HANDBOOK

14-07

JUNE 14

RADIO AND SYSTEM OPERATORS

Lessons and Best Practices

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SUPPORTING THE WARFIGHTER

Radio and System Operators Handbook

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Foreword

The Signal Center of Excellence and the Center for Army Lessons Learned have developed a Signal Operator Handbook for Soldiers assigned, attached, or task-organized as radio/system 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 radios, mission command, and Capability Set 13/14 systems.

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

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

LAWARREN V. PATTERSON
Major General, USA
Commanding

Radio and System Operators Handbook

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Center for Army Lessons Learned	
Director	**Colonel Thomas H. Roe**
Mission Command Team Chief	**Charles F. Raithel**
CALL Analysts	**Bruce Adams**
	Ralph Nichols
	Tom Odom
	Marvin Decker
Contributing Authors	**Ricardo San Miguel**
	Louis Crain
Signal Center Author	**Ricardo San Miguel**

The Secretary of the Army has determined that the publication of this periodical is necessary in the transaction of the public business as required by law of the Department.

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Introduction

How to Select a Radio Operator

The radio operator is more than simply a Soldier who carries the radio for the commander, serves as the commander's driver, or provides the commander personal security. In today's operational environment of uncertainty, our Soldiers are responsible for the operation of systems, such as the Joint Tactical Radio System (JTRS) rifleman radio, Force XXI Battle Command—Brigade and Below (FBCB2)-Blue Force Tracking (BFT), Army Battle Command System (ABCS) and AN/PRC 117G/152/155, mission command systems and, as of recently, Capability Set 13 (CS 13), to share situational awareness, collaboration, and mission command data with each other over the tactical Internet. Today's systems are more complex; they provide vertical and horizontal connectivity and provide an integrated network baseline from the static tactical operations center to the dismounted Soldier.

A commander's radio operator is integrated in the tactical network, providing a common operational picture from the tactical edge. The process for designation and training a radio operator varies widely and is based on the unit's mission and the commander's intent. However, there are common factors that should be taken into account when selecting a commander's radio operator in order to enable effective unit command and control.

Unit commanders should consider the following factors when selecting, training, and employing their radio operator. Radio operators should:

- Be able to competently apply the four principles of providing effective communications: plan, manage, train, and maintain.
- Be trustworthy and discreet. The radio operator will see and hear much more than most other junior enlisted Soldiers and will be expected to maintain confidentiality.

- Possess intangible personal qualities such as sound judgment, maturity, and ability to work well with others (team player); be adaptive and flexible; and, moreover, think and act independently. The radio operator must be intelligent and maintain composure under duress, having the personal courage and stamina to effectively perform and execute with little or no guidance.
- Be able to obtain and maintain a secret security clearance.
- Be able to receive a message and communicate it effectively.
- Be able to train subordinates, replacements, or additional radio operators as the unit mission dictates.
- Be proficient in both traditional analog (map and compass, azimuth, and pace count) and enhanced digital-enabled BFT/BFT-2, Precision Lightweight Global Positioning System Receiver [PLGR], and/or FBCB2 land navigation skills.
- Be technically proficient in the operation of all required communications systems and understand the limitations of that equipment. A dismounted radio operator must be proficient with secure FM, tactical satellite, and high frequency radios.
- Understand the ranges and limitations of the communication equipment. Know and be able to 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, and inclement weather can degrade communication range capabilities.
- Use a headset to monitor the commander's communications. (A headset is used to drown out surrounding noise, enabling clearer communications without distractions.)
- Be in outstanding physical condition, especially if the unit conducts dismounted operations for any length of time. The added weight of the communications equipment and supplies increases the difficulty of all individual movement techniques.

- Have a general understanding of the military decisionmaking process. The radio operator must understand and be able to communicate the commander's intent at all times (Army Doctrine Reference Publication [ADRP] 5-0, *The Operations Process*).

- Be able to rapidly execute the unit standing operating procedures (SOP) for assumption of command in the event the commander becomes a casualty. Some unit SOPs give the radio operator 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 the commander's intent are all essential qualities for a radio operator in these situations.

- Be able to complete a call for fire. In many unit SOPs, the radio operator 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 but no loss of command authority for execution.

- Be familiar with ADRP 1-02, *Operational Terms and Military Symbols* (Incl C1 and C2). Radio operators must understand that operational terms have specific meanings, and they cannot change them or paraphrase when receiving a message. They must understand graphics so they can mark a map when receiving a spot report; situation report; and/or size, activity, location, unit, time, and equipment (SALUTE) report.

- Be familiar with Army Techniques Publication (ATP) 1-02.1, *Multi-Service Brevity Codes.* If operating in a joint and/or coalition/allied environment, radio operators must be familiar with appropriate manuals and regulations.

- Be familiar with Field Manual 6-02.53, *Tactical Radio Operations.* (Revision of Field Manual 6-02.53 will be ATP 6-02.53, *Techniques for Tactical Radios.*) This field manual serves as a reference document for tactical radio systems. It also provides doctrinal procedures and guidance for using tactical radios on the modern battlefield. The field manual targets operators, supervisors, and

planners, and provides a common reference for tactical radios. It provides a basic guidance and gives the system operator and planner the necessary steps for network planning, operations, interoperability considerations, and equipment capabilities.

- Possess and sustain combat driving skills and understand unit convoy procedures in situations where the radio operator is also the commander's vehicle driver. The radio operator should be cross-trained in and be able to assume the duties of the vehicle crew-served weapon operator in extreme situations. The radio operator 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.

Use these personal characteristics and skill sets when selecting a commander's radio operator. Like any other Soldier, a radio operator will be effective only to the extent that the commander and unit leadership rigorously select, train, and sustain that Soldier for the job.

THOMAS H. ROE
COL, IN
Director, Center for Army Lessons Learned

Chapter 1

User Information

This chapter provides a compendium of basic user information and references necessary for all radio/system operators to be successful. It is a handy reference for any Soldier who may be tasked with operator duties. It provides a starting point for unit leaders, from team to brigade, who need to be familiar with: radio net procedures, establishing contact with distant stations, sending and receiving messages, making changes to frequencies and/or cryptographic codes, loss of communications procedures, medical evacuation (MEDEVAC) procedures, and maintaining user communications equipment.

1. Overview.

This handbook is targeted to any Soldier assigned as a commanders radio operator or tasked with the additional duty of a radio/systems operator of mission command systems (Figure 1-1) and/or Capability Set (CS) 13/14 systems (Figure 1-2).

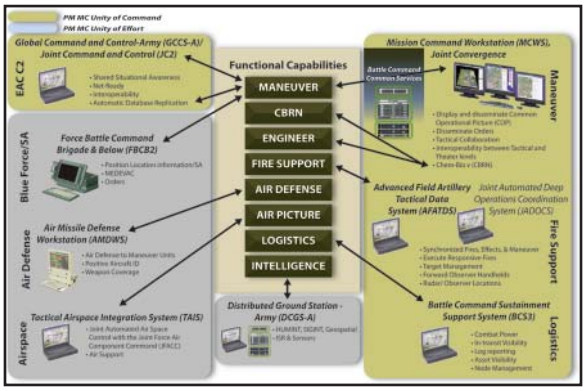

Figure 1-1. Mission command systems overview

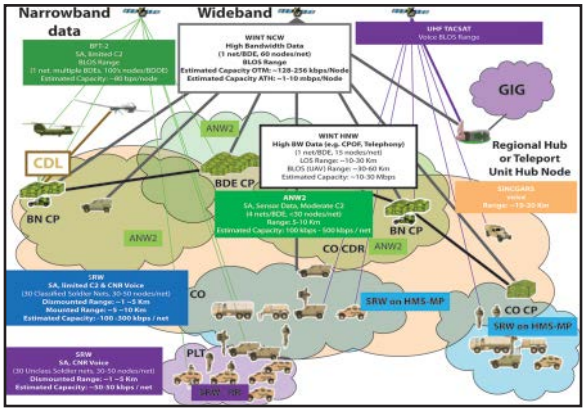

Figure 1-2. Capability Set 13 overview

It is imperative that all radio operators are familiar with the following basic user information and references:

- Operations security (OPSEC).
- Controlled cryptographic equipment (see Chapter 5).
- Global Positioning Systems (GPS) (see Chapter 4).
- Single-Channel Ground and Airborne Radio System (SINCGARS) net synchronization time.
- Compromise procedures.
- Loss of communications procedures.
- Prowords (see Appendix D).
- Communications security (COMSEC) references:

- Special Text (ST) 6-02.75, *Techniques for Communications Security Operations.* (Doctrine 2015 revision Army Techniques Publication [ATP] 6-02.75, *Techniques for Communications Security.)*
- Army Regulation (AR) 25-2, *Information Assurance*, 24 October 2007.
- AR 380-5, *Department of the Army Information Security Program*, 29 September 2000.
- AR 380-40, *Policy for Safeguarding and Controlling Communications Security (COMSEC) Material*, 30 June 2000.
- Field Manual 6-02.43, *Signal Soldiers Guide* (Doctrine 2015 revision ATP 6-02.43, *Techniques for the Signal Soldier*) develops and prepares the signal section of the unit standing operating procedures (SOP) in accordance with the commander's intent.

2. Operations Security.

OPSEC is defined as any measure an operator takes in order to safeguard information from the enemy. OPSEC can be anything from minimizing the number of net identifications (IDs) loaded into a radio, to zeroing an automated net control device (ANCD) or radio if capture by the enemy is imminent, thereby denying the enemy the ability to exploit the ANCD or radio for intelligence against U.S. forces. All personnel assigned to, attached to, or under the operational control of the unit will follow these procedures to maximize OPSEC:

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

b. ANCDs only contain the loadset and COMSEC required by the operator.

c. New editions of the signal operating instructions (SOIs) and COMSEC should not be distributed below the battalion level until authorized by the brigade signal officer (S-6).

d. All radio operators must know all compromise procedures and code words prescribed in Chapter 6, Capability Set 13, and understand the steps for each procedure.

e. Safeguard any radio cheat sheets that list call signs and net IDs and account for cheat sheets according to handling instructions and/or classification (For Official Use Only [FOUO], Confidential, Secret, etc.). Whenever possible, memorize this information.

3. Controlled Cryptographic Equipment.

A radio operator will require instruction in the handling and knowledge of COMSEC material and equipment, to include transferring of COMSEC keys. Chapter 5, Controlled Cryptographic Equipment, discusses the following COMSEC devices in further detail.

Figure 1-3. AN/CYZ-10 ANCD

- The AN/CYZ-10 ANCD is a hand-held device capable of receiving, storing, and transferring data between ANCDs or between ANCD and a SINCGARS radio. The primary application for this device is to fill the SINCGARS with FH data, time, COMSEC, and loadset information. ANCDs are nonrepairable controlled cryptographic items (CCIs) and must be stored in accordance with 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 (a locked door and wall locker using a 200-series lock for example).

Figure 1-4. AN/PYQ-10, Simple Key Loader (SKL)

- The AN/PYQ-10 SKL was designed as a replacement for the AN/CYZ-10 ANCD. A limited understanding of the Electronic Key Management System (EKMS) 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.

4. Global Positioning Systems.

The GPS is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or

more GPS satellites. The system provides critical capabilities to military, civil, and commercial users around the world. It is maintained by the U.S. government and is freely accessible to anyone with a GPS receiver.

- **AN/PSN-11** Precision Lightweight Global Positioning System (GPS) Receiver (PLGR) is a hand-held 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 the SINCGARS. The PLGR is a high-dollar item and should be safeguarded accordingly.
- **Defense Advanced GPS Receiver** (DAGR) is the replacement for the PLGR. The DAGR incorporates anti-jam improvements for enhanced protection and is the first U.S. hand-held GPS receiver program to include the next generation security device, Selective Availability Anti-Spoofing Module (SAASM). The DAGR's dual frequency radio frequency (RF) front end allows continuous track of both the L1/L2 GPS satellite frequencies. Even when turned off, a precision time source (HAL) 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.

5. SINCGARS Net Synchronization Time (NET) Operating Procedures.

a. The 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.

b. The Zulu time stored in a SINCGARS radio will drift significantly over time and, if loaded into the Advanced System Improvement Program (ASIP), will not allow communications with other net members. All radio operators must verify accurate time in the ASIP after loading their radios. All radio operators must also maintain accurate time (hour, minute, 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 the following methods:

(1) Calling the atomic clock: DSN 762-1401, Commercial (202) 762-1401

(2) Via GPS (must be + or – 1 second)

(3) Top of the hour on any 5 kHz frequency via high frequency (HF) radios (PRC-104).

c. Julian date (JD). The SINCGARS JD is the last two digits of the full Julian date. (See Appendix A, Julian Date Calendar, 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 communications with other net members will be lost.

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

Initial net opening

The battalion standard is “hot start” net opening procedure. The procedure is covered in Chapter 3, Net Control Station Tasks, in the operator tasks section.

Passive late net entry

This procedure allows a radio with correct hop set and COMSEC information but inaccurate time (+ or – 59 seconds) to enter a net. The procedures are covered in Chapter 4, Net Control Station Tasks, in the operator tasks section.

Loadset

a. Loadsets are made up of the following components:

(1) Transmission security key (TSK): Frequency hop data.

(2) Esets: Net IDs (example F302).

(3) COMSEC keys (traffic encryption key [TEK] and key encryption key [KEK]): Transmission encryption keys.

(4) Lockout sets: Restricted frequencies within the frequency hop data.

b. 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.

c. Net IDs are normally fixed and will follow the numbering scheme listed below. Specific net IDs within the below listed ranges are designated in the SOI.

Note: These 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 BDE)
FH400–499 (2nd BDE)
FH500–599 (3rd BDE)
FH600–699 (AVN BDE)
FH700–799 (DIVARTY)
FH800–899 (DISCOM)
FH900–999 (DIV HQs)

6. Compromise Procedures.

a. By following applicable SOPs and necessary security procedures, operators can prevent the compromise of sensitive

signal information. The effects of compromise can be minimized through common sense precautions and standardized corrective measures. The operative word in dealing with compromise is a common understanding of those procedures based on repetitive drills. This chapter offers a possible template for units in establishing compromise procedures. But like all standardized procedures, SOPs are absolutely worthless if not practiced and understood. This chapter establishes the guidelines designed to standardize the process for executing compromise procedures.

Note: The code words/definitions used below are provided as examples. Actual code words/definitions will be published in the unit's tactical SOP (TACSOP) and SOI.

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

Minimizing compromise

a. 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 (CP). Knowing what is loaded in a particular device at the battalion and brigade levels mitigates the severity of a compromise.

b. ANCDs or SKLs are not distributed below the infantry company headquarters or below antitank platoon headquarters level. Combat multipliers will not deploy with ANCDs/SKLs and will receive all radio fills from the maneuver element they are supporting. Ensure all CCIs are properly accounted for and secured at all times.

c. SOI data are not distributed below battalion level. The new challenge and password are announced over a secure command net daily at 0001 hours (Zulu).

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

e. Excess ANCDs/SKLs within a deployed unit are zeroed.

If compromise is imminent

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

b. 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 aerial system (UAS) 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!

c. Operators announce on the radio, "ALL STATIONS IN 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.

Compromised confirmed

Once confirmed or a decision has been made by the unit commander to treat the incident as a compromise, the following actions by the NCS will take place.

VENUS, Will be used to announce that a compromise has taken place. It will be used as follows: "Venus, Venus, Venus. Stand by, over."

JUPITER, Will be used to change the operating SOI to a new edition. It will be used as follows: "Guidons, guidons, Jupiter edition _____ , (Date/Time Group [DTG]). Acknowledge in sequence, over."

PLUTO, Will be used to add two days to the existing Julian date. It will be used as follows: "Guidons, guidons, Pluto, Pluto, Pluto_____. Acknowledge in sequence, over."

MERCURY, Will be used to subtract two days from the existing Julian date. It will be used as follows: "Guidons, guidons, Mercury, Mercury, Mercury, over. Respond in sequence, over."

NEPTUNE, Will be used to switch to predesignated net 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. It will be used as follows: "Guidons, guidons, Wheel _____, DTG, _____. Acknowledge, over."

URANUS, Will be used to announce that the net should prepare to receive an automatic rekey (MK-OTAR). "Guidons, guidons, Uranus, Uranus, Uranus, DTG_____. Acknowledge in sequence. over."

MARS, Will be used to announce that the net should prepare to receive an automatic rekey (AK-OTAR). It will be used as follows: "Guidons, guidons, Mars, Mars, Mars, DTG_____. Acknowledge, over."

After a compromise

a. If you suspect a net is compromised, DO NOT announce over the net, “THIS NET IS COMPROMISED!” Use an alternate secure net to notify your higher headquarters and/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.

b. 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.

c. Once the mission allows, the NCS directs a net ID or TEK change using the following code words:

Net ID:

RATTLESNAKE 1: Change to STRIKE NET 1

RATTLESNAKE 2: Change to STRIKE NET 2

RATTLESNAKE 3: Change to original NET ID

d. An alternate method is to change the 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

e. The NCS directs over-the-air-rekey (OTAR) using either the automatic remote keying (AK) method or manual remote keying (MK) method. The procedures for both tasks are covered in Chapter 4, NCS Tasks. Once either method is executed, the NCS

makes 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.

f. Actual STRIKE net IDs are found in the SOI and must be memorized. Do not write down STRIKE net IDs anywhere.

g. Once the new net is established, it is clear for classified traffic again.

h. Code words used to initiate change of SOI editions are as follows:

COBRA: Change to B edition TEK/SOI

PYTHON: Change to C edition TEK/SOI

i. The battalion has the capability to send new SOI information electronically via the ASIP 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 a 16 kb/s rate and normally 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.

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

Unit/Section	Polling #
A Co	1
B Co	2
C Co	3
D Co	4
Administrative and logistical operations center (ALOC)	5
Combat trains (CBT TRNS)	6
Wireless network extension	7

(2) SOI broadcast can handle up to 16 polling numbers. Polling numbers 8-16 will only be assigned when required.

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

7. Loss of Communications 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:

a. Attempt to raise the unit on a different net it is monitoring (i.e., brigade operations and intelligence, brigade administrative and logistics, battalion command, single channel tactical satellite, high frequency, mobile subscriber equipment, etc.).

b. Ensure the proper CUE (to key the radio set) frequency is loaded in the NCS radio. Attempt to contact single channel cipher text. If still fails, attempt plain text.

c. Contact an adjacent unit and have the unit physically make contact with the unresponsive unit.

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

If the station still does not respond for two consecutive hours, notify the battle captain. The battle captain will make a recommendation to the commander that it may be necessary to launch an aircraft to make contact.

8. Prowords.

Common prowords are those words that are used on a regular basis while conducting radio operations. They are NOT interchangeable, as the meanings are specific and clear to the receiver. An example is “Say again” versus “Repeat.” “Say again” means to repeat the last transmission, while “Repeat” is in reference to fire support — to fire the last mission again. See Appendix D for a complete listing of prowords.

Chapter 2

Radio Systems

The family of combat net radios comprises intra-squad radios, Single-Channel Ground and Airborne Radio System (SINCGARS) radios, and single-channel (SC) tactical satellite (TACSAT) radios. These are the essential command and control (C2) systems that directly support the warfighter during daily operations. These radios are the base component in many different configurations.

There are tasks common to all radios; however, some of the newer systems, such as the PRC-148 and PRC-152, have some increased capabilities for radio operators. One of the added features of the newer radios is the ability to be programmed using a personal computer (PC).

The basic essential tasks an operator must accomplish are:

- Set up the radio for operation.
- Load an SC frequency.
- 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 rekeying (OTAR).
- Activate emergency location beacon (AN/PRC-148 and AN/PRC-152).
- Change net identification (ID).

The most common radio systems currently being used are the following:

- EF Johnson 5100 ES intra-squad radio
- Integrated communications security (ICOM) intra-squad radio
- SINCGARS/ASIP
- Force XXI battle command—brigade and below (FBCB2) (Enhanced Position Location and Reporting System [EPLRS]/blue force tracking [BFT])
- Integrated Waveform Operations
- AN/PSC-5C/D
- AN/PRC-104
- AN/PRC-117F
- AN/PRC-117G
- RF 7800B
- AN/PRC-148
- AN/PRC-150
- AN/PRC-152
- AN/PRC-154
- AN/PRC-155
- Iridium satellite phone: Motorola Satellite 9505

Intra-Squad Radios

Intra-squad radios are the simplest radios used by Soldiers today. They are small, lightweight, and have a reduced capacity compared to most other systems. Operation is intuitive; nonetheless, all Soldiers and radio

operators need to be familiar with these systems. The most common types of intra-squad radios are the newer EF Johnson 5100 ES Model 1 and the older ICOM.

EF Johnson 5100 ES

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

General Information	
Program of Record	No
Contractor/Vendor	EF Johnson
Frequency range	380–470 MHz (UHF)
Channels	48 programmable channels (3 zones with 16 channels each)
Channel spacing	12.5/25 MHz
Power requirement	7.2 DC
Operating temperature	-22° F to +140° F
Approximate range	20 miles at 4W (UHF)
Approximate battery life	10 hours

Figure 2-1. EF Johnson 5100 ES

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.

