEST IN PROGRESS screen will appear. See Figure 3-16. R/T will go through the current CHANNEL PLAN and request TOD sync on each channel until a valid sync response is received from the TOD server assigned to the 3G net.

On completion of this procedure, R/T should display CH### SCANNING. If TOD sync was successful, sync meter will be fully to the right indicating 100% sync. If unsuccessful, sync meter will show 0% (empty). Refer to Paragraph 3.9.3.1 for further information on sync meter.

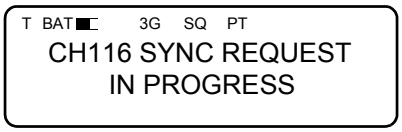


Figure 3-16. Sync in Progress Screen

3.9.3.2.6 Channel Plan Selection

Channel plans can only be selected when the R/T is in 3G mode. Refer to Paragraph 3.9.3.1. Perform the following procedure to make CHANNEL PLAN selections:

a. Starting from the CH### SCANNING screen, use the ◆▶ keys to select the name of the currently selected CHANNEL PLAN.

b. Use up ▲▼ keys to select the desired CHANNEL PLAN name and press **[ENT]**.

c. The R/T will momentarily enter tuning mode. During this time, it tunes the antenna coupler (if enabled) on each channel of the channel group corresponding to the CHANNEL PLAN. See Figure 3-17.

d. The R/T displays the name of the selected CHANNEL PLAN and begins scanning the frequencies of the selected plan.

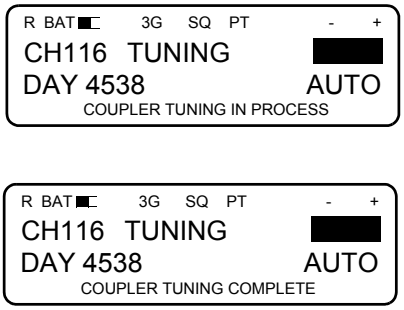


Figure 3-17. Tuning Screen

3.9.3.2.7 3G Preset Selection

In 3G mode, the R/T preset can be changed while the R/T is SCANNING or LINKED. To Change the R/T preset while the R/T is SCANNING or LINKED:

a. Press the **[PRE +]** or **[PRE -]** key.

b. The 3G Preset Select Screen will be displayed with the current preset name and settings.

c. Pressing the **[PRE +]** or **[PRE -]** key a second time will select the next or previous 3G preset in the Preset List.

d. The individual items associated with the Preset can also be modified by using the ◀▶ keys to select the item and the ▲▼ keys to change the value.

e. Press **[ENT]** or **[CLR]** to deselect an item. The Preset Select Screen will not time out while an item is selected.

f. The new preset settings will be activated if the screen times out (after four seconds) or the key or **[ENT]** is pressed. Press the **[CLR]** to exit the Preset Select Screen without activating the new preset settings.

3.9.3.2.8 Data Message Transmission and Reception

Data messages can be exchanged among all R/T radios that are:

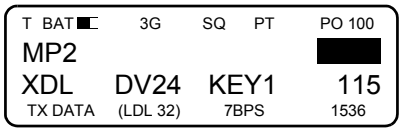
- Members of the same 3G net.
- Have acquired TOD synchronization.
- Currently scanning the same CHANNEL PLAN in 3G Mode.

Refer to Software User's Guide for the RF-6710W Wireless Messaging Terminal and for the RF-6750W Wireless Gateway, (10515-0093-4210) for instruction on generating, sending, and receiving data messages. A terminal product which is appropriate to support chat messaging while in 3G mode is the RF-6551H Tactical Chat Application. See Figure 3-18 for data (packet) transfer screen information.

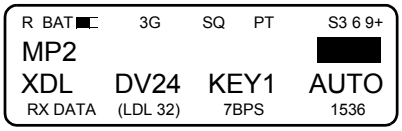
NOTE

In the PACKET TX and PACKET RX screens shown in Figure 3-18, average throughput is given in bytes per second. Therefore, the "7BPS" displayed in these screens represents an average throughput of seven bytes per second, or 56 bits per second.

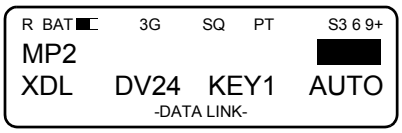
PACKET TX:



PACKET RX:



DATA LINK AFTER XFR:



KEY SIG DURING XFR:

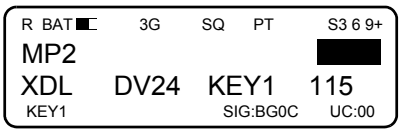


Figure 3-18. Data (Packet) Transfer Screens

3.9.3.2.9 Voice Communication

The following paragraphs provide procedures for making voice calls with the R/T. Voice communications can be made by R/T radios that are all:

- Members of the same 3G net.
- Have acquired net TOD synchronization.
- Currently scanning the same CHANNEL PLAN in 3G Mode.
- Not currently active in data or voice communication.

3.9.3.2.9.1 Point-to-Point Call

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

a. Press **[CALL]**.

b. Use ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-7 for additional information on choices.

c. Use ▲▼ keys to select address type **STATION** and press **[ENT]**. See Figure 3-19.

d. Use ▲▼ keys to select the station name you wish to call and press **[ENT]**.

e. If the call type is **MANUAL**, R/T prompts user for channel number to place call on.

f. KDU displays call status. See Figure 3-20 and Figure 3-21.

g. When 3G circuit setup is successful, a tone is heard in the handsets of transmitting and receiving R/T radios. KDU displays Linked Screen. See Figure 3-22.

NOTE

From the Linked Screen, the Channel Screen can be displayed (see Figure 3-23) by pressing the key.

h. Either operator can now key handset and talk.

i. Either operator can terminate link by pressing **CLR**.

j. Use the ▲▼ keys to select **YES**, press **ENT**. Refer to Table 3-8.

k. The Terminating Screen will be displayed momentarily (see Figure 3-24) and the R/T will return to CH### SCANNING.

NOTE

By default, there is a link time out for both data and voice links after a period of no data or voice activity. These times can be configured using The RF-6550H HF Radio Programming Application (RPA). Default time for IP packet data is 15 seconds, voice is 60 seconds, and 0 (link terminated immediately on message delivery completion) for the use of the RF-6710W Wireless Messaging Technology (WMT), the RF-6750 Wireless Gateway, or the Harris Tactical Chat application.

For information on setting up and programming a 3G network into the R/T, refer to RF-6550H HF Radio Programming Application Software's Help Files or User's Guide, Publication Number: 10518-4230-01.

Table 3-7. Call Initiation Screen

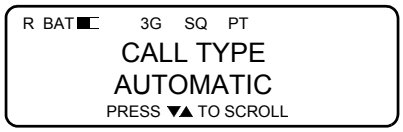
Front Panel Display	Description
	Contains a scroll list of call type selections. Operator uses arrow keys to choose desired selection. This screen is activated from the **CALL TYPE** Options: **AUTOMATIC** - Selects the channels on which call attempts are placed with the goal of minimizing delay. An **AUTO** call might choose a second best channel that will not have as much delay over the best channel that is later in the scan rotation. If the first call attempt fails, the second call attempt is placed on another channel with the same goal of minimizing delay. Generally, an **AUTO** call is the simplest and quickest way to make a connection. **MANUAL** - establishes a circuit with one or more other radios on a specified channel (could take longer to link than an AUTOMATIC call). **BEST** - Always places the first call attempt on the channel with the highest channel score. This could take longer to link than an **AUTOMATIC** call, as there may be a substantial wait for this channel to arrive in the channel scan rotation. If the first call attempt fails, the second call attempt uses the channel with the second highest score, and so on. The total number of call attempts is limited by the **RETRY COUNT**.

Figure 3-19. Station Address Screen

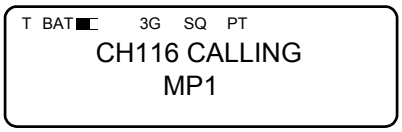


Figure 3-20. Point-to-Point Call Screen

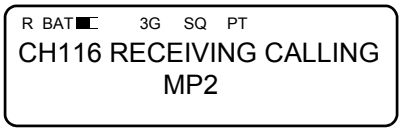


Figure 3-21. Point-to-Point Receiving Call Screen

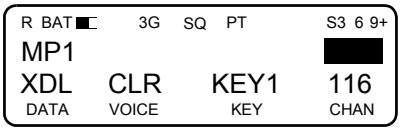


Figure 3-22. Linked Screen

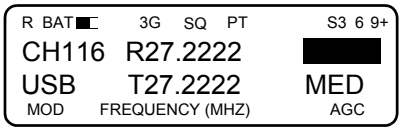


Figure 3-23. Channel Screen

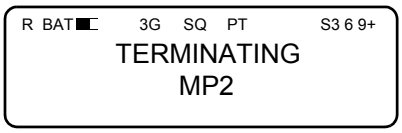


Figure 3-24. Terminating Screen

Table 3-8. Abort/Terminate Link Screen

Front Panel Display	Description
TERMINATE LINK? **YES** **PRESS▲▼ TO SCROLL**	This screen is activated when the CLR or PGM keys are hit while a call (or packet transfer) is in progress or a connection is active. One of the following will be displayed: Condition: Send/Receive Data Transfer Active or data link active, no call pending. **TERMINATE DATA?** Condition: Voice Link, no call/data in progress, or call pending. **TERMINATE LINK?** Condition: Call Pending or call in progress, no data transfer active. **TERMINATE CALL?**

3.9.3.2.10 Net Call

Perform the following procedure to make a Net voice call:

a. Press **[CALL]**.

b. Use ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-7 for additional information on choices.

c. Use ▲▼ keys to select address type **NET** and press **[ENT]**. See Figure 3-25.

d. Use ▲▼ keys to select the net name you wish to call and press **[ENT]**.

e. If the call type is **MANUAL**, R/T prompts user for channel number to place call on.

f. KDU displays call status. See Figure 3-26.

g. When 3G Mode circuit setup is successful, a tone is heard in the handsets of transmitting and receiving R/T radios. KDU displays Linked Screen. See Figure 3-22.

NOTE

From the Linked Screen the Channel Screen can be displayed (see Figure 3-23) by pressing the 0 key.

h. Operators can now key handset and talk.

i. Operators can terminate link by pressing **[CLR]**.

j. Use the ▲▼ keys to select **YES** and press **[ENT]**. Refer to Table 3-8.

k. The Terminating Screen will be displayed momentarily (see Figure 3-24) and the R/T will return to CH### SCANNING.

Figure 3-25. Net Address Screen

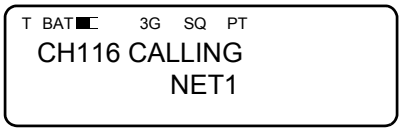


Figure 3-26. Net Call Screen

3.9.3.2.11 Voice Call Break-In

While a data transfer is actively being performed between two R/T's in 3G mode, the data transfer can be preempted to allow a voice call to be made.

NOTE

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

To preempt a data transfer for voice communication:

a. Press **[CALL]**. See Figure 3-27.

b. Make the appropriate selections for the voice call to be initiated.

c. If the data transfer is still in progress, the radio will prompt the user as to whether he wants to abort the current data traffic. See Figure 3-28.

d. If **YES** is selected, the data transfer will be aborted and voice call will proceed. See Figure 3-29. If **NO** is selected or if the **[CLR]** key is pressed, the voice call will be aborted and the data transfer will continue unaffected. See Figure 3-30.

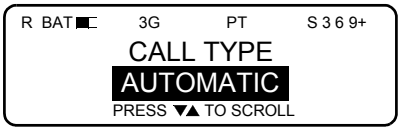


Figure 3-27. [CALL] Key Pressed

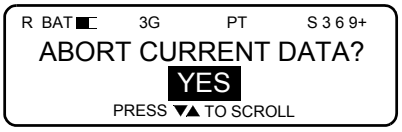


Figure 3-28. Data Transfer Abort Verification Screen

Figure 3-29. Voice Call Proceeding

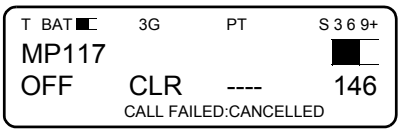


Figure 3-30. Voice Call Aborted

3.9.3.2.12 Sound

See Figure 3-35. Perform the following procedure to transmit a SOUND:

a. Place the R/T in 3G mode. Refer to Paragraph 3.9.3.1.

b. Press **[OPT]**.

c. Use the ◀▶ keys to select **3G** and press **[ENT]**.

d. Use the ◀▶ keys to select **SOUND** and press **[ENT]**.

The R/T transmits a SOUND transmission on each channel in the current CHANNEL PLAN. Other net members operating in 3G mode on the same CHANNEL PLAN can receive the SOUND transmission and use it to automatically update their stored scores for the combination of the station transmitting the SOUND, and the channel in which each SOUND transmission is received. See Figure 3-31.

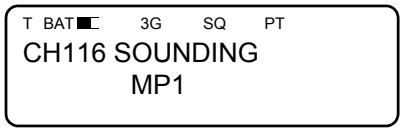


Figure 3-31. LQA Sounding Screen

3.9.3.2.13 Scores

Perform the following procedure to view a list of channels in the current CHANNEL PLAN, ranked by their channel scores:

a. Place the R/T in 3G mode. Refer to Paragraph 3.9.3.1.

b. Press **[OPT]**.

c. Use the ◆▶ keys to select **3G** and press **[ENT]**.

d. Use the ◆▶ keys to select **SCORES** and press **[ENT]**.

e. Use the ◆▶ arrow keys to select the station for which channel scores are to be displayed and press **[ENT]**.

The R/T displays channel number of the channel having the highest channel score, and the value of its channel score. Values range over the interval from 0 (worst) to 100 (best). Other channels within the CHANNEL PLAN and their scores can be displayed by pressing ▲▼.

NOTE

Only channels with scores will be displayed (not necessarily all channels of a CHANNEL PLAN).

f. Press **ENT** to exit.

3.9.3.2.14 Broadcast Sync

Broadcast Sync is used to transmit the current time reference from the Primary TOD Server to the other stations in the 3G net, so that R/T manpacks receiving the Broadcast Sync can become synchronized, allowing communications in 3G Mode.

3.9.3.2.14.1 Transmit a Broadcast Sync

Perform the following procedure to transmit a Sync Broadcast at the Primary TOD Server:

a. Press **[CALL]**.

b. Use ▲▼ keys to select BROADCAST SYNC or BROADCAST SYNC-ALL and press **[ENT]**. If BROADCAST SYNC is selected, Primary TOD server transmits a single TOD sync broadcast. If BROADCAST SYNC-ALL is selected, Primary TOD server transmits multiple TOD sync broadcasts on different scan frequencies. One TOD sync broadcast is transmitted on each channel in the current frequency plan.

NOTE

A BROADCAST SYNC-ALL may require more than a minute to complete. Because of this, an operator should choose to perform this operation only when it is necessary to synchronize an entire radio network, for example, immediately after deployment under conditions in which GPS synchronization is unavailable.

3.9.3.2.15 Schedule a Broadcast Sync

To schedule periodic TOD Broadcast Sync at the primary TOD server, perform the following procedure:

a. Press **[PGM]**.

b. Use ▲▼ keys to select **SCHED** and press **[ENT]**.

c. Use the ◆▶ keys to select **ADD** and press **[ENT]**.

d. On the OFFSET TIME screen, use numeric keys to enter time offset of the transmission schedule relative to midnight, UTC (0000 Zulu), in hours and minutes (24-hour format) and press **[ENT]**. See Figure 3-32.

e. On the INTERVAL TIME screen, use numeric keys to enter time interval between successive TOD sync broadcast transmissions in hours and minutes and press **[ENT]**. See Figure 3-33.

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 day at 0015 UTC; subsequent TOD sync broadcast transmissions will occur every thirty minutes. (00:45, 01:15, 01:45, 02:15, 02:45, etc.).

By selecting **EDIT** or **DELETE** instead of **ADD** in Step c, the operator can edit or delete a previously scheduled broadcast. See Figure 3-34.

Figure 3-32. Offset Time Screen

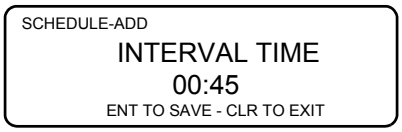


Figure 3-33. Interval Time Screen

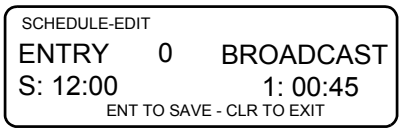


Figure 3-34. Schedule Edit Screen

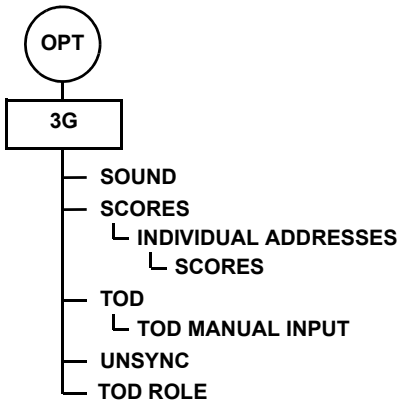


Figure 3-35. 3G Operations Menu

3.10 HOP MODE

Press **[MODE]** repeatedly to scroll through the available operating modes until **HOP** is displayed, and press **[ENT]**. Refer to Paragraph 1.9.6 for additional information.

If a GPS receiver is connected and turned on, the R/T will automatically synchronize to the satellite time. If GPS is available, the R/T's in the HOP net must manually synchronize. Refer to Paragraph 3.10.2 for additional information.

NOTE

If any HOP net radio displays a GPS MAINT REQUIRED message, it is imperative that all radios in the HOP net execute a maintenance cycle before starting or continuing HOP traffic. While it is possible that communications may not appear to be affected, there is no guarantee that all radios are operating from the same time base until the maintenance cycle is executed by each and every radio in the net. **Note that if all radios in the net are powered on and tracking, and the **"GPS MAINT REQUIRED"** message appears on one radio in the net, the message should also appear within fifteen minutes on the front panel of all other radios in the net. Refer to Paragraph 5.2 for corrective action.

3.10.1 HOP Preset Selection

System presets in HOP mode are selected by pressing **[PRE +/-]** until the desired system preset is selected.

NOTE

The radio cannot be placed in HOP mode until HOP programming has taken place. Refer to Paragraph 4.3 for HOP programming information.

3.10.1.1 Plain Text HOP Operation

Perform the following procedure to operate the R/T in the **HOP** frequency plain text mode:

a. Rotate the function switch to the **PT** position.

b. After the power on test is completed, press **[MODE]** and select **HOP**.

c. Press **[ENT]**.

d. Select the desired HOP frequency system preset by pressing **[PRE +/-]** repeatedly until the desired system preset is displayed.

3.10.1.2 Cipher Text HOP Operation

To operate the R/T in the CT HOP mode, perform the following procedure:

a. Rotate the function switch to the **CT** position. Use CC if Citadel Cover communications security is intended.

NOTE

There are some subtle differences between CT and CC operation. In CT, if a key load is unsuccessful, no keys are actively loaded. In CC, however, if a key load is unsuccessful, the last successfully loaded key will remain active.

Also, if an encrypted message is received during CC operations, the radio will automatically select the correct key (if loaded) to decrypt the message. In CT, however, the radio will not automatically select a key.

b. After the power on test is completed, press **[MODE]**.

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

d. Select the desired HOP mode system preset by pressing **[PRE +/-]**.

NOTE

If a key is not loaded into the radio, the message **KEY NOT SELECTED** is displayed on the KDU. If the radio is keyed, the message **KEY NOT AVAILABLE** is displayed.

3.10.2 Sending a Synchronization Request

Perform the following procedure to send a synchronization request:

a. From the preset screen, while in HOP mode, press **[CALL]** to initiate a manual sync request.

b. Using the ▲▼ keys to scroll through the options **(REQUEST, BROADCAST)**, select **REQUEST** and press **[ENT]**.

c. After the R/T sends a sync request, the R/T waits for a response.

NOTE

For BROADCAST sync, the R/T sending the sync request also automatically transmits the sync response.

d. Upon receiving a sync response, the R/T displays **MAN** to indicate that it has acquired MANUAL sync.

3.10.2.1 External PLGR

The R/T has a front panel serial connector that supports an external GPS (J2 Serial Data Connector). The user connects the **PLGR** to the radio using a GPS interface cable. When the user connects the **PLGR**, one of two outcomes occurs:

- If the **PLGR** is not configured correctly, the radio **KDU** displays "**EXTERNAL GPS CONFIG ERROR**", to signal the operator to correct the **PLGR** setup.
- If the **PLGR** is configured correctly, the radio **KDU** displays the message "**EXTERNAL GPS CONNECTED**".
    - If the **PLGR** has accurate time/position information, the radio reports **EXTERNAL GPS TRANSFER COMPLETE**". This message notifies the operator that the fill operation is complete and the **PLGR** can be disconnected from the radio.

When an external GPS is used, the **KDU OPT/GPS** position screens are not accessible. The GPS status screen displays the current state (e.g. **DISCONNECTED**, **CONNECTED**, **TRANSFER COMPLETE**), in case the operator missed the message.

3.11 DATA MODES OF OPERATION

Refer to Paragraph 4.3 for programming information. MODEM presets are programmed to support intended modes of operation. Either pre-coordinate modem types, transmission speeds and COMSEC type, and key prior to mission, or use a voice mode to coordinate it over-the-air with a distant end user.

3.12 COMSEC OPERATIONS

3.12.1 Select Encryption Key

Perform the following procedure to select an encryption key:

a. Press **[▶]** until the encryption field is highlighted on the LCD. If the display shows "-----" in the KEY field, this indicates that no key is currently selected.

b. Use the **[▲][▼]** keys to scroll to the desired key and press **[ENT]**.

While scrolling through the encrypting keys, the key name, key signature and update count are displayed on the bottom row of the display.

3.12.2 Loading COMSEC Fill Data

The R/T holds 25 Traffic Encryption Keys (TEKs), one Key Encryption Key (KEK), and one Transfer KEK (TrKEK) for each COMSEC mode of either VINSON, ANDVT or KG-84. Numbering for each storage set is from 01 to 25.

The following procedures describe how to load COMSEC fill data of either TEKs for VINSON, ANDVT, or KG-84 COMSEC.

3.12.3 Loading COMSEC Fill Data of TEK or KEK with KYK-13, KYX-15, KOI-18 or AN/CYZ-10 using RDS

Perform the following procedure to load COMSEC Fill data with common fill devices:

a. Turn fill device off.

b. Connect fill device to the **J18 FILL** connector.

c. Turn fill device on and select key position on fill device. (If using KOI-18, have key tape ready to pull.)

d. Rotate radio front panel function switch to **LD**.

e. Select appropriate fill device; select KYK-13 if using an AN/CYZ-10 that uses RDS, then press **[ENT]**.

f. Select the desired **CRYPTO TYPE** of either **VINSON, ANDVT or KG-84**, and press **[ENT]**.

g. Select the appropriate **KEY TYPE**. If **TEK** is selected, select the key position number (01 - 25).

h. **PRESS ENT TO INITIATE** displays, and press **[ENT]**.

i. **IN PROGRESS** displays. If using KOI-18, pull tape now.

j. When **FILL DONE PRESS ENT** displays, press **[ENT]**.

k. At prompt **MORE FILL DATA?**, select **YES** to enter more fill data. Repeat Step f through Step k.

l. When all fill data is entered, select **NO** when the **MORE FILL DATA** prompt displays.

m. Turn off fill device and disconnect it from **J18 FILL** connector.

n. Rotate function switch from **LD** to desired operating position (**PT**, **CC**, **CT**, or **RV)**.

3.12.4 Loading COMSEC Fill Data of TEK, KEK, or TrKEK with AN/CYZ-10 Data Transfer Device (DTD) using FILL Application

Using the AN/CYZ-10 DTD varies due to differences in user application software. AN/CYZ-10s using DTD FILL program should be set to DS-101 protocol and perform the following procedure:

NOTE

Ensure DTD FILL program is set to DS-101 protocol before beginning. In the DTD loading process, always select ISSUE as transmit mode. If FILL transmit mode is used, it will result in a BAD FILL.

a. Turn AN/CYZ-10 DTD fill device on. Use DTD FILL program to initiate loading of required key.

b. Connect fill device to **J18 FILL** connector when directed by the DTD menu instructions. Select the key to be loaded and use ISSUE as the transmit mode. Stop at the DTD when it displays to press **SEND**.

c. Rotate function switch to **LD**.

d. Select **KYK-13** as the fill device and press **[ENT]**.

e. Select the **KEY TYPE**, then select the key compartment position number (**01 - 25**). Press **[ENT]**.

NOTE

KEKs and TrKEKs do not require a compartment number.

f. **INITIATE FILL AT FILL DEVICE** displays.

g. Press **SEND** on the DTD. The radio displays **FILL IN PROGRESS**.

h. When **FILL DONE** displays, press **[ENT]**.

i. At prompt **MORE FILL DATA?**, select **YES** to enter more fill data. Repeat Step e through Step i. Use DTD menu to back up for new key selection.

j. When all fill data is entered, select **NO** when the **MORE FILL DATA?** prompt displays.

k. Turn off DTD and disconnect it from the **J18 FILL** connector.

l. Rotate function switch from **LD** to desired operating position (**PT**, **CC**, **CT**, or **RV)**.

3.13 OTAR AND OTHER NETWORK CONTROL DEVICE (NCD) OPERATIONS, U.S. TYPE I COMSEC MODES ONLY

OTAR allows COMSEC variables to be transmitted by the NCS and received by any net member radio. The R/T supports full OTAR operations, SARK, as well as other NCD controlled operations. These operations require the KYX-15 NCD or AN/CYZ-10 DTD. The R/T supports the following operations:

- Transmit Automatic Rekey - Paragraph 3.13.1
- Transmit Manual Rekey - Paragraph 3.13.2
- Receive Automatic Rekey - Paragraph 3.13.3
- Receive Manual Rekey - Paragraph 3.13.4
- Variable Generate - Paragraph 3.13.5
- Variable Update - Paragraph 3.13.6

NOTE

All OTAR operations must be performed in FIX mode.

3.13.1 Transmit Automatic Rekey (TX AK) VINSON, ANDVT, or KG-84

AK rekeying operations require the receiving radio be loaded with the same KEK used to send the rekey from the senders' NCD or DTD. The KEK must be distributed and loaded prior to using AK operations. After each AK OTAR operation, the KEK loaded in the receiving radio is updated automatically by the rekey process. The sending operator must then update the KEK in their DTD or NCD after confirmation of successful OTAR at the receiving radios. For variable update, refer to Paragraph 3.13.6.

For **CRYPTO TYPES VINSON** and **ANDVT**, follow the procedure in Paragraph 3.13.1.1.

For **CRYPTO TYPE KG84**, follow the procedure in Paragraph 3.13.1.2.

3.13.1.1 Transmit Automatic Rekey (TX AK) CRYPTO TYPES VINSON and ANDVT

Perform the following procedure for TX AK mode:

a. Determine TEK that is to be transmitted by AK OTAR. Load this TEK into the R/T to have available for communications checks after OTAR with receiving stations.

b. Notify receiving stations to prepare for AK OTAR. Direct them to use cooperative or non-cooperative method. Refer to Paragraph 3.13.3.1 and Paragraph 3.13.3.2. Verify the **CRYPTO TYPE** is either **VINSON** or **ANDVT**. Additionally, instruct them not to transmit again until they hear a communications check. If using cooperative method, tell receiving station to receive new key and store in an unused storage position.

c. Rotate the function switch to **RV**.

d. Select **TRANSMIT AK** mode; press **[ENT]**. **WAIT - CONFIGURING FOR TX AK** displays. **CONNECT NCD AND INITIATE AK** displays.

e. Connect KYX-15 (NCD) or AN/CYZ-10 (DTD) fill device to **J18 FILL** connector. **INITIATE AK** displays on KDU

f. On the fill device, select **AK** mode and the necessary keys, the TEK to be transmitted, and the KEK used by the receiving stations. Consult NCD or DTD operations manual if necessary.

g. Initiate the AK from the fill device. **TX AK IN PROGRESS** displays on the KDU, followed by **TX AK DONE PRESS ENT**.

h. Press **[ENT]** to return to the rekey/NCD operations menu.

i. Go back to **CT** operation.

j. Turn off DTD or NCD and disconnect it from the **FILL** connector.

k. Conduct a communications check to determine if receiving station has received and stored the new TEK.

l. If **OTAR** was successful, update **KEK** in **NCD** using the procedure described in Paragraph 3.13.6.

3.13.1.2 Transmit Automatic Rekey (TX AK) CRYPTO TYPES KG-84

Perform the following procedure for TX AK mode:

a. Connect Data Transmission Equipment (**DTE)** device to **DATA PORT (J3)**.

b. Determine TEK that is to be transmitted by AK OTAR. Load this TEK into the R/T to have available for communications checks with receiving stations of the OTAR.

c. Notify receiving stations to prepare for AK OTAR. Direct them to use cooperative or non-cooperative method. Refer to Paragraph 3.13.3.1 and Paragraph 3.13.3.2. Verify the **CRYPTO TYPE** is **KG-84**. Additionally, instruct them not to transmit again until they hear a communications check. If using cooperative method, tell receiving station to receive new key and store in an unused storage position.

d. Rotate the function switch to **RV**.

e. Select **TRANSMIT AK** mode; press **[ENT]**. **WAIT - CONFIGURING FOR TX AK** displays.

f. On the fill device, select **AK** mode and the necessary keys, the TEK to be transmitted, and the KEK used by the receiving stations. Consult NCD or DTD operations manual if necessary.

g. When **START TX, CONNECT NCD, AND INITIATE AK** displays, initiate transmission of data traffic from external **DTE** device.

NOTE

Do not attempt to use the handset **PTT** for this action. It should be done by asserting an **RTS** on the radio's **DATA PORT (J3)**.

NOTE

Do not remove **RTS** until **TX AK DONE STOP TX** is displayed.

h. Connect KYX-15 (NCD) or AN/CYZ-10 (DTD) fill device to **J18 FILL** connector.

i. Initiate the **AK** from the fill device. On the KDU**, TX AK IN PROGRESS** displays, then **TX AK DONE STOP TX**, followed by **TX AK DONE PRESS ENT**.

NOTE

Transmission of data will continue for several seconds after **DTE RTS** is removed. Remain in **RV** until **TX AK DONE PRESS ENT** is displayed.

j. Press **[ENT]** to return to the rekey/NCD operations menu.

k. Go back to **CT** operation.

l. Turn off DTD or NCD and disconnect it from the **FILL** connector.

m. Conduct a communications check to determine if receiving station has received and stored the new TEK.

n. If **OTAR** was successful, update **KEK** in **NCD** using the procedure described in Paragraph 3.13.6.

3.13.2 Transmit Manual Rekey (TX MK)

NOTE

The AN/PRC-150(V)(C) does not support TX MK operation in KG-84 mode.

MK process does not require use of KEK for VINSON and ANDVT modes.

Perform the following procedure for TX MK mode:

a. Determine TEK that is to be transmitted by MK OTAR. Load this TEK into the R/T to have available for communications checks with receiving stations of the OTAR.

b. Notify receiving stations to prepare for MK OTAR. Direct them to use cooperative method. Refer to Paragraph 3.13.3.1 and Paragraph 3.13.3.2. Additionally, instruct them to receive new key and store in an unused storage position and not to transmit again until they hear a communications check.

c. Rotate the function switch to **RV**.

d. Select **TRANSMIT MK** mode; press **[ENT]**. **WAIT - CONFIGURING FOR TX MK** displays.

e. If in VINSON or ANDVT mode, **CONNECT NCD AND INITIATE MK** displays.

f. Connect the KYX-15 (NCD) or AN/CYZ-10 DTD fill device.

g. On the fill device, select **MK** mode and the necessary key.

h. Initiate the MK from the fill device. **TX MK IN PROGRESS** displays, followed by **TX MK DONE PRESS ENT**.

i. Press **[ENT]** to return to the rekey/NCD operations menu.

j. Turn off DTD or NCD and disconnect it from the **FILL** connector.

k. Go back to CT operation and conduct a communications check to determine if receiving station has the new TEK.

