MBT-5003

L-Band Up/Down Converter System
Installation and Operation Manual

Part Number MN-MBT5003
Revision 1
October 29, 2010

Part Number MN-MBT5003 Revision 1

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data MBT-5003 L-Band Up/Down Converter System. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the MBT-5003.

Comtech EF Data has reviewed this manual thoroughly in order to provide an easy-to-use guide to your equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, contact the Comtech EF Data Customer Support Department.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the Comtech EF Data Technical Publications Department:

TechnicalPublications@comtechefdata.com.

Conventions and References

Cautions and Warnings

IMPORTANT or NOTE indicates information critical for proper equipment function.

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

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

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations.

Trademarks

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

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-metric to metric conversions.

Electromagnetic Compatibility (EMC) Compliance

This is a Class A product. In a domestic environment, it may cause radio interference that requires the user to take adequate protection measures.

EN55022 –1998 Compliance

This equipment meets the radio disturbance characteristic specifications for information technology equipment as defined per EN55022 1998.

EN55082-1 – 1997 Compliance

This equipment meets the EMC/generic immunity standard as defined per EN55082-1 1997.

Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference; in which case, users are required to correct the interference at their own expense.

> **NOTE**
> *To ensure compliance, properly shielded cables for DATA I/O shall be used. More specifically, these cables shall be shielded from end to end, ensuring a continuous shield.*

Safety Compliance

EN60950

Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN60950. This equipment meets the Safety of Information Technology Equipment specification as defined in EN60950.

Low Voltage Directive (LVD)

The following information is applicable for the European Low Voltage Directive (2006/95/EC):

<HAR>	Type of power cord required for use in the European Community.
⚠	CAUTION: Double-pole/Neutral Fusing ACHTUNG: Zweipolige bzw. Neutralleiter-Sicherung

International Symbols:

Symbol	Definition
~	Alternating Current
⎓	Fuse

Symbol	Definition
⏚	Protective Earth / Safety Ground
⏛	Chassis Ground

> **NOTE**
> *For additional symbols, refer to* Cautions *and* Warnings *listed earlier in this Preface.*

Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

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

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Customer Support

 Refer to p. xii in this Preface for information regarding this product's Warranty Policy.

Contact the Comtech EF Data Customer Support Department for:

- Product support or training

- Reporting comments or suggestions concerning manuals

- Information on upgrading or returning a product

A Customer Support representative may be reached during normal business hours at:

> Comtech EF Data
> Attention: Customer Support Department
> 2114 West 7th Street
> Tempe, Arizona 85281 USA

> 480.333.2200 (Main Comtech EF Data number)
> 480.333.4357 (Customer Support Desk)
> 480.333.2161 FAX

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- **Contact** the Comtech EF Data Customer Support Department during normal business hours. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.

- **Request** a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support representative.

- **Pack** the product in its original shipping carton/packaging to ensure that the product is not damaged during shipping.

- **Ship** the product back to Comtech EF Data. (Shipping charges should be prepaid.)

Online Customer Support

An **RMA number** can be requested electronically by accessing Comtech EF Data's online **Support** page (**www.comtechefdata.com/support.asp**). From this page:

- **Click** the **Service** hyperlink, then read the **Return Material Authorization** section for detailed instructions on Comtech EF Data's return procedures.

- **Click [Send RMA Request]** on the **Support** page or the **RMA Request** hyperlink provided in the **Service | Return Material Authorization** section; fill out the *Billing Information*, *Return Information*, and *Unit to be Returned* sections completely, then click **[Send email]**

  – or –

- **Send an e-mail** providing this same detailed information to the Customer Support Department at **service@comtechefdata.com**.

Chapter 1. INTRODUCTION

1.1 Overview

Comtech EF Data's MBT-5003 L-Band Up/Down Converter System is an indoor product designed to convert between L-Band IF signals to satellite X-Band RF signals. The MBT-5003 is configurable at time of order for either up or down converter operation:

- The **MBT-5003-XUR L-Band Up Converter** incorporates two internal up converter (BUC-5003) modules;

- The **MBT-5003-XDR L-Band Down Converter (shown in Figure 1-1)** incorporates two internal down converter (BDC-5003) modules.

**Figure 1-1. Comtech EF Data MBT-5003 L-Band Up/Down Converter
(MBT-5003-XDR shown)**

1.2   Functional Description

The MBT-5003's 3RU-high, 19-inch wide chassis is designed for rack mounting into a standard 19-inch equipment rack. As shown in **Figure 1-2**, handles installed on the front panel facilitate ease of installation into and removal from the equipment rack.

All operator controls, indicators and displays for local and remote operation are located on the front panel of the MBT-5003.

External interface connectors are located on the front and rear panels of the MBT-5003 chassis. External equipment (e.g., a modem) is connected to each internal converter module via a standard, off-the-shelf coaxial cable. A coaxial cable is also used to connect the output for each module to RF equipment either at the same location or at the antenna location.

The system contains two diode "OR-ed" internal power supplies for increased reliability, and microprocessor-based Monitor and Control (M&C) functions. Particular care has been given to the RF performance of the MBT-5003 to facilitate its successful use in MIL-STD-188-164A systems.

