

# Intelligent Block Upconverter IBUC 3, IBUC 3G

## Operations Manual

24-Hour Technical Support: +1 669.258.9740

This document is provided to customers who have purchased Terrasat Communications, Inc. equipment. This document is copyright protected and no part of this manual may be reproduced, transcribed, or translated into any language or transmitted in any form whatsoever without the prior written consent of Terrasat Communications, Inc.

Technical information contained in this publication is for reference purposes only and is subject to change without notice. Every effort has been made to supply complete and accurate information; however, Terrasat Communications, Inc. assumes no responsibility and will not be liable for any errors, omissions, damage, or loss that might result from any use of this manual or the information contained therein (even if this information is properly followed and problems still arise).

Part Number: O&M-22062-0004

Revision: B

© January 2021 Terrasat Communications, Inc.

315 Digital Drive  
Morgan Hill, CA 95037

Phone: +1 408.782.5911  
FAX: +1 408.782.5912

[www.terrasatinc.com](http://www.terrasatinc.com)

# TABLE OF CONTENTS

## Preface

Conventions and References .....	P-1
Cautions and Warnings .....	P-2
Trademarks.....	P-2
Electrical Safety Notice .....	P-2

## Chapter 1, Introduction

Block Upconverters.....	1-1
Reference Documents .....	1-2
Warranty Information.....	1-5

## Chapter 2, Functional Description

Introduction .....	2-1
System Components.....	2-2
DC Supply.....	2-5
Monitor and Control.....	2-7
RF Signal Flow .....	2-7
Software .....	2-12
System Configurations.....	2-13
Storage Information .....	2-17

## Chapter 3, Installation

Introduction .....	3-1
General Requirements.....	3-1
Unpacking .....	3-1
Furnished Items.....	3-2
Accessories.....	3-3
Installing the ODU.....	3-3
Test Equipment .....	3-3
Site Considerations .....	3-3
Mounting Considerations.....	3-4
Power Requirements .....	3-4
Grounding .....	3-5
Antenna Recommendations .....	3-6
Antenna Mounting .....	3-7
System Pressurization .....	3-9
System Cabling Requirements.....	3-10
Cable and Waveguide Connections .....	3-13
Basic System Alignment.....	3-16

Setting the Tx and Rx Frequencies .....	3-17
Transmit Power Alignment.....	3-18
Transmit RF Output Adjustment with Modem or Converter (70 MHz to L-band).....	3-18
Final Checks.....	3-19

## Chapter 4, Operations

Introduction.....	4-1
Start-up Checklist.....	4-1
Turning On the IBUC .....	4-2
Setting Operating Parameters .....	4-2
Setting the Tx Frequency (L-band).....	4-4
Setting Alarm Thresholds .....	4-4
Configuring Alarm States .....	4-5
Configuring ALC/AGC .....	4-5
Configuring the External Mute .....	4-6
Common Errors.....	4-7
LED is Red.....	4-7
No Power to the IBUC <b>3</b> or IBUC <b>3G</b> .....	4-7
Time Stamp Data is Incorrect .....	4-8
Satellite Network Operations Center Doesn't Recognize Signal .....	4-8
Transmit Power in Saturation .....	4-9
Tx Input/Output Level Verification.....	4-9

## Chapter 5, Monitor and Control Features

Introduction.....	5-1
M&C Interfaces.....	5-1
RS232.....	5-1
Hand-held Terminal.....	5-2
Multifunction LED .....	5-3
Frequency Shift Keying (FSK) Modem Interface .....	5-4
RS485.....	5-5
ASCII Mode.....	5-6
Legacy Binary Mode .....	5-7
Ethernet.....	5-8
Determining the IP Address of Your IBUC.....	5-8
Telnet .....	5-8
Web Server .....	5-9
SNMP.....	5-9
Power Measurement.....	5-10
Input Power Overdrive Protection .....	5-11



## Chapter 6, Troubleshooting

Maintenance .....	6-1
Transceiver Fault Isolation .....	6-1
Site-Related Problems .....	6-1
M&C Checks .....	6-1
Power Supply Checks .....	6-2
Transmit Power Setting .....	6-2
Common Problems .....	6-3
Tx Output is Disabled .....	6-3
Incorrect Frequency Settings .....	6-3
Damaged Cables .....	6-4
10 MHz Reference Signal is at the Wrong Level or Missing .....	6-4
Antenna is Pointed Toward Wrong Satellite or is Misaligned .....	6-5
Moisture Migrated Into the IBUC .....	6-5
Bad Orthogonal Mode Transducer and/or Antenna .....	6-6
LED is Red .....	6-6
Repair Policy .....	6-6
Returned Material Authorization (RMA) .....	6-7

## Chapter 7, Transmit Redundant Systems

Description .....	7-1
Interface for Tx Redundant (1+1) Systems .....	7-2
Component Description .....	7-4
Intelligent Block Upconverter .....	7-4
Tx 1+1 Interface Module .....	7-4
Waveguide Switch .....	7-5
Software .....	7-5
Installation and Setup .....	7-6
System Cabling Requirements .....	7-7
Tx 1+1 System .....	7-7
Tx 1+1 Interface Module .....	7-7
Cable and Waveguide Connections .....	7-11
Water-Resistant Wrap .....	7-12
Typical Initial Setup .....	7-12
Grounding .....	7-13
Antenna Recommendations .....	7-13
Tx Redundancy/PSUI Grounding Recommendations .....	7-14
System Alignment and Operation .....	7-14
General .....	7-14
Test Equipment .....	7-15
Setting the Tx Frequencies .....	7-15
Tx Power Alignment .....	7-15
Final Checks .....	7-16
M&C Setup .....	7-17
Tx Redundant System .....	7-17

General.....	7-17
Service and Maintenance .....	7-23
Standard Maintenance.....	7-23
Fault Isolation .....	7-23
M&C Functions .....	7-28
User Interfaces .....	7-28
RS485 in ASCII Mode.....	7-29
TCP/IP via Ethernet Cable.....	7-30
Repair Policy.....	7-30

## **Appendix A, Part Numbering Schema**

Identifying the Part and Serial Numbers.....	A-1
Decoding the Part Number.....	A-1

## **Appendix B, Using HyperTerminal**

Establishing a HyperTerminal Session .....	B-1
Using a Saved Connection .....	B-6
Ending a HyperTerminal Session .....	B-7

## **Appendix C, Embedded Web Pages**

Introduction.....	C-1
Screen Shots .....	C-4
Log In.....	C-4
Information Tab .....	C-4
Alarm Tab .....	C-6
Sensor Tab .....	C-9
Transmit Configuration Tab .....	C-10
Interface Configuration Tab.....	C-13
System Configuration Tab .....	C-16
Alarm Configuration Tab.....	C-18
Redundancy Configuration Tab.....	C-20
Event Log Tab .....	C-22

## **Appendix D, Hand-Held Terminal Menu Tree**

Menu Options.....	D-1
Info & Sensors .....	D-4
Tx .....	D-4
Alarm .....	D-5
Tx Thresholds .....	D-5
Interface .....	D-5
SNMP.....	D-6
System.....	D-6
Redundancy .....	D-7

## **Appendix E, Legacy Binary Command Message Structure**

Command Set.....	E-1
Legacy Response Message Structure.....	E-3
Data Field Definitions.....	E-5

## **Appendix F, ASCII Command/Response Structure**

Command Set.....	F-1
Common Commands .....	F-4
Transmit-Only Commands .....	F-24
Redundancy Commands .....	F-44

## **Appendix G, Component Specifications and Reference Drawings**

Reference Drawings.....	G-1
Data Sheets.....	G-7

## **Appendix D, Glossary**

Glossary of Terms .....	D-1
-------------------------	-----



# LIST OF TABLES

Table P.1	Typographical Conventions .....	P-1
Table 1.1	Satellite Operation Standards.....	1-2
Table 2.1	IBUC <b>3</b> Transmit Frequency Plans .....	2-3
Table 2.2	IBUC <b>3G</b> Transmit Frequency Plans.....	2-4
Table 2.3	External 10 MHz Reference Signal Parameters.....	2-8
Table 2.4	Internal 10 MHz Reference Signal Parameters.....	2-8
Table 2.5	Basic System Requirements.....	2-13
Table 3.1	Recommended Test Equipment .....	3-3
Table 3.2	Terrasat Outdoor Power Supplies .....	3-5
Table 3.3	Interface Connector Schedule .....	3-10
Table 3.4	Pin Assignments for M&C Interface Connector J2 .....	3-11
Table 3.5	Pin Assignments for DC Power Connector J3 .....	3-12
Table 3.6	Pin Assignments for Ethernet Connector J4 .....	3-13
Table 5.1	Default Alarm Configuration.....	5-3
Table 5.2	Transmitter Link Specifications.....	5-4
Table 5.3	Receiver Link Specifications .....	5-5
Table 5.4	ASCII Mode Command Format.....	5-6
Table 5.5	Legacy Binary Mode Packet Format .....	5-7
Table 5.6	Data Packet Byte Configuration .....	5-7
Table 6.1	Possible Scenarios for IBUCs with an External 10 MHz Reference Signal.....	6-4
Table 7.1	Tx 1+1 Interface Module Connector Schedule.....	7-8
Table 7.2	Pin Assignments for M&C Interface connectors J1, J2, and J3.....	7-9
Table 7.3	Pin Assignments for M&C Interface Connectors J4 and J6 .....	7-9
Table 7.4	Pin Assignments for M&C Interface connectors J5, J7, J8, and J10 .....	7-10
Table 7.5	Pin Assignments for M&C Interface Connector J9 .....	7-10
Table 7.6	Pin Assignment for M&C Interface connector J11.....	7-11
Table 7.7	Recommended Test Equipment .....	7-15
Table C.1	Default Values for Power Monitor Frequency.....	C-11
Table C.2	Default Values for the Burst Threshold .....	C-12
Table E.1	Commands .....	E-1
Table E.2	Response to commands 0x01, 0x02, 0x03, 0x04, 0x08, and 0xFF.....	E-3
Table E.3	Response to IBUC Commands 0x05 and 0x06 (When Data Byte 1 of Command Message = 0x00) .....	E-3
Table E.4	Response to IBUC Command 0x06 (When Data Byte 1 of Command Message = 0x01) .....	E-4
Table E.5	Response to IBUC Command 0x07 .....	E-4
Table E.6	Response to IBUC Command 0x09 .....	E-4
Table E.7	Data Filed Definitions.....	E-5
Table F.1	Alarm Mask .....	F-1
Table F.2	Alarm Flags.....	F-2



Table F.3	Error Response Table.....	F-2
Table F.4	Default Values for the TAH, TAL, and TBT Commands .....	F-33
Table F.5	Band Numbering.....	F-35
Table F.6	Default Values for the TFR Command.....	F-37

# LIST OF FIGURES

Figure 2.1	Front Panel of a IBUC <b>3</b> or IBUC <b>3G</b> .....	2-6
Figure 2.2	DC-powered Low-Power IBUC <b>3</b> Block Diagram.....	2-10
Figure 2.3	DC-powered IBUC <b>3</b> Block Diagram.....	2-11
Figure 2.4	DC Low Power IBUC System Configuration.....	2-15
Figure 2.5	DC Power IBUC System Configuration.....	2-16
Figure 3.1	Furnished items with IBUC <b>3</b> .....	3-2
Figure 3.2	IBUC <b>3</b> Field Installation.....	3-7
Figure 3.3	Location of Mounting Holes.....	3-8
Figure 3.4	IBUC In Line Mounting Configuration .....	3-8
Figure 3.5	Location of Adjustment Slots on Optional Mounting Bracket .....	3-9
Figure 3.6	Connector J1 Caution Symbol .....	3-11
Figure 3.7	Applying the Anti-Seize Lubricant.....	3-15
Figure 3.8	Waveguide Label and Channel for Gasket .....	3-16
Figure 5.1	Hand-held Terminal.....	5-2
Figure 7.1	Transmit Redundant System Setup.....	7-1
Figure 7.2	IBUC <b>3</b> Redundant System Diagram.....	7-3
Figure 7.3	Tx 1+1 Interface Module Block Diagram.....	7-5
Figure 7.4	Tx 1+1 Interface Module View.....	7-7
Figure 7.5	Multifunction LEDs for a Tx 1+1 System .....	7-22
Figure 7.6	Hand-held Terminal.....	7-29
Figure G.1	Fabrication Drawing, FBD-21012-XXXX, Rev A.....	G-2
Figure G.2	Fabrication Drawing, FBD-21984-XXXX, Rev B, page 1 of 2 .....	G-3
Figure G.3	Fabrication Drawing, FBD-21984-XXXX, Rev B, page 2 of 2 .....	G-4
Figure G.4	Example Installation Drawing, IND-10521-0017, Rev A.....	G-5



# REVISION HISTORY

<b>Revision</b>	<b>Date</b>	<b>Description</b>
A	1/26/2021	Initial Public Release
B	1/27/2021	Updated Chapter 2 figures







This manual provides information about the Terrasat Communications, Inc. line of intelligent block upconverters.

## Conventions and References

---

Before you start using this manual, 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 D, Glossary](#).

**Table P.1** Typographical Conventions

Convention	Description/Example
Emphasis	Used to emphasize the importance of a point. The IP Address <i>must</i> be a unique number.
Internal cross-references	References to a section in the same document are marked in blue and are hyperlinked. See <a href="#">Warranty Information</a> on <a href="#">page 1-5</a> .
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. <a href="#">IBUC Operations Manual</a> .
User-entered values	A special font marks text that you type. At the password prompt, type <code>MyPassword</code> .

## 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

Terrasat Communications Inc. is a registered trademark. Also, 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.

## INTRODUCTION

This manual is intended for users of Terrasat Communications, Inc. block upconverter systems including the IBUC **3** and IBUC **3G**. It contains information about

- Installation, operation, and maintenance of IBUC **3** and IBUC **3G** systems.
- Use of user interface protocols for remote monitor and control capabilities

### Block Upconverters

---

The term “intelligent” block upconverter (IBUC) refers to the advanced features and monitor and control capabilities of the entire line of Terrasat IBUC models. Each IBUC model includes automatic gain control (AGC) and automatic level control (ALC) features as well as internal diagnostics. Terrasat IBUCs also provide extensive monitoring and control through software commands and alarms providing access to the numerous operating parameters and features available in the unit. Access to features and monitor and control (M&C) functions is provided via several methods including a hand-held terminal, RS232, RS485, TCP/IP (Telnet, HTTP), UDP (SNMP) and FSK (Frequency Shift Keying) link via the IFL cable. Each IBUC model is also fitted with a multifunction LED for visual status indications.

## 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.
2014/53/EU	Radio (and Telecommunications Terminal) Equipment Directive (RED/RTTE)
ETSI EN 301 443 v2.1.1 (2016-05)	Satellite Earth Stations and Systems (SES); Harmonised Standard for Very Small Aperture Terminal (VSAT); Transmit-only, transmit-and-receive, receive-only satellite earth stations operating in the 4 GHz and 6 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU
ETSI EN 301 430 V2.1.1 (2016-05)	Satellite Earth Stations and Systems (SES); Harmonised Standard for Satellite News Gathering Transportable Earth Stations (SNG TES) operating in the 11 GHz to 12 GHz/13 GHz to 14 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU
ETSI EN 301 428 V2.1.2 (2017-05)	Satellite Earth Stations and Systems (SES); Harmonised Standard 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 the essential requirements of article 3.2 of the Directive 2014/53/EU
ETSI EN 301 360 V2.1.1 (2016-06)	Satellite Earth Stations and Systems (SES); Harmonised Standard for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit, operating in the 27,5 GHz to 29,5 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU
ETSI EN 301 459 V2.1.1 (2016-05)	Satellite Earth Stations and Systems (SES); Harmonised Standard for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit, operating in the 29,5 GHz to 30,0 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU
MIL-STD-188-164C	Interoperability of Super High Frequency (SHF) Satellite Communications Terminals.
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.

**Table 1.1** Satellite Operation Standards (Continued)

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 300 019-2-3	Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 2-3: Specification of environmental tests; Stationary use at weather protected locations
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
MIL-STD-810G	Environmental Engineering Considerations and Laboratory Tests.
2011/65/EU	Restriction of the use of certain hazardous substances (RoHS)
EN IEC 63000:2008	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
2015/863	Amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances
<b>EMC/EMI Standards</b>	
2014/30/EU	Electromagnetic Compatibility (EMC)
EN 55032:2015/AC:2016-07	Electromagnetic compatibility of multimedia equipment - Emission requirements
EN 55024:2010/A1:2015	Information technology equipment - Immunity characteristics - Limits and methods of measurement
EN 61000-3-2:2014	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase)
EN 61000-3-3:2013	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16$ A per phase and not subject to conditional connection
EN 61000-3-11:2000	Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current $\leq 75$ A and subject to conditional connection
EN 61000-3-12:2011	Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current $> 16$ A and $\leq 75$ A per phase
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test



**Table 1.1** Satellite Operation Standards (Continued)

EN 61000-4-3:2006/A2:2010	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
EN 61000-4-5:2014/A1:2017	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
EN 61000-4-6:2014/AC:2015	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-11:2004/A1:2017	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
EN 61000-4-34:2007/A1:2009	Electromagnetic compatibility (EMC) - Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase
ETSI EN 301 489-1 V1.9.2 (2011-09)	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 V3.1.1 (2019-04)	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 between 4 GHz and 30 GHz in the Fixed Satellite Service (FSS)
MIL-STD-461G	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
<b>Safety Standards</b>	
2014/35/EU	Low voltage (LVD)
EN 62368-1:2014/AC:2017-03	Audio/video, information and communication technology equipment - Part 1: Safety requirements (IEC 62368-1:2014, modified)
EN 60950-22:2017	Information technology equipment - Safety - Part 22: Equipment installed outdoors
EN 60529:1991/A2:2013/AC:2019-02	Degrees of protection provided by enclosures (IP Code)

## 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 thirty-six (36) 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 [Repair Policy](#) on [page 6-6](#)

# 2

## FUNCTIONAL DESCRIPTION

The Terrasat outdoor unit (ODU) consists of an intelligent block upconverter (IBUC **3**, IBUC **3G**), power supply unit (PSUI), and low-noise block converter (LNB) for use in satellite earth stations. The outdoor equipment is designed to interface directly with an L-band satellite modem.

### Introduction

---

This chapter contains detailed information about the various system components of the following IBUC **3** models:

- IBUC **3**: All of the original features of the IBUC **2** but in an even smaller, more cost-effective package that is ideal for applications where compact size, light weight, and low thermal dissipation are critical factors.
- IBUC **3G**: The compact physical size of the IBUC **3** powered by gallium nitride (GaN) technology. GaN devices like the IBUC **3G** can operate at much higher temperatures and work at much higher voltages than GaAs devices.

## System Components

---

The interfacility link (IFL) between the ODUs and the L-band modem uses 950 MHz to 2.0 GHz (L-band) as the interface frequency. This approach enables transmission and reception over the entire satellite band as opposed to a single transponder. The L-band IFL can also carry associated signals such as 10 MHz and DC voltage which simplify installation and reduce costs. Terrasat IBUC systems can be used for single channel per carrier/multiple channels per carrier (SCPC/MCPC), point-to-point, or point-to-multiple point network applications (such as voice, data, video, or IP services). The integrated RJ45 connector enables Telnet, SNMP and the embedded Web Pages for monitor and control purposes. Its smaller form factor and lighter weight make the IBUC **3** and IBUC **3G** ideal for situations where mobility is key. These smaller models can be carried in a backpack/case or mounted on antennas that can be quickly assembled and disassembled. See [Figure 2.4](#) on [page 2-15](#) through [Figure 2.5](#) on [page 2-16](#) for typical equipment configurations.

The IBUC **3** and IBUC **3G** are available in a variety of frequency bands as listed in [Table 2.1](#) and [Table 2.2](#). The IBUC houses the IF interface (demux), the upconverter, the monitor and control (M&C) card, a DC-to-DC converter and associated circuitry and a solid state power amplifier (SSPA) assembly. The IBUC can also house an optional internal 10 MHz reference signal module. Higher-power IBUCs also have an external cooling fan assembly. The input interface to the IBUC connects to a 50  $\Omega$  or an optional 75  $\Omega$  coaxial cable that carries the L-Band transmit signal. This IFL (interfacility link cable) interface can also carry an external 10 MHz reference for the oscillator signal band and DC power.



**Table 2.1** IBUC **3** Transmit Frequency Plans

Signal	Standard Ku-band (Band 1)	Full Ku-band (Band 2)
L-band (Inverting)	950 MHz to 1450 MHz	950 MHz to 1700 MHz
LO frequency (Inverting)	—	—
L-band (Non-Inverting)	—	—
LO frequency (Non-Inverting)	13.050 GHz	12.800 GHz
RF frequency	14.000 GHz to 14.500 GHz	13.750 GHz to 14.500 GHz
Output Power	8, 16 watts	8, 16 watts

**Table 2.2** IBUC **3G** Transmit Frequency Plans

Signal	Standard Ku-band (Band 1)	Full Ku-band (Band 2)
L-band	950 MHz to 1450 MHz	950 MHz to 1700 MHz
LO frequency (Inverting)	—	—
LO frequency (Non-Inverting)	13.050 GHz	12.800 GHz
RF frequency	14.000 GHz to 14.500 GHz	13.750 GHz to 14.500 GHz
Output Power	25, 40 watts	25, 40 watts

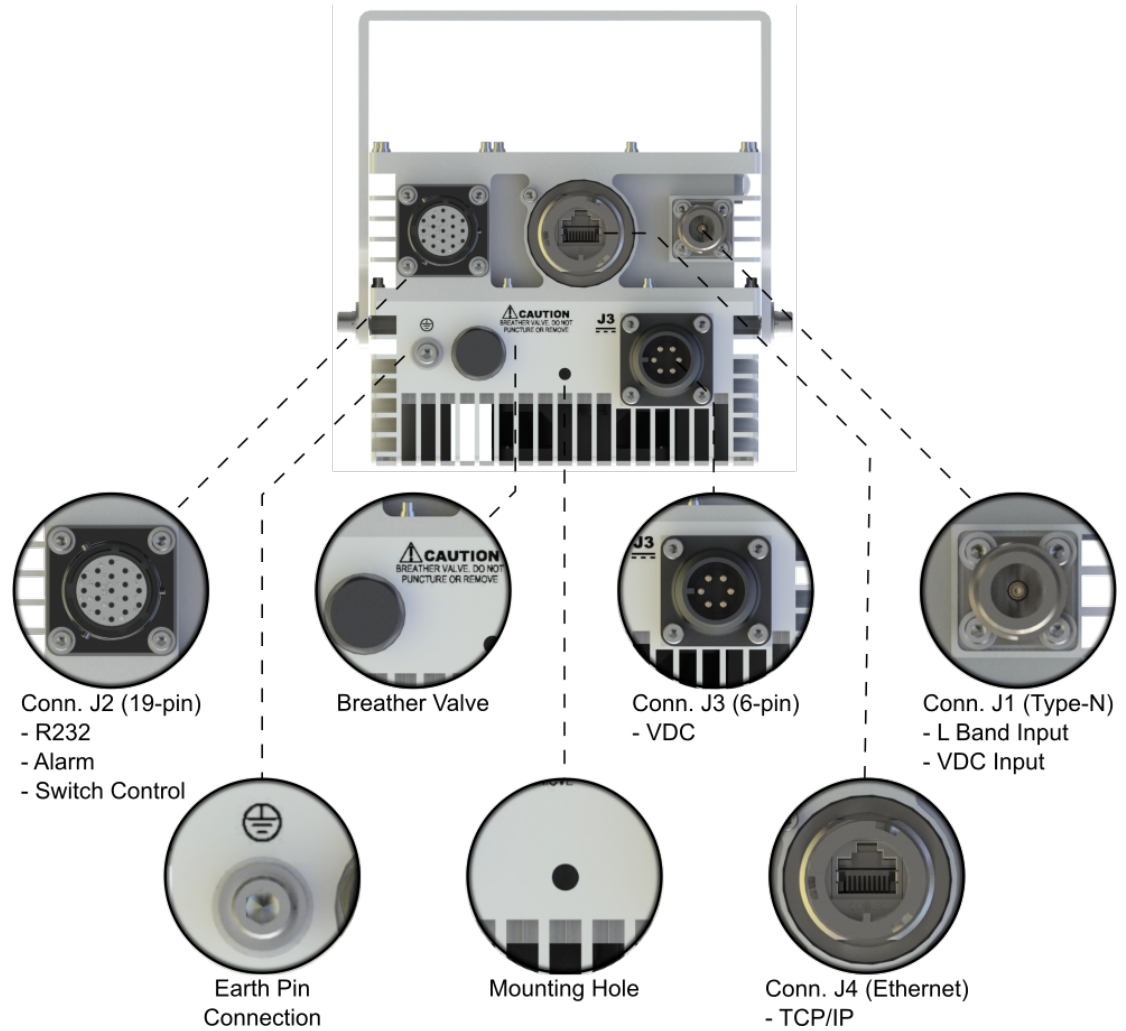
## DC Supply

---

DC power can be supplied through the N-connector or F-connector of the L-band input (labeled J1) or through the external power connector (labeled J3). For low-power units (such as Ku-band 16 watts and below), DC power can be delivered by either input J1 or input J3. For higher-power units (such as Ku-band 25 watts and above), DC power delivery is restricted to the external power connector J3.

Terrasat IBUCs have several supply voltage options. The standard configuration is 48 VDC. However, a 24 VDC option is available for lower power units. Refer to the datasheets in [Appendix G](#) for more information. This choice of 24 VDC or 48 VDC is available only when the IBUC is ordered and configured at the factory. The operating voltage range for the 24 VDC option is 20 VDC to 36 VDC. The operating voltage range for the 48 VDC option is 38 VDC to 76 VDC. Notice that DC-powered units are configured at the factory to have floating input.

Note: For more information about connector types, breather valve system and mounting options, refer to sections: [System Cabling Requirements](#) on page 3-10, [System Pressurization](#) on page 3-9 and [Antenna Mounting](#) on page 3-7 respectively.



**Figure 2.1** Front Panel of a IBUC **3** or IBUC **3G**

## Monitor and Control

---

Each IBUC is equipped with extensive monitor and control (M&C) capabilities. Such capabilities can be accessed via:

- the M&C 19-pin circular connector J2 utilizing two-wire RS485. This method requires that a separate cable be run and connected to J2.
- the J2 connector using RS232. This method requires that a separate cable be run and connected to J2.

[Figure G.1](#) on [page G-2](#) contains a drawing for fabricating your own cable.

- the J4 connector using TCP/IP. This method requires a separate Ethernet cable.

[Figure G.2](#) on [page G-3](#) contains a drawing for fabricating your own cable.

- the L-band input N-connector or F-connector J1, utilizing Frequency Shift Keying (FSK). Using this method requires no additional cables but does require that the FSK be multiplexed onto the L-band cable.

Note: Some modem manufacturers offer built-in FSK capabilities for communicating with the IBUC through the L-band IFL. Refer to the modem manufacturer's documentation for more information.

## RF Signal Flow

---

L-band input to the IBUC is through the J1 connector (Type N or Type F). Required inputs include an L-band signal at -20 dBm or less and a 10 MHz sine wave reference signal between +5 dBm and -12 dBm (for those units that do not have the optional internal 10 MHz reference signal).

The US National Institute of Standards and Technology defines single sideband (SSB) phase noise as the ratio of the spectral power density measured at an offset frequency from the carrier to the total power of the carrier signal. The phase noise unit of measure most generally used has been the single sideband power within a one hertz bandwidth at a frequency  $f$  away from the carrier referenced to the carrier frequency power. This unit of measure is represented as  $\mathcal{L}(f)$  in units of dBc/Hz. An internal phase-locked Local Oscillator provides excellent phase noise when locked to an external 10 MHz reference. Single sideband phase noise using an external reference signal is listed in [Table 2.3](#).

**Table 2.3** External 10 MHz Reference Signal Parameters

Condition	External Reference	IBUC 3, IBUC 3G
10 Hz	-115 dBc/Hz	-50 dBc/Hz
100 Hz	-140 dBc/Hz	-65 dBc/Hz
1 kHz	-150 dBc/Hz	-80 dBc/Hz
10 kHz	-155 dBc/Hz	-85 dBc/Hz
100 kHz	n/a	-90 dBc/Hz
1 MHz	n/a	-115 dBc/Hz

The internal 10 MHz reference signal meets the minimum phase noise requirements listed in [Table 2.4](#).

Note: If an external 10 MHz reference signal is applied to a unit with the optional internal 10 MHz reference signal, the external signal has priority. When the external signal is removed from such units, the system automatically reverts to the internal 10 MHz signal, requiring no additional user input.

**Table 2.4** Internal 10 MHz Reference Signal Parameters

	Minimum	Maximum	Condition
Phase Noise		-125 dBc/Hz	10 Hz
		-145 dBc/Hz	100 Hz
		-160 dBc/Hz	1 kHz
		-165 dBc/Hz	10 kHz
Frequency Stability vs. Operating Temperature Range (referenced to frequency at +25 °C)	-30 ppb	+30 ppb	-40 °C to +85 °C
Tuning Range (referenced to nominal frequency)	±1 ppm	±1 ppm	
Tuning Slope	Positive		

Input to the IBUC includes DC voltage (via the J3 connector) or DC voltage for low-power units and FSK signal via the J1 connector. The input (L-band, 10 MHz, and DC via coaxial cable) is routed to the demultiplexer circuitry where the various signals are split off and routed to the appropriate circuits within the IBUC. The input voltage from the demultiplexer circuitry is routed to the power supply and the FSK signal is routed to the M&C card.

The external 10 MHz reference signal is routed to the multiplier circuitry where its level is first detected and an alarm issued if the signal is low. However, if the signal level is low and the system is equipped with the optional internal 10 MHz signal, the system will automatically switch to the internal 10 MHz signal. The 10 MHz signal is then multiplied to the frequency used for phase-locking purposes. The output of the multiplier is routed to the Synthesizer's reference input. From this input, the signal is processed and routed internally within the Synthesizer to the phase comparator circuitry where the charge pump produces a control signal that will pass through a loop filter and drive the VCO Core via the Vtune input. The output signal is then automatically chosen from one of the multiple output stages. The Synthesizer has been optimized for phase noise at multiple frequencies based on the frequency band of that particular IBUC. The output of the Synthesizer is amplified and routed to the mixer.

The L-band signal that is split off in the demultiplexer circuitry is first filtered and a sample of it detected for input power detection and control purposes. The signal is then amplified, and goes through a variable attenuator. The attenuation is used to provide an attenuation adjustment of 30 dB in 0.1 dB steps and to provide automatic level control (ALC) or automatic gain control (AGC).

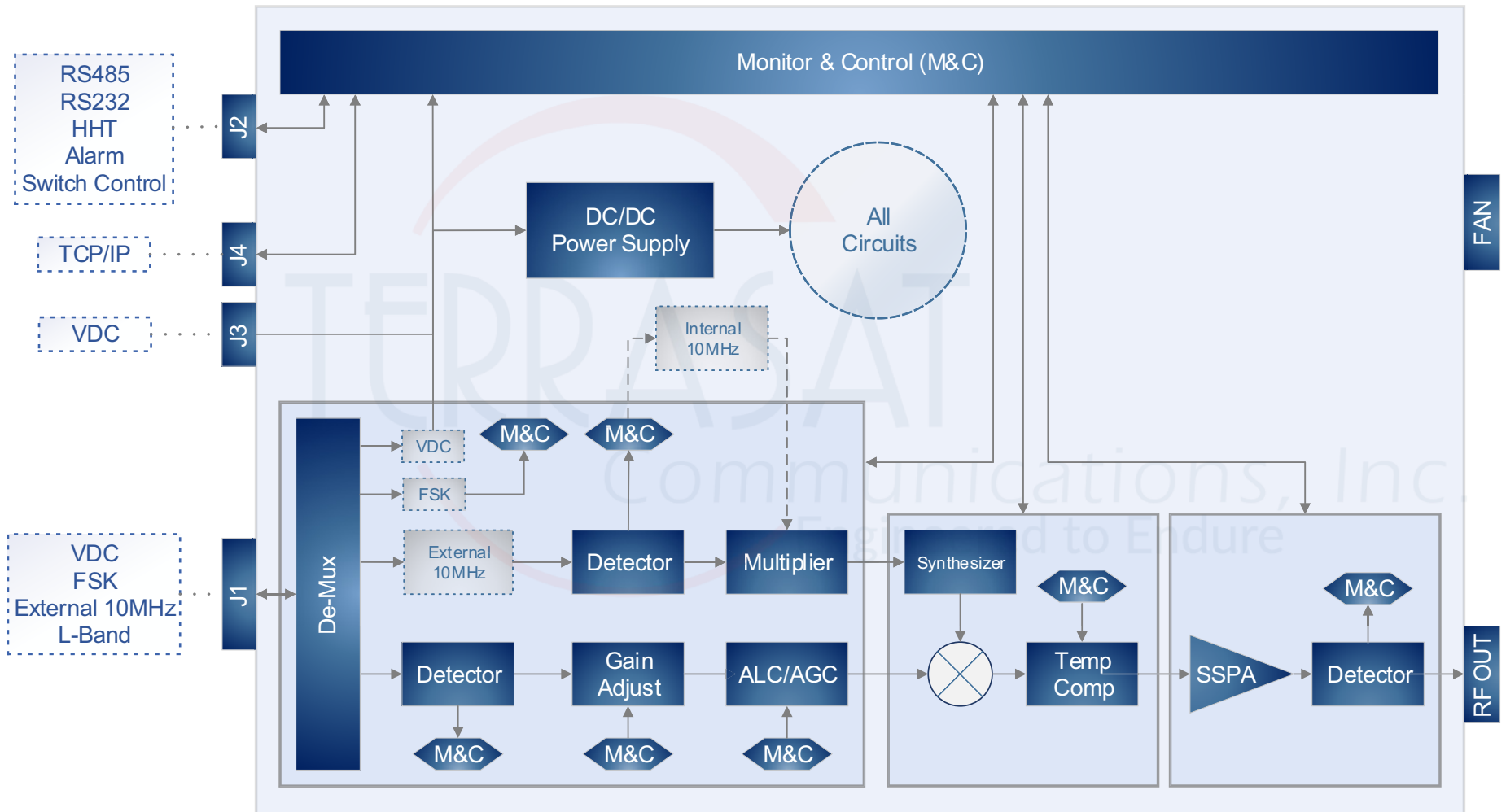
After additional amplification and filtering, the signal is routed to the mixer. The L-band signal is then mixed with the Synthesizer signal to “upconvert” to the appropriate RF signal based on the frequency band of the IBUC. The RF signal is filtered, amplified, and then routed to the temperature compensation circuitry. The temperature compensation circuitry has been calibrated so that the IBUC gain does not vary more than 3 dB at any given frequency.

Note: Some units can vary up to 4 dB at any given frequency.

The signal is then routed through an isolator to the solid-state power amplifier (SSPA). Some models have an additional mechanical filter between the isolator and the SSPA. The SSPA amplifies the signal which is then routed to the output through an isolator for reverse power protection. The RF output is detected for M&C purposes. The IBUC gain has been calibrated so that at minimum attenuation, a -30 dBm input results in rated power of at least  $P_{1dB}$  at the output at any frequency or temperature, for GaAs units. For GaN units the IBUC gain has been calibrated so that at minimum attenuation, the small signal gain is, at a minimum,  $(P_{SAT}+31)$ dB.

To operate at lower power levels, reduce the input to the IBUC or reduce the IBUC gain by using the variable attenuator. Such feature is accessible through any of the M&C interfaces. The output of a Ku-band IBUC is a WR75 cover with groove waveguide.

Figure 2.2 depicts the signal flow for units that are DC powered low energy consumption units, while Figure 2.3 depicts the signal flow for units that are DC powered.



**Figure 2.2** DC-powered Low-Power IBUC3 Block Diagram



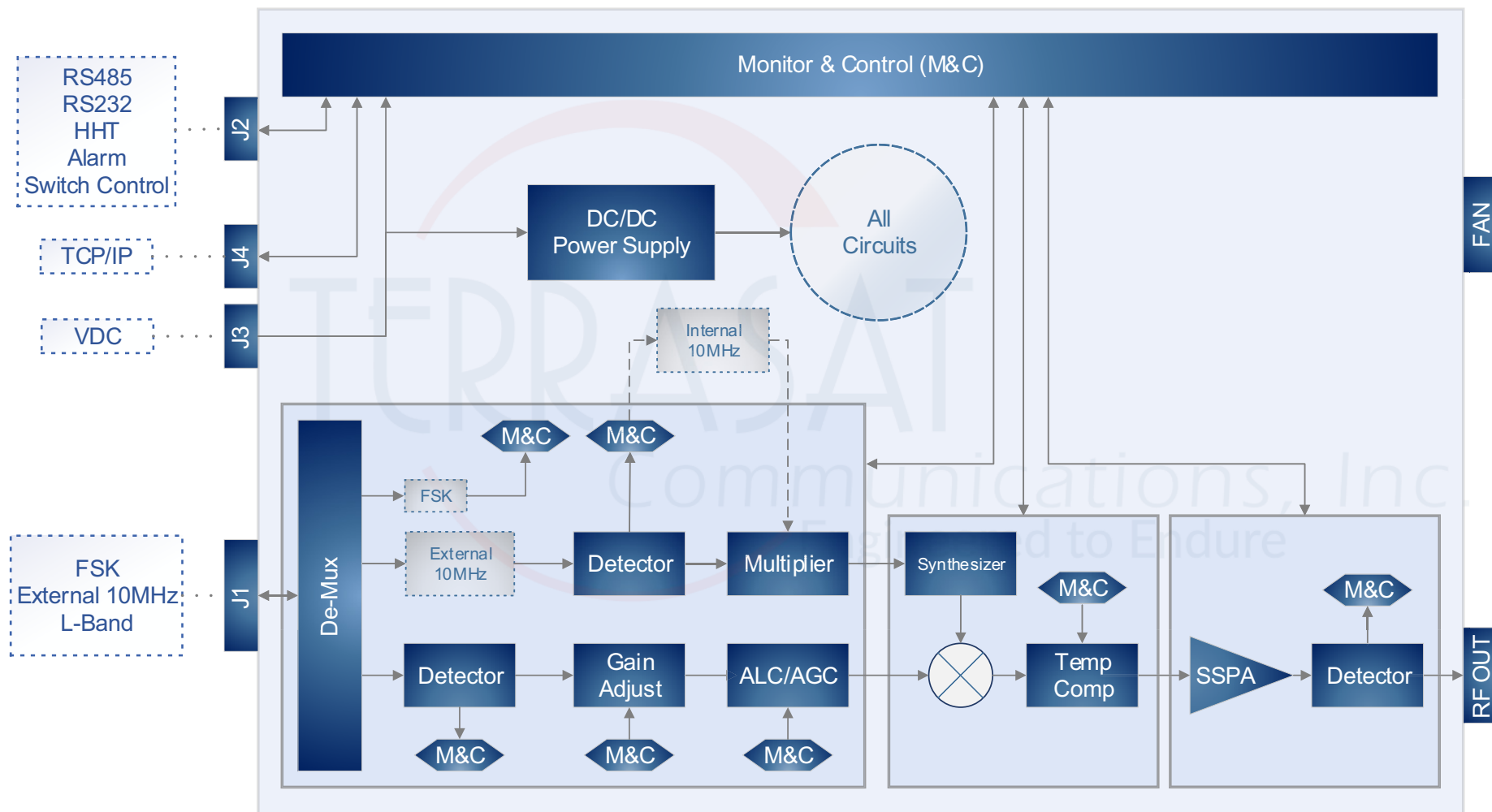


Figure 2.3 DC-powered IBUC3 Block Diagram

## Software

---

The IBUC **3**, IBUC **3G** monitors and controls numerous parameters and has features which simplify installation, use, and enhance system performance. Some of these key features include:

- Monitor and Control

The IBUC can be monitored and controlled through several interfaces including RS232, RS485, Ethernet port, an optional hand-held terminal, or via an FSK link with compatible modems. The FSK link is multiplexed on the L-band IFL thus eliminating the need for an additional cable and simplifying installation. See [Chapter 5, Monitor and Control Features](#), for a full description of these functions.