Operator task: Set-up the radio:

Subtask	Action
a. Install the PC Configure™	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

Operator task: Load a single channel:

Subtask	Action	Result
a. Power on the radio	Turn the on/off volume switch	1. Radio performs a self-test
		2. A tone sounds
		3. The light-emitting diode (LED) comes on (amber)
b. Set the volume	Move the volume switch to desired level	N/A
c. Set the channel	Rotate 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

Operator task: Load COMSEC:

Subtask	Action
Check encryption capability	1. Using the PC Configure™ 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 Data Encryption Standard (DES). This feature has to be enabled from the manufacturer.	

ICOM Radio IC-F43 (Squad Radio)

ICOMs are durable, short-range radios used at the platoon and squad levels. The radio is approved for U.S. Forces Command (FORSCOM) purchase as stay-behind equipment in the Iraqi theater of operations. It has limited use in the continental United States (CONUS) and is not approved for use in United States Army Europe (USAEUR). These simple radio systems computer programmable. It is not complicated to set ICOM radios up for communications.

General Information	
Program of Record	No
Contractor/Vendor	ICOM America
Weight	9.9 oz
Frequency Range	400 520 MHz
Channels	16 (on rotary dial)
Channel spacing	12.5/25 MHz
Power requirement	7.2 DC
Operating temperature	-22° F to +140° F
Approximate range	20 miles at 5W (VHF)
Secure	Type III (equiv), Spread Spectrum Techniques and COTS Rolling Code Scrambler
Approximate battery life	8 hours

Figure 2-2. ICOM Radio IC-F43 (Squad Radio)

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.

Operator task: Set up the radio:

Subtask	Action	Result
a. Assemble the radio	1. Ensure the radio is off	Radio is on ready for the channel to be set
	2. Connect the battery and ensure it is completely latched	
	3. Connect the antenna and ensure it is screwed on tight	
	4. Connect the headset and adjust to desired position	
	5. Rotate volume control to ON and desired volume level	
b. Set the channel	1. Rotate the channel selector switch to the desired channel	Radio is operational
	2. Push the push-to-talk (PTT) button to conduct a radio check with another operator	The radio is ready for operation
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.		

Software setup:

- The standard software is EX-1961 2.3 for the F3 series radios. It 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 operator to lose the military default settings.
- These radios are programmed by the factory with all 32 channels assigned frequencies from 136 to 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; press ENTER.
    - Type in EX1961 and press ENTER again to run the program.
- With 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. (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 load set 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 following the steps above.

2. You can also use the radio-to-radio function to program a radio from a good radio. These steps are listed below.

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 and then send to the nonfunctioning radio.

Note

A radio with corrupt data will show a flashing display.

Programming the radio:

- Read the data (clone) from the radio.
- Save this file and designate it as factory default.
- Preprogrammed function keys are set as follows:
    - P0 locks the keypad against accidental changes.
    - P1 temporarily toggles output power between low/high.
    - P2 illuminates the display for five seconds.
    - 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:

Table 2-1. 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	(P0)	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		

Table 2-2. BASELINE.ICF, Bank 1

Bnk 1	CH Atr	Frequency RX	(MHz) TX	CTCSS/DTCS RX	TX	Text	PWR Save	TOT	RF PWR	Lock Out	Scan
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)
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)

Table 2-3. BASELINE.ICF, Bank 2

Bnk 2	CH Atr	Frequency RX	(MHz) TX	CTCSS/DTCS RX	TX	Text	PWR Save	TOT	RF PWR	Lock Out	Scan
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)
12		150.00000	<_	151.4	<_	28	ON	ON	H		Tag (Ena)
Bnk 2	CH Atr	Frequency RX	(MHZ) TX	CTCSS/DTCS RX	TX	Text	PWR Save	TOT	RF PWR	Lock Out	Scan
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 you make any changes to the radio's programming, such as frequencies or alpha tags, ensure it is saved as a different file with a unique name.

Operator task: 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

SINCGARS

There are several ground unit versions of SINCGARS (RT-1523/A/B/C/D/E/F models). The ICOM version consists of RT-1523A/B, the System Improvement Program (SIP) version is RT-1523C/D, and the ASIP version is RT 1523E/F.

The SINCGARS ASIP is a “user owned and operated” solid-state FM combat net radio (CNR) that operates in the 30.000–87.995 MHz frequency range in the 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 NATO forces in SC, squelch off mode. It provides electronic warfare (EW) protection and a reduced electromagnetic signature in the FH mode.

The SINCGARS ASIP radio incorporates an Enhanced SINCGARS Improvement Program (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.

Advanced System Improvement Program

The SINCGARS ASIP increases the performance of the SINCGARS SIP (RT-1523 C/D models). The SINCGARS ASIP also increases its operational capability in support of the tactical Internet, specifically improved data capability, manpower and personnel integration requirement compliance, and flexibility in terms of interfaces with other systems. Figure 2-3 is an example of the SINCGARS ASIP radio.

Figure 2-3. SINCGARS ASIP radio

The tables below outline a comparison of the SINCGARS ICOM, SINCGARS SIP, and SINCGARS ASIP. All ASIP radios can be physically remoted by another ASIP radio up to 4 kilometers (km) (2.4 miles) away via a two-wire twisted pair (typically WD-1 or WF-16). To remote a radio, an external two-wire adapter is used as the interface between the radio and the wires. This remote control feature can be performed between the dismounted receiver-transmitter (RT) and the vehicle assembly area (VAA) or between two dismounted RTs. Another host controller can control the ASIP radio via the external control interface when the ASIP radio system is integrated as part of a larger system.

SINCGARS Radio Configurations	
AN/PRC-119F	Manpack radio with associated components. (The term "manpack" is the common name for the Soldier-carried AN/PRC-119A.)
AN/VRC-87F	One short-range radio
AN/VRC-88F	One short-range radio with dismount components included
AN/VRC-89F	One short-range and one long-range radio. One power amplifier included.
AN/VRC-90F	One long-range radio. One power amplifier included.
AN/VRC-91F	One short-range and one long-range radio. One power amplifier and dismount components included.
AN/VRC-92F	Two long-range radios. Two power amplifiers included.

General Information	
Program of Record	Yes
Contractor/Vendor	ITT
Weight	7.8 lbs
Range	200 M – 40 KM
Frequency	30-88 MHz
Power	1mW, 100mW, 5W, 50 W (with power amplifier)
Secure	Internal Encryption

ICOM Capabilities (RT-1523A/B)	SIP Capabilities (RT-1523C/D)	ASIP Capabilities (RT 1523E/F)
Point-to-point communications	**Point-to-point communications**	**Point-to-point communications**
1. FH per MIL-STD-188-241	1. FH per MIL-STD-188-241	1. Same as SIP
2. SC per STANAG 4204	2. SC per STANAG 4204	
3. Mode 1, 2, 3 fill	3. Mode 1, 2, 3 fill	
4. Electronic remote fill (ERF)	4. ERF	
Plain Text and Cipher Text Mode	**Circuit Switching and Packet Network Communications**	**Circuit Switching and Packet Network Communications**
1. Railman COMSEC	1. CSMA protocol	1. Same as SIP
2. Seville advanced remote keying	2. Railman COMSEC	
	3. Seville advanced remote keying	
Point-to-Point Data Communications	**Point-to-Point Data Communications**	**Point-to-Point Data Communications**
1. 600 to 4,800 bps standard data mode	1. 600 to 4,800 bps standard data mode	1. Same as SIP
2. Tactical Fire Direction System (TACFIRE), analog data	2. TACFIRE, analog data	

ICOM Capabilities (RT-1523A/B)	SIP Capabilities (RT-1523C/D)	ASIP Capabilities (RT 1523E/F)
Point-to-Point Data Communications	**Point-to-Point Data Communications**	**Point-to-Point Data Communications**
3. Transparent 16 kbps data	3. Transparent 16 kbps data	
	4. 1,200 to 9,600 bps EDM data	
	5. Recommended standard 232 EDM data	
	6. Packet data	
	7. External control interface	
Other Features	**Other Features**	**Other Features**
1. Noisy channel avoidance	1. Noisy channel avoidance	1. Same as SIP, plus —
2. Enhanced message completion	2. Enhanced message completion	a. Enhanced System Improvement Program (ESIP) waveform
	3. External Global Positioning System (GPS) interface	b. Faster channel access to reduce net fragmentation
	4. Embedded GPS hooks	c. Enhanced noisy channel avoidance algorithm to improve FH sync probability
	5. Remote control unit	d. Improved time of day tracking and adjustments

ICOM Capabilities (RT-1523A/B)	SIP Capabilities (RT-1523C/D)	ASIP Capabilities (RT 1523E/F)
Other Features	**Other Features**	**Other Features**
		e. Extra end of message hops to improve sync detection and reduce fade bridging
		f. Embedded battery
VAA (AM-7239B)	**VAA (AM-7239C)**	**VAA (AM-7239E)**
1. Dual transmit power supply	1. Dual transmit power supply	1. Same as SIP, plus —
	2. Host interface	a. More powerful 860 microprocessor
	3. Backbone interface	b. Ethernet interface
	4. MIL-STD-188-220A	c. Enhanced protocols
		d. Increased memory and buffer size

Enhanced System Improvement Program Capabilities

The SINCGARS ASIP radio incorporates an 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. Enhancements include the following:

- **ESIP waveform** – implements a faster channel access protocol, which reduces net fragmentation by shortening the collision intervals between voice and data transmissions. The result is the reduction of voice and data contention problems associated with shared voice and data networks.

- **Noisy channel avoidance algorithm** – always reverts to a known good frequency instead of constantly searching for clear frequencies, thus increasing the FH synchronization probability in high noise and jamming conditions.
- **Time of day enhancement** – uses a reference BIT that assures time constraints are the same during each transmission.
- **End of message enhancement** – reduces fade bridging, whereby the transmission would linger even though adding extra end of message hops to increase the detection and probability of synchronization completes the message.

ASIP operator task 1. Preparation settings from MENU:

Subtask	Action	Result
a. Set 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
	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)

Subtask	Action	Result
	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 (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 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 7 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 SOP
	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/synch 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 and FH data, and synchronizes 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, the operator 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 data and time *	See ASIP operator task 3 for ICOM fill	COMSEC/FH data and time load into all six channels of the RT
b. Enter net	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 load set and from a Precision Lightweight Global Positioning System Receiver (PLGR) as a separate loading of time.		

ASIP operator task 5. Perform LNE:

Subtask	Action	Result
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 late net entry method, use the 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. Stand by for NCS to send ERF	N/A
	2. Note signal display activation	Display shows HFXXX
	3. Press STO	Display shows STO
	4. Enter: X (1–6) *	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 operator has the same COMSEC key loaded in channels 1–5.

ASIP operator task 7. Perform CUE and ERF LNE:

Subtask	Action	Result
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 an answer	N/A
	6. Repeat every 15 seconds until NCS answers	CUE goes through only if the net is quiet
	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 line is complete
*An operator 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	Set FCTN to LD CHAN to 1–6 (channel in which data is stored) *	N/A
b. Enter new net ID in RT	Press:	
	FREQ	Display shows: F XXX
	CLR	Display shows: F ___
	ID numbers (3)	Display shows: F XXX
	STO	Display blinks and the net ID is stored
c. Resume normal communications	Set FCTN to SQ ON CHAN to 1–6 (as desired)	Net 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.		

Force XXI Battle Command—Brigade and Below

Force XXI battle command—brigade and below (FBCB2) forms the principal digital mission command system for the Army at brigade level and below. It provides increased situational awareness on the battlefield by automatically disseminating throughout the network timely friendly force locations, reported enemy locations, and graphics to visualize the commander's intent and scheme of maneuver. FBCB2 is a key component of the Army Battle Command Systems (ABCS). Hardware and software are integrated into the various platforms at brigade and below as well as at appropriate division and corps elements necessary to support brigade operations.

Figure 2-4. FBCB2

FBCB2 is a mission 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 tactical leaders. FBCB2 provides increased situational awareness to commanders by depicting an accurate and automatic view of friendly forces, enemy forces, obstacles, and known battlefield hazards. FBCB2 provides enhanced situational awareness to the lowest tactical level — the individual Soldier — and a seamless flow of information to enable mission command across the battlefield.

FBCB2 supports operational control (OPCON) through the transmission and receipt of orders, reports, and data. FBCB2 uses two forms of communications: terrestrial and satellite. FBCB2 (terrestrial) uses EPLRS, and FBCB2 (satellite) uses BFT. FBCB2 features the interconnection of platforms through EPLRS (terrestrial) and BFT (satellite), allowing the exchange of situational awareness between the two systems. BFT systems share situational awareness with EPLRSs, and EPLRSs share situational awareness with BFT systems and ABCSs that use reach back tunnels found in regional operation centers.

Enhanced Position Location Reporting System

EPLRS is the primary data communications system for FBCB2, which is the data traffic backbone of the tactical Internet from brigade to lower echelons. FBCB2 integrates with Army tactical mission command systems located within the brigade and battalion, and it provides real-time battlefield pictures at the strategic level. Using EPLRS communications and position location features, FBCB2 integrates emerging and existing communications, weapon, and sensor systems to facilitate automated status, position, situation, and tactical awareness reporting.

EPLRS supports the Army's transformation brigades and is interoperable with the U.S. Air Force, U.S. Marine Corps, and the U.S. Navy. EPLRS is employed in commander vehicles, which enable mission command, Army airborne command and control system (A2C2S), and tactical operations center (TOC)/tactical command post (TAC CP) platforms at the sustainment brigade and battalion level.

Figure 2-5. EPLRS

The EPLRS network provides the primary data and imagery communications transmission system. The EPLRS network is employed in the maneuver platforms of the commander, executive officer, first sergeant, platoon leaders, and platoon sergeants at company and platoon levels. EPLRS is used as an alternate data communications link (host-to-host) between mission command platforms at brigade and battalion levels. EPLRS is the primary data communications link between battalion mission command platforms and company/platoon maneuver platforms. EPLRS can be employed in wireless network extension platforms and configured to provide wireless network extension capability.

EPLRS is a wireless tactical communications system that automatically routes and delivers messages, enabling accurate and timely computer-to-computer communications on the battlefield. Using time division multiple access (TDMA), FH, and error correction coding technologies, the EPLRS provides the means for high-speed horizontal and vertical information distribution.

EPLRS radio sets are primarily used as jam-resistant, secure data radios that transmit and receive tactical data that typically includes the following:

- Operation orders (OPORDs).
- Fire support plans.
- Logistics reports.
- Situational awareness data.
- Cryptographic keys for radio sets.
- Configuration files for radio sets.
- Email.

The basis for EPLRS radio connectivity is the EPLRS needline. Each needline defines the operational relationship between the source and destination EPLRS units, without specifying which additional EPLRS units are part of the connection. The type of transmitted data, the mode of operation, and the data rate affects the planning distance between individual EPLRS units and the number of "hops," or relays, that can be included in an EPLRS link. Accurate planning and network configuration is critical to provide proper area coverage within the tactical environment. Refer to Training Bulletin 11-5825-298-10-1 for more information on EPLRS. Refer to Technical Manual (TM) 11-5825-298-13&P, Field Manual 6.02.53, ***Tactical Radio Operations*** (Doctrine 2015 revision ATP 6-02.53, ***Techniques for Tactical Radio Operations***), and ATP 6-02.72, ***Multiservice Tactics, Techniques, and Procedures for Tactical Radios***, for more information on EPLRS network manager.

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 radio set 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 (TMDA), FH (512 times per second), and spread spectrum technology (eight frequencies between 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.
- Has a 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 km (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.

There are four different configurations of the EPLRS:

- AN/PSQ-6 manpack radio set.
- AN/VSQ-2 surface vehicle radio set.
- ASQ-177C airborne radio set.
- AN/GRC-229 grid reference radio set.

The RF network consists of many EPLRS radio sets connected to host computers. This provides secure host-to-host data communications for the host computers.

The radio set uses a wide band direct sequence spread spectrum waveform, TDMA, FH, and embedded error correction encoding. These capabilities provide for secure, high-speed data communications networked between ground units and between ground units and aircraft. Most of the radio set

attributes are programmable, and this programmability lets the planner set up the best possible anti-jam performance and data rate for the unique operational environment and mission.

EPLRS has automatic relay capabilities to support beyond line of sight (BLOS) coverage. These capabilities are automatically and continually adapted to the changing operational environment faced by a mobile communications system.

The radio set also supports position location and identification capabilities. Position location allows users to determine precisely where the user is. It is similar to, but independent of, the GPS. Using position location data from the radio sets, some hosts may have the capability to determine where other radio sets are and can perform navigation functions.

EPLRS needlines functions

Needlines are also known as a logical channel number or permanent virtual circuit. There can be many needlines running on a radio set at one time supporting the hosts' data communications needs. Needlines can be activated manually via the user readout or host, or automatically by the host. The radio set will automatically activate the needline if any data is received on the corresponding logical channel number. If the radio set is turned off or power is lost, active needlines will be automatically reactivated when the radio set is powered back on.

Types of needlines. There are seven major types of needlines, each falling into the two major types of host-to-host services (broadcast and point-to-point):

- **Point-to-point needlines** provide unequal data transfer capability for two endpoints' hosts. Either endpoint can have all the data transfer capability, or it can be split between them in various ratios. Data is transferred at user data rates from 1,200 bps each way, up to 56,000 bps all one way. An example of how a point-to-point needline works would be the same as one person talking to another person on a telephone.

- **Simplex (one-way) needlines** provide a single host the capability to send data to many hosts. For simplex needlines, data is transferred at user data rates from 160–3,840 bps. An example of how a simplex needline works would be the same effect as using a bullhorn to talk to many people at the same time who cannot talk back.

- **Carrier-sense multiple access (CSMA) needlines** provide many hosts the capability to send data to each other. For CSMA needlines, data is transferred at user data rates from 150–487,760 bps (for the whole needline). The radio set ensures there are no other radio sets using the CSMA needline and then sends data from the host. When completed, another radio set will ensure no other radio sets are using the needline and then transmit, and so on. This protocol allows many endpoints' hosts (multiple access) to use the same CSMA needline to send data to one or more endpoints' hosts. An example of a CSMA needline would be like a group of people on a contention voice net, each speaking when they have something to say and no one else is speaking.

- **Multisource group (MSG) needlines** provide up to 16 hosts the capability to send data to many hosts. MSG needlines provide each source host guaranteed bandwidth without conflict, with user data rates from 37.5–485,760 bps. Data transferred from one source also goes to the other sources. If fewer sources are used, the sources can have more than 1/16th of the data transfer capability. Each 1/16th is called a share. For example, a source endpoint can be assigned to have 4/16ths of the total MSG data transfer capability, with 12 other source endpoints each having 1/16th of the total MSG data transfer capability. If there are unused shares, a radio set whose host load is larger than its assignment on the MSG needline will use these available shares. The more shares a radio set has, the more data transfer capability it has. The radio set also supports eight and four share MSG needlines that provide faster speed of service. An example of how an MSG needline works would be the same effect as up to 16 people with bullhorns talking, in a round robin fashion, to many people who cannot talk back. An MSG needline is similar to a CSMA needline, but each sender has a dedicated, guaranteed amount of time to talk (similar to many concurrent simplex needlines).

- **Low data rate duplex (two-way) needlines** provide radio-acknowledged, higher reliability, balanced data transfer between two hosts with data rates from 20–1920 bps each way. They provide equal data rates in both directions. This data transfer capability may be used by either or both endpoints. The endpoint radio sets will automatically ensure that the data is all delivered using radio set to radio set acknowledgement protocols. This needline type requires preplanning for the radio set to be able to use. An example of how a duplex needline works would be the same effect as talking to another person on a telephone.

- **Dynamically allocated permanent virtual circuit (DAP) needlines** are a special type of duplex needline. They have capabilities similar to those of duplex needlines (rates are 60–1920 bps), but DAP needlines are automatically set up and deleted on demand by the host, without any preplanning or NCS involvement. However, if the network resources are not available to support the data rate requested by the host, the needline rate is reduced to the highest rate available that the radio set can support.

- **High data rate (HDR) duplex needlines** have the same features as duplex needlines except that the data rates are higher, from 600–121,440 bps each way.

EPLRS communications needlines capabilities. An EPLRS radio set can support needlines as an endpoint, relay, or as both. A radio set can be a relay on some needlines, an endpoint on other needlines, and both an endpoint and a relay on other needlines, all at the same time. As an endpoint, a radio set can send and/or receive data to/from its host on a needline. A radio set that is only a relay (i.e., not an endpoint) cannot send or receive data to/from its host, and might not even have a host. For simplex, duplex, and DAP needlines, radio sets will automatically sign up as a relay if they have the resources available.

For point-to-point, CSMA, MSG, and HDR duplex needlines, a relay can only be endpoints on the needline, or they must be manually set up. When existing radio sets cannot support the EPLRS network relay needs, then dedicated relays are required.

