HANDBOOK

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RADIO OPERATOR

Tactics, Techniques, and Procedures

Handling Instructions for CALL Electronic Media and Paper Products

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Foreword

The Signal Center of Excellence and the Center for Army Lessons Learned have jointly developed a Radio Operator Handbook for Soldiers assigned, attached, or task-organized as radio operators. The intent of this handbook is to provide user/operator procedures, guidelines, and information that will enhance efficiency in the operation of currently fielded combat net radio systems.

This handbook will assist Soldiers in developing unit training strategies that support the Army Force Generation cycle. By applying the information found in this handbook, Soldiers, leaders, and planners will be provided a solid foundation for unit radio operator training that will build individual confidence and competence while providing individuals with essential skills and knowledge related to radio operations.

Like any other Soldier, a radio operator will be effective only if he is well trained and gains experience through the application of his skills. A good radio operator will enhance command and control at platoon through brigade level. This handbook is designed as a training support guide to supplement unit-level radio operator training and certification.

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Commanding

Radio Operator Handbook

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Introduction

Selecting a Radio Operator

Ralph D. Nichols, Senior Military Analyst, Center for Army Lessons Learned and MAJ Brian Lionberger, Center for Army Lessons Learned

The unit radio operator (RO) provides platoon- to brigade-level maneuver leaders a command and control capability that is critical to mission success. The RO is more than a Soldier who carries the radio for the commander, serves as the commander's driver, or provides the commander personal security, although he often serves in these functions. The RO is the commander's tactical information manager. The process for selecting and training an RO varies widely and is based on the role the unit commander intends the RO to perform; however, there are common factors that every maneuver RO should possess in order to enable effective unit command and control.

Unit commanders should consider the following factors when selecting, training, and employing their ROs. ROs should:

- Be able to competently apply the four principles of providing effective communications: plan, manage, train, and maintain.
- Be able to obtain and maintain a Secret security clearance.
- Be able to receive a message and communicate it effectively.
- Be proficient in both traditional analog (map and compass and azimuth and pace count) and enhanced digital-enabled (blue force tracking [BFT], Precision Lightweight Global Positioning System Receiver, and/or Force XXI battle command—brigade and below [FBCB2]) land navigation skills).
- Be in outstanding physical condition, especially if the unit conducts dismounted operations for any length of time. The added weight of the communication equipment and supplies increases the difficulty of movement.
- Be technically proficient in the operation of all required communications systems and understand the limitations of that equipment. A dismounted RO must be proficient with secure frequency modulation, tactical satellite, and high-frequency radios. The RO must also be proficient with BFT and/or FBCB2 terminals, as most command vehicles and some lift aircraft have these systems.
- Understand the ranges and limitations of the communication equipment. Know and apply employment techniques (such as positioning) and field expedients (such as long-wire antennas) to mitigate the limitations imposed by the environment. Operating in a dense urban environment, traversing long distances and/or mountainous terrain, or inclement weather can degrade communication range capabilities.

- Possess and sustain combat driving skills and understand unit convoy procedures in situations where the RO is also the commander's driver. The RO should be cross-trained and able to assume the vehicle gunner's duties in extreme situations. The RO must have the ability to engage the enemy with lethal force when required.

- Be a certified combat lifesaver. Understand and be able to quickly and effectively apply appropriate medical evacuation procedures when required.

- Be familiar with Field Manual (FM) 1-02, *Terms and Graphics*. ROs must understand that operational terms have specific meanings, and the terms cannot be changed or paraphrased when receiving a message. They must understand graphics so they can mark a map when receiving a spot report; situation report; or size, activity, location, unit/uniform, time, and equipment report.

- Be familiar with FM 6-02.53, *Tactical Radio Operations*. This FM serves as a reference document for tactical radio systems. It also provides doctrinal guidance for using tactical radios on the modern battlefield. The FM targets operators, supervisors, and planners to provide a common reference for tactical radios. It provides basic guidance and gives the system operator and planner the necessary steps for network planning, operations, interoperability, and equipment capabilities.

- Be familiar with FM 1-02.1, *Brevity Codes.* If operating in a joint or coalition/allied environment, ROs must be familiar with appropriate manuals and regulations.

- Have a general understanding of the military decisionmaking process. The RO must understand and be able to communicate the commander's intent at all times.

- Be able to use a headset to monitor the commander's communications. Headsets drown out surrounding noise and enable clearer and distraction-free communication.

- Be trustworthy and discreet. The RO will see and hear much more than most other junior enlisted Soldiers and is expected to maintain confidentiality.

- Be able to complete a call for fire. In many unit standing operating procedures (SOPs), the RO automatically submits a call for fire, "at my command," based on a subordinate's report of troops in contact. This technique allows for a more rapid employment of indirect fires without loss of command authority for execution.

- Be able to rapidly execute the unit's SOP for assumption of command in the event the commander becomes a casualty. Some unit SOPs give the RO significant authority in continuing operations when the commander becomes a casualty and before the next leader in the chain of command assumes control. Judgment, maturity, situational awareness, and a clear

understanding of commander's intent are all essential qualities for an RO in these situations.

- Be able to train subordinate, replacement, or additional ROs as the unit mission dictates.

- Possess intangible personal qualities such as sound judgment, maturity, and ability to work well with others (team player). The RO must be adaptive, flexible, and able to think and act independently. The RO must be intelligent and maintain composure under duress and have the personal courage and stamina to effectively perform and execute with little or no guidance.

Use these personal characteristics and skill sets when selecting an RO. Like any Soldier, an RO will be effective only to the extent that the commander and unit leadership rigorously select, train, and sustain that Soldier for that job. A good RO will enhance command and control at the platoon through brigade levels.

Chapter 1

User Information

This chapter provides a compendium of basic user information and references for all radio operators (ROs). It is not a complete guide to the Single-Channel Ground and Airborne Radio System (SINCGARS) or RO duties. Instead, it is a starting point and a handy reference for any Soldier who may be tasked with RO duties. Because the RO is the small-unit leader's walking, talking, tactical operations center, this chapter also provides a similar starting point for unit leaders, from team to battalion, who must be familiar with the SINCGARS and RO duties.

1. **Purpose.** This handbook establishes procedures, guidelines, and information on operating the various radio systems currently being used. It is designed to supplement unit-level RO training and certification and act as a quick reference for ROs when faced with a communications problem.

2. **General.**

a. SINCGARS. There are several ground unit versions of SINCGARS (RT-1523/A/B/C/D/E/F models). The integrated communications system (ICOM) version consists of RT-1523A/B, the systems improvement program (SIP) version is RT-1523C/D, and the advanced SIP (ASIP) version is RT 1523E/F.

The SINCGARS ASIP is a user-owned and operated solid-state frequency modulation (FM) combat net radio (CNR) that operates in the 30.000–87.995 megahertz (MHz) frequency range in the single-channel (SC) or frequency-hopping (FH) mode. The SINCGARS ASIP increases the performance of the SINCGARS SIP; it also increases its operational capability in support of the tactical Internet. The ASIP is compatible with the older SINCGARS and with North Atlantic Treaty Organization forces in SC, squelch off mode. It provides electronic warfare protection and a reduced electromagnetic signature in the FH mode. The SINCGARS ASIP radio incorporates an enhanced SIP (ESIP) waveform. The waveform includes optimizations to the algorithms of the noisy channel avoidance scheme, the time of day tracking scheme, and the end of message scheme.

b. Squad radios. To meet the communication demands among squad members, the Army allows units to purchase commercial, off-the-shelf (COTS) systems. The two most commonly used COTS systems are the EF Johnson and ICOM radios. It is important to remember these radios have limited capabilities.

c. AN/PSC-5C/5D (Spitfire). This radio was built to replace the AN/PSC-3. The Spitfire can scan up to five line-of-sight (LOS) or dedicated satellite communications (SATCOM) radio voice operation nets. Scanning combinations of cipher text (VINSON encryption) and plain text nets is allowed in voice mode only. The Spitfire operates in SATCOM modes. The Spitfire provides range extension for both SINCGARS and Spitfire radios. Use the AN/PSC-5 for beyond-line-of-sight (BLOS) wireless network extension of SINCGARS nets. Each net requires a SINCGARS and AN/PSC-5 terminal connected for wireless network extension. (For more

information on the AN/PSC-5, refer to Technical Manual [TM] 11-5820-1130-12&P.)

d. AN/PRC-104A. This radio consists of the RT-1209, amplifier/coupler amplitude modulation (AM)-6874, antennas, and handsets. It is a low-power radio that operates in the 2–29.999 MHz frequency range and passes secure command and control (C2) information over medium to long distances and varying degrees of terrain features that would prevent the use of very high frequency (VHF)/FM CNR. It provides 280,000 tunable channels in 100 hertz (Hz) steps and has automatic antenna tuning. (Refer to TM 11-5820-919-12 for more information on the AN/PRC-104A.)

e. AN/VRC-104(V)1 and (V)3. These are vehicular radio systems that provide units with BLOS communications, without having to rely on satellite availability on a crowded communications battlefield. The systems' manpack and vehicular configurations ensure units have reliable communications while on the move and allow for rapid transmission of data and imagery.

f. AN/PRC-117F. This is an advanced, multiband, multi-mission manpack radio that provides reliable tactical communications performance in a small, lightweight package that can maximize user mobility. The AN/PRC-117F is a based, fully digital, software-controlled, voice and data transceiver multiprocessor. The AN/PRC-117F is capable of providing LOS, SATCOM, electronic counter countermeasures, and FH operations (SINCGARS and HAVEQUICK) and is compatible with all tactical VHF/ultra high frequency (UHF) radios. (**Note:** The AN/VRC-103 is the vehicular version of the AN/PRC-117F.)

g. Falcon III AN/PRC-117G. This manpack, wideband networking radio when combined with the RF-7800B provides automatic and secure range extension, connection to out-of-range networks, and entry into the Internet by using satellite-based, wideband BLOS communications.

h. AN/PRC-148 multiband inter/intra team radio. This radio is capable of operating in clear (analog), secure voice (digital), and secure data (digital) modes. It operates over a 30–512 MHz frequency rage in FM, AM, or shaped binary phase keying (SBPSK) radio frequency.

i. AN/PRC-150 (Harris) I advanced high frequency(HF)/VHF tactical radio. This radio provides units with state-of-the-art HF radio capabilities in support of fast moving, wide area operations. HF signals travel longer distances over the ground than the VHF (SINCGARS) or UHF Enhanced Position Location and Reporting System signals do because they are less affected by factors such as terrain or vegetation.

j. ANPRC-152. This is a Joint Tactical Radio System compliant with its software communication architecture (SCA), programmable cryptography (VINSON KY-57/58), and multiple waveform capability. It can operate in the FM and AM bands and has UHF SATCOM capability using weather narrowband or wideband channels and is able to interface with public safety communication systems within the United States.

k. Controlled cryptographic equipment.

(1) The AN/CYZ-10 automated net control device (ANCD) is a handheld device capable of receiving, storing, and transferring data between ANCDs or between an ANCD and a SINCGARS radio. The primary application for this device is to fill the SINCGARS with FH data, time, communications security (COMSEC), and loadset information. ANCDs are nonrepairable, controlled cryptographic items (CCIs) and must be stored according to Technical Bulletin 340-1 (change 1). An ANCD loaded with secret information must be stored in a three-combination safe. ANCDs that are not loaded must be secured with no less than two barrier protection layers (a locked door and wall locker using a 200 series lock for example).

(2) The AN/PYQ-10 simple key loader (SKL) was designed as a replacement for the AN/CYZ-10, ANCD. A limited understanding of the Electronic Key Management System operating environment is helpful in understanding the operation of the SKL. The hardware platform that hosts the SKL software (including the secure library) is a vendor-supplied, ruggedized personal digital assistant device equipped with a KOV-21 personal computer memory card international association card. The SKL is not equipped with a hard drive, so all programs are stored in nonvolatile flash memory.

l. Global Positioning Systems (GPSs).

(1) The AN/PSN-11 Precision Lightweight GPS Receiver (PLGR) is a handheld GPS. The primary application for this device is precision position location and land navigation via programmable waypoints. The secondary application for this device is to update and verify the date and time in SINCGARS. The PLGR is a high-dollar item and should be safeguarded accordingly.

(2) The Defense Advanced GPS Receiver (DAGR) is the PLGR's replacement. The DAGR incorporates anti-jam improvements for enhanced protection and is the first U.S. handheld GPS receiver program to include the next generation security device, Selective Availability Anti-Spoofing Module. The DAGR's dual radio frequency front end allows continuous tracking of both the L1 and L2 GPS satellite frequencies. Even when turned off, a precision time source runs continuously to allow rapid acquisition of the GPS satellites when the receiver is turned on. This system is a great improvement over the PLGR.

Note: The SINCGARS radios, ANCD, and SKL are CCIs and require double-barrier protection according to Department of the Army Pamphlet 25-380-2. All unattended SINCGARS radios will be zeroed. Radios will be reloaded when required using the ANCD/SKL.

3. **Operating procedures.**

a. Net synchronization time (NET).

(1) SINCGARS radios have an internal master clock. Each channel also has the ability to maintain separate time. Time is primarily loaded into the radio via a GPS device or can be manually set. If the ANCD is used, ensure the time in the ANCD has accurate Zulu time stored. GPS Zulu time is the standard time zone used for all radios.

(2) The Zulu time stored in a SINCGARS radio will drift significantly over time and if loaded into the ASIP will not allow communications with other net members. All ROs must verify accurate time in the ASIP after loading their radios. All ROs must also maintain accurate time (hours, minutes, and seconds) on a digital watch to quickly verify time. Time must be within + or – 4 seconds to communicate with other SINCGARS. Accurate Zulu time can be obtained:

- By calling the atomic clock at Defense Switching Network 762-1401 or commercial (202) 762-1401.
- Via GPS (must be + or – 1 second).
- Via HF radio (PRC-04) at the top of the hour on any 5 kilohertz frequency.

(3) The SINCGARS Julian date (JD) is the last two digits of the full JD. Refer to Appendix A for the correct JD. The JD is also automatically loaded via the ANCD. If a net member loads the incorrect JD or accidentally changes the JD, all communication with other net members will be lost.

(4) The net control station (NCS) will always maintain accurate time and will operate a radio in the frequency hopping master (FH-M) mode during FH operations. The NCS for each net is the only radio authorized to operate in the FH-M mode. This procedure will ensure time accuracy throughout the net. If the NCS radio fails during any part of the mission, the alternate NCS will switch its radio to the FH-M mode.

b. The battalion standard for initial net opening is a hot start net opening procedure. Chapter 3 covers this procedure in detail.

c. The passive late net entry procedure allows a radio with the correct hopset and COMSEC information but inaccurate time (+ or – 59 seconds) to enter a net. Chapter 3 covers this procedure in detail.

d. Loadset.

(1) Loadsets are comprised of the following components:

- Transmission security key: frequency hop data
- Esets: net identifications (IDs), for example, F302
- COMSEC keys (transmission encryption key and key encryption key): transmission encryption keys
- Lockout sets: restricted frequencies within the frequency hop data

(2) The ANCD transfers a loadset to a SINCGARS. This loadset is transferred by a menu-driven procedure during normal loading procedures of the SINCGARS with the ANCD.

(3) Net IDs are normally fixed and will follow the numbering scheme in the note below. Specific net IDs within the below listed ranges are designated in the unit's signal operating instructions (SOI).

Note

The following are sample unit standards only and may change for real world contingencies or deployments:

FH000–099	Theater/Joint
FH100–299	Corps/Service
FH300–399	1st Brigade (BDE)
FH400–499	2nd BDE
FH500–599	3rd BDE
FH600–699	Aviation BDE
FH700–799	Fires BDE
FH800–899	Division Support Command
FH900–999	Division Headquarters

e. Operations security (OPSEC) is defined as any measure an operator takes to safeguard information from the enemy. OPSEC can be anything from minimizing the number of net IDs loaded into a radio to zeroing an ANCD or radio if capture by the enemy is imminent. These actions deny the enemy the ability to exploit the ANCD or radio to obtain intelligence information to use against U.S. forces. All personnel assigned to, attached to, or under the operational control of the battalion will follow these procedures to maximize OPSEC.

(1) Loadsets contain only the primary net used by the operator. If the RO requires additional nets, he will manually load the radio with the required net, minimizing the number of channels used.

(2) ANCDs only contain the loadset and COMSEC required by the operator.

(3) New editions of the SOI and COMSEC should not be distributed below the battalion level until authorized by the BDE signal officer.

(4) All ROs must know all compromise procedures and code words prescribed in Chapter 2 and understand the steps for each procedure.

(5) Safeguard any radio cheat sheets that list call signs and net IDs, and account for cheat sheets according to classification such as for official use only, confidential, or secret. Whenever possible, memorize this information.

f. Common prowords are words used on a regular basis while conducting radio operations. They are not interchangeable; the meanings are specific and clear to the receiver. For example, consider the prowords “say again” and “repeat.” “Say again” means to repeat the last transmission while “repeat” refers to fire support, to fire the last mission again.

Chapter 2

Compromise Procedures

Compromise of sensitive signal information is inevitable and always unwelcome. The effects of compromise can be minimized through common sense precautions and standardized corrective measures embedded in unit standing operating procedures (SOPs). The key concept in dealing with compromise is a common understanding of those SOPs based on repetitive drills. This chapter offers units a possible template for establishing compromise procedures. Like all standardized procedures, these SOPs are absolutely worthless if everyone in a unit does not practice and understand them.

Note: The codewords/definitions used below are provided as examples. Actual codewords/definitions will be published in the unit's tactical SOPs (TACSOPs) and signal operating instructions (SOI).

1. **Purpose.** This chapter establishes the guidelines designed to standardize the process for executing compromise procedures. The compromise procedures reflect the steps used by the unit.

2. **General.** A compromise is defined as any communications security (COMSEC) fill device or COMSEC-filled and functioning radio that falls into enemy hands before the radio operator (RO) can zero the device. The procedures listed below detail actions for ROs to take to minimize compromises, if a compromise is imminent, and after a net becomes compromised.

3. **Procedures.**

a. Minimizing compromise.

(1) Effective battle tracking enables the battle staff to attain mutual situational awareness of the battlefield and the ability to track the execution of tactical operations. Battle tracking is achieved by the integration of the staff through teamwork and an interactive flow of information within the command post. Knowing what is loaded in a particular device at the battalion and brigade level mitigates the severity of a compromise.

(2) Automated net control devices (ANCDs) or simple key loaders (SKLs) are not distributed below the infantry company headquarters or below antitank platoon headquarters level. Combat multipliers will not deploy with ANCDs or SKLs and will receive all radio fills from the supported maneuver element. Ensure all controlled cryptographic items are properly accounted for and secured at all times.

(3) SOI data are not distributed below battalion level. The new challenge and password is announced over a secure command net daily at 0100 hours (Zulu).

(4) All command vehicles leaving the tactical operations center (TOC) or headquarters command post (CP) secure their ANCDs at that TOC or CP.

(5) Excess ANCDs within a deployed unit are zeroed.

b. Imminent compromise.

(1) If carrying an ANCD, the RO immediately zeroes the ANCD by hitting the red zero key four times, then removes the COMSEC encryption key and destroys it. By destroying the ANCD's CIK, the ANCD is inoperable.

(2) If carrying an SKL, the operator needs to depress the zeroize button located on the top right of the SKL protected by a swivel cap. Depressing the zeroize button causes the KOV-21 information security (INFOSEC) card to begin a zeroization process of the SKL unmanned aircraft system mission data. Once this process is started, it cannot be stopped. To zeroize the KOV-21 INFOSEC card, swing open the swivel cap and depress and hold down the red button for more than one second—zeroization is immediate.

(3) Operators announce on the radio, "ALL STATIONS THIS NET, THIS IS (call sign) WATERGATE, WATERGATE, WATERGATE!" and then immediately zero the COMSEC by turning the function knob to Z. This message alerts other net members that you have zeroed your radio's COMSEC because you are being captured. You may still use the radio but only in a nonsecure mode until you can receive another ANCD fill.

c. Compromise confirmed. Once a compromise is confirmed or a decision is made by a commander to treat the incident as a compromise, the following actions by the net control station (NCS) will take place.

(1) VENUS will be used to announce that a compromise occurred. This code word will be used as follows: "Venus, Venus, Venus. Stand by, over."

(2) JUPITER will be used to change the operating SOI to a new edition. This code word will be used as follows: "Guidons, guidons, Jupiter edition _____, (date-time group [DTG]) _____, Acknowledge in sequence, over."

(3) PLUTO will be used to add two days to the existing Julian date (JD). This code word will be used as follows: "Guidons, guidons, Pluto, Pluto, Pluto _____, Acknowledge in sequence, over."

(4) MERCURY will be used to subtract two days from the existing JD. This code word will be used as follows: "Guidons, guidons, Mercury, Mercury, Mercury, over. Respond in sequence, over."

(5) NEPTUNE will be used to switch to predesignated net identifications (IDs). The code word WHEEL will be followed with the number designated to represent the predesignated net ID within the SOI. WHEEL 1 and 2 net IDs will be designated within the SOI or published with the signal annex supporting the mission. WHEEL X-RAY is used to return to the original net ID. This code word will be used as follows: "Guidons, guidons, Wheel _____, DTG _____, acknowledge, over."

(6) URANUS will be used to announce that the net should prepare to receive an automatic rekey using manual keying over the air (OTAR). This code word will be used as follows: "Guidons, guidons, Uranus, Uranus, Uranus, DTG _____, acknowledge in sequence, over." This procedure allows an NCS to transfer a transfer encryption key (TEK) (not a key encryption key [KEK]) electronically by OTAR to other NCSs.

(7) MARS will be used to announce that the net should prepare to receive an automatic rekey (OTAR). This code word will be used as follows: "Guidons, guidons, Mars, Mars, Mars, DTG _____, acknowledge, over." This procedure allows an NCS to transfer a TEK (not a KEK) electronically by OTAR to other NCSs.

d. After a compromise.

(1) If you suspect a net is compromised, do not announce "THIS NET IS COMPROMISED" over the net. Use an alternate secure net to notify your higher headquarters or announce over the net, "ALL STATIONS THIS NET, THIS IS (call sign) RED EYE, RED EYE, RED EYE." This message alerts other net members that you suspect the net is compromised, and all classified traffic must come to a halt.

(2) Compromised nets continue to operate on the compromised TEK until the NCS directs a change of the TEK or net ID. The directive will only come from the battalion signal officer.

(3) Once the mission allows, the NCS directs a net ID or TEK change.

Example:
Net ID:
RATTLESNAKE 1: Change to STRIKE NET 1
RATTLESNAKE 2: Change to STRIKE NET 2
RATTLESNAKE 3: Change to original NET ID

An alternate method is to change the Julian date (JD) on the radio net using code words and leaving the net ID alone.

Example:
JD:
WARRIOR SPIRIT 1: Change JD + 3
WARRIOR SPIRIT 2: Change JD + 5
WARRIOR SPIRIT 3: Change JD + 7

(4) The NCS directs an OTAR using either the automatic remote keying method (AK) or manual remote keying (MK) method. Chapter 4 covers the procedures for both tasks. After execution of either method, the NCS conducts a radio check with all net members. An alternate NCS acts as a sweeper and remains on the old net ID or TEK until all members are notified and comply with the change.

(5) Actual STRIKE net IDs are found in the SOI and must be memorized. **Do not write down STRIKE net IDs anywhere**.

(6) Once the new net is established, it is clear for classified traffic again.

(7) Code words used to initiate change of SOI editions are:

- COBRA: Change to B edition TEK/SOI
- PYTHON: Change to C edition TEK/SOI

(8) The battalion has the capability to send new SOI information electronically via the Advanced System Improvement Program and ANCD using the broadcast method. The battalion will only use this method as a last resort if other means of disseminating the SOI information prove impossible or impractical. The broadcast method is a very time-intensive process because the ANCD will only process data at 16 kilobytes per second, and normally it allows units to receive one time period at a time. The procedure includes a polling feature that allows the NCS to determine by automatic query if up to 16 net members (designated by special ID numbers) did or did not receive the SOI information sent by broadcast.

(a) The following list assigns polling ID numbers for each net member:

Unit/Section	Polling Number
A Company	1
B Company	2
C Company	3
D Company	4
Administrative and logistical operations center	5
Combat trains	6
Wireless network extension	7

(b) SOI broadcasts can handle up to 16 polling numbers. Polling numbers 8–16 will only be assigned when required.

Note: The codewords/definitions used in this chapter are provided as examples. Actual codewords/definitions will be published in the unit's TACSOP and SOI.

Chapter 3

Radio Systems

The family of combat net radios is comprised of intra-squad radios, Single-Channel Ground and Airborne Radio System (SINCGARS) radios, and single-channel tactical satellite radios. These are the essential command and control (C2) systems directly supporting the warfighter during daily operations. The most common radio systems currently being fielded are the EF Johnson, Integrated communications security (ICOM), SINCGARS, AN/PRC-148 Multiband Inter/Intra Team Radio (MBITR), AN/PRC-152 (Harris), AN/PRC-117F, and the AN/PSC-5. These radios are the base components for many different configurations. There are tasks common to all radios; however, some of the newer systems such as the PRC-148 or PRC-152 possess increased capabilities for radio operators (ROs). One of the added features of the newer radios is the ability to be programmed using a personal computer (PC). This handbook will focus on essential tasks that an RO must accomplish on a routine basis such as:

- Set-up the radio for operation.
- Load a single-channel (SC) frequency (FREQ).
- Load communications security (COMSEC).
- Load SINCGARS hopset.
- Clone radio (EF Johnson, AN/PRC-148, and AN/PRC-152).
- Receive an electronic remote fill (ERF), SINCGARS advanced systems improvement program (ASIP).
- Receive an over-the-air re-key (OTAR).
- Activate emergency location beacon (AN/PRC-148 and AN/PRC-152).
- Change net identification (ID).

Intra-squad Radios

Intra-squad radios are the simplest radios used by Soldiers today. They are small, lightweight, and have a reduced capacity when compared to most other systems. Operation is intuitive. Nonetheless, all Soldiers and ROs should be familiar with these systems. The most common types are the newer EF Johnson 5100 ES Model 1 and the older ICOM.

EF Johnson 5100 ES Model 1

The EF Johnson 5100 ES Model 1 radio is a commercial off-the-shelf (COTS) system typically used for intra-squad communication. It meets the Project 25 standards for digital radio communications for use by federal, state, and local public safety agencies.

General Information	
Frequency range	380–470 megahertz (MHz) ultra-high frequency (UHF)
Channels	48 programmable channels (3 zones with 16 channels each)
Channel spacing	12.5/25 MHz
Power requirement	7.2 direct current (DC)
Operating temperature	–22° Fahrenheit (F) to +140° F
Approximate range	20 miles at 4W
Approximate battery life	10 hours

Notes

1. The radio's range depends greatly on the terrain. The 20-mile approximate range assumes a clear line of sight (LOS) with little to no interference. The range will be much less in urban areas.

2. Battery life is influenced by environmental conditions and the condition of the battery. Over time, a battery loses its ability to hold a charge. Batteries that no longer hold a charge for an adequate amount of time should be replaced**.**

Figure 3-1. EF Johnson 5100 ES

EF Johnson operator task 1. Radio setup:

Subtask	Action
a. Install PC Configure™	1. Have the unit's information management officer load the program onto a laptop
b. Conduct precombat checks	1. Inspect the radio and antenna for defects
	2. Attach battery to radio
	3. Attach antenna
c. Determine the radio's programmable options	1. Open the PC Connect software on the computer
	2. Connect the radio to the computer
	3. Select the RADIO menu parameter
	4. Select the SERIES menu parameter
	5. Select 5100 PORTABLE
	6. Select TRANSFER and then select READ OPTIONS FROM RADIO

EF Johnson operator task 2. Load a single channel:

Subtask	Action	Result
a. Power on the radio	1. Turn the on/off volume switch	1. Radio performs a self-test
		2. A tone sounds
		3. The light-emitting diode comes on (amber)
b. Set the volume	1. Move the volume switch to the desired level	N/A
c. Set the channel	1. Rotate the channel knob to the appropriate channel number **Note:** All channels must be preprogrammed.	The radio is ready for operation There will be a continuous tone if the channel was not programmed
d. Conduct radio check	N/A	N/A

EF Johnson operator task 3. Load COMSEC:

Subtask	Action
a. Check encryption capability	1. Using the PC Connect software, select the TRANSFER option
	2. Select READ OPTIONS FROM RADIO
	3. If no entry here, delete number
Note: The EF Johnson radio is capable of using DES [data encryption standard]. The manufacturer must enable this feature.	

ICOM Radio IC-F43 (Squad Radio)

ICOMs are durable, short-range radios used at the platoon and squad levels. These simple radio systems are computer programmable. It is not complicated to set ICOM radios up for communications.

General Information	
Frequency range	400–430 MHz and 440–470 MHz
Channels	16 (on a rotary dial)
Channel spacing	12.5/25 MHz
Power requirement	7.2 DC
Operating temperature	–22° F to +140° F
Approximate range	25 miles at 5W (very high frequency [VHF])
Approximate battery life	Eight hours

Notes

1. The radio's range depends greatly on the terrain. The 20-mile approximate range assumes a clear LOS with little to no interference. The range will be much less in urban areas.

