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JUNE 2018
Rev. D

RF-7800B-DU024 LAND PORTABLE RF-7800B-VU104 LAND MOBILE BROADBAND GLOBAL AREA NETWORK TERMINAL

OPERATION MANUAL

HARRIS® TECHNOLOGY TO CONNECT, INFORM AND PROTECT™

LIMITED ONE YEAR WARRANTY
HARRIS CORPORATION (COMMUNICATION SYSTEMS)

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

NOTE: Terms and conditions of the standard warranty may be superseded by the terms and conditions of your contract.

WHAT WE WILL DO - If your Harris Corporation equipment purchased from us fails in normal use because of a defect in workmanship or materials within one year from the date of shipment, we will repair or replace (at our option) the equipment or part with new, reconditioned, or remanufactured equipment or parts without charge to you, at our authorized repair center or factory.

WHAT YOU MUST DO - You must notify us promptly of a defect within one year from date of shipment. Assuming that Harris concurs that the complaint is valid, and is unable to correct the problem without having the equipment shipped to Harris:

- Customers with equipment purchased for use outside the United States must obtain a Return Material Authorization (RMA) Number for the return of the defective equipment or part to our factory in Rochester, NY, U.S.A., for repair or replacement. You must prepay all transportation, insurance, duty and customs charges. We will pay for return to you of the repaired/ replaced equipment or part, C.I.F. destination; you must pay any duty, taxes or customs charges.
- Customers with equipment purchased for use in the United States must obtain an RMA number, properly pack, insure, prepay the shipping charges and ship the defective equipment or part to our factory or to the Authorized Warranty Repair Center indicated by us.
    - RMA may be obtained using our Premier Website https://tcpremier.harris.com
    - Shipping instructions will be provided with the RMA confirmation.
    - Harris Product Service: Phone (585) 242-3561, Toll-free (866) 264-8040, Fax: 585-242-4483

Harris will repair or replace the defective equipment or part and pay for its return to you, provided the repair or replacement is due to a cause covered by this warranty.

WHAT IS NOT COVERED - We regret that we cannot be responsible for:

- Defects or failures caused by buyer or user abuse or misuse.
    - Units that have been misused, neglected, or damaged by accident.
- Defects or failures caused by unauthorized attempts to repair or alter the equipment in any way by persons other than Harris.
    - Includes units that have been disassembled
- Damage caused by leaking batteries
- Consequential damages incurred by a buyer or user from any cause whatsoever, including, but not limited to improper packaging, transportation, non-Harris repair or service costs, downtime costs, costs for substituting equipment or loss of anticipated profits or revenue.
- The performance of the equipment when used in combination with equipment not purchased from Harris.
- HARRIS MAKES NO OTHER WARRANTIES BEYOND THE EXPRESS WARRANTY AS CONTAINED HEREIN. ALL EXPRESS OR IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY ARE EXCLUDED.

SERVICE WARRANTY - Any repair service performed by Harris under this limited warranty is warranted to be free from defects in material or workmanship for sixty days from date of repair. All terms and exclusions of this limited warranty apply to the service warranty.

IMPORTANT - Customers who purchased equipment must obtain an RMA before shipping the defective equipment to us. Failure to obtain an RMA before shipment may result in a delay in the repair/replacement and return of your equipment.

IF YOU HAVE ANY QUESTIONS - Concerning this warranty, please refer to Harris Terms & Conditions of Repair at http:///tcpremier.harris.com/pdf/general/10515-0003_tcm26-18726.pdf

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Firmware Version 6.1.0.3

HARRIS CORPORATION COMMUNICATION SYSTEMS
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SAFETY SUMMARY

1. INTRODUCTION

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

- **WARNING** Used when injury or death to personnel and damage to equipment is possible
- **CAUTION** Used when there is a possibility of damage to equipment
- **NOTE** Used to alert personnel to a condition that requires emphasis

2. PERSONNEL AND EQUIPMENT SAFETY

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

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

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

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

3. OPERATIONAL AND MAINTENANCE SAFETY GUIDELINES

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

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

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

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

d. Extreme care must be used when adjusting or working on operating equipment. Voltages in excess of 70 V or current sources in excess of 25 A are covered with barriers. Barriers include warning information about the hazard encountered upon barrier removal.

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

   1. Shut off power.

   2. Call for help.

   3. Administer first aid if qualified.

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

f. Personnel should work with one hand whenever possible to prevent electrical current from passing through vital organs of the body. In addition, personnel must never work alone. Someone must be available in the immediate area to render emergency first aid, if necessary.

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

h. Some electrolytic capacitors contain aluminum oxide or tantalum. If connected incorrectly, the capacitor will explode when power is applied. Extreme care must be used when replacing and connecting these capacitors. The capacitor terminals must always be connected using the correct polarity: positive to positive and negative to negative.

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

EQUIPMENT USERS

User must be a skilled person. Designated users should not be exposed to conditions that could cause pain or injury, nor intentionally caused said conditions.

DO NOT SERVICE EQUIPMENT ALONE

Never work on electrical equipment unless another person familiar with the operation and hazards of the equipment is near. When the maintenance technician is aided by operators, ensure that operators are aware of the hazards.

GROUNDING

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

TURN OFF POWER AND GROUND CAPACITORS

Whenever possible, power to equipment should be turned off before beginning work on the equipment. Be sure to ground all capacitors that are potentially dangerous.

KEEP AWAY FROM LIVE CIRCUITS

Operators and maintainers must observe all safety regulations at all times. Do not change components or make adjustments inside equipment with a high voltage supply on unless required by the procedure. Under certain conditions, dangerous potentials may exist in circuits with power controls off, due to charges retained by capacitors.

DO NOT BYPASS INTERLOCKS

Do not bypass any interlocks unnecessarily. If it is necessary to employ an interlock bypass for equipment servicing, use extreme care not to come in contact with hazardous voltages.

RADIATION HAZARD

Operators must keep a minimum required clearance of 1 m away from the equipment during operation.

USE CARE HANDLING HEAVY EQUIPMENT

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

HEED WARNINGS AND CAUTIONS

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

PROTECTIVE EYEWEAR

All personnel must wear protective eyewear when servicing or maintaining equipment. Protective eyewear must be worn at all times when using tools.

4. PROTECTION OF STATIC-SENSITIVE DEVICES

Diode input-protection is provided on all static-sensitive devices. This protection is designed to guard against adverse electrical conditions such as electrostatic discharge. Although most static-sensitive devices contain protective circuitry, several precautionary steps should be taken to avoid the application of potentially damaging voltages to the inputs of the device.

To protect static-sensitive devices from damage, the following precautions should be observed.

a. Keep all static-sensitive devices in their protective packaging until needed. This packaging is conductive and should provide adequate protection for the device. Storing or transporting these devices in conventional plastic containers could be destructive to the device.

b. Disconnect power prior to insertion or extraction of these devices. This also applies to PWBs containing such devices.

c. Double check test equipment voltages and polarities prior to conducting any tests.

d. Avoid contact with the leads of the device. The component should always be handled carefully by the ends or side opposite the leads.

e. Avoid contact between PWB circuits or component leads and synthetic clothing.

f. Use only soldering irons and tools that are properly grounded. Ungrounded soldering tips or tools can destroy these devices. SOLDERING GUNS MUST NEVER BE USED.

5. FCC COMPLIANCE

This device conforms to the FCC rules. Any changes or modifications to Harris Corporations equipment, not expressly approved by Harris Corporation could void the user's authority to operate the equipment.

To comply with FCC RF exposure requirements, this device must be operated with a minimum separation distance of 20 cm or more from a person's body. Other operating configurations should be avoided.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

6. DECLARATION OF CONFORMITY

Harris Corporation of Rochester NY, USA, declares under our sole responsibility that the product Harris RF-7800B-VU104 and RF-7800B-DU024 Satellite IP Terminal to which this declaration relates, is in conformity with the following standards and/or other normative documents:

ROHS Directive 2011-65-EU, IEC/EN 62368-1:2014, EN 301 444 V2.1.2 (2016-11), EN 301 489-1 V2.1.1 (2017-02), EN 301 489-20 V1.2.1 (2002-11), EN 62311:2008.

We hereby declare that all essential radio test suites have been carried out and that the above named product is in conformity to all the essential requirements of Radio Equipment Directive (RED) 2014/53/EU

The technical documentation relevant to the above equipment will be held at:

Harris Corporation 1680 University Avenue Rochester, New York 14610

7. EUROPEAN UNION WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT DIRECTIVES

The European Union (EU) directive on waste electrical and electronic equipment mandates recycling of electrical and electronic equipment throughout the EU by August 13, 2005.

Unless otherwise noted, all products, assemblies, and sub-assemblies manufactured by Harris and its sub-contractors will be compliant with this directive and any subsequent revisions or amendments. This product carries the WEEE Directive 2012/19/EU label below to demonstrate compliance.

For addition information, contact Harris Corporation at: www.harris.com.

RF-7800B-DU024 LAND PORTABLE RF-7800B-VU104 LAND MOBILE BROADBAND GLOBAL AREA NETWORK TERMINAL

OPERATION MANUAL

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CHAPTER 1

GENERAL INFORMATION

1.1 SAFETY PRECAUTIONS

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

- WARNING - Paragraph 2.2.1 - Do not operate the BGAN terminal during electrical storms.
- WARNING - Paragraph 2.2.1 - Never use the BGAN terminal where blasting work is in progress.
- CAUTION - Paragraph 2.2.1 - Avoid placing BGAN terminal near any source of heat such as an open flame.
- CAUTION - Paragraph 3.5 - Do not stand in front of the BGAN terminal.
- WARNING - Paragraph 5.3.3 - Do not overcharge, short circuit, incinerate, or mutilate rechargeable batteries.
- WARNING - Paragraph 5.3.4 - Do not dispose of batteries in uncontrolled trash, as batteries may contain hazardous materials.

1.2 PURPOSE OF THIS MANUAL

This operation manual provides operating instructions, as well as technical information required to support Level I (operator) Maintenance of RF-7800B Broadband Global Area Network (BGAN) Terminals (referred to throughout this manual as BGAN terminal).

1.2.1 Acronyms

All acronyms used are contained in the Glossary at the back of this manual. Refer to Appendix B.

1.2.2 Warranty

For warranty information, refer to the inside front cover of this manual.

1.3 EQUIPMENT DESCRIPTION

The Harris RF-7800B Land Mobile and Land Portable BGAN Terminals provide a high-performance Satellite Communications (SATCOM) solution with reliable voice and broadband data connectivity for Beyond-Line-of-Sight (BLOS) SATCOM-on-the-Move (SOTM) and SATCOM-on-the-Quick-Halt (SOQH) applications. The BGAN SATCOM spectrum (L-Band) utilizes the International Marine/Maritime Satellite (INMARSAT) 4 constellation, providing wideband Internet Protocol (IP) data throughput up to 492 kbps. These high data throughput backbone links can interconnect warfighter tactical networks to Tactical Operation Centers (TOC) as well as beyond line of sight vehicles or regional headquarters.

As a standalone device integrated into an existing network infrastructure, the BGAN terminals allow an Integrated Services Digital Network (ISDN)-capable device to be plugged in for circuit switched mode use across the BGAN network. This ISDN interface provides the ability to connect directly to the Public Switched Telephone Network (PSTN) for telephony and data communications. This interface also provides the ability to connect Secure Terminal Equipment (STE) directly to the BGAN terminal for secure telephone calls.

RF-7800B BGAN terminal products ensure a seamless tactical network-centric BLOS connectivity interface to existing Falcon III tactical networks. When the AN/PRC-117G or RF-7800M-MP manpack radio is set up as a BGAN gateway using a BGAN-enabled preset, the BGAN terminal provides BLOS range extension of data networking capabilities through simultaneous operation with mobile wideband networked line-of-sight (LOS) nodes. The Falcon III radios remote control the BGAN terminals to automatically create a connection to the INMARSAT network, providing a fully integrated end-to-end IP data network for assured and secured communications.

BGAN terminals can be configured and actively controlled via an embedded web-based interface. The web interface is used to configure the BGAN terminal to meet system architecture requirements, including all IP networking properties, automatic network connections, inactivity timers and ISDN properties. BGAN satellite connections can be initiated and monitored through the web interface. Active connection status is provided on every page. Network traffic usage is tracked in the amount of megabytes (Background Mode) and minutes (Streaming Mode), both on a mission basis as well as through the BGAN terminal's lifetime. Overall BGAN terminal status and version information may be viewed through the web interface.

1.3.1 RF-7800B-VU104 Land Mobile BGAN Terminal

The Harris RF-7800B-VU104 Land Mobile BGAN Terminal is a Class 10 BGAN SOTM Terminal that provides data rates of up to 492 kbps while on the move. See Figure 1-1. The BGAN terminal will send and receive IP packet data via the Ethernet and Universal Serial Bus (USB) simultaneously with circuit switched telephony and data via the ISDN interface over the INMARSAT BGAN satellite network.

RF-7800B-VU104 may be permanently mounted on a vehicle and is capable of operating at speeds of up to 70 mph. Continuous tracking with the INMARSAT satellite is provided to achieve successful communications. Full network connectivity is uninterrupted when vehicular velocity of motion is up to 100 degrees per second, and vehicular acceleration is up to 100 degrees per second squared in both azimuth and elevation, with simultaneous random pitch and roll.

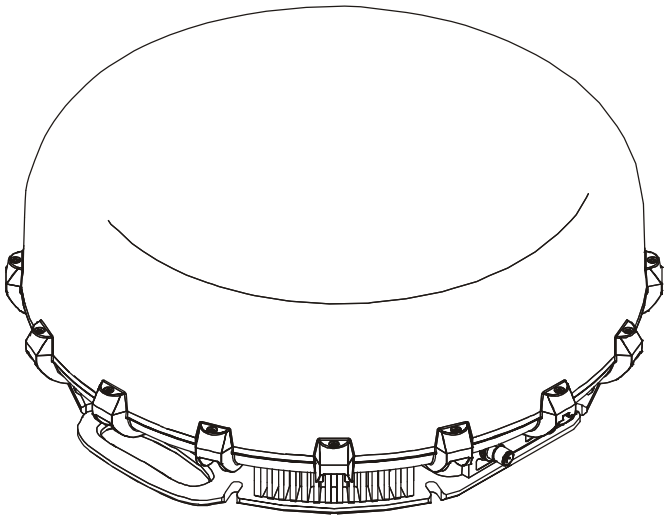

Figure 1-1. RF-7800B-VU104 Land Mobile BGAN Terminal

1.3.2 RF-7800B-DU024 Land Portable BGAN Terminal

The RF-7800B-DU024 Land Portable BGAN Terminal is a Class 2 BGAN Land Portable Terminal that provides data rates of up to 432 kbps. See Figure 1-2. This BGAN terminal is designed for operation in harsh environmental conditions. RF-7800B-DU024 is a manually pointed antenna system capable of rapid deployment for sending and receiving data once pointed at the satellite.

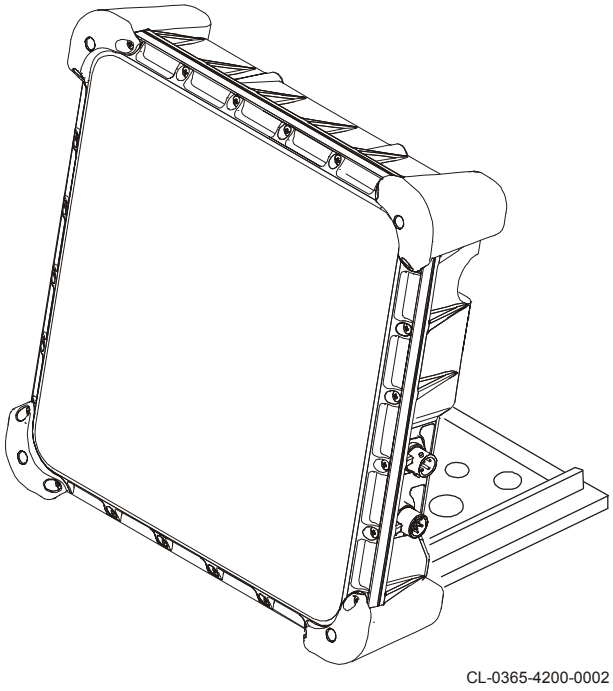

Figure 1-2. RF-7800B-DU024 Land Portable BGAN Terminal

1.3.3 USIM/SIM Card

A Subscriber Identity Module (SIM) contains an identity that uniquely identifies a subscriber of the Universal Mobile Telecommunications System (UMTS). It stores subscription and subscriber related information. The UMTS SIM (USIM) card must be installed for any operation of a BGAN terminal except for emergency calling.

Access to the USIM, and therefore to the BGAN system, may be restricted to an authorized user or number of users, using the USIM Personal Identification Number (PIN). The PIN is stored securely in the USIM. The user enters the PIN using the embedded web-based interface or the Falcon III Manpack radio front panel.

The USIM personalization feature ensures that access to a BGAN terminal or other user equipment is restricted to an authorized USIM. The USIM and the BGAN terminal share a PIN stored securely in the USIM and the BGAN terminal. If a USIM fails to prove its knowledge of the PIN, it is denied access to the BGAN terminal. If the USIM is not detected during operation, the BGAN terminal will deactivate any active Network Connection, detach from the network, and enter a "NO SIM" operational mode. The BGAN terminal must be restarted to detect a new or replaced USIM. Refer to Paragraph 2.4.

1.4 FEATURES

Features and benefits of the BGAN terminal are:

- Global System for Mobile Communications (GSM) / General Packet Radio Service (GPRS) / UMTS IP-based services
- Full IP compatibility for e-mail, File Transfer Protocol (FTP), web browsing, Virtual Private Network (VPN), and so forth.
- Ability to work in multiple modes:
  - Network Address Translation (NAT) Mode: for direct computer(s) connection
  - Relay Mode: for direct router connection
  - Bridge Mode: for direct Harris radio connection
- Multi-user capability for sharing a single unit (up to 11 simultaneous primary user contexts/sessions)
- Simultaneous use of all interfaces: Ethernet, USB, ISDN
- INMARSAT BGAN-X Certified to Land Mobile User Equipment Class 10 (RF-7800B-VU104) and Class 2 (RF-7800B-DU024)
- Federal Communications Commission (FCC), European Conformity mark (CE), and Global Mobile Personal Communications by Satellite (GMPCS) / International Telecommunication (ITM) certified
- Subscriber Identity Module (SIM) / UMTS Subscriber Identification Module (USIM) card security
- Selectable BGAN Streaming Quality of Service (QoS) rates of 32, 64, 128 kbps. Also, 256 kbps for RF-7800B-VU104 (below 45 degree look angle to the satellite the maximum streaming rate is 128 kbps)
- May be configured for automatic registration with the network
- Cost-effective, always-on, access charges for background connections only for data sent and received
- BGAN background user data rates up to 492 kbps (RF-7800B-VU104) and 432 kbps (RF-7800B-DU024) data (transmit and receive)
- RF-7800B-VU104 has fully autonomous tracking antenna to acquire and track the BGAN satellite signal while on the move

1.5 SPECIFICATIONS

Table 1-1 provides specifications for the RF-7800BGGAN Terminal.

Table 1-1. RF-7800B BGAN Terminal Specifications

Function	Specification
GENERAL	
BGAN Satellite L-Band Frequency Operation	Transmit (Tx): 1626.5 to 1660.5 MHz Receive (Rx): 1525 to 1559 MHz Full-duplex, BLOS operation
Power Specifications RF-7800B-DU024	Power consumption: 10 W (Idle), 30 W (Transmit) 15 dBW (45 dBm) Effective Isotropic Radiated Power (EIRP)
Power Specifications RF-7800B-VU104	Power consumption: 25 W (Idle/Tracking); Maximum: 60 W (Transmit) 18 dBW (48 dBm) EIRP

Table 1-1. RF-7800B BGAN Terminal Specifications (Continued)

Function	Specification
Power Options (RF-7800B-VU104)	DC voltage input range 12/24 VDC, Internal MIL-STD-1275 power supply, 120/240 VAC power supply, Standard vehicle DC adapter (refer to Paragraph 3.3.2 for available power cables)
Power Options (RF-7800B-DU024)	DC voltage input range 12/24 VDC, Optional Battery Box (12091-4010) for use with single BA-5590 style battery (nominally 20 hours of continuous operation), 120/240 VAC power supply, Standard vehicle DC adapter (refer to Paragraph 3.3.2 for available power cables)
RF-7800B-VU104 Continuous tracking	360° continuous field of view in azimuth 5° to >110° continuous field of view in elevation Travel speeds up to 70 mph (112 km/h) 100°/second (azimuth and elevation); 100°/second^2 (azimuth and elevation)
Data Interface	Ethernet, ISDN, USB (simultaneous use of all interfaces)
Circuit Switched Services	• Telephony Voice: 4 kbps • ISDN data/voice: 64 kbps, for 3.1 kHz toll quality audio (above 15 degree look angle to the satellite)
IP Networking (Packet Switched)	Supports IPv4, IP Security (IPSEC) encrypted packets, and IP bridging over Ethernet interface, or USB. Choice of Background or Streaming.
DHCP Server	Supports Dynamic Host Configuration Protocol (DHCP) Server capability
Circuit Switching Interfaces	Type 1 Secure Terminal Equipment, Plain Old Telephone System (POTS) Foreign Exchange Subscriber (FXS), and ISDN (using 12091-4160-01 ISDN to POTS Converter)
Remote control	Allows remote control commands over Ethernet
Web interface - using Internet Explorer for example	Full web interface via HyperText Transfer Protocol (HTTP) for configuration, operation, and status of the BGAN terminal
ENVIRONMENTAL	
Operating Temperature	MIL-STD-810F: -40 °C to +70 °C (-40 °F to +158 °F)
Storage Temperature	MIL-STD-810F: -40 °C to +85 °C (-40 °F to +185 °F)
Relative Humidity	MIL-STD-810 Aggravated Temperature-Humidity Cycle (95 ±4%, 30 °C to 60 °C (86 °F to 140 °F)
Rugged	MIL-STD-810F Testing: Functional Shock, Transit Drop, Vibration (Ground Mobile, Loose Cargo), Blowing Sand & Dust, Humidity, Blowing Rain, Icing/Freezing Rain, Altitude, Solar Radiation, Salt & Fog, Fungus
Immersion	1 meter
Compliance	Restriction of Hazardous Substances (RoHS) and Waste from Electrical and Electronic Equipment (WEEE)
MECHANICAL (RF-7800B-VU104)	
Dimensions	8 height x 20 depth - inches (20 x 51 cm)
Weight	28 lbs (12.6 kg)
MECHANICAL (RF-7800B-DU024)	
Dimensions	9.5 height x 9.5 width x 2.5 depth - inches (24 x 24 x 6.5 cm)
Weight	6.5 lbs (3 kg)

NOTE

Because Harris engineers continuously strive to improve all aspects of Harris equipment, specifications are subject to change without notice.

1.6 CONFIGURATIONS

For the equipment firmware revision used when documenting this manual, refer to the title page inside the front cover of this manual. The BGAN terminals covered in this manual can be differentiated as follows:

- RF-7800B-VU104 Land Mobile BGAN Terminal
- RF-7800B-DU024 Land Portable BGAN Terminal

1.7 BGAN NETWORK

BGAN operates with the INMARSAT 4 satellite constellation of four orbital satellites. See Figure 1-3. The map shows the global coverage provided by the BGAN satellites. This BGAN system operates in the L-Band spectrum, with a transmit frequency range of 1626.5 MHz - 1660.5 MHz and a receive frequency range of 1525 - 1559 MHz. The Alphasat satellite offers additional frequency ranges of 1668 - 1675 MHz and 1518 - 1559 for transmit and receive, respectively. The INMARSAT 4 constellation provides access worldwide.

Access a BGAN satellite by pointing the BGAN terminal to that satellite. In addition to the satellites, the BGAN system includes infrastructure equipment on the ground, that connects to telephone networks and the internet. By accessing the satellites, the BGAN terminal can then connect to telephone and data networks. To make use of BGAN services, users must insert their GSM/GPRS/UMTS subscriber identity module into the BGAN terminal hardware, and connect an external telephone handset and/or computer / Personal Data Assistant (PDA) to the BGAN terminal via a cabled connection.

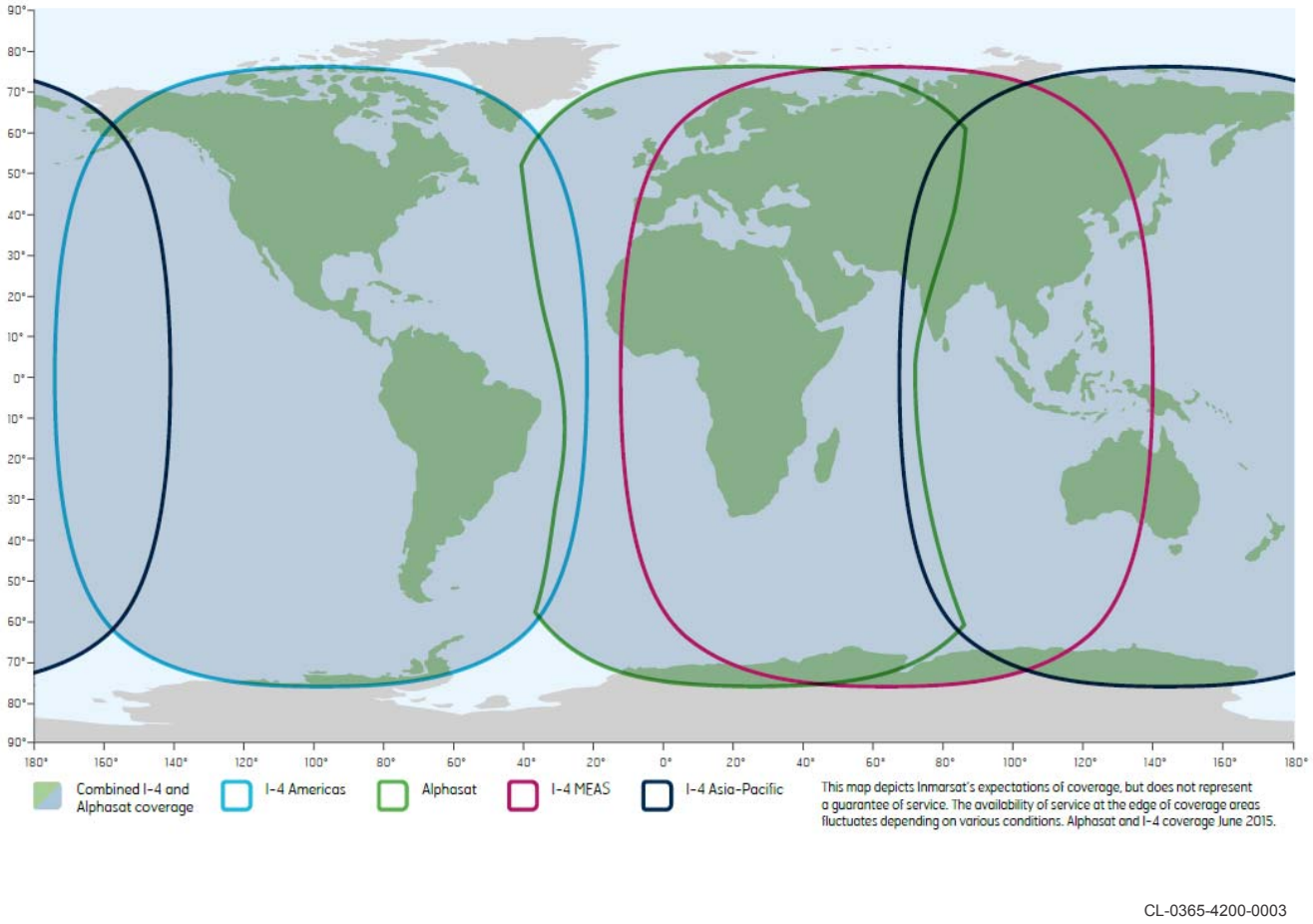

Figure 1-3. BGAN Worldwide Coverage

1.8 COMPATIBILITY

Successful communications depends on using compatible radios and terminal equipment (computer with web interface).