There can be many host-to-host communications services running on a radio set at one time. There can be from one to 30 total needlines activated per radio set, depending upon the size of the needlines. If the maximum number is stored in the radio set, then another activated needline will cause the deletion of the oldest stored needline. There can be a maximum of eight activated CSMA, HDR duplex, MSG, and point-to-point needlines, total, per radio set.

A needline can use any of four waveform modes, 0–3. The higher the waveform mode number, the higher data rate capability the needline has, but the lower the needlines anti-jam capabilities. (For more information on EPLRS and system components, refer to TM 11-5825-283-10.)

EPLRS network manager (ENM)

The ENM equipment suite includes the following major components:

- ENM software package (compact disk): Includes installation program for loading ENM and EPLRS network planner onto ENM computer hard disk.
- ENM computer: Consists of a central processing unit and associated cabling; host computer platform for ENM software.
- AN/VSQ-2D(V)1 surface vehicle radio set (RT-1720DI/G, RT-1720EI/G, or RT-1720FI/G), with a user readout: Also serves as the ENM radio set by connecting to the ENM computer.
- Surface vehicle unit installation kit for SV-radio set: Includes platform, cables, user readout mount, and AS-3449/VSQ-1 antenna.
- KOK-13 key: Generator key generation device for generating red and black cryptographic keys for network radio sets. (Not required for every ENM.)
- KOI-18 tape reader: Tape reading device for inputting seed key data into KOK-13.

- AN/CYZ-10 DTD (ANCD): Key loading device for individually loading red keys into network radio sets; receives keys from KOK-13; physically connects to each radio set to accomplish loading.

Network manager characteristics and capabilities. The ENM is a collection of software applications that run on a rugged host computer. The ENM software can run on Windows 2000 or Linux platforms and can be co-hosted with other applications as operational needs require. The ENM performs automated network management and control of the EPLRS network. The ENM assigns configuration parameters to radio set sets to allow them to perform their missions. The ENM manages the generation of cryptographic keys from a KOK-13 to load into the radio set.

The ENM application is installed on a rugged laptop computer and is used to configure a radio set and to plan, monitor, manage, and maintain an EPLRS network. Hosting ENM on a laptop computer also enables the ENM to be carried into the field for direct connection to a radio set for configuration and troubleshooting. The ENM computer physically connects to an EPLRS radio set, called an ENM radio set, directly via either Ethernet 802.3 or recommended standard-232 point-to-point protocol.

The ENM computer can also connect indirectly via a router using IP-over-Army Data Distribution System Interface Protocol. Refer to Figure 2-6 for an example of the EPLRS radio set and a host computer.

The ENM vehicle is a high mobility multi-purpose wheeled vehicle that contains the ENM and other communications equipment.

Figure 2-6. EPLRS radio set and host computer

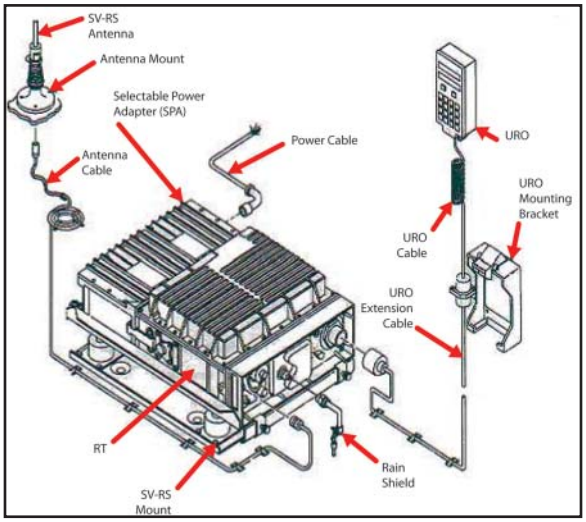

Figure 2-7. EPLRS operations

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

Operator task: Perform EPLRS pre-operations checks:

Subtask	Action	Result
a. Power	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
c. Alarm light	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.		

Operator task: Loading EPLRS radio with COMSEC:

Subtask	Action	Result
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	
	8. Next week TEK also? NO: ENTER	
	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. 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 PMCS 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 pens 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 (BA-5800); 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.

WARNING
Do not insert or use the BA-5800 battery in the PLGR or when configured to the FBCB2, as it will cause personnel injury and equipment damage. The internal battery is used only in a stand-alone configuration when operating the PLGR or when indirectly connected to the vehicle battery.

CAUTION

Do not connect or disconnect the PLGR/DAGR interface cable without first powering down the FBCB2/BFT computer and PLGR/DAGR. Failure to comply will result in equipment damage.

To ensure successful initialization of the FBCB2/BFT system, perform all steps in the startup procedures in the exact sequence presented in Training Bulletin 11-7010-326-10-3.

LESSONS LEARNED

Lessons learned from Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) is the criticality of proper startup and shutdown procedures to successful operations. The correct sequence must be followed to avoid damage to the equipment. Following these simple procedures is the initial key to mission success.

Operator task: FBCB2 startup procedures:

Subtask	Action	Result
Initial startup **Note:** The sequence of these start-up procedures is critical to ensure proper functionality.	1. Start vehicle	Optional
	2. Power on PLGR	Confirm configuration according to PLGR initialization **Note:** Ensure the internal battery (BA-5800) is removed.
	3. Power on EPLRS	Verify RSID and guard channel prior to loading cryptography
	4. Power on VAA (CB1)	

Subtask	Action	Result
	5. Power on FBCB2 computer	Verify green comms and PLGR
	6. Go online into OPS screen	

Operator task: FBCB2 immediate action procedures–system startup:

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 25U
	2. Open CPU door	
	3. Restart system	
b. Page fault/panic dump error message	Bad hard drive	Contact 25U for replacement
c. PMM (personal memory manager) process crash	Exit OPS and clear logs and queues	
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 dialog boxes	
	4. Resume operations	

Subtask	Action	Result
e. System processing slows down	Clear logs and queues	N/A
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 result 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	
h. Red comms at OPS screen	1. Select status (F5)	N/A
	2. Select LOCAL COMMS	

Subtask	Action	Result
	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	

Subtask	Action	Result
	3. Ensure PLGR FOM is at 4 or less	
	4. Check PLGR cables	
	5. Contact 25U	
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 router, DO NOT attempt to reset the INC to default.
	1. Switch the selector knob to LDD	
	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

Subtask	Action	Result
	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	
	6. Using down arrows, scroll until required unit is reached (DIV, BDE, or BN)	
	7. Scroll and highlight required unit name	
	8. Select CONFIGURE	

Subtask	Action	Result
	9. Select YES in verification box	
	10. Select SHUTDOWN when complete	

Operator task: FBCB2 shut down procedures:

Subtask	Action	Result
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

Blue Force Tracking (BFT)

The BFT system is an L-band satellite communications (SATCOM) tracking and communication system that provides the commander with eyes on the friendly forces and the ability to send and receive text messages. BFT maintains situational awareness on the 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.

The BFT contains computer hardware and software, interconnecting cables, 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 their brigade and below-sized units. The 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 their networks. DISA has revised the military specifications for UHF SATCOM to match the need for faster, more efficient, and easier-to use communications.

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 that will implement 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 decibles 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

The AN/PSC-5C/5D was built to replace the AN/PSC-3. The Spitfire can scan up to five LOS or dedicated SATCOM radio voice operation nets. Scanning combinations of CT (VINSON) and PT 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 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 TM 11-5820-1130-12&P.)

Figure 2-8. AN/PSC-5D(C) Spitfire

General Information	
Program of Record	No
Contractor/Vendor	Raytheon
Frequency bands	User selectable from 30–512 MHz
30–89.995 MHz	VHF FM SINCGARS/combat net radio (CNR) band
108–173.995 MHz	VHF AM ATC band, 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, 25 KHz
Data rate	FM LOS: 64 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 to 2.4 kbps
	25 kHz DAMA: 75 bps to 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-1672/U(C): 3.26” X 10.56” X 13.0” (447.53 in^3)
Weight: RT-1672/U(C)	13 lbs (with battery box, less batteries)

General Information	
Batteries	BB-390A/U rechargeable BA-5590/U nonrechargeable
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 antenna (user provided)

AN/PSC-5 Enhanced Manpack UHF Terminal (EMUT) (also known as Spitfire) is a multiband multimode radio (MBMMR) that provides DAMA, LOS, and tactical satellite communications terminal. The AN/PSC-5 provides both wideband and narrowband range extension for both voice and data. The BLOS range extension capability is utilized in the Army's SATCOM on-the-move OE-563 functionality in moving vehicular platforms. 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 to 399.995 MHz) for narrow-band satellite communications. The MBMMR 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 logistics support.

A portion of the Army's SPITFIRE radios (AN/PSC-5) are being upgraded to the SHADOWFIRE (AN/PSC-5C) and will provide enhanced capability to the warfighter, including improved voice recognition.

Operator task: Load LOS presets in the AN/PSC-5:

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

Subtask	Action	Result
	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
	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

Subtask	Action	Result
	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

Subtask	Action	Result
	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	
	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

Operator task: Load COMSEC-AN/PSC-5:

Subtask	Action	Result
In PT, the RT-1672/TJ(C) accepts voice or data, places it onto a radio frequency (RF) carrier, and transmit 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/CYZ10 (ANCD)	SYSTEM LOADING

Subtask	Action	Result
	2. On the AN/CYZ-10, go to RADIO and select COMSEC; choose the key and select SMIT, 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

The AN/PSC-5C terminal provides all the features of the AN/PSC-5 Spitfire terminal plus additional ECCM, COMSEC, and networking capabilities. It operates in the VHF and UHF frequency spectrum and supports LOS with frequency agile modes, SATCOM, DAMA, and Maritime operation. Voice and data operation is available in each of these modes.

The Shadowfire is OTAR/OTAT capable, and the software is programmable.

Figure 2-9. AN/PSC-5C (Shadowfire) RT 1672D (C)

General Information	
Program of Record	No
Contractor/Vendor	Raytheon
Weight	11.5 lbs without batteries
Frequency Range	0-420 MHz (CNR, ATC, Maritime)
Power requirement	21-32 VDC
Secure	Embedded encryption

AN/PRC-104(V) IHFR, Man-pack Radio

The AN/VRC-104(V) 1 and (V) 3 vehicular radio systems, 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.

The AN/PRC-104, a low power, 20-watt, improved high frequency radio (IHFR), 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 primarily used as back-up communications, providing long-range CNR connectivity between operational elements at all echelons of the Army.

The radio utilizes either a nonrechargeable BA-5590 Lithium battery or a rechargeable BB-590 Nickle-Cadmium (NICAD) 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. It is capable of transmitting and receiving voice and data and must be externally secured through the use of the KY-99 miniature terminal (MINTERM) COMSEC device.

Note: The AN/PRC-104A consists of the RT-1209, amplifier/coupler AM-6874, antennas, and handsets. It is a low power radio that operates in the 2 to 29.999 MHz frequency range, and passes secure C2 information over medium to long distances and varying degrees of terrain features that would prevent the use of 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.)

Figure 2-10. AN/PRC-104(V) IHFR

General Information	
Program of Record	No
Contractor/Vendor	Hughes
Weight	14 lbs including battery
Frequency range	2.0000 to 29.9999 MHz
Power requirement	20 watts (PEP), 0.25 (PEP) exciter output
Secure	KY-99 MINTERM

Operator task: AN/PRC-104:

Subtask	Action	Result
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 AN/PRC-117F is an advanced multiband, multimission manpack radio that provides reliable tactical communications performance in a small, lightweight package that can maximize user mobility. The AN/PRC-117F is a multiprocessor-based, fully digital, software-controlled, voice and data transceiver. The AN/PRC-117F is capable of providing LOS, SATCOM, ECCM, and FH operations (SINCGARS and HAVEQUICK), and is compatible with all tactical VHF/UHF radios. (The AN/VRC-103 is the vehicular version of the AN/PRC-117F.)

Figure 2-11. AN/PRC-117F

General information:

- RT nomenclature: RT-1949(P)(C)
- Wideband (WB): UHF: 225 MHz-2 GHz Channel Spacing Narrowband (NB): 5 kHz, 6.25 kHz, 8.33 kHz, 12.5 kHz, 25 kHz
- Frequency range: 30 MHz-2 GHz, NB: VHF Low: 30-90 MHz, VHF High: 90-225 MHz, UHF Low: 225-512 MHz, SATCOM, UHF Low: 243-270 MHz and 292-318 MHz
- Secure: Type I encryption
- Net presets: 100
- Data interfaces: Ethernet, RS-232/RS-422, USB, synchronous and asynchronous
- Control interfaces: Ethernet, RS-232, RS-422, USB
- Management tool: Windows-based Radio Programming Application
- Software environment: JTEL Certified SCA 2.2
- Integrated GPS: SAASM
- Frequency stability: 0.5 ppm
- Frequency tuning: 10 Hz from 30 MHz-512 MHz, 100 Hz from 513 MHz-2 GHz
- Remote control: RS-232 ASCII based

Modes and waveforms:

- Narrowband waveforms: AM/FM, VHF/UHF LOS, SINCGARS, HAVEQUICK I and II, APCO 25 (optional)
- Wideband waveforms: ANW2, ROVER III L-Band Receive (optional)
- UHF SATCOM

- Waveforms: MIL-STD-188-181B Dedicated Channel, MIL-STD-188-182A, 183A DAMA, HPW
- Voice and data modes: Simplex or Half-duplex, MIL-STD-188-113 CVSD, STANAG 4198 LPC-10e, STANAG 4591 MELPe
- Data modes: Synchronous Data (300, 600, 1200, 2400, 12k, 16k bps), SINCGARS ECCM (VHF Low band/1200, 2400, 4800, 9600), Wideband FSK Cipher Text Digital Data (16 Kbps; KY-57), Narrowband Cipher Text Digital Data (2.4 Kbps; ANDVT/KYV-5), KG-84C, HAVEQUICK I/II ECCM (16 Kbps; KY-57 UHF band only)

Security:

- Encryption: Sierra™ II Based Type-1
- Encryption modes: KY-57, KYV-5, KG-84, HAIPE®, AES
- Key fill device: Compatibility AN/CYZ-10 DTD, KOI-18, KYK-13, KYX-15, MX-18290, AN/PYQ-10, KIK-20
- Key storage: Up to 300
- Mission fill device
- Compatibility: Windows-based Communications Planning Application

Power:

- Power input: 19-34 VDC
- Power consumption: 65 W max
- Battery types: BA-5590/U, BA-5390/U, BB-590/U, BB-390/U, BB-2590/U

Physical and environmental:

- Size (no handles): 7.4 W x 3.7 H x 8.8 D in. (without battery), 7.4 W x 3.7 H x 13.5 D in. (with battery)
- Weight: 8 lbs. (without battery), 12 lbs. (with battery)
- Shock/Vibration: MIL-STD-810F for tracked vehicles, wheeled vehicles, shipboard
- Immersion: 1 meter
- Color: CARC Green 383

Transmitter:

- Power output: NB: 10 W, SATCOM: 20 W, WB: 20 W peak/5 W average
- Antenna outputs: NB: 30 MHz-512 MHz, SATCOM: 243 MHz-318 MHz, WB: 225 MHz-2 GHz
- Harmonic suppression: Greater than 50 dBc

Receiver:

- Narrowband sensitivity (for 10 dB SINAD): LOS FM 30-512 MHz: -118 dBm, LOS AM 90-512 MHz: -110 dBm with 70% Modulation, TACSAT FM 243-270 MHz: -120 dBm
- Adjacent channel rejection: 60 dB referenced to 10 dB SINAD (50 kHz channel), VHF: 60 dB (50 kHz off channel), UHF: 50 dB (50 kHz off channel)

Accessories included with AN/PRC-117F:

- 10075-1399: H-250 Handset
- RF-6650M: Communications Planning Application (CPA)
- 12043-0750-A006: USB Programming Cable

- Manuals: Operation Manual, Reference Guide, SINCGARS Pocket Guide, ANW2 Pocket Guide

General Information	
Program of record	No
Contractor/Vendor	Harris
Freq Range	30-512 MHz continuous coverage
Power	20 watts transmit for reliable link closure

The Harris AN/PRC-117F(C) MBMMR is an advanced software-defined radio covering the entire 30 to 512 MHz frequency spectrum using military standard voice and data waveforms, ensuring interoperability with a wide range of fielded 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 radio features advanced TACSAT 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 email 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.

Operator task: Operator procedures:

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-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.	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

Subtask	Action	Result
	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.		

Operator task: Load COMSEC with common fill devices:

Subtask	Action	Result
a. Check for loaded COMSEC	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

Subtask	Action	Result
	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

Operator task: Load COMSEC using AN/CYZ-10:

Subtask	Action	Result
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)

Subtask	Action	Result
	9. Turn off fill device and disconnect the J1 connector	N/A
	10. Rotate switch from LD to PT, CD, or TD	N/A

Operator task: OTAR process:

Subtask	Action	Result
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; ensure communications are possible with all stations with the new key	**Note:** If there is no KEK 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.

Subtask	Action	Result
	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 successful, 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

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

The AN/PRC-117G 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.

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 Joint Tactical Radio System (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.

General information:

- RT nomenclature: RT-1949(P)(C)
- Frequency range: 30 MHz-2 GHz, NB: VHF Low: 30-90 MHz, VHF High: 90-225 MHz, UHF Low: 225-512 MHz, SATCOM, UHF Low: 243-270 MHz and 292-318 MHz
- WB: UHF: 225 MHz-2 GHz
- Channel spacing: NB: 5 kHz, 6.25 kHz, 8.33 kHz, 12.5 kHz, 25 kHz, SATCOM: 5 kHz, 25 kHz, WB: 500 kHz, 1.2 MHz, 2.5 MHz, 5 MHz
- Net presets: 100
- Data interfaces: Ethernet, RS-232/RS-422, USB, synchronous and asynchronous
- Control interfaces: Ethernet, RS-232, RS-422, USB
- Management tool: Windows-based Radio Programming Application
- Software environment: JTEL Certified SCA 2.2
- Integrated GPS: SAASM
- Frequency stability: 0.5 ppm

- Frequency tuning: 10 Hz from 30 MHz-512 MHz, 100 Hz from 513 MHz-2 GHz
- Remote control: RS-232 ASCII based

Modes and waveforms:

- Narrowband waveforms: AM/FM, VHF/UHF LOS, SINCGARS, HAVEQUICK I and II, APCO 25 (optional)
- Wideband waveforms: ANW2, ROVER III L-Band Receive (optional)
- UHF SATCOM
- Waveforms: MIL-STD-188-181B Dedicated Channel, MIL-STD-188-182A, 183A DAMA, HPW
- Voice and data modes: Simplex or Half-duplex, MIL-STD-188-113 CVSD, STANAG 4198 LPC-10e, STANAG 4591 MELPe
- Data modes: Synchronous Data (300, 600, 1200, 2400, 12k, 16k bps), SINCGARS ECCM (VHF Low band/1200, 2400, 4800, 9600), Wideband FSK Cipher Text Digital Data (16 Kbps; KY-57), Narrowband Cipher Text Digital Data (2.4 Kbps; ANDVT/KYV-5), KG-84C, HAVEQUICK I/II ECCM (16 Kbps; KY-57 UHF band only)

Security:

- Encryption: Sierra™ II Based Type-1
- Encryption modes: KY-57, KYV-5, KG-84, HAIPE®, AES
- Key fill device: Compatibility AN/CYZ-10 DTD, KOI-18, KYK-13, KYX-15, MX-18290, AN/PYQ-10, KIK-20
- Key storage: Up to 300

- Mission fill device
- Compatibility: Windows-based Communications Planning Application

Power:

- Power input: 19-34 VDC
- Power consumption: 65 W max
- Battery types: BA-5590/U, BA-5390/U, BB-590/U, BB-390/U, BB-2590/U

Physical and environmental:

- Size (no handles): 7.4 W x 3.7 H x 8.8 D in. (without battery), 7.4 W x 3.7 H x 13.5 D in. (with battery)
- Weight: 8 lbs. (without battery), 12 lbs. (with battery)
- Shock/Vibration: MIL-STD-810F for tracked vehicles, wheeled vehicles, shipboard
- Immersion: 1 meter
- Color: CARC Green 383

Transmitter:

- Power output: NB: 10 W, SATCOM: 20 W, WB: 20 W peak/5 W average
- Antenna outputs: NB: 30 MHz-512 MHz, SATCOM: 243 MHz-318 MHz, WB: 225 MHz-2 GHz
- Harmonic suppression: Greater than 50 dBc

Receiver:

- Narrowband sensitivity (for 10 dB SINAD): LOS FM 30-512 MHz: -118 dBm, LOS AM 90-512 MHz: -110 dBm with 70% Modulation, TACSAT FM 243-270 MHz: -120 dBm
- Adjacent channel rejection: 60 dB referenced to 10 dB SINAD (50 kHz channel), VHF: 60 dB (50 kHz off channel), UHF: 50 dB (50 kHz off channel)

Accessories Included with AN/PRC-117G:

- 10075-1399: H-250 Handset
- RF-6650M: Communications Planning Application (CPA)
- 12043-0750-A006: USB Programming Cable
- Manuals: Operation Manual, Reference Guide, SINCGARS Pocket Guide, ANW2 Pocket Guide

Operator task: AN/PRC-117G 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	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	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	Press OPT: RADIO INFORMATION BATTERY INFORMATION	DC voltage is shown along with the battery charge status (NOMINAL, LOW, or HIGH)
e. Unlock the keypad	Press ENTER to lock the keypad to prevent inadvertent key presses; press 1, 3, 7, 9 to unlock	N/A
f. Access mission plan	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	Press OPT: MISSION PLAN MISSION PLAN HISTORY	N/A

Subtask	Action	Result
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 and mission plan installation instructions.