2. Battery life is influenced by environmental conditions and the condition of the battery. Over time a battery loses its ability to hold a charge. Batteries that no longer hold a charge for an adequate amount of time should be replaced.

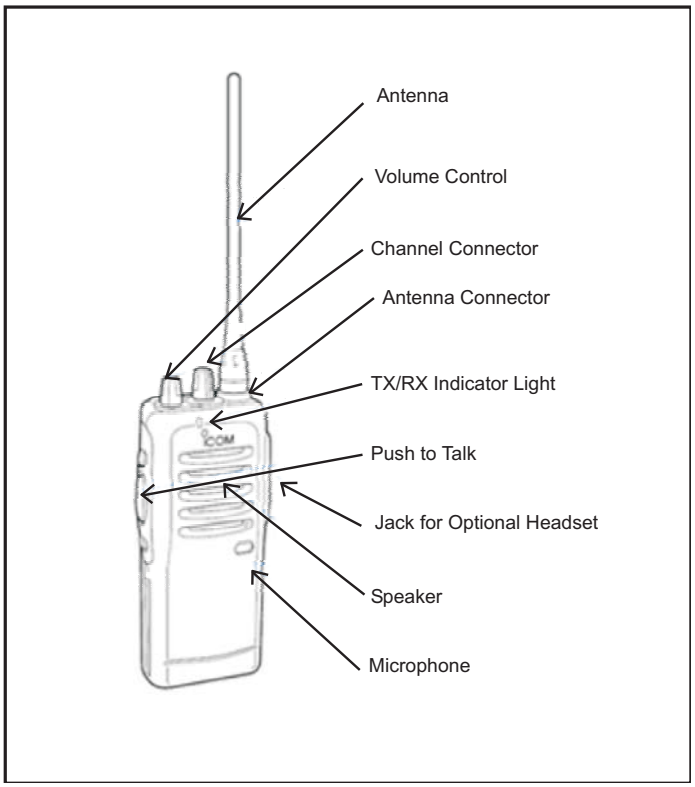

Figure 3-2. ICOM radio IC-F43 (squad radio)

ICOM operator task 1. Radio setup:

Subtask	Action	Result
a. Assemble the radio	1. Ensure the radio is off	N/A
	2. Connect the battery and ensure it is completely latched	N/A
	3. Connect the antenna and ensure it is screwed on tight	N/A
	4. Connect the headset and adjust to desired position	N/A
	5. Rotate volume control to ON and desired volume level	Radio is on and ready for the channel to be set

Subtask	Action	Result
b. Set the channel	1. Rotate the channel selector switch to the desired channel	N/A
	2. Push the push-to-talk (PTT) button to conduct a radio check with another operator **Tip:** Firmly press the PTT button and wait one second before speaking **Tip:** Keep this radio from prolonged contact with moisture or immersion in water	Radio is operational

ICOM operator task 2. Set up the software:

- The standard software is EX-1961 2.3 for F3 series radios. This software was initially written to operate in Microsoft Disk Operating System (DOS) and functions best when used in DOS mode. It is important to make a backup of the programming on a separate disk.
- When initially installed, the baseline for the data is configured with the default military setup. It is very important not to overwrite this file; doing so will cause the RO to lose the military default settings.
- These radios are programmed by the factory with all 32 channels assigned frequencies from 136–152 MHz. Use this program to delete channels or assign different frequencies.
- To start the software:
    - Go to the START tab and select ACCESSORIES.
    - Select the COMMAND prompt.
    - Type EX1961 and press ENTER.
- The software will start with the baseline programming tables displayed.
- If running the software from the floppy drive, enter the following: [A:] press ENTER, then ex1961. Press ENTER.
- If running the software from the hard disk (recommended), change to the directory where the files are located:
    - Type cd followed by the appropriate directory and press ENTER.

- Type in ex1961 and press ENTER again to run the program.

- With the software running, the ALT key takes you to the top menu bar. The arrow keys move the cursor around in the screens. A mouse cannot be used. The F1 key provides help.
- Use the ALT key and the arrow keys to navigate through the software.
- Connect the radio to the PC with the OPC-478 cable.
- To start:
    - Go to CLONE.
    - Select READ to get data from the radio or go to FILE, LOAD, and select the Baseline.icf.file to load the factory default settings. (**Note**: If the Baseline.icf.file or other saved file is not available, the data must be read from a radio. If unable to read from a radio, go to SETUP, RS-232C and check that the port selected matches your computer.)
- You may edit the loadset by deleting channels or writing the new frequency over the old frequency. When editing is complete:
    - Select FILE and save your work using a new and unique filename.
    - Go to CLONE, WRITE to send the new data to the radio. Confirm correct operation of the radio.

Notes

1. If programming additional radios with the same data, connect the next radio using the OPC-478 cable using the steps above.

2. You can also use the radio-to-radio function to program a radio from a good radio. Those steps are listed in the ICOM operator task 4.

Warning

Do not start the software, write frequencies in, and send to the radio. The factory default settings will be lost, and the radio will not work. If this happens, start the programming over by reading from a good radio or loading a good file. Send to the nonfunctioning radio.

Note

A radio with corrupt data will show a flashing display.

ICOM operator task 3. Programming an ICOM radio:

- Read the data (clone) from the radio.
- Save this file and designate it as factory default.
- Preprogrammed function keys are set as follows:
    - º P0 locks the keypad against accidental changes.
    - º P1 temporarily toggles output power between low/high.
    - º P2 illuminates the display for five seconds.
    - º P3 bank up/bank down between:
        - ∗ Bank 1 channels 1–16.
        - ∗ Bank 2 channels 17–32 or scan mode B on/off frequencies are factory programmed as follows:

BASELINE.ICF					
Key and Display Assign 1				Key and Display Assign 2	
Key assign	(+)	Moni		Mic function	OFF
	*(<)	Moni		RF PWR (H/L)	MR CH Individual
Note: Keypad type only	(PO)	Keyboard lock		Backlight	OFF
	(P1)	High/low		Opening text	
	(P2)	Light		LCD contrast	2: Normal- - -
	(P3)	Bank up		LCD display	
	- - - - - - - - - -*(A)	Null		Beep ON/OFF	OFF
At RX only	*(B)	Null			
	*(C)	Null			
	- - - - - - - - - -*(D)	Null			
	(Up/down)	Up/down			

BASELINE.ICF											
Bank 1	CH Atr	FREQ RX	MHz TX	CTCSS/DTCS		Text	PWR Save	TOT	RF PWR	Lock out	Scan
				RX	TX						
1	P	136.00000	<-	151.4	<-	01	ON	ON	H		Tag (Ena)
2		136.50000	<-	151.4	<-	02	ON	ON	H		Tag (Ena)
3		137.00000	<-	151.4	<-	03	ON	ON	H		Tag (Ena)
4		137.50000	<-	151.4	<-	04	ON	ON	H		Tag (Ena)
5		138.00000	<-	151.4	<-	05	ON	ON	H		Tag (Ena)
6		138.50000	<-	151.4	<-	06	ON	ON	H		Tag (Ena)
7		139.00000	<-	151.4	<-	07	ON	ON	H		Tag (Ena)
8		139.50000	<-	151.4	<-	08	ON	ON	H		Tag (Ena)
9		140.00000	<-	151.4	<-	09	ON	ON	H		Tag (Ena)
10		140.50000	<-	151.4	<-	10	ON	ON	H		Tag (Ena)
11		141.00000	<-	151.4	<-	11	ON	ON	H		Tag (Ena)

BASELINE.ICF												
Bank 1 (cont.)	CH Atr	FREQ RX	MHz TX	CTCSS/DTCS		Text	PWR Save	TOT	RF PWR	Lock out	Scan	
				RX	TX							
12		141.50000	<-	151.4	<-	12	ON	ON	H		Tag (Ena)	
13		142.00000	<-	151.4	<-	13	ON	ON	H		Tag (Ena)	
14		142.50000	<-	151.4	<-	14	ON	ON	H		Tag (Ena)	
15		143.00000	<-	151.4	<-	15	ON	ON	H		Tag (Ena)	
16		143.50000	<-	151.4	<-	16	ON	ON	H		Tag (Ena)	

BASELINE.ICF											
Bank 2	CH Atr	FREQ RX	MHz TX	CTCSS/DTCS		Text	PWR Save	TOT	RF PWR	Lock out	Scan
				RX	TX						
1	P	144.00000	<-	151.4	<-	17	ON	ON	H		Tag (Ena)
2		144.50000	<-	151.4	<-	18	ON	ON	H		Tag (Ena)
3		145.00000	<-	151.4	<-	19	ON	ON	H		Tag (Ena)
4		145.50000	<-	151.4	<-	20	ON	ON	H		Tag (Ena)
5		146.00000	<-	151.4	<-	21	ON	ON	H		Tag (Ena)
6		147.00000	<-	151.4	<-	22	ON	ON	H		Tag (Ena)
7		147.50000	<-	151.4	<-	23	ON	ON	H		Tag (Ena)
8		148.00000	<-	151.4	<-	24	ON	ON	H		Tag (Ena)
9		148.50000	<-	151.4	<-	25	ON	ON	H		Tag (Ena)
10		149.00000	<-	151.4	<-	26	ON	ON	H		Tag (Ena)
11		149.50000	<-	151.4	<-	27	ON	ON	H		Tag (Ena)

BASELINE.ICF											
Bank 2 (cont.)	CH Atr	FREQ RX	MHz TX	CTCSS/DTCS		Text	PWR Save	TOT	RF PWR	Lock out	Scan
				RX	TX						
12	P	150.00000	<-	151.4	<-	28	ON	ON	H		Tag (Ena)
13		150.50000	<-	151.4	<-	29	ON	ON	H		Tag (Ena)
14		151.00000	<-	151.4	<-	30	ON	ON	H		Tag (Ena)
15		151.50000	<-	151.4	<-	31	ON	ON	H		Tag (Ena)
16		152.00000	<-	151.4	<-	32	ON	ON	H		Tag (Ena)

Note: If changes are made to the radio's programming, such as frequencies or alpha tags, ensure programming is saved as a different file with a unique name.

ICOM operator task 4. Clone the radio:

Action	Result
1. Connect OPC-474 radio-to-radio cloning cable to the source (master) radio	N/A
2. Turn on the master radio while simultaneously holding down the up arrow and P3 buttons	The radio display should read CLonE; the master radio is now ready to clone to another radio
3. Connect the OPC-474 cable to the target radio to be cloned	N/A
4. Turn on the target radio (nothing else is required to enable the target radio to accept the cloning information)	The master radio will show CL oUt and the target radio will show CL In, followed by CL Good if the clone is successful
5. Press the PTT switch on the master radio	N/A
6. Turn target radio off and back on to use it with the new programming	N/A
7. Connect next target radio to the OPC-474 and turn the radio on; press PTT on the master radio again to clone the next radio	N/A

Advanced Systems Improvement Program Radio Operator Tasks

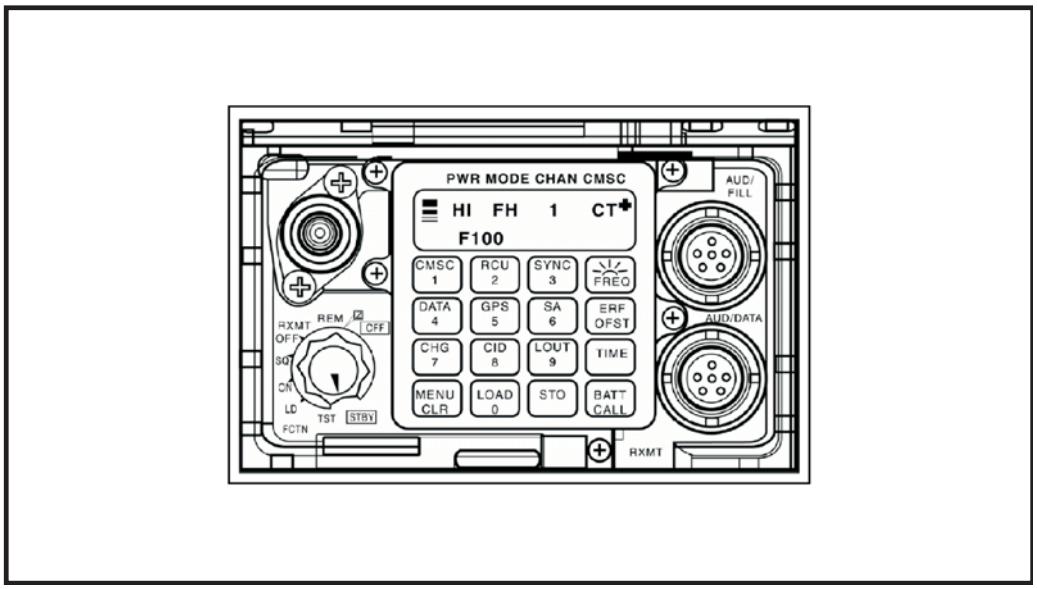

Figure 3-3. Front of an ASIP radio

ASIP operator task 1. Preparation settings from menu:

Subtask	Action	Result
a. Set receiver-transmitter (RT) volume	1. Press MENU	Press MENU to display volume level
	2. Press digits (1–9) for volume setting or (0) for whisper mode	Display reads: WHSP if 0 selected
b. Set RT channel	1. Press MENU (until CHAN is displayed)	Display reads: (1-6) for channel, (Q) for CUE, or (M) for MAN [manual]
	2. Press digits (1–6) for channel desired, (0) for MAN, or (7) for CUE	N/A
c. Set RT power mode	1. Press MENU (until PWR is displayed)	Display reads: (LO, M, HI, PA)
	2. Press CHG for desired PWR setting	N/A
d. Set RT mode	1. Press MENU (until MODE is displayed)	Display reads: (SC, FH, FH-M)
	2. Press CHG for desired MODE	N/A
e. Set COMSEC	1. Press MENU (until MSC is displayed)	Display reads: (PT [plain text], CT [cipher text], TD, RV)
	2. Press CHG for desired COMSEC setting	N/A
f. Set backlight	1. Place RT in SQ ON	Backlight lights (four settings are low, medium, high, and off)
	2. Press FREQ/BACKLIGHT	N/A
	3. Press CHG until desired setting is displayed	N/A

Default settings are: VOL (5), CHAN (1), PWR (LO), MODE (frequency hopping [FH]), and COMSEC (CT).

ASIP operator task 2. Load SC frequency into ASIP:

Subtask	Action	Result
a. Prepare to perform task	1. Obtain proper FREQ from ANCD	(Load CUE FREQ only if directed)*
	2. Set RT controls:** COMSEC to plain text (PT), mode to SC FCTN to Z-FH, TST, and then to load (LD) CHAN to MAN, CUE, or 1–6	RT display reads: GOOD (or see unit maintainer)
b. Load SC FREQ	1. Press FREQ	Display shows 00000 or 30000
	2. Press CLR	Display shows [_____]
	3. Enter five-digit SC FREQ	Display shows SC XXXXX
c. Store SC FREQ	Press STO (within seven seconds)	Display blinks once (data is stored)
d. Prepare to communicate	1. Repeat step b-1 for each FREQ needed	(As directed by net control station [NCS] or unit standing operating procedure)
	2. Set: FCTN to SQ ON	Loading of SC FREQ is complete
*Only NCS and alternate NCS will load a CUE frequency. **RT settings for ASIP are set via the MENU.		

ASIP operator task 3. Load COMSEC/FH data/synchronize time using the ANCD:

1. Select: SOI Radio Supervisor
2. Send Receive Database; Set up COMSEC Time
3. Send to: RADIO ANCD STU PC
4. Select: ICOM NONICOM ABN RCU HAVEQUICK
5. Connect to RT AUD/FILL Connector [ ]
6. Set FCTN switch to LD on RT [ ]
7. Do you want to include time? (Y/N)

8. Press LOAD on RT
9. Transfer in progress/transfer successful

- The ICOM fill procedure loads the radio with COMSEC keys, FH data, and synchronizes (SYNCs) time for all six ASIP channels.
- Select RCU [radio control unit] to fill an RCU with COMSEC keys. The procedure is the same as that shown for ICOM.
- When [ ] appears in the lower right corner of a screen, you must press the down arrow on the ANCD to proceed.
- Load time as part of ICOM fill during net openings and hot start late net entry (LNE) only, not net updates.
- RT settings for ASIP are set via the MENU

ASIP operator task 4. Perform hot start net opening:

Subtask	Action	Result
a. Load RT with COMSEC/FH date and time*	1. See ASIP operator task 3 for ICOM fill	COMSEC/FH data and time load into all six channels of the RT
b. Enter net	1. Call NCS in CT, FH, and request to enter net	Hot start net opening is complete
*All SINCGARS radios will accept time from an ANCD as part of a loadset and from a Precision Lightweight Global Positioning System Receiver (PLGR) as a separate loading of time.		

ASIP operator task 5. Perform passive LNE:

Subtask	Action	Result
a. Use passive method of LNE	1. Press: FREQ SYNC	 Display shows F XXX Display shows LF XXX
	2. Wait for radio traffic to be heard (Do not press PTT key)	Display shows F XXX (L is dropped)
	3. Call NCS and re-enter net	Passive LNE is complete*
*If traffic is not heard for three minutes or more after using passive LNE method, use hot start procedure or CUE and ERF method. Do not key the handset while in the passive LNE mode because it will throw your synchronization time off.		

ASIP operator task 6. Receive net update ERF from NCS:

Subtask	Action	Result
a. Prepare to receive net update operational channel	1. Stay on net	N/A
	2. Set FCTN to LD	N/A
b. Receive and store net update	1. Standby for NCS to send ERF	N/A
	2. Note signal display activation Press STO Enter: X (1–6)*	Display shows HFXXX Display shows STO Display shows STOX and blinks
c. Check communications	1. Set: CHAN to X FCTN to SQ ON	N/A
	2. Call or respond to NCS**	Net update ERF is complete**
*NCS will direct the channel for ERF storage. When update becomes effective, this channel becomes the new net operational channel. **It is assumed the RO has the same COMSEC key loaded in channels 1–5.		

ASIP operator task 7. Perform CUE and ERF LNE:

Subtask	Action	Result
a. Use CUE and ERF method of LNE*	1. Load CUE FREQ (and MAN if not loaded)	See operator task 1
	2. Set COMSEC to PT	RT must be in PT to send CUE
	3. Press PTT (four to five seconds)	Press PTT but do not talk
	4. Set (at once) COMSEC to CT	NCS/alternate NCS will answer in CT
	5. Wait for answer	N/A
	6. Repeat every 15 seconds until NCS answers	CUE goes through only if the net is quiet

Subtask	Action	Result
	7. Request NCS send an ERF	Go to MAN when NCS directs
	8. Receive and store ERF when sent	See operator task 4
	9. Re-enter net	CUE and ERF LNE is complete
*A RO with a loaded ANCD and access to GPS may elect to re-enter the net using the hot start procedure.		

ASIP operator task 8. Change net ID:

Subtask	Action	Result
a. Set proper RT controls	1. Set FCTN to LD CHAN to 1–6 (channel in which data is stored)*	N/A
b. Enter new net ID in RT	1. Press: FREQ CLR ID numbers (3) STO	 Display shows: F XXX Display shows: F ___ Display shows: F XXX Display blinks and the net ID is stored
c. Resume normal communications	1. Set FCTN to SQ ON CHAN to 1–6 (as desired)	New net ID is now available for use
*The ASIP radio allows changing all three digits of a net ID with the MODE switch set to FH or FH-M.		

The Force XXI Battle Command—Brigade and Below and Enhanced Position and Location Reporting System

Force XXI battle command—brigade and below (FBCB2) is a battle command information system designed for units at the tactical level. It is a system of computers, global positioning equipment, and communication systems that work together to provide near-real-time information to combat leaders. FBCB2 provides increased situational awareness (SA) to commanders by depicting an accurate and automatic view of friendly forces, enemy forces, obstacles, and known battlefield hazards. FBCB2 provides enhanced SA to the lowest tactical level—the individual Soldier—and a seamless flow of C2 information across the battlefield. FBCB2 supports operational control through the transmission and receipt of orders, reports, and data. FBCB2 uses two forms of communications: terrestrial and satellite. FBCB2 (terrestrial) uses Enhanced Position and Location Reporting System (EPLRS) and FBCB2 (satellite) uses blue force tracking (BFT). FBCB2 features the interconnection of platforms through EPLRS (terrestrial) and BFT (satellite),

allowing the exchange of SA between the two systems. BFT systems share SA with EPLRS systems, and EPLRS systems share SA with BFT systems and Army Battle Command Systems (ABCSs) that use reach back tunnels found in regional operation centers.

The EPLRS is also the primary data communications system for the FBCB2, which is the data traffic backbone of the tactical Internet from brigade to lower echelons. The EPLRS is used as an alternate data communications link (host-to-host) between C2 platforms at the brigade and battalion levels. The EPLRS is employed in the combat platforms of the commander, executive officer, first sergeant, platoon leaders, and platoon sergeants at the company and platoon levels. The EPLRS consists of an RT, an operator interface device (the user readout), an antenna, and a power source. The radio set provides transmission relay functions transparent to the user. The EPLRS has the following characteristics and capabilities:

- Operates in the 420–450 MHz UHF frequency band.
- Provides secure, jam-resistant digital communications and accurate position location capabilities.
- Uses time division multiple access (TDMA), FH (512 times per second), and spread spectrum technology (8 FREQs 420–450 MHz).
- Has an embedded COMSEC module, transmission security (TRANSEC), and an adjustable power output to provide secure communications with low probability of intercept and detection.
- Built-in test (BIT) function that is activated at power turn on.
- Uses an omnidirectional dipole antenna capable of covering the 420–450 MHz frequency ranges.
- Provides wireless network extension functions that are transparent to the user. The maximum distance the EPLRS can cover is based on 3–10 kilometers (1.8–6.2 miles) distance between each radio and the maximum number of relays in the link.
- Can handle up to 30 needlines. The maximum number of needlines available is dependent on the bits per second (bps) required for each needline.

EPLRS

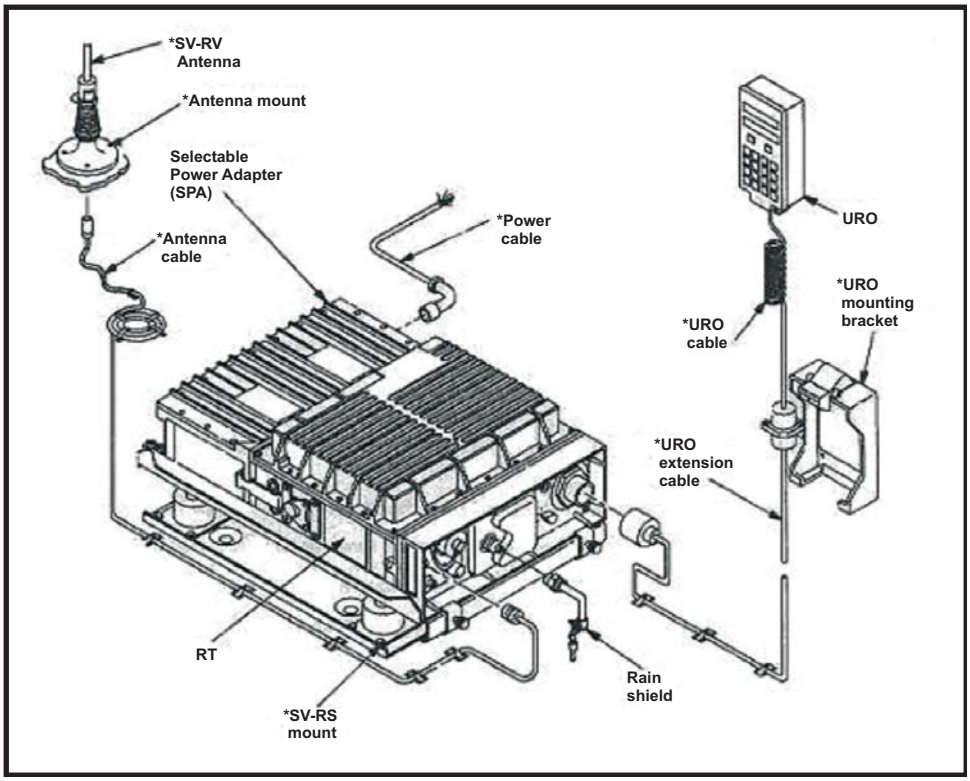

Figure 3-4. Diagram of an EPLRS radio

Note: The radio set ID (RSID) is unique to each platform. If the RSID is unknown, go to the FBCB2 OPS [operations] screen, select F6 ADMIN, select the PLATFORM SETTINGS tab, and then the MISC sub-tab to see the assigned RSID.

Figure 3-5. An EPLRS radio

EPLRS operator task 1. Perform EPLRS pre-operations checks:

Subtask	Action	Result
a. Power	1. Power light should be green	If off, check power cable and/or vehicle power
b. Verify RSID	1. Send "--" command on the user readout (URO) (press 2nd then right, press "-" twice, and then press SEND	
	2. Select RCVD until the URO response is similar	[R][--][12348 54] where "1234" is the RSID and "5" is the guard channel
	3. If RSID or guard channel is not correct	Change to correct RSID/guard channel
c. Alarm light	1. Should be off	If on, zeroize radio and reload the CRYPTO
d. Out of NET light	1. If light is blinking once every second	Radio is searching for NCS and communications are not possible
	2. If light is blinking once every four seconds	Radio is in "track net" and can communicate with other radios, but not with the NCS
Note: Do not recycle or turn off power; continue operations.		

EPLRS operator task 2. Loading EPLRS radio with COMSEC:

Subtask	Action	Result
a. EPLRS ANCD	1. XMIT: ENTER	N/A
	2. EPLRS: ENTER	
	3. RS: ENTER	
	4. MILID: A ENTER	
	5. BOTH: ENTER	
	6. DIVID A: ENTER	See commo rep (2 if after the 15th of the month)
	7. SEGMENT 1: ENTER	

Subtask	Action	Result
	8. Next week TEK [transmission encryption key] also? NO: ENTER	N/A
	9. SECRET: ENTER	
	10. Connect ANCD to EPLRS	
	11. When process is finished, press LOAD on EPLRS, hold for two seconds, and then press ENTER on ANCD	OP [operation] in progress
	12. When process is finished, press LOAD on EPLRS and hold for two seconds, then press ENTER on ANCD	OP in progress
	13. Check URO: Press RECEIVED on URO	@S is a good fill @1 or 4 is a bad fill, zero radio and repeat above steps

FBCB2/EPLRS/SINCGARS product/process and configuration management system checklist:

Warning

If any cables are disconnected, attempt to reconnect. All equipment and cables should remain secured in vehicle.

1. Central processing unit (CPU)	Check for cracks or dents. Ensure cable connections and RAM [random access memory] ball mount are secure.
2. Cable	Check for missing/damaged cables, broken pins or connectors, and cracked cables. **Note:** Equipment must be turned off to connect or remove cables.
3. Display unit (DU)	Check for dents and punctures on the DU touchscreen.
4. Keyboard	Check for sticking or missing keys, and ensure the membrane seal is not torn. Verify the keyboard is connected to the DU.

5. PLGR	Remove the battery (BA5800); ensure grounding plate and cables are properly secured. (PLGR should remain locked in vehicle PLGR mount.)
6. Antennas	Ensure all antennas are free of condensation, present, and properly secured.