3.13.3 Receive Automatic Rekey (RX AK)

The R/T supports cooperative and non-cooperative RX AK mode. AK rekeying mode requires receiving radio to have the same KEK as being used by transmitting NCD or DTD stations.

Use cooperative method to send TEKs to outstations as a routine update to already established nets, or to add capability to operate in additional nets.

NOTE

It is not recommended to use non-cooperative OTAR as a method to update COMSEC in multiple station nets as the possibility of having some stations not receive the update will result in the net being mixed with stations using two different keys. Use of non-cooperative OTAR methods should be limited to stations with untrained operators and as a means of corrective action for stations not able to change keys at end of scheduled crypto periods.

3.13.3.1 Cooperative RX AK OTAR

The AK OTAR process requires that the receiving R/T's have the same KEK that the sending station is using, and loaded for the COMSEC mode being rekeyed.

Perform the following procedure for cooperative RX AK OTAR mode:

a. Upon receiving notification that NCS will transmit an AK OTAR, acknowledge instructions and do not transmit again until procedure has completed and the NCS makes another communications check.

b. Rotate function switch to **RV**.

c. Select **RECEIVE AK** mode; press **[ENT]**. **WAIT - CONFIGURING FOR RX AK** displays followed by **WAIT TO RECEIVE AK**.

d. Wait for sending station to transmit AK OTAR. **RX AK IN PROGRESS** displays, followed by **RX AK OK**.

e. Select the desired TEK location (01 - 25). Use a unused storage position or you will lose your current key which may still be needed. **KEY STORE IN PROGRESS** displays, followed by **KEY STORE OK** if successful. If unsuccessful, coordinate with the sending station to repeat the process.

f. If the KEK is updated during the RX AK, the KEK update count displays.

g. Go back to CT operation. Wait for communications check from NCS. Acknowledge to NCS if process was successful and if KEK update was indicated.

3.13.3.2 Non-Cooperative RX AK

The AK OTAR process requires receiving R/T to have the correct KEK that the sending station is using and loaded for the COMSEC mode being rekeyed.

Perform the following procedure for non-cooperative RX AK mode:

a. Upon notification from the NCS that a AK OTAR is to be transmitted, acknowledge instructions. Do not transmit again until the process is complete and the NCS makes a communications check.

b. Wait to receive the AK.

NOTE

If the preset screen is visible, the encryption key field will blink during the key transfer process.

c. If the AK is received successfully, the new key overwrites the selected TEK.

d. Wait for communications check from sending station. The sending station will make the first check on the new TEK. If the OTAR process was unsuccessful, the communications check will be made on the old key and the process will need to be reattempted.

3.13.4 Receive Manual Rekey (RX MK)

The R/T supports both a cooperative and a non-cooperative RX MK mode in ANDVT and KG-84 COMSEC Modes. VINSON mode does not support non cooperative RX MK OTAR. KG-84 still requires the use of a KEK.

3.13.4.1 Cooperative RX MK OTAR

Perform the following procedure for cooperative RX MK OTAR mode:

a. Upon notification from the NCS that a AK OTAR is to be transmitted, acknowledge instructions. Do not transmit again until the process is complete and the NCS makes a communications check. Determine what TEK will be sent and when it will be put into use.

b. Rotate function switch to **RV**.

c. Select **RECEIVE MK** mode; press **[ENT]**. **WAIT - CONFIGURING FOR RX MK** displays, followed by **WAIT TO RECEIVE MK**.

d. Wait for sending station to transmit MK OTAR. **RX MK IN PROGRESS** displays, followed by **RX MK OK**.

e. Select the desired TEK location (01 - 25). **KEY STORE IN PROGRESS** displays, followed by **KEY STORE OK** if successful. If unsuccessful, coordinate with sending station to repeat process.

f. If the KEK is updated during the RX MK (KG-84 only), the KEK update count is indicated.

g. Go back to CT operation. Wait for communications check from sending station.

3.13.4.2 Non-Cooperative RX MK

VINSON nets do not support a non-cooperative RX MK operation.

Perform the following procedure for non-cooperative RX MK mode:

a. Upon notification from the NCS that a MK OTAR is to be transmitted, acknowledge instructions. Do not transmit again until the process is complete and the NCS makes a communications check.

b. Wait to receive the MK.

NOTE

If the preset screen is visible, the encryption key field will blink during the key transfer process.

c. If the MK is received successfully, the new key overwrites the currently selected TEK.

d. Wait for communications check from the sending station. The sending station will make the first check on the new TEK. If the OTAR process was unsuccessful, the communications check will be made on the old key and the process will need to be reattempted.

3.13.5 Variable Generate

Perform the following procedure for variable generate mode:

a. Rotate function switch to **RV**.

b. Select **VARIABLE GENERATE** mode; press **[ENT]**. **WAIT - CONFIGURING FOR VG** displays, followed by **INITIATE VG - PRESS ENT WHEN DONE**.

c. Connect the KYX-15 (NCD) or AN/CYZ-10 (DTD) fill device to **J18 FILL** connector.

d. On the fill device, select **VG** mode and the key storage location of the desired key variable. AN/CYZ-10 DTD using FILL program must be set to KYX-15 protocol to use the **VG** mode under the FILL program. On AN/CYZ-10 DTD using RDS application, go to the radio program, COMSEC menu, and follow menu instructions for **VG** menu item.

e. Initiate the **VG** from the fill device. Monitor the fill device for the status of the variable generate operation.

f. Press any key to return to the rekey/NCD operations menu.

g. Turn off AN/CYZ-10 (DTD) or KYX-15 (NCD) and disconnect it from the **J18 FILL** connector.

h. Go back to CT operation.

3.13.6 Variable Update

After AK OTAR operation has been verified at the receiving R/T, the KEK used by the net controller must be updated in the fill device to continue operations in AK OTAR.

Perform the following procedure for variable update mode:

a. Rotate function switch to **RV**.

b. Select **VARIABLE UPDATE**; press **[ENT]**. **WAIT - CONFIGURING FOR VU** displays, followed by **INITIATE VU - PRESS ENT WHEN DONE.**

c. Connect the KYX-15 (NCD) or AN/CYZ-10 (DTD) fill device to **J18 FILL** connector.

d. On the fill device, select **VU** mode and the key storage location of the desired key variable. AN/CYZ-10 DTD using FILL program must be set to KYX-15 protocol to use the VU mode under the FILL program. On AN/CYZ-10 DTD using RDS application, go to the radio program, COMSEC menu, and follow menu instructions for **VU** menu item.

e. Initiate the **VU** from the fill device. Monitor the fill device for the status of the variable update operation.

f. Press any key to return to the rekey/NCD operations menu.

g. Turn off DTD or NCD and disconnect it from the **J18 FILL** connector.

h. Go back to CT operation.

3.13.7 ZEROIZING COMSEC

Zeroizing COMSEC is performed by placing the front panel function switch to the **Z** position. After Zeroizing is complete, cycle power off, then on. Refer to Paragraph 3.4.13 for detailed instruction. When R/T is zeroized, the radio presets and all other configuration programming is deleted.

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CHAPTER 4

GENERAL RADIO PROGRAMMING

4.1 CONFIGURATION PROGRAMMING

Configuration programming is the first step in programming the Receiver/Transmitter (R/T). The following series of menu selections allows the R/T to be configured based on operational missions. The settings are global and are not channel specific. See Figure 3-6 for an example of the programming window.

NOTE

Programming the R/T from the front panel, while possible, can be difficult and time consuming. It is strongly suggested to use the RF-6550H High-Frequency (HF) Radio Programming Application (HFRPA, RPA), part number 10518-8564-01. For information on setting up and programming the R/T, refer to RF-6550H HF Radio Programming Application Software User's Guide, Publication Number: 10518-4230-01.

NOTE

Entering programming mode places the radio in an offline state. Communications are not possible while the radio is being programmed.

Perform the following procedure to display the program menu and place the R/T in program mode:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Figure 4-1 shows the program menu, and identifies what areas of radio programming are accessed from each menu.

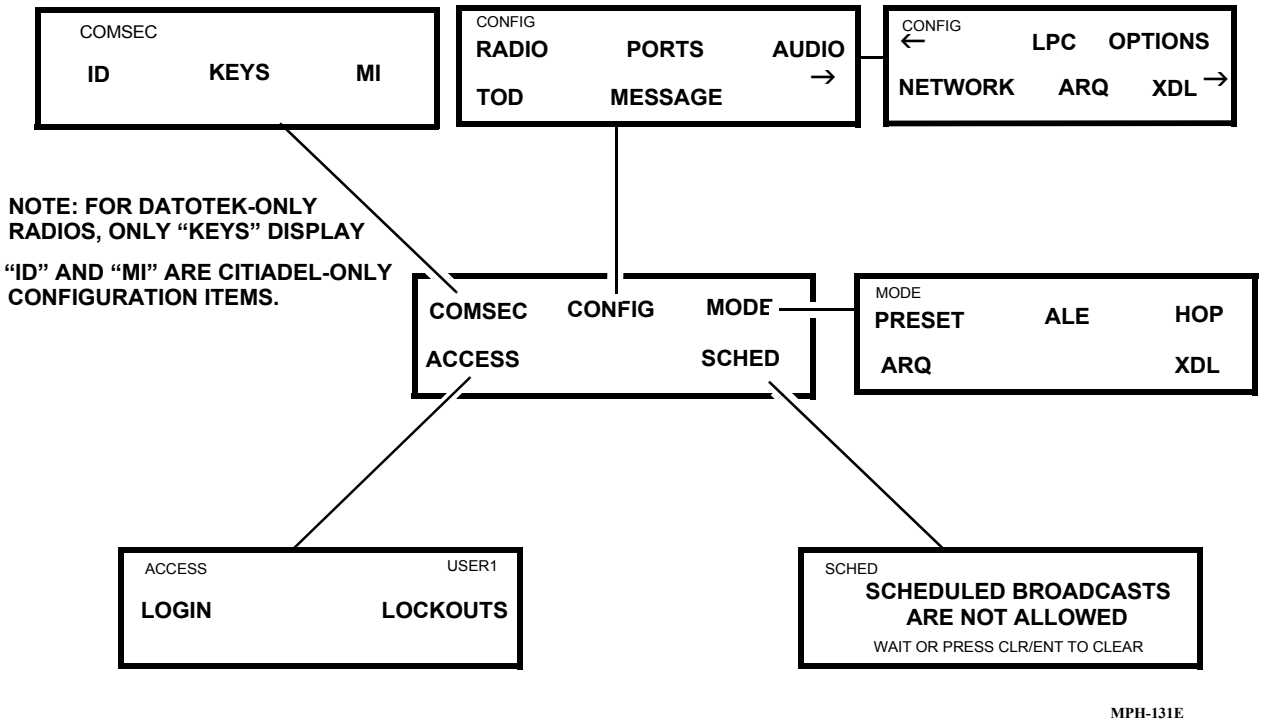

Figure 4-1. Programming Menus

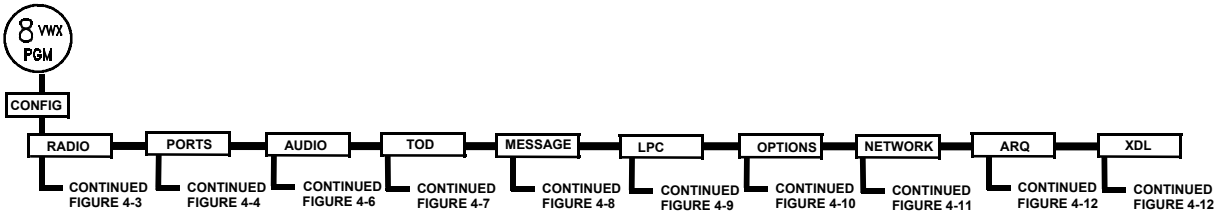

Figure 4-2. Configuration Program Tree

4.1.1 Program Radio Configuration Settings

To program the radio configuration, see Figure 4-3 and refer toTable 4-1 to perform the following procedures:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **RADIO** and press **[ENT]**.

d. Use the ◀▶ ▲▼ keys to scroll through the available selections followed by **[ENT]** for the following radio settings.

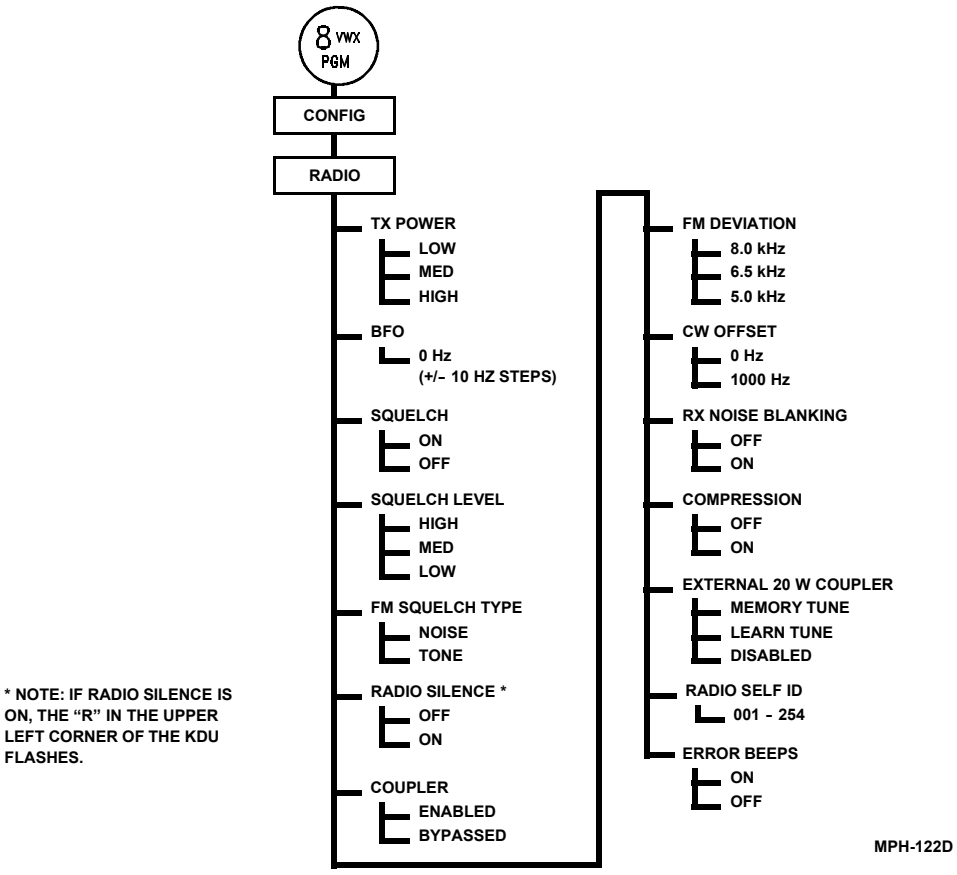

Figure 4-3. Configuration Radio Program Tree

Table 4-1. R/T Configuration Settings

RADIO		
Menu Item	**Options**	**Remarks**
TX POWER	LOW MEDIUM HIGH	**LOW**: 1 watt - recommended when signal is optimal **MEDIUM**: 5 watts - as signal quality decreases, increase Transmit (TX) power **HIGH**: 20 watts, 10 watts only in Frequency Modulation (FM) mode
BFO	**-4000 to +4000 Hz** (in 10 Hz steps)	Allows the operator to make minor adjustments to the current channel frequency without reprogramming the channel.
SQUELCH	ON OFF	**ON**: Mutes the receiver unless a signal is received. **OFF**: Allows all Receive (RX) signals to be monitored.
SQUELCH LEVEL	HIGH MEDIUM LOW	Applies to Analog Voice only, not relevant to digital voice. **HIGH**: Blocks out weaker RX signals allowing only stronger transmissions to be received. **MEDIUM** and **LOW**: Allows weaker signals through.
FM SQUELCH TYPE	NOISE TONE	**NOISE**: Eliminates or blocks out any signal below predetermined level. **TONE**: All RX signals will be blocked unless accompanied by a 150 Hz tone; all transmissions will be sent with a 150 Hz tone.

Table 4-1. R/T Configuration Settings (Continued)

RADIO		
Menu Item	**Options**	**Remarks**
RADIO SILENCE	OFF ON	**OFF**: Radio may transmit normally. **ON**: Radio will not transmit automatically in response to Link Quality Analysis (LQA) exchange calls, Automatic Link Establishment (ALE) calls, HOP autorespond, etc. Radio silence does not prevent transmissions that are manually initiated by the operator.
COUPLER	ENABLED BYPASSED	**ENABLED**: Signal goes through internal coupler only. **BYPASSED**: Direct transmission to nonresonant broadband antennas. NOTE: The internal coupler is bypassed for both TX and RX signals. If an RF-382 external coupler is used, BYPASSED only bypasses the coupler for RX signals, and the coupler is not bypassed in TX modes.
FM DEVIATION	**8.0 kHz, 6.5 kHz, 5. 0kHz**	Depending on receiving radio, deviation is selected. 8 kHz is the standard tactical deviation.
CW OFFSET	0 Hz 1000 Hz	Offsets the frequency **0 Hz** - Standard Continuous Wave (CW) **1000 Hz** - Modulated Continuous Wave (MCW) with 1000 Hz tone

Table 4-1. R/T Configuration Settings (Continued)

RADIO		
Menu Item	**Options**	**Remarks**
RX NOISE BLANKING	OFF ON	The RX noise blanking is used to filter unwanted signals that are interfering with the intended receive signal. May affect weak signals.
COMPRESSION	OFF ON	Removes the peaks from the transmit audio signal while retaining audio quality. This provides for a higher average power to be transmitted. Turn OFF for any type of external analog data device, such as the KL-43 or Digital Message Device Group (DMDG) configured for audio mode.
EXTERNAL 20 W COUPLER	MEMORY TUNE LEARN TUNE DISABLED	**LEARN TUNE**: Initial tuning the first time the coupler is tuned to a frequency. **MEMORY TUNE**: Once tuning has been learned, select this option for faster operation.
RADIO SELF ID	1 - 254	Gives radio a unique ID number, required for radio modem protocols such as High- or Low-Speed Data Link (XDL) and Automatic Retry reQuest (ARQ).
ERROR BEEPS	ON OFF	**ON**: Enables radio to beep for invalid key presses. **OFF**: Silences Error Beeps (recommended for tactical operating mode).

4.1.2 Program Data Port Settings

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

To program the R/T's ports, see Figure 4-4 and refer to Table 4-2 and perform the following procedure:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **PORTS** and press **[ENT]**.

d. Use the ◀▶ keys to select **DATA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the available data port settings followed by **[ENT]** for the following settings and options.

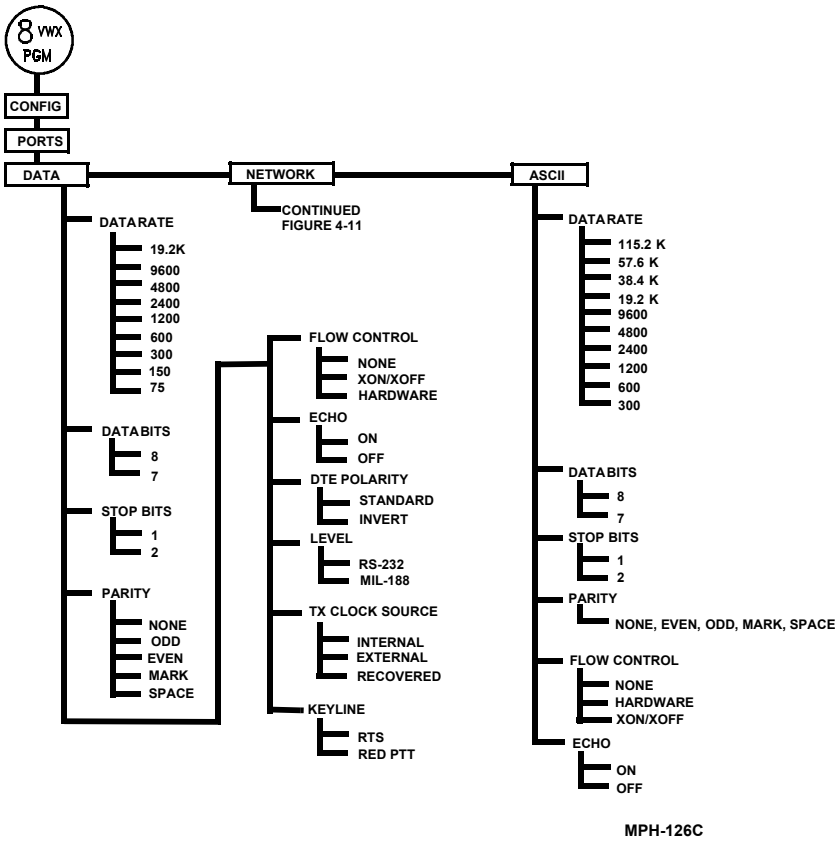

Figure 4-4. Configuration Port Program Tree

Table 4-2. Data Port Settings

DATA		
Menu Item	**Options**	**Remarks**
DATA RATE	75, 150, 300, 600, 1200, 2400, 4800, 9600, or 19.2 k	DTE rate for asynchronous modem transfers. Match port speed to DTE speed. (ASYNC modem preset)
DATA BITS	8 7	The number of bits used to make up a transmitted character. Match DTE setting. (ASYNC modem preset)
STOP BITS	1 2	Number of stop bits per character.
PARITY	NONE SPACE MARK ODD EVEN	An error checking scheme used during data transfer, in which bits in a byte are used to determine the parity.
FLOW CONTROL	NONE XON/XOFF HARDWARE	A method of controlling the flow of data into the radio modem from the DTE.
ECHO	ON OFF	Input will be echoed back to the DTE.
DTE POLARITY	STANDARD INVERT	DTE data polarity invert means sense of the data bits are inverted when they enter and leave the port. This is used for interoperability with external equipment which may be configured for inverted polarity.

Table 4-2. Data Port Settings (Continued)

DATA		
Menu Item	**Options**	**Remarks**
LEVEL	RS-232 MIL-188	Select one that matches the type of DTE interface format.
TX CLOCK SOURCE	INTERNAL EXTERNAL RECOVERED	**EXTERNAL:** Outside source for synchronization. **INTERNAL:** Uses internal clock for synchronization. **RECOVERED:** Clock is derived from digital data stream. **NOTE:** Sync data operation parameter default is INTERNAL.
KEYLINE	RED PTT RTS	Specifies the source of the keyline signal.

4.1.3 Attaching a PC to the Data Port

Programming the R/T from the front panel, while possible, can be difficult and time consuming. It is strongly suggested to use the RF-6550H HF Radio Programming Application (RPA), part number 10518-8564-01. For information on setting up and programming the R/T, refer to RF-6550H HF Radio Programming Application Software User's Guide, Publication Number: 10518-4230-01.

NOTE

The RPA uses the Point-to-Point Protocol (PPP) feature of the J3 DATA PORT.

To connect the R/T to a PC running the RPA, follow Figure 4-5 and perform this procedure:

a. Rotate **FUNCTION SWITCH** to **PT/CT**.

b. Follow procedure in Paragraph 4.1.2 and Paragraph 4.2.1.2 to configure the **PPP PORT** to match the serial port of the PC.

c. Power the R/T **OFF**.

d. Connect the round end of the **PPP Data Cable Assembly** (10535-0775-A006) to the **DATA** port (**J3**) on the R/T.

e. Connect the other end of the cable to the appropriate serial port on the PC.

f. Rotate **FUNCTION SWITCH** to **PT**.

The R/T is now ready to be programmed by the PC using the Harris RPA.

NOTE

There are actually two data ports on the J3 connector: a synch/async DTE port and an async PPP remote port. Interconnect to the Harris WMT or Tactical Chat applications use the PPP port of the connector.

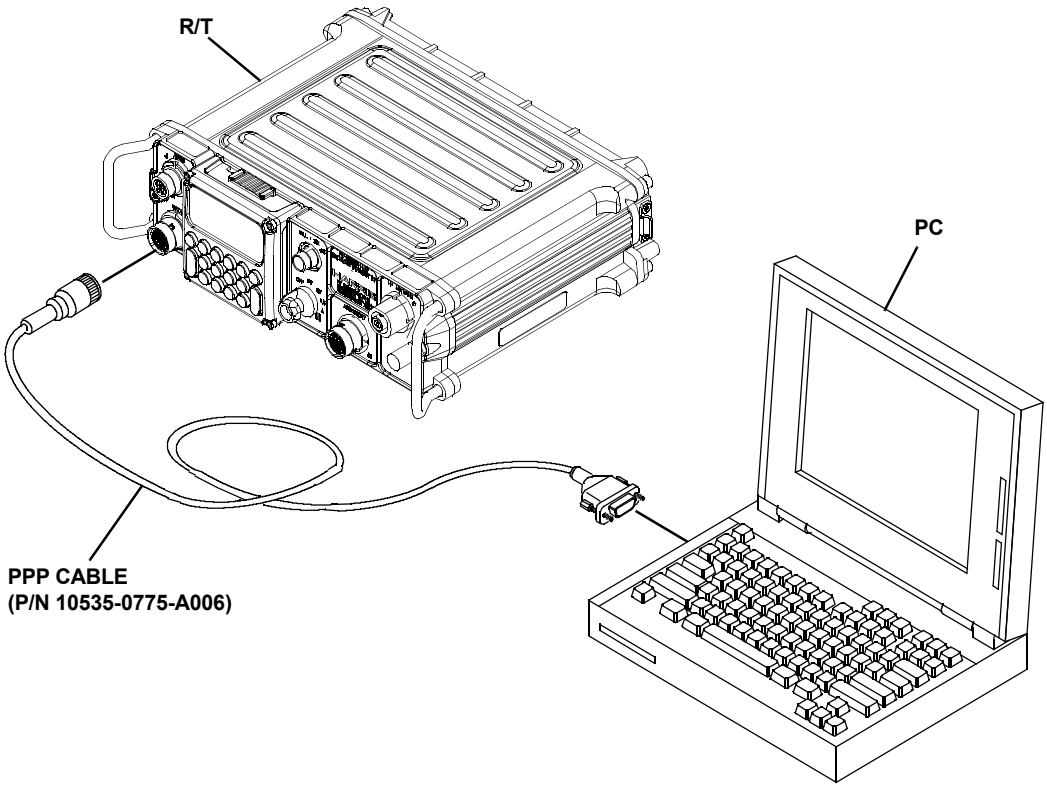

Figure 4-5. R/T PPP Connection to PC

4.1.4 Audio Muting

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

See Figure 4-6 and refer to Table 4-3. Perform the following procedure to view the audio programming tree:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **AUDIO** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the **AUX AUDIO** options (**UNMUTE, MUTE**) and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **SIDETONE AUDIO** options (**UNMUTE, MUTE**) and press **[ENT]**.

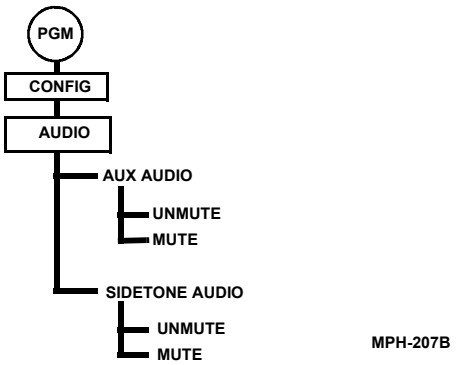

Figure 4-6. Configuration Audio Program Tree

Table 4-3. Audio Configuration Programming

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

4.1.5 Set Radio Time-Of-Day

The R/T Time-of-Day (TOD) is used for operation in HOP and Third Generation (3G) modes as well as for scheduled LQA. Thus, the R/T TOD must be set before attempting to use HOP, 3G or scheduled LQA's.

4.1.5.1 Automated Global Positioning System (GPS) TOD

4.1.5.1.1 External Precision Lightweight (GPS) Receiver PLGR

Refer to Paragraph 3.10.2.1.

4.1.5.2 Manual TOD Setting

HOP operation requires the TOD to be set to within +/- 90 seconds of actual HOP net time in order to transmit or receive TOD syncs with other radios. 3G operation requires the TOD be set to within +/- 7 minutes of the actual 3G net time, to allow the radio to receive 3G sync by means of a sync broadcast or sync request.

NOTE

It is strongly suggested that all radios maintain and use Coordinated Universal Time (UTC, GMT or Zulu) for all operations.

See Figure 4-7 and refer to Table 4-4. Perform the following procedure to set R/T TOD:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◆▶ keys to select **TOD** and press **[ENT]**.

d. Use the ▲▼ keys to select "+" or "-" offset and press **[ENT]**.

e. Press numeric keys to enter the correct **UTC OFFSET** value and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **TIME FORMAT** (**12-HR** or **24-HR**), and press **[ENT]**.

g. Press numeric keys to enter **NEW TOD** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the **DATE FORMAT** options (**MM-DD-YY, DD-MM-YY, YYYY-MM-DD, ZULU**) and press **[ENT]**.

i. Press numeric keys to enter **NEW DATE** and press **[ENT]**.

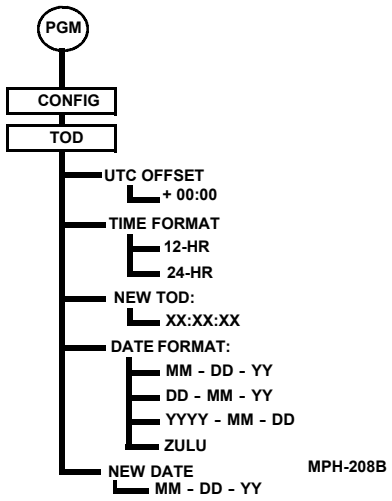

Figure 4-7. Configuration TOD Program Tree

Table 4-4. Time-Of-Day

TOD		
Menu Item	**Options**	**Remarks**
UTC OFFSET	+00:00	Offsets the radio's time from GMT/ZULU time.
TIME FORMAT	12-HR 24-HR	Configure the format that the radio uses to display time-of-day.
NEW TOD	XX:XX:XX	Set the Time-of-Day.
DATE FORMAT	MM-DD-YY DD-MM-YY YYYY-MM-DD ZULU	Set the preferred date format.
NEW DATE	MM-DD-YY	Set the date. The display and date entry varies based on the **DATE FORMAT** selected.

NOTE

If a PLGR is attached and is operational, it may automatically acquire the proper time as the user is entering the date or time. If the GPS acquires the satellites while the time is being manually entered, then after the users presses the [ENT] key, the display will show **ERROR: TIME SETTING CONTROLLED BY GPS** for a few seconds. If it acquires while the date is being entered, the display will show **ERROR: DATE SETTING CONTROLLED BY GPS** for a few seconds.

4.1.6 Message Configuration, Routing Incoming Data

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

See Figure 4-8 and refer to Table 4-5. Perform the following procedure to specify the incoming data routing location:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **MESSAGE** and press **[ENT]**. See Figure 4-1.

d. Use the ▲▼ keys to scroll through the **ROUTE MODEM DATA TO** options, (**DTE PORT, RDP, FILE**) and press **[ENT]**. The **SOURCE ADDRESS** entry screen appears.

e. Enter source address of message and press **[ENT]**. The **DESTINATION ADDRESS** entry screen appears.

f. Enter the destination address of the message and press **[ENT]**. The **AUTO TX TYPE** selection screen appears.

g. Use the ▲▼ keys to scroll through the **AUTO TX TYPE** options (**ARQ, NON-ARW**) and press **[ENT]**.