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

RF-7800B

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 BLOS communications. BGAN operates with the International Marine/ Maritime Satellite (INMARSAT)-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 (UASs). 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 hand-held 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.

General information:

- Frequency range: 30 MHz-2 GHz, NB: VHF low: 30-90 MHz, VHF high: 90-225 MHz, UHF low: 225-512 MHz, WB: UHF 225 MHz-2 GHz
- Channel spacing: NB: 5 kHz, 6.25 kHz, 8.33 kHz, 12.5 kHz, 25 kHz, WB: 1.2 MHz, 5 MHz
- Net presets: 100
- Data interfaces: Ethernet, RS-232/RS-422, synchronous and asynchronous

- Control interface: Ethernet, RS-232, RS-422, USB
- Management tool: Windows-based Radio Programming Application
- Software environment: SCA v2.2
- Internal GPS: 12 channel receiver
- Frequency stability: 0.5 ppm
- Frequency tuning: 10 Hz from 30-512 MHz, 100 Hz from 513 MHz-2 GHz
- Remote control: RS-232 ASCII based
- Programming radio

Voice and data mode (WB):

- Voice mode: 2400 bps MELPe
- Data modes: 64 kbps-3 Mbps GMSK, 1-5 Mbps QAM
- Mac: TDMA based
- Manet protocols: Self-forming and self-healing OLSR

Voice and data mode (NB):

- Voice modes: Analog/PCM AM/FM plain text, CVSD ASK/FSK cipher text
- Data modes: 16 kbps FSK/ASK PT/CT

Security (NB/WB):

- Encryption modes: AES
- Key length: 128/256 bit
- Key fill device: Windows-based Radio Programming Application

- Key storage: 180 total keys
- Mission fill device: Windows-based Radio Programming Application

Transmitter:

- Power output: NB: 10 watts, WB: 20 watts peak/1-5 watts average
- Antenna outputs: NB: 30-512 MHz, WB: 225 MHz-2 GHz
- Harmonic suppression: Greater than 50 dBc

Receiver:

- Narrowband sensitivity LOS FM 30-512 MHz: -118 dBm, LOS AM 90-512 MHz: -110 dBm with, 70% modulation (for 10 dB SINAD)
- Adjacent channel 60 dB referenced to 10 dB SINAD 50 kHz channel, VHF: 60 dB (50 kHz off channel), UHF: 50 dB (50 kHz off channel)
- Rejection

Power:

- Power input: 19-34 VDC
- Power consumption: 65 watts max
- Battery types: BA-5590/U, BA-5390/U, BB-590/U, BB-390/U, BB-2590/U

Physical and environmental:

- Size (no handles): 7.4 W x 3.4 H x 8.8 D in. (without battery), (18.8 W x 8.5 H x 22.4 D cm without battery), 7.4 W x 3.4 H x 13.5 D in. (with battery), (18.8 W x 8.5 H x 34.3 D cm with battery)
- Weight: 3.6 kg (without battery)
- Shock/Vibration: MIL-STD-810F for tracked and wheeled vehicles

- Immersion: 1 meter
- EMI/RFI: MIL-STD-461E
- Color: CARC green 383

Operator task: Operator procedures RF-7800B:

Subtask	Action	Result
a. Installing USIM	Open the USIM plate located on the back of the 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. Initialize turn on/ settings	1. Ensure the data cable is connected between the terminal and the 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

Subtask	Action	Result
	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

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

General information:

- Frequency range: 30-512 MHz
- Modulation types: AM and FM (software)
- Transmit output power: 0.1, 0.5, 1.0, 3.0 and 5.0 watts (FM) and 5.0 watts (AM) user selectable
- Emergency beacons and GPS: AM swept tone beacon
- GPS interface to PLGR
- Programmable channels: 100 memory preset channels
- Menu selectable groups
- User programmable from front panel menu, PC programmer, or radio-radio cloning
- Controls: On/Off/Volume/Whisper/Zeroize knob
- 16-position channel select knob
- Large tactile push-to-talk switch

- Squelch override push-button
- Backlit 7 button keypad (NVG compatible)
- Two software-configurable option keys

Figure 2-12. AN/PRC-148

Indicators 32 x 80 pixel backlit LCD (NVG compatible)
Intuitive menu driven user interface
Channel name/frequency
Group name
Clear/Secure mode
Key location
Battery capacity
Transmit power
Connectors 50 Ohm TNC antenna
10-pin multifunction

Immersion sealed top connector (20M)
6-pin multifunction top connector (2M)
18-pin side connector for extended capabilities and upgrades

COMSEC:

- U.S. Type 1 VINSON and FED-STD-1023
- Selective key zeroization
- Panic radio zeroization with mechanical interlock protection
- Receive OTAR compatible six key locations

Physical characteristics:

- Length: 8.44 inches (21.44 cm)
- Width: 2.63 inches (6.68 cm)
- Depth: 1.52 inches (3.86 cm)
- Volume: 33.74 cu. inches (552.8 cubic cm)
- Weight: 30.6 ounces (867.5 gm)
- Operating temperature: -31° to +60° C
- Storage temperature: -33° to +71° C
- Humidity: 95# non-condensing
- Shock and vibration: EIA-603-1992
- Altitude: 30,000 Feet

AN/PRC-148 accessories:

- Batteries: Rechargeable Lithium-Ion 3000 mAH, >8 hours life at 5 watts, nonrechargeable battery holder commercial Lithium cells, 10 hour life at 5 watts

- Antenna sets: 30-90 MHz, 30-512 MHz, base station, vehicular and SATCOM
- Vehicle adapter
- Radio holster
- Radio system carrying bag
- AC-powered single battery charger
- AC/DC-powered six-way battery charger
- Audio accessories
- Adapters, cables, and connectors

When the radio is first powered up, it performs a POST and displays TESTING. When the POST is completed, 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 10 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.

Initial set-up:

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

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

Table 2-5. MBITR key and ALT functions

KEY	FUNCTION	ALT FUNCTION
ALT	Press and hold to access ALT functions	Not Applicable
MODE	Opens Mode Select screen	Opens Programming Menus screen
GR	Opens Group Select screen	Opens Scan Operation screen
ESC	Closes current screen; returns to previous screen	Lock / Unlock keypad
▼	Decrement selection or value	Highlights character to left of current selection
▲	Increment selection or value	Highlights character to right of current selection
ENT	Confirm operation or selection	Backlight On / 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.

Operator task: Preparation settings from menu:

Subtask	Action	Result
a. Set the MBITR volume	Use the ON/OFF/ volume control to set the desired volume	N/A
b. Set the MBITR channel	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

Subtask	Action	Result
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

IMPORTANT

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

Operator task: Load COMSEC:

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

Subtask	Action	Result
a. Prepare the radio	1. Press the MODE and the ALT keys	The MAIN MENU opens
	2. Use the up arrow 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 (TK 1–5 or KEK)
	4. To change the KEY location, press ENTER and use the up arrow or down 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.		

Subtask	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

Subtask	Action	Result
	10. Connect the 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

Operator task: 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
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

Subtask	Action	Result
	5. Press the down arrow key until the COMSEC mode is highlighted, and press ENTER	The COMSEC mode is changed from PLAIN to SECURE
	6. Press the up arrow or down arrow key until SECURE is displayed, and press ENTER	The mode selection screen is visible
	7. Press the down arrow key to select the operating mode, and press ENTER	The mode is set to SINCGARS, programming screen one is displayed
	8. Press the up arrow or down arrow key until SINCGARS is displayed, and press ENTER	Programming screen two is displayed with SINCGARS highlighted
	9. Press the down arrow key	Settings include CUE, MAN, and 1–6 The selected setting is displayed in programming screen two
	10. Press ENTER then the up arrow or down arrow key to select the correct channel, and press ENTER	Electronic counter-countermeasures (ECCM) are set to FH or SC, and programming screen two is displayed

Subtask	Action	Result
	11. Press the down arrow key to highlight the ECCM, press ENTER, and then press the up arrow or down arrow key until the appropriate setting is displayed, and press ENTER	The right-most number of the frequency will be highlighted
	12. Press the down arrow key until FX=XX. XXX (FREQ) is highlighted, and press ENTER	The available frequency range is 30.000 to 87.975 MHz; after the frequency is set, the programming screen 2 is displayed with the data rate highlighted
	13. Press ALT ENTER to move to the next number and use the up arrow or down arrow key to select the appropriate number until the correct FREQ is displayed, and press ENTER	The data rate settings are 600, 1200, 2400, 4800, and 16000 bps (SINCGARS SDM), 1200N, 2400N, 4800N, and 9600N bps (SINCGARS EDM), and RS232; after selection is made, programming screen 2 is displayed

Subtask	Action	Result
	14. Ensure the XXXXN is selected, press ENTER, scroll through the settings using the up arrow or down arrow 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
	15. Ensure the TEK X is highlighted and press ENTER; use the up arrow and down arrow keys to select the correct KEY, then press ENTER **Note:** A valid key must be loaded.	Programming screen three is displayed
	16. Press the down arrow key	Enter net ID edit mode with the right-most number highlighted, and when confirmed, programming screen three is displayed

Subtask	Action	Result
	17. Ensure net ID=XXX is correct; if not, press ENTER and use the up arrow and down arrow key to change the number; press ALT and up arrow 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; press ENTER and use the up arrow and down arrow key to scroll through the settings, and press ENTER when correct setting is highlighted	N/A
	19. Use the down arrow key to select FADE=X.XS, press ENTER, and use the up arrow and down arrow key until the desired setting is selected, then press ENTER again *	FADE is set, and programming screen three is displayed

*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 beginning of a transmission and normally takes only a fraction of a second. If signal is lost (fades out) during transmission, synchronization is usually lost immediately. Setting the fade value (0 to 4 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 resynchronize. It may be adviseable to set a fade value if operating a radio in secure mode with weak signals.

Operator task: 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 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 up arrow 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

Subtask	Action	Result
	5. Use the up arrow or down arrow 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	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	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

Operator task: 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
Prepare to receive ERF	1. Receive ERF notification from 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 arrow or down arrow key to select the appropriate SINCGARS channel location (1–6), and press ENTER	The data is stored in the selected channel location

Operator task: 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

Subtask	Action	Result
	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
	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

Operator task: 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 down arrow key to select the BEACON OFF, and press ENTER	The beacon setting may be adjusted
	3. Press the down arrow or up arrow key to the setting BEACON ON, and press ENTER	The emergency channel select screen is displayed
	4. Press the down arrow or up arrow 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 ALT and the up arrow or down arrow key to select the digit to be adjusted	The digit can be adjusted by pressing the up arrow or down arrow keys
	7. Using the up arrow or down arrow key, 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.		

Subtask	Action	Result
c. Set the transmit ON TIME	1. Select ON TIME, and press ENTER	The ON TIME can be set
	2. Press ALT and the up arrow or down arrow key to select the digit to be adjusted	The digit can be adjusted by pressing the up arrow or down arrow key (maximum time is 30 seconds)
	3. Using the up arrow or down arrow key, 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 ALT and the up arrow or down arrow key to select the digit to be adjusted	The digit can be adjusted by pressing the up arrow or down arrow key (maximum time is 30 seconds)
	3. Using the up arrow or down arrow key, adjust the FREQ, press ENTER, and press ESC	The OFF TIME is set and the emergency programming menu is displayed

Operator task: Transmit/receive situational awareness (SA) data:

Subtask	Action	Result
a. Enable the side connector	1. Press MODE and the ALT key	Main menu screen is displayed
	2. Select PROGRAM, and press ENTER	Programming screen is displayed
	3. Press the up arrow 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 up arrow or down arrow 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	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 key	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

Subtask	Action	Radio
	4. Press the down arrow key once until COMSEC MODE PLAIN or SECURE is highlighted, and press ENTER	COMSEC mode selection is enabled
	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 key	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 up arrow and down arrow keys to move between digits and the up arrow and down arrow keys again to adjust the digits, press ENTER, and then press the down arrow key	The CID is set and TX SA=OFF is highlighted

Subtask	Action	Result
	7. Press ENTER, then press the up arrow or down arrow key, 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 down arrow key	RX SA=ON is displayed, and the radio is set to receive GPS data from another radio
	9. Press ENTER, then press the down arrow or up arrow 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.		
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 down arrow key to select GPS RX, and press ENTER	The CID and MGRS information received is displayed

Subtask	Action	Result
	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-150HF Manpack Radio

The AN/PRC-148 Multiband Inter/Intra Team Radio (MBITR) 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.

The radio provides tactical and homeland defense forces and emergency operations elements with stand-alone, terrain independent, robust communications for LOS/BLOS, secure voice, and data communications. There is no reliance on retransmission/relay or SATCOM. It provides long distance, wide area, gap free, fixed or on the move, ground, and ground-to-air communications; plain text and secure analog voice with robust data and digital voice modes; advanced serial tone ECCM modem IP networking; and red and black key management and ALE link protection.

General Information	
Program of Record	No
Contractor/Vendor	Harris
Weight	10 lbs. without batteries
Freq	1.6 to 59.999 MHz
Power	1,5,20 watts PEP/Average
Secure	Type I encryption
Frequency range	(MP) 1.6 MHz to 59.9999 MHz in 100-Hz steps

General Information	
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.
Approximate battery life	10 hours **Note:** The battery life is impacted 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.

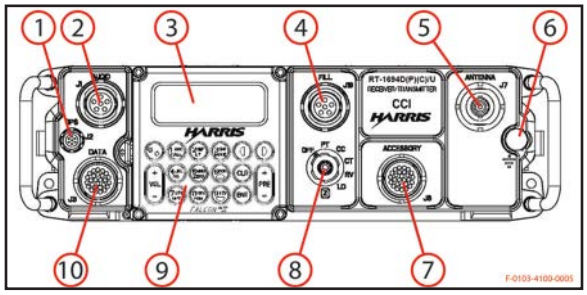

Figure 2-13. AN/PRC-150(C) controls, indicators, and connectors

Table 2-6. AN/PRC-150 functions		
Key	**Control/ Indicator**	**Function**
1	GPS interface connector J2	Serial connection for an external GPS unit
2	Audio connector J1	Connection for an 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
	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)

Key	Control/ Indicator	Function
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 J11	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

Operator task: Set up the AN/PRC-150(C):

Subtask	Action	Result
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 (automatic link establishment), 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 number of PINGS, and press ENTER	
	7. Enter the PING TIMEOUT, and press ENTER	
	8. Select YES and press ENTER to start ping	

Operator task: Zeroize an AN/PRC-150(C) radio:

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

Operator task: Load COMSEC:

Subtask	Action	Result
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

Subtask	Action	Result
	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 operator task: Program radio settings:

Subtask	Action
1. Press PGM	
2. Select CONFIG	
3. Select RADIO	a. Transmit power (HIGH, MEDIUM, or LOW)
	b. BFO (beat frequency oscillator) (0 Hz, -4000 Hz to +4000 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 1000 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 operator task: 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 crypto key, then 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 and down keys to view status of SPECIAL keys

AN/PRC-150 operator task: Program data port settings:

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

Subtask	Action
1. Press PGM	
2. Select CONFIG	
3. Select PORTS	
4. Select DATA	a. Data rate (19.2 Kbps to 75 bps) 2400 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 operator task: Message routing (incoming data):

Subtask	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 operator task: Set radio time of day (TOD):

Subtask	Action
1. Press PGM	
2. Select CONFIG	
3. Select TOD	a. UTC offset (use up/down arrow keys 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 operator task: Channel programming:

Subtask	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)
	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 (0.5 kHz, 0.35 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.

Subtask	Action
	i. Max TX power (00000 watts is the default)
	j. Enable SSB scan (YES or NO) **Note:** Selecting YES automatically places current channel in scan list.
5. Repeat step 4 for the remaining channels to be programmed.	

AN/PRC-150 operator task: Modem programming:

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

Subtask	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 are given default names MDM1 to MDM20.
	b. Enter desired name up to 15 characters (for example, 24SERIAL)
	c. Select MODEM TYPE (for example, SERIAL)

Subtask	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 key, select modem preset name, and repeat steps a–j.	

AN/PRC-150 operator task: ALE 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 then use the up/down arrow keys to view options for each selection.

Subtask	Action
	f. Enter desired CHANNEL GROUP NUMBER
	g. Select ADD CHANNEL
	h. Enter desired CHANNELS for channel group
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 alpha numeric characters. **Note:** At this step, to review or delete a self address, select REVIEW or DELETE.
	g. Enter your 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

Subtask	Action
	e. Select INDIVIDUAL by pressing the up arrow key
	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 the up arrow key
	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 key
	f. Select ADD **Note:** At this step, to review or delete net addresses, select REVIEW or DELETE.
	g. Enter an NET ADDRESS (for example, RT0)

Subtask	Action
	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 that have been programmed into the channel group to be scanned.
	f. Listen before TX (OFF or ON)
	g. Key to call (OFF or ON)
	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)

Subtask	Action
	j. Link to any calls (OFF or ON) **Note:** When a station transmits the address ANY, any ALE-capable radio that receives the transmission will stop scanning and automatically respond to the call.
	k. Link to all calls (OFF or ON) **Note:** 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 message 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 operator task: 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 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

Subtask	Action
	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
	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 an 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

Subtask	Action
	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 five 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)
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

Subtask	Action
	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 operator task: 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 present, use the up/down arrow keys 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 arrow keys to enter a preconfigured modem preset)
	j. Select encryption TYPE (TYPE I, CITADEL, or NONE)
	k. Select Crypto 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

Subtask	Action
	e. To change system preset, use the up/down arrow keys 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)
	i. Modem preset (OFF or use the up/down arrow keys 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)

Subtask	Action
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 keys 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 ALE)
	h. Associated self (select self address to associate with this preset)
	i. Modem preset (OFF or use the up/down arrow keys 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, AVS, DV6, DV24, ME6, or ME24)

Subtask	Action
	n. Select CC/CT VOICE MODE (DV24, NONE, DV6, ME6, or ME24)
	o. Select ENABLE (YES or NO)

AN/PRC-150 operator task: 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 options are common to all modes of operation:

Subtask	Action	Result
1. GPS-TOD	N/A	Displays GPS current 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 in use	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

Subtask	Action	Result
	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
	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

Subtask	Action	Result
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 operator's radio and another radio or group of radios on all preprogrammed frequencies) or SOUND (used as a passive, one-way transmission from the operator'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 message	N/A
	g. RX_MSG is used to review received AMD messages	N/A

AN/PRC-150 operator task: Radio operations selecting radio mode:

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

Subtask	Action
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	From the channel ### scanning screen, use the arrow keys to select the name of the current channel plan; use the up arrow key to scroll to the desired channel plan and press ENTER
2. TOD SYNC operation (all radios +/- 7 minutes of wristwatch sync)	a. If no GPS is available, ensure the radio is within 7 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. Place a 3G call	a. Press CALL key

Subtask	Action
	b. Select CALL TYPE (MANUAL, AUTOMATIC, or BEST) **Note:** Manual call allows operator 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. Terminate 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 operator must send a sync request by selecting REQUEST and pressing ENTER.	a. Press CALL key
	b. Manual SYNC type (REQUEST or BROADCAST)

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

Subtask	Action
1. Enter 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 arrow keys to select correct key to be updated
	f. Select YES to update
3. Erase existing key	a. Press PGM
	b. Select COMSEC
	c. Select KEYS
	d. Select ERASE

Subtask	Action
	e. Use up/down arrow keys to select correct key to be erased
	f. Select YES to erase
Note: You can load 25 keys into each COMSEC type fill position.	

Harris AN/PRC-152

The AN/PRC-152 is a Joint Tactical Radio System (JTRS) compliant radio with software communication architecture (SCA), programmable crypto (VINSON KY-57/58), and multiple waveform capability. It can operate in the FM and AM bands and has UHF SATCOM capability using NB or WB channels. The radio is able to interface with public safety communication systems within the United States.

General Information	
Program of Record	No
Contractor/Vendor	Harris
Weight	2.6 lbs. (with battery)
Secure	Type I encryption (Sierra II)
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

The single-channel multiband, multi-mission hand-held radio provides the optimal transition to JTRS technology. It delivers modern programmable encryption in an SCA-compliant radio that supports current and future algorithms and waveforms.