FBCB2

FBCB2 operator task 1. FBCB2 start up procedures:

Subtask	Action	Result
1. Initial start up **Note:** The sequence of these start-up procedures is critical to ensuring proper functionality.	a. Start vehicle	Optional
	b. Power on PLGR	Confirm configuration according to PLGR initialization **Note:** Ensure the internal battery (BA 5800) is removed.
	c. Power on EPLRS	Verify RSID and guard channel prior to loading cryptography (crypto)
	d. Power on VAA (CB1)	
	e. Power on FBCB2 computer	Verify green comms and PLGR
	f. Go online into OPS screen	

FBCB2 operator task 2. FBCB2 immediate action procedures; system start up:

Subtask	Action	Result
a. Boot disk error message	1. Power off system	Ensure removable hard drive (RHD) is present and reseat RHD; if problem persists, contact 31U
	2. Open CPU door	
	3. Restart system	
b. Page fault/panic dump error message	1. Bad hard drive	Contact 31U for a replacement
c. PMM [Personal Memory Manager] process crash	1. Exit OPS and clear logs and queues	N/A

Subtask	Action	Result
d. Frozen display screen	1. Immediately cease inputting commands	N/A
	2. Place cursor at the top of the frozen dialog box and drag box aside	
	3. Close error box and/or other open message about dialog boxes	
	4. Resume operations	
e. System processing slows down	1. Clear logs and queues	
f. Internal battery warning (V4 computer)	1. On DU if power light (upper left corner of DU) blinks or shows solid red	Computer is on internal battery power
	2. Start vehicle immediately	(If tactical situation permits)
	3. Shut down FBCB2 according to card 4	
g. Red comms at session manager screen	1. Ensure that role is configured for the platform	If GENERIC APPLIQUE appears in the function bar
	2. Go to SYS ADMIN and configure role	
	3. If still red comms, shut off power to VAA for 60 seconds, turn back on; reboot FBCB2 system, and resume operations	
	4. If still red, power down FBCB2, reset INC to default, and reboot system	(Non-command variant only)
	5. If still red, contact 31U	

Subtask	Action	Result
h. Red comms at OPS screen	1. Select status (F5)	N/A
	2. Select LOCAL COMMS	
	3. Select ROUTER 1 (R1)	
	4. If R1 PPP [point-to-point protocol] is NO GO, follow steps 2–4 on card under red comms	
	5. If R1 PPP is a go, select EPLRS	
	6. If LCNS are NO GO, check status of EPLRS on the URO	Take corrective action
	7. If RELIABLE C2 cue is NO GO, exit OPS and clear logs and queues	
i. Red GPS (at start up or OPS)	1. Ensure that camouflage net, gear, structures, etc. do not obstruct antenna LOS	**Note:** PLGR must be turned off prior to connecting/disconnecting cables or damage will occur to the PLGR. Disconnect power cable first when disconnecting; connect power cable first when connecting.
	2. Verify that PLGR settings are according to the PLGR initialization settings	
	3. Ensure PLGR FOM is at 4 or less	
	4. Check PLGR cables	
	5. Contact 31U	

Subtask	Action	Result
j. Reset the INC to default	**Note:** This procedure is performed through the SINCGARS radio and is done in conjunction with FBCB2 immediate action procedures. Using SINCGARS, ensure radio is in FH mode.	**Warning:** If the FBCB2 system connects to a Cisco Systems-brand router, do not attempt to reset the INC to default.
	1. Switch the selector knob to LD	
	2. Press RCU(2) key once	Display RT
	3. Press CHG(7) key twice	Display LDE
	4. When LDE changes to LDE-N, press STO	
	5. Press 1, press STO	Display will read DEFLT. Wait until frequency appears in display.
	6. Switch selector knob back to ON-SQL	**Note:** This procedure will not affect the SINCGARS Fill, but will require a 25-minute startup of the FBCB2 to reload the INC Software (INC SOFTLOAD). Do not interrupt the softload.
k. Configure role after FBCB2 has been powered up	1. Select START (bottom left screen)	N/A
	2. Select LOG IN	
	3. Type PASSWORD	
	4. Select CONTINUE	
	5. Select START FBCB2 CONFIGURE ROLE	

Subtask	Action	Result
	6. Using down arrows, scroll until required unit is reached (DIV, BDE, or BN)	
	7. Scroll and highlight required unit name	
	8. Select CONFIGURE	
	9. Select YES in verification box	
	10. Select SHUTDOWN when complete	

FBCB2 operator task 3. FBCB2 shut-down procedures:

Subtask	Action	Result
a. Power down	1. Select F6 ADMIN	N/A
	2. Select EXIT OPS	N/A
	3. Select YES	Cancel the TIMEOUT
	4. Go to start menu	N/A
	5. Select SHUTDOWN	N/A
	6. Select YES	Screen displays SYNCHING FILES DONE and a blinking cursor appears
	7. Power off FBCB2 computer	N/A
	8. Power off VAA	N/A
	9. Power off EPLRS	N/A
	10. Power off PLGR	N/A
	11. Power off vehicle (optional)	N/A

BFT is an L-band satellite communications (SATCOM) tracking and communication system that provides commanders eyes on friendly forces and the ability to send and receive text messages. BFT maintains SA of location and movement of friendly forces, sometimes termed “blue force” assets. BFT provides the warfighter with a globally responsive and tailorable capability to identify and track friendly forces in assigned areas of operations (in near real time), thereby augmenting and enhancing C2 at key levels of command.

BFT contains computer hardware and software, interconnecting cables, an L-band satellite transceiver, a PLGR, a mission data loader to transfer larger files, and an installation kit appropriate to the host vehicle type (if applicable).

The tracking system gives detailed information on friendly and enemy units up to a range of 5,000 miles. As long as the systems are connected through the satellite network, commanders can see the activities of brigade-and-below level units. BFT supports a wide variety of joint missions and operations. BFT generates and distributes a common view of the operational environment at the tactical and operational levels, identifying and sharing that view with ground vehicles, rotary-wing aircraft, command posts, and Army and joint command centers.

Integrated Waveform Operations

The Defense Information Systems Agency (DISA) has developed and implemented a new enhanced military UHF satellite communications waveform called the Integrated Waveform (IW). As a requirement of the Department of Defense (DOD) Defense Standardization Program, the IW is designed to prolong the life of the UHF Demand-Assigned Multiple Access (DAMA) SATCOM System by enabling it to support new applications and higher performance that users expect from networks. DISA has revised the military specifications for the UHF SATCOM to match the need for faster, more efficient, and easier to use communications. The DOD has selected a number of user terminal types to be upgraded to IW on a priority basis. DISA has contracted with selected terminal vendors to develop software changes implementing IW in their products.

The MD-1324 UHF DAMA SATCOM modem provides UHF SATCOM capability for half and full duplex radios; the A+ modifies the MD-1324A with a redesigned UHF receiver for input protection up to +30 decibels of measured power (dBm), and increases the flash memory size on the modem’s digital signal processing circuit card to support the IW and legacy DAMA operational modes. Currently the AN/PSC-5C/D and the AN/PRC-117F/G have IW capability.

AN/PSC-5D(C) Spitfire

General Information	
Frequency bands	User selectable from 30–512 MHz
30–89.995 MHz	VHF FM SINCGARS/combat net radio band
108–173.995 MHz	VHF AM air traffic control band and VHF FM public service band
225–399.995 MHz	UHF AM have quick I/II/ground-to-air, UHF SATCOM band
403–511.995 MHz	UHF FM public service band
Channel bandwidth	5, 8.33, 12.5, and 25 kilohertz (kHz)
Data rate	FM LOS: 64 kilobits per second (kbps) (+)
	Non-DAMA 5 kHz: 1.2, 2.4, 9.6, 4.8, 7.2, 8.0, or 9.6 kbps
	Non-DAMA 25 kHz: 9.6, 16.0, 19.2, 28.8, 32.0, 38.4, 48.0 or, 56.0 kbps
	5 kHz DAMA: 75 bps–2.4 kbps
	25 kHz DAMA: 75 bps–16 kbps
Embedded U.S. Type I encryption	VINSON: Voice/Data
	FASCINATOR: Voice/Data
	ANDVT/KYV-5: Voice/Data
	KG-84A: Data
	OTAR/OTAT: Tx/Rx SARK
Power requirements	21–32 Volts DC
Dimensions (RT-1672D[C])	3.26 inches (in) x10.56 in x 13 in (447.53 in^3)
Weight (RT-1672D[C])	13 pounds (with battery box, less batteries)
Batteries	BB-390A/U rechargeable BB-5590/U non-rechargeable

General Information	
Ancillary equipment	Battery box (with 2 each BB-390A/U)
	Handset (H-250/U)
	Connecting cables
	Antennas:
	LOS broadband (30–512 MHz)
	LOS high performance (30–88 MHz)
	UHF SATCOM (user provided)

Figure 3-6. AN/PSC-5D(C) Spitfire radio

AN/PSC-5 Enhanced manpack UHF terminal (EMUT) (also known as Spitfire) radio is a man-portable, DAMA, LOS, and TACSAT communications terminal. The system has embedded security systems. The system supports VHF-UHF bands (30–400 MHz) to communicate with SINCGARS and HAVEQUICK II in LOS modes and supports UHF and DAMA services at the UHF band (225.000–399.995 MHz) for narrowband SATCOM. A portion of the Army's SPITFIRE radios (AN/PSC-5) is being upgraded to the Shadowfire (AN/PSC-5C) and will provide enhanced capability to the warfighter including improved voice recognition. The multiband multimode radio is multimission and embedded in a COMSEC radio to support special operations forces missions by providing a full range/band manpack radio with embedded COMSEC, reduced weight and volume, and full logistic support.

AN/PSC-5 operator task 1. Load LOS presets:

Subtask	Action	Result
Note: The AN/PSC-5 radio set gives the operator 14,800 different channels (spaced 25 kHz apart) for LOS communications. **Note:** The AN/PSC-J radio set automatically communicates in AM or FM as required in the designated military bands.	1. Press ESC key as necessary until MAIN MENU is displayed	MAIN MENU: CURRENT MODE DATABASE OPTIONS SET PRESETS BIT OPTIONS MAINTENANCE
	2. From the MAIN MENU press hot key #3	The display shows the last used set preset menu (LOS, SATCOM, DAMA or BEACON); the data rate field will only be displayed when mode switch is in the CT position
	3. Press the NEXT/PREV keys to move cursor past the fields requiring no change; the # sign indicates field data to be entered when loading presets	N/A
	4. With cursor resting on mode field, press arrow keys to select LOS and press ENTER key until cursor is on preset number field	N/A
	5. With cursor resting on preset number field (-P#), enter desired preset number (1–6) using keypad number key and press ENTER key	N/A
	6. With cursor resting on type modulation data field**,** press arrow keys to select AM or FM (select FM for frequency shift keying [FSK]) and press ENTER key	N/A

Subtask	Action	Result
	7. With cursor resting on encryption type field, press arrow keys to select VINSON or KG-84 and press ENTER key	N/A
	8. With cursor resting on V/D field, press arrow keys to select voice (V) or data (D) mode and press ENTER key	N/A
	9. With cursor resting on the variant field (normal or scan), press arrow keys to select normal and press ENTER key (field is bypassed in CT position)	N/A
	10. With cursor resting on the TPWR field, press arrow keys (or use keypad number keys) to select desired power level (power level can be adjusted from 23–38 dbm in AM or 23–39 dbm in FM) and press ENTER	N/A
	11. With the cursor resting on the R###.##-# field, enter the desired receive operating frequency (30.000–399.975) with keypad numbers keys and press ENTER	N/A
	12. With the cursor resting on the T###.### field, enter the desired receive operating frequency (30.000–399.975) with the keypad numbers keys and press ENTER	N/A

Subtask	Action	Result
	13. The cursor moves back to the first data field (LOS); repeat steps 1–9 to load additional presets	The menu now has all parameters entered and is operational

AN/PSC-5 operator task 2. Load COMSEC:

Subtask	Action	Result
a. In PT the RT-1672/TJ(C) accepts voice or data, places it onto a radio frequency (RF) carrier, and transmits it **Note:** The AN/PSC-5 radio set can store and use COMSEC keys up to and including TOP SECRET. The AN/PSC-5 radio set can retain in its memory a total of 14 COMSEC keys.	1. Press ON to activate the AN/CYZ-10 (ANCD)	SYSTEM LOADING
	2. On the AN/CYZ-10, go to RADIO and select COMSEC; choose the key and select XMIT and press ENTER	XMIT appears on the lower right side of the screen
	3. On the AN/CYZ-10, go to SELECT and press ENTER; scroll to QUIT and press ENTER	Connect ANCD to RT appears on the screen
	4. Connect the AN/CYZ-10 to an AN/PSC-5 and place the function knob on the AN/PSC-5 on F1	N/A
	5. Load keys	N/A

AN/PRC-104 Radio

The AN/PRC-104, a low power, 20 watt, improved high frequency radio (IHFR) set, provides single sideband C2 communications for tactical units in the compatible AM, single side band (SSB), continuous wave (CW), and data modes. The AN/PRC-104 is user operated and is about as complex to use as the current family of VHF FM radios.

The radio uses either a nonrechargeable BA-5590 Lithium battery or a rechargeable BB-590 Nickel-Cadmium battery. The radio features automatic antenna tuning, operates in the 2–30 MHz frequency range, has a maximum bandwidth of 3 kHz, 280,000 channels in 100 Hz increments, and has built-in test features. All IHFR radios will provide secure voice communications with KY-65 or future COMSEC equipment. The AN/PRC-104B was upgraded to a digitized front panel display and frequency channel programming.

Any radios declared excess by units are being replaced by unit-to-unit transfer. The AN/PRC-150C COTS replaces the AN/PRC-104 pending Joint Tactical Radio System (JTRS) fielding.

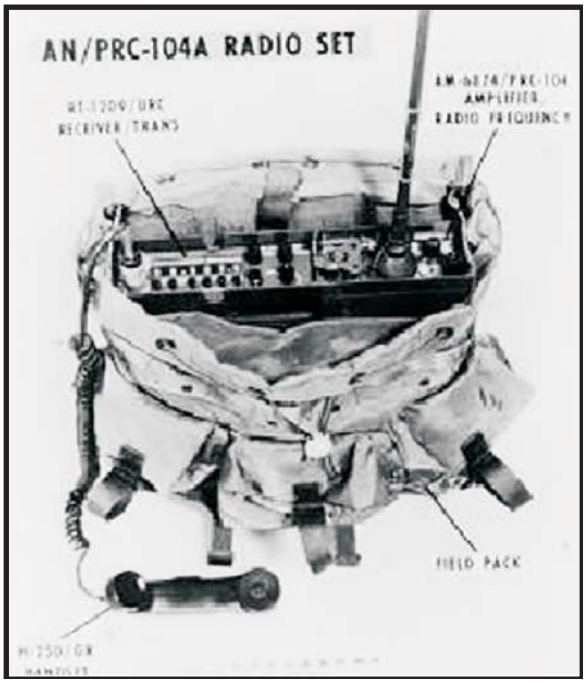

Figure 3-7. AN/PRC-104 radio

AN/PRC operator task. Put the AN/PRC-104 into operation:

Subtask	Action	Result
a. Operating procedures	1. Turn MODE switch to V-TR	N/A
	2. Turn ANT SEL switch to WHIP	N/A
	3. Set FREQUENCY to the net operating frequency	N/A
	4. Turn sideband select switch to USB [universal series bus] or LSB [lower sideband]	N/A
	5. Turn VOLUME control clockwise to apply power and desired listening level	N/A

Subtask	Action	Result
	6. Press PTT button on the handset	The radio will perform its tuning procedure; press to transmit and release to listen
	7. Press the PTT switch, transmit to another station, and release the PTT switch to the other station	N/A

AN/PRC-117F Radio/Multiband Radio

The Harris AN/PRC-117F(C) multiband, multimission radio is an advanced software-defined radio covering the entire 30–512 MHz frequency spectrum using military standard voice and data waveforms, ensuring interoperability with a wide range of equipment. The R/T 1796 (P)/PRC(C) transceiver, VHF blade antenna, and VHF/UHF flex antenna are included with the AN/PRC-117F. The TACSAT radio features advanced voice and data capabilities required to communicate on the digital battlefield and provide the warfighter with unsurpassed battle proven communications technology. The high-performance waveform (HPW) data can securely transmit and receive e-mail and transfer large files over SATCOM and LOS AM/FM nets by adapting to varying channel conditions. HPW ensures error-free data delivery using high-speed, over-the-air data rates up to 64 Kbps on LOS nets and up to 56 Kbps on wideband SATCOM nets.

The AN/PRC-117F(C) has embedded COMSEC and TRANSEC and is fully compatible with VINSON, ANDVT, KYV-5, KG-84C, and 12 Kbps fascinator encryption in voice and data modes with full OTAR capability. Storing up to 75 COMSEC keys, the radio supports DS-101, DS-102 fill, and CT3 interfaces using all common fill devices.

Figure 3-8. AN/PRC-117F radio/multiband radio

AN/PRC-117F operator task 1. Put the AN/PRC-117F into operation:

Subtask	Action	Result
a. Inspect antenna and cables	N/A	N/A
b. Inspect radio case, battery box, connectors, keypad, and display	Use either two BA-559/U, two BA-5390/U, two BB-590/U, two BB-390A/U, or two BB-2590/U	**Note:** Use batteries of the same type, and do not attempt to recharge.
c. Initialize the radio	1. Pull out the function switch and turn it to PT	The radios will start up in the last operating mode.
	2. Observe BIT on the display	If cleared, Warning Black Data Reset will be displayed; press any key to continue
	3. Switching the radio to CLR removes COMSEC and returns the radio to default settings	**Note:** If the voltage is less than 26.0, replace the batteries.
d. Set battery type **Note:** The radio should be set for the battery type in use; each battery provides a different operating volt range.	1. Press up or down arrow keys to scroll through battery types	**Note:** Setting the battery type is a status indicator and has no effect on radio operation.
e. Configure the squelch mode	1. Digital-only functions in CT or time delay	N/A
	2. Analog can be set to OFF, TONE, or NOISE	N/A
	3. Continuous tone-coded squelch system (CTCSS) is used for 67.0–254.1 Hz tone	N/A
	4. CTCSS can be used in either PT or CT mode	N/A
Note: Different squelch frequencies or codes can be used for transmit and receive; the squelch type must be the same for all stations in a net to be able to communicate.		

AN/PRC-117F operator task 2. Load COMSEC with common fill devices:

Subtask	Action	Result
a. Check for loaded COMSEC	1. Check upper right corner for TEK	If NO KEY is displayed, COMSEC is not loaded
b. Prepare KYK-13, KYX-15, or KOI-18	1. Rotate function switch to LD	N/A
	2. Select fill device and press ENTER	**Note:** Ensure the fill device is off.
	3. Connect fill device to J1 AUDIO/DATA/FILL connector	N/A
	4. Select the CRYPTO TYPE and press ENTER	N/A
	5. Select KEY TYPE	**Note:** If TEK is selected, select key position.
	6. Turn fill device on and select key position (have KOI-18 tape ready)	PRESS ENTER to INITIATE displays on the screen
	7. Press ENTER	FILL IN PROGRESS displays (pull KOI-18 tape); FILL DONE displays and press any key
	8. When all fill data is entered, select NO	N/A
	9. Turn off fill device and disconnect the J1 connector	N/A
	10. Rotate switch from LD to PT, CT, or TD	N/A

AN/PRC-117F operator task 3. Load COMSEC using AN/CYZ-10:

Subtask	Action	Result
a. Prepare ANCD	1. Check ANCD	The upper right of the screen should read {K13}; if not, seek technical assistance
	2. Rotate function switch to LD	N/A
	3. Connect fill device to J1/AUDIO/DATA/FILL connector	N/A
	4. Select AN/CYZ-10 DS 101 and press ENTER	N/A
	5. Select KEY TYPE and key position and press ENTER	INITIATE FILL AT DEVICE displays
	6. Turn AN/CYZ-10 DTD [data transfer device] ON	**Note:** Use ISSUE command instead of FILL or the load will fail.
	7. Press SEND on the DTD	FILL IN PROGRESS displays
	8. When all fill data is entered, select NO	When FILL DONE displays, press any key on the keyboard display unit (KDU)
	9. Turn off fill device and disconnect J1 connector	N/A
	10. Rotate switch from LD to PT, CD, or TD	N/A

AN/PRC-117F operator task 4. OTAR process:

Subtask	Action	Result
a. Upon receiving notification the NCS will transmit an AK OTAR, acknowledge instructions and do not transmit again until the procedure is complete and the NCS makes another commo check	1. Rotate function switch to RV	**Note:** Do not transmit until process is complete.
	2. Connect fill device to send AK or MK	A cooperative AN/PRC-117F will ask where to store key; a noncooperative will overwrite current key
	3. Perform update and load new key into sending radio; make sure communications are possible with all stations with the new key	**Note:** If there is no KEK [key encryption key] loaded, the radio will display INVALID KEK—SWITCH to LD AND LOAD KEK. WAIT—CONFIGURING FOR RX AK displays followed by WAIT TO RECEIVE AK.
	4. Wait for sending station to transmit AK OTAR	RX [receive] AK IN PROGRESS displays followed by RX AK OK
	5. Select the desired TEK location (1–25) and choose a location that will not overwrite an operational key	KEY STORAGE IN PROGRESS displays followed by KEK STORE OK (if successful)
	6. If unsuccessful, coordinate with the sending station to repeat the process	If the KEK is updating during the RX AK, the update count displays
	7. Go back to CT operations	N/A

AN/PRC-117G and Broadband Global Area Network Radios

AN/PRC-117G

The AN/PRC-117G (Falcon III) manpack networking radio has been certified by the National Security Agency, the Joint Test and Evaluation Lab, and the Joint Interoperability Test Command.

The AN/PRC-117G has a capability that allows the warfighter access to secure Internet protocol (IP) data at on-air rates up to five megabits per second using its Type-1 certified, software communications architecture-compliant, software-defined architecture. This radio has reliable and secure access to data-intensive applications such as streaming video and biometrics while simultaneously meeting legacy narrowband interoperability requirements and future JTRS networking capabilities. It has significant size, weight, and power advantages over legacy radios and provides space for more sustained expeditionary operations.

The AN/PRC-117G provides the capability of wideband networking through the Harris Advanced Wideband Networking Waveform (ANW2) and the Soldier Radio Waveform (SRW). The radio also includes SINCGARS, HAVEQUICK II, the Harris HPW, UHF DAMA SATCOM, and programmable encryption. Because of its compact nature, the AN/PRC-117G fits into all standard SINCGARS installations.

AN/PRC-117G operator task. Initial operator procedures:

Subtask	Action	Result
a. Inspect radio case, battery box, connectors, keypad, and display	Use either two BB-390B/U, two BB-590/U, two BA-/BB-5590/U, two BB-390A/U, or two BA-5390/U batteries	**Note:** Use batteries of the same type, and do not attempt to recharge.
b. Initialize the radio	1. Pull out the function switch and turn it to PT or CT	This initializes the radio's software and performs a power-on self-test (POST); the HARRIS logo and then the FALCON III screen are displayed followed by the initializing screen which shows the software version **Note:** All key functions are disabled until the process is complete.

Subtask	Action	Result
c. BIT	1. Press OPT: TEST OPTION SELF TEST RUN SELF TEST YES	If no failures occur during testing, TEST PASSED appears on the display; if failure occurs, the fault code is displayed
d. Battery information	1. Press OPT: RADIO INFORMATION BATTERY INFORMATION	DC voltage is shown along with the battery charge status (NOMINAL, LOW, or HIGH)
e. Unlock the keypad	1. Press ENTER to lock the keypad to prevent inadvertent key presses; press 1, 3, 7, 9 to unlock	N/A
f. Access mission plan	1. Press OPT: MISSION PLAN ACTIVATE MISSION PLAN Radio is searching for files installed; press ENTER to select	The display will indicate if plan activation was successful or failed
g. History of a mission plan	1. Press OPT: MISSION PLAN MISSION PLAN HISTORY	N/A
h. GPS options **Note:** The internal GPS uses this signal to determine accurate time and current position; an external GPS can also be connected.	1. Press OPT: GPS OPTIONS to view GPS information	GPS STATUS or GPS POSITION displayed
	2. Press ENTER to continue **Note:** At least four satellites should be shown to accurately track the location.	SEARCHING displayed while acquiring satellites; TRACKING displayed when GPS is locked in and ready
	3. Press ENTER to continue	N/A

Notes

1. The AN/PRC-117G must be programmed before it can be used for radio network operation and cannot receive radio traffic while in program mode.

2. Initial install screens allow the operator to view, install, or uninstall software packages and mission plans in the radio. A software package consists of basic radio operation applications. Mission plan files contain specific radio configuration settings and are used so multiple radios can be programmed with compatible communications parameters. It is recommended that the user refer to the Falcon III application programming manual (10515-0307-4100) for full software mission plan installation instructions.

3. Refer to the *AN/PRC-117G Multiband Manpack Radio Reference Guide,* publication number 10515-0319-4100 or 10515-0319-4200, the operation manuals for VULOS, SINCGARS, HAVEQUICK, HPW, advanced networking wideband waveform (ANW2), and ROVER operations.

Broadband Area Global Network

The RF-7800B series of the Broadband Area Global Network (BGAN) terminals enhances the networking capabilities of the AN/PRC-117G. The RF-7800B BGAN terminals provide satellite-based, wideband beyond-line-of-sight (BLOS) communications. BGAN operates with the International Marine/Maritime Satellite-4 satellite constellation of three orbital satellites, providing wideband IP data up to 492 kbps. When combined with the AN/PRC-117G, the system provides automatic and secure range extension, connection to out-of-range networks, and entry into the Internet or remote private networks. This network provides a next-generation, portable ground base for video captured by the military's growing fleet of unmanned aircraft systems. This is the first video receiver to deliver intelligence, surveillance, and reconnaissance video directly to the tactical edge where it can be viewed, analyzed, and acted upon immediately. The receiver is packaged in a standard, military-hardened handheld form factor, greatly increasing both portability and survivability in demanding operational environments.

The operation of a BGAN terminal uses the subscriber identity module (SIM), which contains an identity that uniquely identifies a subscriber of the Universal Mobile Telecommunications System (UMTS). The UMTS SIM (USIM) card must be installed for any operation except for emergency calling.

RF-7800B operator task. Operator procedures RF-7800B:

Subtask	Action	Result
a. Installing the USIM card	Open the USIM plate located on back of terminal; lift the USIM card holder up and place the card in the holder, ensuring the gold contacts are facing down and the angled part of the USIM is in the upper right-hand corner, and rotate the locking mechanism and secure the plate	**Note:** Do not bend or damage the USIM; cards are sensitive to electronic charges.
b. Initial turn on/settings	1. Ensure the data cable is connected between the terminal and computer	N/A
	2. Ensure the power cable is connected to the terminal and power source	N/A
	3. Contact the G-6/S-6 to obtain an IP address	N/A
	4.Turn switch to ON with pointing tones to local satellite	N/A
	5. Verify connection to the BGAN network	N/A

AN/PRC-148 Multiband Inter/Intra Team Radio Operator Tasks

When the radio is first powered up, it performs a power-on self-test (POST) and displays TESTING. When the POST is complete, the display shows THALES MBITR and the software version. If the radio fails the POST, run the built-in test to identify the cause of failure. See Appendix F for specific codes.

The MBITR has a total of 100 programmable channels. Each channel may be programmed for a different frequency (for both receive and transmit) as well as other communications parameters. Each channel is identified by a 7-character alphanumeric label or by its default channel number (00 to 99) if no label has been programmed.

The MBITR programmed channels can be assigned to groups of up to 16 channels each (to correspond to the 16 positions on the channel select rotary switch). When a channel is assigned to a group, it is “mapped” to a channel select switch position.

Channels can be assigned to more than one group. If a channel is not assigned to any group, the radio cannot operate on that channel. The radio can store up to ten groups of channels. These groups may be assigned names of up to three characters. The user may select only one group at any given time for MBITR operations. This group will be referred to as the MBITR's selected group. When compiling a list of channels to a group, channels are assigned by their default channel numbers.

General Information	
Frequency range	30–512 MHz
Channels	999
Channel spacing	12.5/25 MHz
Power requirement	7.2 DC
Operating temperature	–22° F to +140° F
Approximate range	25 miles at 5W

Figure 3-9. Multiband inter/intra team radio

Initial setup:

1. Attach a charged, MBITR rechargeable battery or battery cassette to the twist-on connector at the radio's base.

2. Screw the appropriate antenna (30–90 MHz or 30–512 MHz) to the threaded Neill Concealman antenna (TNC) connector.

3. Use the ON/OFF/volume control/zeroize switch on top of the radio to turn on the radio.

4. Press the squelch disable button on the side of the radio and adjust the volume. Press the button again to restore squelch.

5. Turn the channel select switch on top of the radio to the desired operating channel.

6. Use the keypad to set the desired operating settings.

Key	Function	Alternate Function
ALT	Press and hold to access ALT functions	N/A
MODE	Opens mode select screen	Opens programming menus screen
GR	Opens group select screen	Opens scan operation screen
ESC	Closes current screen and returns to previous screen	Locks and unlocks keypad
▼	Decrement selection or value	Highlights character to the left of current selection
▲	Increment selection or value	Highlights character to the right of current selection
ENT	Enter confirms operation or selection	Backlight on and off

Operating instructions:

- PTT switch: By pressing the up or down arrow keys on the keypad while pressing the PTT switch, the user can change the output power-level setting. For the new setting to take effect, the user must release the PTT switch and then press it again or re-key the audio accessory (if operating with external audio).

- On/off/volume control/panic zeroize switch: This switch turns the radio on and off and adjusts the volume level. A mechanical interlock switch is located on the side of the radio immediately below the on/off switch that the user must slide down and hold to turn the switch to the panic zeroize position.

- Sixteen-position channel-select rotary switch: The channel-select rotary switch is located on the middle of the radio toward the top. The specific channels associated with each position of the rotary switch are determined by the group selected by the operator.

MBITR operator task 1. Preparation settings from menu:

Subtask	Action	Result
a. Set the MBITR volume	1. Use the on/off/volume control to set the desired volume	N/A
b. Set the MBITR channel	1. Use the 16-position channel-select rotary switch to select the appropriate channel	The specific channels associated with each position of the rotary switch are determined by the group selected by the operator
c. Set the MBITR mode	1. Press MENU (until PWR is displayed)	N/A
	2. Press CHG for desired PWR setting	N/A
d. Set the RT mode	1. Press MENU (until MODE is displayed)	Display reads: (SC, FH, FH-M)
	2. Press CHG for desired MODE	
e. Set COMSEC	1. Press MENU (until MSC is displayed)	Display reads: (PT, CT, TD, RV)
	2. Press CHG for desired CMSC setting	
f. Set backlight	1. Place RT in SQ ON	Backlight lights (four settings from low to high and off)
	2. Press FREQ/BACKLIGHT	N/A
	3. Press CHG until desired setting is displayed	N/A

MBITR operator task 2. Load COMSEC**:**

The radio must have at least one transmission encryption key (TEK) loaded for encrypted (secure or CT) operation. The radio can hold up to five TEKs and one key encryption key (KEK), which is used for OTAR.

