Receive Redundant Systems

Operations Manual

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REVISION HISTORY

Revision	Date	Description
A	May 2011	Preliminary Release
B	May 2013	Initial Release
C	May 2014	• Added information about waveguide switch positions in Chapter 3 and in Appendix F • Added information about AC-powered redundant systems with two inputs

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PREFACE

This guide provides information about the Terrasat Communications, Inc. line of receive redundant (Rx 1+1) systems.

Conventions and References

Before you start using this guide, it is important to understand the typographical conventions and terms used in the documentation.

Table P.1 describes typographical conventions used in Terrasat Communications, Inc. documentation. For definitions of specialized terms used in the documentation, see Appendix G, Glossary.

Table P.1 Typographical Conventions

Convention	Description/Example
Emphasis	Used to emphasize the importance of a point. The IP Address *must* be a unique number.
Internal cross-references	References to a section in the same document are marked in blue and are hyperlinked. See Warranty Information on page 1-4.
Product and feature names	Named Terrasat products and features are identified on first use. ...line of intelligent block upconverters (IBUCs).
Technical Publication References	References to other Terrasat publications. If the reference is hyperlinked, it is also underscored. For detailed information, see the Terrasat Communications, Inc. *IBUC Operations Manual*.
User-entered values	A special font marks text that you type. At the password prompt, type `MyPassword`.

Cautions and Warnings

	**CAUTION** **CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury. CAUTION might also be used to indicate other unsafe practices or risks of property damage.**

	**HIGH VOLTAGE** **HIGH VOLTAGE indicates the presence of a high-voltage hazard.**

	**WARNING** **WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.**

Trademarks

Other product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

Electrical Safety Notice

This equipment has been designed to minimize exposure of personnel to hazards. All operators and technicians must

- Know how to work around, with, and on high-voltage equipment.
- Exercise every precaution to ensure safety of personnel.
- Exercise extreme care when working near high voltages.
- Be familiar with the warnings in this manual.

CHAPTER

1

INTRODUCTION

This User Guide is intended for users of Terrasat Communications, Inc. receive redundant (Rx 1+1) systems.

Receive Redundant Systems

The Rx 1+1 system enables switching of low-noise block converters (LNBs) via a waveguide switch that switches the RF receive signal, and an RF relay (internal to the interface module) that switches the IF signal. The Rx 1+1 system includes a separate outdoor interface module that does not require an indoor controller. It can be powered by the same power supplies used with Terrasat intelligent block upconverters (IBUCs) or via AC mains and performs all the required functions for redundant operation of LNBs.

This manual provides information about:

- Installation, operation, and maintenance of Rx 1+1 systems
- Use of user interface protocols for remote monitor and control

Reference Documents

Use the satellite operation standards listed in Table 1.1 as reference documents.

Table 1.1 Satellite Operation Standards

Earth Station Standards	
Intelsat IESS 308/309	Performance Characteristics for Intermediate Data Rate Digital Carriers Using Convolutional Encoding and QPSK Modulation
Eutelsat EESS 502	Minimum Technical and Operational Requirements for Earth Stations Transmitting to a Eutelsat Transponder for Non-Standard Structured Types of SMS Transmissions. Standard M.

Table 1.1 Satellite Operation Standards (Continued)

Earth Station Standards	
ETSI EN 301 427	Satellite Earth Stations and Systems (SES); Harmonized EN for Low Data Rate Mobile Satellite Earth Stations (MESs) except aeronautical mobile satellite earth stations, operating in the 11/12/14 GHz frequency bands covering essential requirements under article 3.2 of the Radio & Telecommunications Terminal Equipment (R&TTE) directive
ETSI EN 301 428	Satellite Earth Stations and Systems (SES); Harmonized EN for Very Small Aperture Terminal (VSAT); Transmit-only, transmit/receive or receive-only satellite earth stations operating in the 11/12/14 GHz frequency bands covering essential requirements under article 3.2 of the Radio & Telecommunications Terminal Equipment (R&TTE) Directive.
ETSI EN 301 430	Satellite Earth Stations and Systems (SES); Harmonized EN for Satellite News Gathering Transportable Earth Stations (SNG TES) operating in the 11-12/13-14 GHz frequency bands covering essential requirements under article 3.2 of the R&TTE directive
ETSI EN 301 443	Satellite Earth Stations and Systems (SES); Harmonized EN for Very Small Aperture Terminal (VSAT); Transmit-only, transmit/receive, or receive-only satellite earth stations operating in the 4 GHz and 6 GHz frequency bands covering essential requirements under article 3.2 of the R&TTE Directive.
MIL-STD-188-164A with Change 3	Interoperability of SHF Satellite Communications Terminals for tactical and long-haul communications.
MIL-STD 810F	Materiel acquisition program planning and engineering direction for considering the influences that environmental stresses have on materiel throughout all phases of its service life.
ANSI/TIA/EIA 568	Commercial Building Telecommunications Cabling Standard
Environmental Standards	
ETS 300 019-1-1	Equipment Engineering (EE): Environmental Conditions and Environmental Tests for Telecommunications Equipment. Part 1-1: Classification of environmental conditions. Storage.
ETS 300 019-1-2	Equipment Engineering (EE): Environmental Conditions and Environmental Tests for Telecommunications Equipment. Part 1-2: Classification of environmental conditions. Transportation.
ETS 300 019-1-4	Equipment Engineering (EE): Environmental Conditions and Environmental Tests for Telecommunications Equipment. Part 1-4: Classification of environmental conditions. Stationary use at non-weather protected locations.
ETS 300 019-2-1	Equipment Engineering (EE): Environmental Conditions and Environmental Tests for Telecommunications Equipment. Part 2-1: Specification of environmental tests; Storage
ETS 300 019-2-2	Equipment Engineering (EE): Environmental Conditions and Environmental Tests for Telecommunications Equipment. Part 2.2: Specification of environmental tests; Transportation
ETS 300 019-2-4	Equipment Engineering (EE): Environmental Conditions and Environmental Tests for Telecommunications Equipment. Part 2-4: Specification of environmental tests; Stationary use at non-weather protected locations

Table 1.1 Satellite Operation Standards (Continued)

EMC/EMI Standards	
99/5/EEC	The Radio and Telecommunications Terminal Equipment Directive (R&TTE)
ETSI EN 301 489-1	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETSI EN 301 489-12	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 12: Specific conditions for Very Small Aperture Terminal, Satellite Interactive Earth Stations operated in the frequency ranges from 4 GHz through 30 GHz in the Fixed Satellite Services (FSS)
EN 55022A	Information Technology Equipment – Radio Disturbance Characteristics – Limits and methods of measurement
EN 61000-3-2	Electromagnetic Compatibility (EMC) – Part 3.2: Limits for harmonic current emissions (equipment input current <16 A per phase)
EN 61000-3-3	Electromagnetic Compatibility (EMC) – Part 3.3: Limitation of voltage changes, voltage fluctuations, and flicker in public low-voltage supply systems for equipment with rated current ≤16 A per phase and not subject to conditional connection
EN 61000-4-2	Electromagnetic Compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
EN 61000-4-3	Electromagnetic Compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4	Electromagnetic Compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test
EN 61000-4-5	Electromagnetic Compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
EN 61000-4-6	Electromagnetic Compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-11	Electromagnetic Compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions, and voltage variations immunity tests
Safety Standards	
2006/95/EC	The Low Voltage Directive (supersedes 73/23/EEC)
EN 60950-1	Information technology equipment – Safety as applied to mains-powered or battery-powered information technology equipment, including electrical business equipment and associated equipment, with a rated voltage not exceeding 600 V.

Warranty Information

Determination of warranty status of equipment shall be in accordance with the following Terrasat Communications, Inc. Warranty Policy.

(A) This warranty is for equipment of Terrasat Communications, Inc. The term "Terrasat" as used throughout this warranty shall mean Terrasat Communications, Inc., if the equipment was manufactured by Terrasat Communications, Inc.

(B) Terrasat warrants that its equipment shall be free from defects in material or workmanship at the time of shipment and that it will conform to applicable specifications.

For all Satcom products, the buyer shall exercise any and all warranty claims within a period of twenty-four (24) months.

(1) The warranty does not apply to any part of a product if it has been altered, repaired, or misused in any way that, in the opinion of Terrasat, affects the reliability of, or detracts from the performance of any part of the product, or it is damaged as a result of the use of such part in or in connection with equipment not previously approved by Terrasat.

(2) The warranty does not apply to any product or parts thereof if its serial number or the serial number of any of its parts has been altered, defaced, or removed.

(3) The warranty does not cover damages or losses incurred in transport.

(4) The warranty does not cover replacement or repair necessitated by loss or damage resulting from cases beyond the control of Terrasat.

(5) The warranty does not include the furnishing of any labor involved or connected with the removal and/or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for replacement or repair.

(6) In no event shall Terrasat be liable to buyer for any indirect, special, or consequential damages or lost profits arising from the use of the equipment or products, even if Terrasat has been advised of the possibility thereof, or for any inability to use them either separated from or in combination with any other equipment or products.

(C) Terrasat's warranty, as stated herein, is in lieu of all other warranties, expressed, implied or statutory, including those of merchantability and fitness for a particular purpose, and Terrasat neither assumes nor authorizes any person to assume for it any other obligation or liability to any person in connection with the sale or use of Terrasat's products. The buyer shall pass on to any purchaser, lessee, or other user of Terrasat's products, the aforementioned warranty and shall indemnify and hold upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

(D) A fixed charge established for each product will be imposed for all equipment returned for warranty repair and where the cause of failure cannot be identified by Terrasat.

Note: Warranty seals are designed to break upon internal access. Access to the internal electronic components without prior written approval will void the warranty.

For more information about returning a product for repair, see the Repair Policy on page 6-4.

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CHAPTER

2

FUNCTIONAL DESCRIPTION

The Terrasat receive redundant (Rx 1+1) system is available with a separate outdoor interface module that can receive power from the IBUC power supplies or via AC mains and performs all required functions for redundant operation of low-noise block converters (LNBs). No indoor controllers are necessary. Typically, the Rx switch and LNBs are mounted directly to the antenna feed and a separate mounting bracket for the interface module is available. A system diagram is provided in Figure 2.1.

The Rx 1+1 system is available in C-band, X-band, Ku-band, and Ka-band frequencies with a variety of input power options.

System Components

This section contains descriptions of the various system components.

Figure 2.1 contains a system diagram for the transmit redundant (Tx 1+1) and Rx 1+1 systems.

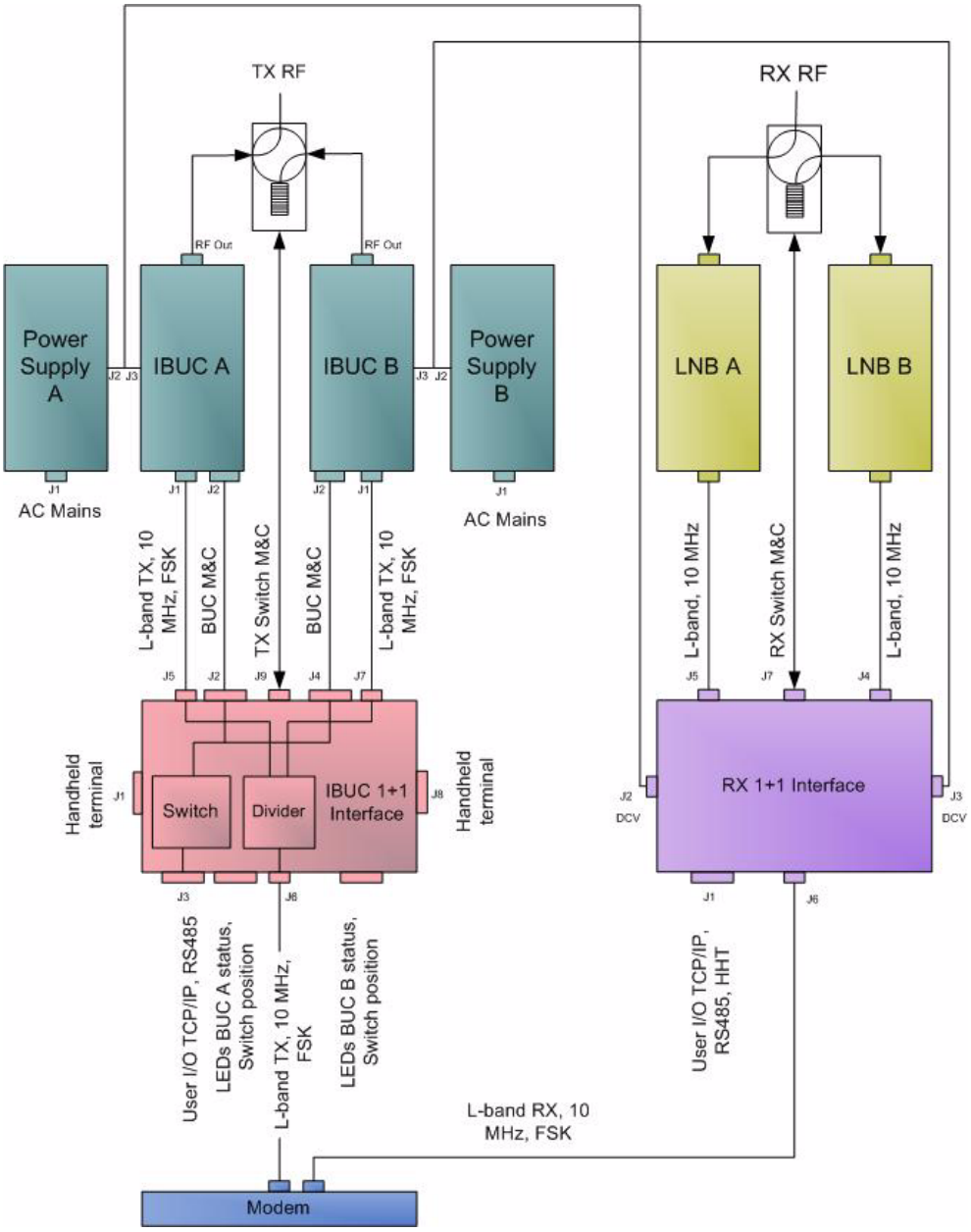


Figure 2.1 Rx 1+1 Redundant System Diagram

Low-Noise Block Converter

The low-noise block converter (LNB) houses the low-noise amplifier (LNA), the Rx conversion circuitry, and the L-band IF interface, as depicted in Figure 2.2. The interface with the LNB consists of a 50 Ω or an optional 75 Ω coaxial cable that carries the L-band receive signal, 10 MHz reference signal, and DC power.

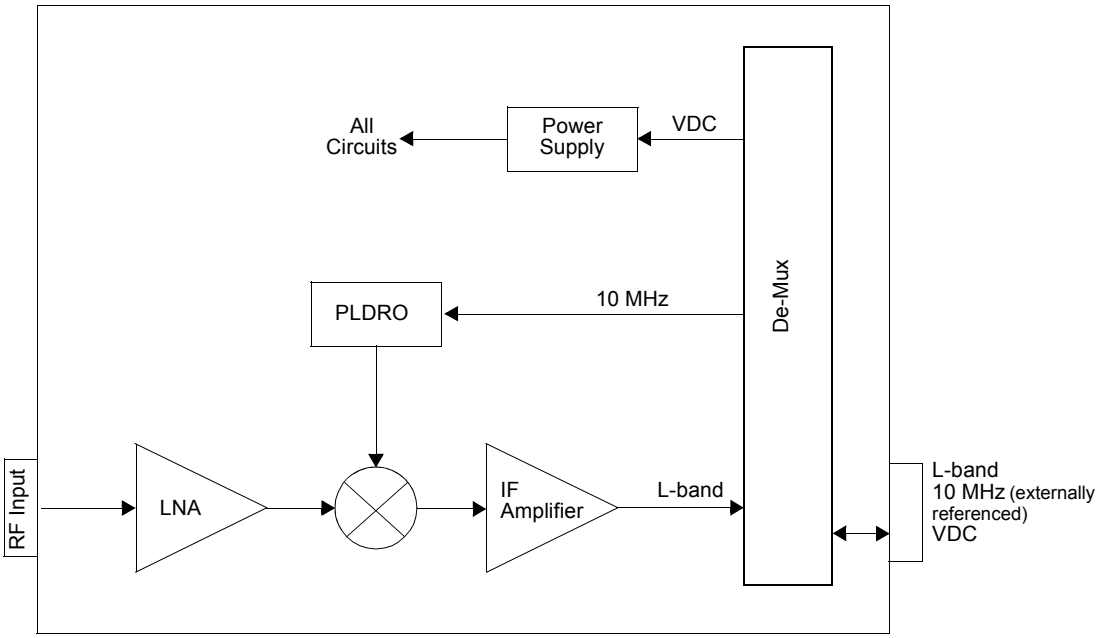


Figure 2.2 LNB Block Diagram of System With an Externally Referenced 10 MHz Signal

Input types to the LNB are listed in Table 2.1

Table 2.1 LNB Input Types

Signal	Waveguide Type
C-band	WR229
X-band	WR112
Ku-band	WR75
Ka-band	WR42

Input to the LNB is typically between -125 dBm to -80 dBm depending on the system design (including such variables as antenna size, satellite operator, number of carriers, etc.). The LNB amplifies the RF input signal and downconverts it to an L-band signal. The dielectric resonator oscillator (DRO) is phase locked to the 10 MHz signal that has been multiplexed onto the L-band output connector. Typically, the 10 MHz input level is between 0 dBm to -10 dBm and meets minimum phase noise requirements. DC voltage is also multiplexed onto the L-band output connector and is typically between 15 VDC to 24 VDC. Current consumption is typically less than 400 mA.

The LNB is available in the frequency bands listed in Table 2.2.

Table 2.2 Receive Frequency Plans

Signal	RF Frequency	L-band Out Frequency	Noise Temperature
Standard C-band	3.625 GHz to 4.200 GHz	950 MHz to 1525 MHz	15 °K/20 °K/35 °K
Palapa C-band	3.400 GHz to 4.200 GHz	950 MHz to 1750 MHz	15 °K/20 °K/35 °K
Insat C-band	4.500 GHz to 4.800 GHz	960 MHz to 1260 MHz	15 °K/20 °K/35 °K
X-band	7.250 GHz to 7.750 GHz	950 MHz to 1450 MHz	60 °K
Ku-band	10.950 GHz to 11.700 GHz 11.700 GHz to 12.200 GHz 12.250 GHz to 12.750 GHz	950 MHz to 1700 MHz 950 MHz to 1450 MHz	50 °K/60 °K
Ka-band	18.200 GHz to 19.200 GHz 19.200 GHz to 20.200 GHz 20.200 GHz to 21.200 GHz	950 MHz to 1950 MHz 950 MHz to 1950 MHz 950 MHz to 1950 MHz	100 °K

DC Supply

The DC-powered Rx 1+1 interface module is supplied with DC voltage from 20 VDC to 60 VDC. For the A: side unit, supply comes through connector J2 (from the power supply that powers the A: side unit). The A: side power supply is routed to a DC/DC converter that generates the voltage that supplies the A: side LNB

For the B: side unit, supply comes through connector J3 (from the power supply that powers the B: side unit). The B: side power supply is routed to a DC/DC converter that generates the voltage that supplied the B: side LNB. Both power supplies are routed to a DC/DC converter that generates the voltage that supplies all internal circuitry.

This process is depicted in Figure 2.3 for +48 VDC systems and in Figure 2.4 for -48 VDC systems.

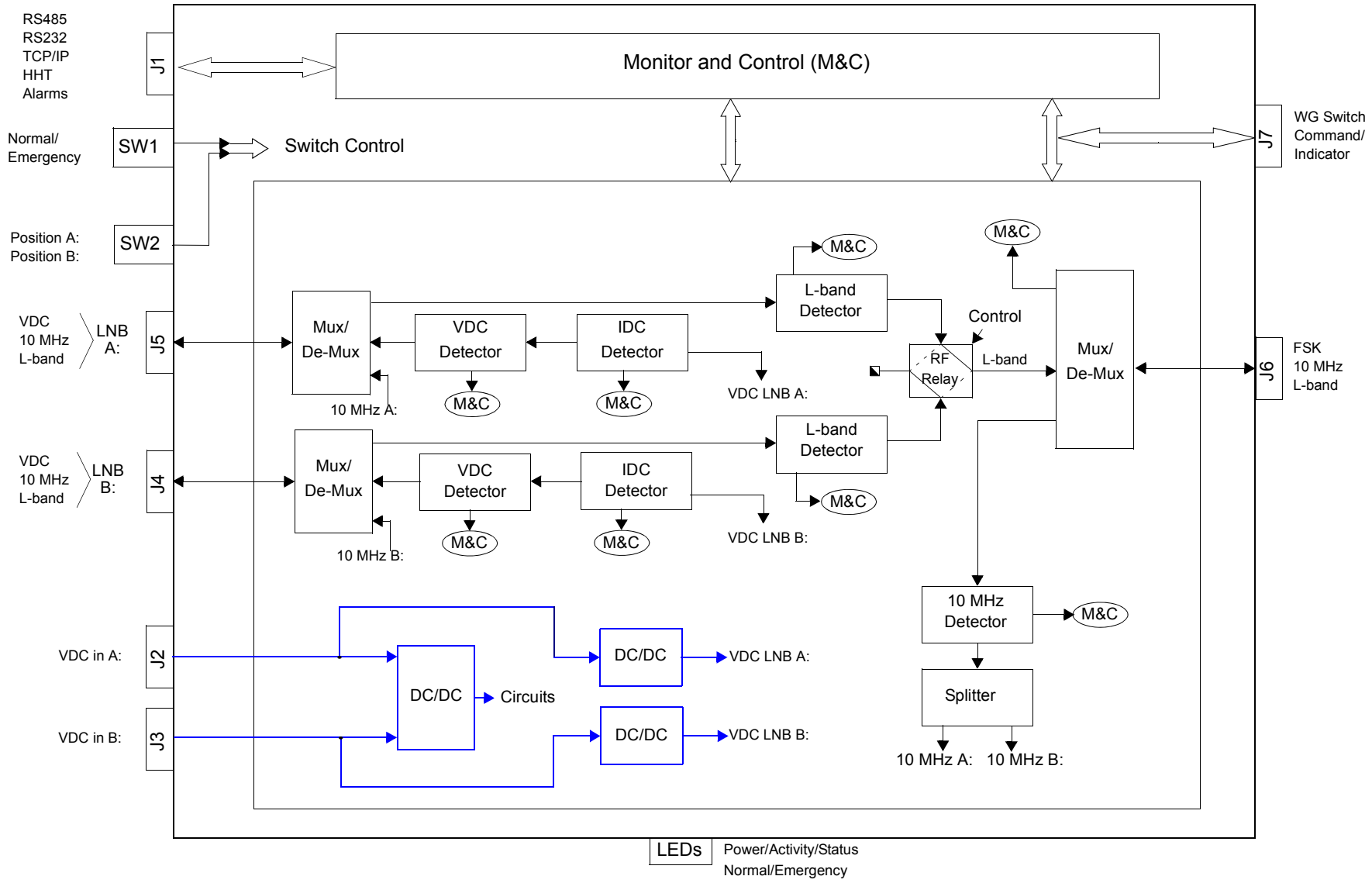


Figure 2.3 Rx 1+1 Block Diagram (for +48 VDC-powered Systems)

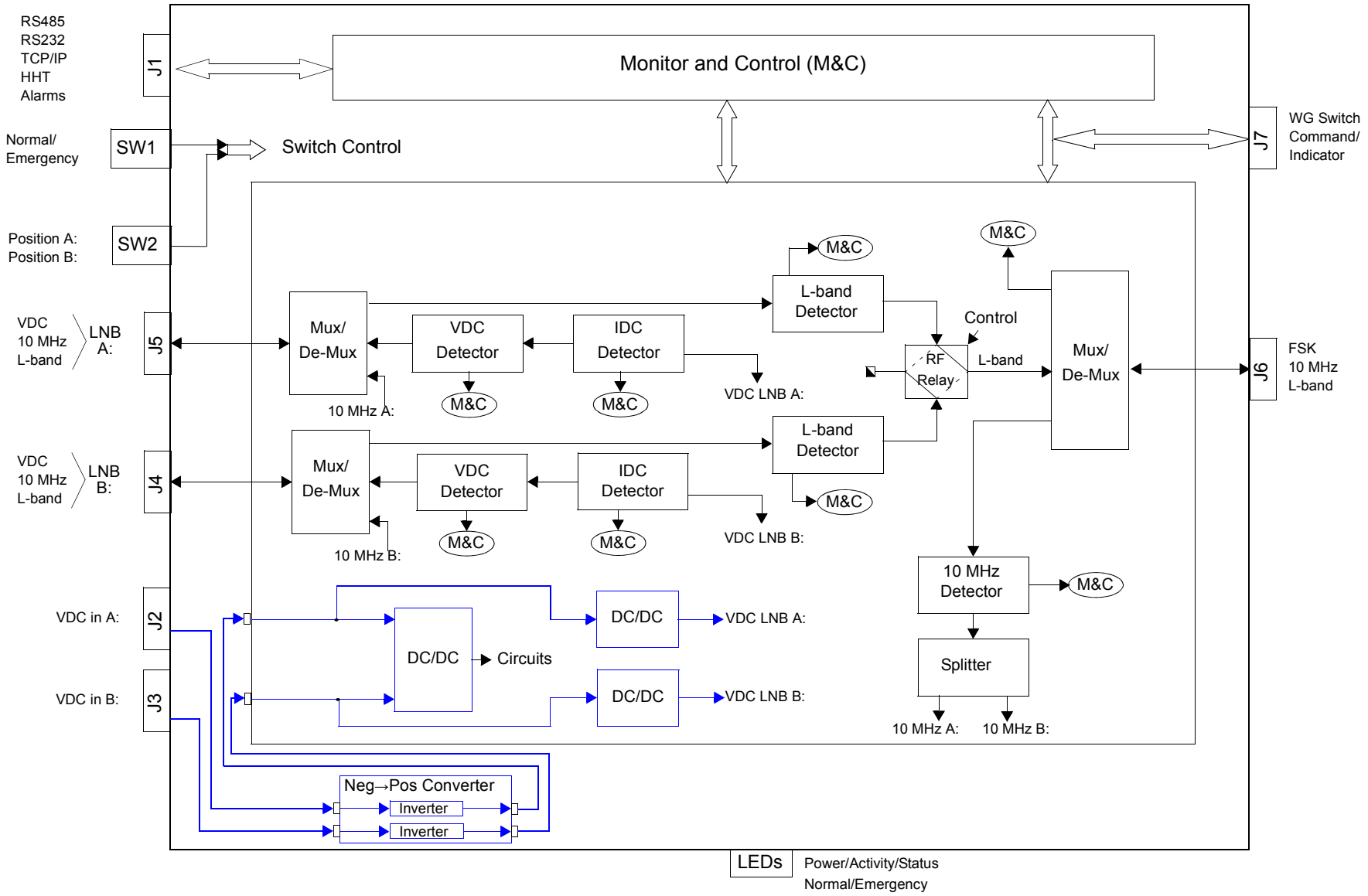


Figure 2.4 Rx 1+1 Block Diagram (for -48 VDC-powered Systems)

AC Supply

The single-input AC-powered Rx 1+1 interface module is supplied with AC voltage through connector J2. The J2 connector feeds two AC/DC converters which are then routed to a DC/DC converter that generates the voltage that supplies the A: side LNB while the B: side power supply is routed to a DC/DC converter that generates the voltage that supplied the B: side LNB. Both power supplies are routed to a DC/DC converter that generates the voltage that supplies all internal circuitry.

This process is depicted in Figure 2.5.

The two-input AC-powered Rx 1+1 interface module is supplied with AC voltage through connectors J2 and J3. The J2 connector feeds one AC/DC converter and the J3 connector feeds another AC/DC converter. Each converter is then routed to a DC/DC converter that generates the voltage that supplies the A: side LNB while the B: side power supply is routed to a DC/DC converter that generates the voltage that supplies the B: side LNB. Both power supplies are routed to a DC/DC converter that generates the voltage that supplies all internal circuitry.

This process is depicted in Figure 2.6.

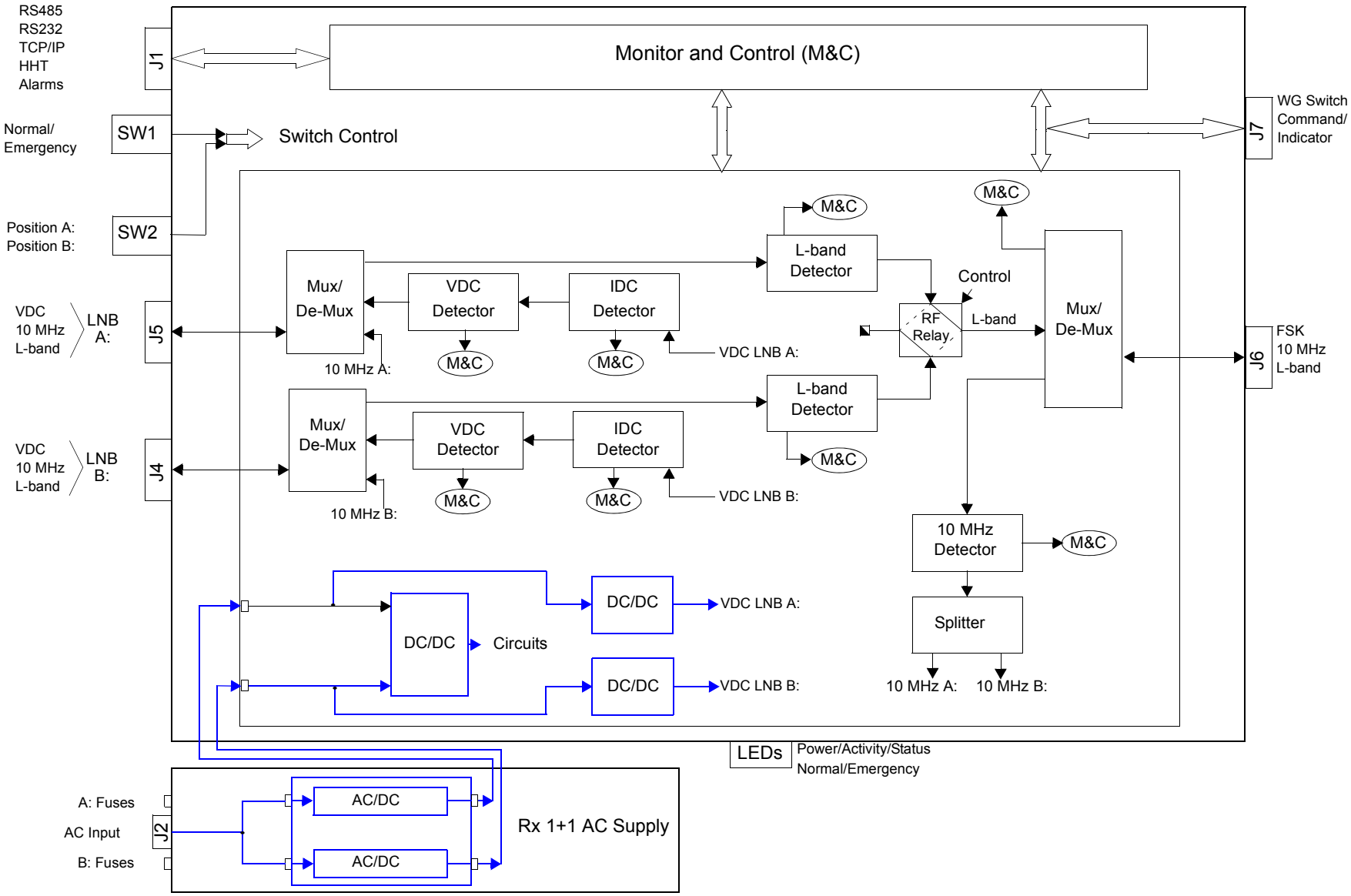


Figure 2.5 Rx 1+1 Block Diagram (for Single-input AC-powered Systems)

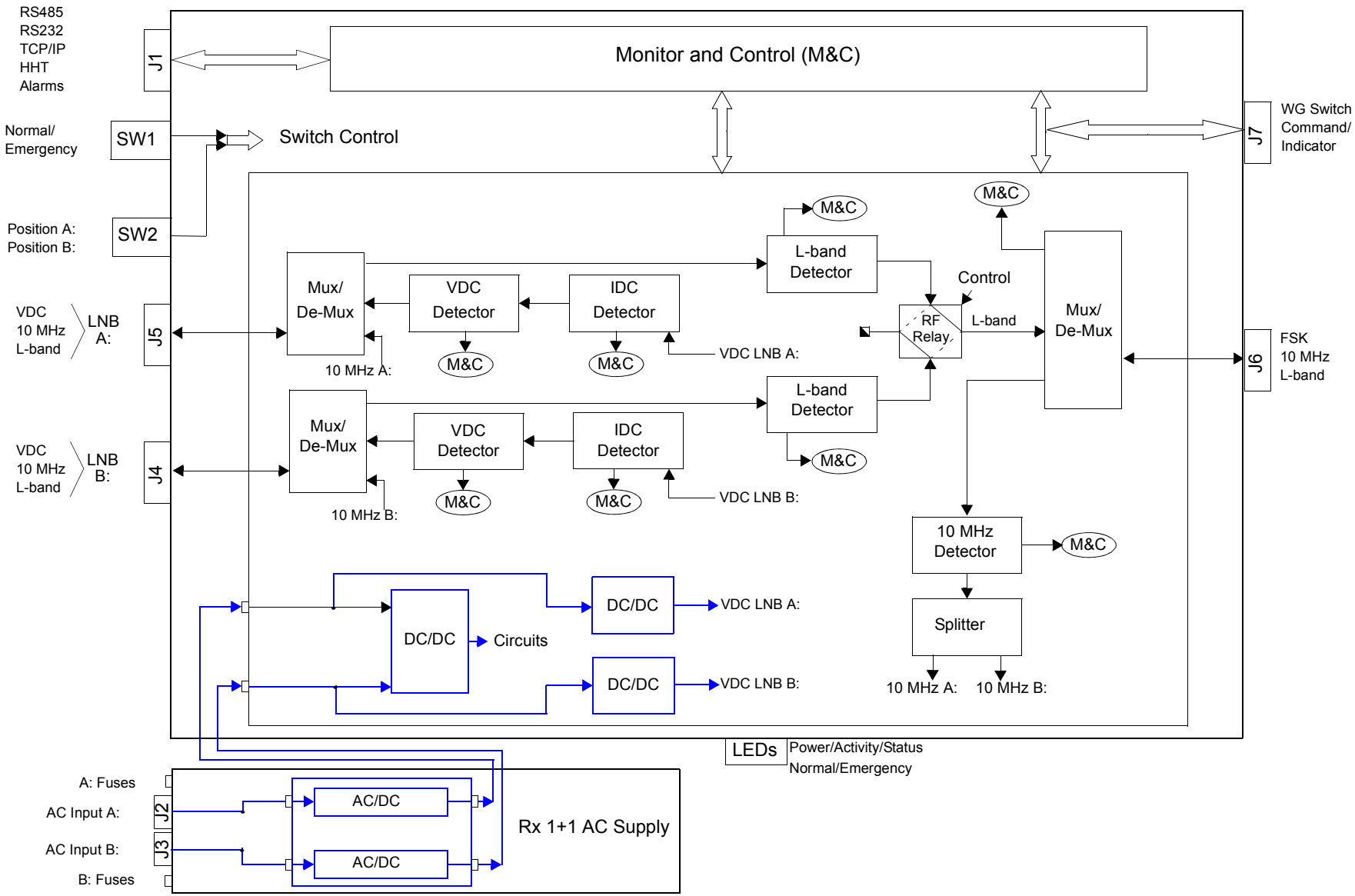


Figure 2.6 Rx 1+1 Block Diagram (for Two-input AC-powered Systems)

RF Signal Flow

The RF signal flow is the same whether the unit is AC powered or DC powered.