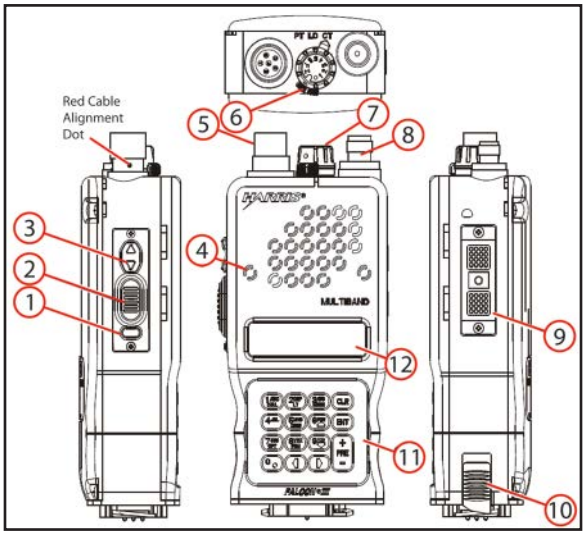

Figure 2-14. Harris AN/PRC-152

Table 2-7. AN/PRC-152 functions		
Key	**Control/ Indicator**	**Function**
1	Squelch	Toggle squelch on and off
2	PTT	Push-to-talk switch
3	Volume control	Up arrow key increases volume, and down arrow 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

Key	Control/ Indicator	Function
6	Cipher switch	
7	Function knob	
8	Antenna connector	
9	Side connector	
10	Battery latch	
11	Keypad	
12	Display	

Operator task: Set up the AN/PRC-152 radio:

Subtask	Action	Result
a. Attach the battery	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	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)	Push the headset or handset connector and twist	N/A

Subtask	Action	Result
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 lastly the initializing screen
e. Unlock the keyboard if necessary	Press 1, 3, 7, 9	The keyboard is unlocked

Operator task: 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

Subtask	Action	Result
	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 up arrow or down arrow keys 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
	10. Select USE RX, and press ENTER	The SC is loaded and set for transmitting and receiving

Operator task: 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

Operator task: 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

Subtask	Action	Result
	7. Use the down arrow or up arrow 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
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.		

Operator task: 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

Subtask	Action	Result
	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 (down arrow) is displayed
	8. On DTD, press ENTER	SET FCTN SWITCH TO LD ON RT (down arrow) 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

Subtask	Action	Result
	11. Wait until transfer is complete	N/A
	12. Select the key classification, and press ENTER	ICOM TRANSFER SUCCESSFUL is displayed
	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

Operator task: 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 down arrow or up arrow key to select OTAR, and press ENTER	OTAR menu is displayed

Subtask	Action	Result
	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 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	Use the up arrow and down arrow keys to select the proper waveform, and press ENTER	The waveform is set, and the CRYPTO MODE is displayed
c. Set the crypto type	Use the up arrow and down arrow 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	Use the up arrow and down arrow keys to select an empty slot (1–25) to store the TEK, and press ENTER	Status window is displayed

Operator task: Receive ERF:

Subtask	Action	Result
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 down arrow and up arrow keys to select the desired preset, and press ENTER	The hopset data is stored in the corresponding preset

Operator task: 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
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

AN/PRC-154

The AN/PRC-154 Rifleman Radio is a lightweight, ruggedized, hand-held, one-channel radio that delivers networking connectivity to the frontline Soldier. The radio is employed by platoon-, squad-, and team-level Soldiers. The radio is capable of operating at various frequencies and transmitting voice and data simultaneously utilizing the Soldier radio waveform (SRW). The SRW allows the radios to form a network that connects lower-echelon Soldiers to one another and back to their leaders at the company level so they can rapidly exchange information. The rifleman radio allows Soldiers to communicate in tactical radio networks and transmit position location information (PLI) using the radio's commercial GPS capability, which enables team and squad leaders to track and assess riflemen GPS locations and other vital situational information.

Figure 2-15. AN/PRC 154

The rifleman radio provides secure Type 2 inter-squad communications to any warfighter at the tactical edge of the battlefield. The AN/PRC 154 connects the warfighter to the combat network, emphasizing safety and enabling enhanced situational awareness and better decisions at the very edge of the battlefield.

General Information	
Frequency range	UHF band
Size	39 cu. in
Communication range	2 km
Weight	2.5 lbs. with battery and antenna
Environmental specifications operating temperature	-32° to +55° C
Storage Temperature	-51° to +71° C
Immersion	2 m
GPS	Integral GPS and antenna
Programmable channels	16 presets, two talk groups per preset

Waveforms/Modes of Operation SRW	
JTRS compliant	Yes
Interfaces supported	Standard headset (H-250)
	Ground Soldier ensemble (GSE)
	USB
	RS-232
Data rate	SRW data modes supported
Operational battery life	7.5 hours
IP talk group access	Dual PTT (talk group select)
OTAR/OTAT	Yes/Yes
Programmable COMSEC and TRANSEC	Yes – Type II

Features and benefits:

- Continuous transmission of individual location information (ILI) enables situational awareness and blue force tracking modular design supports easy technology upgrades.
- Supports hands-free display and external computer interface.
- User-friendly audible HMI (i.e., audio indicators for preset, GPS position, and battery status).
- Actively participates in one voice talk call group while simultaneously monitoring another talk group.
- Software programmable/upgradeable.

- Easy channel reprogramming and presets.
- Operates with common stock AN/PRC-148 battery and utilizes associated charger.
- Operates with talk-group select switch, enabling simultaneous participation in multiple talk groups or use with AN/PRC-148.
- Small, ruggedized, lightweight chassis that is EMI/EMC compliant.

Operator instructions for radio set AN/PRC-154:

Item	Control/Indicator/ Connector	Function
1	J5 GPS antenna	Passive antenna capable of receiving GPS positioning data
2	J1 audio/fill connector	Provides an audio interface for a handset device

Item	Control/Indicator/ Connector	Function
3	J4 RF antenna connector	Connects the antenna that receives and transmits radio communication between Soldiers in the field to the RT
4	Side RIC (J3)	External interface connector for operating the following: speaker audio/PTT USB Client E1A-232 serial port E1A-232 GPS data port GPS 1PPS/ TOD external power amplifier external shutdown
5	J7 external GPS antenna connector	Connects an external GPS antenna (for future use)
6	J6 external UHF/L-band antenna connector	Connects an external UHF or L-band antenna (for future use)
7	J2 battery connector	Connector pins connect for power from battery
8	Increases radio volume control	
9	Zeroizes COMSEC/ TRANSEC material in the radio when this key and other zero key (Item 15) are pressed simultaneously	
10	Decreases radio volume control	

Item	Control/Indicator/ Connector	Function
11	Activates/deactivates keypad backlight; if keypad backlight is OFF, pressing this key for less than 3 seconds turns keypad backlight on a low intensity for 10 seconds; pressing this key for 3 or more seconds turns keypad backlight on at high intensity; if keypad backlight is ON, pressing this key turns keypad backlight OFF	
12	Powers radio on when pressed for more than 3 seconds. Powers off radio when simultaneously pressed with alternate (ALT) key (Item 14) for more than 3 seconds	
13	Battery release latch (2)	Disengages the battery for removal and replacement
14	ALT button pressed when function desired is the one printed in blue on select keys (Items 12, 16, 18, and 19); ALT key is pressed simultaneously with other key	

Item	Control/Indicator/ Connector	Function
15	Zeroizes COMSEC/ TRANSEC material in the radio when this key and other zero key (Item 9) are pressed simultaneously	
16	Locks keypad when pressed more than 3 seconds; unlocks keypad when simultaneously pressed with ALT key (Item 14)	
17	Initiates an audio radio status report when pressed; if pressed for less than 3 seconds, a short status list is generated; if pressed for more than 3 seconds, an extended status list is generated; if pressed with the stat button, there is an audio annunciation of the 10-digit grid coordinates	
18	The radio supports 50 waveform presets; each press of this key decreases the preset positions	

Item	Control/Indicator/ Connector	Function
18 (cont.)	DIVE: When pressed simultaneously with ALT key (Item 14) for more than 3 seconds, locks out side connector to prevent corrosive damage to contacts when exposed to moisture; pressing the two keys again (after locking the side connector) unlocks the side connector	
19	FILL: Activates fill connection when ALT key (Item 14) is pressed simultaneously with this key; see Work Package 0005, COMSEC Key Loading; PRE: The radio supports 50 waveform presets; each press of this key increases the preset positions; the radio announces the preset number each time a new preset is selected The radio has three configuration presets (TX inhibit, maintenance mode, and mission data download); the radio announces these presets by name each time they are selected	

Item	Control/Indicator/ Connector	Function
19 (cont.)	TX inhibit: Terminates all transmissions while waveform is running; transmission resumes when active preset is selected; this is useful for switching out antennas without having to power off the radio Maintenance mode: Used for loading COMSEC keys Mission data download: Used for downloading presets To get to the configuration presets, scroll through the numbered presets; if the user is on the lowest preset loaded (for example, 1) and presses the preset down button, the presets appear in the order listed above; this order is reversed if the user is on the highest preset (for example, 50) and presses the preset up button	

Item	Control/Indicator/ Connector	Function
19 (cont.)	**Note:** The user can manually scroll through various loaded preset positions without initiating preset instantiation until the setting has persisted at a preset position for 5 seconds; instantiation takes about 70 seconds, during which the keypad is locked **Note:** Selection of maintenance mode for 5 or more seconds results in disabling of preset	
20	Status indicator	Radio power up During boot, the status indicator flashes green until POST results are received Illuminated solid green for 20 seconds following POST pass Illuminated solid red continuously following POST fail
		Key fill Illuminated solid green when in key fill mode is selected and the fill port is ready

Item	Control/Indicator/ Connector	Function
20 (cont.)		Flashing green for 5 seconds when in key fill mode and receive key fill status is success, then status indicator is illuminated solid green Illuminated solid red when in key fill mode and receive key fill status is failure or when the key fill session times out; status indicator remains solid red until (a) a key is filled successfully; this is accomplished by disabling the key fill session and then re-enabling the key fill session or (b) the key fill session is disabled The status indicator is extinguished when the user disables the key fill via an ALT > FILL button press
		Radio power down The status indicator is illuminated solid red when the RT is turned OFF, remaining ON for about one second until power is completely off

AN/PRC-154 Rifleman Radio

AN/PRC-154 Quick Reference Guide:

The quick reference guide contains information about turning the radio on/off, adjusting volume, loading presets/COMSEC, checking GPS location, changing presets, zeroizing the radio, trouble shooting, and the RR control app.

Turning on the Radio
1. Press and hold ON/OFF until the green light begins to flash (approximately 3 seconds).
2. Adjust the volume as necessary.
3. Adjust the preset as necessary.
4. After approximately 1.5 minutes, the radio will announce “Radio test success, battery level %, present activating.”
5. After approximately 1.5 minutes, the radio should announce “Radio ready.”
6. When voice services are acquired (it can take 2 to 7 minutes), press the push-to-talk (PTT) switch and perform a radio check.
Within a few seconds, the radio will join the network. If the radio does not join the network with 30 seconds of announcing “Radio ready,” it is either out of range or the radio is malfunctioning and should be rebooted.
Note: Following POST pass, the radio annunciation “Loading” indicates that the preset is loading and the waveform instantiation is in progress. The radio annunciation “Radio ready” indicates the conclusion of the waveform instantiation process and that the radio is ready.
Note: During boot, the status indicator flashes green until POST results are received. The status indicator is illuminated solid green for 20 seconds following POST pass. The status indicator is illuminated solid red continuously following POST fail.

Turning the Radio Off
1. Simultaneously press ALT and ON/OFF.
2. The light will flash red one time, and the radio will turn off.
The status indicator is illuminated solid red when the RT is turned off, remaining on for about one second until the power is completely off.

Adjust Volume
1. Simultaneously press ALT and the LOCK keys. Radio will announce “Keypad unlocked.”
2. Press VOLUME DOWN or VOLUME UP until desired volume is reached.

Change Preset
1. Simultaneously press ALT and the LOCK keys. Radio will announce “Keypad unlocked.”
2. Press PRESET UP or PRESET DOWN until desired preset is reached.
3. After a few seconds, the radio will announce “Preset loading.”
4. After approximately 1.5 minutes, the radio will announce “Radio ready” and join the network.
The radio supports 50 presets. An audio alert is heard each time the switch is moved to a new preset. The audio alert also identifies the current preset selected. Refer to your unit standing operating procedures for the appropriate preset.

Check GPS Location
1. Simultaneously press ALT and STAT.
2. The radio will announce Military Grid Reference System location.

Zeroizing Radio
1. Zeroize radio by pressing both ZERO buttons simultaneously for 2 seconds.
2. Power radio on, and verify that it announces “Empty maintenance mode.”

Loading COMSEC
Note: The following steps may vary depending on the version of simple key loader (SKL) used.
1. Turn on radio.
2. Change radio preset to maintenance mode.
3. Turn on SKL and log on.
4. Press ALT and FIL on radio. Radio announces “Key fill top.” Connect SKL to microphone connector. Ensure LED is solid green.
Note: Once the fill port is active, you have 30 seconds to initiate key transfer. After 30 seconds the fill port will time out.
1. Load TEK, then TSK (select KEY, LOAD, OK).
Note: As key transfers, radio status indicator fill flash green for 5 seconds then extinguish.
Note: If radio key transfer fails, the radio status indicator will illuminate red, indicating key transfer failure. If this occurs, perform previous steps to transfer keys.
2. Disconnect SKL and reconnect microphone. Radio will announce “Key fill disabled.”

Loading Presets
1. Connect USB cable to radio and to computer.
2. Change radio preset to mission data download.
3. Paste the desired preset file into the radio storage device. It will appear as a new drive in the “My Computer” menu.
4. Disconnect the USB cable from the computer. Radio should announce “SKL download success.”
5. Reboot the radio.

Indicators/Alerts	
LED indicator: Successful key load	
Indicator	**Meaning**
Solid green	Key fill: Illuminated solid green when in key fill mode is selected and the fill port is ready. Radio power up: Illuminated solid green for 20 seconds following POST pass.
Blink green 6 times or blink for 5 seconds	Key fill: Flashing green for 5 seconds when in key fill mode and receive key fill status is success, then status indicator is illuminated solid green

Indicators/Alerts	
LED indicator: Successful key load	
Indicator	**Meaning**
Solid red	Key fill: Illuminated solid red when in key fill mode and receive key fill status is failure or when the key fill session times out. Status indicator remains solid red until: 1. A key is filled successfully. This is accomplished by disabling the key fill session and then re-enabling the key fill session. 2. The key fill session is disabled. - Radio power up: Illuminated solid red continuously following POST fail. - Radio power down: The status indicator is illuminated solid red when the RT is turned off, remaining on for about one second until power is completely off.
Continuous blinking	During boot, the status indicator flashes green until POST results are received.
No light	The status indicator is extinguished when the user disables key fill via an ALT > FILL button press.

Indicators/Alerts	
Audio Indicators	**Description**
Preset <number>	Selecting an RT preset position will notify the user of the new preset number. **Note:** The preset position will only be annunciated if a preset has been loaded into the RT configuration.
Activating	This annunciation indicates the activation of a mode or preset.
Loading	This annunciation indicates that the preset is loading and the waveform instantiation is in progress.
Radio ready	The conclusion of the waveform instantiation process is “radio ready.”
Preset failure	Indicates a waveform instantiation failure for the selected preset.
Resuming	If an incorrect preset or mode is selected, going back to the previously selected preset or mode will initiate this annunciation.
Mission data download	Mission data download has been selected by the user.
Mission data download success	Success status of a mission data download.
Mission data download failure	Failure status of a mission data download.

Indicators/Alerts	
Audio Indicators	**Description**
Maintenance mode	Radio maintenance mode has been selected by the user.
Transmit inhibit	Transmit inhibit mode (position 16) has been selected by the user.
Transmit enable	Deselecting transmit inhibit enables the RT transmit mode. **Note:** The radio boots up in transmit enable mode by default.
Battery level <number> percent	An indication of the remaining battery charge level.
Battery low (repeated every 60 seconds)	An indication the battery charge is below the battery low charge threshold, which is 8%. Battery should be replaced as soon as possible.
[Short swept frequency tone] Battery critical	Tone repeated every 120 seconds. An indication the battery charge is below the battery critical charge threshold, which is 6%. Battery should be replaced immediately. **Note:** When battery level reaches 3%, radio will shut down.
Key fill top	An indication that a key fill operation via the RT top connector has been selected.

Indicators/Alerts	
Audio Indicators	**Description**
Key fill side	An indication that a key fill operation via the RT side connector has been selected.
Key fill disabled	An indication that a key fill operation has been disabled.
Radio test success	An indication that the RT has passed the POST.
Radio test failure	An indication that the RT has failed the POST.
Keypad locked	An indication the keypad lock button has been pressed and the keypad is locked.
Keypad unlocked	An indication the ALT button and keypad lock button have been pressed and the keypad is unlocked.
DIVE enabled	An indication the DIVE key and ALT key have been pressed simultaneously for more than 3 seconds and the side connector signals have been disabled.
Latitude <number> Longitude <number>	GPS latitude/longitude position annunciation.
MGRS <position>	GPS MGRS position annunciation

Indicators/Alerts	
Audio Indicators	**Description**
Single tone beep, then dial tone	OK to talk. Waveform-originated tone that indicates that is okay to talk (a) after a PTT when waveform grants access, or (b) the network is available following a previous transmission from a radio user in the network. **Note:** This tone is an audio mixing of 350 Hz and 440 Hz, with a 250 msec tone duration.
Busy signal	PTT ignore. An indication the PTT switch has been activated and (a) no talk group defined or (b) transmit inhibit active, or (c) waveform not instantiated. **Note:** This indicates that voice transmission is not possible under the current circumstances. This tone sounds like the standard telephone busy signal.
Double tone beep and dial tone	PTT release. An indication the PTT switch has been released. The tone consists of two consecutive beeps of two different frequencies (high/low).
Busy signal	Network busy. An indication the network is busy following a PTT request. **Note:** This tone sounds like the standard telephone busy signal.

Indicators/Alerts	
Audio Indicators	**Description**
Repeating tone beep	Catastrophic RT channel failure. **Note:** This tone is a hardware-initiated tone, 500 Hz, 50% duty cycle, repeating every second.
Repeating tone beep	RT critical change notification (CCN). **Note:** This tone is a 3000 Hz short beep (200 msec) that occurs once every 15 seconds (until the CCN is cleared), which indicates an RT fault, such as an antenna fault or RT zeroized.

AN/PRC-155

The AN/PRC-155 hand-held manpack and small form fit manpack radio is a two-channel, software-defined, portable radio that provides network-centric connectivity and legacy interoperability supporting advanced SRW, wideband networking waveform, Mobile User Objective System (MUOS), Link-16, and current-force (SINCGARS, SATCOM, HF, and EPLRS) waveform capabilities to mounted and dismounted warfighters.

The AN/PRC-155 provides Soldiers at company level and below carrying rifleman radios and Nett warrior hand-held devices with real-time information via connection to the network backbone through the SRW and SINCGARS waveforms. The AN/PRC-155 enhances the communication capabilities of Soldiers at company level and below operating in austere environments, enabling the exchange of voice and data information with higher headquarters independent of other communications infrastructure. The AIM II embedded programmable security capability of the AN/PRC-155 allows dismounted warfighters to communicate over any tactical

radio network. The radio provides networked voice and data exchange to support timely tactical actions while dispersed across the battlefield.

Figure 2-16. AN/PRC-155

General Information	
Frequency range	2 MHz–2.5 GHz
Guard	121.5 VHF and 243.0 UHF
Size	257 cu. in. (438 with battery)
	2.875”x 10.5”x 8.5” (without battery bucket)
	2.875” x 10.5” x 14.5” (with battery bucket)
Weight	<9 lbs. (<14 lbs. with battery)
Number of channels	2
Waveform support	SRW, MUOS, SINCGARS, EPLRS, SATCOM, HF SSB w/ALE
Presets	50 per channel
Max. power output	20 watts
JTRS compliant	Yes
JTRS JPO-certified waveforms	Yes
JTRS APIs	Yes

General Information	
Fully programmable COMSEC and TRANSEC (Type 1 and Type 2)	Yes
Multiple Independent Levels of Security (MILS)	Yes
Remote control capability	Yes
CIK function, removable	Yes
OTAR	Yes
Retransmission, voice and data	Integral (2 channels)

Features and benefits:

- Modular design for ease of technology upgrades.
- Scalable from two to four channels by connecting two units through Ethernet ports.
- Remotable/removable, intuitive human machine interface (HMI).
- Common HMI to the JTRS hand-held radio reduces training.
- Modular, detachable power amplifiers for ease of field maintenance and reduced repair time.
- Separation of RF channels provides superior isolation.
- Dual-battery configuration for extended mission life.
- Sealed battery bucket provides protection from environmental elements.

