Tactical Radio Products

AN/PRC-150(C)
ADVANCED TACTICAL HF RADIO

OPERATION MANUAL

assured**communications**™

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LIMITED FIVE YEAR WARRANTY
HARRIS CORPORATION (RF COMMUNICATIONS DIVISION)

FROM HARRIS TO YOU - This warranty is extended to the original buyer and applies to all Harris Corporation, RF Communications Division equipment purchased and employed for the service normally intended, except those products specifically excluded.

NOTE: Terms and conditions of the standard warranty may be superseded by the terms and conditions of your contract.

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- Consequential damages incurred by a buyer or user from any cause whatsoever, including, but not limited to transportation, non-Harris repair or service costs, downtime costs, costs for substituting equipment or loss of anticipated profits or revenue.

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IF YOU HAVE ANY QUESTIONS - Concerning this warranty or equipment sales or services, please contact our Product Service Department.

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SAFETY SUMMARY

1. INTRODUCTION

All operators and maintenance personnel must observe the following safety precautions during operation and maintenance of this equipment. Specific warnings and cautions are provided in the manual and at the end of this Safety Summary. Warnings, Cautions, and Notes appear before various steps in the manual and will be used as follows:

- **WARNING** Used when injury or death to personnel and damage to equipment is possible

- **CAUTION** Used when there is a possibility of damage to equipment

- **NOTE** Used to alert personnel to a condition that requires emphasis

2. PERSONNEL AND EQUIPMENT SAFETY

Basic safety precautions consider factors involved in protecting personnel from injury or death. Electrical, mechanical, Thermal, electromagnetic radiation (EMR), material, or chemical hazards are the most common types of hazards found in electronic equipment. The following are types of hazards that may exist:

ELECTRICAL   Hazardous voltage and current levels may exist throughout the equipment. Contact with these hazards could cause electrocution, electrical shock, burns, or injury due to involuntary reflexes of the body.

MECHANICAL   Mechanical hazards are created when heavy assemblies and components must be removed and replaced. Moving parts (such as fan blades) and hot surfaces are potential mechanical hazards.

THERMAL   Burn hazards may exist in the equipment that could cause personal injuries and/or serious equipment damage. Internal surfaces of the equipment may be in excess of 65°C, the point at which personnel could be burned. Extreme caution should be used when working with any hot assemblies (for example, power supply or power amplifier assemblies). Physical injury or damage may result to personnel and/or equipment as a result of a reflex action to a burn.

CHEMICAL   Chemicals or materials used for servicing the equipment may present potential hazards. Many chemical agents, such as cleaners and solvents, may be toxic, volatile, or flammable. If used incorrectly, these agents can cause injury or death.

EMR   Overexposure to electromagnetic radiation results from amplified radio frequencies that may produce a health hazard.

3. OPERATIONAL AND MAINTENANCE SAFETY GUIDELINES

Good safety discipline is critical to prevent injury to personnel. All other safety measures are useless if personnel do not observe the safety precautions and do not follow safety disciplines. Once aware of a hazard, personnel should ensure that all other personnel are aware of the hazard. The following basic safety disciplines are stressed:

a.   Read a procedure entirely before performing it. Personnel must always perform each assigned task in a safe manner.

b.   Prior to applying equipment power after maintenance, personnel must ensure that all unsecured hand tools and test equipment are disconnected from the serviced/maintained equipment and properly stored.

  c. Power to the equipment must be removed before a piece of equipment is removed.

  d. Personnel must react when someone is being electrically shocked. Perform the following steps:

    1. Shut off power.

    2. Call for help.

    3. Administer first aid if qualified.

    Under no circumstances should a person come directly in contact with the body unless the power has been removed. When immediate removal of the power is not possible, personnel must use a non-conductive material to try to jolt or pry the body away from the point of shock.

  e. Lifting can cause injury. Items weighing more than 37 pounds must be lifted by two or more people.

The next section contains general safety precautions not directly related to specific procedures or equipment. These precautions are oriented toward the maintenance technician. However, all personnel must understand and apply these precautions during the many phases of operation and maintenance of the equipment. The following precautions must be observed:

GROUNDING

Always ensure that all equipment and assemblies are properly grounded when operating or servicing.

USE CARE HANDLING HEAVY EQUIPMENT

Never attempt to lift large assemblies or equipment without knowing their weight. Use enough personnel or a mechanical lifting device to properly handle the item without causing personal injury.

HEED WARNINGS AND CAUTIONS

Specific warnings and cautions are provided to ensure the safety and protection of personnel and equipment. Be familiar with and strictly follow all warnings and cautions on the equipment and in technical manuals.

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 2.2.1, Paragraph 5.4.3 - Do not recharge non-rechargeables; do not short circuit, incinerate, or mutilate Lithium batteries.

- WARNING - Paragraph 2.2.1 - Never expose batteries to any amount of water at any time.

- WARNING - Paragraph 2.2.1, Paragraph 5.4.3 - Do not activate Complete Discharge Device of a damaged Lithium Battery.

- WARNING - Paragraph 2.2.1, Paragraph 5.4.3, Paragraph 5.4.4 - Do not dispose of lithium batteries in uncontrolled trash.

- WARNING - Paragraph 2.2.1 - 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 2.2.1 - Never use batteries of different chemistry.

- CAUTION - Paragraph 2.6 - Power down equipment before connecting or disconnecting cables.

- CAUTION - Paragraph 2.10 - Cover unused connectors.

- WARNING - Paragraph 2.11 - RF shock may be induced if human contact is made with bare metal on the radio case.

- WARNING - Paragraph 2.14, Paragraph 3.19, Paragraph 4.8.4 - The AN/PRC-150(C) can key without operator action.

- WARNING - Paragraph 5.4.2 - Do not overcharge, short circuit, incinerate, or mutilate the BB-590/U Ni-Cd rechargeable Battery.

- WARNING - Paragraph 5.4.3 - Store multicell lithium sulfur dioxide batteries away from personnel during the discharge process.

1.2   PURPOSE OF THIS MANUAL

This operation manual provides the user with AN/PRC-150(C) Advanced Tactical Radio operating instructions, as well as technical information required to support Level I (operator) Maintenance.

1.3   EQUIPMENT DESCRIPTION

The AN/PRC-150(C) is an advanced High Frequency (HF) radio which operates from 1.6 MHz to 29.9999 MHz using skywave (USB, LSB, CW, AME) modulations with selectable low (1.0 watt), medium (5.0 watts), and high (20.0 watts) output power. The AN/PRC-150(C) also operates from 20.0000 MHz to 59.9999 MHz in FM with maximum power of 10.0 watts. Communications can take place with manpack, mobile, and fixed-site radio configurations.

The AN/PRC-150(C) can use two (2) each of the following battery types:

- BB-390A/U Ni-MH rechargeable
- BB-390B/U Ni-MH rechargeable
- BB-590/U Ni-Cd rechargeable
- BB-490/U lead acid rechargeable
- BB-2590 Li-Ion rechargeable (Refer to Paragraph 1.6)
- BA-5590/U Li-SO2 non-rechargeable
- BA-5390/U Li-MnO2 non-rechargeable

NOTE

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

1.4   FEATURES

The AN/PRC-150(C) offers the following features:

- Supports digital security based on optional Harris Citadel.

NOTE

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

- Supports ANDVT-HF (KY-99A), VINSON (KY-57 and KY-58), KG-84A/C (Redundant and Non-Redundant modes), and ANDVT-BD (KY-100) embedded Type I COMSEC
- Last Ditch Voice (LDV) (in 3G only) allows the radio to deliver digital voice under very poor conditions and be saved at the receiving radio end.
- 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 3G radio mode.

- Supports operation in 3G+ Mode, which allows the radio to receive and place ALE and 3G calls without switching modes.

- Supports enhanced Electronic Counter Counter Measure (ECCM) - frequency hopping in HF (narrowband, wideband, and list).

- Supports the ACP193 HF Ground Routing Protocol (HF-GRP) for placing phone calls in the ALE radio mode.

- Provides an external Global Positioning System (GPS) Precision Lightweight GPS Receiver (PLGR) interface for automatic Time-of-Day (TOD) synchronization.

- 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.

- Provides IP Firewall security for voice and data.

- Supports Wireless Internet Protocol (IP) data transfer when operating in STANAG 4538 (3G).

- Support optional Low Probability of Intercept/Low Probability of Detection (LPI/LPD) 3G enhancement that minimizes the probability of detection by providing quick message transfers at low power levels.

NOTE

The AN/PRC-150(C) is considered a Controlled Cryptographic Item (CCI).

1.5 SPECIFICATIONS

Table 1-1 lists the AN/PRC-150(C) specifications.

Table 1-1. AN/PRC-150(C) Specifications

Function	Specification
GENERAL	
Frequency Range	(MP) 1.6 MHz to 59.9999 MHz in 100-Hz steps
Radio Modes of Operation	FIX, HOP, ALE, 3G, and 3G+
Modulation	LSB, USB, AME, CW, and FM
Preset Channels	200
System Presets	75, fully programmable
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 to +32 VDC. Power output is reduced -6 dB of full power at +21 to +23 VDC. When battery voltage goes below 21 VDC, the radio shuts down.
Hold-Up Battery (HUB)	3.6 VDC for memory retention.
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)

Table 1-1. AN/PRC-150(C) Specifications (Continued)

Function	Specification
Immersion	35.4 inches (0.9 m) of water
RECEIVER	
Squelch	Front panel adjustable, active squelch selectable
Audio Output	≥ 1.5 mV with 150-ohm source impedance
Image rejection	First IF Image: >80 dB Second IF Image: >60 dB
Intermediate Frequency (IF) rejection	First IF Image: >80 dB Second IF Image: >70 dB 1.6 to 2.4 MHz, 80 dB 2.4 to 60 MHz
RECEIVER	
Automatic Gain Control (AGC)	Modulation dependent, automatically selected
Overload Protection	Receiver protected to 32 VRMS
TRANSMITTER	
Power Output	1, 5, 20 watts Peak Envelope Power (PEP)/Average HF, (1, 5, 10 watts FM)
Audio Input (MP)	Handset 1.5 mV into 150 ohms or 0 dBm into 600 ohms for full-rated power
Antenna Tuning (MP)	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
FEATURES	
ALE	Supports MIL-STD-188-141A Automatic Link Establishment (ALE)
Frequency Hopping Type	Serial tone (75 bps to 2400 bps)
Frequency Hopping Time of Day (TOD)	Must be within ±1.5 minutes between master and members.
Frequency Hopping Frequency Range	2 MHz to 29.9999 MHz
Wideband Hopping	Frequencies: multiples of 100 Hz Bandwidth: 15 kHz to 1.999 MHz (Coupler must be disabled.)
Narrowband Hopping	Frequencies: multiples of 5 kHz Bandwidth: 2.0 MHz - 3.495 MHz - 15 kHz 3.5 MHz - 4.995 MHz - 42 kHz 5.0 MHz - 9.995 MHz - 81 kHz 10.0 MHz - 14.995 MHz - 120 kHz 15.0 MHz - 19.995 MHz - 201 kHz 20.0 MHz - 24.995 MHz - 252 kHz 25.0 MHz - 29.845 MHz - 303 kHz 29.850 MHz - 29.995 MHz - 300 - 156 kHz (Coupler can be enabled.)

Table 1-1. AN/PRC-150(C) Specifications (Continued)

Function	Specification
List Hopping	Frequencies: multiples of 100 Hz Number of Frequencies: 5 to 50 (Coupler must be disabled.)
Data Link Layer Protocol (ARQ)	Supports data link protocol FED-STD-1052 Automatic Repeat reQuest (ARQ), STANAG-4538 (3G)
KDU with Liquid Crystal Display (LCD)	Removable Keypad Display Unit (KDU) LCD that supports adjustable backlight and contrast levels. The KDU enables local remote control and provides greater flexibility for operational mission employment.
Digital Security	Supports digital security based on optional Harris Citadel or Datotek encryption.
FEATURES	
Vocoder	LPC-10-52E (600/2400 bps) per STANAG-4198, Mixed Excitation Linear Prediction (MELP) (600/2400 bps).
AVS	Supports Analog Voice Security (AVS) operation.
COMSEC	
TYPE 1 COMSEC Interoperability	Vinson KY-57 and KY-58, KY-99A, KY-100, and KG-84A/C (Redundant and Non-Redundant Modes)
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.
COMSEC Fill	Traffic Encryption Keys (TEKs) and Key Encryption Key (KEK) can be manually filled from the following devices: 1. AN/CYZ-10 Data Transfer Device (DTD) (DS-101) using Fill user application software 2. AN/CYZ-10 DTD (DS-102) using RDS user application software 3. KOI-18 General Purpose Tape Reader (DS-102) 4. KYK-13 Electronic Transfer Device (DS-102) 5. 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.
VINSON	Interoperable with KY-57/KY-58. Supports data (16 kbps Wideband Frequency Shift Keying (WBFSK) and digital voice (16 kbps Continuously Variable Slope Delta [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-84A/C Compatible	Enables interoperability with KG-84A/C. Supports data (75 to 4800 bps sync and async) and digital voice (600, 2400 bps). Redundant and non-redundant modes.

1.6   CONFIGURATIONS

The AN/PRC-150(C) is available in only one hardware configuration at this time, however, the AN/PRC-150(C) has firmware options documented by the Modification Record Label shown in Figure 1-1. Modifications are indicated by circled numbers on the top row as follows:

- 1 - Contains transient suppressor design improvement on PA

- 2 - Contains improved PA relays

- 3 - Contains PA Field Effect Transistor (FET) switch design improvement

- 4 - Is BB-2590 Li-ION rechargeable battery compatible

- 5 - Contains Signal Processing and Control Module (SPCM) (10511-3670-01 rev F or later)

- 6 - Contains improved real-time lock accuracy (contains 10511-4610-03 rev - or later)

- 7 - Contains all major modifications 1 through 6 above

- 8 - Corrects COMSEC BIT Fault 36 error

- 9 through 20 - Reserved for Future

Options are indicated by circled letters on the bottom row as follows.

- A - N/A

- B - MELP digital Voice Installed

- C - Low Probability of Intercept/Low Probability of Detection (LPI/LPD) is installed

- D - Customer Algorithm Modification (CAM) capable

- E through X - Reserved for Future
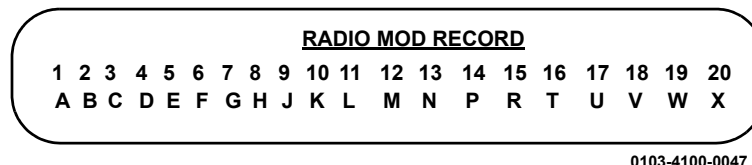

```
                    RADIO MOD RECORD
   1 2 3  4 5  6  7 8 9 10 11  12 13  14 15 16  17 18 19  20
   A B C  D E  F  G H J K  L   M  N   P  R  T   U  V  W   X
```
0103-4100-0047

Figure 1-1. Modification Record Label

1.7   VOICE/DATA COMPATIBILITY

Refer to Table 3-1 for information on the capabilities of the AN/PRC-150(C) for voice or data in each modulation and radio mode.

1.8   COMPATIBILITY

Successful communications depends on using the correct encryption type and compatible radios. Table 1-2 provides a list of compatible Harris radio models and encryption types. Table 1-3 provides a list of compatible Harris radio models and radio modes.

Table 1-2. Radio Model and Encryption Compatibility

Radio Model	Encryption		
	Type I (KY-99/100, KY-57/58, and KG-84)	Citadel	AVS
AN/PRC-150(C)	✓	✓	✓
RF-5800H-MP	○	✓	✓
RF-5022	○	○	✓
AN/PRC-138	○	○	✓

○ = Not Capable, ✓ = Capable

Table 1-3. Radio Model and Radio Mode Compatibility

Radio Model	Radio Mode				
	FIX	ALE	3G	3G+	HOP
AN/PRC-150(C)	✓	✓	✓	✓	✓
RF-5800H-MP	✓	✓	✓	✓	✓
RF-5022	✓	✓	○	✓○	○
AN/PRC-138	✓	✓	○	✓○	○

○ = Not Capable, ✓ = Capable, ○ and ✓ = Voice Mode Only.

1.9   COMPATIBLE CABLES AND CONNECTORS

Because of the many connection possibilities with the AN/PRC-150(C), refer to Table A-10 for cables and connector kits available. For mating connector part numbers, refer to Table A-11.

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CHAPTER 2

SYSTEM SETUP AND TEARDOWN

NOTE

In cases where the AN/PRC-150(C) is installed in a system,
the system level documentation takes precedence.

2.1   ITEMS INCLUDED WITH THE AN/PRC-150(C)

Table 2-1 provides a list of the items included with the supported versions of the AN/PRC-150(C). See Figure 2-1 for all of the items included with the supported versions of the AN/PRC-150(C).

Table 2-1. Items Included With the AN/PRC-150(C)

Description	Part Number
Modified H-250 Handset	10075-1399
Ground Stake Kit	10303-1008-01
Base Whip Adapter	10372-1260-01
OE-505 Whip Antenna Kit	10372-0240-02
6-Foot KDU Extension Cable	10511-0704-012
Battery Box, Wide	10513-4800-02
Operation Manual	10515-0103-4100
Asynchronous Data Cable (For Use with RF-6550H or RF-6551H)	10535-0775-A006
RT-1694D(P)(C)/U	0N672486-01
HF Programming Application (RPA)	RF-6550H
Tactical Chat	RF-6551H
Y-Adapter Assembly	10372-1230
Manpack Backpack	10530-0460-01
RF-3016-03 CW Key, Knee	919-5004-03

BASE WHIP ADAPTER
(10372-1260-01)

RT-1694D(P)(C)/U
ASSEMBLY

COLLAPSIBLE WHIP
(AT271A/PRC-25)

ANTENNA BASE
(10372-0277)

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

ANTENNA BAG
(CW-503/PRC-25)

BATTERY BOX, WIDE
(10513-4800-02)

MANPACK BACKPACK
(10530-0460-01)

Y- ADAPTER
ASSEMBLY
(10372-1230)

GROUND STAKE KIT
(10303-1008-01)

ASYNC DATA CABLE
(10535-0775-A006)

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

6-FT KDU EXTENSION CABLE
(10511-0704-012)

RF-3016-03 CW KEY, KNEE
(919-5004-03)

OPERATION MANUAL
(10515-0103-4100)

HF RPA
(RF-6550H)

TACTICAL CHAT
(RF-6551H)

CL-0103-4100-0001-B

Figure 2-1. Items Included with the AN/PRC-150(C) (Typical)

2.2 BATTERY INSTALLATION

The following paragraphs provides information on battery installation. The AN/PRC-150(C) can use two (2) each of the battery types listed in Paragraph 1.3.

NOTE

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

2.2.1 Battery Safety

⚠ **WARNING**

For batteries containing Lithium, do not charge, short circuit, incinerate, mutilate, recharge non-rechargeable batteries, expose to fire, or expose to temperatures above 130° F (54.4° C). Failure to comply may cause battery to vent, rupture, start a fire, or explode, causing personal injury.

⚠ **WARNING**

Never expose batteries to any amount of water at any time. This could cause a fire or explosion, causing personal injury.

⚠ **WARNING**

Do not activate Complete Discharge Device (CDD) of a damaged Lithium Battery as this could release toxic material that can cause personal injury.

⚠ **WARNING**

Do not dispose of batteries in uncontrolled trash. A partially discharged or damaged lithium battery is considered to be hazardous waste that can cause personal injury.

⚠ **WARNING**

Never use batteries of different chemistry as this could cause personal injury.

⚠ **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 to
reduce risk of personal injury.

Dispose of partially and fully discharged batteries in accordance with your local directives. Improper disposal of hazardous waste is prohibited by law.

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, non-rechargeable, Lithium Sulfur Dioxide BA-5590/U.

2.2.2   Single Battery Considerations (MP)

See Figure 2-2. If only one battery is available, install on the J11 BATTERY 2 connector. If power is applied to the J10 BATTERY 1 connector, the radio thinks that it is connected to vehicular power, and as a result, does not attempt to conserve power. To maximize battery life with only one battery installed, use the J11 BATTERY 2 connector.

2.2.3   Install Batteries

See Figure 2-3. Perform the following to install batteries:

    a.   Place batteries in battery box so connectors align with radio power connectors (battery connectors oriented on opposite sides of the battery box). (For single battery, refer to Paragraph 2.2.2.)

    b.   Attach HF radio chassis to battery box with batteries.

    c.   Latch the side clasps.
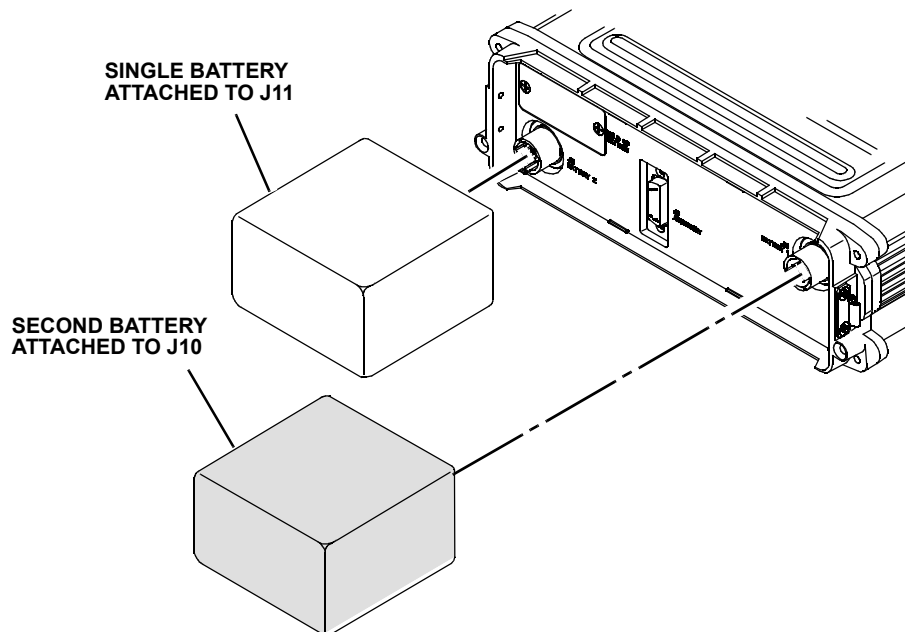
0103-4100-0042

Figure 2-2. Single Battery Connection (MP)

2.3   MANPACK BACKPACK (MP)

With batteries installed, place HF radio chassis inside manpack backpack and fasten handle straps to HF radio chassis handles.

2.4   VEHICULAR POWER INSTALLATION

Connector pinouts have been provided in Appendix A. The HF radio chassis assembly can be mounted in vehicular configurations. Both versions can be powered using the following:

- MP Only - powered via J10 BATTERY 1

- MP as part of a system - powered via control cable connected to J6 ACCESSORY

2.5   ANTENNA INSTALLATION

Several types of antennas may be connected to the AN/PRC-150(C) as described in the following paragraphs. When choosing antenna lengths, take into account factors such as the internal coupler enabled/disabled, and High Frequency (HF) propagation.

2.5.1   OE-505 Manpack Whip Antenna Kit

The OE-505 manpack whip antenna kit provided with the AN/PRC-150(C) is 3.1 meters long and consists 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 AN/PRC-150(C). It has a removable antenna base with a spring-loaded binding post adapter for the attachment of single wire antennas.

When the OE-505 manpack whip antenna kit is used for the first time, the base antenna base needs to be screwed into the base whip adapter. This will require some effort as the threads on the antenna base contain a thread compound that prevents the two sections from coming apart.

See Figure 2-3. When installing the antenna, screw the assembled antenna base and base whip adapter onto J7 ANTENNA, while being careful not to overtighten. Then screw the collapsible whip onto the antenna base.

2.5.2 Coaxial Cable Connection

If using an antenna requiring coaxial cable, attach cable using a UG-88 BNC plug or BNC-N adapter UG-349 for coax cable using an N-series plug to the nested BNC jack inside the J7 ANTENNA connector.

2.5.3 Single Wire Antenna Connection

Perform the following for single wire antenna connection:

    a.   Install the base whip adapter and antenna base without the collapsible whip sections.

    b.   Attach the single wire to the base whip adapter.

    c.   Do not allow the uninsulated portions of the antenna wire to come in contact with the HF radio chassis body or ground binding post.

2.6 DATA CABLES AND AUXILIARY CABLES

Connector pinouts have been provided in Appendix A. Summary of the connectors are as follows:

- J3 DATA - RS-232, Point-to-Point Protocol (PPP), Data, Remote - Connect (10535-0775-A006) asynchronous data cable here

- J6 ACCESSORY - External PA, Antenna Coupler, Power, Audio

- J9 ACCESSORY (Rear Panel) - Ethernet

⚠️ **CAUTION**

Failure to power down the AN/PRC-150(C) before connecting or disconnecting equipment to J6 ACCESSORY or J9 ACCESSORY could damage the AN/PRC-150(C) or accessory equipment.

2.7 AUDIO CONNECTIONS

Connector pinouts have been provided in Appendix A. Summary of the connectors are as follows:

- J1 - AUDIO - Microphone Audio, Intercom Audio - Connect (10075-1399) Modified H-250 Handset

- J3 - DATA - Intercom Audio

2.8 GPS CONNECTIONS

Connector pinouts have been provided in Appendix A. To connect external Global Positioning System (GPS) Precision Lightweight GPS Receiver (PLGR), attach interface cable from GPS unit to radio front panel J2 connector.

2.9 FILL CONNECTOR

J18 is used to connect Type I encryption fill devices, such as the AN/CYZ-10 (DS-101), KOI-18, KYX-15, KYK-13 (DS-102). There are no other functions for this connector.

2.10   UNUSED CONNECTIONS

Place rubber boots over unused front panel connectors.

⚠ **CAUTION**

Failure to cover unused connectors may damage the connectors
due to moisture related shorts or cause the connectors to be
unusable due to dirt or mud being packed into the connector.

2.11   GROUND STAKE KIT

See Figure 2-3. If in an outside manpack configuration, use the ground stake kit to connect the HF radio chassis to
earth ground from the ground binding post at the right side of the front panel.

⚠ **WARNING**

RF shock could occur during operation if human contact is
made with bare metal when the radio is poorly grounded.
Failure to properly ground the radio could cause personal
injury.

NOTE

Make sure ground lead is not accidentally connected to whip
base adapter.

2.12   REMOTING KEYPAD DISPLAY UNIT (KDU)

Connector pinouts have been provided in Appendix A. See Figure 2-3. Perform the following procedure to remote
the KDU from the HF radio chassis (make sure unit is powered off).

  a.   Slide KDU lock to the left.

  b.   Remove KDU from HF radio chassis.

  c.   Connect (10511-0704-012) six-foot KDU extension cable to KDU and HF radio chassis, aligning white
        dots on cable with white dots on connectors.

  d.   Connect other end of KDU cable to connector on left side of the KDU.

  e.   Place the rubber dust cover located near end of KDU extension cable on the jack in the rear of the KDU
        to protect from dust/water while the KDU is not installed on the HF radio chassis.

LEFT TO REMOVE KDU

ANTENNA

KDU

GROUND STAKE KIT

KDU REMOTE CABLE

HANDSET (USE "Y" ADAPTER TO ALSO CONNECT CW KEY TO RADIO)

AN/PRC-150(C) ASSEMBLY

BATTERY

SIDE CLASPS

BATTERY BOX, WIDE

VENT
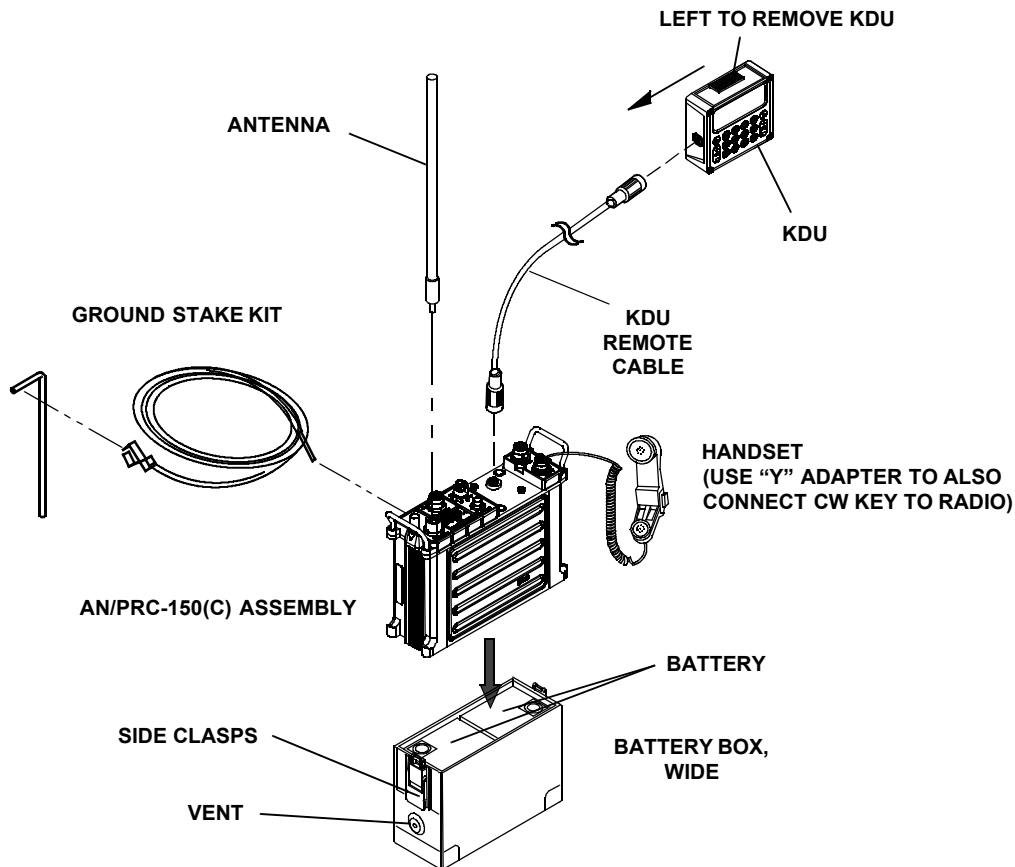
0103-4100-0004

Figure 2-3. Equipment Setup (Typical MP Shown)

2.13   KDU CRYPTO IGNITION KEY (CIK) FUNCTION

The KDU has a CIK function that protects the loaded Communications Security (COMSEC) keys in the AN/PRC-150(C). 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 AN/PRC-150(C) 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 3.7 for more information about zeroizing the radio.

2.14   INITIAL SETTINGS AND TURN-ON

Refer to Paragraph 3.5. Perform the following procedure for step-by step Built-In Test (BIT):

⚠ **WARNING**

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

a. Power AN/PRC-150(C) ON by placing the Function Switch in either the **PT** or **CT** position.

b. Observe battery meter next to BAT on KDU. (VOL appears in place of this display when user adjusts the volume.) BAT flashes when the battery voltage is critically low. If this happens, replace the batteries with freshly charged ones.

c. Go into test menu and run all tests (BIT) (OPT>TEST>BIT).

d. From test menu, run Voltage Standing Wave Ratio (VSWR) test to confirm proper antenna operation (OPT>TEST>VSWR).

NOTE

A VSWR test will not be allowed if the radio is scanning in ALE, 3G or SSB scan. Stop scanning or place the unit in FIX radio mode.

e. From test menu, run battery test (OPT>TEST>BATTERY).

f. See Figure 2-4 for proper battery voltages on the MP.

NOTE

If a fault appears on the KDU, refer to Chapter 5 for troubleshooting.

2.15   LITHIUM BATTERY CONSIDERATIONS

The AN/PRC-150(C) can use Lithium batteries listed in Paragraph 2.2. New, unconditioned, lithium batteries may not be able to deliver the current required to allow the AN/PRC-150(C) to transmit in high power. To condition the lithium batteries after they have been installed, set the AN/PRC-150(C) to low power (via **OPT>RADIO>TX POWER** menu) with Continuous Wave (CW) modulation (via modulation on channel preset [Paragraph 3.12.2]) and key the transmitter for 15 to 20 seconds. Set the AN/PRC-150(C) 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 AN/PRC-150(C) to transmit using high power.

33 VDC — OVERVOLTAGE WARNING*

26 VDC

NORMAL OPERATING VOLTAGE RANGE

23 VDC — MINIMUM FULL-FEATURE OPERATING VOLTAGE

OPERATION WITH REDUCED CAPABILITY**

21 VDC — AN/PRC-150(C) OPERATION CEASES

* WITH LI-ION, NORMAL OPERATIONS TO +33 VDC.
** POWER OUTPUT IS REDUCED -6 DB OF FULL POWER.
MAY AFFECT DATA COMMUNICATIONS.
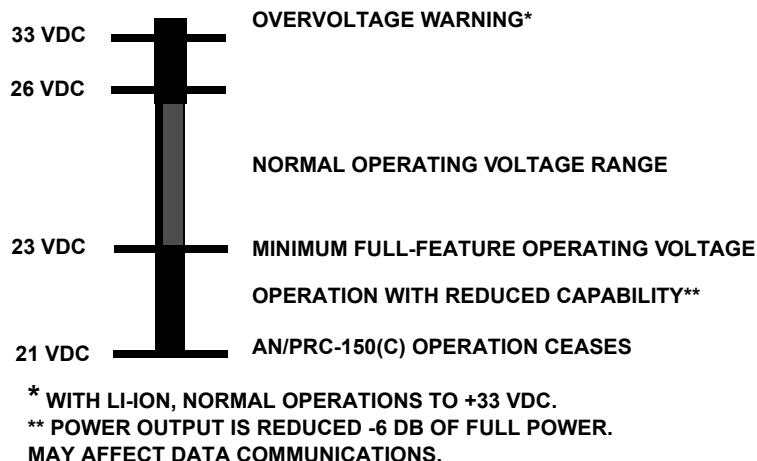
0103-4100-0002B

Figure 2-4. MP Voltage Operating Range

2.16   EQUIPMENT TEARDOWN

When tearing down the equipment, reverse the procedures found in Paragraph 2.2 through Paragraph 2.12.

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CHAPTER 3

OPERATION

3.1 INTRODUCTION

This chapter discusses the operational capabilities and limitations of the AN/PRC-150(C), and provides instructions on how to perform those operations. Before operating the AN/PRC-150(C), the presets, nets, COMSEC keys, encryption keys, etc. must be defined and programmed. Refer to Chapter 4 for information on programming the radio.

3.2 OPERATION TASK SUMMARY

Operations tasks, in general, are performed in the following order:

- Turn on and test radio - Paragraph 3.5
- Zeroize radio - Paragraph 3.7
- Load COMSEC Keys - Paragraph 3.8
- Citadel Key loading/management - Paragraph 3.9
- Modify radio programming - Paragraph 3.10
- Select Plain Text (PT), Citadel Cover (CC), or Cipher Text (CT) - Paragraph 3.11
- Perform basic operations using system preset if using FIX - Paragraph 3.12
- Establish link - Paragraph 3.17, Paragraph 3.18, Paragraph 3.19, Paragraph 3.21
- Change preset - Paragraph 3.13
- Communicate - per local directives
- Change data preset - Paragraph 3.14
- Terminate link - Paragraph 3.17, Paragraph 3.18, Paragraph 3.19, Paragraph 3.21

Some operations can be performed at any time during normal operations and consist of:

- Perform optional tests (if desired) - Paragraph 3.6
- Temporarily override preset settings - Paragraph 3.13
- Set or view radios options - Paragraph 3.15
- Place function switch in OFF position when storing radio - Paragraph 3.24

3.3 VOICE/DATA COMPATIBILITY

Table 3-1 displays the capabilities of the AN/PRC-150(C) for voice or data in each modulation and radio mode.

Table 3-1. Voice/Data Compatibility

Intended Operation	Radio Mode/Modulation										Data	Voice	Frequency Range (MHz)
	Fix					ALE			3G, 3G+	Hop			
	CW	USB	LSB	AME	FM†	USB	LSB	AME	USB	USB			
PT Voice													
	-	✓	✓	-	-	✓	✓	-	✓	✓	N/A	DV6, ME6	1.6 - 29.9999
	-	✓	✓	-	-	✓	✓	-	✓	-	N/A	DV24, ME24	1.6 - 29.9999
	-	-	-	-	-	-	-	-	✓	-	N/A	LDV	1.6 - 29.9999
	-	✓	✓	-	-	-	-	-	-	-	N/A	AVS	1.6 - 29.9999
	✓	✓	✓	✓	-	✓	✓	✓	✓	-	N/A	CLR	1.6 - 29.9999
	-	-	-	-	✓	-	-	-	-	-	OFF	CVSD†	20 - 59.9999†
CC Voice													
	-	✓	✓	-	-	✓	✓	-	✓	✓	N/A	DV6, ME6	1.6 - 29.9999
	-	✓	✓	-	-	✓	✓	-	✓	-	N/A	DV24, ME24	1.6 - 29.9999
	-	-	-	-	-	-	-	-	✓	-	N/A	LDV	1.6 - 29.9999
	-	-	-	-	✓	-	-	-	-	-	N/A	CVSD	20 - 59.9999
CT Voice													
ANDVT-HF†	-	✓	✓	-	-	✓	✓	-	-	✓	N/A	DV24	1.6 - 29.9999
ANDVT-BD‡	-	✓	✓	-	-	✓	✓	-	✓	-	N/A	DV6, ME6, DV24, ME24	1.6 - 29.9999
	-	-	-	-	-	-	-	-	✓	-	N/A	LDV	1.6 - 29.9999
KG-84	-	✓	✓	-	-	✓	✓	-	✓	✓	N/A	DV6, ME6,	1.6 - 29.9999
	-	✓	✓	-	-	✓	✓	-	✓	-	N/A	DV24, ME24	1.6 - 29.9999
	-	-	-	-	-	-	-	-	✓	-	N/A	LDV	1.6 - 29.9999
Vinson	-	-	-	-	✓	-	-	-	-	-	N/A	CVSD	20 - 59.9999
PT Data													
	-	✓	✓	-	-	✓	✓	-	✓	✓	39-TONE, SERIAL*, ARQ, FSK-N, FSK-W, FSK-V, FSK-A, HFNET*, STANAG-4285-C*,	N/A	1.6 - 29.9999
	-	-	-	-	✓	-	-	-	-	-	WBFSK	N/A	20 - 59.9999
CC Data													
	-	✓	✓	-	-	✓	✓	-	✓	✓	39-TONE, SERIAL*, ARQ, FSK-N, FSK-W, FSK-V, FSK-A, HFNET*, STANAG-4285-C*,	N/A	1.6 - 29.9999
	-	-	-	-	✓	-	-	-	-	-	WBFSK	N/A	20 - 59.9999

Table 3-1. Voice/Data Compatibility (Continued)

Intended Operation	Radio Mode/Modulation										Data	Voice	Frequency Range (MHz)
	Fix					ALE			3G, 3G+	Hop			
	CW	USB	LSB	AME	FM†	USB	LSB	AME	USB	USB			
CT Data													
ANDVT-HF†	-	✓	✓	-	-	✓	✓	-	✓	✓	ANDVT-HF	N/A	1.6 - 29.9999
ANDVT-BD‡	-	✓	✓	-	-	✓	✓	-	✓	-	SERIAL*, MIL-110B*	N/A	1.6 - 29.9999
	-	-	-	-	-	-	-	-	✓	-	XDL*	N/A	1.6 - 29.9999
KG-84	-	✓	✓	-	-	✓	✓	-	✓	✓	SERIAL*, MIL-110B*	N/A	1.6 - 29.9999
	-	✓	✓	-	-	✓	✓	-	-	-	39-TONE, ARQ	N/A	1.6 - 29.9999
	-	-	-	-	-	-	-	-	✓	-	XDL*	N/A	1.6 - 29.9999
Vinson	-	-	-	-	✓	-	-	-	-	-	WBFSK	N/A	20 - 59.9999

NOTES:

1. Refer to local directives for modulation and frequency allowed.

2. * - denotes that only serial waveforms are available in 3G and HOP. All waveforms, except XDL, are available in FIX and ALE.

3. When any one of four digital voice options (DV6, ME6, DV24, ME24) is selected, the receiving radio can automatically detect and process the digital voice option used at the transmitting radio. For instance, if the radio has DV6 selected and receives digital voice from a transmitting radio that has ME24 selected, the receiving radio will detect and correctly process the incoming ME24 signalling. However, only radio configurations that support MELP digital voice can either transmit or receive ME6 or ME24 digital voice.

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

5. The 600 bps digital voice options (DV6 and ME6) and the 2400 bps digital voice options (DV24 and ME 24) have different requirements for channel quality. The higher rate voice options require better channels, and may not be usable on channels where DV6 and ME6 can be used with acceptable reliability and quality.

6. Digital voice operation with any of the four options is interoperable only with the other RF-5800H and AN/PRC-150(C) radios. Operation with the four digital voice options is not possible with other radios supporting only analog voice.

7. 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.

8. Refer to Table 4-30 for modem application examples.

9. † Use these settings for compatibility with legacy radios using KY-99A.

10. ‡ Use these settings for compatibility with legacy radios using KY-100.

11. Refer to Table 3-2 for Type I device naming used in the AN/PRC-150(C).

Table 3-2. Type I Cross-Reference

Type I Name	AN/PRC-150(C) Name
KY-99A	ANDVT-HF
KY-100	ANDVT-BD
KY-57, KY-58	VINSON
KG-84A/C Redundant	KG-84R
KG-84A/C Non-Redundant	KG-84NR

3.4   CONTROLS, INDICATORS, AND CONNECTORS

The following covers the controls, indicators, and connectors of the AN/PRC-150(C).

3.4.1   Controls, Indicators, and Connectors

Figure 3-1 shows the AN/PRC-150(C) controls, indicators, and connectors. Table 3-3 describes the controls, indicators, and connectors.
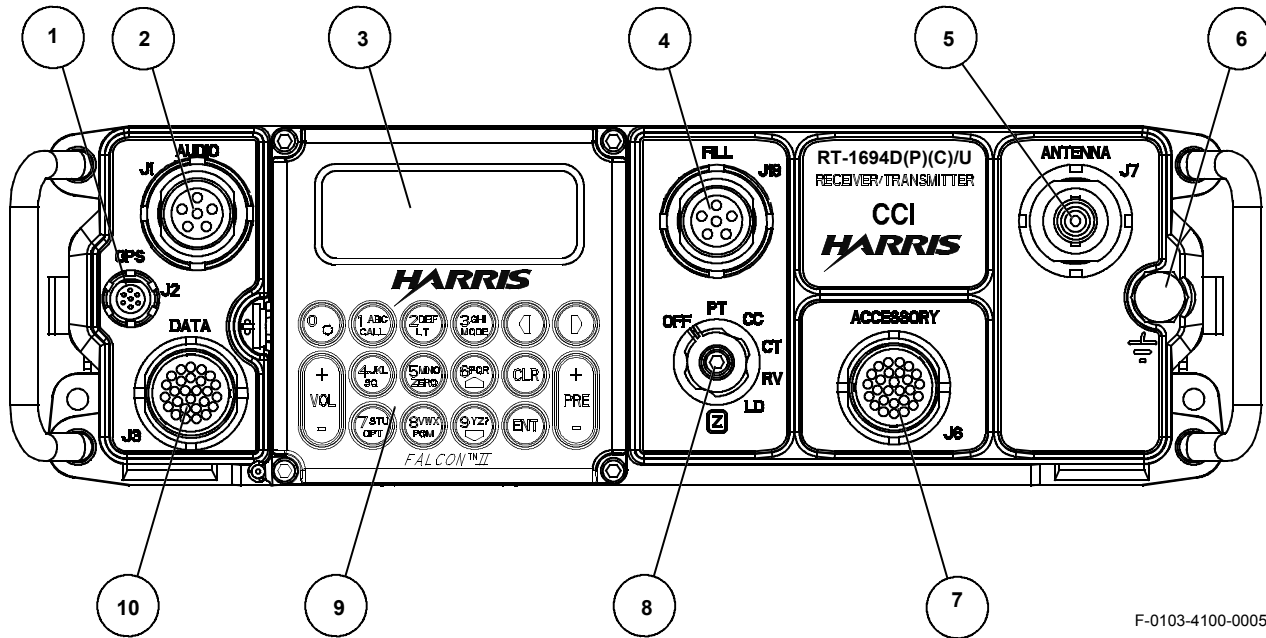
F-0103-4100-0005

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

Table 3-3. AN/PRC-150(C) Controls, Indicators, and Connectors

Key (Figure 3-1)	Control/Indicator	Function
1	Global Positioning System (GPS) Interface Connector **J2**	Provides a serial connection (data and control) for an external Global Positioning System (GPS) unit, such as the Precision Lightweight GPS Receiver (PLGR).
2	Audio Connector **J1**	Provides a connection for an audio handset which uses a six-pin connector.
3	Liquid Crystal Display (LCD)	Displays the operational and programming displays.
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 Bayonet Neill Concelman (BNC) or a whip antenna.
6	Ground Post	Provides a grounding reference for connecting a grounding source to the AN/PRC-150(C).

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

Key (Figure 3-1)	Control/Indicator	Function
7	Accessory Connector **J6**	Provides a connection for power amplifiers, control signals, external keyline, external power, AN/PRC-150(C) On/Off, frequency hopping clock, and remote control data. A blue dot identifies the cable and radio connector.
8	Function Switch	
	OFF	Turns AN/PRC-150(C) OFF.
	PT	Places the AN/PRC-150(C) in PT mode (voice or data).
	CT	Places the AN/PRC-150(C) in **CT** secure mode for US Type I DOD encryption (digital voice or data).
	CC	Places the AN/PRC-150(C) into Citadel encryption (Citadel Cover) (**CC**) mode. Use of this mode is controlled by depot level access.
	LD	Load. Used to load Type I crypto variables. NOTE: Citadel keys must be loaded via remote control or manually using the KDU.
	RV (or **A**)	Receive Variable. Permits transmission and reception of Type I COMSEC over-the-air rekeys using Over-the-Air Rekey (OTAR).
	Z	Zeroize. Zeroizes the AN/PRC-150(C) including the encryption keys. (Requires a pull-to-turn action.)
9	**KDU**	
	⟲	The circular arrow button shows alternate displays for a given operating mode.
	CALL	Has distinctive uses in each of the four radio modes: FIX: initiate a hail. ALE: initiate an Automatic Link Establishment (ALE) call. HOP: transmit or send a response to a sync request. 3G: initiate a 3G call or send a sync request. 3G+: initiate a 3G or ALE call.
	LT	Provides access to the KDU backlight control menus.
	MODE	Allows the operator to change the operating mode to FIX, ALE, HOP, 3G or 3G+.
	SQ	Toggles the programmed squelch mode for the type of channel modulation currently used.
	ZERO	Not used.
	OPT	Provides access to the AN/PRC-150(C)'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 clear a message displayed on the front panel. This key is also used to initiate termination of a link in ALE and 3G modes. In ALE and FIX mode, this key also toggles scanning ON/OFF.

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

Key (Figure 3-1)	Control/Indicator	Function
	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 volume.
	NET or **PRE** +/-	Scrolls the operator through the presets.
10	**DATA CONNECTOR J3**	Provides a connection for a data device (RS-232, Point-to-Point Protocol (PPP)), or auxiliary audio. An orange dot identifies the cable and radio connector.
Not shown (located on rear panel)	Battery Connector **J10** and **J11**	Battery connectors for two (2) each batteries. See Figure 2-2 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 On/Off, external accessory power, and ethernet interface for upgrading the firmware.

3.4.2   KDU Layout

The KDU contains 16 buttons or keys as shown in Figure 3-2.
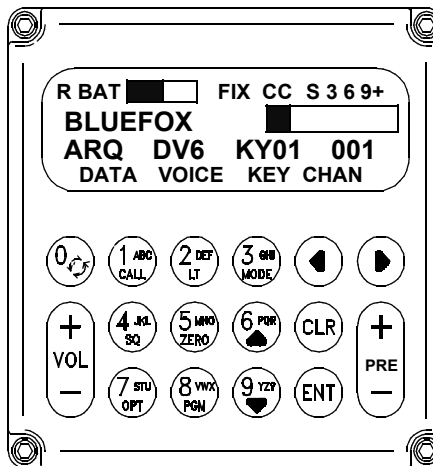
0103-4100-007-A

Figure 3-2. KDU

3.4.3   KDU Button Summary

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. The remaining ten keys can perform several functions, depending on the screen displayed on the KDU. Refer to Table 3-4 for a summary of the functions.

Table 3-4. KDU Button Summary

Keys	Key Function Based On Screen
① ② ③ ④ ⑤ ⑦ ⑧	• Preset screens - radio enters function displayed on bottom of key. • Key entry field - number on key is entered on first key press; letter is entered on second, third, and fourth key press of same key. (Letters are not used in all cases.)
⓪	• Preset screens - radio toggles between preset screens. • Key entry field - 0 is entered.
⑥ ⑨	• Menu or preset screens - key arrows scroll choices • Key entry field - number on key is entered on first key press; letter is entered on second, third, and fourth key press of same key. (Letters are not used in all cases.)
◀ ▶	Menu screens - key arrows scroll choices

3.4.4   Typical Menu Screen

Figure 3-3 describes a typical menu that is displayed after pressing the **[OPT]** key followed by selecting the **CONFIG** menu choice. The CONFIG menu items are then selected by pressing **[ENT]**.
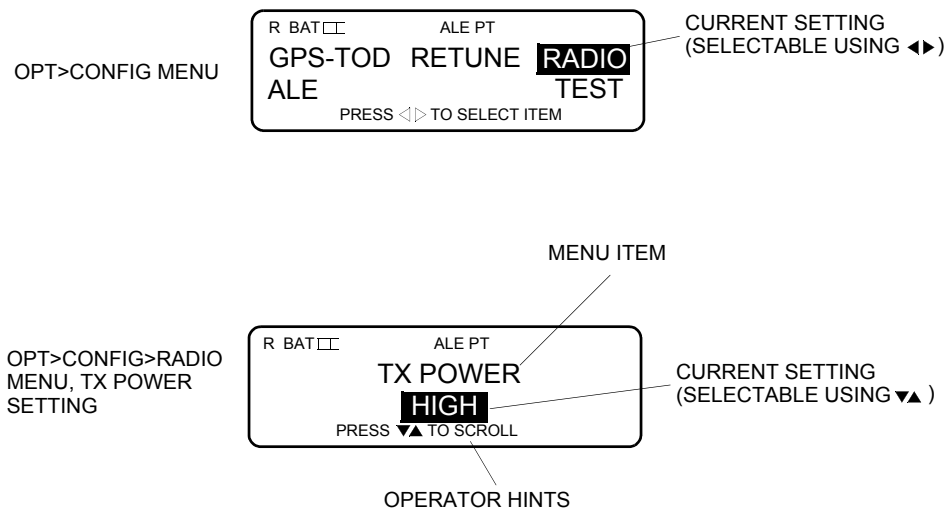
Figure 3-3. Menu and Settings (OPT Menus Shown)

F-0103-4100-0012

3-7

3.5 INITIAL SETTINGS AND TURN-ON

The following paragraphs provide tests that should be performed to ensure operational readiness of the AN/PRC-150(C).

3.5.1 Power On

To power on the AN/PRC-150(C), rotate the function switch from **OFF** to the **PT**, **CC**, or **CT** position. This initializes the radio software and performs a power on self-test. When the test is complete, the system, ALE, HOP, 3G, 3G+, or FIX preset screen is displayed.

3.5.2 Run Built-In Test (BIT)

See Figure 3-4. Perform the following procedure to run BIT:

a. Choose **OPT>TEST>BIT** menu choices.

b. Choose **SYSTEM** to test everything, or choose **RF-5382 COUPLER**, **PREPOST** (for RF-5845H), **EXTERNAL PA**, **KDU**, or **INTERNAL COUPLER**, to test individual parts of a system. **TEST PASSED** should be displayed. If there is a fault, a fault code is displayed. Refer to Chapter 5 for troubleshooting information.

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

3.5.3 Check Battery Voltages

See Figure 2-2 and Figure 3-4. Perform the following procedure to check battery voltages:

a. Choose **OPT>TEST>BATTERY** menu choices. The battery voltage and status screen is displayed.

b. The voltage will register between 21 VDC and 30 VDC (or 32 VDC with Li-ION batteries). The AN/PRC-150(C) will automatically shut down when the voltage goes below 21 volts.

c. Press **[ENT]** to view Hold-Up Battery (HUB) voltage and status.

d. Press **[OPT]** to return to the preset screen, or press **[CLR]** repeatedly.

3.5.4 Check Voltage Standing Wave Ratio (VSWR)

See Figure 3-4. Perform the following procedure to check VSWR:

a. Choose **OPT>TEST>VSWR** menu choices. The VSWR frequency screen is displayed.

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

c. Press **[ENT]** to start the test. Upon completion of the VSWR test, the transmitted power and VSWR are displayed.

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

NOTE

The output power is reduced to protect the AN/PRC-150(C) circuitry if the VSWR reports a reading of 2:1 or higher. The operator does not receive a warning until the VSWR reaches 3:1. The warning usually appears when problems arise in the transmission line, antenna system, or when a user disabled the internal coupler when an antenna was not resonant at the frequency being used.

NOTE

VSWR test will emit RF energy.
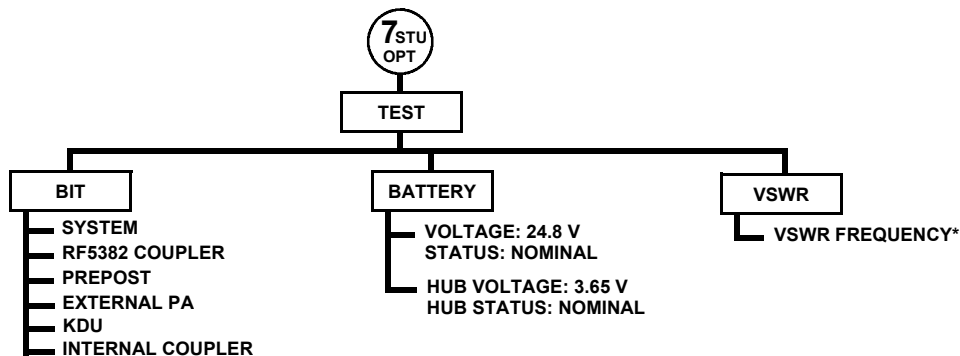
*NOTE: NOT ALLOWED WHILE SCANNING.

0103-4100-0008A

Figure 3-4. Option>Test>BIT, Battery, and VSWR Menus

3.6   OPTIONAL TESTS (ANY TIME)

These optional tests can be performed at any time and are used more for testing and configuration management.

3.6.1   Special Test - Ping Test

See Figure 3-5. Ping tests send a ping packet to a specified Internet Protocol (IP) address when using wireless IP or Ethernet features. Ping tests are generally only required when troubleshooting IP address problems. Perform the following procedure to run a ping test:

a.   Choose **OPT>TEST>PING** menu choices.

b.   Enter the **PING ADDRESS**, the 12-digit (four octet) IP address to send the ping to. Press **[ENT]**.

c.   Enter the **PING PKT SIZE**, the size of the ping packet to send. This may be left at the default value. Press **[ENT]**.

d.   Enter the # **OF PINGS**, the number of pings to perform. Press **[ENT]**.

e.   Enter the **PING TIMEOUT**, the time to wait for a ping response (milliseconds). This may be left at the default value, but should be increased if repeated attempts to ping are unsuccessful. Press **[ENT]**.

f.   Select YES and press **[ENT]** to start the ping. A PING RESPONSE screen and status message will display briefly when either the ping response has been successfully received, or the ping has timed out, whichever occurs first. (This may take a few minutes, depending on network.) While waiting for the PING RESPONSE, you may access other radio menus. The PING RESPONSE screen will temporarily override the currently selected screen to display the ping response status, and will then clear automatically.

3.6.2   Special Version Test (Software and Hardware Versions)

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

a.   Choose **OPT>TEST>SPECIAL>VERSION** menu choices. Module and revision listings are displayed. **SOFTWARE** and **HARDWARE** menus are displayed.

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

c.   Use the ▲▼ keys to scroll through the software module and firmware revision listings. These listings display the version of software installed in the AN/PRC-150(C).

d.   Press **[ENT]** or **[CLR]** to return to the **SOFTWARE** and **HARDWARE** menu screen.

e.   Use the ◀▶ keys to select **HARDWARE** and press **[ENT]**. The hardware version screen will be displayed.

f.   Use the ▲▼ keys to scroll through the hardware module and hardware revision listings. These listings display the version of hardware installed in the AN/PRC-150(C).

g.   Press **[ENT]** or **[CLR]** to return to the **SOFTWARE/HARDWARE** menu.