L-band inputs to the Rx 1+1 interface module are through the input connectors J5 (for the A: side LNB) and J4 (for the B: side LNB). The online signal is selected through an RF switch (relay) and routed to the J6 connector (L-band Rx output) through the mux/de-mux circuitry. Samples of both L-band inputs (from the A: side and B: side LNBs) are detected and sent to the M&C (monitor and control) card for monitoring purposes. The 10 MHz reference signal is demultiplexed and then detected. Information about the 10 MHz signal is then sent to the M&C card for alarm processing. The internally generated DC supply (+18 VDC) and the 10 MHz reference signal are multiplexed to the L-band signal to feed both LNBs through the J4 or J5 connectors. Before multiplexing the DC voltages, the current and voltage that are fed to the LNBs are detected and the information is sent to the M&C card.

The M&C card also controls and monitors both waveguide and relay switches. The connection to the waveguide switch is through the J7 connector.

LED Indicators

The Rx 1+1 interface module has a bank of LEDs that provide quick visual indicators of system status. Indicators include power, Ethernet activity, system status, mode of operation, and alarm status. LED colors signify the following:

- Flashing green – No alarms
- Flashing Red – Minor alarm being reported
- Steady Red – Major alarm being reported

The LEDs are identified in Figure 3.12 on page 3-16.

Emergency Switches

The Rx 1+1 interface module offers two switches that enable you to switch from the A: side system to the B: side system when the M&C card is no longer able to control the switch. Use the SW1 switch to change the mode of operation from normal (controlled by the M&C card) to emergency (manually controlled by the user). Use the SW2 switch to change from the A: side unit to the B: side unit (or vice versa). You must first activate SW1 to be able to see the results of activating SW2.

Note: When in emergency mode, the LED labeled “Normal/Emergency” will turn from green to red. When you return to normal mode, the LED will turn green. The LED must be green in order to enable remote control of the waveguide switch.

To access the switches, unscrew the small cover on the front panel, as shown in Figure 2.7.

Figure 2.7 Location of Access Panel

User Interfaces

You can interface with the Rx 1+1 system by using any of the following methods

- Embedded Web pages via a Web browser
- TCP/IP through a TelNet session
- UDP through SNMP
- RS485
- Hand-held terminal
- RS232
- FSK

Software

Rx 1+1 systems monitor and control several parameters and have features that simplify installation and usage in addition as well as enhance system performance.

Some of the key features include:

- Monitor and control

  Redundant systems can be monitored and controlled through RS232, RS485, Ethernet port, an optional hand-held terminal, or via an FSK link with compatible modems.

- Rx Redundancy

  Voltage and current to the LNB as well as the L-band composite input level are monitored which improve fault detection.

- Embedded Web pages

  Embedded Web pages provide management for small networks by using a Web browser.

- Alarm History (with time stamps)

  A log of alarms that occur is maintained. This can simplify troubleshooting (especially when an intermittent problem occurs).

- 10 MHz Alarm Enable/Disable

  This feature is useful for those LNBs that have an internal 10 MHz reference signal.

- SNMP polling

  SNMP polling is the process of retrieving a specific piece of information from remote devices in order to determine faulty behavior or connection problems.

System Configurations

Figure 2.8 represents a typical system configuration using DC-powered Terrasat receive redundant systems. Figure 2.9 on page 2-14 represents a typical system configuration for AC-powered systems. For most installations, the Rx 1+1 interface is mounted on the boom arm while the LNBs and waveguide switch are mounted on the antenna feed. The Rx 1+1 interface and the LNB can interface directly to a satellite modem or to an IFU. In addition, the indoor equipment will receive the Rx L-band signal from the Rx 1+1 interface.

For LNBs without an internal 10 MHz signal, the indoor unit must provide a 10 MHz reference signal. The LNBs require a 10 MHz input signal at -10 dBm to 0 dBm. In general, the LNBs are located in close proximity (less than 10 ft (10 m)) to the Rx 1+1 interface. However, for installations that require a long cable run (that is, greater than 10 ft (3 m)) between the LNBs and the Rx 1+1 interface, contact Terrasat. for additional information.

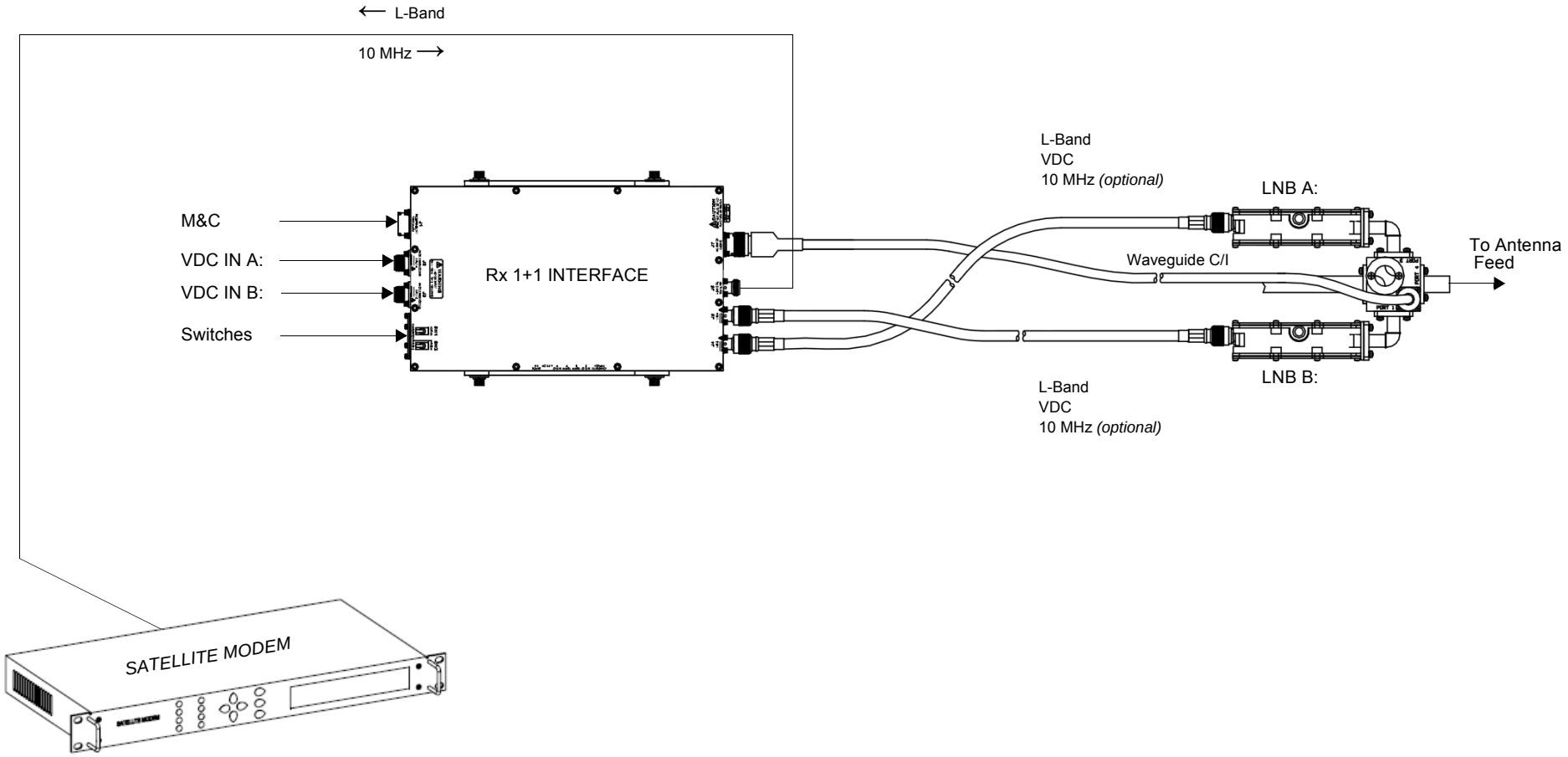


Figure 2.8 Typical System Configuration for DC-powered Systems

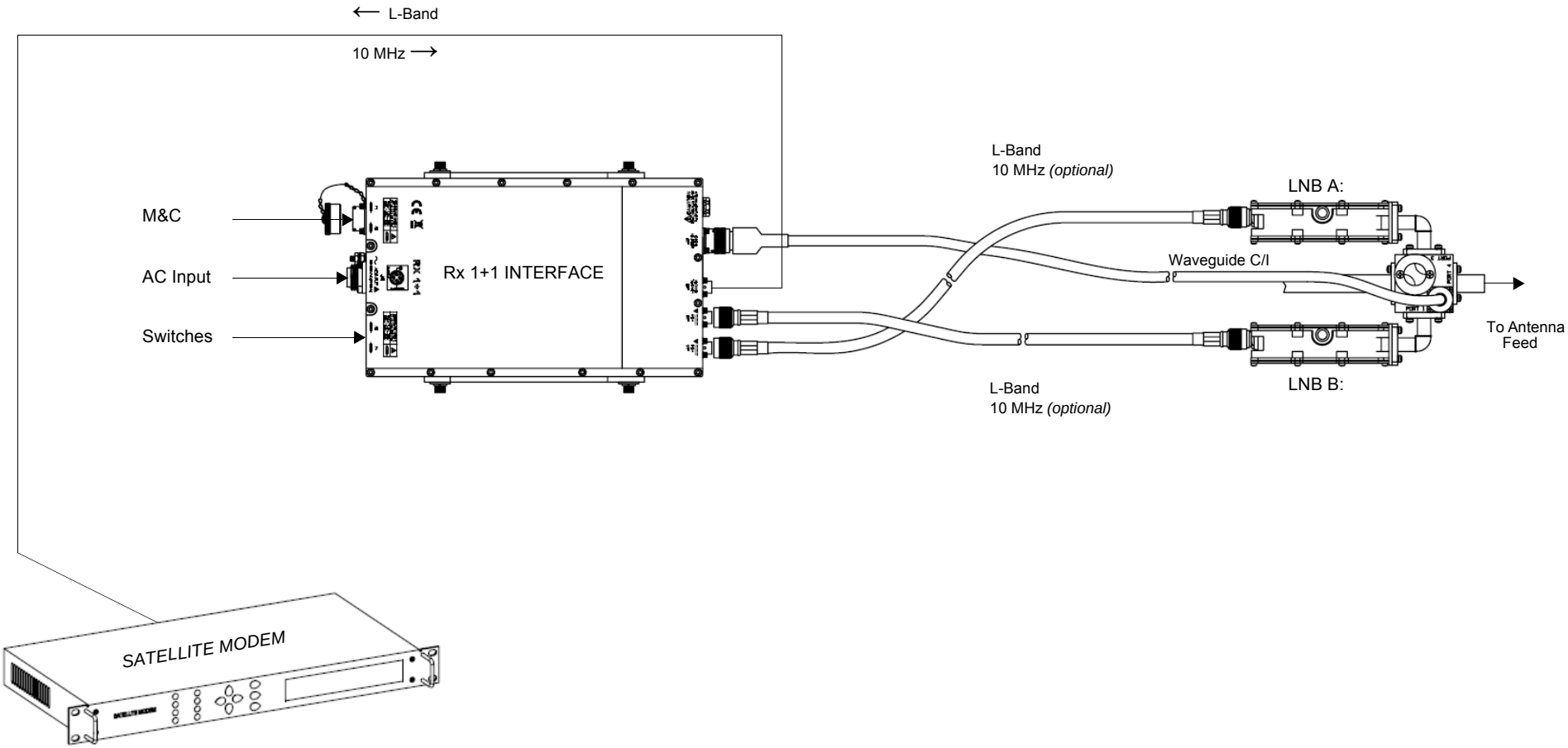
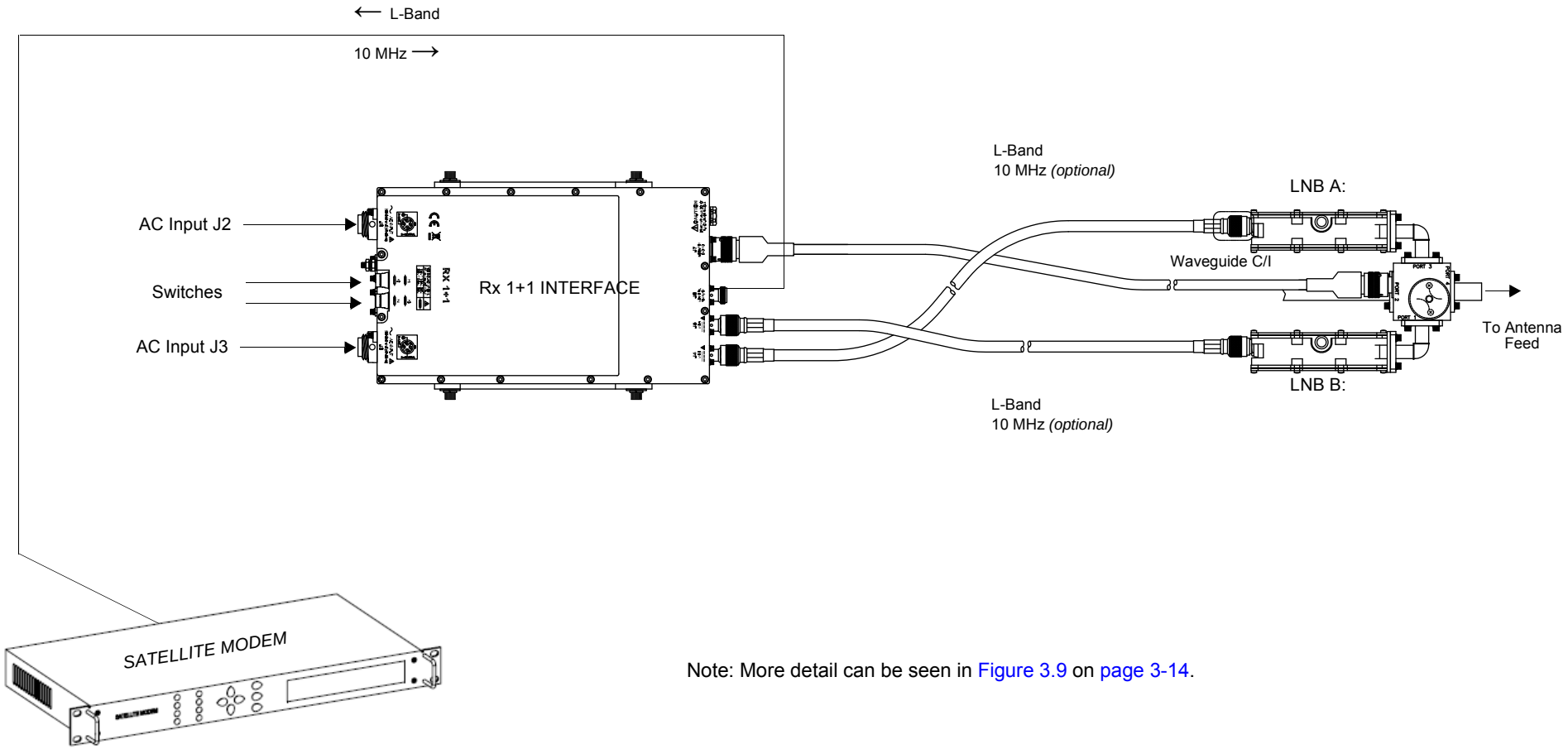


Figure 2.9 Typical System Configuration for Single-input AC-powered Systems



Note: More detail can be seen in Figure 3.9 on page 3-14.

Figure 2.10 Typical System Configuration for Two-input AC-powered Systems

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CHAPTER

3

INSTALLATION

This chapter contains general requirements for installing a receive redundant (Rx 1+1) system.

General Requirements

WARNING

For protection of personnel and equipment, use care when installing the antenna and whenever working on or around the system.

Follow standard safety precautions with hand and/or power tools.

Use care in working with high AC voltages and microwave emissions.

Unpacking

Check to make sure that the equipment has not suffered damage in shipment. If there is any damage, contact the shipper before proceeding. If you need to declare any equipment as damaged during transit, save the original shipping cartons to facilitate inspection reporting.

Note: Terrasat recommends retaining and re-using all shipping cartons and foam forms if the equipment will be stored or reshipped. The cartons should be clearly marked to indicate that they contain fragile electronic equipment.

Compare the contents of the shipping container with the packing list to ensure all items have been received. If any item is missing, contact Terrasat.

Furnished Items

The following items are furnished with Rx 1+1 systems:

- An Rx 1+1 interface module
- A waveguide switch, termination, and waveguide pieces
- L-band interface cables
- Switch cable
- M&C mating connector
- DC cable

  A DC cable is furnished only for DC-powered units that use a Terrasat outdoor power supply.
- DC mating connectors

  DC mating connectors are furnished only for DC-powered units operating with -48 VDC.
- AC mating connector

  An AC mating connector is furnished only for AC-powered units.
- Waveguide gaskets and hardware
- Fuses

  The fuses are intended for 220 VAC operation and are supplied only with units that operate over the range of 100 VAC to 240 VAC.
- Mounting brackets
- Sealant for coaxial connectors
- 5 g pouch of Permatex anti-seize lubricant

  The anti-seize lubricant is a heavy duty high-temperature lubricant that prevents galling, seizing, and corrosion of fasteners during assembly and facilitates disassembly of parts exposed to heat or corrosive environments.
- Product documentation in CD-ROM format

Accessories

The following are optional accessories:

- A hand-held terminal and cable
- A waveguide Tx reject filter
- A four-way combiner/divider module

- TCP/IP test cable
- IFL cables (for example, LMR-400)
- Installation kits

Note: Exact contents of the shipping carton vary according to the model.

Figure 3.1 illustrates what is packaged with an Rx 1+1 system as it leaves the factory (including the waveguide).

Figure 3.1 Contents of Shipping Carton

Installing the Rx 1+1 System

Consider the following when preparing to install the Rx 1+1 system.

Tools and Test Equipment

Have on hand a standard electrician's tool kit that contains, at a minimum, a voltage and continuity tester, wire cutters, wire and/or cable strippers, and a set of screwdrivers; as well as any tools listed in the antenna manufacturer's installation

instructions. Terrasat recommends having access to a digital voltmeter (such as the Fluke 8050).

Site Considerations

The Rx 1+1 system is designed to be mounted on or near the antenna. Locate and install the antenna according to instructions supplied by the antenna manufacturer. Choose an area that is free of interference from motors or other electrical equipment and that has a clear line of sight from the antenna to the satellite. Lightning arrestors should be used at the site to ensure maximum protection of personnel and equipment. Use size 3/0 or 4/0 AWG (American Wire Gauge) stranded copper wire to ground the system to the antenna frame and to the lightning protection ground rod. .

Mounting Considerations

After the antenna has been installed, the Terrasat system can then be mounted on the antenna. The LNBs are mounted directly to the waveguide switch at the focal point of the antenna.

The Rx 1+1 system must be mounted such that the system has sufficient support to minimize the effects of antenna sway in strong winds.

Throughout installation and during any polarization, azimuth or elevation adjustment, ensure that cables and waveguide are not crimped or pinched. Ensure that there is adequate slack in the cable.

Mounting brackets are included to facilitate mounting on most antennas.

Note: Ensure that the threads of the bolts used for mounting the Rx 1+1 system have been swabbed in the included Permatex anti-seize lubricant. This prevents galling, seizing, and corrosion of fasteners during assembly and will facilitate future disassembly.

Power Requirements

WARNING

Installation and connection to the line power supply must be made in compliance with all applicable wiring codes and regulations.

AC-powered systems are furnished with a detachable AC power connector that is used to connect and disconnect power. When connecting the AC connector to the AC

power source, the wiring must include a 15 amp or 20 amp circuit breaker. A disconnect device (such as a circuit breaker or mains supply plug on the power supply cord) that is readily accessible must also be provided. Any outdoor AC connections should be made using suitable connector or boxes with an IEC protection class of IP65.

WARNING

Ensure AC power is off when connecting or disconnecting the power supply's power cord. To turn off power to the unit, use the installed circuit breaker or a similar disconnect device.

If a circuit breaker is not easily accessible as a disconnecting device, the input connector will be the disconnecting device. In this case, the socket-outlet must be installed near the equipment and must be easily accessible for the pluggable equipment.

All AC-powered units are furnished with mating connectors for the AC mains power cable. To remain compliant with the European Low Voltage Directive (EN 60950-1), use a power cable that meets IEC 60227 requirements such as HAR Cable Designation H03VV-F or H03VVH2-F and/or others with water resistance for outdoor applications. Power cable plugs must also comply with all applicable local and federal standards and regulations.

You can reduce current and voltage surges in the AC power input by installing surge protectors and AC power line filters.

Note: AC transients and surges can cause data transmission errors.

To ensure uninterrupted service, Terrasat recommends the use of some method of AC power backup such as an uninterruptible power supply (UPS) as well as a power stabilizer or isolation filter to ensure clean power.

Note: The 48 VDC system can be configured at the factory as positive or negative. Ensure that the correct polarity is applied to any unit.

Grounding

Terrasat recommends the following grounding and lightning protection:

- Cable Shielding

  Shield currents can be eliminated with proper techniques. A grounding strap at the end of the coaxial and data cables should be connected to the ground lug at the antenna base with a #4 gauge copper wire. This provides a path of least resistance prior to entering the electronic equipment.

- AC

  The best way to protect the equipment is to have two protectors. The first is the power mains protector that is mounted directly across the mains in the breaker box. The second should be mounted or grounded directly at the base or hub of the antenna or at the 19-in. rack.

- Data and Control Lines

  The I/O lines can deliver surge current to the equipment and should also be protected.

- Electrical Grounding

  Grounding of the Rx 1+1 interface module is recommended to prevent possible damage from lightning and/or other induced electrical surges. Terrasat recommends the use of 3/0 or 4/0 AWG stranded copper wire for bonding the Rx 1+1 interface module to the earth ground (grounding rod), using the most direct or shortest route.

Antenna Recommendations

Most antenna masts are encapsulated in concrete. Typically, the mast pipe is submerged in a 4 ft to 5 ft (1.22 m to 1.53 m) deep augured hole. This provides a good Ufer ground. A Ufer ground, in this case, is defined such that concrete absorbs moisture quickly and loses that moisture slowly (as much as 15 to 30 days after rain or snow melt). The mineral properties of concrete and their inherent pH means that concrete has a supply of ions to conduct current. The soil around concrete becomes “doped” by the concrete and as a result, the pH of the soil rises. The moisture present in the concrete, in combination with the “doped” soil, makes a good connector of electrical energy. The concrete’s large volume and great area of contact with the surrounding soil allow a good transfer to the ground,

In the concrete base, a Ufer ground can be established by running a #4 gauge solid wire or rebar and connecting to the base of the pedestal with pigtails.

The Ufer ground is only one step in proper grounding. The Ufer ground should be augmented with coupled pairs of 10 ft (3.05 m) rods, placed 20 ft (6.1 m) into the ground and spaced 20 feet (6.1 m) apart. The first rod should be placed close to the

antenna. The second rod should be placed towards the equipment enclosure. A #2 gauge wire should connect the rods and antenna mount. A ground rod should be placed at the equipment enclosure as well. If it is virtually impossible to install the ground rods, then radials are needed. This can be accomplished by laying 10 or more lengths of 1½ in. (3.81 cm) copper strap, at least 50 ft (15.24 m) long, in a radial fashion around the antenna base. The straps should be buried, if possible. The hub must be interconnected to the utility ground.

The ground configuration can vary from one location to another. It is best to measure the soil conductivity and design a 5 Ω or less ground system. To protect the system from a direct strike, a lightning rod placed 2 ft (61 cm) higher than the highest point of the dish should be interconnected to the Ufer ground with #2 gauge copper wire.

Cable and Waveguide Connections

WARNING

Ensure that all power is disconnected prior to making any connections.

When installing the cable and waveguide assemblies, ensure that all connections are weather tight. If a Tx reject filter is being used, attach it to the input waveguide switch. Use proper gasketing methods to prevent the entry of water.

The Rx 1+1 system uses a four-port rectangular waveguide switch. In the Rx path, the received RF signal is directed from the antenna port to one of the two LNBs. Any RF from the offline LNB is directed to a termination. The switch can either be controlled and tested by using the Rx Configuration Tab of the embedded Web pages or the switch can be controlled manually.

When installing the waveguide switch, ensure that the switch positions are set correctly. The are two possible switch position combinations: 1:2 and 3:4 or 1:4 and 3:2. For Position A on most Terrasat Rx 1+1 systems, Port 1 is coupled to the A: side LNB, Port 2 connects to the antenna, Port 3 is coupled to the B: side LNB, and Port 4 is coupled to a termination. This is illustrated in Figure F.3 on page F-4.

Note: For some Rx 1+1 systems, the ports have different couplings. In Position A of these units, Port 1 is coupled to a termination, Port 2 is coupled with the B: side LNB, Port 3 is connected to the antenna, and Port 4 is coupled to the A: side LNB. This is illustrated in Figure F.3 on page F-4.

Terrasat waveguides are single-pole double-throw (SPDT) switches; that is, switches with one input and two outputs. The switch transfers the path from one output to the other output when the switch is actuated, as shown in Figure 3.2.

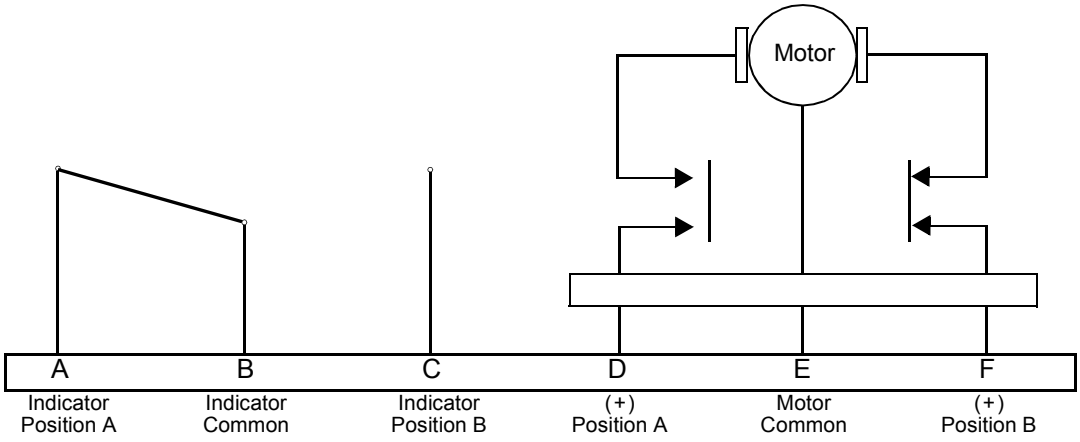

Figure 3.2 Latching (Shown in Position A)

Applying the Anti-Seize Lubricant

Terrasat recommends applying anti-seize lubricant to screws and bolts that could be exposed to weathering or corrosive environments. The lubricant prevents galling, seizing, and corrosion during assembly and facilitates future disassembly. A 5 g packet of Permatex Anti-Seize Lubricant is included with the installation kit for this purpose.

To apply the anti-seize lubricant,

1. Wear appropriate personal protection equipment to avoid contact with skin and eyes. This includes safety glasses, neoprene or nitrile gloves, and clothing sufficient to limit skin exposure.
2. Ensure that mating surfaces (screw holes) are clean; dry; and free of dirt, debris, or loose surface rust.
3. Use a brush or lint-free cloth to apply a thin coat of Anti-Seize to the screws and bolts that require protection, as shown in Figure 3.3. The Anti-Seize should be applied right down to the base of the threads.

Figure 3.3 Applying the Anti-Seize Lubricant

4. Spread the lubricant to a thin film without any lumps.
5. Reassemble the parts using normal torque values.
6. Wipe off any excess material with a disposable towel.

Water-Resistant Wrap

Terrasat recommends applying water-resistant wrap (such as mastic tape) to all outdoor connectors to prevent water entry and subsequent water damage. Mastic tapes are designed to flow and self-heal if cut or punctured. When applied spirally with the proper tension, mastic tapes form a tight continuous coating that permits little or no moisture absorption or penetration. Terrasat provides water-resistant sealing tape for Type-F and Type-N connectors.

Apply the mastic tape, as follows:

1. Ensure that all connectors are firmly tightened, dry, and free from all grease, dust, and dirt.
2. Cut the mastic tape to the desired size. The tape should be long enough to cover the connector completely.
3. Center the tape on the connector to be sealed and wrap the tape in a tight spiral around the connector using a 50% overlap. Squeeze the tape tightly and ensure that both ends of the tape have formed around the connector and the cable without any gaps.

   Apply the tape to all connectors that may be exposed to moisture.

Antenna Mounting

The Rx 1+1 system can be mounted on the boom arm, the antenna back structure, or in the hub depending on the antenna type. However, the LNBs and waveguide switch should always be mounted at the focal point. An actual installation configuration is shown in Figure 3.4.

Figure 3.4 Actual Installation of Rx 1+1 System on Antenna Boom Arm

Figure F.3 on page F-4 contains a sample installation drawing for mounting on the focal point of an antenna.

The Rx 1+1 system has mounting holes on both sides of the unit that can be used to attach it to the antenna. These mounting holes are identified in Figure 3.5.

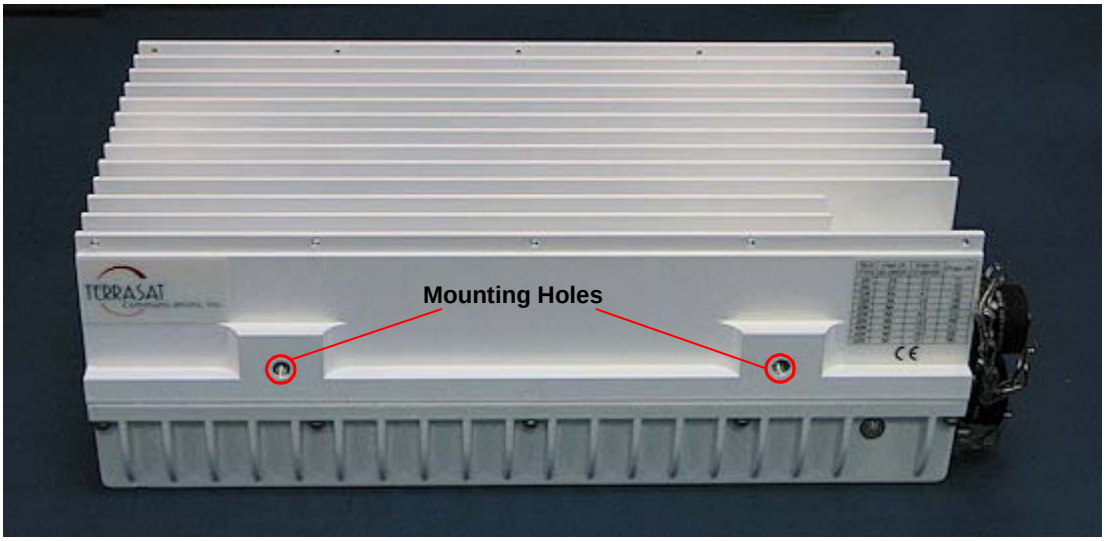

Figure 3.5 Location of Mounting Holes

A mounting bracket is available to facilitate attaching the Rx 1+1 system to antennas. The bracket has mounting slots (identified in Figure 3.6) that give you greater flexibility in placement.

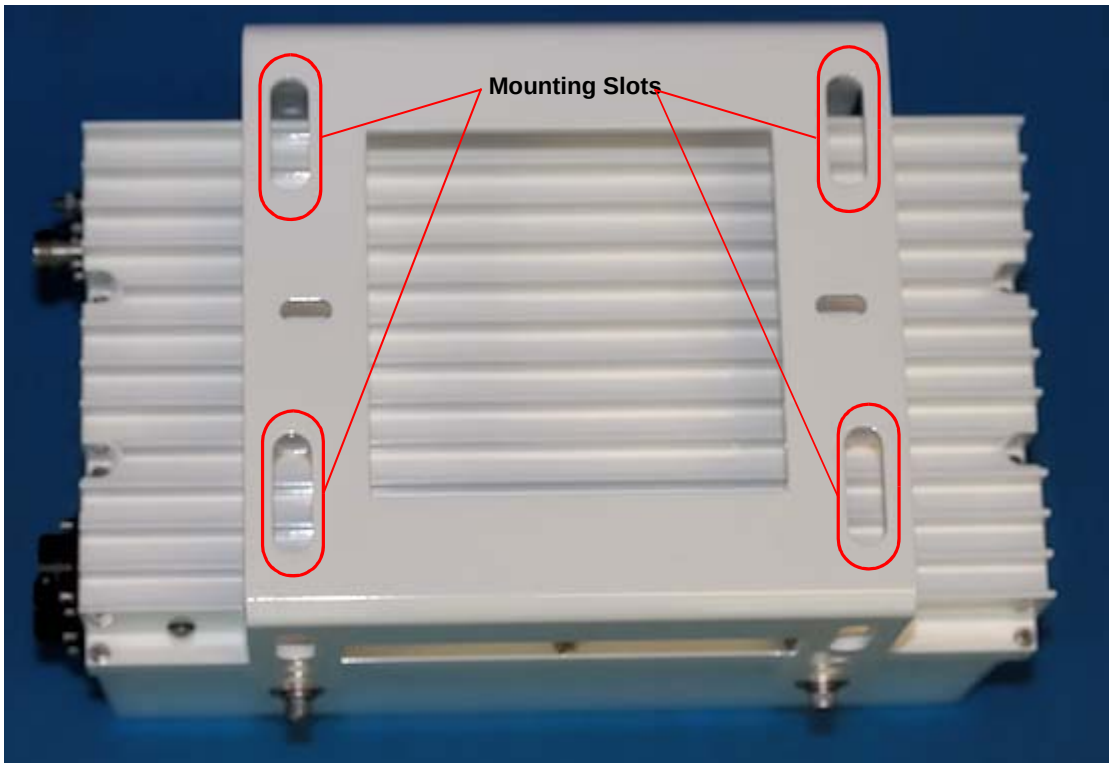

Figure 3.6 Location of Mounting Slots

System Cabling Requirements

The Rx 1+1 system provides interfaces for the LNBs and switch control for the waveguide switch. The interface module also provides DC power connectors receiving 24 VDC or 48 VDC from external power supplies. The interface connectors are shown in the figures that follow and the connector schedule is listed in Table 3.1 on page 3-16.