1.8.1 BGAN Compatible Radios

The following radios with embedded BGAN terminal remote control capability are compatible with the BGAN terminal:

- AN/PRC-117G(V)1(C)
- RF-7800M-MP

The BGAN terminal IP data is encrypted by the Sierra II™ Type-1 algorithms in the AN/PRC-117G or the Acropolis™ II Advanced Encryption Service (AES) encryption algorithms in the RF-7800M-MP. The embedded software of the manpack radio provides the ability to fully configure, remotely control and provide status and fault monitoring of the BGAN terminal using the radio's front panel.

When linked to Harris Falcon III manpack radios or SecNet 54 encryption modules, RF-7800B BGAN terminals provide end-to-end Type-1 High Assurance Internet Protocol Encryptors (HAIPE)-certified security (AN/PRC-117G) or AES256 (RF-7800M-MP) for data transmissions over long-range commercial networks.

1.8.2 Compatible Encryption Equipment

Encryption equipment compatible with the BGAN terminals includes:

- HAIPE Compatible Equipment: AN/PRC117G, Secnet54, or any existing HAIPE (e.g., KG-250, TACLANE KG-175)
- AES256 Encryption Compatible Equipment: RF-7800M-MP, Cisco Router Family
- Software Encryption Compatibility: Compatible VPNs: Cisco-VPN, Client V1 or V2.6.3; Nortel-Contivity VPN Client, V04-15.06; Netscreen-Remote Client 8.1; Checkpoint-V4.1; and SonicWall

1.8.3 Computer Requirements for Embedded Web Interface

These are the minimum computer system requirements for successfully using the web interface with the BGAN terminal:

- Web Interface: recent version of Microsoft Internet Explorer (6.0 or greater for example); or Firefox (1.3 or greater for example) with Java enabled (a portion of the Web interface contains a Java Applet for BGAN network signal strength indication)
- Computer support for at least one of these interface connections - Ethernet or USB

1.9 OPTIONAL ACCESSORIES

The following are optional accessories:

- 12043-0830-A006 AN/PRC-117G, RF-7800M-MP Black Ethernet Cable, 6 feet
  12043-0830-A015 AN/PRC-117G, RF-7800M-MP Black Ethernet Cable, 15 feet
- 12043-0831-A006 AN/PRC-117G, RF-7800M-MP Black Ethernet & ISDN Cable, 6 feet
  12043-0831-A015 AN/PRC-117G, RF-7800M-MP Black Ethernet & ISDN Cable, 15 feet
- 12043-0832-A010 Standalone Ethernet, ISDN, USB Cable, 10 feet
- 12043-0833-A010 BGAN, Ethernet Cable, 10 feet
- 12043-0834-A010 Standalone Ethernet & ISDN Cable, 10 feet
- 12043-0835-A010 Standalone ISDN Cable, 10 feet
- 12043-0836-A010 Standalone USB & ISDN Cable, 10 feet
- 12043-0837-A015 Data Extension Cable, Ethernet & ISDN, 15 feet
  12043-0837-A025 Data Extension Cable, Ethernet & ISDN, 25 feet
  12043-0837-A050 Data Extension Cable, Ethernet & ISDN, 50 feet
- 12043-0839-A010 AN/PRC117G / RF-7800M-MP Radio to RJ45 Ethernet Cable
- 12043-0843-A015 BGAN DC Power to Auto 12 V DC Cable Assembly
- 12043-0890-A010 BGAN DC Power to 4 Leads / RF-7800B-VU Remote On/Off, 10 feet
  12043-0890-A015 BGAN DC Power to 4 Leads / RF-7800B-VU Remote On/Off, 15 feet

- 12043-0891-A006 AC/DC Power Supply Cable (RF-505X PS), 6 feet
  12043-0891-A015 AC/DC Power Supply Cable (RF-505X PS), 15 feet
- 12043-0892-A006 RF-505X PS / RF-7800B-VU Remote On/Off, 6 feet
  12043-0892-A015 RF-505X PS / RF-7800B-VU Remote On/Off, 15 feet
- 12043-0894-A1 BGAN AC to DC Cable Assembly
- 12043-0895-A015 Power Extension Cable, 15 feet
  12043-0895-A025 Power Extension Cable, 25 feet
  12043-0895-A050 Power Extension Cable, 50 feet
- 12043-0896-A010 BGAN DC Power to 2 Leads, 10 feet
  12043-0896-A015 BGAN DC Power to 2 Leads, 15 feet
- 12091-4160-01 ISDN to POTS Converter (ISDN 2-4 wire terminal adapter).
  This adapter is used to connect any two existing analog devices (phone and fax for example) to an ISDN line. In addition, the adapter runs from power provided over the ISDN line.

1.9.1 RF-7800B-DU024 Options

The following are optional accessories for the RF-7800B-DU024:

- 12091-0060-01 AN/PRC-117G, RF-7800M-MP Land Portable Ancillary Kit (Battery)
  Includes: 12043-0830-A006, 12043-0850-A006, 12091-4010-01
- 12091-4010-01 BGAN Battery Box Kit, Tan (See Figure 3-16)
- 12043-0850-A006 Battery Box Cable, 6 feet
- 12091-4150-01 Fix Mount Kit - for building or other fixed infrastructure (See Figure 2-10)

1.9.2 RF-7800B-VU104 Options

The following are optional accessories for the RF-7800B-VU104:

- 12091-0070-01 AN/PRC-117G, RF-7800M-MP Land Mobile Ancillary Kit
  Includes: 12043-0830-A015, 12043-0890-A015, F03-0008-906 Fuse Holder, F15-0012-003 Fuse, Automotive Blade, 5 A 32 V
- 12091-4200-01 HF/VHF/UHF CoSite Low Pass Filter Kit for L-Band
  Filter is for colocated HF/VHF/UHF radio power amplifier output of up to 200 W, removing HF/VHF/UHF harmonics which may impact BGAN terminal operational performance
- 12091-5112-01 Mast Assembly, 4 foot, Heavy
  12091-5113-01 Mast Assembly, 6 foot, Heavy
  12091-5117-01 Mast Assembly, 2 foot, Light (See Figure 2-9)
- 12091-4170-01 Pot Magnet Assembly

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CHAPTER 2

SYSTEM SETUP AND TEARDOWN

2.1 ITEMS INCLUDED WITH RF-7800B BGAN TERMINAL

The standard items included with the Broadband Global Area Network (BGAN) terminals are described below. Refer to Paragraph 1.9 for optional accessories.

RF-7800B-VU104 Land Mobile BGAN Terminal includes the following. See Figure 2-1.

- 12043-0833-A010 BGAN to Ethernet Cable, 10 feet
- 12043-0843-A015 Automobile 12 VDC Power Cable, 15 feet
- 12091-0040-12 BGAN Terminal, Class 10 Land Mobile, Tan

RF-7800B-DU024 Land Portable BGAN Terminal includes the following. See Figure 2-2.

- 12043-0833-A010 BGAN to Ethernet Cable, 10 feet
- 12043-0894-A1 AC to DC Power Supply (includes international plug adapter kit). Refer to Paragraph 2.5.3.
- 12091-0020-12 BGAN Terminal, Class 2 Land Portable, Tan

NOTE

For BGAN network access, contact your service provider for a Universal Mobile Telecommunications System (UMTS) Subscriber Identification Module (SIM) (USIM) and its Personal Identification Number (PIN), and Satellite Terminal configuration instructions.

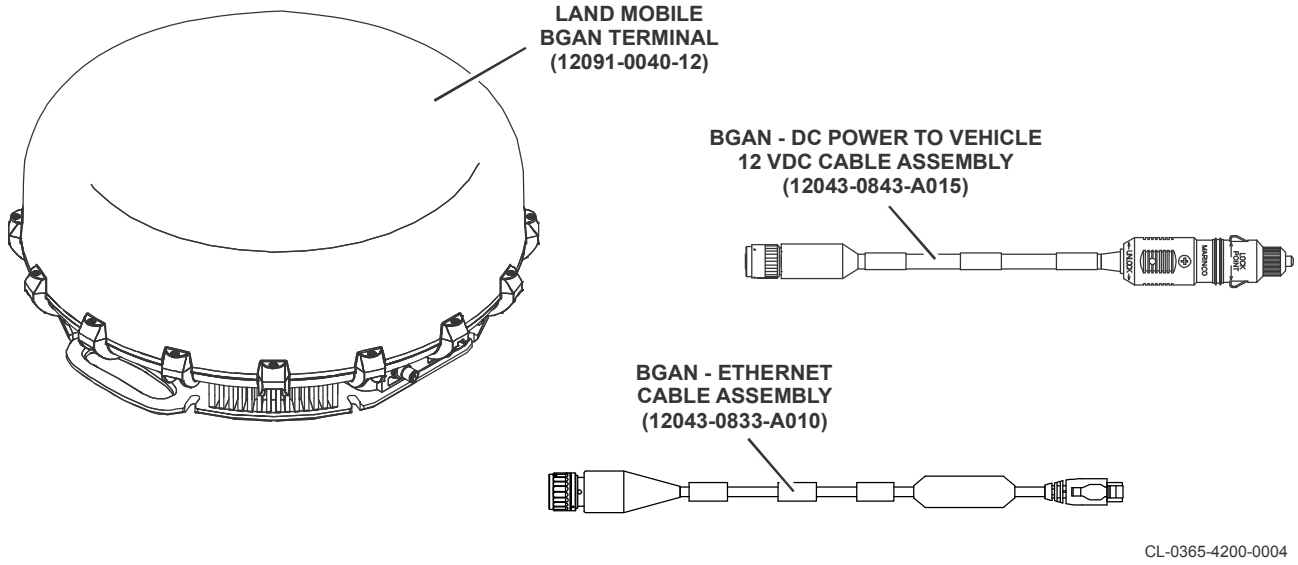


Figure 2-1. Items Included with RF-7800B-VU104

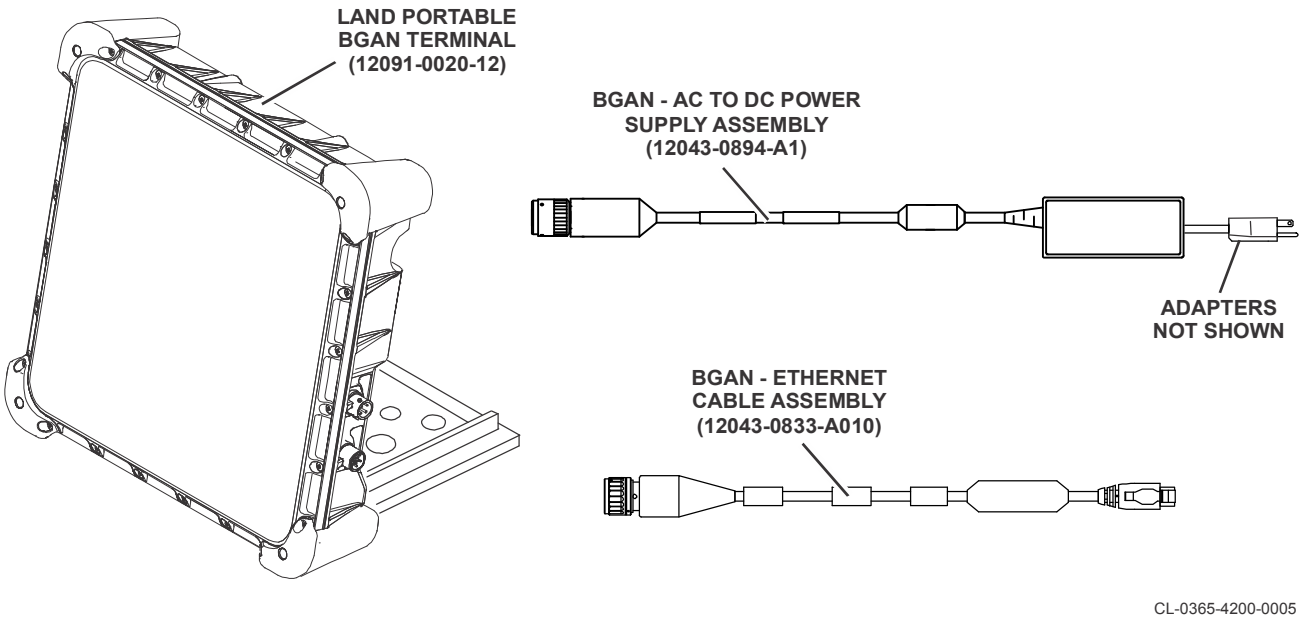


Figure 2-2. Items Included with RF-7800B-DU024

2.2 INSTALLATION GUIDELINES

The information contained here provides general guidelines for installing the BGAN terminal. Read this chapter in its entirety before beginning installation.

2.2.1 Environmental

The BGAN terminal will perform in the environment specified in Table 1-1.

WARNING

Do not operate the BGAN terminal during electrical storms. Disconnect the terminal from the computer and radio and store the unit indoors if lightening is anticipated in the area of operation. Electrocution may result in severe personal injury or death.

WARNING

Never use the BGAN terminal where blasting work is in progress. Observe all restrictions and follow any regulations or rules. Do not use the terminal while at a fuel filling station, do not use near fuel or chemicals. areas with potentially explosive environments are often, but not always, clearly marked.

CAUTION

Avoid placing BGAN terminal near any source of heat such as an open flame or cigarettes.

2.2.2 Dimension and Weight Information

Refer to Table 1-1 for the dimensions and weights.

2.2.3 Power Requirements

Refer to Table 1-1 for power requirements. Refer to Paragraph 1.9 for the various optional power cables available.

2.2.4 Grounding

Neither the RF-7800B-VU104 or RF-7800B-DU024 require mounting on a ground plane for performance.

2.3 UNPACKING AND REPACKING

Equipment is packed in corrugated boxes. A two-piece foam enclosure protects the equipment against corrosion and rough handling. Boxes and packing materials should be retained in case the equipment is reshipped.

2.3.1 Unpacking

Perform the following procedure to unpack the BGAN terminal:

a. Inspect the exterior of the box for signs of damage during shipment. Document any problems and report them to the proper authority.

b. Move the boxed equipment to the general location where it is to be installed.

c. After removing the equipment, check the contents against the packing slip to see that the shipment is complete. Report discrepancies to Harris Product Service Department (telephone: 585-244-5830, toll free: 866-264-8040, web: https://tcpremier.harris.com/).

2.3.2 Repacking

Perform the following procedure to repack the BGAN terminal:

a. Use the original box, if it was retained. If not, use a box that allows at least three inches of clearance on all sides of the BGAN terminal components.

b. Use the original packing material, if it was retained. If not, use foam packing material to fill the space between the BGAN terminal components and the box. Surround the entire unit with several inches of foam packing material.

c. Use a good quality packing tape (or straps) to seal the box after closing.

2.4 BGAN TERMINAL SETUP

After receiving the USIM card from your BGAN service provider, install the card into the BGAN terminal.

2.4.1 Installing USIM in RF-7800B-DU024

Perform the following procedure to install the USIM/SIM in RF-7800B-DU024:

a. Position the BGAN terminal so that the bottom surface is facing you.

b. Remove the four screws and the USIM plate to access the USIM card holder. See Figure 2-3.

c. Put your index finger on the USIM holder and rotate counterclockwise to open. See Figure 2-4.

d. Lift the USIM card holder up in order to place the USIM card in the holder. See Figure 2-5.

NOTE

Do not bend or damage the USIM/SIM. Damaged contacts may cause the card not to work.

CAUTION

USIM cards are sensitive to electrostatic discharges.

e. Install the USIM card in the card holder making sure the gold contacts are facing down. The angled part of the USIM is in the upper right-hand corner. See Figure 2-5.

f. With the card in place, push the holder down and with your index finger, rotate the locking mechanism clockwise to lock card in place. See Figure 2-6.

g. Put the USIM plate back on and tighten the four screws. See Figure 2-3.

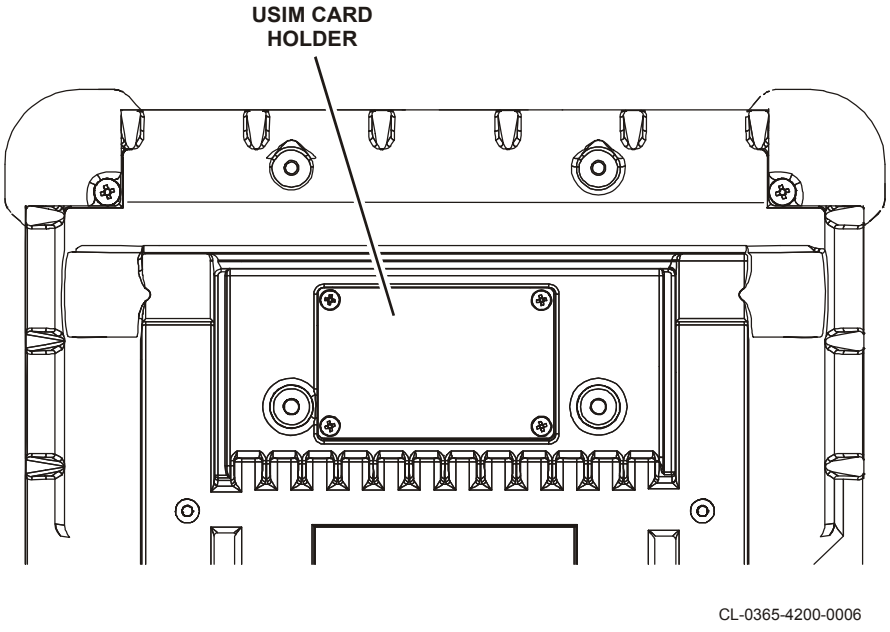


Figure 2-3. Accessing the USIM Card Holder on RF-7800B-DU024

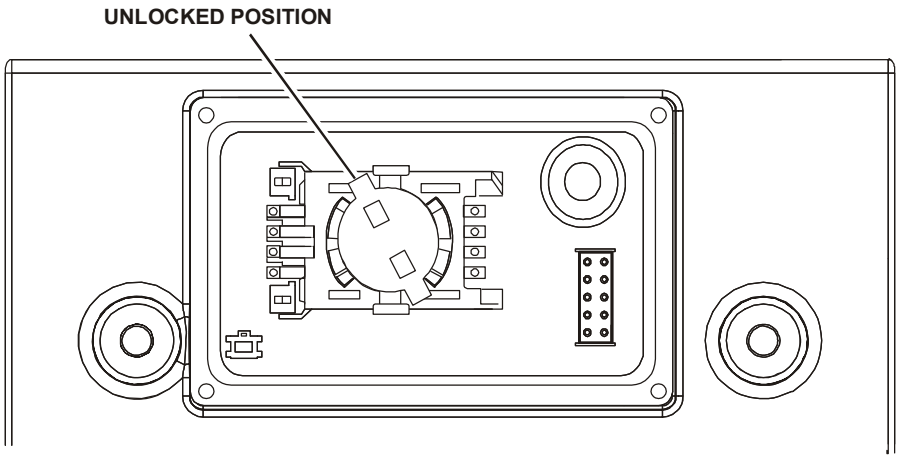


Figure 2-4. Opening the USIM Card Holder on RF-7800B-DU024

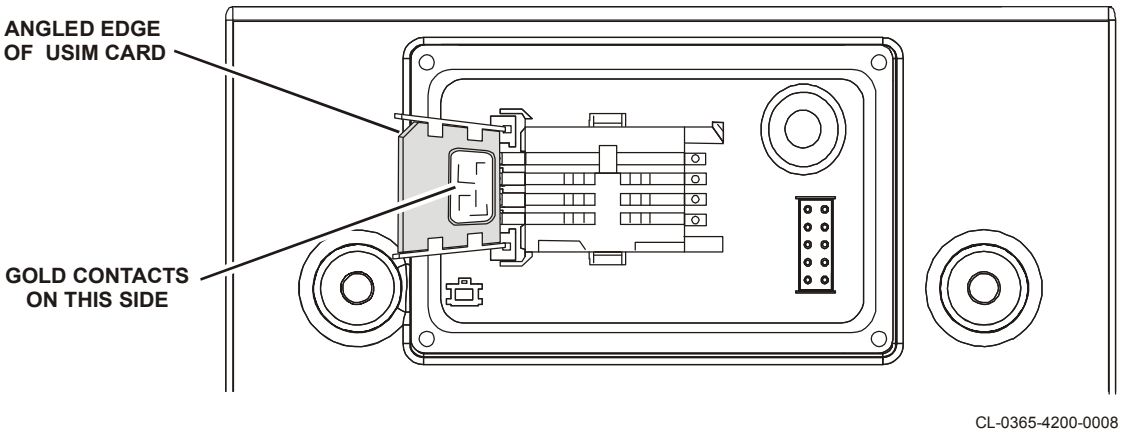


Figure 2-5. Placing the USIM Card in Holder on RF-7800B-DU024

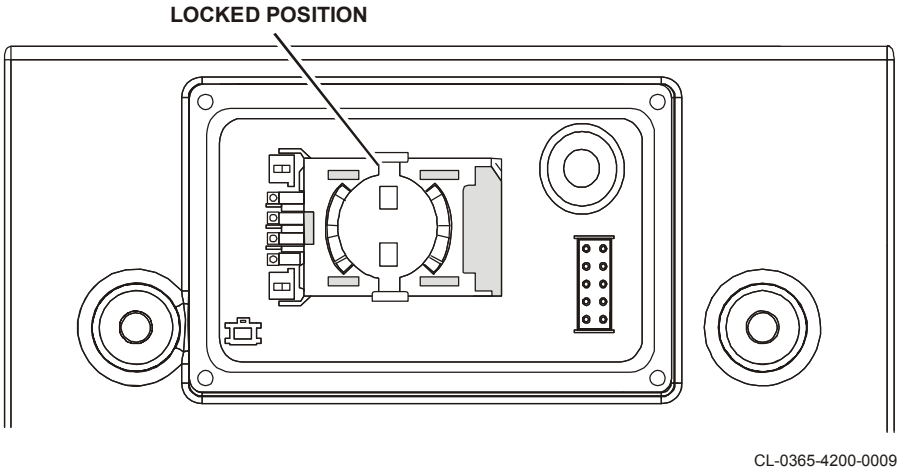


Figure 2-6. USIM Card Located in Holder on RF-7800B-DU024

2.4.2 Installing USIM in RF-7800B-VU104

Perform the following procedure to install the USIM/SIM in the RF-7800B-VU104:

a. Position the BGAN terminal with the topside down onto a smooth/soft surface to prevent scratching the radome and with the bottom surface facing you.

b. Remove the four screws and the USIM plate to access the USIM card holder. See Figure 2-7.

c. Put your index finger on the USIM holder and rotate counterclockwise to open.

d. Lift the USIM card holder up in order to place the USIM card in the holder. See Figure 2-8.

NOTE

Do not bend or damage the USIM/SIM. Damaged contacts may cause the card not to work.

CAUTION

USIM cards are sensitive to electrostatic discharges.

e. Install the USIM card in the card holder making sure the gold contacts are facing down. The angled part of the USIM is in the upper right-hand corner. See Figure 2-8.

f. With the card in place, push the holder down and with your index finger, rotate the locking mechanism clockwise to lock card in place.

g. Put the USIM plate back on and tighten the four screws. See Figure 2-7.