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

3.6.2.1   Special Test - Elapsed (Radio) Time

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

a.   Choose **OPT>TEST>SPECIAL>ELAPSED_TIME** menu choices. Hours the AN/PRC-150(C) has been powered up (**HOURS UP**) and the hours the AN/PRC-150(C) has been transmitting (**HOURS TX**) are displayed.

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

3.6.2.2   Special Test - Config

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

a.   Choose **OPT>TEST>SPECIAL>CONFIG>** menu choices.

b.   Use the ◀▶ keys to select **IDS** or **OPTIONS** and press **[ENT]**.

c.   If **IDS** is selected, use the ▲▼ keys to view:

- Serial Number

- Firmware Number - firmware part number.

- Options Config - Options Configuration Number specifies the installed options.

- Top Level Number - specifies the installed hardware components.

- Order Number - factory order number under which the radio was purchased.

- Manufacture Date

- Encryption ID - ID number of the installed cryptography module.

- Purchased Options - Specifies software options installed

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

e. If **OPTIONS** is selected, use the ▲▼ keys to scroll through the list of options installed in the radio. Refer to Table 3-5 for details about each option.

NOTE

The options listed on the KDU display indicate the included features based on the type of radio. All of the options in Table 3-5 may not be displayed.

f. Press **[OPT]** to exit the Options menu, or **[CLR]** or **[ENT]** to return to the menu.

Table 3-5. Options Summary

Options	Description
ALE7210	The ALE option is installed.
INTERNAL PA INSTALLED	Internal PA is installed.
MAX KEYTIME	The amount of time (in minutes) a user can hold the handset key to remain keyed. This time is enabled by LIMIT KEYUP.
LIMIT KEYUP	Toggles ON/OFF to limit the amount of time a user can stay keyed (MAX KEYTIME).
NETS	Radio can have one network maximum (Net 1).
VHF INSTALLED	Allows radio to use VHF when installed, otherwise restricted to HF.
PT DATA INSTALLED	Plain text data support is installed.
MIL 110B INSTALLED	MIL 110B Serial Data is installed.
MELP INSTALLED	MELP Digital Voice is installed.
ALE3G NETWORKING INSTALLED	Networking is installed for ALE-3G. This screen is not displayed if ALE-3G is not installed, even if the ALE-3G NETWORKING option is installed.
ALE3G STANAG 4538	The ALE-3G option is installed.
DIGITAL MDM INSTALLED	Digital modem is installed.
PT LPC INSTALLED	Plain Text LPC is installed.
PT BEEPS INSTALLED	Plain Text Beeps support is installed.

Table 3-5. Options Summary (Continued)

Options	Description
PPP MTU	The maximum number of bytes that can be sent in a PPP packet (Maximum Transfer Unit).
PPP INSTALLED	Support for PPP Communication is installed.
LPC 600 INSTALLED	Linear Predictive Coding (LPC) 600 Digital Voice is installed.
HOP BANDWIDTH	This screen displays the bandwidth used for ECCM (HOP). If HOP is not installed, this screen is not displayed.
HOP SERIAL	Serial Electronic Counter Counter Measures (ECCM) (HOP) is installed.
CRYPTO KEYSIZE	Maximum allowable size of encryption keys.
CRYPTO COALITION	Citadel encryption is installed.
CONFIG ID	The default ID values after a zeroize. DEFAULT = export settings.
BLACKSIDE ENCRYPT INSTALLED	Black-side encryption is installed.
AVS INSTALLED	Analog Voice Security (AVS) is installed.
DEBUG INSTALLED	Engineering debug capabilities installed.

7 STU OPT

TEST

PING

- **PING ADDRESS**
  XXX.XXX.XXX.XXX
- **PING PKT SIZE**
  xxx (1-999 BYTES)
- **# OF PINGS**
  xx (1-50)
- **PING TIMEOUT**
  xxxxxx (1-500,000 MSEC)
- **START PING**
  - **YES**
  - **NO**

SPECIAL

VERSION

ELAPSED_TIME

- **HOURS UP: 68.4**
  HOURS TX: 9.2

CONFIG

IDS

- **SERIAL NUMBER**
  ######
- **PURCHASED OPTIONS**
  ####-####-####
- **ENCRYPTION ID**
  ####-####-####
- **FIRMWARE NUMBER**
  ####-#### V #.#
- **OPTIONS CONFIG**
  ####-####-####
- **TOP LEVEL NUMBER**
  ####-####-##
- **ORDER NUMBER**
  ####-###
- **MANUFACTURE DATE**
  ####-##-##

OPTIONS

- **ALE**
  7210
- **INTERNAL PA**
  INSTALLED
- **MAX KEYTIME**
  #
- **LIMIT KEYUP**
  OFF
- **NETS**
  #
- **VHF**
  INSTALLED
- **PT DATA**
  INSTALLED
- **MIL 110B**
  INSTALLED
- **MELP**
  INSTALLED
- **ALE3GNETWORKING**
  INSTALLED
- **ALE3G**
  STANAG-4538
- **DIGITAL MDM**
  INSTALLED
- **VEHICLE POWER**
  INSTALLED
- **PT LPC**
  INSTALLED
- **PT BEEPS**
  INSTALLED
- **PPP MTU**
  ####
- **PPP**
  INSTALLED
- **LPC 600**
  INSTALLED
- **HOP BANDWIDTH**
  ##.###### MHZ
- **HOP**
  SERIAL
- **HFNET**
  INSTALLED
- **CRYPTO KEYSIZE**
  XX-BITS
- **CRYPTO**
  COALITION
- **CONFIG ID**
  DEFAULT
- **BLACKSIDE ENCRYPT**
  INSTALLED
- **AVS**
  INSTALLED
- **DEBUG**
  INSTALLED

SOFTWARE

- **## FIRMWARE**
  ####-#### V #.#
- **####-# KDU**
  #### V #.#
- **##### CRYPTO**
  ####-####
- **#####-# CITADELCFG**
  ####-####-####
- **######-# PT_FPGA**
  ####-#### V #.##
- **######-# VDP**
  ####-#### V #.#
- **######-# INFO-FPGA**
  ####-#### V #.##
- **######-# CSEC**
  ####-#### V #.#
- **##### HFA_V2**
  ####-#### V #.#
- **######-# CDSP**
  ####-#### V #.##
- **######-# TMON**
  ####-#### V #.#
- **######-# PPC860**
  ####-#### V #.#####

HARDWARE

- **## TOP_LEVEL**
  PN: ####-####-##
- **#### KDU**
  PWB: #   PL: #
- **#### KDU**
  PN: ####-####-##
- **##### HF_PS**
  PWB: #   PL: #
- **##### HF_PS**
  PN: ####-####-##
- **##### HF_PA**
  PWB: #   PL: #
- **##### HF_PA**
  PN: ####-####-##
- **##### HV_RES**
  PWB: #   PL: #
- **##### HV_RES**
  PN: ####-####-##
- **##### CRYPTO***
  PWB: #   PL: #
- **##### CRYPTO***
  PN: ####-####-##
- **##### INFOSEC**
  PWB: #   PL: #
- **##### INFOSEC**
  PN: ####-####-##
- **##### HFA_V2**
  PWB: #   PL: #
- **##### HFA_V2**
  PN: ####-####-##
- **##### SPCM**
  PWB: #   PL: #
- **##### SPCM**
  PN: ####-####-##
- **##### INTERCONNECT**
  PWB: #   PL: #
- **##### INTERCONNECT**
  PN: ####-####-##

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Figure 3-5. Option>Test>Ping and Special Menus

3.7   ZEROIZE 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.

NOTE

> Accidental use of ZEROIZE may make the Manpack (MP) inoperable for your mission requirements.

a.   Pull on the knob of the function switch and turn to the **Z** position. The AN/PRC-150(C) 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 AN/PRC-150(C) is complete, the **ZEROIZE COMPLETE** message is displayed.

NOTE

> If the function switch is moved to the **Z** position while the AN/PRC-150(C) has no power source connected (batteries disconnected), the AN/PRC-150(C) will zeroize the next time it is powered on.

3.8   LOAD COMSEC KEYS

The AN/PRC-150(C) holds 25 TEKs, one Key Encryption Key (KEK), and one Transfer KEK (TrKEK) for each COMSEC type of either VINSON, ANDVT or KG-84. Numbering for each storage set is from 01 to 25. Table 3-6 shows a sample chart that may be used for key management. The following procedures describe how to load COMSEC fill data of either TEKs for VINSON, ANDVT, or KG-84 COMSEC.

Table 3-6. Key Slots and COMSEC Type

Key Slot	ANDVT*	VINSON	KG-84**
TEK01			
TEK02			
TEK03			
• • •	• • •	• • •	• • •
TEK23			
TEK24			
TEK25			
KEK			
TRKEK			

*Each slot can be used for either ANDVT-HF or ANDVT-BD.
**Each slot can be used for either KG84-R or KG-84-NR.

3.8.1 Load COMSEC Fill Data of TEK or KEK with AN/CYZ-10 Using RDS

Perform the following procedure to load COMSEC Fill data with AN/CYZ-10 (ANCD):

NOTE

AN/CYZ-10 menus vary from device to device. The
instructions here may not exactly match your device.

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

b. Select KYK-13, then press **[ENT]**.

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

d. Select the appropriate **KEY TYPE**. If **TEK** is selected, select the key position number (01 - 25), and press **[ENT]**. **PRESS ENT TO INITIATE** displays.

NOTE

Leave the radio at the PRESS ENT TO INITIATE screen for
now.

e. At AN/CYZ-10, choose **APPL>RDS>RADIO>COMSEC>LD**, then press **[ENTR]**.

f. Choose either **TEK** or **KEK**, and press **[ENTR]**.

g. Use **[P UP]** and **[P DN]** until desired key appears, then press **[ENTR]**. XMT appears in lower right of screen.

h. Select **qUit**. and press **[ENTR]**. **Connect ANCD to RT** appears.

i. Connect AN/CYZ-10 to the **J18 FILL** connector.

j. Press ▼ on AN/CYZ-10. A message appears that the AN/CYZ-10 is sending a key, followed by **Press [LOAD] on RT**.

k. At radio, press **[ENT]**. **IN PROCESS**, followed by **FILL DONE PRESS ENT** should appear.

l. Press **[ENT]**. **MORE FILL DATA?**, will appear.

m. At prompt **MORE FILL DATA?**, select **YES** to enter more fill data. Otherwise, proceed to Step o.

n. To load more keys of the same crypto type, repeat Step d through Step k.

o. To load more keys of a different crypto type, press **[CLR]** and repeat Step c through Step k.

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

q. Turn off AN/CYZ-10 and disconnect from the radio **J18 FILL** connector.

r. Rotate function switch from **LD** to desired operating position (**PT**, **CC**, **CT**, or Receive Variable **[RV]**).

3.8.2 Load COMSEC Fill Data of TEK or KEK with KYK-13, KYX-15, KOI-18

Perform the following procedure to load COMSEC Fill data with KYK-13, KYK-15, or KOI-18 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 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. Otherwise, proceed to Step n.

l.   To load more keys of the same crypto type, repeat Step g through Step k.

m.   To load more keys of a different crypto type, press **[CLR]** and repeat Step f through Step k.

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

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

p.   Rotate function switch from **LD** to desired operating position (**PT**, **CC**, **CT**, or Receive Variable **[RV]**).

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

An AN/CYZ-10 using DTD FILL program should be set to DS-101 protocol. 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.

NOTE

AN/CYZ-10 menus vary from device to device. The instructions here may not exactly match your device.

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 **DS101** 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**).

3.9   CITADEL KEY LOADING/MANAGEMENT

Even though the radio may already be programmed for frequencies, presets, and nets, the keys may need to be changed prior to operating a radio. Paragraph 4.4 provides instructions for creating and managing the keys.

3.10   BEFORE OPERATING THE AN/PRC-150(C)

Before operating the AN/PRC-150(C), the presets, nets, keys, etc. must be established and programmed. The RF-6550H HF RPA can be used to program an entire network of radios, including the Citadel keys. Additionally, many functions may be programmed from the front panel per Chapter 4.

3.11   SET RADIO FUNCTION SWITCH TO PT, CC, OR CT

Rotate function switch to **PT** for clear voice or data. Rotate function switch to **CC** for Citadel encryption voice or data. Rotate function switch to **CT** for Type I COMSEC (ANDVT, KG-84, or Vinson) voice or data. If an encryption key is not loaded into the radio for CC or CT, the message **KEY NOT SELECTED** is displayed on the KDU. If the PTT button is pushed, the message **KEY NOT AVAILABLE** is displayed.

3.12   BASIC OPERATION FROM SYSTEM PRESET (FIX, ALE, 3G, 3G+, HOP)

The AN/PRC-150(C) uses system presets to simplify radio operation.

3.12.1   Overview - Contents of a Preset

See Figure 3-6. A system preset associates a radio mode, encryption key, voice settings, and data settings to a channel, ALE associated self address, 3G net, or hopnet. This hierarchy lessens the amount of manually programmed parameters in the radio. For instance, an operator may use several modems or encryptions for a particular channel or use several channels for a particular modem or encryption. All this information can be pre-programmed into the radio and stored as a system preset for simple access.
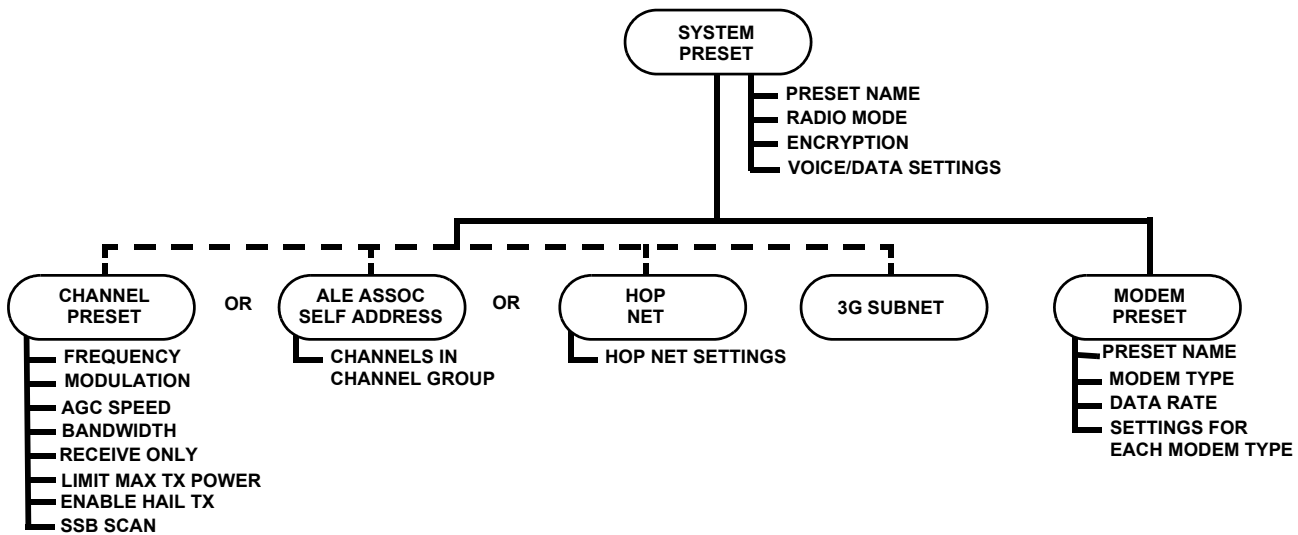
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Figure 3-6. Contents of a Preset Hierarchy

3.12.2   KDU LCD Display - Preset Screens

The system preset screen, shown on the top of Figure 3-7, is used to view and change system presets. The channel preset screen, shown on the bottom of Figure 3-7, is used to view and change channel settings. Some points to remember with these screens consist of the following:

- To change settings, use the ◀ and ▶ keys to scroll to the setting, use ▲▼ to scroll choices, and press **[ENT]** to accept changes.

- To toggle between the system preset and channel preset screen, use the ⓪ key.

- The battery meter is temporarily replaced with the volume level indicator when the **[VOL]** key is pressed.

- The receive signal strength meter (S-Meter) changes to display a power level meter when the AN/PRC-150(C) is transmitting.

- MANUAL is the default for all radio modes (unless disabled).

- The AN/PRC-150(C) changes presets as they are scrolled in FIX and HOP radio modes.

- ALE, 3G, and 3G+ radio modes use the programmed system presets after linking occurs.

- Only the system presets that are configured and enabled for the current radio mode (FIX, ALE, 3G, 3G+ or HOP) will be selectable.
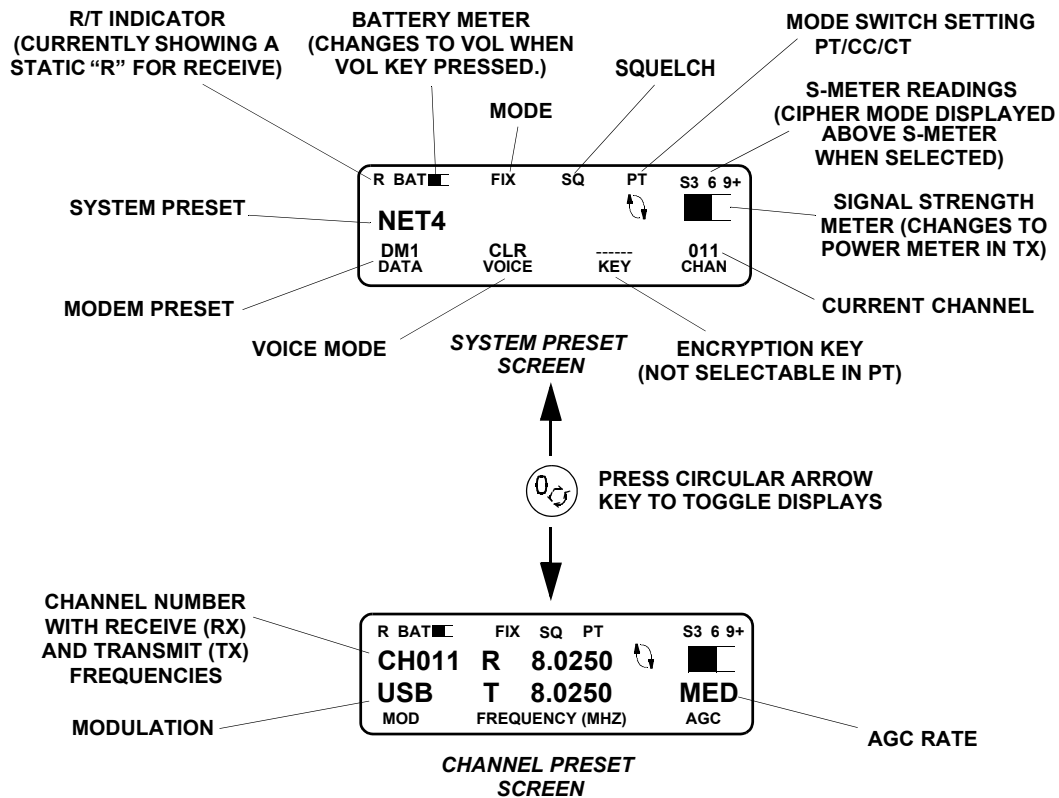
Figure 3-7. Preset Screens (Fixed System and Channel Shown)

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3.12.3   Select a System Preset

System presets are selected by using the **[PRE +/-]** key to scroll the choices.

3.13   TEMPORARILY OVERRIDE SYSTEM PRESET SETTINGS

Any system preset parameter can be temporarily modified. When the system preset is temporarily modified, 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** or **NET +/-]** key, or the AN/PRC-150(C) is power cycled (on, off, on again). This does not apply to the MANUAL preset.

3.13.1   Select Modem/DATA Preset

A stored modem preset can be selected from the DATA field on 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 AN/PRC-150(C) power is cycled. The stored system preset values are not changed. The brackets < > surrounding the system preset name on the preset screen show that the AN/PRC-150(C) is operating in a different configuration from that of the stored system preset.

   a.   To change settings, use the ◀ and ▶ keys to scroll to the **DATA** setting.

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.

NOTE

Some modem presets may be incompatible with a current encryption, voice setting, or modulation setting, and may cause programming to change and/or cause an error condition. Refer to Table 3-1 for compatibility.

3.13.2   Select VOICE Setting

The voice setting can be selected from the system preset screen. The AN/PRC-150(C) provides CLR to pass an analog signal over-the-air to support interoperability with other fixed single channel radio systems. AVS is PT voice that uses analog scrambling techniques that are interoperable with some legacy Harris radios.

Perform the following procedure to select a voice setting:

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

b. Use the ▲▼ keys to scroll through the available voice selections (**CLR, DV24, DV6, ME24, ME6, AVS, CVSD, LDV, NONE**). Press **[ENT]** to select the desired voice setting.

NOTE

Last Ditch Voice (LDV) is a 3G only feature. Refer to Paragraph 3.20.25 for usage.

NOTE

Refer to Table 3-1 and the notes following the table for voice selection compatibility.

3.13.3   Select Encryption Key (CC)

Perform the following procedure to select an encryption key:

NOTE

The radio must be in CC to select encryption keys (Paragraph 3.11).

a. Press **[▶]** until the encryption key 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 encryption keys, the key name, key signature and update count are displayed on the bottom row of the LCD display.

NOTE

A system preset will be temporarily overridden if the preset was programmed for **PT** or **CT** and the Function Switch is rotated to **CC** and a key is selected. The same is true for presets programmed for **CC** and the Function Switch is rotated to **CT** or **PT**.

NOTE

In CC, however, if a key load is unsuccessful, the last key successfully loaded and programmed into the system presets will remain active.

If an encrypted message is received when the radio is in CC, the radio will automatically select the correct key (if loaded) to decrypt the message.

3.13.4 Select Encryption Key and Encryption Mode, US Type I (CT)

Perform the following procedure to select a Type I 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 Traffic Encryption Key (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.

NOTE

Some MODEM presets, channel modulation, and/or operating modes may be incompatible with the selected COMSEC mode and the radio will change them without notice to the operator. Refer to Table 3-1 and the notes following the table for compatibility.

NOTE

A system preset will be temporarily overridden if the preset was programmed for **PT** or **CC** and the function switch is rotated to **CT** and a key is selected. The same is true for presets programmed for **CT** and the function switch is rotated to **CC** or **PT**.

3.14 SENDING AND RECEIVING DATA - HINTS

Refer to Paragraph 4.13 for modem preset programming, refer to Table 3-1 for compatibility, and refer to Table 4-30 for modem application examples. Modem presets are programmed to support intended operation. Modem type, modem speed, encryption type, and encryption key types must be established and agreed upon before a mission. Otherwise, PT analog voice will be required to coordinate the radio settings.

3.15   SET/VIEW RADIO OPTIONS (ANY TIME DURING OPERATION)

Set/View 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 programming which makes the radio go offline. When the radio is offline, the operator cannot receive a call.

3.15.1   Set Transmit Power

Power level depends on power amplifiers and whether the radio is in HF or VHF as described in Table 3-7.

See Figure 3-8. Perform the following procedure to set transmit power level:

   a.   Choose **OPT>RADIO>TX POWER** menu choices. Current power level is displayed.

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

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

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

Table 3-7. PA, Frequency, Modulation, and Power Levels

PA	Frequency	Modulation	Power Level (Watts)		
			Low	Medium	High
None or RF-5830H	1.6 - 29.9999 MHz	USB, LSB, CW, AME	1	5	20
None or RF-5830H	20 - 59.9999 MHz	FM	1	5	10
RF-5832H	1.6 - 29.9999 MHz	USB, LSB, CW, AME	10	50	125
RF-5833H	1.6 - 29.9999 MHz	USB, LSB, CW, AME	12	60	150
RF-5833H	30 - 59.9999 MHz	FM	12	60	60
RF-5834H	1.6 - 29.9999 MHz	USB, LSB, CW, AME	50	200	400

3.15.2   Set Squelch Level

Squelch level choices consist of low, medium, or high. A squelch level of low may cause false squelch breaks to occur while settings of medium or high may not allow AN/PRC-150(C) to unsquelch on weak signals.

See Figure 3-8. Perform the following procedure to set squelch level:

   a.   Choose **OPT>RADIO>SQUELCH LEVEL** menu choices. Radio's current squelch level is displayed.

   b.   Use the ▲▼ to scroll to the desired squelch level and press **[ENT]**.

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

3.15.3   FM Squelch Type

The AN/PRC-150(C) supports analog tone squelch and analog noise 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 AN/PRC-150(C)'s squelch being received on the AN/PRC-150(C)'s receive frequency. This is important for interoperability and should be addressed during mission planning. Most users of VHF-FM radios use tone squelch.

See Figure 3-8. Perform the following procedure to set squelch level:

  a.   Choose **OPT>RADIO>FM SQUELCH TYPE** menu choices. Radio's current squelch type is displayed.

  b.   Use the ▲▼ to scroll to the desired squelch type and press **[ENT]**.

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

3.15.4   Bypass/Enable Internal Coupler

The internal coupler should be enabled to allow a resonant or field expedient antenna to be used at any frequency. The internal coupler must be disabled during wideband and list frequency hopping. Otherwise, a hopping error may occur at some frequencies. When the coupler is disabled, a broadband antenna should be used for maximum performance and VSWR should be measured, as described in Paragraph 3.5.4. See Figure 3-8. To bypass/enable the internal coupler, perform the following:

  a.   Choose **OPT>RADIO>COUPLER** menu choices. Current coupler setting is displayed.

  b.   Use the ▲▼ to scroll to the desired enable or bypass setting and press **[ENT]**.

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

3.15.5   Set Radio Silence On or Off

The AN/PRC-150(C) silence option is used during ALE, 3G and 3G+ radio modes. This feature enables the operator to disable the AN/PRC-150(C) from automatically responding to an ALE or 3G call. This option is only enabled in receive and may be overridden if the operator places an ALE or 3G call. Radio Silence is not the same as Receive Only, which can be programmed into any radio mode. See Figure 3-8. Perform the following procedure to turn radio silence on or off:

  a.   Choose **OPT>RADIO>RADIO SILENCE** menu choices. Current radio silence setting is displayed.

  b.   Scroll to the desired on or off setting and press **[ENT]**.

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

NOTE

If **RADIO SILENCE** is **ON**, the **R** in the upper left corner of the KDU flashes when the channel preset is viewed in ALE or 3G (instead of scanning). Also, upon entering radio silence, KDU light intensity is reduced to zero and the volume is decreased to a minimum. (The operator can still readjust, if desired.)

3.15.6   Set Beat Frequency Oscillator (BFO) Offset

See Figure 3-8. An offset may be required for communications with old radios whose frequencies have drifted. Some operators prefer to change the BFO for personal tone preferences during CW operation. Perform the following procedure to set BFO offset:

- a.   Choose **OPT>RADIO** menu choices.

- b.   Press **[ENT]** until **BFO** is displayed. The display will show the current BFO offset.

- c.   Use the ▲▼ to scroll until the desired BFO frequency is displayed and press **[ENT]**. BFO is adjustable +/- 4000 Hz in 10 Hz steps.

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

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]**.

3.15.7   Set RX Noise Blanking On or Off

The 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. See Figure 3-8. Perform the following procedure to set RX noise blanking:

- a.   Choose **OPT>RADIO>** menu choices.

- b.   Press **[ENT]** until **RX NOISE BLANKING** is displayed. Current RX noise blanking setting is displayed.

- c.   Use the ▲▼ to scroll until the desired **ON/OFF** setting is displayed and press **[ENT]**.

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

3.15.8   Set CTI Autoreject On or Off

The AN/PRC-150(C) Computer Telephony Interface (CTI) autoreject option is used in radios deployed in a CTI capable 3G network. This feature enables the operator to have the AN/PRC-150(C) automatically reject any incoming CTI call. The radio will still respond to 3G calls and the operator will be able to place an outgoing CTI call.

NOTE

CTI autoreject is automatically set to **ON**, if CTI is disabled in the radio. Also, autoreject is automatically set to **OFF** on the basestation radio connected to an RF-6010. In either of these cases, the autoreject setting will not appear.

Perform the following procedure to turn CTI autoreject on or off:

- a.   Choose **OPT**>**RADIO** menu choices.

- b.   Press **[ENT]** until **CTI AUTOREJECT** is displayed.

- c.   Use the ▲▼ to scroll until the desired **ON/OFF** setting is displayed and press **[ENT]**.

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

3.15.9 Check Radio Name

Radio name is used to report the radio name of the AN/PRC-150(C). This is used in programmed Automatic Repeat Request (ARQ) modem presets and in 3G or 3G+ radio mode. RADIO NAME is not modifiable in the options menu, but can be set during programming. Refer to Paragraph 4.5.1 for information about programming the radio name.
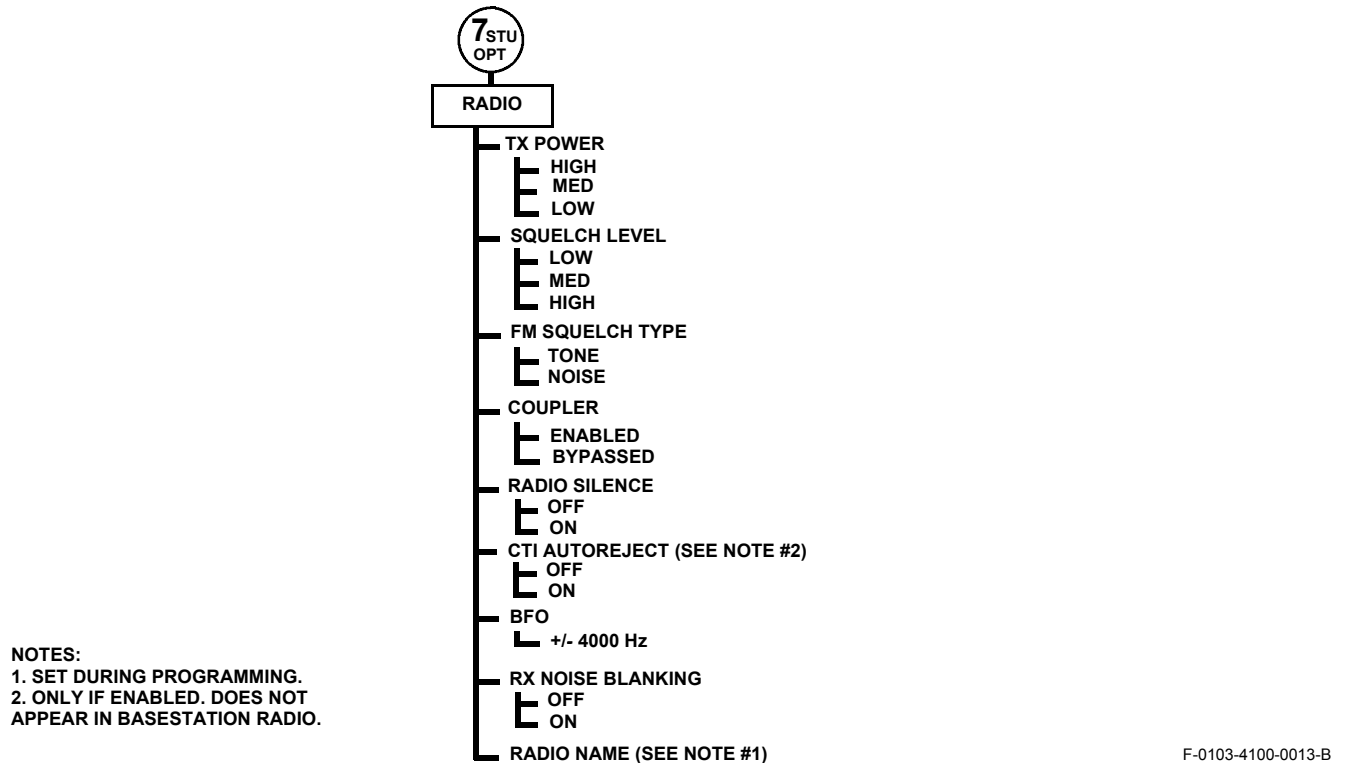
Figure 3-8. Radio Option Menu Tree

3.15.10 View GPS TOD

The GPS TOD screen allows the user to view the current state of the GPS, the current radio time, and if GPS is installed, the current or last known position information.

See Figure 3-9. Perform the following procedure to view the AN/PRC-150(C)'s TOD and GPS information:

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

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

NOTE

The AN/PRC-150(C) Time-Of-Day (TOD) must be set before attempting to use HOP, 3G, scheduled LQAs, or ALE Linking Protection. To modify the TOD, follow the procedure outlined in Paragraph 4.5.4.

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

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

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

c.   Press **[CLR]** or **[ENT]** to return to the option menu**.**

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

NOTE

If the GPS is not connected, EXTERNAL GPS
DISCONNECTED will display.

3.15.11   Retune Manpack (MP)

This function is used to force a retune of the coupler due to an antenna change or loss of tune condition. See Figure 3-9. Perform the following procedure to force a retune of the internal coupler in the MP:

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

NOTE

A retune will emit RF energy.

NOTE

A retune cannot be performed while the radio is scanning in ALE. Retune is not offered while the radio is on a LPI/LPD 3G channel plan.
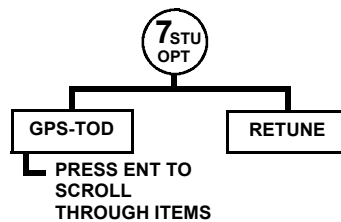
F-0103-4200-0014

Figure 3-9. GPS-TOD and Retune Option Menu Tree

3.15.12 Adjust Backlight Settings

The backlight adjustment is used to adjust the brightness, contrast, and backlight operation of the LCD. There are three ranges (on, off, momentary) of backlight settings. The on setting is only available when the AN/PRC-150(C) is connected to a Direct Current (DC) power source other than batteries or when the AN/PRC-150(C) is powered by a single battery that has been connected to J10 rather than J11. When the momentary setting is used, the backlight turns off after 10 seconds if there is no keypress activity on the KDU. Perform the following procedure to adjust backlight settings:

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**).

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

3.15.13 Adjust Volume

The handset volume can be adjusted up or down with the **[VOL +/-]** key. **VOL** and its bar graph will be momentarily displayed in place of **BAT** and its bar graph. The preset screen reverts back to **BAT** and its bar graph after the absence of **[VOL +/-]** keypress activity. The volume cannot be adjusted while the AN/PRC-150(C) is in program.

3.15.14 Selecting Squelch

From the system preset screen or channel preset screen, press **[SQ]** to toggle squelch on or off. If squelch is on, SQ appears in the top row on the LCD.

3.16 ABOUT COUPLER TUNE AND PTT

Upon selection of an operating channel for the first time and if the internal automatic coupler is enabled, the radio will need to be tuned to the antenna for the frequency of operation. Before any first transmission, the operator should momentarily press the Push-To-Talk (PTT) button on the handset and allow a few seconds for the tune cycle to complete. The KDU will display messages when the coupler is tuning and when tuning is complete.

Once a channel is tuned, the AN/PRC-150(C) will not retune unless the channel has been changed. If the antenna has been changed, the operator should manually retune the coupler as described in Paragraph 3.15.11.

3.17 FIX RADIO MODE OPERATIONS

Normal single channel operations can be performed from FIX radio mode. Channels which have not been programmed will contain a default setting that will display 2.0 MHz. When FIX radio mode is selected, the three letter designator (**FIX**) will be displayed on the top row of the LCD in the preset screen.

3.17.1 Select FIX Radio Mode

To select fix radio mode, press **[MODE]** until **FIX** appears. Press **[ENT]** to select.

3.17.2   Temporarily Select Different Channel Preset

Changes can be made while operating in FIX radio mode without reprogramming the AN/PRC-150(C). This includes operating frequency, squelch, transmitter power levels, modulation, encryption key, and voice.

Fixed frequency channel preset numbers can be selected from the channel screen, either by scrolling channel numbers, or by entering a channel number via the numeric keypad. Changes made in this manner are temporary and are only active until a different system preset is selected or the AN/PRC-150(C) power is cycled. Selectable channel range is 000 to 199.

Perform the following procedure to change channel preset:

a.   To change settings, use the ◀ and ▶ keys to scroll to the **CHAN** setting.

b.   Press **[ENT]** and enter the new channel number from the keypad or use ▲▼ to scroll through channels.

c.   Press **[ENT]** to accept changes.

NOTE

Whenever the preprogrammed parameter changes, the radio places a < > around the system preset name on the KDU. (Does not apply to MANUAL preset.)

3.17.3   Change Manual Channel 000

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. Perform the following procedure to change manual channel settings:

a.   From the preset screen, press ⓪₍ᵧ₎ to display the channel preset screen.

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

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

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

NOTE

An alternate method to Step e is to not press **[ENT]** and use ◀ and ▶ keys to scroll the digit, then use ▲▼ to scroll the digit up or down. Press **[ENT]** when finished.

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

f.   Enter a new transmit frequency (if different from the receive frequency) using the keypad and press **[ENT]**. To keep the transmit frequency the same as the receive frequency, press **[ENT]** without entering a new transmit frequency.

g.   Press ▶ until the modulation (**MOD**) setting is highlighted. Using the ▲▼ keys, scroll to the desired setting (**USB, LSB, AME, CW, FM**) and press **[ENT]**. A change in modulation choice may revert back to the original modulation if change incompatible with selected encryption 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.

3.17.4   SSB Scan - Capabilities and Limitations

SSB Scan is used to scan multiple FIX channels that have been programmed into the AN/PRC-150(C). Each channel must be individually enabled to allow inclusion in the SSB SCAN list (Refer to Paragraph 4.7). SSB scan stops scanning when an incoming signal is strong enough to break the programmed squelch level in the AN/PRC-150(C). See Figure 3-10. SSB Scan limitations consist of the following:

- SSB Scan is only functional in PT.

- All channels (0-199, inclusive) can be programmed for SSB SCAN.

- The frequency range for SSB scan channels varies as shown in Table 3-8.

- Valid modulations for SSB SCAN are USB, LSB, and FM.

NOTE

The external 125 W and 400 W PAs do not support FM operation.

- To scan both HF and VHF frequency ranges in the same scan setup, a 1.6 MHz to 59.9999 MHz antenna would be required. Many vehicular HF antennas are limited to the 2 MHz to 30 MHz range, or the range may be limited by the PA port selected.

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

Table 3-8. Frequency Ranges for SSB Channels

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

3.17.5   Enable SSB Scan

To enable/disable SSB scan, perform the following:

a.   Choose **OPT>SCAN>ENABLE SSB SCAN** menu choices. Current SSB Scan setting is displayed.

b.   Use the ▲▼ to scroll to the desired on or off setting and press **[ENT]**.

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

3.17.6   Start/Stop SSB Scan

Press **[CLR]** to start or stop SSB scan.

NOTE

If no channels have been SSB scan enabled, the radio cannot start an SSB scan and will display NO CHANNELS TO SCAN.
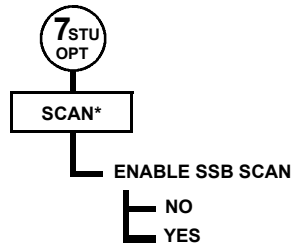
* FIX ONLY

F-0103-4100-0015-A

Figure 3-10. Scan Option Menu Tree

3.17.7   Hail a Hopnet

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

When a radio in HOP radio 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 radio mode and select the FIX radio mode of operation using the same hailing channel on which the hail took place. At this time, the two stations can coordinate wristwatch TOD, if needed, and coordinate net entry. Hailing permits a station to alert other net stations that may be in HOP radio mode, that a station in FIX radio mode wishes to communicate.

NOTE

Hail TX must be enabled during channel programming. Only channels 001 to 010 can be set to be used as hailing channels.If the channel has not been programmed for hail, the AN/PRC-150(C) displays HAIL NOT ALLOWED. Refer to Paragraph 4.7.

Perform the following procedure to hail a Hopnet:

a.   To perform a hail, ensure the AN/PRC-150(C) is in FIX radio mode, and that the channel has been set to **YES** under the **HAIL TX** programming menu. Refer to Paragraph 4.7.

b.   Select the designated hailing radio preset using the **[PRE]** key. Normally a frequency is selected that is near the frequencies of operation of the hopping net that will be hailed.

c.   Press **[CALL]**. The AN/PRC-150(C) will display a "**SEND HAIL**" message.

d. Use the ▲▼ to scroll to the desired yes or no setting. Select **YES** and press **[ENT]** for confirmation to send hail.

e. The AN/PRC-150(C) will display **HAIL IN PROGRESS**, and then **HAIL COMPLETE** when the hail has been sent. Press **[ENT]** to return to the preset screen.

NOTE

At the receiving radio, the user needs to press **[ENT]** to respond to the hail. Once the hail has been responded to, the receiving radio will switch to FIX. Therefore, the radio will need to be switched back to HOP to continue with frequency hopping operation.

NOTE

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

3.18 ALE RADIO MODE OPERATIONS

ALE permits HF stations to call and link on the best HF channel. Each radio in a network is assigned a unique address. When not transmitting, the AN/PRC-150(C) is constantly scanning through its assigned frequencies, listening for calls. When ALE radio mode is selected, the three letter designator (ALE) will be displayed on the top row of the LCD in the preset screen.

Radios are assigned an address which is used for identification by other radios. Each address is assigned to a group of channels called a channel group. There are three basic types of addresses:

* Self Address - This is a radio's address. There may be several. One must be 1 -3 characters.

* Individual Address - These are self addresses of other radios and are used for individual calls.

* Net Address - These are addresses assigned to a group of radios and are used for net calls in which the group of radios can all be called at the same time.

In addition to the three basic types, there are two types of addresses that are not programmed:

* ALL (Not Programmed) - Calling radio's 1 - 3 character self address appears on called radios. Called radios do not respond. (Channel group 0 must be programmed.)

* ANY (Not Programmed) - Called radios respond to calling radio with their 1 - 3 character self addresses. The 1 - 3 character self address appears on the calling radio. (Channel group 0 must be programmed.)

A calling radio calls an individual or net address on a channel with the highest LQA score, if present. (Refer to Paragraph 3.18.11 for LQAs.) If scores are not available, the calls begin with the channel of the highest frequency. If no response is received, it tries a channel with the next lower score or next lower frequency. When the called station or group of stations hears the address, the radio stops scanning on the channel and transmit 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.

3.18.1   ALE Link Protection - General Information

ALE Level 1 linking protection is provided to prevent undesired disruption of ALE links. Linking Protection scrambles ALE handshake signaling with the specified Link Protection key (14 character hexidecimal key) so that only a receiving station with the same link protection key will successfully interpret the signal. Refer to Paragraph 4.8.3 for information on creating linking protection keys.

The default setting for ALE operation is **OFF**, in which Linking Protection is disabled. ALE can be configured to enable level 1 linking protection, where a link protection key must be provided. All stations using Linking Protection must share a common TOD reference. A Coordinated Universal Time (UTC) reference is recommended, which can be acquired using GPS, or can be manually entered by the operator.

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

3.18.2   Select ALE Radio Mode

To select ALE radio mode, press **[MODE]** until **ALE** appears. Press **[ENT]** to select. ALE displays include the following:

- Errors occur when the ALE radio mode is chosen and ALE has not been fully programmed. Refer to Paragraph 4.8 for ALE programming.

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

- The AN/PRC-150(C) automatically begins to scan, listening for its self address to be called.

3.18.3   Ensure Radio is Scanning in ALE

The AN/PRC-150(C) will begin scanning when ALE radio mode is selected. The displayed channel number will change as the AN/PRC-150(C) scans through the list of ALE channels.

NOTE

> If **[CLR]** key is accidentally pressed during ALE operation, the AN/PRC-150(C) will stop scanning and will not receive an ALE call on another channel. If this occurs, press **[CLR]** to begin scanning again.

3.18.4   Place an ALE Call

An ALE call is used to establish communications (connections) between two or more stations. An ALE call may be placed to any programmed individual or net address.

See Figure 3-11. Perform the following procedure to place an ALE call:

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

    b.   Use the ▲▼ keys to scroll through the menu options. Select **AUTOMATIC** and press **[ENT]**.

NOTE

> **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 the lowest frequency if no LQA score data exists.
>
> **MANUAL** 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.

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

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

e. The AN/PRC150(C) will begin transmitting to the selected address. After the call, the AN/PRC-150(C) will wait for the response.

f. When a response has been received, the AN/PRC-150(C) will indicate **LINKED** on the LCD. The radio will then make available the programmed system preset items programmed to the linked self address.

g. The link can be transmitted per .

3.18.5 Placing an ALE Call to a Non-Programmed Net

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

Perform the following procedure to place an ALE call to a non-programmed net:

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

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

c. Use the ▲▼ keys to select **INDIVIDUAL** and press **[ENT].**

d. Press the ⓪ key on the KDU and type in the desired individual address to call and press **[ENT]**.

e. Enter the desired channel to call and press **[ENT]**.

f. The AN/PRC-150(C) will begin transmitting to the selected address.

g. If no response, the AN/PRC-150(C) will return to the scan mode. Repeat Step a through Step f until a link is established.

3.18.6   ALE Group Calls

The ALE Group address type allows ALE calls and ALE AMD calls to be placed to a non-prearranged group of stations. The ALE Group Call capability is useful when there is a need to contact a group of deployed radios, but no preprogrammed ALE Net exists that can be used to call them. Stations that receive a Group Call have no prior knowledge of the group and become aware they are members of the group only after hearing their Self address in the call.

The operator places an ALE Group call by selecting a set of ALE Individual addresses to be called. These Individual addresses used for the Group Call must be previously programmed into the caller's radio. The radio allows recall of the last called ALE Group so that it may be used in subsequent calls. Information for the last called ALE Group is lost when the radio is powered off.

Certain restrictions apply to the use of ALE Group calls. The total number of stations that can be specified in an ALE Group call is affected by the size of each ALE Individual address and the number of unique characters each address has. At most, five (5) to eight (8) stations can be contacted using the ALE Group Call when Individual addresses of six (6) characters or less are specified.

Perform the following to place an ALE GROUP Call:

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

   b.   Use the ▲▼ keys to scroll through the menu options. Select **AUTOMATIC** and press **[ENT].**

NOTE

> **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 the lowest frequency if no LQA score data exists.
>
> In **MANUAL**, 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.

   c.   The **ADDRESS TYPE** menu is then displayed. Use the ▲▼keys to select the **GROUP** address type and press **[ENT].**

   d.   Use the ▲▼ keys to scroll through the GROUP MEMBERS options **(ADD, REVIEW, DELETE, CALL)**. Select **ADD** and press **[ENT]**.

NOTE

> Only **ADD** will be available if the **GROUP MEMBERS** list is empty. **ADD** will not be available if the **GROUP MEMBERS** list is full and cannot accept any more members.

   e.   To add an individual to the **GROUP MEMBERS** list:

      1.   Use the ▲▼ keys to scroll through the **GROUP MEMBERS** options. Select **ADD** and press **[ENT]**.

      2.   Use the ▲▼ keys to scroll through the individual addresses available.

   f.   Repeat Step d and Step e until either all desired addresses are added to the group or the **GROUP MEMBERS** list is full.

g. To review the **GROUP MEMBERS** list:

1. Use the ▲▼ keys to scroll through the **GROUP MEMBERS** options. Select **REVIEW** and press **[ENT]**.

2. Use the ▲▼ keys to scroll though the **GROUP MEMBERS** list.

3. Press **[CLR]** when done.

h. To delete an individual address from the **GROUP MEMBERS** list:

1. Use the ▲▼ keys to scroll through the **GROUP MEMBERS** options. Select **DELETE** and press **[ENT]**.

2. Use the ▲▼ keys to scroll through the individual addresses in the group. Press **[ENT]** to remove the address from the group member list.

i. Use the ▲▼ keys to scroll through the **GROUP MEMBERS** options. Select **CALL** and press **[ENT]**.

j. The radio will begin transmitting to the selected addresses. After the call, the radio will wait for responses.

k. When all responses have been received, the radio will indicate **LINKED** on the KDU. The radio will then make available the programmed system preset items programmed to the linked self address.

3.18.7   ALE Phone Calls

The ALE Phone Call feature allows the AN/PRC-150(C) to call and link to an HF Ground Station (i.e., the RF-6010NW-001 Tactical Network Access Hub User's Manual, 10515-0262-4200). The HF Ground Station is used to connect voice calls to a Public Service Telephone Network (PSTN) landline or similar communications network. The Ground Station contacted must support the HF Ground Routing Protocol (HF-GRP) as specified in ACP193.

NOTE

This feature is only available in Plain Text (PT) mode and requires the radio voice mode to be set to **CLR**.

The AN/PRC-150(C) does not support operation as an "HF Ground Station".

The ALE Phone Call feature supports Direct Dial and Programmed Dial options for specifying telephone numbers.

The Direct Dial option allows the operator to explicitly specify the telephone number to be called. When the AN/PRC-150(C) sends the telephone number to the "HF Ground Station", it routes the call using the telephone number as is. This provides flexibility but comes at the expense of security because the telephone number is sent over-the-air and can be intercepted.

The Programmed Dial option allows the operator to indirectly specify the telephone number using an alphanumeric reference code. When the AN/PRC-150(C) sends the telephone number to the "HF Ground Station", it uses the reference code to lookup the actual telephone number which is then used to route the call. This provides less flexibility but increased security because the actual telephone number is not sent over-the-air.

3.18.8 Place an ALE Direct Dial Phone Call

Perform the following procedure to place an ALE Direct Dial Phone Call:

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

b. Use the ▲▼ keys to scroll through the menu options. Select **AUTOMATIC** and press **[ENT]**.

NOTE

> **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 the lowest frequency if no LQA
> score data exists.
>
> **MANUAL** allows the operator to select the channel to be
> called. The ALE call will be attempted on this channel and if
> the called station is not reachable, the call ends.

c. Use the ▲▼ keys to scroll through the **ADDRESS TYPE** menu options. Choices are **(INDIVIDUAL, NET, PHONE, ANY** and **ALL)**. Select **PHONE** and press **[ENT].**

d. Use ▲▼ keys to scroll through the **DIAL TYPE** menu options. Choices are **(DIRECT_DIAL, PROGRAMMED_DIAL)**. Select **DIRECT_DIAL** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **CALL PRECEDENCE** menu options. Choices are **(ROUTINE, PRIORITY, IMMEDIATE and FLASH)**. Select **ROUTINE** and press **[ENT]**.

f. Enter the telephone number to call and press **[ENT]**. The entered telephone number must consist of numeric digits (0-9) and commas (,).

g. Use the ▲▼ keys to select the individual address of the HF Ground Station to be called and press **[ENT]**.

h. The AN/PRC-150(C) will begin transmitting to the selected address. After the call, the AN/PRC-150(C) will wait for a response.

i. When the response is received, the AN/PRC-150(C) will transmit the telephone number and then indicate LINKED on the LCD.

j. The caller should listen for supervisory tones (telephone ringback) and be prepared to communicate in clear **(CLR)** voice mode with the operator or individual that answers the call at the "HF Ground Station".

k. Terminate the link per .

3.18.9 Place an ALE Programmed Dial Phone Call

Perform the following procedure to place an ALE Programmed Dial Phone Call:

a. Press **[CALL]** to display **CALL TYPE** menu options. Choices are **(MANUAL, AUTOMATIC).**

b. Use the ▲▼ keys to scroll through the options. Select **AUTOMATIC** and press **[ENT]**.

NOTE

> **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 the lowest frequency if no LQA score data exists.
>
> **MANUAL** allows the operator to select the channel to be called. The ALE call will be attempted on this channel and if the called station is not reachable, the call ends.

c. Use the ▲▼ keys to scroll through the **ADDRESS TYPE** menu options. Choices are **(INDIVIDUAL, NET, PHONE, ANY, ALL)**. Select **PHONE** and press **[ENT].**

d. Use ▲▼ keys to scroll through the **DIAL TYPE** menu options. Choices are **(DIRECT_DIAL, PROGRAMMED_DIAL)**. Select **PROGRAMMED_DIAL** and press **[ENT]**.

e. Enter the telephone number to call and press **[ENT]**. The entered telephone number must consist of a three character alphanumeric reference code (0-9, A-Z) followed (optionally) by numeric digits and commas (,).

f. Use the ▲▼ keys to select the individual address of the "HF Ground Station" to be called and press **[ENT]**.

g. The AN/PRC-150(C) will begin transmitting to the selected address. After the call, the AN/PRC150(C) will wait for a response.

h. When the response is received, the AN/PRC-150(C) will transmit the telephone number and then indicate LINKED on the LCD.

i. The caller should listen for supervisory tones (telephone ringback) and be prepared to communicate in clear **(CLR)** voice mode with the operator or individual that answers the call at the "HF Ground Station".

j. Terminate the link per .
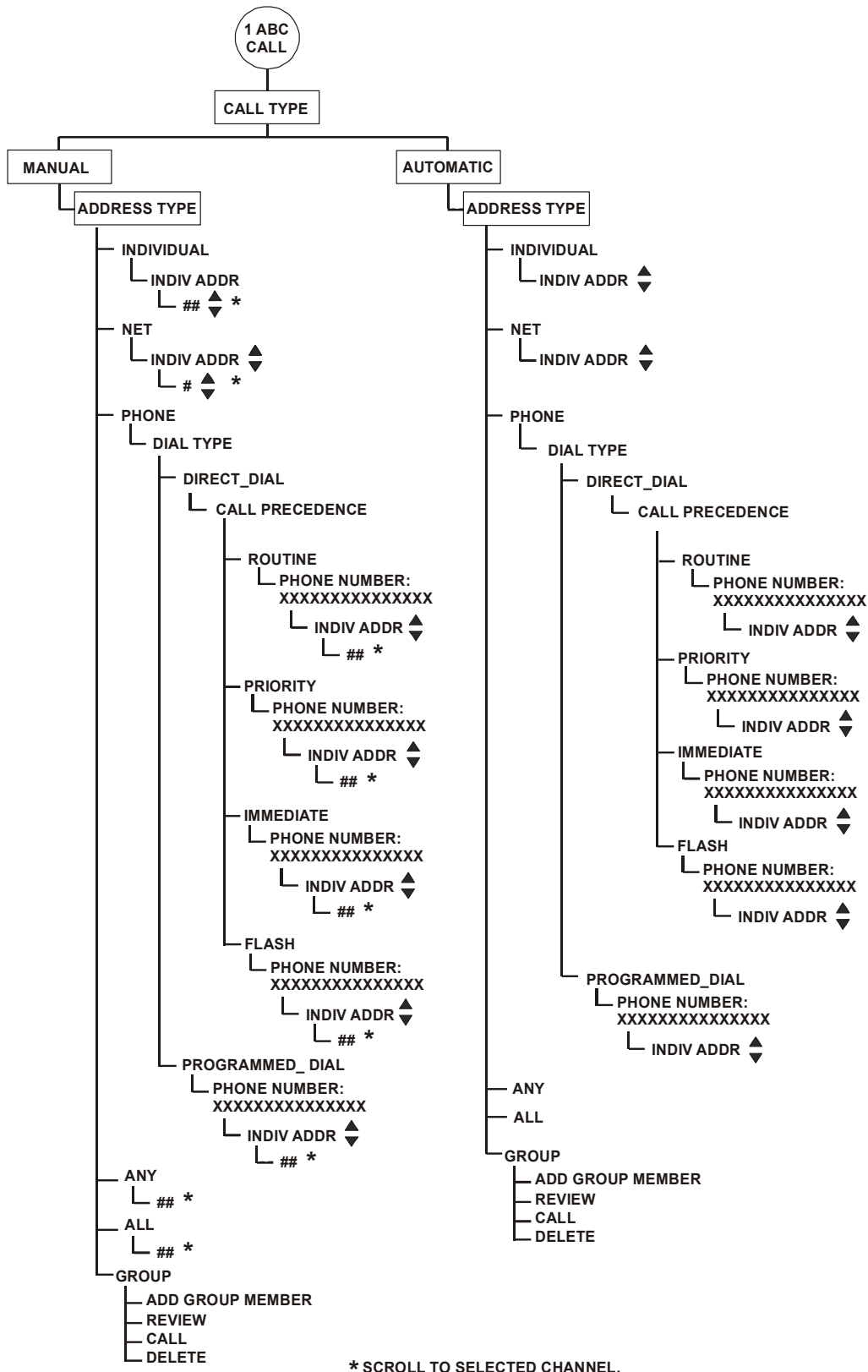
Figure 3-11. Placing an ALE Call

3.18.10   Terminate an ALE Link

Perform the following procedure to terminate an ALE link:

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

b.   The AN/PRC-150(C) will display the **TERMINATE LINK** menu. To terminate the link, scroll to **YES** and press **[ENT]**.

c.   After the link has been terminated, the AN/PRC-150(C) will begin scanning ALE channels again.