MBT-5003 Front Panels

MBT-5003 Typical Rear Panel

Figure 1-2. MBT-5003 Front and Rear Panels

On the pages that follow, **Figure 1-3** depicts the block diagram for the MBT-5003-XUR L-Band Up Converter; **Figure 1-4** shows the MBT-5003-XDR L-Band Down Converter's block diagram.
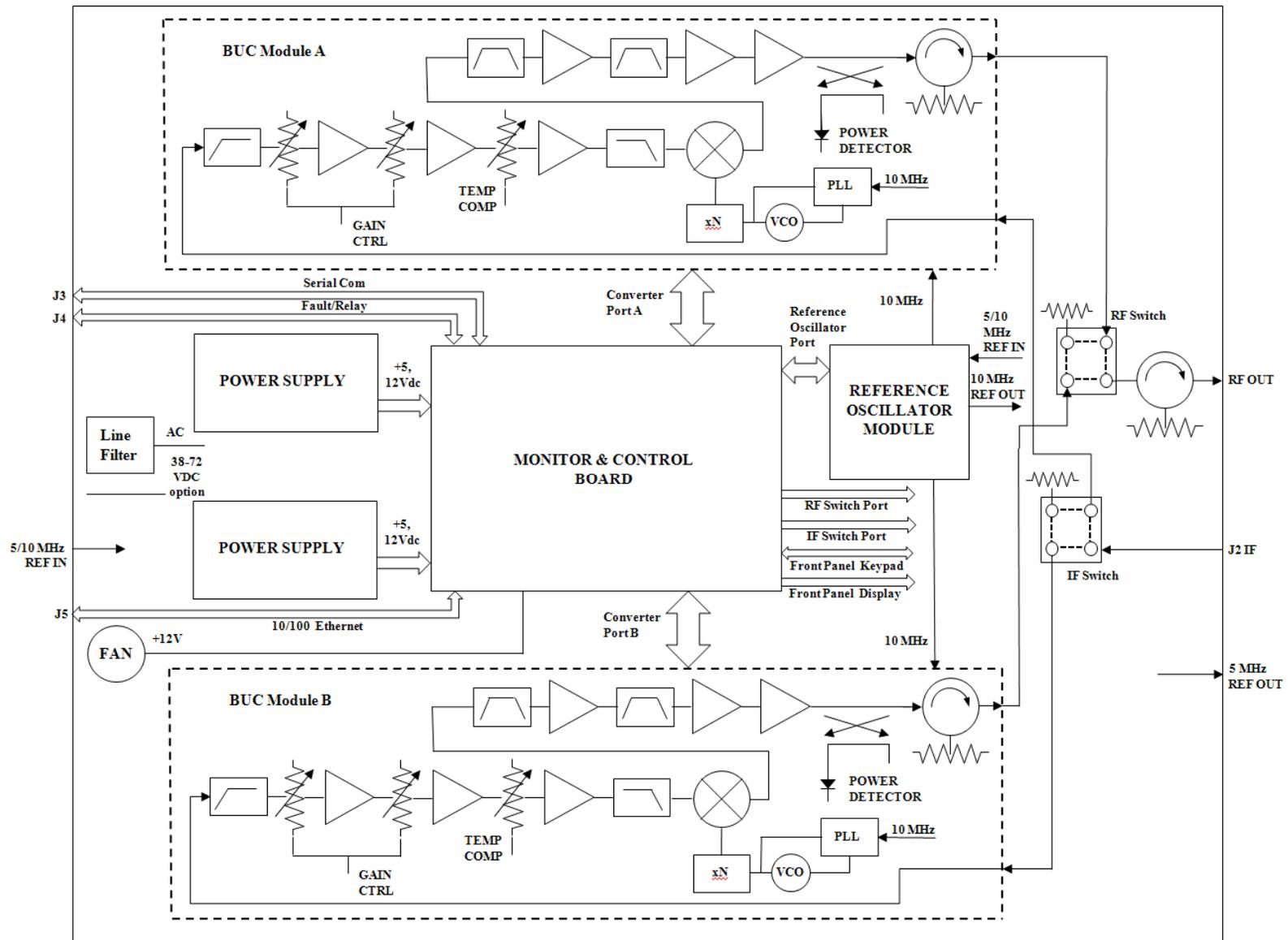
Figure 1-3. MBT-5003-XUR L-Band IF to X-Band RF Up Converter Block Diagram
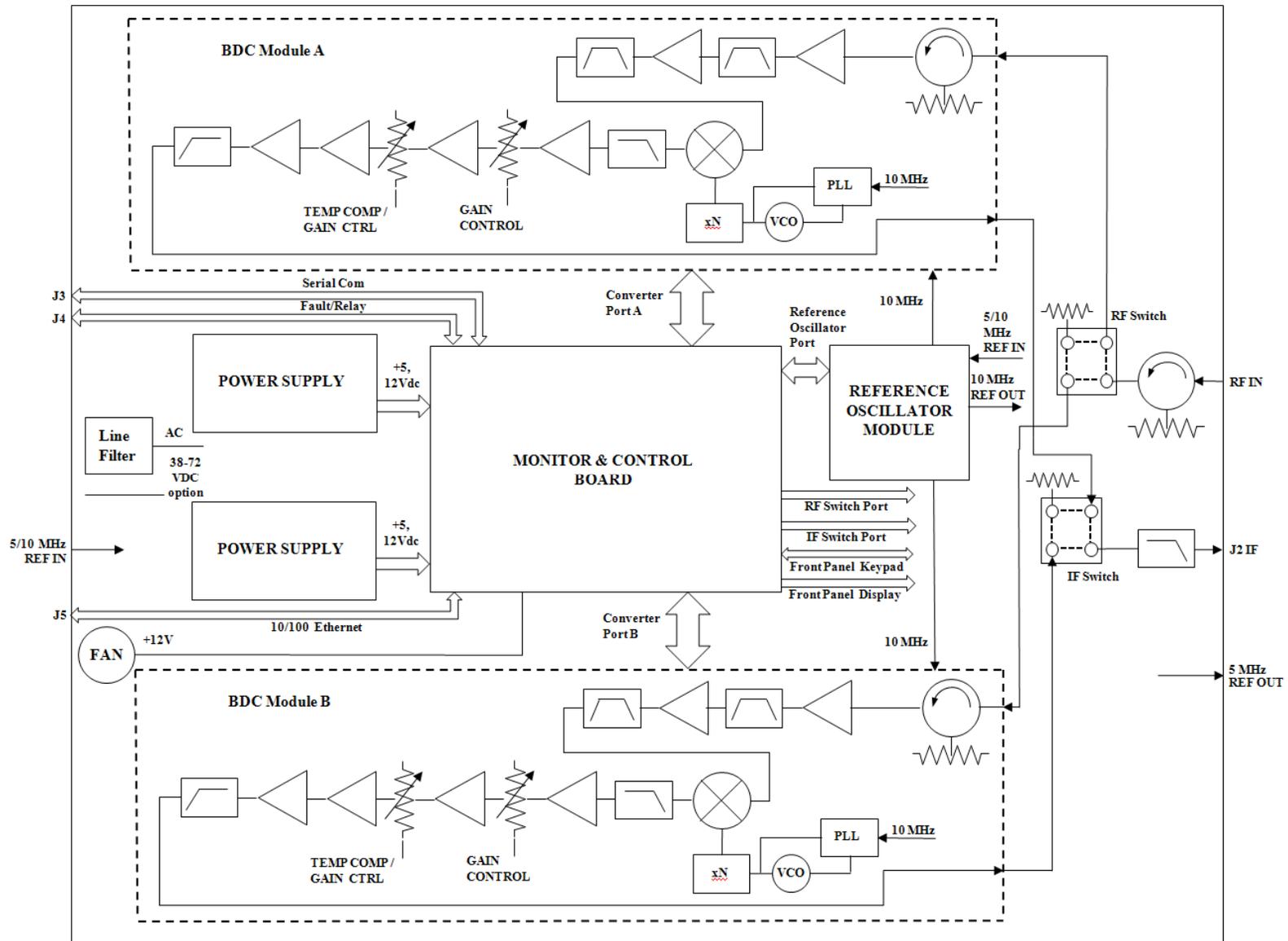
Figure 1-4. MBT-5003-XDR L-Band IF to X-Band RF Down Converter Block Diagram

1.3   Features

- Meets or exceeds IESS-308/309
- Low phase noise
- Designed to facilitate operation within MIL-STD-188-164A systems
- Flexible configuration
- Guarded front panel power switch
- Output power monitor (up converter)

1.3.1   Block Up Converter (BUC-5003)

The BUC-5003 Block Up Converter module translates an L-Band (1000 to 1500 MHz) input carrier to the desired X-Band (7900 to 8400 MHz) output frequency with an output level capable of driving either solid state or tube-based amplifiers.