Figure 3.7 depicts the front panel of a DC-powered Rx 1+1 system; Figure 3.8 and Figure 3.9 on page 3-14 depict the front panel of an AC-powered system. Note the location of the access panel; behind it are two switches. Use the switch labelled SW1 to change the mode of operation from normal (controlled by the M&C card) to emergency (manually controlled by the user. Use the SW2 switch to change from the

A: side unit to the B: side unit (or vice versa). You must first activate SW1 to be able to see the results of activating SW2.

Figure 3.7 Front Panel of a DC-powered Rx 1+1 System

Figure 3.8 depicts the front panel of a single-input AC-powered Rx 1+1 system with the mounting bracket attached.

Figure 3.8 Front Panel of a Single-input AC-powered Rx 1+1 System

Figure 3.9 depicts the front panel of a two-input AC-powered Rx 1+1 system with the mounting bracket attached.

Figure 3.9 Front Panel of a Two-input AC-powered Rx 1+1 System

Figure 3.10 depicts the information that is silk-screened on to the top cover of the chassis of an AC-powered Rx 1+1 system.

Note: The information silk-screened on the top cover is the same for both single-input and two-input AC-powered systems.

Figure 3.10 Information on Top Cover of an AC-powered Rx 1+1 System

Figure 3.11 depicts the back panel of an Rx 1+1 system.

Figure 3.11 Back Panel of an Rx 1+1 System

One side panel contains a row of multifunction LEDs that provide a quick view of system status. LED colors signify the following:

- Flashing green – No alarms
- Flashing Red – Minor alarm being reported
- Steady Red – Major alarm being reported

Figure 3.12 Side Panel of an Rx 1+1 System

Physical Connections

The connector schedule for a DC-powered interface module is listed in Table 3.1.

Table 3.1 DC-powered Rx 1+1 Interface Module Connector Schedule

Ref Desig	Function	Connector	Connector Mate
J1	User Interface	Amphenol Cylindrical Box Mtg Rcpt, 19S (PT3122E14-19S)	Amphenol Cylindrical Straight plug, 19P (PT3116F14-19P)
J2, J3	DC Power	MS Circular Connector Box Mtg Rcpt (ACS02E10SL-4P (553))	MS Circular Connector Straight Plug (ACS06E10Sl-4S (553))
J4, J5	Rx Input	Type-N receptacle	Type-N plug
J6	Rx Output	Type-N receptacle	Type-N plug
J7	Waveguide Switch Control/Indicator	Amphenol Cylindrical Box Mtg Rcpt, 6S (PT3122E10-6S)	Amphenol Cylindrical Straight plug, 6P (PT3116F10-6P)

The connector schedule for an AC-powered interface module is listed in Table 3.2. .

Table 3.2 AC-powered Rx 1+1 Interface Module Connector Schedule

Ref Desig	Function	Connector	Connector Mate
J1	User Interface	Amphenol Cylindrical Box Mtg Rcpt, 19S (PT3122E14-19S)	Amphenol Cylindrical Straight plug, 19P (PT3116F14-19P)
J2, J3	AC Power	Amphenol Power Connector Rcpt (3+PE) (T3110-000)	Amphenol Power Connector Rcpt (3+PE) (T3109-001)
J4, J5	Rx Input	Type-N receptacle	Type-N plug
J6	Rx Output	Type-N receptacle	Type-N plug
J7	Waveguide Switch Control/Indicator	Amphenol Cylindrical Box Mtg Rcpt, 6S (PT3112E10-6S)	Amphenol Cylindrical Straight plug, 6P (PT3116F10-6P)

Note: The J3 connector is only available for two-input AC-powered Rx 1+1 systems.

For units that are DC powered, a mating M&C connector for J1 is included with the Rx 1+1 system. Power for the Rx 1+1 system is supplied directly through the external power connectors J2 and J3. Voltage can range from 20 VDC to 60 VDC.

For units that are AC powered, the voltage from AC mains is applied directly to the J2 connector for single-input sytems and to both the J2 and J3 connectors for two-input sytems. The front end will work with both 115 VAC and 230 VAC,

Terrasat offers a range of power supplies (PSUIs) with auto-ranging AC front ends that will work with both 115 VAC and 230 VAC. Terrasat supplies one Y-cable for each PSUI together with the Rx 1+1 system that is used to connect supply cables to the Rx 1+1 interface module.

User Interface J1 Connector – The M&C user interface is a 19-pin socket connector used to enable remote monitoring and control of the Rx 1+1 interface module operating parameters. Pin assignments are listed in Table 3.3. If the M&C port of the Rx 1+1 interface module is used, the cable should be a shielded multiconnector cable with at least two twisted pairs. The twisted pairs used for TCP/IP purposes must have an impedance of 100 Ω. See the cable drawing in Appendix F. An assembled IP test cable is available from Terrasat.

Table 3.3 Pin Assignments for the J1 User Interface Connector

Pin	Function
A	RS485 (+)
B	RS485 (-)
C	Hand-held Terminal Power (+)
D	RS232 RXD

Table 3.3 Pin Assignments for the J1 User Interface Connector (Continued)

Pin	Function
E	RS232 TXD
F	Hand-held Terminal/RS232 Common
G	TCP/IP Tx +
H	TCP/IP Tx -
J	TCP/IP Rx +
K	TCP/IP Rx -
L	A: side LNB Alarm Output Normally Open
M	A: side LNB Alarm Output Common
N	A: side LNB Alarm Output Normally Closed
P	B: side LNB Alarm Output Normally Open
R	B: side LNB Alarm Output Common
S	B: side LNB Alarm Output Normally Closed
T	N/C
U	N/C
V	N/c

DC Power J2 and J3 Connectors – Prime power is supplied to the Rx 1+1 interface module through 2-pin circular socket connectors. Pin assignments are listed in Table 3.4.

Table 3.4 Pin Assignments for the J2 and J3 DC Power Connectors

Pin	Positive Supply	Negative Supply
A	VDC Common	VDC –
B	VDC +	VDC Common

AC Power J2 and J3 Connector – AC power is supplied to the Rx 1+1 interface module through a 4-pin circular socket connector. Pin assignments are listed in Table 3.5.

Table 3.5 Pin Assignments for the J2 and J3 AC Power Connectors

Pin	Function
1	N/C
2	Neutral
3	Line
4	Ground

Note: The J3 connector is only available for two-input AC-powered Rx 1+1 systems.

The caution symbol (shown at left) that is printed on the chassis indicates that VDC may be present. In general, low-power units with positive or floating supply allow DC power via coaxial cable. However, AC-powered units cannot be supplied via coaxial cable.

Rx Input J4 and J5 Connectors – The Rx input connectors are Type-N socket connectors used to connect the IF at L-band from the LNBs to the Rx 1+1 interface module. 50Ω cables are supplied with the Rx 1+1 system. The Rx 1+1 interface module uses these connectors to supply the LNBs with the 10 MHz reference signal and VDC.

Rx Output J6 Connectors – The Rx output connector is an Type-N socket connector used to connect the IF at L-band to the modem. 50Ω cables should be used to connect to J6. The modem supplies the 10 MHz reference signal for the LNBs through this connector.

Waveguide Switch Control Indicator J7 – This connectors sends commands to physically move the waveguide switch from the A: side to the B side (and vice versa). The indicator then returns a response to the interface module to indicate the position of the switch.

DC-powered Rx 1+1 systems include a Y-cable that enables you to share the power supply with the Tx 1+1 system. Pin assignments are listed in Table 3.6.

Table 3.6 Pin Assignments for the Y-cable Connector

Y-cable J1		Y-cable J2		Y-cable J3	
Pin	**Function**	**Pin**	**Function**	**Pin**	**Function**
A	VDC -	A	VDC -		
B	VDC -	B	VDC -		
C	VDC -	C	N/C	A	VDC -
D	VDC +	D	N/C	B	VDC +
E	VDC +	E	VDC +		
F	VDC +	F	VDC +		

Waveguide Connections

The waveguide is a two-position, four-port switch of a type known as a “baseball switch” because of the resemblance between a cross-section of the switch and the stitching pattern on baseballs. These ports are connected to the LNBs, the antenna

feed, an optional Tx reject filter, and a dummy load. This can be seen in Figure F.3 on page F-4.

WARNING

The output of the IBUC is microwave power. Never look into the waveguide nor put your head into the path of the beam which goes up to the satellite.

Connect a section of flexible waveguide between the Rx port of the waveguide switch to the orthogonal mode transducer (OMT) port or the optional Rx reject filter. The waveguide should be attached to the antenna feed according to the manufacturer's instructions. Use proper gasketing methods to prevent water entry and subsequent damage.

Configuration without IFU

1. Connect the IFL coaxial cable between the J1 (Rx L-band) connector and the modem.
2. Connect the coaxial cable between the LNB (Rx L-band) and the L-band Rx input of the modem.
3. Connect the M&C cable between the Rx 1+1 J1 connector (M&C) and the appropriate M&C computer or LAN connection.
4. Connect the DC cable between the outdoor PSUI J2 connector (DC output), as appropriate, and the J3 connector (DC Input).
5. Connect the AC cable between the PSUI J1 connector (AC input) and the AC power source.

Other Connections

1. Connect the M&C cable between the Rx 1+1 J1 (M&C) and the appropriate M&C computer or LAN connection.
2. Connect the DC cable between the outdoor PSUI J2 (DC Output), as appropriate, and the J3 (DC Input). Low power units can be supplied from the Modem or the IFU through the coaxial cable to the Rx 1+1 system.
3. Connect the AC cable between the PSUI J1 (AC Input) and the AC power source.

Antenna Alignment

Ensure that the desired transponder is in operation.

WARNING

When aligning the antenna, there must be no transmission.

To find the satellite and peak the receive signal,

1. Apply power to the LNB.
2. Point the antenna at an empty sky in order to determine a noise floor reference for your equipment.
3. Sweep the antenna as close to the satellite azimuth and elevation as possible.

Note: This must be done very slowly in order to locate the desired satellite.

4. Begin scanning in 1° increments from left to right and from up to down until you maximize the receive level.
5. Simultaneously monitor the receive signal level at the demodulator.

   Wideband signals such as video carriers are easiest to find and should be used whenever possible. Look for a satellite beacon frequency (a stable signal used for tracking purposes).
6. Tune the antenna and adjust its polarization according to the antenna manufacturer's instructions until the desired satellite is located and the receive signal level is maximized.

Setting the Rx Frequency

All transmit and receive frequencies are set in the modem. When using a direct connection to an L-band modem, follow the modem manufacturers' instructions for setting the transmit and receive frequencies.

Receive L-band Output Measurements

To check the receiver,

1. Ensure that 15 VDC to 24 VDC (LNB bias) is present at the modem or IFU Rx input.

2. Use a spectrum analyzer to ensure that the 10 MHz reference signal is present at the modem or IFU Rx input.

WARNING

DC power will be present on the cable. Terrasat recommends the use of a DC block when using a spectrum analyzer.

3. Connect the LNB to the demodulator Rx input by attaching the coaxial cables from the Rx L-band output on the LNB to the Rx L-band input port of the demodulator. When configured with the IFU, connect the IFU Rx output (J5) to the demodulator Rx L-band input port and connect the LNB to the IFU Rx input by attaching the coaxial cables from the Rx L-band output on the LNB to the Rx input port (J4) on the IFU.

CHAPTER

4

OPERATIONS

This chapter describes general operation of the receive redundant (Rx 1+1) system.

Introduction

Before you begin, you should have already made all necessary connections and are tracking the correct satellite.

Initial Readings

In order for the Rx 1+1 system to operate properly in automatic mode, it must be free of alarms.

1. Follow the instructions in Appendix E, Web Pages to establish a connection with the system.
2. Navigate to the Sensor Tab shown on page E-11.
3. Record the input power, supply voltage, and current consumption levels for both the A side and B: side units. Because every band, system, and satellite is different, make a note of the receive level from an empty sky reading.

   You will use these initial readings to determine high and low threshold levels for your specific setup.

Note: Be sure to record the levels twice for each unit: once when the unit is online and again when it is offline.

4. Navigate to the Alarm Tab shown on page E-8.

   If there are no alarms, skip to Step 1of Setting Threshold Levels on page 4-3.

   If an alarm has occurred, record the alarm name and continue with the next section,

Possible Alarms

Alarms occur whenever a threshold level (high or low) has been exceeded. You can configure these threshold levels as well as the type of alarm (major, minor, or disabled) that is caused.

Input Low Threshold

If you are experiencing an Input Low Threshold alarm,

1. Check the levels on the Sensor Tab shown on page E-11.
2. Compare the levels on the Sensor Tab with the thresholds set by using the Rx Configuration Tab on page E-12.

   Remember that the input level of the online unit must be greater than the level of the offline unit.
3. If your Rx Input level has exceeded the Input Low Threshold, you might have lost track of the satellite.

Supply Voltage

If you are experiencing a Supply Voltage alarm,

1. Check the levels on the Sensor Tab.
2. Compare the levels with the thresholds set by using the Rx Configuration Tab.
3. If your levels indicate a lack of supply voltage,
   - Check to ensure that the unit is being supplied power via the J2 and J3 connectors.
   - Check the power supply to ensure that it is not being overloaded.

     An overloaded power supply can cause the short-circuit protection to activate. Check what is connected to J4 and J5 for short circuits.
   - There could be a problem with the unit itself

     In this case, contact Technical Support

Current Consumption

If you are experiencing a Current Consumption alarm,

1. Check the levels on the Sensor Tab.
2. Compare the levels with the thresholds set by using the Rx Configuration Tab.
3. Verify that the levels are consistent with specifications for the LNB.

   If they are not, you might have a problem with your LNB. Contact the LNB manufacturer for support.

Setting Threshold Levels

1. Navigate to the Rx Configuration Tab shown on page E-12. Compare your current consumption readings to the high and low threshold levels.

Note: Remember that the low-noise block converters (LNBs) consume 224 mA.

Terrasat recommends that you set the higher threshold level to 10% higher than your current consumption levels and the lower threshold level to 10% lower.

10 MHz Low Alarm

The 10 MHz Low alarm occurs when the level of the 10 MHz reference signal from the modem is either low or not present. If the LNB that you are using has an internal 10 MHz signal, the modem will not supply one and you will need to disable the 10 MHz low alarm.

To disable a 10 MHz low alarm,

- Use one of these monitor and control (M&C) interfaces:
  - Web Page: Navigate to the Alarm Configuration Tab shown on page E-19 and set the 10 MHz alarm setting to "Disable."
  - Telnet: After initiating a Telnet session, type the command `CTD=0` and press Enter.

Note: If your system is not operating under revision 0.10 of the firmware, you will need to upgrade in order to use the CTD command. To upgrade, you can download Rx 1+1 revision 0.10 from the Support page of the Terrasat website. Visit http://www.terrasatinc.com/support.htm

To perform the upgrade, connect a laptop directly to the interface and use the laptop to install the upgrade.

Rx Input Level Low Threshold Alarm

The Rx 1+1 interface monitors the input level (coming from the LNB output) to verify whether each LNB has proper gain.

When the LNBs have proper gain, the interface module for the unit that is operating in Standby mode will detect the composite level at the input at the interface. This composite level is the noise at the input of that LNB which has been degraded, amplified, and converted by the LNB and integrated over the bandwidth of the LNB response. If one stage of the internal low-noise amplifier (LNA) fails, you would expect to see a drop in the composite level.

To prevent an Rx input level low threshold alarm,

1. Measure the composite level when the LNB is in standby mode.

2. Set the low threshold level to be lower than the composite level (for example, 10 dB lower).
3. When the Rx 1+1 system is installed, the online LNB is expected to measure a level higher than the unit operating in standby mode because it measures the composite noise plus all of the incoming carriers from the satellite.

CHAPTER

5

MONITOR AND CONTROL FEATURES AND FUNCTIONS

The Rx 1+1 system is equipped with monitor and control (M&C) capabilities that enable remote configuration and control of the system. You can communicate with the Rx 1+1 system via any of the following interfaces:

- RS232
- Hand-held Terminal (HHT)
- Multifunction LEDs
- Ethernet
- RS485

The Rx 1+1 Interface Module also provides status alarm output (Form-C relay) for both LNBs.

Monitor and Control Interfaces

You must first establish communication with the Rx 1+1 system to be able to take advantage of its various M&C features.

RS232

No additional configuration of the Rx 1+1 interface module is required for proper RS232 operation. The RS232 port uses ASCII protocol and a fixed baud rate of 9600, 8 data bits, no parity, no flow control, and one stop bit for communication.

To initiate an RS232 session,

1. Connect a 10-pin to DB9F cable between the computer and the Rx 1+1 system.

   Appendix F contains a drawing for fabricating a cable.

2. Activate a terminal emulation program such as HyperTerminal.

   See Appendix C for information about how to connect using HyperTerminal.

3. Type four single quotes (for example, ‘ ‘ ‘ ‘), and then press Enter.

   Although the default mode is RS232, typing the four single quotes upon activating a terminal emulation program ensures that the unit is in RS232 mode.

4. Type the password command `CPE=1234` and then press Enter.

   You can now use the ASCII commands described in Appendix D, ASCII Command/Response Structure to configure and monitor the Rx 1+1 system.

Note: The password entered in Step 4 is the factory default password. If you have changed the password, type that value instead.

The RS232 port is shared with the hand-held terminal.

Hand-held Terminal

The hand-held terminal (HHT) shown in Figure 5.1 is an optional item that can be used to access the Rx 1+1 system via the J1 connector on the interface module. No additional configuration is needed for proper operation of the HHT.

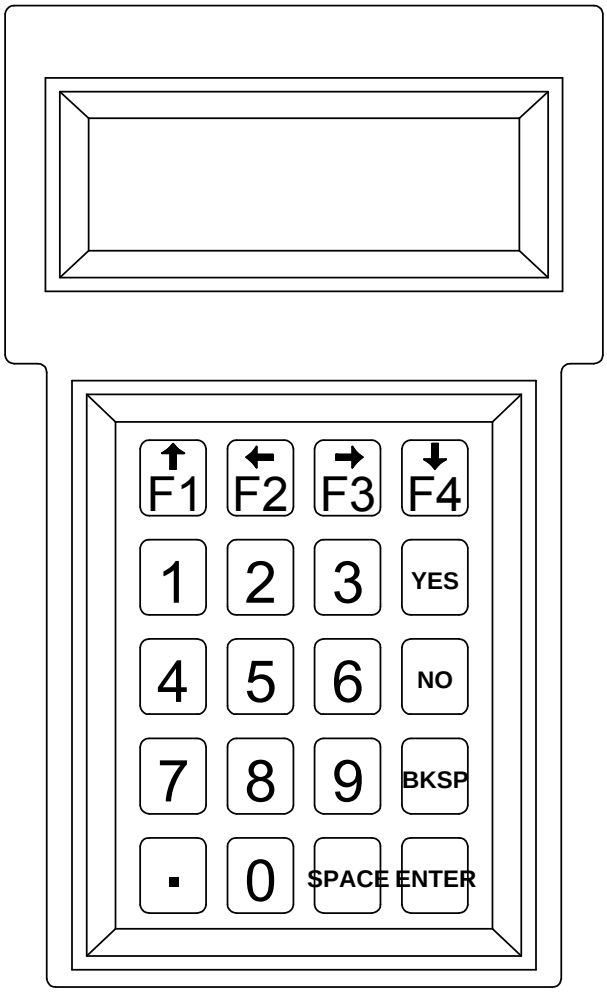

Figure 5.1 Hand-held Terminal Illustration

To activate the HHT,

1. Connect the supplied cable to the J1 connector on the interface module and plug the RJ11 connector in to the HHT.
2. When a flashing cursor is seen in the upper left of the HHT screen, press the decimal key four times (that is, "`....`").
3. The login screen shown in Figure B.2 on page B-3 will appear.
4. Type the password.

   The factory default password is `1234`. If you have changed the password, type that value instead.

The HHT is now ready to accept commands.

See Appendix B, Rx 1+1 Hand-held Terminal Menu Tree for additional information about the HHT.

Multifunction LEDs

There are seven LEDs mounted on the housing of the Rx 1+1 interface module, as shown in Figure 5.2.

Figure 5.2 Side Panel of an Rx 1+1 System

These LEDs provide visual indication of status for the following parameters:

- 1+1 Power

  Indicates whether power is being supplied to the unit.
- Activity

  Indicates whether there is any Ethernet activity.
- A: Online

  Indicates that the A: side unit is receiving the signal from the antenna.
- A: Alarm

  A red light indicates that a major alarm has occurred on the A: side unit. A green light indicates that the A: side unit is operating within specifications.
- B: Alarm

  A red light indicates that a major alarm has occurred on the B: side unit. A green light indicates that the B: side unit is operating within specifications.

- B: Online

  Indicates that the B: side unit is receiving the signal from the antenna.

- Normal/Emergency

  A red light indicates a hardware override of the waveguide switch is active. A green light indicates that the M&C card has control of the waveguide switch.

Certain alarms are configurable which gives you the ability to define them as major, minor, or no alarm when thresholds you set are exceeded. Major alarms will cause switching between the LNAs. The factory default alarm configurations are listed in Table 5.1.

Table 5.1 Default Alarm Configuration

		Alarm State		
		Major	Minor	None
Rx Alarms	**User Configurable**	**Solid Red**	**Flashing Red**	**Log Only**
A: Rx Input Level Low	Yes	X		
B: Rx Input Level Low	Yes	X		
A: Rx Simulated	No	X		
B: Rx Simulated	No	X		
10 MHz Reference	Yes		X	
A: VDC Low Level	Yes		X	
B: VDC Low Level	Yes		X	
A: VDC High Level	Yes		X	
B: VDC High Level	Yes		X	
Switch Fault	No	X		X
A: Current Low Level	Yes	X		
B: Current Low Level	Yes	X		
A: Current High Level	Yes	X		
B: Current High Level	Yes	X		
Emergency Override Switch	No	X		X

Frequency Shift Keying (FSK)

Frequency shift keying (FSK) and RS485 operate in ASCII mode and share a common address. The message formats for both FSK and RS485 are the same. Receiver link specifications are provided in Table 5.2.

Table 5.2 Receiver Link Specifications

Locking Range	±32.5 KHz
Input Impedance	50 Ω
Input Sensitivity	-15 dBm

FSK data is transmitted at 9600 baud with 8 data bits, no parity, no flow control, and one stop bit.

Synchronization is maintained by the following method:

1. Once a < character is received, the link will be in sync. A state machine passes the ASCII characters

   The Rx 1+1 system is capable of responding to messages at a rate of one every 20 ms.
2. If the Rx 1+1 system does not respond within the maximum response time, the command should be cyclically repeated.

Ethernet

Using Ethernet, you can communicate with the Rx 1+1 system through Telnet (ASCII), the on-board Web server (HTTP), or through SNMP. The Rx 1+1 system uses a static IP addressing structure and does not support DHCP. The Rx 1+1 system is factory-configured as follows:

IP Address	192.168.1.254
IP Gateway	192.168.1.1
Subnet Mask	255.255.255.0
Telnet Port	23

Note: Your computer should have a static IP address on the same subnet as the Rx 1+1 interface module. Using a suitable cable, connect the computer to the J1 connector on the interface module.

Note: An Ethernet hub will function with a straight connect cable. If an Ethernet hub is not used to connect to the interface module, a crossover cable must be used instead.

Determining the IP Address of Your Rx 1+1 System

Follow these steps to determine the IP address of your rx 1+1 system:

1. Attach an Ethernet cable between your computer and the J1 connector of the rx 1+1 sytem.
2. Open a Web browser window and navigate to the Support page of the Terrasat Communications, Inc. website at

   www.terrasatinc.com/support.htm
3. Double-click the IBUC v1.*xx* file name, as shown in Figure 5.3.

Note: In Figure 5.3, the version shown is v1.22; your version number may vary.

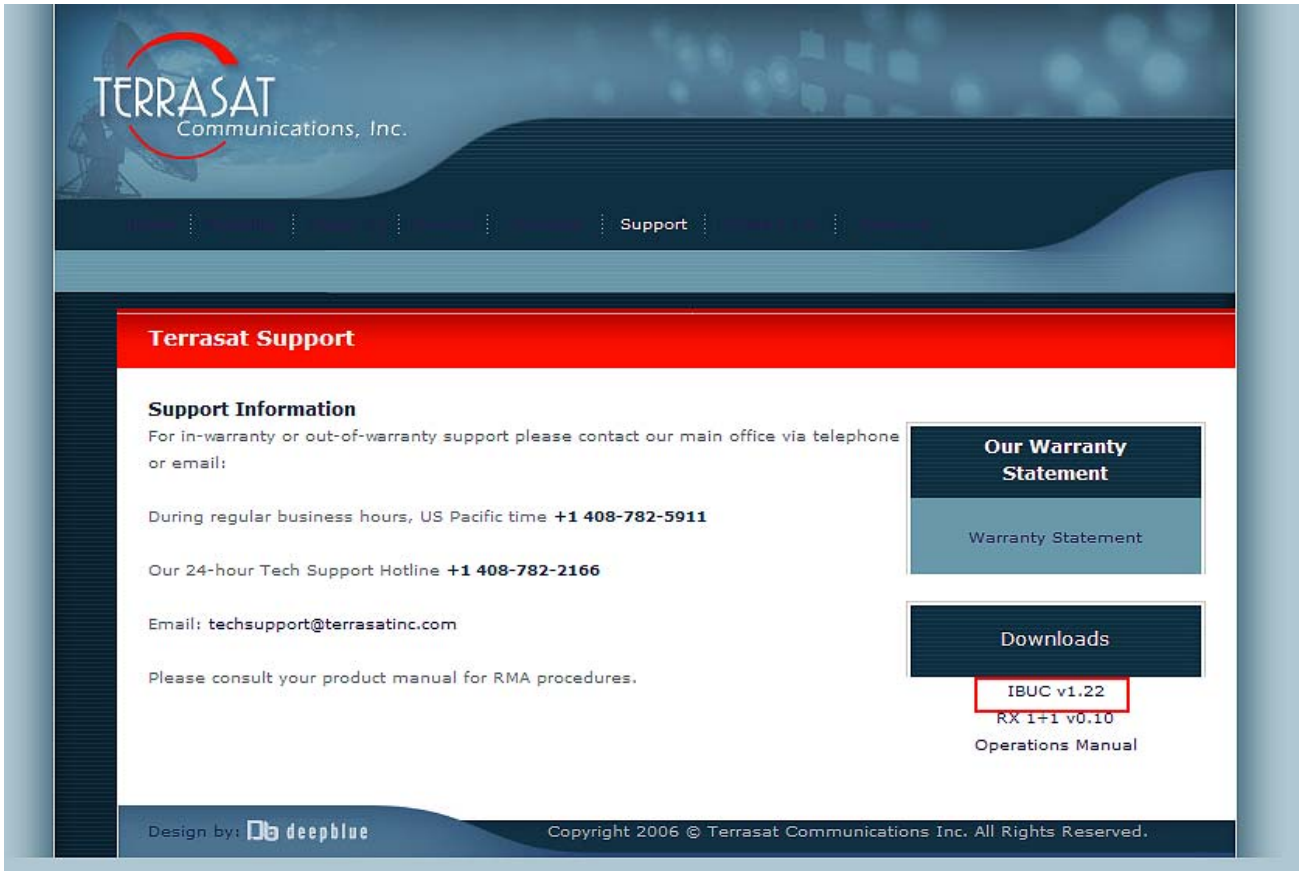

Figure 5.3 Location of Downloads on Terrasat Website

4. After you double-click the file name, a dialog box similar to the one shown in Figure 5.4 appears that asks you whether you want to open or save the .zip file. Click **Open**.

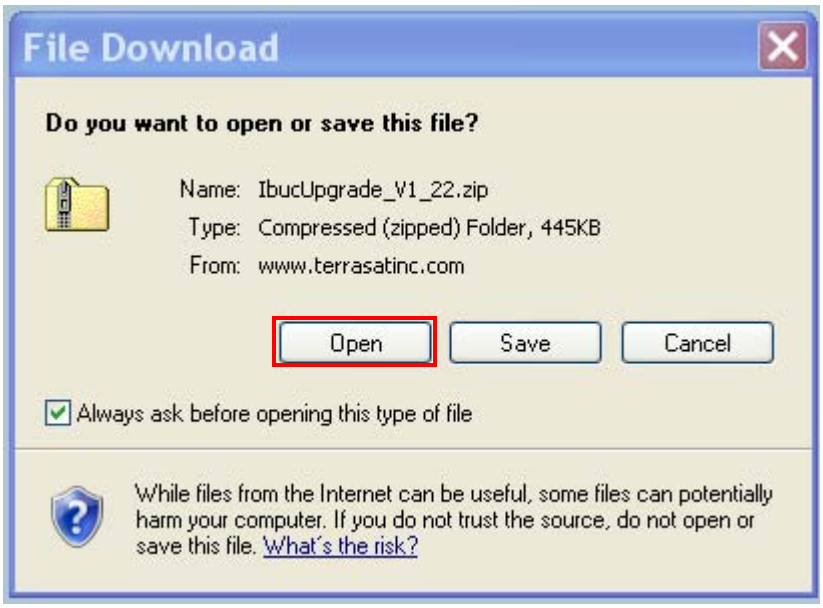

Figure 5.4 Download Instructions for .zip File

5. The contents of the .zip file appear as shown in Figure 5.5. Double-click the file named `UDPDownload-2004-09-05.`

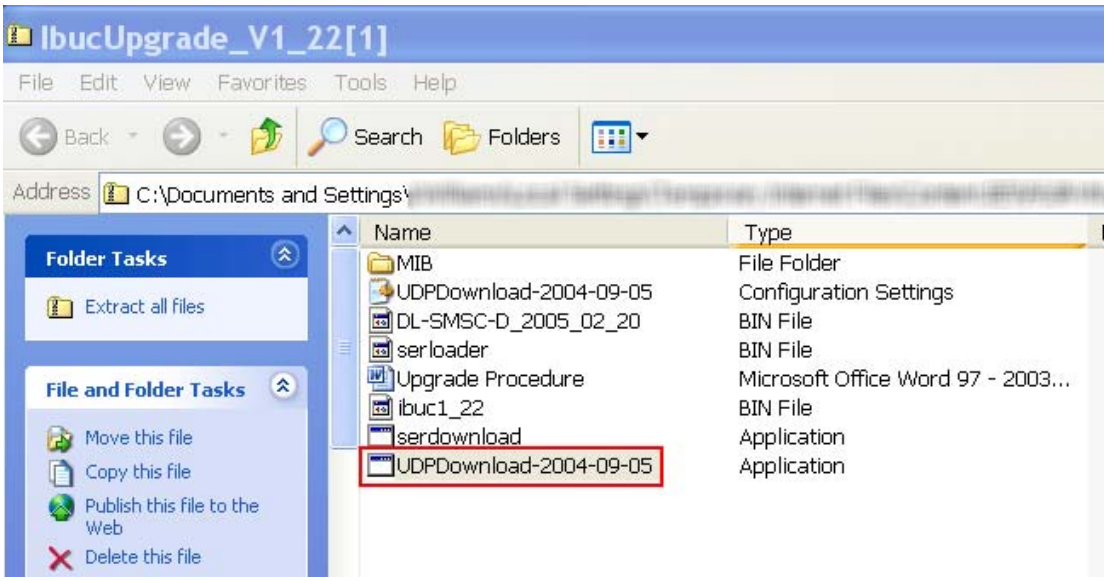

Figure 5.5 Contents of the IBUCUpgrade_v122 .zip File

6. A dialog box similar to the one shown in Figure 5.6 appears. Click **Run**.

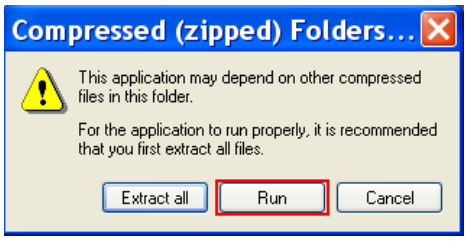

Figure 5.6 Extracting the .zip Files

7. A Security Warning dialog box, similar to the one shown in Figure 5.7, appears. Click **Run**.

Figure 5.7 Security Warning Dialog Box

8. The program begins to search for the IP address of any connected IBUC **2** that is on the same subnet as the computer, and then displays that information in a window similar to the one shown in Figure 5.8.

Note: Be sure to record the IP address for future reference.

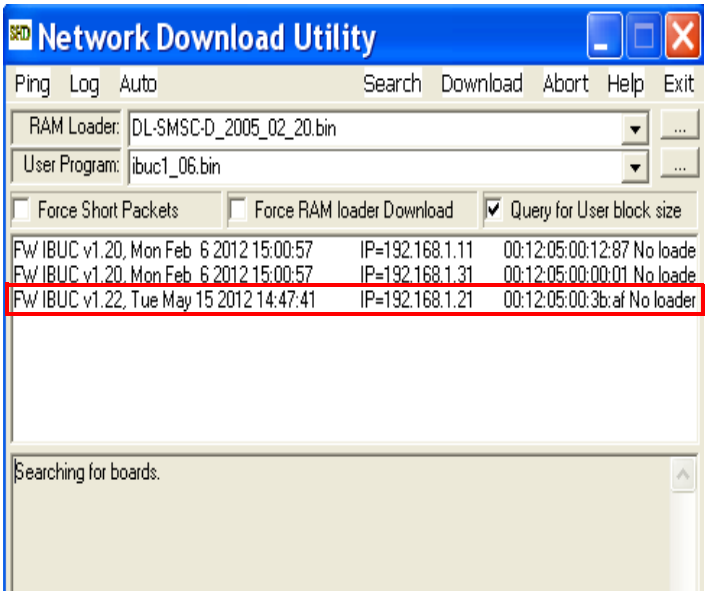

Figure 5.8 Results Window

However, if your unit is not on the same subnet as your computer, your results window will be blank like the one shown in Figure 5.9. Because there are no matches, the message "Searching for boards." will repeat.

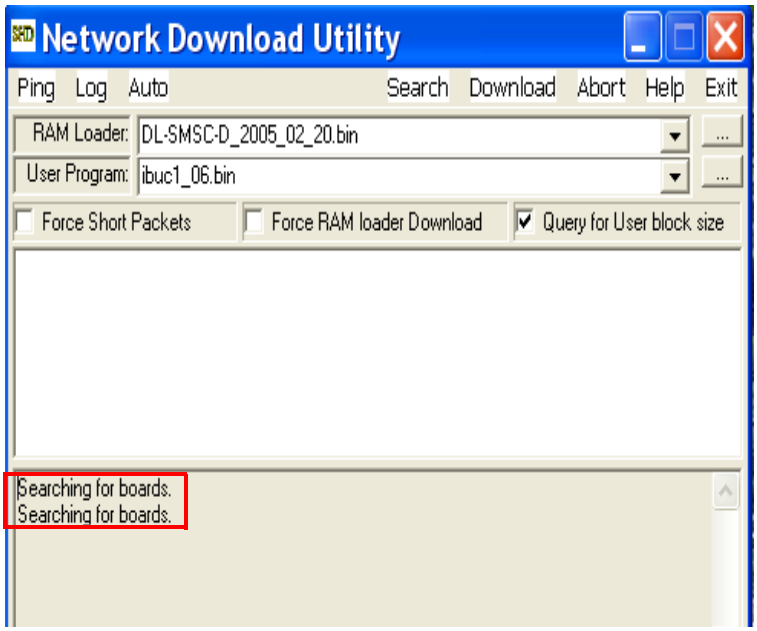

Figure 5.9 Blank Results Window

9. To stop the program, click **Abort**, and then click **Exit**.

You can re-start the program when the unit and the computer are on the same subnet.