- Tx Attenuation

The gain of the unit can be set over a 30 dB range in 0.1 dB steps.

- Automatic Gain Control (AGC)

The IBUC continuously monitors input and output levels. When AGC is enabled, the gain of the system is maintained at a constant level by an internal algorithm. Gain is the difference between output power and input power.

- Automatic Level Control (ALC)

Similar to the AGC system, when ALC is enabled, the gain is adjusted to maintain a constant output level.

- Redundancy

The IBUC automatically senses when configured as a redundant system. This logic is built-in, eliminating the need for an external switching controller.

- Embedded Web Pages

Provides management for small networks by using a Web browser.

- Input Power Overdrive Protection

Based on internal selectable stable references, transistor overdrive will be measured and automatically assessed. Terrasat's algorithm allows the input overdrive point to be up a few dB higher than the device's reference point. For GaN devices, Input Overdrive Protection will be triggered above 6dB; for GaAs devices, protection will be triggered above 2dB. If such condition is met, internal attenuators will be activated to limit power delivery. For more detailed information, refer to [Input Power Overdrive Protection](#) on [page 5-11](#).

- Simple Network Management Protocol (SNMPv1 & SNMPv2c)

Provides integration of IP M&C in existing network management systems.

- Burst Operation

Enables operation in burst mode. The IBUC reports peak output power of valid bursts (above a burst threshold) when in burst mode.

- **Event History (with time stamps)**  
A log of events that occur is maintained. This can simplify troubleshooting of the system (especially when an intermittent problem occurs).
- **Sensors**  
A series of internal sensors enable one to verify performance and troubleshoot the system. Sensors include internal temperature, 10 MHz input detector, supply voltage, current consumption, Synthesizer lock voltage, input level and output level.
- **Statistic History**  
A log of system core statistics is automatically gathered and maintained. This resource can simplify troubleshooting of the system. For a complete list of which variables are gathered, refer to command [SHL](#) on [page F-28](#).
- **Transmit Key Line**  
Both IBUC **3** and IBUC **3G** are Transmit Key Line compatible, enabling significant power reduction by directly turning off the IBUCs internal SSPA. This feature further increases the IBUC **3** lineup compatibility with Communications-On-The-Move (COTM) and emergency response applications in the field.

## System Configurations

[Figure 2.4](#) and [Figure 2.5](#) show typical earth station installations using Terrasat block upconverters. In normal operation, the IBUC and the low-noise block downconverter (LNB) are mounted outdoors. Depending on the model of the IBUC, the PSUI can be mounted indoors or outdoors. The IBUC and the LNB can interface directly with a satellite modem, a 70 MHz to L-band rack converter or modem combiner network. [Table 2.5](#) lists the requirements for proper operation.

**Table 2.5** Basic System Requirements

IBUC	LNB
DC supply	DC supply
~ from the modem	~ from the modem
~ from the outdoor PSUI	10 MHz reference signal
~ from the indoor PSUI	~ internally referenced
~ from the telecom station	~ externally referenced
10 MHz reference signal	~ free running
~ internally referenced	RF input
~ externally referenced	~ from the antenna
L-band signal	

Certain considerations must be made when selecting the IFL because appropriate shielding and signal levels are required for normal system operation. The IBUC **3** and IBUC **3G** are designed to operate with a -30 dBm Tx L-band input signal to achieve rated power at maximum gain/minimum attenuation. Both IBUC **3** and IBUC **3G** provide a variable attenuator that is accessible through the various M&C interfaces that enables the gain of the unit to be reduced by up to 30 dB in 0.1 dB steps. The attenuator can be used to prevent overdrive to the IBUC in configurations with a short cable run (or IFL), thus preserving the dynamic range of the modem. In addition, the externally referenced IBUC and the externally referenced LNB must have a 10 MHz input signal at +5 dBm to -12 dBm for the IBUC, and 0 dB to -10 dBm for the LNB. The maximum voltage drop for a 24 VDC IBUC is 4 volts and the maximum drop for a 48 VDC IBUC is 11 volts.

Note: The system configurations in [Figure 2.4](#) to [Figure 2.5](#) depict an external 10 MHz reference signal; however, an optional internal 10 MHz reference signal is available.

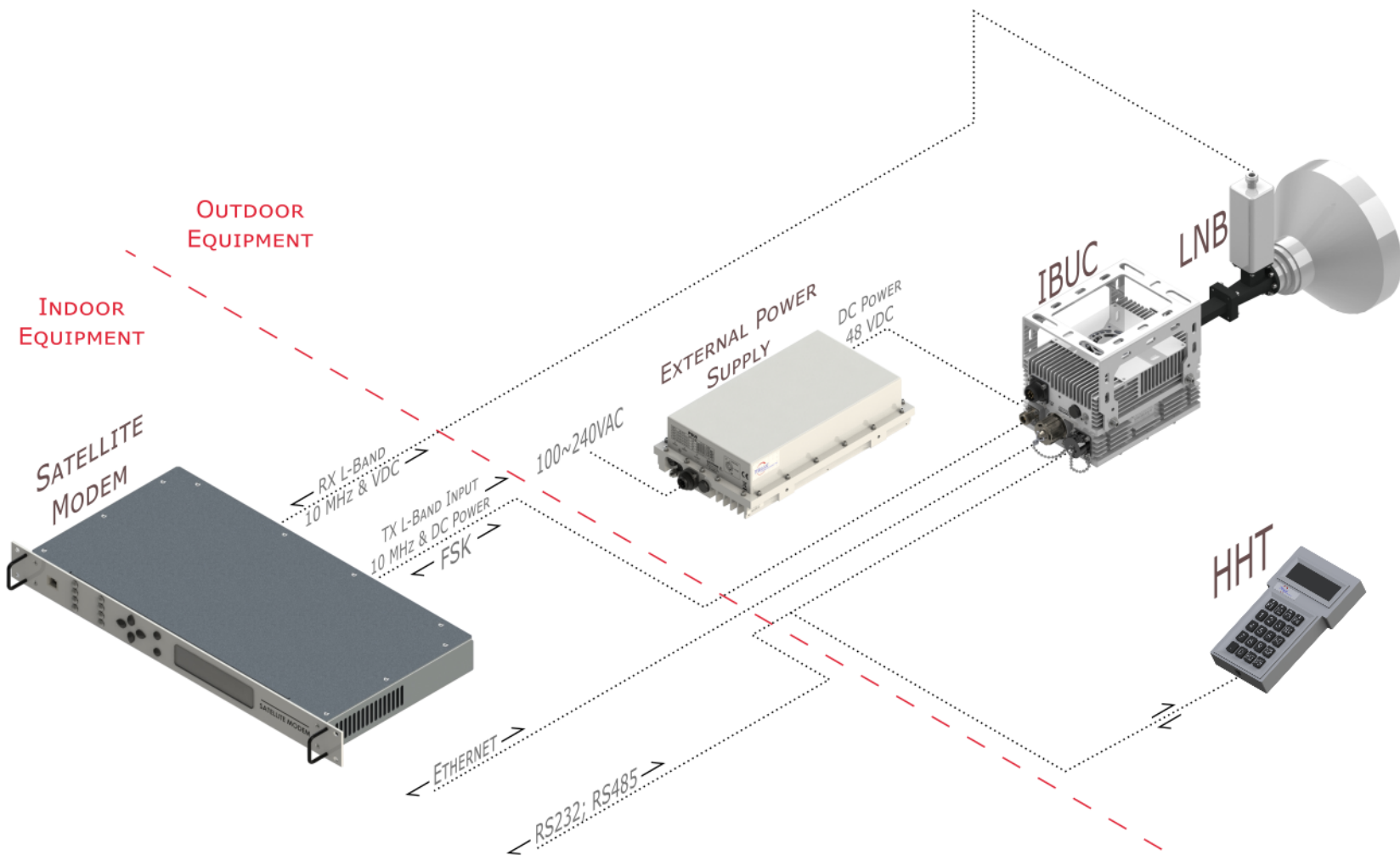
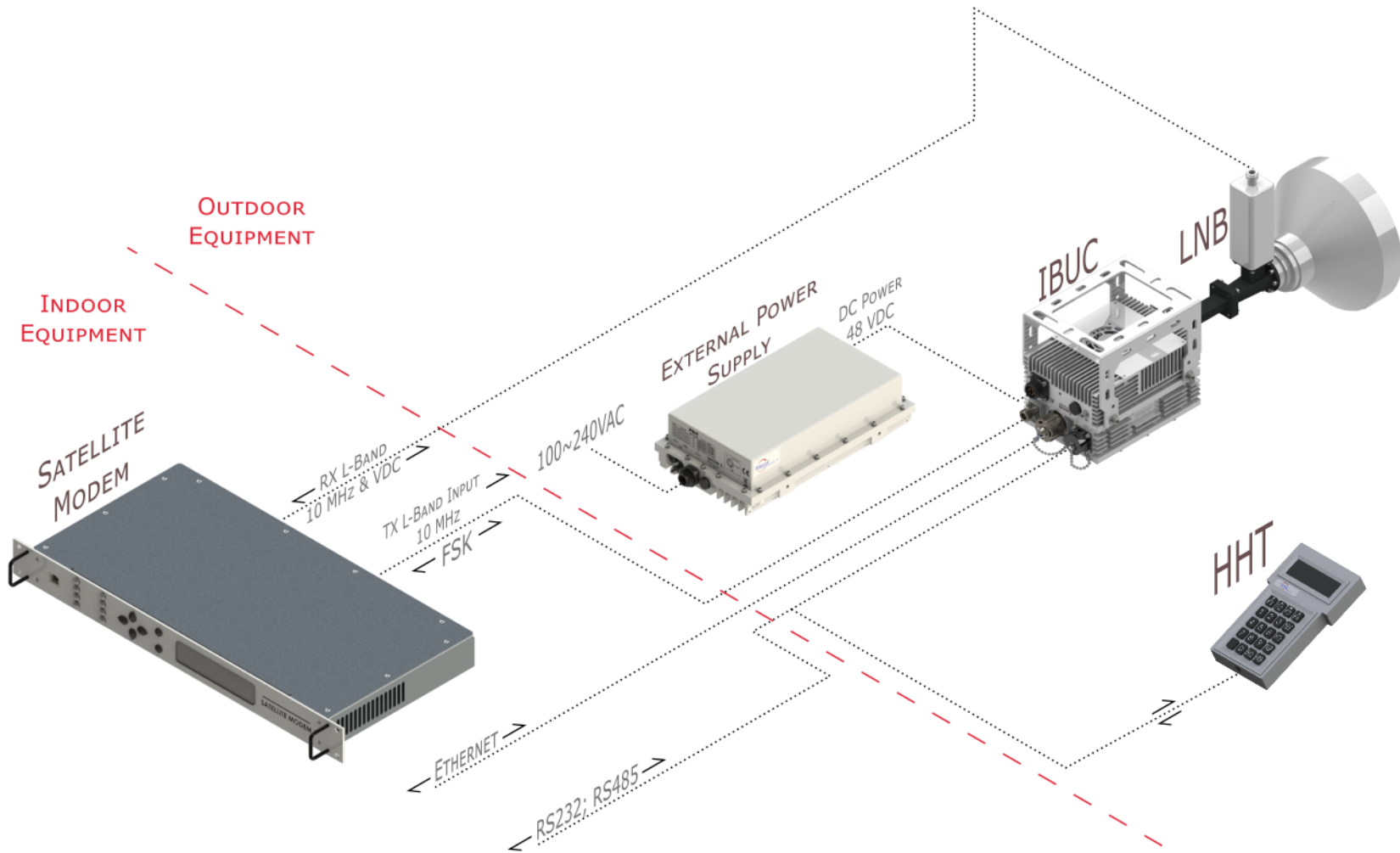


Figure 2.4 DC Low Power IBUC System Configuration



**Figure 2.5** DC Power IBUC System Configuration

## Storage Information

---

There are no storage limitations on the IBUC **3** or IBUC **3G**, or Redundant (1+1) interfaces for redundant systems other than avoiding excessive exposure beyond the -45 °C to +65 °C external ambient temperature.





# INSTALLATION

This chapter contains the general requirements for installing the Terrasat outdoor unit (ODU).

## Introduction

---

The ODU consists of an intelligent block upconverter (IBUC) and a low-noise block converter (LNB). An power supply (PSUI) can also be part of the configuration.

## 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 or power tools.

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

### Unpacking

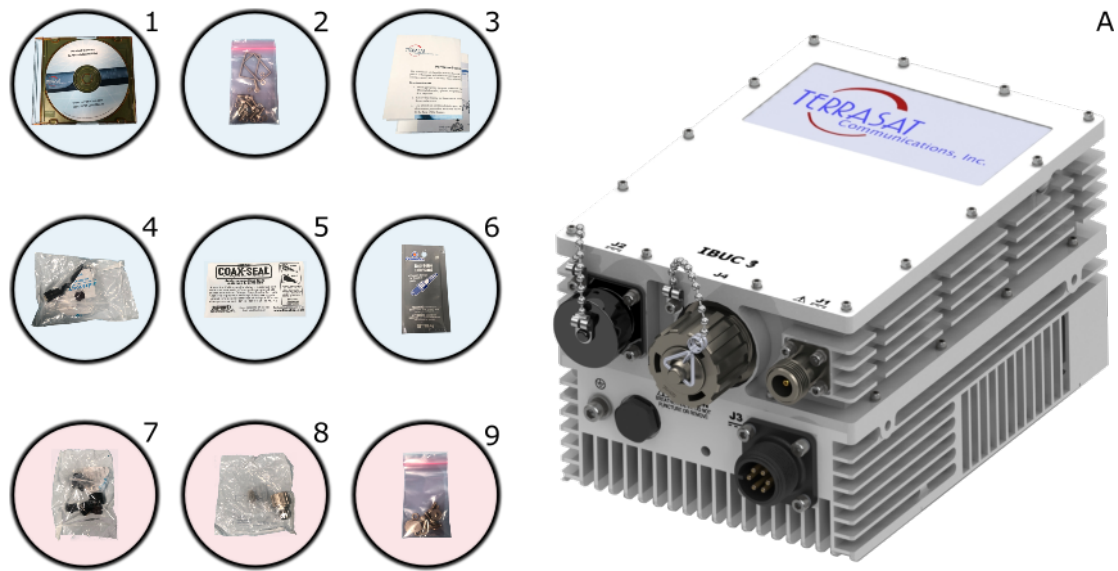
Check to make sure the ODU has not been damaged in shipment. If there is any damage, contact the shipper before proceeding. If you need to declare any equipment as damaged during transit, save the original shipping cartons to ease inspection reporting.

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 that all items have been received. If any item is missing, contact Terrasat.

## Furnished Items

The following list describes items that are furnished with Terrasat Communications, Inc. IBUC's. Refer to [Figure 3.1](#) for visual representation of such items.



**Figure 3.1** Furnished items with IBUC **3**

A. An IBUC **3** or IBUC **3G** with an integrated solid state power amplifier (SSPA)

1. Product documentation on CD
2. Waveguide gaskets and hardware (waveguide units only)
3. Test datasheet
4. DC supply mating connector (for units with DC supply)

[Figure G.4](#) on [page G-5](#) contains information about fabricating your own DC supply cable.

5. Sealing tape for Type-N connector
6. 5 g pouch of Permatex anti-seize lubricant

The anti-seize lubricant is a heavy duty high-temperature lubricant that prevents galling (friction between metal parts that can weld the nut and bolt together and prevent removal), seizing, and corrosion of fasteners during assembly and aids the disassembly of parts exposed to heat or corrosive environments.

7. [Optional] 19-pin monitor and control (M&C) mating connector
8. [Optional] IP67 industrial RJ45 mating connector
9. [Optional] Mounting brackets and bolts. See [Figure 3.5](#) on [page 3-9](#).

## Accessories

The following are optional accessories:

- A hand-held terminal and cable
- A waveguide Rx reject filter
- A four-way combiner/divider module
- A TCP/IP test cable
- Waveguide pieces
- IFL cables (for example, LMR-400)
- Installation kits

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

## Installing the ODU

---

Consider the following when preparing to install the ODU.

### Tools

Have available a standard electrician’s toolkit and any tools listed in the antenna manufacturer’s installation instructions.

### Test Equipment

Terrasat recommends the equipment or its equivalent listed in [Table 3.1](#) for installation and system alignment.

**Table 3.1** Recommended Test Equipment

Equipment	Type
Spectrum Analyzer	Agilent HP8563E
Digital Voltmeter	Fluke 8050
Waveguide-to-coaxial Adapter	C-band or Ku-band
RF cables	With calibrated insertion loss up to 15 GHz
40 dB attenuator	High power to match HPA output
Assortment of cables, connectors and adapters (calibrated up to 15 GHz)	

### Site Considerations

The ODU 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. Use size 3/0 or 4/0 AWG

(American Wire Gauge) stranded copper wire to ground the IBUC **3** or IBUC **3G** to the antenna frame and to the lightning protection ground rod. For higher power units with an external power supply, Terrasat recommends using an isolation filter to reduce power line interference.

## Mounting Considerations

Optional mounting brackets are available to aid mounting on most antennas. The ODU must be mounted such that:

- The IBUC has sufficient support to minimize the effects of antenna sway in strong winds.
- The fan intake and exhausts are free from any obstructions.
- The heat fins have air movement across them.

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.

## Power Requirements



# WARNING

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

For rated power levels of 16 watts and below for Ku-band the power for the IBUC can come either from the IFL supplied from the Terrasat indoor unit (IDU) equipped with a 200 watts power supply or from a satellite modem equipped with a suitable power supply. DC power for these lower power IBUCs can also be supplied directly through the external power connector (J3) by using the Terrasat 250 watts external power supply. Refer to the part number label (shown in [Figure A.1](#) on [page A-1](#)) to determine voltage requirements. Ensure that 24 VDC input voltage is from 20 VDC to 28 VDC and that the 48 VDC input is from 37 VDC to 60 VDC.

## Outdoor Power Supply

Terrasat offers four models of outdoor power supplies. DC-powered IBUCs with a rated power level higher than 16 watts Ku-band require a separate power supply. Units that get their power from the earth (or telecom) station do not require an external power supply. [Table 3.2](#) lists the four outdoor power supply models and applications

for each. Power supplies have an autoranging AC front end that works with both 115 VAC and 230 VAC.

Note: The IBUC is configured at the factory to be floating. Ensure that the correct polarity is applied to any unit.

**Table 3.2** Terrasat Outdoor Power Supplies

Model	Output Power	Application
PSUI-948-0250S-4	250 W	<ul style="list-style-type: none"> <li>• C-band up to 25 W</li> <li>• X-band up to 25 W</li> <li>• Ku-band up to 16 W</li> <li>• Ka-band up to 16 W</li> </ul>
PSUI-948-600-4	600 W	<ul style="list-style-type: none"> <li>• C-band up to 80 W</li> <li>• X-band up to 80 W</li> <li>• Ku-band up to 50 W</li> <li>• Ka-band up to 40 W</li> </ul>
PSUI-948-1000-4	1000 W	<ul style="list-style-type: none"> <li>• C-band 100 W to 125 W</li> <li>• X-band 100 W to 125 W</li> <li>• Ku-band 60 W to 80 W</li> </ul>
PSUI-948-600-4	1200 W	<ul style="list-style-type: none"> <li>• C-band 150 W to 200 W</li> <li>• X-band 150 W to 175 W</li> </ul>

### Indoor Power Supply

Terrasat offers a 1000 watts indoor power supply unit (PSUI) which provides 48 VDC power. The 1000 watts PSUI can power C-band and X-band units through 125 watts, Ku-band units through 80 watts, and Ka-band units through 40 watts. Each indoor PSUI is packaged in a rack-mountable chassis which occupies one rack unit (1.75 in.) of space. The indoor PSUI is shipped with a mating connector for DC power and a power cord for AC mains.

Note: AC transients and surges can cause data transmission errors and loss of synchronization in the modem and/or the ODU. Take proper precautions to ensure uninterrupted service.

### 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 #4 gauge copper wire. This provides a path of least resistance prior to entering the 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 IBUC **3** or IBUC **3G** and PSUI units is recommended to prevent possible damage from lightning or other induced electrical surges. Terrasat recommends using 3/0 or 4/0 AWG stranded copper wire for bonding the IBUC and the PSUI to the earth ground (or grounding rod), using the most direct or shortest route.

## Antenna Recommendations

Most antenna masts are encased in concrete. Typically, the mast pipe is submerged in a 4 ft to 5 ft (1.22m to 1.53 m) deep augered hole. This provides a good Ufer ground. A Ufer ground encases grounding connectors in concrete. Concrete absorbs moisture quickly and loses that moisture slowly—as much 15 to 30 days after rain or snow melt). The mineral properties of concrete and their natural pH mean 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 in the concrete in combination with the “doped” soil make a good connector of electrical energy. The concrete’s large volume and 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 #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 (3.05m) ground rods placed 20 ft (6.1 m) into the ground, spaced 20 ft (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 of 1½-in. (3.81 cm) copper strap at least 50 ft (15.24m) 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 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.

## Antenna Mounting

The IBUC has a variety of mounting options: on the focal point, the boom arm, the antenna back structure, or in the hub (depending on the antenna type).

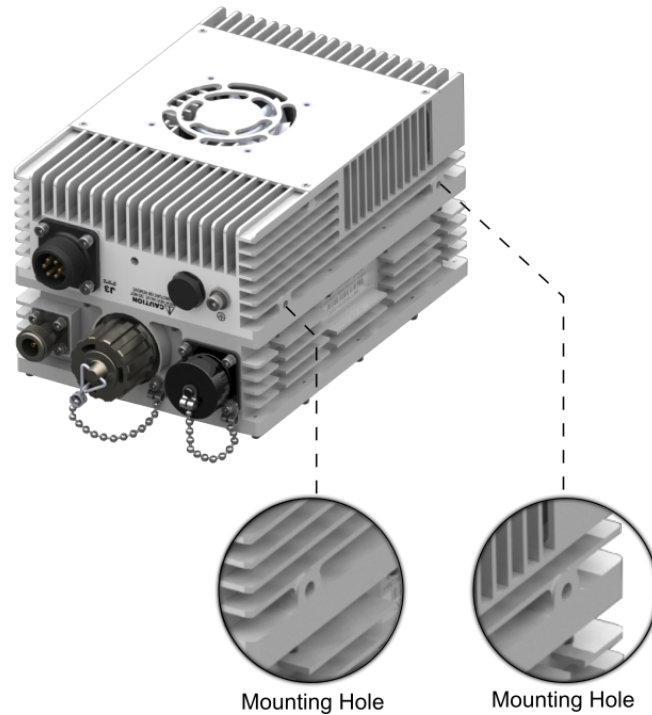
Note: [Figure 3.2](#) depicts photographs of actual installations.



**Figure 3.2** IBUC 3 Field Installation

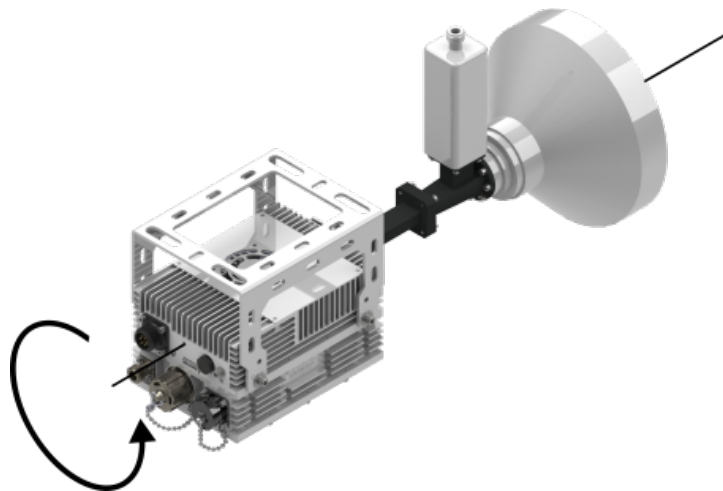


The IBUC **3** or IBUC **3G** have mounting holes on both sides of the unit that can be used to attach the IBUC to the antenna. For the location of these mounting holes, see [Figure 3.3](#).



**Figure 3.3** Location of Mounting Holes

There is also a single mounting hole located on the front of the IBUC that is identified in [Figure 2.1](#). This mounting hole is on the same axis as the center of the waveguide of the unit (that is, it is in line with the center of the waveguide). This single mounting hole enables the unit to be rotated when mounted on the focal point of an antenna.

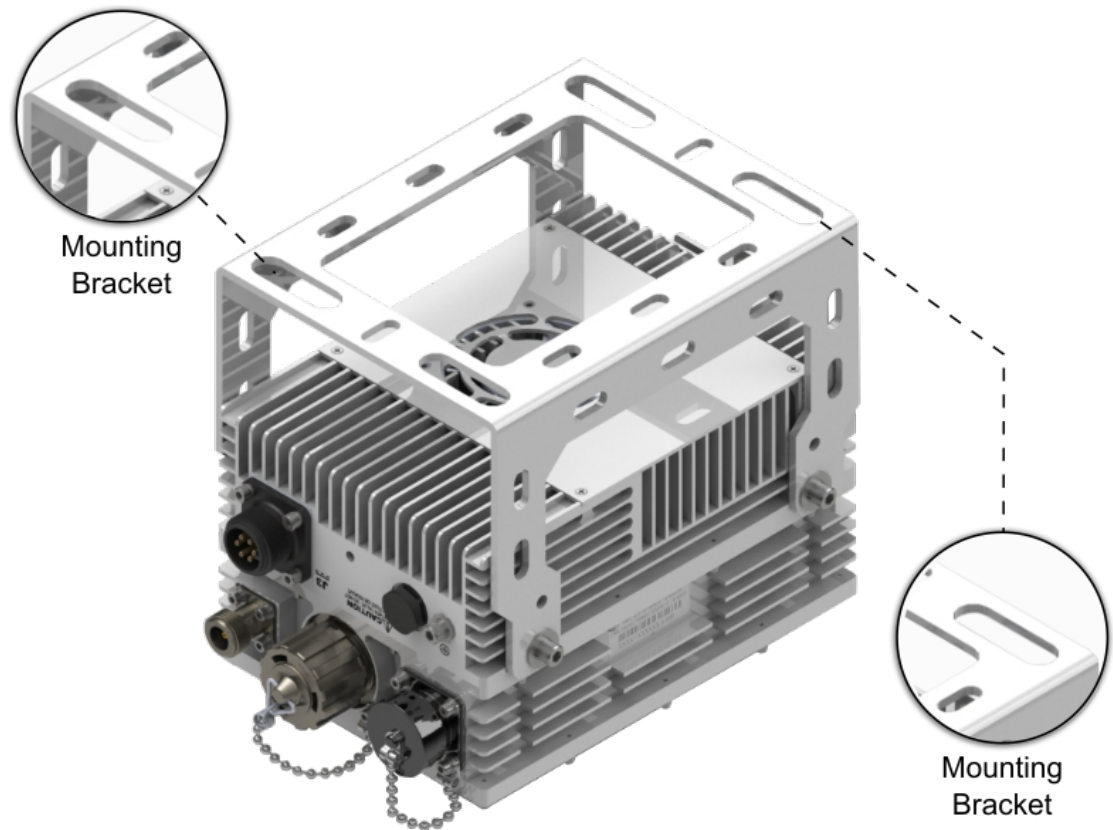


**Figure 3.4** IBUC In Line Mounting Configuration



Optional mounting brackets are available that aid in attachment to antennas. The mounting slots identified in [Figure 3.5](#) on [page 3-9](#) give you additional flexibility when attaching the IBUC to the antenna.

Note: Ensure that the threads of the bolts used for mounting the IBUC have been dipped in the included Permatex anti-seize lubricant. This prevents galling, seizing, and corrosion of fasteners during assembly and will aid in future disassembly. For more information about applying the Permatex lubricant, see [page 3-14](#).



**Figure 3.5** Location of Adjustment Slots on Optional Mounting Bracket

### System Pressurization

The IBUC chassis contains a breather valve (the location is identified in [Figure 2.1](#)) that is designed to equalize pressure inside and outside of the unit while allowing the passage of air or water vapor but not environmental contaminants such as liquids, debris, or dust. If you intend to pressurize the waveguide, you must install a pressure window at the output of the IBUC; otherwise the breather valve will not permit pressurization of the system.

## System Cabling Requirements

### Cables and Connectors

Interface connectors for the IBUC **3** or IBUC **3G** and their mates are listed in [Table 3.3](#). Additional mating connectors and/or cables can be ordered from Terrasat as optional items.

**Table 3.3** Interface Connector Schedule

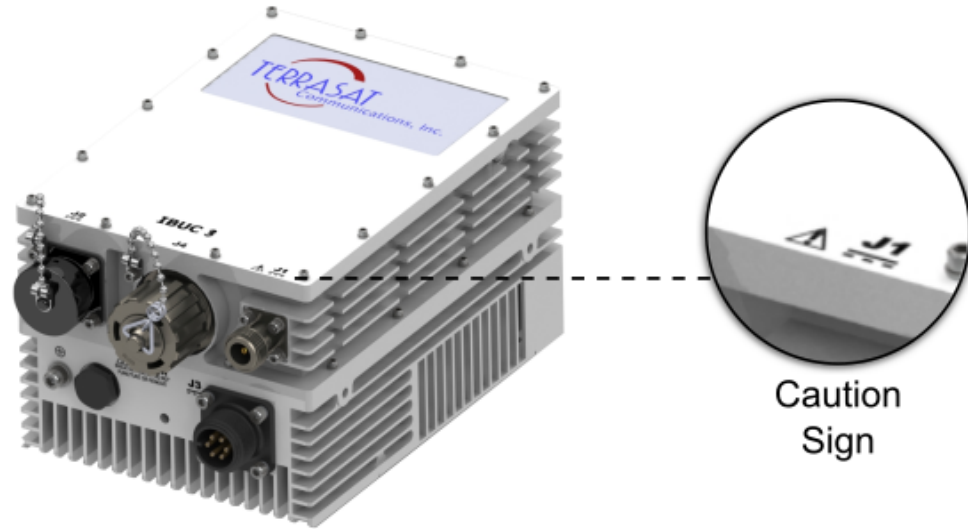
Reference Designator	Function	Interface Connector	Interface Connector Mate
J1	Tx Input	TYPE-N SOCKET (TYPE-F SOCKET optional)	TYPE-N PLUG (TYPE-F PLUG optional)
J2	M&C Interface	AMPHENOL CIRCULAR, BOX MOUNTING SOCKET, 19S (PT02E-14-19S (027))	AMPHENOL CIRCULAR, STRAIGHT PLUG, 19P (PT06E-14-19P (475))
J3	DC Power	AMPHENOL CIRCULAR, BOX MOUNTING SOCKET (ACS02E14S-6P (553))	AMPHENOL CIRCULAR STRAIGHT PLUG (ACS06E14S-6S(553))
J4 <sup>1</sup>	Ethernet	RJ45-IP67 SHIELDED INLINE CONNECTOR WITH CAP	RJ45-IP67 PLUG
RF Output	Ku-band	WR75 COVER FLANGE WITH GROOVE	WR75 COVER FLANGE

1. Ethernet port does **not** support PoE

**J1 – Transmit In** The Tx Input connector is a Type-N socket (Type-F socket, optional) connector used to connect the IF at L-band from the modem to the IBUC. Use 50  $\Omega$  cables (75  $\Omega$  for Type-F connectors) to connect to J1. Certain considerations must be taken when selecting the IFL because appropriate shielding and signal levels are required for normal system operation. The IBUC is designed to operate at rated power with a –30 dBm Tx L-band signal, with the variable attenuator set to minimum attenuation. The variable attenuator is accessible through the M&C interfaces for system gain adjustment. In addition, the IBUC must have a 10 MHz input signal from +5 dBm to –12 dBm (only for those IBUC models with an external 10 MHz reference signal). For IBUC models with both the optional internal reference signal and an external 10 MHz signal, the external signal will automatically receive priority without any user interaction.

For lower wattage IBUCs that are DC powered, the coaxial cable should be selected for its current carrying capacity. A lower wattage IBUC can draw up to 6.0 amps. The maximum voltage drop for a 24 VDC IBUC is 4 volts and the maximum voltage drop for a 48 VDC IBUC is 11 volts. The cable should also have good shielding effectiveness in order to prevent outside interference.

Note: The caution symbol, shown in [Figure 3.6](#), is printed on the chassis next to the J1 connector indicates that VDC may be present. In general, lower power IBUCs allow DC power via coaxial cable.



**Figure 3.6** Connector J1 Caution Symbol

Note: Fire codes may require that cables in occupied building be installed in steel conduit. Local government agencies may waive this requirement with the use of Plenum cables which are standard cables encased in solid Teflon. Check codes for your area.

Note: Equipment outages due to faulty installation are not covered by the Terrasat warranty. Terrasat recommends following OEM procedures when making cables and connectors.

**J2 – M&C Interface** The M&C interface is a 19-pin circular socket connector used to enable remote monitoring and control of IBUC operating parameters. Pin assignments are shown in [Table 3.4](#). If the M&C port of the IBUC is going to be used, the cable should be a shielded multi-conductor cable. For more information about fabricating your own cable, see the IP cable drawing in [Appendix G](#). An optional pre-assembled IP test cable is available from Terrasat.

**Table 3.4** Pin Assignments for M&C Interface Connector J2

Pin	Function
A	RS485(+)
B	RS485(-)
C	Hand-held Terminal Power(+)
D	RS232 RXD
E	RS232 TXD
F	HHT, RS232, RS485 Common

**Table 3.4** Pin Assignments for M&C Interface Connector J2 (Continued)

Pin	Function
G	Alarm Output
H	Redundant Sensor A, B
J	Keyline Enable (+)
K	Keyline Enable (-)
L	IBUC3 Alarm Output Normally Open
M	IBUC3 Alarm Output Common
N	IBUC3 Alarm Input
P	IBUC3 Alarm Output Normally Closed
R	1+1 Switch Command A
S	1+1 Switch Command B
T	1+1 Switch Indicator A
U	1+1 Switch Indicator B
V	1+1 Redundancy Enable

Note: Pin F is the return to close the circuit for RS232.

**J3 – DC Power** DC Power can be supplied to the IBUC through a 6-pin circular socket connector. Pin assignments are listed in [Table 3.5](#)

**Table 3.5** Pin Assignments for DC Power Connector J3

Pin	Function
A	VDC –
B	VDC –
C	VDC –
D	VDC +
E	VDC +
F	VDC +

Note: The IBUC is factory configured for floating supply. J3 is internally connected and has no VDC connection to Common.

Note: The operating voltage is integrated into the model number of each IBUC. For more information about the model number of your particular model IBUC, see [Appendix A, Part Numbering Schema](#).

**J4 – Industrial Ethernet Connector** The industrial Ethernet connector is an IP67-rated RJ45 Cat. 5e interface with a locking protective cover. The connector is configured as described in [Table 3.6](#).

**Table 3.6** Pin Assignments for Ethernet Connector J4

Pin	Function
1	TCP/IP Tx(+)
2	TCP/IP Tx(-)
3	TCP/IP Rx(+)
4	Not Used
5	Not Used
6	TCP/IP Rx(-)
7	Not Used
8	Not Used




## WARNING

The IBUC Ethernet circuit does not support Power Over Ethernet (PoE) functionality.

**RF Output** The types of waveguide used for various bands of the IBUC are listed in [Table 3.3](#) on [page 3-10](#).

### 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 an Rx reject filter is being used, attach it to the IBUC waveguide output. Use proper gasketing methods to prevent the entry of water.

### **Water-Resistant Wrap**

Terrasat recommends applying water-resistant wrap (such as mastic tape) to all outdoor connectors to prevent the entry of water 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 with any gaps.

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

### **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 aids in future disassembly. A 5 g pouch of Permatex anti-seize lubricant is included with the installation kit for this purpose.

To apply the anti-seize lubricant,

1. Wear appropriate person 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 3.7](#). The anti-seize should be applied right down to the base of the threads.



**Figure 3.7** 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.

### **Waveguide Connections**

If necessary, connect a section of flexible waveguide between the orthogonal mode transducer (OMT) transmit port and the IBUC Tx RF output (or 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.

**Note:** During installation, be sure to remove the sticker shown in [Figure 3.8](#) that covers the waveguide flange. The sticker itself does not create a pressure window and will allow moisture to enter the waveguide. Also be sure to install the waveguide gasket into the channel identified in [Figure 3.8](#) to ensure a good seal between surfaces. Do not re-use old gaskets.



**Figure 3.8** Waveguide Label and Channel for Gasket



## WARNING

The output of the IBUC is microwave power. Never look into the waveguide or put your head into the path of the beam that goes to the satellite.

### Basic System Alignment

---

The following sections outline the procedure for setup and alignment of an earth station. Before you align the ODU, the antenna should be set to the desired azimuth and elevation settings per the manufacturer's instructions.

Ensure that the IBUC Tx output power is disabled to prevent accidental transmission interference with adjacent satellite or transponders before attempting to align or perform any other operation involving the ODU. Before attempting any signal changes, carefully evaluate the possible effects of the transmitted signal.





## CAUTION

The IBUC must not transmit until alignment and any necessary adjustments are complete.

### Setting the Tx and Rx Frequencies

All transmit and receive frequencies are set in the modem.

If using a direct connection to an L-band modem, follow the manufacturer's 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 input.
2. Use a spectrum analyzer to ensure that the 10 MHz reference signal is present at the modem.



## 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's Rx input by attaching the coaxial cables from the Rx L-band output on the LNB to the demodulator's Rx L-band input port.

## Transmit Power Alignment

### Transmit L-band Input Adjustment with Modem or Converter



## WARNING

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

To set the power level of the modulator output,

1. Use a spectrum analyzer to measure the power level of the L-band signal at the output of the coaxial cable that connects to the IBUC at the Tx L-band connector J1.
2. Use the level adjust mechanism of the modem or converter to increase or decrease the power level. Adjust to reach a level of  $-30$  dBm. (All IBUC units are designed to reach rated power at P1dB over frequency and temperature with  $-30$  dBm at the input when the attenuator is set to minimum attenuation.) For some modems and shorter cable runs, it is not possible to reach  $-30$  dBm. In this case, the attenuator in the IBUC may be used instead.
3. Check that the 10 MHz reference signal is present and within the range of  $+5$  dBm though  $-12$  dBm.