1.3.2   Block Down Converter (BDC-5003)

The BDC-5003 Block Down Converter module translates any X-Band (7250 to 7750 MHz) signal to a corresponding L-Band (1000 to 15000 MHz) frequency.

1.4   Summary of Specifications

1.4.1   Physical & Environmental

Weight	20 lbs. (9.07 kg) Nominal
Dimensions (excluding connectors)	19″ x 5.25″ x 14″ (482.6 x 133.35 x 355.6 mm) (See Figure 1-3)
Temperature	Operating	32º to 132.8ºF (0º to 56ºC)
	Non-operating (Storage)	-58º to 158ºF (-50º to 70ºC)
Operational Altitude	15,000 ft above sea level
Shock	Normal commercial shipping and handling

1.4.2   Prime Power

AC Input		IEC-320 w/retainer
Voltage	AC	90 – 260 VAC
	DC (optional)	48 VDC
Frequency		47 – 63 Hz
Dissipation	Up converter	100 Watts, typical
	Down converter	80 Watts, typical

1.4.3   Monitor & Control

Serial M&C Interface	TIA/EIA-485, 4-wire DB-9F
Alarm	Form C, DB-9F
Remote Interface	RJ-45 Ethernet
Physical Controls	6-button keypad entry
Display	Vacuum Fluorescent Display (VFD), 24x2 alphanumeric
Status Indicators	5 LEDs per unit: SUM FLT, MUTE, ONLINE, UP, DOWN

1.4.4   Reference

External Input		5 or 10 MHz 5 $\pm$5 dBm, BNC Female
Output		5 MHz 10 $\pm$5 dBm Front Panel, BNC Female
Internal 10 MHz	Stability over Time	$\pm$1 x 10^{-9}/day (higher stability optional)
	Stability over Temp	$\pm$1 x 10^{-8}
Setability (by remote control)	Resolution	Better than 2.5 x 10^{-8}
	Range	>$\pm$5 x 10^{-7}

1.4.5   BUC-5003 Block Up Converter (featured on MBT-5003-XUR)

Output Frequency		7900-8400 MHz
Input Frequency		1000-1500 MHz
Frequency Sense		No Inversion
Impedance		50Ω
Input Return Loss		15 dB minimum
Output Return Loss		18 dB minimum
Input Connector		Type 'TNC' Female
Output Connector		Type 'N' Female
Gain		38 ±2 dB nominal @ minimum attenuation
	Full Band	±1.0 dB
	Per 36 MHz	±0.50 dB
	Per 20 MHz	±0.35 dB
	0° to +56° C	.75 dB/15°C (±1 dB, 0°-56 °C)
Mute		80dB
User Attenuation Range		0-50 dB, in 0.25 dB steps
Output Power, P1dB		22 dBm minimum
Noise Figure		15 dB @ minimum attenuation
Intermodulation Distortion		-30 dBc min w/2 output carriers @ 17 dBm each
AM/PM Conversion		0.1°/dB @ 0 dBm Output
Spurious (In-band)	Carrier Related	-75 dBc (<-80 dBc, typical)
	Non-Carrier Related	-70 dBm
Related	Lo Leakage	-75 dBm
	60 Hz & Harmonics	<-36 dBc (typically <-50 dBc)
Phase Non-linearity	Per 20 MHz BW	8 degrees p-p
	Per 36 MHz BW	12 degrees p-p
Phase Noise		Meets or exceeds MIL-STD-188-164A
	100 Hz	-68 dBc/Hz
	1 kHz	-78 dBc/Hz
	10 kHz	-88 dBc/Hz
	100 kHz	-98 dBc/Hz
	1 MHz	-108 dBc/Hz

1.4.6   BDC-5003 Block Down Converter (featured on MBT-5003-XDR)

Input Frequency		7250-7750 MHz
Output Frequency		1000-1500 MHz
Frequency Sense		No Inversion
Impedance		50Ω
Input Return Loss		18 dB minimum
Output Return Loss		15 dB minimum
Input Connector		Type 'N' Female
Output Connector		Type 'TNC' Female
Gain		38 ±2 dB nominal @ minimum attenuation
	Full Band	±1.0 dB
	Per 36 MHz	±0.50 dB
	Per 20 MHz	±0.35 dB
	0° to +56° C	.75 dB/15°C (±1 dB, 0 to 56 °C)
Mute		-80 dBm
User Attenuation Range		0 to 20 dB, in 0.25 dB steps
Signal Level		10 dBm maximum (non-damage)
Output Power, P1dB		20 dBm minimum
Noise Figure		15 dB @ minimum attenuation
Intermodulation Distortion		-56 dBc w/2 carriers @ 0 dBm each, 3 dBm Total Output Pwr
AM/PM Conversion		0.1°/dB @ 0 dBm Output
Image Rejection		90dB
Spurious (In-band)	Carrier Related	-75 dBc (<-80 dBc typical)
	Non-Carrier Related	-70 dBm
	2nd Harmonic	-20 dBc maximum (-40 dBc typical)
Related	Lo Leakage	-75 dBm
	60 Hz & Harmonics	<-36 dBc (typically <-50 dBc)
Phase Non-linearity	per 20 MHz BW	3 degrees p-p
	per 36 MHz BW	4 degrees p-p
Phase Noise		Meets or exceeds MIL-STD-188-164A
	100 Hz	-68 dBc/Hz
	1 kHz	-78 dBc/Hz
	10 kHz	-88 dBc/Hz
	100 kHz	-98 dBc/Hz
	1 MHz	-108 dBc/Hz