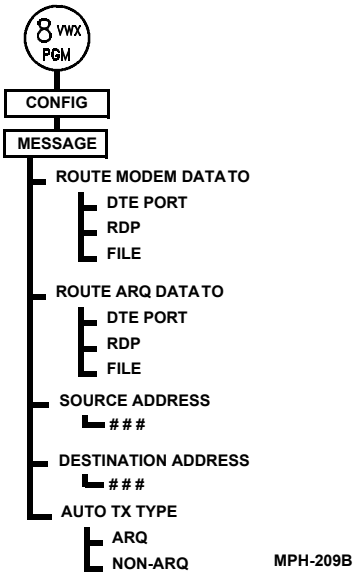

Figure 4-8. Message Program Tree

Table 4-5. Message Programming, Routing Incoming Data Settings

MESSAGE		
Menu Item	**Options**	**Remarks**
ROUTE MODEM DATA TO	DTE PORT RDP FILE	**DTE PORT** - located on the R/T's front panel DATA connector. This port is used to pass data between the R/T and a data terminal using an RS-232 serial data connection. **RDP** - located on the R/T's front panel DATA connector. This port is used to pass data between the R/T and a Harris data terminal, such as the Harris WMT or TacChat. Uses PPP connection at 19.2 kbps to 115.2 kbps. **FILE** - a file in the R/T's internal file system. An external device must be used to access the files. The data stored in the R/T is lost when the radio is powered OFF.
ROUTE ARQ DATA TO	DTE PORT RDP FILE	Same as above.
SOURCE ADDRESS	XXX	Source address of message to be sent.
DESTINATION ADDRESS	XXX	Ultimate destination of the message.
AUTO TX TYPE	ARQ NON-ARQ	Select automatic error detection and correction.

4.1.7 LPC Noise Cancellation

See Figure 4-9 and refer to Table 4-6. Perform the following procedure to configure LPC noise cancellation:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **LPC** and press **[ENT]**. See Figure 4-9.

d. Use the ▲▼ keys to scroll through the **NOISE CANCELLATION** options **(ON, OFF)** and press **[ENT]**.

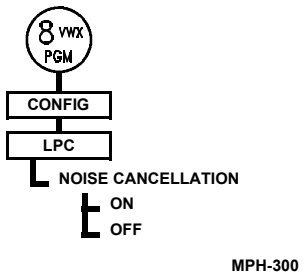

Figure 4-9. LPC Program Tree

Table 4-6. LPC Noise Cancellation

LPC		
Menu Item	**Options**	**Remarks**
NOISE CANCELLATION	ON OFF	An algorithm used on transmit audio that reduces noise (for example, electronic ignition noise) prior to sending digital voice. **NOTE**: This is only supported for DV-600 operation.

4.1.8 Prepost Configuration Options

See Figure 4-10 and refer to Table 4-7. Perform the following procedure to configure prepost options:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **OPTIONS** and press **[ENT]**. See Figure 4-10.

d. Use the ▲▼ keys to scroll through the **EXT POSTSELECTOR** options (**ENABLED, DISABLED**) and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **EXT RX FILTERS** options (**ENABLE DURING SCAN, DISABLE DURING SCAN**) and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **EXT SCAN RATE** options (**FORCE SLOW SCAN, USE ALE SCAN RATE**) and press **[ENT]**.

NOTE

The above two menu choices only appear if the **EXT PRESELECTOR** menu choice is set to **ENABLED**.

g. Use the ▲▼ keys to scroll through the **PREPOST ANTENNA** options (**SINGLE RX/TX, SEPARATE RX/TX**) and press **[ENT]**.

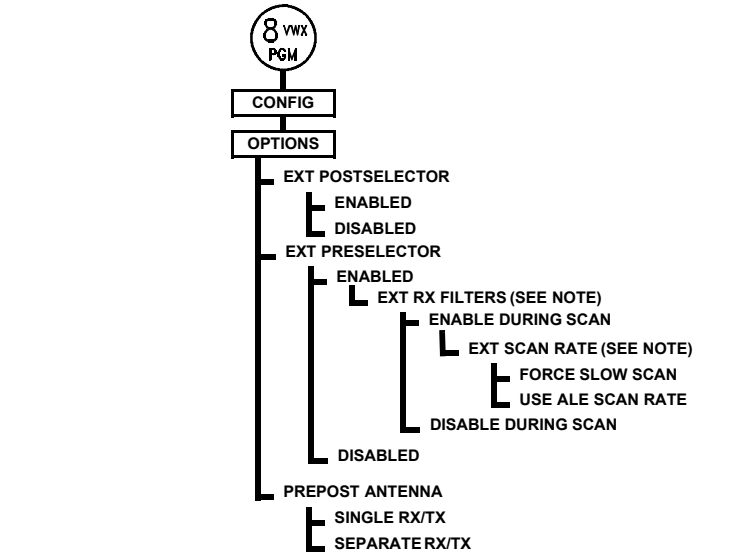

Figure 4-10. Prepost Options Program Tree

Table 4-7. Prepost Settings

OPTIONS		
Menu Item	**Options**	**Remarks**
EXT POSTSELECTOR	ENABLED DISABLED	If TX signal path external postselector is being used.
EXT PRESELECTOR	ENABLED DISABLED	If RX signal path external preselector is being used.
EXT RX FILTERS	ENABLE DURING SCAN DISABLE DURING SCAN	RX filters enabled only during ALE/SSB scan. RX filters disabled only during ALE/SSB scan.
EXT SCAN RATE	FORCE SLOW SCAN USE ALE SCAN RATE	When external prepostselector is connected, the radio is forced to scan at two channels per second. The external prepostselector will scan at the radio's ALE scan rate.
PREPOST ANTENNA	SINGLE RX/TX SEPARATE RX/TX	Configures the pre/postselector for either TX and RX through the same or different antennas.

4.2 NETWORK INTERNET PROTOCOL (IP) PARAMETER PROGRAMMING

Similar to 3G Mode network programming, the operator is strongly encouraged to use the RF-6550H HFRPA for programming IP networking parameters. However, before the RPA can communicate with the R/T, the R/T IP address must be set. It is suggested that only the R/T IP address be set from the front panel and all other programming be done from the RPA.

4.2.1 Setting R/T Ethernet and PPP IP Address

4.2.1.1 Reading or Setting the Ethernet IP Address

NOTE

The Ethernet port of the **TYPE 1** radio is disabled in normal operational modes.

To read or set the Ethernet IP address of the R/T:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◆▶ keys to select **NETWORK** and press **[ENT]**.

d. Use the ◆▶ keys to select **INTERFACE** and press **[ENT]**.

e. Use the ◆▶ keys to select **ETHERNET** and press **[ENT]**.

f. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

g. Use the ◆▶ keys to select **ENABLE ETHERNET PORT** and press **[ENT]**.

h. Use the ▲▼ keys to select **YES** and press **[ENT]**. The **ADDRESS SOURCE** screen appears.

i. Use the ▲▼ keys to select **AUTO** or **MANUAL and** press **[ENT]**. If AUTO is selected, the unalterable hardware address programmed into the R/T when it was manufactured is displayed. Pressing **[CLR]** moves back up the menu tree. If MANUAL is selected, you must enter the **IP ADDRESS** entry screen appears.

j. If no change is required, pressing **[CLR]** repeatedly moves back up the programming tree.

k. To change the displayed IP address, use the ◀▶ keys to select the digit to be changed.

l. Press the number key of the new number.

m. Continue until the new IP address is complete.

n. Pressing **[CLR]** repeatedly moves back up the programming tree.

o. To view the IP programming tree, see Figure 4-11 and refer to Table 4-8 and Table 4-9. Continue the same sequence to configure the **SUBNET MASK** and **GATEWAY ADDRESS**.

4.2.1.2 Reading or Setting the PPP IP Address

To read or set the PPP IP address of the R/T before you program it with the RPA:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **NETWORK** and press **[ENT]**.

d. Use the ◀▶ keys to select **INTERFACE** and press **[ENT]**.

e. Use the ◀▶ keys to select **PPP** and press **[ENT]**.

f. Use the ◀▶ keys to select **PPP ADDR** and press **[ENT]**. The current IP address for the R/T displays.

g. If no change is required, pressing **[CLR]** repeatedly moves back up the programming tree.

h. To change the displayed IP address, use the ◀▶ keys to select the digit to be changed.

i. Press the number key of the new number. The new number is entered and the cursor position moves to the right.

j. Continue until the new IP address is complete.

k. Press **[ENT]** to continue programming, pressing **[CLR]** repeatedly moves back up the programming tree.

l. To view the IP programming tree, see Figure 4-11 and refer to Table 4-8 and Table 4-10. Continue the same sequence to configure the **PEER IP ADDRESS**, **SUBNET MASK** and **GATEWAY ADDRESS**

4.2.2 Programming Other IP Parameters

NOTE

Due to the complexity of configuring IP parameters, it is strongly encouraged that only the R/T PPP (or Ethernet) IP address, subnet mask, and gateway address be set from the front panel and all other programming be done from the RPA.

IP parameters are in three sections: Interface (Ethernet, Paragraph 4.2.1.1; PPP, Paragraph 4.2.1.2; Wireless, Paragraph 4.2.2.1), Protocol (SNMP, Paragraph 4.2.2.2); and Routes (Individual and Global, Paragraph 4.2.2.3).

To access these menus:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **NETWORK** and press **[ENT]**.

d. Use the ◆▶ keys to select **INTERFACE, PROTOCOL, ROUTES** or **TELEPHONE** and press **[ENT]**. To view the IP programming tree, see Figure 4-11 and refer to Table 4-8, Table 4-9, Table 4-10, Table 4-11, Table 4-12 and Table 4-13.

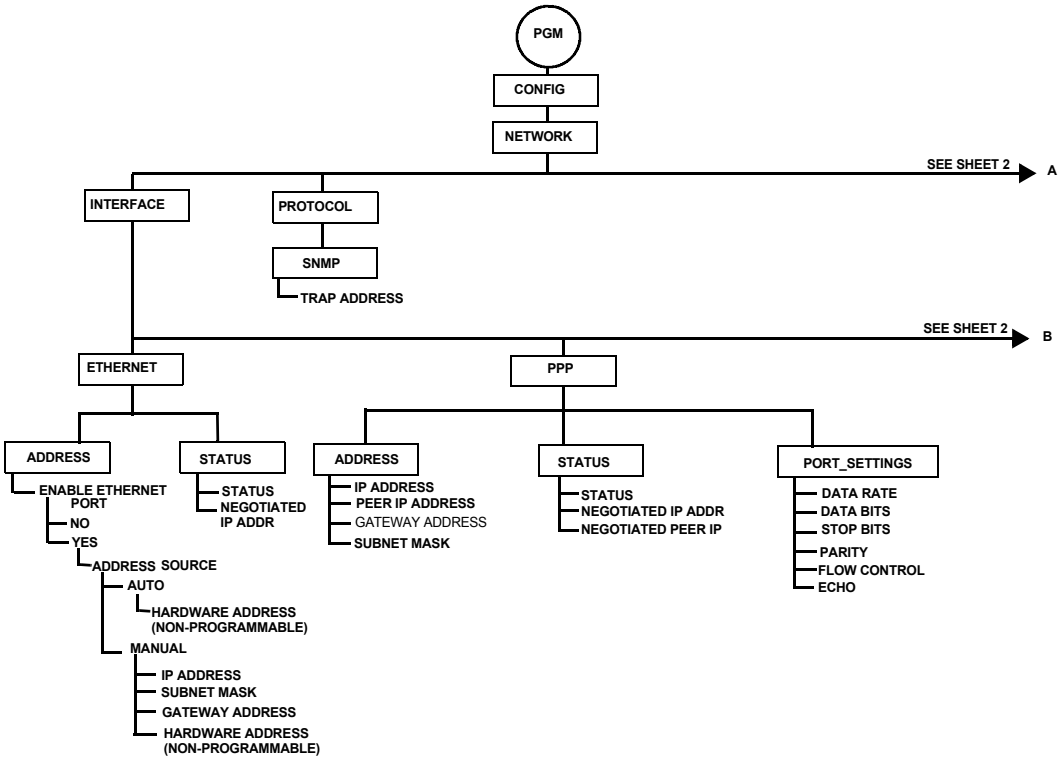

Figure 4-11. Internet Protocol (IP) Programming Tree (Sheet 1 of 2)

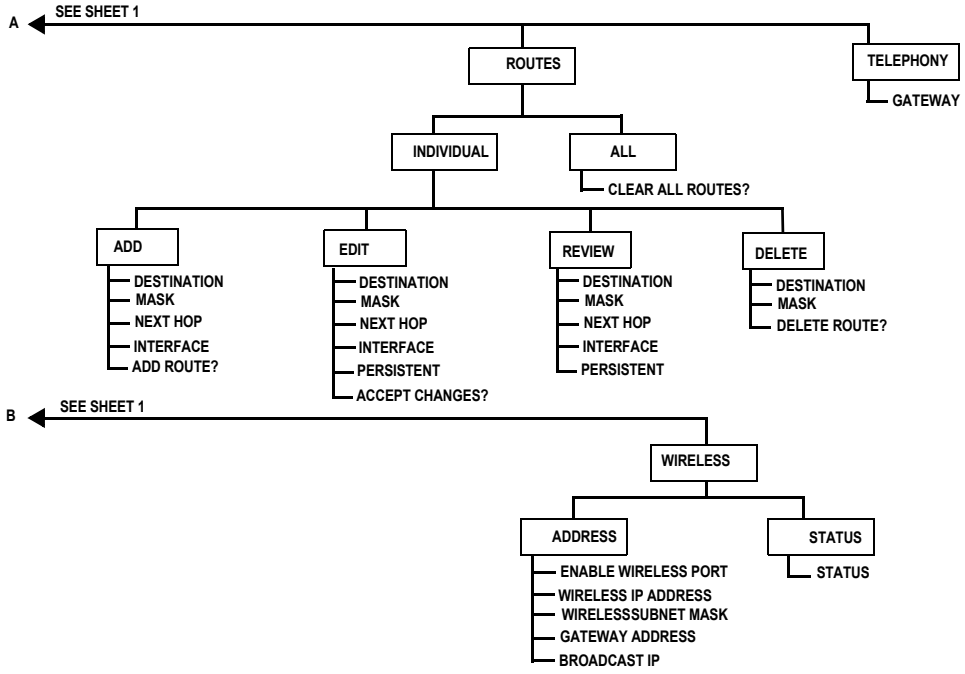

Figure 4-11. Internet Protocol (IP) Programming Tree (Sheet 2 of 2)

Table 4-8. Top-Level IP Menu

Menu Item	Options	Remarks
CONFIG	NETWORK	The setup of parameters that support using the R/T with standard computer networks.
NETWORK	INTERFACE PROTOCOL ROUTES	- The R/T port to be configured - The communications protocol the network uses - Setup of network communications pathways
INTERFACE	ETHERNET PPP WIRELESS	Select the desired interface whose parameters you want to view or program.
PROTOCOL	SNMP DNS	- Simple Network Management Protocol - Domain Name Server (Future Use)
ROUTES	ALL INDIVIDUAL	

Table 4-9. Ethernet Interface Parameters

Menu Item	Options	Remarks
INTERFACE	ETHERNET PPP WIRELESS	- Network setup of hardware ethernet ethernet interface - Network setup of PPP data interface - Setup for over-the-air networking
ETHERNET	CONFIG STATUS	Select CONFIGURE to program selected interface.
CONFIG	ENABLE ADDRESS SOURCE IP ADDRESS SUBNET MASK GATEWAY ADDRESS HARDWARE ADDR	- Ethernet port ENABLE/DISABLE - Manual - Operator programs address (addr) - Automatic - Addr comes from DHCP server - User assignable to this radio - Applied to IP Addr to extend network addr. - Recipient of unrouted packets - Factory programmed, unique addr for a given radio
STATUS	STATUS NEGOTIATED ADDR	

Table 4-10. PPP Interface Parameters

Menu Item	Options	Remarks
INTERFACE	ETHERNET PPP WIRELESS	PPP Port
PPP	CONFIG STATUS PORT SETTINGS	
ADDRESS	IP ADDRESS PEER IP ADDRESS SUBNET MASK GATEWAY ADDRESS	These parameters are setup to configure the R/T PPP interface. Parameter values must also be programmed into whatever PC-based software application (e.g., RPA) is communicating with the R/T over this interface.
STATUS	STATUS NEGOTIATED IP ADDR NEGOTIATED PEER IP	ENABLED-ONLINE, ENABLED-OFFLINE, DISABLED, UNKNOWN IP Address for this radio IP address of the computer (peer) communication with the R/T
PORT SETTINGS	DATA RATE DATA BITS STOP BITS PARITY FLOW CONTROL ECHO	119.2 k, 38.4 k, 57.6 k or 115.2 k 8 bits (not programmable) 1 bit (not programmable) NONE (not programmable) NONE (not programmable) OFF (not programmable)

4.2.2.1 Wireless IP Interface Parameters

To read or set the Wireless IP parameters of the R/T:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◆▶ keys to select **NETWORK** and press **[ENT]**.

d. Use the ◆▶ keys to select **INTERFACE** and press **[ENT]**.

e. Use the ◆▶ keys to select **WIRELESS** and press **[ENT]**.

f. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

g. Use the ◆▶ keys to select **ENABLE WIRELESS PORT** and press **[ENT]**

h. Use the ▲▼ keys to select **YES** and press **[ENT]**.

i. Use the ◆▶ keys to select desired parameters and press **[ENT]**. The current value for the parameter displays.

j. If no change is required, pressing **[CLR]** repeatedly moves back up the programming tree.

k. To change the current parameter, use the ◆▶ keys to select the digit to be changed.

l. Press the number key of the new number.

m. Continue until the new parameter is complete.

n. Pressing **[CLR]** repeatedly moves back up the programming tree.

o. To view the IP programming tree, see Figure 4-11 and refer to Table 4-8 and Table 4-11. Continue programming the **SUBNET MASK, GATEWAY ADDRESS** and **BROADCAST IP**.

Table 4-11. Wireless IP Interface Parameters

Menu Item	Options	Remarks
INTERFACE	ETHERNET PPP WIRELESS	- Select wireless IP for setup parameters of OTA networking.
WIRELESS	CONFIG STATUS	- Select CONFIG to view or edit setup parameters.
CONFIG	ENABLE ADDRESS SOURCE IP ADDRESS SUBNET MASK GATEWAY ADDRESS BROADCAST IP	Enable (Yes/No) the wireless port Relevant IP parameters of the R/T wireless signalling, represented in the outgoing RF modulated signal over the J7 antenna port.
STATUS	STATUS	

4.2.2.2 IP Protocol Parameters

To read or set the Protocol IP parameter of the R/T:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◆▶ keys to select **NETWORK** and press **[ENT]**.

d. Use the ◆▶ keys to select **PROTCOL** and press **[ENT]**.

e. Use the ◆▶ keys to select **SNMP** and press **[ENT]**. The **TRAP ADDRESS** entry screen appears.

f. Use the ◆▶ keys to select **TRAP ADDRESS** and press **[ENT]**. The current value for the TRAP ADDRESS displays.

g. If no change is required, pressing **[CLR]** repeatedly moves back up the programming tree.

h. To change the current parameter, use the ◆▶ keys to select the digit to be changed.

i. Press the number key of the new number.

j. Continue until the new TRAP ADDRESS is complete.

k. Pressing **[CLR]** repeatedly moves back up the programming tree.

l. See Figure 4-11 to view the IP programming tree and refer to Table 4-8 and Table 4-12.

Table 4-12. IP Protocol Parameters

Menu Item	Options	Remarks
PROTOCOL	SNMP	- Simple Network Management Protocol
SNMP	TRAP ADDRESS	- Where traps are set (or 0.0.0.0 to disable)

4.2.2.3 IP ROUTES Parameters

To support IP message routing, the R/T maintains a programmable routing table. To read or set the ROUTES IP parameter of the R/T:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **NETWORK** and press **[ENT]**.

d. Use the ◀▶ keys to select **ROUTES** and press **[ENT]**.

e. Use the ◀▶ keys to select **INDIVIDUAL** or **ALL** and press **[ENT]**.

NOTE

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

f. Use the ◀▶ keys to select **ADD, EDIT, REVIEW** or **DELETE** an individual entry and press **[ENT]**.

g. Use the ▲▼ keys to select **DESTINATION, MASK, NEXT HOP, INTERFACE, ADD ROUTE** (under ADD)**, PERSISTANCE** (EDIT or REVIEW)**, ACCEPT CHANGES** (EDIT)**,** or **DELETE** (DELETE) an individual entry and press **[ENT]**.

h. The first destination entry in the network matrix displays.

i. If no change is required, pressing **[CLR]** repeatedly moves back up the programming tree.

j. To change the current parameter, use the ◀▶ keys to select the digit to be changed.

k. Press the number key of the new number.

l. Continue until the new setting is complete.

m. Pressing **[CLR]** repeatedly moves back up the programming tree.

n. To view the IP programming tree, see Figure 4-11 and refer to Table 4-8 and Table 4-13.

Table 4-13. IP ROUTES Parameters

Menu Item	Options	Remarks
ROUTES	ALL INDIVIDUAL	
ALL	CLEAR ALL ROUTES	
INDIVIDUAL	ADD EDIT REVIEW DELETE	
ADD	DESTINATION MASK NEXT HOP INTERFACE ADD ROUTE?	- These three are in the form XXX.XXX.XXX.XXX - Ethernet, PPP, Wireless (routing service) - No routing information will be saved until **[YES]** and **[ENT]** are selected.

Table 4-13. IP ROUTES Parameters (Continued)

Menu Item	Options	Remarks
EDIT	DESTINATION MASK NEXT HOP INTERFACE PERSISTENT ACCEPT CHANGES?	- These three are in the form XXX.XXX.XXX.XXX - Ethernet, PPP, Wireless - YES is always selected
REVIEW	DESTINATION MASK NEXT HOP INTERFACE PERSISTENT	- Review IP routes that have been programmed.
DELETE	DESTINATION MASK DELETE ROUTE?	- A status message will be displayed if an error occurs while deleting a route.

4.2.3 Program ARQ Parameters

To program ARQ parameters, see Figure 4-12, refer to Table 4-14, and perform the following procedure:

NOTE

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

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◆▶ keys to select **ARQ** and press **[ENT]**.

d. Use the ◆▶ keys to select **ARQ INTERLEAVE** and press **[ENT]**.

e. Use the ▲▼ keys to select the interleave option (**LONG, SHORT)** and press **[ENT]**. The **ARQ BAUD** selection menu appears.

f. Use the ▲▼ keys to scroll through the available BAUD rate options (**AUTO, 2400, 1200, 600, 300, 150, 75)** and press **[ENT]**. The **ARQ MODE** selection menu appears.

g. Use the ▲▼ keys to scroll through the available MODES (**NON-ACKNOWLEDGED, ACKNOWLEDGED)** and press **[ENT]**.

h. Press **[CLR]** to return to **CONFIG** menu.

Table 4-14. ARQ Menu Options

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

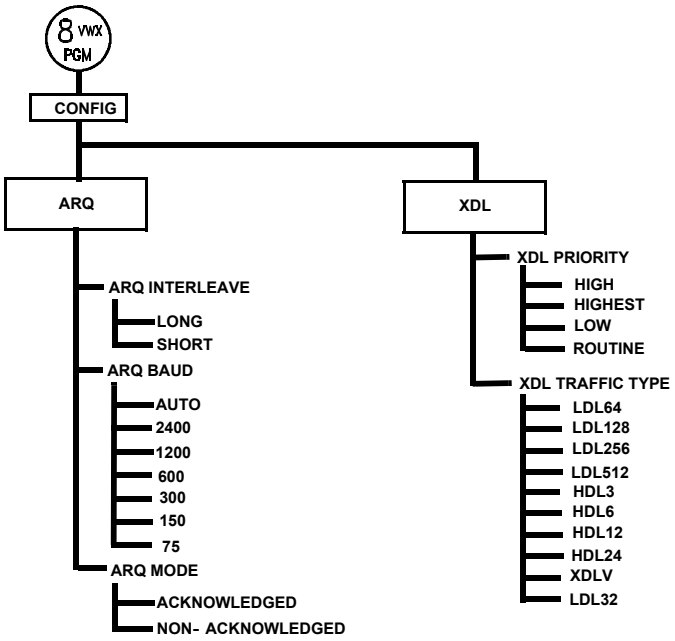

Figure 4-12. ARQ and XDL Program Menu Tree

4.2.4 XDL MODEM Programming

To program **XDL** parameters, see Figure 4-12, refer to Table 4-15 and perform the following procedure:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **XDL** and press **[ENT]**.

NOTE

XDL PRIORITY is an indicator to the message recipient relating the importance of the message. It does not control the R/T.

d. Use the ▲▼ keys to select one of the **XDL PRIORITY** options (**HIGH, HIGHEST, LOW, ROUTINE**) and press **[ENT]**. The **XDL TRAFFIC TYPE** selection menu appears.

e. Use the ▲▼ keys to select one of the **XDL TRAFFIC TYPE** options (**LDL64, LDL128, LDL256, LDL512, HDL3, HDL6, HDL12, HDL24, XDLV, LDL32)** and press **[ENT]**.

NOTE

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

f. Press **[CLR]** to return to **CONFIG** menu.

Table 4-15. XDL Menu Options

Menu Item	Options	Remarks
XDL PRIORITY	ROUTINE LOW HIGH HIGHEST	An indication to the message recipient relating the importance of the message. It does not control the radio.
XDL TRAFFIC TYPE	LDL64 LDL128 LDL256 LDL512 HDL3 HDL6 HDL12 HDL24 XDLV LDL32	LDL rates have slower throughput, but are more robust. HDL rates have higher throughputs, but are less robust. **NOTE**: It is strongly suggested to use XLDV, as it uses both message length and transmission conditions to determine the traffic type to use.

4.3 MODE PARAMETER PROGRAMMING

Mode programming is the second step in the programming process of the R/T. The following series of menu selections allows the R/T to be programmed based on operational missions. See Figure 3-6 for an example of the programming window.

Perform the following procedure to display the R/T's program menu and place the R/T in program mode:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

4.3.1 Preset Programming

Preset programming consists of three types, CHANNEL, MODEM and SYSTEM.

4.3.1.1 Program Channel Presets

Channel presets are used in FIX, ALE and 3G mode. ALE mode can only be programmed with channels 000 - 099. Hailing can only be performed from channels 001 - 010. FIX, SSB and SCAN modes use channels 000 - 199. 3G mode uses channels 100-163.

All 3G Mode network programming must be accomplished through the RPA. For information on setting up and programming a 3G network into the R/T, refer to the HFRP Software User's Guide, Publication Number: 10518-4230-01.

See Figure 4-13. Perform the following procedure to program channel presets:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **PRESET** and press **[ENT]**.

d. Use the ◀▶ keys to select **CHANNEL** and press **[ENT]**.

e. Press the numeric keys to enter the **CHANNEL NUMBER TO CHANGE:** and press **[ENT]**.

f. Press the numeric keys to enter the new **RX FREQUENCY** and press **[ENT]**.

g. Press the numeric keys to enter the new **TX FREQUENCY** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the **MODULATION** options **USB, AME, CW, FM, LSB** and press **[ENT]**.

i. Use the ▲▼ keys to scroll through the **AGC SPEED** options (**SLOW, MED, FAST, DATA, OFF, AUTO**) and press **[ENT]**.

j. Use the ▲▼ keys to scroll through the **IF BANDWIDTH** options and press **[ENT]**. The options depend on which modulation type was selected:

- USB or LSB: **2.0 kHz, 2.4 kHz, 2.7 kHz, or 3.0 kHz**. Use 3.0 kHz if data operation is intended on any channel. 2.7 kHz is normally used for most voice only operation.
- AME: **3.0 kHz, 4.0 kHz, 5.0 kHz, or 6.0 kHz**
- CW: **0.35 kHz, 0.5 kHz, 1.0 kHz, or 1.5 kHz**

k. Use the ▲▼ keys to scroll through the **RX ONLY** options (**YES, NO**) and press **[ENT]**.

l. Use the ▲▼ keys to scroll through the **ENABLE HAIL TX** options (**YES, NO**) and press **[ENT]**.

NOTE

The **ENABLE HAIL TX** screen is not displayed for Channel 00 and only available for channels 001- 010 and only when **USB** is selected in Step h. Select frequencies for these channels appropriately, if using **HOP** mode and Hail capability is desired.

m. If option YES is selected, enter **HAIL KEY** (00-99) and press **[ENT]**.

n. Press the numeric keys to enter the desired **MAX TX POWER** and press **[ENT]**.

NOTE

Entering **00000** causes the R/T to automatically select the maximum transmit power based on the configuration.

This feature assures that the radio output power will not exceed the level specified on this channel. For example, if the R/T were used with an RF-5834-PA 400 Watt power amplifier and the **MAX POWER** level for the channel had been set to 200 W, the radio would reduce power whenever that channel was selected.

o. Use the ▲▼ keys to scroll through the **ENABLE SSB SCAN** options (**YES, NO**) and press **[ENT]**. Selecting YES places the current channel in the SSB SCAN channel list. Only USB, LSB, or FM channels can be used for scanning.

p. Press **[CLR]** twice to return to the **MODE** menu.

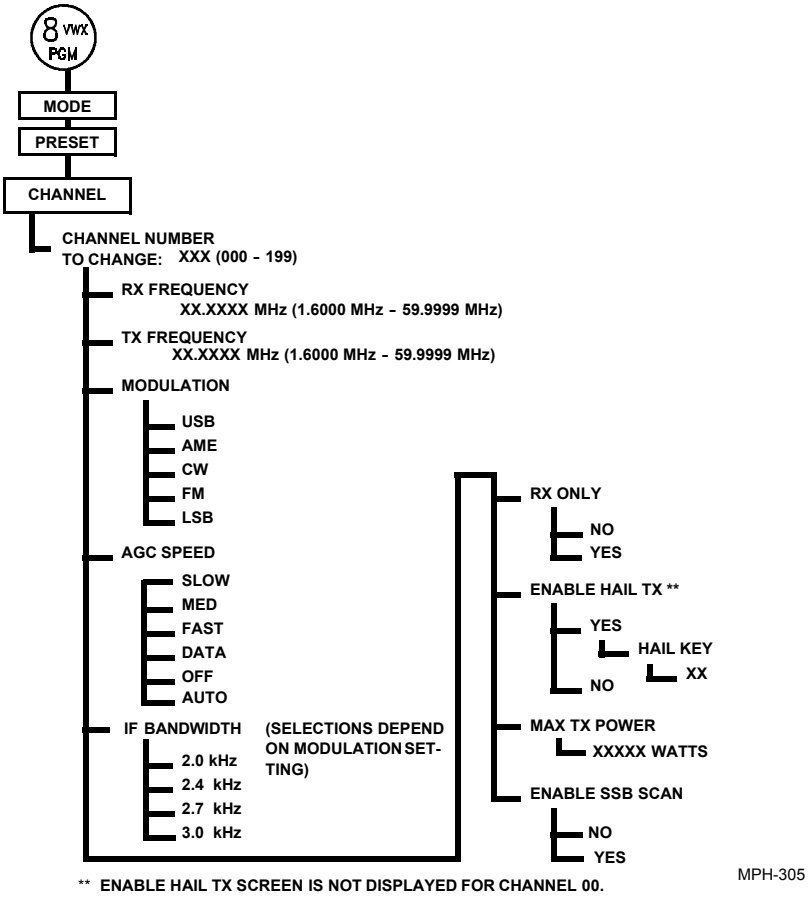

Figure 4-13. CHANNEL Preset Programming Tree

4.3.1.2 Program Modem Presets

See Figure 4-14 and refer to Table 4-16. Perform the following procedure to view modem preset programming trees:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **PRESET** and press **[ENT]**.

d. Use the ◀▶ keys to select **MODEM** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **MODEM PRESET TO CHANGE** and press **[ENT]**.

NOTE

Immediately after the R/T is zeroized, the modem presets are given default names of **MDM1** to **MDM20**.

f. Press the alphanumeric keys to enter the **PRESET NAME** and press **[ENT]**. The name can be up to nine characters in length; however, only the first four characters will appear in the preset screen.

g. Use the ▲▼ keys to scroll through the **MODEM TYPE** and press **[ENT]**. See Figure 4-15.

NOTE

Different modem types have different options available. Figure 4-15 shows the optional modems that may be selected and the parameters that must be entered.

h. Use the ▲▼ keys to scroll through the modem parameters pressing the **[ENT]** key after each selection.

i. If additional modems are to be programmed, repeat Step e through Step h. Press the **[CLR]** key twice to return to the **MODE** menu after the modem parameters have been selected.

NOTE

Table 4-17 suggests several modem waveforms that are commonly selected for a given application.