Important

Do not attach the fill device until after the radio is set up for key fill.

Subtasks	Action	Result
a. Prepare the radio	1. Press the MODE and the ALT keys	The MAIN MENU opens
	2. Use the ▲ key to select KEY FILL and press ENTER	The KEY FILL screen is displayed with COMSEC selected
	3. Ensure COMSEC is selected and press ENTER **Note**: If the crypto-alarm (steady 1 kHz tone) sounds when this screen opens, press the PTT once or twice to stop the alarm and proceed with loading keys.	The COMSEC FILL screen is displayed with KEY highlighted and the key location to be filled (TEK 1–5 or KEK)
	4. To change the KEY location, press ENTER and use the ▲ or ▼ arrow keys to select the desired key location (1–5 and KEK)	The COMSEC FILL screen is displayed with the desired key fill location
Note: Do not attempt to load anything into the KEK location except a valid KEK.		

Subtasks	Action	Result
b. Transfer COMSEC	1. Turn on the ANCD	N/A
	2. Select APPL and press ENTER	The display reads: RADIO/SOI/RDS
	3. Press LOCK LTR	The "letter" is removed from the display
	4. Select RADIO and press ENTER	The display reads: SEND/RECEIVE/ DATABASE/SETUP/ COMSEC/TIME
	5. Select COMSEC and press ENTER	The display reads: VG/LD/RV/AK/MK/VU
	6. Select LD and press ENTER	The display reads: Select TEK/KEK
	7. Select TEK and press ENTER	The display will show the TEKs loaded in the ANCD
	8. Select the desired key, press ENTER and press QUIT	The display reads: Connect ANCD to RT
	9. Ensure the radio is still displaying the COMSEC FILL screen	N/A
	10. Connect ANCD to the radio audio connector	The display reads: Press LOAD on RT
	11. Press the radio PTT **Note:** Load additional keys following the same procedure.	The ANCD displays: one key transferred, and the radio display will increase the TEK number by one

MBITR operator task 3. Load SINCGARS hopset:

Successful SINCGARS operation requires several related functions: one or more of the MBITR channels must be programmed for SINCGARS operation, a SINCGARS loadset must be loaded into the radio, and the MBITR clock must be synchronized with SINCGARS net time.

Subtask	Action	Result
a. Program a SINCGARS channel	1. Press the MODE and ALT keys	Main menu screen is displayed
	2. Select PROGRAM and press ENTER	The programming menu is displayed
	3. Select RADIO CONFIG and press ENTER	The first screen of the channel programming menu is displayed
	4. Ensure the channel number shown is the desired channel	N/A
	5. Press the ▼ key until the COMSEC mode is highlighted and press ENTER	The COMSEC mode is changed from PLAIN to SECURE
	6. Press the ▲ or ▼ key until SECURE is displayed and press ENTER	The mode selection screen is visible
	7. Press the ▼ key to select the operating mode and press ENTER	The mode is set to SINCGARS, programming screen one is displayed
	8. Press the ▲ or ▼ key until SINCGARS is displayed and press ENTER	Programming screen two is displayed with SINCGARS highlighted
	9. Press the ▼ key	Settings include CUE, MAN, and 1–6 The selected setting is displayed in programming screen two

Subtask	Action	Result
	10. Press ENTER then the ▲ or ▼ key to select the correct channel and press ENTER	ECCM are set to FH or SC, and programming screen two is displayed
	11. Press the ▼ key to highlight the electronic counter-countermeasures (ECCM), press ENTER, and then press the ▲ or ▼ key until the appropriate setting is displayed and press ENTER	The right-most number of the FREQ will be highlighted
	12. Press the ▼ key until FX=XX.XXX (FREQ) is highlighted and press ENTER	The available FREQ range is 30.000 to 87.975 MHz. When the FREQ is set on programming screen two, the data rate is highlighted.
	13. Press ALT ENTER to move to the next number and use the ▲ and ▼ keys to select the appropriate number until the correct FREQ is displayed, and press ENTER	The data rate settings are 600, 1,200, 2,400, 4,800, and 16,000 bits per second (bps) (SINCGARS SDM), 1,200N, 2,400N, 4,800N, and 9,600N bps (SINCGARS EDM), and RS232 After selection is made, programming screen two is displayed
	14. Ensure the XXXXN is selected, press ENTER, scroll through the settings using the ▲ or ▼ key until the correct setting is highlighted, and press ENTER	The TEK settings range from 1–5 and when the correct key is selected, programming screen two is displayed

Subtask	Action	Result
	15. Ensure the TEK X is highlighted and press [ENT]. Use the ▲ and ▼ arrows to select the correct KEY, press [ENT]. (**Note:** A valid key must be loaded.)	Programming screen three is displayed
	16. Press the ▼ key	Enter net ID edit mode with the right most number highlighted and when confirmed, programming screen three is displayed
	17. Ensure net ID = XXX is correct; if not, press ENTER and use the ▲ and ▼ keys to change the number; press ALT and ▲ key to move to the next number and then press ENTER	The values for OFFSET are 0, +5, +10, -10, -5 After the OFFSET is set, programming screen three is displayed
	18. Ensure the OFFSET setting is correct; to change the OFFSET, press ENTER and use the ▲ and ▼ key to scroll through the settings and press ENTER when correct setting is highlighted	N/A
	19. Use the ▼ key to select FADE = X.XS, press ENTER, and use the ▲ and ▼ keys until the desired setting is selected, then press ENTER again*	FADE is set and programming screen three is displayed
*__Note:__ Fade is a parameter that affects secure operation. In order for a radio operating in secure mode to decrypt an incoming signal, the encryption chip of the receiving radio must be synchronized (operating at the same clock rate) with the transmitting radio. This synchronization takes place at the beginning of a transmission and normally takes only a fraction of a second. If the signal is lost (fades out) during transmission, synchronization is usually lost immediately. Setting the fade value (zero to four seconds) forces the encryption chip to freewheel or maintain synchronization for the set period of time. When the signal is again received, the radio does not have to re-synchronize. If operating a radio in secure mode with weak signals, it may be advisable to set a fade value.		

MBITR operator task 4. Clone an MBITR:

You can copy (clone) programming information from one radio to another using a cloning cable (part number 3500395-501). Cloning copies all of the information included in a PC programmer configuration. Cloning does not copy COMSEC keys, SINCGARS loadsets, HAVEQUICK, time of day, or real-time clock time.

Subtask	Action	Result
a. Enable the side connector on each radio	1. Press the MODE and ALT keys	Displays the main menu screen
	2. Select PROGRAM and press ENTER	Programming screen is displayed
	3. Press the ▲ key to select GLOBAL and press ENTER	The global screen is displayed with SIDE/MIC LVL highlighted
	4. Ensure SIDE/MIC LVL is selected and press ENTER	The side option screen is displayed with SIDE ENABLED or SIDE DISABLED highlighted
	5. Use the ▲ or ▼ key to toggle to SIDE ENABLED and press ENTER	The screen returns to normal with the side connector enabled icon shown in the upper right-hand corner
b. Clone the radio	1. Ensure the radios are turned on	Displays are lit with the side connector enabled icon shown in the upper right-hand corner
	2. Attach the SEND end of the cloning cable to a radio with the desired programming	Display reads: CLONING, PTT TO SEND
	3. Attach the RECEIVE end of the cloning cable to the radio to be cloned	The display reads: CLONING, RECEIVE RDY
	4. Press and release the PTT button on the send radio	The displays change to CLONING, SENDING DATA on the SEND radio and CLONING, RECEIVING on the RECEIVE radio Upon completion, the radios will reboot

Subtask	Action	Result
	5. While the RECEIVE radio is rebooting, disconnect the cloning cable	N/A
c. Reset the side connector	1. Follow the enable side connector steps to disable the side connector	The side connector is disabled and the icon no longer appears on the main screen

MBITR operator task 5. Receive ERF:

The MBITR can receive but not transmit SINCGARS ERF data. ERF is used to send additional FH data (hopsets and lockout sets) during net opening or to update FH data during net operations. The NCS initiates ERF.

Subtask	Action	Result
a. Prepare to receive ERF	1. Receive ERF notification from the NCS	N/A
	2. Leave the radio in current operating configuration	N/A
	3. Receive new hopset information	Display reads: ERF RECEIVED, CHAN (1–6), ENT TO STORE
	4. Use the up or down arrow to select the appropriate SINCGARS channel location (1–6) and press ENTER	The data is stored in the selected channel location

MBITR operator task 6. Receive OTAR:

Subtask	Action	Result
a. Preparation	1. Set the MBITR to CT mode and select the same TEK that the transmitting radio is using	N/A
	2. Ensure there is secure communication with the transmitting radio on the old TEK	N/A
	3. Load the DTD with the KEK and the new TEK	N/A
	4. Load the MBITR with the KEK and the old TEK	N/A
	5. Load the SINCGARS with the old TEK and the new TEK	N/A
b. Set the DTD	1. Turn on and select the fill application and if necessary use the utility function to select the appropriate DTD	N/A
	2. Press N to select the net function	N/A
	3. Press A to select the SARK-AK function	N/A
	4. Press CLR key	N/A
	5. Select the KEK on the DTD screen and press ENTER	N/A
	6. Press E	DTD will briefly display 1 KEK SELECTED and then display SELECT TEK
	7. Press CLR	N/A
	8. Select the new TEK on the DTD screen and press ENTER	N/A

Subtask	Action	Result
	9. Press E twice	N/A
	10. Connect the DTD to the SINCGARS (or other sending radio) and press SEND	The new TEK is transferred
	11. Verify that the new TEK is loaded and perform a radio check	N/A

MBITR operator task 7. Activate emergency beacon:

Important

Do not use either 121.50000 or 243.00000 MHz unless you are in a real emergency situation. Both of these frequencies are internationally recognized swept tones constantly monitored by search and rescue organizations worldwide.

Subtask	Action	Result
a. Activate emergency beacon	1. Press MODE	The mode options are displayed
	2. Press the ▼ key to select the BEACON OFF and press ENTER	The beacon setting may be adjusted
	3. Press the ▼ or ▲ key to the setting BEACON ON and press ENTER	The emergency channel select screen is displayed
	4. Press the ▼ or ▲ key to select the appropriate FREQ and press ENTER To cancel beacon activation, press ESC and not ENTER	The emergency beacon FREQ is set and begins transmitting
Note: The radio is not intended to replace dedicated emergency beacon equipment such as the AN/PRC-112. The emergency beacon transmission does not contain position information, and the radio does not respond to distance-measuring equipment interrogation.		

Subtask	Action	Result
b. Set a unique beacon FREQ	1. Press MODE and ALT	The main menu is displayed
	2. Select PROGRAM and press ENTER	The programming menu is displayed
	3. Select EMERGENCY and press ENTER	The emergency menu is displayed
	4. Select BEACON and press ENTER	The beacon menu is displayed
	5. Select TX [transmit]= XXX.XXXXX and press ENTER	The FREQ can be set
	6. Press the ALT and ▲ or ▼ keys to select the digit to be adjusted	The digit can be adjusted by pressing the ▲ or ▼ keys
	7. Using the ▲ or ▼ keys, adjust the FREQ and press ENTER	The emergency FREQ is set, and an emergency signal begins transmitting
Note: The user-programmable parameters for the emergency beacon channel are transmit frequency and transmit on/off times. The transmit frequency is limited to the range of 116.00–149.975 MHz or 225.00–399.975 MHz. The transmit on/off times can be set to a maximum of 30 seconds each.		
c. Set the transmit ON TIME	1. Select ON TIME and press ENTER	The ON TIME can be set
	2. Press the ALT and ▲ or ▼ keys to select the digit to be adjusted	The digit can be adjusted by pressing the ▲ or ▼ key (maximum time is 30 seconds)
	3. Using the ▲ or ▼ keys, adjust the FREQ and press ENTER	The ON TIME is set
d. Set the transmit OFF TIME	1. Select OFF TIME and press ENTER	The OFF TIME can be set
	2. Press the ALT and ▲ or ▼ keys to select the digit to be adjusted	The digit can be adjusted by pressing the ▲ or ▼ keys (maximum time is 30 seconds)

Subtask	Action	Result
	3. Using the ▲ or ▼ key, adjust the FREQ, press ENTER, and press ESC	The OFF TIME is set and the emergency programming menu is displayed

MBITR operator task 8. Transmit/receive situational awareness data:

Subtask	Action	Result
a. Enable the side connector	1. Press MODE and the ALT keys	Main menu screen is displayed
	2. Select PROGRAM and press ENTER	Programming screen is displayed
	3. Press the ▲ key to select GLOBAL and press ENTER	The global screen is displayed with SIDE/MIC LVL highlighted
	4. Ensure SIDE/MIC LVL is selected and press ENTER	The side option screen is displayed with SIDE ENABLED or SIDE DISABLED highlighted
	5. Use the ▲ or ▼ key to toggle to SIDE ENABLED and press ENTER	The screen returns to normal with the side connector enabled icon shown in the upper-right-hand corner
b. Connect a PLGR or DAGR to the side connector	1. Attach the GPS cable to the side connection port and the GPS unit	The radio is connected to the GPS unit
c. Set the radio to SECURE mode	1. Press MODE and the ALT keys	Main menu screen is displayed
	2. Select PROGRAM and press ENTER	Programming screen is displayed
	3. Select RADIO CONFIG and press ENTER	Channel programming menu is displayed
	4. Pres the ▼ key once until the COMSEC MODE PLAIN or SECURE is highlighted and press ENTER	COMSEC mode selection is enabled

Subtask	Action	Result
	5. Select SECURE and press ENTER	The radio is set to SECURE mode
d. Activate TX SA and RX SA	1. Press MODE and the ALT keys	Main menu screen is displayed
	2. Select PROGRAM and press ENTER	Programming screen is displayed
	3. Select EMERGENCY and press ENTER	The emergency programming screen is displayed
	4. Select SA and press ENTER	The SA programming screen is displayed
	5. Ensure the combat identification number (CID) is correct	N/A
	6. To set the CID, press ENTER and then use the ALT and ▼ ▲ keys to move between digits and the ▲ ▼ keys again to adjust the digits, press ENTER, and then press the ▼ key	The CID is set and TX SA=OFF is highlighted
	7. Press ENTER, then press ▼ or ▲, and press ENTER **Note:** You do not need to have a GPS connected to receive GPS data.	TX SA=ON is displayed, and the radio is set to transmit location data from the GPS unit RX SA=OFF is highlighted
	8. Press the ▼ key	RX SA=ON is displayed, and the radio is set to receive GPS data from another radio
	9. Press ENTER, then press the ▼ or ▲ key, and press ENTER	The main screen is displayed showing the SA as active
	10. Press ESC four times	N/A
Note: At this point your radio is transmitting its CID and Military Grid Reference System (MGRS) information from the attached GPS unit.		

Subtask	Action	Result
e. View MGRS information being received or transmitted	1. Check the main screen	The appearance of an RX indicates new SA information has been received
	2. Press MODE, press the ▼ key to select GPS RX, and press ENTER	The CID and MGRS information received is displayed
	3. Press ESC	The MODE selection menu is displayed
	4. Select GPS TX and press ENTER	The CID and MGRS being transmitted is displayed

AN/PRC-150(C) Radio

The AN/PRC-150(C) is an advanced HF radio which operates from 1.6–29.9999 MHz using SKYWAVE (USB, LSB, CW, asynchronous modem eliminator [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 20.0000–59.9999 MHz in FM with maximum power of 10.0 watts. Communications can take place with manpack, mobile, and fixed-site radio configurations.

General Information	
Frequency range	(Manpack) 1.6–59.9999 MHz in 100-Hz steps
Preset channels	200
Channel spacing	12.5/25 MHz
Power requirement	7.2 DC
Operating temperature	–22° F to +140° F
Approximate range	20 miles at 4W **Note:** The range of the radio is going to depend greatly on the terrain. The 20-mile range assumes a clear LOS with little to no interference. The range will be much less in urban areas.

General Information	
Approximate battery life	10 hours **Note:** The battery life is impacted by environmental conditions and the condition of the battery. Over time, batteries lose their ability to hold a charge. Batteries that no longer hold a charge for an adequate amount of time should be replaced.

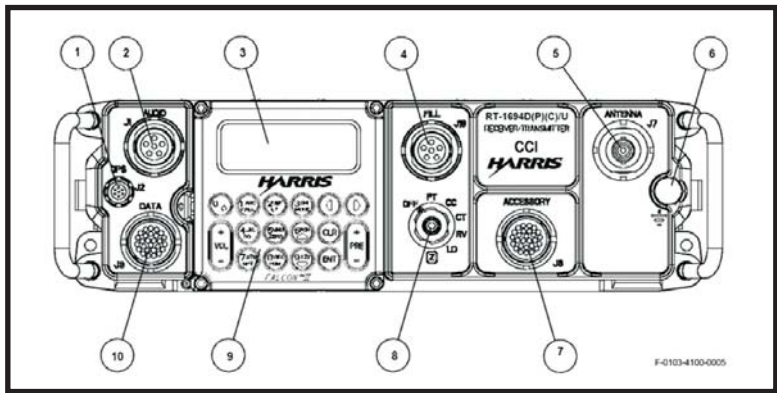

Figure 3-10. An/PRC-150(C) controls, indicators, and connectors

Key	Control/Indicator	Function
1	GPS interface connector J2	Serial connection for an external GPS unit
2	Audio connector J1	Connection for a audio handset that 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
5	Antenna connector J7	Provides a 50-ohm antenna port for a whip antenna
6	Ground post	Grounding reference for connecting a grounding source
7	Accessory connector J6	Connector for power amplifiers, control signals, and external power
8	Function switch	
	OFF	Turns AN/PRC-150 OFF

Key	Control/Indicator	Function
8 (cont.)	PT	Places the AN/PRC-150 in PT mode (voice or data)
	CT	Places the AN/PRC-150 in CT secure mode (digital voice or data)
	CC	Places the AN/PRC-150 in citadel encryption mode (citadel cover)
	LD	Load, used to load Type I cryptographic variables
	RV (or A)	Receive variable, permits transmission and reception of Type I COMSEC using OTAR
	Z	Zeroizes the radio including the encryption keys (requires a pull-to-turn action)
9	KDU button	Volume, radio modes, operating modes, squelch, main and programming menus, clear key, and enter key
10	Data connector J3	Connection for a data device (RS-232)
Rear panel	Battery connectors J10 and J 11	Battery connectors for two each BB-390/490/590 or BA-5590 type batteries
Rear panel	Accessory connector J9	D-type connector for external power amplifier control signals

AN/PRC-150(C) operator task 1. Set-up the AN/PRC-150 radio:

Subtask	Action	Result
a. Initial settings and turn on	1. Rotate the function switch from OFF to the PT, CC [crypto card], or CT position	Radio software is initialized and self test is performed; when complete, the ALE, HOP, 3G, or FIX preset screen is displayed
	2. Run BIT and choose: OPT TEST BIT SYSTEM (to test everything)	TEST PASSED; if fault code appears, refer to troubleshooting information

Subtask	Action	Result
	3. Special ping test, choose: OPT TEST PING	The PING RESPONSE screen and status message will display either the ping response has been successfully received or the ping has timed out
	4. Enter the PING ADDRESS and press ENTER	
	5. Enter the PING PKT SIZE and press enter	
	6. Enter the number of PINGS and press ENTER	
	7. Enter the PING TIMEOUT and press enter	
	8. Select YES, press ENTER, to start ping	

AN/PRC-150(C) operator task 2. Zeroize an AN/PRC-150 radio:

Subtask	Action	Result
a. Zeroize radio **Note:** Zeroizing the radio removes all encryption keys. It also deletes all system presets and configuration settings to default values. CT operation will not be possible until encryption keys are reloaded.	1. Pull on the knob of the function switch and turn to the Z position	ZEROIZE IN PROGRESS window displays ZEROIZE COMPLETE message displayed

AN/PRC-150(C) operator task 3. Load COMSEC:

Subtask	Action	Result
a. Fill data of TEK and KEK with AN/CYZ-10 (ANCD)	1. Press ON	AN/CYZ-10 (ANCD) is activated
	2. Choose: APPL RDS- RADIO COMSEC LD Press ENTER	N/A
	3. Choose: TEK or KEK	N/A
	4. Press ENTER; use up and down arrow keys until the desired key appears and then press enter	XMT screen appears in lower-right screen
	5. Select qUit and press ENTER	Connect ANCD to RT appears
	6. Connect AN/CYZ-10 to J18 FILL connector	N/A
	7. Press down arrow on ANCD	Message appears, ANCD is sending key; press LOAD on RT
	8. Press ENTER on radio	IN PROCESS displays and is followed by FILL DONE PRESS ENTER
	9. Press ENTER	Press YES to load more keys or NO
	10. Turn off ANCD and disconnect J18 connector	Rotate switch from LD to desired operating position
Note: Press ENTER after each step or change to save the programmed features.		

AN/PRC-150(C) operator task 4. Program radio settings:

Action	
1. Press PGM	
2. Select CONFIG	
3. Select RADIO	a. Transmit power (HIGH, MEDIUM, or LOW)
	b. BFO [beat frequency oscillator] (0Hz, –4,000 Hz to + 4,0000 Hz in 10-Hz steps)
	c. Squelch (OFF or ON)
	d. Squelch level (HIGH, MEDIUM, or LOW)
	e. FM squelch type (NOISE or TONE)
	f. Radio silence (OFF or ON)
	g. Internal coupler (ENABLED or BYPASSED)
	h. FM deviation (8.0 kHz, 6.5 kHz, or 5.0 kHz)
	i. CW offset (0 Hz or 1,000 Hz)
	j. Rx noise blanking (OFF or ON)
	k. Compression (OFF or ON)
	l. 20W AMP coupler (MEMORY TUNE, LEARN TUNE, or DISABLED)
	m. Radio self ID (001–254)
	n. Error beeps (OFF or ON)

AN/PRC-150(C) operator task 5. COMSEC CONFIG programming (Type I):

The following configuration options are set prior to operation but are not needed in every installation:

Subtask	Action
1. Erase existing key	a. Press PGM
	b. Select COMSEC
	c. Select TYPE I
	d. Select KEYS
	e. Select ENTER
	f. Use up/down arrows to select correct crypto type to erase
	g. Use RIGHT/LEFT arrows to tab to cryptography key and use up/down arrows to select key to erase
	h. Select YES to erase
2. View special keys	a. Press PGM
	b. Select COMSEC
	c. Select TYPE I
	d. Select KEYS
	e. Select SPECIAL
	f. Use up/down arrow keys to view status of SPECIAL keys

AN/PRC-150(C) operator task 6. Program data port settings:

These settings are only configured when connecting data terminal equipment (DTE). When connecting a Harris software application that uses point-to-point protocol, the port is configured automatically with the Harris application software.

Action	
1. Press PGM	
2. Select CONFIG	
3. Select PORTS	
4. Select DATA	a. Data rate (19.2 Kbps–75 bps) 2,400 bps
	b. Data bits (8, 7)
	c. Stop bits (1, 2)
	d. Parity (NONE, ODD, EVEN, MARK, or SPACE)
	e. Flow control (NONE, XON/XOFF, or HARDWARE)
	f. Echo (ON or OFF)
	g. Level (RS232, MIL-188)
	h. TX clock source (INTERNAL, EXTERNAL, or RECOVERED)
	i. Keyline (RTS. AUX_AUDIO)

AN/PRC-150(C) operator task 7. Operator task message (routing incoming data):

Action	
1. Press PGM	
2. Select CONFIG	
3. Select MESSAGE	a. Route modem data to (DTE PORT, RDP, or FILE)
	b. Route ARQ data to (DTE PORT, RDP, or FILE)

AN/PRC-150(C) operator task 8. Set radio time of day (TOD):

Action	
1. Press PGM	
2. Select CONFIG	
3. Select TOD	a. UTC offset (use up/down arrows to select + or – offset, then use numeric keys to select correct offset value)
	b. Time format (12-hour or 24-hour clock)
	c. New TOD (press numeric keys to enter TOD)
	d. Date format (MM-DD-YY, DD, MM-YY, YYYY-MM-DD, or ZULU)
	e. New date (press numeric keys to enter new date)

AN/PRC-150(C) operator task 9. Channel programming:

Action	
1. Press PGM	
2. Select MODE	
3. Select PRESET	
4. Select CHANNEL	a. Enter desired channel number (000–199)
	b. Enter desired RX FREQUENCY
	c. Enter desired TX FREQUENCY or press ENTER
	d. Modulation (USB, AME, CW, FM, or LSB)
	e. AGC speed (SLOW, MED, FAST, DATA, or OFF)

Action	
	f. If bandwidth: • USB or LSB (2.0 kHz, 2.4 kHz, 2.7 kHz, or 3.0 kHz) • AME (3.0 kHz only) • CW (.35 kHz, .5 kHz, 1.0 kHz, or 1.5 kHz) **Note:** Options are dependent on modulation type selected.
	g. RX only (YES or NO)
	h. Enable hail TX (YES or NO) **Note:** Not available for channel 000.
	i. Maximum TX power (00000 watts is the default)
	j. Enable SSB scan (YES or NO) **Note:** Selecting YES automatically places the current channel in the scan list.
5. Repeat step 4 for the remaining channels to be programmed	

AN/PRC-150(C) operator task 10. Modem programming:

The following actions are only required when sending data messages from a PC:

Action	
1. Press PGM	
2. Select MODE	
3. Select PRESET	
4. Select MODEM **Note:** Different modem types have different options available, please consult the radio operations manual for a detailed explanation of settings.	a. Select the modem preset name for modification **Note:** In a zeroized radio, modem presets have the default names MDM1 to MDM20.
	b. Entered desired name up to 15 characters (for example, 24SERIAL)
	c. Select MODEM TYPE (for example, SERIAL)

Action	
	d. Select DATA RATE (for example, 2400)
	e. Select INTERLEAVE (for example, SHORT)
	f. Select MODE (ASYNC [or SYNCHRONOUS as required])
	g. Select DATA BITS (8)
	h. Select STOP BITS (1)
	i. Select PARITY (NONE)
	j. Select ENABLE? (YES)
5. To program the next modem preset, press the up arrow, select modem preset name, and repeat steps a–j	

AN/PRC-150(C) operator task 11. Automatic link establishment programming (2G):

Subtask	Action
1. Channel group programming	a. Press PGM
	b. Select MODE
	c. Select ALE
	d. Select CHAN_GROUP
	e. Select ADD CHANNEL GROUP **Note:** At this step, to modify, review, or delete channel groups, select REVIEW or DELETE and use the up/down arrow keys to view options for each selection.
	f. Enter desired CHANNEL GROUP NUMBER
	g. Select ADD CHANNEL
	h. Enter desired CHANNELS for channel group

Subtask	Action
2. Self address programming	a. Press PGM
	b. Select MODE
	c. Select ALE
	d. Select ADDRESS
	e. Select SELF
	f. Select ADD! **Note:** A three-character self address must be entered or ALE will not function; for example, 123 must be entered before any address containing 1–15 alphanumeric characters. **Note:** At this step, to review or delete a self address, select REVIEW or DELETE.
	g. Enter operational SELF ADDRESS (for example, RAD1)
	h. Enter CHANNEL GROUP to associate with this address
3. Individual address programming	a. Press PGM
	b. Select MODE
	c. Select ALE
	d. Select ADDRESS
	e. Select INDIVIDUAL by pressing the up arrow
	f. Select ADD **Note:** At this step, to review or delete individual addresses, select REVIEW or DELETE.
	g. Enter an INDIVIDUAL ADDRESS (for example, RAD2)
	h. Enter CHANNEL GROUP to associate with this address
	i. Select correct ASSOCIATED SELF (for example, RAD1) by pressing up arrow

Subtask	Action
	j. Repeat steps 3e–i for remaining INDIVIDUAL ADDRESS(ES)
4. Net address programming	a. Press PGM
	b. Select MODE
	c. Select ALE
	d. Select ADDRESS
	e. Select NET by pressing the up arrow
	f. Select ADD **Note:** At this step, to review or delete net addresses, select REVIEW or DELETE.
	g. Enter a NET ADDRESS (for example, RT0)
	h. Enter CHANNEL GROUP to associate with this address
	i. Select appropriate ASSOCIATED SELF (for example, RAD1)
	j. ADD NET MEMBERS (ensure all net members are programmed in the same order on all radios used)
5. ALE configuration programming	a. Press PGM
	b. Select MODE
	c. Select ALE
	d. Select CONFIG
	e. Max scan channels **Note:** This is a critical parameter; it must be set to the number of channels programmed into the channel group to be scanned.
	f. Listen before TX (OFF or ON)
	g. Key to call (OFF or ON)

Subtask	Action
	h. Max system tune time **Note:** This is a critical parameter; it must be set to the worst case tune time for any radio in the network.
	i. Link timeout (OFF or ON)
	j. Link to any calls (OFF or ON) when a station transmits the address ANY, any ALE-capable radio will stop scanning and automatically respond to the call
	k. Link to all calls (OFF or ON) when a station transmits the address ALL, any ALE-capable radio will stop scanning, but will not respond (transmit)
	l. AMD operation (ENABLED or DISABLED)
	m. AMD auto display (ENABLED or DISABLED)
	n. Scan rate (ASYNC, 2 or 5)
6. AMD create (TX MSG) (not available in 3G)	a. Press PGM
	b. Select MODE
	c. Select ALE
	d. Select AMD
	e. Select TX_MSG
	f. Select TX_MSG (EDIT, REVIEW, or DELETE)
	g. Press ENTER twice
	h. Enter messages using KEYPAD
	i. Press ENTER to save
	j. Press CLR to escape

Subtask	Action
7. AMD review/delete (RX MSG)	a. Press PGM
	b. Select MODE
	c. Select ALE
	d. Select AMD
	e. Select RX_MSG
	f. Select RX_MSG (REVIEW, DELETE, or COPY)
	g. Press ENTER

AN/PRC-150(C) operator task 12. HOP programming narrowband, wideband, and list hopping:

Subtask	Action
1. Narrowband HOP programming	a. Press PGM
	b. Select MODE
	c. Select HOP
	d. Select CHANNEL
	e. Select ADD
	f. Enter channel to be added (must be in the range of 00–19)
	g. Hop type, select (NARROW, WIDE, or LIST)
	h. Enter CENTER FREQ in MHz
	i. Press numeric keys to enter a 1–8 digit HOP CHANNEL ID
	j. Press alphanumeric keys to enter up to an 8 character TOD MASK
	k. Auto respond (YES or NO)
2. Wideband HOP programming	a. Press PGM
	b. Select MODE
	c. Select HOP
	d. Select CHANNEL
	e. Select ADD

Subtask	Action
	f. Enter channel to be added (must be in the range of 00–19)
	g. HOP type, select WIDE
	h. Press numeric keys to enter LOWER FREQ in MHz
	i. Press numeric keys to enter UPPER FREQ in MHz
	j. Press numeric keys to enter a 1–8 digit HOP CHANNEL ID
	k. Press alphanumeric keys to enter up to 8-character TOD MASK
	l. Auto respond (YES or NO)
3. List HOP programming	a. Press PGM
	b. Select MODE
	c. Select HOP
	d. Select CHANNEL
	e. Select ADD
	f. Enter channel to be added (must be in the range of 00–19)
	g. HOP type, select LIST
	h. Select ADD LIST MEMBERS
	i. Press numeric keys to enter frequencies in MHz; must enter 5 frequencies minimum and 50 frequencies maximum between 2 and 29.000 MHz
	j. Press CLR to exit ADD FREQ LIST menu
	k. Select NO to exit ADD LIST MEMBERS menu
	l. Press numeric keys for 1–8 digit HOP CHANNEL ID
	m. Press alphanumeric keys to enter up to an 8-character TOD MASK
	n. Auto respond (YES or NO)

Subtask	Action
4. HOP exclusion band programming	a. Press PGM
	b. Select MODE
	c. Select HOP
	d. Select EXCLUDE
	e. Select ADD exclude band
	f. Press numeric keys to enter the exclude band number from 0–9
	g. Press numeric keys to enter the lower frequency
	h. Press numeric keys to enter the upper frequency
5. HOP configuration programming	a. Press PGM
	b. Select MODE
	c. Select HOP
	d. Select CONFIG using the up/down arrow keys to view available selections (shown in parenthesis with the default in bold) for each of the following: • Manual sync (YES or NO) • Hail RX (YES or NO)
6. 3G ALE programming (no manual programming available)	

AN/PRC-150(C) operator task 13. System preset programming:

Subtask	Action
1. Fix mode system preset	a. Press PGM
	b. Select MODE
	c. Select PRESET
	d. Select SYSTEM
	e. To change system preset, use the up/down arrow to select the preset to change **Note:** On a zeroized radio, system presets are given default names of SYSPRE1 to SYSPRE75.