3.18.11   LQA Operations

Refer to Paragraph 4.8.4 for an LQA overview. Channel scores are used by the radio to determine the best channels to use when placing automatic calls. These channel scores develop over time due to LQA Exchanges/Sounds, call successes and observed traffic. During a call, the radios measure and exchange link quality information, however, the call may not link on the best channel if propagation conditions have changed since the last LQA. In order to link on the best channel, periodic LQAs should be performed.

3.18.11.1   Perform LQA Exchange

See Figure 3-12. To start an exchange LQA, perform the following:

a.   Choose **OPT>ALE>LQA>EXCHANGE** menu choices.

b.   Use the ▲▼ keys to scroll to the exchange type (individual or net) and press **[ENT]**.

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

d.   The AN/PRC-150(C) will try to exchange with the selected station(s) on all frequencies in the channel group associated with the address.

e.   After the LQA is completed, the AN/PRC-150(C) will return to scanning. (View scores per Paragraph 3.18.11.3.)

3.18.11.2   Perform LQA Sound

See Figure 3-12. Perform the following procedure to select sound:

a.   Choose **OPT>ALE>LQA>SOUND** menu choices.

b.   Use the ▲▼ keys to scroll through the associated self addresses and press **[ENT]**. (The user must be aware of which self address is used for individuals or nets.)

c.   The AN/PRC-150(C) 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 AN/PRC-150(C) will return to scanning. (View scores per Paragraph 3.18.11.3.)

3.18.11.3 View LQA Scores

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

    a.   Choose **OPT>ALE>SCORES** menu choices.

    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]** repeatedly or **[OPT]** to return to ALE scanning.

3.18.11.4 Zeroize LQA Scores

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

Perform the following to zeroize channel scores:

    a.   Choose **OPT>ALE>SCORES>ZERO_SCORES** and press **[ENT]**. The KDU display will briefly respond with **ALE LQA SCORES ZEROIZED** to confirm that the scores have been zeroized.

3.18.11.5 Transmit Preprogrammed Automatic Message Display (AMD) Message

AMD messages use a maximum of 90 characters and are not encrypted. Perform the following procedure to transmit preprogrammed AMD messages:

    a.   Choose **OPT>ALE>TX_MSG>TX MESSAGE TO SEND** menu choices.

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

<div align="center">

NOTE

If a message was not programmed, **NO TX MESSAGES** is
displayed. Refer to Paragraph 4.8.5 for information on
programming AMDs.

</div>

    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]**. If **AUTOMATIC** is selected, the AN/PRC-150(C) 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.

<div align="center">

NOTE

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

</div>

3.18.11.6 View a Received AMD Message

NOTE

The message scrolls across the LCD when it is being received.

Perform the following procedure to view received AMD messages:

    a.   Choose **OPT>ALE>RX_MSG** menu choices.

    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.

    d.   Press **[CLR]** repeatedly to return to the ALE scanning screen.

3.18.11.7 ALE AMD In-Link Calls

See Figure 3-12. The ALE AMD In-Link Call allows a radio to broadcast an AMD message to all radios with which it is currently linked. The In-Link Call simplifies the sending of AMD messages within an ALE link because there is no need to specify the destination address when placing the call. In-Link calls cannot be initiated or received when the radio is not linked.

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

    a.   While in ALE Mode, Choose **OPT>ALE>TX_MSG**. The current **TX MESSAGE TO SEND** setting will display.

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

    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]**.

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

    f.   Once the transmission is complete, the radio will display a **LINKED WITH** screen.
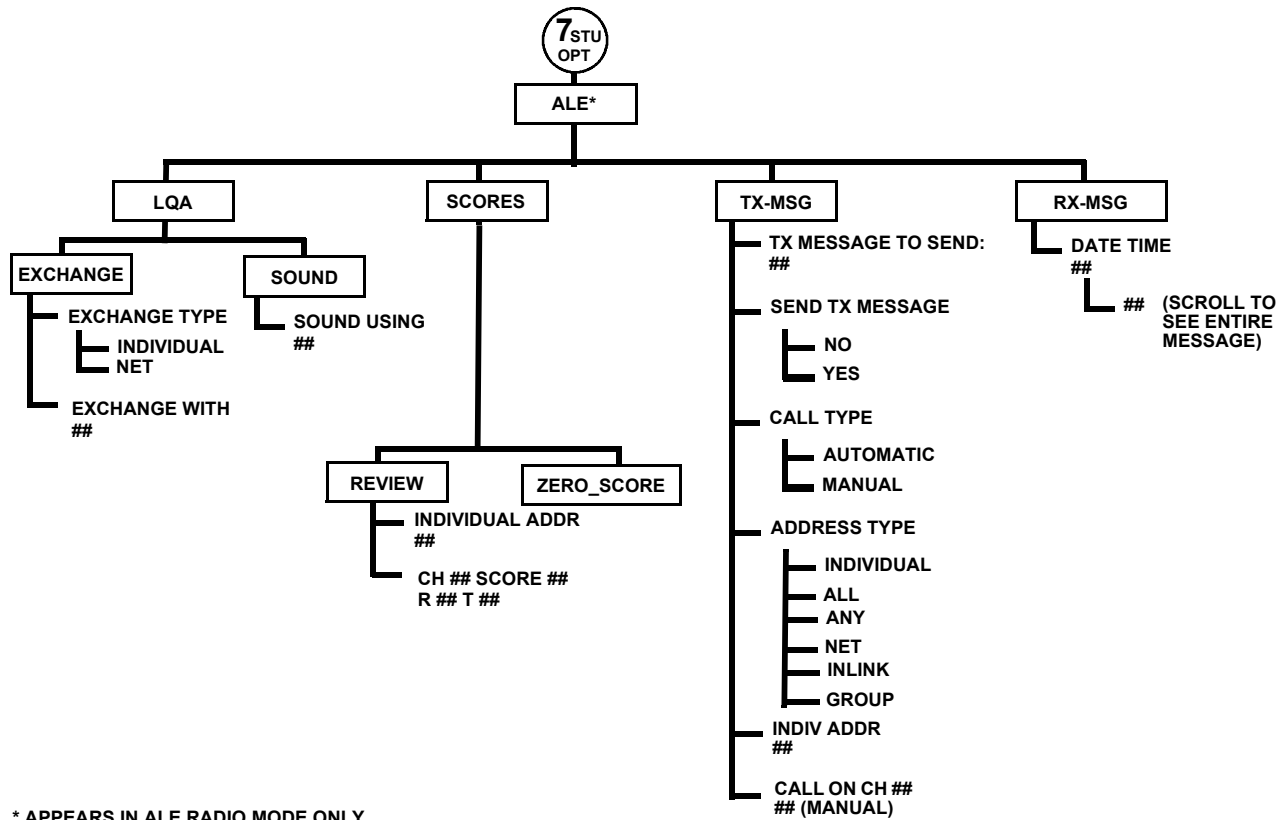
Figure 3-12. ALE Option Menu Tree

3.18.12   Net LQA - General Information

In net exchange LQAs, the receiving units transmit response messages in time slotted order. This may be a lengthy process for large nets. The response messages contain the scores measured by the net members during reception of the initial call message. The net 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.

3.19   3G RADIO MODE OPERATIONS

The AN/PRC-150(C)'s 3G radio mode provides a subset of the capabilities and protocols defined by the North Atlantic Treaty Organization (NATO) standard STANAG 4538: Technical Standards for an Automatic Radio Control System for HF Communications Links.

⚠ WARNING

RF shock could occur from coming into contact with the antenna while radio is transmitting; this could cause injury or death. Radio could transmit without any key presses during operations such as 3G, VSWR test, IP, data operations etc.

3.19.1 Overview - 3G Compared to ALE

3G provides many advantages over the current (second generation) ALE and data link capabilities. Some of the major 3G radio mode improvements are:

- Faster link setup

- Linking at lower Signal-to-Noise Ratios (SNR)

- Improved network channel efficiency

- Link setup signaling and data traffic use the same family of high-performance serial waveforms

- Higher throughput for short and long data messages

- Use of different channel plans for frequency security and close propagation matching

- Pretuning of channels to reduce tune times in linking

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

- Synchronous Channel Scanning

- No AMDs

- No Associated Self's

- No 1-3 Character Self Address

- No ALL or ANY Wildcards

- No Max Channels To Scan

- ALE uses Numbered Channel Group; 3G Uses Named Channel Plan

- ALE Uses Channels 000 through 099; 3G Uses 62 channels indexed higher than Channels 100.

- 3G Requires TOD Server Time Sync Broadcast or GPS

NOTE

TOD synchronization is required for best system performance in 3G mode. TOD sync may be obtained by downloading a GPS time from an external PLGR GPS connected to the radio (refer to Paragraph 3.19.8), or by receiving a time reference from the TOD server radio using one of the manual synchronization procedures described in Paragraph 3.19.8. Use of manual TOD synchronization requires that the operator first enter a wristwatch time into the radio (refer to Paragraph 3.19.10).

3.19.2   Overview - 3G Display

The principal differences between the KDU screens displayed in 3G radio mode operation and the screens displayed in the other radio modes appear on the top-level screens. To enter 3G radio mode press the **[MODE]** key on the KDU until 3G is displayed then press **[ENT]**. The AN/PRC-150(C) will now enter into 3G radio mode and the 3G scanning screen will be displayed. Figure 3-13 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 radio 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 ◀▶ keys to change the CHANNEL PLAN selection. Refer to Paragraph 3.19.6.

- 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 radio modes.

- The battery indicator located in the left-center portion of the top line has the same significance as in other radio modes.

- 3G on the top line indicates that the radio is being operated in 3G radio mode.

- The Squelch (SQ) and PT/CC indicators on the top line have the same significance as in other radio modes.

```
R  BAT▮▯     3G   SQ   PT          -      +
CH116   SCANNING          ▮▮▯
DAY 4538                        AUTO
   CHANNEL PLAN                        SYNC
```
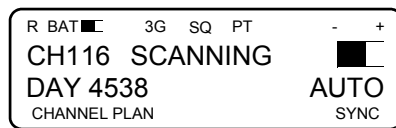
Figure 3-13. 3G Scanning Screen

3.19.3   Overview - 3G Synchronization

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 the external GPS obtains current GPS time from the GPS satellites. If the GPS is disconnected or the radio ceases to receive the GPS time signals, 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 GPS time obtains SYNC (over-the-air) from a radio with a current GPS time reference, the radio receiving the over-the-air sync will display MAN. The radio's SYNC meter bar will also fade as described in the previous paragraph.

The values that can be displayed in this field are:

- **AUTO**: The radio has a TOD synchronization based on a GPS time from the external GPS.

- **MAN**: The radio has TOD synchronization not based on GPS time from the external GPS receiver. Instead, its synchronization is based on a TOD received over-the-air (if the AN/PRC-150(C) is a TOD outstation), or its own internal clock time (if the radio is a TOD server).

- **NONE**: The AN/PRC-150(C) 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 AN/PRC-150(C) 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.

NOTE

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

The width of the bar in the sync meter display indicates what fraction of this time remains before the radio can no longer be assumed to be in sync. Immediately after the AN/PRC-150(C) is synchronized, the bar occupies the full width of the sync meter display. When the bar disappears, the AN/PRC-150(C) is no longer reliably synchronized. The bar width shown in Figure 3-13 indicates that roughly 60% of the sync reliability interval remains. This is how the display would appear if the AN/PRC-150(C) 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. Frequent 3G calls to the TOD server will keep the time sync 100%.

In HCMAC operation (refer to Paragraph 3.20.28), the time period before sync is lost (sync meter bar goes to zero) is less; four hours while the radio is powered on, and two minutes while the radio is powered off.

3.19.4   Overview - TOD Server

TOD characteristics consist of the following:

- One designated station per net

- Time gained manually or by GPS - ZULU UTC should be used

- Answers automatically to sync requests from 3G net members - if not calling

- All radios must be +/- 7 minutes of UTC to begin

- TOD server role - base - all others are designated as TOD Role - outstation

- Can be programmed to periodically send TOD sync on a scheduled interval

NOTE

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

3.19.5   About Auto Tune and Auto Sync Request

This item controls two functions, AUTO TUNE and AUTO SYNC REQUEST. Setup of these parameters permit the operator to allow (or prevent) the AN/PRC-150(C) to automatically transmit, as a part of the normal 3G control.

AUTO TUNE is performed whenever the radio is powered up in 3G radio mode and whenever 3G radio 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 outstation radio whenever its 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 its own. The operator must initiate a manual SYNC REQUEST, or the radio must receive a SYNC BCAST from the TOD server.

3.19.6   Select 3G Channel Plan

3G channel plans can only be selected when the AN/PRC-150(C) is in 3G radio mode. Refer to Paragraph 3.19.2. 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 the ▲▼ keys to select the desired CHANNEL PLAN name and press **[ENT]**.

c.   The AN/PRC-150(C) will momentarily tune. During this time, it tunes the antenna coupler (if enabled) on each channel of the channel group corresponding to the CHANNEL PLAN.

d.   The AN/PRC-150(C) displays the name of the selected CHANNEL PLAN and begins scanning the frequencies of the selected plan.

3.19.7   Select 3G Preset

Perform the following procedure to change the AN/PRC-150(C) preset while the AN/PRC-150(C) is SCANNING or LINKED:

a.   Press the **[PRE +/-]** key. The 3G Preset Select Screen will be displayed with the current Preset name and settings.

b.   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.

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

d.   Press the **[CLR]** to exit the Preset Select Screen without activating the new preset settings.

e.   To change to a different Channel Plan from the main screen, use the ◀▶ keys to select the plan and the ▲▼ keys to change the plan, then press **[ENT]**.

3.19.8   Perform Automatic GPS TOD Synchronization

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

a.   Power OFF AN/PRC-150(C).

b.   Using connecting cable (P/N 12005-0730), connect PLGR/Defense Advanced GPS Receiver (DAGR) GPS to J2 on the front of the AN/PRC-150(C).

    c.   To configure an external PLGR or DAGR for operation with the AN/PRC-150(C):

        1.   Enter the SETUP menu on the PLGR/DAGR.

        2.   Scroll through the various SETUP menus to the SERIAL Input/Output (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 the AN/PRC-150 (C).

        6.   Verify the PLGR/DAGR GPS 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. Refer to Paragraph 3.22 for more information on using the PLGR.

    d.   Rotate the function switch to the **PT**, **CC**, or **CT** position depending desired operation. The GPS PLGR module initiates a search for GPS satellites and continues until at least four GPS satellites are acquired.

    e.   The AN/PRC-150(C) uses information from the GPS 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).

3.19.9   Perform Automatic GPS TOD Synchronization with a NMEA-0183 Compliant GPS (Garmin V)

Perform the following procedure to perform an automatic TOD synchronization using the Garmin V:

    a.   Power OFF AN/PRC-150(C).

    b.   Using connecting cable (P/N 12005-0740), connect the NMEA-0183 (Garmin V) GPS unit to J2 on the front of the AN/PRC-150(C).

    c.   Configure the GPS unit to output NMEA data. The NMEA-0183 (Garmin V) GPS unit must be capable of the following to work properly. NMEA-0183 (Garmin V) GPS units that meet these requirements provide TOD synchronization that is accurate enough to support FLSU (4538) and ALE Link Protection. It does not provide enough accuracy for ECCM (HOP), HCMAC, or LPI/LPD modes of operation.

        ●   NMEA-0183 v. 3.01 RMC sentence

        ●   RMC sentence must be the first sentence output

        ●   RMC sentence must be sent every two seconds

        ●   RMC sentence must be output an average of 20 ms after the UTC time

        ●   The GPS must provide a standard 9-pin RS-232 connector

    d.   Rotate the function switch on the radio to the **PT**, **CC**, or **CT** position depending on desired operation. The GPS module initiates an analysis of the time data from the NMEA-0183 (Garmin V) GPS unit until 30 RMC sentences are received by the GPS module. This typically takes about one minute.

    e.   The AN/PRC-150(C) uses information from the GPS module to generate a GPS time reference. Once generated, the KDU displays AUTO above the word SYNC and the sync meter will show 100% sync (full bar).

f.   Should the NMEA-0183 (Garmin V) be disconnected or the unit loses satellite lock, the KDU will revert to displaying NONE above the word SYNC and the sync meter will show 0% (empty bar).

3.19.10   Perform Manual TOD Synchronization

Perform the following procedures to perform a manual TOD synchronization of an AN/PRC-150(C):

a.   Place the AN/PRC-150(C) in 3G radio mode, displaying CH### SCANNING and a sync status of NONE. It may be necessary to start by executing the procedure given in Paragraph 3.19.12 to force the AN/PRC-150(C) 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 outstation operation. Alternately, if the radio will be operated as a TOD server, it is especially important that the AN/PRC-150(C)'s time reference be established to within +/- fifteen (15) seconds of UTC for proper net timing to be established.

NOTE

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

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

g.   Press **[OPT]** to close the options menu and return to the operation screen. The AN/PRC-150(C) KDU displays the CH### SCANNING screen.

h.   The AN/PRC-150(C) scans, continuing to display a sync state of NONE, until it receives a time reference from the TOD server by receiving a TOD sync broadcast or a response to a sync request. The length of time required depends on how frequently TOD sync broadcasts are transmitted by the 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 3.19.24.1 for the procedures to transmit a broadcast sync transmissions at the primary TOD server. Refer to Paragraph 3.19.24.2 for the procedures to schedule a broadcast sync transmissions at the primary TOD server. Refer to Paragraph 3.19.13 for details of transmitting a sync request from an outstation to the TOD server.

3.19.11   Select TOD Server

An outstation AN/PRC-150(C) can automatically determine which radio is the TOD server by receiving a sync broadcast or a response to a sync request. An outstation AN/PRC-150(C) can also be commanded to assume the role of a TOD server using the front panel. Also, a TOD server can take on the role of an outstation. Only one TOD server is permitted per net.

To determine the current TOD Role or change the current TOD Role, perform the following procedure:

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

b.   Select **3G**.

c.   The **TODROLE** option will be displayed on the **3G Option Menu**. Select **TODROLE** and press **[ENT]**.

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 AN/PRC-150(C). If the role is **BASE**, then it is a TOD basestation (server). If the Role is **OUTSTATION**, this is a TOD outstation. This value can be changed by pressing the ▲▼ keys. 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 ▲▼ keys, select the appropriate answer.

f.   Press **[ENT]**. A prompt will be received to verify the TOD role change.

g.   If **YES** is selected, the new TOD Role will be selected and the option menu will be exited. The AN/PRC-150(C) will retune (if optioned for automatic retune) and activate the new role. If **NO** is selected, the **3G Option Menu** will be displayed.

NOTE

> There must only be one TOD server in a net. Operators must use caution to avoid configuring two or more radios as TOD servers. Doing this can cause synchronization failures and loss of communications.

3.19.12   Force Sync State to None

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

The AN/PRC-150(C) will derive the TOD from GPS if the GPS is connected and the radio is receiving GPS time signals when the procedure below is performed.

To force the AN/PRC-150(C) to a SYNC state of NONE, perform the following procedure:

a.   Leave cable from external PLGR to the AN/PRC-150(C) connected unless you do not want it to supply the TOD reference.

b.   Press **[OPT]**.

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

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

On completion of this procedure, AN/PRC-150(C) should display CH### SCANNING and a sync state of NONE.

NOTE

If the Manual TOD synchronization procedure was performed without disconnecting the GPS from the AN/PRC-150(C), the following things may occur:

- If AN/PRC-150(C) sync state is initially AUTO, and the AN/PRC-150(C) is currently receiving GPS time from satellites, AN/PRC-150(C) 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 AN/PRC-150(C) sync state is not initially AUTO, but AN/PRC-150(C) is receiving GPS time from satellites, AN/PRC-150(C) 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 GPS.

3.19.13 Request TOD Sync from a TOD Server

Only outstations can request a TOD sync from a TOD server. To verify whether a station is an outstation or a basestation, refer to Paragraph 3.19.11. To force the AN/PRC-150(C) to request TOD sync from a primary TOD base (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 3-14. AN/PRC-150(C) 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, AN/PRC-150(C) should display CH### SCANNING. If TOD sync was successful, the sync meter will be fully to the right indicating 100% sync. If unsuccessful, the sync meter will be at the same location as before the sync request. Refer to Paragraph 3.19.2 for further information on sync meter.

```
T BAT▮▮    3G  SQ  PT
 CH116 SYNC REQUEST
    IN PROGRESS
```

Figure 3-14. Sync in Progress Screen

3.19.14   Perform 3G Sound LQA

See Figure 3-15. Perform the following procedure to transmit a SOUND:

    a.   Place the AN/PRC-150(C) in 3G radio mode. Refer to Paragraph 3.19.2.

    b.   Press **[OPT]**.

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

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

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

The AN/PRC-150(C) transmits a SOUND transmission on each channel in the current CHANNEL PLAN. Other net members operating in 3G radio 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.

```
T BAT▮▮    3G    SQ    PT
CH116 SOUNDING           _

```

Figure 3-15. LQA Sounding Screen

3.19.15   Perform 3G Exchange LQA

Perform the following procedure for a 3G Exchange LQA:

    a.   Place the AN/PRC-150(C) in 3G radio mode. Refer to Paragraph 3.19.2.

    b.   Press **[OPT]**.

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

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

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

    f.   Use the ▲▼ keys to select the address of the station to exchange scores with, and then press **[ENT]**. An exchange will be performed with the selected station on each channel in the current CHANNEL PLAN. Both stations update their scores for each other on all channels. See Figure 3-16.

```
T BAT▮▯    3G  SQ  PT
CH116 EXCHANGING WITH
          MP1
```
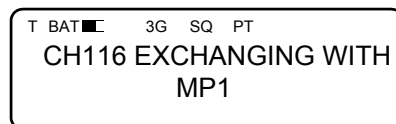
Figure 3-16. LQA Exchange

3.19.16   3G LQA Scores

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

    a.   Place the AN/PRC-150(C) in 3G radio mode. Refer to .

    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 AN/PRC-150(C) displays the channel number of the channel having the highest channel score, and the value of its channel score. Values range from 0 (worst) to 100 (best). The better the channel score, the better the quality that has been observed for that particular channel. Other channels within the CHANNEL PLAN and their scores can be displayed by pressing ▲▼.

NOTE

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

    f.   Press **[CLR]** repeatedly to exit.

3.19.16.1   3G Zeroize Scores

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

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

Perform the following to zeroize 3G channel scores:

    a.   While in 3G mode, choose **OPT>3G>SCORES>ZERO_SCORES** and press **[ENT]**. The KDU display will briefly respond with **ALE3G LQA SCORES ZEROIZED** to confirm that the scores have been zeroized.

3.19.17   Transmit and Receive 3G Data Messages

Data messages can be exchanged among all AN/PRC-150(C) radios that are:

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

Refer to Software User's Guide for the RF-6710W Wireless Messaging Terminal/RF-6750W Wireless Gateway, or the RF-6760W Wireless Message Terminal for instructions on generating, sending, and receiving data messages. A terminal product which is appropriate to support chat messaging while in 3G radio mode is the RF-6551H Tactical Chat Application. See Figure 3-17 for data (packet) transfer screen information.

NOTE

In the PACKET TX and PACKET RX screens shown in Figure 3-17, 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:

T BAT ◼◻	3G	SQ	PT	PO 100
MP2				▉▉▉
XDL	DV24	KEY1		115
TX DATA	(LDL 32)	7BPS		1536

PACKET RX:

R BAT ◼◻	3G	SQ	PT	S3 6 9+
MP2				▉▉▉
XDL	DV24	KEY1		AUTO
RX DATA	(LDL 32)	7BPS		1536

DATA LINK AFTER XFR:

R BAT ◼◻	3G	SQ	PT	S3 6 9+
MP2				▉▉▉
XDL	DV24	KEY1		AUTO
		-DATA LINK-		

KEY SIG DURING XFR:

R BAT ◼◻	3G	SQ	PT	S3 6 9+
MP2				▉▉▉
XDL	DV24	KEY1		115
KEY1		SIG:BG0C	UC:00	
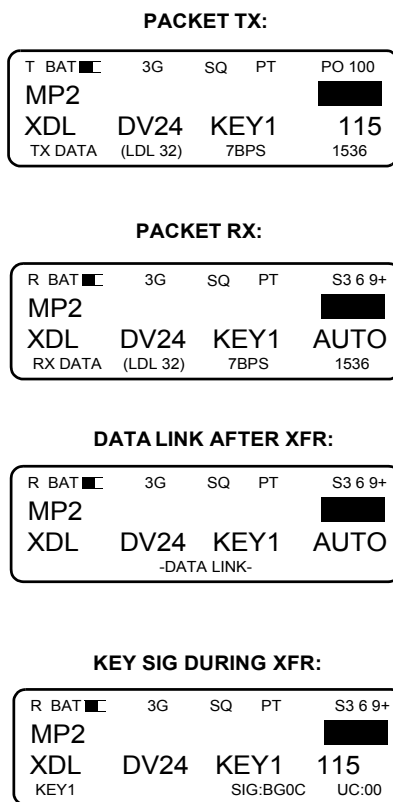
Figure 3-17. Data (Packet) Transfer Screens

3.19.18   3G Voice Communications

Voice communications can be made by AN/PRC-150(C) radios that are all:

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

3.19.19   Place Point-to-Point Call

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

a.   Press **[CALL]**.

b.   Use the ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-9 for additional information on choices.

c.   Use the ▲▼ keys to select address type **STATION** and press **[ENT]**. See Figure 3-18.

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

e.   If the call type is **MANUAL**, the AN/PRC-150(C) prompts the user for the channel number to place the call on.

f.   KDU displays call status. See Figure 3-19 and Figure 3-20.

g.   When 3G circuit setup is successful, a tone is heard in the handsets of transmitting and receiving AN/PRC-150(C) radios. KDU displays Linked Screen. See Figure 3-21.

NOTE

From the Linked Screen, the Channel Screen can be displayed (see Figure 3-22) by pressing the ⓪_Cr key.

h.   Either operator can now key handset and talk. Only one operator can talk at a time. The operator needs to unkey the handset to let the other operator respond.

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

j.   Use the ▲▼ keys to select **YES**, and press **ENT**. Refer to Table 3-10.

k.   The Terminating Screen will be displayed momentarily (see Figure 3-23) and the AN/PRC-150(C) 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).

For information on setting up and programming a 3G Network into the AN/PRC-150(C), refer to RF-6550H HF Radio Programming Application Software's Help Files.

Table 3-9. Call Initiation Screen

Front Panel Display	Description
R BAT◼◻ 3G SQ PT CALL TYPE AUTOMATIC PRESS ▼▲ TO SCROLL	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 linking time. An **AUTO** call might choose a 2nd best channel that will not have as much delay over the best channel that is later in the scan rotation. If the first call attempt fails, the second call attempt is placed on another channel with the same goal of minimizing linking time. Generally, an **AUTO** call is the most efficient 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 best observed quality. This could take longer to link than an **AUTOMATIC** call, as there may be a substantial wait for this channel to arrive in the channel scan rotation. If the first call attempt fails, the second call attempt uses the channel with the 2nd best observed quality, and so on. The total number of call attempts is limited by the **RETRY COUNT**.

R BAT◼◻   3G SQ PT
ADDRESS TYPE
STATION
PRESS ▼▲ TO SCROLL

Figure 3-18. Station Address Screen

T BAT◼◻   3G SQ PT
CH116 CALLING
MP1
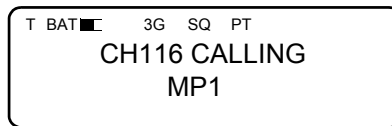
Figure 3-19. Point-to-Point Call Screen

R BAT◼◻   3G SQ PT
CH116 RECEIVING CALL
MP2
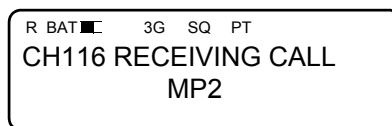
Figure 3-20. Point-to-Point Receiving Call Screen

```
R BAT■□      3G  SQ  PT           S3 6 9+
MP1                            ███████
XDL    CLR      KEY1      116
DATA   VOICE    KEY       CHAN
```
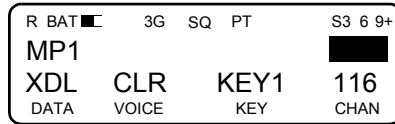
Figure 3-21. Linked Screen

```
R BAT■□      3G  SQ  PT           S3 6 9+
CH116  R27.2222                ███████
USB      T27.2222         MED
MOD    FREQUENCY (MHZ)     AGC
```
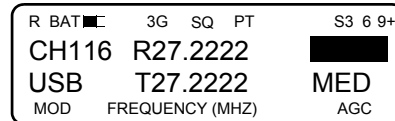
Figure 3-22. Channel Screen

Table 3-10. 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?**

```
R BAT■□      3G  SQ  PT           S3 6 9+
          TERMINATING
              MP2
```

Figure 3-23. Terminating Screen

3.19.20 Place 3G Net Call

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

a. Press **[CALL]**.

b. Use the ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-9 for additional information on choices.

c. Use the ▲▼ keys to select address type **NET** and press **[ENT]**.

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

e. If the call type is **MANUAL**, the AN/PRC-150(C) prompts the user for the channel number to place the call on.

f. KDU displays call status. See Figure 3-24. When a response to the call is received from another net member, the text RESPONSE FROM and the name of the responding station will be displayed on the bottom line of the KDU.

g. When 3G radio mode circuit setup is successful, a tone is heard in the handsets of transmitting and receiving AN/PRC-150(C) radios. KDU displays Linked Screen. See Figure 3-21.

NOTE

From the Linked Screen, the Channel Screen can be displayed (see Figure 3-22) by pressing the (0₀) 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 3-10.

k. The Terminating Screen will be displayed momentarily (see Figure 3-23) and the AN/PRC-150(C) will return to CH### SCANNING.

l. If the initiator of a net call terminates the link, the link for all radios connected in the link will terminate. The Terminating Screen will be displayed momentarily on all radios that were linked in the net. If any non-initiating radio in the net link decides to terminate its link, Step i and Step j apply. All radios still active in the link will receive a pop-up message indicating that the radio has signed off. See Figure 3-25.

```
┌──────────────────────────────┐
│ T BAT▮▯    3G  SQ  PT         │
│  CH116 CALLING               │
│           NET1               │
│      RESPONSE FROM MP1       │
└──────────────────────────────┘
```

Figure 3-24. Net Call Screen

```
┌──────────────────────────────┐
│ R BAT▮▯    3G  SQ  PT         │
│       SIGN OFF FROM          │
│           MP2                │
│                              │
└──────────────────────────────┘
```
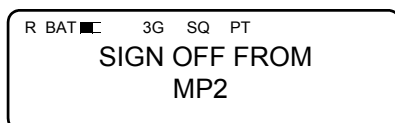
Figure 3-25. Link Termination Pop-up Message

3.19.21 Show Linked Stations

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

    a.   Press **[OPT]**.

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

    c.   Use the ▲▼ keys to select **LINKED** and press **[ENT]**.

    d.   Use the ▲▼ keys to scroll through the list of addresses of linked radios.

This procedure is most useful following a 3G net call. Refer to Paragraph 3.19.20.

3.19.22 Place 3G Net Broadcast Call

A 3G Net Broadcast Call calls the members of a 3G net. Called stations link without transmitting responses to the call.

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

    a.   Press **[CALL]**.

    b.   Use the ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-9 for additional information on choices.

    c.   Use the ▲▼ keys to select address type **NET BROADCAST** and press **[ENT]**.

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

    e.   If the call type is **MANUAL**, the AN/PRC-150(C) prompts the user for the channel number to place the call on.

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

    g.   When 3G radio mode circuit setup is successful, a tone is heard in the handsets of transmitting and receiving AN/PRC-150(C) radios. KDU displays Linked Screen. See Figure 3-21.

NOTE

From the Linked Screen, the Channel Screen can be displayed (see Figure 3-22) by pressing the ⊙ 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 3-10.

    k.   The Terminating Screen will be displayed momentarily (see Figure 3-23) and the AN/PRC-150(C) will return to CH### SCANNING.

    l.   If the initiator of a net call terminates the link, the link for all radios connected in the link will terminate. The Terminating Screen will be displayed momentarily on all radios that were linked in the net. If any non-initiating radio in the net link decides to terminate its link, Step i and Step j apply.

```
 T BAT■▯      3G  SQ  PT
  CH116 CALLING
            NET1
```
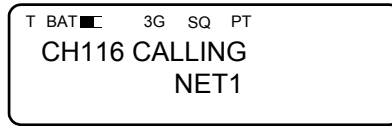
Figure 3-26. Net Call Screen

3.19.23 Voice Call Break-In

While a data transfer is actively being performed between two AN/PRC-150(C)'s in 3G radio mode, the data transfer can be preempted to allow a voice call to be made.

NOTE

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

Perform the following procedure 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.

```
 R BAT■▯     3G       PT      S 3 6 9+
           CALL TYPE
        AUTOMATIC
        PRESS ▼▲ TO SCROLL
```

Figure 3-27. [CALL] Key Pressed

```
 R BAT■▯     3G       PT      S 3 6 9+
        SUSPEND DATA?
             YES
        PRESS ▼▲ TO SCROLL
```
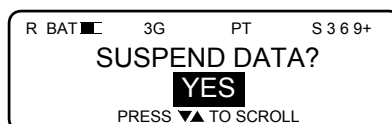
Figure 3-28. Data Transfer Abort Verification Screen

```
┌─────────────────────────────────┐
│ R BAT■□    3G        PT    S3 6 9+│
│  CH148    CALLING               │
│            MP117                │
│                                 │
└─────────────────────────────────┘
```
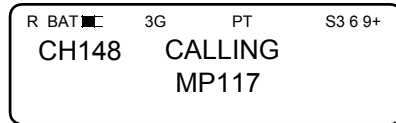
Figure 3-29. Voice Call Proceeding

```
┌─────────────────────────────────┐
│ T BAT■□    3G        PT    S 3 6 9+│
│ MP117                   ■□      │
│ OFF    CLR    ----       146    │
│      CALL FAILED:CANCELLED      │
└─────────────────────────────────┘
```
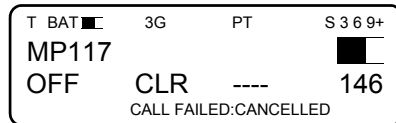
Figure 3-30. Voice Call Aborted

3.19.24   Broadcast Sync

Broadcast Sync is used to transmit the current time reference from the TOD server to the other stations in the 3G net, so that AN/PRC-150(C) manpacks receiving the Broadcast Sync can become synchronized, allowing communications in 3G radio mode. Each net must contain only one TOD server. Points to remember consist of the following:

- Only sent from the TOD server

- Cannot be sent from a radio in the outstation role

- Brings all outstations who receive the message back to full sync

- Aligns TOD in outstations to the TOD server - the outstations must be within +/- 7 minutes of the server time to hear the broadcast

- Sends on one channel

- Very robust signal used for reliability

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

- Use mainly for syncing stations within LOS distance ground wave

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

- Sends on all the channels in the channel plan

- Best method for initial startup of a 3G net

- Best method for syncing stations at varying distances beyond the limit of ground-wave propagation

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

- Only allowed in the TOD Server Radio of the 3G net

- Handles the chore of keeping the net in sync automatically

- Good backup to GPS use

- Method to use if no GPS exists or just one for the base

- Use a logical easily remembered time interval for outstations

- Brings all outstations back to full sync

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

3.19.24.1 Transmit a 3G TOD Broadcast Sync

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

a. Press **[CALL]**.

b. Use the ▲▼ keys to select BROADCAST SYNC or BROADCAST SYNC-ALL and press **[ENT]**. If BROADCAST SYNC is selected, the TOD server transmits a single TOD sync broadcast. If BROADCAST SYNC-ALL is selected, the 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.

3.19.24.2 Schedule a Broadcast Sync

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

a. Press **[PGM]**.

b. Use the ▲▼ 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 3-31.

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 3-32.

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

By selecting **EDIT** or **DELETE** instead of **ADD** in Step c, the operator can edit or delete a previously scheduled broadcast. See Figure 3-33.

```
┌─────────────────────────────┐
│ SCHEDULE-ADD                │
│        OFFSET TIME          │
│          00:15              │
│     ENTER 24-HOUR TIME      │
└─────────────────────────────┘
```

Figure 3-31. Offset Time Screen

```
┌─────────────────────────────┐
│ SCHEDULE-ADD                │
│        INTERVAL TIME        │
│          00:30              │
│   ENT TO SAVE - CLR TO EXIT │
└─────────────────────────────┘
```

Figure 3-32. Interval Time Screen

```
┌─────────────────────────────┐
│ SCHEDULE-EDIT               │
│ ENTRY    0    BROADCAST     │
│ O: 00:15          I: 00:30  │
│    ENT TO SAVE - CLR TO EXIT│
└─────────────────────────────┘
```

Figure 3-33. Schedule Edit Screen

```
                    ( OPT )
                      │
                  ┌───────┐
                  │  3G   │
                  └───────┘
                      │
                      ├── LQA
                      │     ├── EXCHANGE
                      │     │     └── EXCHANGE WITH
                      │     │            └── ##
                      │     └── SOUND
                      │
                      ├── SCORES
                      │     ├── INDIV ADDR
                      │     │     └── SCORES
                      │     ├── REVIEW
                      │     │     └── INDIVIDUAL ADDR
                      │     └── ZERO SCORES
                      │
                      ├── UNSYNC
                      │
                      ├── TOD
                      │     ├── NEW TOD:
                      │     └── NEW DATE:
                      │
                      ├── TOD ROLE
                      │     ├── CURRENT TOD SERVER
                      │     └── CURRENT TOD ROLE
                      │            ├── BASE
                      │            └── OUTSTATION
                      │
                      ├── SCHED
                      │     └── ##
                      │
                      └── LINKED
```

F-0103-4100-0017-D
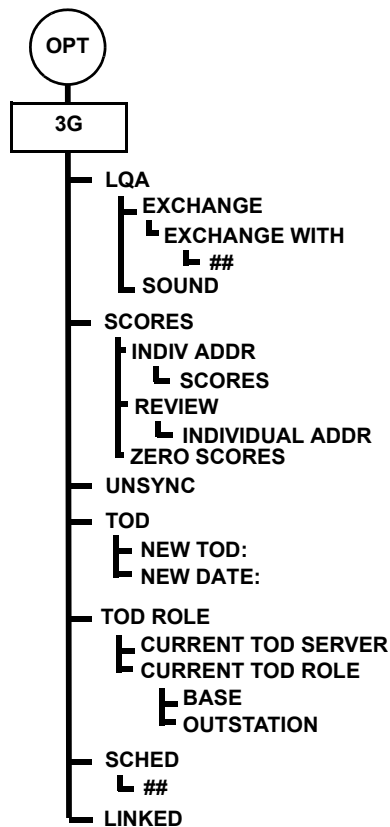
Figure 3-34. 3G Operations Menu

3.20   3G+ MODE OPERATIONS

The AN/PRC-150(C) 3G+ mode allows the radio to receive and place ALE (MIL-STD-188-141A/B) calls while operating in 3G mode. While scanning in 3G+ mode, the radio monitors each channel for both ALE and 3G signals. In this way, communications links can be established with either protocol without requiring the operator to switch between ALE and 3G modes. This is especially useful for interoperability with radios that support ALE calling but do not support 3G (STANAG 4538) calls. The 3G+ capability is supported on Harris Falcon II HF radios using system firmware Version 1.4 or later.

When a radio is enabled for 3G+ operation the valid channel range for 3G and 3G+ operating modes shifts from 100-162 to 1-62. This channel range shift is required to support operation within the valid ALE range of channels. ALE does not allow channel group assignments above channel 99. The radio scratchpad channel (0) is excluded from use as a selectable 3G+ channel since the on-the-fly reprogrammability of the scratchpad channel makes its use unreliable for 3G+.

⚠️ **WARNING**

RF shock could occur from coming into contact with the antenna while radio is transmitting; this could cause injury or death. Radio could transmit without any key presses during operations such as 3G+.

3.20.1   Overview - ALE Operation While in 3G+ Mode

The characteristics of ALE operation while in 3G+ mode are:

*   Scans in 3G mode while listening for ALE signaling on channels that are common to both ALE and 3G scan list.

*   When an ALE call to a station's self address is detected, the radio switches to ALE mode and monitors the ALE call progress.

*   When the call succeeds, the radio links up and remains in ALE mode.

*   If the call attempt fails or the ALE link is terminated, the radio returns to 3G synchronous scanning, waiting for the next ALE or 3G call.

*   When the radio returns to 3G scanning, the 3G auto-tuning sequence is inhibited to prevent unnecessary retuning of the radio's internal coupler or an attached external coupler.

3.20.2   Overview - 3G+ Display

The principal differences between the KDU screens displayed in 3G+ radio mode operation and the screens displayed in the other radio modes appear on the top-level screens. To enter 3G+ radio mode, the radio must be programmed with a communications plan that was developed from the RF-6550H HF Radio Programming Application, version 5.0 or higher. Once the radio is programmed, to enter 3G+ mode, press the **[MODE]** key on the KDU until 3G+ is displayed and then press **[ENT]**. The AN/PRC-150(C) will now enter 3G+ radio mode and the 3G+ scanning screen will be displayed. Figure 3-35 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+ radio 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 ◀▶ keys to change the CHANNEL PLAN selection. Refer to Paragraph 3.19.6.

- 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 radio modes.

- The battery indicator located in the left-center portion of the top line has the same significance as in other radio modes.

- 3G+ on the top line indicates that the radio is being operated in 3G+ radio mode.

- The Squelch (SQ) and PT/CT indicators on the top line have the same significance as in other radio modes.

```
R BAT■□    3G+  SQ  PT        -    +
CH116  SCANNING        ■□
DAY 4538               AUTO
CHANNEL PLAN           SYNC
```
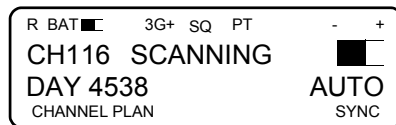
Figure 3-35. 3G+ Scanning Screen

3.20.3   Overview - 3G+ Synchronization

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 the internal GPS receiver obtains current GPS time from the GPS satellites. If the radio's GPS antenna is disconnected or the radio ceases to receive the GPS time signals, the radio will continue to show AUTO sync with the SYNC meter bar gradually getting smaller as the SYNC quality fades.

If a radio without GPS time obtains SYNC (over-the-air) from a radio with a current GPS time reference, the GPS-synchronized radio will display MAN. The radio's SYNC meter bar will also fade as described in the previous paragraph.

The values that can be displayed in this field are:

- **AUTO**: The radio has TOD synchronization based on a GPS time from its internal GPS receiver.

- **MAN**: The radio has TOD synchronization not based on GPS time from its internal receiver. Instead, its synchronization is based on a TOD received over-the-air (if the AN/PRC-150(C) is a TOD outstation), or its own internal clock time (if the radio is a TOD server).

- **NONE**: The AN/PRC-150(C) 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 AN/PRC-150(C) without GPS remains synchronized for approximately 20 minutes while it is powered off, and more than 48 hours while it is powered on.

NOTE

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

The width of the bar in the sync meter display indicates what fraction of this time remains before the radio can no longer be assumed to be in sync. Immediately after the AN/PRC-150(C) is synchronized, the bar occupies the full width of the sync meter display. When the bar disappears, the AN/PRC-150(C) is no longer reliably synchronized. The bar width shown in Figure 3-13 indicates that roughly 60% of the sync reliability interval remains. This is how the display would appear if the AN/PRC-150(C) was synchronized, powered off for 8 minutes, then powered back on, since 20 minutes minus 8 minutes equals 12 minutes, and 12 minutes is 60% of 20 minutes. Frequent 3G calls to the TOD server will keep the time sync at 100%.

3.20.4 Overview - TOD Server

TOD characteristics consist of the following:

- One designated station per net

- Time gained manually or by GPS - ZULU UTC should be used

- Answers automatically to sync requests from 3G+ net members - if not calling

- All radios must be +/- 7 minutes of UTC to begin

- TOD server role - base; all others are designated as TOD Role - outstation

- Can be programmed to periodically send TOD sync on a scheduled interval

NOTE

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

3.20.5 About Auto Tune and Auto Sync Request

This item controls two functions, AUTO TUNE and AUTO SYNC REQUEST. Setup of these parameters permit the operator to allow (or prevent) the AN/PRC-150(C) to automatically transmit, as a part of the normal 3G+ control.

AUTO TUNE is performed whenever the radio is powered up in 3G+ radio mode or whenever 3G+ radio mode is exited and re-entered. When AUTO TUNE/SYNC is disabled, the radio 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 outstation radio whenever its 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 its own. The operator must initiate a manual SYNC REQUEST, or the radio must receive a SYNC BCAST from the TOD server.

3.20.6   Select 3G+ Channel Plan

3G+ channel plans can only be selected when the AN/PRC-150(C) is in 3G+ radio mode. Refer to Paragraph 3.19.2. 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 the ▲▼ keys to select the desired CHANNEL PLAN name and press **[ENT]**.

   c.   The AN/PRC-150(C) will momentarily tune. During this time, it tunes the antenna coupler (if enabled) on each channel of the channel group corresponding to the CHANNEL PLAN.

   d.   The AN/PRC-150(C) displays the name of the selected CHANNEL PLAN and begins scanning the frequencies of the selected plan.

3.20.7   Select 3G+ Preset

Perform the following procedure to change the AN/PRC-150(C) preset while the AN/PRC-150(C) is SCANNING or LINKED:

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

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

   c.   Pressing the **[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 (4) seconds) or the ⊙ key or **[ENT]** is pressed. Press the **[CLR]** to exit the Preset Select Screen without activating the new preset settings.

3.20.8   Perform Automatic GPS TOD Synchronization

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

   a.   Power OFF AN/PRC-150(C).

   b.   Attach the GPS antenna to J2 on the front of the AN/PRC-150(C).

   c.   Rotate the function switch to the **PT** or **CT** position depending on desired operation.
         The GPS module initiates a search for GPS satellites.

   d.   The AN/PRC-150(C) continues to search until at least four GPS satellites are acquired.

   e.   The AN/PRC-150(C) uses information from the satellites 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).

3.20.9   Perform Manual TOD Synchronization

Perform the following procedures to perform a manual TOD synchronization of a AN/PRC-150(C):

a.   Place the AN/PRC-150(C) in 3G+ radio mode, displaying CH### SCANNING and a sync status of NONE. It may be necessary to start by executing the procedure given in Paragraph 3.19.12 to force the AN/PRC-150(C) sync state to NONE.

b.   Press **[OPT]**.

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

d.   Use the ◀▶ 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 outstation operation. Alternately, if the radio will be operated as a TOD server, it is especially important that the AN/PRC-150(C)'s time reference be established to within +/- fifteen (15) seconds of UTC for proper net timing to be established.

NOTE

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

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

g.   Press **[OPT]** to close the options menu and return to the operation screen. The AN/PRC-150(C) KDU displays the CH### SCANNING screen.

h.   The AN/PRC-150(C) scans, continuing to display a sync state of NONE, until it receives a time reference from the TOD server by receiving a TOD sync broadcast or a response to a sync request. The length of time required depends on how frequently TOD sync broadcasts are transmitted by the 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 3.19.24.1 for the procedures to transmit a broadcast sync transmissions at the primary TOD server. Refer to Paragraph 3.19.24.2 for the procedures to schedule a broadcast sync transmissions at the primary TOD server. Refer to Paragraph 3.19.13 for details of transmitting a sync request from an outstation to the TOD server.

3.20.10   Select TOD Server

An outstation AN/PRC-150(C) can automatically determine which radio is the TOD server by receiving a sync broadcast or a response to a sync request. An outstation AN/PRC-150(C) can also be commanded to assume the role of a TOD server using the front panel. Also, a TOD server can take on the role of an outstation. Only one TOD server is permitted per net.

To determine the current TOD Role or change the current TOD Role, perform the following procedure:

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

b.   Select **3G**.

c.   The **TODROLE** option will be displayed on the **3G+ Option Menu**. Select **TODROLE** and press **[ENT]**.

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 AN/PRC-150(C). If the role is **BASE**, then it is a TOD basestation (server). If the Role is **OUTSTATION**, this is a TOD outstation. This value can be changed by pressing the ▲▼ keys. 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 ▲▼ keys, select the appropriate answer.

f.   Press **[ENT]**. A prompt will be received to verify the TOD role change.

g.   If **YES** is selected, the new TOD Role will be selected and the Option Menu will be exited. The AN/PRC-150(C) will retune (if optioned for automatic retune) and activate the new role. If **NO** is selected, the **3G+ Option Menu** will be displayed.

NOTE

There must only be one TOD server in a net. Operators must use caution to avoid configuring two or more radios as TOD servers. Doing this can cause synchronization failures and loss of communications.

3.20.11   Force Sync State to None

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

The AN/PRC-150(C) will derive the TOD from GPS if the GPS antenna is connected and the radio is receiving GPS time signals when the procedure below is performed.

To force the AN/PRC-150(C) to a SYNC state of NONE, perform the following procedure:

a.   Leave the GPS antenna cable to the AN/PRC-150(C) connected unless you do not want it to supply the TOD reference.

b.   Press **[OPT]**.

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

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

On completion of this procedure, AN/PRC-150(C) should display CH### SCANNING and a sync state of NONE.

NOTE

If the Manual TOD synchronization procedure was performed without disconnecting the GPS antenna from the AN/PRC-150(C), the following things may occur:

●   If AN/PRC-150(C) sync state is initially AUTO, and the AN/PRC-150(C) is currently receiving GPS time from satellites, AN/PRC-150(C) 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 AN/PRC-150(C) sync state is not initially AUTO, but AN/PRC-150(C) is receiving GPS time from satellites, AN/PRC-150(C) 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 GPS antenna.

3.20.12   Request TOD Sync from a TOD Server

Only outstations can request a TOD sync from a TOD server. To verify whether a station is an outstation or a basestation, refer to Paragraph 3.19.11. To force the AN/PRC-150(C) to request TOD sync from a primary TOD base (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 3-36. AN/PRC-150(C) 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, AN/PRC-150(C) should display CH### SCANNING. If TOD sync was successful, the sync meter will be fully to the right indicating 100% sync. If unsuccessful, the sync meter will be at the same location as before the sync request. Refer to Paragraph 3.19.2 for further information on sync meter.

```
T BAT■■        3G+  SQ   PT
   CH116 SYNC REQUEST
        IN PROGRESS
```

Figure 3-36. Sync in Progress Screen

3.20.13   Perform 3G+ Sound LQA

See Figure 3-37. Perform the following procedure to transmit a SOUND:

a.   Place the AN/PRC-150(C) in 3G+ radio mode. Refer to Paragraph 3.19.2.

b.   Press **[OPT]**.

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

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

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

The AN/PRC-150(C) transmits a SOUND transmission on each channel in the current CHANNEL PLAN. Other net members operating in 3G+ radio 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 3-38.
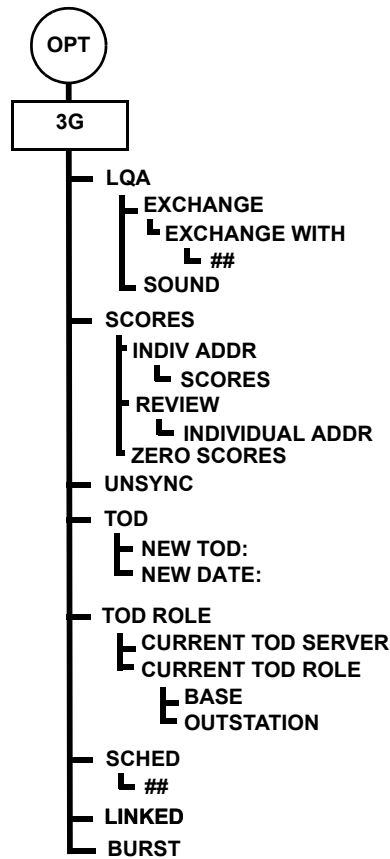
Figure 3-37. 3G+ Operations Menu

F-0103-4100-0017-D
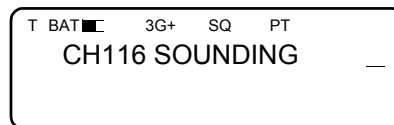
Figure 3-38. LQA Sounding Screen

3.20.14   Perform an Exchange LQA in 3G+

Perform the following procedure for a 3G+ Exchange LQA:

    a.   Place the AN/PRC-150(C) in 3G+ radio mode. Refer to Paragraph 3.19.2.

    b.   Press **[OPT]**.

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

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

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

f. Use the ▲▼ keys to select the address of the station to exchange scores with, and then press **[ENT]**. An exchange will be performed with the selected station on each channel in the current CHANNEL PLAN. Both stations update their scores for each other on all channels. See Figure 3-39.

```
 T BAT◼◻     3G+  SQ   PT
  CH116 EXCHANGING WITH
            MP1
```
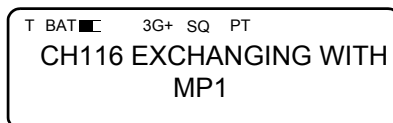
Figure 3-39. LQA Exchange

3.20.15   3G LQA Scores in 3G+

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

a. Place the AN/PRC-150(C) in 3G+ radio mode. Refer to Paragraph 3.19.2.

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 ◀▶ keys to select **REVIEW** and press **[ENT]**.

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

The AN/PRC-150(C) displays the channel number of the channel having the highest channel score, and the value of its channel score. Values range from 0 (worst) to 100 (best). The better the channel score, the better the quality that has been observed for that particular channel. Other channels within the CHANNEL PLAN and their scores can be displayed by pressing ▲▼.

NOTE

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

g. Press **[CLR]** repeatedly to exit.

3.20.15.1 Zeroize Scores IN 3G+

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

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

Perform the following to zeroize 3G+ channel scores:

a. While in 3G+ mode, choose **OPT>3G>SCORES>ZERO_SCORES** and press **[ENT]**. The KDU display will briefly respond with **ALE3G+ LQA SCORES ZEROIZED** to confirm that the scores have been zeroized.

3.20.16 Transmit and Receive 3G+ Data Messages

Data messages can be exchanged among all AN/PRC-150(C) radios that are:

- Members of the same 3G+ net.

- TOD synchronized.

- Currently scanning the same CHANNEL PLAN in 3G+ radio mode.

- Using Harris RF-6710, RF-6750, RF-6760 or TAC CHAT software.

- Connected to the PC using a PPP cable.

Refer to Software User's Guide for the RF-6710W Wireless Messaging Terminal/RF-6750W Wireless Gateway, or the RF-6760W Wireless Message Terminal for instructions on generating, sending, and receiving data messages. A terminal product which is appropriate to support chat messaging while in 3G+ radio mode is the RF-6551H Tactical Chat Application.

NOTE

When using 3G+ with AN/PRC-150(C) system release Version 1.4, RF-6551 Tactical Chat or RF-6710W/6750W/6760W operation is not supported while linked in ALE mode.