Note: The IBUC **3** and IBUC **3G** require a 10 MHz reference signal to operate. Check the model number of your IBUC to determine whether an external 10 MHz signal is required.

4. Disconnect the spectrum analyzer from the coaxial cable.

### Transmit RF Output Adjustment with Modem or Converter (70 MHz to L-band)

To adjust the power level of the IBUC transmitter output,

1. Connect a waveguide-to-coaxial adapter and a 40 dB high-power attenuator to the IBUC waveguide output.
2. Ensure that DC power to the IBUC is applied in the proper voltage range. (Depending on your setup, this could be through the coaxial cable or through the J3 connector.)
3. Connect the Tx L-band input signal to the Tx L-band connector J1 on the IBUC.
4. Enable the Tx signals in the modem or converter and the IBUC.

5. Measure the RF output with a power meter connected to the attenuator attached at the waveguide output. For accuracy, measure pure carrier (that is, continuous wave or CW) and the frequency allotted to you by the satellite network operations center (NOC).
6. If the modem still has available range, use the level adjust mechanism to reach the designated power level. If there is no available range, use the attenuation setting on the IBUC instead.

Note: To set attenuation on IBUC, you first need to establish communication with the IBUC. For more information about the various M&C interfaces you can use to establish communication, see [Chapter 5, Monitor and Control Features](#).

7. If using a satellite modem, adjust the RF output to the designated power level (provided by the satellite network operations center or its engineering staff) with the L-band output (modem) level adjust mechanism.
8. Disable the Tx signal in the modem or converter.
9. Disconnect the Tx L-band input signal.
10. Remove the waveguide-to-coaxial adapter and install the transmit waveguide section to the antenna transmit feed.
11. Once the transmit input and output power levels have been set, begin transmitting by connecting the Tx L-band input signal to the J1 connector on the IBUC and enabling the Tx in the modem or converter.
12. Under the guidance of NOC staff, fine-adjust the transmit power for the desired down link margin at the receiving station by adjusting the Tx L-band output level adjust (modem or converter output) or by adjusting the gain of the IBUC by setting the Tx attenuator.

## Final Checks

---

To ensure reliable operation, inspect the system for crimped or pinched cabling. Make sure that all connections are secure and sealed. Once the system has been aligned and is operating satisfactorily, the IBUC will require infrequent maintenance.



# OPERATIONS

This chapter describes general operation of the IBUC **3** and IBUC **3G**.

## Introduction

---

After the IBUC has been mounted and connections verified, the antenna must be aimed towards the appropriate satellite. Follow the antenna manufacturer's instructions, using the coordinates (azimuth, elevation, and polarity) provided by the satellite operator. Do not transmit until you have received authorization—including a transmit power level—from the satellite network operations center (NOC) staff.

## Start-up Checklist

---

The IBUC leaves the factory preconfigured for operation; however, you can fine-tune its settings for your particular needs.

Prior to start up, verify the following:

- **Transmit/Receive frequencies**  
All transmit and receive frequencies are set using the modem. Follow the modem manufacturer's instruction.
- **Cable connections**  
Ensure that all of the external cables between the IBUC and other equipment are seated correctly and that there are no breaks or cracks, no sharp bends, pinch points nor flattened sections in the cables.
- **Power**  
Ensure that the IBUC is receiving power, Power can come via the modem, an external power supply, or from AC mains.  
If power is supplied by the modem, ensure that the modem provides the correct DC voltage and the DC power has been enabled.

- 10 MHz reference signal

Verify that the 10 MHz reference signal is present. Some IBUC models have an internal 10 MHz reference signal. If this option is not available, a 10 MHz reference signal supplied on the IF cable from the modem is required.

## Turning On the IBUC

---

To turn on the IBUC **3** or IBUC **3G**,

1. Connect the L-band input cable (J1), the M&C cable (J4), and the power cable (J3)
2. Apply power to the IBUC.
3. The Power LED on the side of the unit next to the J4 connector lights up.  
A flashing green light indicates that the IBUC is operating normally.  
A red light indicates only that a fault (or alarm) has occurred. (A flashing red light indicates a minor alarm and a solid red light indicates a major alarm.)
4. Allow the unit to warm up for approximately 15 minutes before operating the transmitter module. This will assure stable gain and power.

## Setting Operating Parameters

---

To set operating parameters, the IBUC must be accessed via a terminal (for example, a terminal emulator such as HyperTerminal) or via the embedded Web pages. The most user-friendly way to connect to the IBUC is by using the embedded Web pages. For either methods the IBUC must be connected to the Ethernet port of a PC by using a TCP/IP cable assembly (such as the one depicted in [Figure G.2](#) on [page G-3](#)).

Note: This Chapter of the Operations Manual describes how to connect and configure the IBUC **3** or IBUC **3G** via embedded Web pages. For instructions about IBUC configuration via RS232, RS485 or Telnet, refer to [Chapter F, ASCII Command/Response Structure](#).

1. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#).
2. Navigate to the Transmit Configuration tab as shown on [page C-10](#).
3. Set the Tx Output by selecting whether the unit is actively transmitting or not. Options include:
  - Enable
  - Disable

When the Tx Output is set to Disabled, the Tx Output level displayed on the Sensor Tab (shown on [page C-9](#)) reads -99.0dBm. This is not the actual reading.

When conditions cause the automatic shut-off of the Tx Output signal, the Tx Output is muted and the Tx Output level displayed on the Sensors Tab (shown [page C-9](#)) reads -96.0dBm. This is not the actual reading.

4. Configure the Power Monitor Frequency to set at which frequency you are operating. The factory default values in [Table F.6](#) on [page F-37](#) are listed according to the model number of the IBUC.

Note: To ensure accurate readings, you must set the actual operating frequency.

**Example:** If, according to your Satellite NOC, your allocated frequency is 6400 MHz, set the Power Monitor Frequency to 6400 MHz. Do not use the factory default value unless that is your actual operating frequency.

5. Set the Power Read Mode. Options include:

- Burst
- Continuous Wave

6. Set the Gain Mode. Options include:

- Open-Loop

Open-Loop is the gain obtained when there is no feedback in the measuring loop.

- AGC (Automatic Gain Control)

The IBUC continuously monitors input and output levels. When AGC is enabled, the gain of the system is maintained at a constant level by an internal algorithm. Gain is the difference between output power and input power.

- ALC (Automatic Level Control)

Similar to the AGC system, when ALC is enabled the gain is adjusted when changes are detected in order to maintain a constant output level.

Note: The IBUC has an internal temperature compensation feature that minimizes gain variations due to changes in temperature. This feature is configured at the factory and requires no user input. For specific information about your particular model IBUC, see the datasheets in [Appendix G, Component Specifications and Reference Drawings](#).

## Setting the Tx Frequency (L-band)

Changing the L-band frequency will cause a change to the RF frequency. To set the L-band frequency,

1. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#).
2. Navigate to the Information tab as shown on [page C-4](#)
3. Verify the data in the Band Inversion field.
4. Calculate the IF frequency by using the following formulas:

$$IF = RF - LO \quad \text{Non-inverted/Low side}$$

$$IF = LO - RF \quad \text{Inverted/High side}$$

Note: RF and LO frequencies for various bands are provided from [Table 2.1](#) on [page 2-3](#) through [Table 2.2](#) on [page 2-4](#).

## Setting Alarm Thresholds

Although the IBUC will function using the factory-configured settings, by setting high and low level thresholds for the Tx Input/Output you can access more information about events such as power fluctuations that might trigger an alarm.

Alarms will be generated when the input and output amplitudes fall outside of the threshold ranges. For this reason, Terrasat recommends that once the user has reached the proper input and output settings for their budget, to narrow the threshold ranges for alarms. To display or set alarm thresholds,

1. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#).
2. Navigate to the Tx Configuration Tab to display/set the Tx Input High/Low thresholds.

The IBUC leaves the factory with a default range of -15 dBm to -60 dBm.

**Example:** After observing the unit, you determine that the IBUC operates consistently at -37 dBm. Although the threshold range is 45 dB, that range is too wide for everyday use. Instead consider setting the input thresholds at  $\pm 3$  dB; this would make the high level threshold -34 dBm and the low level threshold -40 dBm.

Note: You will receive an error message if the input level exceeds the threshold range.

3. Set the Tx Output High/Low thresholds.

When you set up your system and the Tx Output reaches its budgeted level, Terrasat recommends that, instead of the (P1dB - 20 dB) to (P1dB + 1 dB) threshold range that is the default, you narrow the range between the high and low thresholds to  $\pm 3$  dB.



**Example:** After observing the unit, you determine that the output level operates consistently at 32 dBm. Although the threshold range is 21 dB, that range is too wide for everyday use. Instead consider setting the output thresholds at  $\pm 3$  dB; this would make the high level threshold 35 dBm and the low level threshold 29 dBm.

Note: You will receive an error message if the input level exceeds the threshold range.

4. Verify your settings against the readings on the Sensors Page, as shown on [page C-4](#) of the [Appendix C, Embedded Web Pages](#).

## Configuring Alarm States

The IBUC offers flexibility with the levels of alarms produced when user-specified thresholds are exceeded.

1. Consider which alarms to configure. [Table 5.1](#) on [page 5-3](#) contains the default alarm configuration. Each alarm that is user configurable can be set as a major event, a minor event, or be disabled.
2. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#).
3. Navigate to the Alarm Configuration tab shown on [page C-6](#) of [Appendix C, Embedded Web Pages](#).
4. Use the drop-down menus to mark an alarm as a major event, a minor event, or to disable it.
5. Click **Save Settings** when you have completed your inputs to ensure that your settings are saved. If you do not click **Save Settings**, your changes will not be implemented.

## Configuring ALC/AGC

The IBUC **3** and IBUC **3G** offer two methods of ensuring consistent signal levels: automatic level control (ALC) and automatic gain control (AGC).

### ALC

When enabled, the Automatic Level Control (ALC) circuitry in the IBUC monitors output levels and adjusts the gain to maintain a consistent output for input signal variations. If a signal level is consistently below the predetermined target level, the ALC will cause the gain to be increased until the target level is reached. If a signal level exceeds the target level, the ALC will decrease the gain.

To enable ALC,

1. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#), and open the Tx Configuration Tab.

2. With the Gain Mode set to “Open” and the Tx Input and Tx Output Thresholds set, monitor the Tx Output level in order to determine a baseline setting.
3. When the Tx Output Level reading is equal to the level that you want to maintain, enable ALC by setting the Gain Mode to “ALC”.

The IBUC will now continuously self-monitor, increasing or decreasing the gain in order to maintain a constant signal at the level you defined.

Note: The Tx Output Level is “captured” when ALC is enabled.

Terrasat units enable you to offset the target by using the attenuation control without having to first disable the ALC or AGC.

Example: Set the output power level to 40 dBm and enable ALC. From this point forward, the ALC algorithm will maintain the output level at 40 dBm.

If you want to change the output level to 41 dBm, reduce the attenuation by 1 dB. The target level will be updated automatically.

## **AGC**

When enabled, the Automatic Gain Control (AGC) circuitry in the IBUC maintains the gain constant and equal to the target gain that was established when AGC was enabled.

Gain control settings can drift with time or temperature changes. You can reset the Gain Control function by applying the following steps:

1. Change the Gain mode to Open Loop
2. Reset Gain Control
3. Readjust the Target Gain
4. Change the Gain mode back to AGC

Terrasat units enable you to offset the target by using the attenuation control without having to first disable the ALC or AGC.

## **Configuring the External Mute**

Pin N of the M&C interface connector has dual functionality: it functions as an alarm input or an external mute.

### **External Mute**

When the IBUC operates as a single thread IBUC, Pin N of the M&C interface connector functions as an external mute. If it is not connected (left open), then transmission is not muted. When Pin N is connected to Pin F (chassis ground), transmission is muted.

To re-enable transmission, remove the Pin N connection to Pin F. Transmission will now resume. For more information about the M&C interface connector, see [System Cabling Requirements](#) on page 3-10.

### Alarm Input

When the unit is operating as part of the redundant IBUC system, the redundant configuration is sensed automatically. In redundant systems, Pin N functions as an alarm input where the alarm output of the A: side IBUC is connected to the alarm input of the B: side IBUC and vice versa.

For more information about the M&C interface connector, see [System Cabling Requirements](#) on page 3-10.

## Common Errors

---

### LED is Red

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

1. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#).
2. View the Alarm Status Tab (shown on [page C-6](#)) to determine the current alarm. You can also check the Sensor Tab (shown on [page C-9](#)) to determine which reading caused the alarm, and then compare the readings with the threshold levels. If necessary, adjust the threshold level(s).

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

### No Power to the IBUC **3** or IBUC **3G**

If the Power LED is off or not turning on at all, the IBUC is probably not receiving power.

Restore power to the IBUC by

- If the IBUC is powered by the modem, verifying that the modem is working properly.
- Checking that the modem is receiving power (that is, the modem power cord is plugged in) and that DC power to the IBUC is enabled.
- Checking that all cable connections are solid.

- Checking that the power supply is functioning or that AC mains has the proper voltage.
- Checking the disconnect devices such as the circuit breaker.
- Checking the fuses.
  - For DC-powered IBUCs, the fuses are in the power supply.Fuses are 5x20 mm time-lag glass body cartridge type.



## WARNING

Before applying power to the unit, ensure that the waveguide output is properly terminated. Failure to do so could lead to serious personal injury, excessive RF radiation levels, and equipment damage.

### Time Stamp Data is Incorrect

Note: This only applies if the customer is not using NTP.

The time stamp on the event log may be incorrect after the IBUC has lost power for an extended period. You can manually set the system date and time by using the hand-held terminal (see [Appendix D, Hand-Held Terminal Menu Tree](#)) or the System Configuration tab of the embedded Web pages (see [Appendix C, Embedded Web Pages](#)).

Note: When using a Web browser to access the Embedded Web pages, the time stamp information displayed differs slightly by Web browser.

The time stamp displayed on the Web pages records the time that the page was created and is based upon the system time of the computer, and not the IBUC.

### Satellite Network Operations Center Doesn't Recognize Signal

The IBUC **3** or IBUC **3G** appears to be transmitting a signal, but the satellite network operations center (NOC) cannot identify your carrier.

To determine whether your settings are correct,

1. Verify that your frequency is within the bandwidth slot that was allocated to you.
2. Determine whether the IBUC operates with the LO on the low side or the high side of the frequency that was allocated to you.

3. Check the signal mix. Remember that low-side is non-inverting and high-side is inverting.

4. Use the following formulas to calculate IF frequency

low side	$IF = RF - LO$	Non-inverting
high side	$IF = LO - RF$	Inverting

The LO for each IBUC band is found in [Table 2.1](#) through [Table 2.2](#).

5. Check the Tx output state.

When Tx output power is disabled, the Tx output level will read -99.0 dBm. This is not an actual power reading; rather it indicates the loss of power.

When conditions cause the automatic shut-off of the Tx output signal, the Tx output level will read -96.0 dBm. This is not an actual power reading; rather it indicates the automatic shut-off of power.

### Transmit Power in Saturation

The IBUC, at minimum attenuation, makes rated power at -30 dBm input. Operating the IBUC at higher levels will result in spectral distortion and high intermodulation levels. Terrasat recommends operating with power back-off levels sufficient to meet the spectral density mask.

To avoid signal saturation,

1. Reduce input power from the modem.
2. Increase the attenuation setting of the IBUC.

### Tx Input/Output Level Verification

To verify the Tx IF Input level,

1. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#).
2. Use the Sensor Tab of the embedded Web pages to check levels.  
For more information about the Sensor Tab, see [page C-9](#).
3. Compare the reading to your expected level.  
The detector range is -55 dBm to -20 dBm.

To verify the Tx RF Output level,

1. Establish a connection with the IBUC **3** or IBUC **3G** by using the steps provided in [Appendix C, Embedded Web Pages](#).
2. Use the Sensor Tab of the embedded Web pages to check levels.  
For more information about the Sensor Tab, see [page C-9](#).

3. If your reading does not match the correct level, use the Transmit Configuration Tab of the embedded Web pages to modify the attenuation to set the output to the expected level. The Transmit Configuration Tab is shown on [page C-10](#).
4. If, after setting the output to your expected level, you are still having transmission problems, check the flexible waveguide and antenna feed for obstructions. Also check the alignment of the antenna.

# MONITOR AND CONTROL FEATURES

This chapter describes the various monitor and control (M&C) features and functions that the IBUC **3** and IBUC **3G** offer.

## Introduction

---

You must first establish a communication link with the IBUC to be able access any of the M&C interfaces.

## M&C Interfaces

---

The IBUC **3** or IBUC **3G** offer the following M&C interfaces:

- RS232
- Hand-held terminal
- Multifunction LED
- Frequency Shift Keying Modem Interface
- RS485
- Ethernet
- Telnet
- Embedded Web Pages

### RS232

---

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

To initiate an RS232 session,

1. Connect a 19-pin to DB9F cable between the computer and the IBUC.  
[Figure G.1](#) on [page G-2](#) contains a drawing for fabricating a cable.
2. Activate a terminal emulation program such as HyperTerminal or PuTTY.
3. Configure Serial RS232 Session with matching baud rate, stop bits, parity, flow control and stop bit, as given above and connect to the IBUC unit.
4. Once connected press **Enter**. If the connection process was successful a `IBUC>` prompt should appear.
5. At this prompt type `"CPE=<password>"`. The default password from factory is 1234. This is the only configurable password in the system and it can be configured to assume values from 1 to 65535. Once configured, the user should use it to perform login to the unit.

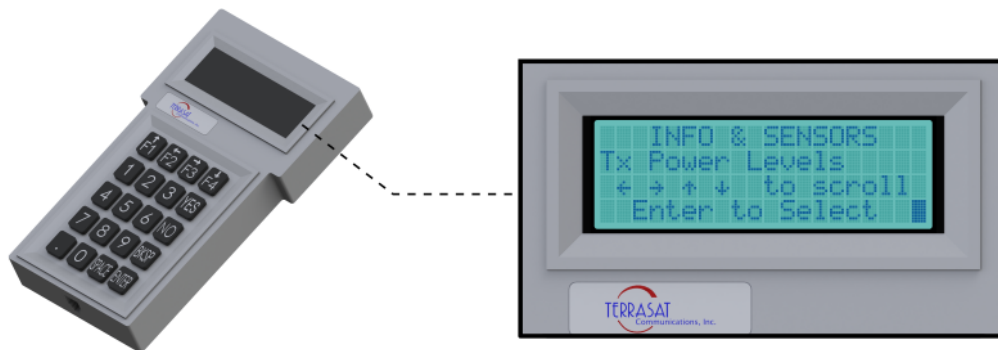
At this point, one may enter commands from [Appendix F, ASCII Command/Response Structure](#).

Note: 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 IBUC **3** or IBUC **3G** via the J2 connector for local monitor and control. No additional configuration of the IBUC is necessary.



**Figure 5.1** Hand-held Terminal

To activate the HHT,

1. Connect the supplied cable to the J2 connector on the IBUC and plug the RJ-11 connector into 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. Type the password.  
The default password is *1234*. If you have changed the password, type that value instead.

The HHT is now ready to accept commands.

Additional information about the HHT and it's operation are further explained in [Appendix D, Hand-Held Terminal Menu Tree](#).

## Multifunction LED

The multifunction LED is mounted on the IBUC **3** and IBUC **3G** housing and provide visual indications of IBUC status. LED colors and modes are as follows:

- Flashing Green - No alarms
- Flashing Red - Minor alarm being reported
- Steady Red - Major alarm being reported

Certain alarms are configurable meaning that you define them as major or minor alarms when thresholds you set are exceeded. Major alarms will cause relay closure (Form-C). The alarms shown in [Table 5.1](#) are the factory default configuration. Thresholds for alarms that are user configurable can be set by using any of the M&C interfaces described in this chapter.

**Table 5.1** Default Alarm Configuration

	User Configurable	Alarm State		
		Major	Minor	None
<b>Tx Alarms</b>		<b>Solid RED</b>	<b>Flashing Red</b>	<b>Log Only</b>
Synth out of lock	No	X		
Tx Output Level High	Yes	X		
Tx Output Level Low	Yes	X		
Tx Input Level High	Yes		X	
Tx Input Level Low	Yes		X	
High Temperature Alarm	Yes		X	
Tx Simulated Fault	No	X		
10 MHz Reference Fault	No		X	
Input Voltage Out of Range	No		X	
Switch Fault	No	X		

**Table 5.1** Default Alarm Configuration (Continued)

	User Configurable	Alarm State		
		Major	Minor	None
<b>Tx Alarms</b>		<b>Solid RED</b>	<b>Flashing Red</b>	<b>Log Only</b>
Input Current Out of Range	No		X	
AGC/ALC Target Out of Range	No			X
AGC/ALC Out of Range	No		X	
Overdrive Alarm	No		X	
Tx Muted Alarm	No	X		

If the user chooses to disable the multifunction LED, several methods are at disposal. One might disable multifunction LED via: System Configurations Tab of the Web pages, described on [Appendix C](#); via the ASCII command “CLE”, described on [page F-25](#); or via the Hand-held terminal described on [Appendix D](#).

## Frequency Shift Keying (FSK) Modem Interface

Several modem brands have the capability to communicate with an IBUC using an FSK signal multiplexed onto the IF output connector with the Tx IF signal and the 10MHz reference signal. The default configuration for the IBUC is RS485/FSK Mode 1, which enables compatible modems to use “Legacy Binary” mode to communicate with the IBUC. The IBUC is also capable of FSK communication using ASCII mode, but requires a modem compatible with this method. Refer to the modem’s documentation for more information about commands and procedures for FSK communication with the IBUC.

FSK and RS485 are tied together by the mode of operation (Legacy Binary or ASCII). Once the mode is selected, both FSK and RS485 will work in the same mode. FSK and RS485 also share a common address. The message formats for both FSK and RS485 are the same. Transmitter link specifications are detailed in [Table 5.2](#) and receiver link specifications are detailed in [Table 5.3](#).

**Table 5.2** Transmitter Link Specifications

Frequency	650 KHz $\pm$ 5%
FSK Deviation	$\pm$ 60 KHz nominal (+60 KHz mark)
Deviation Tolerance	$\pm$ 50 KHz minimum; $\pm$ 70 KHz maximum
Output Level	- 5dBm to -15 dBm
Output Impedance	50 $\Omega$

**Table 5.2** Transmitter Link Specifications

Start Tone	710 KHz
Start Tone Time	10 ms

**Table 5.3** Receiver Link Specifications

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

Synchronization is maintained by the following method:

1. Once a character is received and the inter-character time exceeds 20ms, then the link will reset.  
The IBUC is capable of responding to messages at a rate of one message every 20ms.
2. If the IBUC does not respond within the maximum response time, the command should be cyclically repeated.

Note: This synchronization method is true only for Legacy Binary Mode, not ASCII.

## 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 IBUC across RS485 through ASCII or through the binary protocol known as “Legacy Binary”.

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 the RS485 interface, you will need to set the following:

- RS485 Address
- RS485 Delay
- RS485 Baud Rate
- Legacy Binary mode or ASCII mode

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

## ASCII Mode

Because Legacy Binary is the default RS485 setting for the IBUC, you will need to reconfigure the IBUC in order to use ASCII mode. You can specify ASCII mode by using any of the M&C interfaces described in this chapter.

Communication requires an on-board RS485 card in the host computer. If an external interface converter box is used to convert RS232 to RS485, a terminal emulation program, such as PuTTY will not function unless the interface converter box is equipped with an automatic line turnaround capability. Otherwise, a network management program is required to handle this handshaking requirements.

In the terminal emulator of choice, type the password command, and then press Enter. For example, <0001/CPE=1234 where <0001/ is the address of the IBUC and **1234** is the default password. When the > prompt re-appears, the IBUC is ready to accept commands.

### ASCII Mode Command Format

[Table 5.4](#) lists the differences between SET and GET commands in ASCII Mode.

**Table 5.4** ASCII Mode Command Format

SET Command	GET Command
Start Packet: < (ASCII code 60; 1 character)	Start Packet: < (ASCII code 60; 1 character)
Target Address: (4 characters)	Target Address: (4 characters)
Address Delimiter: / (ASCII code 47; 1 character)	Address Delimiter: / (ASCII code 47; 1 character)
Instruction code <sup>1</sup> : (n characters)	Instruction code: (n characters)
Code qualifier: = (ASCII code 61; 1 character)	End of Packet: CR (ASCII code 13; 1 character)
Arguments: (n characters)	-
End of Packet: CR (ASCII code 13; 1 character)	-

1. For a list of ASCII codes, see [Appendix E, Legacy Binary Command Message Structure](#).

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: XXXX (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)  
     Line Feed (ASCII code 10; 1 character)

Example: >0001/(Variable Length Data) [CR][LF]

Commands and values available in ASCII mode are provided in the command set in [Appendix F](#).

### Legacy Binary Mode

Legacy binary mode is the default RS485 setting for the IBUC. In Legacy Binary Mode, you will need to use a separate network management program.

For the RS485 interface, the packet is encapsulated inside a data link layer packet which has an address “header” byte and a checksum “trailer” byte. [Table 5.5](#) contains the packet format.

**Table 5.5** Legacy Binary Mode Packet Format

Byte	Description
1	RS485 destination address of command. For responses, responder address is shifted left by 4 bits.
2~6	Command or response packet data
7	CHECKSUM: the checksum should be equal to the Data Packet Byte checksum

Each transmitted command data packet consists of the seven bytes shown in [Table 5.6](#).

**Table 5.6** Data Packet Byte Configuration

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
IBUC 3 Address	Command	Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Checksum

Where:

- Byte 1 contains the IBUC address that is being required. The IBUC will accept a command only if the first byte contains the appropriate address.
- Byte 2 contains the major command. See [Appendix E](#) for possible commands.

- Byte 3, Byte 4, Byte 5 and Byte 6 contain the specific command response values. See [Appendix E](#) for possible command responses.
- Byte 7 contains the algebraic sum of bytes 1 through 6. Commands are only executed if the checksum coincides.

For more information about response data packet configuration, see [Appendix E, Legacy Binary Command Message Structure](#).

## Ethernet

---

Using Ethernet, you can communicate with the IBUC **3** or IBUC **3G** through Telnet (ASCII), the onboard Web server (HTTP), or through SNMP. The IBUC uses a static IP addressing structure and does not support DHCP (Dynamic Host Control Protocol).

The IBUC is configured at the factory, as follows:

IP Address	192.168.1.21
IP Gateway	192.168.1.1
Subnet Mask	255.255.255.0

Note: Your computer should have a static IP address on the same subnet as the IBUC. Using a suitable cable, connect the computer to the J2 connector on the IBUC.

### Determining the IP Address of Your IBUC

Due to the lack of support of DHCP, the IBUC IP address will not change after configuration. In the event that such IP address is not known by the user, it is recommended the usage of Wireshark® network packet analyzer for IP discovery.

### Telnet

Telnet is a simple, text-based program that enables the user to connect to another computer by using the Internet. One can connect to the IBUC by using a Telnet client from the host PC. Telnet uses the ASCII command set listed in [Appendix F, ASCII Command/Response Structure](#). The default port for Telnet is port 23. Characters are echoed back to the user. The response format varies depending on the message setting 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 IBUC>.

To initiate a session,

1. Activate a command prompt window from the host computer.
2. Type `Telnet 192.168.1.21` and a cursor should appear on the left of the screen.

3. Type the password command `CPE=1234`.

You can now use ASCII commands to configure and monitor the IBUC. For more information, see [Appendix F](#).

## Web Server

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

Connect to the IBUC M&C and type the IP address of the IBUC through a Web browser. A login page then appears. After login, you have a choice of eight Web pages (nine pages if using redundant IBUCs) with monitoring, control and alarm information. Individual pages are displayed by clicking the tabs at the top of the Web page frame. On a redundant transmit system, the display area will contain two frames. The left side will display the A: side IBUC and the right will display the B: side IBUC.

To initiate a embedded Web page session,

1. Activate a Web browser window from the host computer.
2. Type the IP address of the IBUC in the address window and then press Enter. For more information about the options available on each Web page, see [Appendix C](#).

## SNMP

The IBUC **3** and IBUC **3G** supports both version 1.0 & 2.0c of the SNMP protocol. The SNMP agent listens on Port 161 for messages and uses Port 162 for transmitting trap information. SNMP can be configured from the HHT, RS232, Telnet, Web pages, FSK and the RS485 interfaces (ASCII Mode required for FSK and RS485). The MIB-II system group is implemented.

To configure SNMP using the Hand-held terminal (HHT),

1. Connect the HHT to the IBUC by using the 19-pin connector.
2. Press the decimal key four times (e.g: “. . . .”).
3. Type the password. The default password is 1234.
4. Press the right arrow key to access the SNMP submenu.
5. Press the up/down keys until the “Enable SNMP” selection appears and press **Enter** to configure “Enable SNMP” selection.
6. Press Yes to enable SNMP.
7. Press the Bksp key.
8. Navigate with up/down keys to the “Trap Host1” selection and press **Enter** to configure it.
9. Press Yes to enable traps.

10. Press the Bksp key.
11. Navigate to the “Trap Host1 IP Addr” selection and press **Enter**.
12. Type the trap host IP address.

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

To configure SNMP from the Embedded Web pages,

1. Connect to the IBUC with a Web browser. The default IP address is http://192.168.1.21
2. Type the password. The default password from factory 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. Press submit

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-IBUC-MIB.MIB
- TERRASAT-SMI-MIB.MIB
- TERRASAT-TC-MIB.MIB

## **Power Measurement**

---

The IBUC **3** and IBUC **3G** are capable of accurately reading the input and output power for a single carrier in either continuous signal mode (CSM) or in burst mode. The dynamic range for input power is from -55 dBm to -20 dBm and for output power the dynamic range is from rated power to 20 dB below rated power. Each unit is loaded with a detector calibration lookup table that compensates for detector variations in frequency, power level, and temperature. The reported power level is then based on the user-requested frequency and the internally monitored temperature and power level. If multiple carriers are present, the composite transmit power level is read but accuracy is dependent upon the actual carrier frequencies, levels, and modulation being used.

The power measurement occurs in the following two ways:



## 1. Burst Mode

In burst power measurement mode it is assumed that, in normal operation, a transmit carrier may or not be present due to the nature of burst mode operation. Since the transmit burst pulse has a rise time and a fall time and the envelope level varies during symbol transitions when the signal is modulated, the power must be reported as a peak value. To maintain detected accuracy of the burst pulse, 128 consecutive measurements of the pulse are taken. Once the initial reading exceeds the burst threshold, 128 consecutive readings are taken (regardless of level). The highest value of the 128 is displayed. The IBUC reports the most recent valid reading above the burst threshold.

Burst Time: 500  $\mu$ s to 1 s

Measurement accuracy:  $\pm 2$  dB absolute, 1.5 dB p-p relative. Accuracy is improved as the burst threshold setting is raised closer to the carrier peak. The detector accuracy is based on a pulsed unmodulated signal with a pulse width of 500  $\mu$ s.

## 2. Continuous Signal Mode (CSM)

In CSM power measurement mode, it is assumed that, in normal operation, a transmit carrier is always present. Therefore, reported power is the peak power over 128 consecutive readings.

Measurement accuracy:  $\pm 1$  dB absolute, 1 dB p-p relative\*

The detector accuracy is based on a CW unmodulated carrier.

\* Relative measurement accuracy defines the error between any two power readings at any particular frequency over the dynamic range.

Notes: To make the given accuracy achievable, the operating transmit frequency information must be provided via M&C in order to use the information in the detector's internal calibration look-up table.

By default, the unit will be set to perform CSM measurements.

## Input Power Overdrive Protection

---

To ensure that output stage transistors achieve saturation, and thus, maximum performance, the IBUC **3** and IBUC **3G** allow for input overdrive. The Input overdrive point allows for 6 dB overdrive at 0 dB attenuation in Gallium Nitride FET (GaN) based units and 2dB overdrive at 0dB attenuation in Gallium Arsenide (GaAs) based units. As excessive saturation could diminish signal integrity and damage the device due to unsustainable heat levels, a input overdrive protection algorithm is employed to protect power amplifiers.

Such algorithm takes advantage of the IBUCs input and output power readings to drive internal attenuators, changing input drive level to achieve protection. Input overdrive protection depends on the selected operation mode. The three possible operations modes are: Open Loop, AGC, ALC.

### 1. Open Loop Operation

In Open Loop Operation, input overdrive point changes based on the user input attenuation. Once the input overdrive condition occurs, every 1 dB increase of the input level causes a 1 dB increase in attenuation. If the input level exceeds -15 dBm the algorithm increases the attenuation to maximum.

### 2. AGC Operation

In AGC Operation, input overdrive point changes based on both user input attenuation and any attenuation applied by the AGC loop. Once the input overdrive condition occurs, every 1 dB increase of the input level causes a 1 dB increase in attenuation. If the input level exceeds -15 dBm the algorithm increases the attenuation to maximum.

### 3. ALC Operation

ALC Operation uses no input protection. The output level is automatically controlled by the attenuators. As the input level increases, ALC attenuates to maintain the same level.

# TROUBLESHOOTING

This chapter discusses basic troubleshooting procedures for the Terrasat Communications, Inc. line of intelligent block upconverters (IBUC **3** and IBUC **3G**) and outdoor units (ODUs).

## Maintenance

---

In general, Terrasat power supply units (PSUIs) and ODUs are self-contained and require little maintenance. However, for optimum performance, Terrasat recommends that users inspect the mechanics of the system quarterly 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. The user can use a water hose for this purpose **while the unit is off**.

## Transceiver 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 through the M&C ports, as well as by measuring certain signals using test equipment.

### Site-Related Problems

VSAT antennas are often fitted at the top of buildings. Avoid close proximity to elevator motors, and such. Ensure that the satellite signal path is free and clear of obstructions.

### M&C Checks

When troubleshooting the IBUC, the first level of troubleshooting should be to check the status through the M&C port. Events and an event history log are available with

the IBUC M&C. For specific information about using the RS232, RS485, Ethernet or Hand-held terminal ports, see [Chapter 5, Monitor and Control Features](#).

## Power Supply Checks

Before beginning RF troubleshooting of DC-powered IBUCs, first verify that the proper voltages are being supplied to the IBUC. Input DC voltage and IBUC current consumption data are available from the IBUC M&C. Verify that the values are within limits. If an M&C interface is not available, use a multimeter to verify that the appropriate voltages (24 VDC or floating 48 VDC) are present at the IBUC. Check the part number label on the IBUC to determine the required voltage. The IBUC DC supply can be through either the J1 or J3 connector.

## Transmit Power Setting

There have been several cases reported to Terrasat Technical Support where the transmit power has been turned up to or near saturation while transmitting a digital carrier. This most likely will result in spectral distortion, re-growth, and intermodulation products for multi-carrier operation. To reduce saturation, reduce the input level or increase the attenuation.

**Note:** When transmitting digital carriers, it is customary to operate the power amplifier system with an output back off (OBO) sufficient to meet the spectral density mask requirements and interference requirements of multi-carrier operation.

## Transmit Intermediate Frequency Input Level Verification

If low or no Tx output power is detected, begin troubleshooting by checking the input to the IBUC.



## WARNING

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

1. Check the Tx Input Level displayed in M&C or disconnect the cable at the IBUC J1 connector (Tx L-band) and use a spectrum analyzer to measure the power level of the L-band signal at the output of the coaxial cable that connects to the IBUC at J1 (Tx L-band). The L-band signal level should be within the range of -20 dBm through -55 dBm. If it is not, check the cable and modem output.
2. If the L-band signal is within range, check that the 10 MHz reference signal is within the range of +5 dBm through -12 dBm and is distortion free. If it is not, check the cable and modem output.

3. For DC-powered IBUCs, if the L-band and 10 MHz signals are good check that the DC voltage level is within range. The DC voltage may be on the L-band IFL or from a separate power supply for 16 watts Ku-band, 25 watts C-band, or 20 watts X-band and lower power units. For higher power units, the DC voltage will be on the DC cable that is connected to the IBUC DC Input (J3 connector). If it is not, check the PSUI or modem power supply outputs and cables.
4. For DC-powered IBUCs, if the L-band, 10 MHz and DC voltage signals are within range, continue with the IBUC Tx Output verification procedure that follows.
5. Disconnect the spectrum analyzer from the coaxial cable.

### **IBUC 3 Transmit Output Verification**

This check assumes that the L-band, 10 MHz, and DC inputs (for DC-powered IBUCs) are at the correct levels.

1. Tx Output level is monitored and displayed in the IBUC M&C. Alternatively, you can connect a waveguide-to-coaxial adapter and a 40 dB high-power attenuator to the IBUC Tx waveguide output.
2. Measure the Tx RF output with the spectrum analyzer connected at the waveguide output. Ensure that the cable loss of the cable being used for the measurement has been taken into account.
3. RF power should be between rated power and no lower than 25 dB below rated power. If it is not, the IBUC is defective and should be returned to the factory for repair. Instructions for returning a unit for repair are on [page 6-6](#).
4. If the IBUC Tx RF output measures within specification, ensure that the waveguide, feedhorn, and antenna are properly aligned.

## **Common Problems**

---

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

### **Tx Output is Disabled**

When the Tx Output is set to Disabled, the Tx Output level shown on the Sensor Tab on [page C-9](#) reads -99.00 dBm. This is not an actual reading.

However, when conditions cause the automatic shut-off of the Tx Output signal, the Tx Output is muted and the Tx Output level on the Sensor Tab shown on [page C-9](#) reads -96.00 dBm.

### **Incorrect Frequency Settings**

If the Satellite Network Operations Center (NOC) does not recognize your signal, see [page 4-8](#) for additional information.

## 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 were not discharged prior to connecting them; 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 entire cable whenever possible.

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



## CAUTION

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

## 10 MHz Reference Signal is at the Wrong Level or Missing

A 10 MHz input is used to provide a stable reference frequency to which the synthesizer synchronizes. The 10 MHz reference signal level should be between -12 dBm to +5 dBm.

When the IBUC senses that the synthesizer has gone out of lock, a Synthesizer Lock alarm is triggered. This alarm then initiates a series of routines that leads to the muting of the power amplifier (that is, the IBUC is automatically shut-off). [Table 6.1](#) lists four possible scenarios caused by changes in the 10 MHz reference signal or whether the synthesizer is locked.

**Table 6.1** Possible Scenarios for IBUCs with an External 10 MHz Reference Signal

10 MHz Reference Signal Level	Phase-Locked Local Oscillator	Results
Low	Locked	Causes a minor alarm (10 MHz Detector). Unit is still transmitting. Check the 10 MHz signal level. Resultant phase noise may be degraded.
Low	Out-of-Lock	Causes a major alarm (Synthesizer Out of Lock). Power amplifier is muted and the IBUC is automatically shut-off. Check the 10 MHz reference signal level and whether the 10 MHz reference signal is enabled at the modem.