Subtask	Action
	f. Preset name (press the alphanumeric keys to enter a name up to nine characters in length)
	g. Radio mode (Select FIX)
	h. Channel number (enter the channel number to associate with the preset)
	i. Modem preset (OFF or use the up/down arrows to enter a preconfigured modem preset)
	j. Select encryption TYPE (TYPE I, CITADEL, or NONE)
	k. Select cryptography MODE (for example, KG-84R)
	l. Select encryption KEY (for example, TEK01)
	m. Select PT VOICE MODE (CLR, CVSD, AVS, DV6, DV24, ME6, or ME24)
	n. Select CC/CT VOICE MODE (DV24, NONE, DV6, ME6, or ME24)
	o. Select ENABLE (YES or NO)
2. HOP mode system preset	a. Press PGM
	b. Select MODE
	c. Select PRESET
	d. Select SYSTEM
	e. To change system preset, use the up/down arrow to select the preset to change **Note:** On a zeroized radio, system presets are given default names of SYSPRE1 to SYSPRE75.
	f. Preset name (press the alphanumeric keys to enter a name up to nine characters in length)
	g. Radio mode (select HOP)
	h. HOP channel (select HOP channel to associate with this preset)

Subtask	Action
	i. Modem preset (OFF or use the up/down arrows to enter a preconfigured modem preset)
	j. Select encryption TYPE (TYPE I, CITADEL, or NONE)
	k. Select cryptography MODE (for example, KG-84R)
	l. Select encryption KEY (for example, TEK01)
	m. Select PT VOICE MODE (CLR, DV6, or ME6)
	n. Select CC/CT VOICE MODE (DV6 or ME6)
	o. Select ENABLE (YES or NO)
3. ALE mode system preset	a. Press PGM
	b. Select MODE
	c. Select PRESET
	d. Select SYSTEM
	e. To change system preset, use the up/down arrow to select the preset to change **Note:** On a zeroized radio, system presets are given default names of SYSPRE1 to SYSPRE75.
	f. Preset name (press the alphanumeric keys to enter a name up to nine characters in length)
	g. Radio mode (Select HOP)
	h. Associated self (select SELF ADDRESS with this preset)
	i. Modem preset (OFF or use the up/down arrows to enter a preconfigured modem preset)
	j. Select encryption TYPE (TYPE I, CITADEL, or NONE)
	k. Select cryptography MODE (for example, KG-84R)

Subtask	Action
	l. Select encryption KEY (for example, TEK01)
	m. Select PT VOICE MODE (CLR, AVS, DV6, DV24, ME6, or ME24)
	n. Select CC/CT VOICE MODE (DV24, NONE, DV6, ME6, or ME24)
	o. Select ENABLE (YES or NO)

AN/PRC-150(C) operator task 14. Options programming:

The option menu is selected by pressing the OPT button on the KDU while in FIX, ALE, HOP, or 3G mode. The option menu mode is more specific. The following are common to all modes of operation:

Subtask	Action	Result
1. GPS-TOD	N/A	Displays current GPS status
2. RETUNE	N/A	When selected will retune currently selected channel; will not retune while scanning
3. Radio options are global and affect the entire range of channels and presets	a. Press OPT	N/A
	b. Select RADIO	N/A
	c. TX power (LOW, MED, or HIGH)	N/A
	d. BFO (0, +/– 4 kHz in 10-Hz increments)	N/A
	e. Squelch level (LOW, MED, or HIGH)	N/A
	f. FM squelch type (TONE or NOISE)	N/A
	g. Radio silence (ON or OFF)	N/A
	h. Internal coupler (ENABLED or BYPASSED)	N/A
	i. RX noise blanking (OFF or ON)	N/A

Subtask	Action	Result
	j. Radio name (per communications plan)	N/A
4. Scan options	a. Press OPT	N/A
	b. Select SCAN	N/A
	c. Enable SSB scan (NO or YES)	N/A
5. Test **Note:** Multiple tests can be performed without test equipment by using this feature. Refer to the operator's manual for a detailed description of each test available.	N/A	N/A
6. GPS_MAINT **Note:** Refer to operator's manual.	N/A	N/A
7. ALE options **Note:** This option is mode specific and is only available if the feature is installed in the radio and it is the current operating mode.	a. Press OPT	N/A
	b. Select ALE	N/A
	c. Select LQA	N/A
	d. EXCH (used to perform a two-way link analysis between the RO's radio and another radio or group of radios on all preprogrammed frequencies) or SOUND (used as a passive, one-way transmission, from the RO's radio to another radio or group of radios)	N/A
	e. Scores: Select an individual or net name and scroll through the channels and available scores	N/A
	f. TX_MSG is used to transmit pre-entered AMD messages	N/A

Subtask	Action	Result
	g. RX_MSG is used to review received AMD messages	N/A

AN/PRC-150(C) operator task 15. Radio operations selecting radio mode:

Subtask	Action
1. FIX/ALE/HOP/3G mode	a. Press MODE (#3) button on KDU until desired mode (FIX, ALE, HOP, or 3G) is displayed, and press ENTER or wait and the radio will automatically enter selected mode
2. PT/CC/CT operation	a. Rotate function switch to the desired position

ALE operations:

Subtask	Action
1. ALE scan operation	a. Select ALE and radio begins scanning
	b. Press CLR to stop scan
	c. Press CLR again to resume scan
2. Place an ALE call	a. Press CALL key
	b. Select CALL TYPE (MANUAL or AUTOMATIC) **Note:** A manual call allows the RO to select a specific channel to call on and automatically starts calling on the channel with the highest LQA score.
	c. Select ADDRESS TYPE (INDIVIDUAL, NET, ANY, or ALL)
3. Terminate ALE link	a. Press CLR and the radio will display TERMINATE LINK
	b. Scroll to YES and press ENTER

3G operations:

Subtask	Action
1. Channel plan selection	a. From the channel ### scanning screen, use the arrow keys to select the name of the current channel plan; use the up arrow to scroll to the desired channel plan and press ENTER
2. TOD SYNC operation (all radios +/– seven minutes of wristwatch sync)	a. If no GPS is available, ensure the radio is within seven minutes of ZULU time (refer to TOD section for more information)
	b. With all radios in the same channel plan, the outstation must press the CALL button and select SYNC REQUEST, or TOD base station must press the CALL button and select BROADCAST SYNC, or all radios must be connected to a GPS plugger and achieve SYNC
3. Placing a 3G call	a. Press CALL key
	b. Select CALL TYPE (MANUAL, AUTOMATIC, or BEST) **Note:** Manual call allows ROs to select a specific channel to call on and automatically starts calling on the channel with the highest LQA score.
	c. Select ADDRESS TYPE (INDIVIDUAL or NET)
4. Terminating a 3G link	a. Press CLR and the radio will display TERMINATE LINK
	b. Scroll to YES and press ENTER

HOP operations:

Subtask	Action
1. HOP operation	a. Press MODE button to select HOP
	b. Press PRE button to select desired HOP preset
2. Manual synchronization **Note:** The easiest form of sync is broadcast. Only one station in the net should perform the broadcast which will sync all listening stations. If the station does not receive a sync, the RO must send a sync request by selecting REQUEST and press ENTER.	a. Press CALL key
	b. Manual SYNC type (REQUEST or BROADCAST)

AN/PRC-150(C) operator task 16. COMSEC (CITADEL keys) programming:

Subtask	Action
1. Entering a new key	a. Press PGM
	b. Select COMSEC
	c. Select CITADEL
	d. Select KEYS
	e. Select ENTER
	f. Key type (RF-5800 or RF-5022/PRC-138)
	g. Enter key name (can be up to four alphanumeric characters long) or leave as the default
	h. Use alphanumeric keys to enter 32-character key
	i. Load AVS key (NO or YES); if yes, enter 12-number key
2. Update existing key	a. Press PGM
	b. Select COMSEC
	c. Select KEYS
	d. Select UPDATE
	e. Use up/down arrows to select correct key to be updated

Subtask	Action
	f. Select YES to update
3. Erase existing key	a. Press PGM
	b. Select COMSEC
	c. Select KEYS
	d. Select ERASE
	e. Use up/down arrows to select correct key to be erased
	f. Select YES to erase

Note
Twenty-five keys can be loaded into each COMSEC type fill position.

Harris AN/PRC-152 Operator Tasks

General Information	
Frequency range	30–512 MHz
Channels	999
Channel spacing	12.5/25 MHz
Power requirement	7.2 DC
Operating temperature	–22° F to +140° F
Approximate range	20 miles at 5W

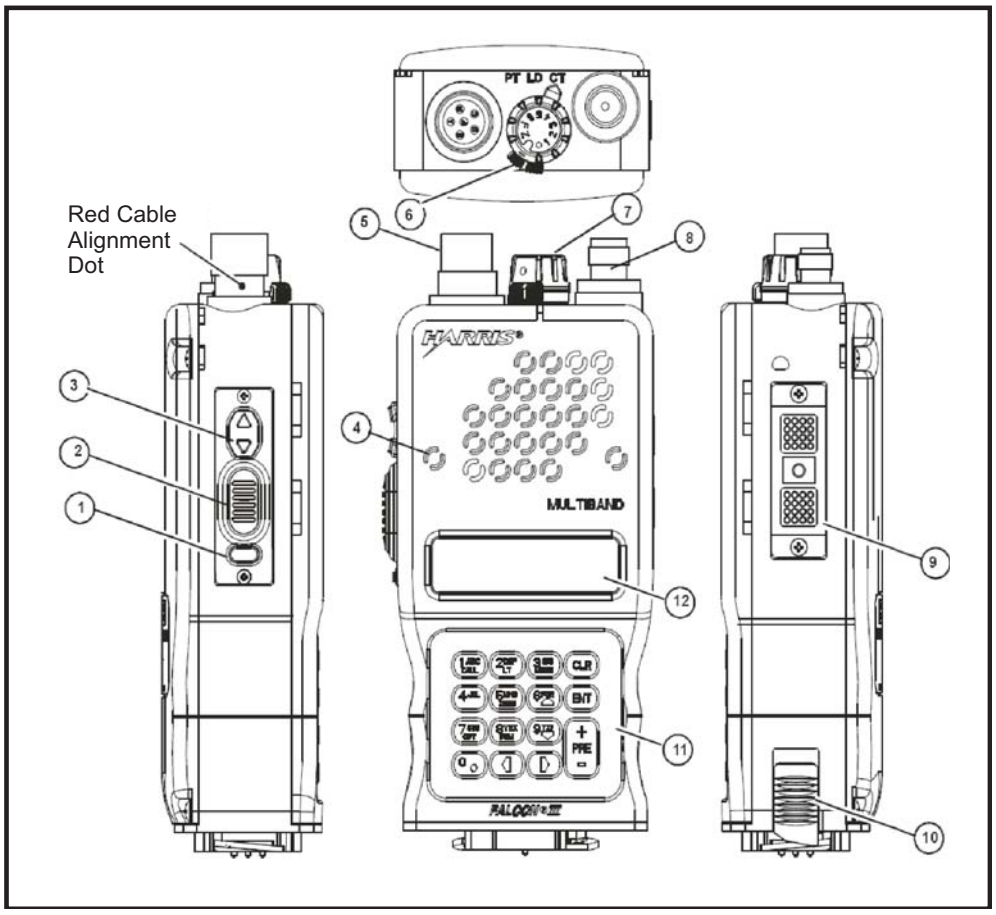

Figure 3-11. Harris AN/PRC-152 radio

Key	Control/Indicator	Function
1	Squelch	Toggles squelch on and off
2	PTT	Push-to-talk switch
3	Volume control	▲ key increases volume and ▼ key decreases volume
4	Microphone	Built-in microphone
5	Six-pin audio/fill connector	Provides a connection for an optional H-250 handset or cryptography-fill device that uses a six-pin connector
6	Cipher switch	
7	Function knob	
8	Antenna connector	
9	Side connector	

Key	Control/Indicator	Function
10	Battery latch	
11	Keypad	
12	Display	

Harris AN/PRC-152 operator task 1. Set-up the AN/PRC-152 radio:

Subtask	Action	Result
a. Attach the battery	1. Place the battery on the bottom of the radio and twist it in a clockwise direction until it is locked into place	N/A
b. Attach the antenna	1. Screw a whip or bladed antenna to the threaded N-connector located on the top of the radio	N/A
c. Connect the handset or headset (optional)	1. Push the headset or handset connector and twist	N/A
d. Power on the radio	1. Rotate the cipher switch to PT or CT	N/A
	2. Set the function knob to 1–5 or F.	Software starts initialization and runs POST, displays the Harris logo, followed by Falcon III, and lastly the initializing screen
e. Unlock the keyboard if necessary	1. Press 1, 3, 7, 9	The keyboard is unlocked

Harris AN/PRC-152 operator task 2. Load a single channel (VHF-UHF LOS [VULOS]):

Subtask	Action	Result
a. Prepare to perform task	1. Determine the proper FREQ	N/A
	2. Rotate the CIPHER knob to PT and the function knob to F	The radio will initialize
b. Load an SC FREQ	1. Press PGM (the 8 button on the keypad), select SYSTEM PRESETS, press ENTER, then select SYSTEM PRESETS CONFIG, and press ENTER	SYSTEM PRESET NUMBER is displayed with the cursor on the preset number identifier
	2. Enter the appropriate number (1–99) by pressing the keypad number and press ENTER	The number is entered as the preset identifier, and the cursor is moved to the channel description
	3. Use the keypad to enter a text description of the preset channel, and press ENTER	The text description is saved, and the enable preset option is displayed
	4. Select YES	Preset is enabled
	5. Use the ▲▼ buttons until LOS is displayed, and press ENTER	The VULOS CONFIG menu is displayed
	6. Select FREQ and press ENTER	The FREQ programming screen is displayed
	7. Select RX FREQ and press ENTER	The receive FREQ can be loaded
	8. Use the key pad to enter the desired FREQ, and press ENTER	The FREQ is loaded, and the FREQ menu is displayed
	9. Select TX FREQ and press ENTER	N/A

Subtask	Action	Result
	10. Select USE RX and press ENTER	The SC is loaded and set for transmitting and receiving

Harris AN/PRC-152 operator task 3. Load a pre-set single channel:

Subtask	Action	Result
a. Prepare the radio	1. Set the cipher switch to PT	The radio is set for PT operation
	2. Set the function knob to F	The radio is set for front panel mode
	3. Allow the radio to initialize	N/A
b. Set the FREQ	1. Press the PRE + or – to select the VULOS preset FREQ	The radio is set to the desired FREQ **Note:** The AN/PRC-152 radio has preprogrammed FREQs.
	2. Press the 0 (NEXT) button	The radio FREQ is set, and the display is returned to the main menu
	3. Use the volume control buttons to set the volume	The radio is operational
c. Send and receive transmissions	1. Ensure the digital squelch is off	There is a PT warning tone that is heard when receiving unsecured messages
	2. Use the PTT button to conduct a radio check with the NCS	N/A
	3. Receive transmission from the NCS	N/A

Harris AN/PRC-152 operator task 4. Load single-channel COMSEC:

Subtask	Action	Result
a. Prepare the radio	1. Turn on the radio	N/A
	2. Rotate cipher knob to LD	N/A
	3. Select FILL on the screen	N/A
	4. Select SINCGARS	N/A
	5. Select the appropriate fill device and press ENTER	N/A
	6. Connect the fill device	N/A
b. Load COMSEC	1. Turn on the fill device	N/A
	2. Select the key position	PRESS ENTER TO INITIATE is displayed
	3. Press ENTER	FILL IN PROGRESS is displayed and then TRANSFER SUCCESSFUL is displayed
	4. Press ENTER	N/A
	5. Select CRYPTO MODE	N/A
	6. Select KEK or TEK, assign TEK to slot 1–25, and press ENTER	N/A
	7. Use the ▼ or ▲ key to select CLASSIFICATION and press ENTER	LOAD ANOTHER KEY is displayed
	8. Select YES to load more keys or select NO when all keys are loaded	N/A

Subtask	Action	Result
c. Verify COMSEC	1. Turn off fill device	N/A
	2. Disconnect from radio	N/A
	3. Rotate cipher switch to CT	N/A
	4. Conduct radio check	N/A
Note: To view COMSEC information, go to OPT and select VIEW KEY INFO.		

Harris AN/PRC-152 operator task 5. Load FH data with an AN/CYZ-10 with RDS application for Mode 2/3:

Subtask	Action	Result
a. Prepare the radio	1. Turn on the radio	N/A
	2. Rotate cipher knob to LD	The radio is ready to load
	3. Select FILL on the screen	N/A
	4. Select SINCGARS	N/A
	5. Select CYZ-10 MODE 2/3 and press ENTER	INITIATE FILL AT DEVICE is displayed
	6. Connect the fill device	N/A
b. Load COMSEC	1. Turn on the fill device	N/A
	2. Start the RDS application on the fill device	N/A
	3. On DTD select RADIO	N/A
	4. On DTD select SEND	N/A
	5. On DTD select RADIO again	N/A
	6. On DTD select ICOM	N/A
	7. On DTD press ENTER	CONNECT TO RT AUD/FILL CONN ↓ is displayed

Subtask	Action	Result
	8. On DTD press ENTER	SET FCTN SWITCH TO LD ON RT ↓ is displayed
	9. On DTD select N	DO YOU WANT TO INCLUDE TIME? Y/N is displayed
	10. Press the LOAD PTT button on the RT	PRESS LOAD ON RT is displayed on the DTD
	11. Wait until transfer is complete	N/A
	12. Select the key classification and press ENTER	ICOM TRANSFER SUCCESSFUL displays
	13. Turn off the DTD and disconnect it from the RT	N/A
	14. Verify load data	N/A
	15. Press ENTER	Load data is displayed and the loaded keys and hopsets can be scrolled through
	16. Select NO and press ENTER	LOAD ANOTHER KEY is displayed
	17. Rotate cipher switch to CT and conduct a radio check	N/A

Harris AN/PRC-152 operator task 6. Receive OTAR:

Subtask	Action	Result
a. Preparation	1. Set the cipher switch to CT and press MODE key	Mode menu is displayed
	2. Use the ▼ or ▲ key to select OTAR and press ENTER	OTAR menu is displayed
	3. Select RECEIVE MK for manual key or RECEIVE AK for automatic key and press ENTER	The KEK is set. **Note:** In order to use AK, the KEK must be distributed prior to the sending the OTAR.
	4. Select RECEIVE OTAR and press ENTER	OTAR RX MK, AWAITING RECEPTION is displayed.
	5. Wait for OTAR transmission to complete	KEY RECEIVED is displayed
	6. Press ENTER	OTAR WAVEFORM screen is displayed
b. Set the waveform	1. Use the ▲ ▼ keys to select the proper waveform and press ENTER	The waveform is set, and the CRYPTO MODE is displayed
c. Set the crypto type	1. Use the ▲ ▼ keys to select the proper type of cryptography and press ENTER	The cryptography is set, and the TEK storage number selection is displayed
d. Save the TEK	1. Use the ▲ ▼ keys to select an empty slot (1—25) to store the TEK and press ENTER	Status window is displayed

Harris AN/PRC-152 operator task 7. Receive ERF:

Subtask	Action	Result
a. Prepare to receive ERF	1. Receive notification from NCS needing updated hopset data	N/A
	2. Press CALL, select NORMAL ERF, and press ENTER	Awaiting data is displayed
	3. Receive hopset data	HOPSET RX OK, STORE IN ## is displayed
	4. An empty compartment number is selected automatically, or a compartment can be manually set by inputting 1–25	N/A
	5. Press ENTER	Hopset data is stored and ASSIGN TO PRESET is displayed
	6. Select YES and press ENTER	SINCGARS presets are displayed for selection
	7. Use the ▼ ▲ keys to select to desired preset and press ENTER	The hopset data is stored in the corresponding preset

Harris AN/PRC-152 operator task 8. Enable beacon mode:

Important

Do not use either 121.50000 or 243.00000 MHz unless you are in a real emergency situation. Both of these frequencies are internationally recognized swept tones constantly monitored by search and rescue organizations worldwide.

Subtask	Action	Result
a. Program beacon FREQ	1. Press PGM	Programming menu is displayed
	2. Select VULOS CONFIG followed by BEACON CONFIG	BEACON FREQ is displayed
	3. Enter a FREQ from 90.0000–511.9999 MHz and press ENTER	The FREQ is set, and the beacon modulation screen is displayed
	4. Select either AM or FM and press ENTER	The beacon modulation is set, and the beacon TX duration screen is displayed
	5. Select the duration for the transmission (1–99 seconds) and press ENTER	The transmit time is set, and the BEACON OFF DURATION is displayed
	6. Select the amount of time to elapse between transmissions (1–99 seconds) and press ENTER	The time between transmissions is set

Chapter 4

Net Control Station Tasks

Without an effective net control station (NCS), a radio net will degenerate rapidly into chaos under the stress of training. Actual combat only accelerates that process. The NCS must maintain net procedures and discipline. As in the case with operator tasks, an experienced NCS operator is familiar with routine tasks and will be able to perform them effortlessly. For nonroutine tasks, the standard task list contained in this chapter will provide guidance, especially to novice NCS personnel.

Purpose. To provide NCS personnel a quick reference to assist with training and operations task performance. Using this radio operator handbook, properly trained NCS personnel should be able to perform without assistance the following NCS tasks.

- Task 1 (Conduct hot start net opening): This task represents a basic NCS requirement to open the Single-Channel Ground and Airborne Radio System (SINCGARS) secure, frequency (FREQ)-hopping (FH) net. During use of the hot start net opening procedure, NCS responsibilities are primarily supervisory. Each operator loads the radio with communications security (COMSEC) keys and FH data and synchronizes time in preparation for the net opening. Upon completing the integrated COMSEC (ICOM) fill, the operator calls the NCS in secure, FH mode and requests permission to enter the net. After the hot start is complete, the NCS initiates a net call and battle tracks unit/net members that have effectively joined the net.

- Task 2 (Respond to CUE calls): An important feature of SINCGARS is its ability to be contacted by a non-FH radio or an FH radio lacking data or synchronization time through a process known as CUEing. To CUE, set the calling radio on the prescribed CUE frequency, press the push-to-talk switch, and wait for a response. This action causes a CUE message to appear in the receiver-transmitter (RT) display of the NCS and alternate NCS radio.

- Task 3 (Transmit updated FH data via net update electronic remote fill [ERF]): This task enables the NCS to electronically transmit new FH data to net operators when distribution by physical connection of automated network control device (ANCD) to ANCD is impossible or impractical. This procedure may be used to update (change) hopsets, TranSec keys (TSKs), net identifications (IDs), and SYNC time. The task involves alerting net operators, sending the ERF using the net operational channel, confirming receipt of the ERF, and conducting a communications check when the changed FH data becomes effective.

- Task 4 (Transfer signal operating instructions [SOI] information using broadcast mode): This procedure enables an NCS to send SOI electronically to net members when updating by physical connection of ANCD to ANCD is impossible or impractical. The broadcast mode requires approximately two minutes to transmit one time period of a battalion's SOI extract. The procedure includes a polling feature that allows the NCS to determine by automatic query if up to 16 net operators

(designated by special ID numbers) did or did not receive the SOI information sent by broadcast mode.

- Task 5 (Send transmission encryption key [TEK] to other NCSs using remote manual keying [MK] method of over-the-air-re-key [OTAR]): This procedure allows an NCS to transfer a TEK (not a key encryption key [KEK]) electronically by OTAR to other NCSs. This capability is useful when the tactical situation or terrain make it impossible or impractical to pass new TEK by physical connection of ANCD to ANCD. Receiving NCSs store the new TEK in their ANCDs. The new TEK can then be passed to operators by physical transfer. NCS tasks 5 and 7 are performed together by source and target NCSs.

- Task 6 (Receive and store TEK sent by MK method OTAR): This task is performed by target NCSs when a source NCS electronically transmits a TEK using the MK method of OTAR. This procedure allows target NCSs to store the new TEK in their ANCDs for physical distribution to net operators. The sending NCS directs receiving NCSs to perform this task as an integral part of the MK OTAR process. This task supplements NCS task 5.

- Task 7 (Send TEK to net operators using the remote automatic keying [AK] method of OTAR): This procedure enables an NCS to electronically transfer a TEK (not a KEK) directly from the NCS ANCD to net member radios. In the AK method, the TEK transferred to net member radios automatically and instantaneously replaces the TEK in use. Also, the KEK in the net member radio is automatically updated (changed) during the AK procedure. After sending a TEK by AK OTAR, the source NCS must load the new TEK. While the AK method of OTAR requires no action on the part of the receiving net members, it is quite demanding of the source NCS.

NCS task 1. Conduct hot start net opening:

Subtask	Action	Result
a. Prepare NCS radio for hot start net opening	1. Load CUE, manual (MAN), and single-channel (SC) FREQs, as required	Perform operator preparation and primary tasks 1 and 2 (select RT settings, load FREQs and COMSEC into RT)
	2. Load COMSEC/FH data and SYNC time into all 6 RT channels*	
b. Prepare net operators for hot start net opening	1. Ensure net ANCDs or SKLs are properly loaded**	N/A
	2. Advise operators when net will be opened	

Subtask	Action	Result
c. Open the net	1. Respond to individual operator calls	N/A
	2. Admit individual operators into cipher text (CT), FH, net	Operator calls when ready to enter the net
	3. Set CHAN [channel] to MAN MODE to FH-M	When all operators have called, hot start is complete
*ANCD converts current date to two-digit Julian date. ** Unit standing operating procedures should specify if net RTs are to be loaded by individual operators or by communications specialists and designated noncommissioned officers. Centralized loading of radios may be an attractive solution when the state of individual operator training is a consideration.		