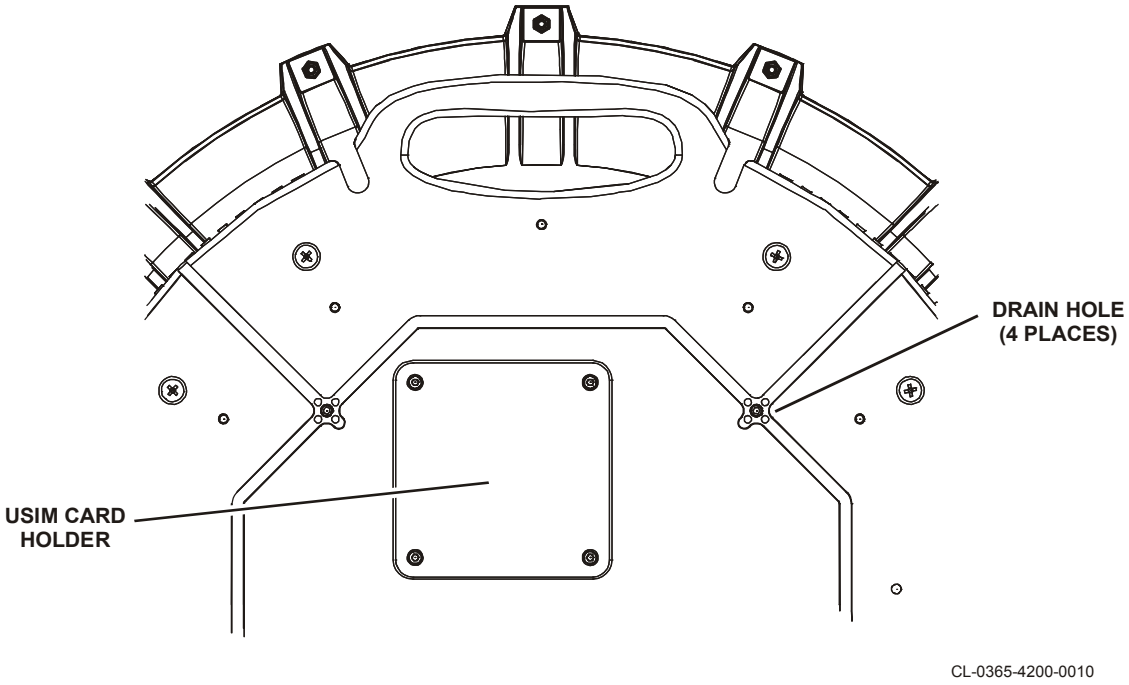


Figure 2-7. Accessing the USIM Card Holder and Drain Holes on RF-7800B-VU104

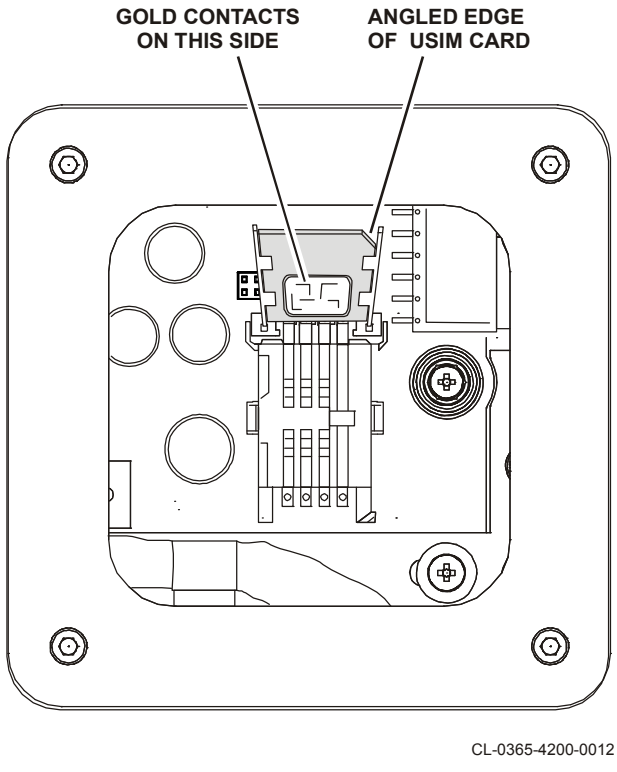


Figure 2-8. Placing the USIM Card in Holder on RF-7800B-VU104

2.5 INSTALLATION PROCEDURES

The paragraphs that follow describe the installation of an BGAN terminal.

2.5.1 RF-7800B-VU104 Installation

RF-7800B-VU104 is intended for installation onto a vehicle roof. Some installation hardware may need to be installer furnished. Tools and installation materials will vary for each application.

a. The four drain holes on the bottom of the RF-7800B-VU104 are shipped in the open position. See Figure 2-7. This allows any moisture from condensation to drain out. If the operational conditions require that these be closed, periodic maintenance to open these and drain any moisture will be required. Refer to Paragraph 5.1.

b. If using a magnetic mount, place BGAN terminal on roof of vehicle. Make sure the area is clear before mounting the antenna using the magnetic mounts. If the mounting area is dirty or covered with snow or ice, the strength of the magnetic mounts may be compromised.

c. If mounting the BGAN terminal on a flat surface using 0.213 - 0.312 inch bolts with 5/16-inch hole stainless steel flat washers, and 5/6-inch nut, do the following:

   1. Make hole pattern template from RF-7800B-VU104 mounting holes.

   2. Place template on flat mounting surface and drill holes.

   3. Mount RF-7800B-VU104 using 0.213 - 0.312 inch bolts with 5/16-inch hole stainless steel flat washers, and 5/6-inch nut.

d. If mounting the BGAN terminal using a pole mount mast assembly, do the following:

   1. Mount the base of the pole mount on a standard 4-bolt antenna base which can support up to 50 pounds (22.68 kg). See Figure 2-9.

   2. Mount the BGAN terminal to the pole mount mast.

e. Make data and power connections. Refer to Paragraph 2.5.3.

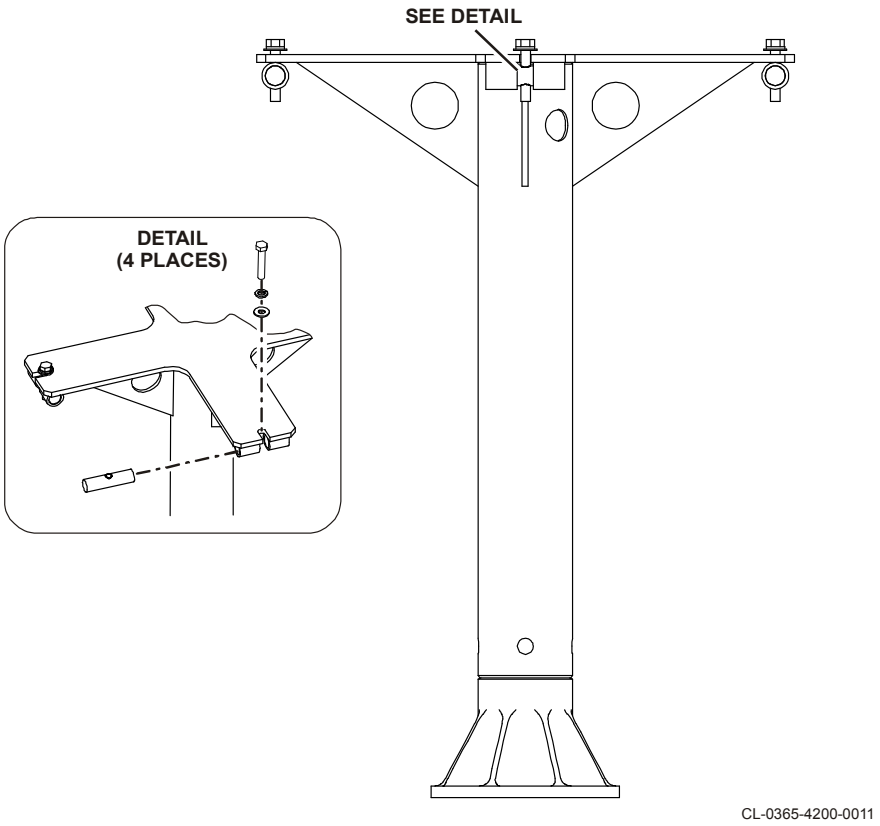


Figure 2-9. Pole Mount Option

2.5.2 RF-7800B-DU024 Fixed/Semi-fixed Installation

The Land Portable BGAN Terminal can be mounted on a pole or flat surface (such as a wall or roof) using the Fixed Mount Kit, 12091-4150-01. See Figure 2-10. This kit includes a universal pole mount, incline bracket, bubble level indicator and holder, pole ground cable, and four terminal mounting screws. Items required to mount the universal pole mount to a structure are customer furnished. Proper installation ensures that the BGAN terminal is always correctly pointed at the satellite. The BGAN terminal can then be left alone for an extended period of time without having to be re-pointed or set-up. The fixed mount kit accessory can be re-used to install the BGAN terminal in different locations.

When mounted in a location where access to the BGAN terminal may not be straightforward (for example, mounted high on a wall), set the BGAN terminal to recover automatically after a power outage. To permit this fixed installation, modify the following BGAN terminal property using the embedded Web interface. See Figure 4-4.

- Bypass Antenna Pointing and Auto Register is enabled

The following items are found in the Fixed Mount Kit, 12091-4150-01. Mount to a suitable surface.

- Fixed Mount Screws
- Mounting bracket and shaft
- Level
- Grounding strap

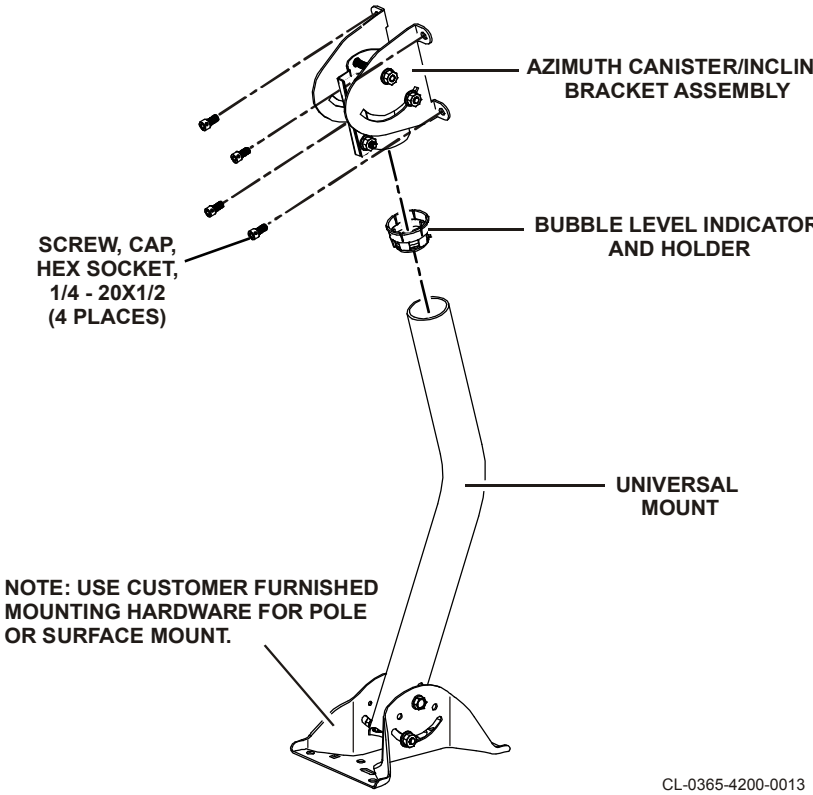


Figure 2-10. Fixed Mount Option

2.5.3 Cable Connections

For connector pinouts, refer to Paragraph A.1. See Figure 2-11 for some installation options. Refer to Paragraph 3.3 for detailed connection information. In general, install the following:

- Data cable between BGAN terminal and computer
- Power cable between BGAN terminal and power source. For the RF-7800B-DU024 using the BGAN, AC to DC Power Supply Assembly with plug kit, use one of the following plugs:
  - ST-5: United States, Canada, Japan, China, Taiwan
  - ST-7: United Kingdom, Hong Kong, Singapore
  - ST-9: Germany, France, Indonesia, Korea
  - ST-16: Australia, New Zealand, China
  - ST-9C: European Union, United Arab Emirates, South America

NOTE

Do not use excessive force when connecting the data and power cables to the BGAN terminal. Connectors are keyed.

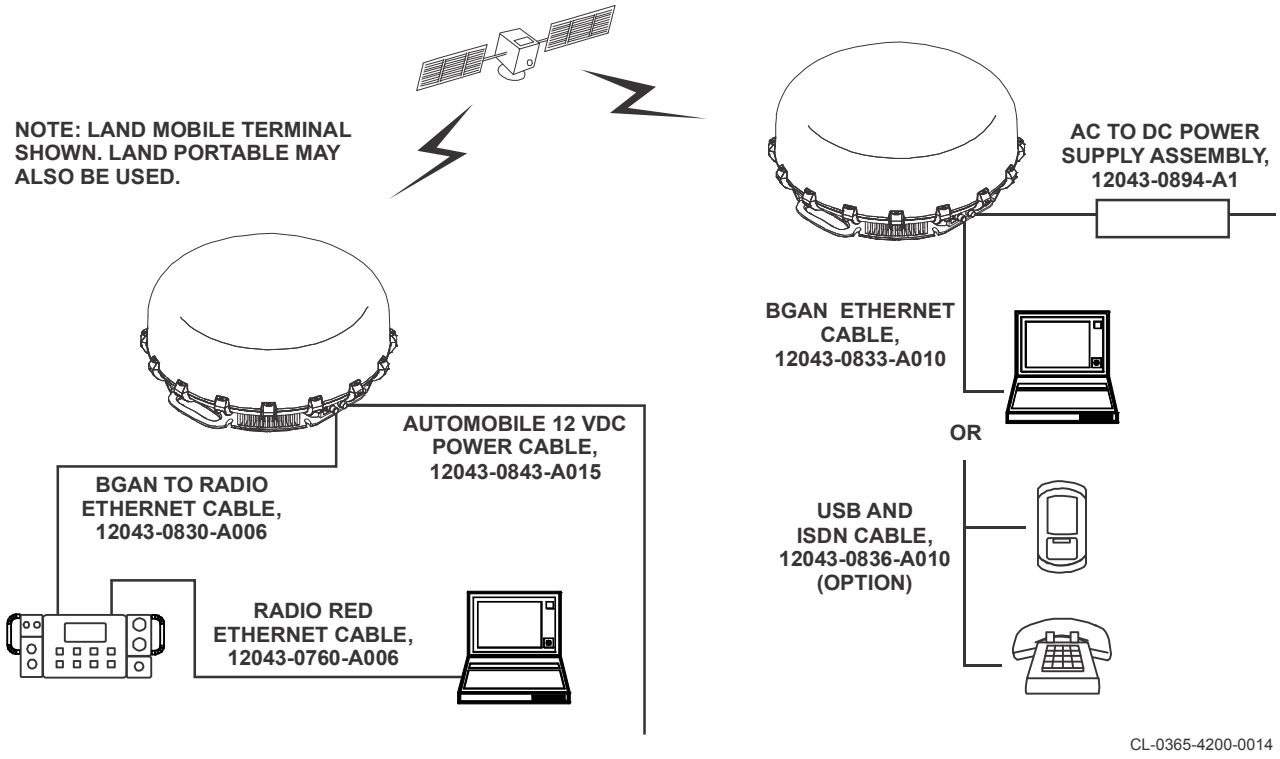


Figure 2-11. Cabling Options

2.5.4 Protecting Connectors

If connectors are to be exposed to a wet or humid environment for extended periods of time, protect the exposed connectors as follows:

a. Silicone Grease (Dow Corning DC-5 or Similar Corrosion Preventative Compound)

Coat all ground connections with silicone grease or an equivalent dielectric compound. Apply a coating approximately 1/8-inch (0.32 cm.) thick. This coating will prevent deterioration of the antenna connection and its associated hardware. This will also protect the insulator from conductive contaminants that could degrade the insulating properties of the connector system, such as oil, dirt, dust, and corrosive material from the atmosphere. This is especially important in a salt-laden air environment.

b. Electrical Tape (3M Company 33+, Permacel 29R or similar)

Wrap connectors exposed to weather with several layers of weather-resistant electrical tape or similar product (3M Company 33+, Permacel 29R). Wrap the tape as close as possible to the case, and far enough up the cable to prevent moisture from contacting any part of the connector.

2.6 INITIAL TURN-ON / CHECK

Once the system is installed, verify that the BGAN terminal is operational. Perform the following:

a. Make sure the data cable is connected to BGAN terminal and computer.

b. Make sure the power cable is connected to BGAN terminal and power source.

c. Turn on power to BGAN Terminal and wait at least 30 seconds for the BGAN Terminal to power-up.

d. Set up a Microsoft Windows computer with the ability to automatically receive an IP address.

   1. Select **Start > Settings > Networks and Connections**.

   2. Select Local Area Connection and select **Properties** from the context menu.

   3. Select the Transmission Control Protocol/Internet Protocol (TCP/IP) connection and select the **Properties** button.

   4. Select **Obtain an IP address automatically** from the General tab of the TCP/IP Properties page.

   5. Select **OK** to close the TCP/IP Properties page and **OK** again to close the Local Area Connection Properties page.

e. Use a web browser on the computer to access the BGAN terminal Web interface using its Internet Protocol (IP) address. For example, open Internet Explorer and enter into the Address field the default Web interface address for the BGAN terminal: **http://192.168.128.100**. If the web interface does not appear, refer to Paragraph 2.6.1 to determine the correct Ethernet IP address of the BGAN terminal, and use that value in the browser address field. Verify that the internet browser's Temporary Internet Files Settings are set to check for newer versions of stored pages "Every time I visit the webpage" to ensure that updated status can be viewed properly.

2.6.1 Determining Ethernet IP address of BGAN Terminal

The BGAN Terminal's default Ethernet IP address can be modified from the Web Interface, requiring a change to the address provided above. Connect the BGAN Terminal to a Microsoft Windows computer and determine its Ethernet IP address.

a. Open a Command prompt window (select **Start > Run**, and type **cmd** and press **Enter**).

b. Type **ipconfig** in the Command Prompt window. The value of the **Default Gateway** will be the value to place in the browser Address field. Refer to Table 5-4 (Was the embedded DHCP server turned off?) if the computer does not obtain an IP address from the BGAN Terminal.

CHAPTER 3

OPERATION

3.1 INTRODUCTION

The Broadband Global Area Network (BGAN) terminal contains an integrated Global Positioning System (GPS) receiver that is used to provide location information to the BGAN system. GPS location information is required to register with the BGAN system, and the BGAN terminal automatically tries to get a GPS position fix every time it is powered up.

The GPS antenna is located in the main antenna. For optimum GPS signal reception, make sure the BGAN terminal is placed in a horizontal position pointed towards the sky. Since the GPS receiver needs to see at least three satellites, it should have visibility of a large part of the sky without obstructions from buildings, mountains or trees. So it might be necessary to take the BGAN terminal out to a clear space to obtain a new GPS location. It may be possible to obtain a new GPS location in a less favorable circumstance, but the time to get the fix may be longer.

3.2 OPERATIONS TASK SUMMARY

Perform the following task to begin using the BGAN terminal that has been setup with a Subscriber Identity Module (SIM) card.

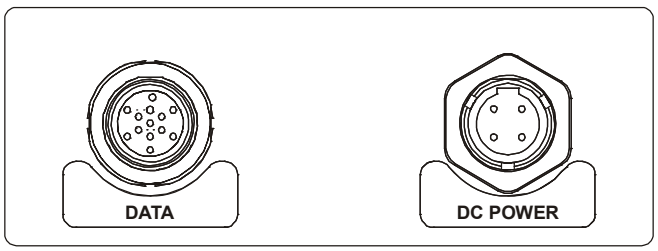
- Make cable connections
- Position the Land Portable BGAN Terminal (RF-7800B-DU024)
- Turn on the BGAN terminal and use pointing tones to locate satellite
- Verify connection to the BGAN network

RF-7800B-VU104 has no controls or indicators.

RF-7800B-DU024 has a power switch on the side. Refer to Paragraph 3.5. Switch positions are: OFF, ON, and ON with audio pointing tones. ON with audio pointing tones is used to accurately point the terminal toward the satellite for optimal data throughput.

3.3 MAKE CABLE CONNECTIONS

Connectors for RF-7800B-VU104 are shown in Figure 3-1. Connectors for RF-7800B-DU024 are shown in Figure 3-2. Connect the power and data cables to the BGAN terminal. Engage the connector locking mechanism to secure the cable to the BGAN terminal.



CL-0365-4200-0015

Figure 3-1. RF-7800B-VU104 Connectors

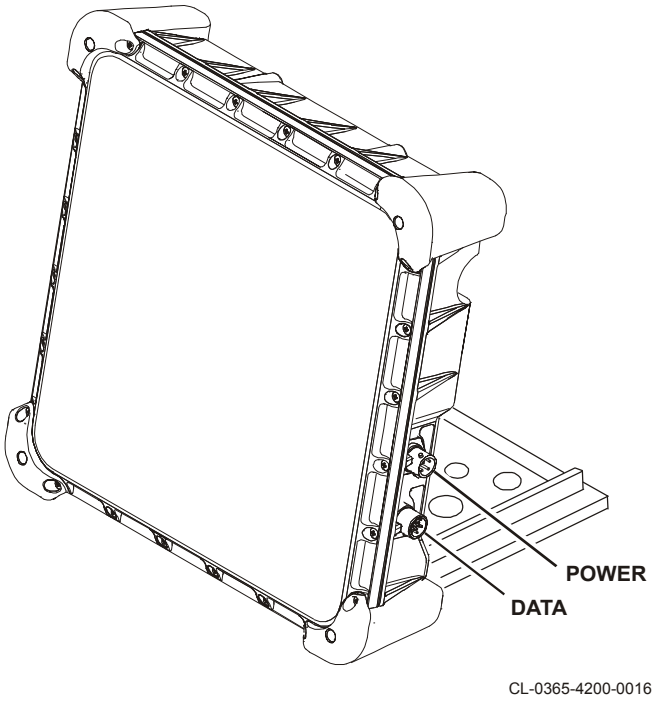


Figure 3-2. RF-7800B-DU024 Connectors

3.3.1 Data Connections

Make a data connection to a computer, radio, an Internet Protocol (IP) encryption device, or an ISDN device. The Data Extension Cable for Ethernet & ISDN, 12043-0837-A0xx, can be used to extend the terminal data connection out 15, 25, or 50 feet (4.57, 7.62, or 15.24 meters).

- Ethernet
- Universal Serial Bus (USB)
- Integrated Services Digital Network (ISDN)

3.3.1.1 Connect Data by Ethernet

Connect the BGAN terminal to the computer Ethernet port using an Ethernet cable supplied with the BGAN terminal or another Ethernet cable option.

- See Figure 3-3 for BGAN Ethernet Cable, 12043-0833-A010 (supplied with BGAN terminal).
- Standalone Ethernet, ISDN, USB Cable, 12043-0832-A010 (optional).
- See Figure 3-4 for Standalone Ethernet and ISDN Cable, 12043-0834-A010 (optional).

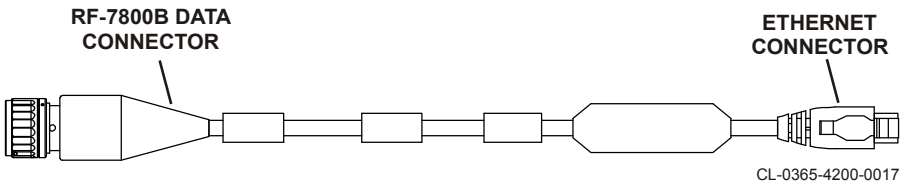


Figure 3-3. BGAN Ethernet Cable, 12043-0833-A010

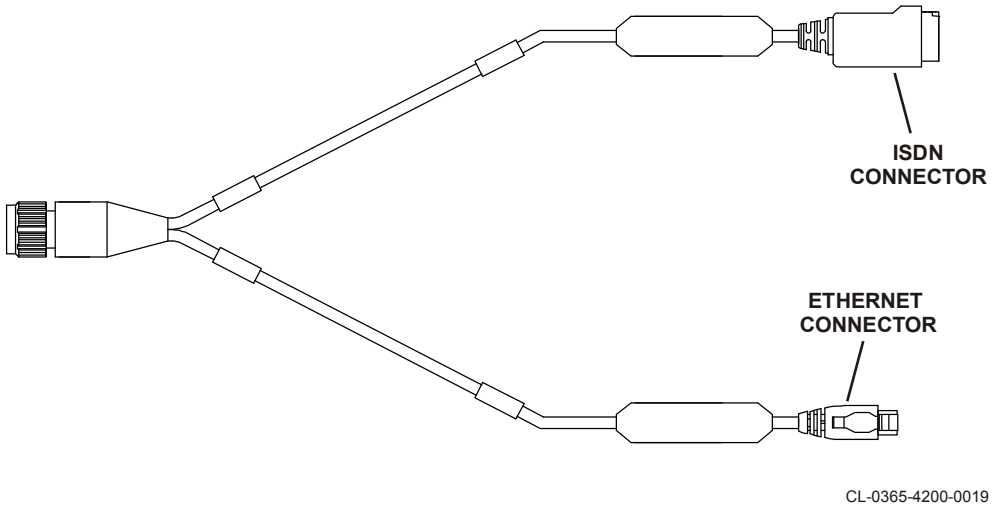


Figure 3-4. Standalone Ethernet and ISDN Cable, 12043-0834-A010 (Optional)

3.3.1.2 Connect Data by USB

Connect the BGAN terminal to the computer USB port using a USB cable option. Use Standalone Ethernet, ISDN, USB Cable, 12043-0832-A010, or Standalone USB and ISDN Cable, 12043-0836-A010 (see Figure 3-5). On first use of the USB port, the computer will detect that new USB hardware has been connected. Follow the installation instructions for the USB Local Area Network (LAN) LINK driver software.

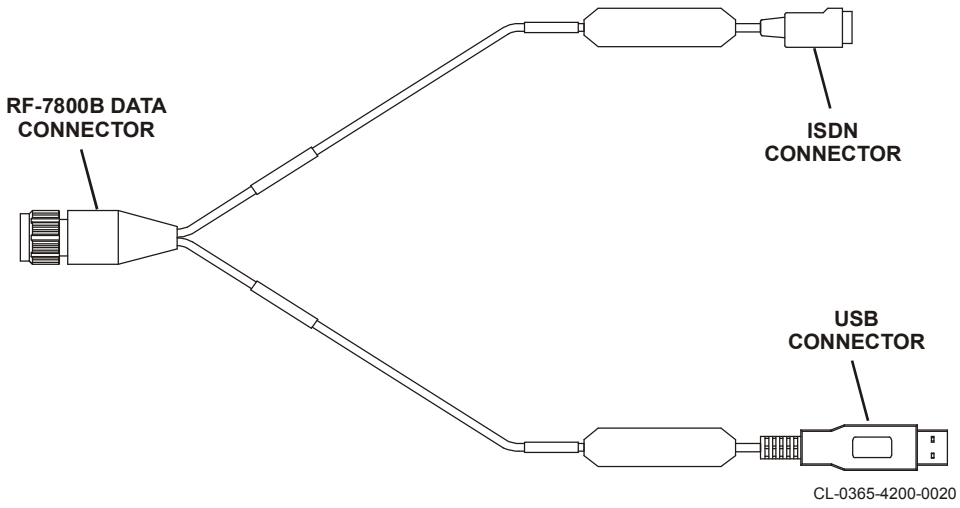


Figure 3-5. Standalone USB and ISDN Cable, 12043-0836-A010 (Optional)

3.3.1.3 Connect Data by ISDN

Connect the BGAN terminal to the computer or phone ISDN port using an ISDN cable option.

- Standalone Ethernet, ISDN, USB Cable, 12043-0832-A010.
- See Figure 3-4 for Standalone Ethernet and ISDN Cable, 12043-0834-A010.
- See Figure 3-5 for Standalone USB and ISDN Cable, 12043-0836-A010.
- See Figure 3-6 for Standalone ISDN Cable, 12043-0835-A010.

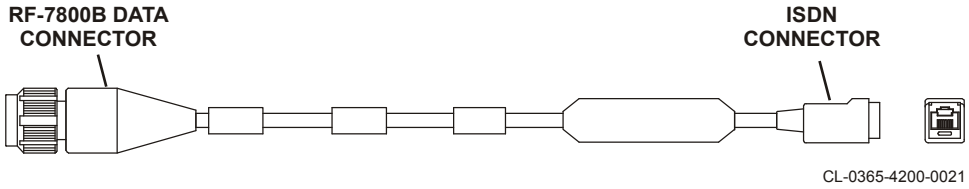


Figure 3-6. Standalone ISDN Cable, 12043-0835-A010 (Optional)

3.3.1.4 Connect Data to Radio

Connect the BGAN terminal to a radio using cable option.