NOTE

Diversity has to do with redundancy in the 39-tone modem. It can be set to occur over TIME intervals or FREQuency intervals. For data rates of 75 to 600, inclusive, diversity can be set to **TIME** or **FREQ** (the default is TIME). For data rates of 1200, 2400, and VOICE, the only choice is **NONE**.

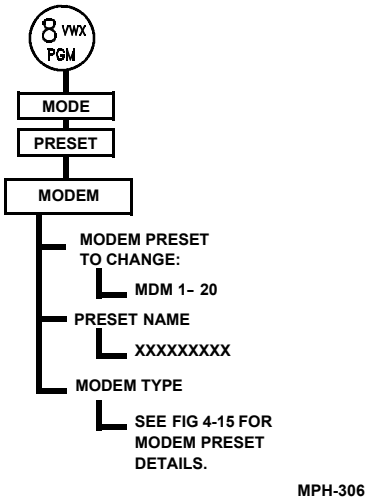

Figure 4-14. Modem Preset Programming Tree

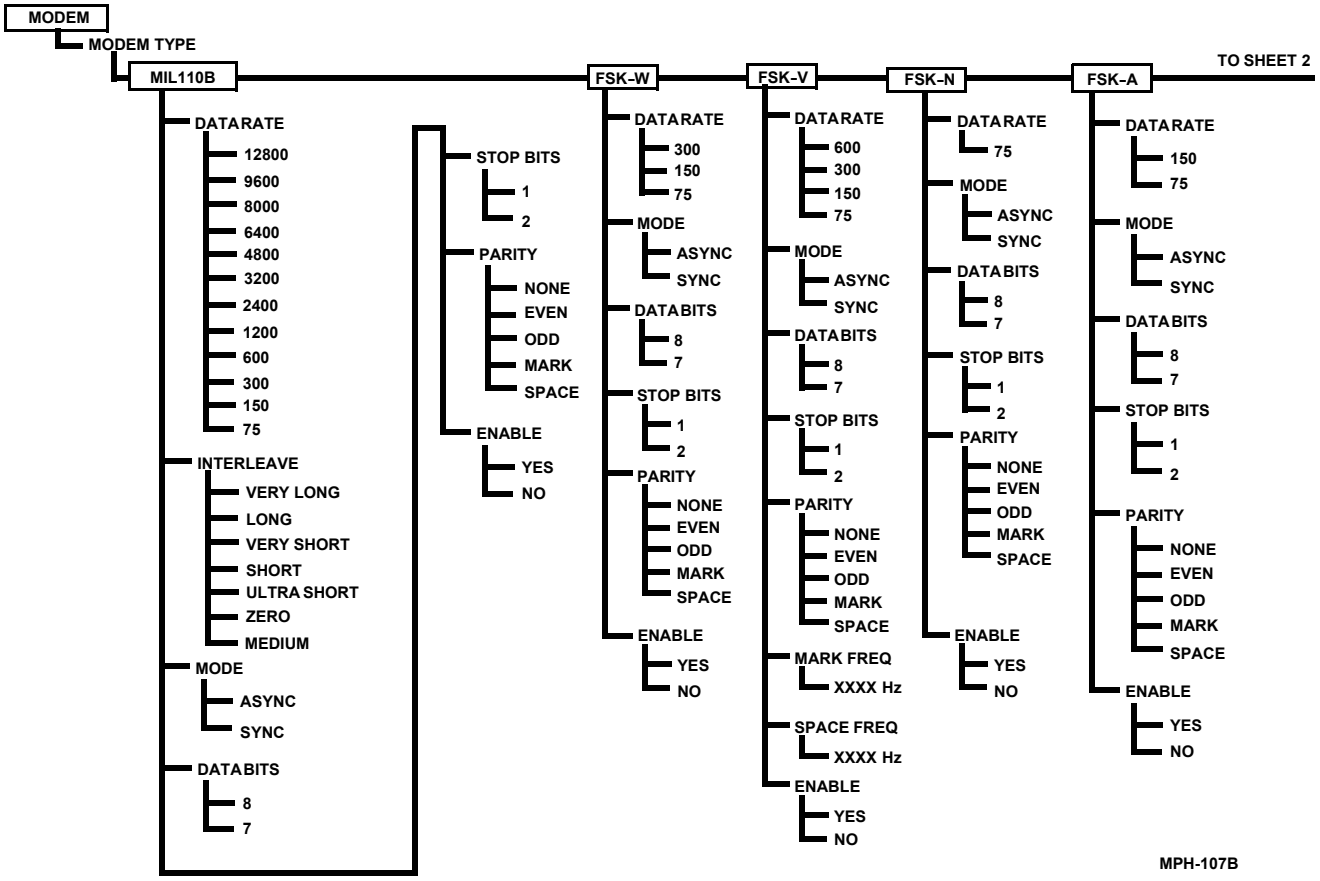

Figure 4-15. Modem Preset Programming Tree Details (Sheet 1 of 3)

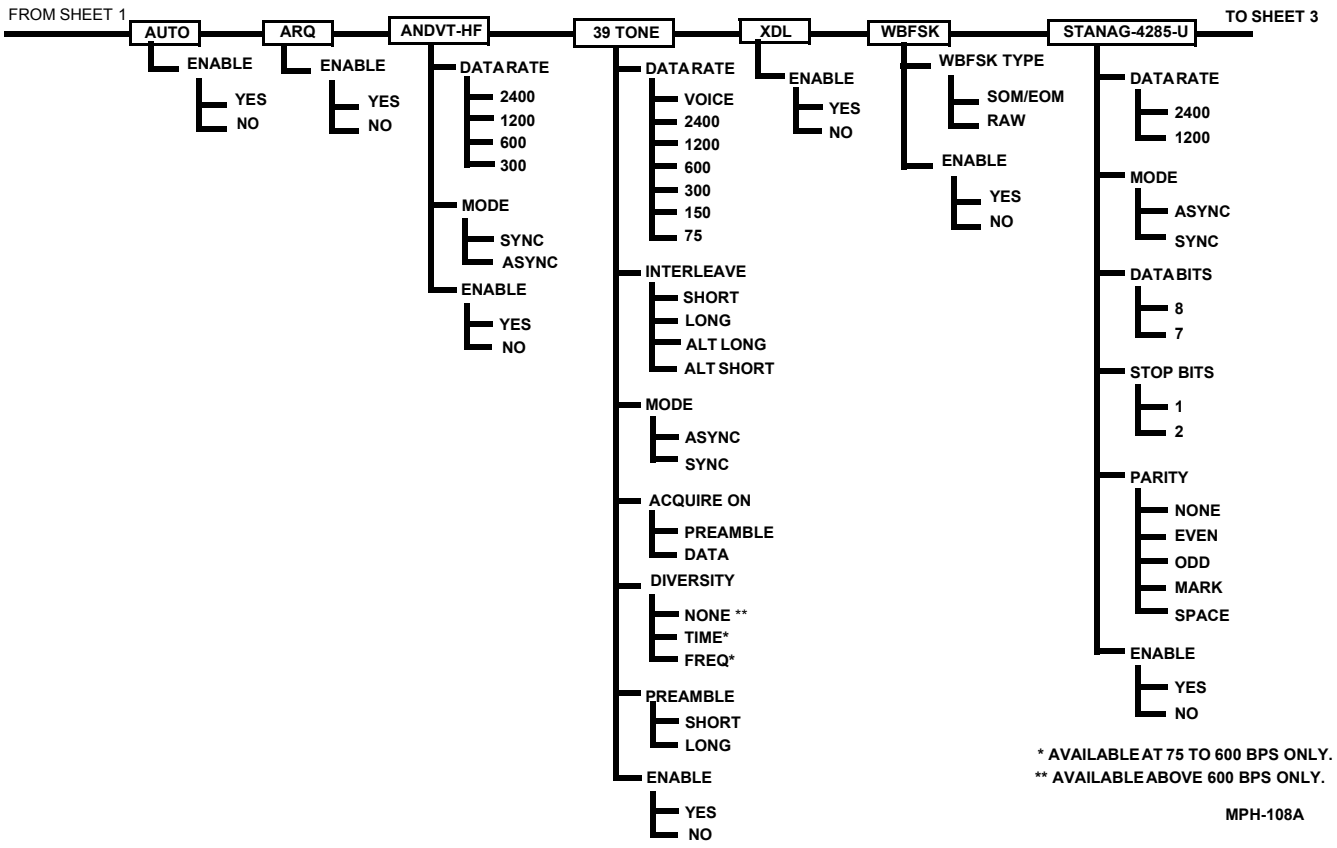

Figure 4-15. Modem Preset Programming Tree Details (Sheet 2 of 3)

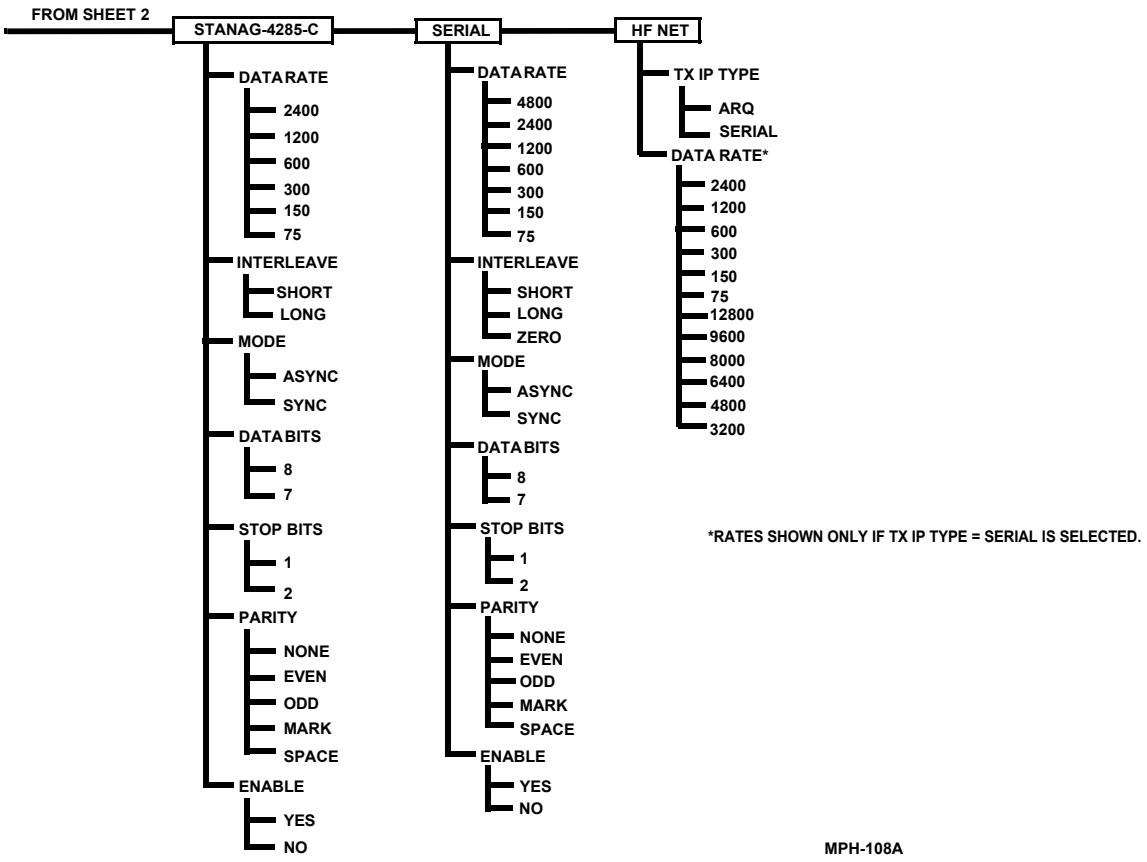

Figure 4-15. Modem Preset Programming Tree Details (Sheet 3 of 3)

Table 4-16. Modem Preset Settings

Menu Item	Description
MODEM	The modem menu.
MODEM PRESET TO CHANGE	Selects modem preset MDM1 through MDM20.
PRESET NAME	Selects the factory preset name or rename to custom preset name.
MODEM TYPE	Allows the selection of one of the following:
39 TONE	MIL-STD-188-110B Appendix B 39-tone modem waveform.
ANDVT-HF	KY-99 interoperable waveform (39-tone for voice, 16-tone for data).
SERIAL	MIL-STD-188-110A Serial tone waveform. The 75 bps data rate is also interoperable with STANAG 4415.
ARQ	Serial tone/ARQ
AUTO	Serial tone/ARQ autodetect mode
WBFSK	Wideband Frequency Shift Keying (FSK) for Very High Frequency (VHF) channels.
FSK-N	FSK modem - narrow +/- 42.5
FSK-W	FSK modem - wide +/- 425
FSK-V	FSK modem - variable
FSK-A	FSK modem - alternate
STANAG C	STANAG 4285 - coded waveform.
STANAG U	STANAG 4285 - uncoded waveform.

Table 4-16. Modem Preset Settings (Continued)

Menu Item	Description
MIL-110B	MIL-STD-188-110B serial tone waveform.
XDL	A robust burst modem waveform for error-free on-air data (ARQ-based).
HFNET	Serial tone/wireless Internet Protocol (IP) net operation

Table 4-17. Modem Waveform Application Examples

MODEM WAVEFORM APPLICATION EXAMPLES		
Application	**Recommended Waveform**	**Remarks**
HF e-mail (long distance)	XDL or ARQ	Guarantees error-free data transfer. Automatically adapts data rate as necessary.
Ship-Shore	SERIAL MIL110B STANAG 4285	600 - 4800 bps 600 - 9600 bps 600 - 2400 bps
Digital Imagery and Video (HUITS)	MIL110B SERIAL STANAG 4285	600 - 9600 bps 600 - 4800 bps 600 - 2400 bps
Legacy Communications (TTY)	FSK	75 - 150 bps

Table 4-17. Modem Waveform Application Examples (Continued)

MODEM WAVEFORM APPLICATION EXAMPLES		
Application	**Recommended Waveform**	**Remarks**
Legacy Communications with AN/PRC-138 or RF-5022	39-Tone or, where available, Serial tone	75 - 2400 bps for DATA. Use 39-tone modem and DV24 (VOICE) for digital voice compatibility with legacy radios.
KY-99 secure voice	ANDVT-HF	Interoperate with fielded equipment that uses KY-99A COMSEC.
KY-100 secure voice	SERIAL	Interoperate with fielded equipment that uses KY-100 COMSEC.
VINSON Secure voice or data	WBFSK Modem	FM modulation normally above 30 MHz. 16 kbps data rate, CVSD voice mode.

4.3.1.3 Program System Presets

A system preset groups COMSEC mode and key, Plain Text (PT) and Cipher Text (CT) voice modes, data modem preset and channel preset, for fast and easy operator selection of these pre-programmed settings. It is advised to load COMSEC prior to programming SYSTEM presets as to have keys available to assign to the presets. However, if you use the RPA, COMSEC keys must be loaded afterward, as the RPA zeroizes the R/T.

See Figure 4-16, and refer to Table 4-18, Table 4-19 and Table 4-20. Perform the following procedure to program system presets:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **PRESET** and press **[ENT]**.

d. Use the ◀▶ keys to select **SYSTEM** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **SYSTEM PRESET TO CHANGE:** and press **[ENT]**.

NOTE

Immediately after the R/T is zeroized, the system presets are given default names of **SYSPRE1** to **SYSPRE75**.

f. Press the alphanumeric keys to enter the **PRESET NAME** and press **[ENT]**. The name can be up to nine characters in length. To erase unused characters in default preset name, use ◀▶.

g. Use the ▲▼ keys to scroll through the **RADIO MODE** options (**FIX, ALE, HOP, 3G**) and press **[ENT]**.

h. The remaining operations to be performed depend on whether **FIX, HOP, ALE** or **3G** was selected. Refer to Paragraph 4.3.1.4 for FIX, Paragraph 4.3.1.5 for HOP, Paragraph 4.3.2 for ALE, or Paragraph 4.5 for 3G information.

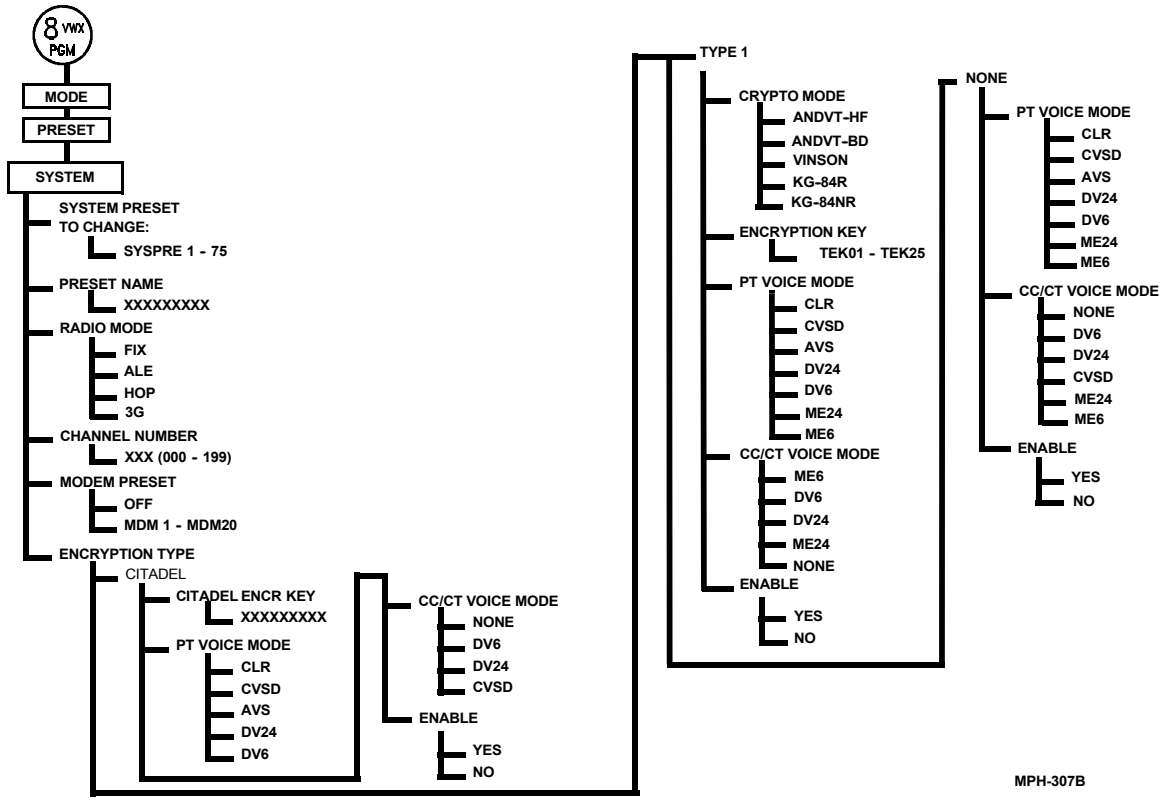

Figure 4-16. System Preset Programming Tree

Table 4-18. System Presets

SYSTEM		
Menu Item	**Options**	**Remarks**
SYSTEM PRESET TO CHANGE	SYSPRE1 - 75	Select one of 75 presets.
PRESET NAME	XXXXXXXXX	Customize preset name. 9-digit alphanumeric name.
RADIO MODE	FIX ALE 3G HOP	Select radio mode of operation.
CHANNEL NUMBER	# # #	Select one of 200 possible channels. 000 - 199
MODEM PRESET	OFF - MDM20	Select one of 20 modem presets, or OFF.
ENCRYPTION TYPE	CITADEL TYPE 1 NONE	Select the desired encryption type. NOTE: CITADEL may not appear, since it may remain locked out by depot access until needed.
CITADEL ENCR KEY	CITADEL	
CRYPTO MODE	TYPE 1	Select COMSEC based on compatibility to intended operation.
ENCRYPTION KEY	TYPE 1	Key selection can only be performed after COMSEC keys have been loaded into the radio.

Table 4-18. System Presets (Continued)

SYSTEM		
Menu Item	**Options**	**Remarks**
PT VOICE MODE	CLR CVSD AVS DV24 DV6 ME24 ME6	**CLR**: Analog Voice **CVSD**: Digital Voice for FM **AVS**: Analog Voice Security **DV2400**: Digital Voice 2400bps **DV600** : Digital Voice 600bps **ME24:** Digital Voice (MELP) 2400bps **ME6**: Digital Voice (MELP) 600bps Select one of the plain text voice modes. **NOTE**: The radio will autoselect on DV and ME settings. For example, Radio 1 is calling Radio 2 at DV600, but Radio 2 is set for ME2400. Radio 2 will autoselect to DV600, allowing communications to take place.
CT/CC VOICE MODE	NONE DV6 DV24 ME6 ME2 CVSD	Choose one of possible cipher text voice modes. This mode requires an encryption key to be programmed. **NOTE**: A radio that is in CC mode can receive AVS if the PT voice preset has AVS selected. A radio in CC mode cannot transmit AVS under any circumstances.
ENABLE	YES NO	**YES**: Current preset will be saved and enabled for use. **NO**: Current preset will be saved but will not be enabled for use.

Table 4-19. Supported Voice Modes by Operating Modes and Crypto Type

Operating Mode	Crypto Type	PT Voice Selection(s)	CT Voice Selection(s)	CC Voice Selection(s)
FIX	ANDVT-HF	CLR CVSD AVS DV6 DV24	DV24 ME24	CLR CVSD DV6 DV24 ME6 ME24
	ANDVT-BD	CLR CVSD AVS DV6 DV24	DV24 ME24 DV6 ME6	CLR CVSD DV6 DV24 ME6 ME24
	VINSON (FM only)	CLR CVSD AVS DV6 DV24	NONE CVSD	CLR CVSD DV6 DV24 ME6 ME24
	KG-84R/NR	CLR CVSD AVS DV6 DV24	DV24 ME24 DV6 ME6	CLR CVSD DV6 DV24 ME6 ME24

Table 4-19. Supported Voice Modes by Operating Modes and Crypto Type (Continued)

Operating Mode	Crypto Type	PT Voice Selection(s)	CT Voice Selection(s)	CC Voice Selection(s)
ALE	ANDVT-HF	CLR AVS DV6 DV24	DV24 ME24	CLR DV6 DV24 ME6 ME24
	ANDVT-BD	CLR AVS DV6 DV24	DV24 ME24 DV6 ME6	CLR DV6 DV24 ME6 ME24
	KG-84R/NR	CLR AVS DV6 DV24	DV24 ME24 DV6 ME6	CLR DV6 DV24 ME6 ME24
HOP*	ANDVT-HF	not supported	not supported	not supported
	ANDVT-BD	not supported	not supported	not supported
	VINSON	not supported	not supported	not supported
	KG-84R/NR	DV6, ME6	DV6, ME6	DV6, ME6

Table 4-19. Supported Voice Modes by Operating Modes and Crypto Type (Continued)

Operating Mode	Crypto Type	PT Voice Selection(s)	CT Voice Selection(s)	CC Voice Selection(s)
3G*	ANDVT-BD	CLR AVS ME6 ME24 DV6 DV24	ME6 ME24 DV6 DV24	CLR DV6 DV24 ME6 ME24
	ANDVT-HF	Not Supported	Not Supported	Not Supported
	VINSON	Not Supported	Not Supported	Not Supported
	KG-84R KG-84NR	CLR AVS ME6 ME24 DV6 DV24	ME6 ME24 DV6 DV24	CLR DV6 DV24 ME6 ME24

***NOTE**: ANDVT-HF, ANDVT-BD, and VINSON crypto types are not supported in HOP mode. The ANDVT-HF and VINSON crypto types are not supported in 3G.

Table 4-20. Supported Data Modes by Operating Mode and Crypto Type

Operating Mode	Crypto Type	39 Tone	ANDVT-HF	FSK	Serial	WBFSK	ARQ	XDL or HFNET	STANAG 4285	MIL-110B
FIX or ALE	**ANDVT-HF**		DTE PPP							
	ANDVT-BD				DTE PPP			DTE PPP		DTE PPP
	VINSON					DTE				
	KG-84R	DTE PPP		DTE PPP	DTE PPP		DTE PPP	DTE PPP	DTE PPP	DTE PPP
	KG-84NR	DTE PPP		DTE PPP	DTE PPP		DTE PPP	DTE PPP	DTE PPP	DTE PPP
HOP	**ANDVT-HF**									
	ANDVT-BD									
	VINSON									
	KG-84R				DTE PPP		DTE PPP			
	KG-84NR				DTE PPP		DTE PPP			

Table 4-20. Supported Data Modes by Operating Mode and Crypto Type (Continued)

Operating Mode	Crypto Type	39 Tone	ANDVT-HF	FSK	Serial	WBFSK	ARQ	XDL or HFNET	STANAG 4285	MIL-110B
3G	ANDVT-HF									
	ANDVT-BD				PPP			PPP		PPP
	VINSON									
	KG-84R				PPP			PPP		PPP
	KG-84NR				PPP			PPP		PPP

4.3.1.4 FIX Mode System Preset

Refer to Paragraph 4.3.1.3 and Table 4-21. This section assumes that FIX mode was selected in Paragraph 4.3.1.3 Step g. Perform the following procedure to program a **FIX** mode system preset:

a. Press the numeric keys to enter the **CHANNEL NUMBER** to use with the preset and press **[ENT]**.

b. Use the ▲▼ keys to select the **MODEM PRESET** and press **[ENT]**.

NOTE

Setting modem preset to OFF indicates that the system preset is used only for voice and not for data.

c. Select the desired **ENCRYPTION TYPE** of either **TYPE 1, CITADEL or NONE**.

d. Use the ▲▼ keys to select one of the loaded COMSEC keys for the selected COMSEC mode. COMSEC keys need to be loaded first in order to program the system preset correctly.

e. Use the ▲▼ keys to scroll through the **PT VOICE MODE** options (**CLR, CVSD, AVS, DV24, DV6, ME6, ME24**) and press **[ENT]**. Options will vary based upon what has been previously selected.

f. Use the ▲▼ keys to select one of the **CC/CT VOICE MODE** options (**NONE, DV6, DV24, DV6, ME6, ME24, CVSD**) and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **ENABLE** options (**YES, NO**) and press **[ENT]**.

h. Press **[CLR]** twice to return to the **MODE** menu after the FIX mode system preset parameters have been programmed. If additional system presets are to be programmed, refer to Paragraph 4.3.1.3.

Table 4-21. FIX Mode System Presets

SYSTEM		
Menu Item	**Options**	**Remarks**
CHANNEL NUMBER	000 -199	Select desired channel. Same channels used in ALE mode. Reserve 000 for scratchpad use. Only channels 01 - 10 can be used for hailing operation in conjunction with HOP mode.
MODEM PRESET	OFF, MDM1 - MDM20	Select one of 20 modem presets.
ENCRYPTION TYPE	CITADEL (CC) TYPE 1 (CT) NONE	Select the desired encryption type. Citadel not authorized for US DOD transmission, Will not be available in menus if locked out by Depot level user.

Table 4-21. FIX Mode System Presets (Continued)

SYSTEM		
Menu Item	**Options**	**Remarks**
CRYPTO MODE (CT)	VINSON ANDVT-HF ANDVT-BD KG-84R KG-84NR	Select COMSEC based on compatibility to intended operation. KG-84 offers best selection for all around capability for all AN/PRC-150(V)(C) nets.
KEY NUMBER	TEK01 - TEK25	Key programming can only be performed with COMSEC keys loaded into radio first.
PT VOICE MODE	DV6 ME6 AVS CVSD CLR DV24 ME24 ME6	**CLR**: Analog Voice **CVSD**: Digital Voice for FM **AVS**: Analog Voice Security **DV2400**: Digital Voice 2400 bps **DV600**: Digital Voice 600 bps **ME24:** Digital Voice (MELP) 2400 bps **ME6**: Digital Voice (MELP) 600 bps **NOTE:** The receiving radio must be set to identical settings for proper reception, with the exception that DV600 and DV2400 reception will autobaud regardless of the receive radio setup.

Table 4-21. FIX Mode System Presets (Continued)

SYSTEM		
Menu Item	**Options**	**Remarks**
CC/CT VOICE MODE	DV24 DV6 ME24 ME6 CVSD NONE	Select one of the choices for cipher text voice. This mode requires an encryption key to be programmed. CVSD requires use of VINSON COMSEC.
ENABLE	YES NO	**YES**: Current preset will be saved and enabled for use. **NO**: Current preset will be saved but will not be enabled for use.

4.3.1.5 HOP Mode System Preset

Refer to Paragraph 4.3.1.3 and Table 4-22. This section assumes that HOP mode was selected in Paragraph 4.3.1.3 Step g. Perform the following procedure to program a HOP mode system preset:

a. Press the numeric keys to enter the **HOP Channel** to associate with the system preset and press **[ENT]**.

b. Use the ▲▼ keys to select the **MODEM PRESET** and press **[ENT]**.

c. Select the desired **ENCRYPTION TYPE** of **TYPE I, CITADEL or NONE**.

d. Press the alphanumeric keys to enter a key name for the **ENCRYPTION KEY**, if using Citadel Cover mode, and press **[ENT]**. Up to twelve characters can be entered. If Type I COMSEC is being used, use

the ▲▼ keys to select one of the loaded COMSEC keys for the selected COMSEC mode and press **[ENT]**. COMSEC keys need to be loaded first in order to program the system preset correctly.

e. **DV6** or **ME6** are the only allowable settings permitted for **CC/CT** and **PT VOICE MODES** in a HOP system preset. Press **[ENT]** twice.

f. Use the ▲▼ keys to scroll through the **ENABLE** (**YES, NO**) and press **[ENT]**.

g. Press **[CLR]** twice to return to the **MODE** menu after the **HOP** system preset parameters have been programmed. If additional system presets are to be programmed, refer to Paragraph 4.3.1.3.

Table 4-22. HOP Mode System Preset

HOP Preset		
Menu Item	**Options**	**Remarks**
HOP CHANNEL	00-19	Select one of twenty available HOP channels.
MODEM PRESET	OFF - MDM20	Select one of twenty available modem presets.
ENCRYPTION TYPE	TYPE 1 CITADEL NONE	Select TYPE I for US Defense information. Citadel is only used for compatibility with coalition forces with similar COMSEC mode.
CRYPTO MODE	KG-84R KG-84NR	Only KG-84 COMSEC is usable in HOP mode, select redundant or non-redundant mode. All must use same setting in a net.
ENCRYPTION KEY	TEK01 - TEK25	**NOTE**: The COMSEC keys loaded will be scrollable. They must be loaded in order to be programmed.

Table 4-22. HOP Mode System Preset (Continued)

HOP Preset		
Menu Item	**Options**	**Remarks**
PT VOICE MODE	DV6 ME6	DV6 and ME6 are the only allowable setting permitted for CT and PT Voice Modes in a HOP preset.
CC/CT VOICE MODE	DV6 ME6	DV6 and ME6 are the only allowable setting permitted for CT and PT Voice Modes in a HOP preset.
ENABLE	YES NO	**YES**: Current preset will be saved and enabled for use. **NO**: Current preset will be saved but will not be enabled for use.

4.3.2 ALE Mode System Preset

ALE system presets configure the radio for operation in ALE after the radio has linked. A system preset can be made for each self address of the radio to call up desired MODEM preset, encryption type, COMSEC key and PT/CT voice modes.

This section assumes that ALE mode was selected in Paragraph 4.3.1.3 Step g. Refer to Paragraph 4.3.1.3, Table 4-24, and Table 4-27. Perform the following procedure to program an ALE mode system preset (see Figure 4-16, and refer to Paragraph 1.9 for additional information):

a. Ensure that ALE parameters have been programmed per Paragraph 4.4.

b. Use the ▲▼ keys to select an **ASSOC SELF** address to associate with the preset and press **[ENT]**.

c. Use the ▲▼ keys to select the **MODEM PRESET** and press **[ENT]**.

d. Use the ▲▼ to select the **ENCRYPTION TYPE (CITADEL, TYPE 1, NONE)** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **PT VOICE MODE** options (**CLR, CVSD, AVS, DV6, DV24, ME6, ME24**) and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **CC/CT VOICE MODE** options (**NONE, DV6, DV24, CVSD, ME6, ME24**) and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **ENABLE** options (**YES, NO**) and press **[ENT]**.

h. Press **[CLR]** twice to return to the **MODE** menu after the **ALE** system preset parameters have been selected. If additional system presets are to be programmed, refer to Paragraph 4.3.1.3.