1.5   Dimensional Envelope
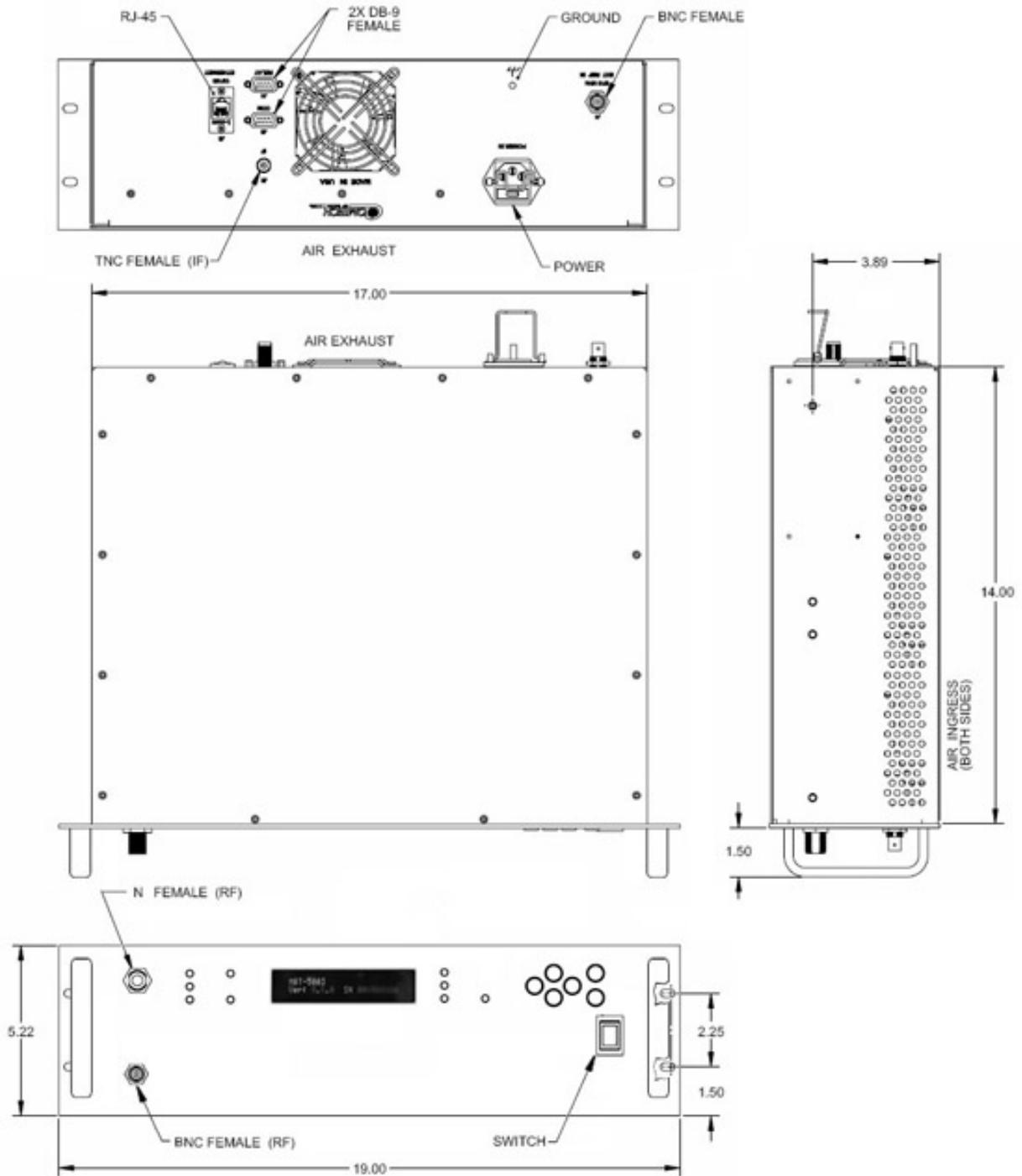
Figure 1-5. MBT-5003 Dimensional Envelope

Notes:

Notes:

Chapter 2. INSTALLATION

2.1　Unpacking and Inspection

The MBT-5003 L-Band Up/Down Converter System and its Installation and Operation Manual are packaged and shipped in a pre-formed, reusable cardboard carton containing foam spacing for maximum shipping protection.

Inspect shipping containers for damage. If shipping containers are damaged, keep them until the contents of the shipment have been carefully inspected and checked for normal operation.

⚠ CAUTION *Do not use any cutting tool that will extend more than 1" into the container and cause damage to the converter.*

Unpack and inspect the MBT-5003 as follows:

Step	Procedure
1	**Cut** the tape at the top of the carton indicated by **OPEN THIS END**.
2	**Remove** the cardboard/foam space covering the MBT-5003.
3	**Remove** the MBT-5003, manual, and power cord from the carton.
4	**Save** the packing material for storage or reshipment purposes.
5	**Inspect** the equipment for any possible damage incurred during shipment.
6	**Check** the equipment against the packing list to ensure the shipment is correct.
7	**Refer** to the next section (Section 2.2) for installation instructions.

2.2   Installation

2.2.1 Standard Rack Mount Installation

The MBT-5003 is designed for installation in a standard 19-inch (48.26 cm) rack cabinet or enclosure. **Figure 2-1** provides a "cut-away" side view of a typical MBT-5003 rack configuration.

The converter chassis requires 3RU (5.25 inches) of panel height space. Adequate air ventilation should be provided on both sides of the rack-mounted equipment. In rack systems where there is high heat dissipation, forced air cooling must be provided by top or bottom mounted fans or blowers. Under no circumstance should the highest internal rack temperature be allowed to exceed 50°C (122°F).
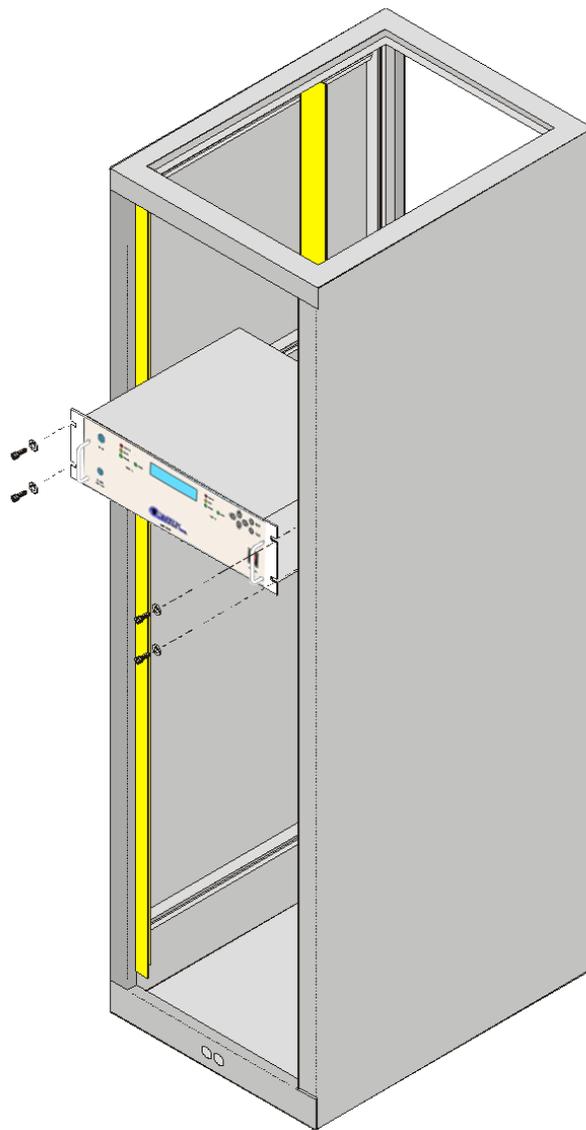
Figure 2-1. Standard Rack Cabinet Installation