See Figure 3-40 for data (packet) transfer screen information. In the PACKET TX and PACKET RX screens shown in Figure 3-40, 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:

```
T  BAT▉◻       3G+      SQ      PT        PO 100
MP2                                      ▉▉▉▉
XDL      DV24    KEY1            115
TX DATA  (LDL 32)      7BPS          1536
```

PACKET RX:

```
R  BAT▉◻       3G+      SQ      PT        S3 6 9+
MP2                                      ▉▉▉▉
XDL      DV24    KEY1            AUTO
RX DATA  (LDL 32)      7BPS          1536
```

DATA LINK AFTER XFR:

```
R  BAT▉◻       3G+      SQ      PT        S3 6 9+
MP2                                      ▉▉▉▉
XDL      DV24    KEY1            AUTO
             -DATA LINK-
```

KEY SIG DURING XFR:

```
R  BAT▉◻       3G+      SQ      PT        S3 6 9+
MP2                                      ▉▉▉▉
XDL      DV24    KEY1            115
KEY1                   SIG:BG0C      UC:00
```
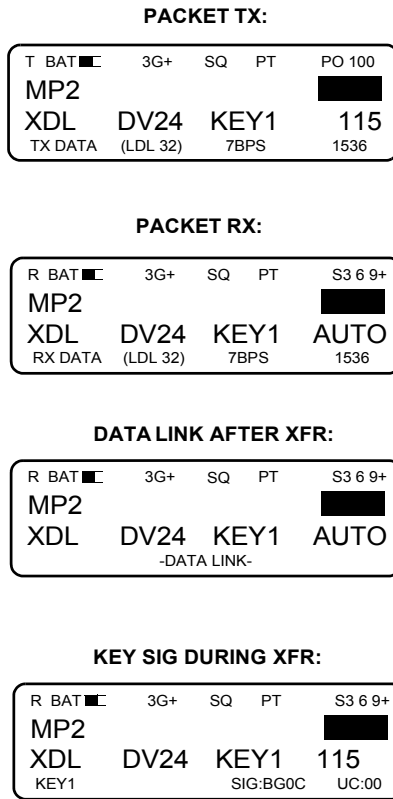
Figure 3-40. Data (Packet) Transfer Screens

3.20.17 3G+ Voice Communications

Voice communications can be made by AN/PRC-150(C) radios that are all:

- Members of the same 3G+ net

- TOD synchronized

- ALE and 3G net members that are scanning the same CHANNEL PLAN in ALE, 3G, and 3G+ radio mode

- Not currently active in data or voice communication

3.20.18 Place a 3G Point-to-Point Call in 3G+

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

a. Press **[CALL]**.

b. Use the ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-11 for additional information on choices.

c. Use the ▲▼ keys to select address type **STATION** and press **[ENT]**. See Figure 3-41.

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

e. If the call type is **MANUAL**, the AN/PRC-150(C) prompts the user for the channel number to place the call on.

 f. KDU displays call status. See Figure 3-42 and Figure 3-43.

 g. When 3G+ circuit setup is successful, a tone is heard in the handsets of transmitting and receiving AN/PRC-150(C) radios. KDU displays Linked Screen. See Figure 3-44.

NOTE

> From the Linked Screen, the Channel Screen can be displayed (see Figure 3-45) by pressing the $\textcircled{0_{Cr}}$ key.

 h. Either operator can now key handset and talk. Only one operator can talk at a time. The operator needs to unkey the handset to let the other operator respond.

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

 j. Use the ▲▼ keys to select **YES**, and press **ENT**. Refer to Table 3-12.

 k. The Terminating Screen will be displayed momentarily (see Figure 3-46) and the AN/PRC-150(C) 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 Terminal (WMT), the RF-6750W Wireless Gateway, the RF-6760W Wireless Message Terminal or the Harris Tactical Chat Application.
>
> For information on setting up and programming a 3G+ Network into the AN/PRC-150(C), refer to RF-6550H HF Radio Programming Application software Help files.

Table 3-11. Call Initiation Screen

Front Panel Display	Description

R BAT◼▯   3G+ SQ   PT
CALL TYPE
AUTOMATIC
PRESS ▼▲ TO SCROLL
	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 - 3G or **ALE**; Selects the channels on which call attempts are placed with the goal of minimizing linking time. An **AUTO** call might choose a 2nd best channel that will not have as much delay over the best channel that is later in the scan rotation. If the first call attempt fails, the second call attempt is placed on another channel with the same goal of minimizing linking time. Generally, an **AUTO** call is the most efficient way to make a connection.
	    MANUAL - 3G or **ALE**; Establishes a circuit with one or more other radios on a specified channel (could take longer to link than an AUTOMATIC call).
	    BEST - 3G; Always places the first call attempt on the channel with the best observed quality. This could take longer to link than an **AUTOMATIC** call, as there may be a substantial wait for this channel to arrive in the channel scan rotation. If the first call attempt fails, the second call attempt uses the channel with the 2nd best observed quality, and so on. The total number of call attempts is limited by the **RETRY COUNT**.

R BAT◼▯   3G+ SQ   PT
ADDRESS TYPE
STATION
PRESS ▼▲ TO SCROLL

Figure 3-41. Station Address Screen

T BAT◼▯   3G+ SQ   PT
CH116 CALLING
MP1
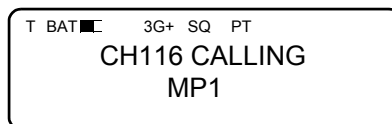
Figure 3-42. Point-to-Point Call Screen

R BAT◼▯   3G+ SQ   PT
CH116 RECEIVING CALL
MP2
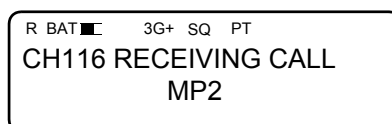
Figure 3-43. Point-to-Point Receiving Call Screen

```
R BAT■▯     3G+ SQ  PT          S3 6 9+
MP1                          ███████
XDL    CLR     KEY1      116
DATA   VOICE      KEY      CHAN
```
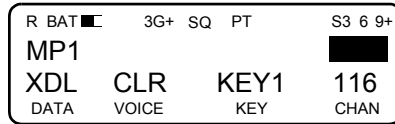
Figure 3-44. Linked Screen

```
R BAT■▯     3G+ SQ  PT          S3 6 9+
CH116  R27.2222            ███████
USB      T27.2222        MED
MOD    FREQUENCY (MHZ)      AGC
```
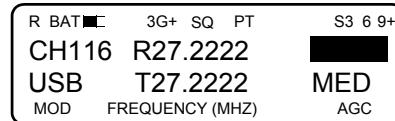
Figure 3-45. Channel Screen

Table 3-12. 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?**

```
R BAT■▯     3G+ SQ  PT          S3 6 9+
              TERMINATING
                  MP2
```

Figure 3-46. Terminating Screen

3.20.19 Place a 3G Net Call in 3G+

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

a. Press **[CALL]**.

b. Use the ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-11 for additional information on choices.

c. Use the ▲▼ keys to select address type **NET** and press **[ENT]**.

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

e. If the call type is **MANUAL**, the AN/PRC-150(C) prompts the user for the channel number to place the call on.

f. KDU displays call status. See Figure 3-48. When a response to the call is received from another net member, the text RESPONSE FROM and the name of the responding station will be displayed on the bottom line of the KDU.

g. When 3G+ radio mode circuit setup is successful, a tone is heard in the handsets of transmitting and receiving AN/PRC-150(C) radios. KDU displays Linked Screen. See Figure 3-44.

NOTE

From the Linked Screen, the Channel Screen can be displayed (see Figure 3-45) 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 3-12.

k. The Terminating Screen will be displayed momentarily (see Figure 3-46) and the AN/PRC-150(C) will return to CH### SCANNING.

l. If the initiator of a net call terminates the link, the link for all radios connected in the link will terminate. The Terminating Screen will be displayed momentarily on all radios that were linked in the net. If any non-initiating radio in the net link decides to terminate its link, Step i and Step j apply. All radios still active in the link will receive a pop-up message indicating that the radio has signed off. See Figure 3-47.

```
 R BAT▮▯     3G+  SQ   PT
         SIGN OFF FROM
              MP2
```

Figure 3-47. Link Termination Pop-up Message

```
 T BAT▮▯     3G+  SQ   PT
      CH116 CALLING
            NET1
       RESPONSE FROM MP1
```
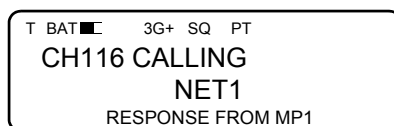
Figure 3-48. Net Call Screen

3.20.20 Show Linked Stations

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

    a.   Press **[OPT]**.

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

    c.   Use the ▲▼ keys to select LINKED and press **[ENT]**.

    d.   Use the ▲▼ keys to scroll through the list of addresses of linked radios.

This procedure is most useful following a 3G net call. Refer to Paragraph 3.19.20.

3.20.21 Place a 3G Net Broadcast Call in 3G+

A 3G Net Broadcast Call is used to call the members of a 3G net. Called stations link without transmitting responses to the call.

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

    a.   Press **[CALL]**.

    b.   Use the ▲▼ keys to select call type of **AUTOMATIC**, **MANUAL**, or **BEST** and press **[ENT]**. Refer to Table 3-11 for additional information on choices.

    c.   Use the ▲▼ keys to select address type **NET BROADCAST** and press **[ENT]**.

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

    e.   If the call type is **MANUAL**, the AN/PRC-150(C) prompts the user for the channel number to place the call on.

    f.   KDU displays call status. See Figure 3-49.

    g.   When 3G+ radio mode circuit setup is successful, a tone is heard in the handsets of transmitting and receiving AN/PRC-150(C) radios. KDU displays Linked Screen. See Figure 3-44.

NOTE

From the Linked Screen, the Channel Screen can be displayed
(see Figure 3-45) by pressing the (0_cr) 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 3-12.

    k.   The Terminating Screen will be displayed momentarily (see Figure 3-46) and the AN/PRC-150(C) will return to CH### SCANNING.

    l.   If the initiator of a net call terminates the link, the link for all radios connected in the link will terminate. The Terminating Screen will be displayed momentarily on all radios that were linked in the net. If any non-initiating radio in the net link decides to terminate its link, Step i and Step j apply.

```
 T  BAT█▊       3G+  SQ   PT
   CH116 CALLING
              NET1
```

Figure 3-49. Net Call Screen

3.20.22   Place an ALE Call in 3G+

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

Perform the following procedure to place an ALE call in 3G+:

a.   Press **[CALL]** to display the CALL TYPE menu choices **(3G MANUAL, 3G AUTOMATIC, 3G BEST, 3G BROADCAST SYNC, 3G BDCAST SYNC-ALL, 3G SEND GPS REPORT, ALE MANUAL, ALE AUTOMATIC)**.

NOTE

Not all menu choices will be displayed. The CALL TYPE menu choices are different depending on if the radio is synchronized and/or if configured as a TOD server or Outstation radio.

b.   Use the ▲▼ keys to scroll through the options. Select **ALE AUTOMATIC** and press **[ENT]**. **ALE 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 **ALE 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.   The link can be terminated per Paragraph 3.18.10.

3.20.23   Voice Call Break-In

While a data transfer is actively being performed between two AN/PRC-150(C)'s in 3G+ radio mode, the data transfer can be preempted to allow a voice call to be made.

NOTE

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

Perform the following procedure 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.

```
R  BAT▮▯     3G+        PT        S 3 6 9+
             CALL TYPE
             AUTOMATIC
             PRESS ▼▲ TO SCROLL
```

Figure 3-50. [CALL] Key Pressed

```
R  BAT▮▯     3G+        PT        S 3 6 9+
           SUSPEND DATA?
                YES
             PRESS ▼▲ TO SCROLL
```
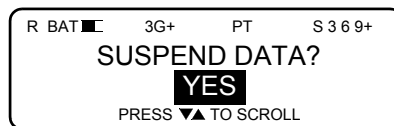
Figure 3-51. Data Transfer Abort Verification Screen

```
R  BAT▮▯     3G+        PT        S3 6 9+
   CH148     CALLING
              MP117
```
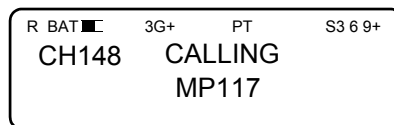
Figure 3-52. Voice Call Proceeding

```
T  BAT▮▯     3G+        PT        S 3 6 9+
   MP117                          ▮▯
   OFF     CLR    ----      146
           CALL FAILED:CANCELLED
```
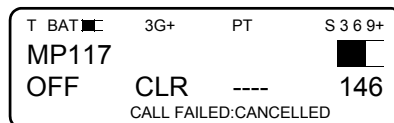
Figure 3-53. Voice Call Aborted

3.20.24   Broadcast Sync

Broadcast Sync is used to transmit the current time reference from the TOD server to the other stations in the 3G+
net, so that AN/PRC-150(C) manpacks receiving the Broadcast Sync can become synchronized, allowing
communications in 3G+ radio mode. Each net must contain only one TOD server. Points to remember consist of the
following:

- Only sent from the TOD server
- Cannot be sent from a radio in the outstation role
- Brings all outstations who receive the message back to full sync
- Aligns TOD in outstations to the TOD server - the outstations must be within +/- 7 minutes of the server
  time to hear the broadcast
- Sends on one channel
- Very robust signal used for reliability
- Less reliable than BROADCAST SYNC-ALL since the single channel used may not be propagating well
  to all stations
- Use mainly for syncing stations within LOS distance ground wave

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

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

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

- Only allowed in the TOD Server Radio of the 3G+ net
- Handles the chore of keeping the net in sync automatically
- Good backup to GPS use
- Method to use if no GPS exist or just one for the base
- Use a logical easily remembered time interval for outstations
- Brings all outstations back to full sync
- Automatic broadcast can be scheduled by going to SCHED during programming - This is not active in an OUTSTATION radio

3.20.24.1 Transmit a 3G+ TOD Broadcast Sync

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

a. Press **[CALL]**.

b. Use the ▲▼ keys to select BROADCAST SYNC or BROADCAST SYNC-ALL and press **[ENT]**. If BROADCAST SYNC is selected, the TOD server transmits a single TOD sync broadcast. If BROADCAST SYNC-ALL is selected, the 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.

3.20.24.2 Schedule a Broadcast Sync

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

a. Press **[PGM]**.

b. Use the ◄► 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 3-54.

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 3-55.

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

By selecting **EDIT** or **DELETE** instead of **ADD** in Step c, the operator can edit or delete a previously scheduled broadcast. See Figure 3-56.

```
 _____
| SCHEDULE-ADD                 |
|         OFFSET TIME          |
|           00:15              |
|     ENTER 24-HOUR TIME       |
|_____|
```
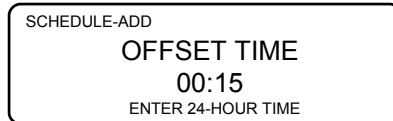
Figure 3-54. Offset Time Screen

```
 _____
| SCHEDULE-ADD                 |
|        INTERVAL TIME         |
|           00:30              |
|    ENT TO SAVE - CLR TO EXIT |
|_____|
```
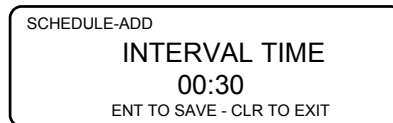
Figure 3-55. Interval Time Screen

```
 _____
| SCHEDULE-EDIT                |
| ENTRY    0    BROADCAST      |
| O: 00:15        I: 00:30     |
|    ENT TO SAVE - CLR TO EXIT |
|_____|
```
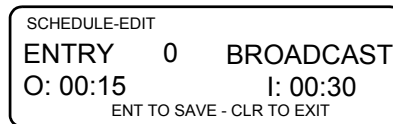
Figure 3-56. Schedule Edit Screen

3.20.25 Overview - Last Ditch Voice

LDV allows the radio to deliver digital voice across a channel that normally would not support digital voice error free. This feature is designed to allow a short emergency message to be transmitted with preconfigured parameters that should work in the poorest conditions. The availability of the ARQ transmission allows a guaranteed error free delivery of the message. When receiving an LDV message, the majority of the message is queued before it is played back. Since there is little indication as to when the reception of the message is going to finish, the message is saved so it can be replayed at a later time if the message is missed on receipt. Only one message can be stored.

The default settings should not need to be changed in the majority of cases. LDV is only available in 3G radio mode. It is recommended that message length be kept to less than two (2) minutes.

3.20.26 Send LDV Message

LDV is sent by selecting LDV in the VOICE setting. (Refer to Paragraph 4.6.12, Paragraph 4.14, and Paragraph 4.15 for configuration and programming.)

3.20.27   Retrieve Saved LDV Message

When an LDV message has been successfully received by the receiving radio, an M will appear on the display next to the sync or signal meter. Only one message can be received and stored. Perform the following procedure to replay a saved LDV message:

a.   Use the ◀▶ keys to select **M** and press **[ENT]**. **LDV MESSAGE ACTION REPLAY/DELETE** appears.

b.   Use the ▲▼ keys to select **REPLAY** or **DELETE** and press **[ENT]**. If **REPLAY** is selected, **REPLAYING LDV MESSAGE** appears. When message replay is complete, a message appears confirming deletion of the message. Use the ▲▼ keys to select the appropriate **YES** or **NO**. If **DELETED** is selected, the message will be deleted.

NOTE

If the radio is busy when an LDV message is attempted,
CAN'T REPLAY MESSAGE IN PROGRESS appears.

3.20.28   Overview - HCMAC and FLSU 3G Protocols

High Capacity Media Access Control (HCMAC) is a link setup protocol similar to Fast Link Set Up (FLSU) of STANAG 4538. Both protocols are supported by the AN/PRC-150(C) in 3G. STANAG 4538 FLSU provides a robust linking capacity suitable for long-haul skywave propagation as well as with less demanding propagation conditions. HCMAC provides a slightly reduced robustness, but faster scan and faster linking. Limitations of HCMAC include:

● HCMAC requires 4 - 5 dB higher Signal-to-Noise Ratio (SNR) and requires more favorable channel conditions for reliable operation than FLSU does. HCMAC operation should be reliable under the conditions where DV6 and ME6 voice settings are reliable.

● HCMAC requires a propagation delay of less than 10 milliseconds - stations must be less than 1243 mi (2000 km) apart.

● A station programmed for HCMAC cannot communicate with a station programmed for FLSU.

● In HCMAC operation, the time period before sync is lost (sync meter bar goes to zero) is less than in operation using FLSU.

The operator determines whether FLSU or HCMAC is used by selecting a channel plan of type 4538 or HCMAC with the KDU. The channel plan type (4538 or FLSU) is specified by the as part of the channel plan when programming using the RF-6550H RPA. For example, a channel plan using FLSU could be named DAY_4538 and a channel plan using HCMAC could be named DAY_HCMAC. The channel plan can then be selected as described in Paragraph 3.19.6.

3.20.29   Sending IP Data

The AN/PRC-150(C) offers a wireless IP capability that allows radio operators to make use of IP-based PC software applications. 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 (joining multiple packets into a single larger assembly) 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 AN/PRC-150(C) has been programmed with a configuration that supports sending IP data (refer to Paragraph 4.6), the radio is placed in 3G radio 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). The operator can specify by selecting a system preset capable of the intended data transfer.

Sending IP data requires use of 3G. The HF RPA is required for programming the AN/PRC-150(C) for wireless IP communications.

NOTE

Data incoming on the PPP interface will be routed based on the radio's routing table for both plain text and cipher text (PT, 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.

3.20.30 CTI Functionality

The CTI functionality allows the operator to connect an AN/PRC-150(C) to a Harris RF-6010 Tactical Network Access Hub via the radio's PPP cable. This configuration provides the ability for base personnel to communicate with a deployed AN/PRC-150(C) or a network of deployed AN/PRC-150(C) radios via the base's telephone system and the AN/PRC-150(C)'s 3G operating mode. In the following subparagraphs, the AN/PRC-150(C) connected to the RF-6010 shall be referred to as the basestation while a deployed CTI capable AN/PRC-150(C) shall be referred to as an outstation.

NOTE

This manual provides information on using the Harris AN/PRC-150(C) only. For detailed information on using the Harris RF-6010 or planning a CTI network, refer to the RF-6010 Tactical Network Access Hub User Manual.

3.20.30.1 Basestation Operations

The radio assumes the role of a CTI basestation when the RF-6010 is connected to the radio via its PPP cable and the RF-6010 initiates CTI communications with the radio. While a CTI phone call is in progress, the handset of the basestation will be disabled. When the handset is disabled, no audio will be heard, other than beeps indicating 3G connections. A hold-off tone will be produced if the operator attempts to key. Only the [**CLR**] button on the basestation's KDU will function as described in Paragraph 3.20.30.4 while in a CTI call.

3.20.30.2 Connecting to the RF-6010

The AN/PRC-150(C) connects to the RF-6010 via its PPP cable. The baud rate of the PPP connection must be configured for 115.2 kbps. Should the PPP baud rate on the basestation be set to any other value, the KDU displays **CTI GATEWAY INVALID PPP BAUD** to indicate the configuration error. This message will appear upon power-up as well as upon entering the 3G radio mode from program or another radio mode.

3.20.30.3 Basestation Screens

The following subparagraphs provide information on basestation screens.

3.20.30.3.1 RF-6010 Initiated Call

When a call is initiated by the RF-6010, the following occurs:

- Upon receiving a call request from the RF-6010, the KDU displays the standard 3G calling screen.

- When the 3G radio mode circuit setup is successful, a tone is heard in the handsets of the outstation and the basestation radios. The KDU displays linked screen for the duration of the phone call, unless a higher priority status message such as **CALL COMPLETE** or **WARNING: HIGH VSWR** is displayed. See Figure 3-57.

- Upon termination of the CTI call (by either the outstation operator or by the phone operator), **TERMINATING PHONECALL** is displayed briefly before the radio returns to scan.


```
T BAT▮▯    3G  SQ  PT
    OUTSTATION MP117
    IPARQ ME24 ------ 106
      -TELEPHONY SERVICE-
```
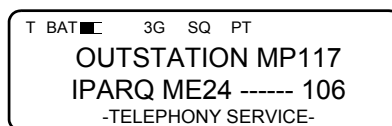
Figure 3-57. CTI Linked Screen

3.20.30.3.2 Outstation Initiated Call

When a call is initiated by the outstation, the following occurs:

- The standard 3G call receive screen is used during the link setup phase of the outstation phone call.

- When the 3G radio mode circuit setup is successful, a tone is heard in the handsets of the outstation and the basestation radios. The KDU displays linked screen for the duration of the phone call, unless a higher priority status message such as **CALL COMPLETE** or **WARNING: HIGH VSWR** is displayed. See Figure 3-57.

- After the 3G link has been established, the outstation will transfer the phone number. During the transfer of the phone number being called by the outstation, the basestation's front panel will display the normal 3G link screen with the transfer information at the bottom of the KDU. See Figure 3-58.

- Successful transfer of the phone number will be indicated by **MESSAGE COMPLETE** on the bottom of the KDU.

- Upon receiving the phone number from the outstation, the basestation displays this message on the KDU. Again, it will display the **-TELEPHONY SERVICE-** on the bottom of the KDU for the duration of the call, unless any other status messages are displayed on the screen. These status messages are displayed on the bottom line for three seconds.

- After receiving the requested phone number from the outstation, it is possible that the CTI call is rejected for some reason. Reasons include basestation not being connected to the RF-6010, or the phone called is busy. When this occurs, the reason that the call is being rejected will be automatically transmitted to the outstation. After the reject reason has been transmitted, the basestation will wait for the outstation to terminate the link or for the link to time out, whichever occurs first.

- Upon termination of the CTI call by either the outstation operator or by the phone operator, **TERMINATING PHONECALL** is displayed briefly before the radio returns to scan.

```
T  BAT▮▮     3G   SQ   PT
      OUTSTATION MP117
   IPARQ ME24 ------ 106
     RX DATA (XXXX) YY BPS
```
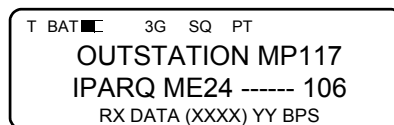
Figure 3-58. Receiving the Phone Number

3.20.30.4 KDU Termination of CTI Calls

While a CTI call is in progress, a basestation operator is prevented from keying up the handset and from using the KDU with the exception of using the KDU to terminate the CTI call. To do this, perform the following procedure:

a. Press **[CLR]**. The radio will display **TERMINATE PHONECALL?**.

b. If **YES** is selected, the phone call will be terminated and the radio will return to scan. If **NO** is selected or if the **[CLR]** key is pressed, the phone call will continue unaffected. Select as appropriate.

3.20.30.5 CTI Automatic Override of Data

If the basestation is in a data communications with another radio or radios when a CTI call request originates from the RF-6010, the data communications will automatically be suspended. There is no need for a response from the operator.

NOTE

A request from the RF-6010 for a CTI call will not override a 3G voice call that is in progress.

3.20.30.6 Outstation Operations

The radio assumes the role of a CTI outstation if the PPP cable between the RF-6010 and the radio is disconnected or if the RF-6010 fails to initiate CTI communications with the radio.

The following subparagraphs cover outstation CTI operations.

3.20.30.6.1 Placing a Phone Call

A CTI call from an outstation allows an AN/PRC-150(C) radio to call a phone that is part of the phone system connected to the RF-6010. Perform the following procedure to place a CTI phone call:

a. Press **[CALL]**.

b. Use the ▲▼ keys to select call type of **PHONE**.

c. Using the KDU keypad, enter the phone number to be called and press **[ENT]**.

NOTE

The phone number is restricted to a length of 25 digits on the KDU. This length may be longer than the phone numbers used by the RF-6010.

Once the number has been entered at the outstation, the following occurs:

- If the phone number is not formatted properly, the KDU will display **INVALID PHONE NUMBER**. Pressing **[CLR]** will return the operator to Step c. If the number is valid, the KDU will display **CALLING <RADIO NAME>**.

- When the 3G radio mode circuit setup is successful, a tone is heard in the handsets of the outstation and the basestation radios, and the KDU displays the screen shown in Figure 3-59.

- The outstation then proceeds to transmit the entered phone number to the basestation. See Figure 3-60.

- If the outstation is configured to have CTI ringback enabled, a short three beep burst will be heard in the outstation handset followed by a period of silence. This pattern will repeat in the handset until the outstation operator keys the radio or the phone operator keys.

- If for some reason the phone call is rejected by the basestation or by the RF-6010, a reject reason will be received by the outstation. The outstation will automatically terminate the CTI call and return to scanning with the reject reason displayed on the bottom of the KDU. (Refer to Table 3-13 for reject reasons.)

- If no reject code is received, then the operator can key the handset and talk.

NOTE

There is no feedback provided to the outstation operator to indicate that the phone operator has answered their phone. Even if CTI ringback is enabled, the ringback tones will continue to be generated until one of the operators keys. It is recommended that the phone operator be required to key upon answering their phone to ensure successful communications.

Perform the following procedure to terminate the CTI call:

    d.   Press **[CLR]**. **TERMINATE PHONECALL** is displayed on the KDU.

    e.   Use the ▲▼ keys to select **YES** and press **[ENT]**. **TERMINATING PHONE CALL** is briefly displayed, followed by **CH### SCANNING**.

```
T  BAT■□      3G   SQ   PT
       BASESTATION MP116
     IPARQ ME24 ------ 106
        CH106 CALL COMPLETE
```
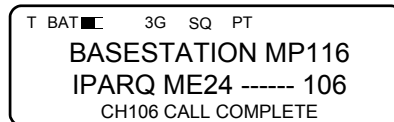
Figure 3-59. CTI Linked Screen

```
T  BAT■□      3G   SQ   PT
       BASESTATION MP116
     IPARQ ME24 ------ 106
    TX DATA (XXXX) YY BPS       0
```
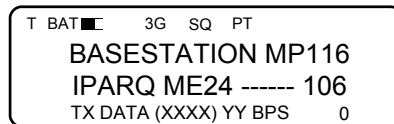
Figure 3-60. Transmitting the Phone Number

Table 3-13. CTI Reject Reasons

Reason	Meaning
NO HUB	The basestation is not connected to the RF-6010.
PHONE UNREACHABLE	The phone number sent is unknown or unreachable by the RF-6010.
PHONE BUSY	The phone number dialed is busy.
NO REASON	The phone number was rejected for an unknown reason.

3.20.30.6.2 Net Phone Call Operation

While not being capable of placing a net CTI call, the outstation can receive a net CTI call that was initiated by the basestation phone.

NOTE

If CTI ringback is enabled on the outstation, there will only be an audible indication (a short three beep burst) upon receiving a Net CTI Call. If CTI ringback is not enabled, there will be no indication of any kind of an incoming CTI Net Call.

NOTE

A CTI net call can only be performed from a phone using a net call phone number that is programmed into the radio using the RPA.

3.20.30.6.2.1 Broadcast CTI Net Call

When the basestation's CTI net call type is set to broadcast, the outstation operator will not see a 3G call status screen. Instead, when the 3G radio mode circuit setup is successful, a tone is heard in the handsets of the outstation and the basestation radios. The KDU displays the screen in Figure 3-57.

If the outstation is configured to have CTI ringback enabled, a short three beep burst will be heard in the outstation handset followed by a period of silence. This pattern will repeat in the handset until either the outstation operator keys the radio or the phone operator keys. At this point, the operator can key the handset and talk.

Perform the following to leave a broadcast CTI call:

   a.   From the outstation, press **[CLR]**. **LEAVE PHONECALL** is displayed. If this is not done, the call will terminate when the base phone is placed back on its hook.

   b.   Use the ▲▼ keys to select **YES** and press **[ENT]**. **LEAVING PHONECALL** is briefly displayed, followed by CH ### SCANNING. If there were other outstations connected in the net CTI call they will not be affected by this. If this was the last outstation in the CTI net call, the call will be terminated.

3.20.30.6.2.2 Role Call CTI Net Call

When the basestation's CTI net call type is set to role call, the outstation operator will not see the 3G call status screens while the radios set up the connection. When a response to the call is received from another net member, the text **RESPONSE FROM** and the name of the responding station will be displayed on the bottom line of the KDU. A tone is heard in the handsets of the outstation and the basestation radios. The KDU displays the screen in Figure 3-57.

If the outstation is configured to have CTI ringback enabled, a short three beep burst will be heard in the outstation handset followed by a period of silence. This pattern will repeat in the handset until either the outstation operator keys the radio or the phone operator keys. At this point the operator can key the handset and talk.

Perform the following to leave a role call CTI net call:

   a.   From the outstation, press **[CLR]**. **LEAVE PHONECALL** is displayed. If this is not done, the call will terminate when the base phone is placed back on its hook.

   b.   Use the ▲▼ keys to select **YES** and press **[ENT]**. **LEAVING PHONECALL** is briefly displayed, followed by CH ### SCANNING. If there were other outstations connected in the net CTI call, they will not be affected by this. If this was the last outstation in the CTI net call, the call will be terminated.

While in a role call CTI net call, it is possible to view the stations that are participating in the phone call. Refer to Paragraph 3.19.21.

3.20.30.6.3 CTI Call Break-In

While a data transfer is actively being performed between two AN/PRC-150(C)s in 3G radio mode, the data transfer can be preempted to allow a CTI phone call to be made. This functionality is similar to voice call break-in described in Paragraph 3.19.23.

NOTE

It is not possible to preempt a 3G voice call for a CTI phone call.

3.20.31   LPI/LPD Operation

The following provides information on Low Probability of Intercept/Low Probability of Detection (LPI/LPD) operation. Refer to Paragraph 4.9.2 for programming considerations.

3.20.31.1   Overview - LPI/LPD

LPI/LPD provides a robust digital data transmission that minimizes the probability of detection by providing quick message transfers at low power levels. This minimizes on-air transmission time. Unlike frequency hopping, LPI/LPD, slowly changes frequency throughout a transmission. Although LPI/LPD will provide protection against some types of jamming, it is not intended to replace frequency hopping as an anti-jam waveform.

LPI/LPD uses the link setup and data transfer capabilities of STANAG 4538. All radios in the net random scan frequencies selected from the current channel plan. The two-way link setup handshake uses the scan frequency for the call, and a nearby random frequency for the response. Data transfers use the Low-latency Data Link protocol (LDL) waveform of STANAG 4538. The LDL waveform provides reliable data transfer at SNR levels down to –6 dB or lower.

3.20.31.2   Overview - Link Setup

Because random frequencies are used, the antenna coupler needs to perform learn tunes, instead of performing the tunes prior to linking. Also, since LPI/LPD requires greater TOD drift tolerance and longer time powered off without losing sync, the radio scans at about half the rate of FLSU. The extra tune time and slower scan rate causes LPI/LPD to have slightly longer link setup times than FLSU.

3.20.31.3   Overview - Data Throughput

In order to minimize the probability of detection, it is important to minimize the duration of each individual transmission as well as the duration of the overall message transfer. LDL type is used to specify the maximum transmission time on any single frequency as listed in Table 3-14. Since the number in the LDL type refers to the number of bytes of data (packet size) in the forward transmission, it can be seen that the higher number has a longer transmission time. Generally, the system is most efficient at transferring data when the packet size is slightly larger than the size of the message (including encryption header and other overhead). A 500-byte message will fit in a single LDL512 packet, but would require 16 LDL32 packets. Using LDL512 could get a 500 byte message through twice as fast as LDL32, however the transmission time of 7.2 seconds may be long enough for detection while the 0.8 second duration of LDL32 transmissions escapes detection. The proper selection must be based on the expected threat, and the expected message size. Usually, selecting LDL64 or LDL128 is a good compromise between LPD and efficiency. The general rules for specifying the LDL traffic type are:

- For efficiency, use an LDL packet size close to the expected message size.

- To lessen the probability of detection, minimize the duration of each transmission by using a small LDL packet size.

Table 3-14. LDL Transmit Times

LDL Type	Forward Transmission Time (Sec)
LDL32	0.8
LDL64	1.2
LDL128	2.1
LDL256	3.8
LDL512	7.2

3.20.31.4 Overview - Time-Of-Day Synchronization

The LPI/LPD system relies on accurate TOD for scanning and call timing as well as for link protection. Because it is necessary to minimize or eliminate on-air transmissions, the preferred method of TOD synchronization for LPI/LPD is GPS, however, GPS may not always be available. As with FLSU or HCMAC, there are several ways to achieve and to maintain TOD synchronization. Table 3-15 compares TOD synchronization of FLSU, HCMAC, and LPI/LPD.

Table 3-15. TOD Synchronization Comparison

Method	HCMAC/FLSU	LPI/LPD	Comments
GPS Sync	Yes	Yes	Preferred method for LPI/LPD. No on-air signature.
Sync Broadcast	Yes	Yes	LPI/LPD uses a 38 sec. transmission to synchronize all radios. All radios must be deployed with wristwatch TOD, accurate to within ±15 seconds of the TOD server radio's time reference. Broadcast transmission does not have LPI/LPD characteristics, and should be transmitted only from a secure location for which potential detection/location is not a concern.
Sync Request	Yes	No	Not allowed in LPI/LPD due to the lengthy transmission necessary from the radio in the field.
Sync Burst	No	Yes	Uses a periodic short (~1 sec.) burst, instead of the 38 sec. Sync Broadcast. Less robust than LPD sync broadcast. Used to make sure everyone has sync, after using a Sync Broadcast to initialize the network.
Sync Maintenance	Yes	Yes	Automatically updates TOD upon detecting transmissions from the TOD server, or after an exchange with a radio with better TOD accuracy.
Power down Sync	20 Min.	2 Hours	In LPD mode, the radio will maintain sync while powered down for up to two hours.
Common Sync	Yes	Yes	There is only one TOD reference for the entire network, across all channel plans.

3.20.31.5 Overview - TOD Operations

There are two actions that a TOD server can take to ensure that all net members have TOD sync. Each has strengths suitable for specific tasks.

A sync broadcast transmits a series of bursts on a single random frequency. The total transmission time is 37.8 seconds. The bursts are of sufficient duration to allow a radio with wristwatch sync to receive the bursts and acquire TOD sync. The sync broadcast is extremely robust, but requires a lengthy transmission on a single frequency and is therefore unsuitable when detection/location of the TOD server radio must be prevented.

The sync burst transmits individual TOD bursts with a duration of approximately one second. When enabled, the TOD server schedules sync bursts for periodic transmission. A radio with wristwatch TOD can still receive a sync burst and achieve TOD sync. Net members that are already in sync can use the sync burst to refresh their TOD. Sync bursts are more difficult to detect, but may require more time to synchronize the entire network.

A recommended plan is to use a manual sync broadcast when the network is first established. Scheduled sync bursts can then be used so all users maintain sync. The sync bursts will also ensure that radios with lost sync have a way to regain sync.

TOD sync is common across all channel plans. This allows changing channel plans throughout the course of a mission without loss of sync. This applies to LPD channel plans also. If the network has been operating in HCMAC or FLSU, radios will retain their TOD sync upon switching to an LPD channel plan.

3.20.31.6 Overview - TOD Sync Maintenance

One feature that LPI/LPD shares with HCMAC or FLSU is sync maintenance. Whenever a synchronized radio detects data traffic from the TOD server, it will update its TOD sync. Additionally, the net members will share their TOD status during normal linking. This ensures that TOD is distributed throughout the net, even if some radios miss the sync transmissions from the TOD server.

3.20.31.7 Select LPI/LPD Channel Plan

Use of LPD operation requires that the radios have been programmed with a communications plan in which one or more channel plans of LPD types have been created as opposed to FLSU or HCMAC. If an LPD channel plan were named DAY_LPD in using the RPA, the operator would just select the plan using the KDU. (Refer to Paragraph 3.19.6.)

3.20.31.8 Synchronization

The best approach for LPI/LPD synchronization is to use GPS. As soon as the GPS acquires sufficient satellites, the radio will have perfect TOD sync. However, there are many reasons why GPS may not always work. All net members may not have GPS sync, so plan accordingly.

To bring up a net from scratch, the TOD server should transmit a sync broadcast. The operator has a choice of sending the sync broadcast on just one, or all sub-bands. Using all sub-bands will take more time, but is more likely to reach all net members. Coordinate this in advance so that all net members can have their radios on and ready at the right time.

To make sure everyone keeps TOD sync, the TOD server should transmit periodic TOD sync transmissions. TOD sync bursts use less time on the air. Scheduled TOD sync broadcasts are more robust, and can be scheduled to transmit at specific times during the day.

3.20.31.9 Sending Data

Most data applications used in HCMAC or FLSU should continue to work in LPI/LPD. WMT or TacChat will work well. LPI/LPD can be used for IP traffic, however, there will be reduced capacity and an increase in latency. DTE data is not supported in LPI/LPD mode. The primary difference to the operator is that the radios cannot be linked on a voice connection, and then send data on that link. The radio must be scanning in order to send data.

3.20.31.10 Voice Operations

LPI/LPD is primarily designed for data operation. Although voice communications is possible in LPI/LPD, the radios will link on a single frequency and the voice communications will not be LPI/LPD (i.e. radio will be more vulnerable to detection and location by hostile forces). For extensive voice communications, HOP may be a better solution.

To use voice in an LPI/LPD network, place a voice call in the same manner as with HCMAC or FLSU. Press the Call button on the front panel, specify automatic, and the address of the station you wish to call. A call to the net could allow the operator to broadcast a voice message to the entire net. When linked for a voice call, data operations are suspended until the radio returns to scan.

3.20.31.11 LQA Exchanges and Sounds

LQA operations in LPI/LPD use the same randomly selected frequencies as any other LPI/LPD operation. Therefore, the LQA will be difficult to detect. Each exchange or sound only provides results of propagation on a single frequency out of the entire sub-band. Scores from subsequent exchanges or sounds on the sub-band are averaged together. After several LQA operations, the radio will begin to form a picture of the average propagation for each sub-band.

Since the goal of an LPI/LPD system is to avoid detection, use of LQA's should be minimized. A basestation might use periodic sounds to allow the outstations to track changing propagation. If that basestation is also the TOD server, periodic TOD burst transmissions will serve the same purpose. A manually run LQA exchange is a quick and easy way to test the current channel plan.

3.21   FREQUENCY HOPPING (HOP) RADIO MODE OPERATIONS

The most commonly used Transmission Security (TRANSEC) technique is frequency hopping (also known as ECCM). This frequency hopping capability provides advanced antijam protection for communications. In HOP radio mode, the transmitter frequency changes so rapidly that it is difficult to intercept or jam the signal. For additional security, hopping data and digital voice data can be encrypted. An important aspect of hopping is synchronization. Synchronization is the process of aligning HOP signals to within a very narrow time sequence. This can be accomplished either manually or with the use of GPS. The AN/PRC-150(C) uses three frequency hopping types discussed in the following paragraphs.

NOTE

The frequency hopping used in the AN/PRC-150(C) is incompatible with hopping used in the AN/PRC-138 and RF-5000/RF-5200 series radios.

3.21.1   Overview - 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 AN/PRC-150(C) 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. 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 in this radio mode. Refer to Paragraph 3.15.4.

3.21.2   Overview - Narrowband Hopping

Narrowband hopping uses frequencies within a defined bandwidth of the center frequency (F_c). The bandwidth must be multiples of 5 kHz. Refer to Table 3-16. 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 3.21.3 for the exception to this rule.

Table 3-16. 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 non-symmetrical hopsets.

3.21.3   Overview - Special Center Frequency Cases

Since transmitted frequencies below 2.0 MHz or above 29.997 MHz are not allowed, the AN/PRC-150(C) 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.

3.21.4   Overview - 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 radio mode to avoid creating a high VSWR situation into a resonant antenna. Refer to Paragraph 3.15.4.

3.21.5   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.

3.21.6   Overview - GPS TOD Synchronization

Radios that obtain and use time information from the PLGR GPS 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 AN/PRC-150(C) 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 to ensure consistency between radios.

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.

3.21.7   Overview - Manual Synchronization

Manual synchronization is a method of synchronizing radios in a net without using GPS synchronization. A sync request is sent to the Net Control Station (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 AN/PRC-150(C).

3.21.8   Overview - 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.

3.21.9   Overview - 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 AN/PRC-150(C). 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.

3.21.10   Overview - 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.

3.21.11   Select HOP Radio Mode

Press **[MODE]** repeatedly to scroll through the available radio modes until **HOP** is displayed, and press **[ENT]** to select HOP radio mode.

NOTE

The radio cannot be placed in HOP radio mode until HOP programming has taken place. Refer to Paragraph 4.10 for HOP programming information.

If a GPS is connected and turned on, the AN/PRC-150(C) will automatically synchronize to the satellite time. If GPS is not available, the AN/PRC-150(C)'s in the HOP net must manually synchronize. Refer to Paragraph 3.21.13 for additional information.

3.21.12   Select HOP Preset

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

3.21.13   Send a Synchronization Request

Perform the following procedure to send a synchronization request:

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

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

  c.   After the AN/PRC-150(C) sends a sync request, the AN/PRC-150(C) waits for a response.

NOTE

For BROADCAST sync, the AN/PRC-150(C) sending the sync request automatically transmits the sync response.

  d.   Upon receiving a sync response, the AN/PRC-150(C) displays **MAN** to indicate that it has acquired MANUAL sync.

3.22   EXTERNAL PLGR/DAGR TIME SYNCHRONIZATION (3G AND HOP MODES)

The AN/PRC-150(C) has a front panel serial connector that supports an external GPS (J2 Serial Data Connector). Refer to Paragraph 3.19.8 for connecting a PLGR or DAGR to the radio using a GPS interface cable. When the user connects the **PLGR/DAGR**, one of two outcomes occurs:

  •   If the **PLGR/DAGR** is not configured correctly, the radio **KDU** displays "**EXTERNAL GPS CONFIG ERROR**", to signal the operator to correct the **PLGR/DAGR** setup.

  •   If the **PLGR/DAGR** is configured correctly, the radio **KDU** displays the message "**EXTERNAL GPS CONNECTED**".

- If the **PLGR/DAGR** 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/DAGR** 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.

3.22.1 External NMEA-0183 (Garmin V) Time Synchronization (3G)

When the user connects an NMEA-0183 GPS (Garmin V), one of three outcomes may occur:

- If the NMEA-0183 (Garmin V) is not configured to output NMEA data, the radio KDU will continue to display "EXTERNAL GPS DISCONNECTED".

- If the radio is configured to use a PLGR or DAGR and the NMEA-0183 (Garmin V) GPS is configured to output NMEA sentences, the radio KDU will display "EXTERNAL GPS CONFIG ERROR".

- If the GPS is configured to output NMEA sentences, the radio KDU reports "EXTERNAL GPS SEARCHING".

    - After the radio has received 30 NMEA RMC sentences, the radio KDU will report "EXTERNAL GPS TRACKING".

3.22.1.1 Configuring GPS Settings

To configure the radio for NMEA-0183 (Garmin V) GPS:

a.   Choose **PGM>CONFIG>GPS** menu choices.

b.   Use the up and down arrow keys to scroll through the GPS options (NONE, EXTERNAL PLGR/DAGR, EXTERNAL NMEA 0183). Select **EXTERNAL NMEA 0183**.

c.   Press **[ENT]**. This completes the GPS configuration.

3.23 OTAR

OTAR allows COMSEC variables to be transmitted by the NCS and received by any net member radio. The AN/PRC-150(C) 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 AN/PRC-150(C) supports the following operations:

- Automatic Rekey -
- Manual Rekey -
- Variable Generate -
- Variable Update -

NOTE

All OTAR operations should be performed in FIX. (A 3G or ALE link could be terminated.)

Some notes on the CYZ-10 include:

- RDS performs OTAR from the COMSEC menu.
- FILL has to be set to K15 emulation; once set, NET menu appears.

- RDS allows the user to generate KEKs for training.

- FILL only allows TEKS for training; KEKs must be obtained from COMSEC custodian.

3.23.1   Automatic Rekey (TX AK and RX AK)

AK rekeying operations require the receiving radio be loaded with the same KEK used to send the rekey from the sender's NCD or DTD. The KEK must be distributed and loaded prior to using AK operations. After each AK OTAR operation, the KEK loaded in radio is updated automatically by the rekey process. The sending operator must then update the KEK in the DTD or NCD after confirmation of successful OTAR at the receiving radios. For variable update, refer to Paragraph 3.23.5. For **CRYPTO TYPES VINSON** and **ANDVT**, follow the procedure in Paragraph 3.23.1.1. For **CRYPTO TYPE KG84**, follow the procedure in Paragraph 3.23.1.2.

3.23.1.1   TX AK Using ANDVT or VINSON

For TX AK operations the radio presets must be correctly set up, depending on COMSEC type. Certain COMSEC types require the correct key type and modem as follows:

- TX AK ANDVT-HF - ANDVT-HF crypto key - ANDVT-HF modem

- TX AK ANDVT-BD - ANDVT-BD crypto key - serial modem

- TX AK VINSON - VINSON crypto key - no modem required

Perform the following procedure for TX AK:

a.   Determine TEK that is to be transmitted by AK OTAR. Load this TEK into the AN/PRC-150(C) 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 noncooperative method. Refer to Paragraph 3.23.1.3.1 and Paragraph 3.23.1.3.2. 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**; 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**, 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 3.23.5.

3.23.1.2   TX AK for KG-84

The radios only need to have the same key. Perform the following procedure for TX AK:

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 AN/PRC-150(C) 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 noncooperative method. Refer to Paragraph 3.23.1.3.1 and Paragraph 3.23.1.3.2. 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**; press **[ENT]**. **WAIT - CONFIGURING FOR TX AK** displays.

f.   On the fill device, select **AK**, 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 as the results may be unreliable. Keying 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 3.23.1.3.

3.23.1.3   Receive Automatic Rekey (RX AK)

The AN/PRC-150(C) supports cooperative and noncooperative RX AK. AK rekeying 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 noncooperative 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 noncooperative 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.

3.23.1.3.1 Cooperative RX AK OTAR

The AK OTAR process requires that the receiving AN/PRC-150(C) have the same KEK and is using the same
COMSEC type that the sending station is using.

Perform the following procedure for cooperative RX AK OTAR:

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

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

   c.   Select **RECEIVE AK**; 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 an 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.

3.23.1.3.2 Noncooperative RX AK

The AK OTAR process requires that the receiving AN/PRC-150(C) have the same KEK and is using the same
COMSEC type that the sending station is using. Perform the following procedure for noncooperative RX AK:

   a.   Upon notification from the NCS that an 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 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.

3.23.2 Manual Rekey (TX MK and RX MK)

MK process does not require use of KEK for VINSON and ANDVT encryption. MK process can not be performed for KG-84 encryption.

3.23.2.1 Transmit Manual Rekey (TX MK)

NOTE

The AN/PRC-150(C) does not support TX MK operation in KG-84. The radio will display MX OTAR NOT SUPPORTED FOR KG-84.

Perform the following procedure for TX MK:

a. Determine TEK that is to be transmitted by MK OTAR. Load this TEK into the AN/PRC-150(C) 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 3.23.1.3.1 and Paragraph 3.23.1.3.2. 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**; press **[ENT]**. **WAIT - CONFIGURING FOR TX MK** displays.

e. If in VINSON or ANDVT, **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** 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.

3.23.3 Receive Manual Rekey (RX MK)

The AN/PRC-150(C) supports both a cooperative and a noncooperative RX MK in ANDVT. VINSON does not support non-cooperative RX MK OTAR.

NOTE

The AN/PRC-150(C) does not support TX MK operation in KG-84. The radio will display MX OTAR NOT SUPPORTED FOR KG-84.

3.23.3.1 Cooperative RX MK OTAR

Perform the following procedure for cooperative RX MK OTAR:

a. Upon notification from the NCS that an MK 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**; 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.

3.23.3.2 Noncooperative RX MK

VINSON nets do not support a noncooperative RX MK operation. Perform the following procedure for noncooperative RX MK:

a. Upon notification from the NCS that an 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.

3.23.4 Variable Generate

Variable generate is used to generate a new key for the DTD or NCD. This is useful if the keys were accidentally deleted form the fill device, however, local directives must be followed. Perform the following procedure for variable generate:

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

b. Use the ▲▼ keys to select **VARIABLE GENERATE**, and then 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** 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** 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.

3.23.5 Variable Update

After AK OTAR operation has been verified at the receiving AN/PRC-150(C), 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:

    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** 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 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.

3.24 RADIO STORAGE AND HUB LIFE

To maximize HUB life, place the radio function switch in the **OFF** position and remove the HUB when storing the AN/PRC-150(C). For information on HUB replacement interval and instructions, refer to Chapter 5.

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CHAPTER 4

RADIO PROGRAMMING

The AN/PRC-150(C) must be programmed for specific user configurations before it can be operated. It is recommended to use the RF-6550H High-Frequency Radio Programming Application (HF RPA) because it can configure and load an entire complex network for multiple radios. Some simple configurations can be performed using the radio front panel keys, however the RPA must be used to program 3G and 3G+ networks.

NOTE

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

4.1 PROGRAMMING TASK SUMMARY

If using the RPA, proceed to Paragraph 4.2 for setup information and use the remainder of the chapter for reference only. Front panel programming tasks, in general, are performed in the following order:

- Program Type I encryption - Paragraph 4.3
- Program Citadel encryption - Paragraph 4.4
- Program channel presets - Paragraph 4.7
- Program ALE channel groups - Paragraph 4.8.1
- Program ALE self addresses - Paragraph 4.8.2
- Program ALE individual addresses - Paragraph 4.8.2
- Program ALE net addresses - Paragraph 4.8.2
- Program ALE configuration - Paragraph 4.8.3
- Program ALE LQAs - Paragraph 4.8.4
- Program ALE AMDs - Paragraph 4.8.5
- Program 3G - Paragraph 4.9
- Program hopnets - Paragraph 4.10
- Program ARQ/XDL - Paragraph 4.11/Paragraph 4.12
- Program modem presets - Paragraph 4.13
- Program system presets - Paragraph 4.14

Some front panel programming can be performed at any time and consists of:

- Program configuration - Paragraph 4.5
- Program Internet Protocol (IP) parameters - Paragraph 4.6
- Program access levels - Paragraph 4.16

4.2 ATTACH A PC TO RADIO'S PPP PORT FOR RPA PROGRAMMING

Although the AN/PRC-150(C) can be programmed from the front panel, it is recommended that the RF-6550H HF RPA is used to ensure programming consistency and faster programming of multiple units. The RPA uses the Point-to-Point Protocol (PPP) via the J3 DATA PORT.

To connect the AN/PRC-150(C) to a PC running the RPA, see Figure 4-1 and perform this procedure:

    a.   Rotate function switch to Plain Text (**PT)/**Cipher Text **(CT)**.

    b.   Follow the procedure in Paragraph 4.5.2 to configure the **PPP PORT** to match the serial port of the PC.

    c.   Follow the procedure in Paragraph 4.6 to set other (more advanced) network IP parameters that may be required.

    d.   Power the AN/PRC-150(C) **OFF**.

    e.   Connect the round end of the **PPP Data Cable Assembly** (10535-0775-A006) to the **DATA** port (**J3**) on the AN/PRC-150(C).

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

    g.   Rotate function switch to **PT**.

The AN/PRC-150(C) is now ready to be programmed by the PC using the Harris RPA.

NOTE

There are actually two ports on the J3 connector: a sync/async DTE port and an async PPP remote port. In addition to the RPA, Harris Wireless Messaging Terminal (WMT) and Tactical Chat applications also use the PPP port of the connector. (Refer to the WMT manuals for proper cabling.)
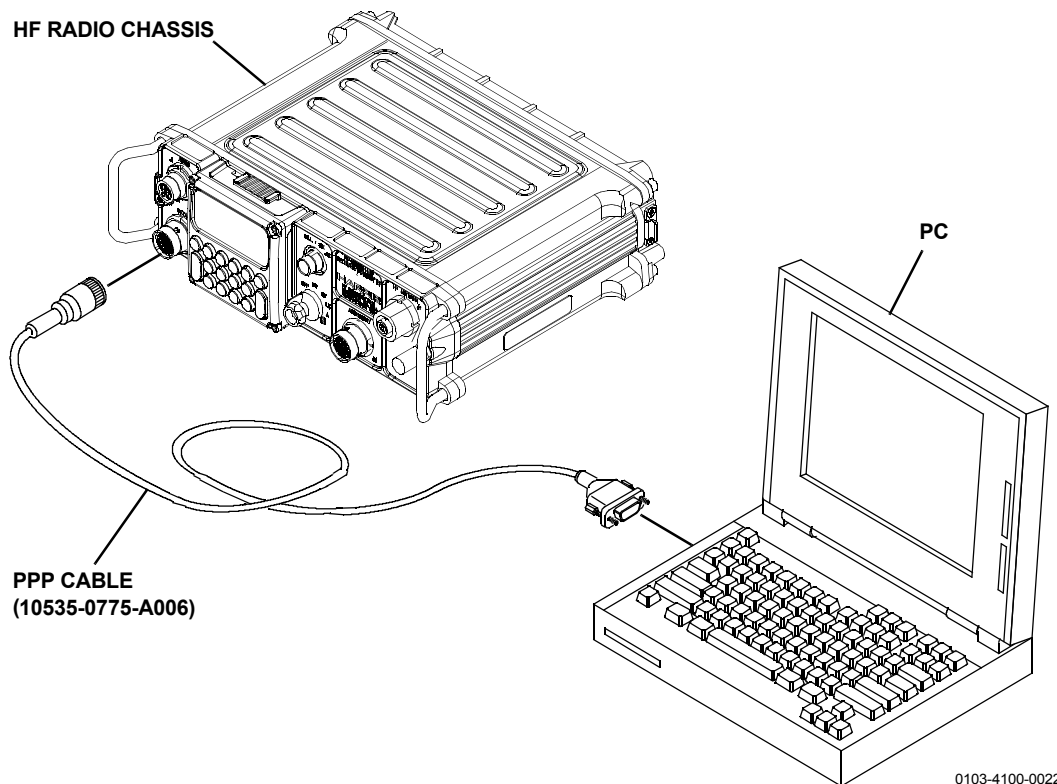
Figure 4-1. Typical PC to AN/PRC-150(C) PPP Port Connection

4.3   TYPE I PROGRAMMING

Type I COMSEC fills are only electronically loaded. Programming refers to the selection, deletion, and review of electronically loaded Type I COMSEC fills. Refer to Paragraph 3.8 for information on loading Type I COMSEC fills. The following paragraphs describe how to program Type I parameters in the AN/PRC-150(C).

4.3.1   Key Loading

Key loading of Type I COMSEC keys is considered an operations procedure and is covered in Paragraph 3.8.

4.3.2   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.

Refer to Table 4-1. See Figure 4-2. Perform the following procedure to erase a key:

a.   Choose **PGM>COMSEC>TYPE_I** menu choices.

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

c.   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.

d.   Use the ▲▼ keys to select one of the following **ERASE KEY** options (**YES, NO**). Select **YES** to erase and press **[ENT]**.

e.   Press **[CLR]** to return to the COMSEC menu.

4.3.3   Disabling PT Beeps

If the AN/PRC-150(C) 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.

Refer to Table 4-1. See Figure 4-2. Perform the following procedure to disable PT beeps:

NOTE

> Cycling the AN/PRC-150(C)'s power **OFF** then ON will automatically enable the PT beeps again. Alternatively, use the following procedure but select **ENABLED** in Step d.

    a.   Choose **PGM>COMSEC>TYPE_I** menu choices.

    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.