- Ruggedized, lightweight chassis that is EMI/EMC compliant.
- Works with legacy key fill devices.
- Remote control capable.
- Accessories available: Vehicle mount, power supply/charger, 6-foot tether for HMI in dismounted application.

Iridium Satellite Phone

Motorola Satellite 9505 portable telephone for voice and data service. The Iridium Satellite Module 9505 provides coverage for individuals outside cellular network coverage or in places with poor coverage. Satellite calls are routed from the iridium phone to iridium satellites orbiting the earth. The Iridium Series 9505 is the first wireless phone to provide total global coverage. Users can call DSN numbers and cell phones, and talk secure to a secure terminal equipment (STE) phone and with other iridium phones.


Status Indicator
Antenna Lock Release Button
Satellite Antenna (stowed)
Cellular Cassette Antenna
Earpiece
Signal Strength Indicator
Real Time Clock
Battery Charge Indicator
Volume Control Keys
Display
Display Status Indicators
Message Key
Battery Compartment/ Cellular Cassette Connector
Alphanumeric Keypad
Infrared Data Port
Headset Jack
Power On/Off Key
Quick Access Key
Accessory and Power Connector
Microphone

Figure 2-17

Key	Function
⏻	Turns the phone's power on and off
OK	Selects menu settings or options, or initiates and answers calls
✉	Takes you directly to the messages menu
M+	Stores numbers in the phone book
MR	Recalls numbers from the phone book
↑	Enters the Quick Access menu
MENU	Enters the options menu and scrolls forward through menu features
C	Clears characters from the screen or exits the Options menu
^ v	Scrolls backwards or forward through menu features, and moves the cursor backward or forward when entering names or messages

If your phone asks...	Then...
View Options?	**Press** OK to enter the submenu.
Select?	**Press** OK to select the displayed feature.
Quit?	**Press** OK to exit the feature.

Figure 2-18

Startup procedures:

Press and hold the power key to turn the phone on. The iridium graphics will show up and then the following animation will appear:

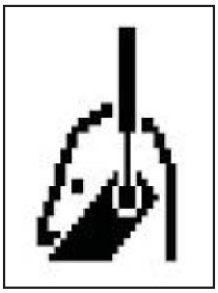

Figure 2-19

A message will appear along with a tone for you to rotate and extend the antenna.

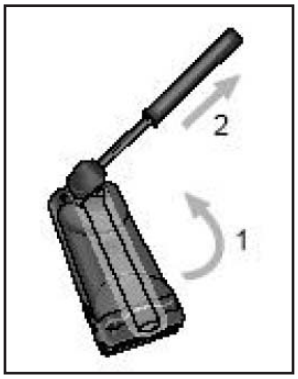

Figure 2-20a

Figure 2-20b

Figure 2-20b shows you that you can have the antenna pointed in either direction when talking, although you should have it perpendicular to the ground. The antenna must be up when making or receiving calls. You can stow the antenna when your calls are complete or when the phone is turned off.

A prompt will come up saying ENTER PIN. The default pin number is 1111. After you enter that, press OK and wait till you see a check mark next to the word COMPLETED. If the pin number 1111 does not work the first time, DO NOT attempt to enter the code again. Entering the pin wrong three times will place the phone in BLOCKED status.

LED status indicator:

If you are outside in a good coverage area, the screen should automatically say REGISTERED, and the word IRIDIUM will be displayed on the screen. If you are not in a clear area such as inside a building or tent, the screen will read SEARCHING... or CHECK SIGNAL beneath that. You will know you have good service when you see the word IRIDIUM displayed. Another way of determining if you have service is by looking at the LED status indicator at the top of the phone. You will see a light

flashing in different colors. The table below shows what each color indicates in satellite mode and cellular mode.

If the LED is . . .	Then in satellite mode . . .	Then in cellular mode . . .
Alternating red and green	A call is incoming	A call is incoming
Flashing green	You are receiving a signal from the iridium satellite network; you can make and receive calls	You are receiving a signal from the cellular network; you can make and receive calls
Flashing yellow	You are temporarily unable to receive calls	You are roaming
Flashing yellow and red	Your SIM card may be inserted incorrectly, may not be inserted, or you may be in a restricted area; you can make emergency calls only	You will not see this indicator in cellular mode
Flashing red	Service is not available	Service is not available

Power on messages:

Once your phone is powered on, you may see the following messages. The SEARCHING… and CHECK SIGNAL messages are normal and are likely to come up if you are in a building and have poor coverage. You will always get the ROTATE AND EXTEND ANTENNA prompt unless you already have the antenna extended when you turn the phone on. Make sure that you always have your SIM card inserted in your phone correctly before you power on.

Message	Description
Searching...	The Phone is attempting to establish communications with the satellite or cellular network.
Rotate and Extend Antenna	You also hear a tone when you see this message. Make sure the antenna is rotated upward and fully extended and has a clear unobstructed view of the sky
Rotate Antenna Registering... or Registering...	Your phone is registering with the network. When the process is complete, you will see Registered.
Check Signal	Your phone is unable to establish registration with the satallite network. Move to a location with a clear unobstructed view of the sky.
Invalid Account	Contact your service provider.
Enter Phone Unlock Code	Your phone was locked after the last use. Enter your four-digit unlock code and press OK to proceed.
Enter PIN	Enter the four-to-eight-digit SIM card PIN code provided by your service provider and press OK to proceed.
Insert Card	Power off your phone, make sure your SIM card is inserted completely, and then power your phone on again.
Check Card	The SIM card is damaged or inserted the wrong way.

Figure 2-21a

Message	Description
Blocked	If the SIM card PIN code is incorrectly entered three times in a row, your SIM card becomes blocked.
! Blocked	If the SIM card PIN2 code is incorrectly entered three times in a row, your SIM card becomes blocked.
Bad Card See Supplier	Your SIM card has been damaged or incorrectly issued. Contact your service provider for information.

Figure 2-21b

Display indicators:

Indicator	Description
	**Signal Strength Indicator** indicates the strength of the signal from the network. The signal strength indicator appears continuously in the top left hand corner of the display. The more segments displayed in the bar graph, the stronger the signal. Five bars indicate full signal strength. No bars indicates a weak signal.
	**Battery Charge Indicator** indicates the strength of the battery charge. The more segments displayed, the greater the battery charge. When you are in satellite mode, you can also check the strength of the charge at any time through the menu.
12:00	**Real Time Clock** displays the time in either 12-hour or 24-hour format.
	**Message Indicator** appears when you receive a new message. It flashes when the SIM card is full.
	**Satellite Mode Indicator** appears when your phone is in satellite mode.

Figure 2-22a

Indicator	Description
	**Home System Indicator** appears in satellite mode when the phone has successfully registered with the Iridium satellite system. In cellular mode (when you have the appropriate Cellular Cassette inserted), this indicator appears when the phone is registered with your home cellular system.
	**Roam Indicator** appears when you are roaming on a cellular system (when you have the appropriate Cellular Cassette insterted). This indicator does not appear when the phone is in satellite mode.
	**No Service Indicator** appears when your phone is not capable of placing or receiving calls.
	**In Use Indicator** appears when a call is in progress.
	**Scroll Bar** appears on the right of the display when you are in a menu. The button on the scroll bar indicates where you are in the list.
	**Check Mark** indicates a menu item is currently selected.
	**Hourglass** appears in the display when your phone has to request setings from the network.
	**Quick Access Menu Icons** allow you to easily identify Quick Access features as you scroll through the Quick Access Menu.

Figure 2-22b

Installing/Removing SIM card:

The SIM card is stored in a tray under the battery of your phone. It is covered by the battery when you use your phone. **Ensure your phone is powered OFF before inserting or removing the SIM card to prevent damaging the memory on the SIM card.**

1. Remove or rotate the satellite antenna before removing the battery. Press and hold the release latch at the top of the battery compartment cover. Pull the cover upward and remove it from the phone.

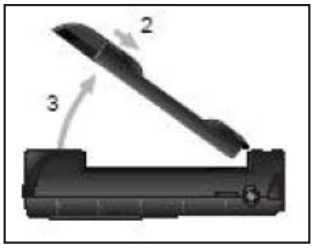

Figure 2-23

2. Press and hold the release latch at the base of the battery and pull the battery upward out of the phone.

Figure 2-24a

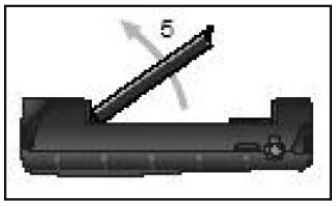

Figure 2-24b

3. Slide the SIM card tray to the left and lift up the right side of the tray. Insert or remove the SIM card from the tray with the notch up and the gold plate facing out. Push down the SIM card tray and slide the tray to the right to lock it in place.

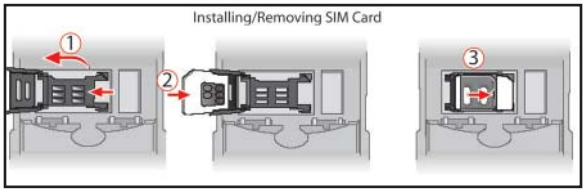

Figure 2-25

4. Insert the battery bottom end first into the compartment and then press the battery downward until it clicks into place.

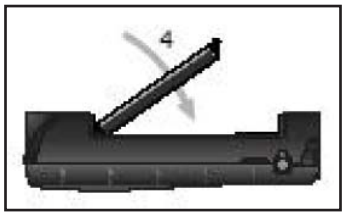

Figure 2-26

5. Insert the bottom end of the cover into the slots and snap it down in place.

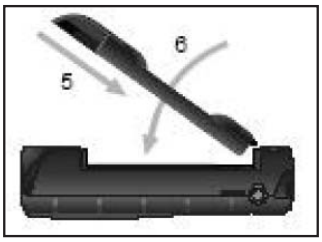

Figure 2-27

Placing a call:

Ensure your phone is powered on, your SIM card is inserted and unlocked, and you are in contact with the satellite network. With those things in place, you can make a phone call. The phone number you enter can have a maximum of 20 digits. See the iridium dialing instructions in this section.

Enter the number from the keypad and the word Call? should appear on the screen as you type the number. You can always make corrections by pressing the C button to clear.

You should be in “satellite always” mode when you are placing an international call. You must dial the number in international format:

> [International access code 00 or +] (**Note:** The + prefix is used when you want to make an international call. Hold the 0 button down for a few seconds and the + should appear. This allows you to call from any country without knowing the local access code.)
>
> [country code or iridium country code]
>
> [phone number]

When you press OK you will see Calling, followed by the number you dialed. The phone may go through a series of tones, followed by a regular dial tone trying to reach your party. When connected, you will see Connected for a few seconds followed by End Call? If you are not connected, you may see the following messages:

Message	Description
Rotate and Extend Antenna	Make Sure the antenna is rotated upward and fully extended and has a clear unobstructed view of the sky.
Busy Try Later or Please Try Later	The phone is unable to access the network. Try again in a few minutes.
Restricted Area	The phone is unable to access the network. Move to an area where calls are allowed.
Redial?	Press OK to redial the number automatically.

Figure 2-28

Receiving a phone call:

In order to receive phone calls, your phone must be powered on with a SIM card inserted, unlocked, and in service. If any of these things are not in place, the other party will receive a busy signal. There are two scenarios when receiving a phone call. Following is how to answer in these situations:

1. With the antenna raised and fully extended:

- The phone rings or vibrates.
- The status LED will alternate red and green.
- The display will read Call followed by Answer?

To answer the call, press any digit key. You will then see Connected.

If you do not get a connection, you will receive one of these following messages:

Message	Description
Orient Antenna Call Attempt	You need to fully extend the antenna upwards with a clear unobstructed view of the sky.
Call Failed	The antenna is not properly adjusted or the network signal is not strong enough

Figure 2-29

2. With the antenna stowed or in the down position:

- The phone will chirp about three times.
- The display will read Rotate Antenna, Call Attempt.

Rotate and fully extend the antenna and you will see Iridium Call Attempt. Do not attempt to answer until you hear a ring or feel a vibration. The display will then read Call followed by Answer?

To answer the call, press any digit key. You will see Connected

If you do not get a connection, you may receive one of the following messages:

Message	Description
Orient Antenna Call Attempt or Rotate Antenna Call Attempt	You need to fully extend the antenna upwards with a clear unobstructed view of the sky.
Call Failed	The antenna is not properly adjusted or the network signal is not strong enough.

Figure 2-30

Additional phone features:

Additional Phone Features	
Keypad Lock	To prevent accidental usage of the phone, press the # and the * keys at the same time to lock the keypad. Press the same keys to unlock the phone. All the of the keys are disabled except for the ⏻ You can still answer incoming calls by pressing OK even when the keypad is locked.
Adjust Ringer Volume	Press the ↑ and then the up or down volume keys on the left side of the phone. You can adjust it to whatever level you want by pressing up or down on the volume keys.
Muting a Call	Press MENU until you see ***Turn Mute on or off***. Press OK to select. You will see "Mute". To unmute the call, press OK again to resume your conversation again.
Changing the SIM card PIN Number	If you wish to change your PIN number, press MENU until you see ***Phone Setup***. Press OK. Press OK until you see ***Require SIM Card PIN*** and press OK. Scroll till you see ***Change SIM Card PIN***. Press OK and you will see ***Enter Old PIN***. Ender that and press OK. It will then ask you to ***Enter New PIN*** and then ***Repeat New PIN***.
Unblock PIN Code.	If the PIN code is entered wrong 3 times then the phoen will be placed in ***Blocked*** status. You must obtain the unblock number from the Motorola help desk or your service provider. Here is how to unblock it. Press * * 0+ 5 * . Enter the unblock code. Enter the new PIN and then repeat.

Figure 2-31

Conducting a secure call:

Conducting a Secure CALL	
To make secure calls on an Iridium phone, you must have the SDNS Type 1 encryption key loaded into the ISM secure sleeve.	Here is how to make your secure call: 1. Enter the ISM pin **before** you make your phone call. Press MENU until you see ***Security Menu*** and then press OK. You will see ***PIN Menu***. Press OK. You should then see ***Enter ISM PIN***: Enter the PIN which should be **1111** and then press OK. You will then see ***ISM PIN Entered KeyExp MM/YY*** Then you'll see the option to ***Lock ISM***. Press C to return to ***PIN Menu***. Make your call to your other party. Press MENU till you see ***Security Menu***. Press OK to select that. Only **one** member will initiate the secure call. You and the other party will go through a series of display messages and voice prompts. This is the secure call setup that lasts approximately 40 seconds. You will hear the voice say repeatedly *"Secure call setup in progress. Please stand by."* *When you hear the voice say "Line is secure (beep)", that means the setup completed. The call becomes unmuted and voice is encrypted. You can now talk secure to your party.*
During the secure call, you have these options	
Return to clear voice	Press MENU until you see ***Go Clear***. Press OK to select. The call will mute and the LED status indicator will be fast-flashing. You will see ***Going Clear*** as the call reverts to clear voice.
End the call	Press MENU or C til you see ***End Call***. Press OK to select. The phone will mute and the LED indicator will be fast-flashing and you will see ***Ending Call*** as the call ends. You can also press the ⏻ to power off the phone.

Figure 2-32

Chapter 3

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. It is up to NCS to maintain net procedures and discipline. As in the case with operator tasks, the experienced NCS will know the routine tasks and be able to perform them without hesitation. For nonroutine tasks, the standard task list provided in this chapter should help. Novice NCS personnel will find this list and "how to" guide useful.

Purpose: To provide NCS personnel with a quick reference to assist in task performance during training and operations. Using this radio operator handbook, properly trained NCS personnel should be able to perform, without assistance, all 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, FH data, and sync time in preparation for the net opening. Upon completing the integrated communications security (ICOM) fill, the operator merely calls the NCS in secure FH mode and requests permission to enter the net. Once the "hot start" is complete, the NCS initiates a net call and then "battle tracks" units/net members who have effectively joined the net.

Task 2. Respond to CUE calls. An important feature of the SINCGARS is its ability to be contacted by a non-FH radio, or an FH radio lacking data or sync 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, transmission security 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 making a communications check when the changed FH data is put into effect.

Task 4. Transfer signal operating instructions (SOI) information using broadcast mode. This procedure enables an NCS to send a SOI electronically to net members whenever updating by physical connection of ANCD to ANCD proves to be impossible or impractical. The broadcast mode requires approximately two minutes to transmit one time period of a battalion 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 traffic encryption key (TEK) to other NCSs using a manual remote keying (MK) method of over-the-air-rekey (OTAR). This procedure allows an NCS to transfer a TEK (not a key encryption key [KEK]) electronically, OTAR to other NCSs. This capability is useful when the tactical situation or terrain makes 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, respectively.

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 when required. 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 above.

Task 7. Send TEK to net operators using the automatic remote keying (AK) method of OTAR. This procedure enables an NCS to transfer electronically 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 being used. 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 operations for "hot start" net opening	1. Ensure net ANCDs or SKLs are properly loaded**	
	2. Advise operators when net will be opened	

Subtask	Action	Result
c. Open the net	1. Respond to individual operator calls	Operator calls as soon as ready to enter the net
	2. Admit individual operators into cipher text (CT), FH, net	
	3. Set: Channel (CHAN) 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 procedure 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
Note "CUE" in RT display	1. Switch to CUE channel	Caller CUEs in plain text (PT), listens in CT
	2. Call CUE caller on CUE freq in CT	CUE caller gets response
	3. Direct CUEer go to MAN/CT	Must have MAN 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	
	7. If enemy has direction-finding (DF) capability, move to a new location	CUE and MAN freq can be DF'd
1. Either the NCS or alternate (alt) NCS may respond to CUE calls. The preferred solution is for an alt NCS to respond to CUE calls, leaving the NCS free to control the net. 2. An alt 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	Obtain from signal officer, ANCD, or SOI, as appropriate
	2. Load new FH data into NCS radio	Perform ICOM fill or change ESET in one channel
b. Prepare net operations for net update ERF	1. Alert net, update ERF is to be sent	Wait until the net is clear of operational traffic
	2. Inform operators what channel to store ERF	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 a 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. Press for 3 seconds	RT display shows [SEND], beeps, and shows [HFXXX]

Subtask	Action	Result
	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	(2-30 seconds should be adequate)
	2. Have operators acknowledge (ACK) receipt of ERF	
	3. Have alt NCS repeat ERF if required	Allows NCS to control the net and continue net operations
e. Perform communications check	1. At the proper time, change to updated ERF data	
	2. Check communications using updated ERF data	
	3. Have alt NCS follow up on nonresponsive operators	Net updated ERF is completed

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 date mode set to 1200 bits per second
b. Prepare ANCD for SOI data broadcast number **Note:** This screen will appear only if QREF file is stored in ANCD.	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 up/down and press ENTER to select groups

Subtask	Action	Result
	9. Press up/down to display and press ENTER	One group selected; keep selecting (Y/N)
	10. Enter YES to continue, 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; 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); 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

Subtask	Action	Result
	20. Press down arrow	Press SEND to send and then wait
c. Prepare net operator for receipt of SOI broadcast	1. Say: “Stand by 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
	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 AUD/DATA [ ]
	10. Say: “Connect ANCD to RT AUD/DATA and handset to AUD/FILL” *	Emphasize AUD/DATA for ANCD connection

Subtask	Action	Result
	11. Say: “When ready, press down arrow and ACK”	Press RCV to receive and then wait
*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 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; CT contact is confirmed

Subtask	Action	Result
	2. After ACK, say: "Make NCS Task 6 preparations; 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 CHAN 1"	Provides final coordination guidance for MK OTAR
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 communications on CHAN 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. Say: "OTAR completed; TEK ID is XXXXXX; 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 AK 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/PgDn to KEK desired; press ENTER	Select key: QUIT (name/number) KEK
	6. Enter QUIT	Select key: QUIT (name/number)
	7. Press PgDn to TEK desired; press ENTER	Connect to RT, press [SEND], and then wait

Subtask	Action	Result
c. Send AK OTAR	1. Say: “Stand by for MK OTAR, ACK”	Target operators are alerted; 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 ENTER to select	Select key: QUIT (name/number) XMT
	4. Enter QUIT	Connect ANCD to RT
	5. Connect ANCD to RT AUD/FILL; press down arrow	Press [LOAD] on RT
	6. Press [LOAD]/ [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, 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

Subtask	Action	Result
	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 4

Global Positioning Systems

The ability for Soldiers to accurately determine their location has always been a major problem. The Global Positioning System (GPS) has revolutionized land navigation. Ideally, Soldiers should be able to determine their position accurately to within 10 meters. But before such a standard can be achieved, Soldiers, and particularly radio operators, must be proficient in the use of GPS.

Note: GPS should be utilized as a navigational aid and should 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 that interface 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. The GPS receivers come in several configurations: hand-held, vehicular-mounted, aircraft-mounted, and water craft-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 that it is tracking and whether the signals are good. 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 that provided by tracking four or more satellites. Each type receiver has a number of mode keys that have 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 PLGR (Precision Lightweight GPS Receiver)*.