**Table 6.1** Possible Scenarios for IBUCs with an External 10 MHz Reference Signal

10 MHz Reference Signal Level	Phase-Locked Local Oscillator	Results
Within Specifications	Locked	Unit is operating normally. No alarms are present.
Within Specifications	Out-of-Lock	Causes a major alarm (Synthesizer Out of Lock). Power amplifier is muted and the IBUC is automatically shut-off. Synthesizer may be faulty and the IBUC might need to be returned for repair.

### Antenna is Pointed Toward Wrong Satellite or is Misaligned

Transmission to the wrong satellite or on the wrong polarization or channel can cause interference with other satellite users and may result in fines from the satellite operator.

To ensure that your antenna is aligned with the correct satellite,

1. Follow the antenna manufacturer’s instructions to verify the azimuth, elevation, and polarization settings.
2. Follow the antenna manufacturer’s instructions to move the antenna into a position that provides maximum signal strength.
3. Establish a communications link with the satellite network operations center (NOC).
4. Peak the signal on the satellite, and then adjust polarization per guidance from NOC staff.

### Moisture Migrated Into the IBUC

Moisture can enter and damage the IBUC if waveguide gaskets are missing, there is a hole in the feed window, or there is a break in the coaxial connectors.

To prevent moisture from entering the IBUC,

- Ensure that the paper label is removed from the waveguide prior to installation and operation.
- Ensure that the rubber waveguide gasket is intact and fully seated in the grooved channel before making the connection.
- Use water-resistant wrap (or mastic tape) on all outdoor connectors to ensure a water-tight seal. Mastic tapes are designed to flow and self-heal if cut or punctured. For more information about applying water-resistant wrap, see [page 3-14](#).
- Avoid using damaged connectors (for example, scratched mating surfaces, eccentric or bent center conductors, and so on.).

- Seal all coaxial cable fittings with putty.

## Bad Orthogonal Mode Transducer and/or Antenna

If the antenna feedhorn and orthogonal mode transducer (OMT) are not positioned correctly, the IBUC will not operate properly.

To position the feedhorn and OMT,

- Refer to the antenna manufacturer's assembly instructions to verify that the feedhorn and OMT were mounted correctly on the antenna.
- Establish a communications link with the satellite network operations center (NOC).
- Guided by NOC staff, slowly rotate the outdoor equipment to the appropriate position.
- If rotation is impossible, it is likely that there is a problem with OMT and it will need to be returned to the antenna manufacturer.

## LED is Red

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

1. Establish a connection with the IBUC by using any of the M&C interfaces.
2. View the [Alarm Tab](#) on [page C-6](#) to determine the current alarm.
3. View the [Sensor Tab](#) on [page C-9](#) to determine which sensor reading caused the alarm.
4. Compare your readings to the thresholds.
5. Adjust the threshold level(s) to bring the reading(s) within specifications and thus clear the fault

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

## Repair Policy

---

The Terrasat IBUC **3**, IBUC **3G** and PSUI 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 phone number
  - Billing information
  - Shipping information
- Contact Terrasat Customer Service to request an RMA number.
  - Telephone: +1 408.782.5911
  - E-mail: techsupport@terrasatinc.com
- Properly package the defective equipment in its original container (if available and undamaged), and mark the RMA number on the outside of the shipping container.

Note: Do not return any equipment without an RMA number.

- Ship the equipment to the following address:
  - Terrasat Communications, Inc.
  - 315 Digital Drive
  - 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 in-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 contact 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.



## TRANSMIT REDUNDANT SYSTEMS

The IBUC **3** and IBUC **3G** can be installed and configured as a redundant system providing automatic switching to a standby unit if the primary unit fails. The outdoor power supplies are configured in pairs to provide full system redundancy.

### Description

---

A transmit redundant (or Tx 1+1) system includes two IBUCs of the same power rating and frequency band (except in very rare conditions) connected to an interface module and an RF switch. An external power supply (such as the Terrasat PSUI-948 or PSUI-1248) is required for each DC-powered IBUC. The IBUCs interface module and RF switch are typically mounted on a common mounting plate (as shown in [Figure 7.1](#)) and connected with supplied cables and waveguide components.



Figure 7.1 Transmit Redundant System Setup

## Interface for Tx Redundant (1+1) Systems

---

The Tx 1+1 interface module is a passive unit. The module divides the frequency shift keying (FSK), 10 MHz reference and L-band signals, as well as routes the Ethernet connection to the IBUCs through an Ethernet switch. It supports various interface connectors and includes a bank of LEDs for visual indication of alarm conditions.

The user interface is one of the following: via Web browser through the included Embedded Web pages, TCP/IP through a Telnet session, UDP through SNMP, RS485, Hand-held Terminal, RS232, as well as FSK link to both IBUCs. The system provides automatic switching between IBUCs in the event of failure. The IBUCs communicate with each other to monitor status and execute switching logic. A software command is available in the IBUC to enable the unit designated as the Master to clone itself to the Slave to match the unit's configuration. Monitor and control (M&C) functions are available through the interface module via Hand-held Terminal, RS232, RS485, TCP/IP, and FSK. Two Form-C relays are provided for alarms (one for the A: side IBUC and one for the B: side IBUC). In the redundant system, remote M&C by using RS485 and TCP/IP is available via the interface module, which eliminates the need to run two separate M&C cables to the IBUCs. In the case of FSK, M&C is available on the IFL cable and no additional cables are required. M&C commands for redundant systems are present in the IBUC software. For more information about ASCII commands, see [Appendix F, ASCII Command/Response Structure](#).

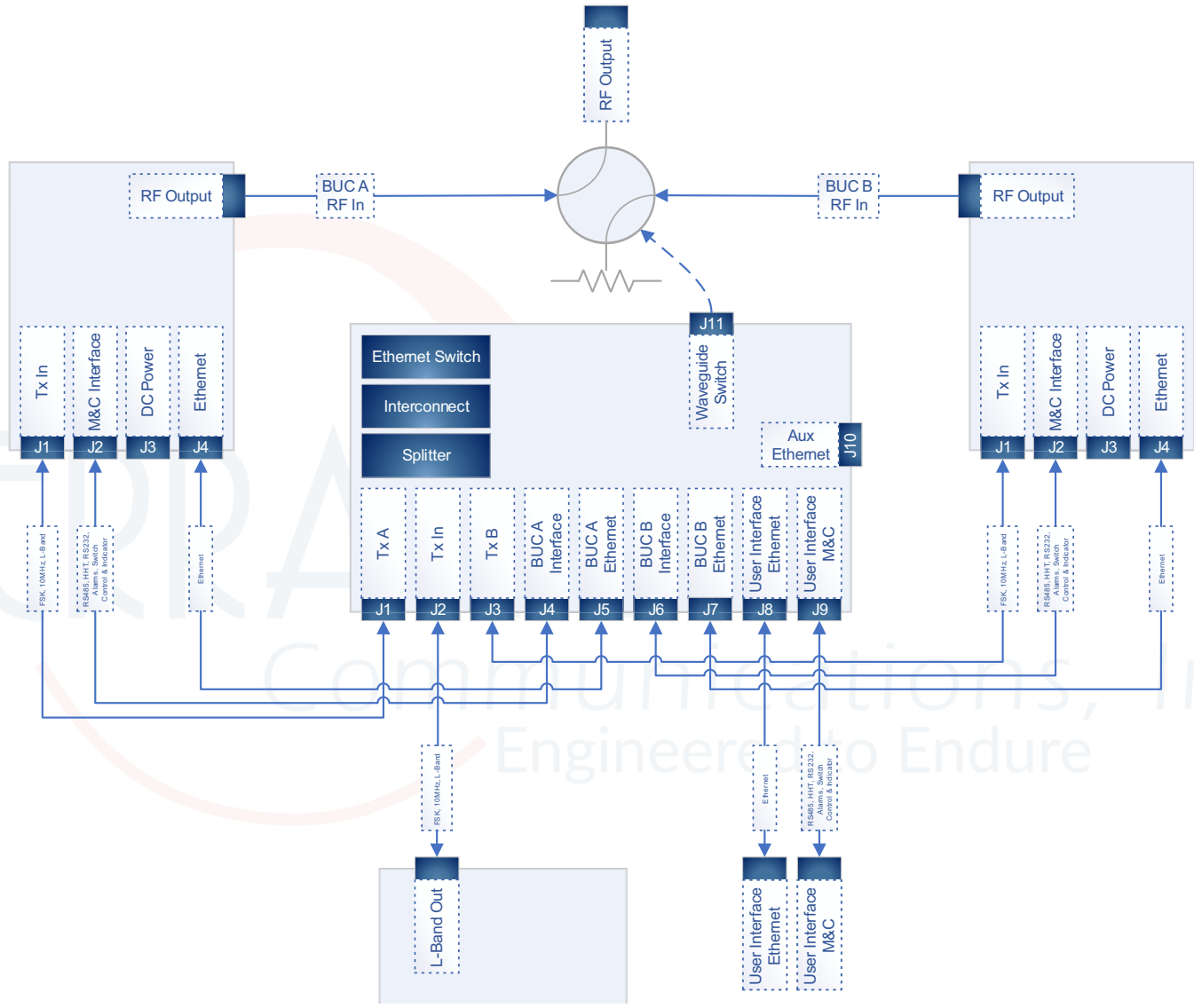


Figure 7.2 IBUC 3 Redundant System Diagram

## Component Description

---

As described previously, except in very rare conditions, the redundant transmit (Tx 1+1) system includes two IBUCs of the same power rating and frequency band connected to an interface module at the input and an RF switch at the output. An external power supply is required for each DC-powered IBUC. This section explains the functionality of each component and their relationships.

### Intelligent Block Upconverter

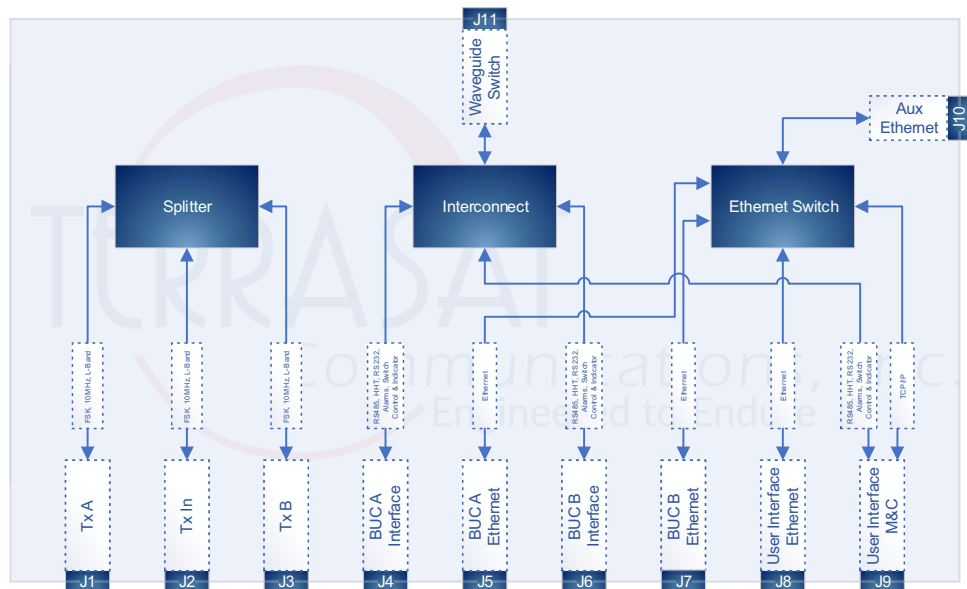
---

More information about the intelligent block upconverter is found in [Chapter 2, Functional Description](#).

### Tx 1+1 Interface Module

---

The Tx 1+1 interface module is powered by both IBUCs through connectors J4 (for the A: side IBUC) and J6 (for the B: side IBUC). Both supply inputs feed a linear regulator that generates the voltage for all internal circuitry. The RS232 interface and the power for the Hand-held Terminal are routed to connector J9. The RS485 interfaces coming from both IBUCs via connectors J4 and J6 are connected together and routed to the user interface via connector J9. The Ethernet ports from the A: side IBUC and the B: side IBUC (connectors J5 and J7, respectively) are routed to the user interface through an internal Ethernet switch. The alarm output (normally open, faulted, or short to ground) of the A: side IBUC is routed to the alarm input of the B: side IBUC and vice-versa. This setup ensures that the A: side IBUC and the B: side IBUC monitor each other. Also, the Form-C relays with the alarms of both IBUCs are routed to the interface via connector J9. The switch commands from the A: side IBUC and the B: side IBUC are connected together and routed to the waveguide switch (connector J11). The waveguide switch indicators (connector J11) are routed to both IBUCs (connectors J4 and J6). The Tx input (L-band, 10MHz and FSK) from connector J2 is routed to a splitter (it also blocks DC, if present at J2). The outputs of the splitter are routed to connector J1 (the A: side Tx output) and J3 (the B: side Tx output). The Tx 1+1 module also has a bank of LEDs that provide a visual indication of the power, Ethernet activity for both IBUCs, the RJ45 user interface (J8), the 19-pin user interface (J9), the auxiliary user interface (J10), the status of both IBUCs, as well as which is IBUC **3** or IBUC **3G** online. [Figure 7.3](#) is a block diagram of a Tx 1+1 interface module.



**Figure 7.3** Tx 1+1 Interface Module Block Diagram

## Waveguide Switch

Redundant systems are provided with the waveguide switch. A switch cable, which is used to connect the Tx Interface to the switch, is also included.

## Software

Tx Redundant systems monitor and control several parameters and have key features to simplify installation and usage, as well as enhance system performance.

Some key features include:

- Monitor and Control

Redundant systems can be monitored and controlled through an assortment of interfaces, including RS232, RS485, Ethernet port, an optional Hand-held Terminal, or via an FSK link with compatible modems.

- Tx Redundancy

The IBUCs automatically sense when they are configured in redundancy mode. The logic for redundant operation is built-in, eliminating the need for an external switching controller.

- **Autoclone**  
The Master IBUC (online) periodically updates the Slave IBUC (standby) with configuration data. This enables you to configure the systems by configuring only the Master IBUC. The Slave IBUC then becomes a “clone” of the Master when autoclone is enabled.
  - **Embedded Web pages**  
Provide management for small networks by using a Web browser.
  - **Event History**  
A log of events that occur is maintained. This can simplify troubleshooting of the system, especially if an intermittent problem occurs.
- For a full description of M&C functions, see [Chapter 5, Monitor and Control Features](#).

## Installation and Setup

---

The redundant Terrasat outdoor unit (ODU) consists of two IBUCs mounted on a common plate, redundant power supplies, and a set of interconnection cables. It can also include an RX 1+1 redundant system.

This section contains the general requirements for installation of the redundant ODU to the antenna.



### 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 when using hand and/or power tools.

Use care when working with dangerous voltages.



## System Cabling Requirements

### Tx 1+1 System

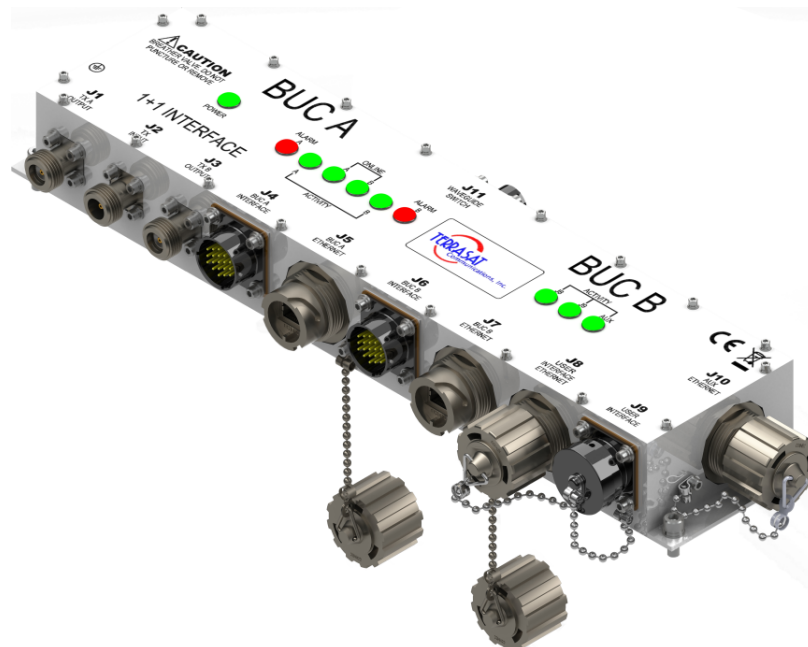
Both the A: side IBUC and the B: side IBUC connect to the interface module via a coaxial cable connection (J1) carrying the L-band, 10 MHz reference and FSK M&C signals, where appropriate. The J2 connector on the IBUC connects to the interface module that provides the M&C interface. An additional connector (J4) is used for TCP/IP between the IBUCs and the interface module. IBUC waveguide outputs are connected to ports on the Tx RF switch using waveguide bends. DC power (48 VDC) is provided from separate power supplies to each DC-powered IBUC at connector J3.

The Tx waveguide switch provides the uplink signal to the antenna feed via a waveguide (customer supplied) or coaxial cable, as required. Power and switching control are carried on an interface cable from the switch to the interface module.

The interface module provides eleven connectors for interfacing the IFL, the IBUC RF switch, and M&C functions. Status LEDs built in to the interface module provide visual system status, as shown in [Figure 7.4](#). Remote M&C for the 1+1 system is available by using RS485 or TCP/IP. systems with FSK-capable modems also have M&C functions available at the modem's front panel. Local monitoring and control is available by using a Hand-held Terminal connected at the interface module.

### Tx 1+1 Interface Module

[Figure 7.4](#) depicts the top view of an interface module of an interface module of a Tx 1+1 system and identifies the locations of the various connectors.



**Figure 7.4** Tx 1+1 Interface Module View

## Physical Connections

Table 7.1 contains information about the various interface connectors and their mates for a Tx +1+ Interface Module.

**Table 7.1** Tx 1+1 Interface Module Connector Schedule

Reference Designator	Function	Interface Connector	Interface Connector Mate
J1	A: Side Tx Output	TYPE-N SOCKET	TYPE-N PLUG
J2	Tx Input	TYPE-N SOCKET	TYPE-N PLUG
J3 <sup>2</sup>	B: Side Tx Output	TYPE-N SOCKET	TYPE-N PLUG
J4	A: Side IBUC Interface	MS CIRCULAR CONNECTOR, BOX MTG SOCKET, 19S (MS3112E-14-19P)	MS CIRCULAR CONNECTOR, STRAIGHT PLUG, 19P (MS3116F-14-19S)
J5 <sup>1</sup>	A: Side IBUC Ethernet	RJ-45-IP67 SHIELDED INLINE CONNECTOR WITH CAP (CONECTECH. 17-103794)	RJ-45-IP67 PLUG (CONECTECH. 17-101794)
J6	B: Side IBUC Interface	MS CIRCULAR CONNECTOR, BOX MTG SOCKET, 19S (MS3112E-14-19P)	MS CIRCULAR CONNECTOR, STRAIGHT PLUG, 19P (MS3116F-14-19S)
J7 <sup>1</sup>	B: Side IBUC Ethernet	RJ-45-IP67 SHIELDED INLINE CONNECTOR WITH CAP (CONECTECH. 17-103794)	RJ-45-IP67 PLUG (CONECTECH. 17-101794)
J8 <sup>1</sup>	User Interface Ethernet	RJ-45-IP67 SHIELDED INLINE CONNECTOR WITH CAP (CONECTECH. 17-103794)	RJ-45-IP67 PLUG (CONECTECH. 17-101794)
J9	User Interface	MS CIRCULAR CONNECTOR, BOX MTG SOCKET, 19S (MS3112E-14-19S)	MS CIRCULAR CONNECTOR, STRAIGHT PLUG, 19P (MS3116F-14-19P)
J10 <sup>1</sup>	Auxiliary Ethernet	RJ-45-IP67 SHIELDED INLINE CONNECTOR WITH CAP (CONECTECH. 17-103794)	RJ-45-IP67 PLUG (CONECTECH. 17-101794)
J11	Waveguide Switch	MS CIRCULAR CONNECTOR, BOX MTG SOCKET, 6S (MS3112E-14-6S)	MS CIRCULAR CONNECTOR, STRAIGHT PLUG, 6P (MS3116F-14-6P)

1. Ethernet port does not support PoE
2. A mating M&C connector for J3 is provided with the Tx 1+1 system.

Terrasat offers a range of outdoor PSUIs to support all IBUC power levels. Power supplies have an auto-ranging AC front end that will work with both 115 VAC and 230VAC. The outdoor PSUI is shipped with a DC power cable (5 ft) and mating connectors for the AC mains power cable.

### J1, J2 and J3

The A: side Tx Output (J1), Tx Input (J2), and B: side Tx Output (J3) connectors are Type-N connectors.

**Table 7.2** Pin Assignments for M&C Interface connectors J1, J2, and J3

Reference Designator	Function
J1	TX A: OUTPUT, L-BAND, 10 MHz, FSK
J2	TX INPUT, L-BAND, 10 MHz, FSK
J3	TX B: OUTPUT, L-BAND, 10 MHz, FSK

### M&C Interface J4 and J6

The M&C interface connectors are 19-pin circular connectors used to enable the IBUCs to exchange communications and status, as well as monitor and control the waveguide switch. Pin assignments are shown in [Table 7.3](#). The M&C cables used to connect to the Tx 1+1 interface module to the IBUCs are supplies with the Tx 1+1 system.

**Table 7.3** Pin Assignments for M&C Interface Connectors J4 and J6

Pin	Function
A	RS485(+)
B	RS485(-)
C	HAND-HELD TERMINAL POWER(+)
D	RS232 RXD
E	RS232 TXD
F	HAND-HELD TERMINAL POWER(-)
G	ALARM OUTPUT
H	NOT USED
J	NOT USED
K	NOT USED
L	IBUC ALARM OUTPUT Normally Open
M	IBUC ALARM OUTPUT Common
N	IBUC ALARM INPUT/MUTE
P	IBUC ALARM OUTPUT Normally Closed
R	1+1 SWITCH COMMAND A:
S	1+1 SWITCH COMMAND B:
T	1+1 SWITCH INDICATOR A:
U	1+1 SWITCH INDICATOR B:
V	1+1 REDUNDANCY ENABLE

## Transmit Output J5, J7, J8 and J10

The J5, J7, J8 and J10 connectors are shielded Ethernet Connectors used to enable remote monitoring and control of the Tx 1+1 System operating parameters. Pin assignments are listed in [Table 7.4](#).

**Table 7.4** Pin Assignments for M&C Interface connectors J5, J7, J8, and J10

Pin	Function
1	TCP/IP TX(+)
2	TCP/IP TX(-)
3	TCP/IP RX(+)
4	NOT USED
5	NOT USED
6	TCP/IP RX(-)
7	NOT USED
8	NOT USED

## User interface J9

The User Interface connector is a 19-pin circular connector used to enable remote monitoring and control of the Tx 1+1 System operating parameters. The J9 connector enables use of RS485, the Hand-held Terminal (HHT), RS232, and alarms. Pin assignments are shown in [Table 7.5](#). If the user interface port of the Tx 1+1 interface module is going to be used, the cable should be a shielded multi-conductor cable with at least two each twisted pairs. The twisted pairs used for TCP/IP must have an impedance of 100 ohms. For cable drawings, see [Appendix G, Component Specifications and Reference Drawings](#). An assembled IP cable is available from Terrasat.

Note: Customers who order a Hand-held terminal (HHT) will receive two cables: one is wired specifically for the A: side IBUC, and the other is wired specifically for the B: side IBUC. The cables are marked for usage.

**Table 7.5** Pin Assignments for M&C Interface Connector J9

Pin	Function
A	RS485(+)
B	RS485(-)
C	HAND-HELD TERMINAL POWER(+)
D	A: HAND-HELD TERMINAL, RS232 RXD
E	A: HAND-HELD TERMINAL, RS232 TXD
F	HAND-HELD TERMINAL, RS232, RS485 COMMON
G	TCP/IP TX(+)
H	TCP/IP TX(-)

**Table 7.5** Pin Assignments for M&C Interface Connector J9

J	TCP/IP RX(+)
K	TCP/IP RX(-)
L	A: IBUC ALARM OUTPUT Normally Open
M	A: IBUC ALARM OUTPUT Common
N	A: IBUC ALARM OUTPUT Normally Closed
P	B: IBUC ALARM OUTPUT Normally Open
R	B: IBUC ALARM OUTPUT Common
S	B: IBUC ALARM OUTPUT Normally Closed
T	B: HAND-HELD TERMINAL, RS232 RXD
U	B: HAND-HELD TERMINAL, RS232 TXD
V	NOT USED

### Waveguide Switch Control/Indicator J11

The waveguide switch control/indicator connector is a 6-pin circular connector used to enable the Tx 1+1 system to monitor and control the waveguide switch. The cable that connects the Tx 1+1 interface module and the waveguide switch is supplied with the system.

**Table 7.6** Pin Assignment for M&C Interface connector J11

Pin	Function
A	SWITCH POSITION A: COMMAND
B	SWITCH POSITION A: COMMON
C	SWITCH POSITION B: COMMAND
D	SWITCH INDICATOR A:
E	SWITCH POSITION B: COMMON
F	SWITCH INDICATOR B:

## Cable and Waveguide Connections



# WARNING

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

When installing the cable and waveguide assemblies, ensure that all connections are weather tight. If the optional Rx reject filter is being used, attach it to the Tx Redundancy waveguide output. Ensure that proper gasketing is used to prevent water damage.

### **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 tape forms 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 tape to all connectors that may be exposed to moisture.

### **Typical Initial Setup**

1. Connect the IFL coaxial cable between the Tx 1+1 interface module connector J2 (Tx L-band In) and the modem (Tx L-band Out).
2. Connect one M&C cable between the J4 connector of the Tx 1+1 interface module and the J2 connector of the A: side IBUC (User Interface) and another M&C cable between the J6 connector of the TX 1+1 interface module and the J2 connector of the B: side IBUC.
3. Connect one Ethernet cable between the J5 connector of the Tx 1+1 interface module and the J4 connector of the A: side IBUC and another Ethernet cable between the J7 connector Tx 1+1 interface module and the J4 connector of the B: side IBUC.
4. Connect a section of flexible waveguide between the OMT transmit port and the Tx RF Output from the waveguide switch (or optional Rx Reject filter). The waveguide should be attached to the antenna feed according to the manufacturer's instructions. Ensure that proper gasketing is used to prevent water damage.
5. Connect the waveguide switch cable between the J11 connector of the Tx 1+1 interface module and the 6-pin connector on the waveguide switch.

6. Connect one coaxial cable between the J1 connector of the Tx 1+1 interface module and the J1 connector of the A: side IBUC and another coaxial cable between the J3 connector of the Tx 1+1 interface module and the J1 connector of the B: side IBUC.
7. Connect the DC cable between the outdoor PSUI J2 connector (DC Output), as appropriate, and the J3 connectors (DC Input) of both IBUCs.

Note: [Figure 7.2](#) on [page 7-3](#) illustrates these connections.

## Grounding

---

### 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. An Ufer ground encases grounding conductions in concrete. Concrete absorbs moisture quickly, yet retains that moisture for a period of time (as much as 15 to 30 days after rain or snow melt). The concrete's large volume and great area of contact with the surrounding soil enables a good transfer to the ground.

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

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, spaced 20 ft (6.1 m) apart. The first rod should be placed close to the antenna. The second rod should be placed towards the equipment enclosure. Connect the rods and antenna mount with #2 gauge wire. 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 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.

## Tx Redundancy/PSUI Grounding Recommendations

Grounding and lightning protection is recommended as follows.

- Cable Shielding

The 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 be protected as well.

- Electrical Grounding

Grounding the IBUC **3**, IBUC **3G** and PSUI units is recommended to prevent possible damage from lightning and/or other induced electrical surges. Terrasat recommends that 3/0 or 4/0 AWG (American Wire Gauge) stranded copper wire be used to bond the IBUC and the PSUI to the earth ground (grounding rod), using the most direct (or shortest) route.

## System Alignment and Operation

---

### General

---

The following sections outline the procedure for setup and alignment of the earth station. Prior to ODU alignment, the antenna should be set to the desired azimuth and elevation settings per manufacturer's instructions.



## CAUTION

The Transmit Redundant System must not transmit until alignment and any necessary adjustments are complete.



## Test Equipment

Terrasat recommends the equipment or its equivalent listed in [Table 7.7](#) for installation and system alignment.

**Table 7.7** Recommended Test Equipment

Equipment	Type
Spectrum Analyzer	Agilent HP8563E
Digital Voltmeter	Fluke 8050
Waveguide-to-coaxial Adapter	C-band or Ku-band
RF cables	With calibrated insertion loss up to 15 GHz
40 dB attenuator	High power to match HPA output
Assortment of cables, connectors and adapters (calibrated up to 15 GHz)	

Ensure that the Tx output power is disabled to prevent accidental transmission interference with adjacent satellites or transponders before attempting to align or performing any other operation involving the ODU. Before attempting any system change, carefully evaluate the possible effects of the transmitted signal.

## Setting the Tx Frequencies

All transmit and receive frequencies are set by using the modem. For a direct connection to an L-band modem, follow the manufacturer’s instructions on setting the transmit and receive frequencies.

## Tx Power Alignment

### Transmit L-band Input Adjustment with Modem or Converter



# WARNING

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

To set the power level of the modulator output:

1. Use a spectrum analyzer to measure the power level of the L-band signal at the output of the coaxial cable that connects to the Tx 1+1 interface module at J2 (Tx L-band).

2. Use the modem or converter level adjust to increase and decrease the power level. Adjust to reach a level of -24 dBm (this will result in rated power at the IBUC **3** or IBUC **3G** output).

3. Check that the 10 MHz reference signal is within the range of +5 dBm to -12 dBm.

Note: The IBUC **3** and IBUC **3G** require a 10 MHz reference signal to operate. Check the model number of the IBUC to determine whether an external 10 MHz signal is required.

4. Disconnect the spectrum analyzer from the coaxial cable.

### Transmit RF Output Adjustment with Modem or Converter

To adjust the power level of the IBUC transmitter output:

1. Ensure that the power level at the input of the IBUC does not exceed -30 dBm at startup.

Note: For more information about how to set the Tx frequency, see [Setting the Tx Frequency \(L-band\)](#) on page 4-4.

2. Ensure that the 10 MHz reference signal (either internal or external) is present

3. Apply power to the IBUCs.

4. Enable the Tx signals in the modem or converter and the IBUCs.

5. With a satellite modem: Adjust the RF output to the designated power level (provided by the satellite network operations center or its engineering staff) with the L-band output (modem) level adjust. Do this for both systems (A: side and B: side). Equalize the gains by using the gain setting control of the IBUCs.

Note: There are differences between the units and the autocloning feature does not transfer the attenuator settings from the Master (or online) unit to the Slave (or standby) unit.

6. Under the guidance of the network operations center, fine-adjust the transmit power for the desired down-link margin at the receiving station by adjusting the Tx L-band output level adjust (modem or converter output).

Note: For more information about configuring the IBUCs, see [Chapter 4, Operations](#). For more information about configuring and operating in redundant mode, see the [Redundancy Configuration Tab](#) on page C-20.

## Final Checks

---

To ensure optimum operation, inspect the system for crimped or pinched cabling. Make sure all connections are secure. Once the system has been aligned and is operating satisfactorily, it will require infrequent and simple maintenance procedures as described in [Maintenance](#) on page 6-1.

## M&C Setup

---

### Tx Redundant System

#### Default Values

##### **A: SIDE IBUC**

RS485 Data Rate is 9600 baud

RS485/FSK Mode is 1 (Legacy Binary mode)

Default IP address is 192.168.1.21

Other (standby) BUC IP address is 192.168.1.22

IP gateway address is 192.168.1.1

##### **B: SIDE IBUC**

RS485 Data Rate is 9600 baud

RS485/FSK Mode is 1 (Legacy Binary mode)

Default IP address is 192.168.1.22

Other (standby) BUC IP address is 192.168.1.21

IP gateway address is 192.168.1.1

Note: RS485/FSK Mode 1 is the default setting to enable compatible modems to use the “Legacy Binary” mode to communicate with the IBUC.

### General

You can communicate with the redundant system via any of the following five interfaces: TCP/IP, RS232, RS485, hand-held terminal (HHT), and FSK link. FSK is delivered to the interface module from the modem via the J2 connector. The FSK link uses FSK signals between the IBUC and modem that are multiplexed on the IFL coaxial cable.

Note: Use only the J8, J9, or J10 connectors when attempting to communicate with the IBUC **3**.

- The J8 connector (labeled User Interface – Ethernet) carries TCP/IP.
- The 19-pin J9 connector (labeled User Interface) carries RS232, RS485, the Hand-held terminal, TCP/IP, and Form-C alarms.
- The J10 connector (labeled Aux Ethernet) carries TCP/IP.

### TCP/IP

You can communicate with the IBUC via TCP/IP through Telnet (ASCII) or the onboard Web server (HTTP). The IBUC uses a static IP addressing structure and does not support DHCP. The IBUC 1+1 system is factory configured as follows:

**A: SIDE IBUC**

IP Address 192.168.1.21  
Other IBUC IP Address 192.168.1.22  
IP Gateway 192.168.1.1  
Subnet Mask 255.255.255.0  
Telnet Port 23

**B: SIDE IBUC**

IP Address 192.168.1.22  
Other IBUC IP Address 192.168.1.21  
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 IBUC 1+1 system. Using a suitable cable, connect the computer to the J8, J9, or J10 connectors on the IBUC 1+1 system.

**Telnet**

On the host computer, activate a command prompt window. Type `Telnet 192.168.1.21` for the A: side IBUC or `Telnet 192.168.1.22` for the B: side IBUC and a cursor should appear on the left of the screen. Type the password command, `CPE=1234`, and the response will be `IBUC>_`. Commands can now be entered to access the IBUC functionality. For more information, see [Chapter 5, Monitor and Control Features](#).

**Web Server**

On the host computer, activate a Web browser window. In the address window, type `http://192.168.1.21` and then press Enter. Within a few seconds, a login screen appears. Type the password in the dialog box (the default is `1234`), and then click **Login**. The page that appears is split with the A: side IBUC on the left side of the browser window and the B: side IBUC on the right side of the browser window. From the Informations Tab, you can select from the following Web pages:

- Alarm
- Sensor
- Transmit Config
- Interface Config
- System Config
- Alarm Config
- Redundancy Config
- Alarm Log

The Sensor tab enables monitoring of various IBUC parameters. Alarms are color coded where solid green indicates OK – no alarms, , yellow indicates a warning, and red indicates an alarm condition.

The “Configuration” pages provide access for changing factory default settings to suit specific site or network requirements. Settings take effect only when you click **Save Settings**. Note that some changes in configuration will cause a loss of communication with the host computer. It will then be necessary to make the corresponding change in the host computer.

For example, to change a unit’s IP address (using the default settings):

1. Navigate to the [Interface Configuration Tab](#).
2. Change the IP address to something other than 192.168.1.21 (the factory default).
3. Click **Save Settings**.  
IP address changes take effect immediately.
4. In the host computer Web browser, type the new address and come back in through the Login page.

## **RS232**

No additional configuration of the IBUC Tx 1+1 system is required for proper RS232 operation. To use RS232, you must connect a suitable cable to the J9 connector. Pin assignments for the cable are listed in [Table 7.3](#) on [page 7-9](#). The RS232 port uses ASCII protocol and a fixed baud rate of 9600 for communication. On the host computer, set the serial port settings to the following: Baud rate to 9600, data bits to 8, parity to none, stop bits to 1, and flow control to none. The IBUC can be accessed using a terminal emulation program on the host computer such as HyperTerminal. For information about how to connect using HyperTerminal, see [Appendix B, Using HyperTerminal](#). To configure TCP/IP, set the following:

### **A: Side IBUC**

CIA=192.168.1.21 // IP Address  
CIB=192.168.1.22 // Other IBUC IP Address  
CIG=192.168.1.1 // IP Gateway  
CIM=255.255.255.0 // Subnet Mask  
CIP=23 // Telnet Port

### **B: Side IBUC**

CIA=192.168.1.22 // IP Address  
CIB=192.168.1.21 // Other IBUC IP Address  
CIG=192.168.1.1 // IP Gateway  
CIM=255.255.255.0 // Subnet Mask  
CIP=23 // Telnet Port

If cloning is disabled set the following commands to configure the RS485 interface:

**A: Side IBUC**

C4A=1 // RS485 Address  
C4D=20 // RS485 Delay  
C4R=9600 // RS485 Baud rate  
If ASCII mode is desired type  
C4M=0 // RS485 Mode (Not factory default)  
If Legacy mode is desired type  
C4M=1 // RS485 Mode

**B: Side IBUC**

C4A=2 // RS485 Address  
C4D=20 // RS485 Delay  
C4R=9600 // RS485 Baud rate  
If ASCII mode is desired type  
C4M=0 // RS485 Mode (Not factory default)  
If Legacy mode is desired type  
C4M=1 // RS485 Mode

If cloning is enabled, C4D, C4R and C4M commands will be automatically cloned from Master to the Slave unit. Thus, when cloning is enabled use the following steps:

1. Configure Master IBUC as shown above
2. Set the C4A command directly at the slave unit.

**RS485**

Communicating with the IBUC across RS485 can be through ASCII or a proprietary binary protocol known as Legacy Binary.

**ASCII Mode**

The default configuration is Legacy Binary mode so you will need to reconfigure the IBUC in order to use ASCII mode. ASCII mode can be selected by using any of the M&C interfaces.

Communication through a terminal emulation program such as HyperTerminal requires an on-board RS485 card in the host computer. In HyperTerminal, type the password command: <0001/CPE=1234 for the A: side IBUC and <0002/CPE=1234 for the B: side IBUC, and then press **Enter**. When the < prompt reappears, the IBUC is ready to accept commands. In the previous example, <0001/ is the address of the IBUC followed by the desired command. Nothing is returned for the CPE command. If there is no error then it was successful.

Most recent RS232 to RS485 converters have the capability of performing a automatic line turn around. In such cases, a terminal emulation program will function normally. If such capabilities are not present, the terminal emulation program will not function. In these cases, a network management program is required to handle this handshaking requirement.

### **Legacy (Binary) Mode**

The default setting of the IBUC is Legacy Binary mode. Use an external network management program to establish communication with the unit.

### **Hand-held Terminal**

No additional configuration of the IBUC is required to use the hand-held terminal (HHT). Connect the 19-pin connector of the HHT cable to the J9 connector and plug the phone jack into the HHT. Once a flashing cursor is seen in the upper left of the HHT screen, press the decimal key on the HHT four times to activate the HHT. The login screen will appear. Type the default password of 1234.

Note: Be sure to use the cables as labeled; that is, use the cable labeled “A: side” with the A: side IBUC and the cable labeled “B: side” with the B: side IBUC.

More information about the hand-held terminal menu tree can be found in [Appendix D, Hand-Held Terminal Menu Tree](#).