Telnet

Telnet is a simple text-based program that enables you to connect to another computer by using the Internet. You can connect to the Rx 1+1 system using a Telnet client from the host PC. Telnet uses the ASCII command set listed in Appendix D, ASCII Command/Response Structure. The default port for Telnet is 23. Characters are echoed back to the user. The response format varies depending on the message type. If the verbose setting is used, the response contains formatting characters which display neatly to the user. If the terse setting is used, the response contains no formatting characters and is terminated with LF and CR. If verbose mode is used, the response is terminated with `RX1+1>`.

To initiate a Telnet session,

1. Activate a command prompt window from the host computer.
2. Type `Telnet 192.168.1.254`
3. A cursor should appear on the left of the screen.
4. Type the password command `CPE=1234`

   The response will be `RX1+1>_`.

You can now use ASCII commands to access functionality. For more information about ASCII commands, see Appendix D, ASCII Command/Response Structure.

Embedded Web Pages

You can access embedded Web pages that contain status and configuration information.

To initiate a session,

1. Activate a Web browser window from the host computer.
2. Type the Rx 1+1 system IP address, and then press Enter.

   A login page then appears. After login, you have a choice of nine Web pages with monitoring, control, and alarm information

More information about the embedded Web pages can be found in Appendix E, Web Pages.

SNMP

The Rx 1+1 system supports SNMP version 1.0 protocol. The SNMP agent listens on Port 161 for SNMP messages and uses Port 162 for transmitting trap information. SNMP ca be configured from the HHT, RS232, Telnet, Web pages, FSK, and RS485 interfaces.

The MIB-II system group was implemented beginning with version 1.04.

The following commands configure SNMP operation on the Rx 1+1 system:

- **CIT** – Enables or disables the SNMP trap capabilities of the Rx 1+1 system

  CIT=1 Enable traps. SNMP must be enabled to generate traps (CIS=1).

  CIT=0 Disable traps

  CIT? Displays the current setting of traps
- **CIS** – Enables or disables the SNMP functionality of the Rx 1+1 system

  CIS=1 Enable SNMPV1

  CIS=0 Disable SNMPV1

  CIS? Displays the current setting of SNMP functionality
- **CIH** – Sets the IP address to send traps

  CIH=<value> where value is an IP address in dotted decimal notation

  CIH? Retrieves the current trap IP address from the Rx 1+1 system
- **CIC** – Sets the SNMP passwords for the Rx 1+1 system

  CIC=<public>,<private>,<trap> where public is the public password, private is the private password, and trap is the trap password.

  All three passwords are require when issuing this command. Each password cannot exceed 16 characters. Passwords may not be read for security purposes.

To configure SNMP using the hand-held terminal (HHT)

1. Connect the HHT to the Rx 1+1 system by using the 19-pin connector.
2. Press the decimal key four times (for example, **. . . .**).
3. Type the password.

   The factory default password is `1234`.
4. Press the right arrow key to access the SNMP submenu.
5. Press the 0 key.
6. Press Yes to enable SNMP.
7. Press the Bksp key.
8. Press the 1 key.
9. Press Yes to enable traps.
10. Press the Bksp key.

11. Press the 2 key.
12. Type the trap host IP address

Note: Community strings cannot be set from the hand-held terminal.

To configure SNMP from the Web pages

1. Connect to the Rx 1+1 system with a Web browser

   The default IP address is `http://192.168.1.254`.
2. Type the password.

   The default password is `1234`.
3. Select the Interface Configuration tab
4. Enable SNMP, SNMP Trap, host trap IP, and set passwords, if desired.

   The default is public, private, and trap.
5. Click `Save Settings` to ensure that your changes are saved.

Note: Changing the SNMP passwords requires a firmware reboot.

MIBs

Management information bases (MIBs) are hierarchical virtual databases used to manage the devices in a communications network. The following MIBs are provided for the SNMP management station:

- TERRASAT-RX1PLUS1-MIB.MIB
- TERRASAT-SMI.MIB
- TERRASAT-TC-MIB.MIB
- TERRASAT-TRAPDEF-MIB.MIB

RS485

The RS485 interface is intended primarily as a network management system (NMS) interface accessed by an NMS program. You can also access the RS485 interface with the host computer by using the host computer's on-board RS485 card or by using an external RS232 to RS485 adapter. You can communicate with the Rx 1+1 system across RS485 through ASCII.

The RS485 interface is a standard two-wire interface (DATA+ and DATA-). The baud rate is programmable to 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 baud. The data is transmitted asynchronously as 8 bits, no parity, no flow control, and one stop bit.

To configure RS485, you will need to set the following:

- RS485 Address
- RS485 Delay
- RS485 Baud rate

You can configure RS485 by using any of the M&C interfaces described in this chapter.

ASCII Mode

Communication requires an on-board RS485 card in the host computer. However, if an external interface converter box is used to convert RS232 to RS485, a terminal emulation program such as HyperTerminal will not function unless it has automatic line turnaround. In this case, a network management program is required to handle this handshaking requirement.

In HyperTerminal, type the password command, and then press Enter. For example, `<001/CPE=1234` where `<001/` is the address of the Rx 1+1 system and `1234` is the default password. When the `>` prompt re-appears, the Rx 1+1 system is ready to accept commands.

ASCII Mode Command Format

Table 5.3 lists the differences between SET and GET commands in ASCII Mode.

Table 5.3 ASCII Mode Command Format

SET Commands	GET Commands
Start of Packet: < (ASCII code 60; 1 character)	Start of Packet: < (ASCII code 60; 1 character)
Target Address: (4 characters)	Target Address: (4 characters)
Address De-limiter: / (ASCII code 47; 1 character)	Address De-limiter: / (ASCII code 47; 1 character)
Instruction code: (3 characters)	Instruction code: (3 characters)
Code qualifier: = (ASCII code 61 or 63; 1 character) See Appendix D for a list of ASCII codes	End of Packet: Carriage Return (ASCII code 13; 1 character)
Arguments: (*n* characters)	—
End of Packet: Carriage Return (ASCII code 13; 1 character)	—

For GET Commands, the format is as follows:

`<address/command[CR}`

Example: `<0001/COI{CR}`

For SET Commands, the format is as follows:

```
<address/command=XXX[CR}
```

Example: `<0001/CPE=1234{CR}`

ASCII Mode Response Format

- Start of Packet: > (ASCII code 62; 1 character)
- Target Address: (4 characters)
- Address De-limiter: / (ASCII code 47; 1 character)
- Variable Length Data: (*n* characters)
- End of Packet: Carriage Return (ASCII code 13; 1 character)

  Example: `>0001/{Variable Length Data}{CR}`

Commands and values available in ASCII mode are shown in the command set in Appendix D.

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CHAPTER

6

TROUBLESHOOTING

This chapter discusses basic troubleshooting procedures for the Terrasat Communications, Inc. line of products.

Maintenance

In general, Terrasat products are self-contained and require little maintenance. However, for optimum performance Terrasat recommends that users inspect the mechanics of the system every three to six months and perform the following:

- Clean the antenna feeds to keep them clear of obstructions.
- Check cables and connectors for signs of wear, damage, or loose connections.
- Check all fan intakes and exhausts to ensure that they are clear of debris.

Fault Isolation

Use the information in this section to assist in determining whether a Terrasat unit is faulty. The intent is to determine a “Go” or No Go” situation based on alarms indicated thought the M&C ports as well as by measuring certain signals using test equipment.

Receive L-band Output Verification

If low or no Rx output power is detected, begin troubleshooting by checking the output of the LNB. Look for interference by contacting the satellite controller or checking with a spectrum analyzer. You can also contact the distant end to check their transmit status.

If you are sure that there is no interference and that the link is still up from your distant end, continue to step 1.

1. Ensure that the 15 VDC to 24 VDC (LNB Bias) is present at the modem Rx input (or IFU Rx input) by using a DVM. If it is not, check the cable and modem.
2. Use a spectrum analyzer to ensure that the 10 MHz signal is present at the modem Rx input (or IFU Rx input). If it is not, check the cable and modem.

WARNING

DC power will be present on the cable. Terrasat recommends the use of a DC block.

3. Connect the LNB to the demodulator (or IFU) by attaching the coaxial cables from the Rx L-band output on the LNB to the demodulator (or IFU) Rx L-band input port. If the Rx level is low, check the cable, feedhorn, and antenna for proper operation.

Power Supply Checks

Before beginning RF troubleshooting, verify that the proper voltage is being supplied to the Rx 1+1 system. Input DC voltage and current consumption data are available using any of the M&C interfaces. Verify that the values are within limits.

If M&C is not available, use a multimeter to verify that the appropriate voltage (24 VDC or 48 VDC are present. Check the part number label of the Rx 1+1 system to determine the required voltage.

AC Power Problems/Conditioning

In today's electrical environment, there are many types of power-related problems that can prevent proper operation of sensitive electronic equipment. These noise problems or disturbances can caused by such things as voltage induced by lightning, switching high-power electrical equipment On/Off, or utility company actions such as power factor correction. Serious problems can arise with the occurrence of transients and spikes which can cause random errors or even failure of the circuitry.

Whatever the origin of the transients, they can be classified into two simple categories:

- Common mode

  Noise voltage that appears equally and in phase from each signal conductor to ground.
- Normal mode (also known as differential mode)

  Noise potential between the power line conductors. It adds to and subtracts from the power line sinusoidal wave.

Category A – At the wall outlets (and more than 30 ft [9 m] from a distribution panel) the typical noise is a 0.5 µs rise time up to 6 kV peak open circuit voltage, 100 kHz ring wave with 200 ampere short circuit capability.

Category B – At the distribution pane, one can experience the 100 kHz ring wave listed previously but with 500 ampere current capability and a unidirectional impulse of to 6 kV potential rising in 1.2 µs and decaying to half voltage in 50 µs. Accompanying this can be a short circuit current up to 3000 amperes rising to peak in 8 µs and decaying to half value in 20 µs.

To ensure uninterrupted service, Terrasat recommends using a line conditioner or uninterruptible power source (UPS) based on the expected AC power at the site.

Site-Related Problems

VSAT antennas are often fitted at the top of buildings. Avoid close proximity to elevator motors, etc. Ensure that the antenna has a clear path to the satellite. Ensure that all cabling to the terminal is protected and has adequate slack.

M&C Checks

When troubleshooting the Rx 1+1 system, the first level of troubleshooting should be to check the status through the M&C port. Alarms and an alarm history log are available. See Chapter 5, Monitor and Control Features and Functions for specific information about using the RS232, RS485, Ethernet, or hand-held terminal ports.

Common Problems

The following problems or occurrences have been noted during normal troubleshooting:

- Weather may cause interference in receive mode.
- The distant end may have weather that lowers their transmission power levels.
- The distant end may have lowered transmission power levels.

Damaged Cables

RF coaxial cable damaged due to improper handling (such as contact damage due to improper mating; cable insulation that is damaged, crushed, cut, or charred; cables that were not discharged prior to mating; or conductors that are nicked, gouged, damaged, or severed) may impair system performance and reliability. Do not attempt to repair broken or damaged coaxial cables unless absolutely necessary. Replace the cable whenever possible.

Damaged cabling and incorrectly tightened connectors can leak RF energy which may lead to excessive levels in the immediate vicinity.

CAUTION

Never disconnect RF cables or connectors associated with a transmitter in operation since this may result in an RF burn through contact with RF conductors.

LED is Red

A red LED indicates only that a fault (or alarm) has occurred and does not necessarily indicate that reception has stopped. A flashing red light indicates a minor alarm and a solid red light indicates a major alarm. You can communicate with the Rx 1+1 system to determine what is causing the fault, and then clear the fault condition.

1. Establish communication with the Rx 1+1 system by using any of the M&C interfaces.
2. View the Alarm tab (shown on page E-8) to determine the current alarm.
3. View the Sensor tab (shown on page E-11) to determine which sensor reading caused the alarm.
4. Compare your readings to the thresholds.
5. Adjust the threshold level to bring the reading within specifications and thus clear the fault.

When the fault is cleared, the LED should be flashing green.

Repair Policy

Terrasat products are not field repairable.

In the event that a failure has been detected, it might be necessary to return the defective unit to the factory or a factory-authorized service center. The following section contains instructions for returning a defective unit to the factory for repair.

Returned Material Authorization (RMA)

If any equipment is determined to be defective:

- Have the following information available:
  - Unit serial number
  - Unit part number and description

  - Complete description of the failure
  - Designated contact name and telephone number
  - Billing information
  - Shipping information
- Contact Terrasat Customer Service to request an RMA number.
  - By telephone +1 408.782.2166
  - By e-mail to techsupport@terrasatinc.com
- Properly package the defective equipment in the original container (if available and undamaged), and mark the RMA number on the outside of the shipping container.
- Ship the equipment to the following address:

  Terrasat Communications, Inc.
  235 Vineyard Court
  Morgan Hill, CA 95037
  U.S.A.
- After the unit is received at Terrasat, an initial evaluation will be performed.
  - If the unit is found to be under warranty, the unit will be repaired and returned at no charge.
  - If the unit is found to be out of warranty, Terrasat Customer Service will approach the designated contact for authorization to proceed with the repair.
- Authorization in the form of a purchase order will be required.
- Once authorization is received, the unit will be repaired and returned.

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APPENDIX

A

PART NUMBERING SCHEMA

The charts in this appendix illustrate the part numbering schema used for Terrasat Communications, Inc. products.

Identifying the Part and Serial Numbers

Figure A.1 illustrates the difference between the unit's part number and serial number.