NCS task 2. Respond to CUE calls:

Subtask	Action	Result
a. Note CUE in RT display	1. Switch to CUE channel	Caller CUEs in plain text, listens in CT
	2. Call CUE caller on CUE frequency in CT	CUE caller receives a response
	3. Direct CUEer to go to MAN/CT	Must have MAN [manual] FREQ loaded in MAN CHAN
	4. Determine CUE caller's requirement	Authenticate if required
	5. Provide ERF if required	If CUEer wishes to enter net
	6. Return to operational channel	N/A
	7. Displace if enemy has direction finding (DF) capability	CUE and MAN frequencies can be DFed
* Either the NCS or alternate NCS may respond to CUE calls. The preferred solution is for an alternate NCS to respond to CUE calls, leaving the NCS free to control the net. ** An alternate NCS may use the FH-M position to send an ERF on the MAN channel while the NCS continues to use FH-M on the operational channel without interfering with net sync time.		

NCS task 3. Transmit updated FH data via net update ERF:

Subtask	Action	Result
a. Prepare to send net update ERF	1. Obtain updated FH data and effective time	As appropriate, obtain ANCD or SOI from signal officer
	2. Load new FH	Perform ICOM fill or enter data into NCS radio and change ESET in one channel
b. Prepare net operations for net update ERF	1. Alert net that update ERF data is to be sent	Wait until the net is clear of operational traffic
	2. Inform operators on what channel to store ERF data	Facilitates channel change when the data sent by the ERF is to be used
	3. Inform operators when new FH data is effective	May be immediate or at later specified time
c. Send net update ERF	1. Set FTCN to load (LD)	If NCS RT is not in FH-M, set it there for sending ERF
	2. Press LOAD on RT	RT display shows high LD (HLD)
	3. Enter channel where ERF data is stored	RT display shows HFXXX, blinks, and beeps
	4. Press ERF on RT keypad for three seconds	RT display shows SEND, beeps, and shows HFXXX
	5. Change FCTN from LD back to squelch (SQ) ON	N/A
d. Confirm receipt of ERF	1. Allow operators to store net update ERF	(20–30 seconds should be adequate)
	2. Have operators acknowledge (ACK) receipt of ERF	N/A
	3. Have alternate NCS repeat ERF if required	Allows the NCS to control the net and continue net operations

Subtask	Action	Result
e. Perform communications check	1. At the proper time, change to updated ERF data	N/A
	2. Check communications using the updated ERF data	N/A
	3. Have alternate NSC follow up with nonresponsive operators	Net-updated ERF is complete

NCS task 4. Transfer SOI information using broadcast mode:

Subtask	Action	Result
a. Prepare NCS radio to send SOI by broadcast mode	1. Ensure RT is set to SQ ON, CT, and FH-M	N/A (normal NCS RT settings)
	2. Change DATA from OFF to 1200	Broadcast (uses data mode set to 1200 bits per second)
b. Prepare ANCD for SOI data broadcast number **Note:** This screen will appear only if the quick reference (QREF) file is stored in the ANCD. Prepare net operator for receipt of SOI broadcast	1. Turn ANCD on	Select: SOI Radio Supervisor
	2. Enter SOI	qRef Group Net sufX Pyro Tmpd Set C/s Find Memo
	3. Enter SET	Select: CHOOSE SEND RECEIVE
	4. Enter SEND	Scroll up/down and press ENTER to select SOI set
	5. Press down arrow	SOI set: (name) Edn: (name)
	6. Press up/down to display and press ENTER to select	Do you want to transfer qRef? # (Y/N)
	7. Respond NO	Do you want to specify groups to send? (Y/N)
	8. Respond YES	Scroll to up/down and press ENTER to select groups

Subtask	Action	Result
	9. Press up/down to display and press ENTER	One group selected and keep selecting (Y/N)
	10. Enter YES to continue or NO to quit	Do you want to specify a time period to send? (Y/N)
	11. Respond YES	Enter time period (# - #) = >##
	12. Enter time period and press ENTER	Include suffix and smoke/pyro data? (Y/N)
	13. Respond YES to include or respond NO to exclude	Send to: ANCD PC broadcast STU
	14. Enter BROADCAST	Enter ID for each polled ANCD and 0 when done [ ]*
	15. Press down arrow	Polled: 1234567890123456 = > # #
	16. Enter IDs for polling (see example) and press ENTER	Polled: 2*456**901*34*6= > # #
	17. Enter 0 to quit	Do you want to save this SOI set? (Y/N)
	18. Respond YES (to save SOI data)	New SOI set name: = > ? ? ? ? ? ? ? ? ? ?
	19. Enter SOI set name and press ENTER	Connect ANCD to RT AUD/DATA
	20. Press down arrow	Press SEND to send and then wait
c. Prepare net operator for receipt of SOI broadcast	1. Say: “Standby for broadcast follow my instruction, ACK”	Alerts net members to an immediate requirement
	2. After ACK, say: “Go to SQ ON, FH, CT, DATA-1200”	Ensures net radios and ANCDs are properly prepared
	3. Say: “Turn ANCD ON”	Select: SOI Radio Supervisor
	4. Say: “Enter SOI”	qRef Group Net sufX Pyro Tmpd Set C/s Find Memo
	5. Say: “Enter SET”	Select: CHOOSE SEND RECEIVE

Subtask	Action	Result
	6. Say: "Enter RECEIVE"	Receive from: ANCD PC Broadcast STU
	7. Say: "Enter BROADCAST"	Enter broadcast ID (1–16): = > # #
	8. Say: "Enter SOP broadcast ID and press ENTER"	Broadcast ID set to X polling: ON/OFF
	9. Say: "Press down arrow"	Connect ANCD to RT audio (AUD)/DATA [ ]
	10. Say: "Connect ANCD to RT AUD/DATA and handset to AUD/FILL"*	Emphasize AUD/DATA for ANCD connection
	11. Say: "When ready, press down arrow and ACK"	Press receive (RCV) to receive and then wait
d. Send SOI info by broadcast mode	1. Say: "Standby; broadcast will now be sent; press RCV now; press SEND now"	Alerts operators that broadcast is about to be sent and coordinates pressing of SEND and RCV
	2. Press SEND on NCS ANCD	Wait while processing Sending SOI data completed
*ANCD connects to bottom fill port and handset is connected to top fill port. ** If polling is used, the NCS ANCD will indicate which stations did and did not receive the broadcast. If polling is not used, the NCS should have net members acknowledge receipt of SOI data. *** Do not press SEND until net members are ready at your direction to press RCV. Then press SEND within 20 seconds of having operators press RCV.		

NCS task 5. Send TEK to other NCSs using MK method of OTAR:

Subtask	Action	Result
a. Prepare source NCS radio to send MK OTAR	1. Set FCTN to SQ ON	N/A
	2. Set MODE to FH-M	N/A
	3. Set COMSEC to CT	N/A
	4. Set DATA to OFF	N/A
b. Prepare source ANCD to send MK OTAR	1. Turn ANCD on	Select: SOI Radio Supervisor
	2. Enter RADIO	Send Receive Database Setup COMSEC Time
	3. Enter COMSEC	Vg Ld Rv Ak Mk vU
	4. Enter MK	Select key: QUIT (name/number)
	5. Press PgDn to display and press ENTER to select	Connect to RT and press SEND and then wait
	6. Connect source ANCD to RT using fill cable	N/A
c. Prepare target NCSs to receive MK OTAR	1. Say: “Standby for MK OTAR, ACK”	Target NCSs are alerted and CT contact is confirmed
	2. After ACK, say: “Make NCS task 6 preparations and ACK when ready to receive MK OTAR”	Readies target NCSs to receive MK OTAR
	3. After ACK, say: “OTAR will now be sent; after receipt of OTAR return to Channel (CHAN) 1”	Provides final coordination guidance for MK OTAR

Subtask	Action	Result
d. Send TEK by MK OTAR	1. Say: "Go to CHAN 6 now; press RCV now"	**Note:** Before pressing SEND, the NCS and all stations need to establish communication on channel 6.
	2. Say: "Go to CHAN 6 and press SEND now"	Transfer in progress, 1 key transferred
	3. Return to CHAN 1	Prepares source NCS radio to communicate with target NCSs
	4. Wait 30 seconds after sending and then say: "OTAR completed; TEK ID is XXXXXXXX; effective at date-time group, ACK"	Informs target NCSs of TEK ID and effective time; advises source NCS which stations did and did not receive OTAR

NCS task 6. Receive and store TEK sent by MK method of OTAR:

Subtask	Action	Result
a. Prepare radio for receipt of MK OTAR	1. Set FCTN to SQ ON	N/A
	2. Set COMSEC to CT	N/A
	3. Set DATA to OFF	N/A
b. Prepare source ANCD to send MK OTAR	1. Turn ANCD on	Select: SOI Radio Supervisor
	2. Enter RADIO	Send Receive Database Setup COMSEC Time
	3. Enter COMSEC	Vg/Ld/Rv/Ak/Mk/vU
	4. Enter RV	Connect to RT, press RCV and then wait
	5. Connect ANCD to RT AUD/FILL port	N/A
	6. ACK to source NCS when ready to receive OTAR	Responds to source NCS's MK OTAR instructions

NCS task 7. Send TEK to net operators using AK method of OTAR:

Subtask	Action	Result
a. Prepare source NCS radio to send AK OTAR	1. Set FCTN to LD	N/A
	2. Set MODE to FH-M	N/A
	3. Set COMSEC to CT	N/A
	4. Set DATA to OFF	N/A
b. Prepare source ANCD to send MK OTAR	1. Turn ANCD on	Select: SOI Radio Supervisor
	2. Enter RADIO	Send Receive Database Setup COMSEC Time
	3. Enter COMSEC	Vg Ld Rv Ak Mk vU
	4. Enter Ak	Select key: QUIT (name/number)
	5. Press PgUp or PgDn to KEK desired and press ENTER	Select key: QUIT (name/number) KEK
	6. Enter QUIT	Select key: QUIT (name/number)
	7. Press PgDn to TEK desired and press ENTER	Connect to RT, press SEND, and then wait
c. Send AK OTAR	1. Say: “Standby for MK OTAR, ACK”	Target operations are alerted, and CT contact is confirmed
	2. Press SEND on ANCD	Transfer in progress, 1 key transferred Vg Ld Rv Ak Mk vU
d. Load TEK sent by AK OTAR in NCS radio	1. Enter LD	Select: TEK KEK
	2. Enter TEK	Select key: QUIT (name/number)
	3. Press PgDn to display and press ENTER to select	Select key: QUIT (name/number) XMT
	4. Enter QUIT	Connect ANCD to RT

Subtask	Action	Result
	5. Connect ANCD to RT AUD/FILL and press down arrow	Press LOAD on RT
	6. Press LD/STO/and X	1 key transferred Vg Ld Rv Ak Mk vU
e. Update KEK used for AK OTAR	1. Set FCTN to LD and enter vU	Select key: QUIT (name/number)
	2. Press PgDn to KEK desired and then press ENTER	Connect to RT and press RCV
	3. Press RCV on ANCD	Transfer in progress; enter text ID→????????????????
	4. Enter TEXT ID and press ENTER	Key updated successfully
	5. Press down arrow	Select key: QUIT (name number)
	6. Press ABORT until screen show appears	Vg Ld Rv Ak Mk vU
	7. Enter LD	Select: TEK KEK
	8. Enter KEK	Select key: QUIT (name/number)
	9. Press PgDn to display and ENTER to select	Select key: QUIT (KEK X) XMT
	10. Enter QUIT	Connect ANCD to RT
	11. Press down arrow	Press LOAD on RT
	12. Press LOAD/STO/6	Transfer in progress/1 key transferred

Chapter 5

Global Positioning Systems

The ability for Soldiers to accurately determine their locations has always been a major problem. The Global Positioning System (GPS) revolutionized land navigation. Ideally, Soldiers should be able to determine their positions accurately to within ten meters. But before Soldiers and particularly radio operators can achieve such a standard, they must be proficient using the GPS.

Note: GPS should be used as a navigational aid and not be relied upon to replace traditional map reading and land navigational skills.

1. **Definition.** The GPS is a satellite-based, radio navigational system. It consists of a constellation with 24 active satellites interfacing with a ground-, air-, or sea-based receiver. Each satellite transmits data that enables the GPS receiver to provide precise position and time to the user. GPS receivers come in several configurations: handheld, vehicular-mounted, aircraft-mounted, and watercraft-mounted.

2. **Operation.** The GPS is based on satellite ranging. It calculates the user's position on earth by measuring the distance from a group of satellites in space to the user's location. For accurate three-dimensional data, the receiver must track four or more satellites. Most GPS receivers provide the user with the number of satellites they are tracking and the signal strength. Some receivers can be manually switched to track only three satellites if the user knows his altitude. This method provides the user with accurate data much faster than data provided by tracking four or more satellites. Each type of receiver has a number of mode keys with a variety of functions. To better understand how the GPS receiver operates, refer to the operators' manual, Technical Bulletin 11-5825-291-10-2, *Soldier's Guide for the Precision Lightweight GPS Receiver (PLGR).*

3. **Capabilities.** The GPS provides worldwide, 24-hour, all-weather, day or night coverage when the satellite constellation is complete. Ninety-five percent of the time, the GPS can locate the position of the user accurately to within 21 meters; however, the GPS has been known to accurately locate the position of the user within eight to ten meters. It can determine the distance and direction from the user to a programmed location (a waypoint [WPT]) or the distance between two WPTs. It provides the exact date and time for the time zone where the user is located. The data supplied by the GPS is helpful for missions requiring Soldiers to know their exact locations, such as:

- Sighting.
- Surveys.
- Tactical reconnaissance.
- Sensor emplacement.
- Artillery forward observation.
- Close air support.

- General navigation.
- Mechanized maneuvers.
- Engineer surveys.
- Amphibious operations.
- Parachute operations.
- Signals intelligence.
- Electronic warfare.
- Ground-based forward air control.

This data is displayed on the AN/PSN-11 PLGR and is also available from a serial data port.

4. **Limitations.** A constellation of 24 satellites broadcasts precise signals for use by navigational sets. The satellites are arranged in six rings that orbit the earth twice daily. The GPS navigational signals are similar to light rays; anything that blocks the light will reduce or block the effectiveness of the signals. The more unobstructed the view of the sky, the better the system performs.

5. **Compatibility.** All GPS receivers have primarily the same function, but the input and control keys vary among the different receivers. The GPS can reference and format position coordinates in any of the following systems:

- Degrees, minutes, and seconds: A latitude- and longitude-based system with position expressed in degrees, minutes, and seconds.
- Degrees and minutes: A latitude- and longitude-based system with position expressed in degrees and minutes.
- Universal Traverse Mercator: A grid zone system with the northing and easting position expressed in meters.
- Military Grid Reference System (MGRS): MGRS can be old or new. If MGRS was selected during setup, the MGRS coordinates will be displayed on lines two and three. Characters 1–3 contain the zone number and grid zone designation. Line 3 displays values for easting and northing followed by “e” and “n,” respectively.
- British National Grid (BNG): This system is associated with the ordnance survey of Great Britain, 1936 (OGB-M) Map Datum Identifier. Selecting BNG causes an easting and northing format (in meters) to be displayed on lines 2 and 3 when the PLGR is physically within the British Isles. Otherwise, it displays latitude/longitude in degrees, minutes, and seconds.

- Irish Transverse Mercator Grid (ITMG): This system is associated with the Ireland (IRL) Map Datum Identifier. Selecting IRL causes an easting and northing format (in meters) to be displayed on lines two and three when the PLGR is physically within Ireland. Otherwise, it displays latitude/longitude in degrees, minutes, and seconds.

The GPS can be used to assist Soldiers in navigating and map reading for the following land navigation subjects:

- Grid coordinates. GPS makes determining a 4-, 6-, 8-, and 10-digit grid coordinate of a location easy. On most GPS receivers, the position mode will give the user a 10-digit grid coordinate to his present location.

- Distance and direction. The mode for determining distance and direction depends on the GPS receiver being used. One commonality shared by the different types of receivers is that to determine direction and distance the user must enter at least one WPT. When the receiver measures direction and distance from the present location or from WPT to WPT, the distance is measured in straight line only. Distance can be measured in miles, yards, feet, kilometers, meters, or nautical miles (knots). To determine direction, the user can select degrees, mils, or radians. Depending on the receiver, the user can select true north, magnetic north, or grid north.

- Navigational equipment and methods. Unlike the compass, a GPS receiver set on navigation (NAV) mode will guide the user to a selected WPT by telling the user how far left or right the user has drifted from the desired azimuth. With this option, the user can take the most expeditious route possible, moving around an obstacle or area without replotting and reorienting.

- Mounted land navigation. While in NAV mode, the user can navigate to a WPT using steering and distance, and the receiver will tell the user how far he has yet to travel and at the current speed, how long it will take to get to the WPT at the current speed.

- Navigation in different types of terrain. The GPS can be used in any terrain, especially open terrain like the desert.

- Unit sustainment. The GPS can be used to read coordinates to quickly and accurately establish and verify land navigation courses.

6. **Concept of operation.** Army GPS devices are highly accurate, satellite-signal navigation sets. The AN/PSN-11 is designed for worldwide battlefield use. It is sealed watertight for all types of weather and day or night operation. The AN/PSN-11 is held in the left hand and operated with the thumb of the left hand. Capability is included for installation in ground facilities and air, sea, and land vehicles. The AN/PSN-11 is operated stand-alone using prime battery power and an integral antenna. It can also be used with an external power source and external antenna.

A GPS provides the user with position coordinates, time, and navigation information if no obstructions block the line-of-sight satellite signal from reaching

the antenna. Valid cryptographic keys are used to protect the GPS from intentionally degraded satellite signals.

Many data fields (such as elevation) display units of information. The format of the units can be changed to the most familiar format.

Map coordinates are entered as a WPT. When a WPT is selected as a destination, the GPS provides steering indications, azimuth, and range information to the destination. A desired course to a WPT is entered. Offset distance from this course line is shown.

Up to 999 WPTs can be entered, stored, and selected as a destination. A route is defined for navigation either start-to-end or end-to-start. The route consists of up to 9 legs (10 WPTs) linked together.

AN/PSN-11 Precision Lightweight Global Positioning System Receiver

1. **Characteristics.** The AN/PSN-11 is less than 9.5 inches long, 4.1 inches wide, and 2.6 inches deep. It weighs 2.75 pounds with all batteries in place. The small size and light weight make the set easy to carry and use. The durable plastic case is sealed for all-weather use. The AN/PSN-11 features also make it easy to use. These features are highlighted in Figure 5-1.

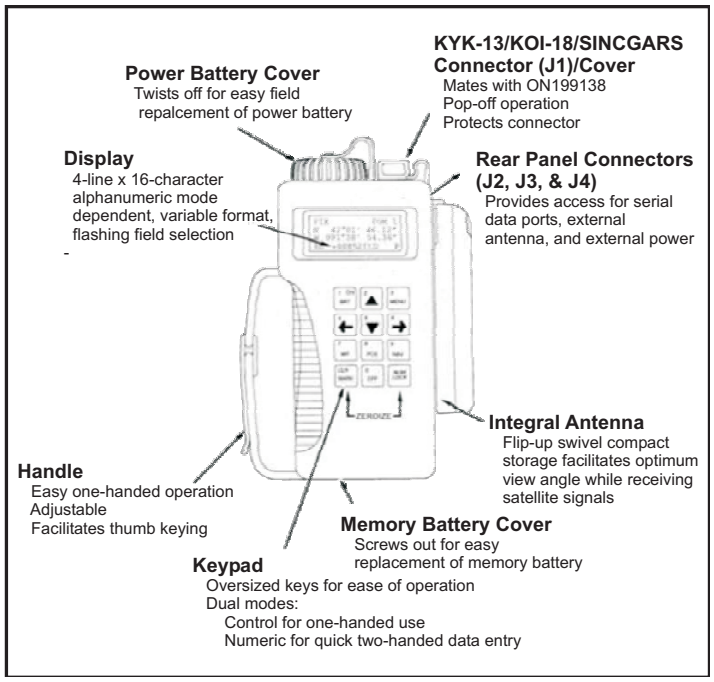

Figure 5-1. AN/PSN-11 PLGR

2. **Setup and control.** Setting up the operation parameters of the PLGR is critical. This section describes the display, procedures, and principles used in setting the AN/PSN-11 displays to suit the user's needs. This display consists of seven pages that allow the user to control the following parameters:

- Operating mode
- Type of satellites to use
- Coordinate system
- Units
- Magnetic variation
- Display customization
- Navigation display mode
- Elevation hold mode
- Time and error formats
- Datum
- Automatic-off timer
- Datum port configuration
- AutoMark mode

To set the PLGR up for continuous operation:

- Turn the PLGR on. Once it has completed its built-in-test, press the MENU key and move the cursor to SETUP. Activate the SETUP function.

<move>	select
STATUS	SETUP
INIT	TEST
HELP	<MORE> P

Setup

- The first screen allows the operator to set the operating mode and sky view-(SV) type. Scroll through the operating modes and select continuous (CONT) and mixed for the SV-type.

SETUP MODE:	CONT
Continuous	POS
and VEL	update
SV-TYPE:	mixedP

Operating mode and SV-type

- The second screen allows the operator to set up the units. Scroll through the available coordinates and select MGRS-New and Metric. For the elevation (Elev), select meter and mean sea level (MSL) and for the angle (ANGL), select degrees (Deg) and magnetic (Mag).

SETUP	UNITS
MGRS-New	Metric
Elev: meter	MSL
ANGL: Deg	Mag P

Set up the units

- The third screen should be set for the magnetic variation (MAGVAR) or grid-magnetic (GM) angle for the area. The operator can select calculate (Calc) the degree (deg) or manually enter degrees as an easterly or westerly GM angle. (**Note:** The world magnetic model is updated at five-year intervals. The new WMM-2010 became available 15 December 2009 and should be used.)

SETUP	MAGVAR
Type:	Calc deg
WMM	2010
	P

Magnetic variation or grid-magnetic angle setup

- The fourth screen of setup allows the operator to set the elevation hold (ELHold), time, and error (ERR). The operator should set the ELHold to automatic. As for time, the operator needs to know how many hours from his present location he is ahead of or behind Coordinated Universal Time (formerly Greenwich Mean Time). To set the ERR, the operator selects –+m to let him know in meters how accurate the PLGR is operating.

SETUP	
ELHold:	automatic
TIME:	Loc=Z-0500
ERR: +–m	P

Set elevation hold, time, and error

- The fifth screen of setup allows the operator to set the PLGR datum (DTM) to his area of operation and to set the automatic-off timer. The PLGR has 52 map DTM sets available. The operator should set the PLGR DTM to his area of operation. For example, if the map DTM is WGS-84, the operator sets the PLGR to WGS-84. If the map is 1927 North America DTM, the operator sets the DTM to NAS-C. The automatic-off timer is used to turn the PLGR off after a prescribed time once it has acquired a fixed position. The operator should set this mode to OFF.

SETUP DTM:	NAS-C
NA27CONUS/Clk66	
AUTOMATIC	OFF
TIMER: off	P

Set the PLGR datum

- The sixth screen of setup is the in/out (I/O) port screen. This page allows the operator to control serial communications, HAVEQUICK, and 1PPS options. Select Standard unless otherwise directed, and select OFF for HAVEQUICK and 1PPS.

SETUP	I/O
SERIAL:	Standard
HAVEQUICK:	Off
1PPS: Off	P

In/out port screen

- The seventh screen is setup AUTOMARK. This feature allows the operator to have the PLGR periodically wake up, acquire a position fix, and store the position as a WPT or return to its previous mode of operation. The operator should set this mode to OFF.

SETUP	AUTOMARK
MODE: off	WP002
26-04-01 REPEAT	0935L
00h00m	P

AUTOMARK setup

- Once the PLGR is set up, the operator can obtain a position. This procedure is accomplished by activating the position key. The position displayed is old information until the receiver collects and calculates satellite data and displays the current position. The receiver must be tracking three satellites to obtain a two-dimensional position fix and four or more satellites for a three-dimensional position fix. The third dimension is elevation.

3. **Waypoint operations.** A WPT is the location of a point on a desired course described by coordinates or a physical location. A normal mission consists of a series of WPTs. There are 999 WPTs available on the AN/PSN-11 (numbered 01 through 999).

The AN/PSN-11's WPT display pages are used to perform the following operations:

- Enter, edit, or review WPTs.
- Copy WPTs.
- Determine the distance between WPTs.
- Calculate a new WPT.
- Clear WPTs.
- Define a mission route.

To enter a WPT, the operator needs to press the waypoint (WP) key. When the WPT menu appears, the ENTER function flashes. The operator presses the down arrow key to activate this field. Now the operator enters a WPT name, grid zone designator, 100,000-meter grid square identifier, 10-digit grid coordinate, and elevation:

WP	<move>	Sel
ENTER	EDIT	COPY
SR-CALC	RNG	CALC
DIST	CLEAR	ROUTE

Entering a WPT

- First line: To enter a WPT name, the operator presses the right arrow key until the first letter of the word UNUSED (WP#) is flashing. Scroll up or down through the alphabet changing the letter U to whatever is desired. For example, if the operator wanted to name their WPT NORTH STAR, the operator scrolls down the alphabet until the letter U is changed to the letter N. The operator repeats this process for the remaining letters.

WP002		UNUSED002
B		MGRS-New
AN	00000e	00000n
No EL		CLR P

Entering a WPT name into an unused location

WP002		NORTHSTAR
10T		MGRS-New
EG	13130e	95750n
No EL		CLR N

Change a WPT's name

- Second line: The operator enters the grid zone designator for the area of operation.
- Third line: The operator must enter a 10-digit grid coordinate with its 100,000-meter grid square identifier. Then the operator plots the grid coordinates on the map and enters it into the PLGR.

Note

Operator plots 8-digit grid coordinates, however a 10-digit coordinate is entered. Therefore, the fifth and tenth digits entered are zero.

- Fourth line: If the WPT's elevation is known, the operator can enter it. If the elevation is unknown, the operator can just leave the data as zero or input No EL. The operator moves the cursor until the up and down arrow symbol appears before the letter P or N in bottom right corner. When activating the down arrow key, the operator stores the WPT into the PLGR's memory. The PLGR notifies the operator that the WPT has been stored.

Note

When entering numbers, the number lock can be activated. The letter N appears in the bottom right corner, allowing the operator to use the numbers on the keypad rather than scrolling up and down.

4. **Navigation.** NAV is using the AN/PSN-11 to find a present position relative to other points. The AN/PSN-11 provides azimuth, range, and steering information in a variety of formats. There are four NAV display modes that may be accessed and selected. The NAV display mode selected determines the type of information shown on the NAV displays. These NAV displays give the user the most useful information for a certain mission profile: SLOW, 2D FAST, 3D FAST, or CUSTOM.

In SLOW NAV mode, the AN/PSN-11 performs two-dimensional NAV. SLOW NAV mode is used for land or sea NAV when the user cannot maintain the minimum necessary speed (about 1.5 kilometers [km] per hour).

In 2D FAST NAV mode, the AN/PSN-11 performs two-dimensional NAV. 2D FAST NAV mode is used for land or sea NAV when the user can maintain the minimum necessary speed for the GPS to compute NAV parameters based on velocity.

In 3D FAST NAV mode, the AN/PSN-11 performs three-dimensional NAV. 3D FAST NAV mode has an APPROACH sub-mode. 3D FAST NAV mode is used in the air when the user can travel in three dimensions and can maintain the minimum speed necessary for the GPS to compute NAV parameters based on velocity.

In CUSTOM NAV mode, the AN/PSN-11 displays the user's navigational pages as desired. It can be set up to support the individual user's performance or mission requirements. The following custom display modes are available:

- Direct
- Course to
- Course from
- Route
- Approach

To navigate with the PLGR on land in a dead-reckoning method the operator presses the NAV key, activating the NAV function. The first screen that appears is the NAV mode. For example: SLOW, 2D FAST, 3D FAST, CUSTOM, DIRECT, CRS (course) TO, and CRS FROM.

- The operator selects the 2D FAST and DIRECT. The second line is the WPT to be navigated. (To choose the desired WPT, scroll through the stored WPTs.)

2D	FAST	DIRECT
WP002	NORTHSTAR002	P

NAV mode

- To see the azimuth that the navigator should be traveling, go to the next page by pressing the down arrow key. This page tells the navigator his current azimuth (tracking [TRK]) and the correct azimuth ([AZ]). The fourth line tells the navigator steering (STR), a direction (< >), and the number of degrees the navigator needs to move to travel on the correct azimuth.

NORTHSTAR002	±30 m
TRK 305.3M	
AZ 311.3M	
STR>6	P

Azimuth

- The next screen tells the navigator the range or distance to the WPT and how much time (TTG2) it will take to reach the WPT. This page also informs the navigator what the elevation difference is from the present location to the WPT and by how much the WPT will be missed (MMD).