- See Figure 3-7 for BGAN to Radio Black Ethernet Cable, 12043-0830-A0xx (optional).
- See Figure 3-8 for BGAN to Radio Black Ethernet and ISDN Cable, 12043-0831-A0xx (optional).

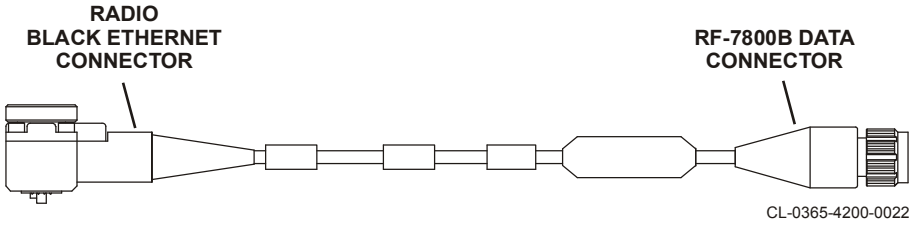


Figure 3-7. BGAN to Radio Black Ethernet Cable, 12043-0830-A006 (Optional)

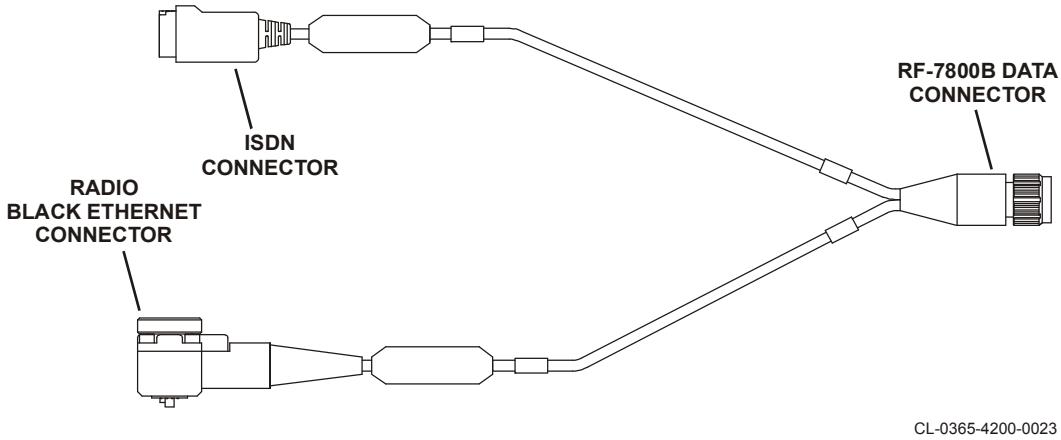


Figure 3-8. BGAN to Radio Black Ethernet and ISDN Cable, 12043-0831-A006 (Optional)

3.3.2 Power Connections

Connect the BGAN terminal to a power source as described in this section. Each of these power connection options can be extended using the BGAN DC Power Extension, 12043-0895-A015, -A025, or -A050 (includes activation). For power sources which do not have built-in current limiting (< 100 W) or fuses, procure the F03-0008-906 Fuse Holder along with the F15-0012-003 Automotive Fuses (Automotive Blade, 5 A 32 V) for applications for 12 V applications. For 24 V applications, use F15-0012-001 for 3 A fusing.

3.3.2.1 Connect BGAN Terminal Power to Commercial Vehicle 12 VDC

Connect BGAN terminal to a vehicle using 12043-0843-A015 Cable Assembly, BGAN, DC Power to Vehicle 12 VDC. See Figure 3-9.

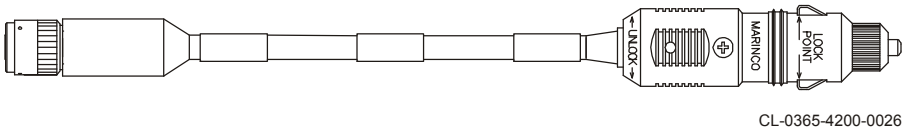


Figure 3-9. BGAN, DC Power to Vehicle 12 VDC, 12043-0843-A015

3.3.2.2 Connect BGAN Terminal Power to AC to DC Power Supply

Connect BGAN terminal to a power supply using 12043-0894-A1 Power Supply Assembly, BGAN, AC to DC. See Figure 3-10. Plug kit (not shown) includes five black plugs. Refer to Paragraph 2.5.3.

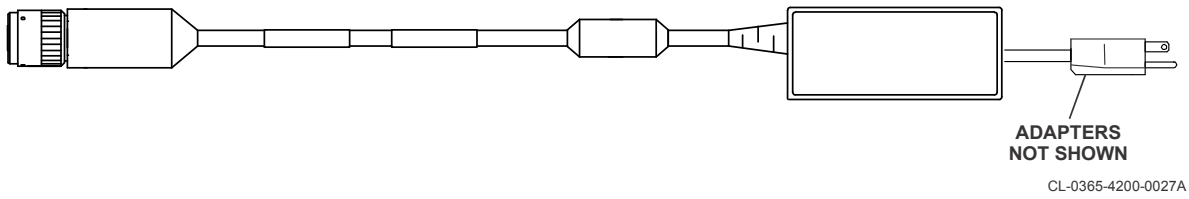


Figure 3-10. BGAN, AC to DC Power Supply Assembly, 12043-0894-A1

3.3.2.3 Connect BGAN Terminal Power to Battery

Connect BGAN terminal to a battery using 12043-0896-A010, or -A015 Cable Assembly, BGAN DC Power to 2 Leads. See Figure 3-11.

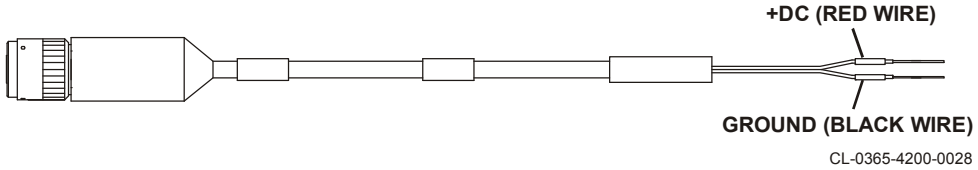


Figure 3-11. Cable Assembly, BGAN DC Power to 2 Leads, 12043-0896-A0xx

Optionally, for RF-7800B-VU104, use the 12043-0890-A010, or -A015 Cable Assembly, BGAN DC Power to 4 Leads as follows: red (+DC), black (ground), orange (power control signal), brown (ground). See Figure 3-12. The Power Control Signal allows the BGAN terminal to be remotely powered on/off. Connecting the power control signal to ground will turn the power on to the BGAN terminal.

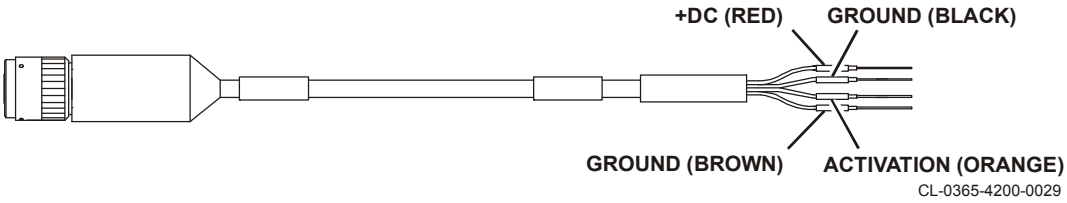


Figure 3-12. Cable Assembly, BGAN DC Power to 4 Leads, 12043-0890-A0xx

3.3.2.4 Connect BGAN Terminal Power to 26 VDC Power Supply

Connect BGAN terminal to a 26 VDC power supply (RF-505X-PS) using 12043-0891-A006, or -A015 BGAN DC Power to 26 VDC. Connect power to RF-505X-PS J15 or J16. See Figure 3-13.

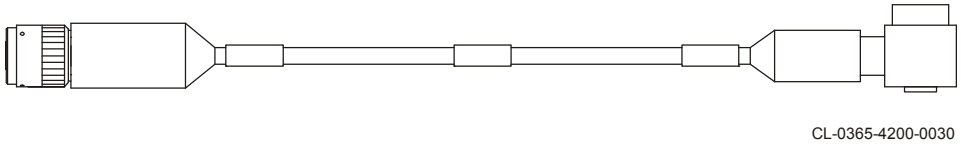


Figure 3-13. AC/DC Power Supply Cable (RF-505X-PS), 12043-0891-A0xx

Optionally, for RF-7800B-VU104, use the 12043-0892-A006, or -A015 Cable Assembly, BGAN DC Power to 26 VDC with remote On-Off as follows: P2 (26 VDC Power Supply), orange (power control signal), brown (ground). This can also be used with the 12043-0845 Power Extension Cable (extension cable plugs into BGAN power). See Figure 3-14. The power control signal allows the BGAN terminal to be remotely powered on/off. Connecting the power control signal to ground will turn the power on to the BGAN terminal.

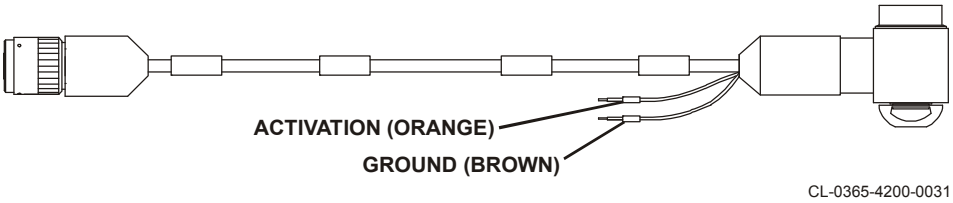


Figure 3-14. BGAN DC Power to 26 VDC/Remote On/Off, 12043-0892-A0xx

3.3.2.5 Connect RF-7800B-DU024 Power to BGAN Battery Box Kit

Connect RF-7800B-DU024 to BGAN Battery Box Kit, 12091-4010-01, using 12043-0850-A006 BGAN DC Power to Battery Box cable. See Figure 3-15. Refer to Paragraph 5.3 for information on batteries. See Figure 3-16 for Battery Box.

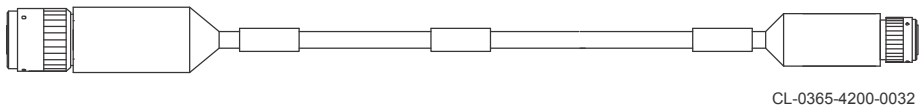


Figure 3-15. BGAN DC Power to Battery Box Cable, 12043-0850-A006

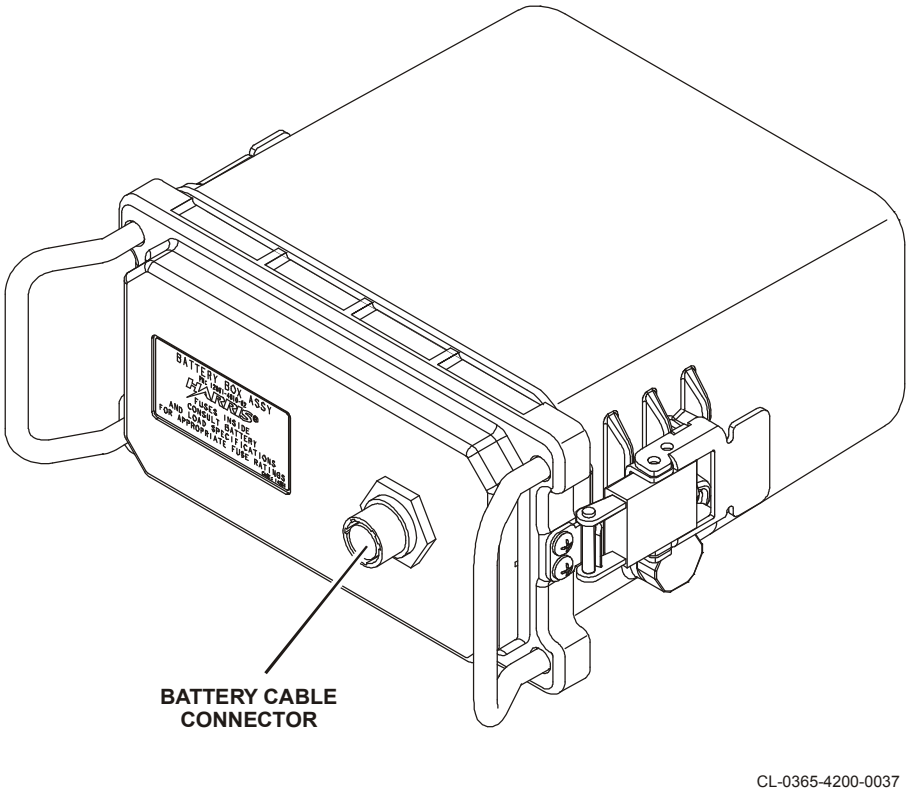


Figure 3-16. Battery Box Kit, 12091-4010-01

3.4 USING RF-7800B-DU024 TERMINAL STAND

The Land Portable BGAN terminal stand is used to position the terminal in the correct direction.

a. Place the Satellite terminal face down on a flat surface to open up the stand. See Figure 3-17.

b. Open the stand by placing your index finger in the upper right (or upper left) hand corner of the unit and placing your other hand on the side of the unit and pulling upwards.

c. Slide out the front stabilizer. See Figure 3-18.

d. Set the Terminal back on a flat surface for pointing.

e. Make adjustments as necessary. Normally there is no need to tighten the stand using the two screws located underneath the stand. If the stand no longer can stand at the angle required for best pointing elevation, tighten the stand using the two screws located underneath the stand. See Figure 3-18.

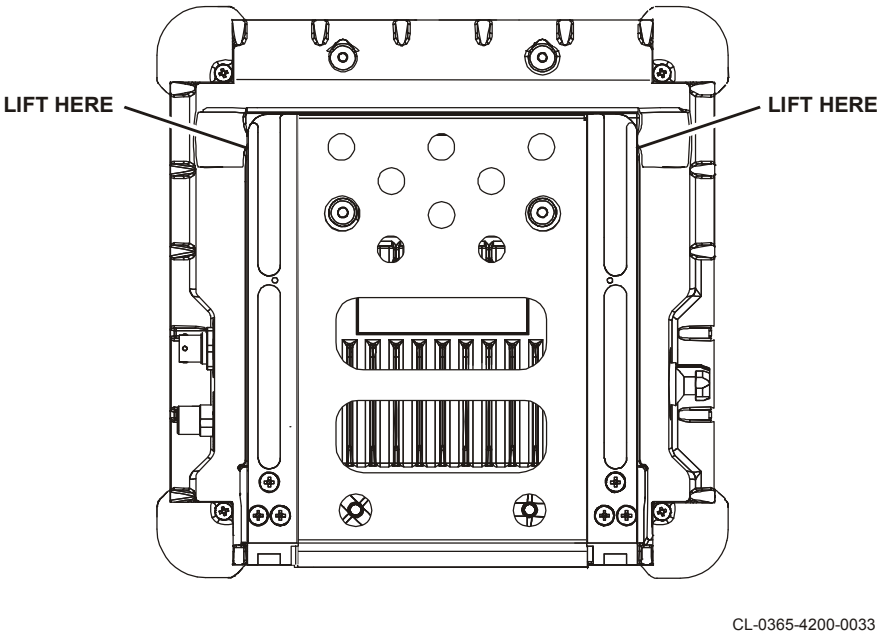


Figure 3-17. Open RF-7800B-DU024 Terminal Stand

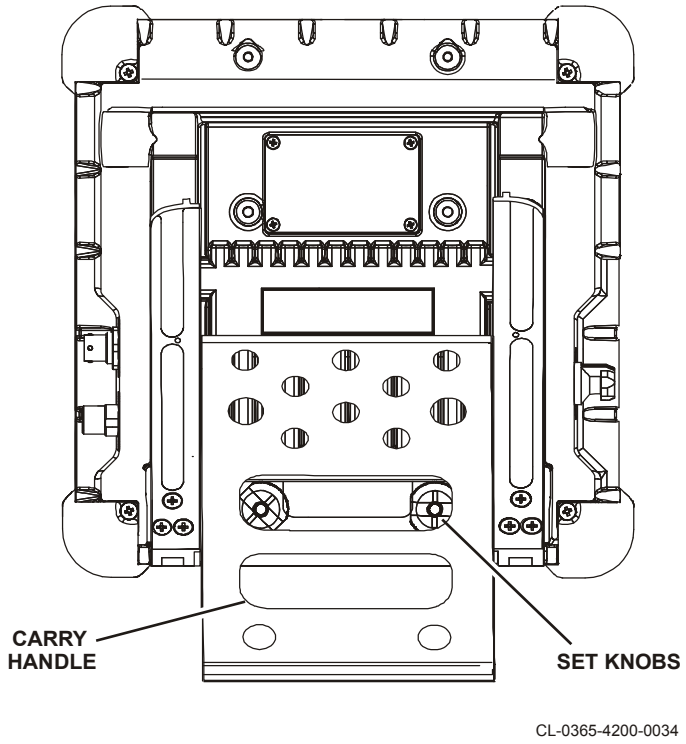


Figure 3-18. Slide Out Stabilizer

3.5 RF-7800B-DU024 INITIAL SETTINGS AND TURN-ON

Perform the following to point RF-7800B-DU024 Land Portable BGAN terminal and get a GPS fix.

CAUTION

Do not stand in front of the BGAN terminal. The BGAN terminal emits radio frequency energy when in operation. Do not stand or place objects in front of the antenna when the BGAN terminal is operational. Maintain a distance of two meters or more from the front of the antenna.

a. Take the Land Portable BGAN Terminal outside and lay it down flat. Verify that the unit has an open view of the sky to get a GPS fix.

b. Power up the BGAN terminal by rotating the ON/OFF knob to either ON or ON with audio. To get a GPS fix only (without using pointing tones), use ON. See Figure 3-19. Typically, a GPS 3D fix can be successfully attained in less than 90 seconds.

c. If using audio, point the terminal in the general direction of a satellite to get a beeping tone. Point the BGAN terminal towards the equator, pointed South if in the Northern Hemisphere, and pointed North if in the Southern Hemisphere. As the terminal is aimed more directly at the satellite, the tones will increase in frequency.

d. Connect the BGAN terminal to a computer and power source.

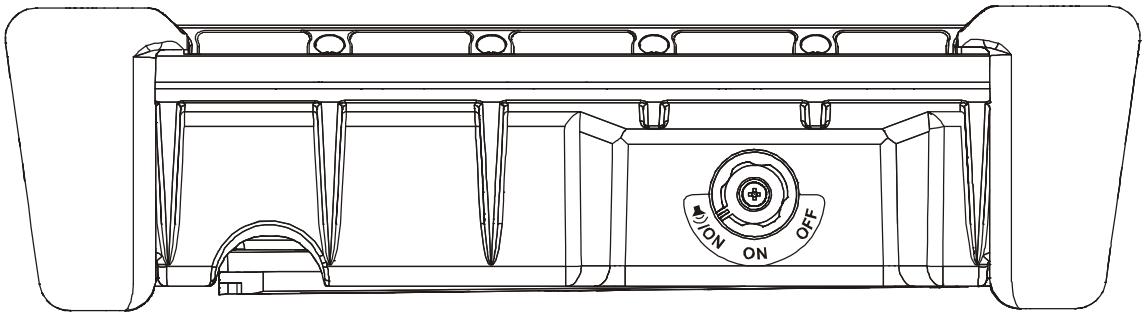
e. Access the Web interface.

1. Open a web browser and type in the Ethernet IP address of the BGAN terminal (default is http://192.168.128.100). Refer to Paragraph 2.6 Initial Turn-On / Check for detailed instructions. The web interface opens up to the Properties page. See Figure 4-6.

2. Monitor the Web interface PROPERTIES page **GPS Position** information to determine when a GPS Fix is obtained. Refer to Paragraph 3.7.1.

NOTE

The BGAN terminal will not achieve optimal capabilities if there is excessive RF interference on its operational or adjacent channels. For maximum performance, a clear Line of Sight (LOS) path should exist to satellites.



CL-0365-4200-0035

Figure 3-19. RF-7800B-DU024 ON, OFF, or ON with Audio Switch

3.6 RF-7800B-VU104 INITIAL SETTINGS AND TURN-ON

Perform the following to point RF-7800B-VU104 Land Mobile BGAN Terminal and get a GPS fix.

a. Move the vehicle with Land Mobile BGAN Terminal outside. Verify that the unit has an open view of the sky to get a GPS fix.

b. Connect the BGAN terminal to a computer and power source.

c. Power up the BGAN terminal.

After power is applied, RF-7800B-VU104 begins a start-up sequence. The tracking antenna searches for BGAN satellites and the antenna motors may be heard during this time. After locking onto a BGAN satellite, some minor adjustments are made to acquire optimum signal strength. Eventually, an optimum position is reached.

d. Access the Web interface.

1. Open a web browser and type in the Ethernet IP address of the BGAN terminal (default is http://192.168.128.100). Refer to Paragraph 2.6 Initial Turn-On / Check for detailed instructions. The web interface opens up to the Properties page. See Figure 4-6.

2. Monitor the Web interface PROPERTIES page **GPS Position** information to determine when a GPS Fix is obtained. Typically, a GPS 3D fix can be successfully attained in less than 90 seconds. Refer to Paragraph 3.7.1.

Automatic tracking keeps the antenna pointed towards the satellite once the vehicle starts moving. During short outages (while driving under a bridge, for example), the antenna will remain in the same position and will pick up the satellite signal immediately upon exiting the blockage. For longer outages, the antenna may need to repeat the search pattern to reacquire the satellite signal.

Circuit switched and packet switched connections will recover from signal outages, as the antenna will perform a 360 degree rescan every 15-20 seconds. In this case, the BGAN terminal will still remain Registered on the network. For outages longer than 60 minutes, the BGAN terminal will need to re-register prior to activating additional circuit or packet switched connections. Refer to Paragraph 4.4.3 to reactivate a connection.

3.7 BGAN SERVICES

BGAN requires GPS for registration with the BGAN network, for both circuit and packet switched connections. For emergency circuit switched voice connections, GPS is not required. Both the RF-7800B-DU024 and the RF-7800B-VU104 BGAN terminals contain an embedded GPS receiver. The BGAN terminal keeps a record of its last GPS fix acquired between power cycles. If the BGAN terminal has not moved far since it last acquired a GPS fix (i.e., remained in the same spot beam), then it can register from the stored GPS position. If the BGAN Terminal attempts to register before it acquires a new GPS fix, it will attempt to register and connect based on the stored GPS fix. If the stored GPS fix does not allow it to connect successfully, the BGAN terminal will wait for a new GPS fix and then complete the registration and connection.

3.7.1 Obtaining a GPS Fix

In normal operation, a GPS receiver needs to be able to receive signals from at least four satellites so that it can then calculate a latitude, a longitude and an altitude. This position fix is referred to as a 3-dimensional or 3-D fix. If only three GPS satellites can be seen by the GPS receiver, then the last available altitude measurement is assumed and the GPS receiver calculates a position fix based on latitude and longitude only. This simpler position fix is referred to as a 2-dimensional or 2-D fix and is quicker and easier to obtain than a 3-D fix, but may be less accurate.

The embedded GPS receiver, with a clear view of the sky, normally takes between 60 and 90 seconds to attain a 3-D GPS fix. How quickly the GPS receiver is able to acquire a fix can also be affected by the visibility that the GPS receiver has of the GPS satellites. The GPS system is relatively tolerant of atmospheric conditions such as heavy cloud or rainfall. However, physical blockages, such as tall buildings or terrain can significantly degrade the ability of the GPS receiver to obtain a fix. For this reason, ensure that the GPS receiver has a clear view of as much open sky as possible.

3.7.2 GPS and BGAN Registration

The BGAN terminal uses the GPS information to perform both Registration, as well as the creation of packet and circuit switched voice and data connections. BGAN Terminal Registration is performed in a Regional Beam, whereas voice and data connections utilize BGAN Spot Beams. The GPS information instructs which Regional Beam to register on, as well as what spot beam the BGAN terminal will create the voice or data connection on. If a packet switched connection has been inactive for some time, the BGAN network may remove the connection, placing the BGAN terminal back in a Registered state. When additional IP data is required to be transferred from the BGAN terminal to the network, the terminal will automatically recreate the packet switched connection. This will place the terminal back into a connected state.

For the RF-7800B-VU104, traveling from one spot beam to another, GPS information will be used to allow a seamless spot beam transition, without the end user even knowing.

Finally, there are Universal Mobile Telecommunications System (UMTS) Subscriber Identification Module (USIM) cards known as “Discreet SIM cards”, which do not provide GPS location information of the BGAN terminal to the BGAN Network. These USIM cards will only provide the Regional or Spot Beam Identification (ID) to the network. Speak to your BGAN Service Provider for provisioning of these types of cards.

3.7.3 ISDN Voice Telephony Services

The Satellite Terminal provides an ISDN interface to connect devices for Circuit Switched voice and data services. It is a Basic Rate (also known as 2B+D) interface and uses the European ISDN protocol. Service for only one 64 kbps B-channel is provided at a time.

The BGAN terminal has been successfully tested with the following ISDN handsets:

- ASCOM Eurit 33 plus
- SwissVoice Eurit 25
- Nera ISDN handsets (old Fleet and new WorldPro handsets)
- Siemens Gigaset SX255
- ISDN to Plain Old Telephone System (POTS) Converter, 12091-4160-01, using any 2-wire analog handset

Before the handset can accept incoming voice calls, program a Mobile Subscriber Number (MSN) using the same number as programmed in the terminal (default is 1). Refer to Paragraph 4.4.2. This ensures that incoming voice calls are directed to the handset. The handset's instruction manual will explain how to do this. Emergency calls can be made without the correct MSN programmed into the handset.

With an ISDN Handset: Connect the phone to the BGAN terminal using a data cable to ISDN connector. The display screen will read "Registering… Please Wait" for less than a minute, then the display will read "Normal Mode".

To command the BGAN Terminal to Register: After the phone is in Normal Mode, Press "#1#", then press send, then press "End Call". The phone is now registered and can make outgoing calls.

3.7.3.1 Dialing

As the ISDN numbering system follows the same pattern as the normal telephone system, dialing is carried out in exactly the same manner as making a normal telephone call. The subscriber number is used with the same international and area codes as any other telephone network.