2.2.2 Installation Using Optional Bearingless Rack Slide Set

If the converter is to be mounted on slides, install the optional bearingless rack slide set FP/SL0006 (**Figure 2-2**) using both included and user-provided mounting hardware:

Install the components of the rack slide set as follows:

Step	Procedure
1	Using the provided mounting hardware, install the rack slides to either side of the MBT-5003 chassis.
2	Using the provided mounting hardware, install the slide rail components into each side of the rack cabinet.
3	Mount the unit into the equipment rack, ensuring that the slides properly engage the cabinet-mounted slide rails.
4	Slide the unit into the rack cabinet until the front panel's back surfaces abut the rack cabinet's front mounting rails.
5	Secure the unit to the rack cabinet front mounting rails using four user-provided screws installed through the front panel mounting slots.
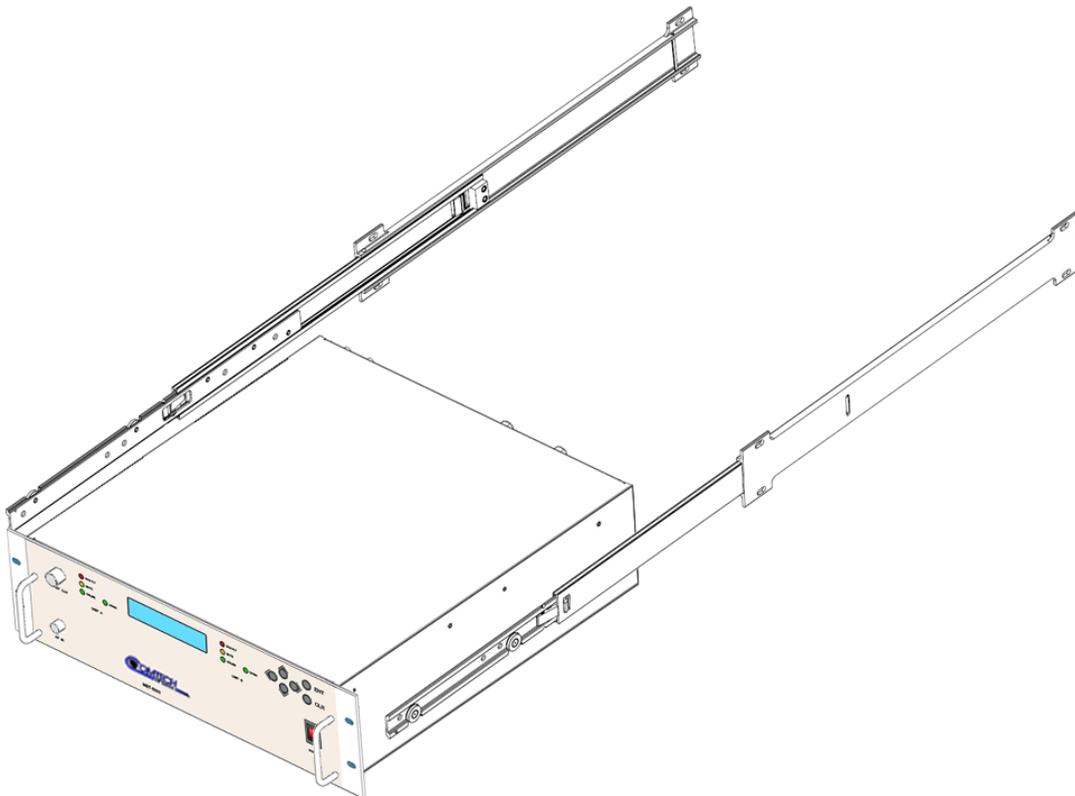
CEFD Part Number	Description
FP/SL0006	Bearingless Rack Slide Set – 26"

Figure 2-2. Optional Bearingless Rack Slide Installation (FP/SL0006)

2.3 Connect External Cables

Proceed to connect all external cables to the connectors identified in the next chapter (**Chapter 3. EXTERNAL CONNECTORS**). Should difficulties occur, contact Comtech EF Data Customer Support for assistance.

Chapter 3. EXTERNAL CONNECTORS

3.1 External Connectors Overview

As shown in **Figure 3-1**, connectors located on the front and rear panels of the MBT-5003 L-Band Up/Down Converter System provide all necessary external connections between the converter and other equipment.

(MBT-5003-XDR Panel Detail)

MBT-5003 Front Panels

MBT-5003 Typical Rear Panel

Figure 3-1. MBT-5003 External Connectors

3.2   MBT-5003 External Connectors

Table 3-1 summarizes the external connectors and identifies the chapter sections that provide more detailed information. *The rear panel connectors are typical for both the MBT-5003-XUR Up Converter and MBT-5003-XDR Down Converter units. Front panel connectors, if not typical, are identified as unique to either unit, both in the table as well as chapter sections that follow.*

Table 3-1. MBT-5003 Front and Rear Panel External Connectors

Ref Des	Name		Sect	Connector Type	Function
N/A	REF OUT		3.2.1.1	BNC (female)	**(Front panel – typical)** External 5/10 MHz Reference Output
N/A	RF OUT		3.2.1.2	Type 'N' (female)	**(Front panel – MBT-5003-XUR only)** RF Output
N/A	RF IN		3.2.1.3	Type 'N' (female)	**(Front panel – MBT-5003-XDR only)** RF Input
J1	5/10 MHz EXT REF IN		3.2.2.1	BNC (female)	External 5/10 MHz Reference Input
J2	IF		3.2.2.2	Type 'TNC' (female)	Upconverted L-Band Input Signal **(MBT-5003-XUR only)**
					Downconverted L-Band Output Signal **(MBT-5003-XDR only)**
J3	COM		3.2.2.3	9-Pin Type 'D' (male)	Serial Remote Control Interface
J4	RELAY		3.2.2.4	9-Pin Type 'D' (female)	Form C Unit Alarm
J5	10/100 ETHERNET		3.2.2.5	RJ-45	10/100 Ethernet M&C
N/A	POWER IN	AC Plug	3.2.2.6	IEC	Converter Power
N/A	GND		3.2.2.7	#10-32 Stud	Grounding

3.2.1 Front Panel Connectors

3.2.1.1   REF OUT Connector, Type 'BNC' Female

The **REF OUT** interface is a type 'BNC' female coaxial connector provided on the MBT-5003-XUR Up Converter and MBT-5003-XDR Down Converter front panels. It is used to supply a 5 MHz signal from the chassis reference oscillator. The impedance is matched for 50/75Ω, and provides an output level of 10 ±5 dBm.