4.3.4   Determining Special Key Availability

Refer to Table 4-1. See Figure 4-2. Perform the following procedure to determine the availability of KEKs and TrKEKs:

    a.   Choose **PGM>COMSEC>TYPE_I** menu choices.

    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.

4.3.5   External KY-100 Compatibility Setup

When using the AN/PRC-150(C) with an external KY-100, it may be necessary to modify certain COMSEC parameters to ensure interoperability.

Refer to Table 4-1. See Figure 4-2. To modify KY-100 specific parameters, perform the following procedure:

    a.   Choose **PGM>COMSEC>TYPE_I** menu choices.

    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(C) will be communicating with.
Before changing any of the default settings, make sure the
KY-100 settings are known.

Table 4-1. PGM>COMSEC Menu Settings (Type I Encryption)

Menu Item	Options	Remarks
KEYS, ERASE	---	Allows selective erasure of Traffic Encryption Keys (TEKs) for each crypto mode.
KEYS, SPECIAL	---	Shows status (LOADED, NOT LOADED) of Key Encryption Key (KEK) and Transfer Key Encryption Key (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.
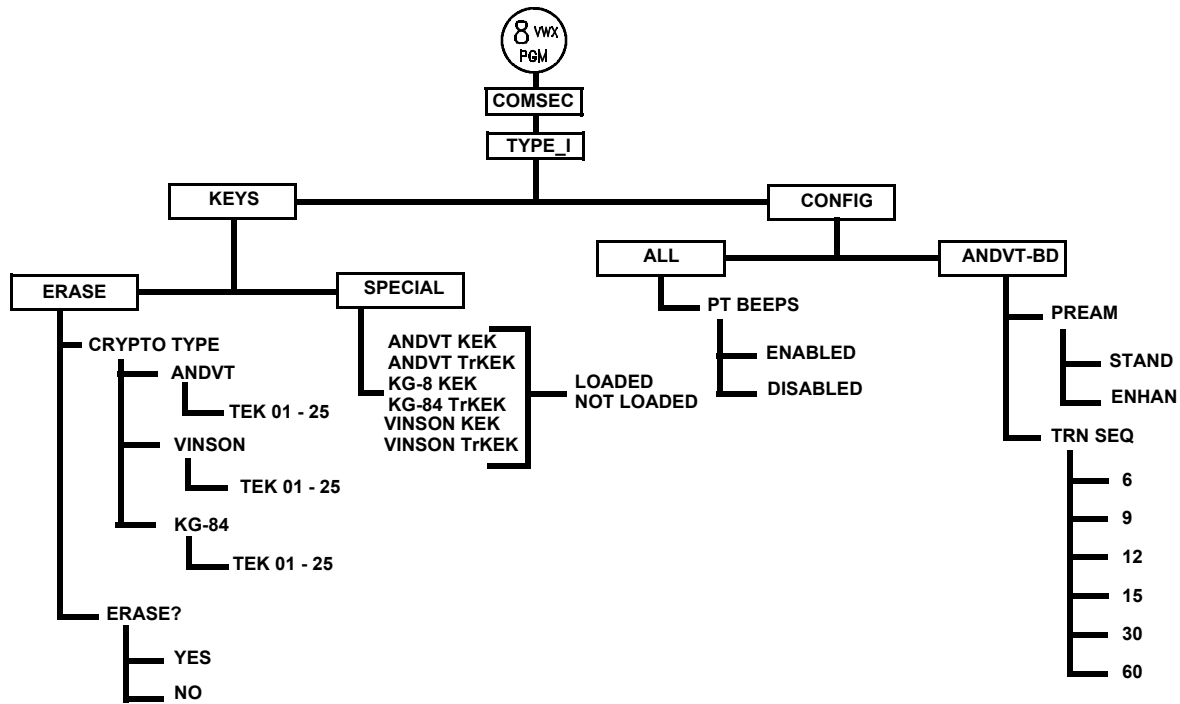
Figure 4-2. PGM>COMSEC Menu (Type I Encryption)

4.4   CITADEL PROGRAMMING

The following paragraphs provide information on programming Citadel encryption, including the keys.

4.4.1   Entering a New Key (Citadel Encryption)

See Figure 4-3 and perform the following procedure to enter a new key:

a.   Choose **PGM>COMSEC>CITADEL>KEYS** menu choices.

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

c.   Use the ▲▼ keys to select the following **KEY TYPE** option. 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.

d.   Use the alphanumeric keys to enter a desired key (KYXX).

e.   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**.

f.   Use the ▲▼ keys to select one of the following **LOAD AVS KEY** options (**YES, NO**).

g.   If you selected **YES**, enter an AVS key of 12 numeric characters and press **[ENT]**.

h.   Press **[CLR]** to return to the COMSEC menu.

4.4.2 Updating a Key (Citadel Encryption)

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 4-3 and perform the following procedure to update a key:

    a.   Choose **PGM>COMSEC>CITADEL>KEYS** menu choices.

    b.   Use the ◀▶ keys to select **UPDATE** and press **[ENT]**. The **UPDATE COUNT** will be displayed.

    c.   Enter the desired **KEY** and press **[ENT]**.

    d.   Use the ▲▼ keys to scroll through the **UPDATE?** options (**YES, NO**). Select **YES** and press **[ENT]**. The key will be updated.

    e.   Press **[CLR]** to return to the **COMSEC** menu.

4.4.3 Erasing a Key (Citadel Encryption)

See Figure 4-3 and perform the following procedure to erase a key:

    a.   Choose **PGM>COMSEC>CITADEL>KEYS** menu choices.

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

    c.   Use the ▲▼ keys to select the desired **KEY TO ERASE** and press **[ENT]**.

    d.   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.

    e.   Press **[CLR]** to return to the **COMSEC** menu.

4.4.4 Display the Kernel ID and CRYPTO ID (Citadel Encryption)

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 information.

See Figure 4-3 and perform the following procedure to display the Kernel ID:

    a.   Choose **PGM>COMSEC>CITADEL>ID** menu choices. The AN/PRC-150(C) will display **KERNEL_ID** and **CRYPTO-ID**.

    b.   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 AN/PRC-150(C) displays the 24-digit configuration ID.

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

4.4.5   Crypto Message Indicator (MI) (Citadel Encryption)

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

The length of the **MI** may be changed to **1X** or **3X** manually. In **DEFAULT**, the AN/PRC-150(C) 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.

See Figure 4-3 and perform the following procedure to display the MI:

    a.   Choose **PGM>COMSEC>CITADEL>MI** menu choices.

    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.
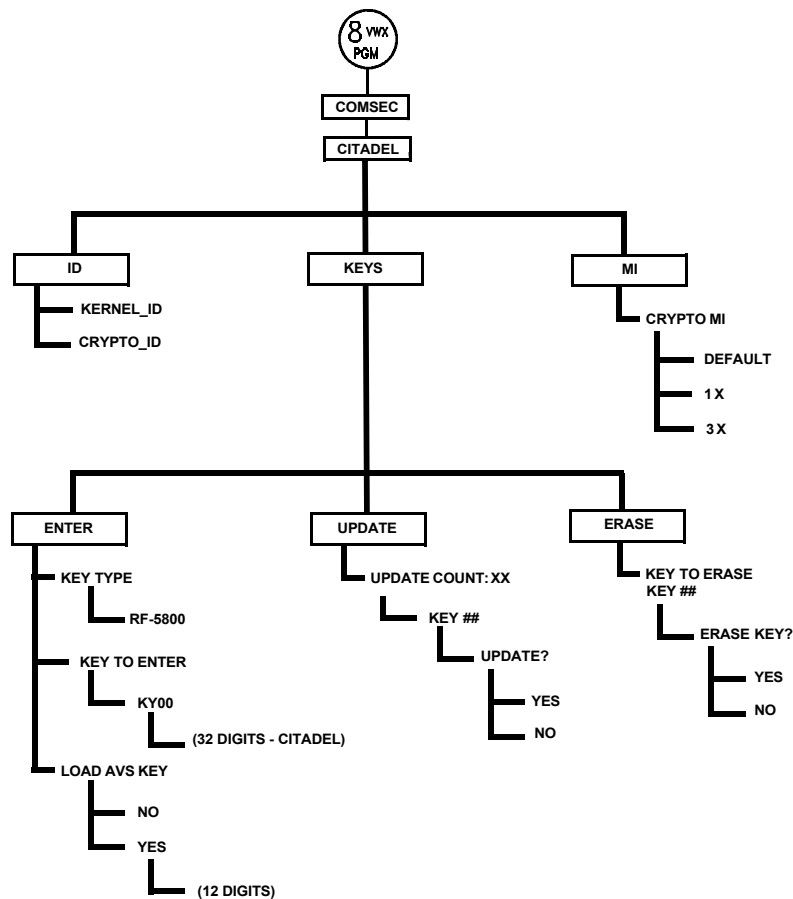
* DISPLAYS HOW OFTEN THE KEY HAS BEEN UPDATED

0103-4100-0040A

Figure 4-3. PGM>COMSEC Menu (Citadel Encryption)

4.5 CONFIGURATION PROGRAMMING

Configuration programming is the first step in programming the AN/PRC-150(C). The following series of menu selections allows the AN/PRC-150(C) to be configured based on operational missions. The settings are global and are not channel specific. For **PGM>CONFIG>NETWORK**, refer to Paragraph 4.6.

4.5.1 Program Radio Configuration

To program the radio configuration, refer to Table 4-2 and see Figure 4-4 to perform the following procedures:

    a.   Choose **PGM>CONFIG>RADIO** menu choices.

    b.   Use the ◄► ▲▼ keys to scroll through the available selections followed by **[ENT]** for the radio settings listed in Table 4-2.

Table 4-2. PGM>Config>Radio Menu Settings

RADIO		
Menu Item	**Options**	**Remarks**
TX POWER	LOW MEDIUM HIGH	**LOW**: 1 watt (MP) - recommended when signal is optimal **MEDIUM**: 5 watts (MP) - as signal quality decreases, increase Transmit (TX) power **HIGH**: 20 watts (MP), 10 watts (MP) only in Frequency Modulation (FM) (Refer to Table 3-7 for radio model and PA power levels.)
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 & 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.
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.

Table 4-2. PGM>Config>Radio Menu Settings (Continued)

RADIO		
Menu Item	**Options**	**Remarks**
COUPLER	ENABLED BYPASSED	**ENABLED**: Signal goes through internal coupler only. **BYPASSED**: Direct transmission to non-resonant broadband antennas. NOTE: The internal coupler is bypassed for both TX and RX signals. If an RF-382 external coupler is used, BYPASSED only bypasses the coupler for RX signals, and the coupler is not bypassed in TX.
FM DEVIATION	8.0 kHz, 6.5 kHz, 5.0 kHz	Depending on receiving radio, deviation is selected. 8 kHz is the standard tactical deviation.
CW OFFSET	0 Hz 1000 Hz	Offsets the frequency. **0 Hz** - Standard Continuous Wave (CW) **1000 Hz** - Modulated Continuous Wave (MCW) with **1000 Hz** tone
RX NOISE BLANKING	OFF ON	The RX noise blanking is used to filter unwanted signals that are interfering with the intended receive signal. May affect weak signals.
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.
EXTERNAL PA/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 NAME	########	Gives radio a unique 8-character alphanumeric ID, required for radio modem protocols such as High- or Low-Speed Data Link (XDL) and Automatic Repeat reQuest (ARQ).
ERROR BEEPS	ON OFF	**ON**: Enables radio to beep for invalid key presses. **OFF**: Silences Error Beeps (recommended for tactical operation).
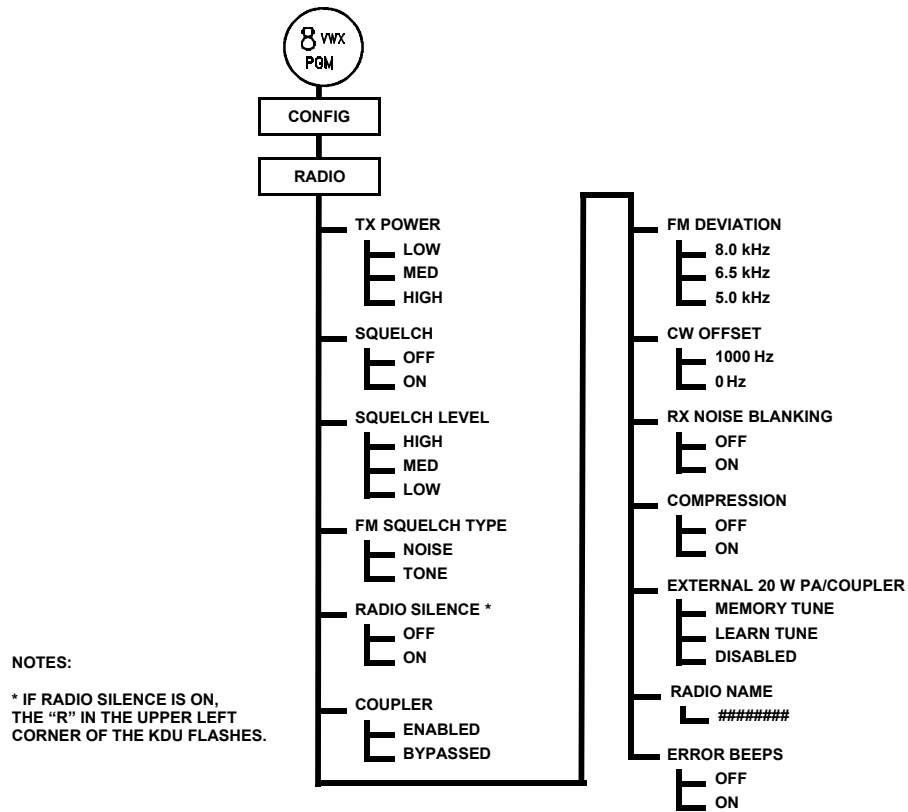
0103-4100-0020

Figure 4-4. Configuration Radio Program Tree

4.5.2   Program Configure Ports

The data port settings are programmed based on the type of data device being connected to that port. The AN/PRC-150(C) 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 AN/PRC-150(C)'s ports, refer to Table 4-3 and see Figure 4-5 and perform the following procedure:

    a.   Choose **PGM>CONFIG>PORTS>DATA (or ASCII)** menu choices.

    b.   Use the ▲▼ keys to scroll through the available data port settings followed by **[ENT]** for the settings listed in Table 4-3.

Table 4-3. PGM>Config>Ports Menu Settings

DATA		
Menu Item	**Options**	**Remarks**
DATA RATE	75**, 150**, 300, 600, 1200, 2400, 4800, 9600, 19.2 k, 38.4 k*, 57.6 k*, or 115.2 k*	Data Terminal Equipment (DTE) rate for asynchronous modem transfers. Match port speed to DTE speed. (ASYNC modem preset)
DATA BITS	8 7	The number of bits used to make up a transmitted character. Match DTE setting. (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.
LEVEL**	RS-232 MIL-188	Select one that matches the type of DTE interface format.
TX CLOCK SOURCE**	INTERNAL EXTERNAL RECOVERED	**INTERNAL:** Uses internal clock for synchronization. **EXTERNAL:** Outside source for synchronization. **RECOVERED:** Clock is derived from digital data stream. **NOTE:** Sync data operation parameter default is INTERNAL.
KEYLINE**	REDPTT RTS	Specifies the source of the keyline signal.
DTE POLARITY*, **	STANDARD INVERT	DTE data polarity invert means sense of the data bits are inverted when they enter and leave the port. This is used for interoperability with external equipment which may be configured for inverted polarity. STANDARD: Default value. INVERT: Supports KY-99 Black Digital interoperability.

Table 4-3. PGM>Config>Ports Menu Settings (Continued)

DATA		
Menu Item	**Options**	**Remarks**
DTE SYNC SOURCE**	DTE SYNCPORT AUDIO	Select DTE SYNC PORT to use the DTE_FLOW_CONTROL and CLKOUT lines for standard DTE usage. Select AUDIO to use the DTE_FLOW_CONTROL line for AUDIO SIGNAL DETECT (ASD) to tell the user when there are audio samples being transmitted to the handset output. In AUDIO the CLKOUT line drives an AUDIO CLEAR TO TRANSMIT (ACTT) line to tell the user when to begin talking into the handset for audio transmit when the keyline is asserted.
CLOCK METHOD**	NORMAL ALWAYS_ON	**Normal:** DTE Clock is present while Clear-To-Send (CTS) is asserted. **Always_On:** DTE Clock continuously present while synchronous modem is active.

*NOTE: These items are not included in DATA menus.

**NOTE: These items are not included in ASCII menus.
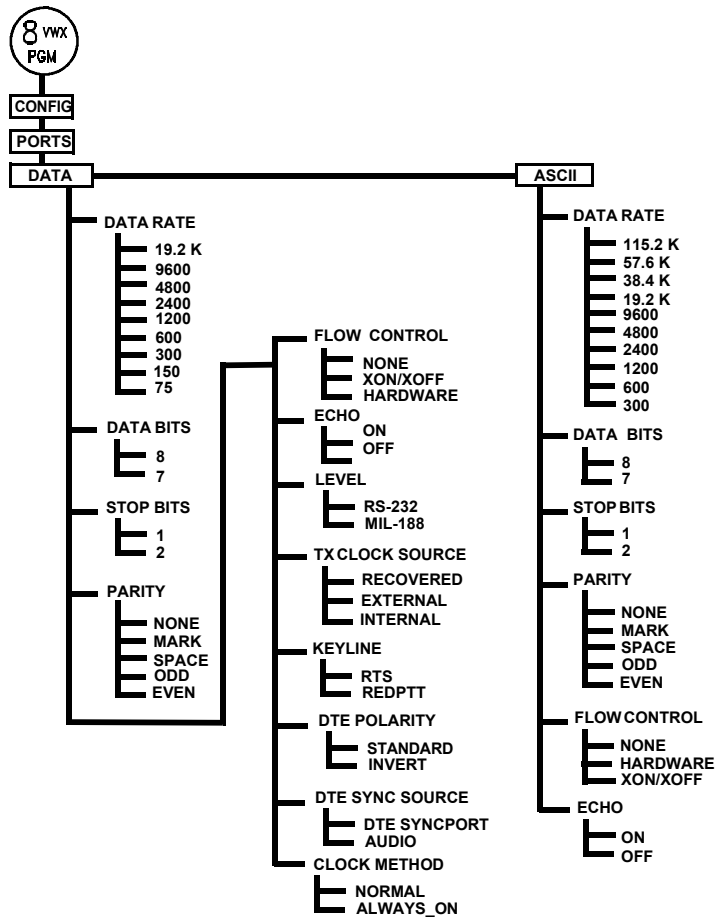
0103-4100-0021-A

Figure 4-5. PGM>Config>Ports Menu

4.5.3   Program Configure Audio

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

Refer to Table 4-4 and see Figure 4-6. Perform the following procedure to view the audio programming tree:

    a.   Choose **PGM>CONFIG>AUDIO** menu choices.

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

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

Table 4-4. Audio Configuration Programming

AUDIO MUTING		
Menu Item	**Options**	**Remarks**
AUX AUDIO	UNMUTE MUTE	**UNMUTE**: Enables audio from **J3 DATA** port, which is necessary when using auxiliary audio equipment interface. **MUTE**: Disables audio from **J3 DATA** connector.
SIDETONE AUDIO	UNMUTE MUTE	**UNMUTE**: Voice or modem audio is heard in earpiece. **MUTE**: Voice or modem audio will not be heard in handset earpiece while transmitting. **NOTE:** Set to MUTE when using external audio equipment to prevent feedback.
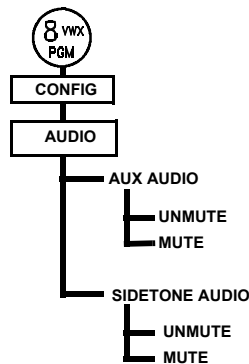
Figure 4-6. Configuration Audio Program Tree

4.5.4   Program Configure TOD

The AN/PRC-150(C) Time-of-Day ([TOD], meaning standard calendar day) is used for operation in HOP and Third Generation (3G) radio modes as well as for scheduled LQA and ALE Linking Protection.

4.5.4.1   Automated Global Positioning System (GPS) TOD

Refer to Paragraph 3.22 for information about using an external Precision Lightweight (GPS) Receiver PLGR.

4.5.4.2 Set TOD Manually

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. ALE operation with Linking Protection requires the TOD to be set to within +/- 15 seconds of the actual ALE net time to allow reliable linking operation.

NOTE

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

Refer to Table 4-5 and see Figure 4-7. Perform the following procedure to set AN/PRC-150(C) TOD:

  a.   Choose **PGM>CONFIG>TOD** menu choices.

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

  c.   Press the numeric keys to enter the correct **UTC OFFSET** value (if necessary) and press **[ENT]**.

  d.   Press the numeric keys to enter the correct **LEAP SECONDS** value and press **[ENT]**.

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

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

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

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

Table 4-5. PGM>Config>TOD Menu

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

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 several seconds. If it acquires while the date is being entered, the display will show **ERROR: DATE SETTING CONTROLLED BY GPS** for several seconds.
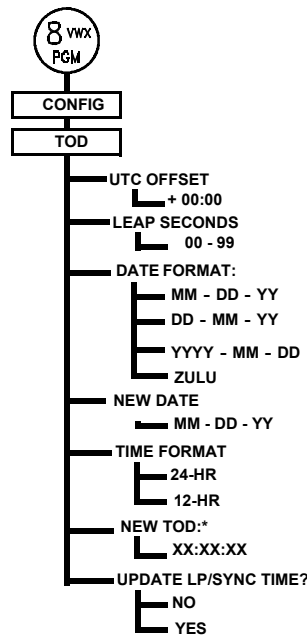
*NOTE: FOR ZULU, NEW DATE/TIME MENU APPEARS INSTEAD.

0103-4100-0024

Figure 4-7. PGM>Config>TOD Menu

4.5.5   Program Configure Message (Routing Incoming Data)

This procedure is used to specify the destination to which incoming data is to be routed. Refer to Table 4-6 and see Figure 4-8. Perform the following procedure to specify the incoming data routing location:

a.   Choose **PGM>CONFIG>MESSAGE** menu choices.

b.   Use the ▲▼ keys to scroll through the **ROUTE MODEM DATA TO** options (**DTE PORT, RDP, FILE**) and press [**ENT**].

c.   Use the ▲▼ keys to scroll through the **ROUTE ARQ DATA TO** options, (**DTE PORT, RDP, FILE**) and press [**ENT**].

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

e.   Enter the destination address of the message and press **[ENT]**.

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

Table 4-6. PGM>Config>Message Menu Settings

MESSAGE Programming		
Menu Item	**Options**	**Remarks**
ROUTE MODEM DATA TO	DTE PORT (default) RDP FILE	**DTE PORT** - located on the AN/PRC-150(C)'s front panel J3 DATA connector. This port is used to pass data between the AN/PRC-150(C) and a data terminal using an RS-232 serial data connection. **RDP** - located on the AN/PRC-150(C)'s front panel J3 DATA connector. This port is used to pass data between the AN/PRC-150(C) and a Harris data terminal, such as the Harris WMT or TacChat. Uses asynchronous PPP connection at 19.2 kbps to 115.2 kbps. PPP port speed should be set to the same speed for all radios on the net to avoid interface problems. **FILE** - a file in the AN/PRC-150(C)'s internal file system. An external device must be used to access the files. The data stored in the AN/PRC-150(C) is lost when the radio is powered OFF.
ROUTE ARQ DATA TO	DTE PORT RDP (default) FILE	Same as above.
SOURCE ADDRESS	XXXXXXXXXXXXXXX	Source address of message to be sent.
DESTINATION ADDRESS	XXXXXXXXXXXXXXX	Ultimate destination of the message.
AUTO TX TYPE	ARQ NON-ARQ	Select automatic error detection and correction.

Figure 4-8. PGM>Config>Message Menu

4.5.6 Program Configure Linear Protective Coding (LPC) Noise Cancellation

To configure LPC options, refer to Table 4-7 and see Figure 4-9 and perform the following procedure:

    a.   Choose **PGM>CONFIG>LPC** menu choices.

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

Table 4-7. PGM>Config>LPC Menu Settings

OPTIONS		
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).
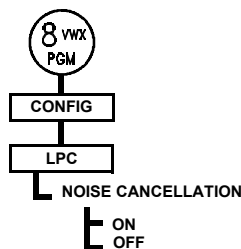
Figure 4-9. PGM>Config>LPC Menu

4.5.7 Program Configure Accessory (RF-5382, Pre/Post)

Refer to Table 4-8 and see Figure 4-10. Perform the following procedure to configure prepost options:

a. Choose **PGM>CONFIG>ACCESSORY** menu choices.

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

c. Use the ▲▼keys to scroll through the **RF-5382 CPLR ANTENNA** options (**HIGH VOLTAGE, 50 OHM**) 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 PRESELECTOR** options (**ENABLED, DISABLED**) and press **[ENT]**.

f. If **EXT PRESELECTOR** is **DISABLED**, skip to Step i.

g. If **EXT PRESELECTOR** is **ENABLED**, use the ▲▼ keys to scroll through the **EXT RX FILTERS** options (**ENABLE DURING SCAN, DISABLE DURING SCAN**) and press **[ENT]**.

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

NOTE

The **EXT RX FILTERS** and **EXT SCAN RATE** menu choices only appear if the **EXT PRESELECTOR** menu choice is set to **ENABLED**.

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

Table 4-8. PGM>Config>Accessory Menu Settings

ACCESSORY		
Menu Item	**Options**	**Remarks**
RF-5382 CPLR ANTENNA	HIGH VOLTAGE 50 OHM	Choose HIGH VOLTAGE if the ceramic high voltage port is used. Choose 50-OHM if the 50-Ohm port is used.
EXT POSTSELECTOR	ENABLED DISABLED	Enables postselector (TX filter) for pre/postselector.
EXT PRESELECTOR	ENABLED DISABLED	Enables preselector (RX filter) for pre/postselector.
EXT RX FILTERS	ENABLE DURING SCAN DISABLE DURING SCAN	Enables or disables RX filters of external pre/postselector while scanning in ALE.
EXT SCAN RATE	FORCE SLOW SCAN USE ALE SCAN RATE	Selects scan rate of 2G ALE, either 2 channels per second or FAST.
PREPOST ANTENNA	SINGLE RX/TX SEPARATE RX/TX	Selects between single (same) antenna for RX and TX, or different antennas for RX and TX. Only applicable when using an external pre/postselector.
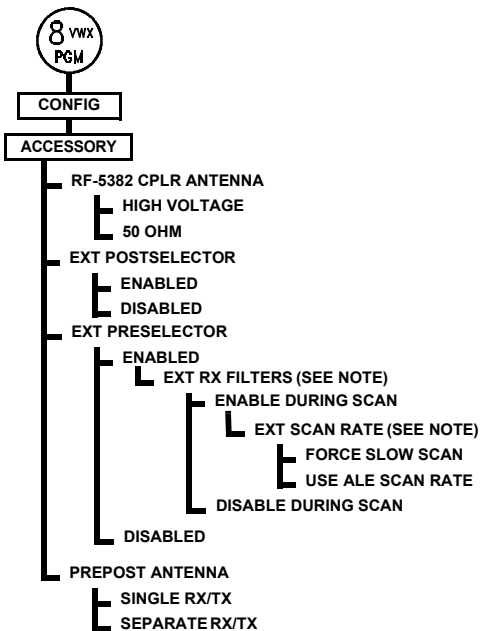
0103-4100-0027

Figure 4-10. PGM>Config>Accessory Menu

4.6   PROGRAM NETWORK INTERNET PROTOCOL (IP) PARAMETERS

The operator is strongly encouraged to use the RF-6550H HF Radio Programming Application (RPA) for programming IP networking parameters. However, before the RPA can communicate with the AN/PRC-150(C), the AN/PRC-150(C) IP address must be set. It is suggested that only the AN/PRC-150(C) IP address be set from the front panel and all other programming be done from the RPA.

NOTE

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

NOTE

Due to the complexity of configuring IP parameters, it is recommended that only the AN/PRC-150(C) PPP or Ethernet IP address, subnet mask, and gateway address be set from the front panel; the RPA should be used for all other IP programming.

4.6.1 Basic Definitions

The following provides brief IP networking definitions:

- IP Address - A number made of four 8-bit binary numbers that uniquely identifies a computer on a net.

- Subnet Mask - A number made of four 8-bit binary numbers that identifies a series of computers by masking part of the IP addresses in the subnet (using 255).

- Gateway Address - Also known as a default gateway, this address is used for routing addresses not known to a subnet to a location outside the subnet (i.e another subnet or host).

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

4.6.2 Basic Rules for Addresses

The following must be observed when creating addresses:

- The first and last 8-bit binary numbers (octets) cannot be zero (000).

- None of the four 8-bit binary numbers can be 255 (reserved for broadcast), or zero (reserved for this host).

- Two computers (or radios) on a network cannot have the same address.

4.6.3 IP Network Example

Figure 4-11 shows an example of an IP network with four stations. One station uses a gateway. All stations used use a peer IP address and the computers connected must be configured to obtain an IP automatically. The example does not cover the WIRELESS scheme and 3G changing networks. Table 4-9 shows the programmed parameters and Table 4-10 shows the programmed routes for each radio in the network.

LEGEND

☁	LAN/WAN	( )	ADDRESS BOUNDARY
⚡	RF PATH	———	NON-RF PATH
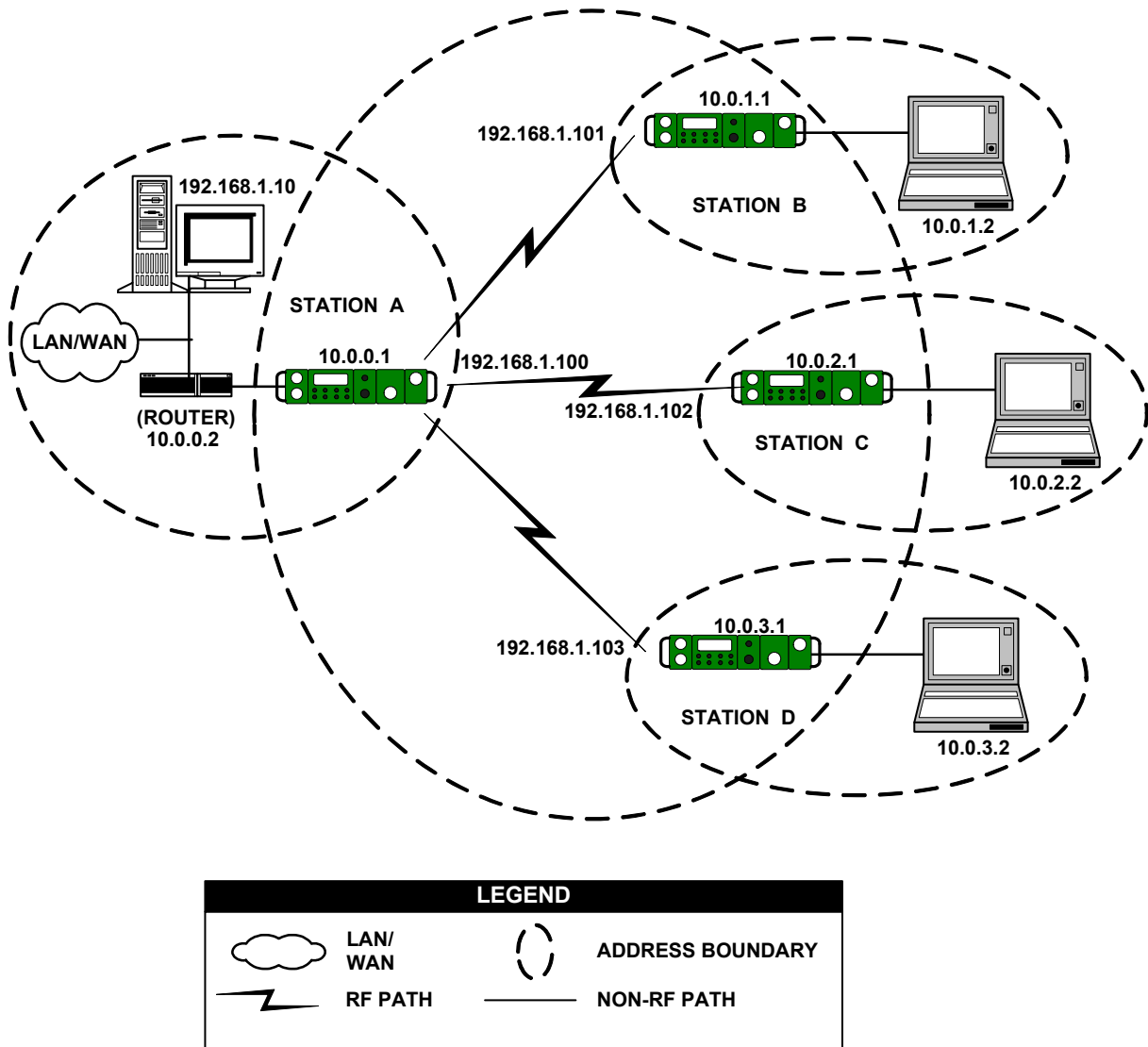
0103-4100-0028

Figure 4-11. IP Network Example

Table 4-9. IP Network Example Parameters (Routing Mode)

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

Table 4-10. IP Network Example Routes

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

4.6.4 Overview - IP Menu

Table 4-11 outlines the top-level IP menus.

Table 4-11. Top-Level IP Menu

Menu Item	Options	Remarks
CONFIG	NETWORK	The setup of parameters that support using the AN/PRC-150(C) with standard computer networks.
NETWORK	INTERFACE PROTOCOL ROUTES	- The AN/PRC-150(C) 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	Simple Network Management Protocol
ROUTES	ALL INDIVIDUAL	- Clears all IP routes. - Access individual IP routes.
FIREWALL	ENABLE/DISABLE PROTOCOLS	- Configure to enable or disable IP Firewall Security. - Configure IP Firewall Ports.

NOTE

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

4.6.5 Program Configuration Network Firewall

From the **PGM>CONFIG>NETWORK>FIREWALL,** the user can select menu choices to enable or disable Firewall protection, for Internet Protocol (IP) traffic data, to and from selected radios. When Firewall is enabled, radios are less vulnerable to IP attacks.

Refer to Table 4-12 for the available commands and see Figure 4-12 to view the Firewall programming menu tree.

Table 4-12. PGM>Config>Network>Firewall Settings

Menu Item	Options	Remarks
FIREWALL	FIREWALL	- Internet Protocol Firewall
ENABLE	ENABLE FIREWALL: ENABLED POWER ON DISABLED	- Use arrows to access available Firewall options: - Press **[ENT]** to enable Firewall. - Press **[ENT]** to allow automatic enable upon power cycle of radio. - Press **[ENT]** to disable Firewall.
PROTOCOLS	TCP UDP	- Press **[ENT]** to access Transmission Control Protocol (TCP) port protocol options. - Press **[ENT]** to access User Datagram Protocol (UDP) port protocol options.
TCP	TELNET PORT DEBUG PORT	- Select **OPEN** or **CLOSE** for TELNET PORT. - Press **[ENT]** to **OPEN** or **CLOSE** DEBUG PORT.
UDP	SNMP PORT	- Press **[ENT]** to **OPEN** or **CLOSE** SNMP PORT.
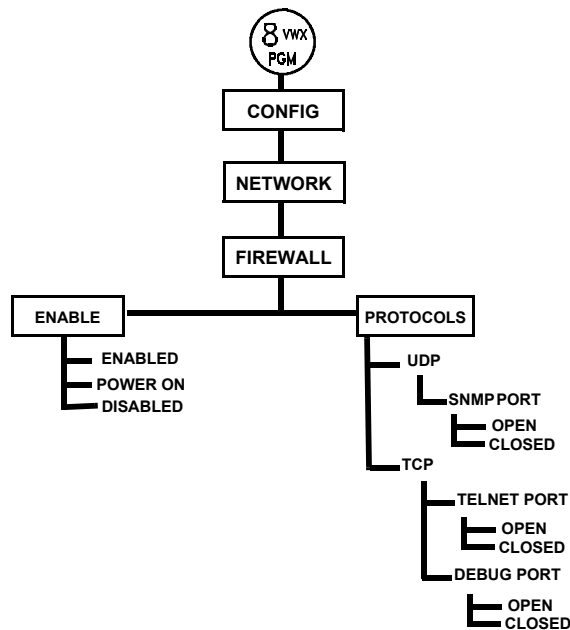
F-0228-4200-0099

Figure 4-12. PGM>Config>Network>Firewall Menu

4.6.6 Program Configure Network Interface Ethernet Address (IP Address)

See Figure 4-13 and refer to Table 4-13 and Table 4-11. Perform the following procedure to read or set the Ethernet IP address for the AN/PRC-150(C):

NOTE

Ethernet capability is not available when the AN/PRC-150(C) is on battery power.

a. Choose **PGM>CONFIG>NETWORK>INTERFACE>ETHERNET>ADDRESS** menu choices.

b. At the **ENABLE ETHERNET PORT** prompt, use the ▲▼ keys to select **YES** and press **[ENT]**.

c. Use the ▲▼ keys to select an address source of **AUTO** or **MANUAL** and press **[ENT]**. If AUTO is selected, the unalterable hardware address programmed into the AN/PRC-150(C) when it was manufactured is displayed. If MANUAL is selected, the current **IP ADDRESS** is displayed.

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

e. Use the number keys to enter a new IP address.

f. To view the IP programming tree, see Figure 4-13 and refer to Table 4-13 and Table 4-11. Continue the same sequence using an address source of MANUAL to configure the **SUBNET MASK** and **GATEWAY ADDRESS** (**NONE** or **CUSTOM IP**).

Figure 4-13. Internet Protocol (IP) Programming Tree (Sheet 1 of 2)
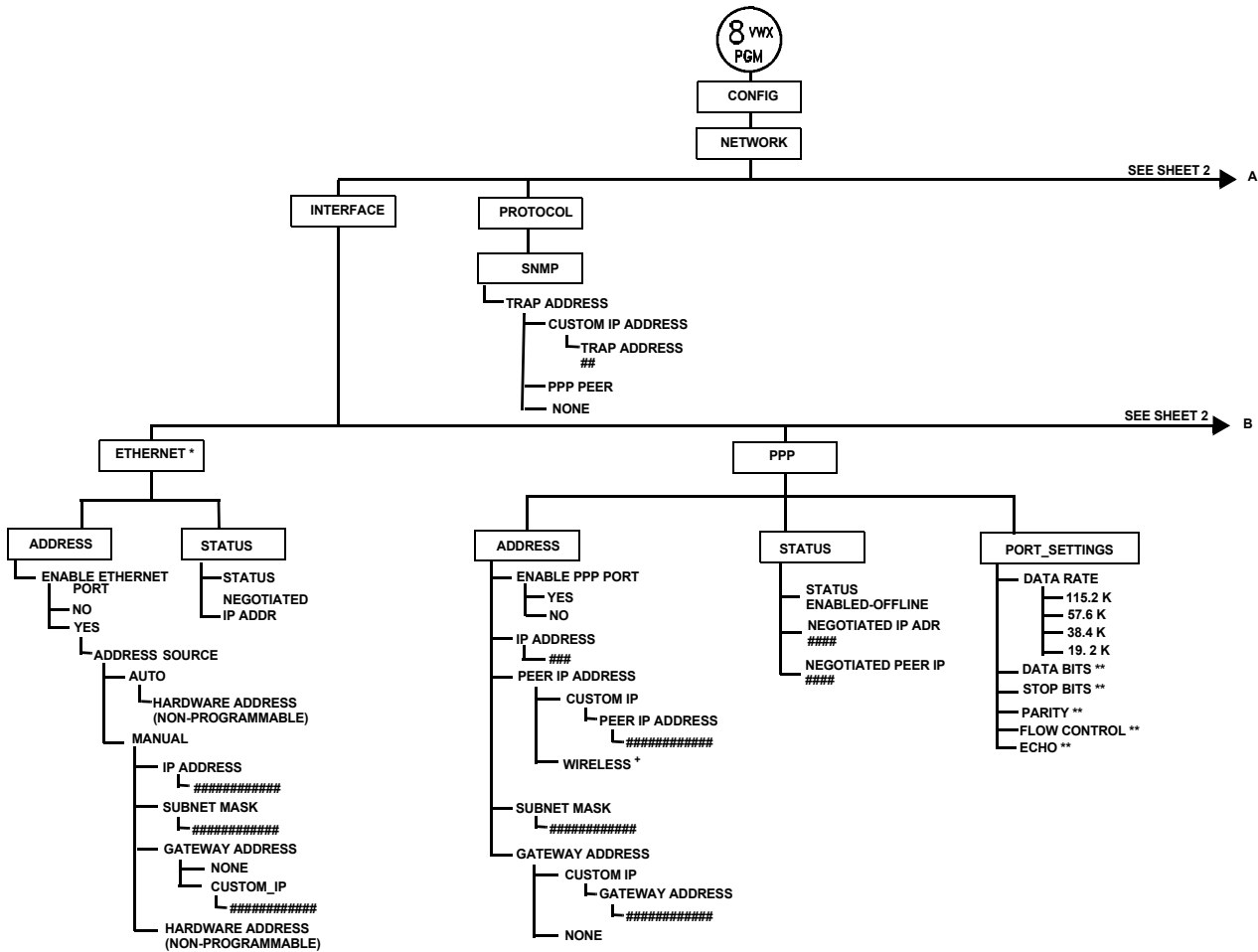
* NO ETHERNET WITH BATTERY POWER.
** NOT ADJUSTABLE WITHIN THE PORT SETTINGS MENU.
⁺ AVAILABLE ONLY IF 3G IS INSTALLED.

0103-4100-0029A-1

Harris®

Figure 4-13. Internet Protocol (IP) Programming Tree (Sheet 2 of 2)
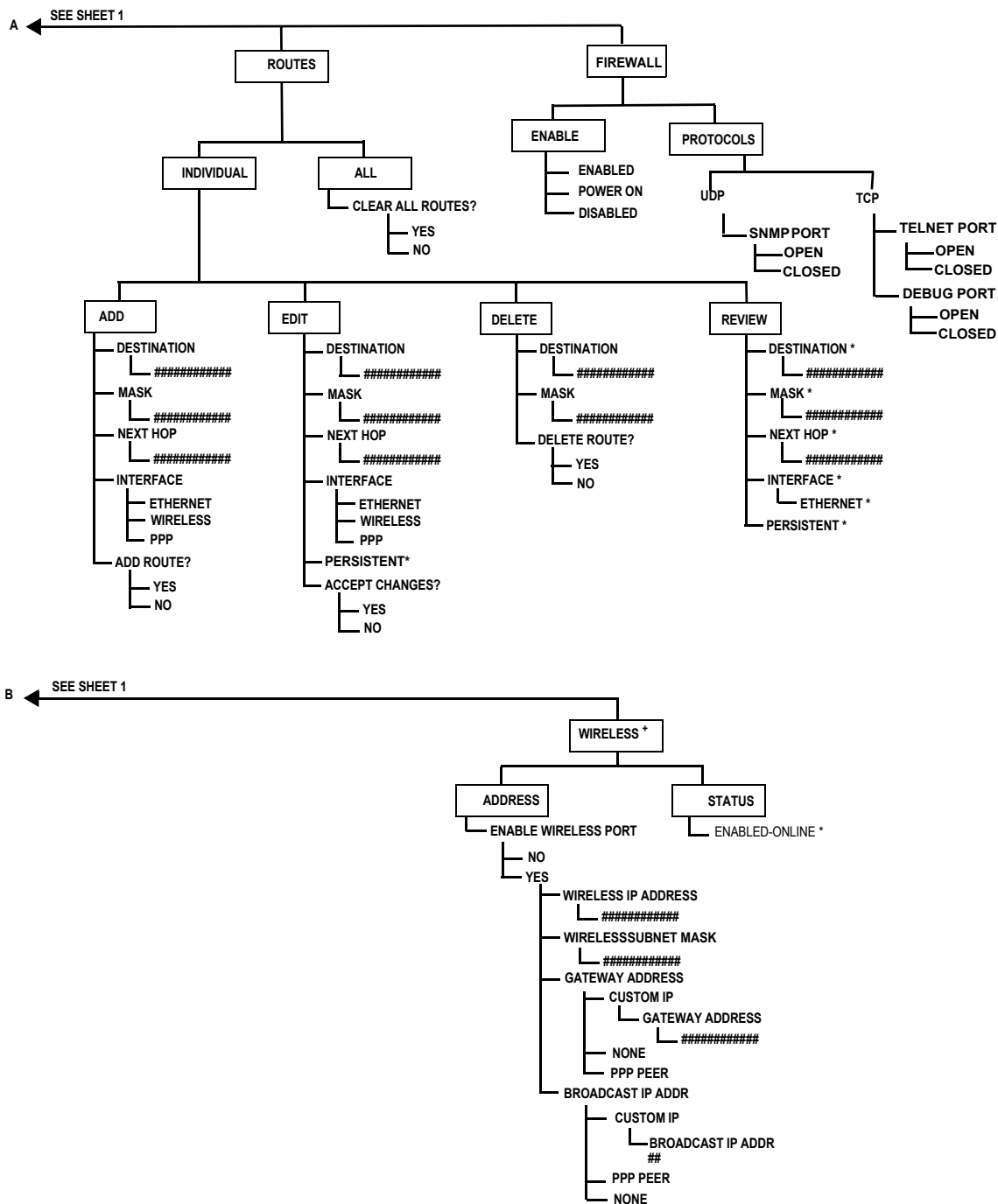
* NOT ADJUSTABLE FROM THIS MENU.

⁺ AVAILABLE IN 3G ONLY.

0103-4100-0029A-2

Table 4-13. PGM>Config>Network>Interface>Ethernet Menu Settings

Menu Item	Options	Remarks
INTERFACE	ETHERNET PPP WIRELESS	- Network setup of hardware ethernet interface. - Network setup of PPP data interface. - Setup for over-the-air networking.
ETHERNET	ADDRESS STATUS	- Select ADDRESS to program selected interface. - Select STATUS to display current port status and NEGOTIATED IP ADDRESS.
ADDRESS	ENABLE ETHERNET PORT ADDRESS SOURCE IP ADDRESS SUBNET MASK GATEWAY ADDRESS HARDWARE ADDRESS	- Ethernet port enable YES/NO - Manual - Operator programs address (addr) Automatic - Addr comes from DHCP server - User assignable to this radio (15 digit) - Applied to IP Addr to extend network address (15-digit) - Recipient of unrouted packets (NONE or CUSTOM IP) - Factory programmed, unique address for a given radio. Only the hardware address will display when AUTO is selected as the ADDRESS SOURCE.
STATUS	STATUS NEGOTIATED IP ADDR	- Displays current port status. - Displays NEGOTIATED IP ADDRESS received from DHCP server.

4.6.7   Program Configure Network Interface PPP

See Figure 4-13 and refer to Table 4-14 and Table 4-11.Perform the following procedure to read or set the PPP IP address of the AN/PRC-150(C) 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 **ADDRESS** and press **[ENT]**. ENABLE PPP PORT YES or NO appears.

g.   Use the ▲▼ keys to **YES** and press **[ENT]**. The current IP address for the AN/PRC-150(C) displays.

h.   Use the number keys to enter a new IP address.

i.   Press **[ENT]** to continue programming.

j.   Continue and configure the **PEER IP ADDRESS**, **SUBNET MASK,** and **GATEWAY ADDRESS** (**NONE** or **CUSTOM IP**). Once the address parameters have been programmed, ADDRESS, STATUS, and PORT_SETTINGS menus should appear.

k.   Use the ◀▶ keys to select **STATUS** and press **[ENT]**. Scroll through the status screens and view status. The ADDRESS, STATUS, and PORT_SETTINGS menus should again appear.

l. Use the ◀▶ keys to select **PORT_SETTINGS** and press **[ENT]**. Continue and configure the desired port settings.

Table 4-14. PGM>Config>Network>Interface>PPP Menu Settings

Menu Item	Options	Remarks
INTERFACE	ETHERNET PPP WIRELESS	- PPP Port
PPP	ADDRESS STATUS PORT SETTINGS	- Select to change PPP addresses. - Select to display PPP port settings. - Select to change PPP port settings.
ADDRESS	ENABLE PPP PORT IP ADDRESS PEER IP ADDRESS SUBNET MASK GATEWAY ADDRESS	These parameters are setup to configure the AN/PRC-150(C) PPP interface. Parameter values must also be programmed into whatever PC-based software application (e.g., RPA) is communicating with the AN/PRC-150(C) 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 AN/PRC-150(C).
PORT SETTINGS	DATA RATE DATA BITS STOP BITS PARITY FLOW CONTROL ECHO	19.2 k, 38.4 k, 57.6 k or 115.2 k 8 bits (not programmable) 1 bit (not programmable) NONE (not programmable) NONE (not programmable) OFF (not programmable)

4.6.8   Program Configure Network Interface Wireless

With the wireless network interface, relevant IP parameters are represented in the outgoing RF modulated signal. See Figure 4-13 and refer to Table 4-11 and Table 4-15. Perform the following procedure to read or set the Wireless IP parameters of the AN/PRC-150(C):

a. Choose **PGM>CONFIG>NETWORK>INTERFACE>WIRELESS** menu choices.

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

c. At the **ENABLE WIRELESS PORT** prompt, use the ▲▼ keys to select **YES** and press **[ENT]**. The current value for the **WIRELESS IP ADDRESS** parameter displays.

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

e. Use the number keys to change the current parameter.

f. To view the IP programming tree, see Figure 4-13 and refer to Table 4-11 and Table 4-15. Continue programming the **WIRELESS SUBNET MASK, GATEWAY ADDRESS** (**CUSTOM_IP**, **NONE**, and **PPP PEER**) and **BROADCAST IP ADR** (**PPP PEER**, **CUSTOM IP**, **NONE**).

Table 4-15. PGM>Config>Network>Interface>Wireless Settings

Menu Item	Options	Remarks
INTERFACE	ETHERNET PPP WIRELESS	- Select wireless IP for setup parameters of OTA networking.
WIRELESS	ADDRESS STATUS	- Select ADDRESS to view or edit setup parameters.
ADDRESS	ENABLE WIRELESS PORT WIRELESS IP ADDRESS WIRELESS SUBNET MASK GATEWAY ADDRESS BROADCAST IP ADDR	Enable (Yes/No) the wireless port Relevant IP parameters of the AN/PRC-150(C) wireless signalling, represented in the outgoing RF modulated signal over the J7 antenna port.
STATUS	STATUS	Only ENABLED-ONLINE is available for Wireless IP.

4.6.9 Program Configuration Network Protocol

See Figure 4-13, and refer to Table 4-11 and Table 4-16. Perform the following procedure to read or set the IP Protocol parameter of the AN/PRC-150(C):

    a.   Choose **PGM>CONFIG>NETWORK>PROTOCOL** menu choices. SNMP appears.

    b.   Press **[ENT]**.

    c.   Use the ◀▶ keys to select **PPP_PEER**, **CUSTOM IP**, or **NONE**.

    d.   Under **CUSTOM_IP**, use the number keys to enter a new **TRAP ADDRESS**.

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

    f.   See Figure 4-13 to view the IP programming tree and refer to Table 4-11 and Table 4-16.

Table 4-16. PGM>Config>Network>Protocol Settings

Menu Item	Options	Remarks
PROTOCOL	SNMP	Simple Network Management Protocol
SNMP	TRAP ADDRESS	Where undeliverable messages are sent (or 000.000.000.000 to disable)

4.6.10 Program Configuration Network Routes

To support IP message routing, the AN/PRC-150(C) maintains a programmable routing table. See Figure 4-13 and refer to Table 4-11 and Table 4-17. To read or set the IP ROUTES parameter of the AN/PRC-150(C), perform the following procedure:

    a.   Choose **PGM>CONFIG>NETWORK>ROUTES** menu choices.

    b.   Use the ◀▶ keys to select **INDIVIDUAL** or **ALL** and press **[ENT]**.

NOTE

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

c. Use the ◀▶ keys to select **ADD, EDIT, REVIEW** or **DELETE** an individual entry and press **[ENT]**.

d. Pressing **[ENT]** repeatedly cycles through the submenus. To change a value, enter it when the parameter appears. Pressing **[ENT]** keeps the current value and moves to the next parameter.

ADD cycles through **DESTINATION, MASK, NEXT HOP, INTERFACE** (**ETHERNET, WIRELESS, PPP**)**, ADD ROUTE**? (YES, NO)

EDIT cycles through **DESTINATION, MASK, NEXT HOP, INTERFACE** (**ETHERNET, WIRELESS, PPP**)**, PERSISTENT, ACCEPT CHANGES**? (YES, NO)

REVIEW cycles through **DESTINATION, MASK, NEXT HOP, INTERFACE, PERSISTENT**.

DELETE cycles through **DESTINATION, MASK, DELETE ROUTE**? (YES, NO)

e. The first destination entry in the network matrix displays.

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

g. Use the number keys to change the displayed value.

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

i. To view the IP programming tree, see Figure 4-13 and refer to Table 4-11 and Table 4-17.

Table 4-17. PGM>Config>Network>Routes Settings

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

Table 4-17. PGM>Config>Network>Routes Settings (Continued)

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

4.6.11   Program Configuration ARQ

To program ARQ parameters, refer to Table 4-18 and see Figure 4-14, and perform the following procedure:

NOTE

Leave the ARQ configuration parameters at their default settings for best performance, unless the user has a detailed understanding of ARQ operations. The ARQ modem is recommended for use with the RF-6710 WMT and TAC CHAT.

a. Choose **PGM>CONFIG>ARQ** menu choices. **ARQ INTERLEAVE** appears.

b. Press **[ENT]**.

c. Use the ▲▼ keys to select the interleave option (**LONG, SHORT**) and press **[ENT]**. The **ARQ BAUD** selection menu appears.

d. 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.

e. Use the ▲▼ keys to scroll through the available ARQ MODES (**NON-ACKNOWLEDGED, ACKNOWLEDGED**) and press **[ENT]**.

f. Press **[CLR]** key to return to **CONFIG** menu

Table 4-18. PGM>Config>ARQ Setting

Menu Item	Options	Remarks
ARQ INTERLEAVE	LONG SHORT	Interleave determines the run length for error correction. Longer interleaves give higher levels of correction and lower throughput and should be used in poor conditions. Short interleaves have higher throughput but should be reserved for high quality transmission conditions.
ARQ BAUD	AUTO 2400 1200 600 300 150 75	AUTO will give the optimal data transfer rate and will change as conditions change. Operator may select a fixed rate.
ARQ MODE	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.

4.6.12   Program Configuration LDV

Last Ditch Voice (LDV) allows the radio to deliver a short emergency message using digital voice using preconfigured parameters that should work in the poorest of conditions. The availability of ARQ allows a guaranteed delivery of the message. To program LDV parameters, refer to Table 4-19 and see Figure 4-14, and perform the following procedure:

a. Choose **PGM>CONFIG>LDV** menu choices.

b. Use the ▲▼ keys to select one of the **LDV VOICE** options (**MELP600, LPC600**) and press **[ENT]**. The **MDM TX TYPE** selection menu appears.

c. Use the ▲▼ keys to select either **ARQ** or **NON-ARQ** from the **MDM TX TYPE** options and press **[ENT]**.

d. For **MDM TX TYPE** of **ARQ**, use the ▲▼ keys to select one of the **ARQ TRAFFIC TYPE** options **(XDLV, LDL128, LDL64, LDL32)** and press **[ENT]**.

NOTE

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

e. For **MDM TX TYPE** of **NON-ARQ**, use the ▲▼ keys to select one of the **BAUD RATE** options **(75, 150, 300)** and press **[ENT]**. The **INTERLEAVE** selection menu appears.

f. For **MDM TX TYPE** of **NON-ARQ**, use the ▲▼ keys to select one of the **INTERLEAVE** options **(SHORT, LONG)** and press **[ENT]**.

g. Press **[CLR]** key to return to **CONFIG** menu.