RNG	3598.55 km	
TTG2AN	0036:05	
ELD	-00050 m	
MMD2	30 m	P

Range or distance

AN/PSN-13 Defense Advanced Global Positioning System Receiver Satellite Signals Navigation Set

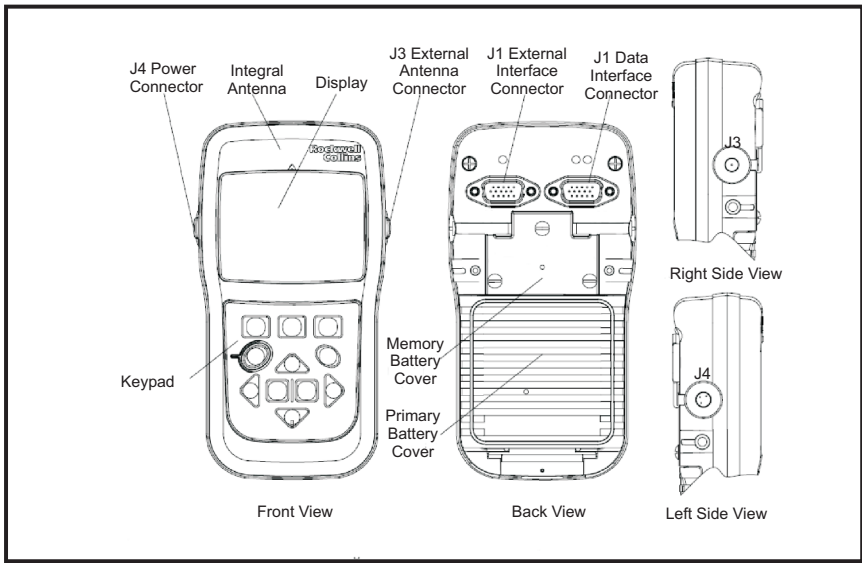

Figure 5-2. Defense Advanced GPS Receive Satellite Signals Navigation Set (AN/PSN-13)

The PLGR is being phased out as the Army's position, velocity (ground speed), and time device and replaced by the Defense Advanced GPS Receiver (DAGR). The DAGR is better suited for military use because it is able to withstand harsh environmental conditions under which typical commercial receivers are compromised. Further, the DAGR is specifically designed to work during jamming operations. When jamming is present, the DAGR continues to track, while commercial receivers lose their satellite tracking Position, Velocity, and Time data.

DAGR messages

This power-on status message display is immediately followed by the following messages. All messages may not be listed, as they are dependent on how the DAGR is configured. When applicable, use the up and down cursor control keys to scroll and view all display messages:

- Self-test: Indicates self-test results as pass (no self-test failures found) or fail (self-test failures detected). The power-on self-test performs an automatic self-test of receiver hardware (Selective Availability Anti-Spoofing Module) and does not require any input from the operator. This message is always displayed.

- Battery used: Indicates primary battery capacity used (the amount of time DAGR was operating using the primary battery, in hours and minutes). This message is only displayed when using internal primary battery power.

- Battery left: Indicates primary battery capacity remaining in hours and minutes. This message is only displayed when using internal primary battery power.
- Power: Indicates external power is being used. This message is only displayed when using external power.
- Days remaining: If the cryptovariable (CV) weekly or black CV monthly key is loaded, this message indicates the number of days remaining in a mission and if there are enough CV keys loaded for the mission's duration.
- Default: Indicates DAGR's position, time, and date default values or if initialization is recommended for the DAGR.

DAGR operator task 1. Prepare DAGR for operation:

Subtask	Action	Result
a. Install batteries	1. Remove battery pack from unit	**Note:** Do not mix rechargeable and nonrechargeable types of batteries.
	2. Inspect the battery pack gasket and, if necessary, lubricate or replace it	N/A
	3. Install new batteries in battery pack and reattach to unit	N/A
b. Power on unit	1. Press and release the PWR key	N/A
	2. Observe the POWER-ON STATUS message and ensure the unit passes the self-test	N/A
	3. If required, press the ENTER key	N/A
	4. Press the MENU key twice	Main menu is displayed

Subtask	Action	Result
c. Set battery information	1. Use the cursor control keys to highlight RECEIVER SET-UP and press ENTER	Displays RECEIVER SETUP submenu
	2. Use the cursor key to highlight BATTERY and press ENTER	The battery page is displayed
	3. Select the POWER BATTERIES INSTALLED field and press ENTER	Battery information fields are displayed
	4. Use the cursor controls to change the field information to read the date and time when the batteries were installed and press ENTER	Battery information is set, and the battery page is displayed again
	5. Select the BATTERY TYPE field and press ENTER	The BATTERY TYPE menu is displayed
	6. Select the correct type of batteries and press ENTER	The battery type is set, and the battery page is displayed again
	7. Select the RECHARGEABLE field and press ENTER	The rechargeable field is displayed
	8. Select the correct type of batteries and press ENTER	Battery recharging is set, and the battery page is displayed
	9. Press the MENU key	The MENU page is displayed
	10. Select RESET BATTERY USED and press ENTER	Battery use is reset to zero, and the battery page is displayed completing primary battery installation
Note: Continuous is the default mode when on external power; fix is the default mode on battery power.		

DAGR operator task 2. Operate DAGR:

Subtask	Action	Result
a. Turn on DAGR to find current location	1. Press the PWR/QUIT button	The power-on message is displayed for approximately two seconds indicating the DAGR software and hardware versions **Note:** To determine the latest DAGR software version, refer to the GPS support Web site, <https://gps.army.mil> (Technical Manual [TM] 11-5820-1172-13, *Defense Advanced GPS Receiver [DAGR]*).
	2. Wait for the power-on message to clear	The self-test is complete, and the DAGR does not need initialization
	3. If the power-on message does not clear, press WP/ENTER to acknowledge any conditions	A message stating CV key, group unique variable (GUV) key, or SV code condition will appear
	4. Wait for the present position page to appear	The SV Sky View page is displayed until the present position is acquired and displayed
b. Set the mode of operation	1. From any display, push and hold the POS [position] key until the present position page is displayed	If a field is highlighted, press the QUIT key to unhighlight the field
	2. Press MENU	Highlight SELECT OP MODE
	3. Press ENTER	Highlight the desired operating mode
	4. Press ENTER	Display returns to the present position page and displays the selected operating mode below the coordinates of the present position

Subtask	Action	Result
c. Power off	1. Press and hold PWR	The 30-second power-down warning is played
	2. Press ENTER to immediately power off the DAGR	N/A
d. Install map	1. Right click on the DAGR map toolkit loader link	Select SAVE TARGET AS to save the .zip file to the PC
	2. Open the .zip file and run setup.exe	GPS map loader installs and creates a program icon on the PC
	3. Go to the DAGR product library page	Download the required map set(s)

Note: Before installing map installation software, the PC must not have any previous version of the GPS map toolkit software. The following paragraphs from TM 11-5820-1172-13 will assist with the following key functions:

TM 11-5820-1172-13 Paragraph	Function
11.2	Transfer maps and images between two DAGR units
17.3.2.1	PC minimum specifications for maps installation
17.3.3.1	Install maps installation software into a PC using CD
17.3.4.4.2	Uninstall a previous version

A common access card (CAC) and CAC personal identification number are required to access the Web site at <https://tsunami.tec.army.mil/Products/DAGRMapSupport/index.cfm>, with maps and installation software available for download.

Chapter 6

Controlled Cryptographic Equipment

Automated Net Control Device AN/CYZ-10

The Automated Net Control Device (ANCD) system replaced the paper-version signal operating instructions (SOI), the KYK-13, and MX-18290 hopset device.

The ANCD was designed to load the Single-Channel Ground and Airborne Radio System (SINCGARS) radio with communications security (COMSEC) and frequency-hopping (FH) data without the use of the KYK-13 and the MX-18290 hopset device. The ANCD also provides operators with frequencies, call signs, suffixes, expanders, and other SOI information, except the authentication table. This chapter provides the knowledge radio operators need to transfer COMSEC keys/FH data and SOI information from ANCD to ANCD, extract SOI information from an ANCD, and load the SINCGARS radio using Mode 2 fill. This chapter also describes how to store data sent by over-the-air rekeying (OTAR) and broadcast modes.

General Information	
Size	6.3 inches x 4.4 inches x 2.0 inches
Weight	Approximately 2 pounds with batteries
Power source	3x3-volt lithium batteries
Purpose	Used to transfer and store COMSEC keys and FH data and display, transfer, and store SOI information

Note

The ANCD eliminates the use of the KYK-13, KYX-15, MX-18290, and paper SOI.

The main menu consists of three areas:

- SOI pertains to SOI information.
- Radio pertains to COMSEC keys/FH data to be loaded into the radio.
- Supervisor pertains to areas performed by the supervisor only.

Select main menu areas:

- Use the ARROW key function by pressing either the left or right arrow keys, then press the ENTER key.
- Press the corresponding capital letter on the keyboard to take you directly to a specific topic.

Example:
S—for signal operating instructions
R—for radio
U—for supervisor

ANCD operator task 1. Prepare to transfer COMSEC keys/FH data (ANCD to ANCD):

Subtask	Action (Source ANCD to transfer)	Result (Target ANCD to receive)
a. One ANCD must be selected as the source ANCD and the other as the TARGET ANCD to transfer COMSEC keys/FH data The transfer process uses the DS-101 protocol, which allows the transfer of the short title, edition, segment, text identification (ID), and actual key	1. Press the ON/OFF key to turn on the source ANCD	1. Turn on ANCD
	2. Select RADIO; press the cursor on the keyboard and then press ENTER or press "R" for radio	2. Select RADIO and press ENTER
	3. Enter SEND	3. Select RECEIVE and press ENTER
	4. Select ANCD and press ENTER	4. Receive from—select ANCD and press ENTER
	5. Select DATABASE and press ENTER	5. Select DATABASE, and press ENTER
	6. ANCD will ask, "Do you want to include TIME? Y/N?" ENTER Y for yes	6. ANCD will ask. "Do you want to delete FH and COMSEC data?" Select YES to proceed
	7. Connect both ANCDs with fill cable (W4) and press SEND **Note:** The receiving ANCD must press RCV on the ANCD keyboard within 20 seconds.	7. Connect to ANCD and press RCV [receive] **Note:** Do not press RCV until the source ANCD is ready because RCV must be pressed within 20 seconds after source ANCD sends data.

Subtask	Action (Source ANCD to transfer)	Result (Target ANCD to receive)
	8. Display screen on the sending ANCD will read PREPARING TO TRANSFER TIME and then both ANCDs will read TRANSFER IN PROGRESS; once the transfer has been completed, the display screen will read TRANSFER SUCCESSFUL	8. The target ANCD display screen will read TRANSFER IN PROGRESS; once transfer is complete, display screen will read TRANSFER SUCCESSFUL

ANCD operator task 2. Transfer SOI data from ANCD to ANCD:

Subtask	Action (Source ANCD)	Result (Source ANCD)
a. Source ANCD menu selections	1. Press ON/OFF	Select SOI
	2. Enter SOI	Select SEND
	3. Enter SEND	Scroll with up/down arrow and press ENTER to select SOI set
	4. Press down arrow key; press up/down arrow key	SOI set (name/number)
	5. Press ENTER to select	Edition (name/time periods); the ANCD will ask, “Do you want to specify groups to send?”
	6. Enter NO	The ANCD will ask, “Do you want to specify a time period to send?”
	7. Enter NO	Send to ANCD
	8. Enter ANCD	Connect ANCD to ANCD with cable
	9. Press down arrow key; wait to press SEND	Press SEND

Subtask	Action (Target ANCD)	Result (Target ANCD)
b. Target ANCD menu selections Transfer data from ANCD to ANCD	1. Press ON/OFF	Select RECEIVE
	2. Enter SOI	N/A
	3. Enter RECEIVE	Receive from ANCD
	4. Enter ANCD	Connect ANCD to ANCD with cable
	5. Press down arrow key; connect ANCDs with cable and press SEND and RCV	Press RCV to receive The display will read PROCESSING PLEASE WAIT and shows the percentage of bytes sent When sending of SOI data is complete, the display will read RECEIVE OPERATION SUCCESSFUL

Simple Key Loader AN/PYQ-10(C)

The simple key loader (SKL) will significantly enhance the user's ability to use and distribute electronic key material, electronic protection material, and SOI information. The SKL is a hand held and portable digital computer that is ruggedly designed to withstand battlefield conditions. The SKL is backward-compatible with the AN-CYZ-10, existing end cryptographic units (ECUs) and forward-compatible with future crypto-modernization equipment. The SKL provides for the receipt, display, transmission, preparation, storage, and accountability of key material and SOI information.

The SKL runs a Windows CE.Net operating system hosting the core library and SKL user application software (UAS). The UAS programs interface with the local COMSEC management software, the automated communications engineering software workstations, and ECUs on the battlefield. Refer to Technical Manual (TM) 11-7010-354-12&P, *Operator's and Unit Maintenance Manual Including Repair Parts and Special Tools List for the Computer System, Digital AN PYQ-10 (Simple Key Loader)* and TM 11-5810-410-13&P for additional information.

General Information	
Size	7.4 inches x 3.75 inches x 1.5 inches
Weight	Approximately 18.25 ounces without batteries; 27.4 ounces with Li-ion battery
Power source	Battery pack or 8 AA batteries

General Information	
Fill port connector	6-pin
Purpose	Replace or complement the AN/CYZ-10 data transfer device (DTD) currently fielded to support the Electronic Key Management System (EKMS) architecture
Note: The PCMCIA KOV-21 card is can only be removed from the SKL during depot-level maintenance.	

SKL operator task 1. Initial power up after delivery of SKL:

Subtask	Action	Result
a. Locate the power push button at the front upper right-hand corner of the SKL.	Press and hold the power push button for approximately 3 seconds or until the system starts to boot and then release the button	The system should boot to the window, default SSO [single sign on] login.
b. Observe the KOV-21 light-emitting diode (LED) **Note:** If the LED is flashing, a log-on window indicates the default SSO account has a DEFAULTPIN as a password and the DTD 2000 information security (INFOSEC) card is in an uninitialized state. When the SKL is issued to the unit it will have a default administrative account already created. The user ID for this account is SSO (case-sensitive). This window asks if the user wants to initialize the card and pair it to this host computer.	1. Press OK	External CIK window opens
	2. Press the OK button in the upper right-hand corner of the window	Change password window opens **Note:** This allows the SSO to change the password from DEFAULTPIN to something else that will be associated with the KOV-21 INFOSEC card; type in the new password and confirm it. Secure SSO account password
	3. Press OK	Password successfully updated window opens

Subtask	Action	Result
c. Launch SKL UAS **Note:** Normally the user would stay in the core library and create other user accounts required by the unit. However, SKL UAS first must be launched to turn on the new database flag. Once in the SKL UAS, the user can exit back to the core library to create new users.	1. Press the OK button in the upper-right-hand corner of the window	Core library desktop window opens
	2. Select Launch→Launch UAS from the core library main menu	N/A
	3. Make sure that SKL is highlighted and then press OK	Information window opens.
	4. Press the OK button in the upper right-hand corner of the window	Progress window opens briefly and then the startup information window opens
	5. Press OK	SKL UAS desktop window opens

SKL operator task 2. Powering up and logging onto the SKL:

Subtask	Action	Result
a. Power push button is located at the front upper- right-hand corner of the SKL	1. Press and hold the power push button for approximately 3 seconds or until the system starts to boot and then release the push button	The system should boot to the window core library logon.
b. Observe the KOV-21 LED	1. If not flashing	A logon window will open indicating the user must logon to the core library to proceed
	2. If it is flashing, the probable fault is that the SKL has been "zeroized," which is most likely the result of an intentional (active) zeroization; the SSO did not logon successfully after 10 consecutive attempts.	Corrective actions include documenting the fault indicating the troubleshooting steps taken (and results, if any) and delivering the SKL to the SSO

Subtask	Action	Result
c. Enter the required information in the user ID and password fields. **Note:** A blinking cursor will be displayed in the user ID field. To enter alphabetical upper case keyboard characters, make sure the CAP key is toggled on. Then using the stylus, select each letter of the user ID. Notice that the selected letters appear in the ID field of the logon window. Toggle the keyboard and tap the stylus on the CAP key to display numeric characters.	1. Once the user ID has been entered, tap the stylus in the password field and a blinking cursor will be displayed; enter the password Tap OK with the stylus	The logon window and virtual keyboard disappears if the user ID and password are correct and then the core library desktop window appears.
d. SKL startup	1. Using the stylus, select Launch→Launch UAS	The launch UAS window opens
	2. Select SKL by tapping the selection, if necessary, with the stylus to highlight it and then tap the OK button.	The progress window, opens followed by the SKL startup information window **Note:** This window displays the SKL version, date of the highest SOI classification, and the highest key classification.
	3. Tap on the OK button with the stylus.	The SKL UAS main menu window is displayed; the SKL UAS main menu is now open and ready to use

Subtask	Action	Result
e. Set the equipment profile instruction mode	1. Select settings→options from the main menu of the SKL UAS **Note:** The options menu is used to select either a detailed or condensed mode of key operation. It is highly recommended to select the detailed equipment profile instruction mode. Segment, suffix, designator, and text ID are the four selections to be selected at all times.	The SKL returns to the tab you had open when you started this final routine.
	2. When satisfied with the selections, tap the stylus on OK to close the window	N/A

SKL operator task 3. Powering down the SKL from the SKL UAS:

Subtask	Action	Result
a. Exit the SKL UAS program **Note:** Save changes to the mission database before powering down.	1. Select File→Exit from the SKL main menu, SKL UAS file menu **Note:** The X button in the top right-hand corner of the SKL main menu may also be tapped with the inductive stylus to exit the application.	The core library desktop is now displayed
	2. Select session→logout in logout	The logout selection is made and the core library desktop window returns
	3. Press and hold the power button until the power down sequence begins	The SKL will power down normally

SKL operator task 4. Fill to SKL transfer:

Subtask	Action	Result
a. Transfer any key present in the fill DTD to the SKL **Note:** A FILL DTD can transfer any key present in the DTD to the SKL such as key encryption keys (KEKs), transmission encryption keys (TEKs), transfer KEKs (TrKEKs), and transmission security keys (TSKs). This transfer process will use the DS-101 protocol. With this protocol, the short title, edition, segment, and text ID can be transferred as well as the actual key.	1. On the FILL DTD, highlight XMIT and press the ENTER button	The select a transmit mode window opens
	2. Highlight issue and press ENTER to issue a key	N/A
	3. Press the PDN button to see the keys to select the key to transfer; press ENTER	A XMIT indication in the right-hand corner of the screen
	4. On the FILL DTD highlight SEND and press the ENTER button	DIRECT will be highlighted, so press ENTER; the FILL DTD display reads connect to station
	5. Connect the standard FILL cable to the FILL DTD and the SKL; do not press SEND at this time On the SKL, select File→Receive→Key	The receive key, select key source window opens
	6. Highlight DTD DS-101 and tap NEXT	On the SKL, the receive key, profile window opens
	7. Make sure the devices are connected together with the standard FILL cable and tap on finish On the FILL DTD, press SEND; the transfer takes place	On the SKL, the receive edition DS-101 tag window opens **Note:** This is the window where the effective date, supersession rate, and crypto period are set. This information can be obtained from the COMSEC custodian.

Subtask	Action	Result
	8. Use the virtual keyboard to enter this data and when finished tap OK Once selected, tap the OK button	If the SKL does not recognize the key type, a status window opens allowing user to select the key type If the SKL recognizes the key, the status window will open and the display reads operation successful
	On the FILL DTD, press the main menu button to go back to the main menu	The transfer is complete

SKL operator task 5. SKL to fill transfer:

Subtask	Action	Result
a. An SKL can transfer any key present in the SKL to the FILL DTD such as KEKs, TEKs, TrKEKs, and TSKs; this transfer process uses the DS-101 protocol with which the short title, edition, segment, text ID, and actual key can be transferred	1. On the SKL, tap on the keys tab to display the list of keys present in the SKL; select File→Transmit→Load selected keys	The key load select keys, selected keys window opens
	2. Scroll down the list and select the key(s) to transfer to the FILL DTD and then tap OK	Key load settings window opens
	3. Select the protocol by tapping on the down arrow and selecting DS-101; press the down arrow on the activation mode and select DS-101 and in the mode field select issue Using the standard FILL cable connect the SKL to the FILL DTD and then tap OK	On the SKL, the status window opens and the display reads attempting to connect

Subtask	Action	Result
	4. On the FILL DTD from the DS-101 main menu, highlight RECV and press ENTER	The FILL DTD the display shows connect to station; press RCV
	5. Press RCV; the transfer takes place	On the SKL, the status window shows transmit successful then operation successful
	6. Tap OK	The transfer is complete
	7. On the FILL DTD, press main menu to return to the main menu	The transfer is complete

SKL operator task 6. ANCD to SKL transfer:

Subtask	Action	Result
a. An ANVD DTD can transfer any key present in the SKL to the FILL DTD such as KEKs, TEKs, TrKEKs, and TSKs; this transfer process uses the DS-101 protocol with which the short title, edition, segment, text ID, and actual key can be transferred	1. On the ANCD DTD, highlight XMIT and press ENTER and then highlight DTD and press ENTER	The key load select keys, selected keys window opens
	2. Select key menu and the first key in the list is shown; select this key by pressing ENTER or PDN key; once you have found the key you wish to transfer, press ENTER	After ENTER is pressed, there will be a * indication in the lower right-hand corner of the screen
	3. On the ANCD DTD, highlight done and press ENTER	The display directs connection of the ANCD to the DTD; use a standard FILL cable to connect to the SKL
	4. Press ENTER	The ANCD DTD display reads attempting to connect
	5. On the SKL select File→Receive→Key	The receive key, select key source window opens
	6. Highlight DTD DS-101 and select NEXT	On the SKL, the receive key, profile window opens

Subtask	Action	Result
	7. On the FILL DTD, press main menu button to return to the main menu	On the SKL, the receive edition DS-101 tag window opens; this is the window where the effective date, supersession rate, and crypto period are set; this information can be obtained from the COMSEC custodian If the SKL does not recognize the key type, a status window opens allowing user to select the key type
	8. Make sure the devices are connected together with the standard FILL cable and press FINISH	N/A
	9. Use the virtual keyboard to enter this data and when finished press OK	If the SKL recognizes the key, the status window will open and the display will read operation successful
	10. Once selected, press OK	N/A
	11. Press OK button to complete the transfer process	The transfer is complete
	12. On the ANCD DTD, press the main menu button back to the main menu.	N/A

SKL operator task 7. SKL to ANCD transfer:

Subtask	Action	Result
a. A SKL can transfer any key present in the SKL to the FILL DTD such as KEKs, TEKs, TrKEKs, and TSKs; this transfer process uses the DS-101 protocol with which the short title, edition, segment, text ID and actual key can be transferred	1. On the SKL, tap on the keys tab to display the list of keys present in the SKL and select file→transmit→load selected keys	The key load select keys, selected keys window opens
	2. Scroll down the list and select the TEK or KEK to transfer to the ANCD DTD; multiple keys can be selected	Press OK and the key load settings window opens
	3. Select the protocol by tapping on the down arrow and selecting DS-101; press the down arrow on the activation mode and select DS-101 and in the mode field select issue Using the standard FILL cable, connect the SKL to the ANCD DTD and then tap the OK button	On the SKL, the status window opens displaying attempting to connect
	4. On the ANCD DTD from the main menu, highlight RCV and press ENTER, highlight unassisted and press ENTER, press PDN until KP is displayed, and then press ENTER; make sure the two devices are connected with the standard FILL cable and press the ENTER	On the ANCD DTD, the display shows press LMD start button
	5. Press ENTER again	The transfer takes place
	6. Once the transfer is complete, the change tag values? No/Yes opens; highlight NO and press ENTER; this window will repeat if multiple keys are being received	The ANCD DTD display shows receive more key(s)? Yes/No

Subtask	Action	Result
	7. Highlight NO and press ENTER	On the SKL, the status window shows transmit successful then operation successful
	8. Press OK	The transfer is complete
	9. On the ANCD DTD, press the main menu button back to the main menu	The transfer is complete

Appendix A

Julian Date Calendar

Regular Year

Julian Date Calendar (Regular Year)												
Day/ Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	01	32	60	91	21	52	82	13	44	74	05	35
2	02	33	62	92	22	53	83	14	45	75	06	36
3	03	34	63	93	23	54	84	15	46	76	07	37
4	04	35	63	94	24	55	85	16	47	77	08	38
5	05	36	64	95	25	56	86	17	48	78	09	39
6	06	37	65	96	26	57	87	18	49	79	10	40
7	07	38	66	97	27	58	88	19	50	80	11	41
8	08	39	67	98	28	59	89	20	51	81	12	42
9	09	40	68	99	29	60	90	21	52	82	13	43
10	10	41	69	00	30	62	91	22	53	83	14	44
11	11	42	70	01	31	63	92	23	54	84	15	45
12	12	43	71	02	32	63	93	24	55	85	16	46
13	13	44	72	03	33	64	94	25	56	86	17	47
14	14	45	73	04	34	65	95	26	57	87	18	48
15	15	46	74	05	35	66	96	27	58	88	19	49
16	16	47	75	06	36	67	97	28	59	89	20	50
17	17	48	76	07	37	68	98	29	60	90	21	51
18	18	49	77	08	38	69	99	30	62	91	22	52
19	19	50	78	09	39	70	00	31	63	92	23	53
20	20	51	79	10	40	71	01	32	63	93	24	54
21	21	52	80	11	41	72	02	33	64	94	25	55
22	22	53	81	12	42	73	03	34	65	95	26	56
23	23	54	82	13	43	74	04	35	66	96	27	57
24	24	55	83	14	44	75	05	36	67	97	28	58
25	25	56	84	15	45	76	06	37	68	98	29	59
26	26	57	85	16	46	77	07	38	69	99	30	60
27	27	58	86	17	47	78	08	39	70	00	31	62
28	28	59	87	18	48	79	09	40	71	01	32	63
29	29		88	19	49	80	10	41	72	02	33	63
30	30		89	20	50	81	11	42	73	03	34	64
31	31		90		51		12	43		04		65

Leap Year

Julian Date (Leap Year)												
Day/ Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	01	32	61	92	22	53	83	14	45	75	06	36
2	02	33	62	93	23	54	84	15	46	76	07	37
3	03	34	63	94	24	55	85	16	47	77	08	38
4	04	35	64	95	25	56	86	17	48	78	09	39
5	05	36	65	96	26	57	87	18	49	79	10	40
6	06	37	66	97	27	58	88	19	50	80	11	41
7	07	38	67	98	28	59	89	20	51	81	12	42
8	08	39	68	99	29	60	90	21	52	82	13	43
9	09	40	69	00	30	61	91	22	53	83	14	44
10	10	41	70	01	31	62	92	23	54	84	15	45
11	11	42	71	02	32	63	93	24	55	85	16	46
12	12	43	72	03	33	64	94	25	56	86	17	47
13	13	44	73	04	34	65	95	26	57	87	18	48
14	14	45	74	05	35	66	96	27	58	88	19	49
15	15	46	75	06	36	67	97	28	59	89	20	50
16	16	47	76	07	37	68	98	29	60	90	21	51
17	17	48	77	08	38	69	99	30	61	91	22	52
18	18	49	78	09	39	70	00	31	62	92	23	53
19	19	50	79	10	40	71	01	32	63	93	24	54
20	20	51	80	11	41	72	02	33	64	94	25	55
21	21	52	81	12	42	73	03	34	65	95	26	56
22	22	53	82	13	43	74	04	35	66	96	27	57
23	23	54	83	14	44	75	05	36	67	97	28	58
24	24	55	84	15	45	76	06	37	68	98	29	59
25	25	56	85	16	46	77	07	38	69	99	30	60
26	26	57	86	17	47	78	08	39	70	00	31	61
27	27	58	87	18	48	79	09	40	71	01	32	62
28	28	59	88	19	49	80	10	41	72	02	33	63
29	29	60	89	20	50	81	11	42	73	03	34	64
30	30		90	21	51	82	12	43	74	04	35	65
31	31		91		52		13	44		05		66

Appendix B

World Time Zones and Time Conversion

Zulu Time

Zulu time is synchronized with the Naval Observatory Atomic Clock. Zulu time can be confirmed from the U.S. Naval Observatory master clock telephone voice announcer, Defense Switched Network (DSN) 762-1401, 762-1069 (Washington, D.C.), or 560-6742 (Colorado Springs, CO). You can only connect to these numbers for a brief time before the call is terminated. If DSN is not available, call (202) 762-1069 or (202) 762-1401. These are not toll-free numbers, and callers outside the local calling area are charged at regular long-distance rates. Another alternative is to go to <http://tycho.usno.navy.mil/> or use the time from a Precision Lightweight Global Positioning System Receiver or Defense Advanced Global Positioning System Receiver that is tracking at least one satellite. The net control station should update and verify net time daily or according to unit standing operating procedures.

Time Zone Conversions

There are 25 integer world time zones from 12 through 0 to +12 Coordinated Universal Time (UTC) (formerly Greenwich Mean Time). Each is 15 degrees longitude measured east and west from the prime meridian of the earth at Greenwich, England.

When UTC is 12:00, the diametrically opposed time zone is 00:00. This is indicated by the dashed line and also indicates a date change. By convention, the area to the left of the dashed line is the following day, while the area to the right is the preceding day.