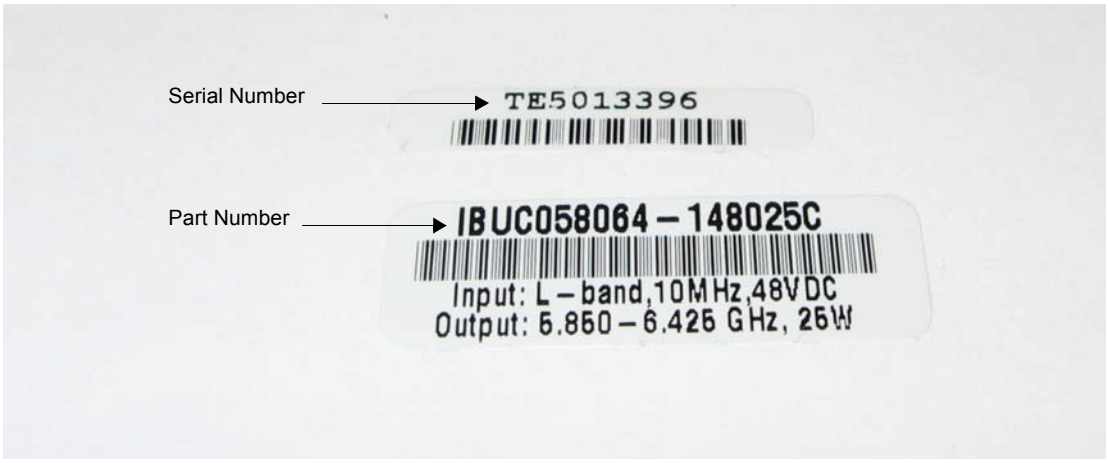

Figure A.1 Identifying the Part and Serial Numbers

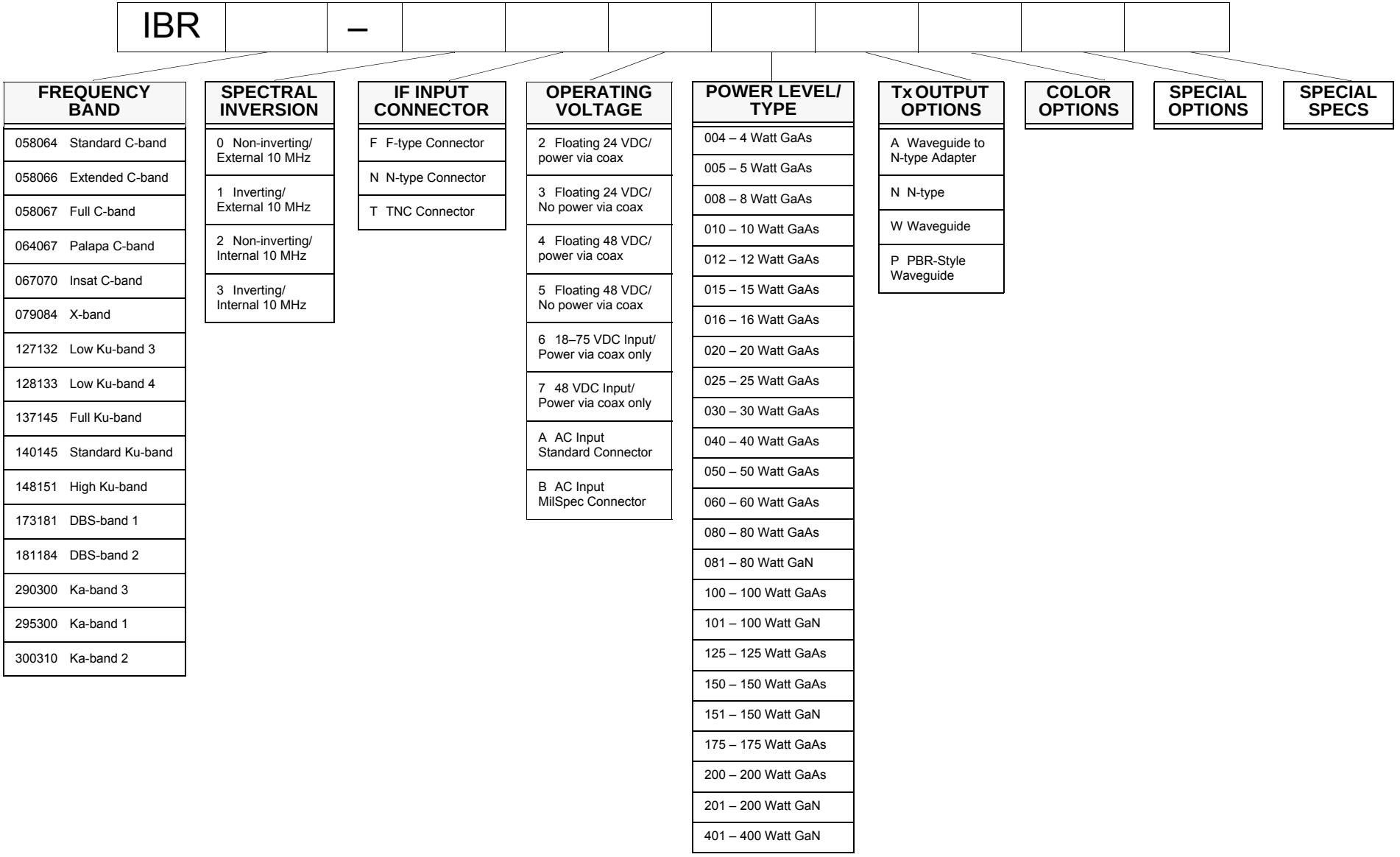

Figure A.2 Part Numbering Schema for IBUC Gs, IBUC 2s, and IBRs

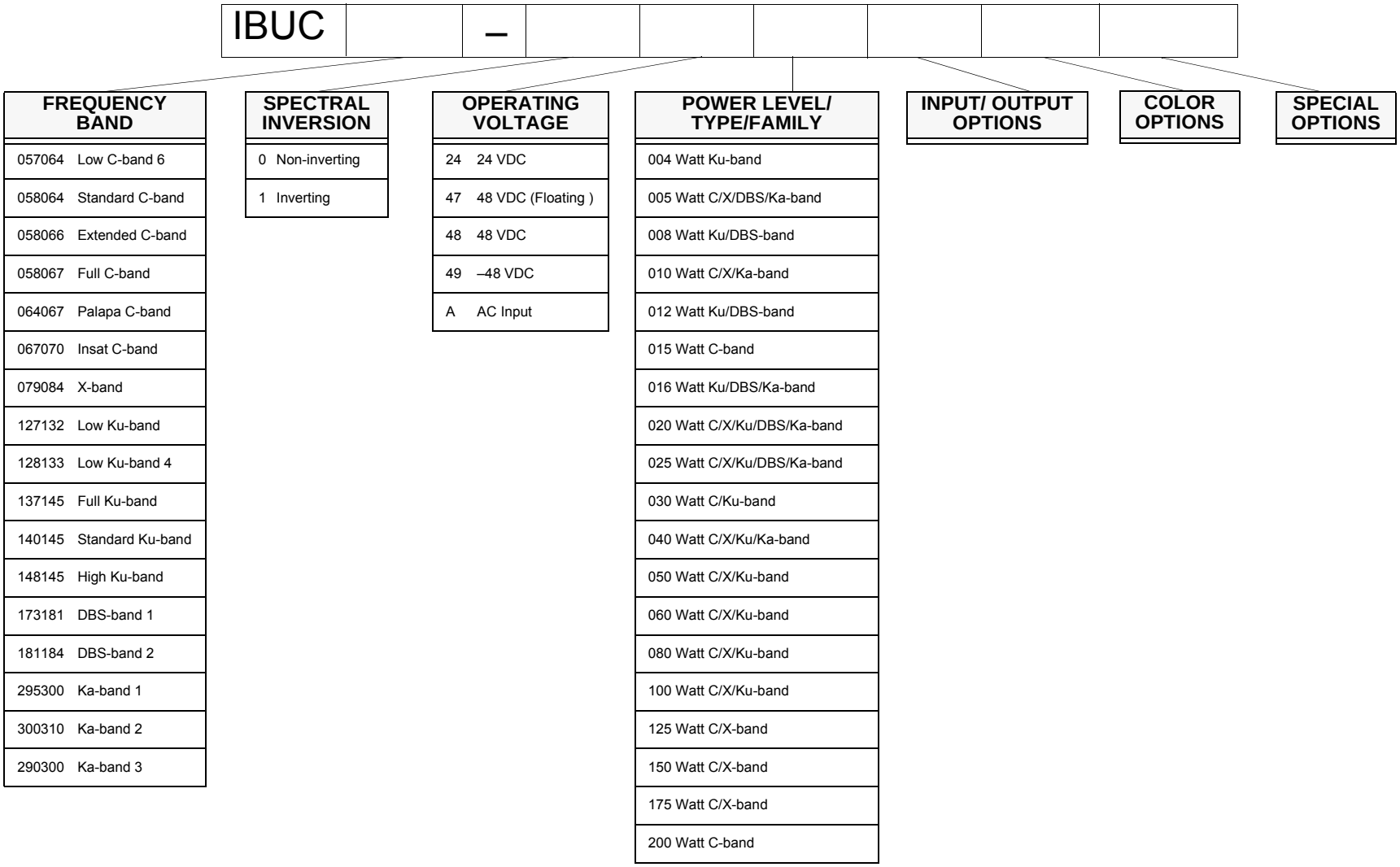

Figure A.3 Part Numbering Schema for IBUCs

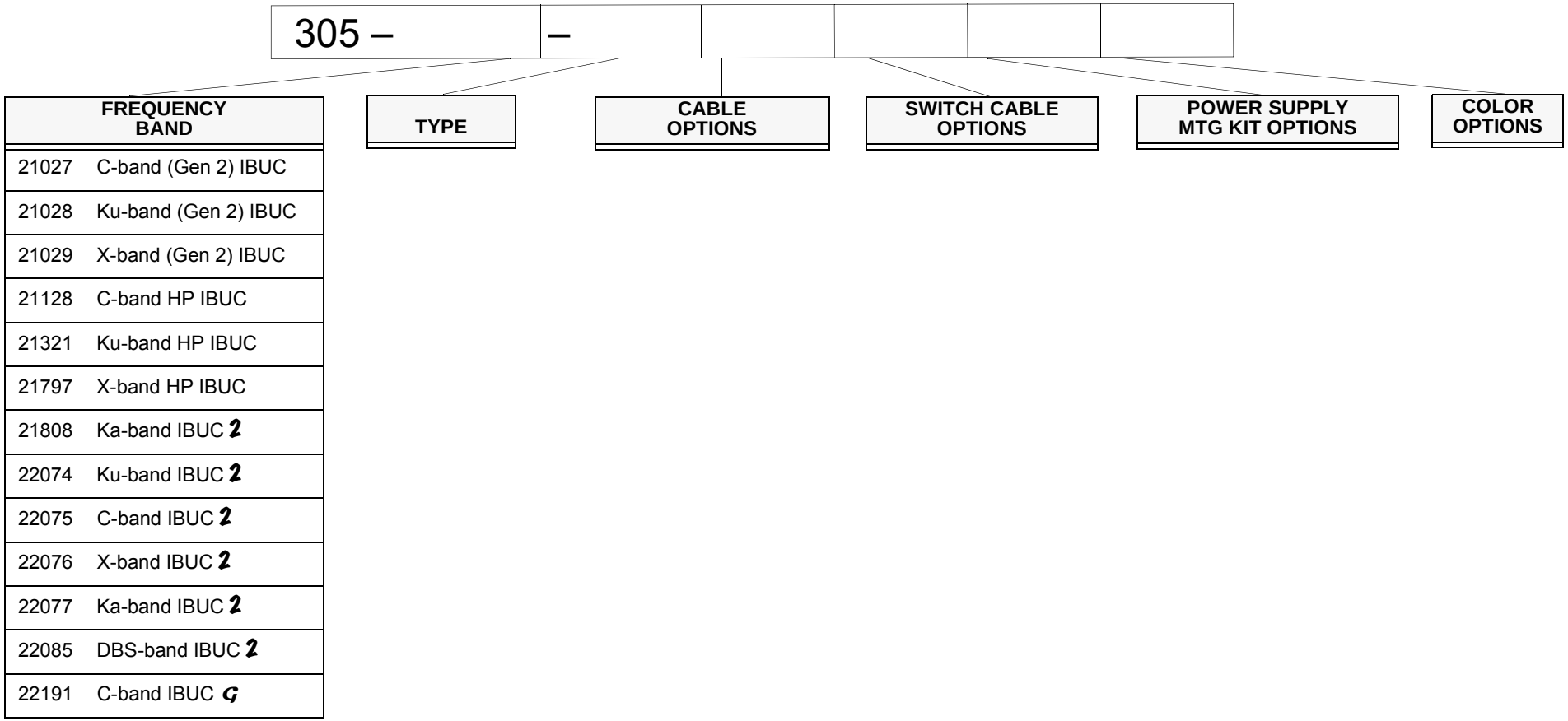

Figure A.4 Part Numbering Schema for Transmit Redundant (Tx 1+1) Systems

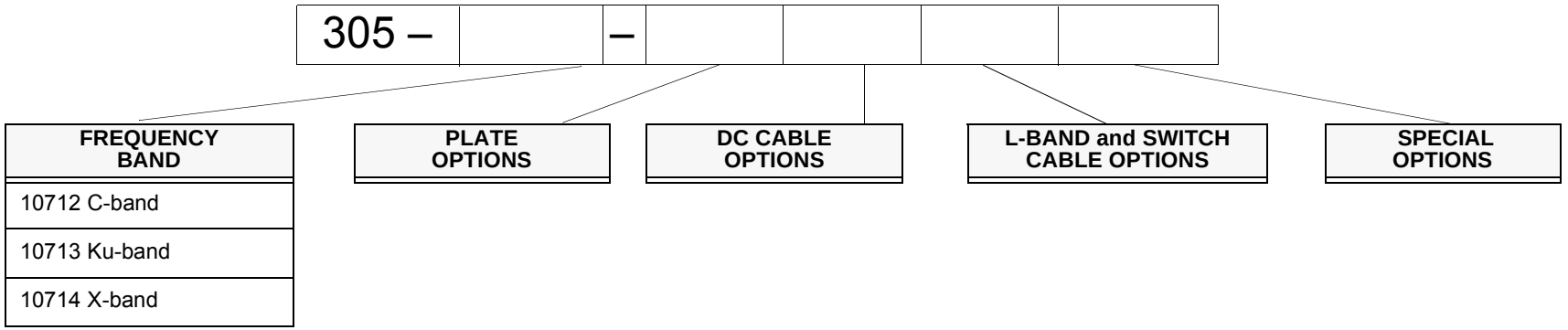

Figure A.5 Part Numbering Schema for Receive Redundant (Rx 1+1) Systems

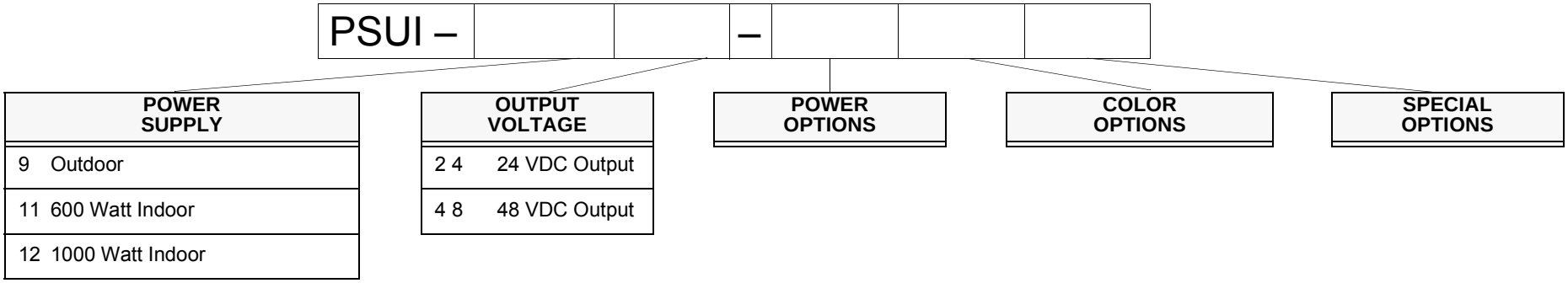

Figure A.6 Part Numbering Schema for IBUC with PSUI Systems

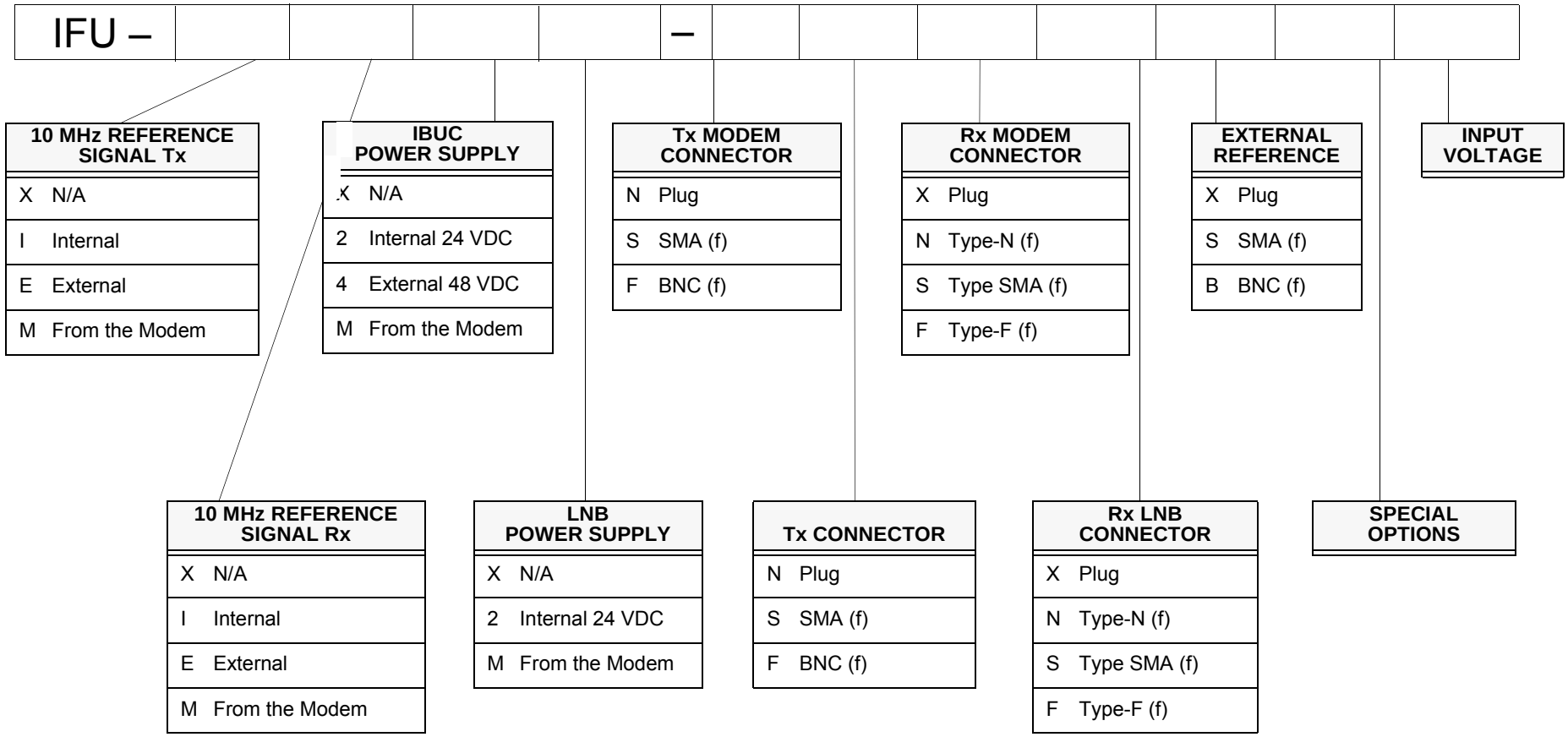

Figure A.7 Part Numbering Schema for IFU Systems

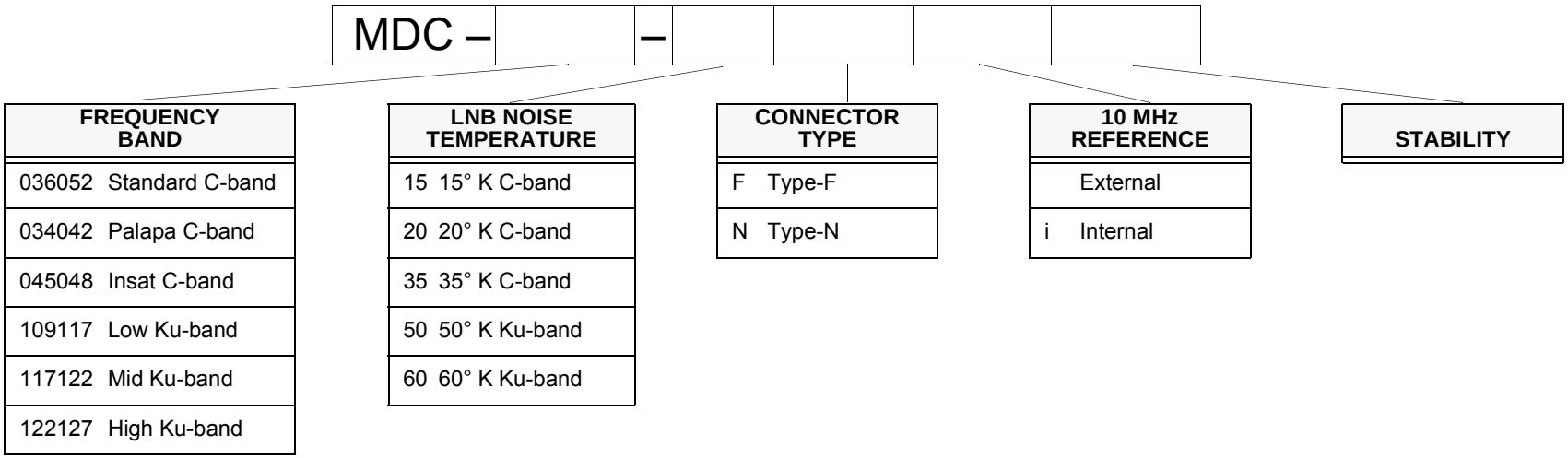

Figure A.8 Part Numbering Schema for LNBs

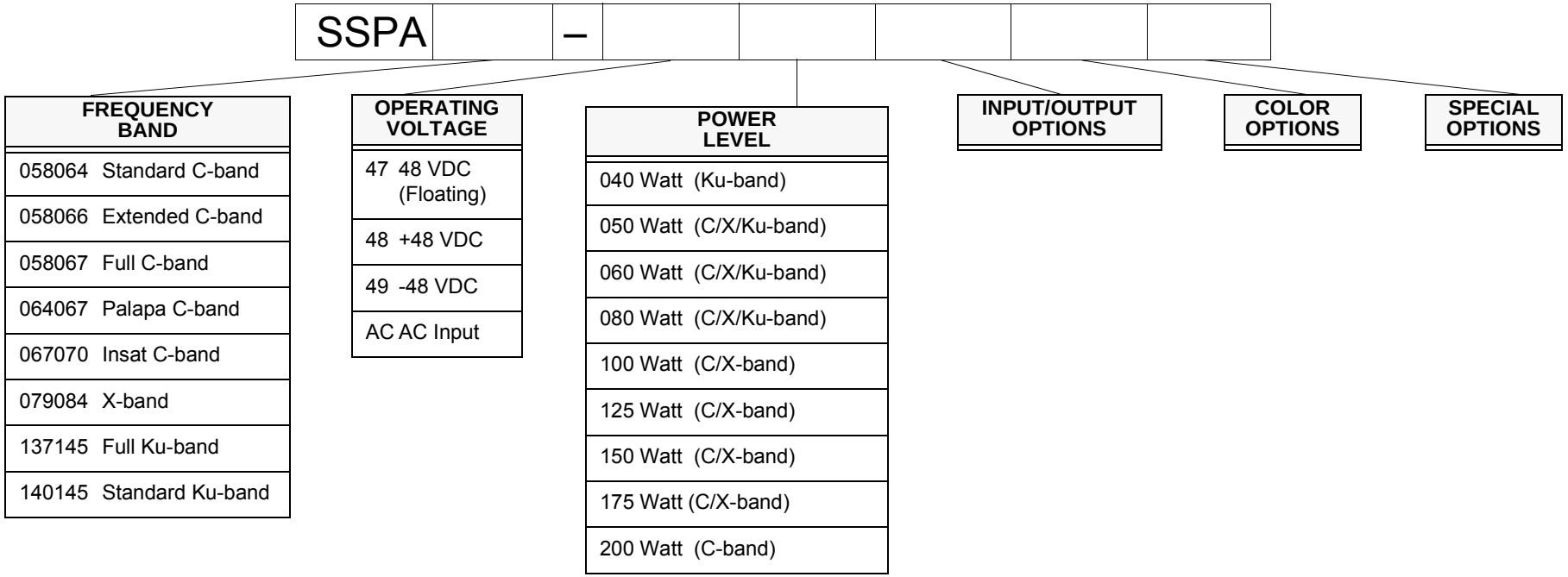

Figure A.9 Part Numbering Schema for SSPAs

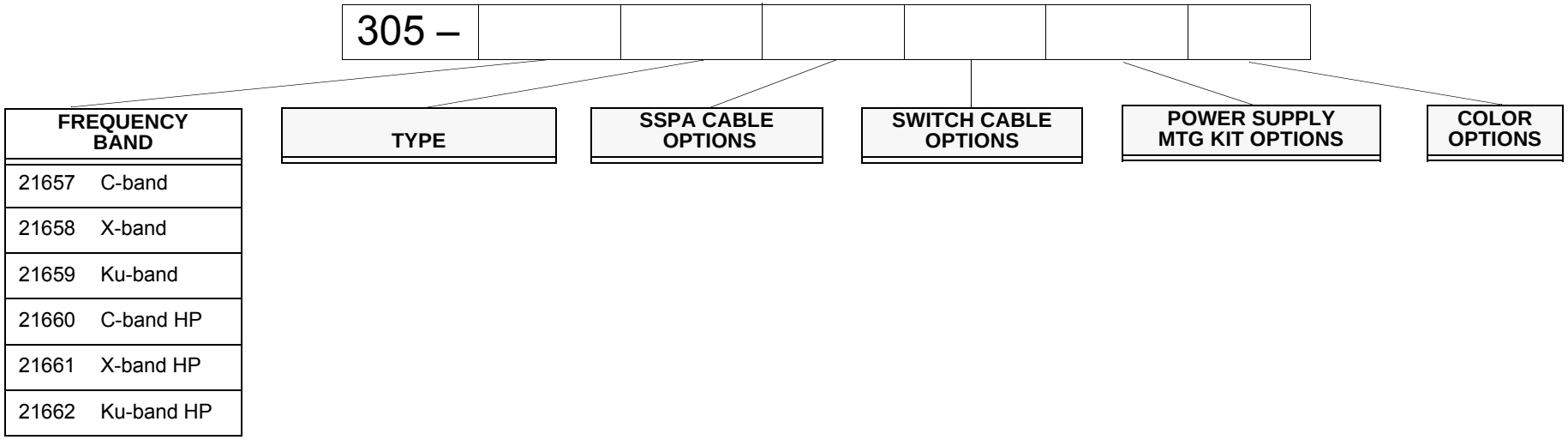

Figure A.10 Part Numbering Schema for Redundant SSPA 1+1 Systems

APPENDIX

B

RX 1+1 HAND-HELD TERMINAL MENU TREE

Menu Options

Beginning with firmware version 0.07, the structure of the hand-held terminal's menu tree and menu options changed. Figure B.1 illustrates the updated menu tree and the options available when using the hand-held terminal (HHT). Those options are described in the pages that follow.

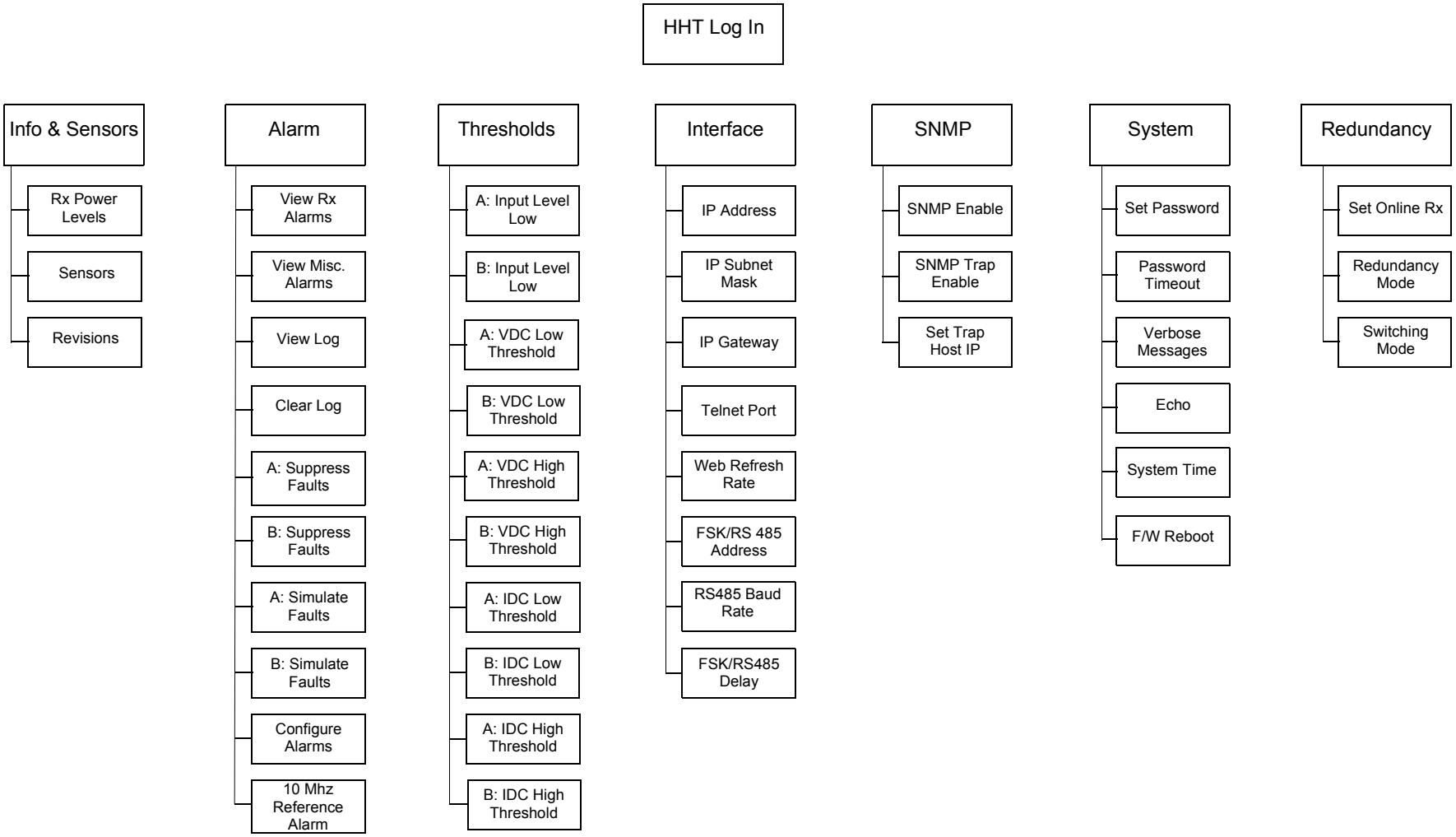

Figure B.1 Rx 1+1 Hand-held Terminal Menu Tree Structure

To enable the HHT,

1. Connect the HHT to the system by attaching the 19-pin connector to J1.
2. When the connection is made and the HHT is receiving power, a blinking cursor appears in the upper left corner of the HHT display.
3. To initialize a session, enter "**....**" by using the decimal key on the HHT keypad.

   The screen displays the model number and serial number and the system requests a password, as shown in Figure B.2.

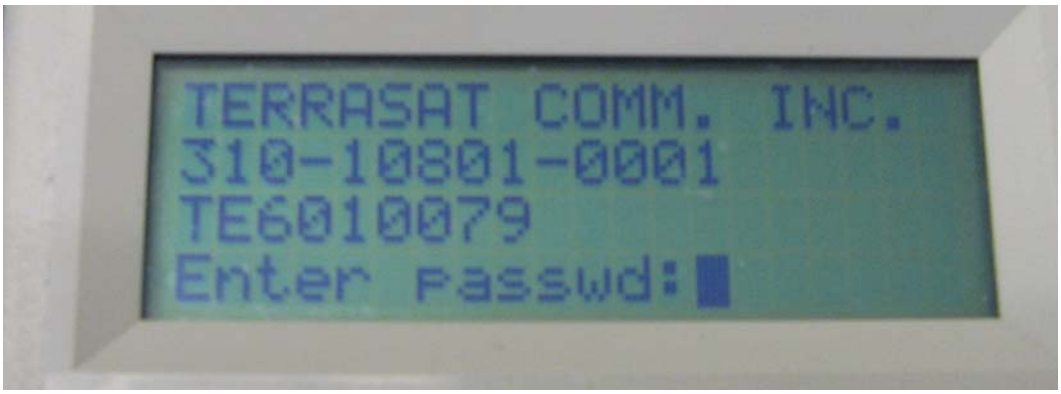

Figure B.2 Sample Hand-held Terminal Initial Display

4. Enter the password by using the number keys on the HHT, and then press the "ENTER" key.

   The default password is "1234".
5. The "Main Menu" window shown in Figure B.3 appears.

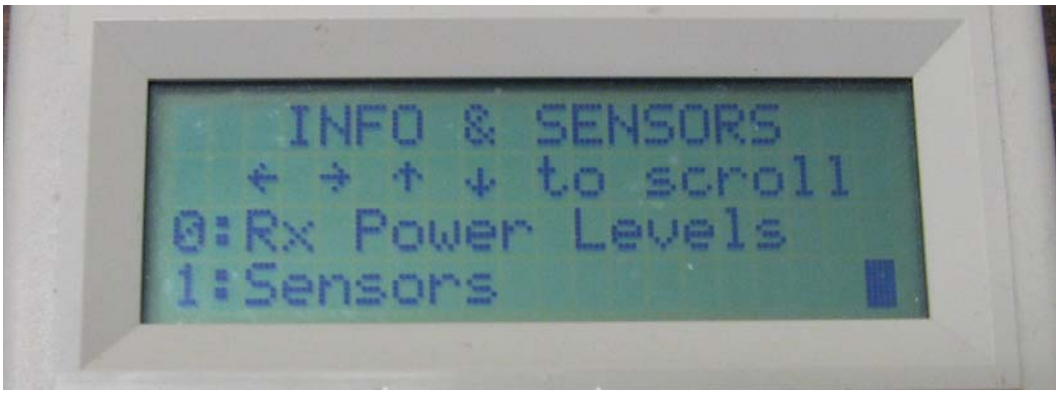

Figure B.3 Sample Main Menu Window

6. The unit is now ready to receive input.

Note: The HHT now offers "adaptive learning;" that is, users no longer need to scroll up and down through all of the menu options during a single session. For example, if a user repeatedly uses the IP Address and Clear Alarm Log options, after the first time

accessing those options by using the up and down arrow keys to access the submenus, the user can now use the right and left arrow keys to move between submenu branches because the system "learns" to access those two options. Users can continue lateral movement by using the right and left arrow keys.

There is no need to logout from the HHT once the session is complete. However, once the HHT is disconnected from the system or the firmware is rebooted, all of the previous learned menu movements are lost.

Info & Sensors

Rx Power Levels – Displays the input LNB power levels.

Sensors – Displays unit power supply voltage and current.

Revisions – Displays firmware and hardware revision strings.

Alarm

View Rx Alarms – Displays current receiver alarms.

View Misc Alarms – Displays current miscellaneous alarms.

View Log – Displays the unit alarm log.

Clear Log – Clears the unit alarm log.

A: Suppress Faults – Displays or sets whether alarms configured for suppression are suppressed.

B: Suppress Faults – Displays or sets whether alarms configured for suppression are suppressed.

A: Simulate Fault – Displays or sets a major receive alarm (used for troubleshooting).

B: Simulate Fault – Displays or sets a major receive alarm (used for troubleshooting).

Configure Alarms – Displays or sets whether individual alarms cause a major/minor/ no alarm and whether the alarm is suppressible.

10 Mhz Reference Alarm – Disables the 10 MHz reference alarm.

Thresholds

A: Input Level Low – Displays or sets the input power low threshold.

B: Input Level Low – Displays or sets the input power low threshold.

A: VDC Low – Displays or sets the LNB voltage low threshold.

B: VDC Low – Displays or sets the LNB voltage low threshold.

A: VDC High – Displays or sets the LNB voltage high threshold.

B: VDC High – Displays or sets the LNB voltage high threshold.

A: IDC Low – Displays or sets the LNB current low threshold.

B: IDC Low – Displays or sets the LNB current low threshold.

A: IDC High – Displays or sets the LNB current high threshold.

B: IDC High – Displays or sets the LNB current high threshold.

Output Level High – Displays or sets the output power high threshold.

Output Level Low – Displays or sets the output power low threshold.

Interface

IP Address – Displays or sets the IP address of the unit.

IP Subnet Mask – Displays or sets the subnet mask of the unit.

IP Gateway – Displays or sets the IP gateway of the unit.

Telnet Port – Displays or sets the TCP port used for Telnet communications.

Web Refresh Rate – Displays or sets the rate at which Web pages will request updates.

FSK/485 Address – Displays or sets the address used for both the FSK and the RS485 links.

RS485 Baud Rate – Displays or sets the baud rate for RS485 communications.

FSK/485 Delay – Displays or sets the amount of time the unit delays sending a response to a command.

SNMP

SNMP Enable – Displays or sets whether SNMPV1 is enabled or not.

SNMP Trap Enable – Displays or sets whether the unit will generate traps. Valid only when SNMP Enable is enabled.

Set Trap Host IP – Displays or sets the IP address that traps will be directed to.

System

Set Password – Changes the password for the unit. Affects all modes of access.

Password Timeout – Displays or sets the inactivity time before the unit automatically logs the user off.

Verbose Messages – Displays or sets the format of the replies to commands on all links.

Echo – Displays or sets whether the unit responds to sets commands.

System Time – Displays or sets the current system real time clock.

F/W Reboot – Causes the firmware to reboot.

Redundancy

Set Online IBUC – Displays or changes the physical position of the waveguide switch.

Redundancy Mode – Displays or sets whether the unit is free to switch once or multiple times on a failure.

Switching Mode – Displays or sets whether the unit switches manually or due to unit alarms.

APPENDIX

C

USING HYPERTERMINAL

This appendix describes how to use an RS232 connection and HyperTerminal to communicate with the receive redundant (Rx 1+1) system.

Establishing a HyperTerminal Session

To communicate with the Rx 1+1 system using an RS232 connection and HyperTerminal,

1. Connect a cable to a serial port of a PC and the M&C connector of the Rx 1+1 system.

   Refer to the fabrication drawing (FBD-210121A.pdf) in Figure F.1 on page F-2 for information about making a 19-in to DB9F cable.

2. From the Windows Start menu, choose Start → All Programs → Accessories → Communications → HyperTerminal.

   A HyperTerminal window with a New Connection Description window appears, as shown in Figure C.1. By following the prompts, you can establish the settings for your session and then save them for future use.

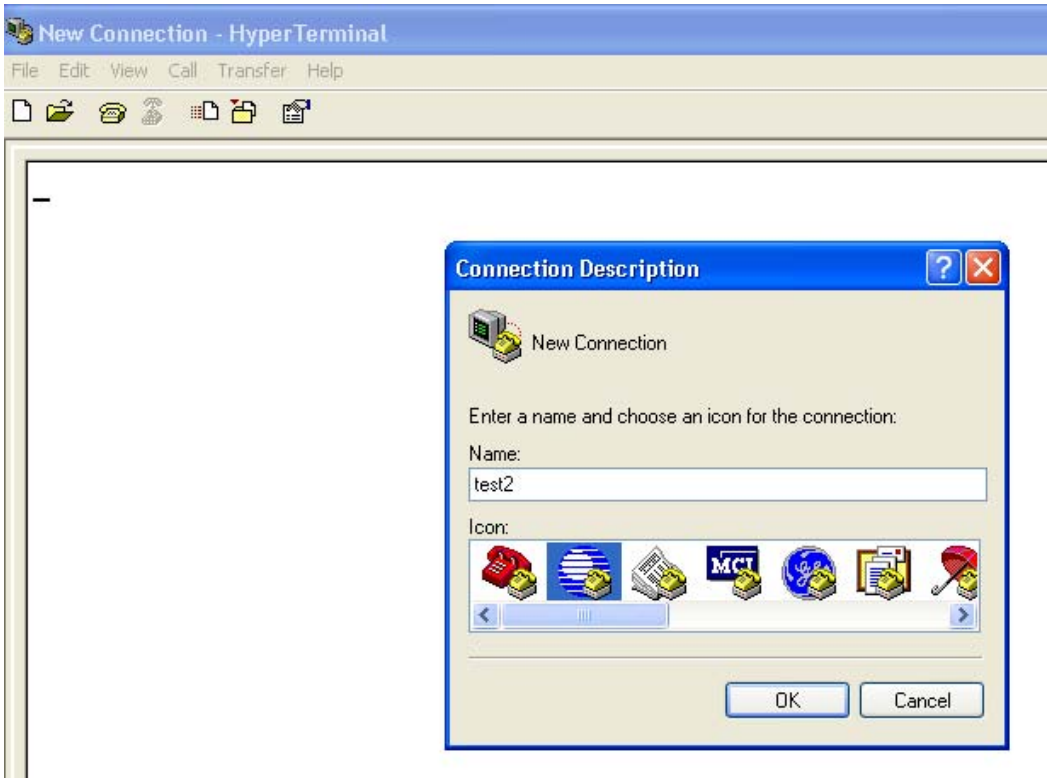

Figure C.1 New Connection Description Window

3. Type a name for the connection and click an icon to select it, and then click OK. In this example, the connection is named “test2”.

4. The Connect To dialog box appears. See Figure C.2.

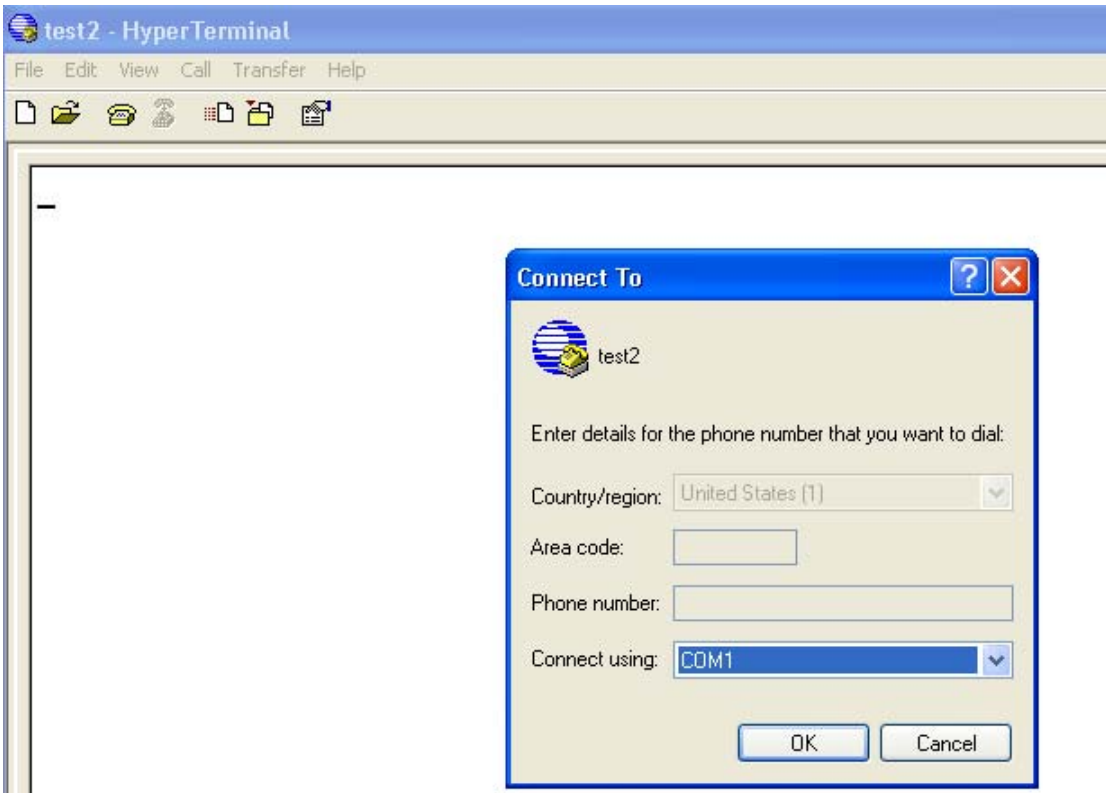

Figure C.2 Connect To Window

5. From the Connect Using drop-down menu, choose the COM port where RS232 is connected (in this example, it is COM1), and then click OK.

   The COM1 Properties Window shown in Figure C.3 appears.

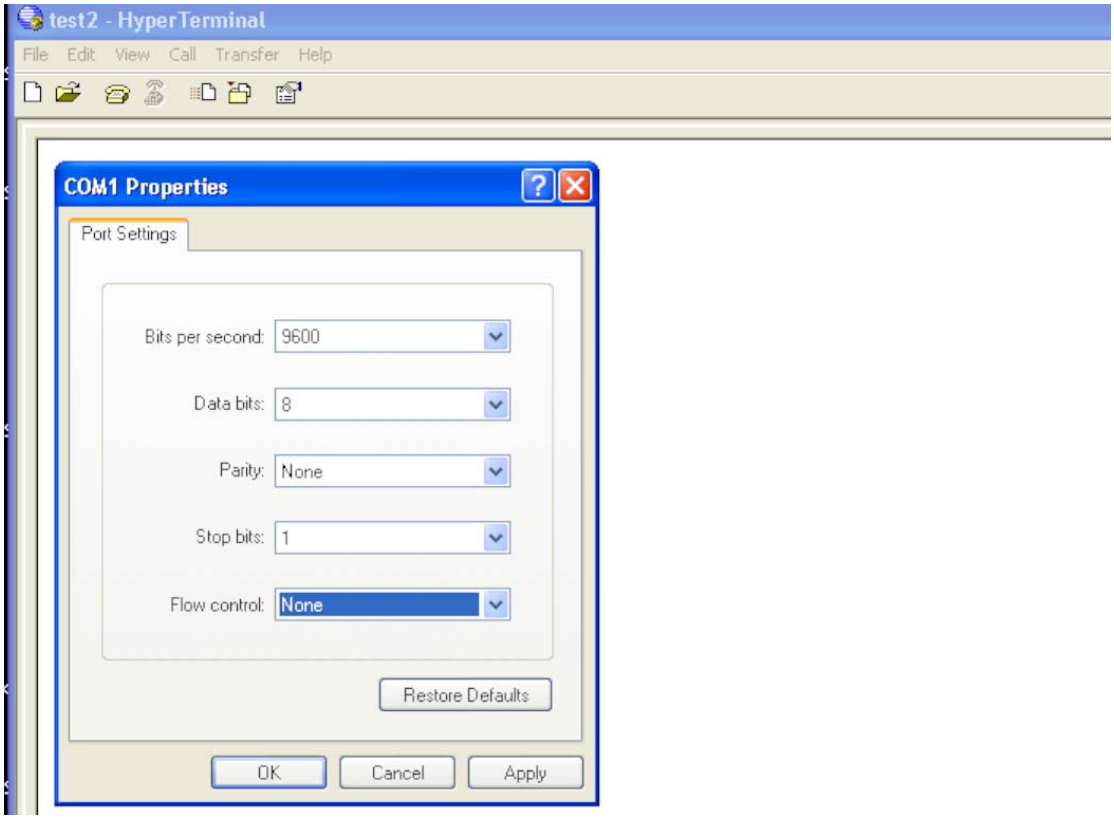

Figure C.3 COM1 Properties Window

6. In the Port Settings dialog box, choose the following options
   - Bits per second: 9600
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None
7. Click `Apply`, and then click `OK` to save the settings.
8. In the HyperTerminal window, a blinking cursor indicates that the session is now active.

   Test the connection by pressing Enter. You should receive an "`error=Please enter valid password`" message and the `RX1+1>` prompt as shown in Figure C.4.

Note: The format of the responses will vary according to whether the message response mode is set to verbose (the default) or terse. The figures in this document show verbose mode (indicated by the `RX1+1>` prompt). In verbose mode, the output is formatted for easier viewing To change to terse mode, type `C4V=0` at the command line. To return to verbose mode, type `C4V=1` at the command line.

Figure C.4 Invalid Password Error Message

9. From the menu bar, choose File → Properties → Settings. Click on the Settings tab, and then click ASCII Setup. See Figure C.5.

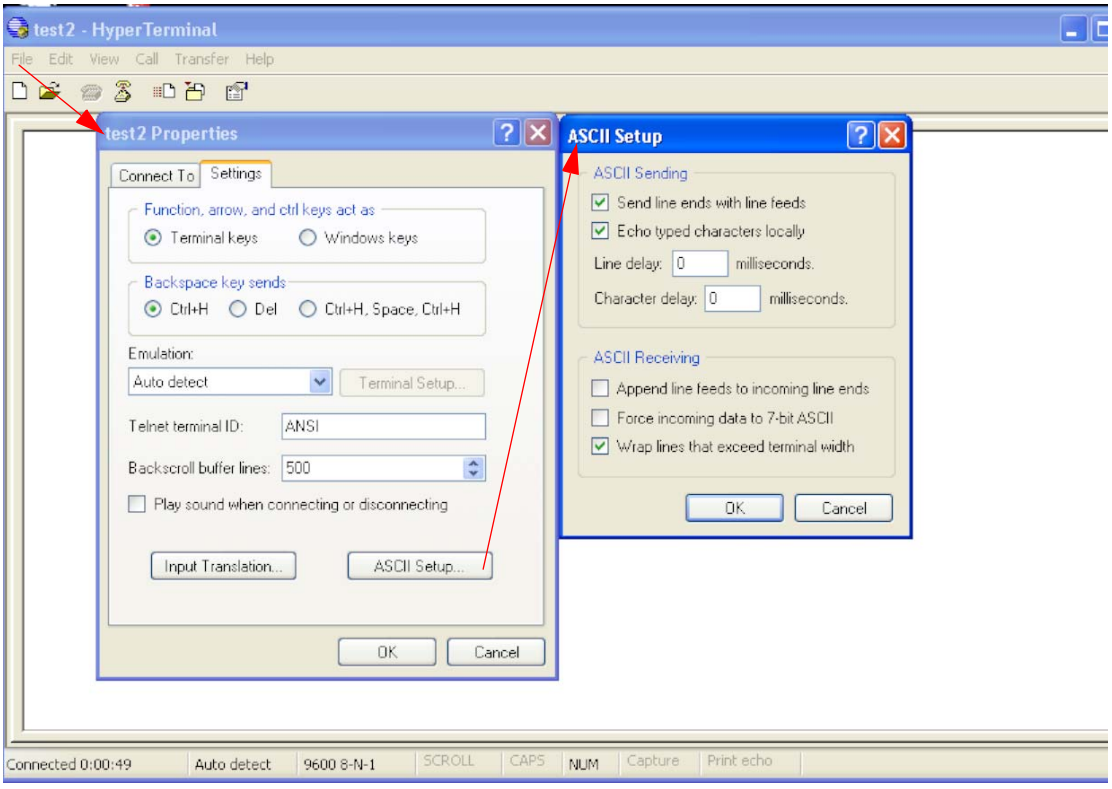

Figure C.5 ASCII Setup Window

10. In the ASCII Setup window, select the following options:
    - ASCII Sending
        - Send line ends with line feeds
        - Echo typed character locally

- ASCII Receiving
  - Wrap lines that exceed terminal width

11. Click `OK` to save the settings and to close the ASCII Setup dialog box.
12. Click `OK` to save the new Properties.

    The properties window closes and there is a blank HyperTerminal window with a blinking cursor.
13. At the `RX1+1>` prompt, type `CPE=1234` and press Enter. This command logs you in to the Rx 1+1 system.

    If you have changed the password from the default `1234`, type that password instead.
14. Your login was successful if you receive a blinking prompt in the HyperTerminal window. If you receive an "`Error=invalid value`" message such as the one in Figure C.6, your login was not successful. Check the password value and try again.

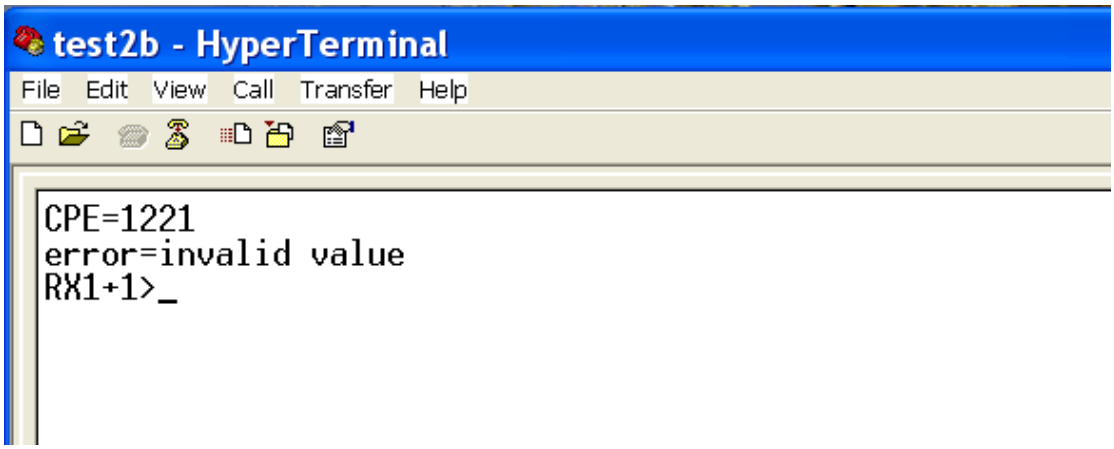

Figure C.6 Invalid Value Error Message

15. The Rx 1+1 system is now ready to accept commands. An example session begins with Step 16.
16. Type `COI` and then press Enter.

    This command displays general information about the Rx 1+1 system, such as the serial number and firmware version level.
17. Type `CIA` and then press Enter.

    This command displays the IP address of the unit.
18. Type `CIM` and then press Enter.

    This command displays the IP netmask.
19. Type `CIG` and then press Enter.

    This command displays the IP Gateway address of the unit.

20. Type `CIP` and then press Enter.

    This command displays the TCP port used for Telnet communications.

Your screen should resemble the one shown in Figure C.7.

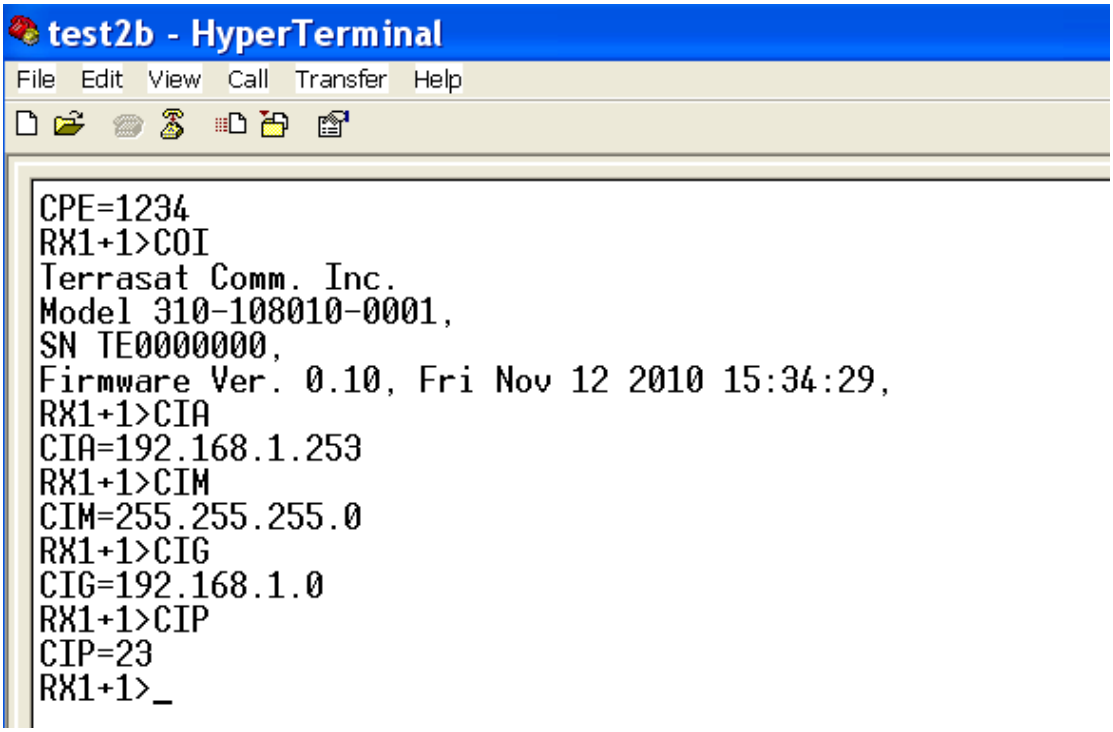

Figure C.7 Active HyperTerminal Window

21. To end the HyperTerminal session, choose File → Exit.

    The system will prompt you to confirm that you want to end the session. If this is correct, click `Yes`. If not, click `No`.