3.7.3.2 Multi-Subscriber Numbering (MSN)

ISDN supports MSN which allows more than one telephone number to be allocated to an ISDN line. The BGAN Satellite Terminal assigns different MSNs for 4 k Voice, 3.1 kHz Audio, 64 k Unrestricted Digital Information (UDI) and 56 k Restricted Digital Information (RDI) devices. Each incoming call will be directed to the appropriate MSN depending on the type of call. This allows proper routing of incoming calls to the correct ISDN device (e.g. ISDN phone, data card or Fax).

3.7.4 Data Services

The five types of Packet Switched data connections (Network Connections) consist of a Background data service, and four Quality of Service (QoS) Streaming services.

Background Service: A Background connection shares the bandwidth of the satellite spot beam with all the other active background connections in the spot beam, minus all the bandwidth allocated to streaming connections. Background connections can reach up to 492 kbps for the RF-7800B-VU104, and up to 432 kbps for the RF-7800B-DU024. For usage such as Email and Internet browsing, usually a Background connection operates at a higher data rate and less cost than a Streaming connection. Background service rates are charged by the amount of MegaBytes transferred across the network.

Streaming Service: A Streaming data connection acquires a dedicated amount of bandwidth from the satellite spot beam to ensure a minimum amount of guaranteed QoS of data throughput for that connection. The Streaming Service allows the ability for data rates of 32 kbps, 64 kbps, 128 kbps, or 256 kbps. The RF-7800B-VU104 can operate at Streaming rates of up to 256 kbps, whereas the RF-7800B-DU024 can operate at streaming rates of up to 128 kbps.

Streaming channels may be preferred when transferring video teleconferencing across the network. Streaming service rates are charged by the amount of minutes the connection is up on the network. Refer to your BGAN Service Provider for associated costs.

It should be noted, that International Marine/Maritime Satellite (INMARSAT) guarantees the QoS of the stream up to where their private network meets the public Internet. It is up to the customer to make arrangements to maintain the QoS over the Internet to the final destination.

Each device connected to the BGAN terminal can have its own primary Network Connection (e.g. background or streaming connection). Up to 11 devices may be connected to one BGAN terminal at a time. Each device will have a separate global IP address to the network.

3.7.5 Virtual Private Network (VPN) Connections

When a computer establishes a VPN connection from their computer, through the BGAN terminal, to a remote network, all data going to or through the BGAN terminal will be encrypted. Thus, after the VPN is established, that same computer will not be able to remotely control the BGAN terminal using the embedded Web interface. Thus, ensure all BGAN terminal settings are as required prior to establishing the VPN connection.

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CHAPTER 4

CONFIGURATION

4.1 INTRODUCTION

This chapter describes the configuration parameters of the Broadband Global Area Network (BGAN) Terminal and any tasks performed to configure the terminal for different operations. To start, open a web browser and type in the Ethernet IP address of the BGAN terminal (default is http://192.168.128.100). Refer to Paragraph 2.6 Initial Turn-On / Check for detailed instructions.

4.2 CONFIGURATION CAPABILITIES

The following capabilities are common to both the RF-7800B-VU and RF-7800B-DU BGAN Terminals:

- Configure and initiate network connections for Internet Protocol (IP) data transfer, for either Background operation or Streaming operation reserving from 32, 64, 128, 256 kbps of data throughput. Up to 11 simultaneous connections are possible.
- Modify the Ethernet IP address and Dynamic Host Configuration Protocol (DHCP) Server settings of the terminal.
- Enable/Disable Bypass Antenna Pointing Mode and Auto Register for Land Portable use in fixed installations.
- Enable/Disable 24/7 Network Connection Keep Alive mode, which forces any data connections to remain active until manually deactivated.
- Ability to choose automatic or manual satellite selection, when in areas of two satellite coverage.
- Ability to work in multiple modes: Network Address Translation (NAT) Mode (for direct computer connections), Relay Mode (for direct router connection), and Bridge Mode (for direct Harris Radio connection).
- Configuration of the Streaming Inactivity timer, allowing the automatic shutdown of any Streaming connection when not in use for a specific duration.
- View and reset the terminal's air-time usage meters.
- Configure the Integrated Services Digital Network (ISDN) settings of the terminal.
- Perform a diagnostic self-test of the BGAN terminal.
- Note that the ISDN, Universal Serial Bus (USB), and Ethernet interface are active when the unit is turned on.

4.2.1 RF-7800B-VU104 Land Mobile BGAN Terminal

RF-7800B-VU104 is equipped with a tracking antenna. Additional capabilities are:

- Bypass Antenna Pointing (On) and automatically register with the network: The BGAN terminal will automatically attempt to register with the network once the tracking antenna has acquired the satellite signal and obtained a Global Positioning System (GPS) fix.

4.2.2 RF-7800B-DU024 Land Portable BGAN Terminal

RF-7800B-DU024 additional capabilities are:

- ISDN Power: The ISDN interface provides power to the connected ISDN device. If there is no operational device connected to it within five minutes, the ISDN power will be turned off, in order to save power. The ISDN interface can be re-enabled from the Web interface when an ISDN device is connected.

4.3 BGAN TERMINAL MODES OF OPERATION

BGAN Terminals have three modes of operation:

- NAT Mode (for direct computer connection(s))
- Relay Mode (for direct Router connection)
- Bridge Mode (for direct Harris Radio connection)

4.3.1 NAT Mode

The RF-7800B NAT Mode enables the use of directly connected computers to access the BGAN Network. Up to 11 computers can be directly connected to the BGAN Terminal (when more than one computer is connected, a network hub/switch will be required). This allows each computer to independently control its own connection to the BGAN network, enabling each computer to access up to 492 kbps throughput. See Figure 4-1 for the NAT Mode of operation. In this case, each computer can use the Web interface to create a specific network connection specifically for data between that computer and the BGAN network.

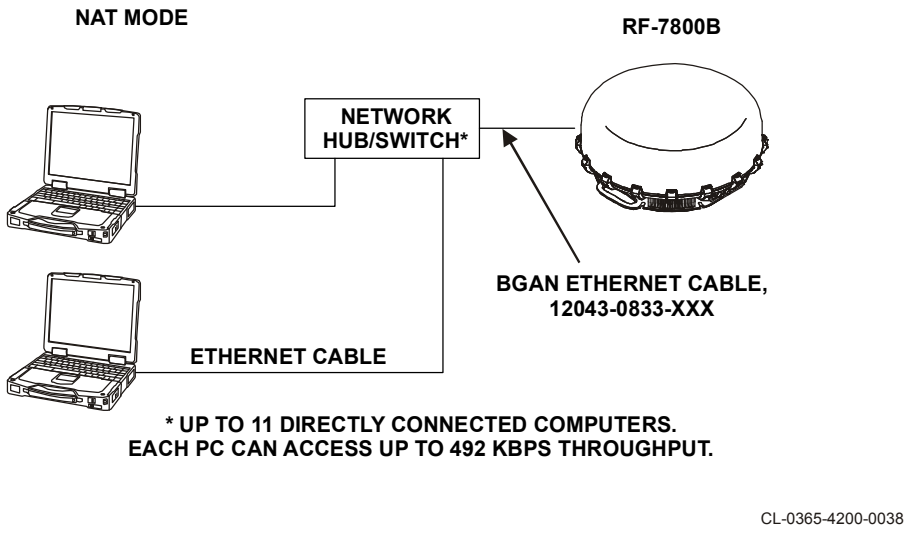

Figure 4-1. NAT Mode Connections

Each computer will receive an IP address from the BGAN Terminal's DHCP Server, normally providing private non-routable IP addresses in the 192.168.128.101-199 range. Internally, the BGAN Terminal performs a Network Address Translation (NAT) on each computer's IP address, and will utilize the public IP address it receives from the BGAN Service Provider to enable normal Internet access for each connected computer.

The RF-7800B BGAN Terminals are configured for NAT Mode by default. The ability to Restore to Factory Defaults is provided in the BGAN Terminal's Web Interface, and will place the terminal back to all settings appropriate for NAT Mode.

The following is a sample configuration, modified by the Web Interface, to create BGAN network connections by a computer when using the default NAT Mode:

a. Navigate to the **Registration, GPS, Properties** page of the Web Interface.

b. If **Terminal Registration Status** is Not Registered, select the **Register with Network** button. Following up to 30 seconds, the BGAN Terminal should be registered with the BGAN Network, as shown in the status at the top of this page.

c. Select the **Connect to Network** page of the Web Interface. Refer to Paragraph 4.4.3 for additional information.

d. Select the **Apply** button at the bottom (using all the default properties for Context Identifier (CID), Local IP, Quality-of-Service (QoS)=Background, Access Point Name (APN) Name, APN Username and APN Password).

e. Wait for the status to show that the BGAN Terminal is connected with the network, where one of the rows above is now filled in with the Global IP Address, along with other properties.

f. Use the computer to send data over the BGAN network.

4.3.2 Relay Mode

Relay mode operation allows the use of a Router directly connected to the BGAN Terminal, to serve a Local Area Network. The router may provide Virtual Private Network (VPN) security across the BGAN network, and when doing so, it may require a public IP address for the VPN tunnel. In this mode, the Router is configured to be a DHCP Client, receiving its IP address from the BGAN Terminal. The BGAN Terminal will still operate and allow its Web Interface to be accessible using its configured Ethernet IP address (e.g., http://192.168.128.100). When connected to the BGAN Network, the BGAN Terminal will obtain a public IP address (assigned by your BGAN service provider), and ultimately provide that public IP address to the Router. See Figure 4-2 for the Relay Mode of operation.

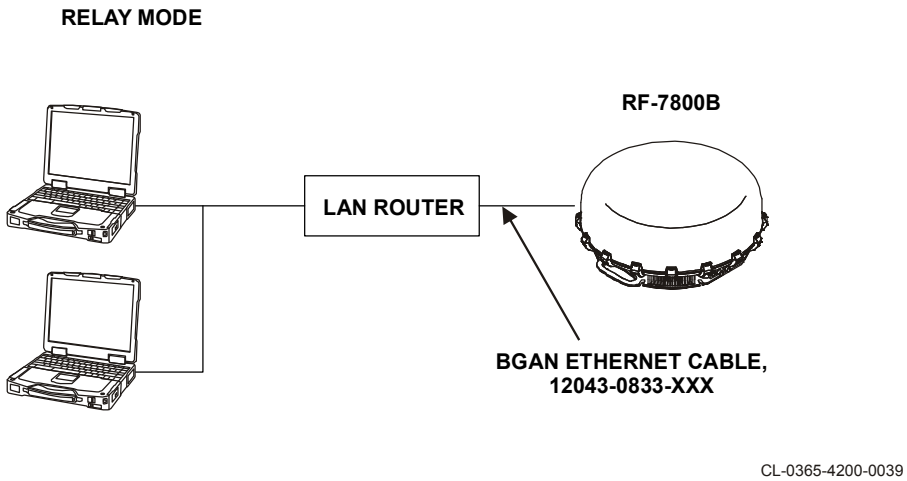

Figure 4-2. Relay Mode Connections

In Relay Mode, when the BGAN Terminal does not have an active BGAN network connection, the BGAN Terminals DHCP Server will assign a private IP address from its DHCP Server Address range configured via the web interface. When the BGAN Terminal has an active BGAN Network connection, the DHCP Server will reassign the public IP address associated with the active network connection to the Router, and data will be automatically routed between the Local Area Network (LAN) and the BGAN network though the BGAN Terminal. Relay mode uses short DHCP Server lease times to allow the Router's IP address to change dynamically once the BGAN Terminal attains a connection to the BGAN Network, as well as when it relinquishes its connection from the network. The BGAN Terminal's DHCP Server lease times assigned are configurable via the web interface.

The following is a sample configuration, modified by the Web Interface, to enable Relay Mode operation with and without the use of Automatic Network Connection Activation:

a. Navigate to the Configuration page of the Web Interface.

   1. Set **BGAN Terminal Mode** to RELAY Mode.
   2. Set **DHCP Server** to Enable.
   3. Set **Idle mode DHCP Lease Time** to 60 seconds (some devices have minimum DHCP lease time requirements).
   4. Set **Connected-mode DHCP Lease Time** to 120 seconds (some devices have minimum DHCP lease time requirements).
   5. Set the **24/7 Network Connection Keep Alive** to Enable.
   6. Click the **Apply** button at the bottom of the page.
   7. Refresh the web page and confirm the settings changes.

b. Without using Automatic Network Connections: If the BGAN Terminal's Web Interface will still be accessible by a computer in the Local Area Network served by the Router, registration and the creation of connections to the BGAN Network can be done manually using the Web Interface. Refer to Paragraph 4.4.3 Connect to Network for directions how to create these connections.

c. With using Automatic Network Connections: If the Web Interface will not be accessible by a computer in the Local Area Network served by the Router, the BGAN Terminal can be configured to create an Automatic Connection to the Network. To configure this operation, navigate to the Configuration Page and set the **Bypass Antenna Pointing & Auto Register** to Enable. Then, navigate to the **Automatic Network Connections** page of the Web Interface:

   1. Turn **On** one of the Automatic Connection Entries.
   2. Set the **Low IP Address** and **High IP Address** equal to the configured DHCP Address Range.
   3. Enter the desired **QoS**, **APN**, **Username**, and **Password** information as desired.
   4. Click the **Apply** button at the bottom of the page.
   5. Select **Restart Terminal**.

Once configured, point the RF-7800B-DU024 BGAN Terminal toward the satellite as defined in Paragraph 3.5 (the RF-7800B-VU104 will automatically point). Once pointed correctly, the BGAN Terminal will begin the automatic Registration process. The user may then physically plug in the Ethernet network connection between the Router and the BGAN Terminal. Once the network connection between the Router and BGAN Terminal is electrically connected, the BGAN Terminal's DHCP Server will provide an initial private IP address to the Router, which also

triggers an automatic BGAN Network Connection to be created. When the BGAN network connection is created and the terminal receives the public IP address, the BGAN Terminal will then provide the BGAN Public IP address to the Router on the subsequent DHCP transaction between it and the Router, changing the Router's IP address from the previous private IP address to the new public IP address.

4.3.3 Bridge Mode

Bridge Mode of operation is utilized by a compatible Harris Falcon III Radio to fully remote control the BGAN Terminal and also encrypts all IP data traffic traversing through the BGAN network. In this mode, the Harris radio remotely controls the BGAN Terminal from the radio's front panel. The Harris radio contains the set of configuration required for the BGAN Terminal operation, and will program that configuration into the BGAN Terminal upon startup of the Harris radio. Refer to the AN/PRC-117G Multiband Manpack Radio Operation Manual (10515-0319-4200) for a full description of this operation. See Figure 4-3 for the Bridge Mode of operation.

There is no manual configuration required to operate in Bridge Mode. If a compatible Harris Falcon III Radio is used to control the BGAN Terminal, all required configurations will be set automatically.

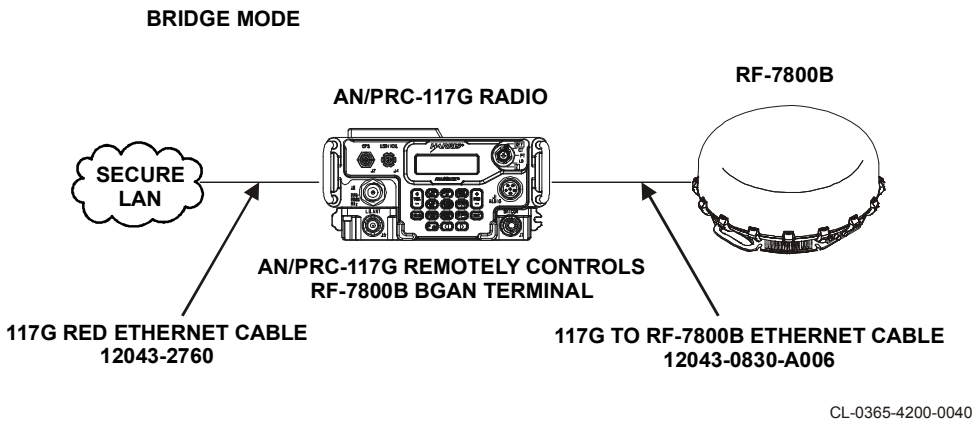

Figure 4-3. Bridge Mode Connections

4.4 CONFIGURATION PARAMETERS

The BGAN terminal includes its own internal web interface. To access the web interface,

a. Open a compatible Web Browser.

b. Type in the Ethernet IP address of the BGAN terminal (for example, http://192.168.128.100). Refer to Paragraph 2.6 Initial Turn-On / Check for detailed instructions. The web interface opens up to the Properties page. See Figure 4-6.

4.4.1 Configuration

See Figure 4-4. The Configuration page is used to configure the following BGAN terminal parameters.

BGAN Terminal Local IP Address: Use this to change the Ethernet IP address of the BGAN terminal from the default 192.168.128.100 IP address. All four octets are available to change. Select **Apply** after changing the Ethernet IP address on this page. The IP address ranges for the DHCP server, the Network Connection page and Automatic Network Connection page will also be changed automatically. Changes to this field take affect after the BGAN terminal is rebooted.

Terminal Subnet Mask: Use this to change the Subnet Mask of the BGAN Terminal. The default is 255.255.255.0. All four octets are available to change. Select **Apply** after changing the Ethernet IP address on this page.

NOTE

Only the most significant 29 bits of the Subnet Mask can be set. The maximum value that can be entered is 255.255.255.248.

BGAN Terminal Mode: Provides the ability for the BGAN Terminal to work in multiple modes. Refer Paragraph 4.3 for more detailed information on configuration and operation.

- NAT Mode. Use this for multiple direct computer connections.
- Relay Mode. Use this for single direct router connection.
- Bridge Mode. Use this for direct Harris radio connection.

DHCP Server (Enable/Disable): Use this to allow an automatic IP address allocation to the computer(s) connected to the BGAN Terminal.

NOTE

The Ethernet IP address of the terminal can be modified along with disabling the DHCP Server. If the Ethernet IP address of the terminal is forgotten, remove the USIM card and restart the BGAN terminal. With the USIM card not present, the DHCP Server will automatically be enabled, allowing the user to configure the BGAN Terminal's Ethernet IP address and DHCP Server settings.

DHCP Server Address Range: The DHCP Server Address Range (default of 192.168.128.101 to 199) are provided to the connected computers which have been configured for dynamic Transmission Control Protocol/Internet Protocol (TCP/IP) addressing. If the DHCP Server is set to **Disable**, then devices connected to the BGAN terminal must be configured to be in the same IP subnet address space as the BGAN terminal Ethernet IP address.

Idle-mode DHCP Lease Time: Use this to change the default time (60 seconds) that the DHCP lease to the computer is good for when the BGAN terminal is not connected to the network. This parameter helps solve a problem with some models of Cisco routers that will not accept a short DHCP lease time. The longer the Idle-mode DHCP lease time, the longer it will take the Network/BGAN terminal to update the computer with the correct Domain Name System (DNS) servers for web browsing after establishing a Network Connection.

Connected-mode DHCP Lease Time: The Connected-mode DHCP Lease Time refers to the DHCP lease time when the BGAN terminal is connected to the network. Normally, there is no need to change this parameter. Note that some devices, including some Cisco router models, have a minimum value (i.e., 300 seconds) that will be accepted.

Bypass Antenna Pointing & Auto Register: Use **Enable** to bypass antenna pointing and have the BGAN terminal go straight into Registering with the Network. This is set to On as default for the RF-7800B-VU104. Enabling this for the RF-7800B-DU024 allows the Land Portable terminal to be mounted in fixed installation, and automatically connect to the network following a power failure.

24/7 Network Connection Keep Alive: Set this to **Enable** to keep the Network Connection(s) active. If the BGAN network terminates a Network Connection due to inactivity, the BGAN Terminal will automatically recreate the Network Connection. Use this feature when there is time critical IP data, when the IP data must be sent immediately and cannot wait any delays for a subsequent Network Connection to be made.

Satellite Selection: Use this parameter within a satellite overlap region to override the default satellite (AUTO selects a satellite based upon elevation angle/GPS location). The change to a different satellite does not take effect until the BGAN terminal is reset.

Streaming Activity Timer: Given that Streaming contexts are billed by the minute, this allows the ability to limit unnecessary usage charges independently on each Streaming connection. The default timer is set to tear down a streaming context after two hours of inactivity.

Emergency Call Numbers: Use this to update the emergency call number that is applicable in that part of the world where the BGAN terminal is being used.

PIN and PUK (attempts left): A 4-8 digit PIN may be used to enable use of the BGAN terminal for non-emergency functions. If the USIM card has previously been utilized to require a PIN number, each time the terminal is powered up, a PIN number will be required by the Subscriber Identification Module (SIM) card. The PIN number entered here is stored in the BGAN terminal, and provided to the SIM card upon power up. If the wrong PIN is typed in more than three times, the SIM card becomes locked. When a PIN is locked, enter a Personal Unblocking Key (PUK) provided by the service operator as well as the desired PIN and press the Apply button. This will revert the USIM card to the original unlocked state. If a wrong PUK is entered ten times in a row, the SIM will become permanently blocked and unrecoverable, requiring a new SIM card. The attempts left is a read only indication of the number of remaining attempts at entering a PIN number and a PUK number.

Use **Apply**, **Cancel**, and **Restart Terminal** buttons to make changes, cancel changes, or reboot BGAN terminal. Any changes made to the above fields are not programmed into the BGAN terminal until the **Apply** button is pressed. The **Cancel** button discards any changes made to the values on the web page and leaves the settings stored in the BGAN terminal unchanged.

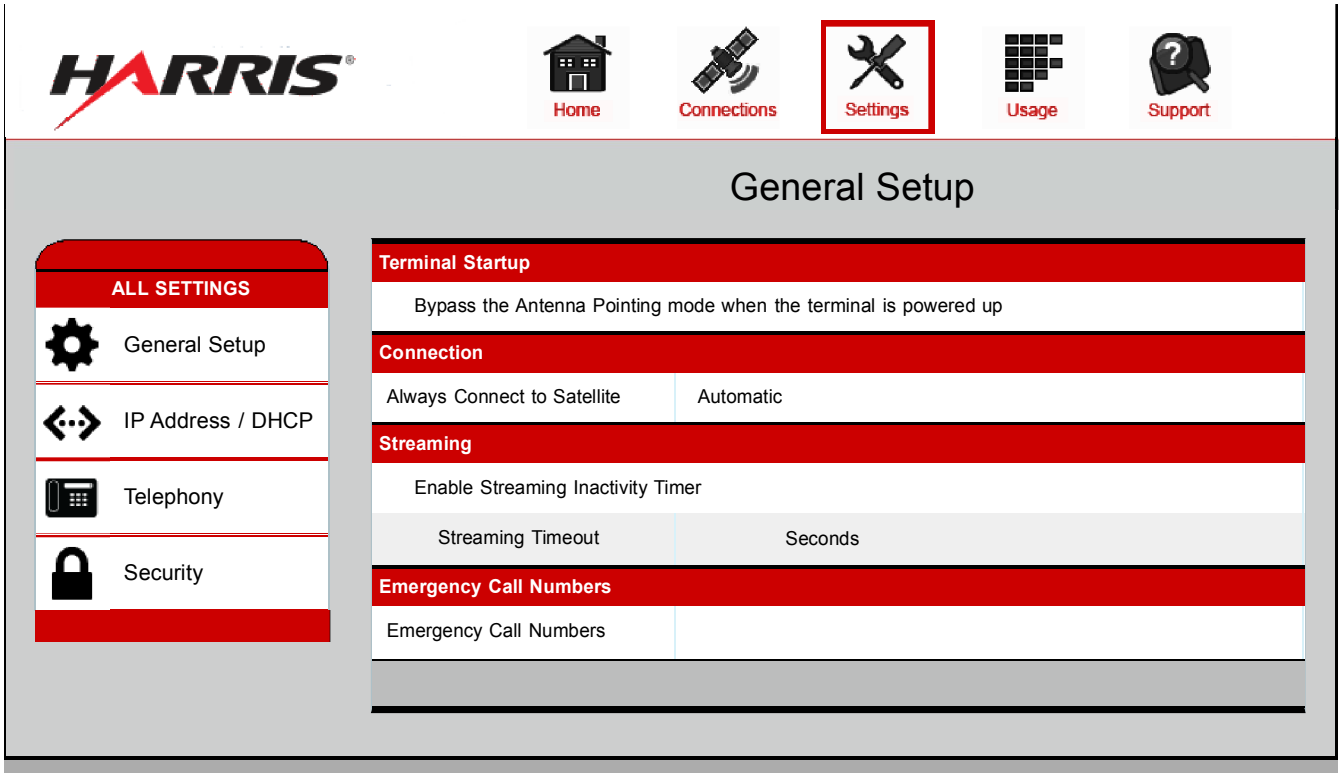

Figure 4-4. BGAN Terminal Configuration

4.4.2 Registration, GPS, Properties

See Figure 4-5 and Figure 4-6. The Properties page shows the current status of the BGAN terminal. The three status items in the top left-hand corner of the screen update automatically when the status of that item changes:

- Signal: Satellite Signal Strength
- BEAM: Beam Identification (ID)
- BATT: Battery Status

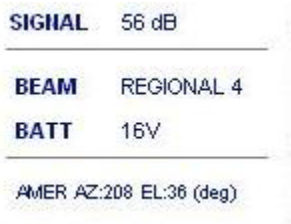

Figure 4-5. BGAN Terminal Configuration Detail

The remaining properties page items are described below.

Terminal Registration Status: Shows as Registered with Home Network or Not Registered. See Figure 4-8. If not registered, select the **Register with Network** button. If the BGAN terminal is not registered, but the Register button is greyed out, then the terminal is actively attempting to register. Please wait. Additionally, the BGAN terminal must be registered prior to sending IP data or creating ISDN calls.

NOTE

RF-7800B-VU104 has Bypass Antenna Pointing turned on by default, enabling it to automatically register with the Network as long as this setting is enabled.

Packet Switched (IP Data) Service: Indicates whether the BGAN terminal is Packet Switch (PS) attached with the Network. Network connections, either Background or Streaming, must be set up to transfer IP data.

Circuit Switched (ISDN) Service: Indicates whether the BGAN terminal is Circuit Switch (CS) attached with the Network. CS calls can be made once the BGAN Terminal is Registered with the network.

GPS Position: Displays the current GPS position status. The terminal will always report whether the GPS Fix Quality is **Acquiring**, **2D**, or **3D**, and the **Last Update** time, using Greenwich Mean Time (GMT). The GPS display policy, which comes from the satellite, determines whether or not the **Longitude** and **Latitude** information will be displayed to the user.

Emergency Call Numbers: Displays the Emergency call numbers that can be used with the BGAN terminal.

BGAN Terminal Software Version: Displays the current version of software that is running on the BGAN terminal.