### **FSK Link**

Several brands of modem are capable of communicating with an IBUC using an FSK signal multiplexed onto the IF output connector along with the Tx IF signal and 10 MHz reference. This enables the operator to monitor and control the IBUC from the modem front panel. The IBUC default configuration is RS485/FSK Mode 1 (Legacy Binary mode) since all modems currently require this protocol for FSK links.

The IBUC is also capable of FSK communication using ASCII mode but requires a modem compatible with this method. Refer to the modem’s documentation for commands and procedures for FSK communication with the IBUC.

### **Multifunction LEDs**

There are 10 LEDs mounted on the Tx 1+1 interface module housing to provide visual indication of IBUC status. [Figure 7.5](#) depicts the locations of the LEDs. LED colors and modes are as follows:

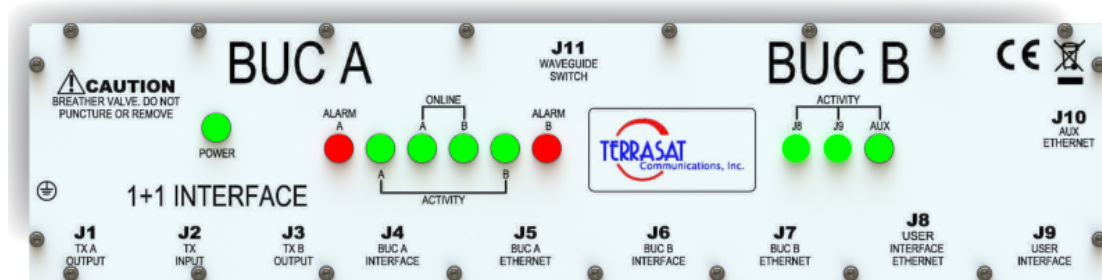
Solid Green – No Alarms

Flashing Green – Activity is being reported

Steady Red – Major Alarm is being reported

Note: A solid green light is also used to indicate which IBUC is the unit that is currently online.

Alarms are defined in [Chapter 5, Monitor and Control Features](#). Note that certain alarms are configurable – enabling you to define them as Major or Minor.



**Figure 7.5** Multifunction LEDs for a Tx 1+1 System

The 10 LEDs include:

**Power:** – indicates power is supplied to the unit.

**Alarm A:** – red indicates a major alarm is present for the A: side IBUC. Green indicates OK.

**Activity A:** – indicates Ethernet activity on the A: side IBUC.

**Online A:** – indicates that the A: side IBUC is transmitting the Tx signal to the antenna.

**Online B:** – indicates that the B: side IBUC is transmitting the Tx signal to the antenna.

**Activity B:** – indicates Ethernet activity on the B: side IBUC.

**Alarm B:** – red indicates a major alarm is present for the B: side IBUC. Green indicates OK.

**Activity J8** – indicates Ethernet activity on User Interface port J8.

**Activity J9** – indicates M&C activity on User Interface port J9.

**Activity Aux** – indicates Ethernet activity on the Auxiliary User Interface port J10.



## Mechanical Interface

Tx redundant systems are mounted on a mounting plate to facilitate installation. The interface module, two IBUCs, and the Tx RF switch with associated cables and waveguide are mounted on a single plate. Power supply units are mounted on a similar plate that is meant to be mounted close to the IBUC system. For outline drawings of the redundant mounting system, see [Appendix G](#).

# Service and Maintenance

---

The Terrasat redundant systems are self-contained units that require very little maintenance.

## Standard Maintenance

---

For optimum performance, inspect the mechanics of the system every six months. Clean the antenna feeds as necessary to keep them clear of obstructions and check the cables and connectors for signs of wear, damage, or loose connections. Check all fan intakes and exhausts to ensure that they are free and clear of debris. Ensure that all cables have adequate slack.

## Fault Isolation

---

### Transceiver Fault Isolation

The information contained in this section should suffice in determining whether a Terrasat redundant system is faulty. The intent is to determine a “GO” or “NO GO” situation based on alarms indicated through the M&C ports, as well as measuring certain signals using test equipment.

### AC Power Problems/Conditioning

In today's electrical environment there are many types of power-related problems that prevent proper operation of sensitive electronic equipment. These noise problems or disturbances can be caused by such things as voltage induced by lightning, the switching on/off of high-power electrical equipment, or utility company actions such as power factor correction. Serious problems can arise with the occurrence of transients and spikes causing random errors, or even failure of the PSUI circuitry. Whatever the origin of the transients, they can be classified in two categories:

- COMMON MODE: The noise voltage that appears equally and in phase from each signal conductor to ground.
- NORMAL MODE: The noise potential between the power line conductors. It adds to and subtracts from the power line sinusoidal voltage wave.

### **Category A**

At the wall outlets (and more than 30 ft from a distribution panel), the typical noise is a 0.5  $\mu$ s rise time up to 6 kV peak, open circuit voltage 100 kHz ring wave with 200 ampere short circuit current capability.

### **Category B**

At the distribution panel, equipment can experience the 100 kHz ring wave but with 500 ampere current capability and a unidirectional impulse up to 6 kV potential rising in 1.2  $\mu$ s and decaying to half voltage in 50  $\mu$ s. Accompanying this can be a short circuit current up to 3000 amperes rising to peak in 8  $\mu$ s and decaying to half value in 20 $\mu$ s.

To ensure uninterrupted service, Terrasat recommends the use of a line conditioner and/or UPS based on the expected AC power at the site.

### **Site-Related Problems**

VSAT antennas are often fitted on top of buildings. Avoid close proximity to elevator motors, etc. Also ensure that the satellite signal path is free and clear of obstructions.

### **M&C Checks**

When troubleshooting redundant systems, the first level of troubleshooting should be to check the status through the M&C ports. Alarms and an alarm history are available. Refer to this chapter for specific information when using the RS232, RS485, Ethernet, or hand-held terminal ports.

### **Power Supply Checks**

For DC-powered IBUCs, before starting RF troubleshooting first verify that the proper voltages are being supplied to the Tx Redundant System. Input DC Voltage and current consumption data are available from the M&C. Verify that values are within limits. If M&C is not available, use a multimeter to verify that the appropriate voltages (24 VDC or 48 VDC) are present at the IBUC and Tx 1+1 Interface Module. The part number label on the IBUCs contains the required voltage (24 VDC or 48 VDC).

### **Warm Standby Mode**

In redundant operation, you can set the power amplifier into standby mode (a lower power-consumption mode that is designed to reduce energy usage when enabled). Depending on the model, the standby unit will only consume 20 watts to 100 watts. When enabled, the standby unit will be muted (its output power turned Off) until the switch to it occurs. Warm standby mode is available only when the A: side unit is the primary (or protected) unit and the B: side unit is the standby unit. When the A: side unit has been repaired, user intervention is required to place it back in redundancy mode.

When enabled, warm standby mode uses the A: side unit as the primary unit and the B: side unit as the standby unit. In a protected system, redundancy control is shared. The interface module that links the two units has no microprocessor of its own and acts only as a conduit to split signals, transfer communications channels, and to produce a summary alarm. The system must be in a known starting state in order to operate properly.

Warm standby mode operates only in non-reverting mode. This mode was chosen to avoid repeated switching between the A: side unit and the B: side unit in a scenario where both units fail.

**Note:** If warm standby mode is later disabled, the redundancy mode remains non-reverting until you manually change it.

The transmitter enable state is not user-configurable. Due to the nature of warm standby mode, both transmitters can never be On at the same time. If you have a stringent power budget that cannot support both units being On at the same time and you inadvertently enable both transmitters, the system will not operate properly.

If your power budget will allow both the A: side unit and the B: side unit to be powered On at the same time, do so. If your power budget does not allow this, follow these steps,

1. Power On the B: side unit.
2. Disable the transmitter.
3. Enable warm standby mode by using any of the interfaces (hand-held terminal, RS232, RS485, telnet, or the Web interface).
4. Power Off the B: side unit.
5. Power On the A: side unit.
6. Enable the transmitter.
7. Enable warm standby mode by using any of the interfaces.
8. Power On the B: side unit.



## CAUTION

1. If both BUCs are operating without alarms, ensure that the A: side unit is online before leaving the transmitter site. Doing so will enable protected mode.
2. Before upgrading a transmit redundant (Tx 1+1) system, ensure that you have downloaded the latest firmware from the Terrasat website at:

<https://terrasatinc.com/resources/firmware-updates/>

### Transmit Power Setting

There have been several cases where the transmit power has been turned up to or near saturation while transmitting a digital carrier. This most likely will result in spectral distortion, re-growth, and intermodulation products for multi-carrier operation.

When transmitting digital carriers, it is customary to operate the power amplifier system with an output back off (OBO) sufficient to meet the spectral density mask requirements and the interference requirements of multi-carrier operation.

### Tx IF Input Level Verification

If low or no Tx output power is detected, start the troubleshooting by checking the input to the Tx Redundant System. Use the following procedure:

1. Check the Tx Input Level displayed in any of the IBUC M&C interfaces or disconnect the cable at the IBUC J2 (Tx L-band) connector and use a spectrum analyzer to measure the power level of the L-band signal at the output of the coaxial cable that connects to the IBUCs at J2 (Tx L-band). The L-band signal level should be between -20 dBm and -55 dBm. If it is not, check the cable and modem output.
2. If the L-band signal is good, check that the 10 MHz reference signal is between +5 dBm and -12 dBm and is free of distortion. If it is not, check the cable and modem output (or IFU Tx Output).
3. If the L-band and 10 MHz signals are within specifications, check that the DC voltage level is within range (for DC-powered IBUCs). The DC voltage will be on

the DC cable that is connected to the IBUC J3 (DC Input) connector. If it is not, check the PSUI outputs and cables.

4. If the L-band, 10 MHz, and DC voltage (for DC-powered IBUCs) signals are good, proceed to the [Tx Redundancy Output Verification](#) check.
5. Disconnect the spectrum analyzer from the coaxial cable.

### **Tx Redundancy Output Verification**

This check assumes that the L-band, 10 MHz, and DC inputs (for DC-powered IBUCs) are at the correct levels.

1. Tx Output level is monitored and displayed in any of the IBUC M&C interfaces. Alternately, you may connect a waveguide-to-coaxial adapter and a 40 dB high-power attenuator to the Tx waveguide output.
2. Measure the Tx RF output with the spectrum analyzer connected at the waveguide output. Ensure that the cable loss of the cable being used for the measurement has been taken into account.
3. The RF power should be between rated power and rated power –25 dB. If it is not, the IBUC is defective and should be returned to the factory for repair. The Terrasat Repair Policy on [page 6-6](#) has information about returning a defective unit to the factory.
4. If the IBUC Tx RF output measures good, check the waveguide, feedhorn and antenna for proper operation.

### **Common Problems**

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

- Supply voltage at IBUC is low or missing
- 10 MHz reference at the IBUC is at the wrong level or missing
- 10 MHz phase noise does not meet the minimum requirements
- Antenna is misaligned
- Bad OMT and/or antenna
- Damaged cables
- Antenna on the wrong satellite
- Tx L-band input level is misadjusted or turned off
- Water in the IBUC due to no gasket in the waveguide or a hole in the feed window.
- Water in the coaxial connectors
- Incorrect frequency settings

## M&C Functions

---

The Tx and Rx redundant systems are designed to provide an interface for user configuration and control of the systems. In the Tx system, the IBUCs monitor & status can initiate switching when required. The Online/Master unit always clones itself to the Offline/Slave unit when cloning is enabled, ensuring that switching between units can occur as soon as possible. M&C features are available via the interface module enabling a single point of control for both IBUCs. Commands and alarms unique to the redundant system are built in to the IBUC M&C software.

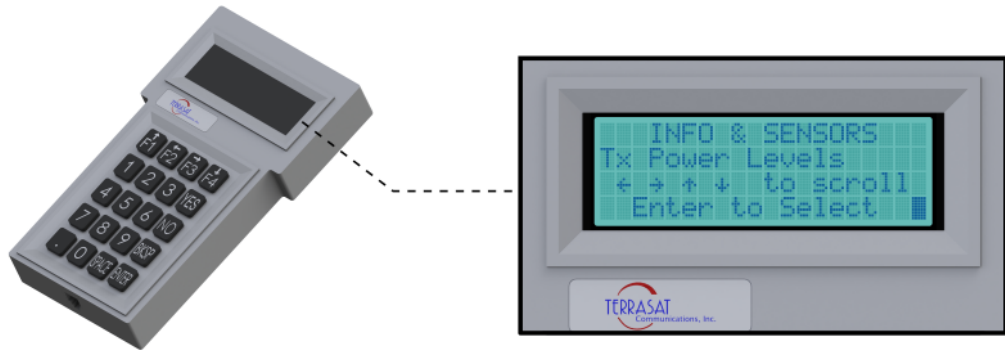
The interface module includes an Ethernet hub to enable users to monitor and control both IBUCs in TCP/IP with a single Ethernet connection and cable.

For remote operation, the redundant systems are equipped with a Monitor and Control function. The M&C function includes an FSK modem interface, an RS232 interface, an RS485 interface, a hand-held terminal, an Ethernet interface, multifunction LEDs, and two alarm relay closures (Form-C): one for the A: side IBUC and one for the B: side IBUC.

### User Interfaces

- **Tx Systems:** A bank of LEDs provide visual indications of Tx 1+1 status.
- **Hand-held Terminal (HHT):** An optional item that can be used to access the Tx Systems for local M&C via ports J4 (the A: side IBUC) and J6 (the B: side IBUC). The HHT has a 4-row x 20-column display with four function keys (F1-F4), a numeric keypad (0-9), and YES, NO, BKSP (backspace), SPACE, and ENTER keys. Initiate the HHT session by typing “. . .” (4 dots), followed by the password. The default password is 1234. [Figure 7.6](#) on [page 7-29](#) depicts the HHT.

The HHT menu consists of a main menu with multiple submenus. Access the main menus by pressing the left/right arrows (F2, F3) and the submenus by pressing the up/down arrow keys (F1, F4). Select a submenu item by pressing the ENTER key. To maneuver back to the previous screen, press the BKSP (backspace) key. Some screens (for example, INFO) only display information whereas other screens require user input. User input fields are reflected by the corresponding digit and a colon (such as 0:) as shown in the HHT Menu Tree on [page D-3](#) for Tx systems.



**Figure 7.6** Hand-held Terminal

- **Frequency Shift Keying:** FSK is multiplexed onto the IF cable by means of an FSK-modulated signal. FSK for redundancy commands operates only in ASCII mode. For more information about commands and values available in ASCII mode for Tx redundant systems, see [Appendix F](#). FSK and RS485 are tied together by the mode of operation (Legacy Binary or ASCII). Once the mode is selected, both will work in the same mode.

For more information about FSK specifications, see [Chapter 5](#).

- **RS485:** Two-wire half duplex which is on a separate cable. There are two modes of operation for RS485 interface: ASCII mode and Legacy Binary mode. Commands for redundant systems are available only in ASCII mode.

### RS485 in ASCII Mode

The RS485 interface is a standard two-wire interface (DATA+, DATA-). The baud rate is programmable to 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 baud. The data is transmitted asynchronously at 8 bits, no parity, 1 stop bit.

Basic protocol:

Start of Packet: < (ASCII code 60; 1 character)

Target Address: (4 characters)

Address De-limiter: / (ASCII code 47; 1 character)

Instruction code: (n characters)

Code qualifier: = (ASCII code 61 or 63; 1 character)

Optional arguments: (n characters)

End of Packet: Carriage Return (ASCII code 13; 1 character)

Example: <0001/CPE=1234{CR}

Commands and values available in ASCII mode for Tx Redundant Systems can be found in [Appendix F](#).

## TCP/IP via Ethernet Cable

The Ethernet port is a highly integrated Ethernet Controller which offers an NE2000-compatible adapter with full-duplex and power-down features. The full-duplex function enables simultaneous transmission and reception on the twisted-pair link to a full-duplex Ethernet switching hub. The Ethernet interface is connected through an isolation transformer and filter.

For the Ethernet interface, the packet is encapsulated in several layers (TCP segment inside of an IP datagram inside of an Ethernet frame). The Ethernet MAC address is preset at the factory – each IBUC has a unique MAC address. The IP address, network mask, default route, DNS server, and TCP listen port are configurable through the hand-held terminal interface. The IBUC controller does not support DHCP.

The command set for Tx Redundant Systems RS232, RS485, FSK, TCP/IP and hand-held terminal is provided in [Appendix F](#).

M&C using TCP/IP is displayed in embedded Web pages. Users connect to the redundant system M&C and type one of the IBUC IP addresses through a Web browser (for Tx Redundancy). After login, you have a choice of Web pages with monitoring, control, and alarm information. For Tx redundant systems, the screen splits in half with information for both the A: side IBUC and the B: side IBUC.

## Repair Policy

---

The Terrasat transmit redundant systems are not repairable in the field.

In the event that a failure has been detected, it may be necessary to return the defective unit to the factory. Terrasat's [Repair Policy](#) on [page 6-6](#) has instructions for returning a defective unit to the factory.





## 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

### Decoding the Part Number

---

Use the charts on the following pages to help determine the information contained in the part number about your specific unit.

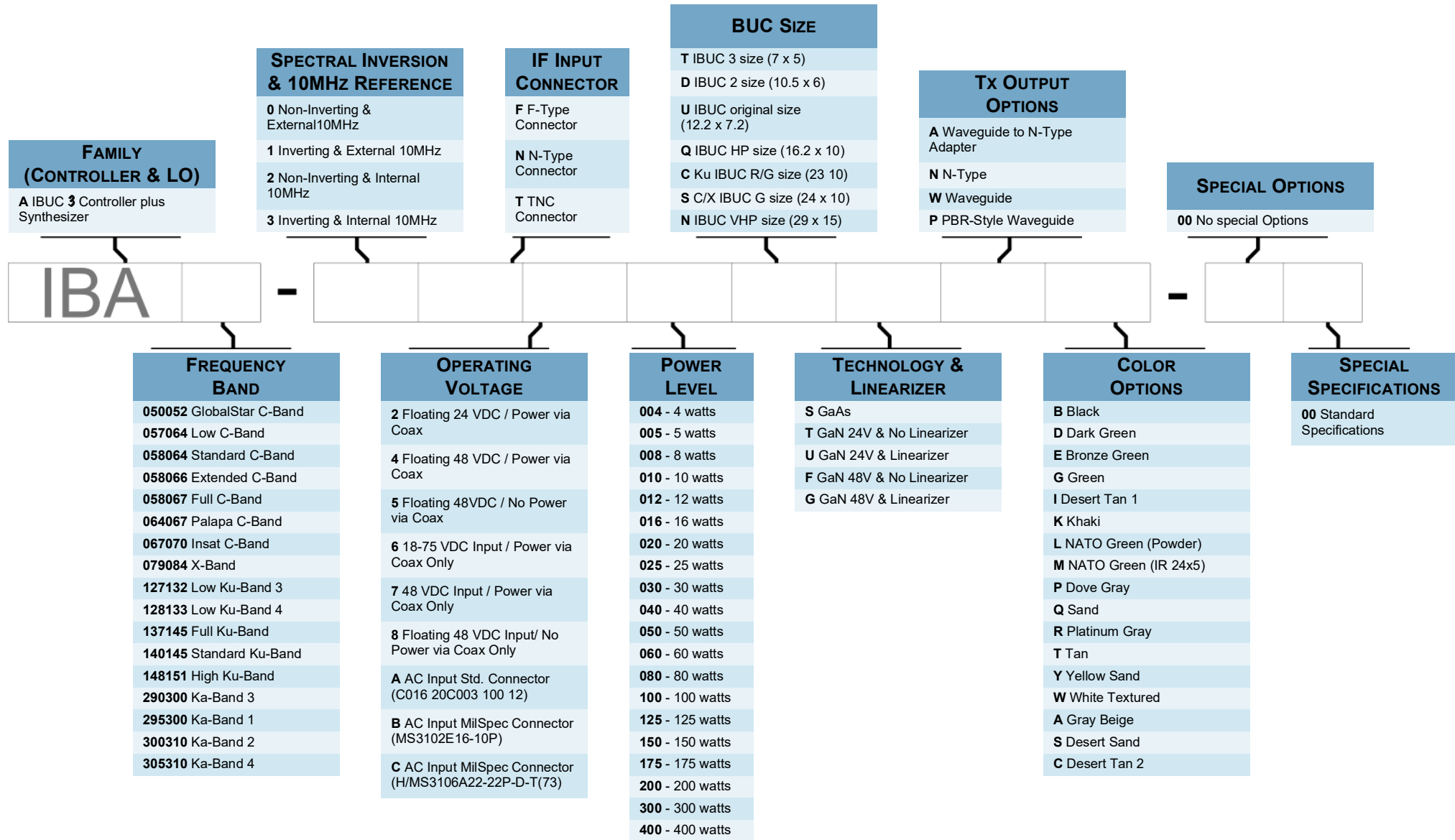


Figure A.2 Part Numbering Schema for IBUC 3 & IBUC 3G

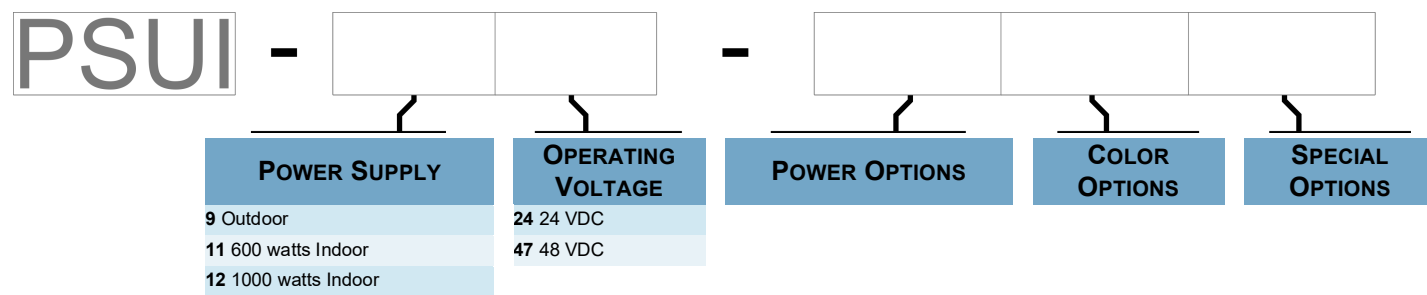
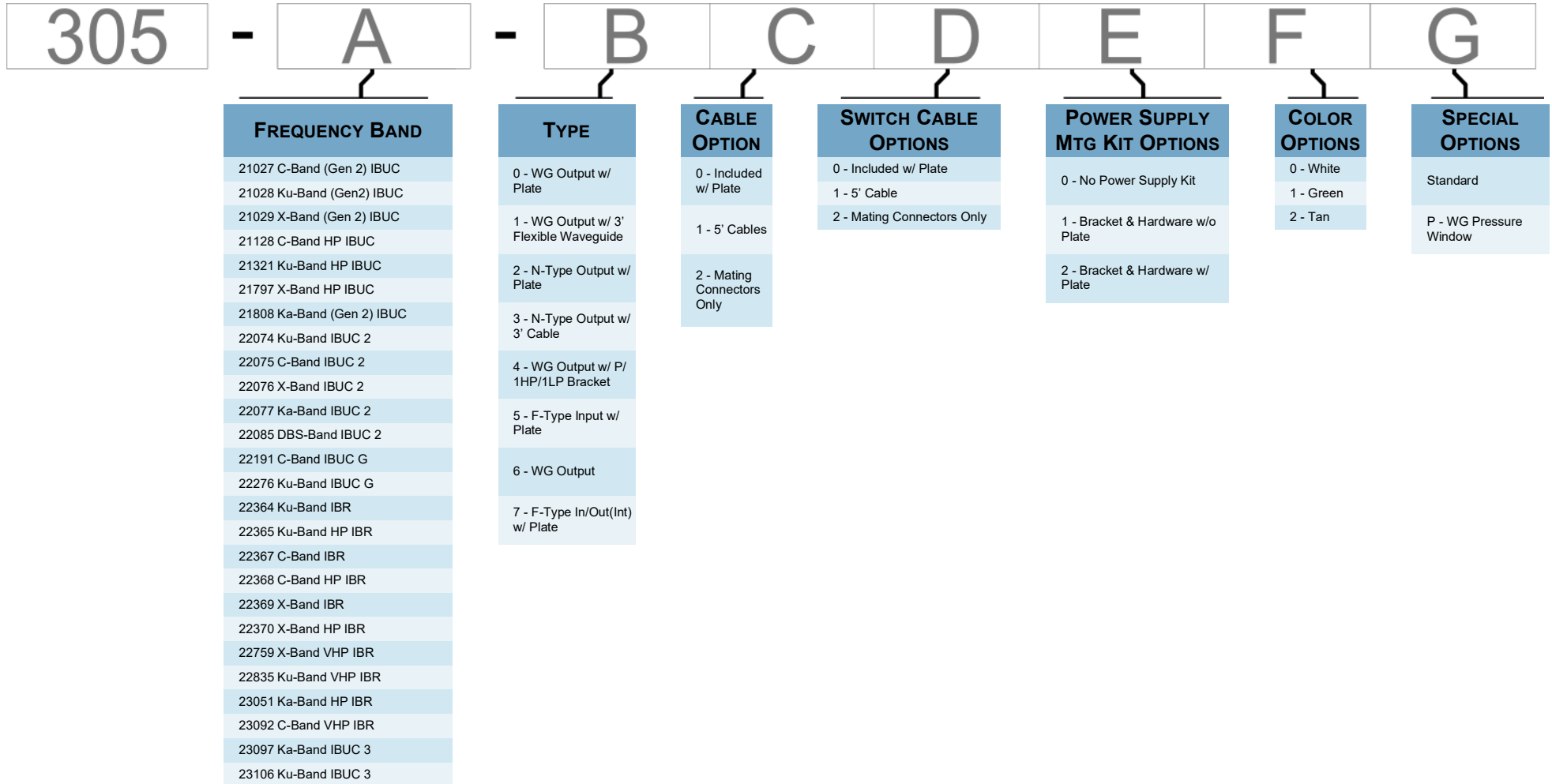


Figure A.3 Part Numbering Schema for IBUC with PSUI Systems



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

## USING HYPERTERMINAL

This appendix describes how to use an RS232 connection and HyperTerminal to communicate with the IBUC.

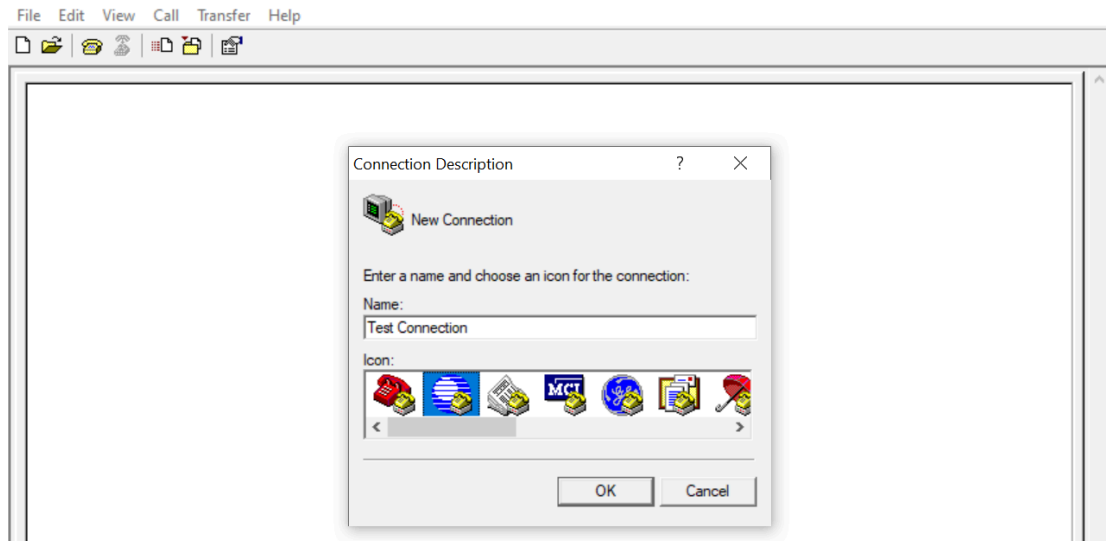
### Establishing a HyperTerminal Session

---

To communicate with the IBUC using an RS232 connection and HyperTerminal,

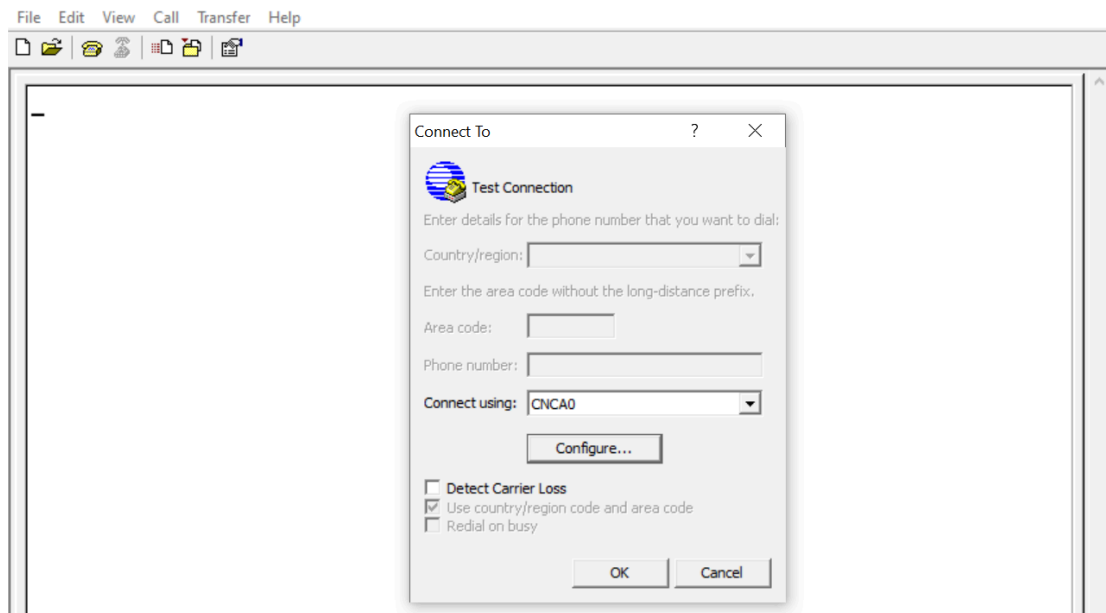
1. Connect a cable to a serial port of a PC and the M&C connector of the IBUC.  
Refer to the fabrication drawing in [Figure G.1](#) on [page G-2](#) for information about making a 19-in to DB9F cable.
2. From the Windows Start menu, choose Start → All Programs → Accessories → Communications → HyperTerminal.

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



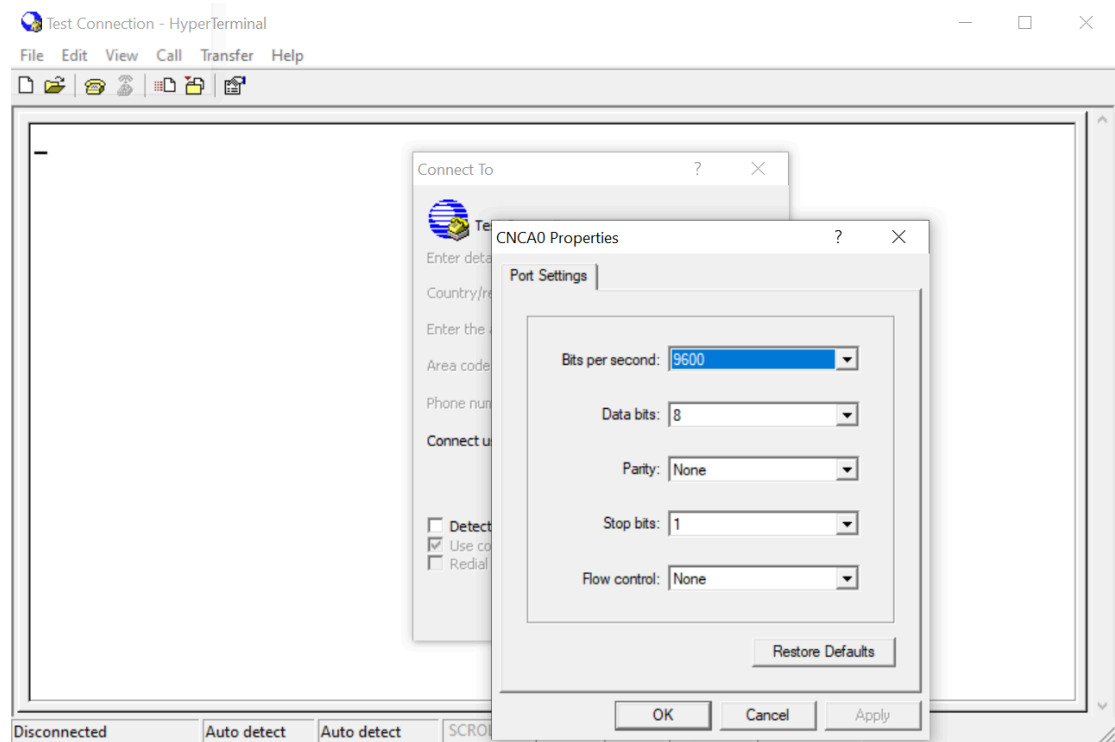
**Figure B.1** New Connection Description Window

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 B.2](#)



**Figure B.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 B.3](#) appears.

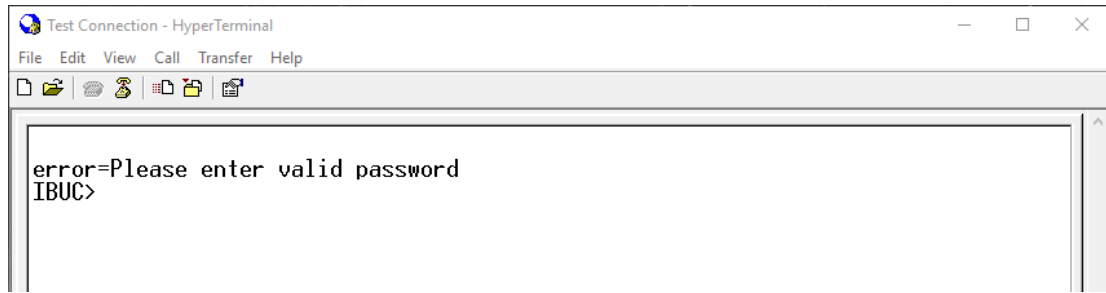


**Figure B.3** Port Properties Window

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.

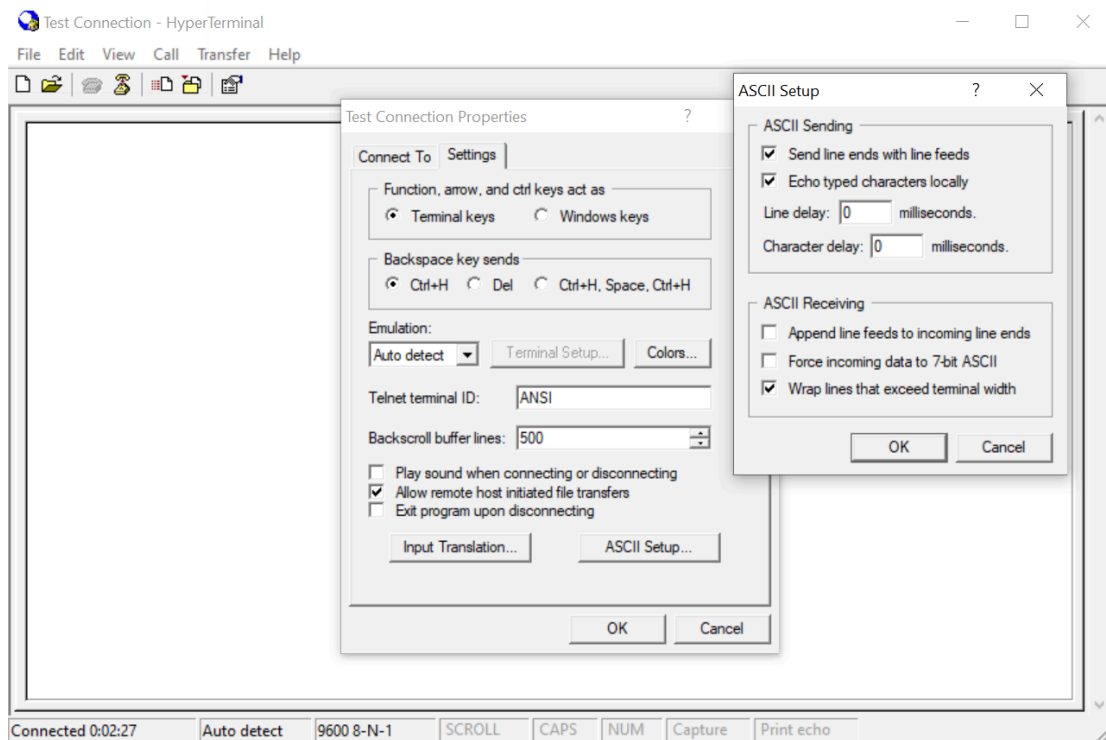
Test the connection by pressing Enter. You should receive an “error=Please enter valid password” message and the IBUC> prompt as shown in [Figure B.4](#).

**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 IBUC> 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 B.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 B.5](#).



**Figure B.5** ASCII Steup 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 IBUC> prompt, type CPE=1234 and press Enter. This command logs you in to the IBUC.

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 B.6](#), your login was not successful. Check the password value and try again.



**Figure B.6** Invalid Value Error Message

15. The IBUC 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 IBUC 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 B.7](#).

```
cpe=1234
IBUC>coi
TERRASAT COMM. INC.
Model IBUC140145-048008,
SN TE000000,
FW IBUC v.103, Mon Feb 9 2009 15:07:40,
P=4 (8 W)
LOid=6:KuS, (14000 to 14500 MHz)
IBUC>cia
CIA=192.168.1.8
IBUC>cim
CIM=255.255.255.0
IBUC>cig
CIG=192.168.1.1
IBUC>cip
CIP=23
IBUC>_
```

**Figure B.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 B.1](#) on [page B-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 to log into the IBUC.

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,

1. Choose File → Exit





## EMBEDDED WEB PAGES

The embedded Web pages shown in this appendix are a user-friendly way to access the various monitor and control (M&C) features offered by the IBUC **3** and IBUC **3G**.

Most of the screen shots from the Web interface shown in this appendix are from a transmit redundant (Tx 1+1) system. The main data area below the tabs is split into two identical windows for the A: side IBUC and the B: side IBUC. In a single IBUC system, only a single data window is displayed.