22. If you clicked `Yes` to end the session, the system will prompt you about saving the session settings you input beginning with Step 3. Click `Yes` to save the named connection.

The HyperTerminal session is now complete.

Using a Saved Connection

To begin a new HyperTerminal session using a named connection,

1. From the Windows Start menu, choose Start → All Programs → Accessories → Communications → HyperTerminal.

   A blank New Connection window with a Connection Description window (similar to Figure C.1 on page C-2) appears.

2. Click `Cancel` when prompted to type a name and to choose an icon for the connection.
3. From the menu bar, choose File → Open.

   A list of previously saved HyperTerminal names appears.
4. Click the connection name you want to use, and then click `Open`.

   A blank HyperTerminal window with the previously saved settings appears.
5. Type `CPE=1234` and then press Enter to log into the Rx 1+1 system.

   (Note: If the password has been changed, use that value instead of the default `1234`.)

You can now enter ASCII commands at the prompt.

Note: When you create a named connection and then save it, that connection name will also appear as an option when you choose Start → All Programs → Accessories → Communications → HyperTerminal → <*`Named Connection`*>. Click the name to access your saved connection settings.

Ending a HyperTerminal Session

To end the HyperTerminal session,

- Choose File → Exit.

APPENDIX

D

ASCII COMMAND/RESPONSE STRUCTURE

This command set is used with Telnet and RS232. The command set is used with RS485 and FSK.

Command Set

All commands and responses are terminated by using <LF><CR>, where

<LF> indicates line feed (0x0A)

<CR> indicates carriage return (0x0D)

Command responses shown are for Terse mode (when C4V=0).

Table D.1 shows the alarm mask that is used with the following commands:

- CAS
- CM1
- CM2
- CMS
- AHI

Table D.1 Alarm Mask

	Receive Alarm Mask
0x0001	A: side Rx Input Level Low Alarm
0x0002	B: side Rx Input Level Low Alarm
0x0004	A: side Simulated Alarm
0x0008	B: side Simulated Alarm

Table D.1 Alarm Mask (Continued)

	Receive Alarm Mask
0x0010	10 MHz Reference Alarm
0x0020	A: side VDC Low Threshold Alarm
0x0040	A: side VDC High Threshold Alarm
0x0080	B: side VDC Low Threshold Alarm
0x0100	B: side VDC High Threshold Alarm
0x0200	Waveguide Switch Fault
0x0400	A: side IDC Low Threshold Alarm
0x0800	A: side IDC High Threshold Alarm
0x1000	B: side IDC Low Threshold Alarm
0x2000	B: side IDC Low Threshold Alarm
0x4000	Emergency Override Switch
0x8000	Not Used

*These represent the valid mask for configuring alarms using the CM1, CM2, and CMS commands.

Table D.2 lists miscellaneous alarm flags. Miscellaneous alarms do not involve the actual reception of data. Instead, they are primarily informational.

Table D.2 Miscellaneous Alarm Flags

Miscellaneous Alarm Flags	
0x0001	Event Long Corrupted Alarm
0x0002	Configuration Reset to Default Alarm
0x0004	Ethernet Download Alarm
0x0008	Serial Download Alarm
0x0010	Reboot Alarm

Table D.3 lists the possible error responses when using RS485, RS232, FSK, and Telnet.

Table D.3 Error Response Table

Code	Error Message	Description
1	error = invalid value	This is not a valid value for this command.
2	error = bad command	This command is not in the command set.
3	error = func not yet done	This command has not been implemented.
4	error = bad format in command	One of the parameters is formatted incorrectly.
5	error = error accessing config storage	Unable to access EEPROM.
6	error = ODU fault	Cannot switch, target unit has a major fault.

Table D.3 Error Response Table (Continued)

Code	Error Message	Description
7	error = Please enter valid password	Incorrect password has been entered.
8	error = Switch Fault	The waveguide switch is faulted.
9	error = ODU Comm Fault	Legacy Binary packet checksum is invalid.
10	error = Timeout waiting for packet	UDP has timed out waiting for response packet.
11	not used	
12	not used	
13	not used	
14	not used	
15	not used	
16	not used	
17	not used	
18	error = Invalid IP for subnet	The IP subnet selected is invalid for the configured IP address.
19	SET is not valid with <command>	You can only query this parameter.
20	GET is not valid with <command>	You can only change this parameter.

Common Commands

Commands in this section can be used with transmit and receive systems.

AHI

Description: Displays the contents of the alarm log. The alarm log holds a maximum of 40 events and events can contain multiple alarms. This is a read-only command.

Error Responses: 7, 19

Response Values:

Event log is empty

AHI=<alarm string>, <alarm string>,…

AHZ

Description: Clears the alarm log.

Error Responses: 7, 19

Response Values:

AHZ=event log cleared

BAM

Description: Displays or sets the redundancy switching mode of operation. When configured for reverting, the units can switch between each other when a fault occurs multiple times unless both units are faulted. In non-reverting operation, when the A: side unit faults, a switch to the B: side unit will occur unless the B: side unit has faulted. Once on the B: side unit, no additional switches can occur without user intervention. This item can be changed only from the Online/Master unit.

Error Responses: 1, 7, 17

Default Value = 0

Command/Response Values:

BAM=<Parameter>

Parameter:

0 – Reverting

1 – Nonreverting

BSM

Description: Displays or sets the switching type. When configured for manual switching, you can switch between units at will by using the BSW command regardless of any faults. While in manual mode, the units will not switch due to a fault. When configured for automatic operation, a switch will occur if a major fault occurs on the online unit unless the standby is also faulted. If both units are not faulted, you can switch between the A: side and the B: side by using the BSW command described on page D-6.

Error Responses: 1, 7, 17

Default Value = 1

Command/Response Values:

BSM=<Parameter>

Parameter:

0 – Manual

1 – Automatic

BST

Description: Displays system status for a redundant pair.

Error Responses: 7, 17, 19

Response Values:

BST=<A: mode>, <A: online>, <B: mode>, <B: online>, <Switch>

A: mode/B: mode:	Auto or Manual
A: online/B: online:	Online or Standby
Switch:	A: side or B: side

BSW

Description: Displays or sets the online status of a redundant pair. This command controls which unit is online by physically changing the waveguide switch position.

Error Responses: 1, 7, 8, 17

Command/Response Values:

BSW=<Parameter>

Parameter:

0 – A: side

1 – B: side

C10

Description: Displays the state of the 10 MHz detector. This is a read-only command.

Error Responses: 7, 19

Response Values:

C10=<Parameter>

Parameter:

0 – 10 MHz is too low

1 – 10 MHz is within range

C4A

Description: Displays or sets the RS485/FSK address. If the address is changed, both the RS485 and the FSK communication links are affected. The new address is then used for the response.

Error Responses: 1, 7

Default Value = 1

Command/Response Values:

C4A=<Parameter>

Parameter:

1–254

C4D

Description: Displays or sets the delay in milliseconds before a response is returned on the RS485 and FSK link.

Error Responses: 1, 7

Default Value = 20

Command/Response Values:

C4D=<Parameter>

Parameter:

1–255

C4R

Description: Displays or sets the RS485 baud rate. This does not affect the FSK link because that is fixed at 9600 baud.

Error Responses: 1, 7

Default Value = 9600

Command/Response Values:

C4R=<Parameter>

Parameter:

1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200

C4V

Description: Displays or sets the message response mode. Terse mode is used for computers where the response items are separated by commas and the message is terminated with <LF><CR>. Verbose is better suited for use with terminal emulation programs such as Telnet or HyperTerminal. Output is formatted for easier viewing by the user. This is a global command affecting all interfaces operating in ASCII mode.

Error Responses: 1, 7

Default Value = 1

Command/Response Values:

C4V=<Parameter>

Parameter:

0 – Terse

1 – Verbose

CAS

Description: Displays the current active alarms. Use the CAS command to display hexadecimal values that represent the Receive and Miscellaneous alarms. See Table D.1 on page D-1 for the meaning of the individual alarms or use CAS=1 to display the alarm strings.

Error Responses: 1, 7

Response Values:

CAS=R:0x0010, M:0x0010 Rx Only

CCM

Description: Displays the model number and serial number of the IBUC. This is a read-only command.

Error Responses: 1, 7, 19

Response Values:

CCM=<Model number>, <Serial number>

where

Model number is a variable string of up to 20 characters

Serial number is a variable string of up to 10 characters

CCS

Description: Displays the M&C firmware version level. This is a read-only command.

Error Responses: 1, 7, 19

Command/Response Values:

CCS=<Firmware revision string>

where

Firmware revision is a variable string of characters.

CIA

Description: Displays or sets the IP address of the unit. Valid values range from (but do not include) 1.0.0.0 through 224.0.0.0. When the netmask is applied, 0 and 255 in the last byte are excluded.

Error Responses: 1, 4, 7, 18

Default Value = 192.168.1.254

Command/Response Values:

CIA=<Dotted Decimal IP Address>

CIC

Description: Sets the SNMP community string.

Error Responses: 1, 2, 4, 5, 7

Default: public, private, trap

Command/Response Values:

CIC= public, private, trap

CID

Description: Displays the current consumption. This is a read-only command.

Error Responses: 1, 20

Response Values:

CID=<Parameter A:>,<Parameter B:>

Parameter:

0.0–25.0 Amperes

CIG

Description: Displays or sets the IP Gateway address. This address cannot be the same as the IP address of the unit. This is the address the unit will send to if the requested IP address does not reside on the local LAN segment.

Error Responses: 1, 4, 7

Default Value = 192.168.1.1

Command/Response Values:

CIG=<DOTTED DECIMAL IP ADDRESS>

CIM

Description: Displays or sets the IP netmask.

Error Responses: 1, 2, 7, 18

Default Value = 255.255.255.0

Command/Response Values:

CIM=<netmask>

CIP

Description: Displays or sets the TCP port used for Telnet communication.

Error Responses: 1, 4, 7

Default Value = 23

Command/Response Values:

CIP=<Port>

Port:

1–65535

CIS

Description: Displays or sets the SNMPv1 enable state. When enabled, the unit will respond to SNMPv1 requests.

Error Responses: 1, 4, 7

Default Value = 1

Command/Response Values:

CIS=<Parameter>

Parameter:

0 – Disable SNMPv1

1 – Enable SNMPv1

CIT

Description: Displays or sets the generation of SNMPv1 traps.

Error Responses: 1, 4, 7

Default Value = 1

Command/Response Values:

CIT=<Parameter>

Parameter:

0 – Disable Traps

1 – Enable Traps

CM1

Description: Displays or sets the minor alarm mask of the unit. This is a hexadecimal value.

Error Responses: 1, 4, 7

Default Value = 0x00E0

Command/Response Values:

CM1=<Hex Value>

Hex Value:

See Table D.1 on page D-1 for available hexadecimal values.

CM2

Description: Displays or sets the major alarm mask of the unit. This is a hexadecimal value.

Error Responses:1, 4, 7

Default Value = 0x0018

Command/Response Values:

CM2=<Hex Value>

Hex Value:

See Table D.1 on page D-1 for available hexadecimal values.

CMS

Description: Displays or sets the alarm suppression mask of the unit. This is a hexadecimal value.

Error Responses: 1, 4, 7

Default Value = 0x0078

Command/Response Values:

CMS=<Hex Value>

Hex Value:

See Table D.1 on page D-1 for available hexadecimal values.

COI

Description: Displays general information about the unit. This is a read-only command.

Error Responses: 1, 7

CPE

Description: Logs the user into the unit. You cannot query this item.

Error Responses: 1, 7, 20

Command Values:

CPE=<Value>

Value:

1–65535

CPL

Description: Displays the private label string of the unit.

Error Responses: 1, 7, 20

Response Values:

CPL=<Value>

Value:

Variable string up to 20 characters

CPS

Description: Sets the password for logging into the unit. The password does not take effect until the next login. You cannot query this item.

Error Responses: 1, 7, 20

Default Value: 1234

Command Values:

CPS=<Value>

Value:

1–65535

CPT

Description: Displays or sets the login timeout. After the configured time period elapses with no user interaction, the session is dropped (ends).

Error Responses: 1, 7

Default Value = 0

Command/Response Values:

CPT=<Value>

Value:

0 – No timeout

1–65535 minutes

CTM

Description: Displays or sets the system time.

Error Responses: 1, 2, 4, 7

Default Value: random default value

Command Values:

CTM=<mm/dd/yyyy hh:mm:ss

CVD

Description: Displays the current power supply voltage. This is a read-only command.

Error Responses: 1, 7, 20

Response Values:

CVD=<Value A:>,<Value B:>

Value:

0.0–60.0 Volts DC

CWR

Description: Displays or sets the rate at which the Web page automatically refreshes.

Error Responses: 1,7

Default Value = 0

Command/Response Values:

CWR=<Seconds>

Seconds:

0 – No refresh

1–3600 second

CZZ

Description: Reboots the M&C firmware and resets all parameters to their default values.

Error Responses: 1, 7

Command/Response Values:

CZZ

CZZ=1

Parameter:

1 – Resets only int_values and reboots

DCN

Description: Disconnects the current Telnet session.

Error Responses: None

Command Values: No response

EKO

Description: Displays or sets whether the unit responds to commands. If EKO is disabled, you will receive no response to commands. However, responses are always returned to queries. This does not affect characters being echoed to the terminal during Telnet sessions.

Error Responses: 1, 7

Default Value = 1

Command/Response Values:

EKO=<Parameter>

Parameter:

0 – No command response

1 – Respond to commands

Receive-only Commands

This section contains information about various commands used only for reception

CTD

Description: Displays or sets the 10 MHz reference alarm enable state.

Error Responses: 1, 2, 4, 5, 7

Command/Response Values:

CTD=<Parameter>

Parameter:

0 – Disable

1 – Enable

IAH

Description: Displays or sets the current alarm high threshold for the A: side.

Error Responses: 1, 7

Default Value = 500

Command/Response Values:

IAH=<Parameter>

Parameter:

100 – 600 ma (must be greater than the low threshold)

IAL

Description: Displays or sets the current alarm low threshold for the A: side.

Error Responses: 1, 7

Default Value = 250

Command/Response Values:

IAL=<Parameter>

Parameter:

100 – 600 ma (must be less than the high threshold)

IBH

Description: Displays or sets the current alarm high threshold for the B: side.

Error Responses: 1, 7

Default Value = 500

Command/Response Values:

IBH=<Parameter>

Parameter:

100 – 600 ma (must be greater than the low threshold)

IBL

Description: Displays or sets the current alarm low threshold for the B: side.

Error Responses: 1, 7

Default Value = 1

Command/Response Values:

IBL=<Parameter>

Parameter:

100 – 600 ma (must be less than the high threshold)

RAL

Description: Displays or sets the input low power level threshold for the A: side.

Error Responses: 1, 7

Default Value = -40.0

Command/Response Values:

RAL=<Parameter>

Parameter:

5.0 dBm to –40.0 dBm (in 0.1 dBm steps)

RAS

Description: Displays or sets the receive alarm simulation for the A: side unit. Places alarm relay into “faulted” state and sets bit in alarm byte.

Error Responses: 1, 7

Default Value = 0

Command/Response Values:

RAS=<Parameter>

Parameter:

0 – Off

1 – On

RAZ

Description: Displays or sets receive alarm suppression for the A: side unit. If suppression is enabled, any alarms configured for suppression by using the CMS command will not cause a major alarm.

Error Responses: 1, 7

Default Value = 0

Command/Response Values:

RAZ=<Parameter>

Parameter:

0 – Off

1 – On

RBL

Description: Displays or sets input low power level threshold for the B: side unit .

Error Responses: 1, 7

Default Value = 0

Command/Response Values:

RBL=<Parameter>

Parameter:

5.0 dBm to –40.0 dBm (in 0.1 dBm steps)

RBS

Description: Displays or sets the receive alarm simulation for the B: side unit. Places alarm relay into "faulted" state and sets bit in alarm Byte.

Error Responses: 1, 7

Default Value = 0

Command/Response Values:

RBS=<Parameter>

Parameter:

0 – Off

1 – On

RBZ

Description: Displays or sets receive alarm suppression for the B: side unit. If suppression is enabled, any alarms configured for suppression by using the CMS command will not cause a major alarm.

Error Responses: 1, 7

Default Value = 0

Command/Response Values:

RBZ=<Parameter>

Parameter:

0 – Off

1 – On

RDT

Description: Displays the current input power level in dBm. This is a read-only command.

Error Responses: 1, 7

Command/Response Values:

RDT=<Parameter A:>,<Parameter B:>

Parameter:

VAH

Description: Displays or sets the high voltage threshold for the A: side.

Error Responses: 1, 7

Default Value = 24

Command/Response Values:

VAH=<Parameter>

Parameter:

10.0 to 25.0 VDC (Must be greater than the low threshold)

VAL

Description: Displays or sets the low voltage threshold for the A: side.

Error Responses: 1, 7

Default Value = 15

Command/Response Values:

VAL=<Parameter>

Parameter:

10.0 to 25.0 VDC (Must be less than High Threshold)

VBH

Description: Displays or sets the low voltage threshold for the B: side.

Error Responses: 1, 7

Default Value = 1

Command/Response Values:

VBH=<Parameter>

Parameter:

10.0 to 25.0 VDC (Must be greater than the low threshold)

VBL

Description: Displays or sets the low voltage threshold for the B: side.

Error Responses: 1, 7

Default Value = 1

Command/Response Values:

VBL=<Parameter>

Parameter:

10.0 to 25.0 VDC (Must be less than High Threshold)

APPENDIX

E

WEB PAGES

The Web pages shown on the following pages are for a receive redundant (Rx 1+1) system.

Screen Shots

To access the Web pages,

1. Connect the host computer to the Rx 1+1 system.

   When using a receive redundant system, connect a TCP/IP cable to the 19-pin J1 connector on the Rx 1+1 interface module. Figure F.2 on page F-3 contains a drawing for fabricating such a cable.

2. Choose “Start,” and then “Control Panel.”
3. Choose Network Connections.”
4. Choose “Local Area Connection.”
   The Local Area Connection Status window shown in Figure E.1 appears.

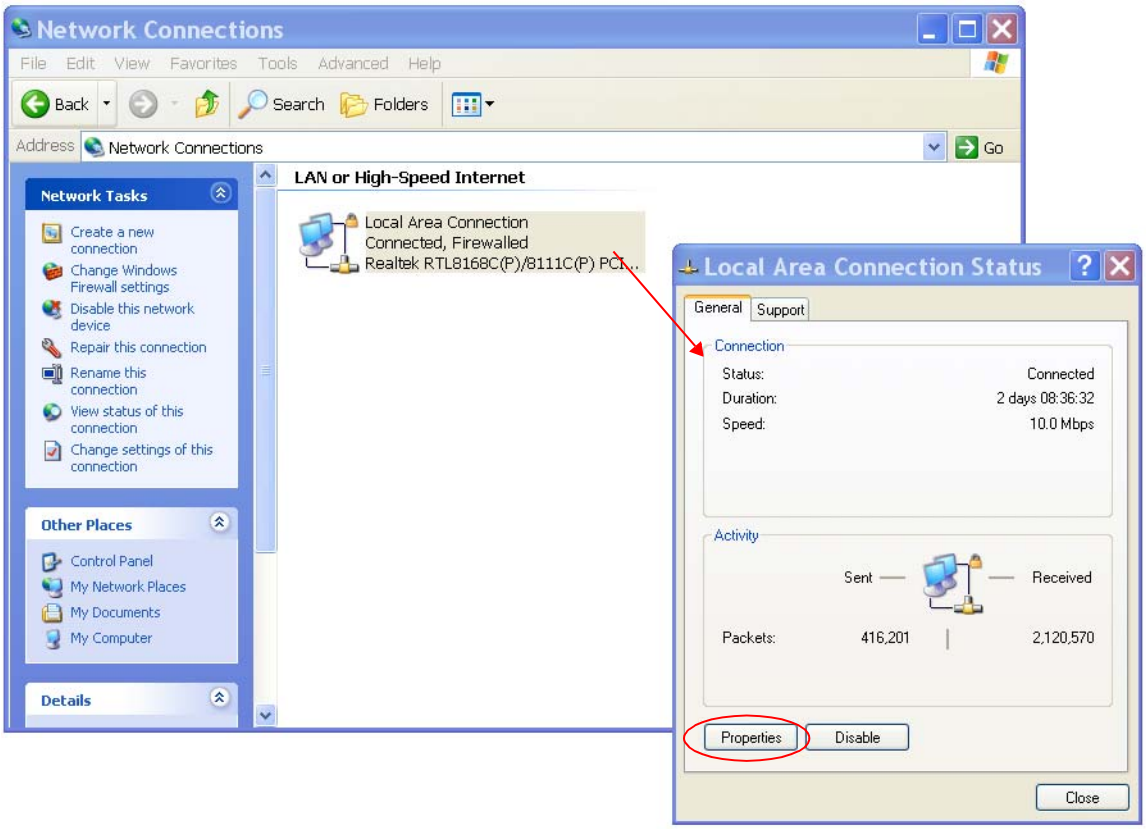

Figure E.1 Choosing Network Connections

5. Click Properties.
   The window shown in Figure E.2 appears.

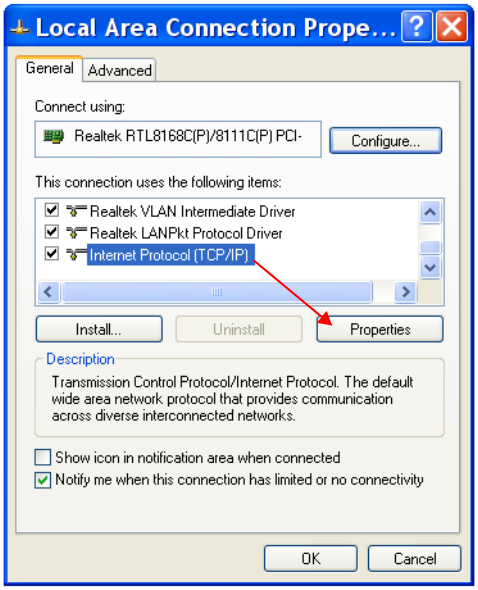

Figure E.2 Choosing the Internet Protocol (TCP/IP) Properties

6. In the dialog window, scroll down until “Internet Protocol (TCP/IP)” becomes visible.
7. Select “Internet Protocol (TCP/IP).”
   As shown in Figure E.2, it will become highlighted once you select it.
8. Click Properties.
   The window shown in Figure E.3 appears.

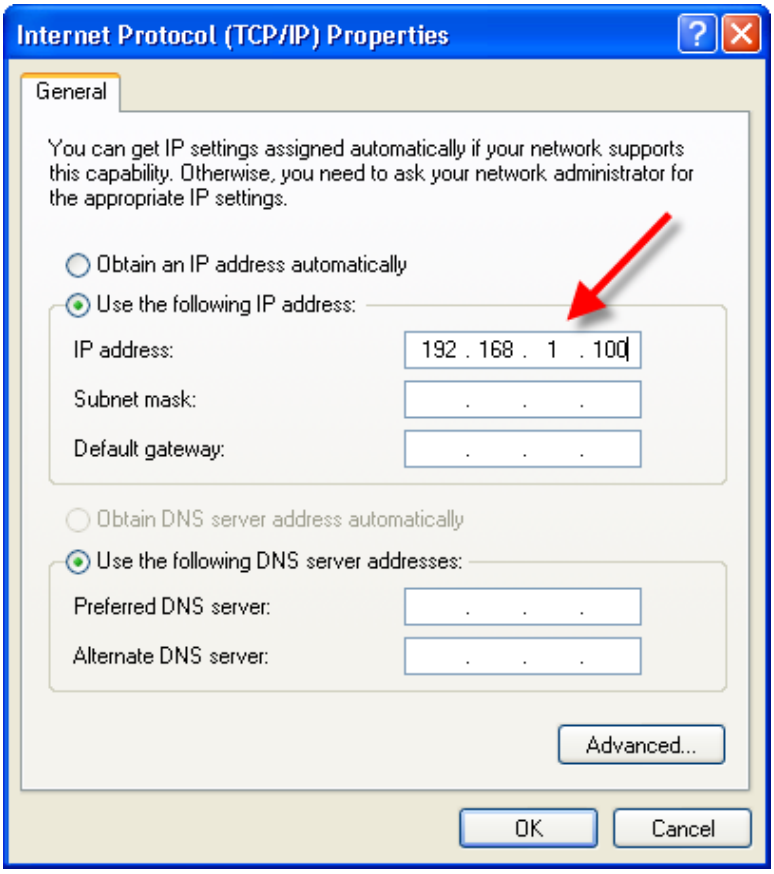

Figure E.3 Typing the IP Address

9. Select “Use the following IP address,” and then type an IP address.

   The IP address cannot be the same IP address as the Rx 1+1 system. It must be on the same subnet, however.
10. Click OK.
    The error message shown in Figure E.4 appears.

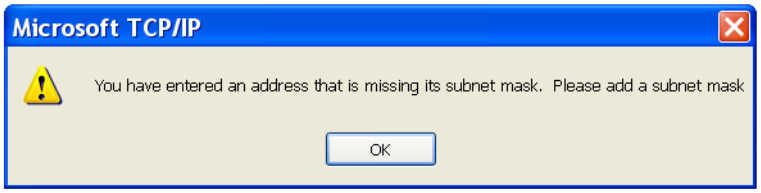

Figure E.4 Invalid Subnet Mask Error Message

11. Click OK.
    This causes the "Subnet Mask" fields to be filled in with the default subnet mask address.
12. Click OK.
13. Using the host computer, activate a Web browser window.
14. Type the IP address of the Rx 1+1 system in the address window, and then click Enter.

    The factory default IP address is `http://192.168.1.254`.
15. Within a few seconds, the Login tab shown in Figure E.5 on page E-5 will appear.
16. Type the password in the dialog box, and then click Enter.

    The default password is 1234.
17. If the login password is accepted, the page of the tab that is highlighted appears.

    If the login password is not accepted, the screen remains the same so that you can re-enter a password.
18. Click the tabs at the top of the screen to access the various Web pages described in this chapter.

Note: Your computer should have a static IP address on the same subnet as the Rx 1+1 system.

Login

This page appears to prompt you to login to the system. You can login or logout from any of the tabs shown in Figure E.5.

Type your password in the dialog box, and then click `Login`. The default password is `1234`. If the login password that you entered is accepted, the page of the highlighted tab appears. In Figure E.5, the Info tab is highlighted; thus the Info tab will appear upon successful login. If the login password is incorrect, the screen remains the same.

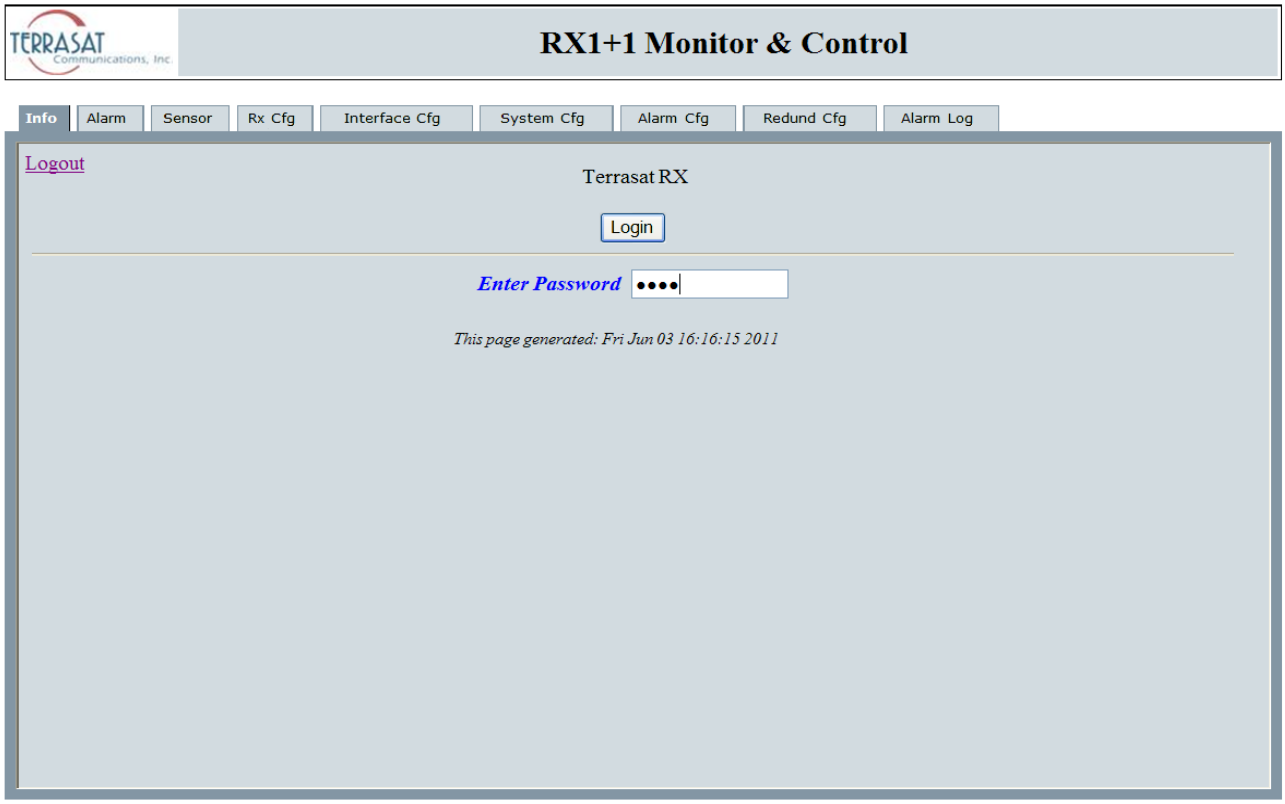

Figure E.5 Login

Information Tab

Use this tab to view read-only system information such as model number, serial number, version levels, and voltage range.

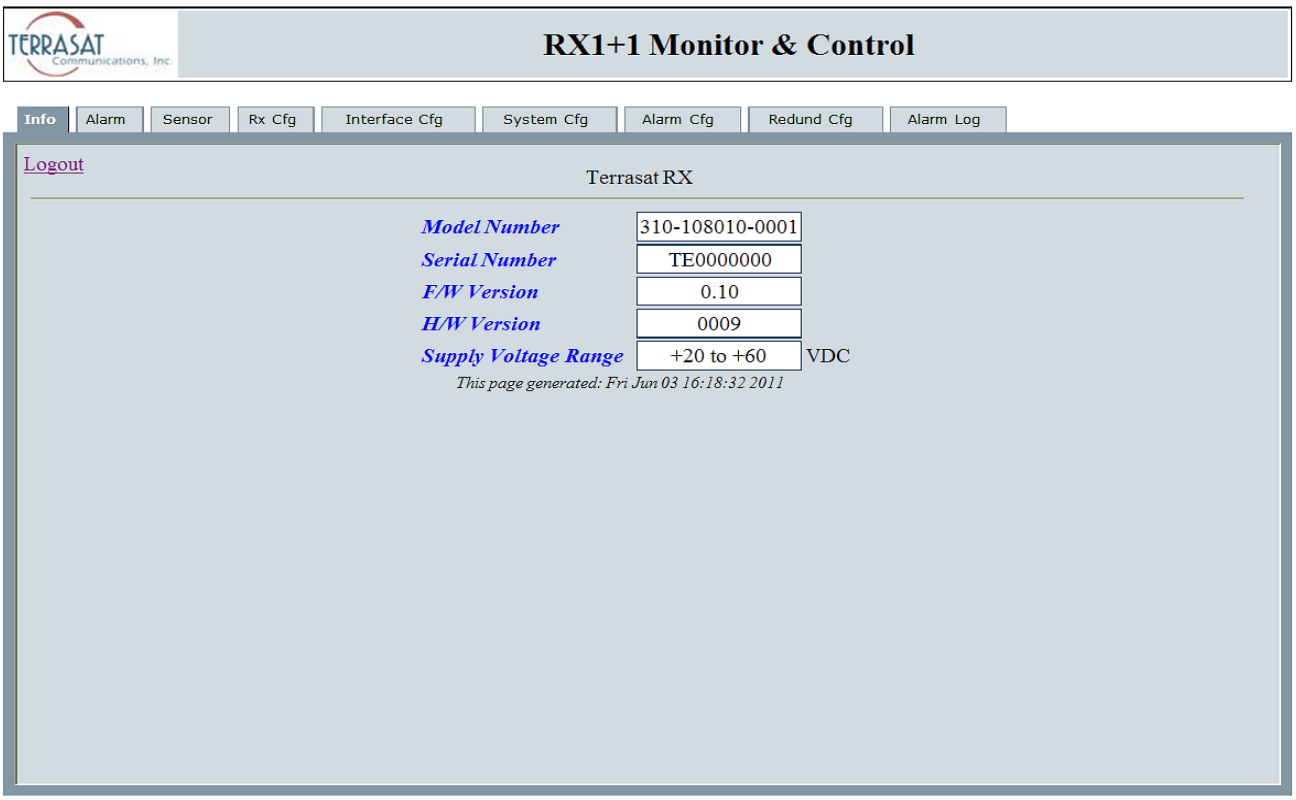

Figure E.6 Information Tab

From this page, you can view the following parameters:

- Model Number

  Displays the model number of the Rx 1+1 system. More information about the data contained within the part number is found in Appendix A, Part Numbering Schema.

- Serial Number

  Displays the unique serial number of the Rx 1+1 system.

- Firmware Version

  Displays the version number. The firmware version number of the Rx 1+1 system is used mainly by Terrasat Technical Support personnel.

- Hardware Version

  Displays the version number of the hardware.

Note: The hardware version can be updated only when the Rx 1+1 system is returned to the factory.

- Supply Voltage Range

  Displays the power supply voltage range for which the Rx 1+1 system was designed. The supply voltage range is based on the configuration of your particular system.