Satellite Modem IMEI: Displays the International Mobile Equipment Identity (IMEI) number of the BGAN terminal.

Satellite Modem IMSI: Displays the International Mobile Subscriber Identity (IMSI) number of the Universal Mobile Telecommunications System (UMTS) Subscriber Identification Module (USIM) card in the BGAN terminal. If the IMSI is not displayed, it indicates that there is a problem reading the SIM card. Possible problems could be: no SIM, SIM installed incorrectly, or Personal Identification Number (PIN) must be entered.

UE Class: The RF-7800B-DU024 Land Portable Terminal is a Class 2 BGAN Terminal. The RF-7800B-VU104 Land Mobile is a Class 10 BGAN Terminal.

USIM PIN Status: Displays the PIN status as Ready if a valid PIN is entered. The PIN is used to unlock the USIM every time the terminal is powered up or reset. Entering a PIN into the Web interface stores the PIN in the terminal (see Figure 4-4). If the USIM requires a PIN at startup, the terminal will use the stored PIN.

USIM APN Name: Is pre-populated with the default Access Point Name that has been provisioned on the USIM card. Some USIM cards may have multiple APN's provisioned on them.

Extract System Log: Click this button to automatically extract a system log from the BGAN terminal and save the file to a location on the computer for debugging purposes. This file can be e-mailed to Harris directly for fault analysis.

Restore Factory Defaults: Click this button to restore the BGAN terminal back to factory defaults and delete any parameters that have been changed. Try all possible debug procedures before using this feature. Contact Harris for additional help if necessary.

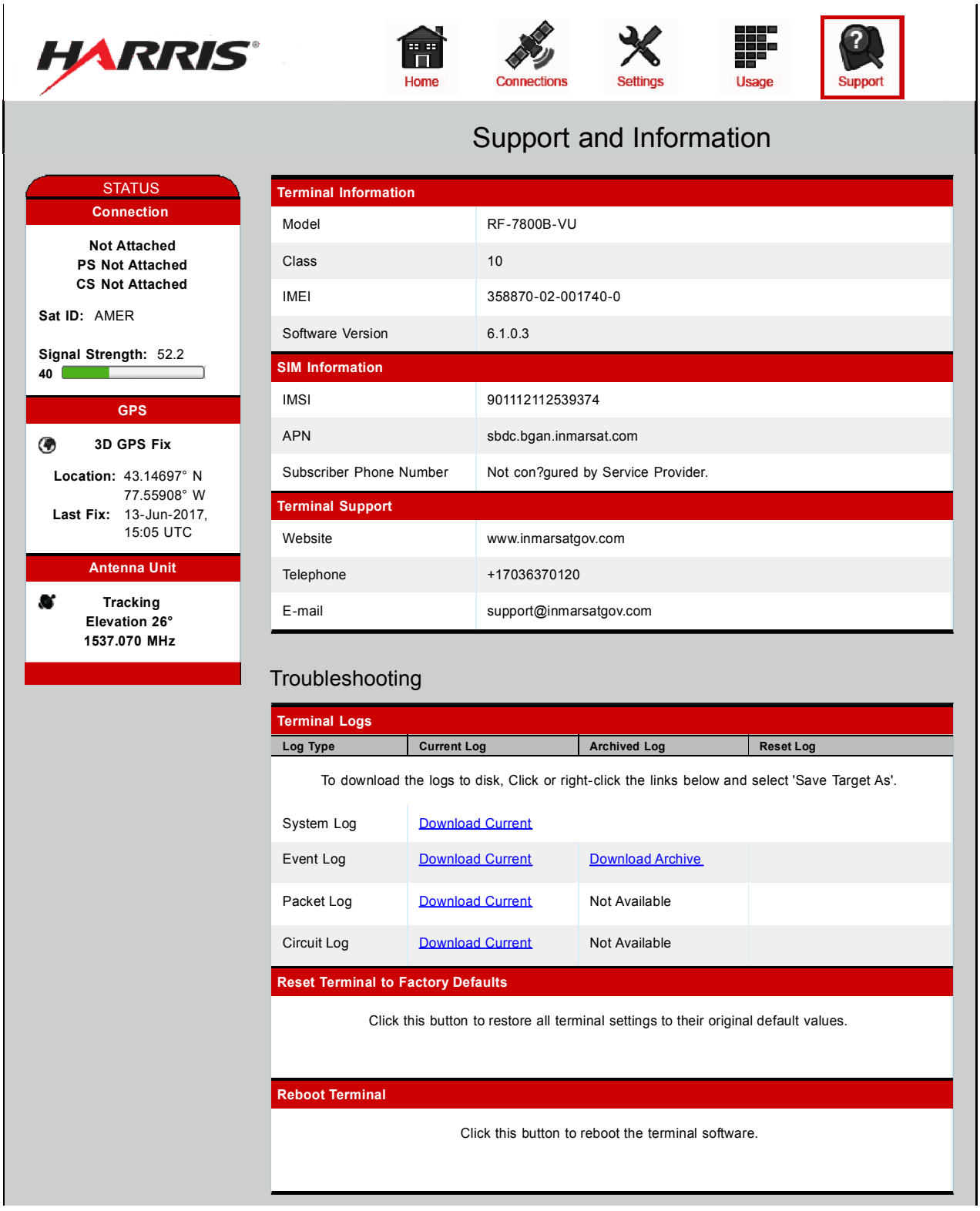

Figure 4-6. BGAN Terminal Properties

4.4.3 Connect to Network

See Figure 4-7. The Connect to Network page is used to setup and configure Network Connections for any computer that is connected to the BGAN terminal.

NOTE

Before attempting a connection, ensure that the terminal is Registered. Refer to Paragraph 4.4.2.

To activate a Network Connection, go to the bottom of the page. Look for the Context Identifier, Local IP address, APN Name, Requested QoS, Username and Password fields.

CID: The Context Identifier of each context is automatic by default. Automatic is the preferred setting for most uses. Use the CID when managing multiple contexts, either by a single computer or multiple computers connected.

Local IP Address: This is the local IP address of the computer to be setup with a Network Connection. The default IP address octets are entered by default from the setup screen. Enter the correct IP address of the connected computer, as only IP data from this IP address will be sent across this context.

To find the IP address of a computer,

a. Open a command window (select **Start > Run**, type `cmd`, and select **OK**).

b. Type `ipconfig` in the command window.

c. Press **Enter**.

Requested QoS: Use the drop down list to see all of the different QoS types: background, streaming 32 k, streaming 64 k, streaming 128 k, and streaming 256 k. Select the appropriate QoS required for the Network Connection being set up.

APN Name: This field is configurable, but it will always show the default APN that has been provisioned on the USIM. The first character must be a-z, A-Z, or 0-9, same for the first character but the subsequent characters must be alphanumeric or “.” or “-”. If the USIM has been provisioned with multiple APN's, type in any of these secondary APN names as part of the Network Connection setup. Consult with your BGAN service provider to understand the conditions under which each APN is appropriate.

APN Username and **Password**: The APN Username and Password may be required for authorization to the network. The first character must be a-z, A-Z, or 0-9, but the subsequent characters can be anything. The length is actually 19 characters. Additionally, the APN Username and Password can be used to ensure a static public Satellite IP Address is received from the network. The APN Username and Password fields are case-sensitive. See Figure 4-9.

4.4.3.1 Activating a Network Connection

In order for a user to be able to transfer data across a network, a Network Connection must be activated in the Terminal and associated Core Network. To activate a Network Connection, do the following:

a. Enter an unused Context Identifier number into this field, where the default CID is - which uses the first available context.

b. Enter the IP Address of the specific computer which will be used with this Network Connection. Only packets with this IP address will be sent across this Network Connection.

c. Select the QoS that is needed by selecting it from the drop down list.

d. If the Service Provider requires a username and password, enter it in the Username and Password boxes, then click **Apply**.

e. The new connection appears in the Network Connections table. Once the context has been setup, whether it is successful or not, the properties will remain in the table above. In the table above, the entry can be cleared by clicking the associated **Clear** button.

There are two buttons to the right of each CID definition in the table. When a context is defined but inactive, the **Activate** button is available to try and start the connection. If the connection is active, the button changes to **Deactivate** to break the connection. The **Clear** button is used to delete an Inactive connection and make the CID available for reuse.

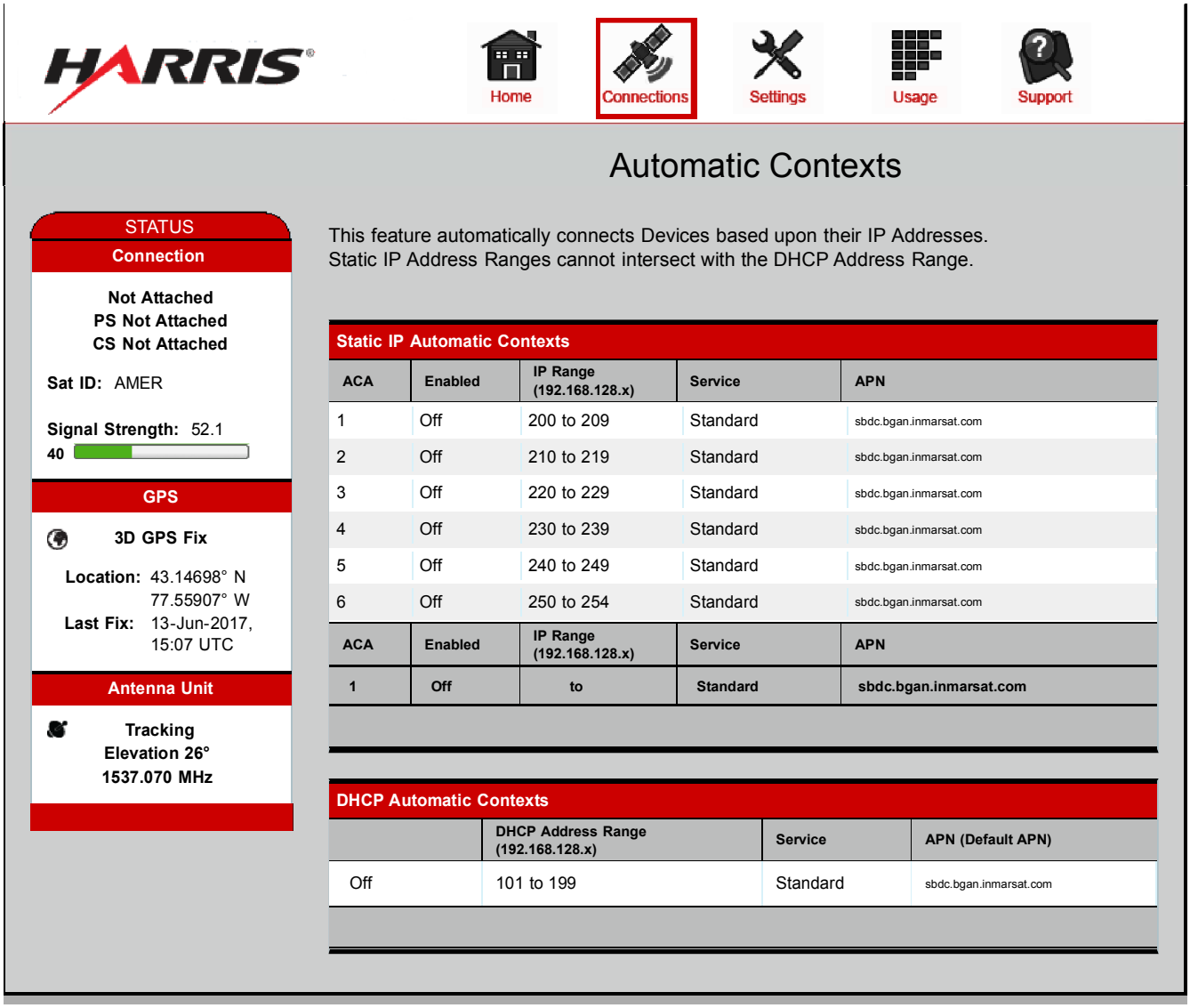

Figure 4-7. BGAN Terminal Network Connections

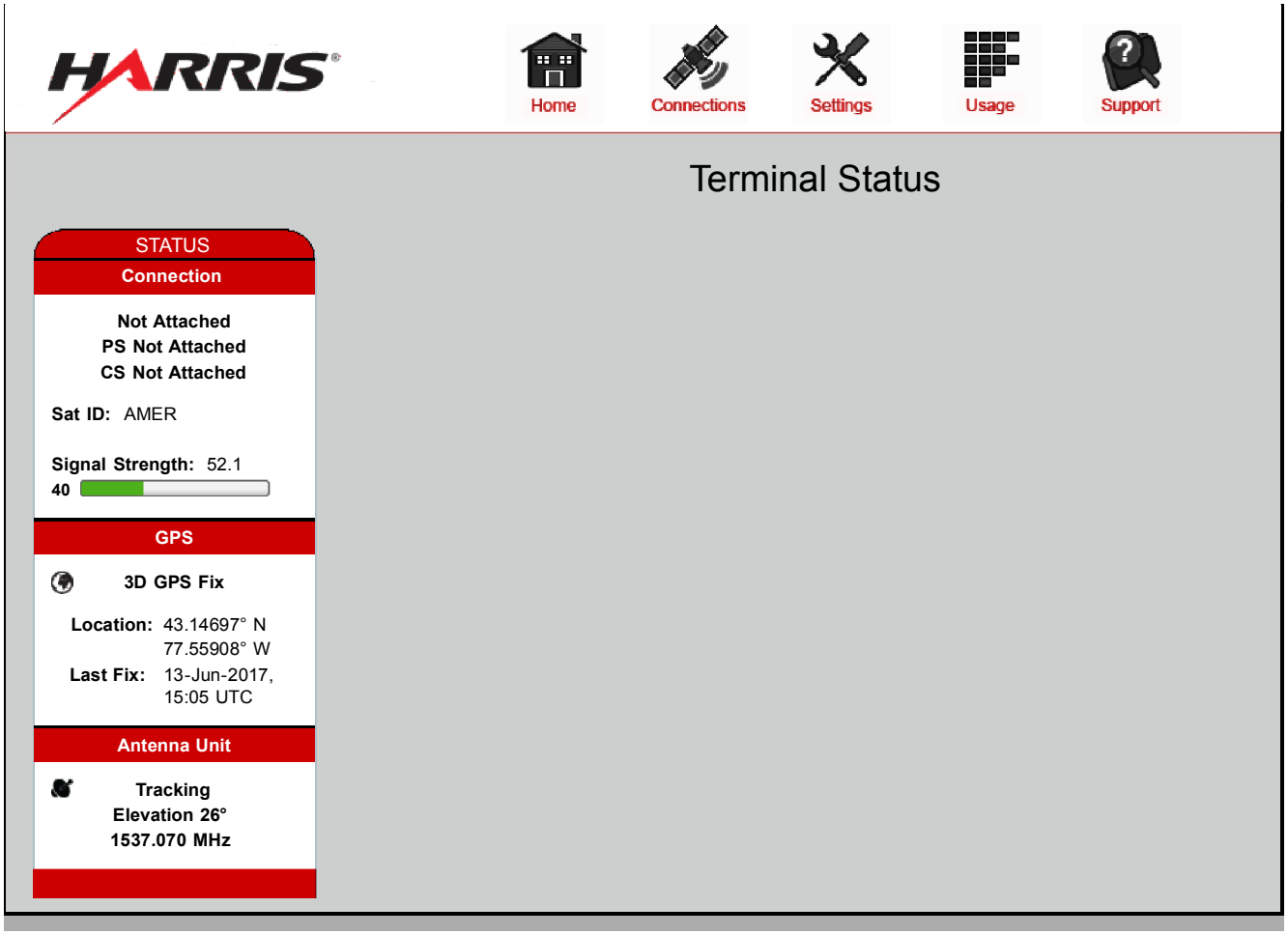

Figure 4-8. Terminal Status

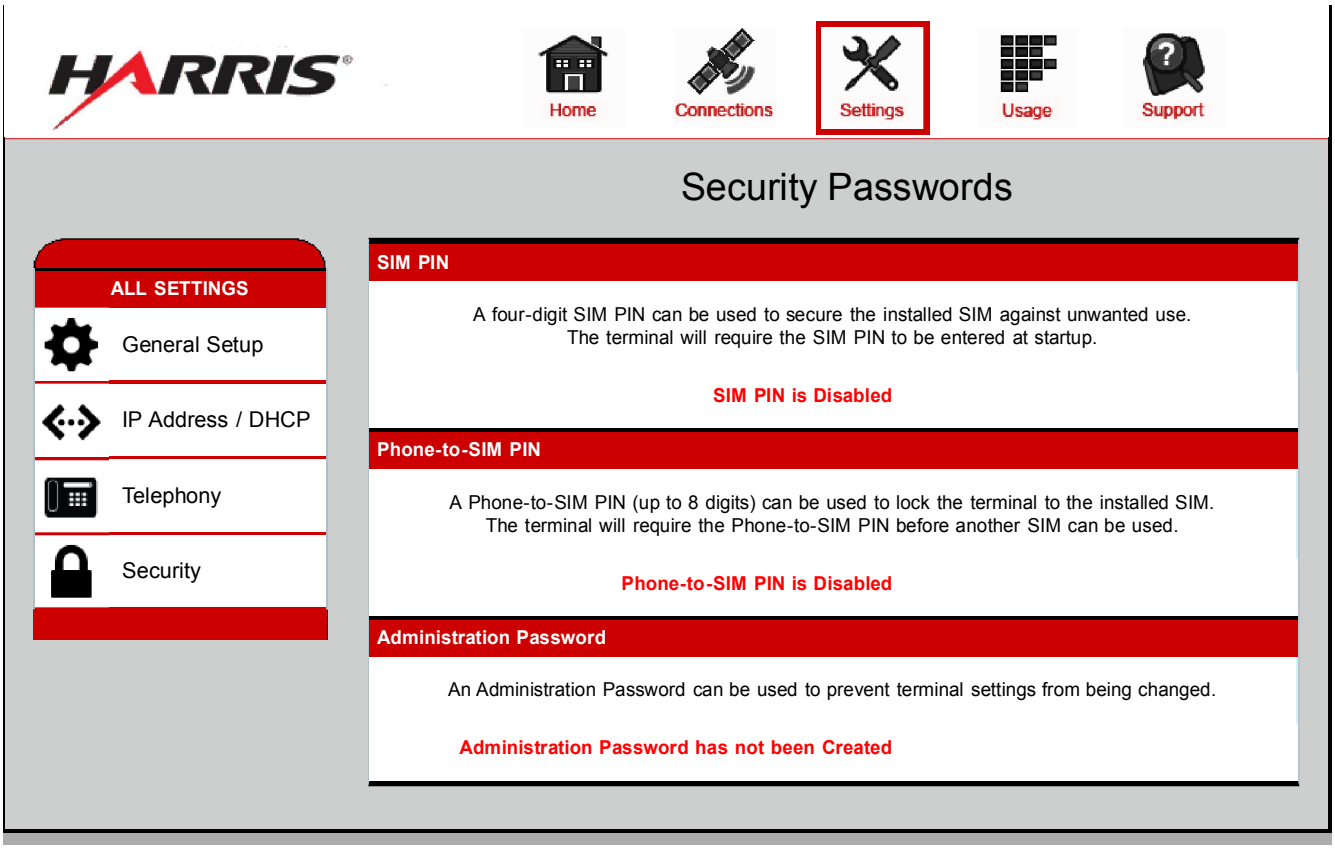

Figure 4-9. Security Passwords

4.4.3.2 Activating Multiple Network Connections

To activate multiple Network Connections for additional computers, repeat the instructions for a single Network Connection. Each time a context is activated for a particular local IP address, it will show up in the table.

NOTE

Multiple network connections are only possible in NAT mode.

Up to 11 computers can be connected to the BGAN terminal. More than one computer can be connected to the Ethernet interface by using either a hub, router or a switch. When a hub is used, the BGAN terminal operating in NAT Mode can allocate private IP addresses to each computer connected to the hub, allowing each computer to have a dedicated primary Network Connection. In this case, each computer has the ability to individually attain up to a 492 kbps connection to the BGAN network. If a router is used, the BGAN terminal operating in Relay Mode allows a simplified connection to the router. However, this would limit the throughput to all those computers behind the router to a single 492 kbps connection, using a single Network Connection.

4.4.4 Automatic Network Connections

See Figure 4-10. The automatic network connection feature provides the ability to create a Network Connection automatically using a specified IP address of the Terminal Equipment (TE). The TE is an IP device (e.g., IP camera), which can transfer IP data. The IP Automatic Network Connections page allows automatic context activation with two different methods:

- Terminal Equipment using Static IP addressing, to create automatic Network Connections when a specified IP Address is detected on the local network
- Terminal Equipment using the BGAN Terminal DHCP Server's assigned IP addresses, to create automatic Network Connections when a specified IP Address is detected on the local network

Selecting "ON": A one-time automatic connection is established when a specified IP Address is detected on a local network.

Selecting "DA": An automatic connection is established when data traffic sourced by the specified IP Address is detected on a local network. If previously established data connection went inactive, it will be reactivated each time data is sent.

NOTE

The BGAN Terminal does not save and restore these defined contexts across power cycles, and requires the reception of a subsequent ARP packet following a power cycle to initiate the definition of the context. Decreasing ARP refresh times from the connected router or device to reinitiate a context definition may be required to ensure timely network connectivity.

The **24/7 Network Connection Keep Alive** property will allow the data connection to remain active in the event of a network timeout due to a long period of inactivity.

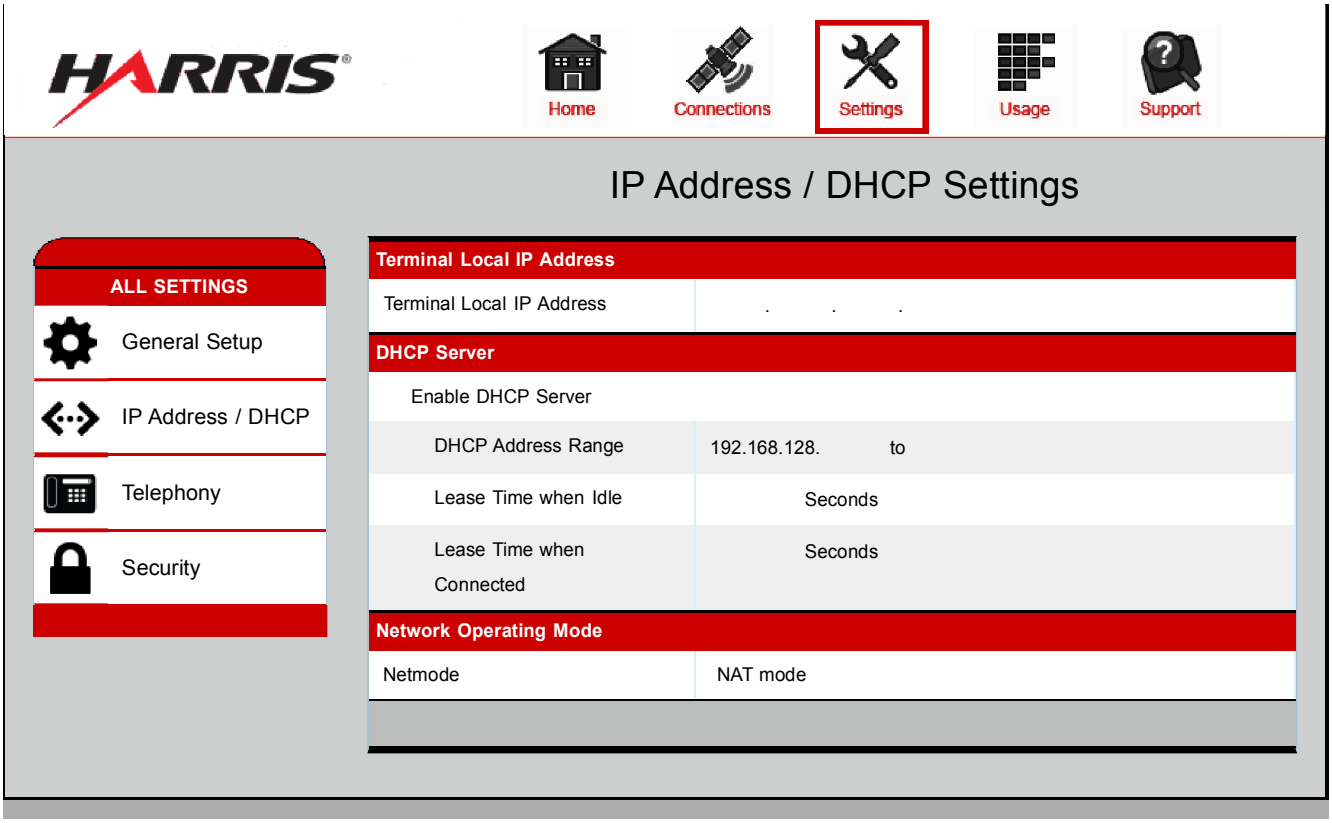

Figure 4-10. BGAN Terminal IP Automatic Network Connections

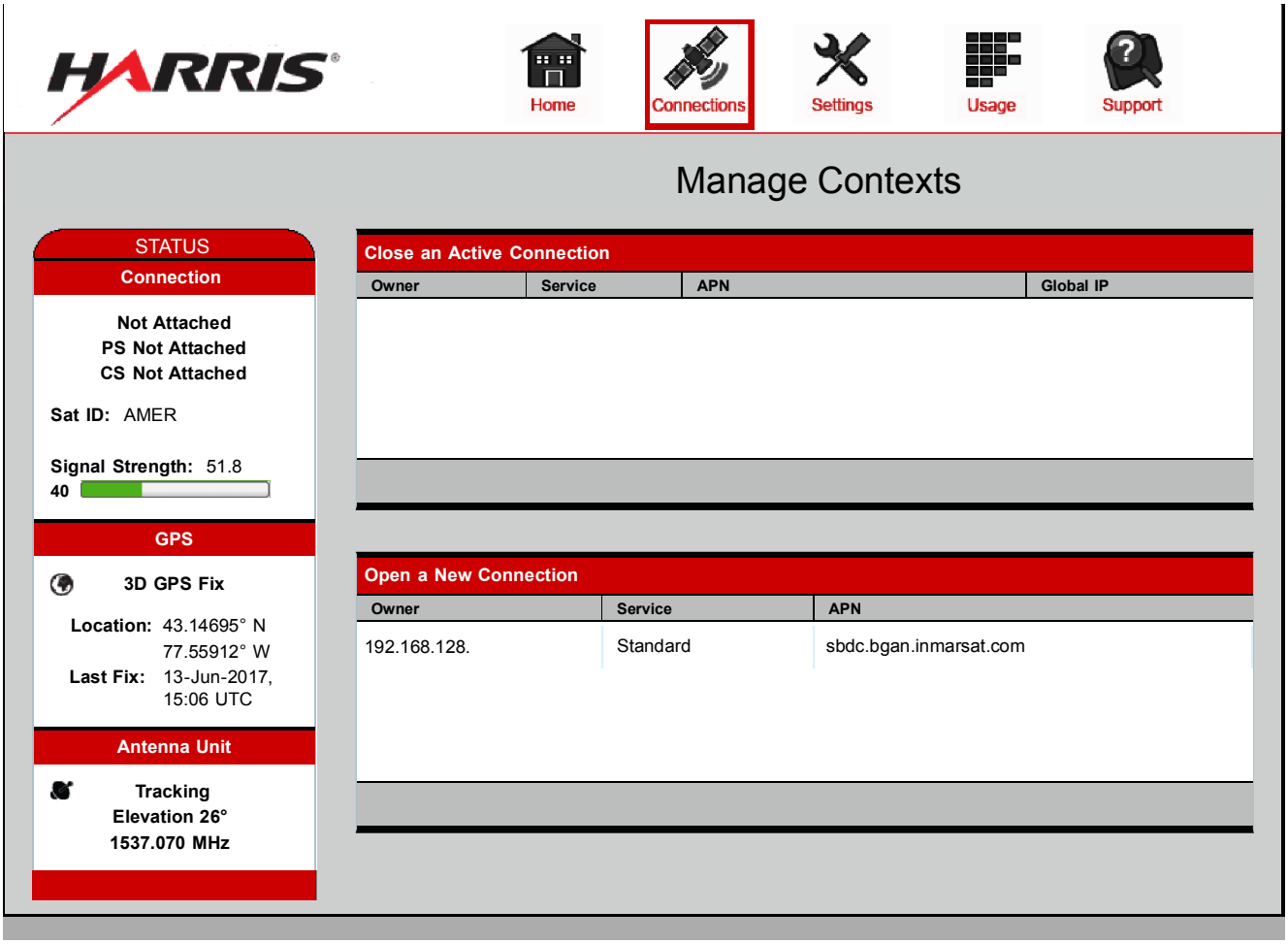

Figure 4-11. Manage Contexts

4.4.4.1 Automatic Network Connections Settings for TE with Static IP Address

A custom range of static IP addresses can be used for setting up an automatic Network Connection with any of the QoS's offered by the network. To turn on a particular range of addresses:

a. Select **DA** and enter the low and high range of IP addresses to use (e.g. 192.168.128.210 to 192.168.128.219).

b. Select the desired QoS for that range of IP addresses (32 k) for streaming. The APN listed is the default APN read from the USIM card (bgan.inmarsat.com). If the USIM is provisioned for more than one APN, then type a secondary APN in this field.

c. If a user name and password is required to attain a known static public IP address, enter it in the next two fields. When requiring more than one BGAN network connection with different BGAN static public IP addresses (using different APN Username and Passwords), it is recommended to utilize multiple rows of the Automatic Network Connection configuration with different address ranges. For example, row 1 can contain a value of Low and High IP address of “192.168.128.101”, and row 2 can contain a value of Low and High IP address of “192.168.128.102”.