Table 4-19. PGM>Config>LDV Settings

Menu Item	Options	Remarks
LDV VOICE	MELP600 LPC600	Selects the vocoder type used to send LDV messages.
MDM TX TYPE	ARQ NON-ARQ	Select whether automatic error detection and correction is used for deliver of LDV messages.
ARQ TRAFFIC TYPE	XDLV LDL128 LDL64 LDL32	Setting is not used if MDM TX TYPE is set to NON-ARQ.
BAUD RATE	75 150 300	Setting is not used if MDM TX TYPE is set to ARQ.
INTERLEAVE	SHORT LONG	LONG provides increased error correction capability for improved reliability under poor channel conditions, but increases the time required to deliver each message. SHORT provides less delay, but delivery is less reliable. Setting is not used if MDM TX TYPE is set to ARQ.
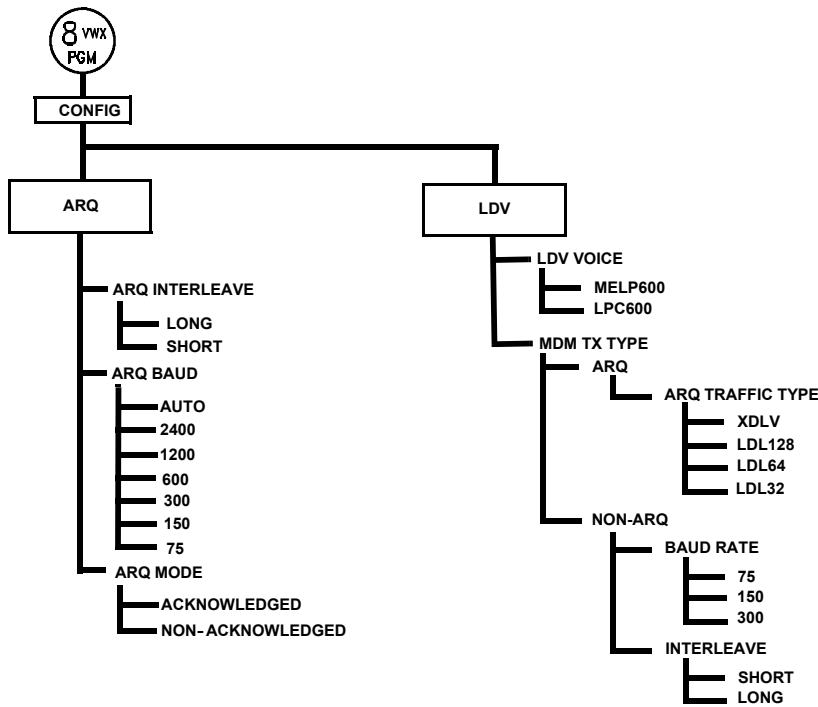
0103-4100-0030

Figure 4-14. PGM>Config>ARQ and LDV Program Menus

4.6.13   Program Configure Restore

The restore function reverts all radio settings to their factory defaults. The restoration includes settings normally cleared by the radio's zeroize function as well as settings store in EEPROM memory which are not normally cleared or reverted by a zeroize. The IP address parameters are restored to factory defaults to allow the radio to be returned to a known state to facilitate connection to the radio for reprogramming with the HF RPA. Restore is not necessary to program with the HF RPA, but allows the radio to be easily returned to a known state if the radio has been customized for use in a wireless network. See Figure 4-15. Perform the following procedure to restore the factory defaults:

NOTE

Restore does not delete red keys and should not be used as a substitute for a zeroize when a full zeroize is required. (Refer to Paragraph 3.7 for zeroize.)

a.   Choose **PGM>CONFIG>RESTORE** menu choices. **RESTORE DEFAULTS?** is displayed.

b.   Use the ▲▼ keys to select **YES** or **NO** and press **[ENT]**. If YES was selected, **FACTORY DEFAULTS RESTORED CYCLE POWER** appears.
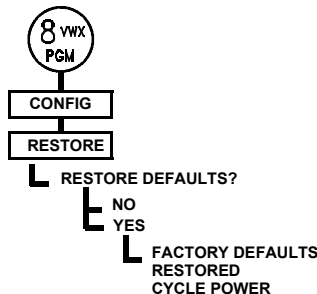
0103-4100-0045

Figure 4-15. PGM>Config>Restore Program Menu

4.6.14   Program Configure CTI

Refer to Table 4-20 and see Figure 4-16. Perform the following procedure to configure CTI options:

a.   Choose **PGM**>**CONFIG**>**CTI** menu choice. **RINGBACK** is displayed.

b.   Use the ▲▼ keys to select **ENABLE** or **DISABLE** and press **[ENT]**. **GATEWAY** should appear.

c.   Use the ▲▼ keys to select the desired radio to use as the CTI gateway and press **[ENT]**.

Table 4-20. PGM>Config>CTI Settings

CTI		
Menu Item	**Options**	**Remarks**
RINGBACK	ENABLE DISABLE	Enables or disables the ringback sound in the CTI outstation radio that consists of three short beeps and a period of silence followed by repetition of this pattern until either the phone or outstation operator keys.
GATEWAY	3G Radio Name from the Station Table	Allows the operator to select which radio is to be considered the CTI gateway or basestation. This must be set to the name of a radio connected to the RF-6010.
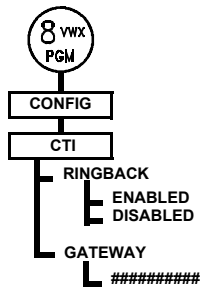
0103-4200-0049

Figure 4-16. PGM>Config>CTI Program Menu

4.7   PROGRAM MODE PRESET CHANNEL

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

All 3G network programming must be accomplished through the RPA. For information on setting up and programming a 3G network into the AN/PRC-150(C), refer to the HF RPA help files.

See . Perform the following procedure to program channel presets:

    a.   Choose **PGM>MODE>PRESET>CHANNEL** menu choices.

    b.   Press the numeric keys to enter the **CHANNEL NUMBER TO CHANGE:** and press **[ENT]**.

    c.   Press the numeric keys to enter the new **RX FREQUENCY** and press **[ENT]**.

    d.   Press the numeric keys to enter the new **TX FREQUENCY** and press **[ENT]**.

    e.   Use the ▲▼ keys to scroll through the **MODULATION** options **USB, AME, CW, FM, LSB** and press **[ENT]**.

    f.   Use the ▲▼ keys to scroll through the **AGC SPEED** options (**SLOW, MED, FAST, DATA, OFF, AUTO**) and press **[ENT]**. The available options depend on which modulation type was selected.

g. 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, 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.

- CW: **0.35 kHz, 0.5 kHz, 1.0 kHz, 1.5 kHz**

h. Use the ▲▼ keys to scroll through the **RX ONLY** options (**YES, NO**) and press **[ENT]**.

i. If **RX ONLY** option **NO** is selected, use the keys to scroll through the **LIMIT MAX TX POWER?** options (**YES, NO**) and press **[ENT]**.

j. If **LIMIT MAX TX POWER?** option **YES** is selected, press the numeric keys to enter the desired **MAX TX POWER** and press **[ENT]**. This value is limited to the range 1 to 1000. If **LIMIT MAX TX POWER?** option **NO** is selected, the AN/PRC-150(C) automatically selects the maximum transmit power based on the configuration.

k. Use the ▲▼ keys to scroll through the **ENABLE HAIL TX** options (**YES, NO**) and press **[ENT]**.

NOTE

> The **ENABLE HAIL TX** screen is only available for channels 001-010 and only when **USB** is selected in Step e. Select frequencies for these channels appropriately, if using **HOP** radio mode and Hail capability is desired. Refer to Paragraph 3.17.7 for additional information on hailing.

This feature assures that the radio output power will not exceed the level specified for this channel. For example, if the AN/PRC-150(C) was used with an RF-5834H-PA 400-Watt Power Amplifier and the **MAX POWER** level for the channel had been set to 200 W, the radio would automatically limit power to 200 W, whenever that channel was selected. If MAX POWER output is set above the level of the system configuration, the system output power is limited to the maximum power output of the power amplifier.

l. If option YES is selected, enter **HAIL KEY** (00-10) and press **[ENT]**.

m. Press the numeric keys to enter the desired **MAX TX POWER** and press **[ENT]**.

NOTE

> Entering **00000** causes the AN/PRC-150(C) to automatically select the maximum transmit power based on the configuration.

n. 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.

o. Press **[CLR]** twice to return to the **MODE** menu.
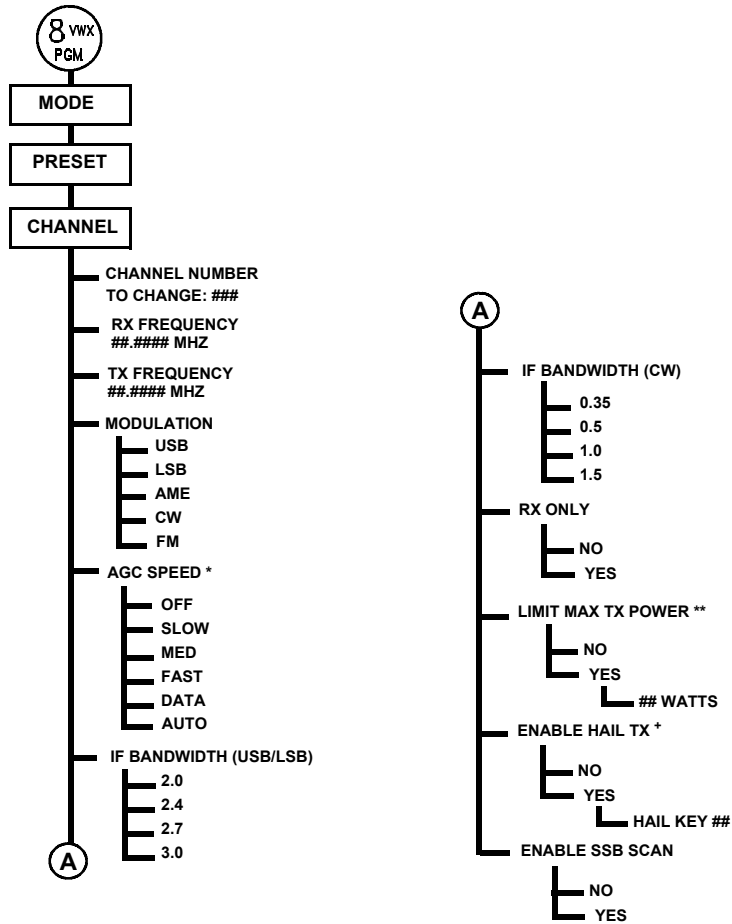
NOTES:

* DOES NOT APPEAR FOR FM.

** DOES NOT APPEAR FOR RX ONLY.

⁺ ONLY APPEARS FOR CHANNELS 001-010 IN USB.

0103-4100-0032B

Figure 4-17. PGM>Mode>Preset>Channel Menu

4.8 PROGRAM MODE ALE

See Figure 4-18.

4.8.1 Program Mode ALE Channel Group

Perform the following procedures to add, modify and delete channel groups.

4.8.1.1 Program Mode ALE Channel Group - Add Channel Group

See Figure 4-18. Perform the following procedure to add a channel group:

a. Choose **PGM>MODE>ALE>CHAN_GROUP** menu choices.

b. Use the ▲▼ keys to scroll through **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

c. Press the 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.

d. Use the ▲▼ keys to scroll through **CHANNEL** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

e. Press the numeric keys to enter the channel number and press **[ENT]**.

f. Repeat Step e 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 radio mode and may get changed during operations in that radio mode.

NOTE

Channel groups are restricted to 20 channels if programming radio with the HF-RPA.

g. To add additional channel groups, press **[CLR]** twice to return to the channel group screen and repeat Step b through Step f.

h. Press **[CLR]** repeatedly to return to the **ALE** menu.
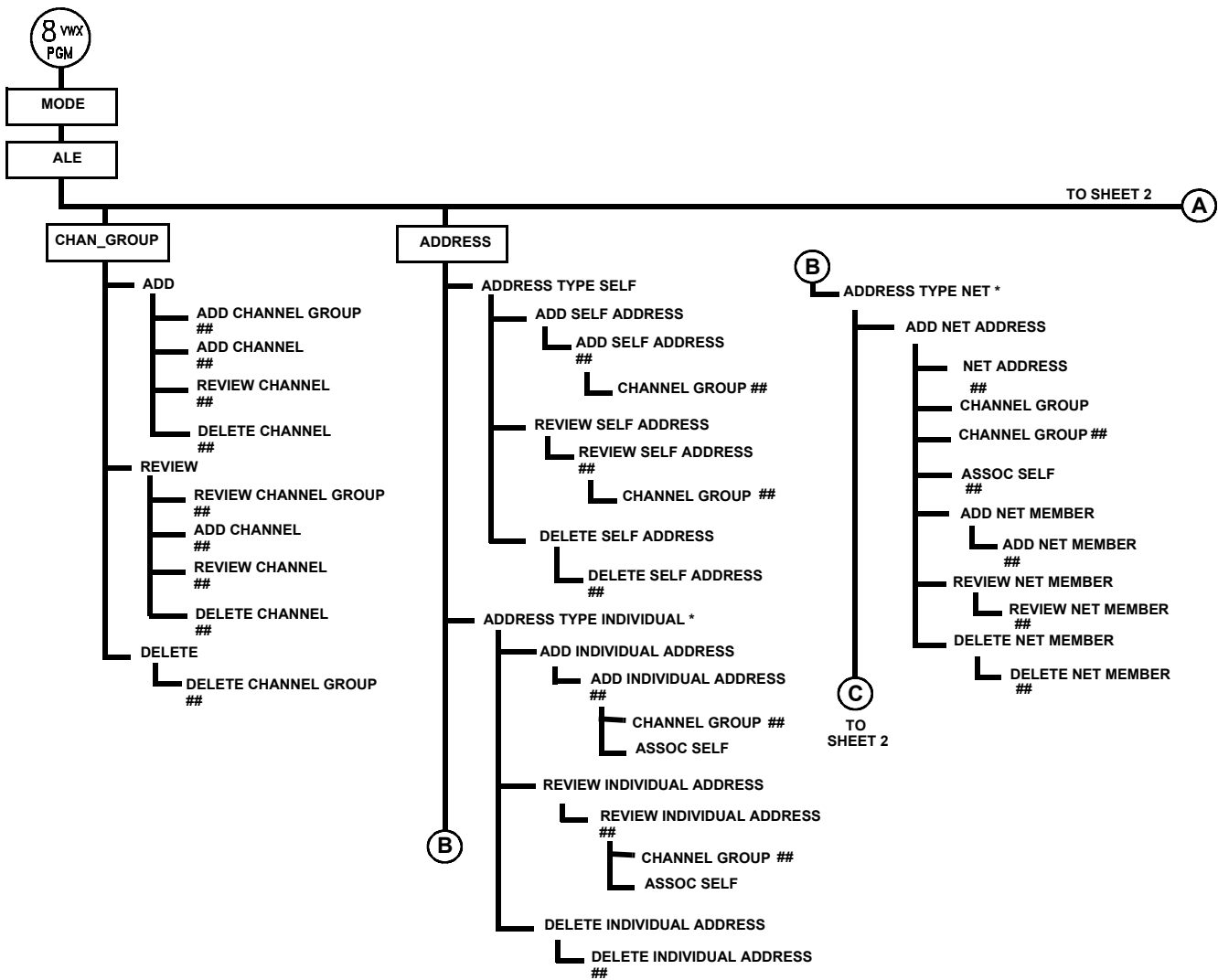
NOTES:

* AT LEAST ONE SELF ADDRESS MUST BE PROGRAMMED BEFORE SELECTION BECOMES AVAILABLE.

AT LEAST ONE INDIVIDUAL ADDRESS SHOULD BE PROGRAMMED PRIOR TO PROGRAMMING A NET ADDRESS.

0103-4100-0035A-1

Figure 4-18. PGM>Mode>ALE Menus (Sheet 1 of 3)

Harris®

CONFIG

C

REVIEW NET ADDRESS
##

REVIEW NET ADDRESS
##

REVIEW
##

CHANNEL GROUP ##

ASSOC SELF
##

ADD NET MEMBER

ADD NET MEMBER
##

REVIEW NET MEMBER

REVIEW NET MEMBER
##

DELETE NET MEMBER

DELETE NET MEMBER
##

DELETE NET ADDRESS
##

DELETE NET ADDRESS
##

ADD NET MEMBER

ADD NET MEMBER
##

REVIEW NET MEMBER

REVIEW NET MEMBER
##

DELETE NET MEMBER

DELETE NET MEMBER
##

MAX SCAN CHANNELS
1 - 100

LISTEN BEFORE TX

OFF
ON

KEY TO CALL

OFF
ON

MAX TUNE TIME
1 - 60

LINK TIMEOUT

OFF
ON

LINK TIMEOUT MINUTES

##

LINK TO ANY CALLS

OFF
ON

LINK TO ALL CALLS

OFF
ON

LINK TO INLINK CALLS

OFF
ON

AMD OPERATION

DISABLED
ENABLED

AMD AUTO DISPLAY*

DISABLED
ENABLED

SCAN RATE

ASYNC
2
5

LINK PROTECT LEVEL

OFF
LEVEL 1

LINK PROTECT KEY

#############

* ONLY DISPLAYED IF AMD IS ENABLED.

0103-4100-0035A-2

Figure 4-18. PGM>Mode>ALE Menus (Sheet 2 of 3)
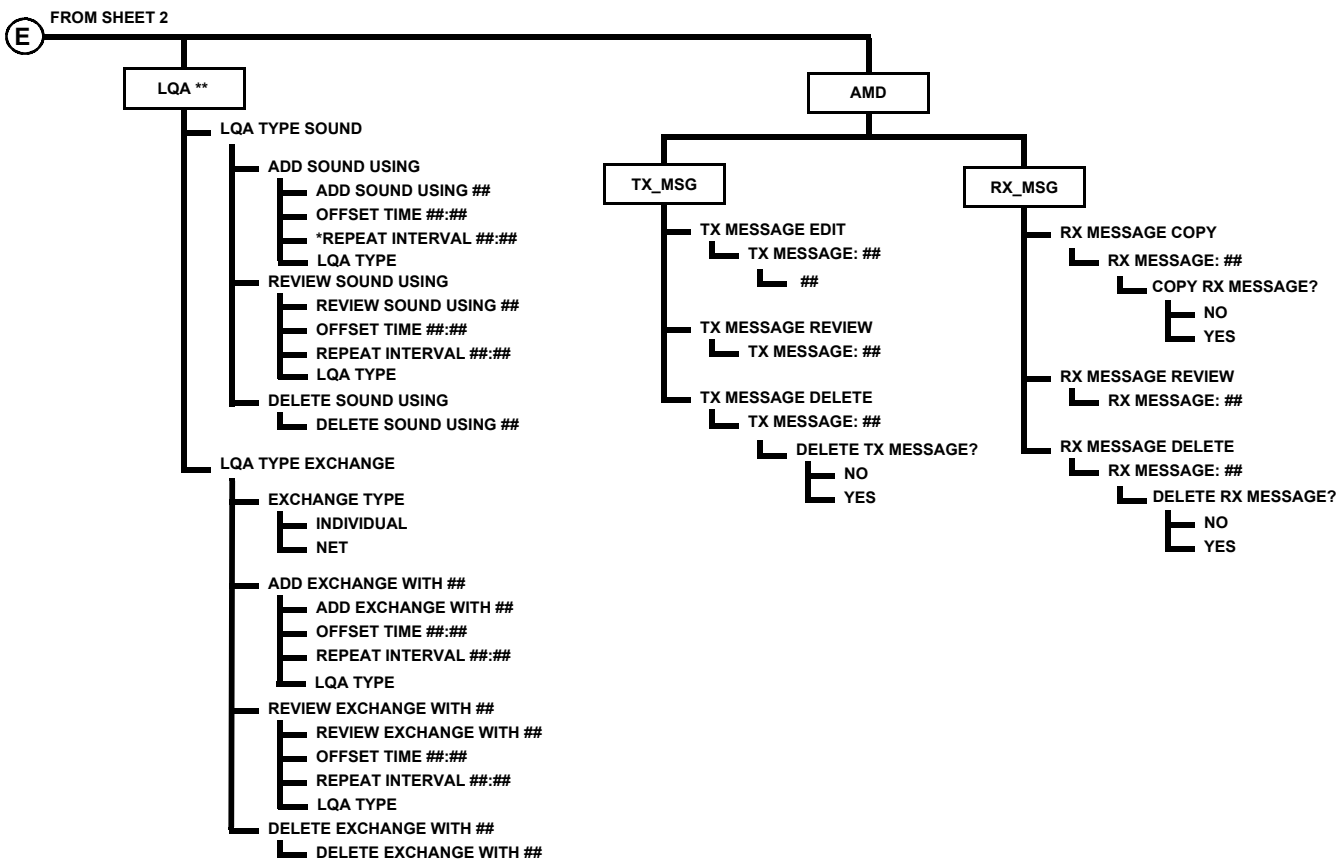
NOTES:

* A VALUE OF 0 FOR REPEAT INTERVAL CREATES AN INVALID SOUND.
**USE OF LQA PROGRAMMING WILL CAUSE THE RADIO TO KEY WITHOUT ANY OPERATOR ACTIONS.

0103-4100-0035A-3

Figure 4-18. PGM>Mode>ALE Menus (Sheet 3 of 3)

4.8.1.2   Program Mode ALE Channel Group - Review or Modify Channel Group

See Figure 4-18. Perform the following procedure to review or modify a channel group:

    a.   Choose **PGM>MODE>ALE>CHAN_GROUP** menu choices.

    b.   Use the ▲▼ keys to scroll through **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

    c.   Press the numeric keys to enter the channel number and press **[ENT]**.

    d.   Use the ▲▼ keys to scroll through **CHANNEL** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

    e.   Press the numeric keys to enter the channel number and press **[ENT]**.

    f.   Repeat Step c to add additional channels to the channel group. The channel group can contain up to 100 channels (Channels 00 through 99).

    g.   Press **[CLR]** three times to return to the **ALE** menu.

4.8.1.3   Program Mode ALE Channel Group - Review Channel Group - Delete Channel

See Figure 4-18. Perform the following procedure to delete a channel from a channel group:

    a.   Choose **PGM>MODE>ALE>CHAN_GROUP** menu choices.

    b.   Use the ▲▼ keys to scroll through **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

    c.   Use the ▲▼ keys to scroll through existing channel groups until the number of the desired channel group is displayed, and press **[ENT]**.

    d.   Use the ▲▼ keys to scroll through **CHANNEL** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

    e.   Use the ▲▼ keys to scroll through the channels until the desired channel is displayed.

    f.   Press **[ENT]** to delete the channel, or press **[CLR]** to go back without deleting the channel.

    g.   Press **[CLR]** three times to return to the **ALE** menu.

4.8.1.4   Program Mode ALE Channel Group - Delete Channel Group

See Figure 4-18. Perform the following procedure to delete a channel group:

    a.   Choose **PGM>MODE>ALE>CHAN_GROUP** menu choices.

    b.   Use the ▲▼ keys to scroll through the **CHANNEL GROUP** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

    c.   Use the ▲▼ keys to scroll through the channel groups until the desired channel group is displayed.

    d.   Press **[ENT]** to delete the channel group, or press **[CLR]** key to go back without deleting the channel group.

    e.   Press **[CLR]** repeatedly to return to the **ALE** menu.

4.8.2   ALE Address Programming

Channel groups need to be defined prior to programming of the self addresses. Addresses are defined by the following:

- Self Address - This is a radio's address. There may be several. One must be 1 - 3 characters. Additional self addresses may be up to 15 characters long. Up to 20 can be programmed.

- Individual Address - These are self addresses of other radios and are used for individual calls. INDIVIDUAL addresses can only be programmed after at least one SELF ADDRESS has been programmed. Up to 200 can be programmed.

- Net Address - These are addresses assigned to a group of radios and are used for net calls in which the group of radios can all be called at the same time. NET addresses can only be selected after at least one INDIVIDUAL address has been programmed. Up to 20 can be programmed.

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

4.8.2.1 Program Mode ALE Address - Add Self Address

Channel groups need to be defined prior to programming of the self addresses. Each station is permitted to have up to 20 different self addresses. A 1 - 3 character address must be programmed, especially if the desired self address is longer than three characters. See Figure 4-18. Perform the following procedure to add a self address:

    a.   Choose **PGM>MODE>ALE>ADDRESS** menu choices.

    b.   Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **SELF** and press **[ENT]**.

    c.   Use the ▲▼ keys to scroll through **SELF ADDRESS** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

    d.   Press the alphanumeric keys to enter a 1 to 15 character self address and press **[ENT]**.

    e.   Press the alphanumeric keys to enter the **CHANNEL GROUP** for this **SELF ADDRESS** and press **[ENT]**.

    f.   Repeat Step b through Step e to add additional self addresses.

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

4.8.2.2 Program Mode ALE Address - Review Self Address

See Figure 4-18. Perform the following procedure to review an existing self address:

    a.   Choose **PGM>MODE>ALE>ADDRESS** menu choices.

    b.   Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **SELF**, and press **[ENT]**.

    c.   Use the ▲▼ keys to scroll through **SELF ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW**, and press **[ENT]**.

    d.   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.

    e.   Press **[ENT]** to return to the Address Type screen.

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

4.8.2.3 Program Mode ALE Address - Delete Self Address

See Figure 4-18. Perform the following procedure to delete a self address:

    a.   Choose **PGM>MODE>ALE>ADDRESS** menu choices.

    b.   Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**).

    c.   Select **SELF**, and press **[ENT]**.

    d.   Use the ▲▼ keys to scroll through **SELF ADDRESS** options (**ADD, REVIEW, DELETE**).

    e.   Select **DELETE** and press **[ENT]**.

    f.   Use the ▲▼ keys to scroll through self addresses programmed into the AN/PRC-150(C).

    g.   Select the **SELF ADDRESS** to be deleted and press **[ENT]**.

    h.   Press **[CLR]** repeatedly to return to the **ALE** menu.

4.8.2.4 Program Mode ALE Address - Add Individual Address

See Figure 4-18, and refer to Table 4-21. Perform the following procedure to add an individual address:

a. Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through **INDIV ADDR** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

d. Press the alphanumeric keys to enter a 1 to 15 character individual address and press **[ENT]**.

e. Press the numeric keys on the keypad to select a **CHANNEL GROUP** to associate with this individual address and press **[ENT]**.

f. Use the ▲▼ keys to scroll through self addresses. Press **[ENT]** to select a self address to associate with this individual address.

g. Repeat Step b through Step f to add additional individual addresses.

h. Press **[CLR]** to return to the **ALE** menu.

Table 4-21. PGM>Mode>ALE Individual Address Settings

INDIVIDUAL ADDRESS		
Menu Item	**Options**	**Remarks**
ADD	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.
DELETE	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	XXXXXXXXXXXXXXX	Review a previously-programmed Individual Address and its associated Self Address and Channel Group.
CHAN_GROUP	00-49	Assign a preprogrammed Channel Group to this Individual address.
SELF	XXXXXXXXXXXXXXX	Assign a preprogrammed Self Address to this Individual address.

4.8.2.5 Program Mode ALE Address - Review Individual Address

See Figure 4-18. Perform the following procedure to review an individual address:

a. Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through **INDIV ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the individual addresses until the desired individual address is displayed and press **[ENT]** to review.

e. Review channel group and press **[ENT]**.

f. Review associated self address and press **[ENT]**.

g. Review address type and press **[ENT]**.

h. Press **[ENT]** to return to individual address options.

i. Repeat Step c through Step d to review additional individual addresses.

j. Press **[CLR]** to return to the **ALE** menu.

4.8.2.6 Program Mode ALE Address - Delete Individual Address

See Figure 4-18. Perform the following procedure to delete an individual address:

a. Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through **INDIV ADDRESS** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the individual addresses until the desired individual address is displayed.

e. Press **[ENT]** to delete the individual address, or press **[CLR]** to go back without deleting the individual address.

f. Repeat Step c through Step e to delete additional individual addresses.

g. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.8.2.7 Program Mode ALE Address - Add Net Address

See Figure 4-18 and refer to Table 4-22. Perform the following procedure to add an ALE net address:

a. Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

d. Press the alphanumeric keys to enter a 1 to 15 character net address and press **[ENT]**.

e. Press the numeric keys to enter the **CHANNEL GROUP** to associate with this net address and press **[ENT]**.

f. 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.

g. Use the ▲▼ keys to scroll through the **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

h. 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 net members **must be the same in all radios on the net** to allow for proper communication. Review address in all radios by scrolling the list in the same direction. Use of the RPA ensures the proper order in all radios.

i. Press **[CLR]** repeatedly to return to the **ALE** menu.

Table 4-22. PGM>Mode>ALE Net Address Settings

ALE NET ADDRESS/NET MEMBERS		
Menu Item	**Options**	**Remarks**
CHANNEL GROUP	0-49	Assign a preprogrammed Channel Group to this Net address.
ASSOC SELF	XXXXXXXXXXXXXXX	Assign a preprogrammed Self Address to this Net address.
NET ADDRESS		
ADD	XXXXXXXXXXXXXXX	Net addresses can be up to 15 characters in length. **NOTE**: ALE converts addresses into three-character bundles. Because of this, an address that is four characters long takes as long to transmit as an address that is six characters long.
DELETE	XXXXXXXXXXXXXXX	Delete a programmed Net address.
REVIEW	XXXXXXXXXXXXXXX	Review a previously-programmed Net Address and its associated Self Address, Channel Group, and Net Members.

Table 4-22. PGM>Mode>ALE Net Address Settings (Continued)

NET MEMBER		
Menu Item	**Options**	**Remarks**
ADD	XXXXXXXXXXXXXXX	Assign a preprogrammed address to this net member. **NOTE:** One Self Address must be associated with a net; the remaining associated addresses are selected from the preprogrammed Individual addresses.
DELETE	XXXXXXXXXXXXXXX	Delete a programmed Net member.
REVIEW	XXXXXXXXXXXXXXX	Review a previously-programmed Net Member and its associated Self Address, Channel Group, and Net Address.

4.8.2.8   Program Mode ALE Address - Change Channel Group of a Net Address

See Figure 4-18. Perform the following procedure to change the channel group of a net address:

a.   Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b.   Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

c.   Use the ▲▼ keys to scroll through **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d.   Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed, and press **[ENT]**.

e.   Press the numeric keys to enter the **CHANNEL GROUP** to associate with this net address and press **[ENT]**.

f.   Press **[CLR]** four times to return to the **ALE** menu.

4.8.2.9   Program Mode ALE Address - Change Associated Self Address

See Figure 4-18. Perform the following procedure to change the associated self address of a net address:

a.   Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b.   Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

c.   Use the ▲▼ keys to scroll through **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d.   Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed, and press **[ENT]**.

e.   Press **[ENT]** to advance to the **ASSOC SELF** screen.

f.   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.

g.   Press **[CLR]** four times to return to the **ADDRESS TYPE** screen.

4.8.2.10   Program Mode ALE Address - Add Net Member

See Figure 4-18 and refer to Table 4-23. Perform the following procedure to add a net member:

a.   Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b.   Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

c.   Use the ▲▼ keys to scroll through the **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d.   Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed, and press **[ENT]**.

e.   Press **[ENT]** two times to advance to the **NET MEMBER** screen.

f.   Use the ▲▼ keys to scroll through **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

g.   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.

h.   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.

4.8.2.10.1   Program Mode ALE Address - Review Net Member

See Figure 4-18 and refer to Table 4-23. Perform the following procedure to review a net member:

a.   Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b.   Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

c.   Use the ▲▼ keys to scroll through the **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d.   Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed and press **[ENT]**.

e.   Press **[ENT]** two times to advance to the **NET MEMBER** screen.

f.   Use the ▲▼ keys to scroll through **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

g.   Use the ▲▼ keys to scroll through the net members.

h.   Press **[CLR]** repeatedly to return to the **ALE** menu.

4.8.2.11 Program Mode ALE Address - Delete Net Member

See Figure 4-18 and refer to Table 4-23. Perform the following procedure to delete a net member:

a. Choose **PGM>MODE>ALE>ADDRESS** menu choices.

b. Use the ▲▼ keys to scroll through **ADDRESS TYPE** options (**SELF, INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **NET ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through net addresses until the desired net address is displayed and press **[ENT]**.

e. Press **[ENT]** two times to advance to the **NET MEMBER** screen.

f. Use the ▲▼ keys to scroll through **NET MEMBER** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the net members until the net member to be deleted is displayed.

h. Press **[ENT]** to delete the net member or press **[CLR]** to go back without deleting the net member.

i. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.8.3 Program Mode ALE Configuration

See Figure 4-18 and refer to Table 4-23. Perform the following procedure to configure the ALE parameters:

a. Choose **PGM>MODE>ALE>CONFIG** menu choices.

b. Press the numeric keys to enter **MAX SCAN CHANNELS** (**1 to 100**) and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **LISTEN BEFORE TX** options (**OFF, ON**) and press **[ENT]**.

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

e. Press the numeric keys to enter the **MAX TUNE TIME** in seconds (**1 to 60**) and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **LINK TIMEOUT** options (**OFF, ON**) and press **[ENT]**.

g. If **LINK TIMEOUT** was set to **ON** in Step f, 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 f.

h. Use the ▲▼ keys to scroll through the **LINK TO ANY CALLS** options (**OFF, ON**) and press **[ENT]**.

i. 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.

j. Use the ▲▼ keys to scroll through the **LINK TO INLINK CALLS** option (**OFF, ON**) and press **[ENT]**.

k. Use the ▲▼ keys to scroll through the **AMD OPERATION** options (**ENABLED, DISABLED**) and press **[ENT]**.

l. Use the ▲▼ keys to scroll through the **AMD AUTO DISPLAY** options (**ENABLED, DISABLED**) and press **[ENT]**. (AMD AUTO DISPLAY only appears when AMD operation is enabled.)

m. 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.

n. Use the numeric keys to configure the **LINK PROTECT LEVEL** (OFF = Linking Protection disabled, Level 1 = Linking Protection).

NOTE

All stations using linking protection must use the same link protection key and TOD reference (i.e. all UTC). Stations with Linking Protection enabled will also be unable to interoperate with stations configured with Linking Protection disabled.

o. Use the alphanumeric keys to enter the 14-digit hexidecimal **LINK PROTECTION KEY**. Each digit must be in the range 0 - 9 or A - F.

Table 4-23. PGM>Mode>ALE>Config Settings

Menu Item	CONFIG (ALE)
MAX SCAN CHANNELS	Tells the calling radio station how long to call so that the receiving station(s) have time to complete scan cycle. Number should be maximum number 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.
LINK TIMEOUT	When set to **ON**, this feature returns the radio from linked to scan if the radio has not been keyed or has not received an ALE signal for this specified period of time. When set to **OFF**, the operator must return the radio to scan manually.
LINK TO ANY CALLS	This function enables or disables link to ANY call in receive. Operator can still place ANY call.
LINK TO ALL CALLS	This function enables or disables link to ALL call in receive. Operator can still place ALL call.
LINK TO INLINK CALLS	This function enables or disables link to INLINK call in receive. Operator can still place INLINK call.
AMD OPERATION	Enables or disables Automatic Message Display (AMD) function.
AMD AUTO DISPLAY	Enables or disables scrolling display of received messages on the front panel.

Table 4-23. PGM>Mode>ALE>Config Settings (Continued)

Menu Item	CONFIG (ALE)
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.
LINK PROTECT LEVEL	Enables or disables ALE Level 1 Linking Protection (OFF = disable, Level 1 = enable). ALE Level 1 linking protection prevents undesired disruption of ALE links. Linking protection scrambles ALE handshake signaling with the specified Link Protection key so that only a receiving station with the same link protection key will successfully interpret the signal. (This is not to be confused with DOD Type I encryption.)
LINK PROTECT KEY	Configures the Link Protection key, a 14-digit hexidecimal number.

4.8.4   Program Mode ALE LQA

The AN/PRC-150(C) uses Link Quality Analysis (LQA) to predict the quality of the radio channels. Each channel score is a weighted average of Signal + Noise + Distortion to Noise + Distortion Ratio (SINAD) and Bit Error Rate (BER) accumulation over the entire signalling interval. The score ranges from 0 to 100, where 100 is the best score. Scores are stored for each ALE address the LQA was performed with. LQAs consist of exchange and sound. Exchanges are bidirectional. Each station transmits so both (or all in a net) can measure the link quality. Sounds are one-way transmissions and allow the receiving station to measure the link quality. The transmitting station will not have LQA scores. The following paragraphs describe programming of LQAs.

> ⚠ **WARNING**
>
> RF shock could occur from coming into contact with the antenna while radio is transmitting. Radio could transmit without any key presses during operations such as 3G, VSWR test, IP, data operations, LQAs etc.

4.8.4.1   Program Mode ALE LQA - Add LQA Exchange with Individual Address

See Figure 4-18. Perform the following procedure to add an LQA exchange with an individual address:

    a.   Choose **PGM>MODE>ALE>LQA** menu choices.

    b.   Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

    c.   Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

    d.   Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

    e.   Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed and press **[ENT]**.

    f.   Press the numeric keys to enter the **OFFSET TIME** (24-hour format) and press **[ENT]**.

g. Press the numeric keys to enter the **REPEAT INTERVAL** (24-hour format), and press **[ENT]**.

NOTE

A repeat interval of 0 cause the exchange to be invalid

h. Press **[CLR]** to return to the **ALE** menu.

4.8.4.2 Program Mode ALE LQA - Review LQA Exchange with Individual Address

See Figure 4-18. Perform the following procedure to review an individual LQA exchange:

a. Choose **PGM>MODE>ALE>LQA** menu choices.

b. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed.

f. Press **[ENT]** to view the **OFFSET TIME**.

g. Press **[ENT]** to view the **REPEAT INTERVAL**.

h. Press **[CLR]** to return to the **ALE** menu.

4.8.4.3 Program Mode ALE LQA - Delete LQA Exchange with Individual Address

See Figure 4-18. Perform the following address to delete an LQA exchange with an individual address:

a. Choose **PGM>MODE>ALE>LQA** menu choices.

b. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **INDIVIDUAL** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed.

f. 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.

g. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.8.4.4   Program Mode ALE LQA - Add LQA Exchange with Net Address

See Figure 4-18. Perform the following procedure to add a net LQA exchange:

a.   Choose **PGM>MODE>ALE>LQA** menu choices.

b.   Use the **▲▼** keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

c.   Use the **▲▼** keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

d.   Use the **▲▼** keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

e.   Use the **▲▼** keys to scroll through the list of individual addresses until the desired address is displayed and press **[ENT]**.

f.   Press the numeric keys to enter the **OFFSET TIME** (24-hour format) and press **[ENT]**.

g.   Press the 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 f.

h.   Press **[CLR]** to return to the **ALE** menu.

4.8.4.5   Program Mode ALE LQA - Review LQA Exchange with Net Address

See Figure 4-18. Perform the following procedure to review a net LQA exchange:

a.   Choose **PGM>MODE>ALE>LQA** menu choices.

b.   Use the **▲▼** keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

c.   Use the **▲▼** keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

d.   Use the **▲▼** keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

e.   Use the **▲▼** keys to scroll through the list of individual addresses until the desired address is displayed.

f.   Press **[ENT]** to view the **OFFSET TIME**.

g.   Press **[ENT]** to view the **REPEAT INTERVAL**.

h.   Press **[CLR]** to return to the **ALE** menu.

4.8.4.6   Program Mode ALE LQA - Delete LQA Exchange with Net Address

See Figure 4-18. Perform the following procedure to delete a LQA exchange with net address:

a.   Choose **PGM>MODE>ALE>LQA** menu choices.

b.   Use the **▲▼** keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **EXCHANGE** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **EXCHANGE TYPE** options (**INDIVIDUAL, NET**). Select **NET** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the **EXCHANGE WITH** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the list of individual addresses until the desired address is displayed.

f. 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.

g. Press **[CLR]** repeatedly to return to the **ALE** menu.

4.8.4.7 Program Mode ALE LQA - Add LQA Sound

See Figure 4-18. Perform the following procedure to add an LQA sound:

a. Choose **PGM>MODE>ALE>LQA** menu choices.

b. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **SOUND** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **SOUND USING** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the sound using addresses until the desired address is displayed, and press **[ENT]**.

e. Press the numeric keys to enter the **OFFSET TIME** (24-hour format) and press **[ENT]**.

f. Press the numeric keys to enter the **REPEAT INTERVAL** (24-hour format) and press **[ENT]**.

g. Use the ▲▼ keys to scroll the **LQA TYPE** options (**EXCHANGE, SOUND**) 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.

h. Press **[CLR]** to return to the **ALE** menu.

4.8.4.8 Program Mode ALE LQA - Review LQA Sound

See Figure 4-18. Perform the following procedure to review an LQA sound:

a. Choose **PGM>MODE>ALE>LQA** menu choices.

b. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **SOUND** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **SOUND USING** options (**ADD, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the sound using addresses until the desired address is displayed and press **[ENT]**.

e. Press **[ENT]** to view the **OFFSET TIME**.

f. Press **[ENT]** to view the **REPEAT INTERVAL**.

g. Press **[CLR]** to return to **ALE** menu.

4.8.4.9   Program Mode ALE LQA - Delete LQA Sound

See Figure 4-18. Perform the following procedure to delete an LQA sound:

a. Choose **PGM>MODE>ALE>LQA** menu choices.

b. Use the ▲▼ keys to scroll through the **LQA TYPE** options (**EXCHANGE, SOUND**). Select **SOUND** and press **[ENT]**.

c. Use the ▲▼ keys to scroll through the **SOUND USING** options (**ADD, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

d. Use the ▲▼ keys to scroll through the sound using addresses until the desired address is displayed.

e. 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.

f. Press **[CLR]** to return to **ALE** menu.

4.8.5   Program Mode ALE AMD

The AN/PRC-150(C) 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 AN/PRC-150(C) until the message is deleted or the AN/PRC-150(C) 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.

4.8.5.1   Program Mode ALE AMD TX_MSG - Create a TX_MSG

See Figure 4-18. Perform the following procedure for **TX_MSG** programming:

a. Choose **PGM>MODE>ALE>AMD>TX_MSG** menu choices.

b. Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

c. Press the ▲▼ keys to scroll to an empty **TX MESSAGE** and press **[ENT]**. Empty text messages consist of a string of underscore characters.

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.

NOTE

Press the 0 key repeatedly to insert zero, space, or punctuation characters. The sequence of 0 key characters is as follows: 0 <space>,. ' " / \ _ : ; * & ! ? @ # $ % + - = < > ^ ( ) [ ]

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.

    d.   Press **[ENT]** to start editing the message.

    e.   Press the alphanumeric keys to enter the message, then press **[ENT]** to save the message.

    f.   Press **[CLR]** twice to return to the **ALE** menu.

4.8.5.2 Program Mode ALE AMD TX_MSG - Edit a TX_MSG

See Figure 4-18. Perform the following procedure to edit a TX_MSG:

    a.   Choose **PGM>MODE>ALE>AMD>TX_MSG** menu choices.

    b.   Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

    c.   Use 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.

    d.   Press the alphanumeric keys to enter the message, then press **[ENT]** to save the message.

    e.   Press **[CLR]** twice to return to the **AMD** menu.

4.8.5.3 Program Mode ALE AMD TX_MSG - Review a TX_MSG

See Figure 4-18. Perform the following procedure to review a **TX_MSG**:

    a.   Choose **PGM>MODE>ALE>AMD>TX_MSG** menu choices.

    b.   Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

    c.   Use the ▲▼ keys to scroll through the TX messages until the desired message is displayed and press **[ENT]**.

d.   Use the ▲▼ keys to scroll through the message (if applicable).

e.   Press **[ENT]** to view the whole message.

f.   Press **[ENT]** to return to the **TX MESSAGE** screen.

g.   Press **[CLR]** twice to return to the **AMD** menu.

4.8.5.4   Program Mode ALE AMD TX_MSG - Delete a TX_MSG

See Figure 4-18. Perform the following procedure to delete a TX_MSG:

a.   Choose **PGM>MODE>ALE>AMD** menu choices.

b.   Use the ▲▼ keys to scroll through the **TX MESSAGE** options (**EDIT, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

c.   Use the ▲▼ keys to scroll through the TX messages until the desired message is displayed and press **[ENT]**.

<div align="center">

NOTE

The operation (**DELETE**) and the index of the TX message
appear on the top line of the display.

</div>

d.   Use 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.

e.   Press **[CLR]** twice to return to the **AMD** menu.

4.8.5.5   Program Mode ALE AMD RX_MSG - 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 4-18. Perform the following procedure to review an RX_MSG:

a.   Choose **PGM>MODE>ALE>AMD>RX_MSG** menu choices.

b.   Use the ▲▼ keys to scroll through the **RX MESSAGE** options (**COPY, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

c.   Use the ▲▼ keys to scroll through the RX messages until the desired message is displayed and press **[ENT]**.

<div align="center">

NOTE

The message NO RX MESSAGE is displayed if there are not
receive messages available to review.

</div>

d.   Use the ▲▼ keys to scroll through the message (if applicable).

e.   Press **[ENT]** to view the whole message.

f.   Press **[ENT]** to return to the **RX MESSAGE** screen.

g.   Press **[CLR]** repeatedly to return to the **AMD** or **ALE** menu.

4.8.5.6   Program Mode ALE AMD RX_MSG - Copy an RX_MSG

Use this operation to create a TX_MSG from an RX_MSG to be retransmitted. See Figure 4-18. Perform the following procedure to copy an RX_MSG:

a. Choose **PGM>MODE>ALE>AMD>RX_MSG** menu choices.

b. Use the ▲▼ keys to select message to copy and press **[ENT]**.

c. Scroll through the **RX MESSAGE** options (**COPY, REVIEW, DELETE**). Select **COPY** and press **[ENT]**.

d. Use 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.

e. Press **[CLR]** repeatedly to return to the **AMD** or **ALE** menu.

4.8.5.7   Program Mode ALE AMD RX_MSG - Delete an RX_MSG

See Figure 4-18. Perform the following procedure to delete an RX_MSG:

a. Choose **PGM>MODE>ALE>AMD>RX_MSG** menu choices.

b. Use the ▲▼ keys to scroll through the **RX MESSAGE** options (**COPY, REVIEW, DELET**E). Select **DELETE** and press **[ENT]**.

c. Use 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.

d. Use 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.

e. Press **[CLR]** repeatedly to return to the **AMD** or **ALE** menu.

4.9   PROGRAM MODE 3G

Due to the complexity of configuring the radio for use in 3G or 3G+ radio mode, all 3G network programming must be accomplished initially through the RF-6550H-RPA, however a limited set of 3G network programming functions are available via the KDU. For information on setting up and programming a 3G network into the AN/PRC-150(C), refer to RPA online help and Paragraph 4.2. If programming fails to load properly, the screen shown in Figure 4-19 is displayed.

```
 R  BAT ■▭      3G   SQ PT
       INCOMPLETE 3G FILL
```
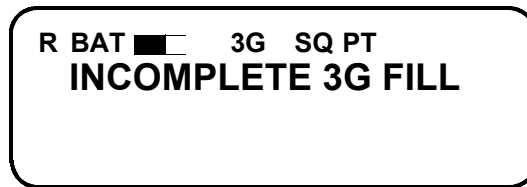
Figure 4-19. Incomplete 3G Fill Screen

4.9.1   HCMAC and FLSU Programming

The selection of High Capacity Media Access Control (HCMAC) or Fast Link Set Up (FLSU) (4538) is established when 3G parameters are set for each 3G or 3G+ communications plan within the RF-6550H RPA. Refer to Paragraph 3.20.28 for operational overview of HCMAC and FLSU.

4.9.2   LPI/LPD Programming

Use of Low Probability of Detection (LPD) operation requires that the radios have been programmed with a communications plan in which one or more channel plans of LPD types have been created as opposed to FLSU or HCMAC. If an LPD channel plan were named DAY_LPD in using the RPA, the operator would just select the plan using the KDU. (Refer to Paragraph 3.19.6.)

4.9.3   Program 3G Net COMSEC Keys

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

The following sections show how to Add/Edit/Review/Delete the COMSEC key associated to a 3G NET.

NOTE

TYPE 1 COMSEC keys are only activated when the radio cipher mode switch is in CT.

If the radio is unable to activate the TYPE 1 COMSEC key because the radio cipher mode switch is in Citadel Cover (CC), the radio will attempt to activate a CITADEL key if it can find a CITADEL key name that matches the TYPE 1 key name.

If the radio cannot activate any COMSEC key while operating in CC or CT cipher mode, a "KEY NOT SELECTED" error will be reported and the radio will be unable to pass digital voice or data traffic.

4.9.4 Program Mode 3G - Add/Edit (TYPE 1) COMSEC Key for a 3G Net

Refer to Table 4-24 and see Figure 4-20. Perform the following procedure to program a TYPE 1 encryption key for a 3G net:

a. Choose **PGM>MODE>3G>ASSIGN KEYS** menu choices.

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

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

d. Use ▲▼ keys to scroll through the **ENCRYPTION TYPE** options **(TYPE1, CITADEL, NONE)**. Select **TYPE1** and press **[ENT]**.

e. Use ▲▼ keys to scroll through the **CRYPTO MODE** options **(ANDVT-BD, KG-84R, KG-84NR)**. Select the desired encryption mode and press **[ENT]**.

f. Use ▲▼ keys to scroll through the **ENCRYPTION KEY** currently loaded into the radio. Press **[ENT]** to associate the encryption key name to the 3G net and return to the **ASSIGN KEYS** menu.

4.9.5 Program Mode 3G - Add/Edit (CITADEL) COMSEC Key for a 3G Net

Refer to Table 4-24 and see Figure 4-20. Perform the following procedure to program a **CITADEL** encryption key for a 3G net:

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

NOTE

If no 3G nets have been programmed, a warning message will be displayed and the user will not be allowed to proceed.

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

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

d. Use ▲▼ keys to scroll through the **ENCRYPTION TYPE** options **(TYPE1, CITADEL, NONE)**. Select **CITADEL** and press **[ENT]**.

e. Use ▲▼ keys to scroll through the **CITADEL ENCR KEY** currently loaded into the radio. Press **[ENT]** to associate the encryption key name to the 3G net and return to the **ASSIGN KEYS** menu.

NOTE

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

f. Press **[ENT]** to assign the crypto mode and encryption key name to the 3G net and return to the **ASSIGN KEYS** menu.

4.9.6 Program Mode 3G - Review COMSEC Key for a 3G Net

Refer to Table 4-24 and see Figure 4-20. Perform the following procedure to review an encryption key for a 3G net:

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

NOTE

If no 3G nets have been programmed, a warning message will be displayed and the user will not be allowed to proceed.

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

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

4.9.7 Program Mode 3G - Delete COMSEC Key Associated to a 3G Net

Refer to Table 4-24 and see Figure 4-20. Perform the following procedure to delete the encryption key associated to a 3G NET:

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

NOTE

If no 3G nets have been programmed, a warning message will be displayed and the user will not be allowed to proceed.

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

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

d. Use ▲▼ keys to scroll through the **ENCRYPTION TYPE** options **(TYPE1, CITADEL, NONE)**. Select **NONE** and press **[ENT]** and return to the **ASSIGN KEYS** menu. The 3G net no longer has any encryption key associated with it.

NOTE

If the radio is operating in CC or CT cipher mode and a 3G link is established with a NET that has no COMSEC key associated with it, a "KEY NOT SELECTED" error will be reported and the radio will be unable to pass digital voice or data traffic.

Table 4-24. PGM>Mode>3G Menu Settings

3G MENU		
Menu Item	**Options**	**Remarks**
NET	XXXXXXXXXXXXXXX	3G NET address to assign an encryption key. 3G NET address can be up to 15 characters in length.
CURRENT ENCR KEY	TTTTTTT:KKKKK	Displays the encryption key currently associated to the 3G NET.
		For a TYPE 1 Key: • TTTTTTT - shows the TYPE1 encryption mode **(ANDVT-BD, KG-84R, KG-84NR)**
		For a CITADEL KEY: • TTTTTTT - set to **"CITADEL"**
		KKKKK - shows the encryption key type (i.e. TEK01)
		If no encryption key is assigned to the 3G NET, then "NONE" is displayed.
ENCRYPTION TYPE	TYPE1 CITADEL NONE	Assign the encryption type for the 3G NET.
CRYPTO MODE	ANDVT-BD KG-84R KG-84NR	Assign the (TYPE1) encryption mode for the 3G NET.
ENCRYPTION KEY	XXXXX	Assign the (TYPE1) encryption key for the 3G NET. Displays only TYPE1 keys that are currently loaded in the radio (for a given encryption mode).
CITADEL ENCR KEY	XXXXX	Assign the (CITADEL) encryption key for the 3G NET. Displays only CITADEL keys that are currently loaded in the radio.

```
        ( 8 VWX
            PGM )
            |
        [ MODE ]
            |
        [ 3G ]
            |
    [ ASSIGN KEYS ]
            |
            |——— NET
            |      ##
            |
            |——— CURRENT ENCR KEY
            |      ###### : ####
            |
            |——— ENCRYPTION TYPE
            |        |——— TYPE1
            |        |——— CITADEL
            |        |——— NONE
            |
            |——— CRYPTO MODE*
            |        |——— ANDVT-BD
            |        |——— KG-84R
            |        |——— KG-84NR
            |
            |——— ENCRYPTION KEY*
            |      #####
            |
            |——— CITADEL ENCR KEY**
                   #####
```
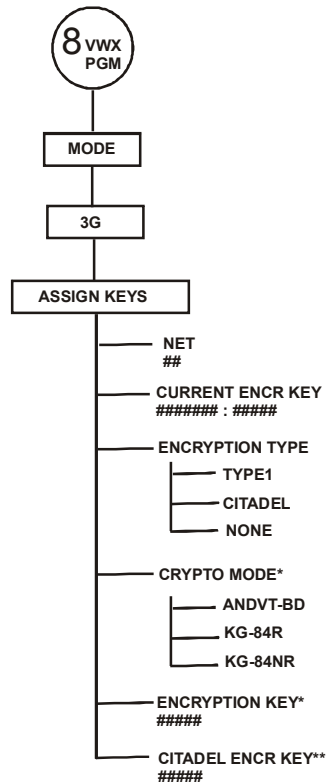
*ONLY DISPLAYED WHEN ENCRYPTION TYPE IS TYPE1.
**ONLY DISPLAYED WHEN ENCRYPTION TYPE IS CITADEL.

CL-0103-4200-0050

Figure 4-20. PGM>Mode>3G Menu

4.10   PROGRAM MODE HOP

The following paragraphs provide information on programming HOP net.

4.10.1   Overview

The most commonly used TRANSEC technique is frequency hopping (also known as ECCM). This frequency hopping capability provides advanced antijam protection for communications. In HOP radio mode, the transmitter frequency changes so rapidly that it is difficult to intercept or jam the signal. For additional security, hopping data and digital voice data can be encrypted. An important aspect of hopping is synchronization. Synchronization is the process of aligning HOP signals to within a very narrow time sequence. This can be accomplished either manually or with the use of GPS. The AN/PRC-150(C) uses three frequency hopping techniques discussed in the following paragraphs.

NOTE

The frequency hopping used in the AN/PRC-150(C) is incompatible with the HOP radio mode in the RF-5000 and AN/PRC-138.

4.10.2 Overview - 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 AN/PRC-150(C) 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 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. Because bandwidth requirements of wideband hopping exceed 15 kHz, the coupler must be disabled and a wideband antenna must be used.

4.10.3 Overview - Narrowband Hopping

Narrowband hopping uses frequencies within a defined bandwidth of the center frequency (F_c) (multiples of 5 kHz). Refer to Table 4-25. 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). Additionally, the internal coupler can be enabled. Refer to Paragraph 4.10.4 for the exception to this rule.

Table 4-25. 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 non-symmetrical hopsets.

4.10.4 Overview - Special Center Frequency Cases

Since transmitted frequencies below 2.0 MHz or above 29.997 MHz are not allowed, the AN/PRC-150(C) 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.

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. The highest frequency can be found by adding the bandwidth to the lowest frequency in the hopset. 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.

4.10.5 Overview - 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. Frequencies entered must be in the same order in all radios of the planned net. The coupler must be disabled and a wideband antenna must be used in list hopping. If the span of frequencies is too wide and the coupler is enabled, VSWR errors could occur.

4.10.5.1 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.

4.10.5.2 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(C) radio software supports the external time fill from a standard GPS device for TOD setting. Time accuracy is required for channel scanning synchronization, frequency hopping synchronization, and 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 AN/PRC-150(C) 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.

4.10.5.3 Manual Synchronization

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

4.10.5.4 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.

4.10.5.5 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 AN/PRC-150(C). 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.

4.10.5.6 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.

4.10.6 Program Mode Hop - Add Narrowband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to program a HOP channel:

a. Choose **PGM>MODE>HOP>CHANNEL** menu choices.