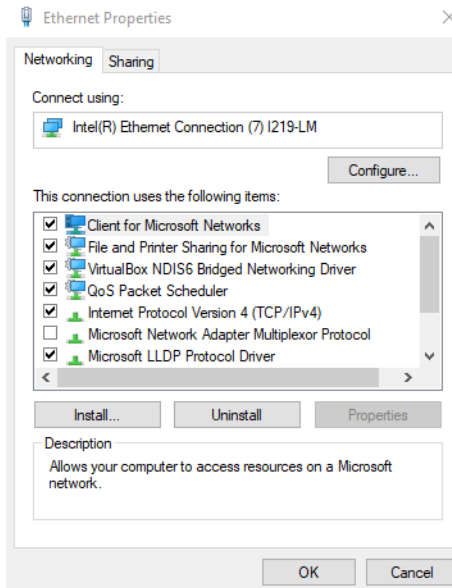
### Introduction

---

To access the embedded Web pages,

1. Connect the host computer to the IBUC **3** or IBUC **3G**.
  - When using a single IBUC, connect a TCP/IP cable to J4 connector on the IBUC.
  - When using a Tx 1+1 redundant system, connect a TCP/IP cable to the 19-pin J4 connector.

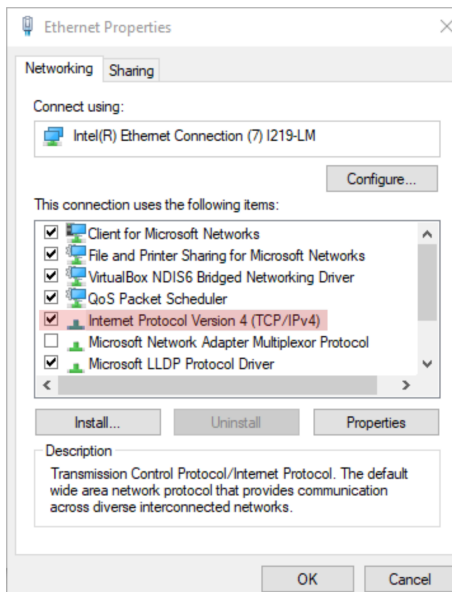
- Note: Steps 2 through 8 will guide the user on how to setup the host PC for the first access to the IBUC embedded web pages. Despite this process being shown on a Windows machine, the process can be achieved on other Operating Systems
2. On Windows Operational Systems, open the Start Menu by pressing the Windows icon and then search for “Control Panel” in the search bar.
  3. Navigate to “Network Connections > Network and Sharing Center > Change Adapter Settings”.
  4. Right Click on Ethernet Connection Icon and select “Properties”.  
The Local Area Connection Status window shown in [Figure C.1](#) appears.



**Figure C.1** Ethernet Properties Window

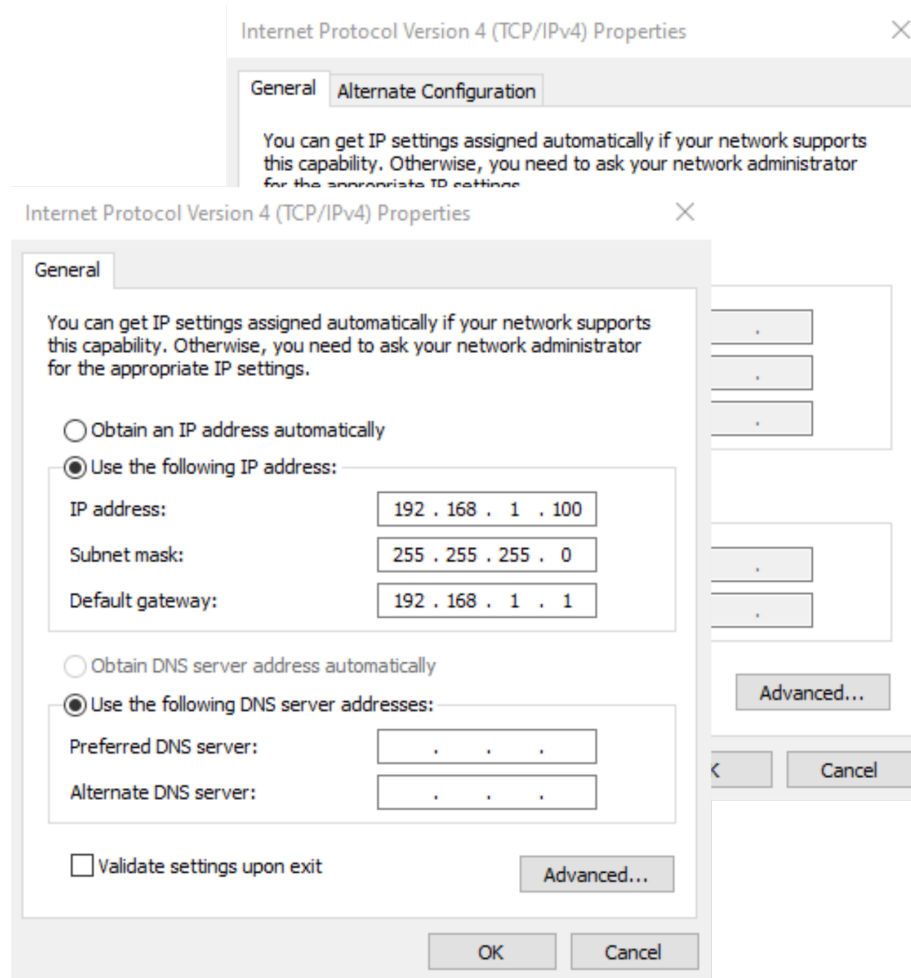
5. In the dialog window, scroll down until “Internet Protocol Version 4 (TCP/IPv4)” becomes visible and select it.
6. Click Properties.

The window shown in [Figure C.2](#) appears



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

7. Select “Use the following IP address”, set the IP Address to 192.168.1.100 and any appropriate gateway.



**Figure C.3** Typing the IP Address

8. Click OK
9. Using the host computer, activate a Web Browser window.
10. The IP address of the IBUC was assigned at the factory and is shown in the test data that accompanies the unit.
  - In a single IBUC systems, the factory default IP address is  
http://192.168.1.21
  - In a Tx 1+1 system, the factory default IP address for the A: side IBUC is  
http://192.168.1.21
  - The factory default IP address for the B: side IBUC is  
http://192.168.1.22
11. Within a few seconds, the Login page shown in [Figure C.4](#) on [page C-4](#) will appear.

## Screen Shots

### Log In

This page appears to prompt you to log in to the IBUC **3** or IBUC **3G**. You can log in or log out from any of the tabs shown in [Figure C.4](#). Type your password in the dialog box, and then click Login. The default value is 1234. If the login password that you entered is accepted, the page of the highlighted tab appears. In [Figure C.4](#), the Info tab is highlighted; thus, the Info tab will appear upon successful login. If the login password entered is incorrect, the screen remains unchanged.



Figure C.4 Login Tab

### Information Tab

Use this tab to view read-only data such as the model number, serial number, revisions, and frequencies for the IBUC **3** or IBUC **3G**.

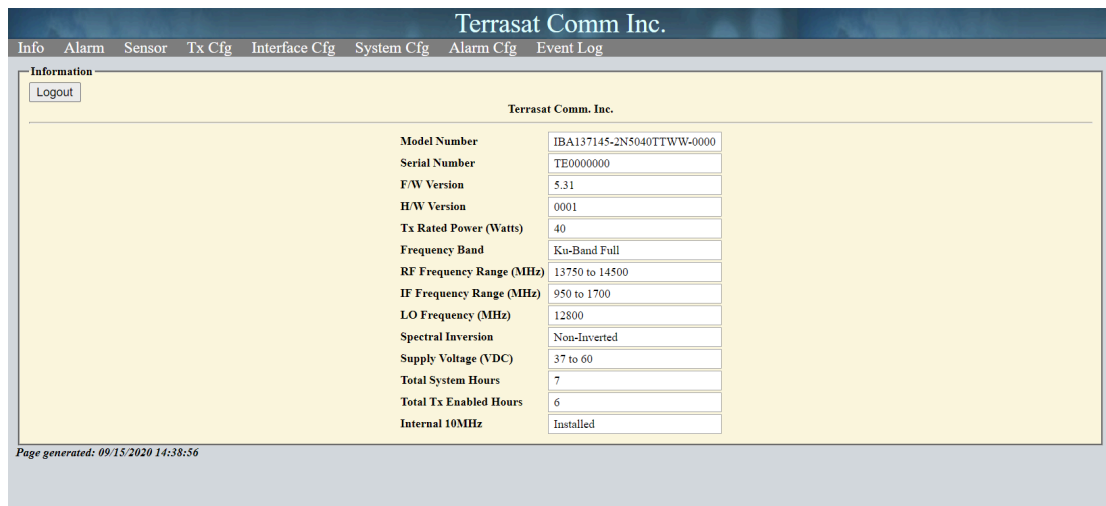


Figure C.5 Information Tab



From this page, you can view the following parameters:

- Model Number

Displays the model number of the IBUC(s). 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 IBUC(s).

- Firmware Version

Displays the version number. The firmware version number of the IBUC 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 IBUC is returned to the factory.

- Tx Rated Power (Watts)

Displays transmitter output power at P1dB for GaAs and Psat for GaN units in watts. Power class information is contained within the part number. More information about locating the power level of the IBUC is found in [Appendix A](#).

- Frequency Band

Displays the standard name of the band.

- RF Frequency Range

Displays the valid RF frequencies for the IBUC(s). The RF Frequency range for each of the various IBUC bands is listed in [Table 2.1](#) on [page 2-3](#).

- IF Frequency Range

Displays the valid IF frequencies for the IBUC(s). The L-band IF Frequency range for each of the various IBUC bands is listed in [Table 2.1](#) on [page 2-3](#).

- LO Frequency

Displays the valid LO frequencies for the IBUC(s). The LO Frequency for each of the various IBUC bands is listed in [Table 2.1](#) on [page 2-3](#).

- Spectral Inversion

Options include:

- Non-Inverted
- Inverted

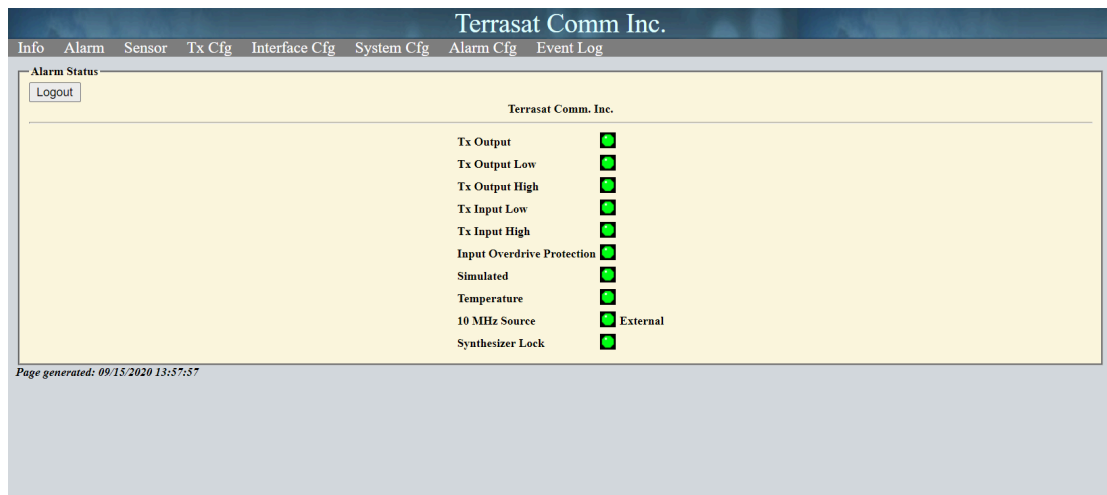
When inverted, the relationship between the RF and IF frequencies is inverse; that is, as the RF Frequency increases, the lower the IF Frequency from the modem must be.

- **Supply Voltage Range**  
 Displays the power supply voltage range for which the IBUC was designed. The Supply Voltage Range is based on the configuration of your IBUC(s).
- **Total System Hours**  
 Displays the total number of hours that the system has been operating (that is, the total number of hours that the system has been powered on).
- **Total Tx Enabled Hours**  
 Displays the total number of hours that the transmitter has been enabled (that is, with transmit = On and mute = Off).
- **Internal 10MHz**  
 Displays if the IBUC is equipped with an internal 10MHz modules. Options include:
  - Installed
  - Not installed

## 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 parameter is operating within specifications and no faults have occurred, a yellow background indicates a minor fault, and a red background indicates a major fault. [Table C.1](#) on [page C-11](#) contains the default configuration and lists which alarms are available for user configuration.

For information about how to configure these alarms, see the [Alarm Configuration Tab](#) on [page C-18](#).



**Figure C.6** Alarm Status Tab

From this page, you can view the following parameters:

- Tx Output  
Indicates whether the IBUC **3** or IBUC **3G** is currently transmitting. Options include:
  - On
  - Disabled
  - Muted (Alarm)
- Tx Output Low  
Indicates whether the Tx Output level is operating below a minimum threshold. Options include:
  - OK
  - Major
  - Minor
- Tx Output High  
Indicates whether the Tx Output level is operating above a maximum threshold. Options include:
  - OK
  - Major
  - Minor
- Tx Input Low  
Indicates whether the Tx Input level is operating below a minimum threshold. Options include:
  - OK
  - Major
  - Minor
- Tx Input High  
Indicates whether the Tx Input level is operating above a maximum threshold. Options include:
  - OK
  - Major
  - Minor

- Simulated Alarm

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

- OK
- Major

- Temperature (Internal)

Indicates that the internal temperature of the IBUC exceeds 85° C.

Note: If the High Temperature Shutdown alarm has been enabled and the internal temperature of the IBUC exceeds 85° C, the IBUC will shut down automatically

- ALC Range

Indicates that the Tx Output level is being kept constant by the automatic level control (ALC) function. Options include:

- OK
- Out of Range
- N/A

Note: An alarm occurs when the IBUC can no longer maintain the Tx Output level. This alarm is coded into the IBUC and is not available for user configuration.

- AGC Range

Indicates that the automatic gain control function is unable to maintain the gain level.

- 10 MHz Source

Indicates whether the source of the 10 MHz reference signal is internal or external.

Note: For IBUCs operating with only an external 10 MHz reference signal, this field is labeled “10 MHz Detector” and the options include:

- OK (indicates that the 10 MHz signal is functioning properly)
- Low (indicates that the 10 MHz signal is low or missing)

- Synthesizer Lock

Indicates whether the Synthesizer frequency is locked (or stable). When the Synthesizer is out-of-lock, this alarm causes the muting of the amplifier and automatically shuts down the IBUC. Options

include:

- OK (indicates that the Synthesizer is locked and functioning properly)
- Major

Note: This alarm is always a major alarm and is not available for user configuration.

- Switch Fault

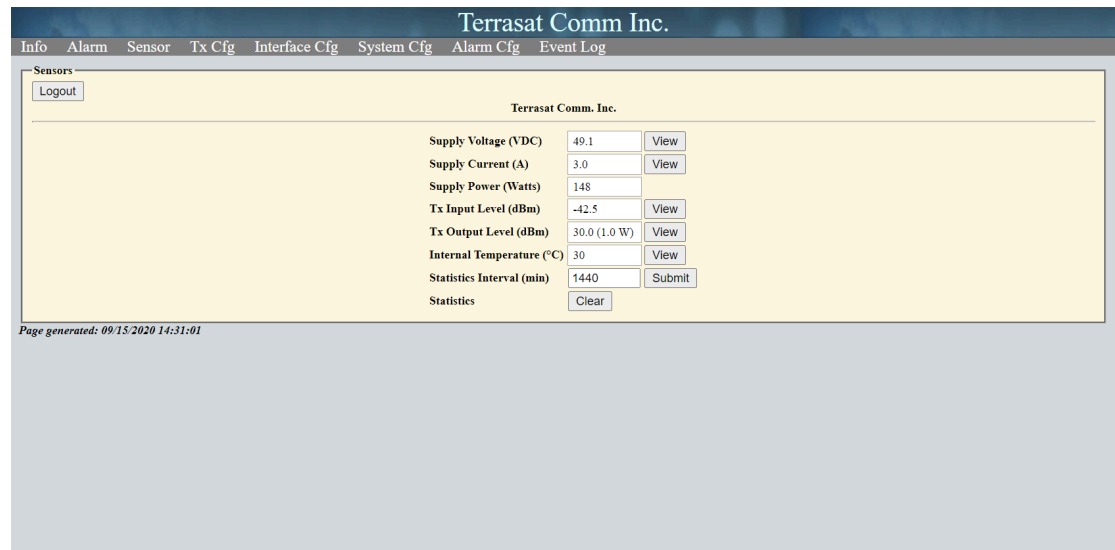
Indicates whether the waveguide switch is operating properly. This alarm is coded into the IBUC and is not available for user configuration. Options include:

- OK (indicates that the Synthesizer is locked and functioning properly)
- Major

Note: This alarm is only available for redundant systems. It does not appear on the Alarm Status tab for single IBUC systems.

## Sensor Tab

Use this tab to view real-time voltage, current, and power levels for the IBUC **3** and IBUC **3G**.



**Figure C.7** Sensor Tab

From this page, you can view the following parameters:

- Supply Voltage

Displays the voltage reading of DC-powered IBUCs in volts; the voltage reading of AC-powered IBUCs is displayed in VAC. Valid values depend on the IBUC model. The readings on this page should fall within the range listed on the [Information Tab](#) on [page C-4](#).

- Current Consumption

Displays the current draw at the input of DC-powered IBUCs in amps.

- Power Consumption

Displays the power consumption of the IBUC in watts. The current draw of AC-powered IBUCs is displayed in VA.

- **Tx Input Level**  
Displays the Tx Input level in dBm.
- **Tx Output Level**  
Displays the Tx Output level in dBm.
- **Internal Temperature**  
Displays the real-time internal temperature of the IBUC in ° C.

**Note:** If the High Temperature Shutdown alarm has been enabled and the internal temperature of the IBUC exceeds 85° C, the IBUC will shut down automatically.

## Transmit Configuration Tab

Use this tab to configure transmission operating parameters for the IBUC **3** and IBUC **3G**. Click **Save Settings** when you have completed entering data to ensure that your changes are saved and then implemented.

The screenshot displays the 'Tx Cfg' configuration page for Terrasat Comm. Inc. The page includes a navigation menu at the top with options: Info, Alarm, Sensor, Tx Cfg, Interface Cfg, System Cfg, Alarm Cfg, and Event Log. The main content area is titled 'Terrasat Comm. Inc.' and contains a list of configuration parameters, each with a corresponding input field or dropdown menu. The parameters and their values are as follows:

Parameter	Value
Tx Output	Enabled
Monitor Frequency (MHz)	14125
Output Power Offset (dB)	0.0
Tx State at Powerup	Enabled
Tx Powerup Delay (sec)	0
Power Read Mode	Continuous
Burst Threshold (dBm)	22.0
Burst Timeout (sec)	0
Gain Mode	Open
Attenuation (dB)	0.0
Input Threshold Low (dBm)	-60.0
Input Threshold High (dBm)	-15.0
Output Threshold Low (dBm)	22.0
Output Threshold High (dBm)	43.0
Current Gain Control (dB)	0.0
Gain Control Reset	Select
Internal 10MHz Trim	2048
Keyline	Disable
Update Settings	Submit

At the bottom left of the page, it says 'Page generated: 09/15/2020 14:00:47'.

**Figure C.8** Tx Configuration Tab

From this page you can configure the following parameters:

- **Tx Output**  
Select whether the unit is actively transmitting. Options include:
  - Enable
  - Disable

- Power Monitor Frequency

Sets the Power Monitor Frequency which is the actual frequency at which you are operating. To ensure accurate readings, you must set your operating frequency which might be different from the factory default values listed in [Table C.1](#).

Example: If the frequency allocated to you by the satellite carrier is 6400 MHz, set the Power Monitor Frequency to 6400 MHz.

The factory default values in [Table C.1](#) are listed according to the model number of the IBUC. For more information about identifying the model number of the IBUC, see [Appendix A](#).

**Table C.1** Default Values for Power Monitor Frequency

MODEL NUMBER	DEFAULT VALUE	MODEL NUMBER	DEFAULT VALUE
057064	6075	137142	14000
058064	6137	137145	14125
058066	6250	140145	14250
058067	6287	173181	17700
064067	6575	181184	18250
067070	6875	290300	29500
079084	8150	295300	29750
127132	13000	300310	30500
128133	13050		

- Output Power Offset

- Allows the user to offset the power reading returned by the IBUC by  $\pm 3$ dB

- Tx State at Power-Up

Sets whether the unit is transmitting upon power-up. Options include:

- Enable
- Disable

- Tx Power-Up Delay

Sets the transmit power output delay of the IBUC in seconds. When configured, the Tx Output will be muted for the time period specified before beginning to transmit.

- Power Read Mode

Sets the mode in which power is read. Options include:

- Burst

In burst mode, the signal is active only a small percentage of the time because packets of data are sent in bursts.

- Continuous

In continuous mode, the signal continues without interruption.

- Burst Threshold

Sets the burst threshold for the IBUC. This value determines the level at which a burst is considered valid. The threshold is for the output power level; the threshold for input power is configured internally.

The value must be between rated power and no less than 2 dB below rated power. Default values are listed in [Table C.2](#).

**Table C.2** Default Values for the Burst Threshold

POWER LEVEL	DEFAULT VALUE	POWER LEVEL	DEFAULT VALUE
002	13.0	040	26.0
004	16.0	050	27.0
005	17.0	060	28.0
008	19.0	080	29.0
010	20.0	100	30.0
012	21.0	125	31.0
016	22.0	150	32.0
020	23.0	175	32.4
025	24.0	200	33.0
030	25.0		

- Burst Timeout

Sets the burst timeout of the IBUC. Burst timeout allows the user to configure a maximum length between bursts before the IBUC declares an alarm. This parameter can range from 1 to 300 seconds. A value of 0 disables burst timeout.

- Gain Mode

Options include:

- Open-Loop ( no feedback in the measuring loop).

Keep in mind the open-loop gain is affected by temperature and frequency; however, the temperature compensation feature is still active when the unit operates with open-loop gain. Open is the default setting.

- Automatic Gain Control (AGC)
- Automatic Level Control (ALC)

- Attenuation

Type a value within the range of 0.0 dB to 30.0 dB in 0.1 dB steps. After you click **Save Settings**, the gain of the unit will be reduced by that value.

- The default setting is 0.0 dB



- Tx Input Threshold Low  
Sets the lowest permitted transmit input value down to -60 dBm. You will receive an error message if you try to exceed the threshold range. Click **OK** to return to the Tx Config page to enter a valid value.
- Tx Input Threshold High  
Sets the highest permitted transmit input value up to -15 dBm. You will receive an error message if you try to exceed the threshold range. Click **OK** to return to the Tx Config page to enter a valid value.
- Tx Output Threshold Low  
Sets the lowest permitted transmit input value down to (rated P1dB - 20 dB). You will receive an error message if you try to exceed the threshold range. Click **OK** to return to the Tx Config page to enter a valid value.
- Tx Output Threshold High  
Sets the highest permitted transmit input value up to (rated P1dB+ 1 dB). You will receive an error message if you try to exceed the threshold range. Click **OK** to return to the Tx Config page to enter a valid value.
- Current Gain Control  
This option is always greyed-out. The Gain Control represents the current attenuation correction in dB needed to maintain the ALC/AGC target. When the Gain Control Reset option is selected, this value will reset to 0.0 (midrange).
- Gain Control Reset  
When the Gain Control Reset option is enabled, the gain control resets to 0.0 (midrange) Options include:
  - Select (default)
  - Reset

Note: You must choose “Reset” and then click **Save Settings** in order to reset the gain control.

- Internal 10 MHz Trim  
You can specify a frequency trimming value for IBUCs equipped with the optional internal 10 MHz reference signal  
Valid values: 0 – 4095

Note: When the IBUC **3** or IBUC **3G** is operating using an external 10 MHz reference signal, this field is greyed-out and unavailable for user input.

## Interface Configuration Tab

Use this tab to configure the interfaces (TCP/IP or RS485/FSK) for the IBUC **3** and IBUC **3G**. You can also specify SNMP settings. Click **Save Settings** when you have completed entering data to ensure that your changes are saved and then implemented.

**Figure C.9** 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 255 in the last byte are excluded.

- IP Subnet Mask

Sets the IP netmask.

- Valid values range from 8 through 30 representing the number of ones in the netmask. This corresponds to 255.0.0.0 to 255.255.255.252.

- Gateway Address

Sets the IP Gateway Address which is the address that the IBUC 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.

- Web Server Refresh

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

Valid values: 0 to 3600

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

- **RS485/FSK Address**  
Sets a unique designator for the unit.  
Valid values for Legacy Binary: 1 to 15  
Valid values for ASCII: 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 Mode**  
Sets the transmission protocol. Options include:
  - ASCII
  - Binary Mode (default)
- **RS485/FSK Delay**  
Sets the delay in milliseconds 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**  
Selects which version of the SNMP protocol should be used to perform communications. Options include:
  - Disabled
  - SNMPv1.0
  - SNMPv2.0c
- **SNMP Host1 Traps**  
Sets the generation of SNMP traps. SNMP traps are one-way messages that are initiated by a network element to indicate status changes and sent to the network management system. After receiving the message, the manager displays it and can choose to take an action based on the event. Options include:
  - Disabled
  - SNMPv1.0
  - SNMPv2.0c
- **SNMP Host2 Traps**  
Sets the generation of SNMP traps. SNMP traps are one-way messages that are initiated by a network element to indicate status changes and sent to the network management system. After receiving the message, the manager displays it and can choose to take an action based on the event. Options include:
  - Disabled
  - SNMPv1.0
  - SNMPv2.0c

- **SNMP Host1 Trap IP**  
 Sets the IP address to which the network management system sends traps.
- **SNMP Host2 Trap IP**  
 Sets the IP address to which the network management system sends traps.
- **SNMP Public Community String**  
 The SNMP public community string is used for requesting information from the IBUC. The password cannot exceed 32 alphanumeric characters.
- **SNMP Private Community String**  
 The SNMP private community string is used for making changes to the IBUC. The password cannot exceed 32 alphanumeric characters.
- **SNMP Trap Community String**  
 Sets the password for the trap manager. The community String cannot exceed 32 alphanumeric characters.

Note: Changing the SNMP passwords requires a firmware reboot.

## System Configuration Tab

Use this tab to set the system password and the password timeout. You can also reset (reboot) the controller card from here. Additionally, you can set the system time here. Click **Save Settings** when you have completed entering data to ensure that your changes are saved and then implemented.

The screenshot displays the 'System Cfg' tab in the Terrasat Comm Inc. web interface. The page contains the following configuration fields:

Parameter	Value
System Password	[Empty text box]
Password Timeout (min)	0
Verbose Messages	Enable
Echo	Enable
Time (mm/dd/yyyy hh:mm:ss)	03/08/2012 03:04:41
NTP Server Address	0.0.0.0
NTP Timezone Offset	+00:00
Web Page Title	Terrasat Comm. Inc.
Enable External LED	Enable
Reboot Firmware	Select
Update Settings	Submit

Page generated: 09/15/2020 14:04:55

**Figure C.10** 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  
Changes 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 system timeout
- Verbose Message  
Sets whether responses of the serial and TCP connections are terse (for computers to read) or verbose (for people to read).
  - Enabled = Terse
  - Disabled = Verbose
- Echo  
Sets whether the system responds back to SET commands or remains silent.  
Options include:
  - Enabled
  - Disabled
- Time  
Sets the system time of the IBUC in a [mm/dd/yyyy hh:mm:ss] format.
- Web Page Title  
Use this 32-character alphanumeric field to create a customized label for each IBUC. Use information that will help you to identify the IBUC (such as company name, location of each IBUC, and so on).
- External LED  
Sets the state of the multifunction LED indicator. Options include
  - Disabled (LED is off)
  - Enabled (LED is on)Enabled is the default setting.
- System Reset  
When selected, this causes a momentary muting of the transmitter and should be used with caution. A dialog box appears and you are asked to confirm your selection.

## 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. This is particularly important when operating in redundancy mode where summary alarms will cause switch overs. You can also configure the 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 and then implemented.

Terrasat Comm. Inc.	
Temperature	Minor
Input Threshold Low	Minor
Input Threshold High	Minor
Output Threshold Low	Major
Output Threshold High	Major
Temperature Suppressible	Disable
Input Threshold Low Suppressible	Enable
Input Threshold High Suppressible	Enable
Output Threshold Low Suppressible	Enable
Output Threshold High Suppressible	Enable
High Temperature Shutdown	Enable
Suppress Faults	Disable
Simulate Fault	Disable
Update Settings	Submit

Page generated: 09/15/2020 14:06:17

**Figure C.11** Alarm Configuration Tab

From this page you can configure the following alarms:

- **Temperature Alarm**  
Sets the type of alarm produced when the temperature threshold has been exceeded. Options include:
  - Disable
  - Minor
  - Major
- **Tx Input Threshold Low**  
Sets the type of alarm produced when the lower Tx Input Threshold has been exceeded. Options include:
  - Disable
  - Minor
  - Major

- Tx Input Threshold High  
Sets the type of alarm produced when the higher Tx Input Threshold has been exceeded. Options include:
  - Disable
  - Minor
  - Major
- Tx Output Threshold Low  
Sets the type of alarm produced when the lower Tx Input Threshold has been exceeded. The default lower threshold is equal to rated P1dB - 20. Options include:
  - Disable
  - Minor
  - Major
- Tx Output Threshold High  
Sets the type of alarm produced when the higher Tx Input Threshold has been exceeded. The default higher threshold is equal to rated P1dB+ 1. Options include:
  - Disable
  - Minor
  - Major
- Temperature Alarm Suppressible  
Sets whether the temperature alarm is suppressible. When suppressed (enabled), a temperature alarm will not appear as an event in the Alarm Log. Options include:
  - Disable
  - Enable
- Input Threshold Low Suppressible  
Sets whether the lower input threshold is suppressible. Options include:
  - Disable
  - Enable
- Output Threshold Low Suppressible  
Sets whether the lower output threshold is suppressible. Options include:
  - Disable
  - Enable
- Output Threshold High Suppressible  
Sets whether the higher output threshold is suppressible. Options include:
  - Disable
  - Enable

- **High Temperature Shutdown**  
Sets whether to shutdown the IBUC when the internal temperature threshold of 85° C has been exceeded. The unit must cool down by 20° C before resuming transmission. Transmission will resume automatically once the unit has cooled by 20° C. Options include:
  - Disable
  - Enable (default)
- **Suppress faults**  
Sets whether the unit will suppress all alarms that are configured as suppressible. Options include:
  - Disable
  - Enable
- **Simulate faults**  
When enabled, a simulated alarm is issued that does not affect transmission status or traffic. Options include:
  - Disable
  - Enable

Use this alarm to determine whether your alarm settings are functional. It is most useful for redundant systems to test whether a major alarm will successfully trigger a switchover to the standby unit.

## Redundancy Configuration Tab

Use this tab to configure redundancy settings for a protected pair of IBUCs. Only the online IBUC can control the redundancy mode, redundancy switching type, and auto clone settings. The set IBUC location, set online IBUC, and other IBUC IP address are set individually. Click **Save Settings** when you have completed entering data to ensure that your changes are saved and then implemented.

Figure C.12 Redundancy Configuration Tab



From this page you can configure the following parameters:

- **Set IBUC Location**  
Specifies the physical location of each IBUC on the switch. In a redundant system, there must be an A: side IBUC and an B: side IBUC (not two A: side IBUCs nor two B: side IBUCs). Options include:
    - A
    - B
  - **Set Online IBUC**  
Specifies which IBUC is online. Options include:
    - A
    - B
  - **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 non-reverting mode, when the A: side unit faults, a switch to the B: side unit will occur. However, once operation has switched to the B: side unit no additional switches will occur without user intervention. This item can be changed only from the unit designated as Online (Master). Options include:
    - Reverting
    - Non-reverting
  - **Redundancy Switching Type**  
Sets the switching type. Options include
    - Automatic
    - Manual
- Note: In Automatic Mode, if the standby unit is faulty, the online IBUC will not switch to the standby unit. However, you can force this switch when in Manual Mode.
- **Auto Clone Settings**  
Sets the cloning configuration of a redundant pair. When enabled, the settings that are common to both units are copied from the online IBUC to the standby IBUC. Options include:
    - Enable
    - Disable
  - **Other IBUC IP Address**  
Sets the IP address used to determine the location of the partner IBUC. This address is used by the internal Ethernet Switch of the interface box (see [Figure 7.3 on page 7-5](#)) to enable communication between IBUCs.

- **Other IBUC Public IP Address**  
Sets the public IP address of the partner IBUC. This option is used to enable the dual display of the embedded web pages for each IBUC unit on the same browser.
- **Warm Standby Mode**  
Sets the power amplifier into standby mode (a lower power-consumption mode that is designed to reduce energy usage when not in use). Depending on the model, the unit will only consume 20 watts to 100 watts. When enabled, the standby unit will have its output power turned Off until the switch to it occurs. Warm standby mode is available only when the A: side unit is the primary (or protected) unit and the B: side unit is the standby unit.  
Options include:
  - Enable
  - Disable

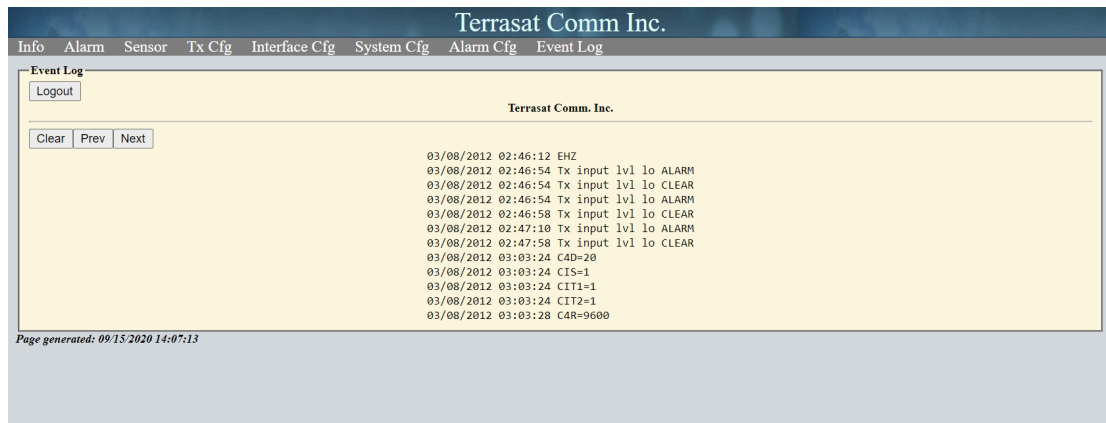
**Note:** When warm standby mode is enabled, the redundancy mode automatically switches to non-reverting. If warm standby mode is later disabled, the redundancy mode remains non-reverting until you manually change it.

**Note:** When the A: side unit has been repaired, user intervention is required to place it back in redundancy mode.

## Event Log Tab

Use this tab to view the event history of the IBUC **3** and IBUC **3G**. When a fault occurs, an entry is added to the event log. Entries are timestamped to determine the order in which the events occurred. These events can be used to help determine cause during system troubleshooting.

A total of 1000 events are stored by the IBUC. In [Figure C.13](#), the events recorded consist of a timestamp and text string. The string can describe an alarm or informational text. Events are displayed oldest to newest in multiples of 25. The **Next** button displays the next screen of events while the **Back** button displays the previous screen. To clear the alarm history, click **Clear**.



**Figure C.13** Event Log Tab

## HAND-HELD TERMINAL MENU TREE

The IBUC **3** and IBUC **3G** offer an optional hand-held terminal (HHT) that enables you to access monitor and control functions from a simple menu system. These functions include:

- Display parameters such as temperature, serial number, power level, and sensor feedback
- Set parameters such as gain, transmit state, and alarm thresholds
- Display alarm status

The HHT obtains power from the IBUC and does not require its own power source.

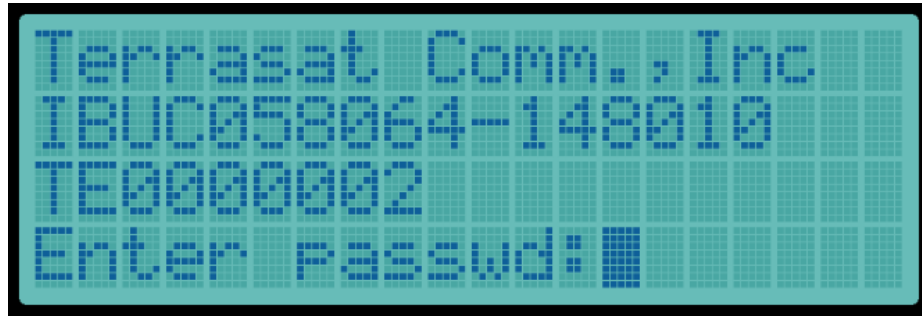
### Menu Options

---

[Figure D.3](#) on [page D-3](#) illustrates the updated menu tree and the available options when using the hand-held terminal (HHT). Those options are described in this appendix. To enable the HHT,

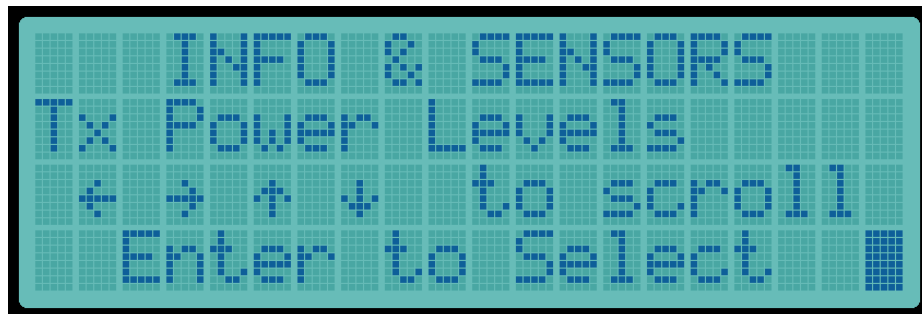
1. Connect the HHT to the system by using the 19-pin connector.
  - When using a single IBUC, connect the HHT to the system by using the J3 connector.
  - When using redundant IBUCs, connect the HHT to the system by using the either the J1 connector (for the A: side IBUC) or the J8 connector (for the B: side IBUC).
2. When the connection is made and the HHT is receiving power, a blinking cursor appears in the upper left of the HHT display.
3. Type “. . .” by using the decimal key on the HHT keypad.

The screen now displays the IBUC model number and serial number which are shown in [Figure D.1](#), and the system requests a password.



**Figure D.1** Sample HHT Display

4. Type the password by using the number keys on the HHT.  
The default password is 1234.
5. The “Info & Sensors” menu shown in [Figure D.2](#) appears.