Alarm Tab

Use this tab to verify the alarm status of the unit. Alarm status is indicated with color and text: a green background indicates that the parameter is within specifications, a yellow background indicates a minor fault, and a red background indicates a major fault, as shown in Figure E.7. A white background indicates that particular parameter is unavailable. The information on this tab is read only.

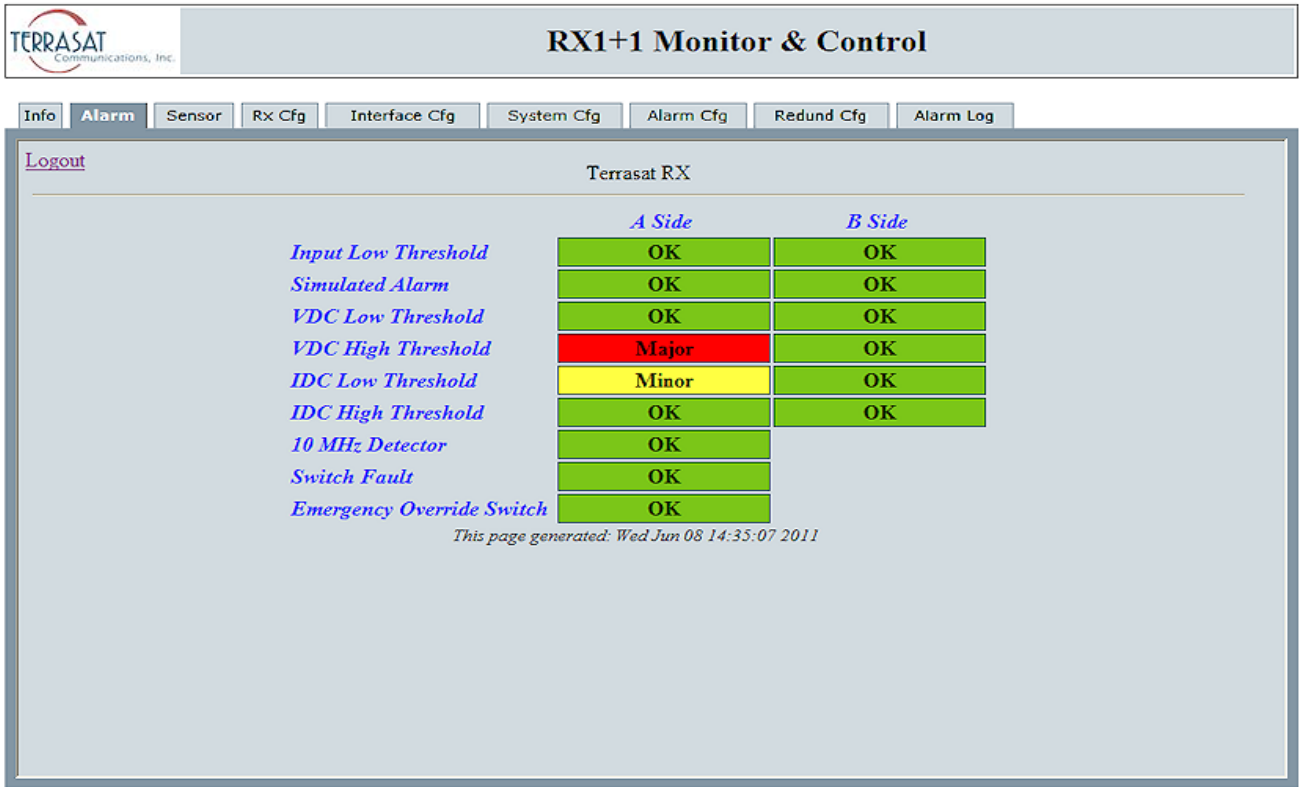

Figure E.7 Alarm Status Tab

From this page, you can view the following alarm statuses:

- Input Low Threshold

  Indicates whether the Rx Input level is operating below a minimum threshold. Options include:

  - OK
  - Major
  - Minor

- Simulated Alarm

  Indicates whether a simulated alarm has been issued. A simulated alarm is used mainly for testing purposes. Options include

  - OK
  - Major

- VDC Low Threshold

  Indicates whether the VDC (DC voltage) level is operating below a minimum threshold. Options include:

  - OK
  - Major
  - Minor

- VDC High Threshold

  Indicates whether the VDC (DC voltage) level is operating above a maximum threshold. Options include:

  - OK
  - Major
  - Minor

Note: A change in VDC level indicates that the LNA is not amplifying the signal as it should.

- IDC Low Threshold

  Indicates whether the IDC (DC current) level is operating below a minimum threshold. Options include:

  - OK
  - Major
  - Minor

- IDC High Threshold

  Indicates whether the IDC (DC current) level is operating above a maximum threshold. Options include:

  - OK
  - Major
  - Minor

Note: A change in IDC level indicates that the LNA is not amplifying the signal as it should.

- 10 MHz Detector

  Indicates whether the 10 MHz reference signal is present. Options include:

  - OK – the 10 MHz signal is functioning properly
  - Low – the 10 MHz signal is low or missing

- Switch Fault

  Indicates whether the waveguide switch is operating properly. This alarm is coded into the Rx 1+1 system and is not available for user configuration. Options include:

  - OK – indicates that the switch is functioning properly
  - Major – indicates that there is a problem with the waveguide switch

- Emergency Override Switch

  Indicates thatyou are manually overriding system software commands.Options include:

  - OK
  - Major

Sensor Tab

Use this tab to view voltage, current, and power levels for the Rx 1+1 system. This information is read only.

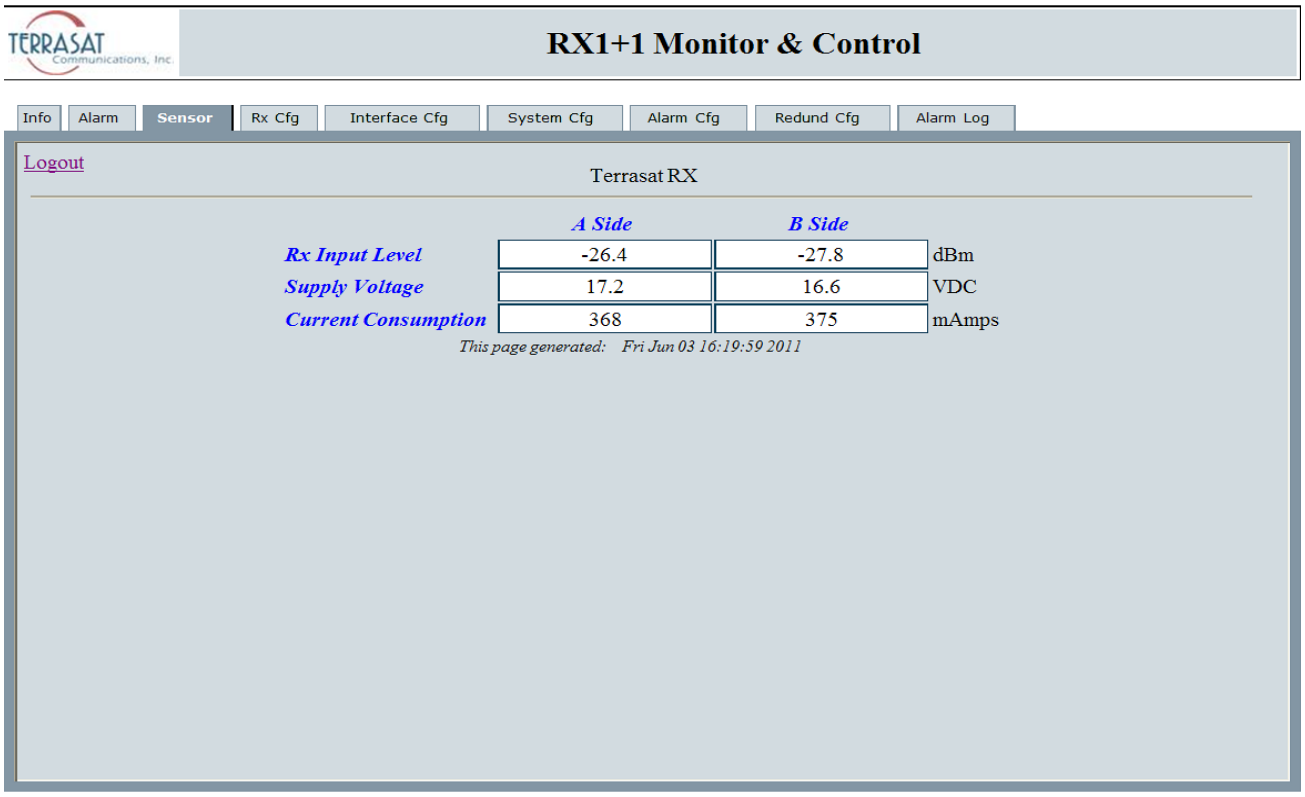

Figure E.8 Sensor Tab

From this page, you can view the following parameters:

- Rx Input Level

  Indicates the actual Rx input level, in dBm, of both the A: side and B: side LNAs.
- Supply Voltage

  Indicates the actual supply voltage level of both the A: side and B: side LNAs.
- Current Consumption

  Indicates the actual current consumption, in milliamperes, of both the A: side and B: side LNAs.

Rx Configuration Tab

Use this tab to configure Rx 1+1 system operating parameters. Click `Save Settings` when you have completed entering data to ensure that your changes are saved.

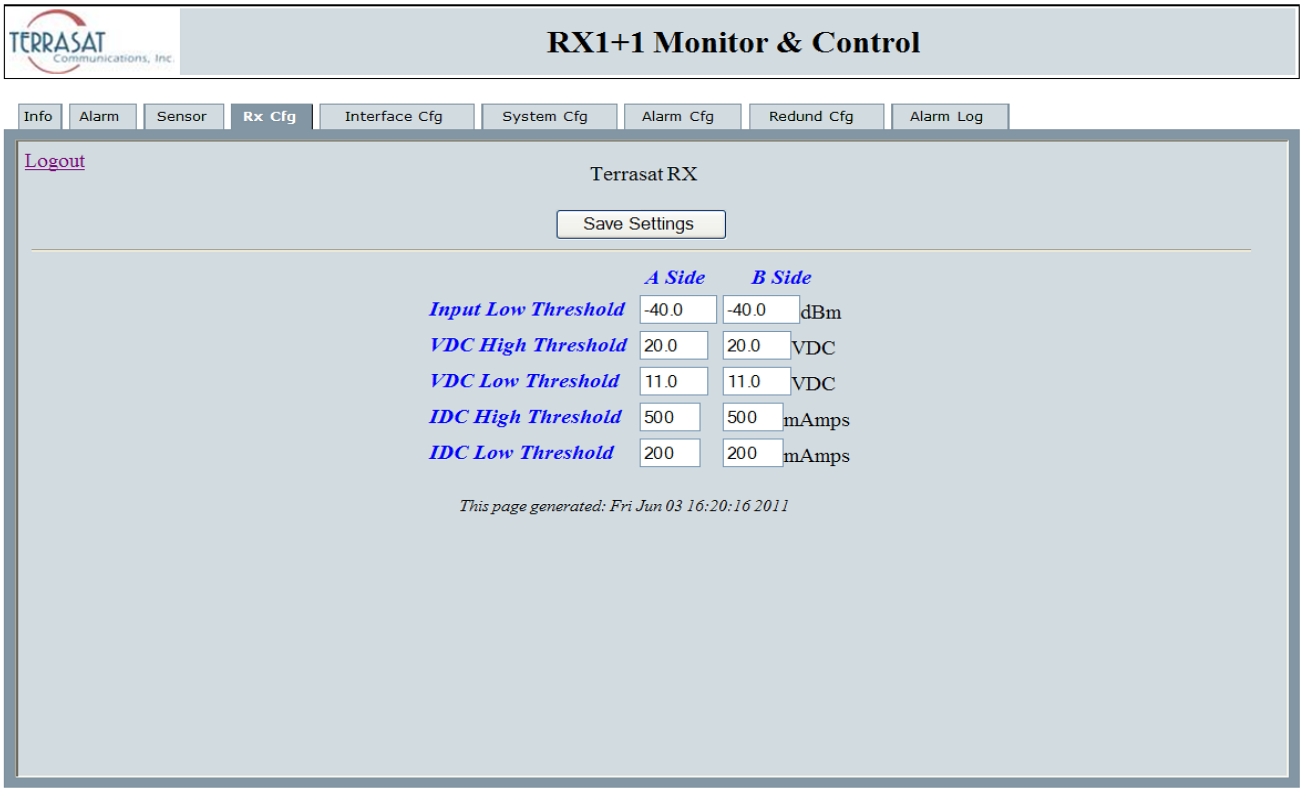

Figure E.9 Rx Configuration Tab

From this page, you can set the following parameters. You will receive an error message if you the value you enter exceeds the threshold range. Click OK to return to the Rx Configuration page to re-enter a valid value.

- Input Low Threshold

  Sets the lowest permitted receive input level down to -40 dBm.
- VDC High Threshold

  Sets the highest permitted level up to 25 V.
- VDC Low Threshold

  Sets the lowest permitted level down to 10 V
- IDC High Threshold

  Sets the highest permitted level up to 600 mA

- IDC Low Threshold

  Sets the lowest permitted level down to 100 Ma

Interface Configuration Tab

Use this tab to configure the interfaces (TCP/IP or RS485/FSK). Users can also set the Web server refresh rate and SNMP settings. Click `Save Settings` when you have completed entering data to ensure that your changes are saved.

Note: When set to 0 sec, the Web page will **not** be refreshed.

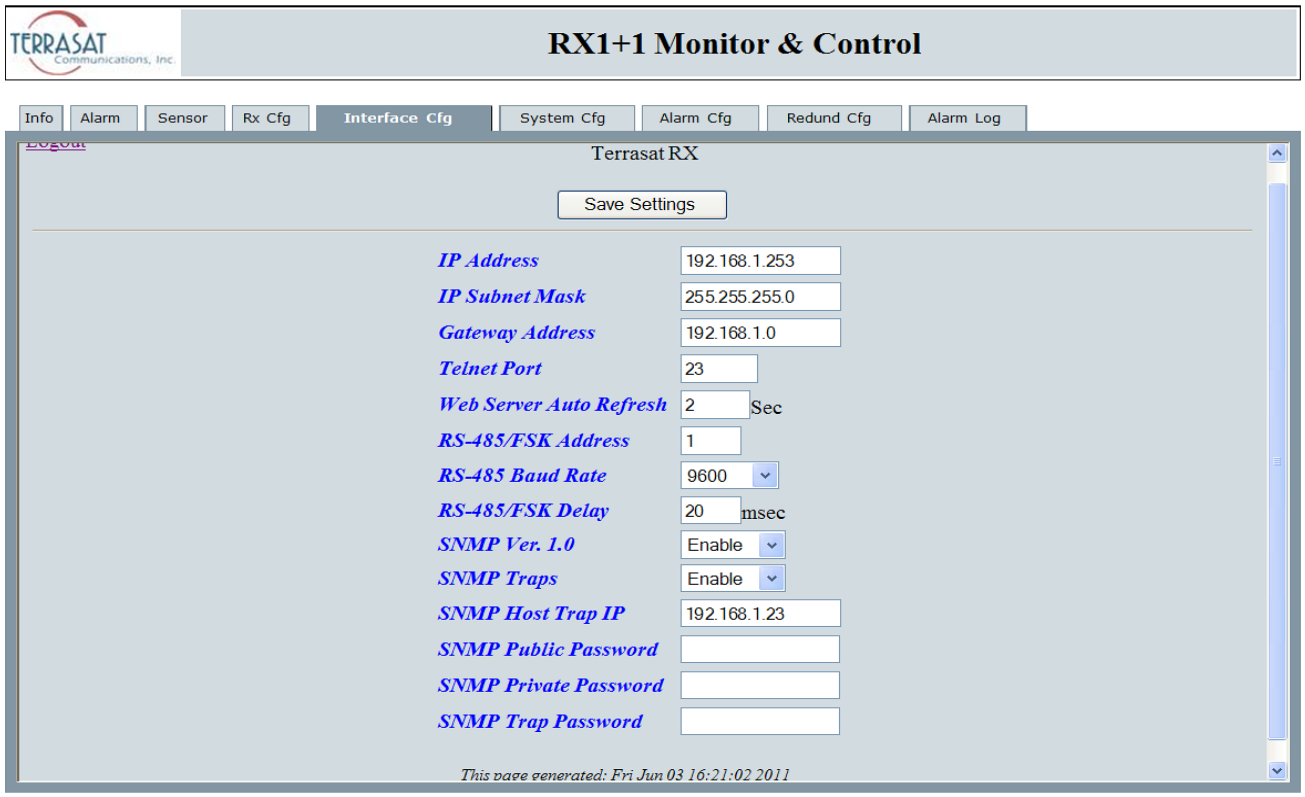

Figure E.10 Interface Configuration Tab

From this page, you can configure the following parameters:

- IP Address

  Valid values range from (but do not include) 1.0.0.0 through 224.0.0.0. When the netmask is applied, 0 and 225 in the last byte are excluded.

- IP Subnet Mask

  Sets the IP netmask. Valid values correspond to 255.0.0.0 to 255.255.255.252.

- Gateway Address

  Sets the IP gateway address which is the address the unit will send to if the requested IP address does not reside on the local LAN segment.

Note: This address cannot be the same as the IP address of the unit itself.

- Telnet Port

  Telnet is a network protocol used to establish remote communication. Ports are specific channels for network services. In the Rx 1+1 system, the default port is 23.

  Valid values include port numbers within the range of 1 to 65535.

- Web Server Auto Refresh

  Sets the interval in seconds after which the Web page refreshes. The default is 0.

  Valid values: 0 to 3600

Note: When set to 0 (the factory default), the Web page will **not** refresh.

- RS485/FSK Address

  Sets a unique designator for the unit.

  Valid values: 1 to 254

- RS485 Baud Rate

  Sets the baud rate at which data is sent. The default is 9600 baud.

  Valid values include: 1200, 2400, 4800, 9600, 38400, 57600, or 115200.

- RS485/FSK Delay

  Sets the delay in msec between the end of one transmission and the beginning of reception in half-duplex mode.

  Valid values include 1 to 255, and the default value is 20.

- SNMP Version 1.0

  SNMPv1 is a communication protocol used for managing TCP/IP networks. SNMP is used to monitor network-attached devices for conditions that require administrative attention. When enabled, the unit will respond to SNMPv1 requests. Options include:

  - Enable (default)
  - Disable

- SNMP Traps

  Sets the generation of SNMPv1 traps. A trap is a one-way message from a networked device to the network management system that indicates a status change. The device will not send a trap unless it has been configured to do so. After receiving the message, the network manager displays it and can choose to take an action based on the event.

  Options include:

  - Enable (default)
  - Disable

- SNMP Host Trap IP

  Sets the IP address to which the network management system sends traps. The default is

- SNMP Public Password

  The SNMP public password (or community string) is used for requesting information from the Rx 1+1 system. The password cannot exceed 16 alphanumeric characters. The default password is `public`.

- SNMP Private Password

  The SNMP private password (or community string) is used for making changes to the Rx 1+1 system. The password cannot exceed 16 alphanumeric characters. The default password is `private`.

- SNMP Trap Password

  Sets the password for the trap manager. The password cannot exceed 16 alphanumeric characters. The default password is `trap`.

System Configuration Tab

Use this tab to set the System Password and the Password Timeout. You can also reset (reboot) the Controller card by enabling the "System Reset" option. Additionally, the system time can be set here. Click `Save Settings` when you have completed entering data to ensure that your changes are saved.

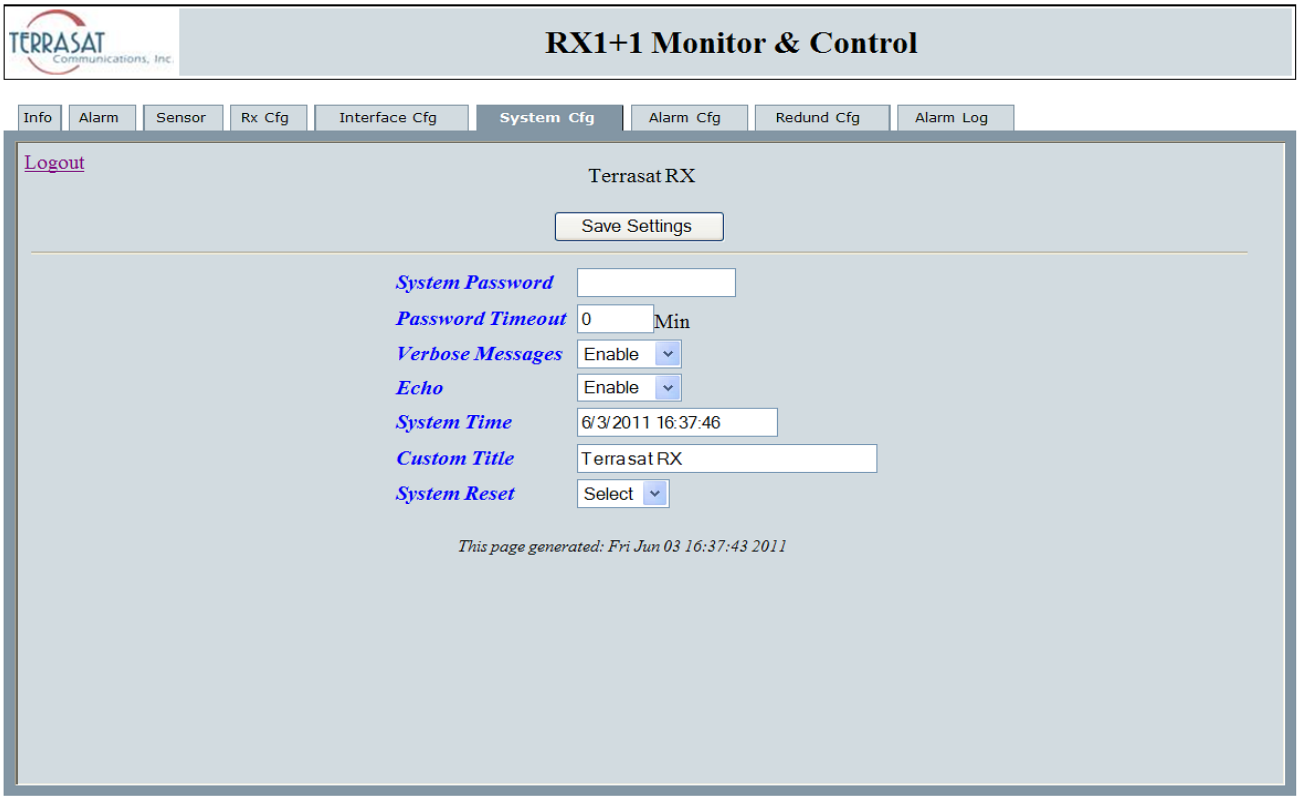

Figure E.11 System Configuration Tab

From this page, you can configure the following parameters:

- System Password

  To change the system password, type a numerical value between 1 and 65535.

Note: The default password is `1234`.

- Password Timeout

  Use to change the time period during which you can log in to the system. Options include:

  - 0 = No password timeout
  - 1 to 65535 = Number of minutes before inactivity timeout

- Verbose Messages

  Use to set whether response of the serial and TCP connections are terse (intended for computers to read) or verbose (intended for people to read) Options include:

  - Disabled = terse mode
  - Enabled = verbose mode

- Echo

  Use to set whether the system responds to SET commands or remains silent. Options include:

  - Enabled
  - Disabled

- System Time

  Use to set the system time of the Rx 1+1 system in a mm/dd/yyyy format. The system default is 01/01/1970.

- Custom Title

  Use this 32-character alphanumeric field to create a customized label for the Rx 1+1 system. Use information that will help you to identify the system (for example, office name or location of the Rx 1+1 system).

- System Reset

  When selected, this resets all parameters to their factory default settings.

Alarm Configuration Tab

Use this tab to configure alarms as Minor, Major, or None. Major alarms cause a summary alarm (relay closure) with the Form-C relay. Major alarms will cause switchovers. Users can also configure alarms as suppressible. Suppressible alarms will be suppressed only when the "Suppress Faults" option is enabled. Click `Save Settings` when you have completed entering data to ensure that your changes are saved.

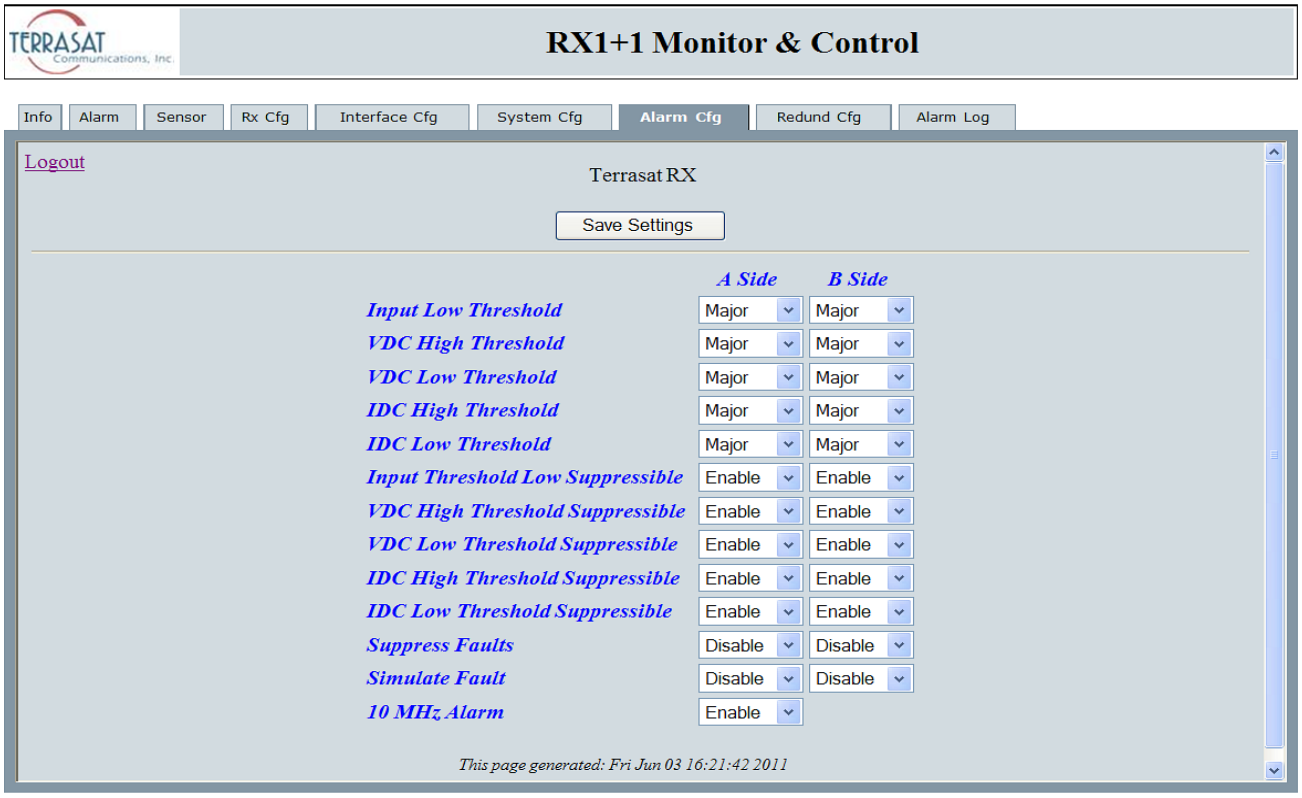

Figure E.12 Alarm Configuration Tab

From this page, you can configure the following alarms:

- Input Low Threshold

  Sets the type of alarm produced when the lower input threshold level has been exceeded. Options include:

  - Disable
  - Minor
  - Major

- VDC High Threshold

  Sets the type of alarm produced when the upper VDC threshold level has been exceeded. Options include:

  - Disable
  - Minor
  - Major

- VDC Low Threshold

  Sets the type of alarm produced when the lower VDC threshold level has been exceeded. Options include:

  - Disable
  - Minor
  - Major

- IDC High Threshold

  Sets the type of alarm produced when the upper IDC threshold level has been exceeded. Options include:

  - Disable
  - Minor
  - Major

- IDC Low Threshold

  Sets the type of alarm produced when the lower IDC threshold level has been exceeded. Options include:

  - Disable
  - Minor
  - Major

- Input Threshold Low Suppressible

  Sets whether the input low alarm is suppressible. When suppressed (enabled), an input low alarm will not appear as an event in the Alarm Log. Options include:

  - Disable
  - Enable

- VDC High Threshold Suppressible

  Sets whether the VDC high threshold alarm is suppressible. When suppressed (enabled), an input low alarm will not appear as an event in the Alarm Log. Options include:

  - Disable
  - Enable

- VDC Low Threshold Suppressible

  Sets whether the IDC low threshold alarm is suppressible. When suppressed (enabled), an input low alarm will not appear as an event in the Alarm Log. Options include:

  - Disable
  - Enable

- IDC High Threshold Suppressible

  Sets whether the IDC high threshold alarm is suppressible. When suppressed (enabled), an input low alarm will not appear as an event in the Alarm Log. Options include:

  - Disable
  - Enable

- IDC Low Threshold Suppressible

  Sets whether the IDC low threshold alarm is suppressible. When suppressed (enabled), an input low alarm will not appear as an event in the Alarm Log. Options include:

  - Disable
  - Enable

- Suppress Faults

  Sets whether the unit will suppress all alarms that are configured as suppressible. Options include:

  - Disable
  - Enable

- Simulate Fault

  When enabled, a simulated alarm is issued that does not affect reception or traffic. Options include:

  - Disable
  - Enable

- 10 MHz Alarm

  Sets whether an alarm will be issued if the external 10 Mhz signal. Options include:

  - Disable
  - Enable

Redundancy Configuration Tab

Use this tab to configure redundancy settings. Click `Save Settings` when you have completed entering data to ensure that your changes are saved.

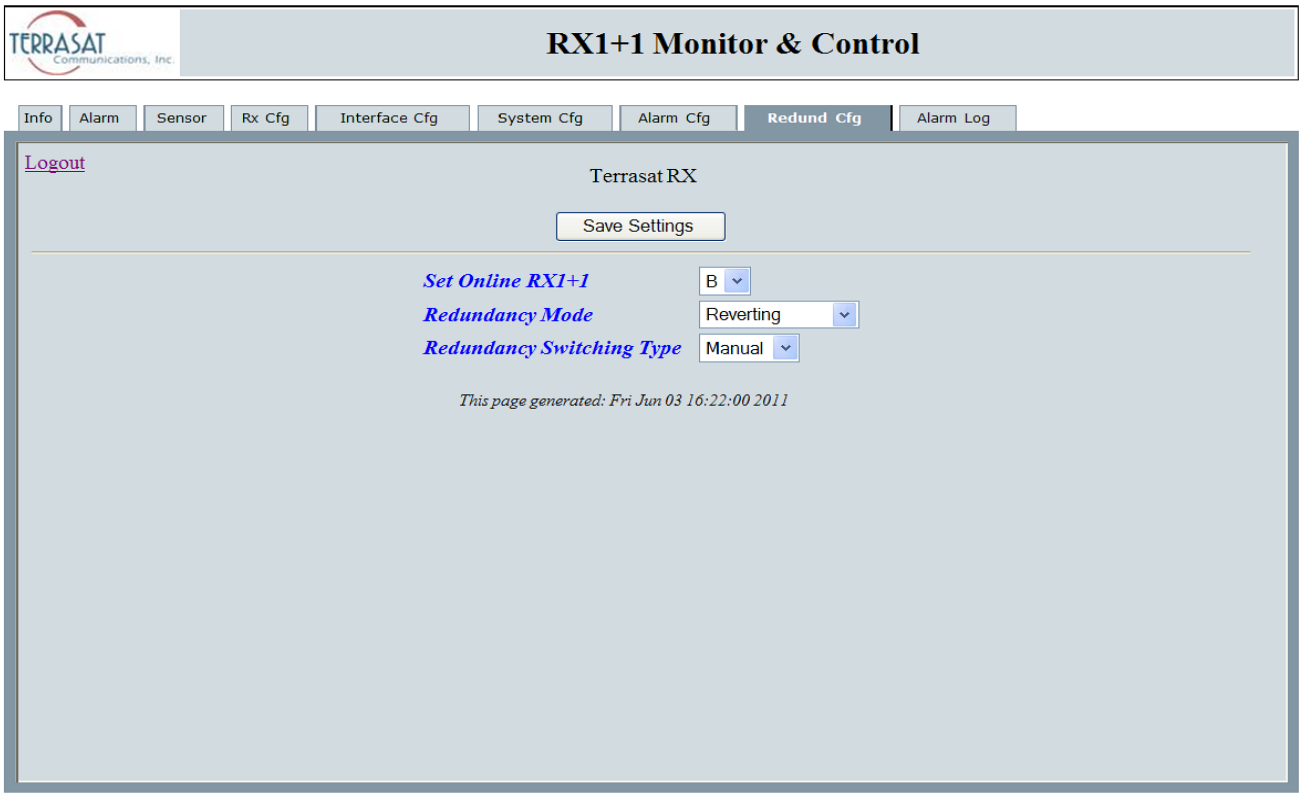

Figure E.13 Redundancy Configuration Tab

From this page, you can configure the following parameters

- Set Online Rx 1+1

  Changes the position of the waveguide switch.

  Options include:

  - A – Places A: side online
  - B – Places B: side online
- Redundancy Mode

  Sets the redundancy switching mode of operation. When configured for reverting, the units can switch between each other multiple times when a fault occurs unless both units are faulted. In nonreverting mode, when the A: side unit faults, a switch to the B: side unit will still occur. However, once operation has switched from the A: side unit to the B: side unit, no additional switches will occur without user intervention.

Options include

- Reverting
- Nonreverting

- Redundancy Switching Type

  Sets the switching type. Options include:

  - Automatic
  - Manual

Note: In Automatic mode, if the standby unit is faulty, the online unit will not switch to the standby unit However, you can force this switch when in Manual mode.

Alarm Log Tab

Use this tab to view the alarm history. When a fault occurs, entry is added to the alarm log. Entries are time-stamped to determine the order in which the alarms occurred. These entries can be used to help determine cause during system troubleshooting.

A total of 40 events are stored by the Rx 1+1 system. An event can consist of multiple alarms. In Figure E.14, the events recorded consist of miscellaneous (M) and receive (R) alarms.

To clear the alarm history, click Clear.