3.2.1.2   RF OUT Connector (MBT-5003-XUR only), Type 'N' Female

The **RF OUT** connector is a type 'N' female coaxial connector provided only on the MBT-5003-XUR Up Converter front panel. It provides the upconverted RF output signal for customer use.

3.2.1.3 RF IN Connector (MBT-5003-XDR only), Type 'N' Female

The **RF IN** connector is a type 'N' female coaxial connector provided only on the MBT-5003-XDR Down Converter front panel. It provides the downconverted RF input signal for customer use.

3.2.2 Rear Panel Connectors (Typical MBT-5003-XUR / MBT-5003-XDR)

3.2.2.1 J1 | 5/10 MHz EXT REF IN Connector, Type 'BNC' Female

The **J1 | 5/10 MHz EXT REF IN** interface is a type 'BNC' female coaxial connector, used to supply a master reference to the entire chassis. The input signal supplied here by the user is used for phase-locking the internal 5/10MHz reference oscillator. The impedance is matched for 50/75Ω, and requires an input level of 5 ±5 dBm.

3.2.2.2 J2 | IF Connector, Type 'TNC' Female
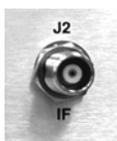
The **J2 | IF** connector is a type 'TNC' female coaxial connector. For the MBT-5003-XUR, it provides the L-Band input signal to be upconverted; for the MBT-5003-XDR, it provides the L-Band output signal to be downconverted.

3.2.2.3 J3 | COM Connector (EIA-485 Interface), DB-9F

The **J3 | COM** EIA-485 4-wire interface is a 9-pin type 'D' (DB-9F) connector (the mating connector is a DB-9M connector). The pinout specifications for EIA-485 are contained in **Table 3-2**.

Table 3-2. J3 | COM – EIA-485 (4-Wire) Interface

Pin #	Description
1	+Tx; Signal
2	
3	
4	
5	GND; Ground
6	-TX; Signal Complement
7	
8	+RX; Signal
9	-RX; Signal Complement

Note: Tx is the signal which transmits out of the MBT-5003.

3.2.2.4   J4 | RELAY (Summary Fault Output) Connector, DB-9F

The **J4 | RELAY** summary fault output interface is a 9-pin type 'D' (DB-9F) connector (the mating connector is a DB-9M connector). The pinout specifications are contained in **Table 3-3.**

Table 3-3. J4 | RELAY – Summary Fault Output

Pin #	Description
1	SUMFLT1_NC
2	SUMFLT1_NO
3	SUMFLT2_NC
4	SUMFLT2_NO
5	GND
6	SUMFLT1_COM
7	EXT_FLT_IN#
8	SUMFLT2_COM
9	NC

Notes:
1. Pin 1 to Pin 6: Unit 'A' Fault
2. Pin 2 to Pin 6: Unit 'A' OK
3. Pin 3 to Pin 8: Unit 'B' Fault
4. Pin 4 to Pin 8: Unit 'B' OK

3.2.2.5   J5 | 10/100 Ethernet (M&C 10/100 BaseT Ethernet) Port, (RJ-45)

The **J5 | 10/100 ETHERNET** port provides a standard RJ-45 female interface for 10/100 BaseT Ethernet M&C (used for management and control via Telnet, HTTP, and SNMP). It is also used for upgrading MBT-5003 firmware. This CAT5 receptacle uses a UTP cable to connect to an Ethernet hub, router, switch, PC, etc. The pinout specifications are contained in **Table 3-4**.

Table 3-4. J5 | 10/100 ETHERNET – M&C

Pin #	Description	Direction
1	Tx+	Out
2	TX-	Out
3	Rx+	In
4	N/A	
5	N/A	
6	Rx-	In

3.2.2.6   POWER IN (IEC Line Input AC Power) Connector

For continued operator safety, always replace the fuses with the correct type and rating.

A standard, detachable, non-locking, 3-prong power cord (IEC plug) supplies the Alternating Current (AC) power to the converter.

Observe the following:

AC Power Specifications	
Input Power	290W maximum, 110W typical.
Input Voltage	100 to 240 volts AC, +6/-10% - autosensing (total absolute max. range is 90 to 254 VAC)
Connector Type	IEC-320
Fuse Protection	T2A (2.0A) Slow-blow Line and neutral fusing 20 mm type fuses

3.2.2.7   Ground Connector

A #10-32 stud is used for connecting a common chassis ground among equipment.

Note: The AC power connector provides the safety ground.

Notes:

Notes:

Chapter 4. FLASH UPGRADING

4.1 Introduction

The MBT-5003 uses 'Flash memory' technology, and new firmware can be uploaded from an external Microsoft Windows®-compatible computer. This makes software upgrading very simple, and upgrade files containing the current version of firmware are available over the Internet (**Figure 4-1**), via e-mail, or on CD.

The complete upgrading process is as follows:

- New firmware can be downloaded via the Internet to an external PC.

- The upgrade can be performed without opening the MBT-5003 by simply connecting the unit to the Ethernet port or serial port of the external PC.

- The firmware update is transferred, via File Transfer Protocol (FTP), from the external PC to the MBT-5003.
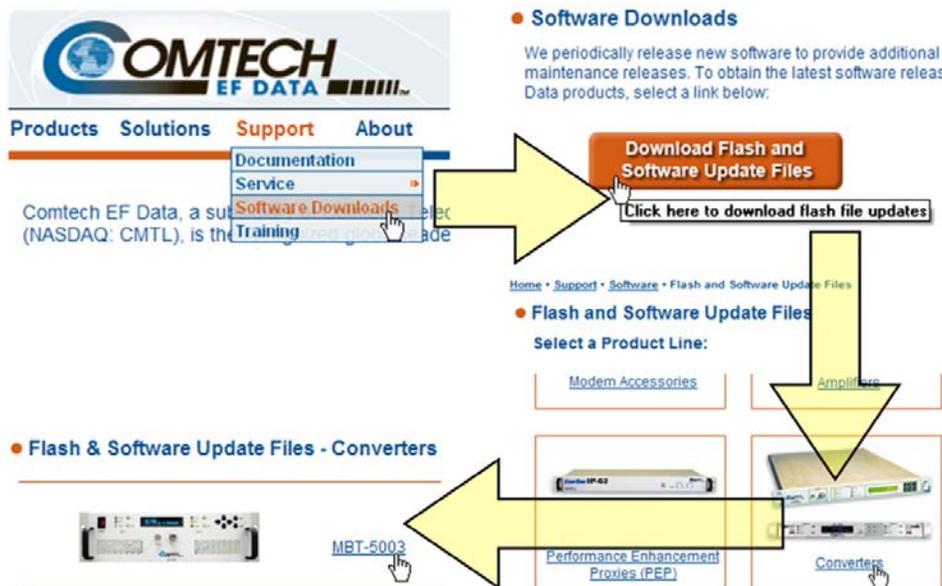
Figure 4-1. Flash Upgrade via Internet