3. Capabilities. The GPS provides worldwide, 24-hour, all weather, day or night coverage when the satellite constellation is complete. The GPS can locate the position of the user accurately to within 21 meters, 95 percent of the time. However, the GPS has been known to accurately locate the position of the user within 8 to 10 meters. It can determine the distance and direction from the user to a programmed location or the distance between two programmed locations, called waypoints (WPTs). It provides exact date and time for the time zone in which the user is located. The data supplied by the GPS is helpful for missions that require Soldiers to know their exact location, such as:

- Sighting.
- Surveying.
- Tactical reconnaissance.
- Sensor emplacement.
- Artillery forward observing.
- Close air support.
- General navigation.
- Mechanized maneuvers.
- Engineer surveying.
- Amphibious operations.
- Parachute operations.
- Signal intelligence.
- Electronic warfare.
- Ground-based forward air control.

This data is displayed on the AN/PSN-11 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 each day. The GPS navigational signals are similar to light rays, so 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 between the different receivers. The GPS can reference and format position coordinates in any of the following systems:

- **Degrees, minutes, seconds (DMS):** Latitude/longitude-based system with position expressed in degrees, minutes, and seconds.
- **Degrees, minutes (DM):** Latitude/longitude-based system with position expressed in degrees and minutes.
- **Universal Traverse Mercator (UTM):** Grid zone system with the northing and easting position expressed in meters.
- **Military Grid Reference System (MGRS):** MGRS can be old or new. If you selected MGRS during setup, the MGRS coordinates will be displayed on lines 2 and 3. 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):** Associated with 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):** Associated with IRL Map Datum Identifier. Selecting IRL causes an easting and northing format (in meters) to be displayed on lines 2&3 when the PLGR is physically within Ireland. Otherwise it displays latitude/longitude in degrees, minutes, and seconds.

The following is a list of land navigation subjects from other sections in which the

GPS can be used to assist Soldiers in navigating and map reading:

- **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 thing the different types of receivers have in common 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) or feet. For determining direction, the user can select degrees, mils, or rads. Depending on the receiver, the user can select true north, magnetic north, or grid north.
- **Navigational equipment and methods.** Unlike the compass, the GPS receiver, when set on navigation (NAV) mode, will guide the user to a selected WPT by actually 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 the 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.
- **Navigation in different types of terrain.** The GPS is capable of being used in any terrain, especially more 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 battlefield use anywhere in the world. It is sealed watertight for all-weather 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 integral antenna. It can 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 crypto 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 nine legs (10 WPTs) linked together.

Precision Lightweight Global Positioning System Receiver (PLGR) AN/PSN-11

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 make it easy to use. (These features are highlighted in the physical description.)

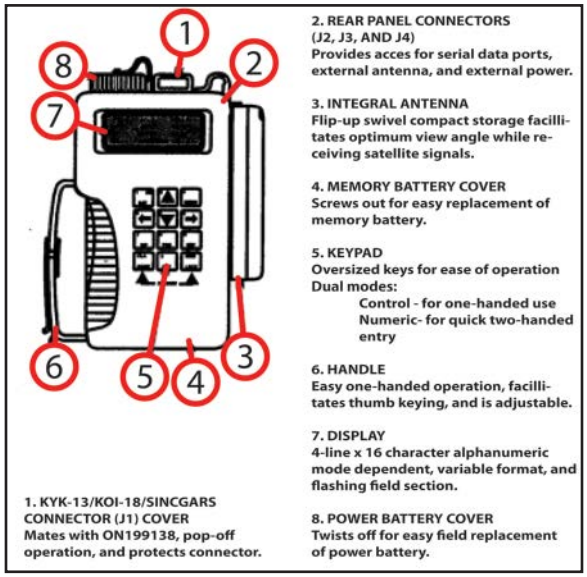

Figure 4-1. Precision Lightweight Global Positioning System Receiver (PLGR) AN/PSN-11

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 needs of the user. 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 (BIT), press the MENU key and move the cursor to SETUP. Activate the SETUP function.

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

Setup

The first screen allows the operator to set the operating mode and SV-type. Scroll through the operating modes and select 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 MAGVAR (Magnetic variation or grid–magnetic [G–M] angle for your area). The operator can select calculate (Calc) the degree or manually enter degrees as an easterly or westerly GM angle; for example, E004.0 for the Fort Polk map sheet.

Note: The World Magnetic Model is updated at 5-year intervals; new release of WMM-2010 will be available 15 December, 2009 and the new patch should be installed at that time.

SETUP	MAGVAR
TYPE:	Calc deg
WMM	2005
	P

Magnetic variation or G–M angle setup

The fourth screen of setup allows the operator to set the elevation hold (ELHold), TIME, and error (ER). The operator should set the ELHold to automatic. As for time, the operator needs to know from his present location how many hours he is ahead of or behind Greenwich Mean Time (GMT). For example, during daylight savings time, Fort Polk, LA, is Loc=Z-0500. 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-0400
ERR: =+-m	P

Set elevation, time, hold, 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 datum sets available. The operator should set the PLGR datum to his area of operation. For example, if the map datum is WGS-84, the operator sets the PLGR to WGS-84. If the map is 1927 North America datum, the operator sets the datum to NAS-C. The automatic timer off 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 TIMER: OFF	OFF
	P

Set the PLGR datum

The sixth screen in 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: HAVE QUICK	Standard
1PPS: Off	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, store the position as a WPT, or return to the mode of operation it was previously in. The operator should set this mode to off. The remaining pages for SETUP are for advanced GPS users.

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

AUTOMARK setup

Once the PLGR is set up, the operator can obtain a position. This procedure is accomplished by activating the position (POS) 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.

Waypoint (WPT) 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. The WPTs available on the AN/PSN-11 are 999 (numbered 01 through 999).

This paragraph describes the AN/PSN-11 WPT displays and WPT operations. The 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

Enter 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	00000e	MGRS-New
AN		00000n
No EL		CLR P

Unused

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

Change a name

Second line: The operator enters the grid zone designator for their area of operation. For example, the Fort Polk area falls in the 15R zone.

Third line: The operator must enter a 10-digit grid coordinate with its 100,000-meter grid square identifier. For example, if the WPT location is Carnis Village, Fort Polk map sheet, the 100,000-meter grid square identifier is WQ. 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 5th and 10th digit entered is a zero (0).

For the fourth line, if the elevation of the WPT is known, the operator can enter it. If the elevation is not known, the operator can just leave the data as zero or 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 (NUM 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/down.

7. Navigation.

Navigation (NAV) is using the AN/PSN-11 to find your present position relative to other points. The AN/PSN-11 provides azimuth, range, and steering information in a variety of formats. There are four navigation

display modes that may be accessed and selected. The navigation display mode selected determines the type of information shown on the navigation displays. These navigation displays give the user the most useful information for a certain mission profile: SLOW, two dimensional (2D) FAST, three dimensional (3D) FAST, or CUSTOM.

In SLOW NAV mode, the AN/PSN-11 performs 2D NAV. SLOW NAV mode is used for land or sea, when the user cannot maintain the minimum speed necessary (about 1.5 kmph).

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

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

In CUSTOM NAV mode, the AN/PSN-11 displays users' 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 PLGR NAV mode is accomplished as follows:

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 (course) FROM.

2D	FAST	DIRECT
WP002	NORTHSTAR002	P

Navigation mode

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 WPTs that are stored.)

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 (TRK=tracking) 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 TRK 305.3M	± 30M
AZ311.3M	
STR >6	P

Azimuth

The third screen tells the navigator the range or distance to his WPT and how much time (TTG2) it will take him to get to his WPT. This page also lets the navigator know what the elevation difference is from his present location to the WPT and by how much he will miss their WPT (MMD).

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

Range or distance

Defense Advanced GPS Receiver (DAGR) Satellite Signals Navigation Set (AN/PSN-13)

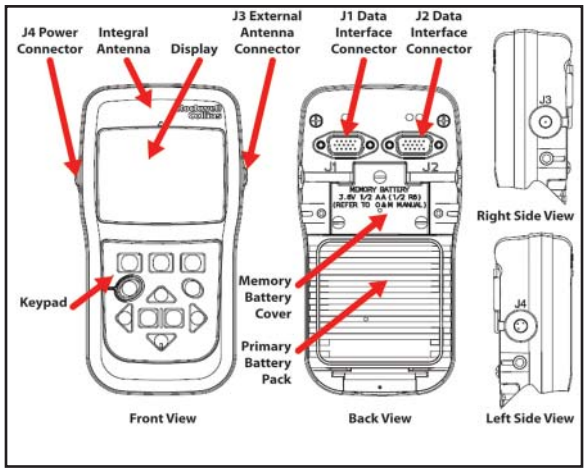

Figure 4-2. DAGR Satellite Signals Navigation Set (AN/PSN-13)

The PLGR is being phased out and replaced by the DAGR as the Army's position, velocity (ground speed), and time (PVT) device. The DAGR is "militarized" to withstand harsh environmental conditions under which typical commercial receivers are compromised.

The DAGR is specifically designed to operate during jamming operations. When jamming is present, the DAGR continues to track, while commercial receivers lose their satellite tracking and position, velocity, and time data.

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

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

Operator task: 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; lubricate or replace if necessary	
	3. Install new batteries in battery pack and reattach to unit	
b. Power on unit	1. Press and release the PWR key	
	2. Observe the POWER ON STATUS message and ensure the unit passes the self-test	
	3. Press ENTER key if required	
	4. Press the MENU key twice	Main menu is displayed
c. Set battery information	1. Use the cursor control keys to highlight RECEIVER SET-UP; push ENTER	Displays RECEIVER SETUP submenu

Subtask	Action	Result
	2. Use the cursor key to highlight BATTERY; press ENTER	The battery page is displayed
	3. Select the POWER BATTERIES INSTALLED field; press ENTER	Battery information fields are displayed
	4. Use the cursor controls to change the field information to read the current date and time the batteries were installed; press ENTER	Battery information is set, and the battery page is displayed again
	5. Select the BATTERY TYPE field; press ENTER	The BATTERY TYPE menu is displayed
	6. Select the correct type of batteries; press ENTER	The battery type is set, and the battery page is displayed again
	7. Select the RECHARGEABLE field; press ENTER	The rechargeable field is displayed
	8. Select the correct type of batteries; press ENTER	Battery recharging is set, and the battery page is displayed
	9. Press the MENU key	The MENU page is displayed

Subtask	Action	Result
	10. Select RESET BATTERY USED; press ENTER	Battery use is reset to zero, and the battery page is displayed; primary battery installation is complete
Note: After power on, "Continuous" is the default mode when on external power; "Fix" is the default on battery power.		

Operator task: Operate DAGR:

Subtask	Action	Result
a. Turn on DAGR to find current location	1. Push the PWR/ QUIT button	The power-on message is displayed for approximately two seconds indicating the DAGR software and hardware versions
	2. Wait for the power-on message to clear	The self-test has passed, 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

Subtask	Action	Result
	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. Select operating mode	1. From any display, press and hold the POS key until the present position page is displayed	If a field is highlighted, press the QUIT key to unhighlight the field
	2. Press MENU key	Highlight SELECT OP mode
	3. Press ENTER key	Highlight the desired operating mode
	4. Press ENTER key	Display returns to the present position page displaying the selected operating mode below the present position coordinates
c. Power off	1. Press and hold the PWR key	The 30-second power down warning is displayed
	2. Push ENTER key to immediately power off the DAGR	

Subtask	Action	Result
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 the setup. exe file	GPS map loader installs and creates a program icon on the PC
	3. Go the DAGR product library page	Download the required map set(s)

Notes:

1. To determine the latest DAGR software version, refer to the GPS support website at https://gps.army.mil.

2. Before installing maps installation software, the PC must not have any previous version of the GPS Map Toolkit software. Refer to paragraph 17.3.4.4.2 of Technical Manual 11-5820-1172-13, *Defense Advanced GPS Receiver (DAGR),* to uninstall a previous version. To transfer maps and images between two DAGR units, refer to paragraph 11.2. Refer to paragraph 17.3.2.1 for PC minimum specifications for maps installation. Refer to paragraph 17.3.3.1 to install maps installation software into a PC using CD.

3. Maps installation software and maps are available for downloading. A common access card (CAC) and CAC PIN are required to access the website at https://tsunami.tec.army.mil/Products/DAGRMapSupport/index.cfm.

Chapter 5

Controlled Cryptographic Equipment

Effective tactical communications require the management of keys, devices, and other communications security (COMSEC) material handled at the lowest echelon possible while maintaining the highest physical security level of equipment and material. This chapter provides the knowledge radio operators need to transfer COMSEC/frequency hopping (FH) data and signal operation instructions (SOI) information from automated net control device (ANCD) to ANCD, extract SOI information from an ANCD, store data sent by over-the-air rekeying (OTAR), and load the Single-Channel Ground and Airborne Radio System (SINCGARS) radio using Mode 2 fill. The following COMSEC devices — the AN/CYZ-10 ANCD and the AN/PYQ-10, Simple Key Loader (SKL) — are discussed in detail.

Automated Net Control Device AN/CYZ-10

The ANCD system replaced the paper version SOI, the KYK 13, and MX 18290 hopset device.

The ANCD was designed with the capability of loading the SINCGARS radio with COMSEC and 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 authentication table.

Characteristics of the ANCD:

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

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.

Selection of 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. For example:

  S - for signal operating instructions

  R - for radio

  U - for supervisor

Operator task: Transfer COMSEC keys/FH data, ANCD to ANCD:

Subtask	Action (Source ANCD to transfer)	Result (Target ANCD to receive)
To transfer COMSEC keys/FH data, one ANCD must be selected as the source ANCD and the other as the target ANCD.	1. Press the ON/OFF key to turn on the source ANCD	1. Turn on the ANCD

Subtask	Action (Source ANCD to transfer)	Result (Target ANCD to receive)
This transfer process uses the DS-101 protocol, which allows the transfer of the short title, edition, segment, text identification (ID), and actual key	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 on the ANCD keyboard **Note:** The receiving ANCD must press RECEIVE 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 show preparing to transfer time and then both ANCDs will show Transfer in Progress Once the transfer has been completed, the display screen will show Transfer Successful	8. The target ANCD display screen will display Transfer in Progress; once transfer is complete, display screen will display Transfer Successful

Operator task: Transfer SOI Data from ANCD to ANCD:

Subtask	Action (Source ANCD)	Result (Source ANCD
a. Source ANCD menu selections	1. Press ON/OFF buttons	Select SOI
	2. Enter SOI	Select SEND
	3. Enter SEND	Scroll up/down arrow and press ENTER to select SOI set
	4. Press down arrow key; press up/down arrow key	SOI set: (name/ number)

Subtask	Action (Source ANCD)	Result (Source ANCD)
	5. Press ENTER to select	Edition: (name/ time periods); the ANCD will ask, "Do you want to specify groups to send? (Y/N)"
	6. Enter NO	The ANCD will ask, "Do you want to specify a time period to send? (Y/N)"
	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 to send
Subtask	**Action (Target ANCD)**	**Result (Target ANCD)**
b. Target ANCD menu selections Transfer data from ANCD to ANCD	1. Press ON/OFF buttons	Select RECEIVE
	2. Enter SOI	
	3. Enter RECEIVE	Receive from ANCD
	4. Enter ANCD	Connect ANCD to ANCD with cable

Subtask	Action (Target ANCD)	Result (Target ANCD)
	5. Press down arrow key; connect ANCDs with cable; press SEND and RCV	Press RCV to receive The display will read Processing Please Wait and shows 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 purpose of the SKL is to replace/complement the AN/CYZ-10 Data Transfer Device (DTD) that is currently fielded to support the Electronic Key Management System (EKMS) architecture.

The SKL will significantly enhance the ability of the user to utilize and distribute electronic key material, electronic protection (EP) material, and SOI information. The SKL is backward-compatible with AN-CYZ-10 and 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. 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.

Description and Characteristics of the SKL

The SKL is a hand-held digital computer, with the added features of portability, and is ruggedly designed to withstand battlefield conditions, running 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.

- The SKL can be operated by battery pack or with 8 AA batteries.
- The PCMCIA KOV-21 card is only removable from the SKL during depot-level maintenance.
- Fill port connector: 6-pin.
- Size: 7.4" x 3.75" x 1.5".
- Weight: Approximately 18.25 ounces without battery, 27.4 ounces with Li-lon battery.

Operator task: 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 you see the system start to boot, and then release the button	The system should boot to the default SSO login window
b. Observe the KOV-21 LED **Note:** If the LED is flashing, a logon 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 (all caps). This window asks if the user wants to initialize the card and pair it to this host computer	1. Press the OK button	External CIK window opens

Subtask	Action	Result
	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
c. Launch SKL UAS **Note:** Normally the user would stay in the core library and create the other user accounts that are required by the unit. However, SKL UAS must first 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

Subtask	Action	Result
	2. Select Launch > Launch UAS from the core library main menu	
	3. Make sure that SKL is highlighted and then press the OK button	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 the OK button	SKL UAS desktop window opens

Operator task: Powering up and logging onto the 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 you see the system start to boot, and then release the button	The system should boot to the core library login window
b. Observe the KOV-21 LED **Note:** If the LED is flashing, a logon 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 (all caps). This window asks if the user wants to initialize the card and pair it to this host computer	1. If the LED is not flashing	A logon window will open indicating the user must logon to the core library to proceed

Subtask	Action	Result
	2. If the LED 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 including the troubleshooting steps taken (and results, if any) and delivering the SKL to the SSO
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.	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 disappear if the user ID and password are correct; the core library desktop window then appears

Subtask	Action	Result
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 tape the OK button	The progress window opens, followed by the SKL startup information window
	3. Tape on the OK button with the stylus	The SKL UAS main menu is displayed; the SKL UAS main menu is now open and ready to use
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 the user had open when starting this final routine

Subtask	Action	Result
	2. When satisfied with the selections, tap the stylus on the OK button to close the window	

Operator task: Powering down the SKL from the SKL UAS:

Subtask	Action	Result
Exit the SKL UAS program **Note:** Save changes to your 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 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

Operator task: SKL to fill transfer:

Subtask	Action	Result
An SKL can transfer any key present in the SKL to the FILL DTD such as KEKs, TEKs, TrKEKs, and TSKs; this transfer process will use the DS-101 protocol, with which the short title, edition, segment, and 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	On the SKL, the status window opens and the display reads Attempting to Connect
	4. On the FILL DTD from the DS-101 main menu, highlight RCV and press the ENTER button	On the FILL DTD, the display shows Connect to Station; press RCV
	5. Press the RCV button	On the SKL, the status window shows Transmit Successful then Operation Successful
	6. Tap OK	The transfer is complete

Subtask	Action	Result
	7. On the FILL DTD, press the main menu button to return to the main menu	The transfer is complete

Operator task: ANCD to SKL transfer:

Subtask	Action	Result
An ANCD DTD can transfer any key present in the SKL to the FILL DTD such as KEKs, TEKs, TrKEKs, and TSKs; this transfer process will use the DS-101 protocol, although it can use the DS-102 protocol as well, with which the short title, edition, segment, and text ID, and actual key can be transferred	1. On the ANCD DTD, highlight Xmt 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 to see the next 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 you to connect the ANCD to the DTD; use a standard FILL cable to connect to the SKL

Subtask	Action	Result
	4. Press ENTER	The ANCD DTD shows 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
	7. On the FILL DTD, press the main menu button to return to the main menu	On the SKL, the Receive Edition DS-101 tag window opens; this is 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 the user to select the key type
	8. Make sure the devices are connected together with the standard FILL cable and press FINISH	N/A

Subtask	Action	Result
	9. Use the virtual keyboard to enter this data; when finished, press OK	If the SKL recognizes the key, the status window opens and the display will read operation successful
	10. Once selected, press OK	N/A
	11. Press OK to complete the transfer process	The transfer is complete
	12. On the ANCD DTD, press the main menu button to return back to the main menu	N/A

Operator task: SKL to ANCD transfer:

Subtask	Action	Result
An ANCD DTD can transfer any key present in the SKL to the FILL DTD such as KEKs, TEKs, TrKEKs, and TSKs; this transfer process will use the DS-101 protocol, although it can use the DS-102 protocol as well, with which the short title, edition, segment, and text ID, and actual key can be transferred	1. On the SKL, tape 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 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 press OK	On the SKL, the status window opens displaying Attempting to Connect

Subtask	Action	Result
	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 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, and 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
	7. Highlight No and press ENTER	On the SKL, status window shows Transmit Successful then Operation Successful
	8. Press OK	The transfer is complete

Subtask	Action	Result
	9. On the ANCD DTD, press the main menu button to return back to the main menu	

Chapter 6

Capability Set 13

The Army's first capability set (CS), known as CS 13, is a package of network components, associated equipment, and software that provides an integrated network capability from the static tactical operations center (TOC) to the dismounted Soldier. Capability sets will be distributed throughout a combat formation and its supporting elements — from the brigade command post to the commander on the move to the dismounted Soldier. CS 13 provides commanders and Soldiers vastly increased abilities to communicate and share information. Significant capability enhancements include Mission Command on the Move (MCOTM), allowing leaders access to network capabilities found in a TOC while mounted in combat vehicles and delivering the network to individual Soldiers at the squad level.