Table 4-23. ALE Menu Options

Menu Item	Description
CONFIG	The configuration menu
-Max Scan Channels	Tells the calling radio station how long to call so that the receiving station(s) have time to complete the scan cycle.
-Listen Before TX	This function forces the radio to monitor for ALE traffic on the selected channel before it makes an ALE call.
-Key to Call	This function allows the operator to simply key the handset to place an ALE call to the last address called.
-Max Tune Time	This parameter sets the length of time the calling station waits for the target to tune its antenna coupler, power amplifier, etc., and respond to a call.
-Link Timeout	This feature returns the radio from the linked mode to scan if the radio has not been keyed or has not received an ALE signal for this specified period of time.

Table 4-23. ALE Menu Options (Continued)

Menu Item	Description
-Link to ANY Calls	This function enables or disables link to ANY call.
-Link to ALL Calls	This function enables or disables link to ALL call.
-AMD Operation	Enables or disables automatic message display function.
-AMD Auto Display	Enables or disables automatic message display on the front panel.
-Scan Rate	This function sets the rate that the frequencies will be scanned.
-LQA in Call	Function performs channel analysis prior to radio call.

Table 4-24. ALE Mode System Preset

ALE Presets		
Menu Item	**Options**	**Remarks**
ASSOC SELF	XXXXXXXXXXXX	**NOTE**: Calls made to this Self Address and calls made to an Individual Address from this Associated self, will activate this preset upon linking.
MODEM PRESET	OFF, MDM1 - MDM20	Select one of 20 modem settings.
ENCRYPTION TYPE	CITADEL TYPE 1 NONE	Select the desired encryption type. CITADEL may be missing from menus due model radio have.
ENCRYPTION KEY	TEK01 - TEK25	**NOTE**: The COMSEC keys loaded will be scrollable. They must be loaded in order to be programmed.

Table 4-24. ALE Mode System Preset (Continued)

ALE Presets		
Menu Item	**Options**	**Remarks**
PT VOICE MODE	DV6 AVS CVSD CLR DV24 ME6 ME24	CLR: Analog Voice CVSD: Digital Voice for FM AVS: Analog Voice Security DV2400: Digital Voice 2400 bps DV600: Digital Voice 600 bps ME24**:** Digital Voice (MELP) 2400 bps ME6: Digital Voice (MELP) 600 bps **NOTE**: The receiving radio must be set to identical settings for proper reception, except that DV600 and DV2400 will autobaud regardless of the receiving radio setup.
CC/CT VOICE MODE	DV6 ME6 DV24 ME24 NONE	Choose from the selections for cipher text voice. This mode requires an encryption key to be programmed.
ENABLE	YES NO	**YES**: Current preset will be saved and enabled for use. **NO**: Current preset will be saved but will not be enabled for use.

4.4 PROGRAM ALE PARAMETERS

See Figure 4-17 to view the ALE programming tree.

4.4.1 Channel Group Programming

Perform the following procedures to add, modify and delete channel groups.

4.4.1.1 Add a Channel Group

See Figure 4-17. Perform the following procedure to add a channel group:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **CHAN_GROUP** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

f. Press numeric keys to enter the number of the channel group to be added and press **[ENT]**. The channel group can be from 00 to 49 inclusive.

g. Use the ▲▼ keys to scroll through **CHANNEL** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

h. Press numeric keys to enter the channel number and press **[ENT]**.

i. Repeat Step h to add additional channels to the channel group. The channel group can contain up to 100 channels (00 through 99, inclusive). It is recommended to not use channel 00 as it is the manual scratchpad channel for FIX mode and may get changed during operations in that mode.

j. To add additional channel groups, press **[CLR]** twice to return to the channel group screen and repeat Step e through Step i.

k. Press **[CLR]** repeatedly to return to the **ALE** menu.

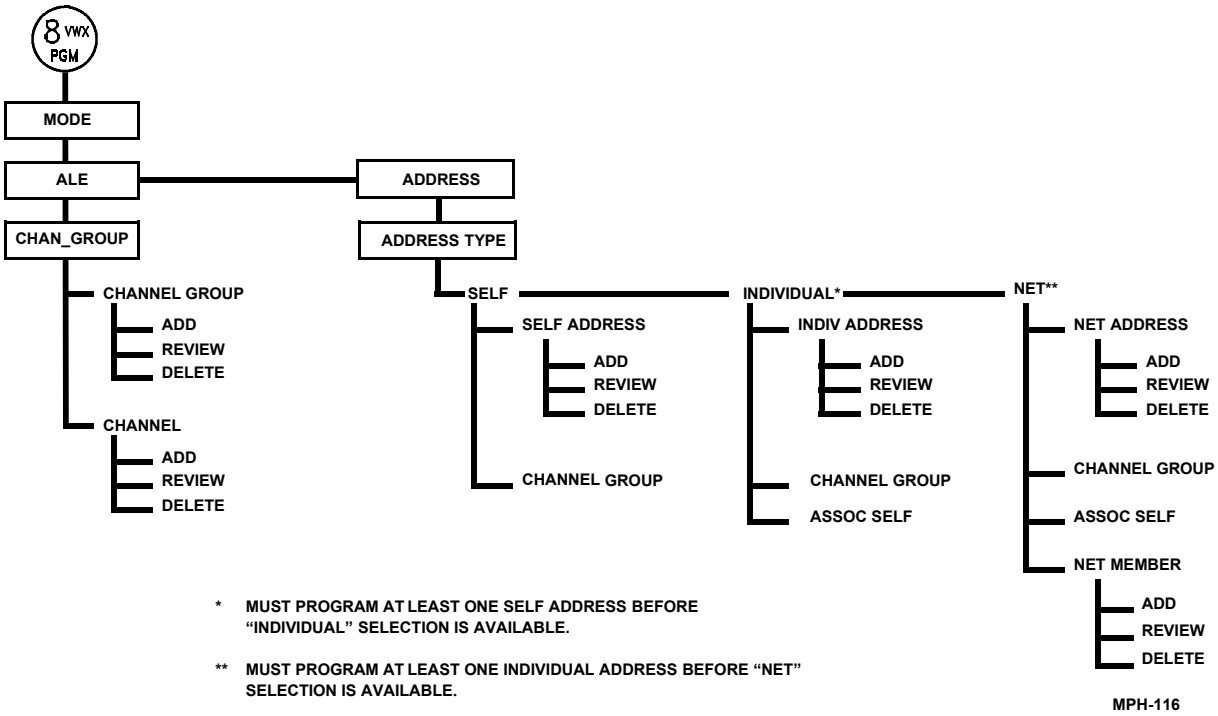

Figure 4-17. ALE Program Tree

4.4.1.2 Modify a Channel Group

See Figure 4-17. Perform the following procedure to modify a channel group:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **CHAN_GROUP** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

f. Press numeric keys to enter the channel number and press **[ENT]**.

g. Use the ▲▼ keys to scroll through **CHANNEL** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

h. Press numeric keys to enter the channel number and press **[ENT]**.

i. Repeat Step f to add additional channels to the channel group. The channel group can contain up to 100 channels (Channels 00 through 99, inclusive).

j. Press **[CLR]** three times to return to the **ALE** menu.

4.4.1.3 Delete a Channel

See Figure 4-17. Perform the following procedure to delete a channel:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **CHAN_GROUP** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through existing channel groups until the number of the desired channel group is displayed, and press **[ENT]**.

g. Use the ▲▼ keys to scroll through **CHANNEL** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the channels until the desired channel is displayed.

i. Press **[ENT]** to delete the channel, or press **[CLR]** to go back without deleting the channel.

j. Press **[CLR]** three times to return to the **ALE** menu.

4.4.1.4 Delete a Channel Group

See Figure 4-17. Perform the following procedure to delete a channel group:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **CHAN_GROUP** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the channel groups until the desired channel group is displayed.

g. Press **[ENT]** to delete the channel group, or press **[CLR]** key to go back without deleting the channel group.

h. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.4.2 ALE Address Programming

NOTE

INDIVIDUAL addresses can only be selected after at least one SELF ADDRESS has been programmed. NET addresses can only be selected after at least one INDIVIDUAL address has been programmed.

4.4.2.1 Self Address Programming

Self addresses are addresses (call signs) by which the radio is known to other stations. At least one 1-3 character self address is required to be programmed to enable the radio for ALE mode. Channel groups need to be defined prior to programming of the self addresses.

4.4.2.1.1 Add a Self Address

It is mandatory that a 1-3 character address be programmed, especially of the desired self address is longer than 3 characters.]

See Figure 4-17. To add a self address:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **SELF** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through **SELF ADDRESS** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

g. Press the alphanumeric keys to enter a 1 to 15 character self address and press **[ENT]**.

h. Press the alphanumeric keys to enter the **CHANNEL GROUP** for this **SELF ADDRESS** and press **[ENT]**.

i. Repeat Step e through Step h to add additional self addresses.

j. Press **[CLR]** to return to the **ALE** menu.

4.4.2.1.2 Review a Self Address

See Figure 4-17. To review an existing self address:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **SELF**, and press **[ENT]**.

f. Use the ▲▼ keys to scroll through **SELF ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW**, and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the self addresses until the desired self address is displayed. Press **[ENT]** to see the channel group associated with this self address.

h. Press **[ENT]** to return to the Address Type screen**.**

i. Press **[CLR]** to return to the **ALE** menu.

4.4.2.1.3 Delete a Self Address

See Figure 4-17. To delete a self address:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**).

f. Select **SELF**, and press **[ENT]**.

g. Use the ▲▼ keys to scroll through **SELF ADDRESS** options (**ADD, REVIEW, DELETE**).

h. Select **DELETE,** and press **[ENT]**.

i. Use the ▲▼ keys to scroll through **SELF ADDRESSES** programmed into the R/T.

j. Select the **SELF ADDRESS** to be deleted and press **[ENT]**. The selected **SELF ADDRESS** is deleted.

k. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.4.2.2 Individual Address Programming

4.4.2.2.1 Add an Individual Address

See Figure 4-17, and refer to Table 4-25. Perform the following procedure to add an individual address:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through **INDIV ADDR** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

g. Press the alphanumeric keys to enter a 1 to 15 character individual address and press **[ENT]**.

h. Press the numeric keys on the keypad to select a channel group to associate with this individual address and press **[ENT]**.

i. Use the ▲▼ keys to scroll through self addresses. Press **[ENT]** to select a self address to associate with this individual address.

j. Repeat Step e through Step i to add additional individual addresses.

k. Press **[CLR]** to return to the **ALE** menu.

Table 4-25. ALE Individual Address Programming

INDIVIDUAL ADDRESS		
Menu Item	**Options**	**Remarks**
ADD INDIV ADDRESS	XXXXXXXXXXXXXXX	Individual address can be up to 15 characters in length. **NOTE**: ALE converts addresses into three-character bundles. Because of this, an address that is four characters long takes as long to transmit as an address that is six characters long.
CHANNEL GROUP	0-49	Assign a preprogrammed Channel Group to this Individual address.
ASSOC SELF	XXXXXXXXXXXXXXX	Assign a preprogrammed Self Address to this Individual address.
DELETE INDIV ADDRESS	XXXXXXXXXXXXXXX	Delete a programmed Individual address. **NOTE**: If Individual addresses are deleted or deleted and re-added out of sequence, ALE may not operate or may appear to operate sporadically.
REVIEW INDIV ADDRESS	XXXXXXXXXXXXXXX	Review a previously-programmed Individual Address and its associated Self Address and Channel Group.

4.4.2.2.2 Review an Individual Address

See Figure 4-17. Perform the following procedure to review an individual address:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through **INDIV ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the individual addresses until the desired individual address is displayed and press **[ENT]** to review.

h. Press **[ENT]** to return to the Address Type screen.

i. Repeat Step f through Step g to review additional individual addresses.

j. Press **[CLR]** to return to the **ALE** menu.

4.4.2.2.2.1 Delete an Individual Address

See Figure 4-17. Perform the following procedure to delete an individual address:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through **INDIV ADDRESS** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the individual addresses until the desired individual address is displayed.

h. Press **[ENT]** to delete the individual address, or press **[CLR]** to go back without deleting the individual address.

i. Repeat Step f through Step h to delete additional individual addresses.

j. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.4.2.3 Net Address Programming

4.4.2.3.1 Add a Net Address

See Figure 4-17 and refer to Table 4-26. To add a net address:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

g. Press the alphanumeric keys to enter a 1 to 15 character net address and press **[ENT]**.

h. Press the numeric keys to enter the **CHANNEL GROUP** to associate with this net address and press **[ENT]**.

i. Use the ▲▼ keys to scroll through the list of existing self addresses until the desired self address is displayed. Press **[ENT]** to associate the self address with this net address.

j. Use the ▲▼ keys to scroll through the **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

k. Use the ▲▼ keys to scroll through the addresses available for inclusion in the net. Press **[ENT]** to include the address as a net member.

NOTE

When all available addresses have been added to the net, dashes are displayed.

NOTE

Net address requires all stations be programmed identically. The order of self addresses **must be the same in all radios on the net** to allow for proper communication. Review address in all radios by scrolling the list in the same direction. Use of the RPA ensures the proper order in all radios.

l. Press **[CLR]** repeatedly to return to the **ALE** menu.

Table 4-26. ALE Net Address Programming

NET ADDRESS/NET MEMBERS		
Menu Item	**Options**	**Remarks**
ADD NET ADDRESS	XXXXXXXXXXXXXXX	Net addresses can be up to 15 characters in length. **NOTE**: ALE converts addresses into three-character bundles. Because of this, an address that is four characters long takes as long to transmit as an address that is six characters long.
CHANNEL GROUP	0-49	Assign a preprogrammed Channel Group to this Net address.

Table 4-26. ALE Net Address Programming (Continued)

NET ADDRESS/NET MEMBERS		
Menu Item	**Options**	**Remarks**
ASSOC SELF	XXXXXXXXXXXXXXX	Assign a preprogrammed Self Address to this Net address.
ADD NET MEMBER	XXXXXXXXXXXXXXX	Assign a preprogrammed address to this net. **NOTE:** One Self Address must be associated with a net; the remaining associated addresses are selected from the preprogrammed Individual addresses.
DELETE INDIV ADDRESS	XXXXXXXXXXXXXXX	Delete a programmed Net address.
REVIEW INDIV ADDRESS	XXXXXXXXXXXXXXX	Review a previously-programmed Net Address and its associated Self Address, Channel Group, and Net Members.

4.4.2.3.2 Modify a Net Address

See Figure 4-17. To modify a net address:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

4.4.2.3.3 Change the Channel Group

See Figure 4-17. To change the channel group of a net address:

a. Use the ▲▼ keys to scroll through **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed, and press **[ENT]**.

c. Press the numeric keys to enter the channel group to associate with this net address and press **[ENT]**.

d. Press **[CLR]** three times to return to the **ALE** menu.

4.4.2.3.3.1 Change the Associated Self Address

See Figure 4-17. To change the associated self address of a net address:

a. Use the ▲▼ keys to scroll through **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed, and press **[ENT]**.

c. Press **[ENT]** to advance to the **ASSOC SELF** screen.

d. Use the ▲▼ keys to scroll through the list of self addresses until the desired self address is displayed. Press **[ENT]** to associate the self address with this net address.

e. Press **[CLR]** four times to return to the **ADDRESS TYPE** screen.

4.4.2.3.4 Add a Net Member

See Figure 4-17 and refer to Paragraph 4.4.2.3.2. To add a net member:

a. Use the ▲▼ keys to scroll through the **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed, and press **[ENT]**.

c. Press **[ENT]** two times to advance to the **NET MEMBER** screen.

d. Use the ▲▼ keys to scroll through **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the addresses available to add to the net. Press **[ENT]** to include the address as a net member.

NOTE

When all available addresses have been added to the net, dashes are displayed.

f. Press **[CLR]** repeatedly to return to the **ALE** menu.

NOTE

Ensure all net members are programmed into the net in the same order for all radios.

4.4.2.3.5 Review a Net Member

See Figure 4-17 and refer to Paragraph 4.4.2.3.2. To review a net member:

a. Use the ▲▼ keys to scroll through the **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed and press **[ENT]**.

c. Press **[ENT]** two times to advance to the **NET MEMBER** screen.

d. Use the ▲▼ keys to scroll through **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the net members.

f. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.4.2.3.6 Delete a Net Member

See Figure 4-17 and refer to Paragraph 4.4.2.3.2. To delete a net member:

a. Use the ▲▼ keys to scroll through the **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed and press **[ENT]**.

c. Press **[ENT]** two times to advance to the **NET MEMBER** screen.

d. Use the ▲▼ keys to scroll through **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the net members until the net member to be deleted is displayed.

f. Press **[ENT]** to delete the net member or press **[CLR]** to go back without deleting the net member.

g. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.4.2.4 Programming ALE Configuration Parameters

See Figure 4-18 and refer to Table 4-27. To configure the ALE parameters:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

e. Press numeric keys to enter **MAX SCAN CHANNELS** (**1 to 100**) and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **LISTEN BEFORE TX** options (**OFF, ON**) and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **KEY TO CALL** options (**OFF, ON**) and press **[ENT]**.

h. Press numeric keys to enter the **MAX TUNE TIME** in seconds (**1 to 60**) and press **[ENT]**.

i. Use the ▲▼ keys to scroll through the **LINK TIMEOUT** options (**OFF, ON**) and press **[ENT]**.

j. If **LINK TIMEOUT** was set to **ON** in Step i, press numeric keys to enter the desired **LINK TIMEOUT** duration in minutes (**0 to 60**) and press **[ENT]**. If 0 is entered for minutes, there is no link timeout. Notice that this screen is only displayed when Link Timeout is set to **ON** in Step i.

k. Use the ▲▼ keys to scroll through the **LINK TO ANY CALLS** options (**OFF, ON**) and press **[ENT]**.

l. Use the ▲▼ keys to scroll through the **LINK TO ALL CALLS** options (**OFF, ON**) and press **[ENT]**.

NOTE

Link to Any/All should be used cautiously. This capability allows an unknown person to connect to the radio without knowing if that person is friend or foe.

m. Use the ▲▼ keys to scroll through the **AMD OPERATION** options (**ENABLED, DISABLED**) and press **[ENT]**.

n. Use the ▲▼ keys to scroll through the **AMD AUTO DISPLAY** options (**ENABLED, DISABLED**) and press **[ENT]**.

NOTE

This screen is only displayed when **AMD OPERATION** is **ENABLED** in Step m.

o. Use the ▲▼ keys to scroll through the **SCAN RATE** options (**ASYNC, 2, 5**) and press **[ENT]**.

NOTE

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

Table 4-27. ALE Menu Options

Menu Item	CONFIG (ALE)
MAX SCAN CHANNELS	Tells the calling radio station how long to call so that the receiving station(s) have time to complete scan cycle. Number should be maximum number channels in channel group.
LISTEN BEFORE TX	This function forces the radio to monitor for ALE traffic on the selected channel before it makes an ALE call.
KEY TO CALL	This function allows the operator to simply key the handset to place an ALE call to the last address called.
MAX TUNE TIME	This parameter sets the length of time the calling station waits for the target to tune its antenna coupler, power amplifier, etc., and respond to a call. (Redial)
LINK TIMEOUT	When set to **ON**, this feature returns the radio from the linked mode to scan if the radio has not been keyed or has not received an ALE signal for this specified period of time. When set to **OFF**, the operator must return the radio to scan manually.
LINK TO ANY CALLS	This function enables or disables link to ANY call in receive mode. Operator can still place ANY call.
LINK TO ALL CALLS	This function enables or disables link to ALL call in receive mode. Operator can still place ALL call.
AMD OPERATION	Enables or disables automatic message display function.

Table 4-27. ALE Menu Options (Continued)

Menu Item	CONFIG (ALE)
AMD AUTO DISPLAY	Enables or disables scrolling display of received messages on the front panel.
SCAN RATE	This function sets the rate that the frequencies will be scanned. **2**: Scans at two channels per second. **5**: Scans at five channels per second. **ASYNC**: Scans at least seven channels per second or faster. **NOTE**: The scan rate setting is also affected by the power source (battery or vehicle power) and external equipment.

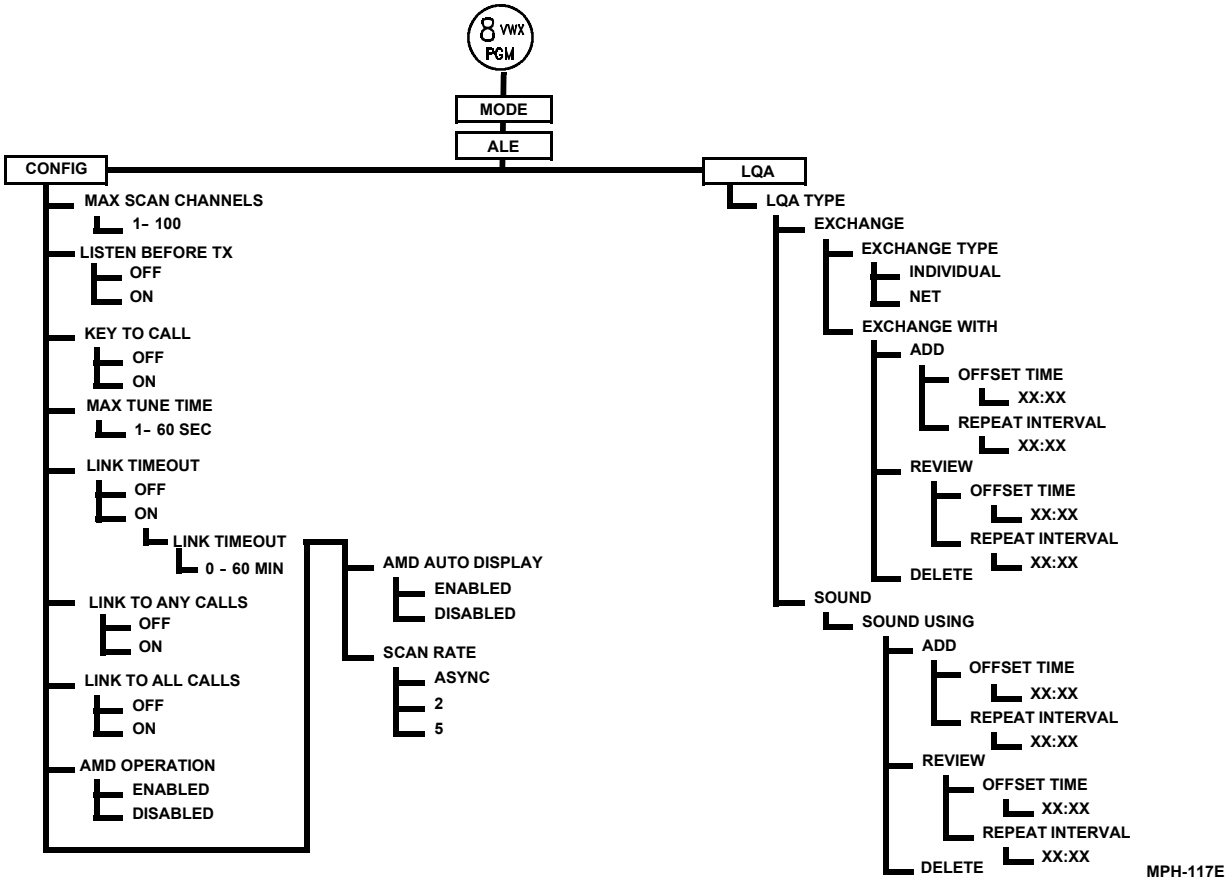

Figure 4-18. ALE Configuration Program Menu Tree

4.4.2.5 LQA Programming

4.4.2.5.1 Add an Individual LQA Exchange

See Figure 4-18. Perform the following procedure to add an individual LQA exchange:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed and press **[ENT]**.

i. Press numeric keys to enter the **OFFSET TIME** (24-hour format) and press **[ENT]**.

j. Press numeric keys to enter the **REPEAT INTERVAL** (24-hour format), and press **[ENT]**.

NOTE

A repeat interval of 0 will cause only one exchange to be performed at the start time entered in Step i.

k. Press **[CLR]** to return to the **ALE** menu.

4.4.2.5.2 Review an Individual LQA Exchange

See Figure 4-18. Perform the following procedure to review an individual LQA exchange:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed.

i. Press **[ENT]** to view the **OFFSET TIME**.

j. Press **[ENT]** to view the **REPEAT INTERVAL**.

k. Press **[CLR]** to return to the **ALE** menu.

4.4.2.5.3 Delete an Individual LQA Exchange

See Figure 4-18. Perform the following procedure to delete an individual LQA exchange:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed.

i. Press **[ENT]** to delete the individual LQA exchange, or press **[CLR]** to go back without deleting the individual LQA exchange.

NOTE

The individual address field displays dashes when there are no more individual LQA exchanges to delete.

j. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.4.2.5.4 Add a Net LQA Exchange

See Figure 4-18. Perform the following procedure to add a net LQA exchange:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed and press **[ENT]**.

i. Press numeric keys to enter the **OFFSET TIME** (24-hour format) and press **[ENT]**.

j. Press numeric keys to enter the **REPEAT INTERNAL** (24-hour format) and press **[ENT]**.

NOTE

A repeat interval of 0 will cause only one exchange to be performed at the start time entered in Step i.

k. Press **[CLR]** to return to the **ALE** menu.

4.4.2.5.5 Review a NET LQA Exchange

See Figure 4-18. Perform the following procedure to review a net LQA exchange:

a. Press **[PGM]**.

b. Use the ◆▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◆▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◆▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed.

i. Press **[ENT]** to view the **OFFSET TIME**.

j. Press **[ENT]** to view the **REPEAT INTERVAL**.

k. Press **[CLR]** to return to the **ALE** menu.

4.4.2.5.6 Delete a NET LQA Exchange

See Figure 4-18. Perform the following procedure to delete a net LQA exchange:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

h. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed.

i. Press **[ENT]** to delete the net LQA exchange, or press **[CLR]** to go back without deleting the net LQA exchange.

NOTE

The net address field displays dashes when there are no more net LQA exchanges to delete.

j. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.4.2.5.6.1 Add an LQA Sound

See Figure 4-18. Perform the following procedure to add an LQA Sound:

a. Press **[PGM]**.

b. Use the ◄► keys to select **MODE** and press **[ENT]**.

c. Use the ◄► keys to select **ALE** and press **[ENT]**.

d. Use the ◄► keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **SOUND** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **SOUND USING** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the sound using addresses until the desired address is displayed, and press **[ENT]**.

h. Press numeric keys to enter the **OFFSET TIME** (24-hour format) and press **[ENT]**.

i. Press numeric keys to enter the **REPEAT INTERVAL** (24-hour format) and press **[ENT]**.

NOTE

A repeat interval of 0 will cause only one sound to be performed at the offset time entered in Step d.

j. Press **[CLR]** to return to the **ALE** menu.

4.4.2.5.7 Review an LQA Sound

See Figure 4-18. Perform the following procedure to review an LQA sound:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **SOUND** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **SOUND USING** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the sound using addresses until the desired address is displayed and press **[ENT]**.

h. Press **[ENT]** to view the **OFFSET TIME**.

i. Press **[ENT]** to view the **REPEAT INTERVAL**.

j. Press **[CLR]** to return to **ALE** menu.

4.4.2.5.8 Delete an LQA Sound

See Figure 4-18. Perform the following procedure to delete an LQA sound:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **LQA** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **SOUND** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **SOUND USING** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the sound using addresses until the desired address is displayed.

h. Press **[ENT]** to delete the LQA sound, or press **[CLR]** to go back without deleting the LQA sound.

NOTE

The self address field displays dashes when there are no more LQA sounds to delete.

i. Press **[CLR]** to return to **ALE** menu.

4.4.2.6 Automatic Message Display (AMD) Programming

The R/T has ten slots for **TX AMD** messages and ten slots for **RX AMD** messages. Each message can be up to ninety characters in length. An AMD message is saved in the R/T until the message is deleted or the R/T is zeroized.

Perform the following procedures to add, review, and delete **TX AMD** messages.

NOTE

AMD messages are saved and sent in-the-clear and are **NOT** secure.

NOTE

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

4.4.2.6.1 TX_MSG Programming

See Figure 4-19. Perform the following procedure for **TX_MSG** programming:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALE** and press **[ENT]**.

d. Use the ◀▶ keys to select **AMD** and press **[ENT]**.

e. Use the ◀▶ keys to select **TX_MSG** and press **[ENT]**.

NOTE

When creating and editing a message, the following special keystrokes are available.

Press the ▶ key twice to add a space character after the last character entered.

Press the 0 key repeatedly to insert zero, space, or punctuation characters. The sequence of 0 key characters is as follows: 0 <space> , ’ “ / \ _ : ; * & ! ? @ # $ % + - = < > ^ ( ) [ ]

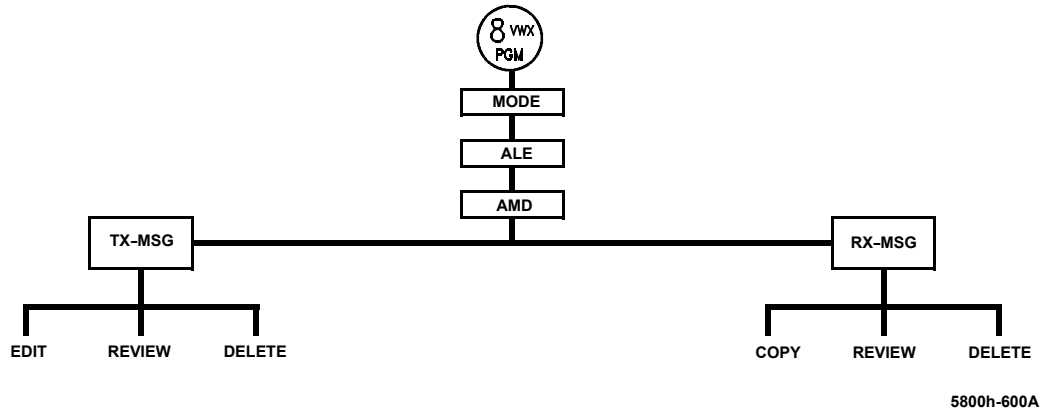

Figure 4-19. AMD Programming

4.4.2.6.1.1 Create a TX_MSG

See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Perform the following procedure to create a TX message:

a. Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

b. Press the ▲▼ keys to scroll to an empty **TX MESSAGE** and press **[ENT]**. Empty text messages consist of a string of underscore characters.

NOTE

The operation (**EDIT**) and the index of the TX message (0 through 9) appears in the top line of the display as the messages are being scrolled. If no empty TX messages are available, follow the procedure for deleting a **TX_MSG** and create the new message in that message slot.

c. Press **[ENT]** to start editing the message.

d. Press the alphanumeric keys to enter the message, then press **[ENT]** to save the message.

e. Press **[CLR]** twice to return to the **ALE** menu.

4.4.2.6.1.2 Edit a TX_MSG

See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Perform the following procedure to edit a TX_MSG:

a. Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

b. Press the ▲▼ keys to scroll to the desired **TX MESSAGE** and press **[ENT]**.

NOTE

The operation (**EDIT**) and the index of the TX message are displayed on the top line of the display.

c. Press the alphanumeric keys to enter the message, then press **[ENT]** to save the message.

d. Press **[CLR]** twice to return to the **AMD** menu.

4.4.2.6.1.3 Review a TX_MSG

See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Perform the following procedure to review a **TX_MSG**:

a. Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

b. Press the ▲▼ keys to scroll through the TX messages until the desired message is displayed and press **[ENT]**.

NOTE

The operation (**REVIEW**) and the index of the TX message appear on the top line of the display. The message NO RX MESSAGES is displayed if there are no RX messages available to review.

c. Press the ▲▼ keys to scroll through the message (if applicable).

d. Press **[ENT]** to view the whole message.

e. Press **[ENT]** to return to the **TX MESSAGE** screen.

f. Press **[CLR]** twice to return to the **AMD** menu.