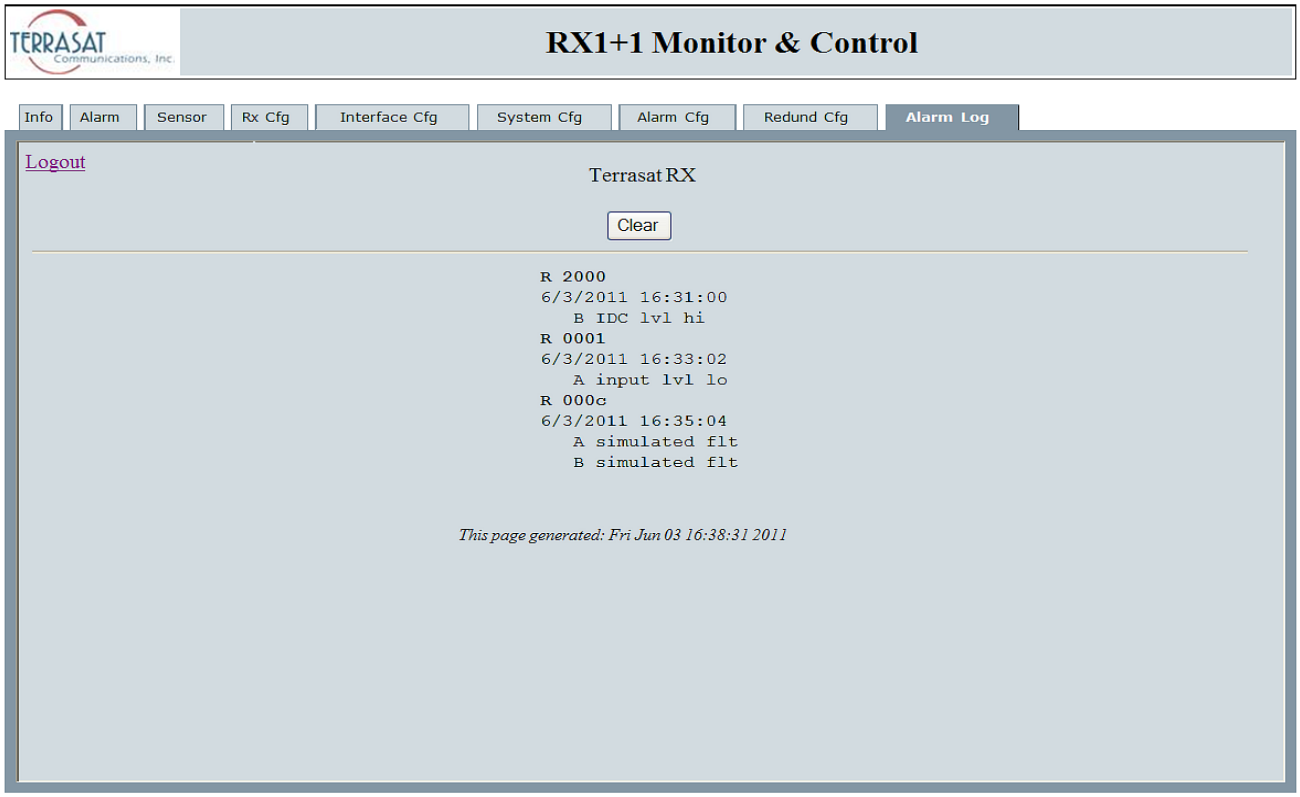

Figure E.14 Alarm Log Tab

Note: The Alarm Log updates every minute but the information displayed updates only when there is a change from no alarms to an alarm.

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for double-sided printing.

APPENDIX

F

REFERENCE DRAWINGS AND COMPONENT SPECIFICATIONS

This chapter contains outline drawings and component specifications for the Terrasat Communications, Inc. line of receive redundant systems.

Reference Drawings

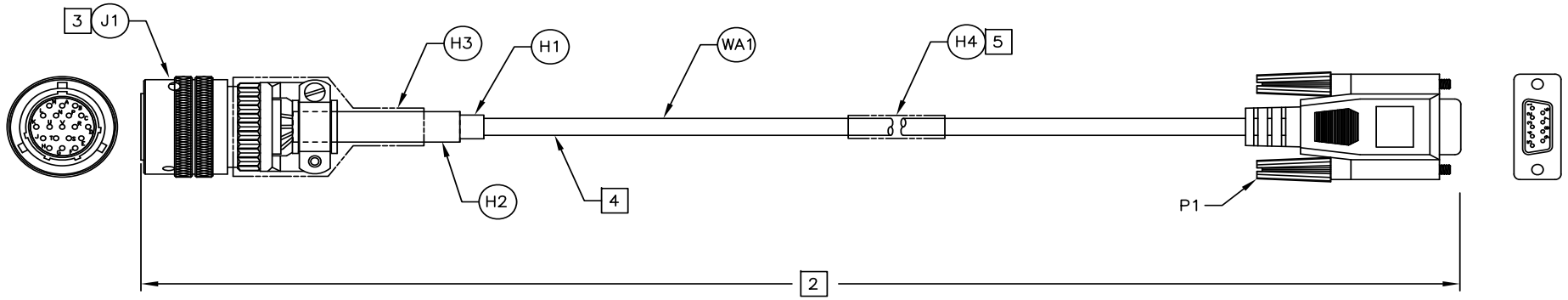
Outline drawings are subject to change without notice. To ensure you are using the latest information available, contact Terrasat.

DWG.#	SH	REV.

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
A	RELEASE PER ECO# 11970	12/05/06	J. HECHT

WIRING SCHEDULE	
FROM (WA1, P1)	TO (J1)
PIN–2	PIN–E
PIN–3	PIN–D
PIN–5	PIN–F



NOTES: (UNLESS OTHERWISE SPECIFIED)
1. FOR ALL ITEMS, USE PART NUMBER INDICATED OR EQUIVALENT.
2. DASH NUMBER EQUALS CABLE LENGTH IN FEET.
3. J1, PINS (A–C & G–V) ARE NOT USED.
4. CUT THE DB9 CONNECTOR AT THIS END AND STRIP THE CABLE OUTER JACKET TO THE DESIRED LENGTH AND CUT THE WIRES FROM PIN 1, PIN 4, PIN 6, PIN 7, PIN 8 & PIN 9.
5. IDENTIFY CABLE WITH TERRASAT COMMUNICATION INC PART NUMBER AND CURRENT REVISION LEVEL ON LABEL (H4) AND WRAP LABEL AROUND CABLE APPROXIMATELY WHERE SHOWN.
6. FINISHED PART MUST BE RoHS COMPLIANT.

ITEM#	QTY	TERRASAT PART#	DESCRIPTION	MANUF. PART#
H4	1	395–10893–0001	LABEL, SELFLAMINATING, 1.0 X 2.25 X 0.75	TYCO/RAYCHEM, SB100225WE5
H3	2.00"	557–10662–0003	TUBING, HEAT SHRINK, POLYOLEFIN, BLACK, 1.25	DABURN, DAFLEX SM278
H2	1.75"	557–10662–0004	TUBING, HEAT SHRINK, POLYOLEFIN, BLACK, 0.75	DABURN, DAFLEX SM278
H1	2.00"	557–10662–0002	TUBING, HEAT SHRINK, POLYOLEFIN, BLACK, 5/16	DABURN, DAFLEX SM278
WA1	1	550–10883–XXXX	CABLE ASSY, DB9 FEMALE TO DB9 FEMALE	ASSMANN AKXXX–X–R
J1	1	533–20740–0001	CONN, CIRC, STRAIGHT PLUG, SHELL SIZE 14, 19P	AMPHENOL, PT06E–14–19P(476)

PARTS LIST

MATERIAL: SEE NOTES
FINISH: SEE NOTES

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES
TOLERANCES ARE: XX ±.01, XXX ±.005
SURFACE FINISH
ANGLES

DRAWN BY: S. LOW — DATE: 12/05/06
APPROVED BY: J.HECHT — DATE: 12/05/06
CHANGED BY: — DATE:
CHECKED BY: — DATE:

DO NOT SCALE DRAWING

TERRASAT COMMUNICATIONS, INC.

FABRICATION DRAWING,
CABLE ASSY, 19P STRAIGHT PLUG TO DB9F

SIZE: B | DR# FBD–21012–XXXX | REV A

SCALE: 1:1 | FILE: 210121A | SHEET 1 OF 1

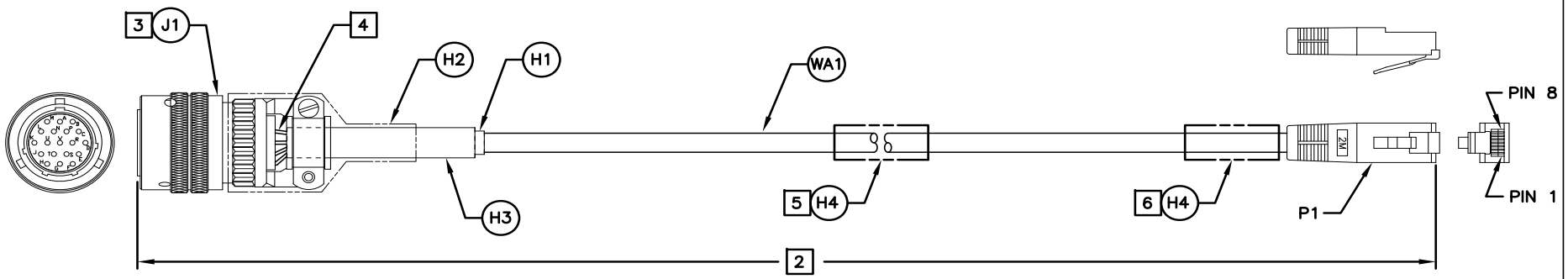
Figure F.1 Fabrication Drawing, FBD-21012-XXXX, Rev. A

DWG.#	SH	REV.

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
A	RELEASED PER ECO# 11882	4/22/08	J. HECHT

NOTES: (UNLESS OTHERWISE SPECIFIED)
1. FOR ALL ITEMS, USE PART NUMBER INDICATED OR EQUIVALENT.
2. DASH NUMBER EQUALS CABLE LENGTH IN FEET.
3. J1, PINS (A–F & L–V) ARE NOT USED.
4. CUT THE RJ45 CONNECTOR AT THIS END AND STRIP THE CABLE OUTTER JACKET TO THE DESIRE LENGTH AND CUT THE BLUE WHITE/BLUE, WHITE/BROWN AND BROWN WIRES.
5. IDENTIFY CABLE WITH TERRASAT PART NUMBER AND CURRENT REVISION LEVEL ON LABEL'S PRINTABLE AREA.
6. FOR –0XXX CABLE, MARK WITH "ETHERNET STRAIGHT" ON LABEL'S PRINTABLE AREA.
   FOR –1XXX CABLE, MARK WITH "ETHERNET CROSSOVER" ON LABEL'S PRINTABLE AREA.
7. FINISHED PART MUST BE RoHS COMPLIANT.



WIRING SCHEDULE (–0XXX, STRAIGHT CONNECT)		
WIRE	FROM P1	TO J1
WHT/ORG	PIN–1	PIN–G
ORG	PIN–2	PIN–H
WHT/GRN	PIN–3	PIN–J
GRN	PIN–6	PIN–K
BLU	PIN–4	NC
WHT/BLU	PIN–5	NC
WHT/BRN	PIN–7	NC
BRN	PIN–8	NC

WIRING SCHEDULE (–1XXX, CROSS CONNECT)		
WIRE	FROM P1	TO J1
WHT/ORG	PIN–1	PIN–J
ORG	PIN–2	PIN–K
WHT/GRN	PIN–3	PIN–G
GRN	PIN–6	PIN–H
BLU	PIN–4	NC
WHT/BLU	PIN–5	NC
WHT/BRN	PIN–7	NC
BRN	PIN–8	NC

ITEM#	QTY	TERRASAT PART#	DESCRIPTION	MANUF. PART#
H3	4.00"	557–10662–0004	TUBING, HEAT SHRINK, POLYOLEFIN, BLACK, 0.75	DABURN, DAFLEX SM278–3/4"
H4	2	395–10893–0001	LABEL, SELF LAMINATING, 1.0 x 2.25 x .75	TYCO/RAYCHEM, SB100225WE5
H2	2.00"	557–10662–0003	TUBING, HEAT SHRINK, POLYOLEFIN, BLACK, 1.25	DABURN, DAFLEX SM278–1 1/4"
H1	4.00"	557–10662–0002	TUBING, HEAT SHRINK, POLYOLEFIN, BLACK, 5/16	DABURN, DAFLEX SM278–5/16"
WA1	1	550–10787–XXXX	CABLE ASSY,CAT5(e),RJ45,PATCH,GRAY	ASSMANN A–MCUP–80XXX
J1	1	533–20740–0001	CONN, CIRC, PLUG, SHELL SIZE 14, 19P	AMPHENOL PT06E–14–19P(476)

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
XX ±.01
XXX ±.005

MATERIAL SEE NOTES

FINISH SEE NOTES

CONTRACT #

DRAWN BY: S. HAN	DATE: 4/22/08	
APPROVED BY: J. HECHT	DATE: 4/22/08	
CHANGED BY:	DATE:	
CHECKED BY:	DATE:	

DO NOT SCALE DRAWING

TERRASAT COMMUNICATIONS, INC.

FABRICATION DRAWING,
CABLE ASSY,TCP/IP,RJ45 TO 19P PLUG

SIZE: B | DR# FBD–20786–XXXX | SCALE: 1:1 | REV. A | SHEET 1 OF 1

Figure F.2 Fabrication Drawing, FBD-20786-XXXX, Rev. A

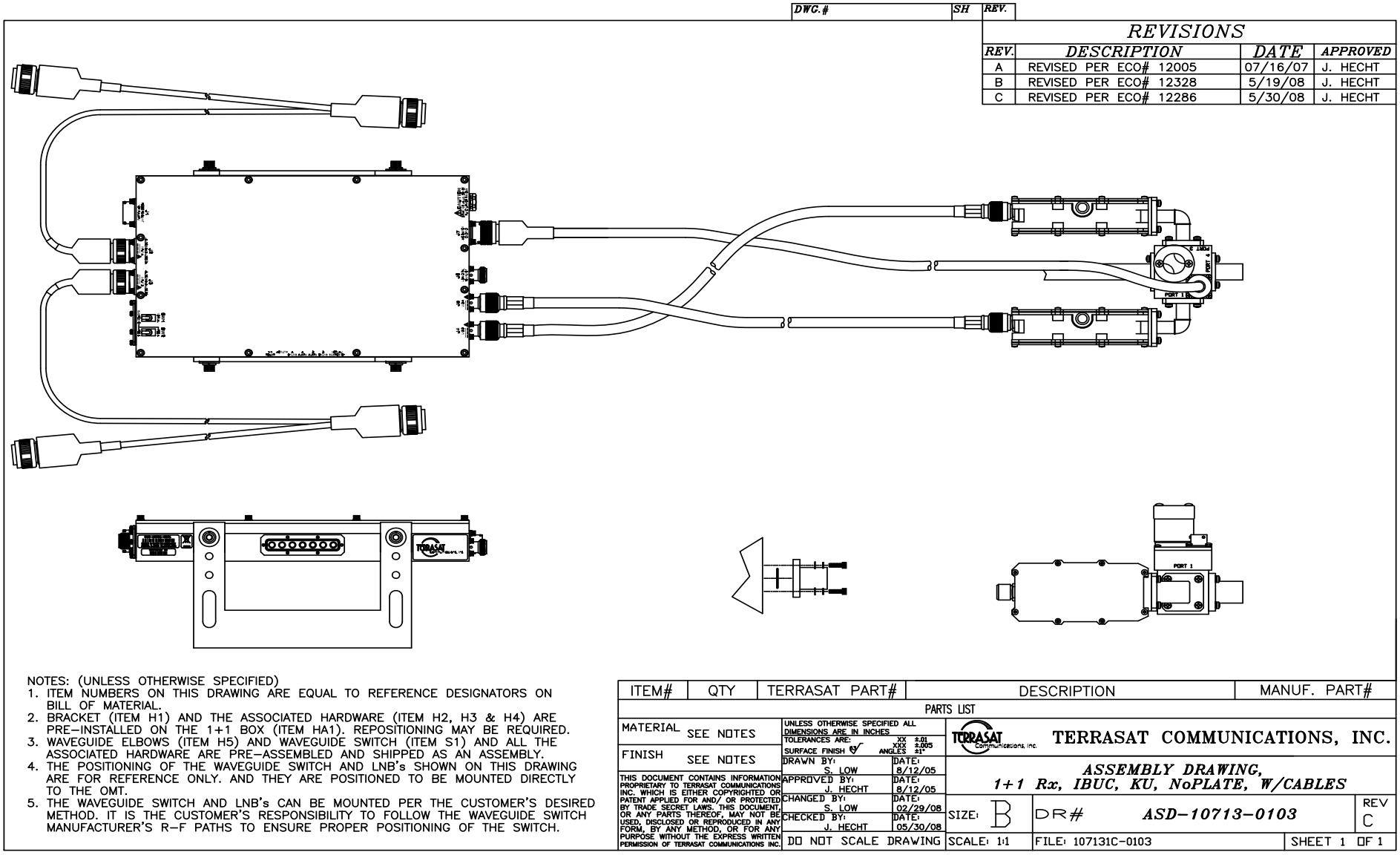


Figure F.3 Assembly Drawing, ASD-10713-0010, Rev A

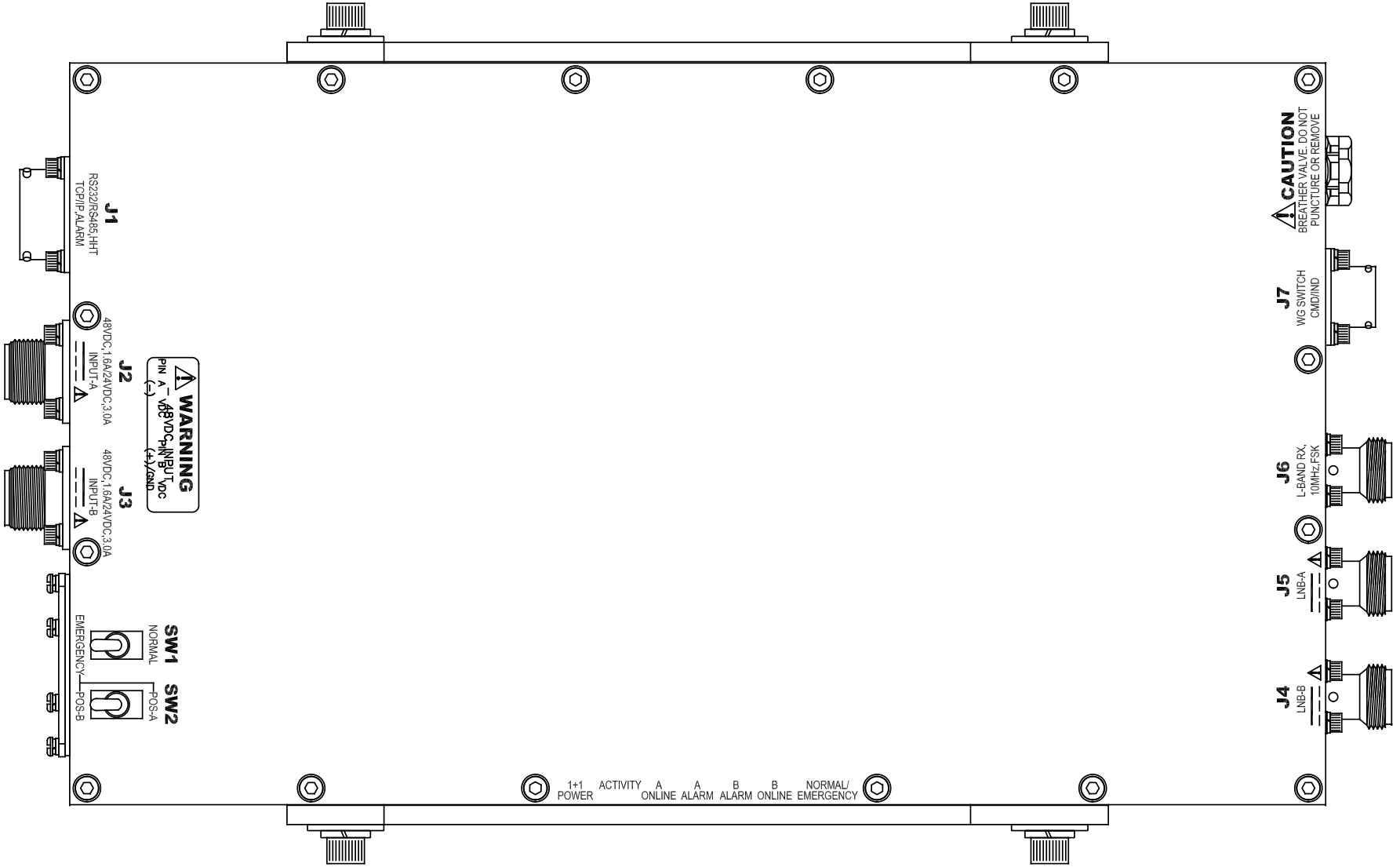


Figure F.4 Top View of Rx 1+1 System Showing Connector Locations

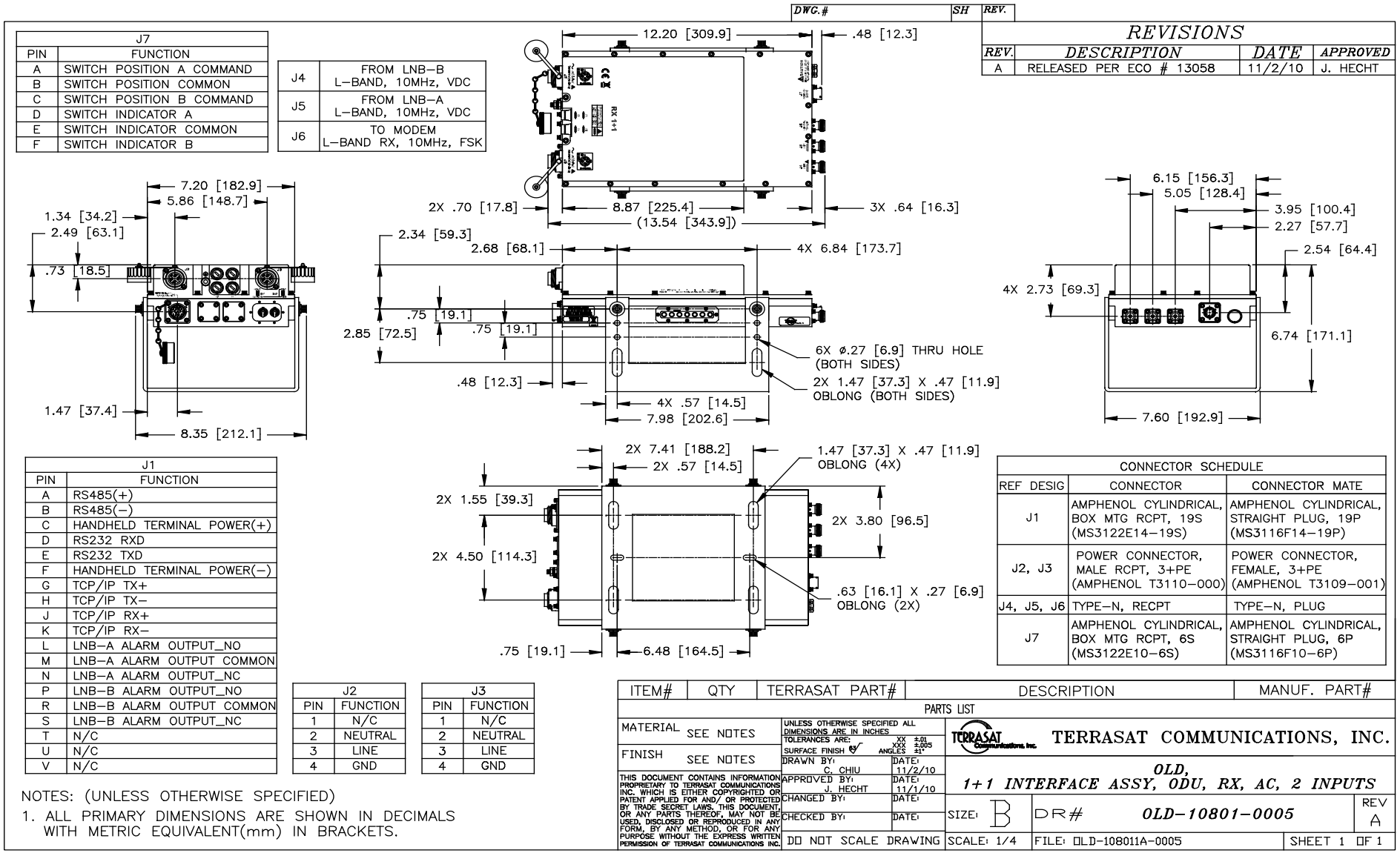


Figure F.5 Outline Drawing, OLD-10801-0005, Rev A

Data Sheets

Refer to the datasheets in this section for detailed product information.

Product specifications are subject to change without notice. To ensure you are using the latest information available, contact Terrasat.

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for double-sided printing.

IBUC 1:1 Protection System

Advantages

1:1 switching logic and drivers reside in the IBUCs - no external logic controller required.

Supports IBUC's with AC power input or separate DC power supplies.

Web browser interface with embedded web pages for easy setup, monitor, and control.

Auto-Cloning function means user sets up primary IBUC as desired and secondary unit clones its settings.

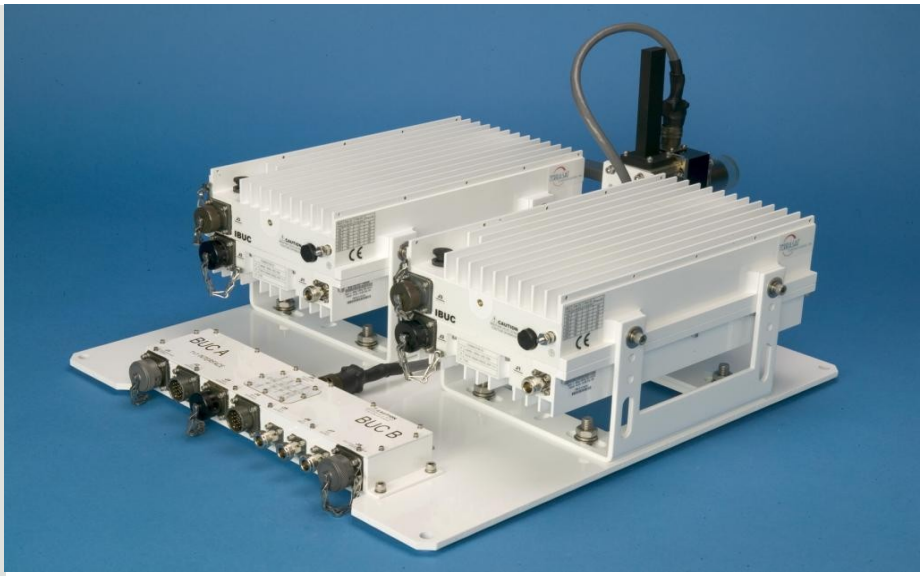
LEDs provide quick visual indication of IBUC condition.

Compact, integrated mounting package.

Separate outdoor RX 1:1 system available in AC-powered version or operating with DC power from IBUC power supplies.

Access via:

- FSK through TX IFL cable.
- TCP/IP with embedded web pages.
- SNMP agent
- RS485/232 serial port.
- Handheld Terminal.



The IBUC redefines 1:1 protection switching. Instead of using a separate switching logic unit with its expense and complexity, Terrasat incorporates the switching logic and drivers into the IBUC itself.

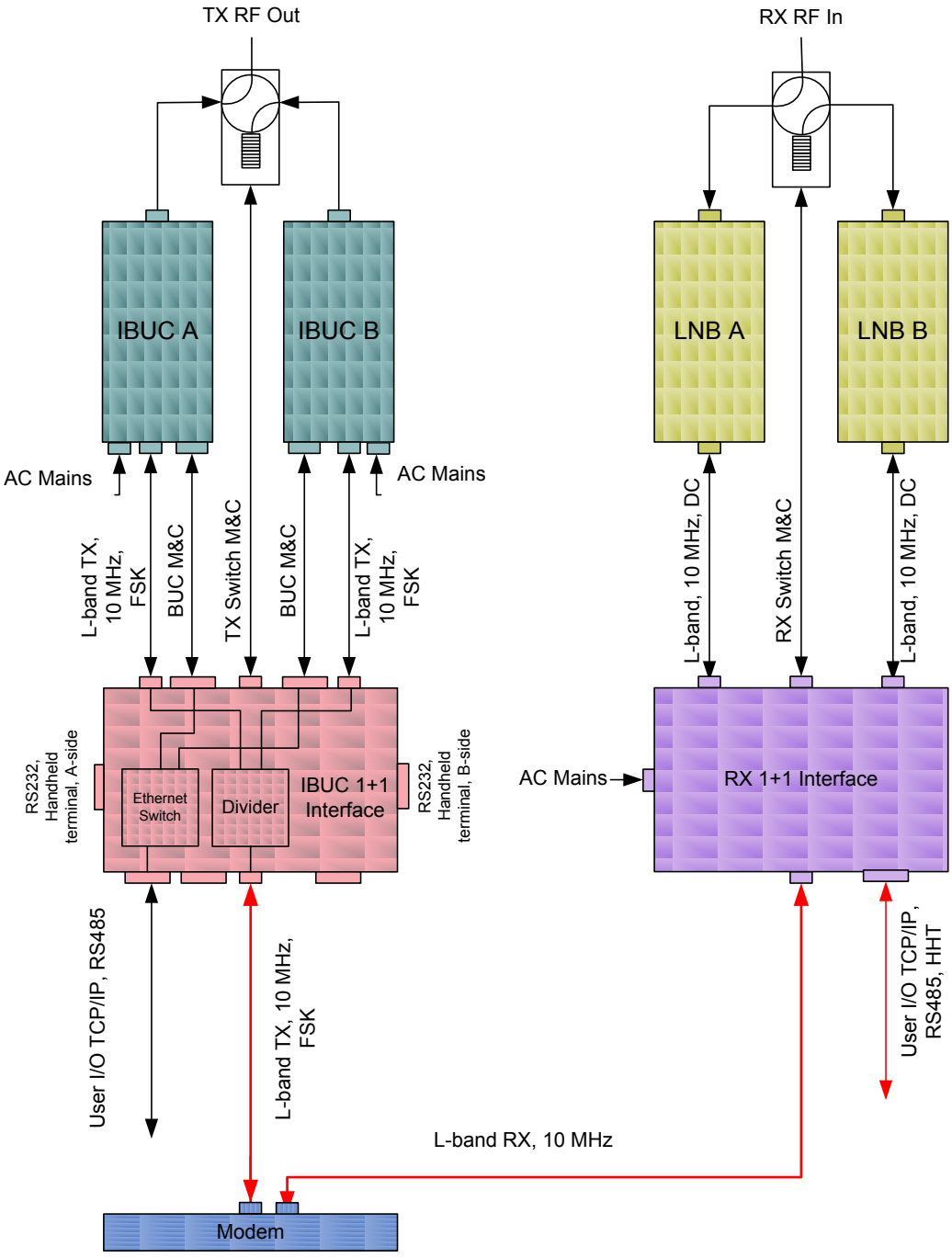
Protected units monitor each other's alarm condition and, through a simple switching junction box, make the decision to switch. The IBUC 1:1 package includes a cloning feature to simplify 1:1 setup. Terrasat's 1:1 solution is a complete package with a dual-IBUC mounting bracket for convenient installation.

A 1:1 junction box mounts on the 1:1 mounting plate. Practically a passive unit, the junction box manages the functions of dividing the IF signal and routing signals through an Ethernet switch. It supports interface connectors and includes a bank of LEDs for visual indication of alarm conditions. The user interface is via web browser to embedded web pages, handheld terminal, RS232 or RS485.

A Receive 1:1 system is available with a separate outdoor RX interface box. The receive interface box receives DC power from the IBUC power supplies and performs all required functions for 1:1 operation of LNB's. An AC-powered model is available. No indoor controller is necessary. Monitoring and control is via TCP/IP port on the interface box. The interface box fits the Terrasat universal mounting bracket and the system comes with cables and waveguide switch.

For additional information contact Terrasat Sales at +1 408-782-5911 or by Email: Sales@Terrasatinc.com.
235 Vineyard Court, Morgan Hill, CA 95037 www.terrasatinc.com

IBUC 1:1 System Block Diagram



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APPENDIX

G

GLOSSARY

Glossary of Terms

The following acronyms are used in Terrasat Communications, Inc. documentation:

°C	Degrees Celsius
°K	Degrees Kelvin
1RU	One Rack Unit (1.75 in.)
µs	Microsecond
AC	Alternating Current
AGC	Automatic Gain Control
ALC	Automatic Level Control
AWG	American Wire Gauge
ATE	Automated Test Equipment
ATP	Acceptance Test Procedure
BER	Bit Error Rate
BUC	Block Upconverter
CSM	Continuous Signal Mode
CW	Continuous Wave
DAB	Digital Audio Broadcasting
dB	Decibel
dB/oct	Decibel per Octave
dBc	Decibel Below Carrier
dBm	Decibel referenced to 1 milliwatt

DBS	Direct Broadcast Satellite
DC	Direct Current
DCE	Data Communication Equipment
DRO	Dielectric Resonator Oscillator
DTE	Data Terminal Equipment
DVM	Digital voltmeter
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ERM	Electromagnetic Compatibility and Radio Spectrum Matters
fr	Frequency
FSK	Frequency Shift Keying
FSS	Fixed Satellite Services
F/W	Firmware
g	Gravity
GHz	Gigahertz
GUI	Graphical User Interface
HHT	Hand-held Terminal
HPA	High-Power Amplifier
HPC	High-Power Converter
HTTP	Hypertext Transfer Protocol
Hz	Hertz
I/O	Input/Output
IBUC	Intelligent Block Upconverter
IDU	Indoor Unit
IF	Intermediate Frequency
IFL	Interfacility Link
IFU	Interface Unit
IP	Internet Protocol
kg	Kilogram
LNB	Low Noise Block Converter
LO	Local Oscillator
M&C	Monitor and Control
max	Maximum

MCPC	Multiple Carrier Per Channel
MHz	Megahertz
MIB	Management Information Base
min	Minimum
ms	Millisecond
MTBF	Mean Time Between Failure
MUC	Microwave Upconverter
ns	Nanosecond
OCXO	Oven-controlled Quartz Oscillator
ODU	Outdoor Unit
OMT	Orthogonal Mode Transducer
p-p	Peak to Peak
P1dB	Power at the 1dB Compression Point
PFC	Power Factor Corrected
PLDRO	Phase-Locked Dielectric Resonator Oscillator
PLL	Phase-Locked Loop
PLLNBC	Phase-Locked Low-Noise Block Converter
PLO	Phase Locked Oscillator
ppb	Parts Per Billion
ppm	Parts Per Million
PSUI	Power Supply Unit
Pwr	Power
QTP	Qualification Test Procedure
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RFT	Radio Frequency Transceiver
RH	Relative Humidity
RMS	Root Mean Square
RTC	Real Time Clock
RTS/CTS	Request to Send/Clear to Send
Rx	Receive
s	Second

SCPC	Single Carrier Per Channel
SNG	Satellite News Gathering
SNMP	Simple Network Management Protocol
SSB	Single Side Band
SSPA	Solid-State Power Amplifier
TCP/IP	Transfer Control Protocol/Internet Protocol
TRF	Transmit Reject Filter
Tx	Transmit
UDP	User Datagram Protocol
UPC	Upconverter
UPS	Uninterruptible Power Supply
VAC	Volts Alternating Current
VDC	Volts Direct Current
VSAT	Very Small Aperture Terminal
VSWR	Voltage Standing Wave Ratio
VVA	Variable Voltage Attenuator
W	Watt
WG	Waveguide

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