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]**.

d. Use the ▲▼ keys to select **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **NARROW** and press **[ENT]**.

e. Press the numeric keys to enter the **CENTER FREQUENCY** in MHz (5 kHz resolution; for example: 12.550 MHz), and press **[ENT]**.

f. Press the 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.

g. Press the 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 AN/PRC-150(C) will provide a default TOD Mask for the
net if none is programmed.

h. Use the ▲▼ keys to select **AUTORESPOND** options (**YES, NO**) and press **[ENT]**. This setting determines whether the AN/PRC-150(C) will respond automatically to sync requests on this channel.

NOTE

When using Autorespond, only one radio in the net should be
configured to Autorespond.

i. Press **[CLR]** to return to the **HOP** menu.

4.10.7   Program Mode Hop - Review Narrowband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to review a narrowband HOP channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

c.   Press the ▲▼ keys to select the **HOP CHANNEL** to be reviewed and press **[ENT]**.

d.   Check that the **HOP TYPE** option **NARROW** is selected and press **[ENT]**.

e.   Check that the **CENTER FREQ** option is correct and press **[ENT]**.

f.   Check that the **HOP CHANNEL ID** is correct and press **[ENT]**.

g.   Check that the **TOD MASK** is correct and press **[ENT]**.

h.   Check that the **AUTORESPOND** option **(YES/NO)** is correct and press **[ENT]**.

i.   Press **[CLR]** to return to the **HOP** menu.

4.10.8   Program Mode Hop - Edit Narrowband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to edit a narrowband HOP channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

c.   Press the ▲▼ keys to select the **HOP CHANNEL** to be edited and press **[ENT]**.

d.   Press the ▲▼ keys to select the **HOP TYPE** option **(NARROW, WIDE, LIST)** select **NARROW** and press **[ENT]**.

e.   Press the numeric keys to enter the **CENTER FREQUENCY** in MHz (5 kHz resolution; for example: 12.550 MHz), and press **[ENT]**, or press **[ENT]** to use the displayed Center Frequency.

f.   Press the 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.

g.   Press the 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.

h.   Press the ▲▼ keys to select the **AUTORESPOND** option **(YES/NO)** and press **[ENT]** to accept the option.

NOTE

When using Autorespond, only one radio in the net should be configured to Autorespond.

i. Press **[CLR]** to return to the **HOP** menu.

4.10.9   Program Mode Hop - Delete Narrowband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to delete a narrowband HOP channel:

a. Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b. Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

c. Press the ▲▼ keys to select the **HOP CHANNEL** to be deleted. Press **[CLR]** to go back without deleting the Hop Channel or press **[ENT]** to delete the Hop Channel.

d. Press **[CLR]** to return to the **HOP** menu.

4.10.10   Program Mode Hop - Add Wideband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to program a wideband HOP channel:

a. Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b. Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). 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]**.

d. Use the ▲▼ keys to select **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **WIDE** and press **[ENT]**.

e. Press the numeric keys to enter the **LOWER FREQUENCY** in MHz (minimum 2 MHz) and press **[ENT]**.

f. Press the numeric keys to enter the **UPPER FREQUENCY** range (100 Hz resolution) in MHz (maximum 29.9999 MHz) and press **[ENT]**.

g. Press the 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.

h. Press the 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 AN/PRC-150(C) will provide a default TOD Mask for the net if none is programmed.

i. Use the ▲▼ keys to select **AUTORESPOND** options (**YES, NO**) and press **[ENT]**. This setting determines whether the AN/PRC-150(C) will respond automatically to sync requests on this channel.

j.   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.

4.10.11   Program Mode Hop - Review Wideband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to review a wideband HOP channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

c.   Press the ▲▼ keys to select the **HOP CHANNEL** to be reviewed and press **[ENT]**.

d.   Check that the **HOP TYPE** option **WIDE** is selected and press **[ENT]**.

e.   Check that the **LOWER FREQ** value is correct and press **[ENT]**.

f.   Check that the **UPPER FREQ** value is correct and press **[ENT]**.

g.   Check that the **HOP CHANNEL ID** value is correct and press **[ENT]**.

h.   Check that the **TOD MASK** value is correct and press **[ENT]**.

i.   Check that the **AUTORESPOND** option **(YES/NO)** is correct and press **[ENT]**.

j.   Press **[CLR]** to return to the **HOP** menu.

4.10.12   Program Mode Hop - Edit Wideband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to edit a wideband HOP channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

c.   Press the ▲▼ keys to select the **HOP CHANNEL** to be edited and press **[ENT]**.

d.   Press the ▲▼ keys to select the **HOP TYPE** option **(NARROW, WIDE, LIST)** select **WIDE** and press **[ENT]**.

e.   Press the numeric keys to enter the **LOWER FREQUENCY** in MHz (minimum 2 MHz) and press **[ENT]**, or press **[ENT]** to use the displayed Lower Frequency.

f.   Press the numeric keys to enter the **UPPER FREQUENCY** in MHz (100 Hz resolution) (maximum 29.999 MHz) and press **[ENT]**, or press **[ENT]** to use the displayed Upper Frequency.

g.   Press the 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.

h.   Press the 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.

i.   Press the ▲▼ keys to select the **AUTORESPOND** option **(YES/NO)**. Press **[ENT]** to accept the option. This setting determines whether the R/T will respond automatically to sync requests on this channel.

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.

j.   Press **[CLR]** to return to the **HOP** menu.

4.10.13   Program Mode Hop - Delete Wideband HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to delete a wideband HOP channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

c.   Press the ▲▼ keys to select the **HOP CHANNEL** to be deleted. Press **[CLR]** to go back without deleting the Hop Channel, or press **[ENT]** to delete the Hop Channel.

d.   Press **[CLR]** to return to the **HOP** menu.

4.10.14   Program Mode Hop - Add List HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to add list frequencies to a list Hop channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). 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]**.

d.   Use the ▲▼ keys to scroll through the **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **LIST** and press **[ENT]**.

e.   Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE LIST MEMBERS?** options (**YES, NO**).
If **YES** is selected, press **[ENT]** and proceed to Step f.
If **NO** is selected, press **[ENT]** and proceed to Step k.

f.   Use the ▲▼ keys to scroll through the **LIST FREQ** options (**ADD, REVIEW, DELETE**). Select **ADD** and press **[ENT]**.

g.   Press the 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. Frequencies entered must be in the same order in all radios of the planned net.

h.   Repeat Step g 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).

i.   Press **[CLR]** twice to exit the **ADD LIST FREQ** menu and return to the **ADD/REVIEW/DELETE** List Members screen.

j.   Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE** List Members options (**YES, NO**). Select **NO** and press **[ENT]**.

k.   Press the 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.

l.   Press the 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.

m.   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.

n.   Press **[CLR]** to return to the **HOP** menu.

4.10.15   Program Mode Hop - Review List Frequencies of a List HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to review list frequencies of a list HOP channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **REVIEW** and press **[ENT]**.

c.   Use the ▲▼ keys to scroll through the hop channels. Select the **HOP CHANNEL** to be reviewed and press **[ENT]**.

d.   Check that the **HOP TYPE** is **LIST** and press **[ENT]**.

e.   Use the ▲▼ keys to scroll through the **REVIEW LIST MEMBERS?** options (**YES, NO**).
If **YES** is selected, press **[ENT]** and proceed to Step f.
If **NO** is selected, press **[ENT]** and proceed to Step h.

f.   Use the ▲▼ keys to review the frequency list.

g.   Press **[CLR]** to return to the **REVIEW LIST MEMBERS?** options (**YES, NO**), select **NO** and press **[ENT].**

h.   Check that the **HOP CHANNEL ID** value is correct and press **[ENT]**.

i.   Check that the **TOD MASK** value is correct and press **[ENT]**.

j.   Check that **AUTORESPOND** option is set to **(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.

4.10.16   Program Mode Hop - Edit List Frequencies of a List HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to edit list frequencies from a list HOP channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

c.   Use the ▲▼ keys to select the **HOP CHANNEL** to be edited and press **[ENT]**.

d.   Use the ▲▼ keys to scroll through the **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **LIST** and press **[ENT]**.

e.   Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE LIST MEMBERS** options (**YES, NO**).
To Add, Review or Delete List Members, select **YES**, press **[ENT]** and proceed to Step f.
To skip this step, select **NO**, press **[ENT]** and proceed to Step g.

f.   Use the ▲▼ keys to scroll through the **LIST FREQ** options **(ADD, DELETE, REVIEW)**.
If option is **ADD**, select **ADD**, press **[ENT]** and proceed to Step g in Paragraph 4.10.14.
If option is **REVIEW**, select **REVIEW**, press **[ENT]** and proceed to Step f per Paragraph 4.10.15.
If option is **DELETE**, select **DELETE**, press **[ENT]** and proceed to Step c per Paragraph 4.10.17.

g.   To complete this procedure, proceed to Step k per Paragraph 4.10.14.

4.10.17   Program Mode Hop - Delete List Frequencies from a List HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to delete list frequencies from a list Hop channel:

a.   Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b.   Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **EDIT** and press **[ENT]**.

c.   Use the ▲▼ keys to select the **HOP CHANNEL** to edit and press **[ENT]**.

d.   Use the ▲▼ keys to scroll through the **HOP TYPE** options (**NARROW, WIDE, LIST**). Select **LIST** and press **[ENT]**.

e. Use the ▲▼ keys to scroll through the **ADD/REVIEW/DELETE LIST MEMBERS** options (**YES, NO**). Select **YES** and press **[ENT]**.

f. Use the ▲▼ keys to scroll through the **ADD LIST FREQ** options **(ADD, REVIEW, DELETE)**. Select **DELETE** and press **[ENT]**.

g. Use the ▲▼ keys to scroll through the frequency list until the desired frequency is displayed.

h. Press **[ENT]** to delete the frequency, or press **[CLR]** to go back without deleting the frequency.

i. Press **[CLR]** several times 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 g and Step h until dashes are displayed (indicating that the list is empty).

4.10.18   Program Mode Hop - Delete a List HOP Channel

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to delete a wideband HOP channel:

a. Choose **PGM>MODE>HOP>CHANNEL** menu choices.

b. Use the ▲▼ keys to select **HOP CHANNEL** options (**ADD, EDIT, REVIEW, DELETE**). Select **DELETE** and press **[ENT]**.

c. Press the ▲▼ keys to select the **HOP CHANNEL** to be deleted. Press **[CLR]** to go back without deleting the Hop channel, or press **[ENT]** to delete the channel.

d. Press **[CLR]** to return to the **HOP** menu.

4.10.19   Program Mode Hop - Add/Edit/Review/Deleting an 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.

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to add an exclusion band:

a. Choose **PGM>MODE>HOP>EXCLUDE** menu choices.

b. Use the ◀▶ keys to select **EXCLUDE** from the **HOP** menu and press **[ENT]**.

c. Use the ▲▼ keys to scroll through **EXCLUDE BAND** options (**ADD, EDIT, REVIEW, DELETE**). Select and press **[ENT]**.

d. Press the numeric keys to enter the exclusion band number when adding; scroll to select band number when editing, reviewing, or deleting. The number entered must be in the range **0** to **9**. Press **[ENT]**.

e. Press the numeric keys to enter the lower frequency (100 Hz resolution), and press **[ENT]**.

f. Press the numeric keys to enter the upper frequency (100 Hz resolution), and press **[ENT]**.

g. Press **[CLR]** to return to the **HOP** menu and repeat Step b 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 f.

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4.10.20 Program Mode Hop - Configure

Refer to Table 4-26 and see Figure 4-21. Perform the following procedure to program the HOP configuration:

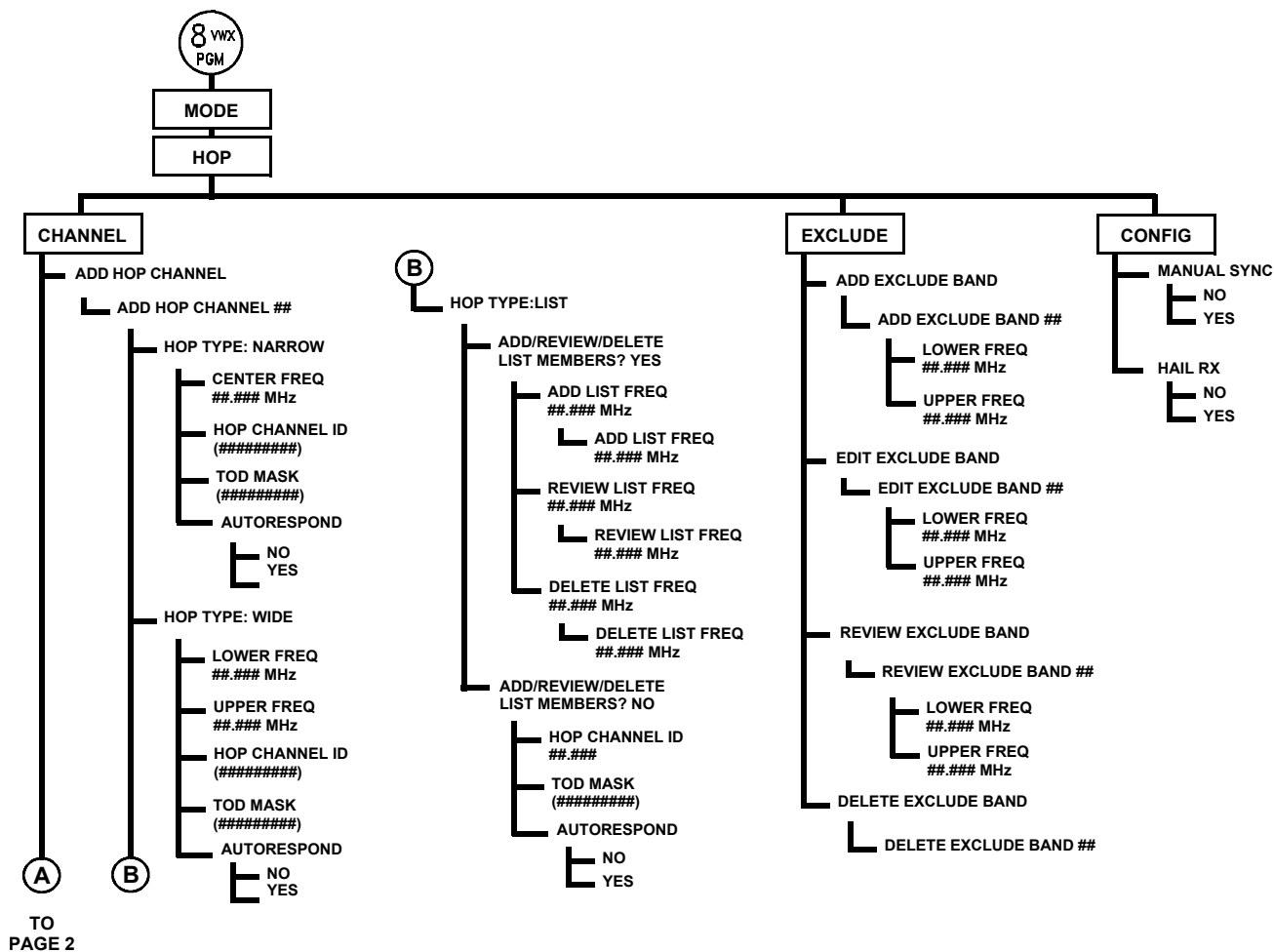   a.   Choose **PGM>MODE>HOP>CONFIG** menu choices.

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

    c.   Use the ▲▼ keys to select **MANUAL SYNC** options (**YES, NO**). This controls whether the AN/PRC-150(C) will send a manual sync when commanded to do so by the operator, and whether the AN/PRC-150(C) will respond to a manual sync sent by another radio. Press **[ENT]**.

    d.   Use the ▲▼ keys to select **HAIL RX** options (**YES, NO**). This controls whether the AN/PRC-150(C) will respond to a HOP Hail transmission from another radio. Press **[ENT]** to return to the **HOP** menu.

    e.   Press **[PGM]** to return to the normal operations display.

Table 4-26. PGM>Mode>Hop>Menu Settings

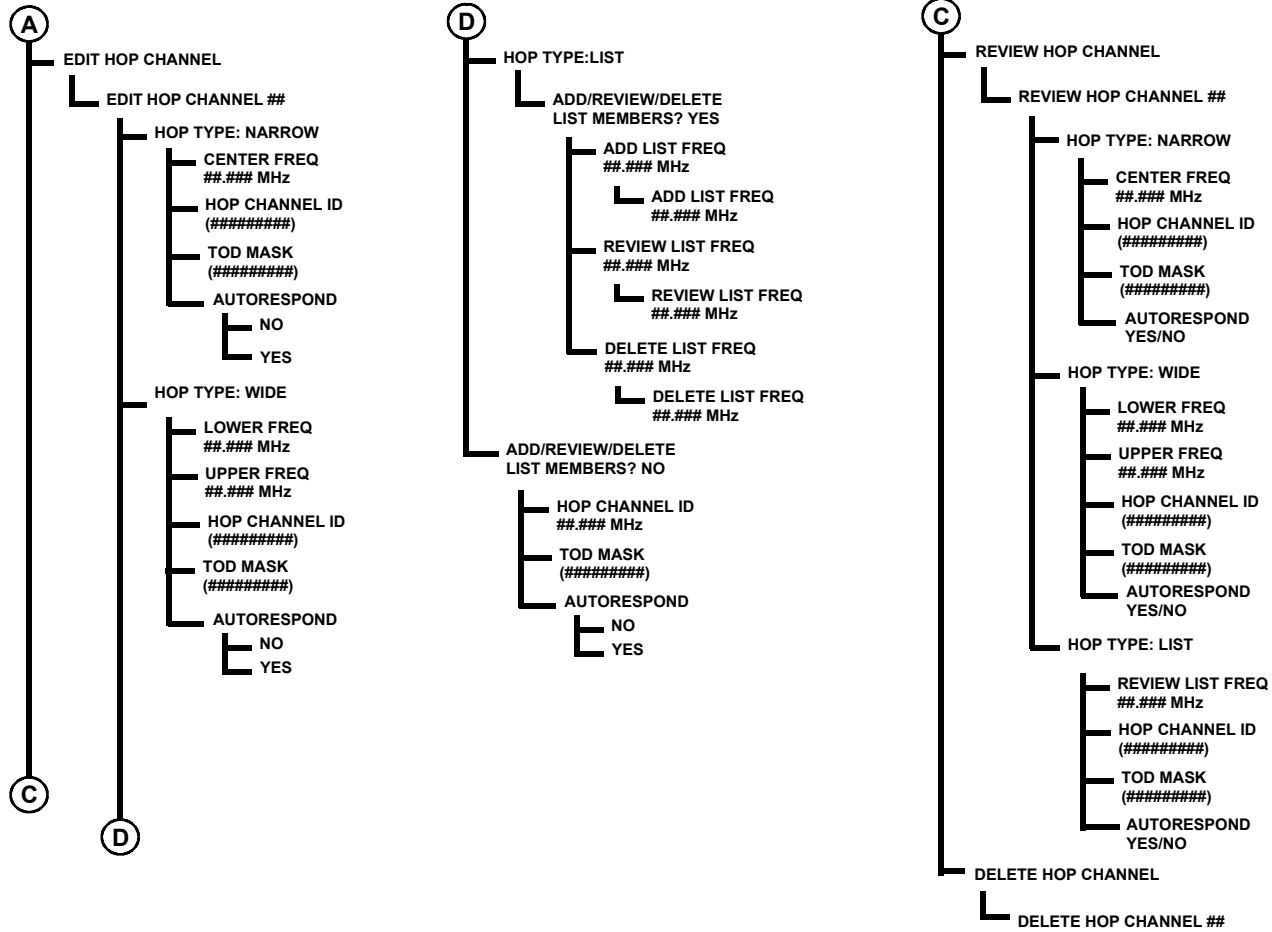| HOP MENU		
Menu Item	**Options**	**Remarks**
CHANNEL	---	Access to HOP channel (hopset) programming.
EXCLUDE	---	Access to HOP exclusion band programming.
CONFIG	---	Access to HOP configuration settings.
CHANNEL (HOP)		
HOP CHANNEL	00-19	Channel to be used for frequency hopping.
HOP TYPE	NARROW, WIDE, 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 4.10.6(d).
HOP MENU		
Menu Item	**Options**	**Remarks**
AUTORESPOND	YES, NO	**YES**: automatically respond to a sync request without operator intervention. **NO**: operator must initiate the response to a sync request.

Table 4-26. PGM>Mode>Hop>Menu Settings (Continued)

HOP TYPE		
Menu Items	**Options**	**Remarks**
NARROWBAND	2.0 MHz to 29.999 MHz (in multiples of 5 kHz)	Program the center frequency of the hopping bandwidth; choice of center frequency 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.
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 radio mode. **YES**: Accept hail. **NO**: Do not accept hail.
EXCLUDE		
ADD/EDIT/ REVIEW/DELETE BAND	**LOWER FREQ** 2.0 MHz to 29.999 MHz	Lower boundary of a bandwidth to be excluded from the hopping bandwidth.
	UPPER FREQ 2.0 MHz to 29.99 MHz	Upper boundary of a bandwidth to be excluded from the hopping bandwidth.

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Figure 4-21. PGM>Mode>Hop>Menu (Sheet 1 of 2)

FROM PAGE 1

(A)

EDIT HOP CHANNEL

　EDIT HOP CHANNEL ##

　　HOP TYPE: NARROW

　　　CENTER FREQ ##.### MHz

　　　HOP CHANNEL ID (########)

　　　TOD MASK (########)

　　　AUTORESPOND

　　　　NO

　　　　YES

　　HOP TYPE: WIDE

　　　LOWER FREQ ##.### MHz

　　　UPPER FREQ ##.### MHz

　　　HOP CHANNEL ID (########)

　　　TOD MASK (########)

　　　AUTORESPOND

　　　　NO

　　　　YES

(C)

(D)

(D)

HOP TYPE:LIST

　ADD/REVIEW/DELETE LIST MEMBERS? YES

　　ADD LIST FREQ ##.### MHz

　　　ADD LIST FREQ ##.### MHz

　　REVIEW LIST FREQ ##.### MHz

　　　REVIEW LIST FREQ ##.### MHz

　　DELETE LIST FREQ ##.### MHz

　　　DELETE LIST FREQ ##.### MHz

ADD/REVIEW/DELETE LIST MEMBERS? NO

　　HOP CHANNEL ID ##.### MHz

　　TOD MASK (########)

　　AUTORESPOND

　　　NO

　　　YES

(C)

REVIEW HOP CHANNEL

　REVIEW HOP CHANNEL ##

　　HOP TYPE: NARROW

　　　CENTER FREQ ##.### MHz

　　　HOP CHANNEL ID (########)

　　　TOD MASK (########)

　　　AUTORESPOND YES/NO

　　HOP TYPE: WIDE

　　　LOWER FREQ ##.### MHz

　　　UPPER FREQ ##.### MHz

　　　HOP CHANNEL ID (########)

　　　TOD MASK (########)

　　　AUTORESPOND YES/NO

　　HOP TYPE: LIST

　　　REVIEW LIST FREQ ##.### MHz

　　　HOP CHANNEL ID (########)

　　　TOD MASK (########)

　　　AUTORESPOND YES/NO

DELETE HOP CHANNEL

　DELETE HOP CHANNEL ##

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Figure 4-21. PGM>Mode>Hop Menu (Sheet 2 of 2)

4.11   PROGRAM MODE ARQ

Refer to Table 4-27 and see Figure 4-22. Perform the following procedure to program ARQ parameters:

   a.   Choose **PGM>MODE>ARQ** menu choices.

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

   c.   Use the ▲▼ keys to scroll through the **SELF ADDRESS** options (**ADD, REVIEW, DELETE**). Select **ADD,** and press **[ENT]**.

   d.   Press the numeric keys to enter an ARQ self address and press **[ENT]**.

   e.   Use the ▲▼ keys to scroll through the **SELF ADDRESS** options (**ADD, REVIEW, DELETE**). Select **REVIEW,** and press **[ENT]**.

   f.   Use the ▲▼ keys to review the existing **ARQ** self addresses and press **[ENT]**.

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

NOTE

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

   h.   Use the ▲▼ keys to select the **ARQ MODE** attribute (**ACKNOWLEDGED, NON-ACKNOWLEDGED**) and press **[ENT]**.

   i.   Use the ▲▼ keys to select one of the **NUMBER OF RETRIES** options (**0, 1, 2, 3, 4, 5, 6, 7**) and press **[ENT]**.

   j.   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.

   k.   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.

   l.   Press **[CLR]** key to return to **MODE** menu.

Table 4-27. PGM>Mode>ARQ Menu Settings

Menu Item	Options	Remarks
SELF ADDR	XXXXXXXXXXXXXXX	A 15-character address by which other radios identify this radio during an ARQ transmission.
CONFIG	ARQ MODE	**ACKNOWLEDGED**: Receiver requests retransmission of data that was received in error. **NON-ACKNOWLEDGED**: The transmission is sent once with no response from the receiving stations.

Table 4-27. PGM>Mode>ARQ Menu Settings (Continued)

Menu Item	Options	Remarks
NUMBER OF RETRIES	0-7	Number of times that a message is retransmitted before the transmitter terminates the data transfer.
LINK TRAFFIC MONITOR	ON, OFF	**ON**: Listens and identifies the source and destination of an ARQ transmission not addressed to this radio. **OFF**: Listens only for transmissions addressed to this radio.
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).
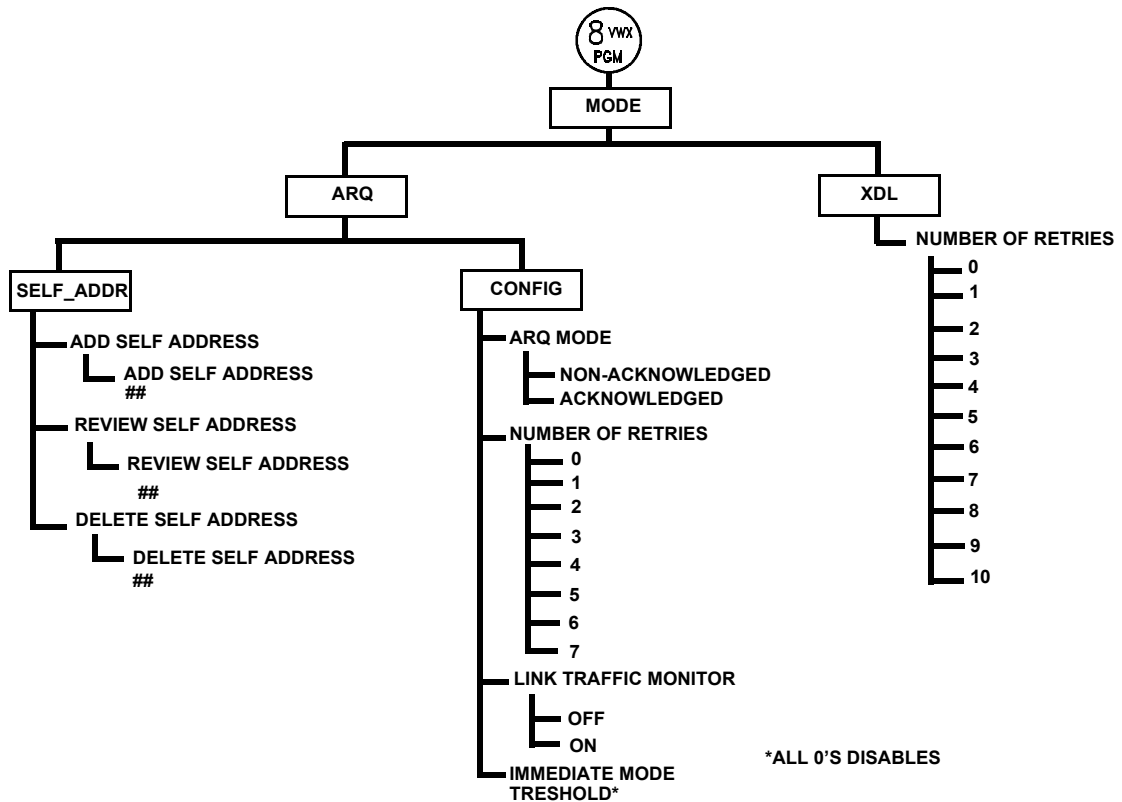
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Figure 4-22. PGM>Mode>ARQ and XDL Menus

4.12   PROGRAM MODE XDL

Refer to Table 4-28 and see Figure 4-22. Perform the following procedure to program XDL parameters:

a.   Choose **PGM>MODE>XDL** menu choices.

b.   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]**.

c.   Press **[CLR]** key to return to program menu.

Table 4-28. PGM>Mode>XDL Menu Settings

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

4.13   PROGRAM MODEM PRESETS

Refer to Table 4-29 and see Figure 4-23. Perform the following procedure to view modem preset programming trees:

a.   Choose **PGM>MODE>PRESET>MODEM** menu choices.

b.   Use the ▲▼ keys to scroll through the **MODEM PRESET TO CHANGE** and press **[ENT]**.

NOTE

Immediately after the AN/PRC-150(C) is zeroized, the modem presets are given default names of **MDM1** to **MDM20**.

c.   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.

d.   Use the ▲▼ keys to scroll through the **MODEM TYPE** and press **[ENT]**. See Figure 4-23.

NOTE

Different modem types have different options available. Figure 4-23 shows the optional modems that may be selected and the parameters that must be entered.

e.   Use the ▲▼ keys to scroll through the modem parameters pressing the **[ENT]** key after each selection.

f.   If additional modems are to be programmed, repeat Step b through Step e. Press the **[CLR]** key twice to return to the **MODE** menu after the modem parameters have been selected.

NOTE

Table 4-30 suggests several modem waveforms that are commonly selected for a given application. Table 3-1 lists the modems that are compatible with encryption, voice setting, or modulation.

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**.

NOTE

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.

Table 4-29. PGM>Mode>Preset>Modem Menu Setting

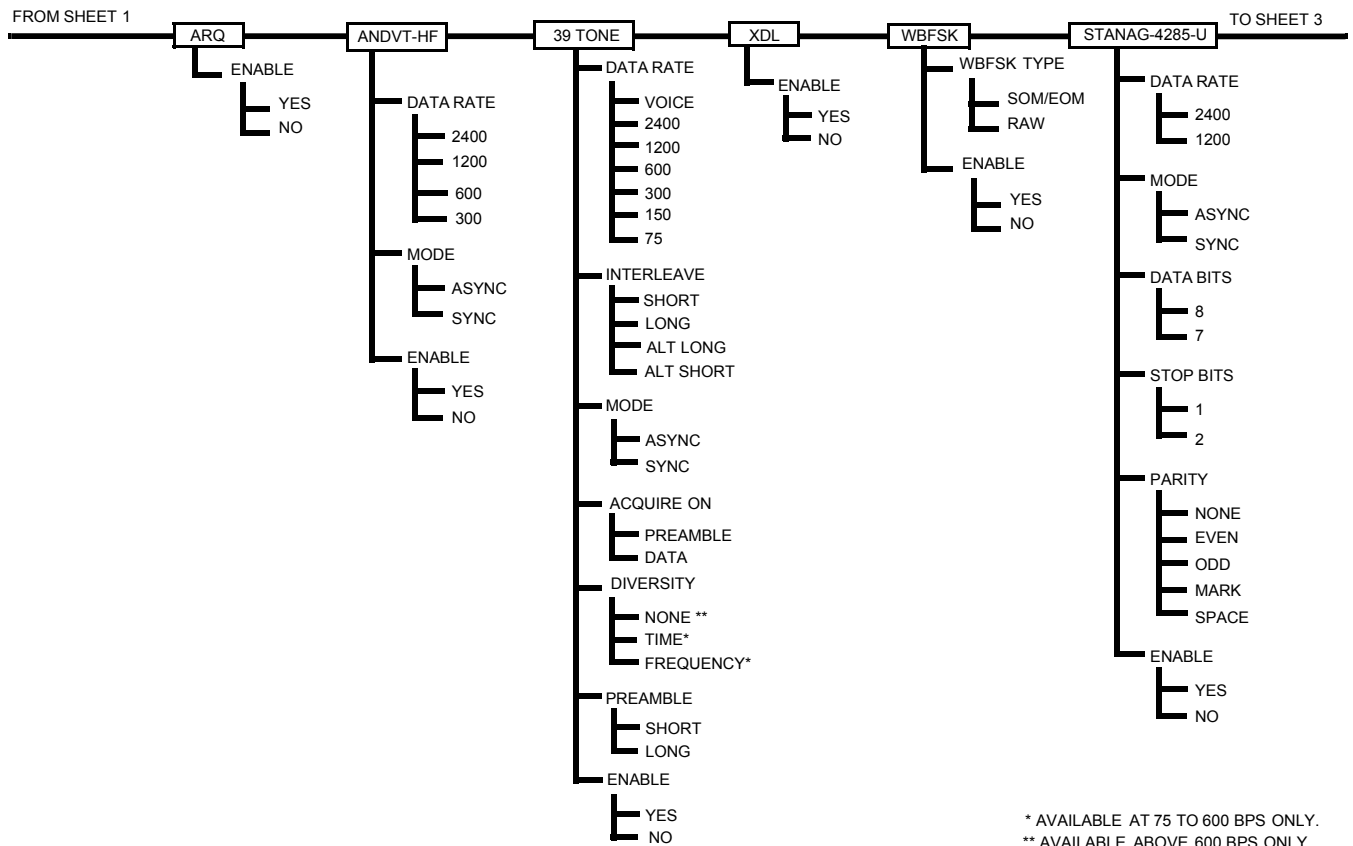| Menu Item	Description
MODEM	The modem menu.
MODEM PRESET TO CHANGE	Selects modem preset MDM1 through MDM20.
PRESET NAME	Selects the factory preset name or rename to custom preset name.
MODEM TYPE	Allows the selection of one of the following:
39-TONE	MIL-STD-188-110B Appendix B 39-tone modem waveform.
SERIAL	In FIX, ALE and 3G radio modes, specifies MIL-STD-188-110A serial tone waveform. The 75 bps data rate is also interoperable with STANAG 4415. In HOP radio mode, SERIAL waveform is HARRIS Proprietary.
ARQ	Serial tone/ARQ
ANDVT-HF	KY-99 compatible
AUTO	Serial tone/ARQ auto detect
WBFSK	Wideband Frequency Shift Keying (WBFSK) 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
HFNET	Must be selected to use the wireless IP capability of the radio.
STANAG-4285-C	STANAG 4285 - coded waveform.
STANAG-4285-U	STANAG 4285 - uncoded waveform.
MIL-110B	MIL-STD-188-110B serial tone waveform.
XDL	A robust burst modem waveform for error-free on-air data (ARQ-based) in 3G.

MODE

PRESET

MODEM

MODE PRESET
TO CHANGE:
MDM 1– 20

PRESET NAME
XXXXXXXX

MODEM TYPE

TO SHEET 2

MIL110B

DATA RATE
12800
9600
8000
6400
4800
3200
2400
1200
600
300
150
75

INTERLEAVE (75-2400)
LONG
SHORT
ZERO

INTERLEAVE (3200-9600)
SHORT
VERY LONG
LONG
MEDIUM
VERY SHORT
ULTRA SHORT

INTERLEAVE (12800)
ZERO

MODE
ASYNC
SYNC

DATA BITS
8
7

STOP BITS
1
2

PARITY
NONE
EVEN
ODD
MARK
SPACE

ENABLE
YES
NO

HFNET

ENABLE
YES
NO

TXIP TYPE
ARQ
SERIAL

DATA RATE (SERIAL TXIP)
12800
9600
8000
6400
4800
3200
2400
1200
600
300
150
75

INTERLEAVE (SERIAL TXIP)
SHORT
VERY LONG
LONG
MEDIUM
VERY SHORT
ULTRA SHORT

INTERLEAVE (SERIAL TXIP 12800)
ZERO

FSK-W

DATA RATE
300
150
75

MODE
ASYNC
SYNC

DATA BITS
8
7

STOP BITS
1
2

PARITY
NONE
EVEN
ODD
MARK
SPACE

ENABLE
YES
NO

FSK-V

DATA RATE
600
300
150
75

MODE
ASYNC
SYNC

DATA BITS
8
7

STOP BITS
1
2

PARITY
NONE
EVEN
ODD
MARK
SPACE

MARK FREQ
XXXX Hz

SPACE FREQ
XXXX Hz

ENABLE
YES
NO

FSK-N

DATA RATE
75

MODE
ASYNC
SYNC

DATA BITS
8
7

STOP BITS
1
2

PARITY
NONE
EVEN
ODD
MARK
SPACE

ENABLE
YES
NO

FSK-A

DATA RATE
150
75

MODE
ASYNC
SYNC

DATA BITS
8
7

STOP BITS
1
2

PARITY
NONE
EVEN
ODD
MARK
SPACE

ENABLE
YES
NO

NOTE: AVAILABLE OPTIONS ARE DEPENDENT UPON PARAMETERS SELECTED.

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Figure 4-23. PGM>Mode>Preset>Modem Menu (Sheet 1 of 3)

FROM SHEET 1

ARQ
- ENABLE
  - YES
  - NO

ANDVT-HF
- DATA RATE
  - 2400
  - 1200
  - 600
  - 300
- MODE
  - ASYNC
  - SYNC
- ENABLE
  - YES
  - NO

39 TONE
- DATA RATE
  - VOICE
  - 2400
  - 1200
  - 600
  - 300
  - 150
  - 75
- INTERLEAVE
  - SHORT
  - LONG
  - ALT LONG
  - ALT SHORT
- MODE
  - ASYNC
  - SYNC
- ACQUIRE ON
  - PREAMBLE
  - DATA
- DIVERSITY
  - NONE **
  - TIME*
  - FREQUENCY*
- PREAMBLE
  - SHORT
  - LONG
- ENABLE
  - YES
  - NO

XDL
- ENABLE
  - YES
  - NO

WBFSK
- WBFSK TYPE
  - SOM/EOM
  - RAW
- ENABLE
  - YES
  - NO

TO SHEET 3

STANAG-4285-U
- DATA RATE
  - 2400
  - 1200
- MODE
  - ASYNC
  - SYNC
- DATA BITS
  - 8
  - 7
- STOP BITS
  - 1
  - 2
- PARITY
  - NONE
  - EVEN
  - ODD
  - MARK
  - SPACE
- ENABLE
  - YES
  - NO

* AVAILABLE AT 75 TO 600 BPS ONLY.
** AVAILABLE ABOVE 600 BPS ONLY.

0103-4100-0033A-2

NOTE: AVAILABLE OPTIONS ARE DEPENDENT UPON PARAMETERS SELECTED.

Figure 4-23. PGM>Mode>Preset>Modem Menu (Sheet 2 of 3)

FROM SHEET 2

```
STANAG-4285-C          SERIAL              AUTO

    DATA RATE              DATA RATE           ENABLE
        2400                   4800                YES
        1200                   2400                NO
        600                    1200
        300                    600
        150                    300
        75                     150
    INTERLEAVE                 75
        SHORT              INTERLEAVE (75-2400)
        LONG                   SHORT
    MODE                       LONG
        ASYNC                  ZERO
        SYNC               INTERLEAVE (4800)
    DATA BITS                  ZERO
        8                  MODE
        7                      ASYNC
    STOP BITS                  SYNC
        1                  DATA BITS
        2                      8
    PARITY                     7
        NONE               STOP BITS
        EVEN                   1
        ODD                    2
        MARK               PARITY
        SPACE                  NONE
    ENABLE                     EVEN
        YES                    ODD
        NO                     MARK
                               SPACE
                           ENABLE
                               YES
                               NO
```

NOTE: AVAILABLE OPTIONS ARE DEPENDENT UPON PARAMETERS SELECTED.

0103-4100-0033A-3

Figure 4-23. PGM>Mode>Preset>Modem Menu (Sheet 3 of 3)

Table 4-30. Modem Waveform Application Examples

MODEM WAVEFORM APPLICATION EXAMPLES		
Application	**Recommended Waveform**	**Remarks**
HF e-mail, WMT (long distance), TAC CHAT	XDL or ARQ	Guarantees error-free data transfer. Automatically adapts data rate as necessary.
Point to Point (or short distance WMT)	MIL110B SERIAL STANAG 4285	600 - 9600 bps 600 - 4800 bps 600 - 2400 bps
Digital Imagery and Video (HUITS)	MIL110B SERIAL STANAG 4285	600 - 9600 bps 600 - 4800 bps 600 - 2400 bps
Wireless IP	HFNET	Use of ARQ is recommended.
Legacy Communications (TTY)	FSK	75 - 150 bps

Table 4-30. Modem Waveform Application Examples (Continued)

MODEM WAVEFORM APPLICATION EXAMPLES		
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.
Communications with legacy radios using KY-99 for data	ANDVT-HF	300 - 2400 bps
Communications with legacy radios using KY-100 for data	Serial or MIL-110B	up to 12800 bps, depending on modem used.

4.14   PROGRAM SYSTEM PRESET

A system preset ties a radio mode, encryption, voice settings, and data settings to a channel, ALE associated self address, or hopnet. Refer to Paragraph 3.12.2 for more detail. It is advised to program encryption prior to programming SYSTEM presets as to have keys available to assign to the presets.

Refer to Table 4-31 and see Figure 4-24. Perform the following procedure to program system presets:

   a.   Choose **PGM>MODE>PRESET>SYSTEM** menu choices.

   b.   Use the ▲▼ keys to scroll through the **SYSTEM PRESET TO CHANGE:** and press **[ENT]**.

NOTE

   Immediately after the AN/PRC-150(C) is zeroized, the system presets are given default names of **SYSPRE1** to **SYSPRE75**.

   c.   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 ◀▶.

   d.   Use the ▲▼ keys to scroll through the **RADIO MODE** options (**FIX, ALE, HOP, 3G**) and press **[ENT]**.

   e.   Perform one of the following:

   1.   Fix - Press the numeric keys to enter the **CHANNEL NUMBER** to use with the preset and press **[ENT]**.

   2.   ALE - Use the ▲▼ keys to select an **ASSOC SELF** address to associate with the preset and press **[ENT]**.

   3.   Hop - Press the numeric keys to enter the **HOP CHANNEL** to associate with this system preset and press **[ENT]**.

   4.   3G - 3G ALE system presets configure the radio for operation in 3G radio mode after the radio has linked. In the RPA, a system preset can be made for each self address of the radio to call up desired MODEM preset, encryption type, encryption key and PT/CC voice. If programming fails to load properly, the "Incomplete 3G Fill" screen will be displayed on the KDU.

   f.   Use the ▲▼ keys to select the **MODEM PRESET** and press **[ENT]**.

NOTE

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

g.   Use the ▲▼ keys to select the desired **ENCRYPTION TYPE** of (**CITADEL**, **TYPE 1**, or **NONE** - depending on installed option).

h.   Use the ▲▼ keys to select the desired the **ENCRYPTION KEY** and press **[ENT]**.

NOTE

Encryptions keys need to be filled/programmed first in order
to program the system preset correctly.

i.   Use the ▲▼ keys to scroll through the **PT VOICE MODE** options (**NONE, CLR, CVSD, AVS, DV24, DV6, ME6, ME24, LDV** [3G in CC]) and press **[ENT]**. Options will vary based upon what has been previously selected.

j.   Use the ▲▼ keys to select one of the **CC VOICE MODE** options (**NONE, DV6, DV24, ME6, ME24, CVSD,** [3G in CC]) and press **[ENT]**.

NOTE

Only DV24 and NONE are valid selections for Datotek.

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

l.   Press **[CLR]** repeatedly to return to the **MODE** menu after the system preset parameters have been programmed.

Table 4-31. PGM>Mode>Preset>System Menu Settings

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.
(Fix) CHANNEL NUMBER	000-199	Select desired channel. Same channels used in ALE radio mode. Reserve 000 for scratchpad use, and reserve channels 100 - 162 for 3G programming with the RPA. Only channels 01 - 10 can be used for hailing operation in conjunction with HOP radio mode.
(ALE) ASSOC SELF	XXXXXXXXXXXX	**NOTE**: Calls made to this Self Address and calls made to an Individual Address from this associated self, will activate this preset upon linking.
(Hop) HOP CHANNEL	00-19	Select one of twenty available HOP channels.

Table 4-31. PGM>Mode>Preset>System Menu Settings (Continued)

SYSTEM		
Menu Item	**Options**	**Remarks**
MODEM PRESET	OFF, MDM1 - MDM20	Select one of 20 modem presets, or OFF.
ENCRYPTION TYPE	CITADEL TYPE 1 NONE	Select the desired encryption type. CITADEL and/or Datotek may be missing from menus due to the model of radio you have.
CITADEL	CITADEL ENCR KEY	
TYPE 1	TYPE 1 ENCR KEY	
PT VOICE MODE	CLR CVSD AVS DV24 DV6 ME24 ME6 LDV (3G ONLY) NONE	**CLR**: Analog Voice **CVSD**: Digital Voice for FM **AVS**: Analog Voice Security **DV24**: Digital Voice 2400 bps **DV6**: Digital Voice 600 bps **ME24:** Digital Voice (MELP) 2400 bps **ME6**: Digital Voice (MELP) 600 bps Select one of the plain text voice. **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.
CC/CT VOICE MODE	NONE DV6 DV24 ME6 ME24 CVSD LDV (3G ONLY)	Choose one of possible cipher text voice. This 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.

Figure 4-24. PGM>Mode>Preset>System Menu
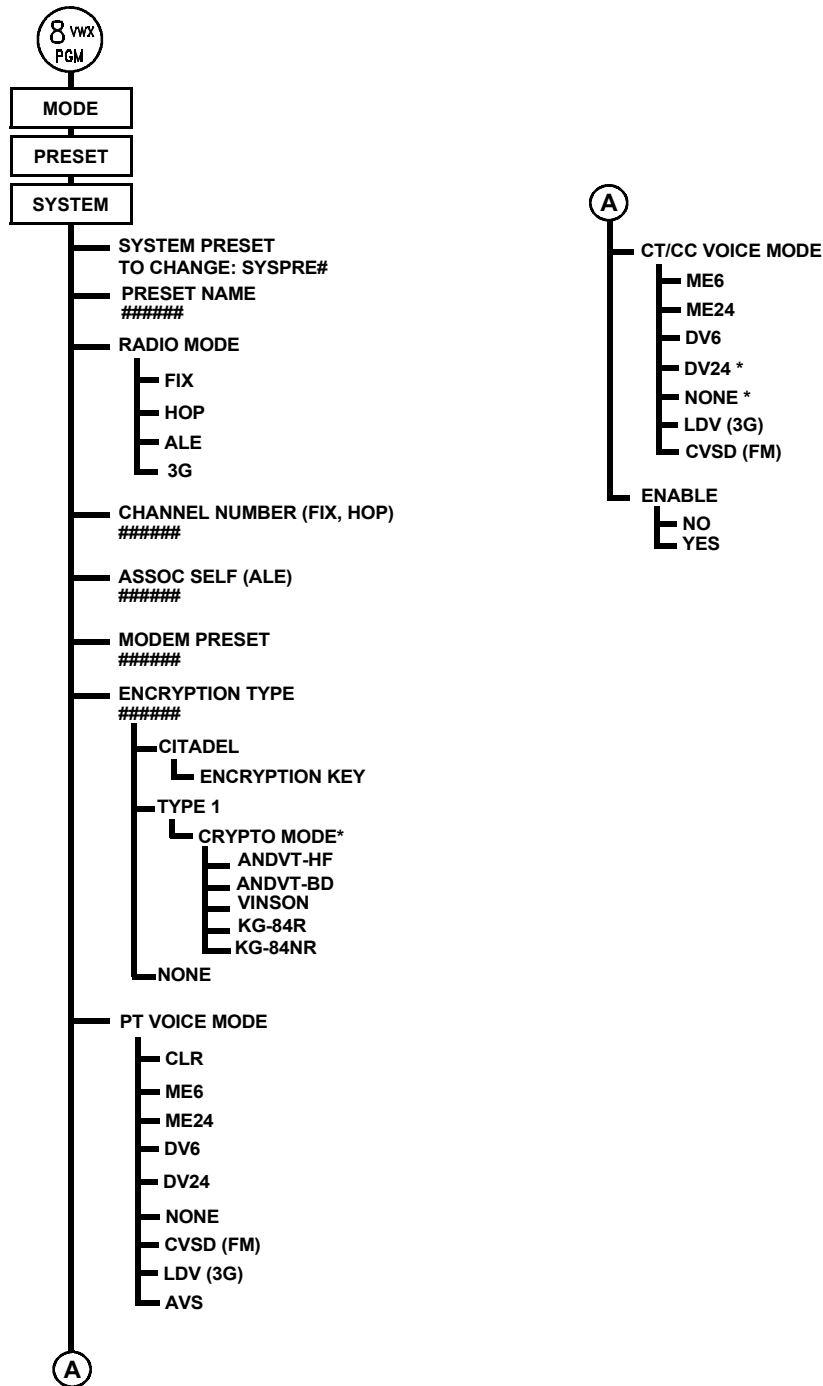
NOTES:

 * CHOICES FOR OPTIONAL TYPE1.

0103-4100-0034

4.15   PROGRAM MANUAL PRESET

A a manual preset is similar to a system preset except only one manual preset is programmed compared to the 75 system presets. Refer to Paragraph 4.14 for system preset parameters as most of these also apply to manual presets. A manual preset has an unmodifiable preset name of MANUAL that can be selected using the **PRE +/-** key. See Figure 4-25 for the manual preset programming tree.

NOTES:

* CHOICES FOR OPTIONAL TYPE1.

0103-4100-0046
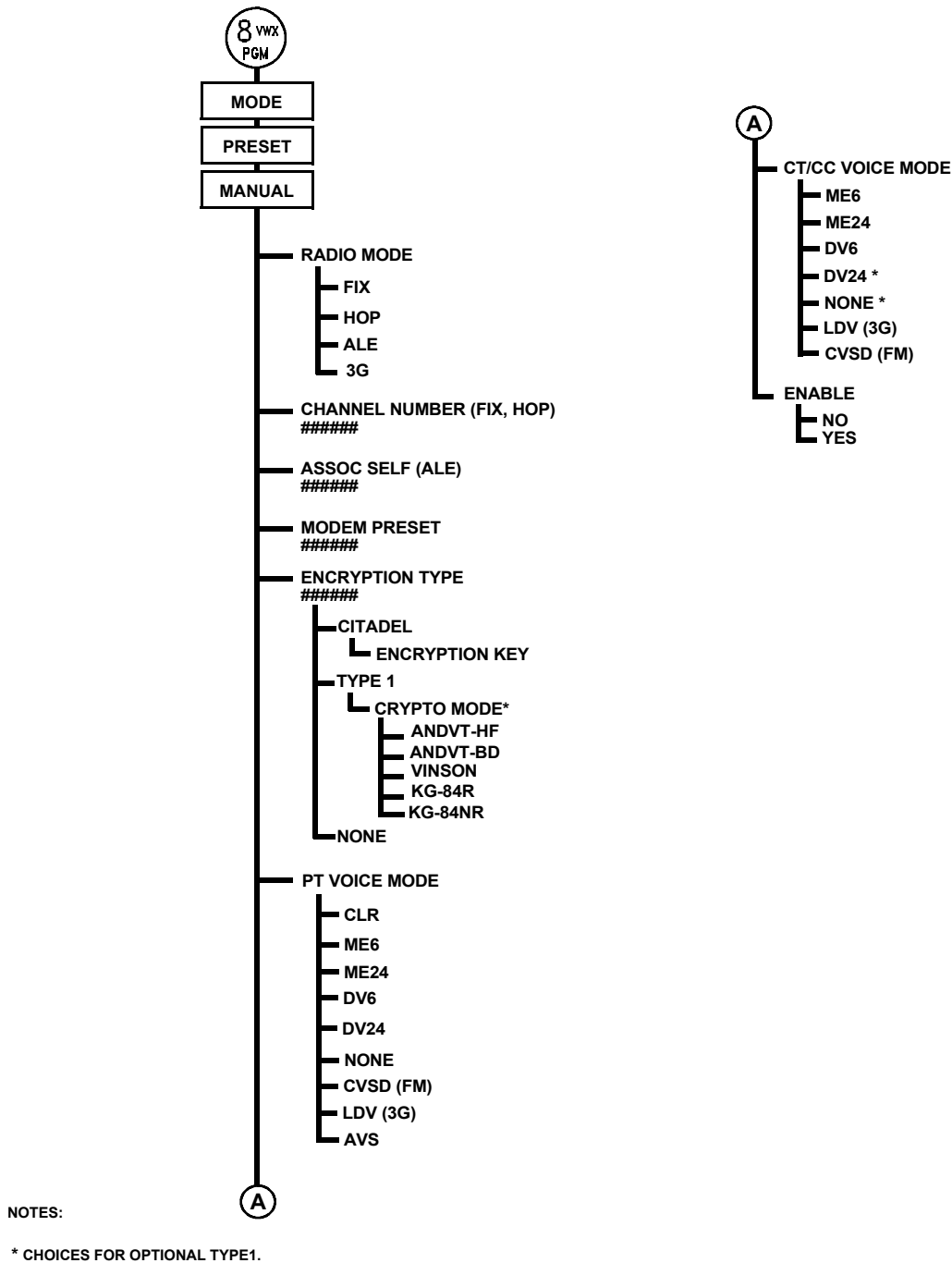
Figure 4-25. PGM>Mode>Preset>Manual Menu

4.16   RADIO SECURITY ACCESS PROGRAMMING

The AN/PRC-150(C) 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 AN/PRC-150(C)'s capabilities. Refer to Table 4-32. **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 AN/PRC-150(C) 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.

Table 4-32. 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.

4.16.1   Lockouts

See Figure 4-26. Setting the lockouts is completed at the user level. Access to the lockout is controlled at the DEPOT level. Setting the lockouts for each user level can be performed at the user level, but is usually performed by the DEPOT level user. The DEPOT user logs in as a user, selects all necessary lockouts, sets them, and logs out of that user level. The final action the DEPOT user performs is to login at the DEPOT level and set the user control permissions to NO and then log out. After this action, the lockout menu item will no longer be visible on the user level display screen.

NOTE

When a password is required for a radio that has not had a password programmed or has been zeroized, press **[ENT]**.

Perform the following procedure to configure the **OPER**, **PGM**, **OPT** and **ALL** lockouts for each user level:

    a.   Choose **PGM>ACCESS** menu choices.

NOTE

The current access level is displayed on the top right corner of the front panel display screen.

    b.   To access the lockout parameters, perform one of the following:

        1.   For **USER1**, use the ◆▶ keys to select **LOCKOUT** and press **[ENT]**. Proceed to Step e

2. For **USER2, USER3,** use the ◀▶ keys to select **LOGIN** and press **[ENT]**.

NOTE

Do not use the **DEPOT** level in the next step. It will not access the lockout parameters.

c. Use the ▲▼ keys to select the access level **(USER2, or USER3)** and do one of the following:

1. If no password has been entered, press **[ENT]** twice.

2. If a password has been programmed, press **[ENT]**.

3. Enter the password for the access level, press **[ENT].**

NOTE

If the entry is invalid, press **[CLR]** and begin again at Step 2, above.

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

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

f. If a complete change in lockouts is required, perform the following steps, otherwise, press **[ENT]** twice and proceed to Step g.

1. To clear all lockouts at this login level, press the ▲▼ keys and select **YES** at **CLEAR ALL USER** (Login level) **LOCKOUTS** screen, press **[ENT]** and proceed to Step g. Otherwise, select **NO,** press **[ENT]** and proceed to Step 2.