4.4.2.6.1.4 Delete a TX_MSG

See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Perform the following procedure to delete a TX_MSG:

a. Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

b. Press the ▲▼ keys to scroll through the TX messages until the desired message is displayed and press **[ENT]**.

NOTE

The operation (**DELETE**) and the index of the TX message appear on the top line of the display.

c. Press the ▲▼ keys to scroll through the **DELETE TX MESSAGE** options (**YES, NO**). Select **YES** and press **[ENT]** to delete the TX message, or select **NO** and press **[ENT]** to go back without deleting the TX message.

d. Press **[CLR]** twice to return to the **AMD** menu.

4.4.2.6.2 RX_MSG Programming

See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Use the ◄► keys to select **RX_MSG** and press **[ENT]**.

4.4.2.6.2.1 Review a RX_MSG

This section describes how to obtain access to RX messages from the programming screen only. An RX_MSG can also be reviewed when received. See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Perform the following procedure to review an RX_MSG:

a. Use the ▲▼ keys to scroll through the **RX MESSAGE** options (**COPY, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

b. Press the ▲▼ keys to scroll through the RX messages until the desired message is displayed and press **[ENT]**.

NOTE

The operation (**REVIEW**) and the index of the RX message appear on the top line of the display.

c. Press the ▲▼ keys to scroll through the message (if applicable).

d. Press **[ENT]** to view the whole message.

e. Press **[ENT]** to return to the **RX MESSAGE** screen.

f. Press **[CLR]** three times to return to the **ALE** menu.

4.4.2.6.2.2 Copy an RX_MSG

Use this operation to create a TX_MSG from an RX_MSG to be retransmitted. See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Perform the following procedure to copy an RX_MSG:

a. Use the ▲▼ keys to scroll through the **RX MESSAGE** options (**COPY, REVIEW, DELETE**). Select **COPY** and press **[ENT]**.

b. Press the ▲▼ keys to scroll through the **COPY RX MESSAGE** options (**YES, NO**). Select **YES** and press **[ENT]** to copy the RX message, or select **NO** and press **[ENT]** to go back without copying the RX message.

NOTE

The operation (**COPY**) and the index of the RX message appear on the top line of the display.

c. Press **[CLR]** three times to return to the **ALE** menu.

4.4.2.6.2.3 Delete an RX_MSG

See Figure 4-19 and refer to Paragraph 4.4.2.6.1. Perform the following procedure to delete an RX_MSG:

a. Use the ▲▼ keys to scroll through the **RX MESSAGE** options (**COPY, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

b. Press the ▲▼ keys to scroll through the RX messages until the desired message is displayed and press **[ENT]**.

NOTE

The operation (**DELETE**) and the index of the RX message are displayed on the top line of the display.

c. Press the ▲▼ keys to scroll the **DELETE RX MESSAGE** options (**YES, NO**). Select **YES** and press **[ENT]** to delete the RX message, or select **NO** and press **[ENT]** to go back without deleting the RX message.

d. Press **[CLR]** three times to return to the **ALE** menu.

4.4.3 Program HOP Parameters

See Figure 4-20 and refer to Table 4-28. Perform the following procedure to program HOP parameters:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **HOP** and press **[ENT]**.

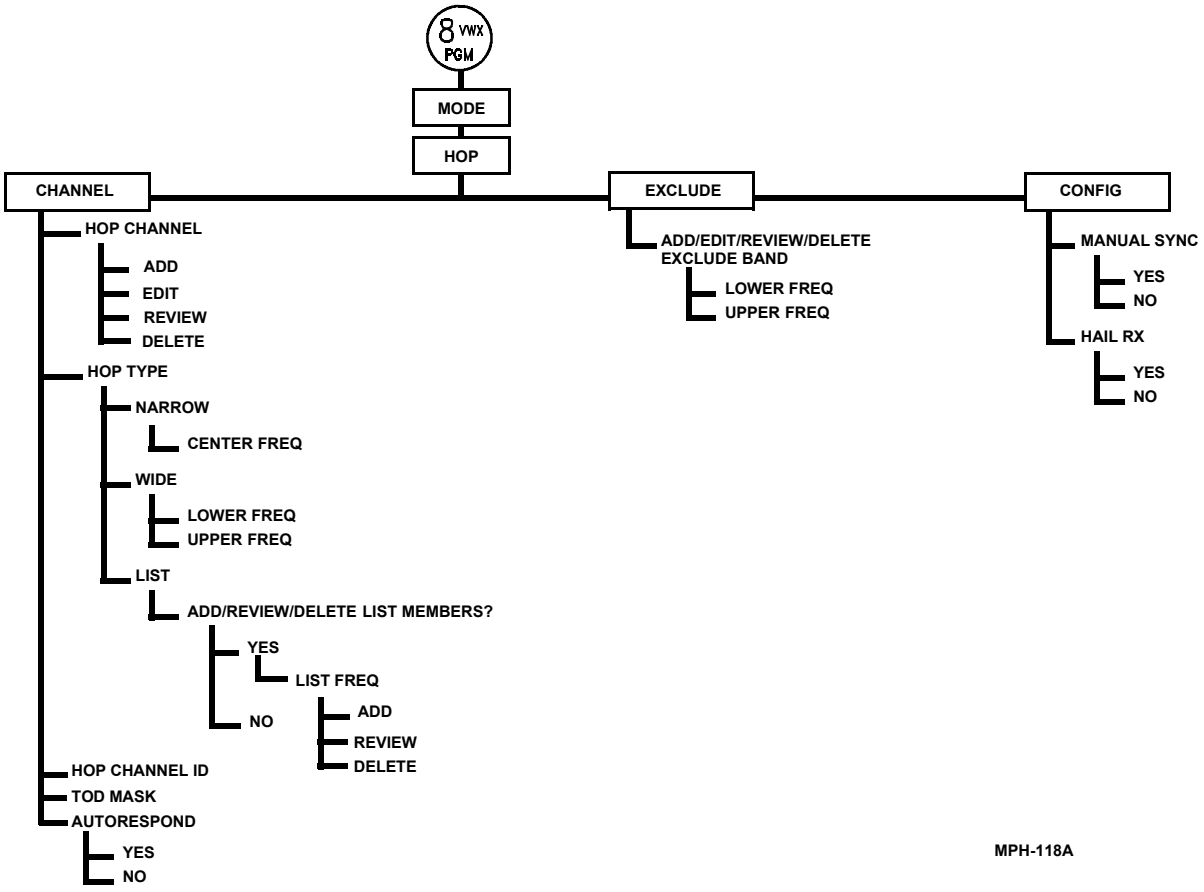

Figure 4-20. HOP Mode Program Tree

Table 4-28. HOP Menu Options

HOP MENU		
Menu Item	**Options**	**Remarks**
CHANNEL	---	Access to HOP channel (hopset) programming.
EXCLUDE	---	Access to HOP exclusion band programming.
CONFIG	---	Access to HOP configuration settings.
CHANNEL (HOP)		
HOP CHANNEL	00-19	Channel to be used for frequency hopping.
HOP TYPE	NARROW, WIDE, LIST	Method of hopping on the selected channel.
HOP CHANNEL ID	XXXXXXXX	An 8-digit number that is used as the identifier for the net. All radios in the net must have the same HOP channel ID.
TOD MASK	[ ]	An optional 1-to-8 digit number that is used to identify a net. If used, all radios in the net must have the same TOD MASK. Refer to Paragraph 4.4.3.1(d).
AUTO RESPOND	YES, NO	**YES**: automatically respond to a sync request without operator intervention. **NO**: operator must initiate the response to a sync request.

Table 4-28. HOP Menu Options (Continued)

HOP TYPE		
Menu Item	**Options**	**Remarks**
NARROW	2.0 MHz to 29.999 MHz (in multiples of 5 kHz)	Program the center frequency of the hopping bandwidth; choice of center frequency affects the bandwidth as follows: Center Frequency (MHz)* — Bandwidth (kHz) 2.0-3.495 — 15 3.5-4.995 — 42 5.0-9.995 — 81 10.0-14.995 — 120 15.0-19.995 — 201 20.0-24.995 — 252 25.0-29.845 — 303 29.850-29.995 — 300-156 *Center frequencies near the upper and lower boundaries result in non-symmetrical hopsets.
WIDEBAND	2.0 MHz to 29.999 MHz maximum bandwidth: 28 MHz	Program the upper and lower frequencies of the hopping bandwidth. **NOTE:** If exclusion bands are programmed, the usable bandwidth is decreased; the usable bandwidth must be at least 15 kHz.

Table 4-28. HOP Menu Options (Continued)

HOP TYPE - Continued		
Menu Item	**Options**	**Remarks**
LIST	2.0 MHz to 29.999 MHz (in multiples of 100 Hz) 5 to 50 frequencies per list	Program the desired hop frequencies.
CONFIG (HOP)		
MANUAL SYNC	YES, NO	A way of synchronizing radios in the net without using GPS sync. **YES**: Allow operator to initiate a manual sync request. **NO**: Prevent operator from initiating a manual sync request.
HAIL RX	YES, NO	Configures whether or not the radio will accept a hail from a transmitting station while in HOP mode. **YES**: Accept hail. **NO**: Do not accept hail.
EXCLUDE		
LOWER FREQ	2.0 MHz to 29.999 MHz	Lower boundary of a bandwidth to be excluded from the hopping bandwidth.
UPPER FREQ	2.0 MHz to 29.99 MHz	Upper boundary of a bandwidth to be excluded from the hopping bandwidth.

4.4.3.1 Program a New HOP Channel

See Figure 4-20 and refer to Paragraph 4.4.3. Perform the following procedure to program a HOP channel:

a. Use the ◆▶ keys to select **CHANNEL** from the HOP menu and press **[ENT]**.

b. Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, REVIEW, DELETE, EDIT**). Select **ADD** and press **[ENT]**.

c. Press the numeric keys to enter the **HOP CHANNEL** to be added. HOP channel number must be in the range of **00** to **19**. Press **[ENT]**.

Follow the steps in Paragraph 4.4.3.1.1 to program the HOP channel for narrowband hopping.

Follow the steps in Paragraph 4.4.3.1.2 to program the HOP channel for wideband hopping.

Follow the steps in Paragraph 4.4.3.1.3 to program the HOP channel for list mode hopping.

4.4.3.1.1 Narrowband HOP Channel

See Figure 4-20 and refer to Paragraph 4.4.3. Perform the following procedure to program a narrowband HOP channel:

a. Use the ▲▼ keys to select **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **NARROW** and press **[ENT]**.

b. Press numeric keys to enter the **CENTER FREQUENCY** in MHz (5 kHz resolution; for example: 12.550 MHz), and press **[ENT]**.

c. Press numeric keys to enter the **HOP CHANNEL ID** and press **[ENT]**, or press **[ENT]** to use the displayed HOP Channel ID. The **HOP CHANNEL ID** is a one- to eight-digit number. The digits default to **0** when no value is entered.

d. Press alphanumeric keys to enter the **TOD MASK** and press **[ENT]**, or press **[ENT]** to use the displayed TOD Mask. The TOD Mask is a string of up to eight alphanumeric characters. The TOD Mask parameter provides a randomization of the TOD seed that is used in generating HOP frequencies.

NOTE

The TOD Mask must be the same for all stations in the net. The R/T will provide a default TOD Mask for the net if none is programmed.

e. Use the ▲▼ keys to select **AUTORESPOND** options (**YES, NO**) and press **[ENT]**. This setting determines whether the R/T will respond automatically to sync requests on this channel.

NOTE

When using Autorespond, only one radio in the net should be configured to Autorespond.

f. Press **[CLR]** to return to the **HOP** menu.

4.4.3.1.2 Wideband HOP Channel

See Figure 4-20 and refer to Paragraph 4.4.3. Perform the following procedure to program a wideband HOP channel:

a. Use the ▲▼ keys to select **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **WIDE** and press **[ENT]**.

b. Press numeric keys to enter the **LOWER FREQUENCY** in MHz (minimum 2 MHz) and press **[ENT]**.

c. Press numeric keys to enter the **UPPER FREQUENCY** range (100 Hz resolution) in MHz (maximum 29.999 MHz) and press **[ENT]**.

d. Press numeric keys to enter the **HOP CHANNEL ID** and press **[ENT]**, or press **[ENT]** to use the displayed HOP Channel ID. The HOP Channel ID is a one- to eight-digit number. The digit defaults to **0** when no value is entered.

e. Press alphanumeric keys to enter the **TOD MASK** and press **[ENT]**, or press **[ENT]** to use the displayed TOD Mask. The TOD Mask is a string of up to eight alphanumeric characters. The TOD Mask parameter provides a randomization of the TOD seed that is used in generating HOP frequencies.

NOTE

The TOD Mask must be the same for all stations in the net. The R/T will provide a default TOD Mask for the net if none is programmed.

f. Use the ▲▼ keys to select **AUTORESPOND** options (**YES, NO**) and press **[ENT]**. This setting determines whether the R/T will respond automatically to sync requests on this channel.

g. Press **[CLR]** to return to the **HOP** menu.

NOTE

The types of antennas used and coupler tuning operation are considerations in the type of hopping selected. WIDE must have the radio connected to a 50-ohm broadband antenna with the coupler bypassed.

4.4.3.1.3 List Mode HOP Channel

A valid frequency list must contain a minimum of five frequencies, and may contain up to fifty frequencies. Each HOP list frequency must not be less than 2.0000 MHz and not greater than 29.999 MHz. Frequencies entered must be in the same order in all radios of the planned net.

4.4.3.1.3.1 Add List Frequencies

See Figure 4-20 and refer to Paragraph 4.4.3. Perform the following procedure to add list frequencies:

a. Use the ▲▼ keys to scroll through the **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **LIST** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE LIST MEMBERS?** options (**YES, NO**). Select **YES** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **LIST FREQ** options (**ADD, DELETE, REVIEW**). Select **ADD** and press **[ENT]**.

d. Press numeric keys to enter a HOP list frequency in MHz and press **[ENT]**.

NOTE

Each **HOP LIST** frequency must be **not less than 2.0000 MHz** and **not greater than 29.999 MHz**.

e. Repeat Step d until a minimum of five frequencies have been entered.

NOTE

To program a **LIST** mode **HOP Channel**, you must enter at least **five** frequencies but not more than **50** frequencies (100 Hz resolution).

f. Press **[CLR]** twice to exit the **ADD LIST FREQ** menu and return to the **ADD/REVIEW/DELETE** List Members screen.

g. Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE** List Members options (**YES, NO**). Select **NO** and press **[ENT]**.

h. Press numeric keys to enter the **HOP CHANNEL ID** and press **[ENT]**, or press **[ENT]** to use the displayed HOP Channel ID. The HOP Channel ID is a one- to eight-digit number. The digit defaults to **0** when no value is entered.

i. Press alphanumeric keys to enter the **TOD MASK** and press **[ENT]**, or press **[ENT]** to use the displayed TOD Mask. The TOD Mask is a string of up to eight alphanumeric characters. The string defaults to empty when no value is entered.

j. Use the ▲▼ keys to select **AUTORESPOND** options (**YES, NO**) and press **[ENT]**. This setting determines whether the R/T will respond automatically to sync requests on this channel.

k. Press **[CLR]** to return to the **HOP** menu.

4.4.3.1.3.2 Review List Frequencies

See Figure 4-20 and refer to Paragraph 4.4.3. Perform the following procedure to review list frequencies:

a. Use the ▲▼ keys to scroll through the **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **LIST** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE LIST MEMBERS?** options (**YES, NO**). Select **YES** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **ADD LIST FREQ** options (**REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d. Use the ▲▼ keys to review the frequency list.

e. Press **[CLR]** to return to the List Freq options field.

f. Press **[CLR]** repeatedly to return to the **HOP** menu.

4.4.3.1.3.3 Delete List Frequencies

See Figure 4-20 and refer to Paragraph 4.4.3. Perform the following procedure to delete list frequencies:

a. Use the ▲▼ keys to scroll through the **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **LIST** and press **[ENT]**.

b. Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE LIST MEMBERS** options (**YES, NO**). Select **YES** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **ADD LIST FREQ** options (**REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the frequency list until the desired frequency is displayed.

e. Press **[ENT]** to delete the frequency, or press **[CLR]** to go back without deleting the frequency.

f. Press **[CLR]** repeatedly to return to the **HOP** menu.

NOTE

A frequency list must be empty, or contain a minimum of five frequencies. To delete an entire list, repeat Step d and Step e until dashes are displayed (indicating that the list is empty).

4.4.3.2 Program HOP Exclusion Band

Each exclusion band is a range of frequencies that are not to be used in wideband hopping. When the hopset is generated for each wideband hopping channel, the frequencies in the hopset will be selected to ensure that no frequency in the hopset occurs within any of the defined exclusion bands. See Figure 4-20.

4.4.3.2.1 Add an Exclusion Band

See Figure 4-20. Perform the following procedure to add an exclusion band:

a. Use the ◀▶ keys to select **EXCLUDE** from the **HOP** menu and press **[ENT]**.

b. Use the ▲▼ keys to scroll through **EXCLUDE BAND** options (**ADD, REVIEW, DELETE, EDIT**). Select **ADD** and press **[ENT]**.

c. Press the numeric keys to enter the exclusion band number. The number entered must be in the range **0** to **9**. Press **[ENT]**.

d. Press numeric keys to enter the lower frequency (100 Hz resolution), and press **[ENT]**.

e. Press numeric keys to enter the upper frequency (100 Hz resolution), and press **[ENT]**.

f. Press **[CLR]** to return to the **HOP** menu and repeat Step a to review, edit, or delete the exclusion band. Press **[PGM]** to return to the normal operations display. Editing the exclusion band information can be performed by repeating Step c through Step e.

4.4.3.3 Program HOP Configuration

See Figure 4-20. Perform the following procedure to program the HOP configuration:

a. Use the ◀▶ keys to select **CONFIG** from the **HOP** menu and press **[ENT]**.

b. Use the ▲▼ keys to select **MANUAL SYNC** options (**YES, NO**). This controls whether the R/T will send a manual sync when commanded to do so by the operator, and whether the R/T will respond to a manual sync sent by another radio. Press **[ENT]**.

c. Use the ▲▼ keys to select **HAIL RX** options (**YES, NO**). This controls whether the R/T will respond to a HOP Hail transmission from another radio. Press **[ENT]** to return to the **HOP** menu.

4.4.4 Program ARQ Parameters

See Figure 4-21 and refer to Table 4-29. Perform the following procedure to program ARQ parameters:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **ARQ** and press **[ENT]**.

d. Use the ◀▶ keys to select **SELF ADDRESS** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **ADD SELF ADDRESS** options (**ADD, REVIEW, DELETE**). Select **ADD,** and press **[ENT]**.

f. Press the numeric keys to enter an **ARQ SELF ADDRESS** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the **ADD SELF ADDRESS** options (**REVIEW, DELETE**). Select **REVIEW,** and press **[ENT]**.

h. Use the ▲▼ keys to review the existing **ARQ ADDRESSES** Self Address and press **[ENT]**.

i. Use the ◄► keys to select **CONFIG** option and press the **[ENT]** key.

NOTE

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

j. Use the ▲▼ keys to select the **ARQ MODE** attribute (**ACKNOWLEDGED, NON-ACKNOWLEDGED**) and press **[ENT]**.

k. Use the ▲▼ keys to select one of the **NUMBER OF RETRIES** options (**0, 1, 2, 3, 4, 5, 6, 7**) and press **[ENT]**.

l. Use the ▲▼ keys to select the **LINK TRAFFIC MONITOR** options (**ON/OFF**) and press **[ENT]**. This option listens for ARQ traffic on the channel and responds to an ARQ call, or disregards if addressed to another station.

m. Use the ▲▼ keys to select the **IMMEDIATE MODE THRESHOLD** option (**0000000 to 2097150**) and press **[ENT]**. This threshold establishes the maximum amount of data (in bytes) that ARQ will send before turning around the radio link. Immediate mode sends the header and data traffic simultaneously rather than separately. This should only be used for small messages (max threshold 2 mB) on extremely good quality channels. If the threshold is set to “0", the header and data will be sent separately and immediate mode is not possible.

n. Press **[CLR]** key to return to **MODE** menu.

Table 4-29. ARQ Menu Options

Menu Item	Options	Remarks
SELF ADDR	XXXXXXXXXXXXXXXX	A 16-character address by which other radios identify this radio during an ARQ transmission.
ARQ MODE	ACKNOWLEDGED, NON-ACKNOWLEDGED	**ACKNOWLEDGED**: Receiver requests retransmission of data that was received in error. **NON-ACKNOWLEDGED**: The transmission is sent once with no response from the receiving stations.
NUMBER OF RETRIES	0-7	Number of times that a message is retransmitted before the transmitter terminates the data transfer.

Table 4-29. ARQ Menu Options (Continued)

Menu Item	Options	Remarks
LINK TRAFFIC MONITOR	ON, OFF	**ON**: Listens and identifies the source and destination of an ARQ transmission not addressed to this radio. **OFF**: Listens only for transmissions addressed to this radio.
IMMEDIATE MODE THRESHOLD	0-2097150	The maximum number of data bytes that will be sent "immediately" with the initial ARQ header. If the number of data bytes exceeds the threshold setting, the initial ARQ header will be sent and acknowledged separately, before any data is transmitted. **0**: Disable immediate mode (always send the initial ARQ header separately). **2097150**: Enable immediate mode (always send data with the initial ARQ header). **NOTE**: The actual setting is usually between the minimum and maximum values and based on predetermined knowledge of message content. The default setting is 1000 (bytes).

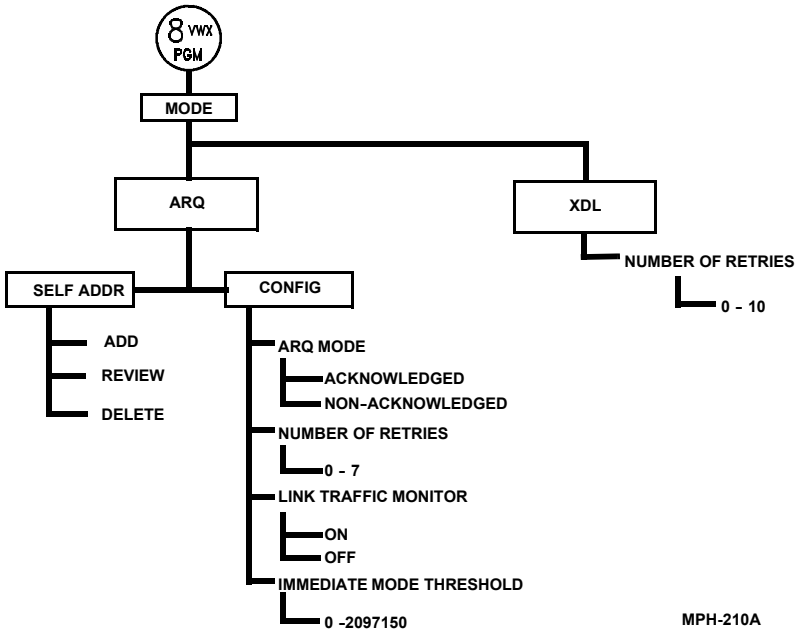

Figure 4-21. ARQ and XDL Program Menu Tree

4.4.5 XDL MODEM Programming

See Figure 4-21 and refer to Table 4-30. Perform the following procedure to program XDL parameters:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **MODE** and press **[ENT]**.

c. Use the ◀▶ keys to select **XDL** and press **[ENT]**.

d. Use the ▲▼ keys to select one of the **NUMBER OF RETRIES** options (**0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10**) and press **[ENT]**.

e. Press **[CLR]** key to return to **MODE** menu.

Table 4-30. XDL Menu Options

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

4.5 3G PROGRAMMING

Due to the complexity of configuring the radio for use in 3G mode, all 3G Mode network programming must be accomplished through the RF-6550H HFRPA. For information on setting up and programming a 3G network into the R/T, refer to RF-6550H HFRPA Software's Help Files.

4.5.1 3G Mode System Preset

Third Generation (3G) ALE system presets configure the radio for operation in 3G Mode after the radio has linked. A system preset can be made for each self address of the radio to call up desired MODEM preset, encryption type, COMSEC key and PT/CT voice modes.

If programming fails to load properly, the “Incomplete 3G Fill screen” will be displayed on the KDU. See Figure 4-22.

Figure 4-22. Incomplete 3G Fill Screen

4.6 RADIO SECURITY ACCESS PROGRAMMING

The R/T provides four access levels to its user interface: **USER1**, **USER2**, **USER3** and **DEPOT**. Each access level provides access to a specific, customized set of the R/T’s capabilities. Refer to Table 4-31. **USER1** is the lowest access level in the radio. To activate a higher access level (**USER2**, **USER3**, or **DEPOT**), the user must correctly enter the corresponding password.

The lockouts programmed for each access level determine which actions can be performed using the front panel keypad, which items are displayed in menu screens, and when each access level is active. Each access level controls its lockouts separately, so the R/T can be customized for up to three different users. There are no differences between the functions available for **USER1**, **USER2**, or **USER3**. However, **USER2** and **USER3** have the added task of having to login to obtain the access granted by the **DEPOT** level controller.

The **DEPOT** level configures passwords and determines whether or not the passwords and lockouts can be changed at the other access levels. The **DEPOT** level also controls access to Citadel Cover mode at a global level.

Table 4-31. Security Programing

SYSTEM		
Menu Item	**Options**	**Remarks**
OPER	-	Operational lockouts.
PGM	-	PGM screen lockouts.
OPT	-	OPT screen lockouts.
ALL	-	Provides a shortcut method to enable or disable all lockouts from a single screen.

4.6.1 OPER Lockouts

See Figure 4-23. Setting the lockouts for each user level is usually performed by the DEPOT level user. The DEPOT user login for each access level, selects all necessary lockouts, sets them all and logs out from that level. The final action the DEPOT user performs is logging into the DEPOT level to program no changes to lockouts and passwords, then sets all lockouts before logging out. After this, each access level will only allow actions as determined by the DEPOT level user.

Perform the following procedure to configure the OPER, PGM and OPT lockouts for each user level:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **ACCESS** and press **[ENT]**.

NOTE

The current access level is displayed on the top right corner of the front panel display screen.

c. Use the ◆▶ keys to select **LOGIN** and press **[ENT]**.

d. Use the ▲▼ keys to select **USER2, USER3, DEPOT** and press **[ENT]**. **PASSWORD [ ] ENT TO ACCEPT - CLR TO ABORT** displays on the KDU.

e. Enter your password.

NOTE

If your entry is invalid, press [CLR] and begin again at Step a, above.

f. Use the ◆▶ keys to select the access level (**USER2**, **USER3**, **or DEPOT**) and press **[ENT]** twice if no password has been set. Enter the password for the access level if one has been programmed.

g. Use the ◆▶ keys to select **LOCKOUTS** and press **[ENT]**.

h. Use the ◆▶ keys to select **ALL** and press **[ENT]**.

i. Use the ▲▼ keys to select **YES** at **CLEAR ALL** (level logged in at) **LOCKOUTS**. This clears any existing lockouts. Only perform this step if this is a complete change in lockouts.

j. Use the ◆▶ keys to select **OPER** and press **[ENT]**.

k. Refer to Table 4-32 for a listing of **OPER** parameters that can be locked out. Select items to lockout as necessary.

l. After setting **OPER** parameter lockouts, continue to **PGM** and **OPT** lockouts if desired.

m. Refer to Table 4-33 for a listing of **PGM** parameters that can be locked out.

n. Refer to Table 4-34 for a listing of **OPT** parameters that can be locked out.

o. Log out of the current access level and login to a different access level requiring lockout programming or go to **DEPOT** level if all levels are programmed to set final access control options. Refer to Paragraph 4.6.2.