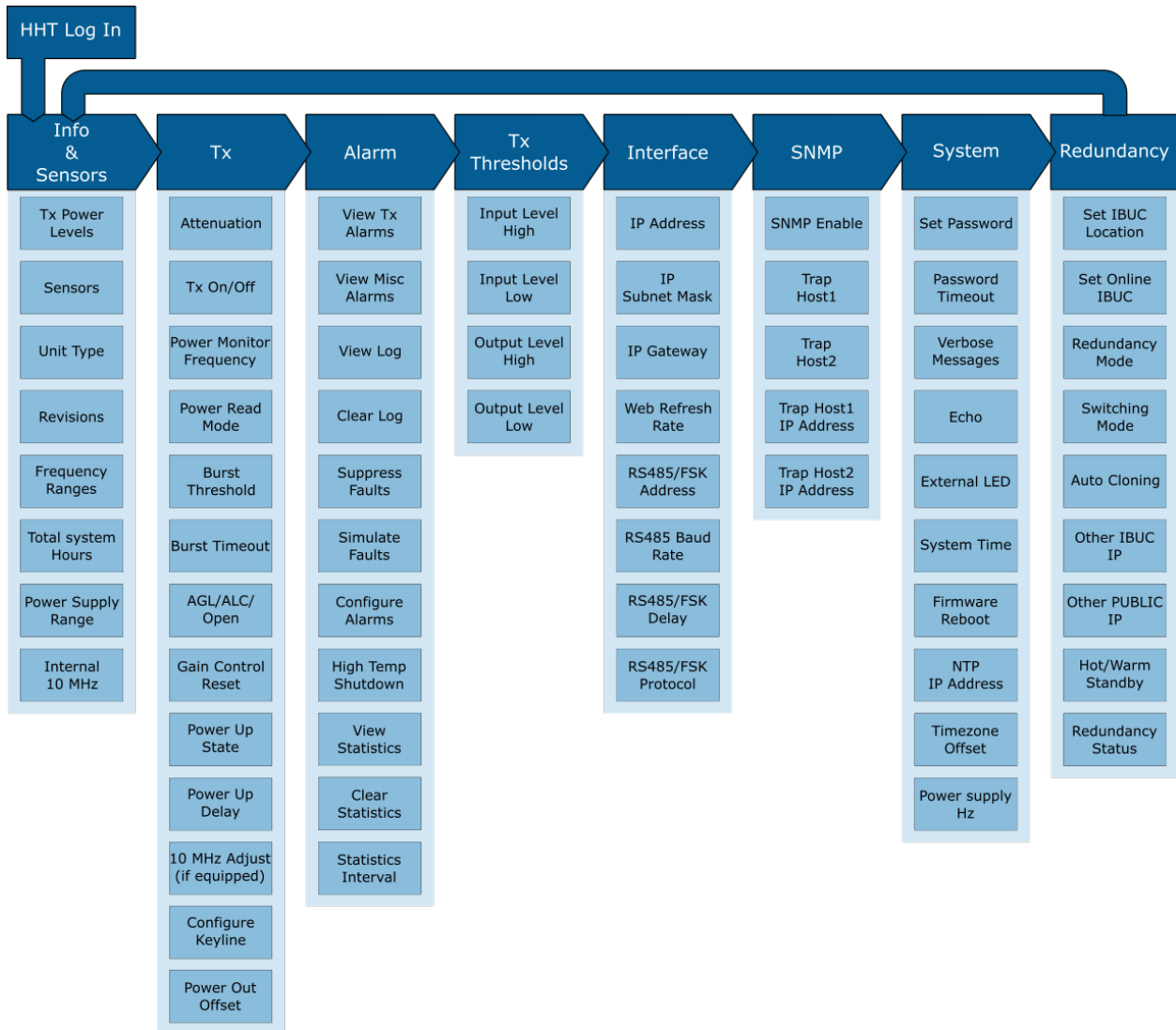
**Figure D.2** Sample Info & Sensors Menu

6. The unit is now ready to receive input.

Note: The HHT now offers “adaptive learning” – that is, you 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 arrows to move between submenu branches because the system “learns” to access keys those two options. You can continue lateral movement by using the → and ← 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 session ends, all of the previous menu movements are lost.

The HHT has eight menus and these menus are shown in [Figure D.3](#) and the items in each menu are discussed in [page D-4](#) through [page D-7](#).



**Figure D.3** Hand-held Terminal Menu Tree

## Info & Sensors

SECTION	DESCRIPTION
<b>Tx Power Levels</b>	Displays the input and output power levels
<b>Sensors</b>	Displays unit power supply voltage, current, Synthesizer voltage, temperature and 10MHz reference state
<b>Unit Type</b>	Displays frequency band name, rated wattage and DC voltage required
<b>Revisions</b>	Displays firmware and hardware revision strings
<b>Frequency Ranges</b>	Displays LO frequency, RF frequency range, and IF frequency range
<b>Total System Hours</b>	Displays the total number of hours that the system has been operating
<b>Power Supply Range</b>	Displays the power supply voltage range for which the IBUC was designed. The Supply Voltage Range is based on the configuration of your IBUC(s)
<b>Internal 10 MHz</b>	Displays whether the IBUC is equipped with an internal 10MHz module

## Tx

SECTION	DESCRIPTION
<b>Attenuation</b>	Displays or sets gain attenuator
<b>Tx On/Off</b>	Displays or sets whether the transmitter is enabled/disabled
<b>Power Monitor Frequency</b>	Displays or sets the frequency for power readings from the IBUC
<b>Power Read Mode</b>	Displays or sets whether the power reading is collected continuously or only during bursts
<b>Burst Threshold</b>	Displays or sets the level that determines a valid burst when Power Read Mode is set to burst
<b>Burst Timeout</b>	Displays or sets the number of seconds after the bursts stop before registering a fault when Power Read Mode is set to burst
<b>AGC/ALC/Open</b>	Displays or sets the gain mode of the unit
<b>Gain Control Reset</b>	Displays the current gain control setting, or sets the gain control to 0
<b>Power Up State</b>	Displays or sets the transmitter state at power up
<b>Power Up Delay</b>	Displays or sets the off time of the transmitter before enabling at power up
<b>10 MHz Adjust (if equipped)</b>	Displays or sets the internal 10 MHz frequency trimming value
<b>Configure Keyline</b>	Displays or sets the Keyline feature. When enabled, the modem is able to directly control the transmitter On/Off state
<b>Power Out Offset</b>	Displays or sets the offset power reading returned by the IBUC by $\pm 3\text{dB}$

## Alarm

SECTION	DESCRIPTION
<b>View Tx Alarms</b>	Displays current transmitter alarms
<b>View Misc Alarms</b>	Displays current miscellaneous alarms
<b>View Log</b>	Displays the unit alarm log
<b>Clear Log</b>	Clears the unit alarm log
<b>Suppress Faults</b>	Displays or sets whether alarms configured for suppression are suppressed
<b>Simulate Fault</b>	Displays or sets a major transmitter alarm (used for troubleshooting)
<b>Configure Alarms</b>	Displays or sets whether individual alarms cause a major/minor/no alarm and if the alarm is suppressible
<b>High Temperature Shutdown</b>	Displays or sets the high temperature shutdown setting of the unit
<b>View Statistics</b>	Displays the latest unit statistic history entries
<b>Clear Statistics</b>	Clears the unit statistic history entries
<b>Statistics Interval</b>	Displays or sets the data collection period for statistics

## Tx Thresholds

SECTION	DESCRIPTION
<b>Input Level High</b>	Displays or sets the input power high threshold
<b>Input Level Low</b>	Displays or sets the input power low threshold
<b>Output Level High</b>	Displays or sets the output power high threshold
<b>Output Level Low</b>	Displays or sets the output power low threshold

## Interface

SECTION	DESCRIPTION
<b>IP Address</b>	Displays or sets the IP address of the unit
<b>IP Subnet Mask</b>	Displays or sets the subnet mask of the unit
<b>IP Gateway</b>	Displays or sets the IP gateway of the unit
<b>Web Refresh Rate</b>	Displays or sets the rate at which the Embedded Web Pages will request updates
<b>RS485/FSK Address</b>	Displays or sets the address used for both the RS485 and FSK interfaces
<b>RS485 Baud Rate</b>	Displays or sets the RS485 Baud Rate
<b>RS485/FSK Delay</b>	Displays or sets the amount of time the unit delays sending a response to a command
<b>RS485/FSK Protocol</b>	Displays or sets whether the unit communicates with ASCII or Legacy Binary protocols on both RS485 and FSK interfaces

## SNMP

SECTION	DESCRIPTION
<b>SNMP Enable</b>	Displays or sets whether: SNMPv1.0 is enabled; SNMPv2.0c is enabled: or if the SNMP interface is disabled for the unit
<b>Trap Host1</b>	Displays or sets whether the unit will generate traps for SNMPv1.0, SNMPv2.0c or if the Trap service is disabled for Host 1
<b>Trap Host2</b>	Displays or sets whether the unit will generate traps for SNMPv1.0, SNMPv2.0c or if the Trap service is disabled for Host 2
<b>Trap Host1 IP Address</b>	Displays or sets the IP address that Traps directed to Host 1 should be directed to
<b>Trap Host2 IP Address</b>	Displays or sets the IP address that Traps directed to Host 2 should be directed to

## System

SECTION	DESCRIPTION
<b>Set Password</b>	Changes the password for the unit. Affects all modes of access
<b>Password Timeout</b>	Displays or sets the inactivity time before the unit automatically logs the user off
<b>Verbose Messages</b>	Displays or sets the format of the replies to commands on all interfaces
<b>Echo</b>	Displays or sets whether the unit responds to SET commands
<b>External LED</b>	Displays or sets whether the external LED is used
<b>System Time</b>	Displays or sets the current system real time clock
<b>Firmware Reboot</b>	Causes the firmware to reboot
<b>NTP IP Address</b>	Displays or sets the NTP Server IP Address
<b>Timezone Offset</b>	Displays or sets the NTP Server timezone offset. Such offset can be set from -12h to +14h
<b>Power Supply Hz (if AC Powered)</b>	When enabled, applies a 50 Hz correction to AC-powered IBUCs. This command is not available for DC-powered IBUCs



## Redundancy

This menu item will appear only if the IBUC is part of a Tx 1+1 system and you are connecting through the interface box.

SECTION	DESCRIPTION
<b>Set IBUC Location</b>	Displays or sets the position this IBUC transmitter occupies on the waveguide switch
<b>Set Online IBUC</b>	Displays or change the physical position of the waveguide switch
<b>Redundancy Mode</b>	Displays or sets whether the unit is free to switch once or multiple times on a failure event
<b>Switching Mode</b>	Displays or sets whether the unit switches manually or due to unit alarms
<b>Auto Cloning</b>	Displays or sets whether the Slave unit is updated when parameters are changed on the Master unit
<b>Other IBUC IP</b>	Displays or sets the partner unit IP address
<b>Other PUBLIC IP</b>	Displays or sets the partner unit Public IP address. This option is used when the IBUCs are accessed through a router.
<b>Hot/Warm Standby</b>	Displays or sets whether Warm Standby Mode will be used in the redundant system.  See <a href="#">Warm Standby Mode</a> on <a href="#">page 7-24</a> for more info
<b>Redundancy Status</b>	Displays system status for a redundant pair



# LEGACY BINARY COMMAND MESSAGE STRUCTURE

## Command Set

---

The command set listed in [Table E.1](#) is used on the RS485 and FSK links only when C4M=1.

**Table E.1** Commands

BYTE	NAME	DESCRIPTION	VALUE
1	Address	IBUC Address	0x01 to 0x0F
		Request Status	0x01
2	Command	Set Transmit On/Off State	0x02
		Change IBUC address or set RS485 response delay	0x03
		Set Detected Carrier Frequency	0x04
		Set Power Threshold	0x05
		Request Burst Power Level	0x06
		Request Device Type ID	0x07
		Request/Set Temperature Log	0x09
		Gain Attenuator Adjust	0xFF

**Table E.1** Commands

BYTE	NAME	DESCRIPTION	VALUE
3	Data Byte 1 If command=		
	0x01	Not Used	0xAA
	0x02	Tx Control	0x00 = Off 0x01 = On 0x02 = Off @ Power On 0x03 = On @ Power On
	0x03	Set new IBUC Address	0x01 to 0x0F
	0x04	Set Detected Carrier Frequency MSB	MSB
	0x05	Set Power Threshold MSB	MSB
	0x06	Request "Current Burst Power"	0x00
	0x07	Request "Stored Min/Max Burst Power"	0x01
4	Data Byte 2 If command=		
	0x01	Not Used	0xAA
	0x02	Not Used	0xAA
	0x03	RS485 Delay Value in ms	0x01 to 0xFF
	0x04	Detected Carrier Frequency LSB	LSB
	0x05	Power Threshold LSB	LSB
	0xFF	Gain Backoff	0x01 to 0x0F
5	Data Byte 3	0xAA (Factory Use Only)	
6		Not Used	0xAA
7	Checksum	Algebraic Sum of Bytes 1-6	Sum of Bytes 1-6

Note: Command 0x05

For continuous signal mode (CSM), the setting must be 20.1 dB below rated power. For burst mode, the setting must be between rated power and no less than 20 dB below rated power.

Command 0x03, Data Byte 2

The smallest delay is 0x01, which is 1 ms. The delay value of 0x00 is equal to 0xFF and gives a 256 ms delay. The delay value of 0xAA is the only exception; it will not change anything. It aims to maintain compatibility with previous versions of the software. However, the delay time might not be accurate when the EEPROM write command is being executed (delay time longer by a few ms).

## Legacy Response Message Structure

See [Data Field Definitions](#) on [page E-5](#) for valid settings.

**Table E.2** Response to commands 0x01, 0x02, 0x03, 0x04, 0x08, and 0xFF

BYTE	NAME	DESCRIPTION	VALUE
1	Address	Reports IBUC Address shifted left by 4 bits	0x10 to 0xF0
2	Level Byte 1	Reports Current Tx Output Power MSB	MSB
3	Level Byte 2	Reports Current Tx Output Power LSB	
4	Temperature	Reports Housing Temperature in °C	
Status Byte 1			
5	Bit: 0	Housing Temperature	0x00 = Normal 0x01 = Out of Range
	Bit: 1	Synthesizer Lock	0x00 = Locked 0x01 = Out of Lock
	Bit: 2	Checksum	0x00 = Normal 0x01 Command Error
	Bit: 3	Tx Status	0x00 = Off 0x01 = On
	Bits 4~7:	Power Class	0x01 to 0x0A
Status Byte 2			
6	Bits 0~3	Summary Alarm Activated Summary Alarm Deactivated	0x09 0x0A
	Bits 4~7	Software Version	0x00 to 0x0F
7	Checksum	Algebraic Sum of Bytes 1-6	Sum of Bytes 1-6

**Table E.3** Response to IBUC Commands 0x05 and 0x06  
(When Data Byte 1 of Command Message = 0x00)

BYTE	NAME	DESCRIPTION	VALUE
1	Address	Address of IBUC Shifted Left by 4 bits	0x10 to 0xF0
2	Level Byte 1	Current Tx Output Power (Burst Mode)	MSB
3	Level Byte 2	Current Tx Output Power (Burst Mode)	LSB
4	Level Byte 3	Current Power Threshold	MSB
5	Level Byte 4	Current Power Threshold	LSB
6	Bits 0 to 3:	If Command = 0x05 If Command = 0x06	0x0B 0x0C
	Bits 4 to 7		0x00
7	Checksum	Algebraic Sum of bytes 1-6	Sum of bytes

**Table E.4** Response to IBUC Command 0x06  
(When Data Byte 1 of Command Message = 0x01)

BYTE	NAME	DESCRIPTION	VALUE
1	Address	Address of IBUC Shifted Left by 4 bits	0x10 to 0xF0
2	Level Byte 1	Max Stored Tx Output Power (Burst Mode)	MSB
3	Level Byte 2	Max Stored Tx Output Power (Burst Mode)	LSB
4	Level Byte 3	Min Stored Tx Output Power (Burst Mode)	MSB
5	Level Byte 4	Min Stored Tx Output Power (Burst Mode)	LSB
6	Bits 0 to 3:		0x0D
	Bits 4 to 7		0x00
7	Checksum	Algebraic Sum of bytes 1-6	Sum of bytes

**Table E.5** Response to IBUC Command 0x07

BYTE	NAME	DESCRIPTION	VALUE
1	Address	Address of IBUC Shifted Left by 4 bits	0x10 to 0xF0
2	Bits 0 to 3:	Manufacturer ID	2
	Bits 4 to 7:	Frequency ID	1 to 15
3	Serial Number Byte 1	Decimal Digits 1 and 2 of Serial Number	0000 to 1001
4	Serial Number Byte 2	Decimal Digits 3 and 4 of Serial Number	0000 to 1001
5	Serial Number Byte 3	Decimal Digits 5 and 6 of Serial Number	0000 to 1001
6	Bits 0 to 3:		0x0D
	Bits 4 to 7:		0x00
7	Checksum	Algebraic Sum of bytes 1-6	Sum of bytes

**Table E.6** Response to IBUC Command 0x09

BYTE	NAME	DESCRIPTION	VALUE
1	Address	Address of IBUC Shifted Left by 4 bits	0x10 to 0xF0
2	Data Byte 1	Temperature Shutdown @ Temp State	0x00 = Off 0x01 = On
3	Data Byte 2	Minimum Stored Unit Temperature (Two's Complement if below 0)	0x00 to 0xFF
4	Data Byte 3	Maximum Stored Unit Temperature (Two's Complement if below 0)	0x00 to 0xFF
5	Data Byte 4	Number of Writes to Temperature Memory after memory was cleared or unit rebooted	0x00 to 0xFF
6	Not Used	-	-
7	Checksum	Algebraic Sum of bytes 1-6	Sum of bytes

## Data Field Definitions

Table E.7 contains data field definitions.

**Table E.7** Data Filed Definitions

BYTE	NAME	DESCRIPTION
1	IBUC Address	Integer between 1 and 15
2	Tx Power Level	Integer in 1/100 dBm
3	Detect Threshold	Integer in 1/100 dBm
4	Carrier Frequency	Integer in MHz
5	Temperature	Unsigned Integer in °C
6	Power Class	
	2 Watt	0x01
	4 Watt	0x02
	5 Watt	0x03
	8 Watt	0x04
	10 Watt	0x05
	12 Watt	0x0E
	16 Watt	0x06
	20 Watt	0x07
	25 Watt	0x08
	30 Watt	0x0B
	50 Watt	0x0F
	60 Watt	0x0A
	80 Watt	0x0C
100 Watt	0x0D	
7	Frequency Band	
	Standard C-band	3
	Palapa C-band	12
	Insat C-band	4
	Extended C-band	9
	Full C-band	10
	Standard Ku-band	6
	Full Ku-band	8
	Low-Ku-band	11
	Extended Ku-band	5
X-band	7	





## F

# ASCII COMMAND/RESPONSE STRUCTURE

## Command Set

---

This command set is used with RS232 and Telnet interfaces. It can be also used with RS485 and FSK when C4M=0.

- Parameters are delimited by “<>” for clarity and are not part of the actual query or command. Single quotes delimit an exact string used for a parameter.
- It is expected that both commands and responses are terminated by using <LF><CR>, where

<LF> = 0x0A. (Line Feed)

<CR>= 0x0D. (Carriage Return)

Be sure to configure the Telnet or RS232 client accordingly.

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

Table F.1 shows the alarm mask that is used with the following commands: CAS; CM1; CM2; CMS.

**Table F.1** Alarm Mask

Transmit Alarm Mask		Transmit Alarm Mask	
0x0001	AGC/ALC Out of Range	0x0100	Tx Simulated
0x0002	Tx Muted	0x0200	10MHz Reference
0x0004	IBUC Loss of Lock	0x0400	Supply Voltage Out of Range
0x0008	Tx Output Threshold High *	0x0800	Waveguide Switch Fault (Tx1+1 Only)
0x0010	Tx Output Threshold Low *	0x1000	Input Overdrive Alarm
0x0020	Tx Input Threshold High *	0x2000	Supply Current Out of Range
0x0040	Tx Input Threshold Low *	0x4000	AGC/ALC Target Out of Range
0x0080	High Temperature *	0x8000	

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

[Table F.2](#) lists possible transmit and miscellaneous alarm flags. Miscellaneous alarms do not involve actual transmission of data. Instead, they are primarily informational.

**Table F.2** Alarm Flags

Transmit Flags		Miscellaneous Flags	
0x0001	AGC/ALC Out of Range	0x0004	Firmware Download <sup>1</sup>
0x0002	Tx Muted	0x0008	Not Used
0x0004	IBUC Loss of Lock	0x0010	Reboot Alarm <sup>1</sup>
0x0008	Tx Output Threshold High	0x0020	Clone Communications Error <sup>2</sup>
0x0010	Tx Output Threshold Low	0x0040	Not Used
0x0020	Tx Input Threshold High	0x0080	Not Used
0x0040	Tx Input Threshold Low		
0x0080	High Temperature		
0x0100	Tx Simulated		
0x0200	10MHz Reference		
0x0400	Supply Voltage Out of Range		
0x0800	Waveguide Switch Fault (Tx1+1 Only)		
0x1000	Input Overdrive Alarm		
0x2000	Supply Current Out of Range		
0x4000	AGC/ALC Target Out of Range		
0x8000	Not Used		
0x0001	Not Used		
0x0002	Configuration Reset		

- 1 - These alarms can be classified as transient alarms because, when they are triggered, they will not cause the LED to turn red nor will that alarm appear in the alarm log of the CAS commands as a current alarm. It will, however, appear in the alarm log of the AHI command.
- 2 - These alarms can be classified as persistent alarms because they will appear as current alarms in the alarm log of the CAS command and they do cause the LED to become flashing red, indicating the status of the alarm. The alarm persists until action is taken to clear the condition causing the alarm.

In some cases users may type queries/commands with structures that differ from what is expected. In this case one should receive an “Error Response” from the IBUC unit. In such cases, refer to [Table F.3](#) for a more detailed explanation about such errors.

**Table F.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.

**Table F.3** Error Response Table (Continued)

Code	Error Message	Description
5	error = error accessing config storage	Unable to access EEPROM.
6	error = ODU fault	Cannot switch, target unit has a major fault.
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	error = Not master	The slave cannot perform the requested command.
12	error = Turn on Tx first	Cannot engage AGC/ALC because Tx Output is muted.
13	error = Tx Alarms present	Cannot engage AGC/ALC because DRO is out of lock.
14	error = Burst Not Detected	AGC/ALC time out waiting for a valid burst (15 seconds).
15	error = AGC/ALC Targets OOR	The ALC target power is outside the valid power range of the unit. The AGC target gain is outside the range of the unit.
16	error = Gain Control OOR	When engaging AGC/ALC mode, the gain control is outside preset limits.
17	error = Redund not enabled	This unit is not part of a redundant pair.
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.

### EHI

Description: Displays the content of the event log. The alarm log holds a maximum of 1000 events.

**Q** Query: EHI  
Response Values: EHI = <Event String>, <Event Type>  
Error Responses: 7, 19

### EHZ

Description: Clears the Event Log.

**Q** Query: EHZ  
Response Values: EHZ = Event Log Cleared  
Error Responses: 7, 19

## C10

Description: Display the current state of the external 10 MHz source. When no external 10 MHz source is configured the <State> parameter will always be read as '1=10MHz within Range'.

Q

Query: C10

Response: <State>

Error Responses: 7, 19

Parameters:

<State>

1 = 10MHz within Range / 0 = 10MHz out of 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.

Q

Query: C4A

Response: C4A=<Address>

Error Response: 1, 7

C

Command: C4A=<Address>

Response: C4A=<Address>

Error Response: 1, 7

Parameters:

<Address> = 1 (Default)

If C4M=1, address is a decimal number [1 to 15].

If C4M=0, address is a decimal number [1 to 254].

## C4D

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

**Q** Query: C4D  
Response: C4D=<Delay>  
Error Response: 7, 19

**C** Command: C4D=<Delay>  
Response: C4D=<Delay>  
Error Response: 7, 19

Parameters:

<Delay> = 20 (Default)  
Decimal number in milliseconds [1-255].

## C4R

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

**Q** Query: C4R  
Response: C4R=<Baud>  
Error Response: 7, 19

**C** Command: C4R=<Baud>  
Response: C4R=<Baud>  
Error Response: 7, 19

Parameters:

<Baud>  
Decimal number from predefined list [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 emulations 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.

**Q** Query: C4V  
Response: C4V=<Mode>  
Error Response: 1, 7

**C** Command: C4V=<Mode>  
Response: C4V=<Mode>  
Error Response: 1, 7

### Parameters:

<Mode> = 1 (Default)  
0 - Terse Mode  
1 - Verbose Mode

## CAS

Description: Displays the current active alarms. Use the CAS command to display hexadecimal values that represent the Transmit and Miscellaneous alarms. For the meaning of the individual alarms or to use CAS=1 to display the alarm strings, see [Table F.1](#) on [page F-1](#).

**Q** Query: CAS  
Response: CAS= T<Tx alarm hex>, M<Misc alarm hex>

### Parameters:

## C8T

Description: Displays or sets the burst timeout. After the configured time period elapses, a fault is registered when Power Read Mode is set to burst

**Q** Query: C8T  
Response: C4V=<Timeout>  
Error Response: 1, 7

**C** Command: C8T=<Timeout>  
Response: C8T=<Timeout>  
Error Response: 1, 7

Parameters:

<Timeout> = 0 (Default)  
Decimal value in seconds [0 - 300]. If value 0 is selected, no timeout is configured.

## CCM

Description: Displays the model number and serial number of the IBUC **3** or IBUC **3G**

**Q** Query: CCM  
Response Values: CCM=<Model Number>,<Serial Number>  
Error Responses: 1, 7, 19

Parameters:

<Model number>  
Model number variable string [up to 20 characters]

<Serial Number>  
Serial number variable string [up to 10 characters]



## CCS

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

**Q** Query: CCS  
Response: CCS=FW IBA v<mm>.<nn>, <date> <time>  
Error Responses: 1, 7, 19

Parameters:

<mm>  
Major revision number [0 to 99]

<nn>  
Minor revision number [0 to 99]

## CFD

Description: Displays the number of total system operating hours.

**Q** Query: CFD  
Response: CFD= <Number of Operating Hours>  
Error Responses: 1, 7

Parameters:

<Number of Operating Hours>  
String of characters representing the total number of system operating hours.

## CIA

Description: Displays or sets the IP address of the unit. Valid values range from (but do not include) 1.0.0.0 through 223.255.255.254..

**Q** Query: CIA  
Response: CIA=<IP Address>

**C** Command: CIA=<IP Address>  
Response: CIA=<IP Address>

Parameters:

<IP Address> = 192.168.1.21 (Default)  
IP address of the unit [1.0.0.0 to 223.255.255.254]

Note: Typical usage of this command to set up network is,

```
IBUC>CIA=192.168.1.200
IBUC>CIM=255.255.255.0
IBUC>CIG=192.168.1.1
```

For CIM and CIG commands descriptions, see [CIM](#) on [page F-13](#) and [CIG](#) on [page F-11](#).

## CIC

Description: Sets the SNMP Public, Private and Trap community strings.

**C** Command: CIC=<Public String>,<Private String>,<Trap String>  
Response: CIC=<Public String>,<Private String>,<Trap String>  
Error Response: 1, 2, 4, 5, 7

Parameters:

<Public String>,<Private String>,<Trap String> = public, private, trap (Default)  
Community Strings used by SNMP protocol.

## CID

Description: Displays the current consumption by the IBUC.

**Q** Query: CID  
Response: DC Current=<Value> Amps  
Error Response: 1, 20

Parameter:

<Value>  
Decimal number indicating current consumption in Amperes [0.0 - 25.0]

## CIG

Description: Displays or configures the IBUC network gateway address. This address will be sent to if the requested IP address does not reside on the local LAN segment.

**Q** Query: CIG  
Response: CIG=<Gateway IP>  
Error Responses: 1, 4, 7

**C** Command: CIG=<Gateway IP>  
Response: CIG=<Gateway IP>  
Error Responses: 1, 4, 7

Parameter:

<Gateway IP> = 192.168.1.1 (Default)  
Network Gateway Address [1.0.0.0 to 223.255.255.254]

## CIH1

Description: Sets or displays SNMP Trap Target IP Address 1.

**Q** Query: CIH1  
Response: CIH1=<Trap Target IP Address>

**C** Command: CIH1=<Trap Target IP Address>  
Response: CIH1=<Trap Target IP Address>

Parameter:

<Trap Target IP Address>  
Target IP Address [1.0.0.0 to 223.255.255.254]

## CIH2

Description: Sets or displays SNMP Trap Target IP Address 2.

**Q** Query: CIH2  
Response: CIH2=<Trap Target IP Address>

**C** Command: CIH2=<Trap Target IP Address>  
Response: CIH2=<Trap Target IP Address>

Parameter:

<Trap Target IP Address>  
Target IP Address [1.0.0.0 to 223.255.255.254]

## CIM

Description: Displays or sets the Network Mask..

**Q** Query: CIM  
Response: CIM=<Netmask>  
Error Responses: 1, 2, 7, 18

**C** Command: CIM=<Netmask>  
Response: CIM=<Netmask>  
Error Responses: 1, 2, 7, 18

Parameter:

<Netmask> = 255.255.255.0 (Default)  
Network Mask [255.0.0.0 to 255.255.255.252]

## CIP

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

**Q** Query: CIP  
Response: CIP=<Port>  
Error Responses: 1, 4, 7

**C** Command: CIP=<Port>  
Response: CIP=<Port>  
Error Responses: 1, 4, 7

Parameters:

<Port> = 23 (Default)  
Decimal number [1-65535]

## CIS

Description: Displays, enables or disables SNMP interface.

**Q** Query: CIS  
Response: CIS=<Mode>  
Error Response: 1, 4, 7

**C** Command: CIS=<Mode>  
Response: CIS=<Mode>  
Error Response: 1, 4, 7

Parameters:

<Mode> = 1 (Default)  
0 - Disable SNMP  
1 - Enable SNMPv1  
2 - Enable SNMPv2c

## CIT1

Description: Displays, enables or disables SNMP Trap service for Host 1.

**Q** Query: CIT1  
Response: CIT1=<Mode>  
Error Response: 1, 4, 7

**C** Command: CIT1=<Mode>  
Response: CIT1=<Mode>  
Error Response: 1, 4, 7

Parameter:

<Mode> = 1 (Default)  
0 - Disable Traps  
1 - Enable SNMPv1 Traps  
2 - Enable SNMPv2c Traps

## CIT2

Description: Displays, enables or disables SNMP Trap service for Host 2.

**Q** Query: CIT2  
Response: CIT2=<Mode>  
Error Response: 1, 4, 7

**C** Command: CIT2=<Mode>  
Response: CIT2=<Mode>  
Error Response: 1, 4, 7

Parameter:

<Mode> = 1 (Default)  
0 - Disable Traps  
1 - Enable SNMPv1 Traps  
2 - Enable SNMPv2c Traps

## CM1

Description: Displays or sets the minor alarm mask of the unit. This is a hexadecimal value. See [Table F.1](#) on [page F-1](#) for available hexadecimal values..

**Q** Query: CM1  
Response: CM1=<Hex Mask>  
Error Response: 1, 4, 7

**C** Command: CM1=<Hex Mask>  
Response: CM1=<Hex Mask>  
Error Response: 1, 4, 7

Parameter:

<Hex Mask> = 0x00E0 (Default)  
Minor alarm mask [Hexadecimal value]. See [Table F.1](#) on [page F-1](#) for available hexadecimal values.

## CM2

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

**Q** Query: CM2  
Response: CM2=<Hex Mask>  
Error Response: 1, 4, 7

**C** Command: CM2=<Hex Mask>  
Response: CM2=<Hex Mask>  
Error Response: 1, 4, 7

Parameter:

<Hex Mask>

Major alarm mask [Hexadecimal value]. See [Table F.1](#) on [page F-1](#) for available hexadecimal values.



## CMS

Description: Display or configure the alarm suppression mask. This command does not suppress alarms. You must set TAZ=1 to enable suppression..

**Q** Query: CMS  
 Response: CMS=<Hex Mask>  
 Error Response: 1, 4, 7

**C** Command: CMS=<Hex Mask>  
 Example: CMS=0x0008 will set the Tx Output Threshold High Alarm to suppressible.  
 Response: CMS=<Hex Mask>  
 Error Response: 1, 4, 7

Parameter:

<Hex Mask> = 0x0078 (Default)

Alarm suppression mask [Hexadecimal value]. See [Table F.1](#) on [page F-1](#) for available hexadecimal values.

Note: To suppress alarms,

IBUC> CMS=<Hex Mask>

IBUC> TAZ=1

## COI

Description: Displays general information about the IBUC.

**Q** Query: COI  
 Error Response: 1, 7

Parameters:

## CPE

Description: Logs the user into the unit.

**C** Command: CPE=<Value>  
Response: CPE=<Value>  
Error Response: 1, 7, 20

Parameter:

<Value>  
Decimal value [1-65535].

Note: CPE command can access both Read-Write and Read-Only user. The Read-Write user password can be changed [1 - 65535] while the Read-Only password is always 1111.

## CPL

Description: Displays the private label string of the unit..

**Q** Query: CPL  
Response: <Manufacturer>  
Error Response: 1, 7, 20

Parameter:

<Manufacturer>  
String representing the manufacturer of the IBUC [Up to 20 characters string]

## CPS

Description: Sets the password for the user who is logged in. The password does not take effect until the next login.

**C** Command: CPS=<New Password>  
Response: CPS=<New Password>  
Error Response: 1, 7, 20

Parameter:

<New Password> = 1234 (Default)  
Decimal number [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).

**Q** Query: CPT  
Response: <Timeout>  
Error Response: 1, 7

**C** Command: CPT=<Timeout>  
Response: CPT=<Timeout>  
Error Response: 1, 7

Parameters:

<Timeout> = 0 (Default)

Decimal value in minutes [0 - 65535]. If value 0 is selected, no timeout is configured.

## CRT

Description: Display or configure the internal 10 MHz source frequency. When the IBUC is equipped with an internal 10 MHz source, the user can trim the frequency output of the IBUC. Depending upon the frequency band, the incremental frequency movement at the output of the IBUC will vary..

**Q** Query: CRT  
Response: CRT=<Value>  
Error Response: 1, 7

**C** Command: CRT=<Value>  
Response: CRT=<Value>  
Error Response: 1, 7

Parameters:

<Value>

Internal 10 MHz source trim value [0 - 4095]

## CTI

Description: Display internal 10 MHz source installed..

**Q** Query: CTI  
Response: CTI=<Value>  
Error Response: 1, 4, 7

Parameters:

<Value>  
0 - Not Installed  
1 - Installed

## CTM

Description: Display or configure the IBUC real time clock. If NTP is not used this provides a way of manually setting the system clock. The IBUC will maintain time up to a week during power losses. It is preferable to use NTP to avoid having to reset the system time..

**Q** Query: CTM  
Response: CTM=<Date> <Time>  
Error Response: 1, 2, 4, 7

**C** Command: CTM=<Date> <Time>  
Response: CTM=<Date> <Time>  
Error Response: 1, 2, 4, 7

Parameters:

<Date>  
Date used by IBUC unit [mm/dd/yyyy] (e.g.: 07/02/2020)  
<Time>  
Time used by IBUC unit [hh:mm:ss] (e.g.: 15:40:27)

## CVD

Description: This command displays the current input DC power supply voltage.

**Q** Query: CVD  
Responses: DC Voltage=<DC Reading> Volts  
Error Responses: 1, 7, 20

Parameters:

<DC Reading>  
Current DC input voltage [0.0 - 60.0 VDC]

## CWR

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

**Q** Query: CWR  
Response: CWR=<Refresh Rate>  
Error Response: 1, 7

**C** Command: CWR=<Refresh Rate>  
Response: CWR=<Refresh Rate>  
Error Response: 1, 7

Parameters:

<Refresh Rate> = 0 (Default)  
Decimal number representing Refresh Rate in seconds [0 - 3600]. If 0 is chosen, the Embedded Web Pages will not refresh automatically.

## **CZZ**

Description: Reboots the IBUC and/or resets all parameters to their default values. .

**C** Command: CZZ  
Response: None  
Error Response: 1, 7

**C** Command: CZZ=1  
Response: None  
Error Response: 1, 7

Note: Issuing the command CZZ=1 will prompt the IBUC to reset all internal parameters to their default and then reboot the IBUC. Both commands will cause a momentary mute of the transmitter, and should be used with caution.

## DCN

Description: Disconnects the current Telnet session.

**C** Command: DCN  
Response: None  
Error Response: None

Parameters:

## 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.

**Q** Query: EKO  
Response: EKO=<Mode>  
Error Response: 1, 7

**C** Command: EKO=<Mode>  
Response: EKO=<Mode>  
Error Response: 1, 7

Parameters:

<Mode> = 1 (Default)  
0 - No command response  
1 - Respond to commands

## Transmit-Only Commands

---

This section contains information about various commands used only for transmission.

### ATL

Description: Display the temperature log in degrees C recorded since leaving the factory.

**Q** Query: ATL  
Response Values: <±aaa>, <±bbb>, <nnnnn>  
Error Response: 7, 19

Parameters:

<±aaa>: Minimum temperature in degrees C. This parameter can assume positive or negative values

<±bbb>: Maximum temperature in degrees C. This parameter can assume positive or negative values

<nnnnn>: Number of writes to temp. log

### C4M

Description: Displays or sets the RS485 or FSK messaging protocol.

**Q** Query: C4M  
Response: C4M=<Mode>  
Error Response: 1, 7

**C** Command: C4M=<Mode>  
Response: C4M=<Mode>  
Error Response: 1, 7

Parameters:

<Mode>=0 (Default)

0 - ASCII Mode

1 - Legacy Binary Mode

For more information, see [Appendix E, Legacy Binary Command Message Structure](#).



## CLE

Description: Displays or sets the state of the external LED indicator. If disabled, the external LED indicator will remain off.

**Q** Query: CLE  
Response: CLE=<State>  
Error Responses: 1, 4, 7

**C** Command: CLE=<State>  
Response: CLE=<State>  
Error Responses: 1, 4, 7

Parameters:

<State> = 1 (Default)  
0 - Disabled / 1 - Enabled

## COX

Description: Displays the current internal temperature of the unit..

**Q** Query: COX  
Response: COX=<Internal Temperature>  
Error Responses: 1, 7

Parameter:

<Internal Temperature>  
Current internal temperature of the unit in degrees C [-50 - +100]. Parameter can assume negative or positive values.

## HLP

Description: Display the available list of commands.

**Q** Query: HLP  
Response: None  
Error Response: None

Parameters:

## KLD

Description: This command enables a modem to control the on/off state of the transmitter from an external differential pair of hardware lines. These hardware lines are on connector J2 pins [J,K].

**Q** Query: KLD  
Response: KLD=<Mode>  
Error Responses: TBD

**C** Command: KLD=<Mode>  
Response: KLD= <Mode>  
Error Responses: TBD

Parameters:

<Mode>  
0 - Enable hardware lines  
1 - Disable hardware lines

## NTP

Description: Display or configure the NTP Server IP address.

**Q** Query: NTP  
Response: NTP=<IP Address>  
Error Responses: 1, 7

**C** Command: NTP=<IP Address>  
Response: NTP=<IP Address>  
Error Responses: 1, 7

### Parameters:

<IP Address>  
IP address of the unit [1.0.0.0 to 223.255.255.254]

## SHL

Description: Display up to 25 IBUC statistic history entries. Each subsequent call displays up to 25 more entries. Once history end is reached the 'No New Stats' string will appear. Issuing the command SHL=0 will reset the statistics log index to the beginning.