4.2   Ethernet FTP Upload Procedure

Step	Procedure
1	**Identify** the reflashable product, firmware number, and version for download. The current unit M&C version can be viewed at the top-level menu of the front panel display (press the **[CLR]** key several times to view). The firmware information can also be found within the **SELECT: Utility → Firmware → Info → Image#1** *or* **Image#2** menu trees. Using serial remote control, the firmware revision levels may be obtained with the **<0/SWR?** query. For more information, refer to **Appendix A. REMOTE CONTROL.** **Alternately,** when using the Web Server Interface, the Bootrom, Bulk1 and Bulk2 firmware loads may be viewed after selecting the **Utility** hyperlink, available under the **Config** page tab. For more information, refer to **Chapter 6.5. WEB SERVER INTERFACE**.
2	**Create a temporary folder** (directory) on an external PC: • *For Windows Explorer:* Select **File > New > Folder** to create a new folder, then rename it from "**New Folder**" to "**temp**" or another convenient, unused name. Assuming "**temp**" works, a "*c:\temp*" folder should now be created. **Note:** The drive letter **c:** is used in this example. Any valid writable drive letter can be used. • *For Windows Command-line:* Click **[Start]** on the Windows taskbar, then click the "**Run...**" icon (or, depending on Windows OS versions *prior* to Windows 95, click the "**MS-DOS Prompt**" icon from the Main Menu). Then, to open a Command-line window… o *For Windows 95 or Windows 98* – Type "**command**". o *For any Windows OS versions <u>later</u> than Windows 98* – Type "**cmd**" *or* "**command**". *Alternately,* from **[Start],** select *All Programs > Accessories > Command Prompt*. At the Command-line prompt (c:\>), type "**mkdir temp**" or "**md temp**" (without quotes – **mkdir** and **md** stand for *make directory*). This is the same as creating a new folder from Windows Explorer. There should now be a "*c:\temp*" subdirectory created (where **c:** is the drive letter used in this example).
3	**Download** the correct firmware file to this temporary folder. As shown in **Figure 4-1**: a) **Go online** to: **www.comtechefdata.com**; b) **Click** on: *Support* tab; c) **Click** on: *Software Downloads* drop-down or hyperlink from *Support* page; d) **Click** on: *Download Flash and Software Update Files* icon; e) **Click** on: (Select a Product Line) *Converters* hyperlink; f) **Click** on: The **MBT-5003** product hyperlink; g) **Select** the appropriate firmware hyperlink. **About Firmware Numbers, File Versions, and Formats:** The flashable files on the download server are organized by product prefix; firmware number (verify that the correct firmware number is known – see **Step 1**) and, where applicable, revision letter and release version. The MBT-5003 firmware archive file hyperlink is **FW-0000303x_V###** (where 'x' denotes the revision letter, and V### denotes the firmware version number).

3 (cont)	The current version firmware release is provided. If applicable, one version prior to the current release is also available. Be sure to identify and download the desired version.
	The downloadable files are stored in two formats: *.exe (self-extracting) and *.zip (compressed). Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead.
	For additional help with "zipped" file types, refer to *PKZIP for Windows*, *WinZip*, or *ZipCentral* help files. *PKZIP for DOS* is not supported due to file naming conventions.
4	**Extract** the files to the temporary folder on the PC. A minimum of two files should be extracted: a) **FW-0000303x_#_#_#.bin** – the bulk firmware file (where 'x' denotes the revision letter, and #_#_# denotes the firmware version number). b) **ReleaseNotes_MBT5003_V###.pdf** (where "###" denotes the firmware version number).
5	**Confirm** that the files have been extracted to the specified temporary folder on the PC: In Command-line, use "**cd c:\temp**" to change to the temporary directory created in **Step 2**, then use the "**dir**" command to list the files extracted from the downloaded archive file.
6	**Connect** the client PC to the MBT-5003's **J5	10/100 Ethernet** M&C port via a hub or a switch, or directly to the PC with a crossover cable.
7	**Send a "ping" command** to the unit to verify the connection and communication: **First,** determine the IP address of the unit remotely or by using the MBT-5003 Front Panel: **Remotely** – use the **<0/IPA?** command **Via Front Panel** – use the **SELECT: Configure → Remote → EthernetConfig → IP Address/ Range** menu. *Then,* **using Command-line to PING:** At the Command-line prompt, type "**ping xxx.xxx.xxx.xxx**" (where '*xxx.xxx.xxx.xxx*' is the Management IP address of the unit). The results should confirm whether or not the unit is connected and communicating.
8	**Initiate** an FTP session with the unit (this example uses Command-line): a) From the PC, type "**ftp *xxx.xxx.xxx.xxx***" where "*xxx.xxx.xxx.xxx*" is the IP address of the MBT-5003. b) Enter the **Admin User Name** (there will be no prompt for a password) to complete login. c) Verify the FTP transfer is binary by typing "**bin**". d) Type "**prompt**", then type "**hash**" to facilitate the file transfers.
9	**Transfer** the files from the temporary folder on the PC: Type "**put FW-0000303x_#_#_#.bin bulk:**" to begin the file transfers. The destination "**bulk:**" must be all lower-case. Approximately **one minute** is required to transfer the file.
10	**Verify** the file transfer: a) The PC should report that the file transfer has occurred, and the display on the unit will start reporting "Programming App Flash … Please wait". After a few minutes, the unit will display "Programming main FPGA … Please wait". b) **Terminate** the FTP session by typing "**bye**" and close the Command-line window. c) **Confirm** that the new file was loaded by using the procedure in **Step 1**.
11	**Change** the desired image to boot. From the MBT-5003 front panel menu: **SELECT: Utility → Firmware → Select** Use the ◄ ► arrow keys to change to the other image, then cycle power to reboot the unit.