CS 13 is a network baseline anchored on the integration of satellite-based communications and terrestrial networking radios, which can be adjusted annually based on changing requirements, emerging technology, and operational feedback. It provides enhanced capability over current theater-provided network equipment and is anchored by two major upgrades: MCOTM, allowing commanders to take the network with them via the WarFighter Information Network-Tactical (WIN-T) Increment 2, and bringing dismounted Soldiers into the network by empowering ground troops with a new level of real-time information through advanced radios and hand-held devices. CS 13 is a critical enabler, leveraging integrated networked capabilities to provide today's warfighter the decisive advantage in any environment.

Commander's Vehicle with Capability Set 13

A commander's vehicle will be equipped with the following CS 13 systems, which will be operated by the commander's driver/radio operator (not necessarily a signal Soldier).

Table 6-1. Commander's vehicle equipped with CS 13			
SYSTEM	**CO CDR VEH**	**BN CDR VEH**	**BDE CDR VEH**
Point of presence (PoP)	1	1	1
JCR/BFT 2	1	1	1
AN/PRC-117G	1	1	1
JTRS HMS MPs	1	3	2
AN/VRC 104(V)1	1	1	1
Soldier network extension (SNE)	1		
AN/VRC-92	1		

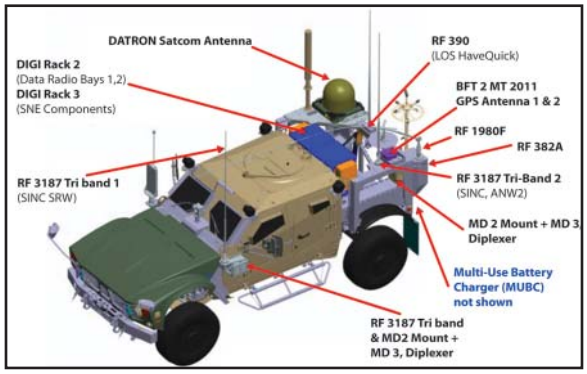

Figure 6-1. M-ATV with CS 13/14

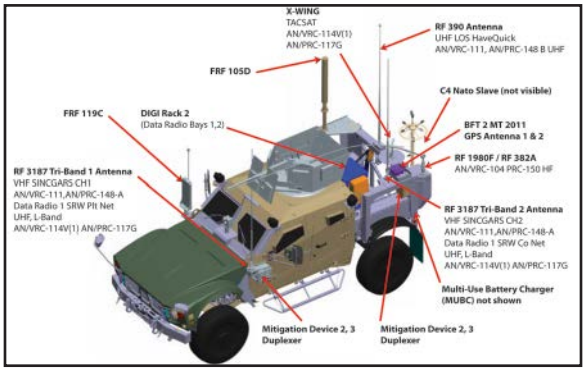

Figure 6-2. M-ATV Lite Variant with CS 13/14

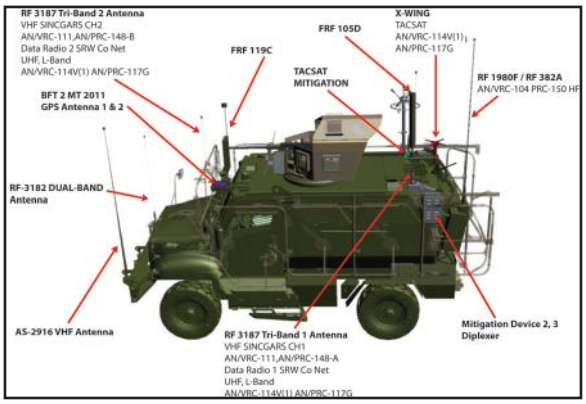

Figure 6-3. MaxxPro with CS 13/14

The first CS 13 systems were fielded to the 10th Mountain Division. They included the systems described below.

WIN-T Increment 2

The WIN-T is essentially the Soldier's Internet, providing the tactical communications network backbone to which other networked systems need to connect to function. The currently fielded WIN-T Increment 1 provides satellite-based, beyond-line-of-sight voice, video, and data communication down to the battalion level. Vehicle-borne Soldiers have only to pull over to the side of the road to communicate.

WIN-T Increment 2 is a major upgrade that will introduce mission command on the move, allowing Soldiers to communicate continuously inside moving tactical vehicles. WIN-T Increment 2 will also extend satellite communications down to the company level, which means that the Soldiers closest to the fight will have greater connectivity than ever before. WIN-T Increment 2 also introduces self-forming, self-healing networking radios and enhances network operations tools for network planning and monitoring. Among WIN-T Increment 2's main component systems for the BCT are the tactical communications node (TCN), PoP, SNE, and the vehicular wireless package (VWP).

The TCN is the centerpiece and hub of the WIN-T network, delivered to the unit on a medium tactical vehicle platform. As the main network support element for command posts and TOCs, the Increment 2 TCN remains connected as Soldiers "jump" to a new command post location — a capability that is not possible with Increment 1 technology.

The WIN-T PoP is the primary on-the-move configuration item that will be installed on the tactical combat platforms of select commanders and staff officers at division, brigade, and battalion echelons. WIN-T SNEs will be installed in combat vehicles for select battalions and companies. The final component of the WIN-T Increment 2 network is the VWP, which extends the WIN-T network to command post vehicles moving in convoy with the TCN.

Note: WIN-T Increment 2 began fielding in October 2012 and is deploying as the backbone of CS 13. The total Army will ultimately be

equipped with a combination of WIN-T Increments (Increment 1, 2, or 3) best suited to meet mission and need. Capabilities –

- Supports initial collaboration, mission planning, and rehearsal, and for the first time introduces mobility to the network.
- Brings a mobile network infrastructure, which means the network stays connected while moving.
- Extends the network down to company level.
- Introduces networking radios and enhances network operations for network planning and monitoring.

Company Command Post

The company command post (CoCP) delivers to the company level communication capabilities previously found only at the battalion level and above, thereby increasing the effectiveness of commanders in decentralized operations. A CoCP for a maneuver company is scalable, supports mobile and short-halt operations, requires minimum manpower, and is reliable, with limited field support necessary to sustain it.

Figure 6-4. Company command post

Joint Capabilities Release

The Joint Capabilities Release (JCR) is a key software upgrade to the widely fielded Force XXI Battle Command Brigade and Below/Blue Force Tracking (FBCB2/BFT) system that allows Soldiers in vehicles, aircraft,

and command posts to track friendly forces and exchange messages in order to synchronize operations and avoid fratricide. JCR utilizes the faster BFT2 satellite network for improved accuracy of position location information. Future JCR releases will provide additional services, including open office file transfers, image downloads, chat, and instant messaging.

Figure 6-5. FBCB2/BFT

Nett Warrior

Nett Warrior is a Soldier-worn, smartphone-like mission command system that runs various mission applications. These hand-held devices will be fielded to team leaders and above, allowing them to communicate seamlessly within their units and with higher headquarters. These devices connect to the Army's larger tactical communications network through the Joint Tactical Radio System (JTRS) Rifleman Radio.

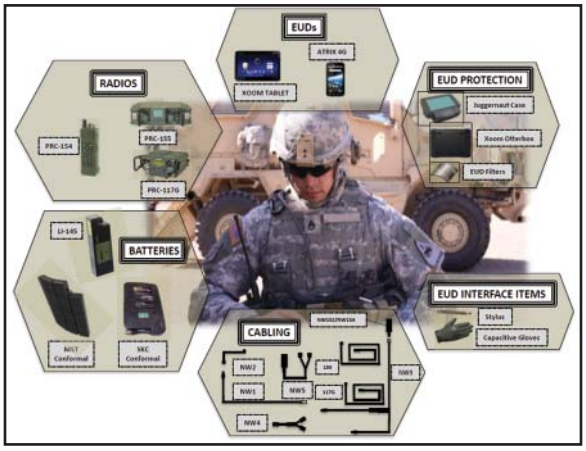

Figure 6-6. NETT Warrior

AN/PRC-155, JTRS Hand-held, Manpack (MP), Small Form Fit (HMS) Manpack

HMS-MP: Two-channel software reprogrammable radio that supports the Single-Channel Ground and Airborne Radio System (SINCGARS), Soldier Radio Waveform (SRW), Mobile User Objective System (MUOS), ultrahigh frequency (UHF) tactical satellite (TACSAT), and high frequency (HF) waveforms. Configured as manpack or vehicle mounted, this radio is geared to be in virtually all leader vehicles and dismounted radio telephone operators.

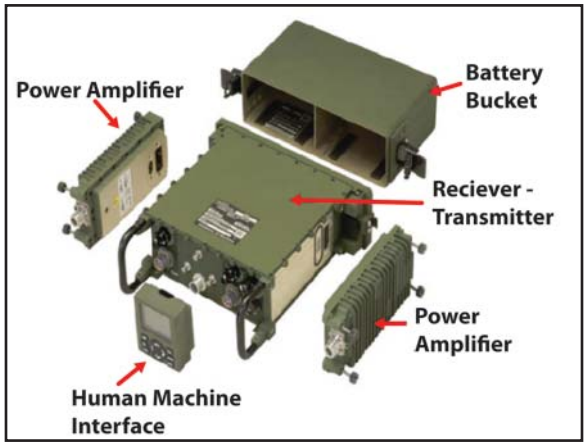

Figure 6-7. AN/PRC-155, JTRS Hand-held, MP, Small Form Fit MP

Single-Channel Ground and Airborne Radio System

This device is the primary radio the Army uses for voice communications in the field today. With configurations including MP, vehicular (both low and high power), and airborne models, more than 500,000 SINCGARS have been fielded.

Soldier Radio Waveform Appliqué

Generic term for a single-channel reprogrammable radio that supports the SRW and depending on vendor solution MUOS, SINCGARS, TACSAT, and HF. Designed to fit into legacy SINCGARS Advanced System Improvement Programs (ASIPs), some vendor solutions provide independent mounts with jerk-and-run capability (for dismounting). This radio is for vehicles that do not need all of the two-channel capabilities of the HMS-MP.

AN/PRC-117G Tactical Radio

This wireless voice and data radio allows Soldiers to exchange large amounts of tactical data, such as video and biometrics. The radio can support small-unit operations and connect the tactical edge with forces at the company level and above.

Figure 6-8. AN/PRC 117G

AN/PRC-154, Rifleman Radio

A single-channel, hand-held (type 2) radio running the SRW that is designed for dismounted Soldiers. This radio provides voice, PLI, and command and control capability down to the lowest echelons. In virtually all cases this radio system requires a gateway SRW and cross-domain guard to bridge between the dismounted and mounted network.

Figure 6-9. AN/PRC-154

Appendix A

Julian Date Calendar

Julian Date Calendar (Regular Year)												
Day/ Mo	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

Figure A-1

Julian Date (Leap Year)												
Day/ Mo	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

Figure A-2

Appendix B

World Time Zones and Time Conversion

Zulu Time

Zulu time remains in sync 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 762-1401, 762-1069 (Washington, DC) or DSN 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 (GPS) Receiver or a Defense Advanced GPS 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.

Figure B-1 outlines each time zone around the world and their relationship to Zulu time. Figure B-2 shows a world time zone map.

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

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

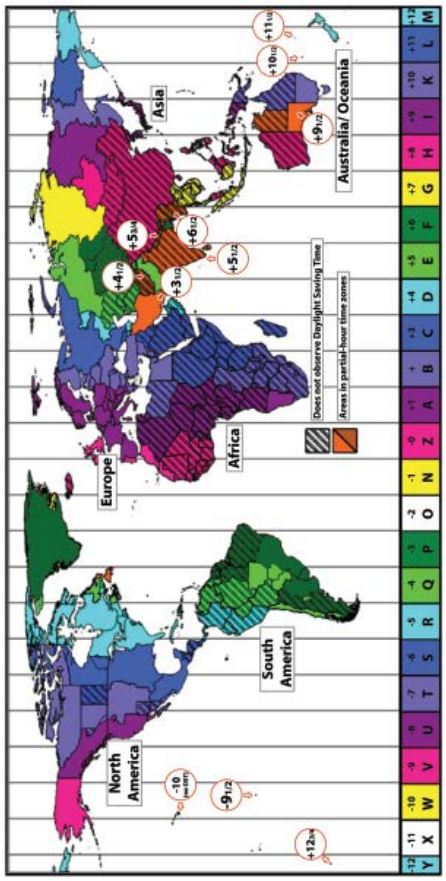

Figure B-2. World time zones chart from http://www.time.gov/images/worldzones.gif

Appendix C

Radio Frequency Spectrum

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

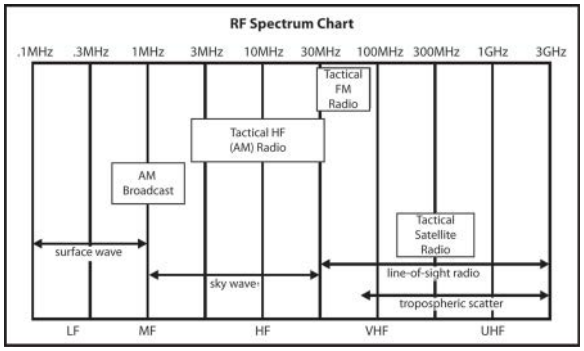

Figure C-1. RF spectrum chart

The Army uses the following single-channel radios:

- **Frequency modulation (FM) radio.** The FM radio has a range of approximately 35 to 40 kilometers, which covers 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.** An HF radio's longer range overcomes terrain limitations for users with greater dispersion. Using the improved high frequency radio provides a versatile capability for short- and long-range communications. 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 LOS cannot be achieved.

- **Tactical satellite (TACSAT) radio.** The use of satellite communications gives the commander the greatest range. It is useful when users are separated by long distances, such as rapid deployment forces and special operations units. The single-channel TACSAT radio transmits in the ultra HF or very HF range, which requires 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 single-channel 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 procedures (SOPs). If the operator 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 operator should ensure the radio system is installed properly, to include verifying operating frequency, correct azimuth for directional antennas, and polarization of antennas, and verify the distance from other radio systems or other sources of electromagnetic interference, such as generators. If interference persists, the operator should follow unit SOPs on proper interference reporting procedures.

Note: For additional information, see Field Manual 6-02.70, *Army Electromagnetic Spectrum Operations*, May 2010

Appendix D

Radio Procedures

Prowords

Proper procedure words (often called prowords) are words or phrases that should be used during radio transmissions. Prowords are used to facilitate communication by conveying information in a condensed form. Radio operators should be familiar 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.

Proword	Meaning
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 acknowledgement has been received.)
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 10 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.

Proword	Meaning
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 addresses 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.
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.

Proword	Meaning
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.
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.)

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

Phonetic Alphabet and Numbers

Letter/#	Word	Letter/#	Word	Letter/#	Word	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	Z	Zulu	0	Zero	1	One
2	Two	3	Three	4	Four	5	Five
6	Six	7	Seven	8	Eight	9	Niner

Figure D-1

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 report is used to request help in handling a hazard that influences a unit's mission and beyond the unit's ability to handle. This report helps commanders set priorities based on the battlefield situation.

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.

Spot Report		
Line 1	DTG	DTG item was discovered
Line 2	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
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 and should be free from embellishments or exaggeration.

SALUTE Report	
Size	What is the size of the unit (number of personnel and vehicles [highway, rail, etc.] and equipment [tents, weapons, etc.])?
Activity	What are they doing (moving in column/mass, or setting up a defensive position; 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, 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?

SALUTE Report	
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 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, NCS will call directly for any stations that failed to respond. If the station still does not reply, execute Loss of Communications Procedures (see Appendix F). 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 procedure 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 Communications 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:

- Attempt to raise the unit on a different net it is monitoring (for example, brigade operations and intelligence, brigade administrative and logistics, battalion Crypto Management System, signal conditioning tactical satellite, high frequency, or mobile subscriber equipment).
- 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.
- Contact an adjacent unit and have it physically make contact with the nonresponsive unit.
- If there has been a frequency period change, attempt to reach on old CUE frequency.

If the 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

The necessity for secure communication in transmitting a 9-line medical evacuation (MEDEVAC) request is mission, enemy, terrain and weather, troops and support available-time available, and civil considerations (METT-TC) dependent. Specific procedures, frequencies, and security requirements for transmittal of evacuation requests are delineated through the orders process and are made a part of unit/command standing operating procedures.

Often MEDEVAC requests are sent from the point of injury through intermediaries such as higher headquarters, which then transmits the request up to the nearest MEDEVAC unit. The unit relaying the request must ensure it relays the exact information originally received. The radio call sign and frequency relayed are that of the requesting unit. However, the intermediaries' contact information may be given as additional information for purposes of call-back and mission clarification.

Questions concerning evacuation requests or requirements for Air Force aeromedical assets should be referred to the nearest supporting medical treatment facility, such as the area support medical company.

Table G-1. Categories of evacuation precedence:

Category	Criteria
Priority I – URGENT *	Assigned to emergency cases that should be evacuated as soon as possible and within a maximum of one hour in order to save life, limb, or eyesight; to prevent complications of serious illness; or to avoid permanent disability
Priority IA – URGENT-SURG	Assigned to patients who must receive far forward surgical intervention to save life and to stabilize them for further evacuation
Priority II – PRIORITY	Assigned to sick and wounded personnel requiring prompt medical care. This precedence is used when the individual should be evacuated within four hours or his medical condition could deteriorate to such a degree that he will become an URGENT precedence, or whose requirements for special treatment are not available locally, or who will suffer unnecessary pain or disability.
Priority III – ROUTINE	Assigned to sick and wounded personnel requiring evacuation but whose condition is not expected to deteriorate significantly. The sick and wounded in this category should be evacuated within 24 hours.

Category	Criteria
Priority IV – CONVENIENCE **	Assigned to patient for whom evacuation by medical platform is a matter of medical convenience rather than necessity.

* The new requirement for the URGENT and URGENT SURGICAL evacuation categories has been changed to one hour as a directive of the Department of Defense.

** NATO Standardization Agreement 3204 has deleted the category of Priority IV – CONVENIENCE; however, it will still be included in the U.S. Army evacuation priorities, as there is a requirement for it on the battlefield.

Table G-2. Example 9-Line MEDEVAC request:

Line	Item	Evacuation Request Message
1	Location of pickup site	Transmittals of grid coordinates are described in the operation order (OPORD) and are made a part of the unit/command standing operating procedures (SOPs). The necessity for secure communication in transmitting a request is METT-TC dependent.
2	Radio frequency, call sign, and suffix	Transmittals of the frequency of the radio at the pickup site, not a relay frequency, are described in the OPORD and are made a part of unit/command SOPs. The necessity for secure communication in transmitting a request is METT-TC dependent. The call sign (and suffix used) of person to be contacted at the pickup site may be transmitted in the clear.
3	Number of patients by precedence	Report only applicable information, and encrypt brevity codes. A = Urgent, B = Urgent-Surgery, C = Priority, D = Routine, E = Convenience. (If two or more categories are reported in the same request, insert the word “break” between each category.)
4	Special equipment required	Encrypt applicable brevity codes. A = None, B = Hoist, C = Extraction equipment, D = Ventilator.

Line	Item	Evacuation Request Message
5	Number of patients by type	Report only applicable information and encrypt brevity code. If requesting MEDEVAC for both types, insert the word “break” between the litter entry and ambulatory entry: L = number of patients-litter, A = number of patients-ambulance (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), 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, 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, E = Enemy prisoner of war.

Line	Item	Evacuation Request Message
9	CBRN contamination (wartime)	Include this line only when applicable. Encrypt the applicable brevity codes. C = Chemical, B = Biological, R = Radiological, N = Nuclear.
	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 (lake, mountain, tower).

Appendix H

Glossary

ACADA	automatic chemical agent detector
AK	automatic remote keying
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	communications security encryption key
CODEWORD	one-word notice that refers to other information
COMMEX	communications exercise
COMSEC	communications security
COP	common operational picture
CS	Capability Set
CT	cipher text
CUE	to key the radio net
DTED	digital terrain elevation data
DU	display unit
EPLARS	Enhanced Position Location and Reporting System
ERF	electronic remote fill
FBCB2	Force XXI battle command—brigade and below
FH-M	frequency hopping-manual

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
KEK	key encryption key
KU	keyboard unit
LOS	line of sight
LRAS3	Long Range Advanced Scout Surveillance System
MAN	manual
MANPACK	man portable radio set
MDL	mission data load
MUOS	Mobile User Objective System
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 Global Positioning System (GPS) Receiver
PLI	position location information
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 procedures
SRW	Soldier Radio Waveform
TEK	transmission encryption key
TIRS	Tactical Information Retrieval System
TSK	transmission security key
UMTS	Universal Mobile Telecommunications System
VPF	Vector product information

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