To setup additional ranges of addresses, follow the same instructions as above. IP address ranges cannot overlap. If there is an overlap, an error will pop-up for the overlap region. Check all of the ranges for overlaps and try again.

When finished, select **Apply**. The Operation Successful message should display.

4.4.4.2 Automatic Network Connections Settings for TE using DHCP Assigned IP Address

This option allows the BGAN terminal to be set up for dynamic background Automatic Network Connections. This means that any device connected to the BGAN terminal, will automatically receive a background Network Connection. To activate this feature:

a. Select the **DA** radio button under **Automatic Network Connections settings for TEs using DHCP assigned IP address**.

b. Click on **Apply**.

To see if the context has been setup properly, click on Network Connections page. This page will show all contexts that have been setup (active or inactive).

4.4.5 ISDN Setup

See Figure 4-12. To establish Integrated Services Digital Network data communication, connect the BGAN terminal ISDN port to ISDN equipment using the ISDN/Ethernet cable. Use the ISDN Interface page to activate 40 V power sourcing on the ISDN interface, and set Multi-Subscriber Numbering (MSN) numbering options.

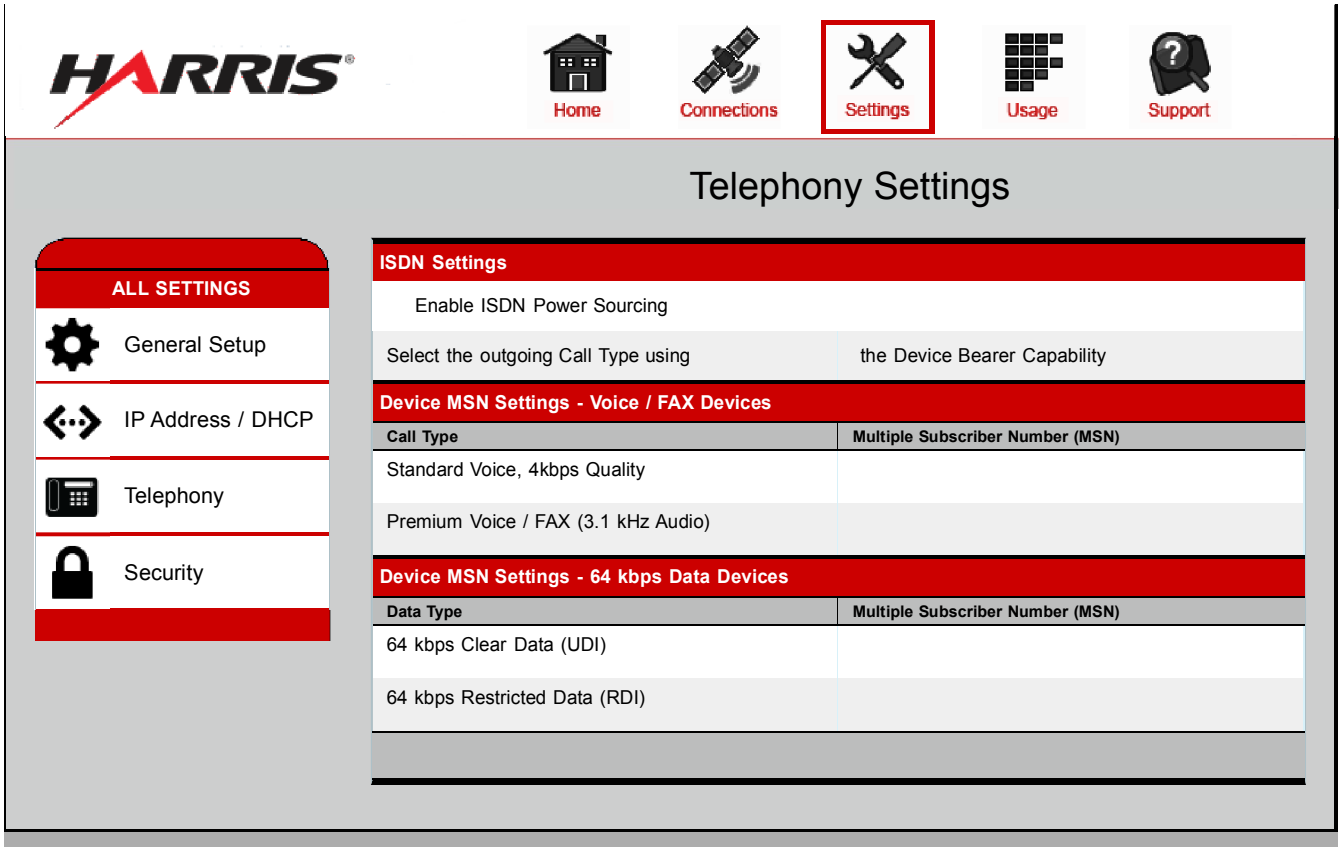

Figure 4-12. BGAN Terminal ISDN Properties

ISDN Power Sourcing: To turn on the ISDN power sourcing, click on the **On** radio button. The ISDN device should receive 40 V power immediately via the ISDN cable. This field should be on unless the ISDN is not being used or the ISDN device has its own power source.

MSN Speech: By default, MSN 1 is entered into the MSN Speech number text box. To receive incoming calls, configure the same MSN into the ISDN handset connected to the ISDN port.

MSN 3.1 KHz audio: By default, MSN 2 is entered into the MSN 3.1 kHz Audio number text box. To receive incoming calls, configure the same MSN into the ISDN fax machine connected to the ISDN port.

MSN UDI: By default, MSN 3 is entered into the MSN Unrestricted Digital Information text box. UDI is a 64 kbps service that is a European standard ISDN.

MSN RDI: By default, MSN 3 is entered into the MSN Restricted Digital Information text box. RDI is a 56 kbps service that is normally found in the USA.

Trigger for Mobile-Originated call type (Bearer): This drop down box controls the mechanism used by the BGAN terminal to select the bearer type for mobile originated calls.

- **Bearer Capability** is set by default as the trigger.
- **MSN Number** can be set if there is a problem and the ISDN device does not correctly signal the call type (speech, 3.1 kHz audio, UDI, RDI) via the bearer capability. Different MSN numbers can be used for any of the ISDN call types. However, the ISDN equipment must be configured with the same MSN to accept incoming calls, and different numbers must be used for speech, audio and UDI/RDI calls.

Once all changes have been made, click on **Apply**. Any changes to this screen require a re-boot of the BGAN terminal to save the new configuration. Use the power button on the BGAN terminal or the **Restart Terminal** button to gracefully power down and power back up the BGAN terminal.

MS-ISDN 1 thru 4: Every USIM card has four separate Mobile Subscriber Integrated Services Digital Network (MS-ISDN) numbers if the USIM has been provisioned for these services.

- MS-ISDN 1 is for 4 k Speech
- MS-ISDN 2 is for 3.1 kHz Audio (facsimile)
- MS-ISDN 3 is for 64 k Unrestricted Digital Information (UDI) data
- MS-ISDN 4 is for 56 k Restricted Digital Information (RDI) data

4.4.6 Usage Report

See Figure 4-13. The Usage Report page provides an estimate of the amount of Packet Switched data sent and received, along with time spent on a CS call. The data is broken up into three types.

Session: The PS session statistics track the cumulative PS data sent and received on background Network Connections since the unit was powered on. CS sessions statistics track the time of the last call.

Trip: The trip counter is similar to the trip counter on a vehicle. It can be zeroed out at anytime (select **Reset data** button) and it will track the statistics until it is reset.

Lifetime: The Lifetime counter is similar to the odometer on a vehicle. It shows the statistics of the BGAN terminal since the software version that added this feature was loaded onto the BGAN terminal. These counters cannot be reset.

If power is suddenly lost for some reason, statistics will not be saved to flash for the session and may be inaccurate.

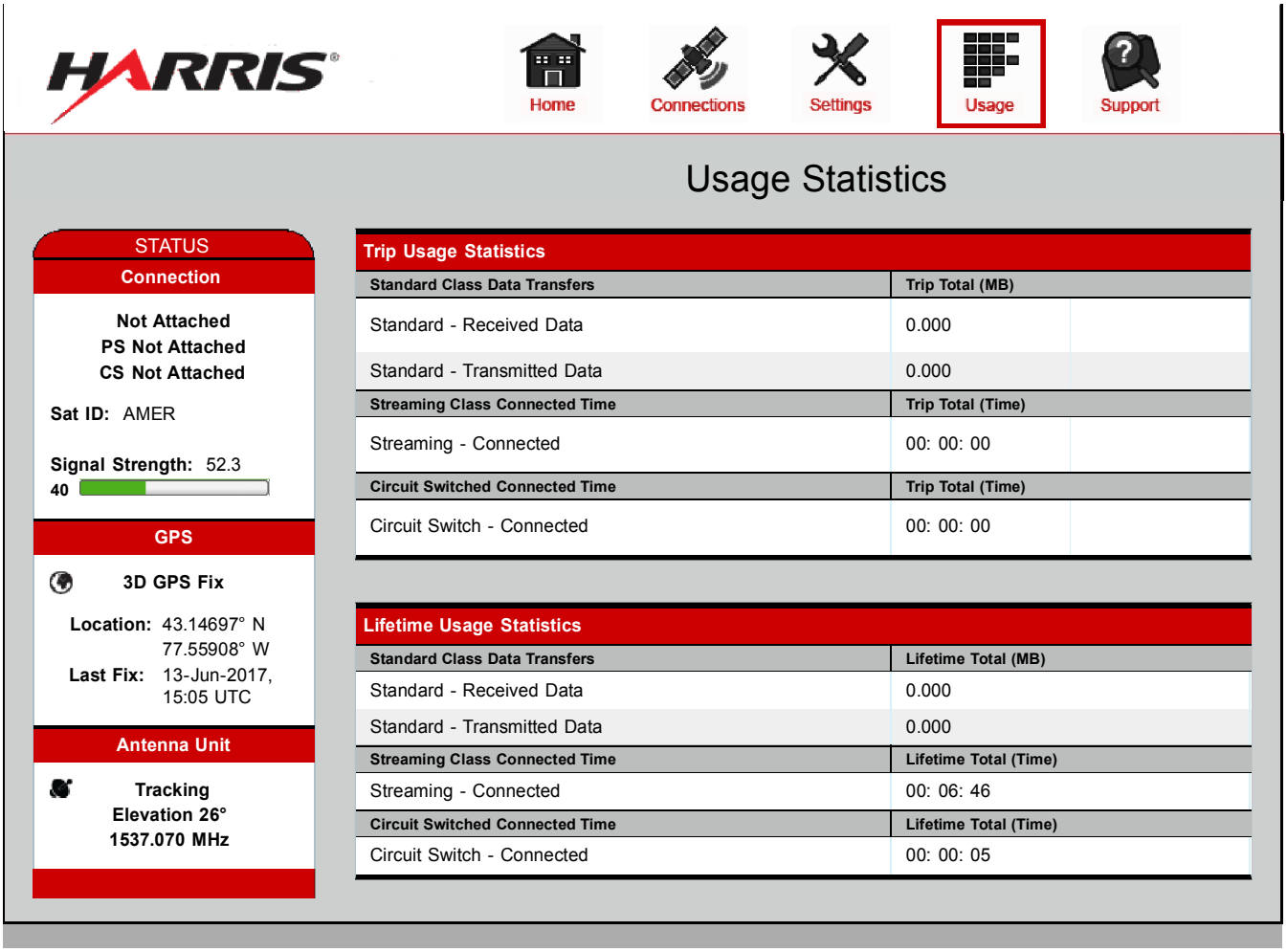

Figure 4-13. BGAN Terminal Usage Report

4.4.7 Antenna Status

See Figure 4-14. The Antenna Status page is only used for the RF-7800B-VU104 tracking antenna. It is used to monitor the status of the antenna. This page does not automatically update and must be refreshed to poll for the latest status.

ATB State: This field indicates the detailed state of the Antenna Tracking Board (ATB) and indicates whether the antenna is tracking or searching for the satellite. Refer to Table 4-1.

Elevation: The current elevation angle of the antenna.

Frequency (KHz): The frequency of the global beam in kHz that the antenna is tracking. Possible values are the primary and secondary frequencies of the three satellites. Refer to Table 4-2.

Antenna Tracking: Indicates (TRUE or FALSE) whether or not the antenna is currently tracking the satellite (in states 5, 6 or 7).

Built-in Test Results: Provides values for the built-in tests performed at startup. A displayed value of Pass means No Fault. A displayed value of 255 means test result not available. A displayed value other than Pass or 255 indicates a possible failure. Refer to Table 4-3 for Antenna Built-In Test (ABIT) results. For faults, refer to Paragraph 5.2.1. For any recurring faults, return unit for repair.

Visible Satellites: Information on the nearest satellite as well as the primary and secondary satellites is displayed. Where two satellite regions overlap, information on the nearer of the two satellites will be displayed.

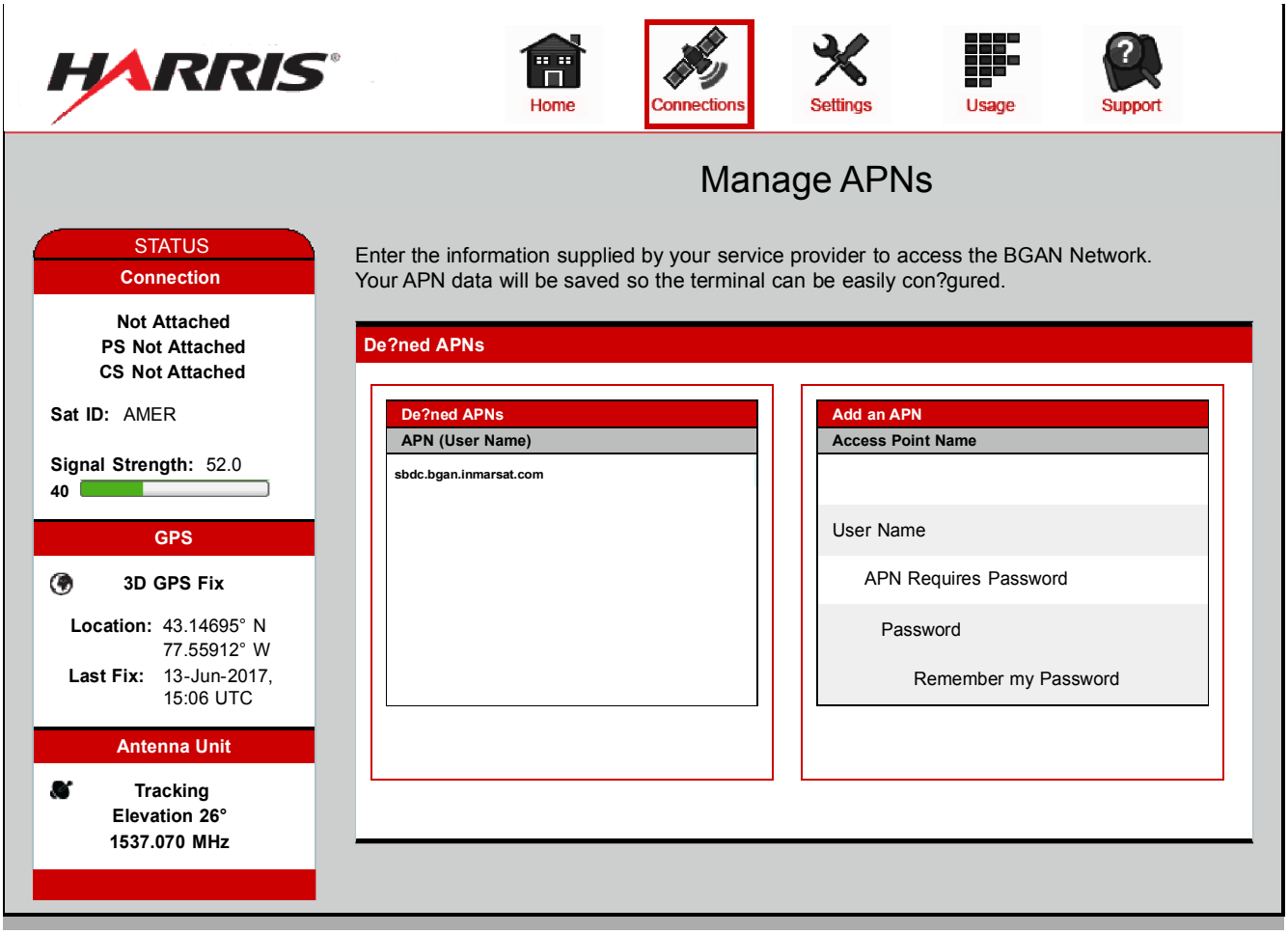

Figure 4-14. BGAN Terminal Antenna Status

Table 4-1. Antenna Status ATB State

State Name	State Description
Initial	Initial state
Idle	Wait on a frequency from the BGAN terminal.
Seek 1	Determine minimum/maximum signal levels in a full sky scan.
Seek 2	Find azimuth direction.
Seek Elevation	Determine minimum/maximum signal levels on a single elevation.
Track and Tune	Track and tune elevation state.

Table 4-1. Antenna Status ATB State (Continued)

State Name	State Description
Track and Tune PLL	Track and tune Phased Lock Loop (PLL) state.
Track	Track state.
Block	Blocked state
Freeze	Antenna has stopped all motors.
Test	Test state.

Table 4-2. Satellite Frequencies

Satellite ID	Satellite Longitude	Primary Frequency kHz	Alternate Frequency kHz
5 (I4-F1)	143.5 East (E)	1537485	1540825
6 (I4-F2)	25.0 E	1537920	1541115
7 (I4-F3)	98 West (W)	1537070	1540730

Table 4-3. ABIT Test Results

ABIT Test	ABIT Result Types
ABIT Azimuth Motor Result	1 = Motor shorted to ground 2 = Motor shorted to supply 3 = Undervoltage or Overvoltage
ABIT Elevation Motor Result	1 = Motor shorted to ground 2 = Motor shorted to supply 3 = Undervoltage or Overvoltage
ABIT EEPROM Result	1 = Electrically Erasable Programmable Read Only Memory (EEPROM) Write verification fault
ABIT RF Result	1 = PLL repeatedly loses lock
ABIT Low Noise Amplifier (LNA) Result	1 = Low Received Signal Strength Indication (RSSI) level
ABIT Microcontroller Result	1 = Microcontroller temperature too low 2 = Microcontroller temperature too high
ABIT HPA Result	1 = High Power Amplifier (HPA) is turned off

4.5 UPGRADING THE BGAN TERMINAL SOFTWARE

Software updates for the RF-7800B BGAN Terminals can be accessed from the Harris Premier website:

https://tcpremier.harris.com/.

The new embedded software will come with Harris created Microsoft Windows application called the BGAN Terminal Upgrader. This application simplifies installing new BGAN Terminal software.

A .zip file will be provided with all files to upgrade the terminal. Unzip the .zip file into a new directory on the computer's drive. Navigate to that folder and verify that the file name beginning with “bganx” has a version number that matches the desired version for the upgrade (i.e. Version 5.1.1.5 will be bganx_5_1_1_5.bin). If this does not match, obtain the correct files from the Harris Premier website.

NOTE

When supporting multiple versions of Harris BGAN Terminal software, do not copy new binary files into an existing Upgrade Application directory. Only one copy/version of each binary file may be in the folder or the Upgrade Application may not be able to perform a successful upgrade. It is suggested to create a new directory for each new version of BGAN Terminal Software.

NOTE

Do not rename files in the upgrade directory or the Upgrade Application may not be able to perform a successful upgrade.

NOTE

The following requirements must be met:

- Microsoft .NET Framework Version 2.0 Redistributable Package (x86) or later is installed on the computer. The link may be found at: http://www.microsoft.com/net.
- The computer is setup to get its IP address dynamically (usually true on most computers).
- The BGAN Terminal’s DHCP Server should be enabled (is enabled by default).

a. Power on the BGAN Terminal and connect it to the computer. Refer to Paragraph 2.6 Initial Turn-On / Check for detailed instructions.

b. Launch the Harris BGAN Upgrader application by double clicking **HarrisBGANUpgrader.exe**. The Harris Upgrader application should automatically establish communication with the BGAN Terminal and display the currently installed version. See Figure 4-15. If there was a communication issue, check the connections and then click the **Check Connection** button to retry.

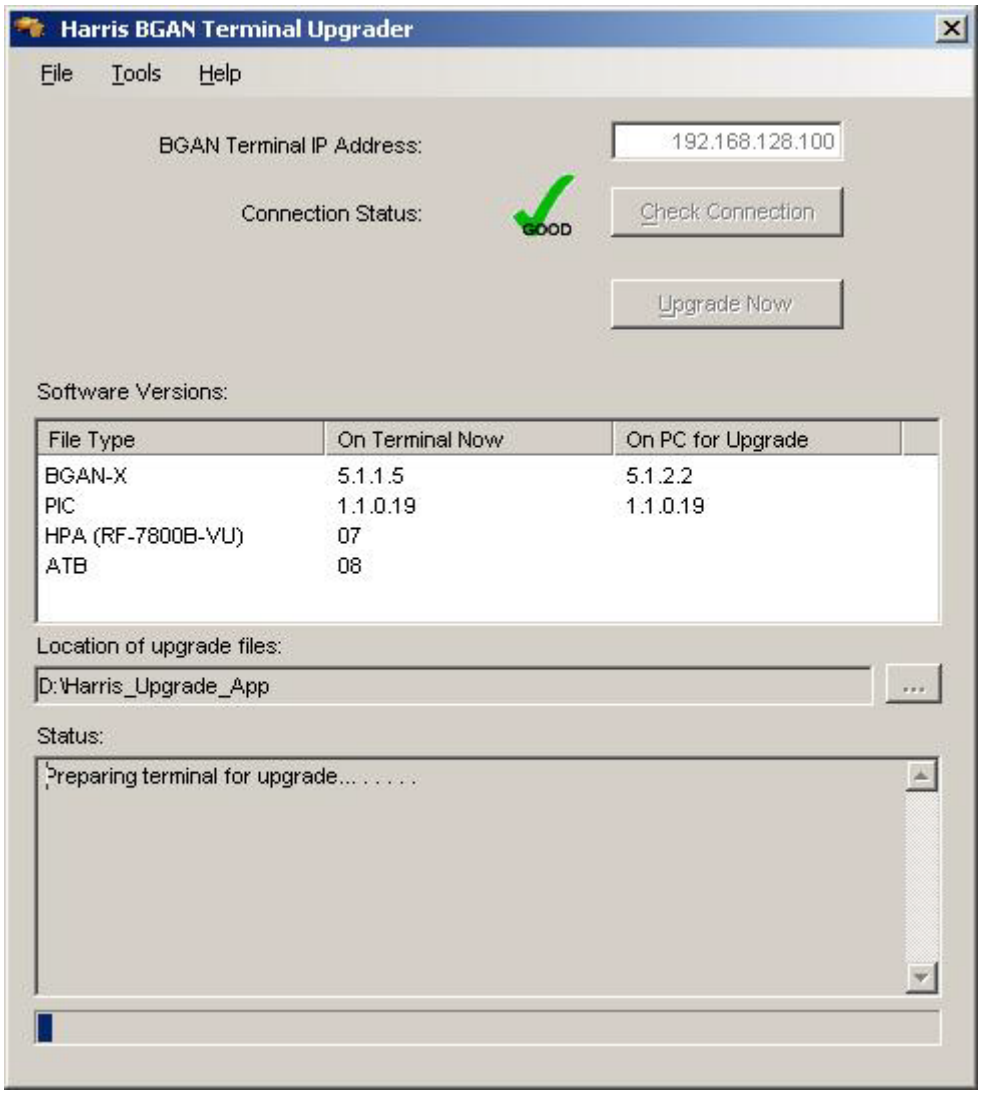

Figure 4-15. BGAN Terminal Upgrader

NOTE

The HPA file is only used for the RF-7800B-DU BGAN Terminal. The Upgrade Application will automatically ignore this file if not upgrading a RF-7800B-DU.

c. Click the **Upgrade Now** button to begin the upgrade process.

d. Click the **Yes** button to confirm the desire to proceed with the upgrade.

e. Wait a several minutes while the Upgrade Application performs the task. The Status area will show the following along with a progress bar:

Uploading BGAN-X Binary to BGAN Terminal
Connected, transferring... . . . . .

f. After the Upgrade Application displays the message “Upgrade operation completed successfully!”, select the **Check Connection** button to query the installed version from the BGAN Terminal. See Figure 4-16.

g. At this point, you may attach another BGAN Terminal to the PC and select the **Check Connection** button to begin upgrading an additional BGAN Terminal.