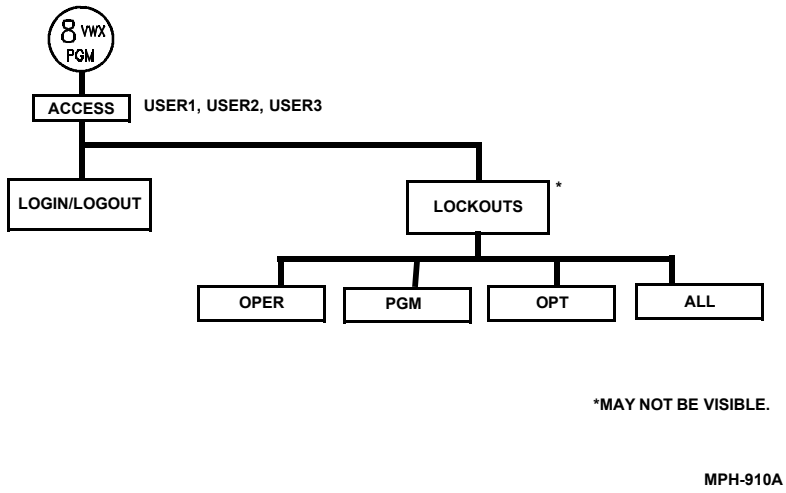

Figure 4-23. LOCKOUTS Program Menu Tree

Table 4-32. OPER Lockouts

Lockout Parameter	Configuration Options	Remarks
ALLOW 3G OPERATION?	YES/NO	
ALLOW ALE OPERATION?	YES/NO	---
ALE: ALLOW AMD SEND?	YES/NO	Only visible if ALLOW ALE OPERATION=YES
ALLOW HOP OPERATION?	YES/NO	---
HOP: ALLOW HAIL?	YES/NO	Only visible if ALLOW HOP OPERATION=YES
HOP: SHOW HOPSET FREQUENCIES?	YES/NO	Only visible if ALLOW HOP OPERATION=YES
ALLOW SSB SCAN?	YES/NO	---
ALLOW SELECT/CHANGE DATA PRESET?	YES/NO	---
ALLOW SELECT/CHANGE VOICE MODE?	YES/NO	---
ALLOW SELECT/CHANGE ENCRYPTION KEY?	YES/NO	---

Table 4-32. OPER Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
ALLOW SELECT/CHANGE CHANNEL?	YES/NO	---
ALLOW SELECT/CHANGE HOPSET?	YES/NO	Only visible if ALLOW HOP OPERATION=YES
ALLOW SELECT/CHANGE FREQUENCY?	YES/NO	---

Table 4-33. PGM Lockouts

Lockout Parameter	Configuration Options	Remarks
COMSEC:	SHOW/HIDE	
COMSEC: ID	SHOW/HIDE	Only visible if COMSEC=SHOW (CITADEL only)
COMSEC: KEYS	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: KEYS, ENTER	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: KEYS, ERASE	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: KEYS, UPDATE	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: MI	SHOW/HIDE	Only visible if COMSEC=SHOW (CITADEL only)
COMSEC:	SHOW/HIDE	

Table 4-33. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
COMSEC ID	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: KEYS	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: KEYS, ENTER	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: KEYS, ERASE	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: KEYS, UPDATE	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: CI	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC: CITADEL	SHOW/HIDE	Only visible of CC MODE not locked out
COMSEC: CITADEL, ID	SHOW/HIDE	Only visible of CC MODE not locked out
COMSEC: CITADEL, KEYS	SHOW/HIDE	Only visible of CC MODE not locked out
COMSEC: CITADEL, MI	SHOW/HIDE	Only visible of CC MODE not locked out
COMSEC: TYPE_I	SHOW/HIDE	---
COMSEC: TYPE_I-CFG	SHOW/HIDE	---
COMSEC: TYPE_I-CFG, ALL	SHOW/HIDE	---
COMSEC: TYPE_I-CFG, ANDVT-BD	SHOW/HIDE	---
COMSEC: TYPE_I-KEYS	SHOW/HIDE	---
COMSEC: TYPE_I-KEYS, ERASE	SHOW/HIDE	---
COMSEC: TYPE_I-KEYS, SPECIAL	SHOW/HIDE	---

Table 4-33. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
CONFIG:	SHOW/HIDE	---
CONFIG: AUDIO	SHOW/HIDE	---
CONFIG: HFNET	SHOW/HIDE	---
CONFIG: LPC	SHOW/HIDE	---
CONFIG: MESSAGE	SHOW/HIDE	---
CONFIG: NETWORK	SHOW/HIDE	
CONFIG: NETWORK-INTERFACE	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, ETHERNET	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, ETHERNET-ADDRESS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, ETHERNET-STATUS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, PPP	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, PPP-ADDRESS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, PPP-PORT_SETTINGS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW

Table 4-33. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
CONFIG: NETWORK-INTERFACE, PPP-STATUS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, WIRELESS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, WIRELESS-ADDRESS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-INTERFACE, WIRELESS-STATUS	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOL	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOL, SNMP	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOL, ROUTES	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOL, ROUTES-ALL	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOLROUTES-INDIVIDUAL	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOL, ROUTES-INDIVIDUAL-ADD	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOL, ROUTES, INDIVIDUAL-DELETE	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW

Table 4-33. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
CONFIG: NETWORK-PROTOCOL, ROUTES, INDIVIDUAL-EDIT	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-PROTOCOL, ROUTES, INDIVIDUAL-REVIEW	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: NETWORK-TELEPHONY	SHOW/HIDE	Only visible of CONFIG:NETWORK=SHOW
CONFIG: OPTIONS	SHOW/HIDE	---
CONFIG: PORTS	SHOW/HIDE	---
CONFIG: PORTS, ASCII	SHOW/HIDE	Only visible if CONFIG:PORTS=SHOW
CONFIG: PORTS, DATA	SHOW/HIDE	Only visible if CONFIG:PORTS=SHOW
CONFIG: RADIO	SHOW/HIDE	
CONFIG: RADIO, BFO	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW
CONFIG: RADIO, COUPLER	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW
CONFIG: RADIO, CW OFFSET	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW
CONFIG: RADIO, FM DEVIATION	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW
CONFIG: RADIO, RX NOISE BLANK	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW
CONFIG: RADIO, RADIO SELF ID	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW
CONFIG: RADIO, RADIO SILENCE	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW
CONFIG: RADIO, TX POWER	SHOW/HIDE	Only visible if CONFIG:RADIO=SHOW

Table 4-33. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
CONFIG: RADIO, TOD	SHOW/HIDE	
CONFIG: RADIO, TOD, DATE FORMAT	SHOW/HIDE	Only visible if CONFIG:TOD=SHOW
CONFIG: RADIO, TOD, TIME FORMAT	SHOW/HIDE	Only visible if CONFIG:TOD=SHOW
MODE	SHOW/HIDE	
MODE: ALE	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ALE, ADDRESS	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ALE, AMD	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ALE, AMD-RX_MSG	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ALE, AMD-TX_MSG	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ALE, CHNGRP	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ALE, CONFIG	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ALE, LQA	SHOW/HIDE	Only visible if MODE:ALE=SHOW
MODE: ARQ	SHOW/HIDE	---
MODE: ARQ, CONFIG	SHOW/HIDE	Only visible if MODE:ARQ=SHOW
MODE: ARQ, SELF_ADDR	SHOW/HIDE	Only visible if MODE:ARQ=SHOW
MODE: HOP	SHOW/HIDE	
MODE: HOP, CHANNEL	SHOW/HIDE	Only visible if MODE:HOP=SHOW

Table 4-33. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
MODE: HOP, CONFIG	SHOW/HIDE	Only visible if MODE:HOP=SHOW
MODE: HOP, EXCLUDE	SHOW/HIDE	Only visible if MODE:HOP=SHOW
MODE: PRESET	SHOW/HIDE	---
MODE: PRESET, CHANNEL	SHOW/HIDE	Only visible if MODE:PRESET=SHOW
MODE: PRESET, MODEM	SHOW/HIDE	Only visible if MODE:PRESET=SHOW
MODE: PRESET, SYSTEM	SHOW/HIDE	Only visible if MODE:PRESET=SHOW
MODE: XDL	SHOW/HIDE	---
MODE: XDL, CONFIG	SHOW/HIDE	Only visible if MODE:XDL=SHOW
SCHED	SHOW/HIDE	

Table 4-34. OPT Lockouts

Lockout Parameter	Configuration Options	Remarks
3G	SHOW/HIDE	
3G:BURST	SHOW/HIDE	Only visible if 3G=SHOW
3G:EXCHANGE	SHOW/HIDE	Only visible if 3G=SHOW
3G:RANK	SHOW/HIDE	Only visible if 3G=SHOW
3G:SCHEDULE	SHOW/HIDE	Only visible if 3G=SHOW

Table 4-34. OPT Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
3G:SOUND	SHOW/HIDE	Only visible if 3G=SHOW
3G:TOD	SHOW/HIDE	Only visible if 3G=SHOW
ALE	SHOW/HIDE	
ALE:AMD_RX_MSG	SHOW/HIDE	Only visible if ALE=SHOW
ALE:AMD_TX_MSG	SHOW/HIDE	Only visible if ALE=SHOW
ALE:EXCHANGE	SHOW/HIDE	Only visible if ALE=SHOW
ALE:LQA	SHOW/HIDE	Only visible if ALE=SHOW
ALE:SCORES	SHOW/HIDE	Only visible if ALE=SHOW
ALE:SOUND	SHOW/HIDE	Only visible if ALE=SHOW
RADIO	SHOW/HIDE	
RADIO: BFO	SHOW/HIDE	---
RADIO: COUPLER	SHOW/HIDE	---
RADIO: RX NOISE BLANK	SHOW/HIDE	---
RADIO: RADIO SELF ID	SHOW/HIDE	---
RADIO: RADIO SILENCE	SHOW/HIDE	---

Table 4-34. OPT Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
RADIO: TX POWER	SHOW/HIDE	---
RADIO: RETUNE	SHOW/HIDE	---
EDITION	SHOW/HIDE	

4.6.2 DEPOT Level Access Control Programming

See Figure 4-24. The DEPOT level user is the overall administrator in setting the privileges of **USER1**, **USER2** and **USER3**. After setting lockouts in any or all of these levels, the DEPOT user must set the passwords for the levels, lock access to level lockouts, and the ability to allow user level password changes.

4.6.2.1 Changing Passwords

Password can be changed for all levels by the **DEPOT** level user or at each user level by that specific level if allowed by the **DEPOT** user.

Perform the following procedure to change a password:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **ACCESS** and press **[ENT]**.

NOTE

The current access level is displayed on the top right corner of the front panel display screen.

c. Use the ◀▶ keys to select **LOGIN** and press **[ENT]**.

d. Use the ▲▼ keys to select **DEPOT** and press **[ENT]**. If a lower level access level is selected of either USER2 or USER3, only the password for that level may be changed, if allowed.

e. Use the ◀▶ keys to select **PASSWORD** and press **[ENT]**. If **USER2** or **USER3** was selected and **PASSWORD** is missing from menu, then the **DEPOT** level user has programmed the R/T to prevent user level password changes. Contact the **DEPOT** level user to change the password.

f. If logged in at DEPOT level, use the ◀▶ keys to select the access level (**USER2**, **USER3**, **or DEPOT**) and press **[ENT]** twice.

g. Use the ◀▶ keys to reselect **PASSWORD** and press **[ENT]**.

NOTE

Pressing **ENT** twice erases the current password for the selected level. A confirmation message is displayed.

h. Use the ◀▶ keys to reselect the access level used in Step f and press **[ENT]**.

i. Press alphanumeric keys on the keypad to enter the password (up to eight characters) for the specified access level.

NOTE

The entered password is masked with asterisk's **(*******#)**. The last character will be masked when the **[ENT]** key is pressed.

j. Press **[ENT]**.

k. Press the **[CLR]** key to return to the **PROGRAM** menu or the **[PGM]** key to return to the preset screen. This procedure will exit the current menu and allow you to stay logged into the current access level.

l. Use the ◀▶ keys to select **LOGOUT** and press **[ENT]**. This procedure will **LOGOUT** from the current access level.

m. Press **[CLR]** to return to the program menu or the **[PGM]** key to return to the preset screen.

NOTE

If power is turned off while logged in to one of the USER levels (**USER1**, **USER2**, or **USER3**), the same user level will be in effect when the radio powers up. Therefore, if it is desirable for the radio to power up in the **USER1** access level, **USER2** and **USER3** should log out before turning off power to the radio. The radio returns to USER1 level after log out.

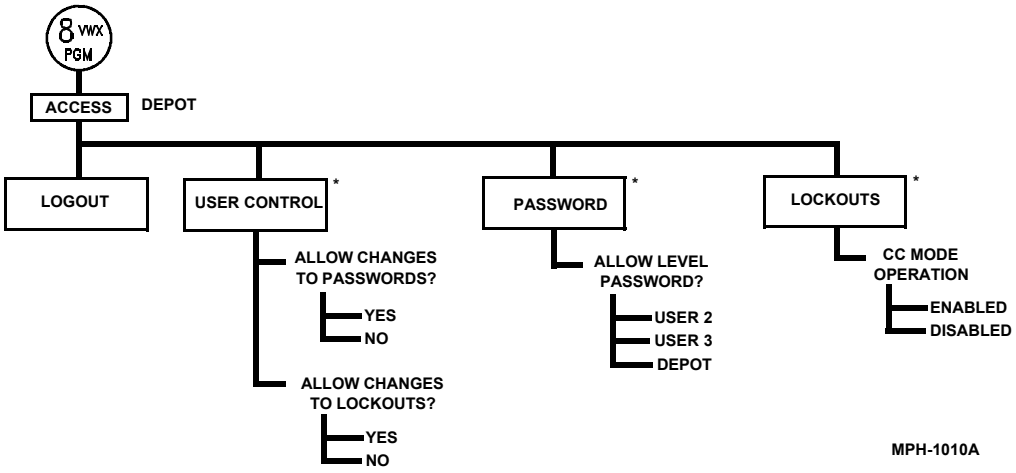

Figure 4-24. DEPOT ACCESS Program Menu Tree

4.6.2.2 Preventing Users from Changing Passwords

Perform the following procedure to prevent a user from changing a password:

a. Press **[PGM]**.

b. Use the ◀▶ keys to select **ACCESS** and press **[ENT]**.

NOTE

The current access level is displayed on the top right corner of the front panel display screen.

c. Use the ◀▶ keys to select **LOGIN** and press **[ENT]**.

d. Use the ▲▼ keys to select **DEPOT** and press **[ENT]**.

e. Use the ◀▶ keys to select **USER_CONTROL** and press **[ENT]**.

f. Verify that **ALLOW CHANGES TO PASSWORDS?** is set to **NO**. At access level **USER2** and **USER3**, the menu item PASSWORD will not be viewable nor accessible to the user and that level password will not be able to be changed.

g. Press **[ENT]**.

h. Press the **[CLR]** key to return to the **Program** menu or the **[PGM]** key to return to the preset screen. This procedure will exit the current menu and allow you to stay logged into the current access level.

i. Use the ◀▶ keys to select **LOGOUT** and press **[ENT]**. This procedure will **LOGOUT** from the current access level.

j. Press **[CLR]** to return to the program menu or the **[PGM]** key to return to the preset screen.

4.6.2.3 Lockouts and Lockout Access Control

The **DEPOT** level user upon setting lockouts in any or all of the user levels must enforce lockouts from programming only contained at the DEPOT level access menus.

Perform the following procedure to configure lockouts and lockout access:

a. Refer to Paragraph 4.6.2.1 Step a through Step d to LOGIN at the **DEPOT** level.

b. Verify that **ALLOW LOCKOUT CHANGES?** is set to **YES**.

c. Power the R/T **OFF** then **ON**.

d. Perform Step a again, logging in at the **USER1**, **USER2**, and **USER3** levels. For each level, configure **ALLOW CHANGES TO LOCKOUTS?** as required.

e. Perform Step a through Step c again, logging in at the **DEPOT** level. Configure **ALLOW CHANGES TO LOCKOUTS?** to **NO**.

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

g. Press the **[CLR]** key to return to the **Program** menu or the **[PGM]** key to return to the preset screen.

4.7 COMMUNICATIONS SECURITY (COMSEC) PROGRAMMING

COMSEC programming allows the R/T to communicate in secure mode (cipher text), after choosing the proper key.

4.7.1 COMSEC Keys Programming

NOTE

If Citadel Cover mode is locked out by DEPOT level access control, no references to Citadel encryption in AN/PRC-150(V)(C) operations and programming menus will be available.

See Figure 4-25 to view the programming tree, and refer to Table 4-35. The following paragraphs describe how to program COMSEC keys in the R/T.

a. Press the **[PGM]** key to enable the programming mode.

b. Use the ◀▶ keys to select **COMSEC** and press **[ENT]**.

c. Proceed to Paragraph 4.7.1.1 through Paragraph 4.7.1.5.

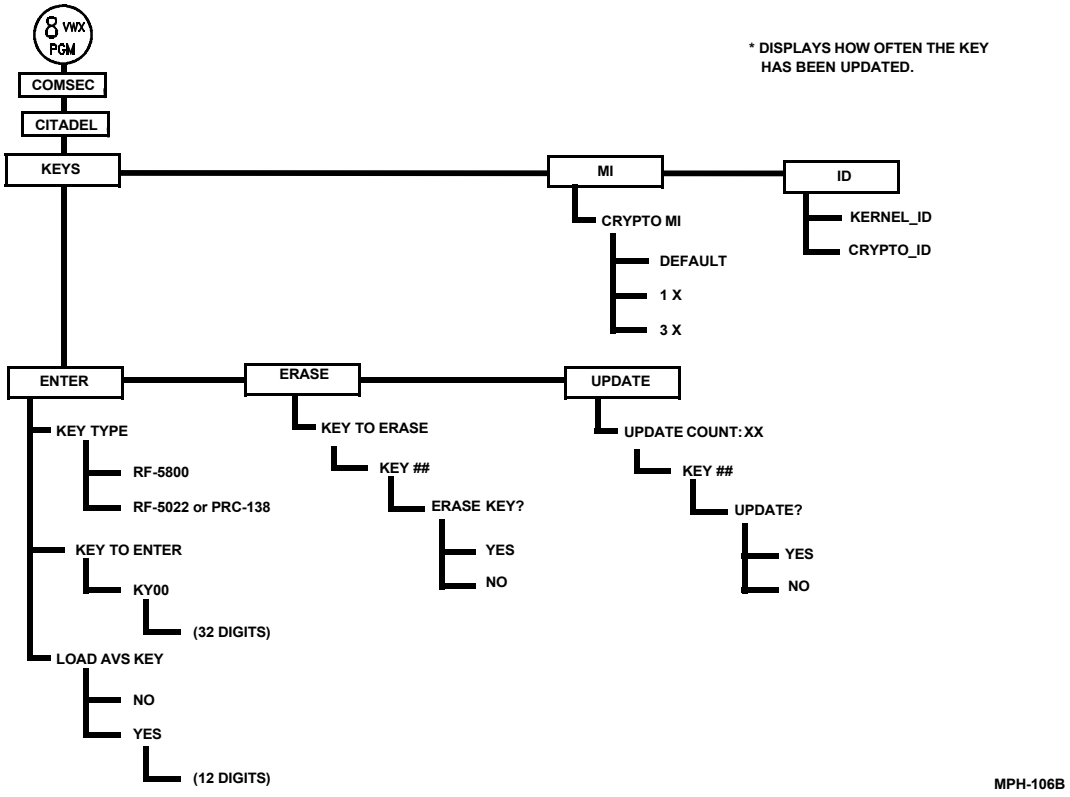

Figure 4-25. COMSEC CITADEL Programming Menu Tree

Table 4-35. CITADEL Programming Menu

Menu Item	Options	Remarks
KERNEL_ID (Citadel only)	---	Identifies the unique serial number of the file that contains Citadel configuration info.
CRYPTO_ID (Citadel only)	---	Identifies the configuration of the Citadel (e.g. algorithm, key size, etc.)
KEYS	ENTER, UPDATE, ERASE	Allows manipulation of keys
MI (Citadel only)	DEFAULT, 1X, 3X	Allows operator to modify the length of the crypto preamble. **1X**: shortest length **3X**: longest length **DEFAULT**: Radio selects an appropriate size based on the current operation.

4.7.1.1 Entering a New Key, Citadel Encryption

See Figure 4-25 and perform the following procedure to enter a new key:

a. Use the ◀▶ keys to select **ENTER** and press **[ENT]**.

b. Use the ▲▼ keys to select one of the following **KEY TYPE** options (**RF-5800** (i.e. CITADEL), **RF-5022/PRC-138**). Select **RF-5800** and press **[ENT]**. The selection **RF-5022/PRC-138** is used for backwards interoperability with the RF-5000 and AN/PRC-138 Systems.

c. Use the alphanumeric keys to enter a desired key (KYXX).

NOTE

A Citadel keyname can contain a maximum of 15 alphanumeric characters. It is recommended, however, that keynames be limited to five characters since any remaining characters will not be displayed in the key field on the preset screen.

d. Use the alphanumeric keys to enter a 32-digit key and press **[ENT]**. The hexadecimal numbering system is used in the key with numbers **0-9** and letters **A-F**.

e. Use the ▲▼ keys to select one of the following **LOAD AVS KEY** options (**YES, NO**).

f. If you selected **YES**, enter an AVS key of 12 numeric characters and press **[ENT]**.

g. Press **[CLR]** to return to the COMSEC menu.

4.7.1.2 Updating a Key (Citadel only)

This feature allows an operator to change keys without having to perform a load operation. After the update completes, the new key (with the same name) is different from the old key. As a result of this, all radios trying to communicate with a particular key must coordinate updates to that key.

See Figure 4-25 and perform the following procedure to update a key:

a. Use the ◄► keys to select **UPDATE** and press **[ENT]**. The **UPDATE COUNT** will be displayed.

b. Enter the desired key and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **UPDATE** options (**YES, NO**). Select **YES** and press **[ENT]**. The key will be updated, and the update count will be displayed.

d. Press **[CLR]** to return to the **COMSEC** menu.

4.7.1.3 Erasing a Key

See Figure 4-25 and perform the following procedure to erase a key:

a. Use the ◀▶ keys to select **ERASE** and press **[ENT]**.

b. Use the ▲▼ keys to select the desired key to erase and press **[ENT]**.

c. Use the ▲▼ keys to select one of the following **ERASE KEY** options (**YES, NO**). Select **YES** to erase and press **[ENT**].

NOTE

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

d. Press **[CLR]** to return to the **COMSEC** menu.

4.7.1.4 Display the Kernel ID and CRYPTO ID (Citadel Only)

The **CRYPTO_ID** identifies the configuration of the Citadel (e.g. algorithm, key size, etc.). The **KERNEL_ID** identifies the unique serial number of the file that contains Citadel configuration info.

See Figure 4-25 and perform the following procedure to display the Kernel ID:

a. From the **COMSEC** menu (**ID**, **KEYS**, **MI**), use the ◀▶ keys to select **ID** and press **[ENT]**.

b. The R/T will display **KERNEL_ID** and the **CRYPTO-ID**. Use the ◆▶ keys to select **KERNEL_ID** and press **[ENT]**.

c. The radio displays the 24-digit kernel ID. Press **[ENT]**.

d. Use the ◆▶ keys to select **CRYPTO-ID** and press **[ENT]**.

e. The R/T displays the 10-digit configuration ID.

f. Press **[CLR]** to return to the **COMSEC** menu.

4.7.1.5 Crypto Message Indicator (MI) (Citadel Only)

This is the Crypto Synchronization Pattern that acts as a preamble to the encrypted data.

The length of the **MI** may be changed to **1X** or **3X** manually. In the **DEFAULT** mode, the R/T will do the selection automatically. It is desirable for the MI to be as short as possible, but too short of an MI length (and a shorter delay) may sacrifice performance over marginal channels.

a. From the **COMSEC** menu (**ID, KEYS, MI**), use the ◆▶ keys to select **MI** and press **[ENT]**.

b. Use the ▲▼ keys to select one of the following **Crypto MI** options (**DEFAULT, 1X, 3X**), and press **[ENT]**.

c. Press **[CLR]** to return to the **PGM** menu.

4.7.2 Type I COMSEC Keys Programming

Type I COMSEC fills are only electronically loaded. Programming refers to the selected deletion and review of electronically loaded Type I COMSEC fills. Refer to Paragraph 3.12 for information on loading Type I COMSEC fills.

The following paragraphs describe how to program Type I keys in the R/T. See Figure 4-26 to view the programming tree, and refer to Table 4-36.

a. Press the **[PGM]** key to enable the programming mode.

b. Use the ◀▶ keys to select **COMSEC** and press **[ENT]**.

c. Use the ◀▶ keys to select **TYPE_ I** and press **[ENT]**.

d. Proceed to Paragraph 4.7.2.1 through Paragraph 4.7.2.3.

Table 4-36. COMSEC Type I Programming Menu

Menu Item	Options	Remarks
KEYS, ERASE	---	Allows selective erasure of TEK keys for each crypto mode.
KEYS, SPECIAL	---	Shows status (LOADED, NOT LOADED) of KEK and TrKEK keys for each crypto mode.
CONFIG, ALL	PT BEEPS	Allows temporary disabling of PT beeps when the radio is operated in PT mode with an external KY-99 (ANDVT) crypto. **NOTE:** Setting defaults to ENABLE; power cycling the radio will cause the default setting to be in effect.
CONFIG, ANDVT-BD	PREAM, TRNSEQ	Allows an operator to match PREAM and TRNSEQ settings of the internal ANDVT-BD crypto to the corresponding settings of an external KY-100 crypto attached to another radio operating in PT mode.

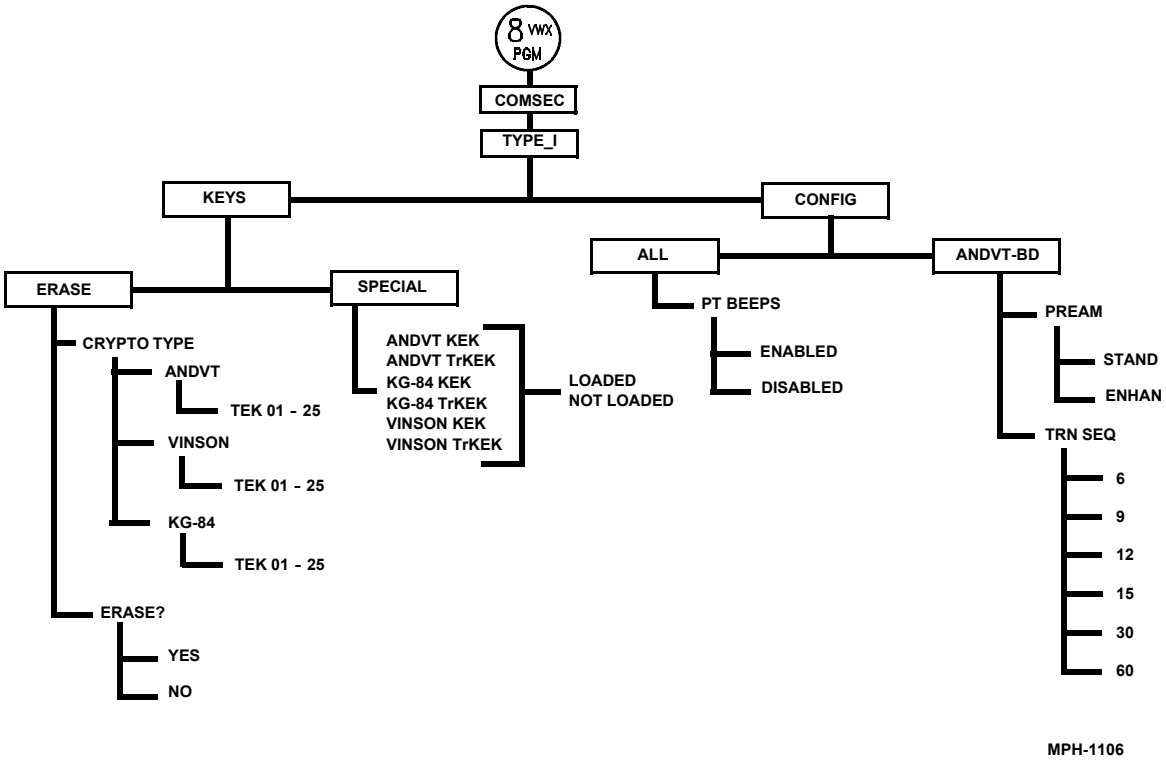

Figure 4-26. COMSEC Type I Programming Menu Tree

4.7.2.1 Entering a New Key

Loading Type I COMSEC keys into the radio is considered an operations procedure, not a programming procedure. For more information, refer to Paragraph 3.12.

4.7.2.2 Erasing a Key

COMSEC TEK keys can be individually erased whenever they are no longer needed. Ensure that all superseded keys are immediately erased upon start of new key period.

See Figure 4-26 and refer to Paragraph 4.7.2. Perform the following procedure to erase a key:

a. Use the ◆▶ keys to select **ERASE** and press **[ENT]**.

b. Use the ▲▼ keys to select the desired key type to erase (**ANDVT, VINSON, or KG-84**) and press **[ENT]**. Only loaded TEKs for the COMSEC mode will be selectable.

c. Use the ▲▼ keys to select one of the following **ERASE KEY** options (**YES, NO**). Select **YES** to erase and press **[ENT]**.

d. Press **[CLR]** to return to the COMSEC menu.

4.7.2.3 Disabling PT BEEPS

If the R/T is in PT mode and is connected to an external KY-99 (ANDVT) encryption device, it is necessary to temporarily disable the PT beeps so that the beeps do not interfere with the KY-99. PT beeps notify the user that PT mode is being used.

Perform the following procedure to disable PT beeps:

NOTE

Cycling the R/T's power **OFF** then ON will automatically enable the PT beeps again. Alternatively, use the following procedure but select **ENABLED** in Step d.

a. From the **COMSEC** menu (**CITADEL, TYPE_I**), use the ◀▶ keys to select **TYPE_I** and press **[ENT]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **ALL** and press **[ENT]**.

d. Use the ▲▼ keys to select **DISABLED** and press **[ENT]**.

e. Press **[CLR]** to return to the **PGM** menu.

4.7.2.4 Determining Special Key Availability

Perform the following procedure to determine the availability of KEKs and TrKEKs:

a. From the COMSEC menu, use the ◀▶ keys to select **TYPE-I** and press **[ENT]**.

b. Use the ◀▶ keys to select **KEYS** and press **[ENT]**.

c. Use the ◀▶ keys to select **SPECIAL** and press **[ENT]**.

d. Use the ▲▼ keys to view the availability of KEK and TrKEK for each COMSEC mode.

e. Press **[CLR]** to return to the **KEYS** menu.

4.7.2.5 External KY-100 Compatibility Setup

When using the AN/PRC-150(V)(C) with an external KY-100, it may be necessary to modify certain COMSEC parameters to ensure interoperability. These KY-100 specific parameters can be modified as follows:

a. From the COMSEC menu, use the ◀▶ keys to select **TYPE-I** and press **[ENT]**.

b. Use the ◀▶ keys to select **CONFIG** and press **[ENT]**.

c. Use the ◀▶ keys to select **ANDVT-BD** and press **[ENT]**.

d. Use the ▲▼ keys to select **STAND** (for Standard Preamble) or **ENHAN** (for Enhanced Preamble) and press **[ENT]**.

e. Use the ▲▼ keys to select **6**, **9**, **12**, **15**, **30**, or **60** for the Training Sequence and press **[ENT]**.

f. Press **[CLR]** to return to the **CONFIG** menu.

NOTE

The parameters selected must match those of the external KY-100 the AN/PRC-150(V)(C) will be communicating with. Before changing any of the default settings, make sure the KY-100 settings are known.

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CHAPTER 5

PREVENTIVE AND CORRECTIVE MAINTENANCE

5.1 PREVENTIVE MAINTENANCE

Preventive maintenance is the systematic, scheduled care and inspection of equipment to prevent equipment failure and to reduce downtime.

Physical preventive maintenance consists of keeping the equipment clean, dry, and dust free.

Recommended materials to keep equipment clean are a soft brush, a moist sponge and a clean cloth.

Table 5-1 contains the checks and services that should be performed either on a daily basis when the equipment is in use or on a weekly basis when the equipment is in a standby condition. Table 5-2 contains the checks and services that should be performed on a weekly basis. Table 5-3 contains the checks and services that should be performed on an annual basis.

Table 5-1. Daily Preventive Maintenance Checks and Services

Check No.	Item to be Inspected	Procedure
1	Operation	Perform self-test (refer to Paragraph 3.3.1.1.).
2	Battery Box Vent	Check that battery case is securely attached and that pressure vent is clear. Vent valve should allow any gas to escape and prevent any water from entering the battery box.
3	Intercabling and Connectors	Check that the interconnecting cables and connectors are tight on the R/T and throughout the antenna system.

Table 5-2. Weekly Preventive Maintenance Checks and Services

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

Table 5-3. Annual Preventive Maintenance Checks and Services

Check No.	Item to be Inspected	Procedure
1	Hold-Up Battery (HUB)	Replace HUB. Refer to Paragraph 5.3.4.
2	Radio performance	Refer to RT-1694D(P)(C)/U Intermediate Maintenance Manual (10515-0103-4300) for annual radio performance checks.

5.2 CORRECTIVE MAINTENANCE

Shortcomings and defects which are revealed during preventive maintenance, or which appear when the Receiver/Transmitter (R/T) is in service, must be attended to by means of corrective maintenance. The type of work required determines if the corrective maintenance procedure can be performed by the operator, or if it must be performed at a maintenance repair facility.

The following procedures assume that the operator has determined that the R/T is faulty. This could be determined in three ways:

- The self-test has been run and a fault has been identified by the R/T.
- A run-time fault message is displayed by the R/T.
- The observed degraded operation suggests that the system is faulty.

Whenever it is believed that the R/T may be faulty, the troubleshooting procedures in this chapter should be followed to determine the recommended corrective action. If the symptom observed is not covered, report the problem to a Level III maintainer (Direct Support, Intermediate Maintenance, or Factory Warranty Support).

5.2.1 Troubleshooting Procedures

Faults can be detected by the Built-In Test Equipment (BITE) or visual observation. Self-test faults are displayed on the Keypad Display Unit (KDU). The following paragraphs identify probable failure causes, and suggested corrective actions.

5.2.1.1 BIT Faults

BIT faults occur following an operator-executed self-test. For information on running BIT, refer to Paragraph 3.3.1.1.

When the R/T displays a fault message, record all fault code information displayed on the KDU, then report the fault to a Level III maintainer. A complete list of BIT Fault codes is published the Level III Maintenance Manual (10515-0103-4300).

5.2.1.2 Non-BIT Faults

Non-BIT faults are operator-observed failures, or cases of degraded operation. Locate the observation in the first column of Table 5-4 and follow the recommended action. If the recommended action is unsuccessful, report the fault to a Level III maintainer.

Table 5-4. Non-BIT Troubleshooting

Observation	Action
R/T does not power on.	Check batteries and/or KDU.
No Receive (RX)/Transmit (TX) audio; R/T will not Push-To-Talk (PTT) key.	Use a different handset.
Intermittent RX audio.	Clean handset connectors. Replace handset.
******FAULT******RECEIVER PROTECTION is displayed on front panel.	Move R/T away from source of strong RF signal.
FW VERSION MISMATCH is displayed on front panel.	Send R/T to Level III maintenance facility as soon as possible.
HW VERSION MISMATCH is displayed on front panel.	Send R/T to Level III maintenance facility as soon as possible.

5.3 BATTERIES

The R/T is supplied with a Battery Box (10513-4800-02), which can contain either two BB-590/U nickel-cadmium rechargeable batteries, two BA-5590 lithium batteries, two BB-390A/U nickel-metal hydride batteries, or two BB-490/U lead-acid batteries.

If necessary, the R/T can be operated on a single battery connected to the **J11** battery connector. Operation on a single battery seriously degrades battery life (refer to Paragraph 5.3.1) and should be avoided whenever possible. Refer to Paragraph 2.3, and see Figure 2-4 for information on installing a single battery into the battery box, and how to install the battery box onto the transceiver when operating with only one battery.