Y	X	W	V	U	T	S	R	Q	P	O	N	Z	A	B	C	D	E	F	G	H	I	K	L	M
Civilian Time Zones																								
IDLW	NT	HST	ASDT	PST	MST	CST	EST	AST	NST	AT	WAT	UTC	CET	EET	BT	ZP4	ZP5	ZP6	WAST	CCT	JST	GST	SBT	IDLE
1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200

Standard Time=Universal Time+Value from Table

Z	0	E	+5	K	+10	P	-3	U	-8
A	+1	F	+6	L	+11	Q	-4	V	-9
B	+2	G	+7	M	+12	R	-5	W	-10
C	+3	H	+8	N	-1	S	-6	X	-11
D	+4	I	+9	O	-2	T	-7	Y	-12

*= Today **=Yesterday

AT-Azores Time	AWST-Australian Western Standard Time	
IDLW-International Date Line West	WAT-West Africa Time	CCT-China Coast Time
NST-Newfoundland Standard Time	UTC-Coordinated Universal Time	GST-Guam Standard Time
HST-Hawaii Standard Time	CET-Central European Time	JST-Japan Standard Time
EET-EasternEuropean Time	IDLE-International Date Line East	ASDT-Alaska Standard Time
PST-Pacific Standard Time	BT-Baghdad	NT-Nome Time
MST-Mountian Standard Time	ZP-4	WAST-West Africa Time Zone
CST-Central Standard Time	ZP-5	AST-Atlantic Standard Time
EST-Eastern Standard Time	ZP-6	SBT-Solomon Island Time

Figure B-1. Time conversion table from Field Manual 6-02.53, *Combat Net Radio Operations*, 22 July 2008

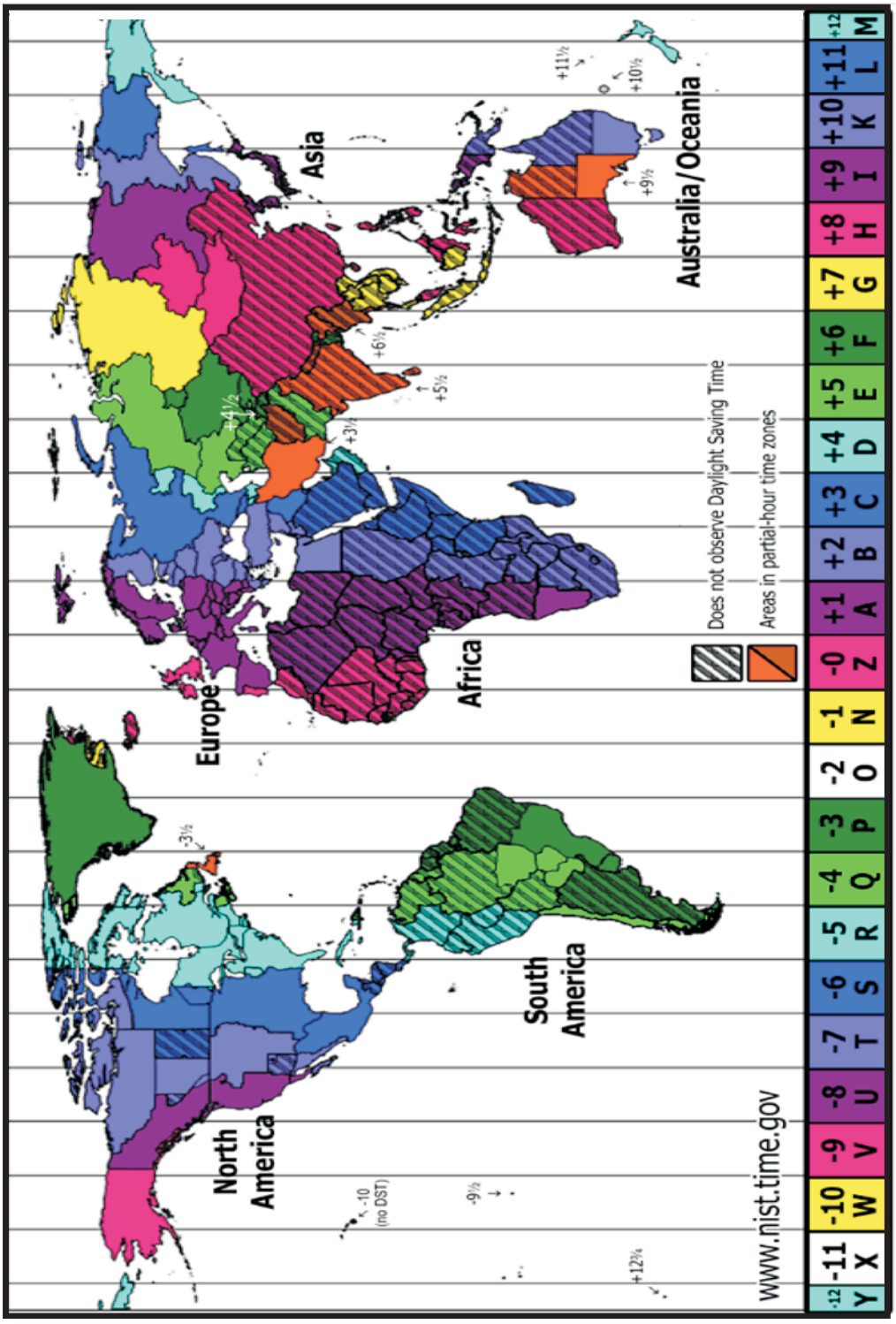

Figure B-2. World time zone chart from <http://www.time.gov/images/worldzones.gif>

Appendix C

Radio Frequency Spectrum

The Army uses several types of single-channel (SC) radios that operate in different frequencies across the radio frequency (RF) spectrum as shown in Figure C-1.

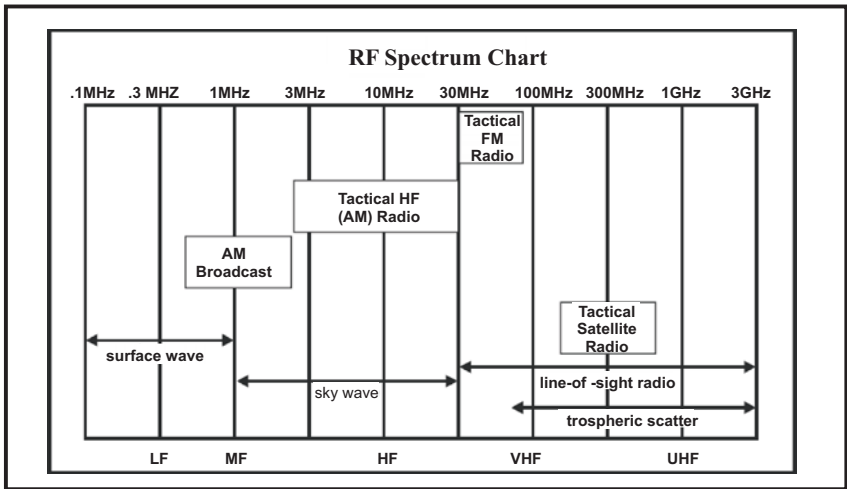

Figure C-1. Radio frequency spectrum chart

The Army uses the following SC radios:

- Frequency modulation (FM) radio: The FM radio has a range of approximately 35 to 40 kilometers, covering a brigade or battalion maneuver area. FM radio transmissions are normally line-of-sight (LOS), and large terrain features can block transmission. FM radios can transmit data.

- High frequency (HF) radio: HF radios' longer range overcomes terrain limitations for users with greater dispersion. Using the improved HF radio provides a versatile capability for short- and long-range communication. HF is the only tactical communications asset that may achieve long-range communications independent of terrestrial or satellite relays. HF communications may be either voice or secure data. HF is also useful where Soldiers cannot achieve LOS.

- Tactical satellite (TACSAT) radio: The use of satellite communications gives the commander the greatest range. It is useful when users such as rapid deployment forces and special operations units are separated by long distances. The SC TACSAT radio transmits in the ultra HF or very HF range, requiring the antenna to have LOS with the satellite. Satellite access time must be requested in advance. This radio has narrow and wide bandwidth and can transmit data. These radios are used in functional networks such as command, administrative, logistical, fire support, and intelligence nets.

The capabilities of the SC radio make it flexible, securable, mobile, and reliable. However, the radio is the most detectable means of electronic communications and is subject to intentional and unintentional electronic interference. Good electronic protection and remoting techniques are highly recommended.

The joint spectrum interference resolution procedures replaced the Department of Defense's meaconing, intrusion, jamming, and interference report in 1992. The component command is the lower echelon user and may prescribe reporting procedures. Reporting procedures would normally be addressed in the communications annex of the operations plan or unit standing operating procedure (SOP). If the radio operator (RO) suspects or experiences radio interference, he should first check all equipment to ensure it is in proper operating order. This includes checking radio components such as cable connections, antenna elements, and grounding. Additionally, the RO should make sure the radio system is installed properly, to include verifying operating frequency, correct azimuth for directional antennas and polarization of antennas, and distance from other radio systems or other sources of electromagnetic interference such as generators. If interference persists, the RO should follow the unit SOP on proper interference reporting procedures.

If the problem cannot be resolved locally, it will be reported to a higher echelon. Reporting to higher levels typically happens through the spectrum manager because Spectrum XXI is used to send the report; however, the Defense Message System may also be used.

Appendix D

Radio Calls and Reports

Prowords

Prowords are standard calls used on the radio to ensure understanding of common terms and tasks. Radio operators should be familiar with and use these prowords.

Proword	Meaning
ALL AFTER	The portion of the message to which I have reference is all that which follows: _____.
ALL BEFORE	The portion of the message to which I have reference is all that which precedes: _____.
AUTHENTICATION IS	The transmission authentication of this message is _____.
BREAK	I hereby indicate the separation of the text from other portions of the message.
CORRECT	You are correct, or what you have transmitted is correct.
CORRECTION	An error has been made in this transmission. Transmission will continue with the last word correctly transmitted.
	An error has been made in this transmission (or message indicated). The correct version is _____.
	The following is a corrected version in answer to your request for verification.
DISREGARD THIS TRANSMISSION–OUT	This transmission is in error. Disregard it. (This proword shall not be used to cancel any message that has been completely transmitted and for which receipt or acknowledgment has been received.)

Proword	Meaning
DO NOT ANSWER	Stations called are not to answer this call, indicate receipt of this message, or otherwise to transmit in connection with this transmission. When this proword is employed, the transmission shall be ended with the proword OUT.
EXEMPT	The addresses immediately following are exempt from the collective call.
FIGURES	Numerals or numbers follow (optional).
FLASH	Precedence FLASH is reserved for initial enemy contact reports on special emergency operational combat traffic originated by specifically designated, high commanders of units directly affected. This traffic shall be short reports of emergency situations of vital proportion. Handling is as fast as is humanly possible with an objective time of ten minutes or less.
FROM	The originator of this message is indicated by the address designation immediately following.
GROUPS	This message contains the number of groups indicated.
IMMEDIATE	Precedence immediate is reserved for messages relating to situations gravely affecting the security of national/allied forces or populace and which requires immediate delivery.
INFO	The addressees immediately following are addressed for information.
I AUTHENTICATE	The group that follows is the reply to your challenge to authentication.
I READ BACK	The following is my response to your instructions to read back.
I SAY AGAIN	I am repeating transmissions or specific portion indicated.

Proword	Meaning
I VERIFY	The following has been verified at your request and is repeated (to be used as a reply to verify).
MESSAGE	A message that requires recording is about to follow (transmission immediately after the call).
MORE TO FOLLOW	Transmitting station has additional traffic for the receiving station.
OUT	This is the end of my transmission to you and no answer is required or expected. (Since OVER and OUT have opposite meanings, they are never used together.)
OVER	This is the end of my transmission to you and a response is necessary. Go ahead; transmit.
PRIORITY	Precedence PRIORITY is reserved for important messages requiring precedence over routine traffic. This is the highest precedence that normally may be assigned to an administrative message.
READ BACK	Repeat this entire transmission back to me exactly as received.
RELAY (TO)	Transmit this message to all addresses (or addresses immediately following this password). The address component is mandatory when this proword is used.
ROGER	I received your last transmission satisfactorily.
ROUTINE	Precedence ROUTINE is reserved for all types of messages that are not sufficiently urgent to justify a higher precedence but must be delivered to the addressee without delay.
SAY AGAIN	Repeat all of your last transmission (followed by identification data means REPEAT _____ [portion indicated]).
SERVICE	The message that follows is a service message.

Proword	Meaning
SILENCE	Cease transmission immediately. Silence will be maintained until lifted. (Transmissions imposing silence must be authenticated.)
SILENCE LIFTED	Silence is lifted. (When an authentication system is in force, the transmission lifting silence is to be authenticated.)
SPEAK SLOWER	Your transmission speed is too fast. Reduce speed of transmission.
THIS IS	This transmission is from the station whose designator immediately follows.
TIME	The following is the time or date-time group (DTG) of the message.
TO	The addressee(s) immediately following is (are) addressed for action.
VERIFY	Verify entire message (or portion indicated) with the originator and send correct version. (To be used only at the discretion of the addressee to which the questioned messages was directed.)
WAIT	I must pause for a few seconds.
WAIT OUT	I must pause for longer than a few seconds.
WILCO	I received your signal, understand it, and will comply. (To be used only by the addressee. Since the meaning of ROGER is included in that of WILCO, the two prowords are never used together.)
WORD AFTER	The word of the message referenced is the following _____.
WORD BEFORE	The word of the message referenced is the preceding _____.
WORDS TWICE	Communication is difficult. Transmit (ring) each phrase (or each code group) twice. This proword may be used as an order, request, or as information.

Proword	Meaning
WRONG	Your last transmission was incorrect. The correct version is _____.

Phonetic Alphabet and Numbers

Letter	Word
A	Alpha
B	Bravo
C	Charlie
D	Delta
E	Echo
F	Foxtrot
G	Golf
H	Hotel
I	India
J	Juliet
K	Kilo
L	Lima
M	Mike
N	November
O	Oscar
P	Papa
Q	Quebec
R	Romeo
S	Sierra
T	Tango
U	Uniform
V	Victor
W	Whiskey
X	X-ray
Y	Yankee

Letter	Word
Z	Zulu

Number	Word
0	Zero
1	One
2	Two
3	Three
4	Four
5	Five
6	Six
7	Seven
8	Eight
9	Niner

Spot Report

The spot report is a detailed, two-way reporting system that clarifies hazard area locations, identifies clearance priority, and identifies affected units. The spot report is the first-echelon report that is sent when an enemy is encountered. The report consists of nine lines and is sent by the fastest means available. The report is used to request help in handling a hazard influencing a unit's mission and beyond the unit's ability to handle. This report helps commanders set priorities based on the battlefield situation.

Spot Report		
Line 1	DTG	DTG item was discovered
Line2	Unit and location	Reporting activity (unit identification code) and location
Line 3	Contact method	Radio frequency, call sign, point of contact, and telephone number
Line 4	Type of ordnance	Indicate if ordnance dropped, projected, placed, or thrown. If available, supply the subgroup. Provide the size of the hazard area.
Line 5	Nuclear, biological, and chemical contamination	Be as specific as possible

Spot Report		
Line 6	Resources threatened	Report any equipment, facilities, or other assets threatened
Line 7	Impact on mission	Current tactical situation and how the presence impacts the mission
Line 8	Protective measures	Describe measures taken to protect personnel and equipment
Line 9	Recommended priority	Recommend a priority for response by explosive ordnance disposal or engineers

Priority level recommendations

Priority	Basic
Immediate	Stops the unit's maneuver and mission capability or threatens critical assets vital to the mission.
Indirect	Slows the unit's maneuver and mission capability or threatens critical assets important to the mission.
Minor	Reduces the unit's maneuver and mission capability or threatens noncritical assets of value.
No threat	Has little or no effect on the unit's capabilities or assets.

Size, Activity, Location, Unit/Uniform, Time, and Equipment Report

Size, activity, location, unit/uniform, time, and equipment (SALUTE) reports should be given in a clear, concise, and accurate manner without embellishment or exaggeration.

SALUTE Report	
Size	What is the size of the unit (number of personnel, vehicles [highway, rail, etc.], and equipment [tents, weapons, etc.])?
Activity	What are they doing (moving in column/mass, or setting up a defensive position or deploying, redeploying, sustainment activities, or training)?
Location	Where are they located? Use a map, if available. If no map is available, describe their position as accurately as possible (grid coordinates or airfield, military base, and/or terrain association).
Unit/Uniform	What unit do they belong to (company, battalion, brigade, division, and/or country)? What type of uniform are the soldiers wearing?
Time	What time of day/night unit was observed (DTG, Zulu, or local)?
Equipment	What type of equipment was observed (types of weapons, vehicles, aircraft, and/or other gear)?
Note: All SALUTE points are important so the commander is able to determine his next course of action.	

Appendix E

Radio Net Procedures

Opening a Net (Nonsecure Voice)

NET, THIS IS NCS [net control station], AUTHENTICATE _____, OVER

NCS, THIS IS 1ST SUB, I AUTHENTICATE _____, OVER

NET, THIS IS NCS, I AUTHENTICATE _____, OVER

NET, THIS IS 2D SUB, I AUTHENTICATE _____, OVER

NET, THIS IS 3D SUB, I AUTHENTICATE _____, OVER

NET, THIS IS NCS, OUT

Opening a Net (Secure Voice)

NET, THIS IS NCS, OVER

NCS, THIS IS 1ST SUB, OVER

NCS, THIS IS 2D SUB, OVER

NCS, THIS IS 3D SUB, OVER

NET, THIS IS NCS, OUT (IF NCS HAS NO TRAFFIC) or

NET, THIS IS NCS, THIS IS A DIRECTED NET— OF WHAT PRECEDENCE AND FOR WHOM ARE YOUR MESSAGES, OVER (NCS DESIRES CONTROL OF TRAFFIC BEING PASSED).

Note

The last letter of the call sign determines the answering order. The stations in a net respond alphabetically. For example, A3D will answer before A2E, and A2E will answer before BIF. If two stations in a net have the same last letter such as A1D and A2D, the answering order will be determined by numerical sequence, with the lower number, A1D, answering first.

Transmission Time Minimization

To minimize transmission time, use radio checks sparingly. Transmit only when you have message traffic.

NET, THIS IS NCS RADIO CHECK, OVER

NCS, THIS IS 1ST SUB, ROGER OUT

NCS, THIS IS 2D SUB, WEAK READABLE, OVER (2D SUB receives NCS weak)

NCS, THIS IS 3D SUB, ROGER OUT

NET, THIS IS NCS, ROGER OUT

Station Entering Net

1. The third substation was unable to answer when the net was opened and now wishes to report into the net:

NCS, THIS IS 3D SUB REPORTING INTO NET, OVER

3D SUB, THIS IS NCS, AUTHENTICATE _____, OVER

NCS, THIS IS 3D SUB, I AUTHENTICATE _____, OVER

3D SUB, THIS IS NCS, I AUTHENTICATE _____, OVER

NCS THIS IS 3D SUB, ROGER OUT

2. The third substation finds it necessary to enter a net in which it does not normally operate:

NCS, THIS IS 3D SUB, REQUEST PERMISSION TO ENTER NET, OVER

3D SUB, THIS IS NCS, IDENTIFY YOUR STATION, OVER

NCS THIS IS 3D SUB, REFER TO _____ I AM PREPARED

TO AUTHENTICATE, OVER

3D SUB, THIS IS NCS, AUTHENTICATE _____, OVER

NCS, THIS IS 3D SUB, I AUTHENTICATE _____, OVER

3D SUB, THIS IS NCS, PERMISSION TO ENTER NET, OUT

Station Leaving Net

1. When leaving a net in which your station is a substation:

NCS, THIS IS 3D SUB, REQUEST PERMISSION TO CLOSE DOWN (until _____) OVER

3D SUB, THIS IS NCS, ROGER OUT

2. When leaving a net in which you have entered but do not normally operate:

NCS, THIS IS 3D SUB, REQUEST PERMISSION TO LEAVE NET, OVER

3D SUB, THIS IS NCS, ROGER OUT

Closing a Net (Nonsecure Voice)

NET, THIS IS NCS, CLOSE DOWN, OVER

NCS, THIS IS 1ST SUB, AUTHENTICATE _____, OVER

NET, THIS IS NCS, I AUTHENTICATE _____, OVER

NCS, THIS IS 1ST SUB, ROGER OUT

NCS, THIS 2D SUB, ROGER OUT

NCS, THIS IS 3D SUB, ROGER OUT

Closing a Net (Secure Voice)

NET, THIS IS NCS, CLOSE DOWN, OVER

NCS, THIS IS 1ST SUB, ROGER OUT

NCS, THIS IS 2D SUB, ROGER OUT

NCS, THIS IS 3D SUB, ROGER OUT

Radio Checks

NCS radio operators (ROs) are responsible for ensuring all stations remain in their nets. This requirement is best accomplished by regular net traffic. ROs will be provided a net list of all stations to check off as stations conduct regular radio traffic. If a station fails to make a regular radio call in the period of an hour, the NCS will contact them with a radio check. During periods of low traffic, NCS ROs will conduct a net call. Stations will respond in sequence with ROGER OUT.

Example:

NCS: GUIDONS, GUIDONS, GUIDONS, THIS IS NCS, RADIO CHECK, OVER.

STATION 1: ROGER OUT

STATION 2: ROGER OUT

Once all stations respond, the NCS will call directly for any stations that failed to respond. If a station still does not reply, execute loss of communications procedures (see Appendix H). All NCS radios should have the CUE and MAN frequencies loaded to assist stations that lose the correct time or communications security to reenter the net.

Global Positioning System Time Checks

It is important to keep the net time exactly on Global Positioning System (GPS) Zulu time to allow stations to enter the net via hot start procedures. Left alone, net time significantly drifts. To avoid this drifting, NCS ROs must be proactive and check time regularly. First, ROs need to ensure the NCS radio is on frequency-hopping master. This will push time out to other stations. At every shift change, ROs will check their net time against a tracking GPS with a time figure of merit of at least +/– 10 milliseconds. If the net has drifted, attempt to bring it back in line with the correct time by making three-second corrections followed by net calls. This will keep other stations in the same net on the correct time.

Remember, net time is always set to GPS Zulu time. The date is determined by the last two digits of the Julian date.

Appendix F

Loss of Communication Procedures

If a station fails to respond to a net call or radio check during its assigned time, initiate the following procedures to restore communications:

1. Attempt to raise the unit on a different net it is monitoring (for example, brigade [BDE] operations and intelligence, BDE administration and logistics, battalion Crypto Management System, signal conditioning tactical satellite, high frequency, mobile subscriber equipment, etc.).

2. Ensure proper CUE frequency is loaded in the net control station radio. Attempt to contact single-channel cipher text. If this method fails, attempt to contact using plain text.

3. Contact an adjacent unit and have it physically make contact with the nonresponsive unit.

4. If there has been a frequency period change, attempt to reach on old CUE frequency.

5. If a station still does not respond for two consecutive hours, notify the battle captain. If it is necessary to launch an aircraft to make contact with the unit, the battle captain will make a recommendation to the commander.

Appendix G

Medical Evacuation Request

Line	Item	Evacuation Request Message
1	Location of pickup site	
2	Radio frequency, call sign, and suffix	
3	Number of patients by precedence	
4	Special equipment required	
5	Number of patients by type	
6	Security of pickup site (wartime) or number and type of wound, injury, or illness (peacetime)	
7	Method of marking pickup site	
8	Patient nationality and status	
9	Nuclear, biological, and chemical (NBC) contamination (wartime) or terrain description (peacetime)	

Example of a medical evacuation (MEDEVAC) request:

Line	Item	Evacuation Request Message
1	Location of pickup site	Encrypt grid coordinates. When using DRYAD Numeral Cipher, the same SET line will be used to encrypt grid zone letters and coordinates. To preclude misunderstanding, a statement is made that grid zone letters are included in the message (unless unit standing operating procedure specifies its use at all times).
2	Radio frequency, call sign, and suffix	Encrypt the frequency of the radio at the pickup site, not a relay frequency. The call sign (and suffix if used) of the person to be contacted at the pickup site may be transmitted in the clear.

Line	Item	Evacuation Request Message
3	Number of patients by precedence	Report only applicable information and encrypt brevity codes. A = urgent, B = urgent–surgery, C = priority, D = routine, and E = convenience. (If two or more categories are reported in same request, insert the word BREAK between each category.)
4	Special equipment required	Encrypt applicable brevity codes. A = none, B = hoist, C = extraction equipment, and D = ventilator.
5	Number of patients by type	Report only applicable information and encrypt the brevity code. If requesting MEDEVAC for both types, insert the word BREAK between the litter entry and ambulatory entry: L + number of patients (pnt)–litter; A + number of pnt–ambulatory (sitting).
6	Security of pickup site (wartime)	N = no enemy troops in area, P = possibly enemy troops in area (approach with caution), E = enemy troops in area (approach with caution), and X = enemy troops in area (armed escort required).
	Number and type of wound, injury, or illness (peacetime)	Specific information regarding patient wounds by type (such as gunshot or shrapnel). Report serious bleeding along with patient blood type, if known.
7	Method of marking pickup site	Encrypt the brevity codes. A = panels, B = pyrotechnic signal, C = smoke signal, D = none, and E = other.
8	Patient nationality and status	Number of patients in each category need not be transmitted. Encrypt only applicable brevity codes. A = U.S. military, B = U.S. civilian, C = non-U.S. military, D = non-U.S. civilian, and E = enemy prisoner of war.

Line	Item	Evacuation Request Message
9	NBC contamination (wartime)	Include this line only when applicable. Encrypt the applicable brevity codes. N = nuclear, B = biological, and C = chemical.
	Terrain description (peacetime)	Include details of terrain features in and around the proposed landing site. If possible, describe the relationship of the site to a prominent terrain feature (for example, a lake, mountain, or tower).

References

1. Field Manual 8-10-6, *Medical Evacuation in a Theater of Operation,* pp. 7-7 through 7-9.

2. Graphic Training Aid 08-01-004, *MEDEVAC Request Form*.

Appendix H

Glossary

ACADA	Automatic chemical agent detector
ANCD	Automated net control device
AO	Area of operations
ASIP	Advanced Systems Improvement Program
BFT	Blue force tracking
BLOS	Beyond-line-of-sight
CADRG	Compressed ARC digitized raster graphics
CCI	Controlled cryptographic item
CIK	Communication security encryption key
CODEWORD	One-word notice that refers to other information
COMMEX	Communications exercise
COMSEC	Communications security
COP	Common operational picture
CT	Cipher text
CUE	To key the radio net
DTED	Digital terrain elevation data
DU	Display unit
EPLRS	Enhanced Position Location and Reporting System
ERF	Electronic remote fill
FBCB2	Force XXI battle command—brigade and below
FIPR	Flash, immediate, priority, routine
FM	Frequency modulation
GMT	Greenwich Mean Time (Zulu)
GPS	Global Positioning System
ICOM	Integrated communications security
ID	Identification
INMARSAT	International Marine/Maritime Satellite
IP	Internet protocol
JD	Julian date
KU	Keyboard unit

LOS	Line of sight
LRAS3	Long Range Advanced Scout Surveillance System
Manpack	Man portable radio set
MDL	Mission data load
NCS	Net control station
NET	Net synchronization time, also refers to a network
NET ID	Network identification
OPORD	operation order
OTAR	Over-the-air rekey
PLGR	Precision Lightweight GPS Receiver
PMCS	Preventive maintenance checks and services
Polling	Radio transmitting priority
Prowords	Proper words for radio transmission (not slang)
PT	Plain text
RADIAC	Radiation detection, indication, and computation
RAM	Random access memory
RCU	Remote control unit
RF	Radio frequency
RHDDC	Removable hard disk drive cartridge
RT	Receiver-transmitter
SA	Situational awareness
SALT	Size, activity, location, time
SALUTE	Size, activity, location, unit/uniform, time, equipment
SIM	Subscriber identity module
SINCGARS	Single-Channel Ground and Airborne Radio System
SOI	Signal operating instructions
SOP	Standing operating procedure
TEK	Transmission encryption key
TIRS	Tactical Information Retrieval System
UMTS	Universal Mobile Telecommunications System

Appendix I

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EFJohnson Publication, *5100 Series Portable Radio,* <http://efjohnson.com>

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Conclusion

Although this handbook's primary audience is the radio operator (RO), a communications problem is everyone's concern until it is resolved. Signal Corps Soldiers are all trainers. When a user has a communications problem, members of the Signal Corps try to educate the user to become self-reliant. When the Signal Corps does not effectively train others, the Corps must do its own work as well as the work of others.

The Army must train as if it is going to war; it cannot accept the training standard by allowing communications assets into threat areas in advance to ensure communications are ready. In a tactical situation the Army must develop specific channels for accurate and timely intelligence, battle tracking, and environmental and situational awareness and promptly disseminate this information to the lowest levels possible. This information ensures teams understand and can support the maneuver schemes and are synchronized with other warfighting functions across the battlefield. Awareness of the enemy or threat enables Soldiers to feel secure in their surroundings. As an RO, you are tasked with great responsibility. Command and control is an essential part of operations, and you must plan for success.

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