**Q** Query: SHL

Response: <Date> <Time> <POut> <PIn> <Temp> <Synth> <Volt>  
<Amp>

**C** Command: SHL=0

Response: <Date> <Time> <POut> <PIn> <Temp> <Synth> <Volt>  
<Amp>

### Parameters:

<Date>

Date of the statistic entry [mm/dd/yyyy]

<Time>

Time that the statistic entry was issued [hh:mm:ss]

<POut>

IBUC output RF power [decimal number]

<PIn>

IBUC input IF power [decimal number]

<Temp>

Internal temperature of the IBUC in degrees C [integer]

<Synth>

Synthesizer tuning voltage [decimal number]

<Volt>

DC power input voltage [decimal number]

<Amp>

DC power input current [decimal number]

## SHP

Description: Display or configure the data collection period for statistics.

**Q** Query: SHP  
Response: SHP=<Period>

**C** Command: SHP=<Period>  
Response: SHP=<Period>

Parameters:

<Period>

Period of data collection [1 to 1440 minutes]. If Period is selected to be 0 statistic collection will be disabled.

## SHZ

Description: Clear the statistics history of the IBUC.

**C** Command: SHZ  
Response: stat log cleared

Parameters:

## TAH

Description: Displays or sets the output high power threshold based upon the IBUC **3** or IBUC **3G** Rated Power Level (RPL). See [Table F.4](#) on [page F-33](#). This item must be greater than the TAL setting.

**Q** Query: TAH  
Response: TAH=<Value>  
Error Responses: 1, 7

**C** Command: TAH=<Value>  
Response: TAH=<Value>  
Error Responses: 1, 7

Parameters:

<Value>

Output high power threshold [RPL – 20 dBm to RPL +0 dBm]

## TAL

Description: Displays or sets the output low power threshold based upon the IBUC **3** or IBUC **3G** Rated Power Level (RPL). See [Table F.4](#) on [page F-33](#). This setting must be less than the TAH setting.

**Q** Query: TAL  
Response: TAL=<Value>  
Error Responses: 1, 7

**C** Command: TAL=<Value>  
Response: TAL=<Value>  
Error Responses: 1, 7

Parameters:

<Value>

Output low power threshold [RPL – 20 dBm to RPL + 0 dBm]

## TAS

Description: Displays or sets the Tx simulated alarm setting.

**Q** Query: TAS  
Response: TAS=<Setting>  
Error Responses: 1, 7

**C** Command: TAS=<Setting>  
Response: TAS=<Setting>  
Error Responses: 1, 7

Parameter:

<Setting> = 0 (Default)  
0 - No alarm  
1 - Simulate a Tx alarm

## TAZ

Description: Enables the suppression of any alarms configured as suppressible.

**Q** Query: TAZ  
Response: TAZ=<Setting>  
Error Responses: 1, 7

**C** Command: TAZ=<Setting>  
Response: TAZ=<Setting>  
Error Responses: 1, 7

Parameter:

<Setting> = 0 (Default)  
0 - No suppression  
1 - Suppress configured alarms

## TBH

Description: Display or configure the input power high alarm threshold. This setting must be greater than the TBL setting.

**Q** Query: TBH  
Response: TBH=<Value>  
Error Responses: 1, 7

**C** Command: TBH=<Value>  
Response: TBH=<Value>  
Error Responses: 1, 7

Parameters:

<Value> = -15 (Default)  
Input power high alarm threshold [-60 dBm to -15 dBm]

## TBL

Description: Display or configure the input power low alarm threshold. This setting must be less than the TBH setting.

**Q** Query: TBL  
Response: TBL=<Value>  
Error Responses: 1, 7

**C** Command: TBL=<Value>  
Response: TBL=<Value>  
Error Responses: 1, 7

Parameters:

<Value> = - 60 (Default)  
Input power low alarm threshold [-60 dBm to -15 dBm]



## TBT

Description: Displays or sets the burst threshold based upon the IBUC **3** or IBUC **3G** Rated Power Level (RPL). See [Table F.4](#). This command only applies if the IBUC is configured for burst power monitoring.

**Q**

Query: TBT

Response: TBT=<dBm>

Error Responses: 1, 7

**C**

Command: TBT=<dBm>

Response: TBT=<dBm>

Error Responses: 1, 7

Parameters:

<dBm> = [See [Table F.4](#)] (Default)

Burst threshold [RPL – 20 dB to RPL + 1 dB]

**Table F.4** Default Values for the TAH, TAL, and TBT Commands

Power Level		TAH	TAL	TBT
Watts	dBm	Default Value	Default Value	Default Value
002	33.0	34.0	13.0	13.0
004	36.0	37.0	16.0	16.0
005	37.0	38.0	17.0	17.0
008	39.0	40.0	19.0	19.0
010	40.0	41.0	20.0	20.0
012	40.8	41.8	21.0	21.0
016	42.0	43.0	22.0	22.0
020	43.0	44.0	23.0	23.0
025	44.0	45.0	24.0	24.0
030	44.8	45.8	25.0	25.0
040	46.0	47.0	26.0	26.0
050	47.0	48.0	27.0	27.0
060	47.8	48.8	28.0	28.0
080	49.0	50.0	29.0	29.0
100	50.0	51.0	30.0	30.0

**Table F.4** Default Values for the TAH, TAL, and TBT Commands (Continued)

Power Level		TAH	TAL	TBT
Watts	dBm	Default Value	Default Value	Default Value
125	51.0	52.0	31.0	31.0
150	51.8	52.8	32.0	32.0
175	52.4	53.4	32.4	32.4
200	53.0	54.0	33.0	33.0
400	56.0	57.0	36.0	36.0

## TDT

Description: Display the input L-band power level.

**Q** Query: TDT  
 Response: Tx Input Power=<Level> dBm  
 Error Responses: 7, 19

Parameter:

<Level>  
 Decimal number representing L-Band input power level in dBm [-15.0 - -60.0]

## TFB

Description: Displays the RF frequency band of this IBUC **3** or IBUC **3G**. See [Table F.5](#) for more information about band numbers and corresponding frequency range.

**Q** Query: TFB  
 Response: TFB=<Band Number> dBm  
 Error Responses: 7, 19

Parameter:

<Band Number>  
 Corresponding band numbering [Integer]

**Table F.5** Band Numbering

Band Number	Band Name	Frequency	
03	Standard C-band	05850 - 06425	MHz
04	Insat C-band	06725 - 07025	MHz
05	Extended Ku-band	13750 - 14250	MHz
06	Standard Ku-band	14000 - 14500	MHz
07	X-band	07900 - 08400	MHz
08	Full Ku-band	13750 - 14500	MHz
09	Extended C-band	05850 - 06650	MHz
10	Full C-band	05850 - 06725	MHz
11	Low Ku-band	12750 - 13250	MHz
12	Palapa C-band	06425 - 06725	MHz
14	DBS-band 1	17300 - 18100	MHz
15	DBS-band 2	18100 - 18400	MHz
16	Ka-band 1	29500 - 30000	MHz
17	Ka-band 2	30000 - 31000	MHz
18	Ku-band 4	12800 - 13300	MHz
19	C-band 6	05725 - 06425	MHz
20	Ka-band 3	29000 - 30000	MHz
21	Ka-band 4	30500 - 31000	MHz
22	GlobalStar C-band	05000 - 05200	MHz

## TFI

Description: Displays the spectral inversion for this IBUC **3** or IBUC **3G**. This is a read-only command.

**Q** Query: TFI  
Response: TFI=<Value>  
Error Responses: 7, 19

### Parameters:

<Value>  
0 - Non-inverted (low side LO)  
1 - Inverted (high side LO)

## TFR

Description: Displays or sets the output power monitor frequency of the IBUC **3** or IBUC **3G**. The default values in [Table F.6](#) on [page F-37](#) are listed according to the model number of the IBUC. The command only increases the accuracy of the displayed power levels.

**Q** Query: TFR  
Response: TFR=<Frequency>  
Error Responses: 1, 7

**C** Command: TFR=<Frequency>  
Response: TFR=<Frequency>  
Error Responses: 1, 7

### Parameter:

<Frequency>  
Which IF or RF frequency (in MHz) to monitor is based upon the frequency band of the IBUC. IF will be automatically converted to RF.

**Table F.6** Default Values for the TFR Command

Model Number	Default Value (MHz)	Model Number	Default Value (MHz)
057064	6075	137142	14000
058064	6137	137145	14125
058066	6250	140145	14250
058067	6287	173181	17700
064067	6575	181184	18250
067070	6875	290300	29500
079084	8150	295300	29750
127132	13000	300310	30500
128133	13050	305310	30750

## TGC

Description: Displays or sets the operating mode of the IBUC **3** or IBUC **3G**. When using AGC or ALC, the IBUC power levels must be set prior to closing the loop.

**Q** Query: TGC  
 Response: TGC=<Control Type>  
 Error Responses: 1, 7, 12, 13, 14, 15, 16

**C** Command: TGC=<Control Type>  
 Response: TGC=<Control Type>  
 Error Responses: 1, 7, 12, 13, 14, 15, 16

Parameter:

- <control type> = 0 (Default)
- 0 – Open loop
- 1 – Automatic Level Control (ALC)
- 2 – Automatic Gain Control (AGC)

## TGL

Description: Displays the gain and level targets for AGC or ALC. This is a read-only command.

**Q** Query: TGL  
Response: gain\_target = <xx.xx>, level\_target = <yy.yy>  
Error Responses: 7, 19

Parameter:

<xx.xx>: AGC gain target in dB [decimal number]  
<yy.yy>: ALC level target in dBm [decimal number]

## TGR

Description: Displays or resets the gain control of the IBUC **3** or IBUC **3G**.

**Q** Query: TGR  
Response: TGR=<xx.x>  
Error Responses: 1, 7

**C** Command: TGR=0  
Response: Gain Control Reset  
Error Responses: 1, 7

Parameter:

<xx.x>  
Decimal number representing the delta (in dB) from the attenuator setting when AGC/ALC was activated [-8.0 - 8.0]

## TPM

Description: Displays or configures the power monitoring mode of the IBUC **3** or IBUC **3G**. When configured for burst, TBT must also be set. Default values for the TBT command are given in [Table F.4](#) on [page F-33](#). If CSM is selected power is read continuously. If burst is selected the power reading only changes when a valid burst is detected.

**Q** Query: TPM  
 Response: TPM=<Value>  
 Error Responses: 1, 7

**C** Command: TPM=<Value>  
 Response: TPM=<Value>  
 Error Responses: 1, 7

Parameter:

<Value> = 0 (Default)  
 0 - CSM  
 1 - Burst

## TPO

Description: Displays the current output power of the IBUC **3** or IBUC **3G**. If TPM is set to burst, this will be the last valid burst sample of the output power. Use the TFR command to configure the desired frequency to be monitored. This is a read-only command.

**Q** Query: TPO  
 Response: Tx Output Power=<xx.xx> dBm  
 Error Responses: 7, 19

Parameter:

<xx.xx>  
 Decimal number representing current output power [RPL-20dBm - RPL+0dBm]

## TPT

Description: Displays or sets the attenuator of the IBUC **3** or IBUC **3G** .

**Q** Query: TPT  
Response: TPT=<xx.x>  
Error Responses: 1, 7

**C** Command: TPT=<xx.x>  
Response: TPT=<xx.x>  
Error Responses: 1, 7

Parameter:

<xx.x>  
Decimal number representing IBUC attenuation [00.0 - 16.0].

## TSD

Description: Displays or sets the transmit power output delay before the transmitter is enabled. When configured, the Tx output will be muted for the time period configured.

**Q** Query: TSD  
Response: TSD=<value>  
Error Responses: 1, 7

**C** Command: TSD=<value>  
Response: TSD=<value>  
Error Responses: 1, 7

Parameter:

<Value> = 0 (Default)  
Power up delay before transmitter is enabled [0–500 seconds]. If 0 is chosen, there will be no powerup delay.



## TSP

Description: Displays or sets the state of the Tx output at power up.

**Q** Query: TSP  
 Response: TSP=<State>  
 Error Responses: 1, 7

**C** Command: TSP=<State>  
 Response: TSP=<State>  
 Error Responses: 1, 7

Parameter:

<State>  
 0 – Tx output OFF  
 1 – Tx output ON

## TST

Description: Displays or sets the state of the Tx output. This command can be overridden by alarms.

**Q** Query: TST  
 Response: TST=<Response Value>  
 Error Responses: 1, 7

**C** Command: TST=<Set Value>  
 Response: TST=<Response Value>  
 Error Responses: 1, 7

Parameters:

<set value>  
 0 - Disable Tx Output  
 1 - Enable Tx Output  
 <response value>  
 0 - Tx disabled  
 1 - Tx enabled, not muted  
 2 - Tx enabled, muted

## TTS

Description: Displays or sets the high-temperature shutdown alarm. If the IBUCs internal temperature exceeds maximum operating temperature of 85°C, enabling this alarm will disable the transmitter. Disabling this could cause damage to the IBUC, therefore caution should be exercised.

**Q** Query: TTS  
Response: TTS=<State>  
Error Responses: 1, 7

**C** Command: TTS=<State>  
Response: TTS=<State>  
Error Responses: 1, 7

Parameter:

<State> = 1 (Default)  
0 - Disable Shutdown  
1 - Enable Shutdown.

## TTT

Description: Displays the number of total hours that the transmitter has been enabled (that is, with the transmit signal ON and the mute OFF) since leaving factory.

**Q** Query: TTT  
Response: TTT=<Hours>  
Error Responses: 1, 7

Parameters:

<Hours>  
Integer representing the total number of hours transmitter has been ready to transmit or transmitting.

## TZO

Description: Displays or configures the time zone offset. TZO can be set from -12 to 14 hours.

**Q** Query: TZO  
Response: TZO=<±hh:mm>  
Error Responses: 1, 7

**C** Command: TZO=<±hh:mm>  
Response: TZO=<±hh:mm>  
Error Responses: 1, 7

Parameter:

<±hh:mm>

Time zone offset [hh = hours, mm = minutes]. This parameter can assume positive or negative values.

## Redundancy Commands

---

This section contains information about various redundancy commands. The commands are applicable to Tx 1+1 and Rx1+1 systems, unless noted otherwise. Definitions of error responses are found in [Table F.3](#) on [page F-2](#).

### BAE

Note: Applies only to Tx 1+1 Systems

Description: Displays the redundancy configuration of the IBUC **3** or IBUC **3G**.

Q

Query: BAE

Response: BAE=<Redundancy>, <Position>, <Clone>

Error Response: 7, 19

Parameters:

<Redundancy>

0 - Redundancy disabled

1 - Redundancy enabled

<Position>

Master Position

Slave Position

<Clone>

Clone Enabled

Clone Disabled

## 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.

Q

Query: BAM

Response: BAM=<Mode>

Error Response: 1, 7, 17

C

Command: BAM=<Mode>

Response: BAM=<Mode>

Error Responses: 1, 7, 17

### Parameters:

<Mode> = 0 (Default)

0 - Reverting Mode

1 - Non-Reverting Mode

## **BAP**

Note: Applies only to Tx 1+1 systems.

Description: Displays or sets the position of the IBUC **3** or IBUC **3G** on the waveguide switch. This does not change the position of the waveguide switch, but instead tells the IBUC firmware to which port the Tx output is connected on the waveguide switch. This item must be set for each IBUC in a redundant pair.

**Q** Query: BAP  
Response: BAP=<Mode>  
Error Response: 1, 7, 17

**C** Command: BAP=<Mode>  
Response: BAP=<Mode>  
Error Responses: 1, 7, 17

### Parameters:

<Mode> = 0 (Default)  
0 - A: side  
1 - B: side

## BCL

Note: Applies only to Tx 1+1 systems.

Description: Displays or sets the cloning configuration of a redundant pair. The following commands are always cloned: [BAM, BSM, BRM and BCL]. Such commands can only be changed from the Online/Master IBUC. All other commands can be individually set with cloning disabled. When enabled, the following commands are automatically sent to the Offline/Slave IBUC on a periodic basis: [C4V, C4D, C4M, C4R, CPS, CPT, CM1, CM2, CMS, CWR, EKO, TAH, TAL, TAZ, TBH, TBL, CBT, TBT, TFR, TPM, TSD, TSP, TST, and TTS] and can be changed only from the Online/Master IBUC.

Q

Query: BCL

Response: BCL=<Mode>

Error Response: ??

C

Command: BCL=<Mode>

Response: BCL=<Mode>

Error Responses: ??

Parameters:

<Mode>

0 - Cloning disabled

1 - Cloning enabled

## BRM

Note: Applies only to Tx 1+1 systems.

Description: Displays or sets the power amplifier into standby mode (a lower power consumption mode that is designed to reduce energy usage when not in use). When enabled, the standby unit will have its output power turned Off until the switch to it occurs. Warm standby mode is available only when the A: side unit is the primary (or protected) unit and the B: side unit is the standby unit.

Q

Query: BRM

Response: BRM=<Mode>

Error Response: 1, 7, 17

C

Command: BRM=<Mode>

Response: BRM=<Mode>

Error Responses: 1, 7, 17

Parameters:

<Mode> = 0 (Default)

0 - Disable

1 - Enable



## 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 F-48.

**Q**

Query: BSM

Response: BSM=<Mode>

Error Response: 1, 7, 17

**C**

Command: BSM=<Mode>

Response: BSM=<Mode>

Error Responses: 1, 7, 17

Parameters:

<Mode> = 1 (Default)

0 - Manual

1 - Automatic

## BST

Description: Displays system status for a redundant pair.

**Q**

Query: BST

Response: BST=<A:Mode>,<A:Online>,<B:Mode>,<B:Online>,<Switch>

Error Response: 1, 7, 17

Parameters:

<A/B Mode>: “Auto” or “Manual”

<A/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.

**Q** Query: BSW  
Response: BSW=<Switch Position>  
Error Response: 1, 7, 8, 17

**C** Command: BSW=<Switch Position>  
Response: BSW=<Switch Position>  
Error Responses: 1, 7, 8, 17

### Parameters:

<Switch Position>  
0 - A: Side  
1 - B: Side

## CIB

Note: Applies only to Tx 1+1 systems.

Description: Displays or sets the IP address of the other IBUC in a redundant (Tx 1+1) pair. The A: side IBUC should have the IP address of the B: side IBUC entered here. The B: side IBUC should have the IP address of the A: side IBUC entered here. This enables the IBUC to identify its partner in a redundant pair for communication purposes.

**Q**

Query: CIB

Response: CIB=<IP Address>  
Error Response: 1, 4, 7

**C**

Command: CIB=<IP Address>

Response: CIB=<IP Address>  
Error Responses: 1, 4, 7

Parameters:

<IP Address> = 192.168.1.22 (Default)  
IP address of the unit [1.0.0.0 to 223.255.255.254]

Note: Typical usage of this command to set up network is,

A: Side	B: Side
CIA=192.168.1.200	CIA=192.168.1.201
CIB=192.168.1.201	CIB=192.168.1.200

For more informations about CIA command, [CIA](#) on [page F-10](#).

## OPI

Description: This command is used only in redundancy when mapping IP addresses through a router. The Embedded Webpages (see [Appendix C, Embedded Web Pages](#) for more information) for both IBUCs are displayed side by side. To accomplish this effect, two different IP addresses should be used by the Web Browser. One of the addresses is either A or B, provided by the user when typing the URL into the browser to connect. The other IBUCs public IP address is known only through the OPI command. .

**Q**

Query: OPI

Response: OPI=<IP Address>

Error Responses: TBD

**C**

Command: OPI=<IP Address>

Response: OPI=<IP Address>

Error Responses: TBD

### Parameters:

<IP Address>

IP address of the unit [1.0.0.0 to 223.255.255.254]

Note: Any valid IP address can be used to point to the paired IBUC but, no multi-cast is allowed

# COMPONENT SPECIFICATIONS AND REFERENCE DRAWINGS

This chapter contains component specifications and outline drawings for the Terrasat Communications, Inc. line of C-band, X-band, Ku-band and Ka-band intelligent block upconverters (IBUC **3** and IBUC **3G**), power supply units (PSUIs), low-noise block converters (LNBS), associated interface units and accessories supplied with IBUC **3** and IBUC **3G** systems.

## Reference Drawings

---

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

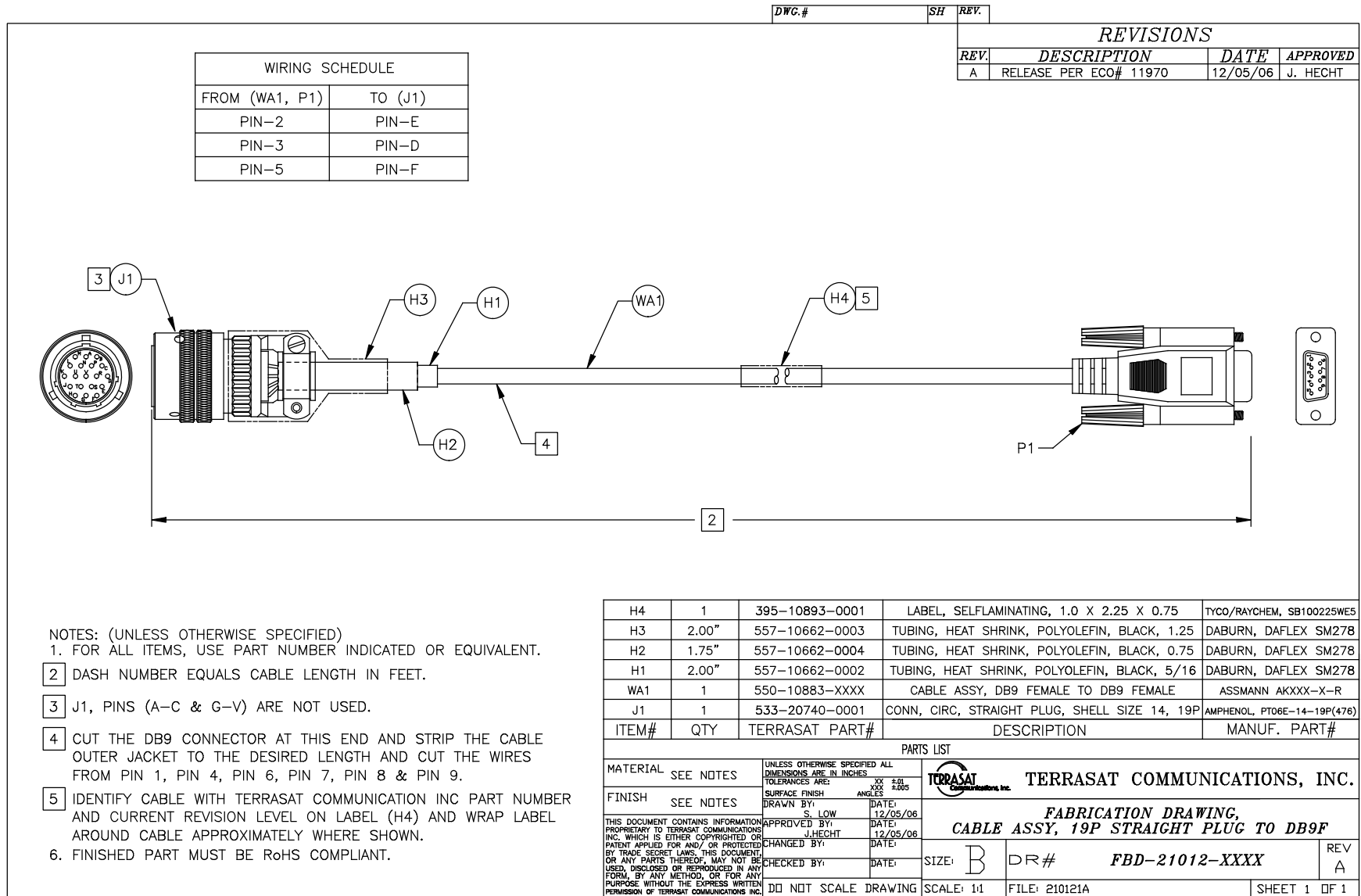


Figure G.1 Fabrication Drawing, FBD-21012-XXXX, Rev A

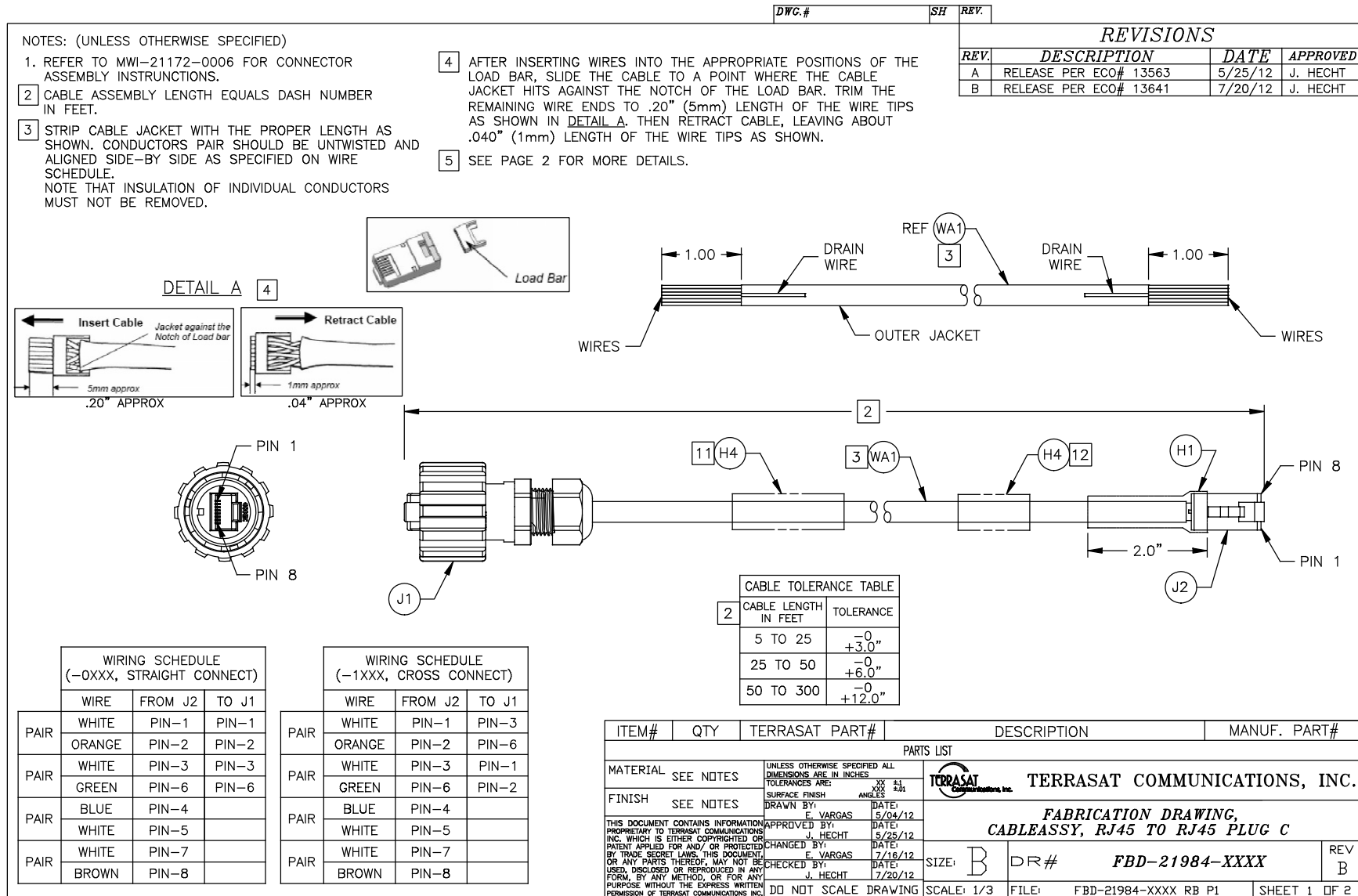


Figure G.2 Fabrication Drawing, FBD-21984-XXXX, Rev B, page 1 of 2

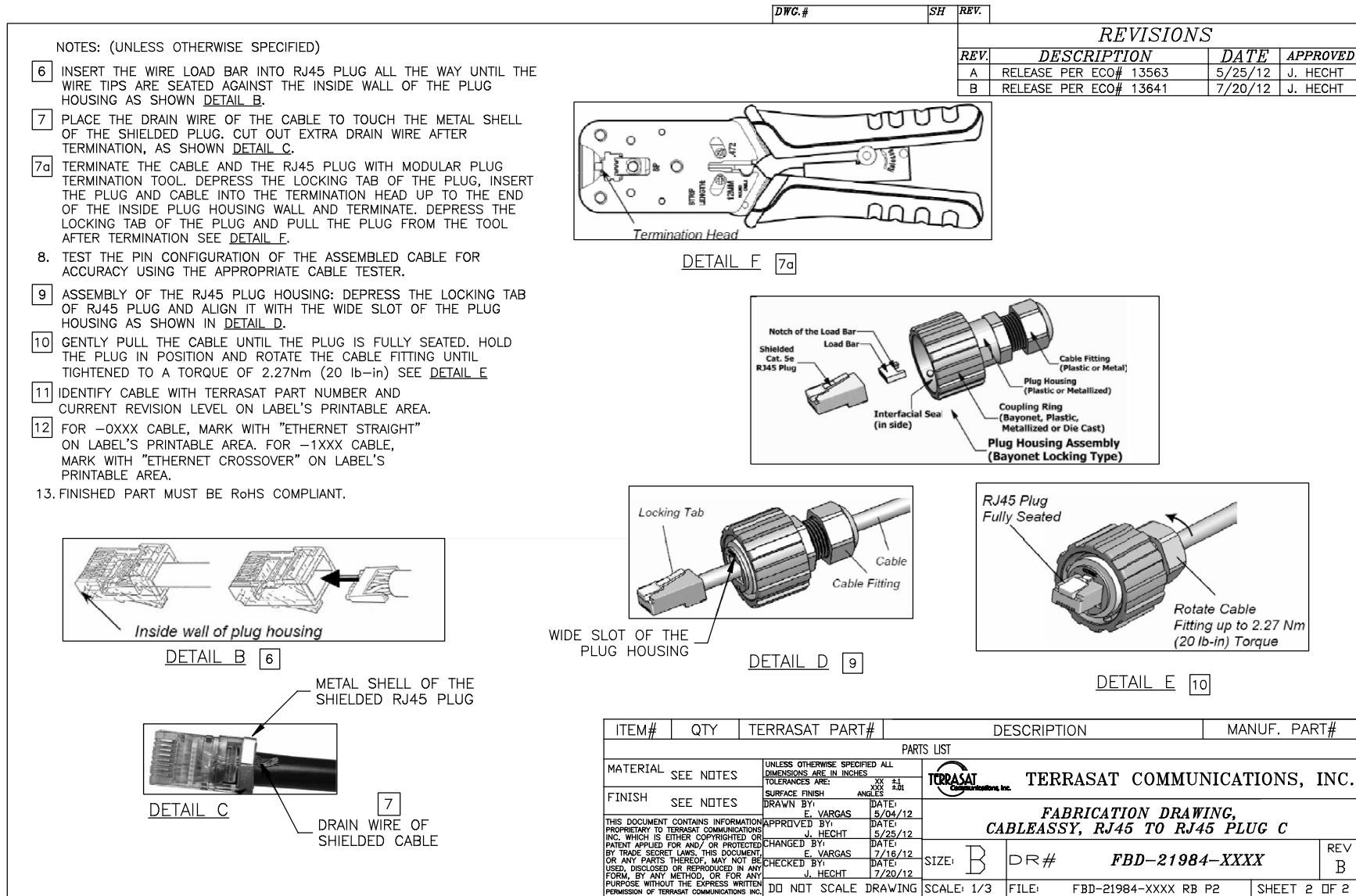


Figure G.3 Fabrication Drawing, FBD-21984-XXXX, Rev B, page 2of 2



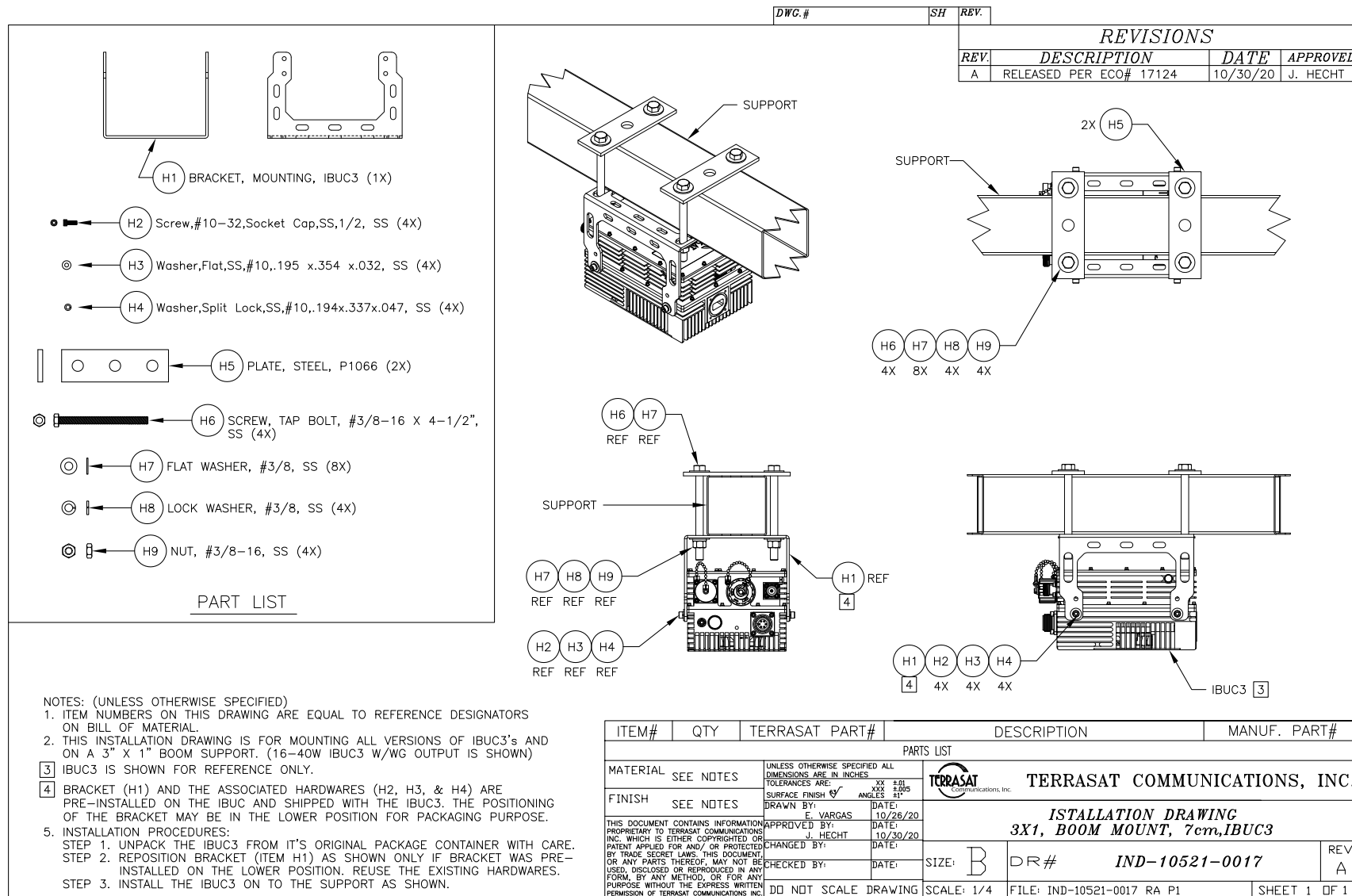


Figure G.4 Example Installation Drawing, IND-10521-0011, Rev A

## Data Sheets

---

Refer to the datasheets in Terrasat, Inc. web site: [www.terrasatinc.com](http://www.terrasatinc.com).

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

## D

## 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
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	<u>E</u> lectromagnetic Compatibility and <u>R</u> adio Spectrum <u>M</u> atters
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
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	watts
WG	Waveguide

# INDEX

## Numerics

10 MHz reference signal  
priority, 2-8

## A

alarm log  
incorrect time stamp, 4-8  
alarms  
default configuration, 5-3  
antenna mounting options, 3-7  
ASCII commands  
common, F-1  
attenuation, 2-12, 2-14  
setting, 3-19  
automatic gain control (AGC), 2-12  
automatic level control (ALC), 2-12, 4-5  
available bands, 2-2  
avoiding  
signal saturation, 4-9

## B

block diagram  
AC-powered IBUCs, 2-11  
DC-powered IBUCs, 2-10  
IBCU 2e, 2-11  
burst mode  
power measurement, 5-11

## C

checks  
M&C, 6-1  
power supply, 6-2  
continuous signal mode  
IBUC power measurement, 5-11  
CSM  
*See* continuous signal mode

## D

DC block, 3-17  
default transmit alarms, 5-3

## E

Ethernet  
SNMP, 5-9

## F

factory configuration  
IP address, 5-8  
IP gateway, 5-8  
subnet mask, 5-8  
floating supply, 3-12  
frequency plans  
transmit, 2-3, 2-4

## G

gain, 2-9  
galling, 3-2

## I

IBUC  
gain, 2-9  
L-band input, 2-7  
power measurement  
burst mode, 5-10  
continuous signal mode, 5-10  
required inputs, 2-7  
system configurations, 2-13 to ??  
IFL  
*See* interfacility link  
indoor power supply  
applications, 3-5  
interface frequency, 2-2  
interfacility link  
definition, 2-2  
IP address  
default, 5-8

IP gateway, 5-8  
isolation filter, 3-4

## L

L-band input, 2-7

## M

M&C interfaces  
  Ethernet  
    SNMP, 5-9  
    multifunction LED, 5-3  
    RS232, 5-1  
mastic tape  
  application, 3-14  
MIBs, 5-10  
mounting hole, 3-8

## P

phase noise  
  external reference, 2-7  
  internal reference, 2-8  
Plenum cables  
  use of, 3-11  
power measurement  
  modes, 5-10  
power supply checks, 6-2  
pressure window, 3-9  
pure carrier, 3-19

## R

reference documents  
  satellite operation, 1-2  
reference signal  
  priority, 2-8  
repair policy, 6-6  
replacement fuse type, 4-8  
returned material authorization, 6-7  
RF signal flow  
  required inputs, 2-7  
RMA procedure, 6-7  
RS232  
  initiating a session, 5-1

## S

saturation  
  transmit power, 6-2  
signal saturation  
  avoidance, 4-9  
single sideband  
  phase noise, 2-7  
SNMP  
  MIBs, 5-10  
solid-state power amplifier, 2-9  
standards  
  satellite operation, 1-2  
subnet mask, 5-8  
supply voltage options, 2-5  
system requirements, 2-13

## T

thresholds  
  Tx Input, 4-4  
time stamp  
  incorrect data, 4-8  
transceiver faults, 6-1  
transmit alarm default configurations, 5-3  
transmit frequency plans, 2-3, 2-4

## U

Ufer ground, 3-6

## V

variable attenuator, 2-14  
voltage  
  drop, 2-14  
  options, 2-5

## W

warranty policy, 1-5  
warranty seals  
  breaking, 1-6  
waveguide  
  flange types, 2-9