NOTE

When operating with standard rechargeable batteries, using only one battery will still yield 100% power transmission. When using lithium batteries, one battery will yield only 50% power during transmission.

5.3.1 Battery Life

Battery life is the approximate amount of time a battery can be used before it needs recharging (nickel-metal hydride, lead-acid, or nickel-cadmium batteries) or replacing (lithium batteries). The chief factor in determining battery life is transmission power and duty cycle. To maximize battery life, utilize the lowest transmit power level required to successfully communicate. To help conserve battery life, power off the R/T when not in use. During daylight hours, turn the backlight to the OFF position.

5.3.2 Recharging the Ni-Cd Battery Packs

WARNING

Do not recharge a BA-5590/U disposable lithium battery.

The optional Battery Charger (10309-0550) provides fully automatic battery charging and fault detection. The unit can charge up to four BB-590/U battery packs at the same time. It displays the status of each connected battery during operation.

5.3.3 Disposing of Lithium Batteries

WARNING

Do not dispose of lithium batteries in uncontrolled trash. A partially discharged lithium battery is considered to be hazardous waste.

Partially discharged batteries may contain a significant amount of energy and should be handled with care. The battery pack should be wrapped with insulating material such as plastic and packed for disposal. Do not place lithium batteries in trash compactors.

Dispose of partially and fully discharged lithium batteries in accordance with your local directives. Improper disposal of hazardous waste is prohibited by law.

5.3.4 Memory Hold-Up Battery (HUB)

If the R/T does not retain programming and configuration information and/or COMSEC fill variables after being powered off, the HUB (B41-0010-003, NSN 6135-01-461-5322) must be replaced. It is recommended that this be done on a yearly basis. Some units may choose to replace the battery prior to important deployments or missions to ensure readiness during operations. This method ensures success rather than relying on planned time rotation set to rated life of the HUB.

See Figure 5-1. Perform the following procedure to replace the HUB without losing radio programming and configuration information:

a. Without using a battery box, connect a battery to the R/T's rear panel (**J10**) **BATTERY 1** connector.

b. Power the R/T ON by placing the function switch in the Plain Text (**PT)** or Cipher Text (**CT)** position.

c. Without turning the R/T **OFF**, remove and replace the HUB as shown in Figure 5-1.

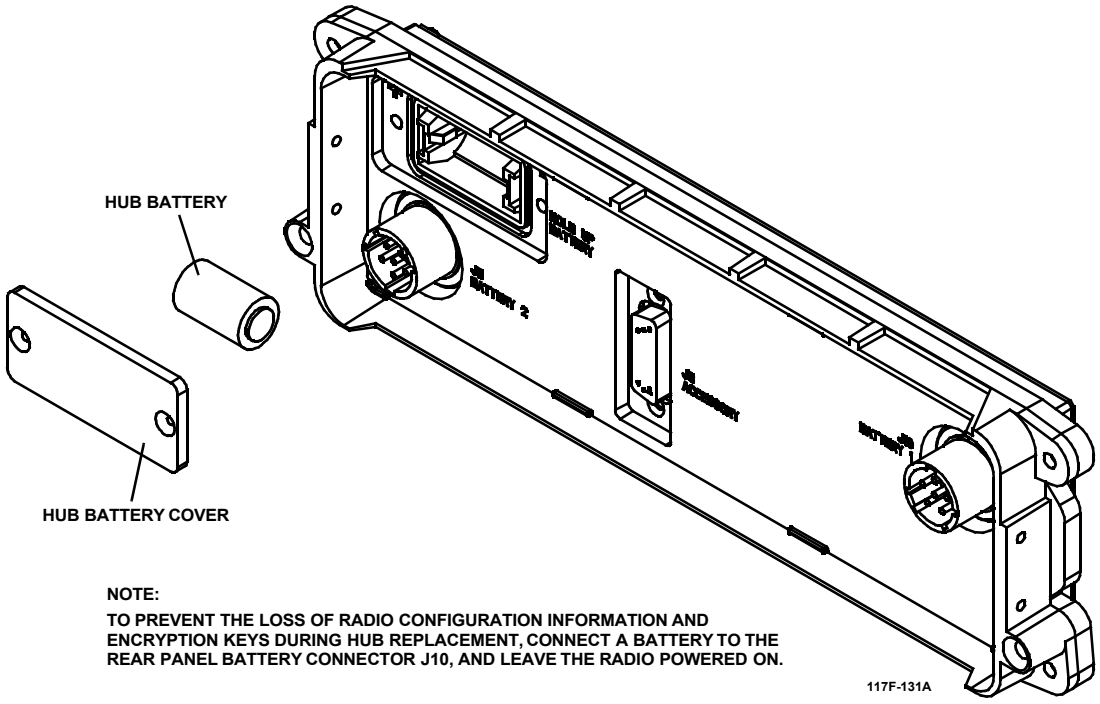

Figure 5-1. Replacing HUB

APPENDIX A

A.1 CHASSIS CONNECTOR PINOUT DATA

Table A-1 through Table A-8 provide pinout data for the external connectors mounted on the R/T chassis.

Table A-1. Front Panel J1 AUDIO Connector

Pin #	Dir	Description	Specifications	Notes/Modes
A	N/A	Audio Connector Ground	Ground	
B	O	Variable Audio Out	3.87 Vrms Audio into 1 k load	When mode is audio.
C	I	Handset Push-To-Talk (PTT)	3.3 V through 15 k ohms, ground to activate.	
D	I	Microphone Audio In	1.5 mVrms, Z in = 150 ohms	
E	O	Keyline Out	Open collector, active low	Used to key another device for retransmission.
F	O	R_Audio_Out		

Table A-2. Front Panel J2 GPS Connector (PLGR)

Pin #	Dir	Description	Specs	Notes/Modes
1				Not connected
2	I	Precision Positioning System (PPS) Time Mark Out	Load: 50 ohm Pulse Width: 20 usec ± 20% Rise Time: 50 nsec max Fall Time: 1 usec max	Voltage With Respect To Ground (WRT): Logic 1: 3 to 5 VDC Logic 0: 0 to 0.5 VDC
3	O	Serial Data Port In RS-232E Global Position System (GPS) Receive Data	Load: > 3 kohm Slew rate: 30 volts/usec max Baud rate tolerance: ± 1.7%	Voltage WRT Ground: Logic 0: +3 to +25 VDC Logic 1: -3 to -25 VDC
4	I	Ground	Signal Reference	
5	I	Serial Data Port Out RS-232E GPS Transmit Data	Load: > 3 kohm in parallel with <2500 pF Slew rate: 30 volts/usec max Baud rate tolerance: ± 1%	Voltage WRT Ground: Logic 0: +5 to +25 VDC Logic 1: -5 to -25 VDC
6	I	Not Used		Not used
7	O	External GPS Power	Battery Voltage (19.5 to 33 VDC @ 100 mA max)	Optional

Table A-3. Front Panel J18 FILL Connector (Compatible with DS-101 and DS-102 Fill Devices)

Pin #	DS-102 Description	DS-101 Description
A	Reference (+ 5 VDC)	Return (0 VDC)
B	Sense (pull-up; ground to activate)	Bal + (RS-485 compatible)
C	Request To Send (RTS)	Not used
D	Data	Not used
E	Clock Input/Output (I/O)	Bal - (RS-485 compatible)
F	Override	Not used

NOTE

J18 interface is determined by the selection of the type of COMSEC Fill Device in the LD menu. DS-101 is for using the CYZ-10 with UAS FILL set to D101 protocol. DS-102 interface is used when any of the common fill devices is selected, such as the KYK-13, KYX-15, or KOI-18.

Table A-4. Front Panel J3 DATA Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	O	Transceiver Clear to Send (CTS)	RS-232E or MIL-STD-188-114A; Unbalanced	
2	O	Transceiver Data Carrier Detect (DCD)	RS-232E or MIL-STD-188-114A; Unbalanced	
3	O	Transceiver Receive Data (RXD) Clock (out of radio)	RS-232E or MIL-STD-188-114A; Unbalanced	
4				Not connected
5	N/A	Chassis Ground		
6	O	Transceiver RXD (out of radio)	Unbalanced	
7				Not connected
8	I	Remote Control TXD - (Transmit Data) (into radio)	RS-232E or MIL-STD-188-114A; Balanced	
9	I	Remote Control TXD + (into radio)	RS-232E or MIL-STD-188-114A; Balanced	
10				Not connected
11	O	Red Fixed Level Audio Out	600 ohm, 0 dBm or -10 dBm	Programmable level
12	I	Red Fixed Level Audio In	600 ohm, 0 dBm or -10 dBm	Programmable level

Table A-4. Front Panel J3 DATA Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
13	N/A	Chassis Ground		
14	O	Battery Out	19.5 - 33 VDC, 100 mA, maximum	
15	I	Red PTT	Pulled up, 3.3 V through a 15 kohm resistor	Ground closure to activate.
16	I	Transceiver Data Terminal Ready (DTR) (into radio)	RS-232E or MIL-STD-188-114A; Unbalanced	
17				Not connected
18	I	Transceiver TXD Clock (into radio)	RS-232E or MIL-STD-188-114A; Unbalanced	
19	I	Transceiver TXD (into radio)	RS-232E or MIL-STD-188-114A; Unbalanced	
20				Not connected
21	O	Remote Control RXD (out of radio)	RS-232E or MIL-STD-188-114A; Unbalanced	
22	I	Data Carrier Detect (DCD) In, or CTS In	RS-232E or MIL-STD-188-114A; Unbalanced	

Table A-4. Front Panel J3 DATA Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
23	O	Retransmit Keyline Out	100 mA, 60 V	Open collector
24	O	Transceiver Data Set Ready	RS-232E or MIL-STD-188-114A; Unbalanced	
25				Not connected
26	I	Transceiver Request-To-Send (RTS)	RS-232E or MIL-STD-188-114A; Unbalanced	
27				Not connected

Table A-5. Front Panel J6 ACCESSORY Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	I	Ethernet ARX+	±1200 mV (max)	Ethernet Provision
2	I	Front Panel External Power Return		Diode clamped to ground.
3	I/O	External PA Control -	0 V, +5 V differential asynch control data, 150 kbaud	
4	I/O	External PA Control +	0 V, +5 V differential asynch control data, 150 kbaud	
5	N/A	Chassis Ground		

Table A-5. Front Panel J6 ACCESSORY Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
6	I	Black Fixed Audio In	600 ohm, 0 to -10 dBm	For modem baseband testing.
7	O	Black Fixed Audio Out	600 ohm, 0 to -10 dBm	For modem baseband testing.
8	O	External Keyline Out	Open collector, active low	
9	O	External PA ON/OFF Control	0.0 V CMOS = On; +5.0 V CMOS = OFF	
10	I	RT ON/OFF Control	0.0 V = OFF; OPEN = ON	
11	I/O	TX Debug Data	RS-232E	
12	I/O	Ethernet ATX+	±1200 mV (max)	Ethernet Provision
13	N/A	Chassis Ground		
14	I	Front Panel External Power In+	22.1 VDC to 32.5 VDC	
15	I	Front Panel External Power In+	22.1 VDC to 32.5 VDC	
16	I	Ethernet ARX-	±1200 mV (max)	Ethernet Provision
17	N/A	Front Panel External Power Return	Diode clamped to ground.	
18	I	External PTT	Active low	
19	I	External PA Feedback +	+0.5 V min, +4.3 V typical, +7.0 V max	
20	I	External PA Feedback -	PA feedback ground return	
21	O	Frequency Hopping Clock	0 V, 5 V CMOS levels	

Table A-5. Front Panel J6 ACCESSORY Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
22	I/O	Radio Debug Port, Receive	RS-232E	
23	I/O	Ethernet ACX+	±1200 mV (max)	Ethernet Provision
24	I/O	Ethernet ACX-	±1200 mV (max)	Ethernet Provision
25	I	Remote Control RX Data	RS-232E	ASCII Remote Control
26	O	Remote Control TX Data	RS-232E	ASCII Remote Control
27	I/O	Ethernet ATX-	±1200 mV (max)	Ethernet provision

NOTE

For unbalanced interfaces, the negative signal sense is typically used. This translates to a Logic 1 corresponding to a negative voltage.

Table A-6. Front Panel KDU Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	I	TX Data + from KDU	RS-485	Differential
2	I	TX Data - from KDU	RS-485	Differential
3	I	KDU Present	Ground = KDU present	
4	N/A	Ground		

Table A-6. Front Panel KDU Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
5	O	RX Data + to KDU	RS-485	Differential
6	O	RX Data - to KDU	RS-485	Differential
7	O	+Battery Power Supply to KDU	+26.5 V Nominal	

Table A-7. Rear Panel J10 and J11 Battery Connectors

Pin #	Dir	Description	Specifications	Notes/Modes
1	N/A	- DC Input Voltage (Cell A)		
2	N/A	- DC Input Voltage (Cell B)		Tie pin 2 to pin 4 for 24 V.
3	I	Battery Type Indicator	GND = Ni-Cd or other; Open = Lithium	Ground for external power source
4	I	+12 VDC Input Voltage (Cell A)		Tie pin 4 to pin 2 for 24 V.
5	I	+12 VDC Input Voltage (Cell B)		Pin 2-4 tie produces + 24 VDC here.
6	I/O	Charge Status for Smart Battery	Bi-directional serial	

Table A-8. Rear Panel J9 ACCESSORY Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	I	Black Fixed Audio In	600 ohm, 0 to -10 dBm	
2	O	Black Fixed Audio Out	600 ohm, 0 to -10 dBm	
3	O	External PA Control +	0 V, +5 V differential asynch control data, 150 kbaud	
4	O	External PA Control -	0 V, +5 V differential asynch control data, 150 kbaud	
5	I	External PA Feedback -	PA Feedback Ground Return	
6	I	External PA Feedback +	+0.5 V min, +4.3 V typical, +7.0 V max	
7	I	Remote Control TX Data	RS-232E	
8				Unused
9	I/O	Ethernet ACX+	±1200 mV (max)	Ethernet Provision
10	I	External PTT	Active Low	
11	I	Radio Debug Port, Receive	RS-232E	Debug port
12		External DC Power Return	DC Return	
13	I/O	Ethernet ATX-	±1200 mV (max)	Ethernet Provision
14	I/O	Ethernet ATX+	±1200 mV (max)	Ethernet Provision
15	I/O	Ethernet ACX-	±1200 mV (max)	Ethernet Provision

Table A-8. Rear Panel J9 ACCESSORY Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
16	O	External PA ON/OFF Control	0.0 V = On; +5 V CMOS = OFF	
17	O	Remote Control RX Data	RS-232E	
18	I	Debug Port Enable	Apply 3.3 V to enable Debug Port.	Leave open for GPS.
19	I/O	Radio Debug Port, Transmit	RS-232E	Debug port
20	I	External PA Present	+19.5 VDC to +32 Vdc, 1 mA	
21	O	Frequency Hopping Clock	0 V, 5 V CMOS levels	
22	O	External Keyline Out	Open collector, active low.	
23	I	External RT ON/OFF	Ground = OFF	R/T front panel switch must be On.
24	O	AIC Connector Power Output	18.5 VDC to 33.5 VDC at 100 mA max	Power for external device. Short circuit protected.
25	I/O	Ethernet ARX-	±1200 mV (max)	Ethernet Provision
26	I/O	Ethernet ARX+	±1200 mV (max)	Ethernet Provision

NOTE

For unbalanced interfaces, the negative signal sense is typically used. This translates to a Logic 1 corresponding to a negative voltage.

Because of the large number of connections possible with the R/T, Table A-9 shows the variety of cables and connector kits available.

Table A-9. Compatible Cables and Connector Kits

Interface	Cable	Description
KY-99	10535-0701-A004	KY-99 Audio/Data
KY-99	10535-0702-A1	RS-232 Black data to encryption device
KY-99/RF-6710W	10372-1230	Y-cable, KY-99 Audio, R/T control (DB25)
PA	10535-0720	PA-R/T control cable
PA/Remote	10535-0730-A1	Y-cable, ASCII remote & PA control
Remote	10535-0740-A006	ASCII remote control from Accessory Connector (J6)
KG-84C	10535-0750-A006	Black Data cable
Remote	10535-0760-A006	ASCII remote control from Rear D-Connector
Data	10535-0770-A006	Sync/Async RS-232 DTE Data
Data	10535-0780-A006	Synchronous RS-232 DTE Data (DB-25)
KDU	10511-0704-012	KDU extension
RF-6710W/RF6750W	10535-0775-A006	Async RS-232 control/data (DB-9)
RF-5833-PA	10497-0300-01	150-watt Ancillary Mating Connector Kit
RF-5830-PA	10255-9600-01	20-watt PA/Coupler Ancillary/Mating Connector Kit

Table A-10. Connectors and Mating Connector Part Numbers

Chassis Connector	Mating Connector Part Number
J1 AUDIO and J18 FILL	J69-0001-623
J3 DATA	J69-0016-001 with J09-0039-001 backshell
J6 ACCESSORY	J69-0016-002 connector with J09-0039-001 backshell
J7 ANTENNA	UG-88C/U
KDU Interface	J29-0014-015 or -013
Rear Panel D-Connector	J22-0126-026 with J55-0015-515 connector hood

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GLOSSARY

3G — Third generation ALE, characterized by faster linking and the ability to operate successfully in lower signal-to-noise ratio situations.

-A-

ACK — Acknowledgement positive.

ACRS — Automatic Control of Radio Systems

AGC (Automatic Gain Control) — Circuit employed to vary gain or amplification in proportion to the input signal strength so that the output remains at a constant level.

ALE (Automatic Link Establishment) — The process of making a point-to-point radio connection without operator involvement using data automatically collected by the system in accordance with a pre-established protocol.

ALE Net Call — A type of ALE call-answer protocol where the caller requests connection to all other radios in the net and the radios respond in a specific sequence so as not to interfere with each other.

ALE Net Address — 15 character identifier used to describe the net in the radio to allow the radio to perform an ALE “net call.”

AMD — Automatic Message Display. A data mode only used in ALE that uses the ALE modem to transmit and receive short text messages with a very robust ARQ method.

GLOSSARY - Continued

-A- - Continued

AME	Amplitude Modulation Equivalent. A efficient type of AM where one sideband is removed and the carrier suppressed to improve transmission.
ANDVT-HF	The common name for KY-99 encryption. Voice is encrypted at 2400 bps and DATA rates are 300, 600, 1200 and 2400 bps user selectable.
ANDVT-BD	The common name for KY-100 encryption (black digital). For KY-100 interoperability, voice is encrypted at 2400 bps and DATA rates are 75, 150, 300, 600, 1200 and 2400 bps, user selectable.
ARQ (Automatic Repeat reQuest)	A data transmission system in which the receive terminal upon detecting a transmission error in a message automatically transmits a request to the originator to re-send the flawed parts of the message. Also see ACK and NACK.
ANY Call	ALE call made to all stations scanning on a given channel in which responses are required from the target stations.
Associated Self	ALE self address used in programming a Net.
AVS	Analog Voice Security. A voice scrambling feature of Citadel COMSEC. Is not considered secure but does provide privacy.

-A- - Continued

Automatic Call — A call in which the best available channel is selected by the ALE. The radio will call on the highest frequency first, and progress through the remaining frequencies in descending order when LQA scores are not available for channels in a channel group.

-B-

Bandwidth — A range of frequencies occupied by a given signal.

Baud — A unit of transmission speed, expressed as the number of code elements transmitted over a serial communications device in one second. For an RS-232 port, this may be interpreted as bits per second, including start bits, stop bits, and parity bits.

BFO — Beat Frequency Oscillator

Bidirectional LQA — An LQA technique which involves two-way messages sent between two stations on all common channels. Channel rankings are established.

Bit Error Rate (BER) — An evaluation of the ability of a channel to pass error-free data information.

BIT — A binary digit that can have a value of 0 or 1.

BITE — Built-In Test Equipment

-B- - Continued

BLOS	Beyond Line of Sight, HF skywave communications using selected frequencies that refract from the ionosphere.
BNC	British Naval Connector. UG-88 plug for a standard RG-58 coax cable.
BPS	Bits per Second
BW	Bandwidth

-C-

Calling Station	The station initiating a call to a target station.
CC	Citadel Cover. New cipher mode switch position on Type I radios, added to accommodate both Citadel and Type I encryption in a single radio. CC mode can be disabled by Depot level user in Access Control Menu.
CCI	Controlled Cryptographic Item. US type I encryption devices must be protected by applicable service regulations concerning CCI. Keyed radios become classified to same level of the loaded fill.
Channel (CH., CHAN)	A programmed combination of frequency and mode of transmission, bandwidth, and AGC value.
Channel Score	ALE rating of overall channel quality
CIK	Crypto Ignition Key - Seed for cryptographic keys

-C- - Continued

Coalition Operations	Combined military operations involving US and other countries. Communication systems interoperability is a major factor in coordinating all operations.
Collocation	Placing or arranging systems in close proximity of each other.
Command	A single instruction to a computer program (including the operating system) from a user.
Communication Plan	A definition of up to 75 system presets in the three operating modes of FIX, ALE, or HOP for data specific to those nets and data common among all the nets. Also referred to as COMM PLAN.
COMSEC Keys	Refers to Communication Security Keys of TEKs, TrKEKs and KEKs.
Compression (data)	Reducing the size of ASCII text messages through an algorithm that eliminates redundant information. The data compression algorithm allows significant reductions in transmission time of a message.
Configuration	The process of setting parameter values which define the current hardware setup and/or operational modes. Also, a collection of all such values at any given time.
CSMA/CA	Carrier Sense Multiple Access with Collision Avoidance

GLOSSARY - Continued

-C- - Continued

CT	Cipher Text. Function switch position to enable the Type I encryption programmed for the system preset being used.
CTS	Clear-To-Send.
CVSD	Continuous Variable Slope Delta. Digitization process for analog voice used in conjunction with Vinson encryption.
CW	Continuous Wave. Method of sending or receiving International Morse Code.

-D-

Data Presets	A named, pre-defined set of modem parameters that allows the radio to be setup using only the name. Also referred to as modem presets.
DC	Direct Current.
Default Settings	Transmission parameters established during the setup of the network configuration that remain in effect unless they are explicitly changed.
DMDG	Digital Message Device Group
DOD	Department of Defense
DTD	Data Transfer Device, AN/CYZ-10
DTE	Data Transfer Equipment

-D- - Continued

DUN	Dial-up networking
DV (Digital Voice)	Analog voice that has been converted into digital data.

-E-

ECCM (Electronic Counter Counter Measures)	Techniques used to prevent signal detection or jamming of the transmission path.
ECCM Frequency Exclusion	A specific type of exclusion band that applies only to wide band ECCM mode and is given directly to the radio.
ECCM Channel Type	ECCM can operate in one of three modes: wideband, narrowband and list.
Exchange	ALE LQA technique which involves two-way messages sent between two stations. Channel rankings are established based on received signal quality.
Exclusion Band	A range of frequency values, stated as a lower and upper exclusive frequency, which must be omitted from all frequency lists in the appropriate scope.

-F-

F_c	Center frequency. The frequency around which HOPPING occurs

-F- - Continued

FEC (Forward Error Correction)	A data formatting system in which redundant bits are added to a message and are used to correct errors in the received message. This system does not require a return link to the sender to make the corrections.
FED-STD 1052	ARQ protocol which provides error-free transmission of digital data over HF radio circuits.
Fixed Frequency	A single frequency operating mode.
FM	Frequency Modulation
FSK	Frequency Shift Keying

-G-

GPS (Global Positioning System)	A unique system that uses satellites to provide Time-Of-Day used with frequency hopping and 3G synchronization.

H-

Hailing	A method by which a station that is not operating in ECCM mode can signal radios in an ECCM net. Hailing consists of transmitting a special signal on a single frequency from SSB mode. The members of the ECCM net are programmed with a list of hail frequencies which the ECCM radios periodically check for hail signalling. When a radio in ECCM mode detects a hail transmission, its operator is notified so that he may choose to change to FIX mode and contact the hailing station.
HAZMAT	Hazardous Materials
HF	High Frequency. The 1.6 - 29.9999 MHz range of the AN/PRC-150 Radio Set.
HOP	Same definition as ECCM.
Hopnet	Defines the set of ECCM frequencies or hopping characteristics that the radio is allowed to use.
HUB	Hold Up Battery. Maintains the radio configuration programming and loaded COMSEC fills when the radio is off or has it's main batteries removed.

-I-

ID	Identification
Individual Address	A maximum 15 character ALE name which one radio uses to refer to another radio (also referred to as a call sign).
Individual Call	ALE call placed to a single target station using an individual address. Each station must be programmed with the address and channel list of the other station before initiating the call.
Interface	A boundary between two systems, a device which connects two systems, or a specification for connecting two systems.
Interleaving	A form of forward error correction designed to overcome fading and impulse noise.
IP	Internet Protocol.

-J-

-K-

KDU	Keypad Display Unit
KEK	Key Encryption Key - Encryption of a key so it can be transmitted without fear of its interception compromising security. Used in OTAR

-K- - Continued

KG-84NR	A Type I encryption type. “NR” stands for “non-redundant”.
KG-84R	A Type I encryption type. “R” stands for “redundant”. More COMSEC synchronization information is added to help overcome problems with difficult channel conditions.
KY-57	A Type I encryption type. Commonly referred to as VINSON.
KY-99	A Type I encryption type. Commonly referred to as ANDVT.
KY-99A	A Type I encryption type. An improvement where KY-99 were improved to add Vinson mode while keeping existing ANDVT capability.

-L-

LCD	Liquid Crystal Display
Li-MH	Lithium-Metal Hydride
LOS	Line of Sight
LPC (Linear Predictive Coding)	Used to produce Digital Voice.

-L- - Continued

LQA (Link Quality Analysis)	The process of determining the quality of a channel by measuring various parameters of the received signal such as signal-to-noise ratio and bit error rate. Typically, LQA information is stored and then used in the ALE process.
LSB	Lower Sideband

-M-

Manual Call	A call in which the channel is selected by the user.
Manual Synchronization	A way of synchronizing radios in the net without using GPS Sync. With all radios in wristwatch sync, a signal is sent to the net control station, requesting a special synchronization transmission. The net control station responds by transmitting timing information on the channel that all radios use to synchronize their clocks. The over-the-air timing information must be accepted by the operator before it is put into use by the radio.
Max Scan Channels	The largest value of the number of ALE channels scanned by each radio in a net. The number of channels scanned by a radio is the sum of all the ALE channels in all the nets the radio is a member of.
MCW	Modulated Continuous Wave

-M- - Continued

MELP Mixed Excitation Linear Prediction - method of digitizing analog voice signals. Speech is more recognizable and works well in poor signals strengths.

MHz Abbreviation for megahertz, or millions of cycles per second.

Mode The HF signalling method being employed which include SSB\FIX, ALE, 3G and HOP.

Modem Acronym for MOdulator/DEModulator. This is a type of data communications equipment which converts digital signals into an analog format (modulation) suitable for transmission through various media and reconverts received signals into a digital format (demodulation).

MTOD Manual Time-of-Day

-N-

NACK (Negative ACKnowledgement) In an ARQ system, a-request from the receiving station that a message block in which errors were detected be retransmitted.

NCD (Net Control Device) A COMSEC fill device with added capability to perform RV operations.

NCS (Net Control Station) The station in the radio net that has radio control over net members.

-N- - Continued

Net Configuration — Data describing a net including name, description, radio members and their ALE addresses, etc. Nets can exist in multiple plans, but have distinct configurations in each plan.

Net — A group of radios that share common communications parameters, such as frequencies, ALE information, COMSEC mode and key, etc.

Ni-CD — Nickel-Cadmium

Ni-MH — Nickel-Metal Hydride

Non-ARQ Mode — A form of message transmission that does not require the destination to confirm the receipt of a message. The message may be directed to one or more stations.

-O-

OTA — Over-the-Air

OTAR — Over-the-Air Rekey

-P-

Parameter — Data provided to a program to alter its function in some manner defined by that program. Parameters may be either optional or required. The actual value selected by the user is called a parameter value.

PC — Personal Computer

-P- - Continued

PEP	Peak Envelope Power
PLGR	Precision Lightweight GPS Receiver
PPP	Point to point protocol
PPS	Precision Positioning System - Special derivation from GPS to give exceedingly accurate locations.
PSK	Phase-Shift Keying
PT	Plain Text
PTT	Push (or Press) to Talk - The button on the handset you press to activate the transmitter for voice transmission.

-Q-

-R-

Radio Presets	A named, pre-defined set of radio parameters.
Radio Silence	A feature which prevents automatic response to incoming calls or LQA requests.
RCP	Radio Control Protocol
RCV/RX	Receive

-R- - Continued

RDS	RBECS DTD Software. A common AN/CYZ-10 User Application Software found in US Army and Marine units for handling COMSEC fill data. Uses DS-102 interface protocol.
RF	Radio Frequency
RFI	Radio Frequency Interference
RPA	Radio Programming Application. A Harris MS Windows based program used by a net planner to configure the necessary configuration programming on the AN/PRC-150. The data is then uploaded to each radio by a DUN PPP connection to the radio J3 RDP interface.
RS-232	A set of standard specifications for the design of serial ports. An RS-232 port is a serial port which conforms to the EIA standard designated as RS-232.
R/T	Receiver/Transmitter - the Radio
RTS	Abbreviation for Request-To-Send.
RV	Receive Variable mode switch position. Used for OTAR operation. In this mode, the radio has limited RX/TX capabilities for only OTAR COMSEC operations.

-S-

SARK	Secure Automatic ReKey
Score	A rating of overall channel quality in ALE mode determined by link quality analysis.
Self Address	An address used to identify a calling station. A station may have more than one self address. The same character string is used as the individual address when receiving calls as a target station.
Serial Port	A communications device which transfers data over a data line one bit at a time. The serial ports on a PC-compatible conform to the RS-232 standard.
Sounding	An LQA technique which involves sending a one-way message on all channels programmed for a self address. Target stations establish channel rankings based on received signal quality by receiving the sounding signal and do not have to transmit back a response ensuring security of location.
SINAD	Signal + Noise + Distortion to Noise + Distortion Ratio
SNR	Signal-to-Noise Ratio
SQ	Squelch
SSB	Single Sideband

-S- - Continued

Start Bit	An extra bit written at the beginning of each byte in serial communications.
Stop Bit	An extra bit written at the end of each byte in serial communications. This helps to keep the two ends of the line synchronized and improve reliability.
SYNC	Synchronous. A data transmission method using a clock signal between the DTE and DCE for proper synchronization. Does not require the stop and start bits in the data stream as asynchronous requires.

-T-

Target Station	A station called by a calling station.
TEK	Traffic Encryption Key - Key used to encrypt normal radio traffic**.**
TFOM	Time Figure of Merit
TOD (Time-of-Day)	The time used to synchronize station to calibrate the hopping sequence.
T/R	Transmit/Receive
TRANSEC	Transmission security techniques that prevent signal detection or jamming of the transmission path.
TrEK	Transmission Encryption Key - Key used to encrypt special radio traffic**.**

-T- - Continued

TrKEK	Transfer Key Encryption Key
TX	Transmit

-U-

UAS	User Application Software, Operating software used by the AN/CYZ-10 DTD to handle COMSEC Fill Data. FILL and RDS are most commonly used.
USB	Upper Sideband
UTC	Coordinated Universal Time

-V-

VDC	Voltage, Direct Current
VINSON	Vinson COMSEC, KY-57 compatible embedded COMSEC mode. Uses 16 kbps data rate for voice and data.
VSWR (Voltage Standing Wave Ratio)	Is the difference between the Standing voltage and the reflected voltage on the transmission line.

-W-

WBFSK Wideband Frequency Shift Keying - a modem waveform

WMT Wireless Messaging Terminal. The Harris RF-6710 Outlook based messaging interface that capitalizes on the ARQ modem preset to ensure reliable data communications.

-X-

XDL High Data rate Linking (HDL) or Low Data rate Linking (LDL). Together, they are referred to as XDL, where “X” is a variable.

XMT Transmit

-Y-

-Z-

Zeroize A command sequence which erases all programmed channel parameters, presets, loaded COMSEC variables and option settings and overwrites them with zeros.

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