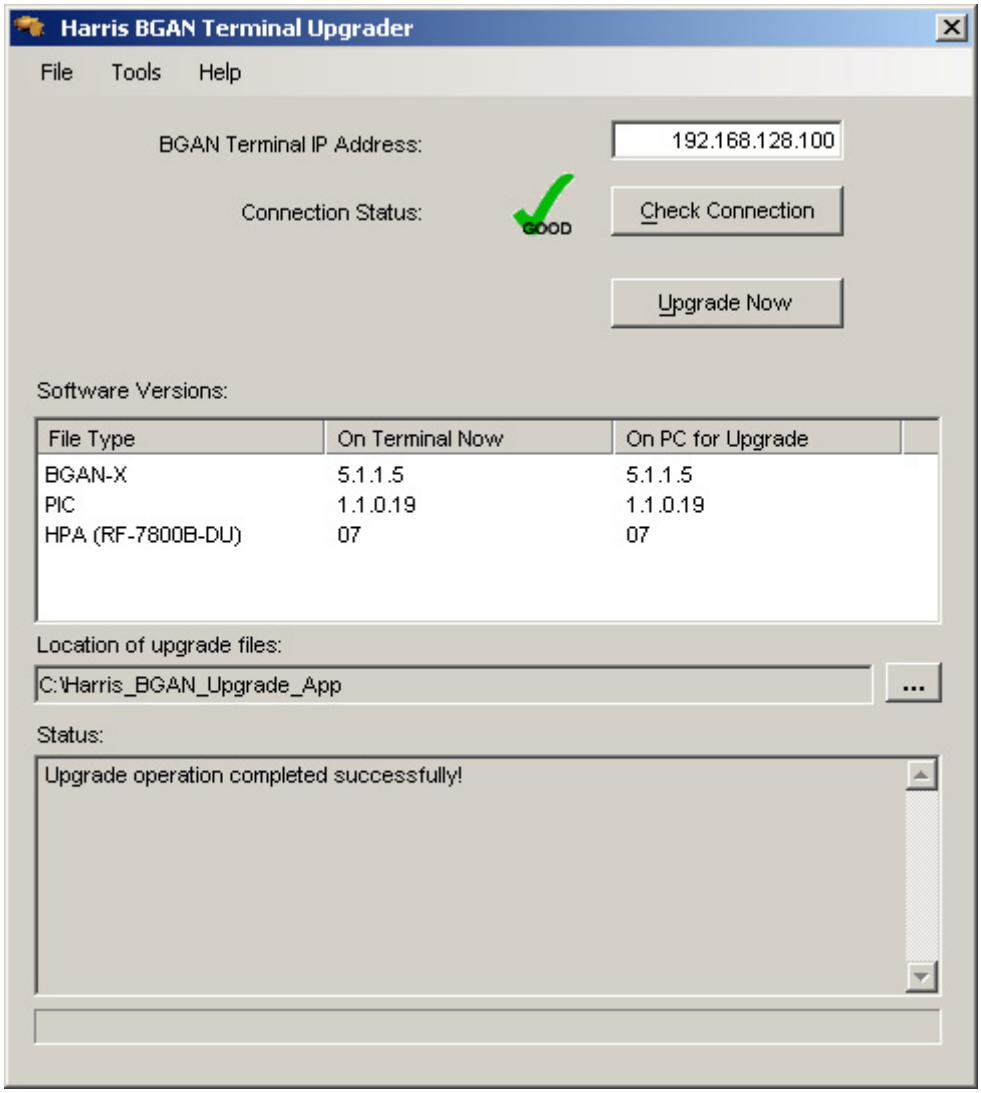

Figure 4-16. BGAN Terminal Upgrade Complete

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CHAPTER 5

SCHEDULED MAINTENANCE

5.1 PREVENTIVE MAINTENANCE

Preventive maintenance is the systematic, daily care and inspection of equipment to prevent equipment failure and reduce downtime.

Table 5-1 contains the checks and services that should either be performed on a daily basis when the equipment is in use or on a weekly basis when the equipment is in a standby condition. Table 5-2 contains the checks and services that should be performed on a weekly basis.

Table 5-1. Daily Preventive Maintenance Checks and Services

Check No.	Item to be Inspected	Procedure
1	Completeness	Check to see that the equipment is complete.
2	Exterior Surfaces	Remove dust, dirt, and moisture from all surfaces. Only use a soft damp cloth to clean the Broadband Global Area Network (BGAN) Terminal.
3	Operation	Verify connection to BGAN terminal web interface.
4	Installation	Check hardware for looseness. Make sure unit is secure.
5	RF-7800B-VU104 drain holes	There are four separate drain holes on the bottom of the RF-7800B-VU104 that will allow condensation and moisture out of the antenna to prevent any corrosion. Turn the screws clockwise to Open and counterclockwise to Close.

Table 5-2. Weekly Preventive Maintenance Checks and Services

Check No.	Item to be Inspected	Procedure
1	Connectors	Check all connectors for debris, damage, or corrosion. Elevate to a higher level of maintenance, if required.
2	Antenna	Check for breaks or strains; repair or replace as required.
3	Cables	Check for cracks or cuts; repair or replace as required.

NOTE

To avoid impaired BGAN terminal performance, make sure the antenna is not damaged or the surface is not covered with foreign material like paint of labeling.

5.2 CORRECTIVE MAINTENANCE

Shortcomings and defects which are revealed when the BGAN terminal is in service must be attended to by means of corrective maintenance. The type of work required determines if the corrective maintenance procedure can be performed by the operator, or if it must be performed at a maintenance facility.

The following procedures assume that the operator has determined that the BGAN terminal is faulty. This could be determined in three ways:

- The self-test has been run and a fault code has been identified by the BGAN terminal.
- A run-time fault message is displayed by the Antenna Status page.
- The observed degraded operation suggests that the BGAN terminal is faulty.

Whenever it is believed that the BGAN terminal may be faulty, the troubleshooting procedures in this chapter should be followed to determine the recommended corrective action. If the symptom observed is not covered, report the problem to a Level II or III maintainer (Direct Support, Intermediate Maintenance, or Factory Warranty Support). Faults can be detected by the Built-In Test (BIT) or visual observation.

5.2.1 Troubleshooting Procedures

Self test faults are displayed on the Antenna Status page. The following paragraphs identify probable failure causes, and suggested corrective actions.

5.2.1.1 Power-on BIT Faults

BIT faults are saved following an power-on BIT and are displayed on Antenna Status page.

5.2.1.2 Operator-Initiated BIT Faults

BIT faults are displayed following an operator-initiated BIT. For information on running BIT, refer to Paragraph 4.4.7. When a fault message is displayed, record all fault code information and report the fault to a Level II or Level III maintainer.

5.2.1.3 Run-Time Faults

Run-Time faults mostly occur due to programming errors and are listed in Table 5-3. Sometimes hardware failures can cause run-time failures. Send the radio to a level II or III repair facility for hardware failures.

Table 5-3. Run-Time BIT Faults, Descriptions, and Corrective Action

Text Message	Description/Corrective Action
Hot, Very Hot, Very Very Hot, Too Hot	Temperature warnings. Hot = warning, Very Hot = reducing functionality, Very Very Hot = shutting down calls, Too Hot = imminent shutdown.
Personal Identification Number (PIN) Required	Enter a 4-8 digit PIN to enable non-emergency functions.
Personal Unblocking Key (PUK) Required	Enter a 4-8 digit PUK to revert Subscriber Identity Module (SIM) to the original unlocked state.

5.2.1.4 Non-BIT Faults

Non-BIT faults are operator-observed failures, or cases of degraded operation. Locate the observation in the first column of Table 5-4 and follow the recommended action. If the recommended action is unsuccessful, report the fault to a Level III maintainer.

Table 5-4. Non-BIT Troubleshooting

Observation	Action
BGAN terminal does not power on.	Check batteries and/or power source. Check cable connections.
Battery Box not supplying power. Applies to the RF-7800B-DU024 only.	Check Fuse F1, F2 (Automotive Blade, 5 A 32 V). Check Batteries.
Integrated Services Digital Network (ISDN) calls are not accepted.	The Mobile Subscriber Number (MSN) programmed into the ISDN device does not match the MSN programmed into the terminal.
ISDN calls are not being made.	The ISDN interface is turned off (the interface turns off automatically when the terminal is operating from battery power, or if no ISDN device is detected within five minutes from power on).
BGAN terminal is connected to the BGAN network, but cannot obtain the requested Quality of Service.	The BGAN terminal is not optimally pointed at the satellite. Re-point the terminal.
Terminal does not obtain a Global Positioning System (GPS) fix.	BGAN terminal location limits visibility of four or more GPS satellites. Move the terminal to a location where there are few obstructions.
BGAN terminal makes a continuous beep when an ISDN device is connected to the ISDN port.	The ISDN device is trying to draw too much power from the BGAN terminal's ISDN interface. Make sure it is an ISDN device that draws less than 70 mA of current at 40 V (equivalent power 2.8 W). It might be an Ethernet device.
The terminal will not register with the BGAN Network. • When viewing the terminal's Web interface, does the terminal have a 3D GPS fix?	The BGAN terminal requires a GPS fix to determine the correct Rx and Tx radio frequencies to use. Using the BGAN terminal's Web interface, wait for the terminal to acquire a 3D fix. Attempt to move the terminal to a location with a more open view of the sky. Once the unit has acquired a GPS fix, it can be moved into a more sheltered location nearby.
The terminal will not register with the BGAN Network. • Does the terminal have a clear line of sight to the satellite?	Move the terminal to a more open location. In urban environments, buildings produce regions of signal reflection and fade that can result in strong signal readings, but which introduce sufficient noise to prevent communication. In such conditions, often moving the terminal only a couple meters can fix the problem.
The terminal will not register with the BGAN Network. • Are you in a geographical location where two BGAN satellites have coverage?	The Land Mobile SATCOM-on-the-Move terminal will automatically search for the best satellite connection, but your position may be blocking the view to the nearer satellite. You can force the terminal to search for the other satellite by changing the 'Satellite Selection' setting on the Web interface Setup page from 'AUTO' to the desired satellite.

Table 5-4. Non-BIT Troubleshooting (Continued)

Observation	Action
The terminal will not register with the BGAN Network. • Is the 'Satellite Selection' configured with the appropriate setting?	The 'Satellite Selection' allows for specification of the satellite to use. This can be configured to use a specific satellite, or to automatically locate the most appropriate one. If a specific satellite is selected, ensure that it is within your field of view. Alternatively, select 'AUTO' if the specific satellite is unknown.
Using the Web interface on the Properties screen, the terminal shows the "Registration Status" as "Registered", but the "PS Attach" status as "Not Attached".	Is your BGAN subscription valid? The most common cause for a failure to PS Attach is that your BGAN service provider is denying you service. Contact your BGAN service provider to ensure the subscription is valid.
The Network Connection activation attempt fails because the requested static Internet Protocol (IP) address is in use or otherwise unavailable. • Are you requesting the correct static public IP address?	Confirm you are using the correct Access Point Name (APN), username, and password to obtain the desired public IP address. These parameters may vary based on your geographical location. Check with your BGAN service provider.
The Network Connection activation attempt fails because the requested static public IP address is in use or otherwise unavailable. • Is the requested public IP address permitted in your current location?	The use of static public IP addresses is specific to geographical regions. Your BGAN service provider will provide the details. Confirm that you are requesting the correct static public IP address for your current geographical position.
The Network Connection activation attempt fails because the requested static public IP address is in use or otherwise unavailable. • Was the last context activation made to the requested public IP address properly deactivated?	The BGAN system is designed to allow for short outages in the connection link between the terminal and the satellite. For example, when the vehicle with a BGAN terminal drives behind a building, the BGAN system will allow the Background Network Connection to remain broken for one hour. During that one hour the public IP address remains assigned to that context. (Note, if you remove DC power from the BGAN terminal without properly deactivating a context, the BGAN Network will keep the public IP address for that context allocated to that BGAN terminal for one hour. Moving the Land Portable power switch to OFF will correctly deactivate the Network Connection before shutting off power to the unit.) You can power the terminal back on, reactivate the context, and then properly deactivate it to release the public IP address. Alternatively, wait one hour for BGAN to release the public IP address, or use a different public IP address.

Table 5-4. Non-BIT Troubleshooting (Continued)

Observation	Action
The Network Connection activation attempt fails because the requested static public IP address is in use or otherwise unavailable. • Is there network congestion in your specific spot beam?	It is possible during periods of heavy network usage that the network is too busy to grant a Network Connection request. Continuously retry activation attempts. As soon as the network is able to grant you a Network Connection, it will. Additionally, your BGAN Service Provider can determine if the problem is due to network congestion.
The terminal has power, but the Ethernet electrical link indication is not present.	Verify that the MIL Data Connector on the cable is fully connected to the MIL Data Connector on the BGAN terminal. The red outline on the BGAN terminal connector should not be seen when fully screwed in. Cable 12043-0834 contains both a female ISDN and a male Ethernet connector. Ensure the correct connector is used.
The terminal has power, but the Ethernet electrical link indication is not present. • Check computer settings.	Ensure that the Ethernet Device is properly configured on your computer. Refer to Paragraph 2.6 Initial Turn-On / Check.
The terminal Ethernet electrical link is present, but IP traffic to the default Ethernet IP address of the terminal gets no response. • Was the Ethernet IP address of the terminal changed from the default?	Retry the communication using the correct Ethernet IP address for the terminal. If the address was changed and forgotten, proceed to the actions below to recover the Ethernet IP address of the terminal.
The terminal Ethernet electrical link is present, but IP traffic to the default Ethernet IP address of the terminal gets no response. • Is the DHCP server feature enabled in the terminal?	Configure the communicating device to use Dynamic Host Configuration Protocol (DHCP).
The terminal Ethernet electrical link is present, but IP traffic to the default Ethernet IP address of the terminal gets no response. • Was the embedded DHCP server turned off?	Configure the communicating device to use DHCP. If the BGAN terminal was changed to a static Ethernet IP address, and that Ethernet IP address was forgotten, remove the Universal Mobile Telecommunications System Subscriber Identification Module (USIM) card, then power the terminal up. With the USIM removed, the terminal will automatically enable the DHCP server feature. This will allow a directly connected computer to use DHCP to receive an address from the BGAN terminal, as well as allow the computer to reconfigure the BGAN terminal appropriately. Ensure that the computer is configured to be in the same subnet as the terminal if the terminal is not configured for DHCP. If DHCP is enabled on the terminal, ensure that the computer got an IP Address from the BGAN terminal. Refer to Paragraph 2.6 Initial Turn-On / Check.

Table 5-4. Non-BIT Troubleshooting (Continued)

Observation	Action
The Network Connection is active, but data will not flow over the connection.	On the 'Network Connection Web interface page, confirm that the Local IP address of the active context matches the Ethernet IP address of the device attempting to send data. Only packets sourced from the Local Ethernet IP Address will be allowed to pass over the Network Connection created. If the addresses do not match, you must deactivate the context and create a new one with the correct Local IP Address. Note that when using DHCP from the computer, the computer Ethernet IP address may change.
The Network Connection is active, but data will not flow over the connection. • Does your Local Area Network (LAN) route packets between the Local IP Address and the BGAN terminal?	Confirm you network configuration is correctly routing packets between the Local IP Address of the active context to the BGAN terminal.
I can't hear pointing tones on my RF-7800B-DU when the switch is in the audio position	Check the 'Bypass Antenna Pointing' setting on the Web interface Setup page.
What frequency is my BGAN terminal transmitting on?	Check the Web interface 'Antenna' page. It varies slightly by location. Register and create a Network Connection with the terminal. Then check the 'Antenna' page on the terminal's Web interface for your spot beam frequency. This is the frequency that user data is transmitted on.
The BGAN terminal was online, but has since been placed offline without user intervention. • Has the view of the satellite become obstructed?	Restore a clear line of sight between the terminal and the satellite. The connection will automatically be restored if the interruption was less than one hour.
The BGAN terminal was online, but has since been placed offline without user intervention. • Was there any data sent over the connection for 12 hours?	The BGAN system will automatically deactivate a context that has not sent any data for 12 hours. Manually reactivate the Network Connection. If desired, enable the '24/7 Network Connection Keep Alive' feature on the 'Setup' page of the Web interface to keep unused connections active longer than 12 hours.
The BGAN terminal was online, but has since been placed offline without user intervention. • Did you reach the data limit for your BGAN subscription?	To limit BGAN expenses, USIM cards can be commissioned to have a daily/weekly/monthly traffic or monetary limit. Contact your USIM administrator to obtain more air-time. Check with your BGAN Service Provider to determine if this was the cause.

5.3 BATTERIES

The BGAN Battery Box Kit 12091-4010-01 can use one of the following batteries:

- BA-5590/U Lithium Sulfur Dioxide (Li-SO2) non-rechargeable
- BA-5390/U Lithium Manganese Dioxide (Li-MnO2) non-rechargeable
- BB-590/U Nickel-Cadmium (Ni-Cd) rechargeable
- BB-390A/U Nickel-Metal Hydride (Ni-MH) rechargeable
- BB-390B/U Ni-MH rechargeable
- BB-490/U lead-acid rechargeable
- BB-2590/U Lithium-Ion (Li-ION) rechargeable

Refer to Paragraph 3.3.2.5 for information on connecting the battery box to RF-7800B-DU024 Land Portable BGAN Terminal.

5.3.1 Battery Life

The most significant factor in determining battery life is transmission output power level and duty cycle. To maximize battery life, keep BGAN terminal off when not needed, and minimize transmissions.

5.3.2 Battery Safety

WARNING

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

WARNING

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

WARNING

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

WARNING

If the battery becomes hot, a hissing sound is heard, and an irritating smell occurs; power the radio OFF, disconnect the batteries from the radio and move the equipment to a

well-ventilated area. If a battery leak is detected, follow appropriate Hazardous Materials (HAZMAT) procedures to reduce risk of personal injury.

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

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

5.3.3 Rechargeable Battery Packs

WARNING

Do not overcharge, short circuit, incinerate, or mutilate rechargeable batteries. Charge batteries per manufacturer's instructions. Failure to comply could cause personal injury or death.

Optional battery chargers are available to provide fully automatic battery charging and fault detection. Models are available for single or multiple battery charging, and display the status of each connected battery during operation. Contact Harris for particular applications.

5.3.4 Disposing of Lithium Batteries

WARNING

Do not dispose of batteries in uncontrolled trash, as batteries may contain hazardous materials. Check with local directives for proper disposal. Failure to comply could cause injury or death to personnel.

WARNING

Store multicell lithium sulfur dioxide batteries in a well ventilated area away from personnel. Do not activate the CDD of a damaged battery. Damaged multicell lithium sulfur dioxide batteries must be processed as hazardous waste and should not be thrown into a local dumpster. Otherwise, personal injury or death may result.

Lithium batteries, whether discharged or partially discharged, should only be disposed of per local directives. Refer to local directives for additional information on lithium batteries. Do not place lithium batteries in trash compactors. Refer to local directives for more information on lithium batteries.

APPENDIX A

TECHNICAL INFORMATION

A.1 CHASSIS CONNECTOR PINOUT DATA

Table A-1, and Table A-2, provide pinout data for the connectors mounted to the BGAN terminal. Figure A-1 shows the connector locations and pinouts. For information on connectors that mate to the BGAN terminal chassis connectors, refer to Paragraph A.1.1.

Table A-1. DATA

Pin #	Signal Name	Dir	Description	Specs
1	ISDN_TX-	I	ISDN Receive -	
2	ISDN_TX+	I	ISDN Receive +	
3	ISDN_RX-	O	ISDN Transmit -	
4	ISDN_RX+	O	ISDN Transmit +	
5	ETHER_TX-	I	Ethernet Receive -	
6	ETHER_TX+	I	Ethernet Receive +	
7	ETHER_RX-	O	Ethernet Transmit -	
8	ETHER_RX+	O	Ethernet Transmit +	
9	USB_GND	I	USB Ground	
10	USB_VBUS	I	USB Voltage Bus	
11	USB_D-	I/O	USB Data -	
12	USB_D+	I/O	USB Data +	

Table A-2. POWER

Pin #	Signal Name	Description	Specs
A	DC+	DC +	
B	GND	Ground	No cable connection
C	Power Control (ACTIVATION_SIGNAL)	Jumper to D to enable Power Control Signal	For RF-7800B-VU104 only. Activates power when grounded.
D	GND	Ground	

CL-0365-4200-0036

Figure A-1. RF-7800B Data and Power Connector Pinouts

A.1.1 Mating Connectors

Table A-3 provides part numbers for the cable connectors that mate to the chassis connectors.

Table A-3. Connectors and Mating Connector Part Numbers

Chassis Connector	Mating Connector Part Number
RF-7800B Data	J09-0024-102
RF-7800B Power	J09-0007-207

APPENDIX B

GLOSSARY

B.1 GLOSSARY

The following provides a glossary of terms used in this manual.

-A-

A	Ampere
ABIT	Antenna Built-In Test
AC	Alternating Current
AES	Advanced Encryption Standard
APN	Access Point Name
ATB	Antenna Tracking Board

-B-

BIT	Built-In Test
BGAN	Broadband Global Area Network
BLOS	Beyond-Line-of-Sight

-C-

°C	Celsius, degrees
C/NO	Carrier-to-Noise ratio
CDD	Complete Discharge Device
CE	Conformité Européenne, a French term that can be literally translated into English as European Conformity. The CE Marking is a certification for products within the European Economic Area.
CID	Context Identifier
cm	Centimeter
CS	Circuit Switch

-D-

dB	Abbreviation for decibel, which is one-tenth of a bel.
dBm	The amount of power relative to that represented by a 1 kHz signal which is fed one milliwatt of power into a 600 ohm resistive load; or 1 dB relative to one milliwatt, 0 dBm = 1 mW.
dBW	1 dB relative to one Watt.

GLOSSARY - CONTINUED

-D- (Continued)

DC	Direct Current
DHCP	Dynamic Host Configuration Protocol (Automates the assignment of IP addresses to computers)
DNS	Domain Name System

-E-

E	East
EEPROM	Electrically Erasable Programmable Read Only Memory
EIRP	Effective Isotropic Radiated Power

-F-

°F	Fahrenheit, degrees
FAX	
FCC	Federal Communication Commission
FTP	File Transfer Protocol
FXS	Foreign Exchange Subscriber

-G-

GMPCS	Global Mobile Personal Communications by Satellite
GMT	Greenwich Mean Time
GND	Ground
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications

-H-

HAIPE	High Assurance Internet Protocol Encryptors
HAZMAT	Hazardous Materials
HF	High Frequency

GLOSSARY - CONTINUED

-H- (Continued)

HPA	High Power Amplifier
http	Hypertext Transfer Protocol (world wide web protocol)
Hz	Abbreviation for hertz, or cycles per second.

-I-

ID	Identification
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
INMARSAT	International Marine/Maritime Satellite
IP	Internet Protocol
IPSEC	Internet Protocol Security
ISDN	Integrated Services Digital Network
ITM	International Telecommunication

-J-

-K-

k	One thousand
kbps	One thousand bits per second
kg	Abbreviation for kilogram, or one thousand grams.
kHz	Kilohertz or one thousand hertz
km	Kilometers or one thousand meters
km/h	Kilometers Per Hour or one thousand meters per hour.

-L-

LAN	Local Area Network
lbs	Abbreviation for pound
Li-ION	Lithium-Ion
Li-MnO2	Lithium Manganese Dioxide
Li-SO2	Lithium Sulfur Dioxide
LNA	Low Noise Amplifier
LOS	Line-of-Sight

GLOSSARY - CONTINUED

-M-

mA	Milliampere
MHz	Abbreviation for Megahertz, or one million cycles per second.
MIL	Military
MIL-SPEC	Military Specification
MIL-STD	Military Standard
mph	Miles Per Hour
MS-ISDN	Mobile Subscriber Integrated Services Digital Network
MSN	Mobile Subscriber Number
mW	milli Watt

-N-

NAT	Network Address Translation
Ni-Cd	Nickel-Cadmium
Ni-MH	Nickel-Metal Hydride

-O-

-P-

PDA	Personal Data Assistant
PIN	Personal Identification Number
PLL	Phase Locked Loop
POTS	Plain Old Telephone System
PS	Packet Switch
PSTN	Public Switched Telephone Network
PUK	Personal Unblocking Key

-Q-

QoS	Quality-of-Service

-R-

RDI	Restricted Digital Information
RF	Radio Frequency

GLOSSARY - CONTINUED

-R- (Continued)

RoHS	Restriction of Hazardous Substances
RSSI	Low Received Signal Strength Indication
Rx	Receive

-S-

SATCOM	Satellite Communications
SIM	Subscriber Identification Module
SOQH	SATCOM-on-the-Quick-Halt
SOTM	SATCOM-on-the-Move
STE	Secure Terminal Equipment

-T-

TCP/IP	Transmission Control Protocol/Internet Protocol
TE	Terminal Equipment
TOC	Tactical Operation Centers
Tx	Transmit

-U-

UDI	Unrestricted Digital Information
UHF	Ultra High Frequency
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USIM	UMTS Subscriber Identification Module

-V-

V	Volts
VAC	Volts Alternating Current
VDC	Volts Direct Current
VHF	Very High Frequency
VPN	Virtual Private Network

GLOSSARY - CONTINUED

-W-

W	Watts, West
WEEE	Waste from Electrical and Electronic Equipment

-X-

-Z-

TECHNICAL PUBLICATION
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TROUBLESHOOTING INST.	[ ]	[ ]	[ ]	[ ]
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CHAPTER	**EXCELLENT**	**GOOD**	**FAIR**	**POOR**
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