2. To set all lockouts at this login level, press the ▲▼ keys and select **YES** at **SET ALL USER** (Login level) **LOCKOUTS** screen, press **[ENT]** and proceed to Step g. Otherwise, select **NO,** press **[ENT]** and proceed to Step g.

g. Use the ◀▶ keys to select **OPER** and press **[ENT]**.

h. Refer to Table 4-33 for a listing of **OPER** parameters that can be locked out. Press **[ENT]** to scroll forward or **[CLR]** to scroll backwards through the list. Select each item to lockout as necessary. Press ▲▼ keys to select **YES/NO**.

i. After setting **OPER** parameter lockouts, continue to **PGM** and **OPT** lockouts if desired.

j. Refer to Table 4-34 for a listing of **PGM** parameters that can be locked out. Press **[ENT]** to scroll forward or **[CLR]** to scroll backwards through the list. Select each item to lockout as necessary. Press ▲▼ keys to select **YES/NO**.

k. Refer to Table 4-35 for a listing of **OPT** parameters that can be locked out. Press **[ENT]** to scroll forward or **[CLR]** to scroll backwards through the list. Select each item to lockout as necessary. Press ▲▼ keys to select **YES/NO**.

l. Logout 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 4.16.2.
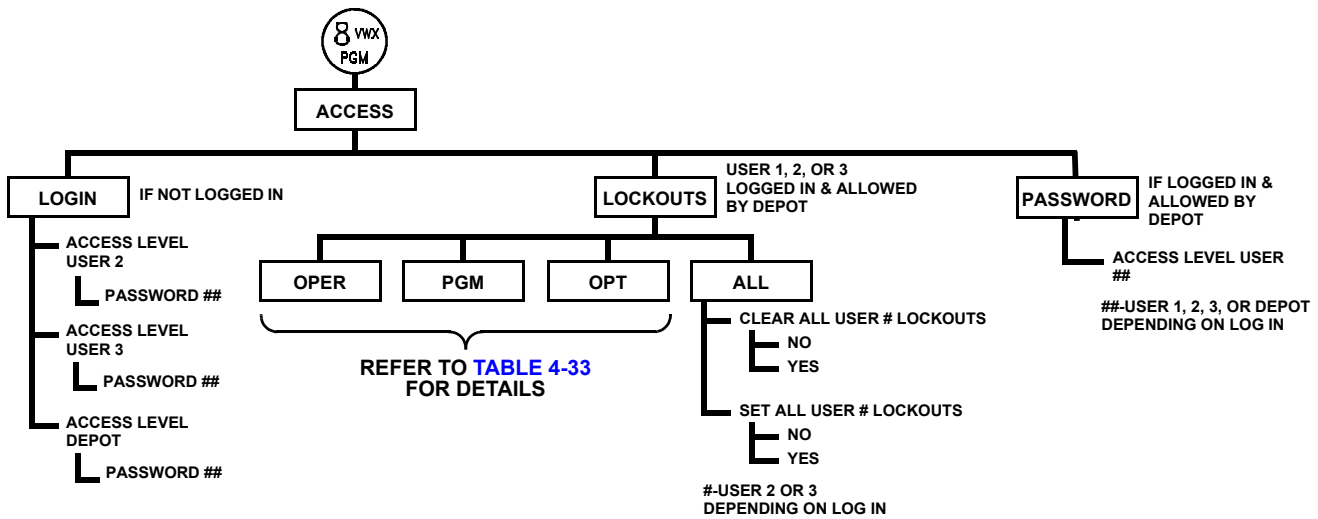
0103-4200-0051

Figure 4-26. LOCKOUTS Program Menu Tree

Table 4-33. 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	---
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	---
ALLOW CTI PHONE CALL	YES/NO	---
ALLOW CTI AUTOREJECT	YES/NO	---
ALLOW ALE PHONE CALL	YES/NO	---

Table 4-34. PGM Lockouts

Lockout Parameter	Configuration Options	Remarks
COMSEC	SHOW/HIDE	---
COMSEC-CITADEL	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC-CITADEL ID	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-CITADEL=SHOW
COMSEC-CITADEL KEYS	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-CITADEL=SHOW
COMSEC-CITADEL KEYS-ENTER	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-CITADEL KEYS=SHOW
COMSEC-CITADEL KEYS-ERASE	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-CITADEL KEYS=SHOW
COMSEC-CITADEL KEYS-UPDATE	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-CITADEL KEYS=SHOW
COMSEC-CITADEL MI	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC-TYPE_I	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC-TYPE_I KEYS	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-TYPE_I=SHOW
COMSEC-TYPE_I KEYS-ERASE	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-TYPE_I KEYS=SHOW
COMSEC-TYPE _I KEYS-SPECIAL	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-TYPE_I KEYS=SHOW
COMSEC-TYPE_I CONFIG	SHOW/HIDE	Only visible if COMSEC=SHOW
COMSEC-TYPE_I CONFIG-ALL	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-TYPE_I CONFIG=SHOW
COMSEC-TYPE_I CONFIG-ANDVT-BD	SHOW/HIDE	Only visible if COMSEC=SHOW, COMSEC-TYPE_I CONFIG=SHOW
CONFIG:	SHOW/HIDE	---
CONFIG-AUDIO	SHOW/HIDE	Only visible if CONFIG=SHOW
CONFIG-GPS	SHOW/HIDE	Only visible if CONFIG=SHOW
CONFIG-LPC	SHOW/HIDE	Only visible if CONFIG=SHOW
CONFIG-LDV	SHOW/HIDE	---
CONFIG-MESSAGE	SHOW/HIDE	Only visible if CONFIG=SHOW
CONFIG-NETWORK	SHOW/HIDE	Only visible if CONFIG=SHOW
CONFIG-NETWORK-INTERFACE	SHOW/HIDE	Only visible if CONFIG=SHOW, CONFIG-NETWORK=SHOW
CONFIG-NETWORK-INTERFACE-ETHERNET	SHOW/HIDE	Only visible if CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW

Table 4-34. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
CONFIG-NETWORK-INTERFACE-ETHERNET ADDRESS	SHOW/HIDE	Only visible if CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW, CONFIG-NETWORK-INTERFACE-ETHERNET=SHOW
CONFIG-NETWORK-INTERFACE-ETHERNET STATUS	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW, CONFIG-NETWORK-INTERFACE-ETHERNET=SHOW
CONFIG-NETWORK-INTERFACE-PPP	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW
CONFIG-NETWORK-INTERFACE-PPP-ADDRESS	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW CONFIG-NETWORK-INTERFACE-PPP=SHOW
CONFIG-NETWORK-INTERFACE-PPP-PORT_SETTINGS	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW CONFIG-NETWORK-INTERFACE-PPP=SHOW
CONFIG-NETWORK-INTERFACE-PPP-STATUS	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW CONFIG-NETWORK-INTERFACE-PPP=SHOW
CONFIG-NETWORK-INTERFACE-WIRELESS	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW
CONFIG-NETWORK-INTERFACE-WIRELESS ADDRESS	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW, CONFIG-NETWORK-INTERFACE-WIRELESS-STATUS=SHOW

Table 4-34. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
CONFIG-NETWORK-INTERFACE-WIRELESS STATUS	SHOW/HIDE	Only visible if COMSEC=SHOW, CONFIG=SHOW, CONFIG-NETWORK=SHOW, CONFIG-NETWORK-INTERFACE=SHOW, CONFIG-NETWORK-INTERFACE-WIRELESS-STATUS=SHOW
CONFIG-NETWORK-PROTOCOL	SHOW/HIDE	Only visible if CONFIG=SHOW, CONFIG-NETWORK=SHOW
CONFIG-NETWORK-PROTOCOL-SNMP	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW, CONFIG-NETWORK-PROTOCOL=SHOW
CONFIG-NETWORK-ROUTES	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW
CONFIG-NETWORK-ROUTES-ALL	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW, CONFIG-NETWORK-ROUTES=SHOW
CONFIG-NETWORK-ROUTES-INDIVIDUAL	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW, CONFIG-NETWORK-ROUTES=SHOW
CONFIG-NETWORK-ROUTES-INDIVIDUAL-ADD	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW, CONFIG-NETWORK-ROUTES=SHOW, CONFIG-NETWORK-ROUTES-INDIVIDUAL=SHOW
CONFIG-NETWORK-ROUTES-INDIVIDUAL-DELETE	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW, CONFIG-NETWORK-ROUTES=SHOW, CONFIG-NETWORK-ROUTES-INDIVIDUAL=SHOW
CONFIG-NETWORK-ROUTES-INDIVIDUAL-EDIT	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW, CONFIG-NETWORK-ROUTES=SHOW, CONFIG-NETWORK-ROUTES-INDIVIDUAL=SHOW
CONFIG-NETWORK-ROUTES-INDIVIDUAL-REVIEW	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW, CONFIG-NETWORK-ROUTES=SHOW, CONFIG-NETWORK-ROUTES-INDIVIDUAL=SHOW
CONFIG-NETWORK-FIREWALL	SHOW/HIDE	Only visible if CONFIG-NETWORK=SHOW
CONFIG-ACCESSORY	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: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

Table 4-34. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
CONFIG-RADIO:RADIO NAME	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
CONFIG-TOD	SHOW/HIDE	---
CONFIG-TOD:DATE FORMAT	SHOW/HIDE	Only visible if CONFIG-TOD=SHOW
CONFIG-TOD:TIME FORMAT	SHOW/HIDE	Only visible if CONFIG-TOD=SHOW
MODE	SHOW/HIDE	---
MODE-ALE	SHOW/HIDE	Only visible if MODE=SHOW
MODE-ALE-ADDRESS	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ALE=SHOW
MODE-ALE-AMD	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ALE=SHOW
MODE-ALE-AMD-RX_MSG	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ALE=SHOW, MODE-ALE-AMD=SHOW
MODE-ALE-AMD-TX_MSG	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ALE=SHOW, MODE-ALE-AMD=SHOW
MODE-ALE-CHNGRP	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ALE=SHOW
MODE-ALE-CONFIG	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ALE=SHOW
MODE-ALE-LQA	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ALE=SHOW
MODE-ARQ	SHOW/HIDE	Only visible if MODE=SHOW
MODE-ARQ-CONFIG	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ARQ=SHOW
MODE-ARQ-SELF_ADDR	SHOW/HIDE	Only visible if MODE=SHOW, MODE-ARQ=SHOW
MODE-HOP	SHOW/HIDE	Only visible if MODE=SHOW
MODE-HOP-CHANNEL	SHOW/HIDE	Only visible if MODE:HOP=SHOW, MODE-HOP=SHOW
MODE-HOP-CONFIG	SHOW/HIDE	Only visible if MODE:HOP=SHOW, MODE-HOP=SHOW
MODE-HOP-EXCLUDE	SHOW/HIDE	Only visible if MODE=SHOW, MODE-HOP=SHOW
MODE-PRESET	SHOW/HIDE	Only visible if MODE=SHOW
MODE-PRESET-CHANNEL	SHOW/HIDE	Only visible if MODE=SHOW, MODE-PRESET=SHOW

Table 4-34. PGM Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
MODE-PRESET-MODEM	SHOW/HIDE	Only visible if MODE=SHOW, MODE-PRESET=SHOW
MODE-PRESET-SYSTEM	SHOW/HIDE	Only visible if MODE=SHOW, MODE-PRESET=SHOW
MODE-XDL	SHOW/HIDE	Only visible if MODE=SHOW
MODE-XDL-CONFIG	SHOW/HIDE	Only visible if MODE=SHOW, MODE-XDL=SHOW
SCHED	SHOW/HIDE	---
MODE-3G	SHOW/HIDE	

Table 4-35. 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
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
GPS MAINT	SHOW/HIDE	---
RADIO:BFO	SHOW/HIDE	---
RADIO:COUPLER	SHOW/HIDE	---
RADIO:RX NOISE BLANK	SHOW/HIDE	---
RADIO:RADIO NAME	SHOW/HIDE	---
RADIO:RADIO SILENCE	SHOW/HIDE	---
RADIO:TX POWER	SHOW/HIDE	---

Table 4-35. OPT Lockouts (Continued)

Lockout Parameter	Configuration Options	Remarks
RADIO:RETUNE	SHOW/HIDE	---
APR:STOP	SHOW/HIDE	---

4.16.2 DEPOT Level Access Control Programming

See Figure 4-27. 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 has the ability to allow user level password changes.
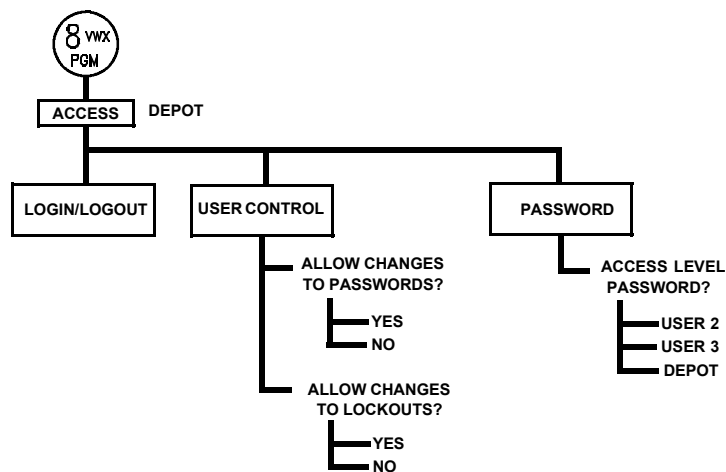
0103-4100-0039

Figure 4-27. DEPOT ACCESS Program Menu Tree

4.16.2.1 Changing Passwords

Passwords 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 keypad to enter the password and press **[ENT]** (Factory default; just press **[ENT]**). If **USER2** or **USER3** was selected and **PASSWORD** is missing from the menu, then the **DEPOT** level user has programmed the AN/PRC-150(C) 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 the 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 cycled 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.

4.16.2.2   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.   Enter the depot password and press **[ENT]**.

f.   Use the ◀▶ keys to select **USER_CONTROL** and press **[ENT]**.

g.   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.

h.   Press **[ENT]**.

i.   Press the **[CLR]** key twice 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.

j.   Use the ◀▶ keys to select **LOGOUT** and press **[ENT]**. This procedure will **LOGOUT** from the current access level.

k.   Press **[CLR]** to return to the program menu or the **[PGM]** key to return to the preset screen.

4.16.2.3   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 4.16.2.1 Step a through Step d to LOGIN at the **DEPOT** level.

b.   Verify that **ALLOW CHANGES TO LOCKOUT?** is set to **YES**.

c.   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.

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.

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 AN/PRC-150(C) 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 semi-annual basis. Table 5-4 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 3.5.2.).
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 AN/PRC-150(C) 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. Preventive Maintenance Checks and Services to Perform Every Eight Months

Check No.	Item to be Inspected	Procedure
1	Hold-Up Battery (HUB)	Replace HUB every eight (8) months* or prior to deployment. Refer to Paragraph 5.4.4.

*NOTE: Time interval given for (Harris B41-0010-004 or Saft LS 14250C). If using (Harris B41-0010-003 or Saft LS 14250), replace HUB twice as often (every four [4] months).

Table 5-4. Annual Preventive Maintenance Checks and Services

Check No.	Item to be Inspected	Procedure
1	Radio performance	Refer to RT-1694D(P)(C)/U Intermediate Maintenance Manual (10515-0103-4300) for annual radio performance checks.

5.2   REPLACEMENT PARTS

Table 2-1 list items included with the AN/PRC-150(C). Additionally, the OE-505 Whip Antenna Kit, shown in Figure 2-1, can be broken down into the following spare parts:

- Collapsible Whip - AT271A/PRC-15

- Antenna Base - 10372-0277

- Base Whip Adapter - 10372-1215-01

5.3   CORRECTIVE MAINTENANCE

Shortcomings and defects which are revealed during preventive maintenance, or which appear when the AN/PRC-150(C) 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 AN/PRC-150(C) is faulty. This could be determined in three ways:

- The self-test has been run and a fault code has been identified by the AN/PRC-150(C). (See Figure 5-1.)

- A run-time fault message is displayed by the AN/PRC-150(C).

- The observed degraded operation suggests that the AN/PRC-150(C) is faulty.

Whenever it is believed that the AN/PRC-150(C) 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 II or III maintainer (Direct Support, Intermediate Maintenance, or Factory Warranty Support).

NOTE

All system BIT faults are reported through the KDU. The first two characters of the module code (for example, the "A1" in "A1 F02" shown in Figure 5-1) identify the faulty MP radio chassis. A1 identifies a faulty MP, A4 identifies a faulty external power amplifier, A5 or A6 identify a faulty pre/postselector, and A7 identifies a faulty RF-5382H Antenna Coupler.

HARRIS®

INDICATES
CHASSIS

MODULE #:   A1
FAULT   #:   F02

PRESS ENT

MODULE #: A1 FAULT #: F02

FPGA INTERRUPT
REQUEST ERROR

FAULT CODE

TEXT DESCRIPTION
OF FAULT
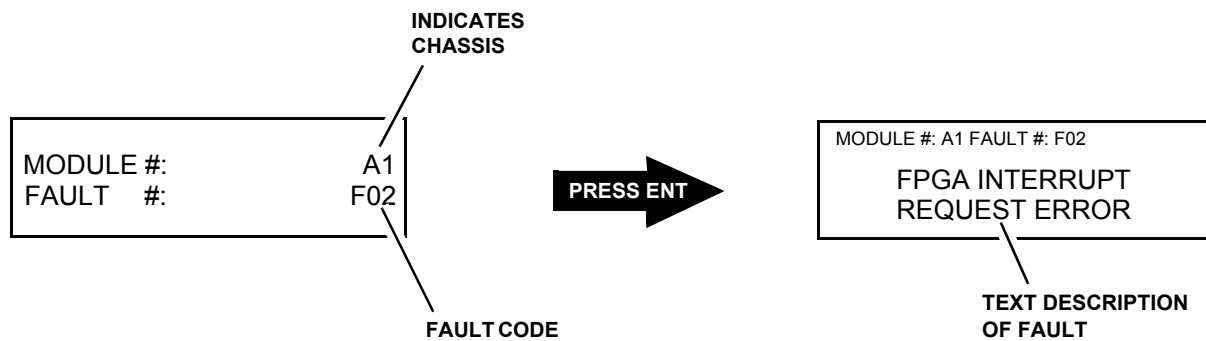
Figure 5-1. Sample Fault Code Display

F-0103-4100-0052

5.3.1   Troubleshooting Procedures

Faults can be detected by the Built-In Test (BIT) 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.

5.3.1.1   Operator-Initiated BIT Faults

BIT faults are displayed following an operator-initiated BIT. For information on running BIT (refer to Paragraph 3.5.2). When the KDU displays a fault message, record all fault code information and report the fault to a Level II or Level III maintainer. The exception is **A1A4 02 HOLD-UP BATTERY VOLTAGE** which means the HUB is out of the 3.0 VDC to 3.85 VDC range. A complete list of BIT fault codes is published in the RT-1694D(P)(C)/U Manpack Radio Intermediate Maintenance Manual (10515-0103-4300).

5.3.1.2   Run-Time Faults

Run-Time faults mostly occur due to programming errors and are listed in Table 5-5. Sometimes hardware failures can cause run-time failures. Send the radio to a level II or III repair facility for hardware failures.

Table 5-5. Run-Time BIT Faults, Descriptions, and Corrective Action

Text Message Displayed on KDU	Description/Corrective Action
NO KEY AVAILABLE	Traffic Key not available for selected preset. Make sure radio was filled properly.
CRYPTO SYNC FAILED	Crypto Synchronization Failed - message will not be received/decrypted. This can sometimes occur over HF. If problem continues with good channel conditions, make sure radio was filled properly.
INVALID CRYPTO OPERATION	This is a firmware error. Send radio to level III maintenance.
UNSUPPORTED MODE	Operator attempted to utilize a radio mode not supported for a particular configuration. Send radio to level III maintenance.
INFOSEC HW FAILURE	There has been a catastrophic hardware failure. Send radio to level III maintenance.

Table 5-5. Run-Time BIT Faults, Descriptions, and Corrective Action (Continued)

Text Message Displayed on KDU	Description/Corrective Action
ALARM PRESENT	COMSEC Alarm is present. Make sure radio was filled properly.
INVALID KEY DATA	Traffic Key data is not valid. Make sure radio was filled properly.
UNKNOWN COMMAND	Firmware error. Send radio to level III maintenance.
STATE ERROR	Firmware error. Send radio to level III maintenance.
PARAM ERROR	Firmware error. Send radio to level III maintenance.
CRYPTO DETECTED IN PT RADIO!	Firmware error. Send radio to level III maintenance.
RV INVALID INTERNAL STATE	Firmware error. Send radio to level III maintenance.
RV KM COMMAND FAILED	Firmware error. Send radio to level III maintenance.
RV KEY SELECT FAILED	Firmware error. Send radio to level III maintenance.
KEYLINE INHIBIT: ACTIVE	Keyline has been inhibited. If condition persists, refer to system level documentation.
READ FAILURE - FACTORY CM INFORMATION	Firmware error. Send radio to level III maintenance.
WRITE FAILURE - FACTORY CM INFORMATION	Firmware error. Send radio to level III maintenance.
CRYPTO UNDEFINED ERROR	Firmware error. Send radio to level III maintenance.
COMMUNICATION ERROR WITH GPS (RUN BITE)	Internal communications with internal Global Positioning System (GPS) failed. Send radio to level III maintenance.
ERROR DETECTED BY VDP - OPERATION ABORTED	Firmware error. Send radio to level III maintenance.
ERROR DETECTED BY CSEC - OPERATION ABORTED	Firmware error. Send radio to level III maintenance.
KEY SELECT FAILURE (ERRCODE: %04X)	Key is not valid. Make sure radio was filled properly.
SYSTEM NOT READY	One or more system elements are preventing normal radio operation. Shutdown system, then power up.
REAL TIME CLOCK INVALID	Real Time clock failed. Send radio to level III maintenance.
NVRAM CORRUPTED - FP LOCKOUT PARAMETERS ERASED	Non-volatile Random-Access Memory (RAM) has been corrupted. If new firmware has been loaded, send radio to level III maintenance.
HOP CONFIGURATION ERROR: NO HOPSET PROGRAMMED	No hopset was programmed. Check HOP programming or fill.
HOP CONFIGURATION ERROR: NO CHANNEL ID PROGRAMMED	No channel ID was programmed. Check HOP programming or fill.

Table 5-5. Run-Time BIT Faults, Descriptions, and Corrective Action (Continued)

Text Message Displayed on KDU	Description/Corrective Action
HOP CONFIGURATION ERROR: INVALID BANDWIDTH SETTING (MINIMUM BANDWIDTH IS 15 KHZ)	Programming is invalid for bandwidth requirements. Check HOP programming or fill.
HOP CONFIGURATION ERROR: INVALID EXCLUSION BAND SETTING(S) (CHECK PROGRAMMING)	Incorrect exclusion band settings were programmed. Check HOP programming or fill.
HOP CONFIGURATION ERROR: HOPLIST TOO SMALL (MINIMUM HOPLIST SIZE IS 5)	Programmed hopset is too small. Check HOP programming or fill.
HOP CONFIGURATION ERROR: INVALID HOPSET	Invalid hoplist was programmed. Check HOP programming or fill.
NOT IN SYNC	Radios are not synced. Sync radios.
INVALID POWER INPUT CONFIG	Power input invalid to Power Amplifier (PA). Send radio to level III maintenance.
SSBSCAN: CANNOT SCAN - NO CHANNELS MARKED FOR SCAN	Channels are not marked for scan. Program radio for Single Sideband (SSB) scan.
SSBSCAN: CANNOT SCAN - ALL CHANNELS ARE UNUSABLE	Channels are unusable. Reprogram radio for SSB scan.
SSBSCAN: IGNORING UNUSABLE CHANNEL(S) - FREQUENCY TOO LOW	Channels are unusable. Radio ignoring.
SSBSCAN: IGNORING UNUSABLE CHANNEL(S) - MODULATION TYPE NOT ALLOWED	Channels are unusable. Radio ignoring.
SSBSCAN: IGNORING UNUSABLE CHANNEL(S) - CHANNEL INVALID	Channels are unusable. Radio ignoring.
CAN'T KEY - CHANNEL IS RX ONLY	Channel was programmed as receive only. Reprogram if frequency plan allows.
BATTERY VOLTAGE TOO LOW	Battery voltage is too low. Replace.
POWER AMPLIFIER TOO HOT	External power amplifier is too hot. Refer to system level documentation for instructions on cleaning cooling fins and further troubleshooting that may be required.
TRANSCEIVER: CONFIGURATION ERROR	Firmware error. Send radio to level III maintenance.
UNSUPPORTED RF HARDWARE CONFIGURATION	Firmware error. Send radio to level III maintenance.
TX FREQ OUT OF RANGE	Transmit frequency entered is beyond radio's frequency range.

Table 5-5. Run-Time BIT Faults, Descriptions, and Corrective Action (Continued)

Text Message Displayed on KDU	Description/Corrective Action
HUB VOLTAGE LOW	HUB voltage is low. Replace.
RX FREQ OUT OF RANGE	Transmit frequency entered is beyond radio's frequency range.
CAN'T KEY - RX PROTECTION IS ACTIVE	Radio cannot key because receive protection is active. Remove strong signal causing receive protection.
COMMUNICATION ERROR WITH EXTERNAL POWER AMPLIFIER	Refer to system level documentation for isolating to a PA or AN/PRC-150(C) failure.
COMMUNICATION ERROR WITH EXTERNAL PREPOST SELECTOR 1	Refer to system level documentation for isolating to a pre/postselector or AN/PRC-150(C) failure.
COMMUNICATION ERROR WITH EXTERNAL PREPOST SELECTOR 2	Refer to system level documentation for isolating to a pre/postselector or AN/PRC-150(C) failure.
CHANNEL ERROR	Channel is invalid for radio mode. Check programming.
FREQUENCY ERROR	Frequency is invalid for radio mode. Check programming.
MODE ERROR	Mode is invalid for radio mode. Check programming.
AGC ERROR	An error occurred in the AGC. If problem persists, send radio to level III maintenance.
TARGET ADDRESS ERROR	Error occurred in communicating with target address.Try again. Channel conditions may be poor.
TARGET CHARACTER COUNT ERROR	Error occurred in communicating with target address. Try again. Channel conditions may be poor.
KEY ERROR	Error occurred in keyline in system. If problem persists, refer to system level documentation.
UNKEY ERROR	Error occurred in keyline in system. If problem persists, refer to system level documentation.
NO CHANNELS FOR TARGET ADDRESS	Target address does not have channels associated with it.
LQA REQUEST ABORTED - RADIO SILENCE IS ON	Link Quality Analysis (LQA) request was aborted because radio silence is on. Turn off radio silence if conditions warrant.
INCOMPLETE ALE CONFIGURATION	Automatic Link Establishment (ALE) configuration is incomplete. Check fill or programming.
NO CONTACT	Call failed to make contact.
CALL ABORTED	Call was operator aborted.
SELF ADDRESS ERROR	Self address is incorrect. Check fill or programming.
REQUEST IGNORED IN CURRENT ALE STATE	Request was ignored in current ALE state. Keypress may have been invalid.
ALE IS DISABLED	Firmware error. Send radio to level III maintenance.
AMD PROCESSING IS DISABLED	Firmware error. Send radio to level III maintenance.

Table 5-5. Run-Time BIT Faults, Descriptions, and Corrective Action (Continued)

Text Message Displayed on KDU	Description/Corrective Action
REQUEST IGNORED WHEN RADIO SILENCE ON	Request was ignored because radio silence is on. Turn off radio silence if conditions warrant.
RF-5382 COUPLER CONFIG ERROR: NO 50-OHM PORT IS PRESENT	50 ohm port selection was attempted on RF-5382H-CU050 which does not have a 50 ohm port.
CONFIGURATION VERIFICATION: CONFIG FILE NOT LOADED	Firmware error. Send radio to level III maintenance.
CONFIGURATION VERIFICATION: FIRMWARE REVISION MISMATCH	Firmware error. Send radio to level III maintenance.
CONFIGURATION VERIFICATION: HARDWARE MISMATCH	Firmware error. Send radio to level III maintenance.
CONFIGURATION VERIFICATION: INSTALLED OPTION MISMATCH	Firmware error. Send radio to level III maintenance.
SARK KEY SELECT FAILED	Key Selection failed during OTAR. Try operation again.
RV UPDATE COUNT ERROR	Firmware error. Send radio to level III maintenance.
RV INVALID KEY	Firmware error. Send radio to level III maintenance.
RV SARK KEY RECEIVE FAILED	OTAR receive failed. Try operation again.
SARK KEK UPDATE NOT REQUIRED	OTAR KEK Update is not required.
RV MODE NOT SUPPORTED (CHECK CRYPTO MODE)	Cannot do OTAR operations for installed crypto key. Reload key.
******FAULT****** RECEIVER PROTECTION is displayed on front panel.	Move the AN/PRC-150(C) away from source of strong RF signal.
INIT FAULT	Try switching to 3G again. If problem persists, try reloading radio before sending to level III maintenance.
BUSY	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
INVALID REQUEST	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
INVALID TRAFFIC	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
INVALID TRAFFIC	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
INVALID CHANNEL	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.

Table 5-5. Run-Time BIT Faults, Descriptions, and Corrective Action (Continued)

Text Message Displayed on KDU	Description/Corrective Action
INVALID STATION	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
ABORT RECEIVED	User at receiving station aborted. Try 3G transmission again.
STATION UNAVAILABLE	Receiving station is busy. Try 3G transmission again.
REPLY NOT ALLOWED	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
INVALID TRAFFIC	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
PREEMPTED	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
UNDERFLOW	Try 3G transmission again. If problem persists, try another plan or try reloading radio before sending to level III maintenance.
ABORTED	Transmission aborted.
LOW HUB VOLTAGE	HUB is out of the 3.0 VDC to 3.85 VDC range.

5.3.1.3   Non-BIT Faults

Non-BIT faults are operator-observed failures, or cases of degraded operation. Locate the observation in the first column of Table 5-6 and follow the recommended action. If the recommended action is unsuccessful, report the fault to a Level III maintainer.

Table 5-6. Non-BIT Troubleshooting

Observation	Action
AN/PRC-150(C) does not power on.	Check batteries and/or KDU.
No Receive (RX)/ Transmit (TX) audio; AN/PRC-150(C) 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 AN/PRC-150(C) away from source of strong RF signal.
FW VERSION MISMATCH is displayed on front panel.	Send AN/PRC-150(C) to Level III maintenance facility as soon as possible.
HW VERSION MISMATCH is displayed on front panel.	Send AN/PRC-150(C) to Level III maintenance facility as soon as possible.

5.4   BATTERIES

The AN/PRC-150(C) is supplied with Battery Box (10513-4800-02). Use either two BB-590/U Ni-Cd rechargeable batteries, two BA-5590 lithium batteries, two BA-5390 lithium batteries, two BB-390A/U Ni-MH rechargeable batteries, two BB-490/U lead-acid rechargeable batteries, or two BB-2590/U lithium rechargeable batteries (refer to Paragraph 1.6).

Refer to Paragraph 2.2 for information on installing the batteries into the battery box and how to install the battery box onto the AN/PRC-150(C).

5.4.1   Battery Life

The chief factor in determining battery life is transmission output power and duty cycle. To maximize battery life, keep radio off when not needed, minimize transmissions, and use the lowest transmit power level required to successfully communicate.

5.4.2   Recharging the Ni-Cd Battery Packs

> ⚠ **WARNING**
>
> Do not overcharge, short circuit, incinerate, or mutilate the BB-590/U Ni-Cd rechargeable battery. Charge batteries per manufacturer's instructions. Failure to comply could cause personal injury or death.

The optional Harris Fast Battery Charger (10372-0304) provides fully automatic battery charging and fault detection. The battery charger connects with as many as four BB-590/U battery packs. It displays the status of each connected battery during operation.

5.4.3   Disposing of Lithium Batteries

> ⚠ **WARNING**
>
> For batteries containing Lithium, do not crush, puncture, disassemble, mutilate, short circuit, incinerate, or immerse in water, or expose to temperatures above 130° F (54° C); otherwise battery may vent or rupture, releasing toxic material which may cause injury or death to personnel.

> ⚠ **WARNING**
>
> Do not dispose of batteries in uncontrolled trash, as batteries may contain hazardous materials. Check with local directives for proper disposal. Failure to comply could cause injury or death to personnel.

⚠️ **WARNING**

Do not activate the Complete Discharge Device (CDD) of a damaged battery. Damaged multicell lithium sulfur dioxide batteries must be processed as hazardous waste and should not be thrown into a local dumpster, Otherwise, personal injury or death may result.

⚠️ **WARNING**

Store multicell lithium sulfur dioxide batteries during discharge process away from personnel, or personal injury or death may result.

Batteries, whether discharged or partially discharged, should only be disposed of per local directives. Refer to local directives for additional information on lithium batteries. Do not place lithium batteries in trash compactors. Refer to local directives for more information on lithium batteries.

5.4.4 Hold-Up Battery

The HUB retains programmed parameters, FH data, and Citadel encryption keys in memory when the radio has its main batteries removed. The AN/PRC-150(C) should be stored with the function switch in the **OFF** position.

It is recommended that the HUB (Harris part number B41-0010-004; Saft LS 14250C) is replaced every eight (8) months (four [4] months for Harris B41-0010-003 or Saft LS 14250). Some tactical users may choose to replace the HUB prior to any foreseen long-term high priority missions. See Figure 5-2. If the radio does not hold programmed parameters and fill data after removing and replacing main batteries, check and replace the HUB. To check HUB, refer to Paragraph 3.5.3.

⚠️ **WARNING**

Do not dispose of lithium batteries in uncontrolled trash, as batteries may contain hazardous materials. Check with local directives for proper disposal. Failure to comply may cause injury or death to personnel.

Most of these batteries have a date code in the format of C.YY.DDD.F which is deciphered as follows:

- C - Country of manufacture
- YY - Year of manufacture
- DDD - Day in year of manufacture
- F - Internal manufacturer code

For example, a date code F. 03. 253. F means:

- F - France

- 03 - Year 2003

- 253 - 253rd day or Aug 11

- F - Manufacturer's internal reference

Perform the following procedure to replace the HUB:

a.   Without using a battery box, connect a battery to the rear panel battery connector **J10**.

b.   Power the radio on to operate in **PT** or **CT** position.

c.   Without turning the radio OFF, remove the HUB cover using a #1 Phillips®-tip screwdriver and replace the HUB, as shown in Figure 5-2. Ensure HUB is correctly oriented with the battery polarity aligned with the polarity markings on the radio. Replace the HUB cover.

d.   Turn the radio off, install the second battery and battery box.

e.   Perform radio self-test to determine if the HUB is installed correctly. The BIT will detect an incorrectly replaced HUB.
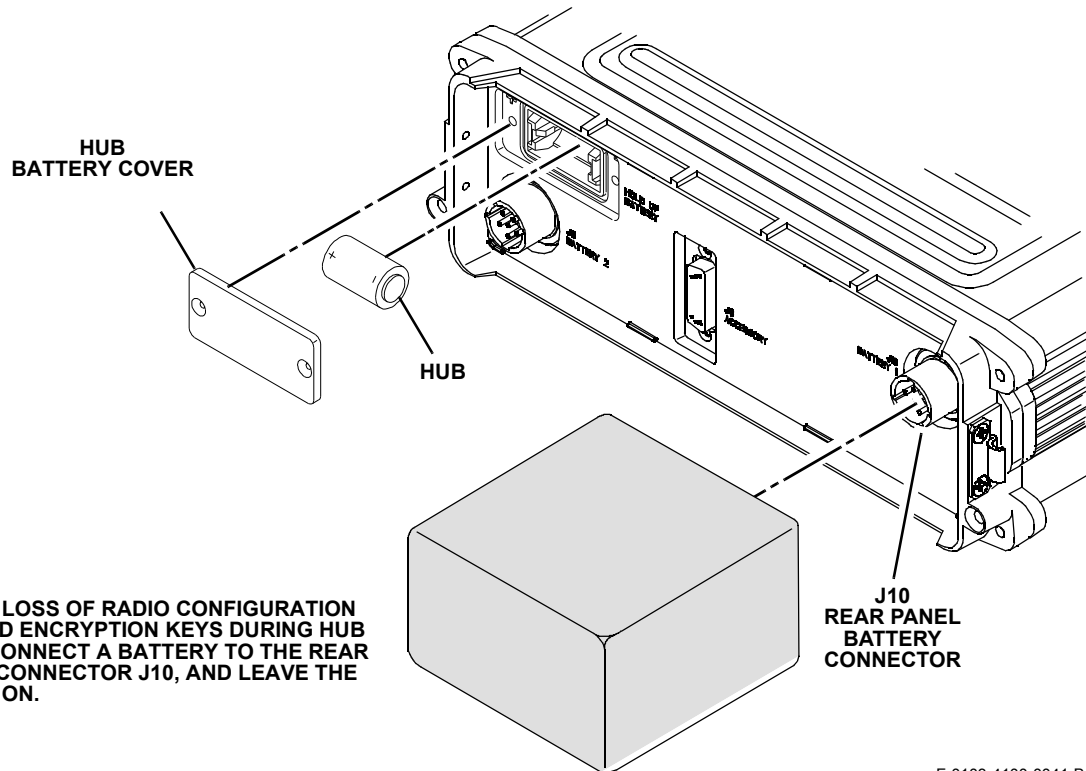
NOTES:
TO PREVENT THE LOSS OF RADIO CONFIGURATION
INFORMATION AND ENCRYPTION KEYS DURING HUB
REPLACEMENT, CONNECT A BATTERY TO THE REAR
PANEL BATTERY CONNECTOR J10, AND LEAVE THE
RADIO POWERED ON.

F-0103-4100-0041-B

Figure 5-2. Replacing HUB (MP Shown)

APPENDIX A

A.1   CHASSIS CONNECTOR PINOUT DATA

Table A-1 through Table A-9 provides pinout data for the external connectors mounted on the AN/PRC-150(C) chassis.

Because of the large number of connections possible with the AN/PRC-150(C), Table A-10 shows the variety of cables and connector kits available. Table A-11 shows the connectors and mating connector part numbers. See Figure A-1 for connector pinout details.

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

Pin #	Dir	Description	Specs	Notes/Modes
1	I	Antenna (Provision for use of WW Fisher connector as antenna.)	50 ohm	Experimental Not Connected
2	I	TIME_MARK_OT_U (1 PPS Time Mark Out)	Load: 50 ohm nominal Pulse Width: 20 usec ± 20% Rise Time: 50 nsec max Fall Time: 1 usec max	Voltage WRT Ground: Logic 1: 3 to 5 VDC Logic 0: 0 to 0.5 VDC
3	O	DATA_IN Serial Data Port In RS-232 GPS Receive Data	Load: NLT 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	GND	Signal Reference	
5	I	DATA_OUT_U Serial Data Port In RS-232 GPS Transmit Data	Load: NLT 3 kohm in parallel with NMT 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

Table A-2. Front Panel J2 GPS Connector (Continued)

Pin #	Dir	Description	Specs	Notes/Modes
6	I	HQ_OT_U (Have Quick Out)	Sink/Source ≤ 0.5 mA Data period: 600 ± 2 usec	Voltage WRT Ground: Logic 1: 300 usec at +4.5 to +5.5 VDC followed by 300 usec at 0 to +0.5 VDC Logic 0: 300 usec at 0 to +0.5 VDC followed by 300 usec at +4.5 to +5.5 VDC
7	O	GPS_PWR (External GPS Power)	Battery Voltage (19.5-33Vdc @ 100 mA MAX)	Optional

Table A-3. Front Panel J18 FILL Connector (DS-102 Mode)

Pin #	Dir	Description	Specs	Notes/Modes
A	O	ADF_A (Fill Reference)	+5.0 V Output	DS-102
B	I	ADF_B (Fill Sense/Mux)	Pulled Up, ground to activate	DS-102
C	I/O	ADF_C (Fill RTS)	Fill RTS	DS-102
D	I/O	ADF_D (Fill Data)	Fill Data IO	DS-102
E	I/O	ADF_E (Fill Clock)	Fill Clock IO	DS-102
F	I	ADF_F (Fill Override)	Fill Override	DS-102

Table A-4. Front Panel J18 FILL Connector (DS-101 Mode)

Pin #	Dir	Description	Specs	Notes/Modes
A	NA	ADF_A (Fill Reference)	GND RTN	DS-101D
B	I/O	ADF_B (Bal [+])	RS-485 compatible	DS-101D
C	-	ADF_C (Not Used)		
D	-	ADF_D (Not Used)		
E	I/O	ADF_E (Bal [-])	RS-485 compatible	DS-101D
F	-	ADF_F (Not Used)		

Table A-5. 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	

Table A-5. Front Panel J3 DATA Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
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 Transmit Data (TXD) - (into radio)	RS-232E or MIL-STD-188-114A; Balanced	
9	O	Data Carrier Detect (DCD)	RS-232E or MIL-STD-188-114A; Balanced	
10				Not connected
11	O	Red Fixed Level Audio Out	600 ohm, 0 dBm	Programmable level
12	I	Red Fixed Level Audio In	600 ohm, 0 dBm	Programmable level
13	N/A	Chassis Ground		
14	O	Battery Out	19.5 - 33 VDC, 100 mA, maximum	Output level depends on battery input or vehicular battery input at J6 Accessory connector.
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	Transceiver Data Terminal Ready (DTR)	RS-232E or MIL-STD-188-114A; Unbalanced	
23	O	Retransmit Keyline Out	100 mA, 60 V	Open collector

Table A-5. Front Panel J3 DATA Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
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-6. 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		
6	I	Black Fixed Audio In	600 ohm, 0 dBm	For modem baseband testing.
7	O	Black Fixed Audio Out	600 ohm, 0 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	

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Table A-6. Front Panel J6 ACCESSORY Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
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	
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-7. Front Panel Keypad Display Unit (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		
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-8. 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.

Table A-8. Rear Panel J10 and J11 Battery Connectors (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
5	I	+12 VDC Input Voltage (Cell B)		Pin 2-4 tie produces + 24 VDC here.
6	I/O	Charge Status for Smart Battery	Bidirectional serial	

Table A-9. Rear Panel J9 ACCESSORY Connector

Pin #	Dir	Description	Specifications	Notes/Modes
1	I	Black Fixed Audio In	600 ohm, 0 dBm	
2	O	Black Fixed Audio Out	600 ohm, 0 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
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	AN/PRC-150(C) front panel switch must be On.

Table A-9. Rear Panel J9 ACCESSORY Connector (Continued)

Pin #	Dir	Description	Specifications	Notes/Modes
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.

Table A-10. 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-adapter, KY-99 Audio, AN/PRC-150(C) control (DB25)
PA	10535-0720	PA-AN/PRC-150(C) control cable
PA/Remote	10535-0730-A1	PA-AN/PRC-150(C) Control Y-cable, ASCII remote
Remote	10535-0740-A006	ASCII RMT CTL (J6)
KG-84C	10535-0750-A006	KG-84C BLK DIG DATA
Remote	10535-0760-A006	ASCII RMT CTL (J9)
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
PPP (RPA Cable)	10535-0775-A006	Async RS-232 control (DB-9)
RF-6710W/RF-6750W	10518-1694-A006	Async RS-232 control/data (DB-9/DB-25)*
ANC KIT, RF-5800H-MP	10535-0900-01	RF-5800H Ancillary/Mating Connector Kit

*NOTE: May require additional equipment such as synchronous card. Refer to RF-6710W/RF-6750W manuals for details.

Table A-11. Connectors and Mating Connector Part Numbers

Chassis Connector	Mating Connector Part Number
J1 AUDIO	J69-0001-623
J2 GPS (Internal GPS radios)	P-0104
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
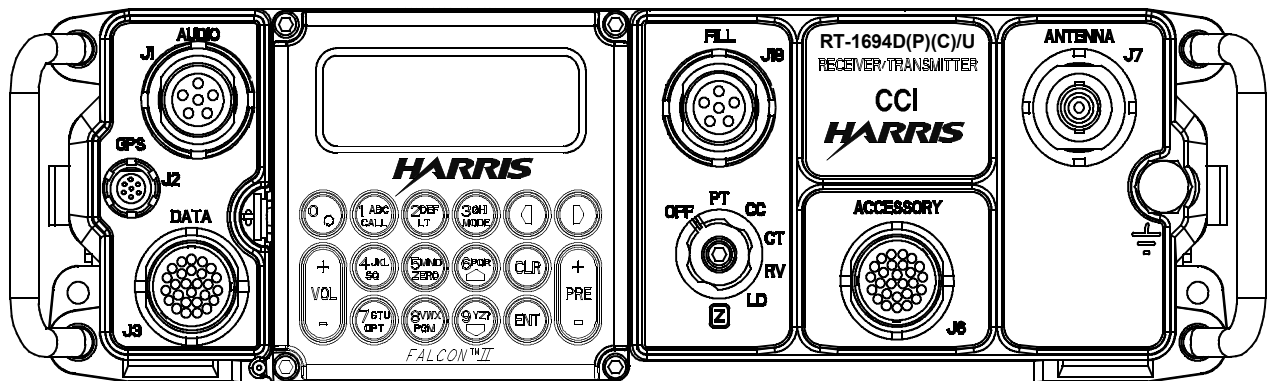
AN/PRC-150(C) FRONT PANEL

**J3, J6
CONNECTOR DETAILS**
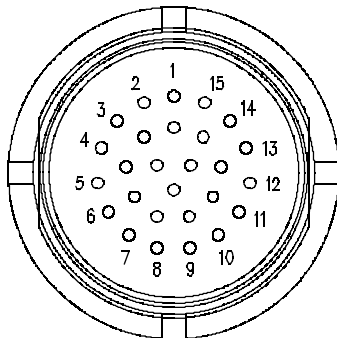
**J1, J18*
CONNECTOR DETAILS**
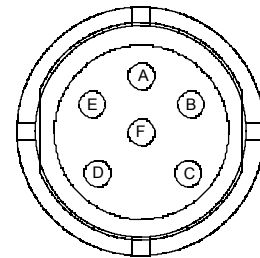
**J10/J11
CONNECTOR DETAILS**
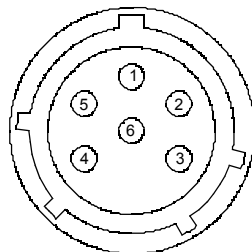
**J9
CONNECTOR DETAILS**
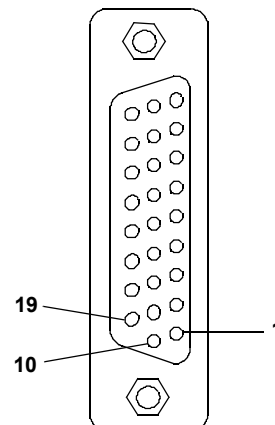
F0117-4200-0043

Figure A-1. AN/PRC-150(C) Connector Pinouts

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GLOSSARY

3G	Third generation HF communication protocols defined by STANAG 4538, characterized by faster linking and the ability to operate successfully in lower signal-to-noise ratio situations.
3G+	Radio Mode that allows the radio to receive and place ALE (MIL-STD-188-141A/B) calls while operating in 3G mode.

-A-

ACK	Acknowledgement positive.
ACP193	Ground Routing Protocol for use with Automatic Link Establishment (ALE) capable HF radios
ACTT	Audio Clear-To-Transmit.
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.
ALL Call	ALE call made to all stations scanning on a given channel in which no responses are required from the target stations.
AMD (Automatic Message Display)	A data mode only used in ALE that uses the ALE modem to transmit and receive short text messages with a very robust ARQ method.
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.

GLOSSARY (Continued)

-A- - Continued

ANY Call	ALE call made to all stations scanning on a given channel in which responses are required from the target stations.
ARCS	Automatic Radio Control System
ARQ (Automatic Repeat reQuest)	A data transmission system in which the receive terminal upon detecting a transmission error in a message automatically transmits a request to the originator to re-send the flawed parts of the message. Also, refer to ACK and NACK.
ASD	Audio Signal Detect.
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.
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.
BER	Bit Error Rate
BFO	Beat Frequency Oscillator
Bit Error Rate (BER)	An evaluation of the ability of a channel to pass error-free data information.
BIT	A binary digit that can have a value of 0 or 1.
BITE	Built-In Test Equipment
BLOS	Beyond Line of Sight, HF skywave communications using selected frequencies that refract from the ionosphere.
BNC	Bayonet Neill Concelman. UG-88 plug for a standard RG-58 coax cable.
BPS	Bits per Second
BW	Bandwidth

GLOSSARY (Continued)

-C-

Calling Station	The station initiating a call to a target station.
CAM	Customer Algorithm Modification
CC	Citadel Cover. Cipher mode switch position used for Citadel encryption. 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.
CDD	Complete Discharge Device
Channel (CH., CHAN)	A programmed combination of frequency and mode of transmission, bandwidth, and AGC value.
Channel Score	ALE rating of overall channel quality
CIK	Crypto Ignition Key - Seed for cryptographic keys
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	Communications Security.
COMSEC Keys	Refers to COMSEC 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	Multiple Access with Collision Avoidance
CT	Cipher Text. Function switch position to enable Type I encryption.
CTI	Computer Telephony Interface.
CTS	Clear-To-Send.
CVSD (Continuously Variable Slope Delta)	Digitization process for analog voice used in conjunction with Vinson encryption.

GLOSSARY - Continued

-C- - Continued

CW (Continuous Wave)	Method of sending or receiving International Morse Code.

-D-

DAGR	Defense Advanced GPS Receiver
Data Presets	A named, pre-defined set of modem parameters that allows the radio to be setup using only the name. Also referred to as modem presets.
dB	Decibel
DC	Direct Current.
Default Settings	Transmission parameters established during the setup of the network configuration that remain in effect unless they are explicitly changed.
DHCP	Dynamic Host Configuration Protocol. A DHCP server is configured with a block of available IP addresses and their subnet masks. When the radio is connected to a network that includes a DHCP server, the radio's IP address can automatically be assigned to the radio by the DHCP server.
DMDG	Digital Message Device Group
DOD	Department of Defense
DTD	Data Transfer Device, AN/CYZ-10
DTE	Data Terminal Equipment
DUN	Dial-up networking
DV (Digital Voice)	Digital data converted from analog voice.

-E-

ECCM (Electronic Counter Counter Measures)	Techniques used to prevent signal detection or jamming of the transmission path.
ECCM Frequency Exclusion	A specific type of exclusion band that applies only to wide band ECCM mode and is given directly to the radio.
ECCM Channel Type	ECCM can operate in one of three modes: wideband, narrowband and list.
EEPROM	Electrically Erasable Programmable Read-Only Memory
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.

GLOSSARY - Continued

-F-

F_c — Center frequency. The frequency around which HOPPING occurs.

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.

FET — Field Effect Transistor

Fixed Frequency — A single frequency operating mode.

FLSU — Fast Link Set Up

FM — Frequency Modulation

FSK — Frequency Shift Keying

-G-

Gateway Address — Also known as a default gateway, this address is used for routing addresses not known to a subnet to a location outside the subnet (i.e. another net or subnet).

GPS (Global Positioning System) — A unique system that uses satellites to provide Time-Of-Day used with frequency hopping and 3G synchronization.

GMT — Greenwich Mean Time

-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

HDL — High-throughput Data Link protocol defined by NATO STANAG 4538.

HF — High Frequency. The 1.6 - 29.9999 MHz range of the RF-5800H-MP Radio Set.

HF-GRP — HF Ground Routing Protocol

HF RPA — Radio Programming Application for High Frequency Radios

HCMAC — High Capacity Media Access Control

GLOSSARY - Continued

-H- - Continued

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.
I/O	Input/Output
IP	Internet Protocol.
IP Address	A number made of four 8-bit binary numbers that uniquely identifies a computer on a network.
IP Address - Subnet Mask	A number made of four 8-bit binary numbers that identifies a series of computers by masking part of all the IP addresses in the subnet (using 255).
IP Firewall	A programmable network option to enable or disable IP Firewall security.

-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
km (kilo-meter)	1000 meters
KG-84NR	A Type I encryption type traditionally used for narrow-band data (the AN/PRC-150(C) allows KG-84 [digital] voice). "NR" stands for "non-redundant".

GLOSSARY - Continued

-K- - Continued

KG-84R	A Type I encryption type (KG-84). "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 for wideband voice or data (wider VHF bandwidth). Commonly referred to as VINSON.
KY-99	A Type I encryption type for narrowband voice or data. Commonly referred to as ANDVT.
KY-99A	An improvement to KY-99 to add Vinson mode while keeping existing ANDVT capability.
KY-100	A Type I encryption type for narrowband voice or data at higher speeds than KY-99. Also referred to as Black Digital (BD).

-L-

LCD	Liquid Crystal Display
LDV	Last Ditch Voice
LDL	Low-latency Data Link protocol defined by NATO STANAG 4538
Li-ION	Lithium-Ion rechargeable battery
Li-MnO$_2$	Lithium Manganese Dioxide non-rechargeable battery
Li-SO$_2$	Lithium Sulfur Dioxide non-rechargeable battery
LOS	Line-of-Sight
LP	LEAP time interval measured in 00-99 seconds
LPC (Linear Predictive Coding)	Used to produce Digital Voice.
LPD	Low Probability of Detection
LPI	Low Probability of Intercept
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

GLOSSARY - Continued

-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
MELP (Mixed Excitation Linear Prediction)	A 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).
MP	Manpack
MTOD	Manual Time-of-Day
mW	milliwatt or 1×10^{-3} Watt

-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.
NATO	North Atlantic Treaty Organization
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.

GLOSSARY - Continued

-N- - Continued

Net Configuration	Data describing a new including name, description, radio members and their ALE addresses, etc. Nets can exist in multiple plans, but have distinct configurations in each plan.
Net	A group of radios that share common communications parameters, such as frequencies, ALE information, encryption mode and key, etc.
Ni-Cd	Nickel-Cadmium
Ni-MH)	Nickel-Metal Hydride
NVIS	Near Vertical Incidence Skywave
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-

PA	Power Amplifier
Parameter	Data provided to a program to alter its function in some manner defined by that program. Parameters may be either optional or required. The actual value selected by the user is called a parameter value.
Peer IP Address	An IP address sent from the radio to the computer as part of a dynamic address negotiation scheme (as opposed to static [never changing]). This is either a custom IP address, or a WIRELESS setting, and is required for changing 3G nets. Peer IP addresses that are determined via shared communications between the radio and the computer are referred to as negotiated peer IP addresses.
PEP	Peak Envelope Power
PKT	Packet, as in data packets
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.
PSTN	Public Service Telephone Network.
PT	Plain Text

GLOSSARY - Continued

-P- - Continued

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, predefined 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
RDP	Remote Data Port
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 RF-5800H. 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.
RX	Receive, receiver
RX AK	Receive Automatic Rekey
RX MK	Receive Manual Rekey
RXD	Receive Data

-S-

SARK	Secure Automatic ReKey
Score	A rating of overall channel quality in ALE and 3G modes determined by link quality analysis.

GLOSSARY - Continued

-S- - Continued

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
SQ	Squelch - Noise limiting function that requires an incoming signal strength to be above a threshold level to be passed through the receiver.
SNR	Signal-to-Noise Ratio
SNMP	Simple Network Management Protocol
SPCM	Signal Processing and Control Module
SSB	Single Sideband
STANAG	Standard, North Atlantic Treaty Organization (NATO) Agreement
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.
TCP	Transmission Control Protocol
TEK	Traffic Encryption Key - Key used to encrypt normal radio traffic.
TOD (Time of Day)	The time used to synchronize station to calibrate the hopping sequence.
TRANSEC	Transmission security techniques that prevent signal detection or jamming of the transmission path.

GLOSSARY - Continued

-T- - Continued

TrKEK	Transfer Key Encryption Key
TrEK	Transmission Encryption Key - Key used to encrypt special radio traffic**.**
TX	Transmit
TX MK	Transmit Manual Rekey
TXD	Transmit Data

-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.
UDP	User Datagram Protocol
UTC	Universal Time Coordinated
UTM/UPS	Universal Transverse Mercator/Universal Polar Stereographic
USB	Upper Sideband

-V-

VDC	Volts, Direct Current
VINSON	Vinson COMSEC, KY-57 compatible embedded COMSEC mode. Uses 16 kbps data rate for voice and data.
VRMS	Volts, Root Mean Square
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 wave-form
WMT (Wireless Messaging Terminal)	The Harris RF-6710 messaging interface that capitalizes on the ARQ modem preset to ensure reliable data communications.

-X-

XDL	High-throughput Data Link protocol (HDL) or Low-latency Data Link protocol (LDL). Together, they are referred to as XDL, where "X" is a variable.
XMT	Transmit

GLOSSARY - Continued

-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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CUT HERE

LEAF-043A MAP

NAME: _____   **DATE:** _____

COMPANY: _____

ADDRESS: _____

CITY: _____   **STATE:** _____

ZIP: _____   **COUNTRY:** _____

PHONE NUMBER (INCLUDE AREA CODE): _____

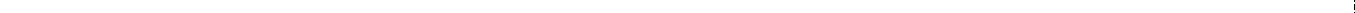## NOTE

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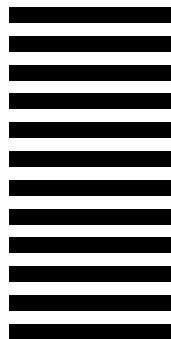
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