12	**Verify** the new firmware version has booted by observing the firmware version displayed on the MBT-5003 front panel:
	MBT-5003
	Version: #.#.# SN #########
	Note: To load the second image, repeat **Steps 8 through 11**.
	The Flash Upgrade Procedure is now complete.

Notes:

Chapter 5. FRONT PANEL OPERATION

5.1 Introduction
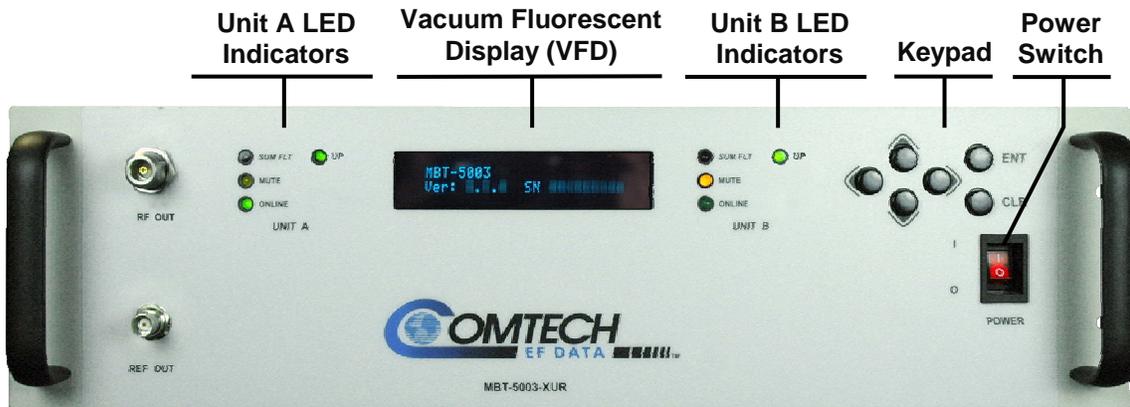
Figure 5-1. MBT-5003 Front Panel (MBT-5003-XUR shown)

Figure 5-1 identifies the key operational features of the MBT-5003 L-Band Up/Down Converter System front panel. The front panel features (from left) two sets of four **L**ight-**E**mitting **D**iode (LED) indicators, a **V**acuum **F**luorescent **D**isplay (VFD), a six-button keypad, and the prime power switch.

The function and behavior of the LED indicators, keypad, and VFD is described in detail in this chapter. The keypad comprises six individual keyswitches. The user can fully control and monitor the operation of the MBT-5000 from the front panel using the keypad and display. The user enters data via the keypad, and messages are displayed on the VFD. The LEDs indicate, in a summary fashion, the status of the unit.

5.1.1   Switch Power On

Prior to turning power on to the unit, check to ensure that installation is complete, and verify that the MBT-5003 is connected to the proper prime power source, RF Input, and RF Output.

For more information, refer to **Chapter 2. INSTALLATION** and **Chapter 3. EXTERNAL CONNECTORS**.

Switch on the unit and verify that the cooling fan is operational, the LED indicators illuminate as expected, and the Vacuum Fluorescent Display is readable.

5.1.2   LED Indicators

MBT-5003-XUR
Unit A / Unit B LED Array

MBT-5003-XDR
Unit A / Unit B LED Array

The following table defines the operational condition, when lit, of the front panel LED indicator arrays (four LEDs each per Units A and B, as depicted above):

LED	Color	Operational Condition (When Lit)
SUM FLT	Red	The designated unit has active faults.
MUTE	Amber	The designated unit is in Mute Mode.
ON LINE	Green	The designated unit is operational when lit.
UP	Green	**(MBT-5003-XUR only)** The designated unit is operating as an Up Converter when lit.
DOWN	Green	**(MBT-5003-XDR only)** The designated unit is operating as a Down Converter when lit.

5.1.3   Keypad
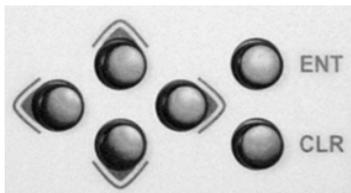
The keypad comprises six individual key switches. They have a positive 'click' action, which provides tactile feedback. The function of the front panel keypad is as follows:

The **ENT (ENTER)** key is used to select a displayed function or to execute a modem configuration change.

The **CLR (CLEAR)** key is used to back out of a selection or to cancel a configuration change which has not been executed using **ENT**. Pressing **CLR** generally returns the display to the previous selection.

(Up, Down) These arrows are used primarily to change configuration data (numbers), at the current cursor position. Occasionally, they may be used to scroll through a number of choices at the current cursor position. Most of the menus (space permitting) include arrow key hints to guide the user.

(Left, Right) These arrows are used to move to the next selection or to move the cursor position. Most of the menus (space permitting) include arrow key hints to guide the user.

> **IMPORTANT**
>
> *The keypad has an auto-repeat feature. If a key is held down for more than 1 second, the key action will repeat, automatically, at the rate of 15 keystrokes per second. This is particularly useful when editing numeric fields, with many digits, such as frequency or data rate.*

5.1.4   Vacuum Fluorescent Display (VFD)

The MBT-5003 features a **V**acuum **F**luorescent **D**isplay (VFD). The VFD is an active display showing two lines of 24 characters each. It produces a blue light, the brightness of which can be controlled by the user. Compared to a **L**iquid **C**rystal **D**isplay (LCD), it has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

On most menu screens, the user will observe a flashing solid block cursor, which blinks at a once-per-second rate. This indicates the currently selected item, digit, or field. Where this solid block cursor would obscure the item being edited (e.g., a numeric field) the cursor will automatically change to an underline cursor.

If the user were to display the same screen for weeks at a time, the display could become 'burnt' with this image. To prevent this, the unit has a 'screen saver' feature, which will activate after a few minutes. The top line of the VFD will display the Circuit ID, and the bottom line will display '`Press any key...`'. The message moves from right to left across the screen, then wraps around. Pressing any key will restore the previous screen.

5.2   Opening Screen

```
MBT-5003
Ver: #.#.#  SN ########
```

This screen is displayed whenever power is first applied to the unit. When the prime power is turned on, this VFD 'splash' display indicates the converter model number – i.e., 'MBT-5003' – along with the version number of the firmware installed, and the serial number assigned for the unit in use.

The opening screen may be accessed from any location within the MBT-5003 menu structure by pressing the **CLR** key repeatedly. Otherwise, press any key to access the **SELECT: (Main)** menu.

5.3   SELECT: (Main) Menu

```
SELECT: Config  Monitor
Info Utility Test
```

Figure 5-2 illustrates the hierarchal structure of the **SELECT: (Main)** menu tree. The converter commands are in a tree structured menu format designed for access and execution of all control functions, and to prevent the execution of an invalid entry by the operator.
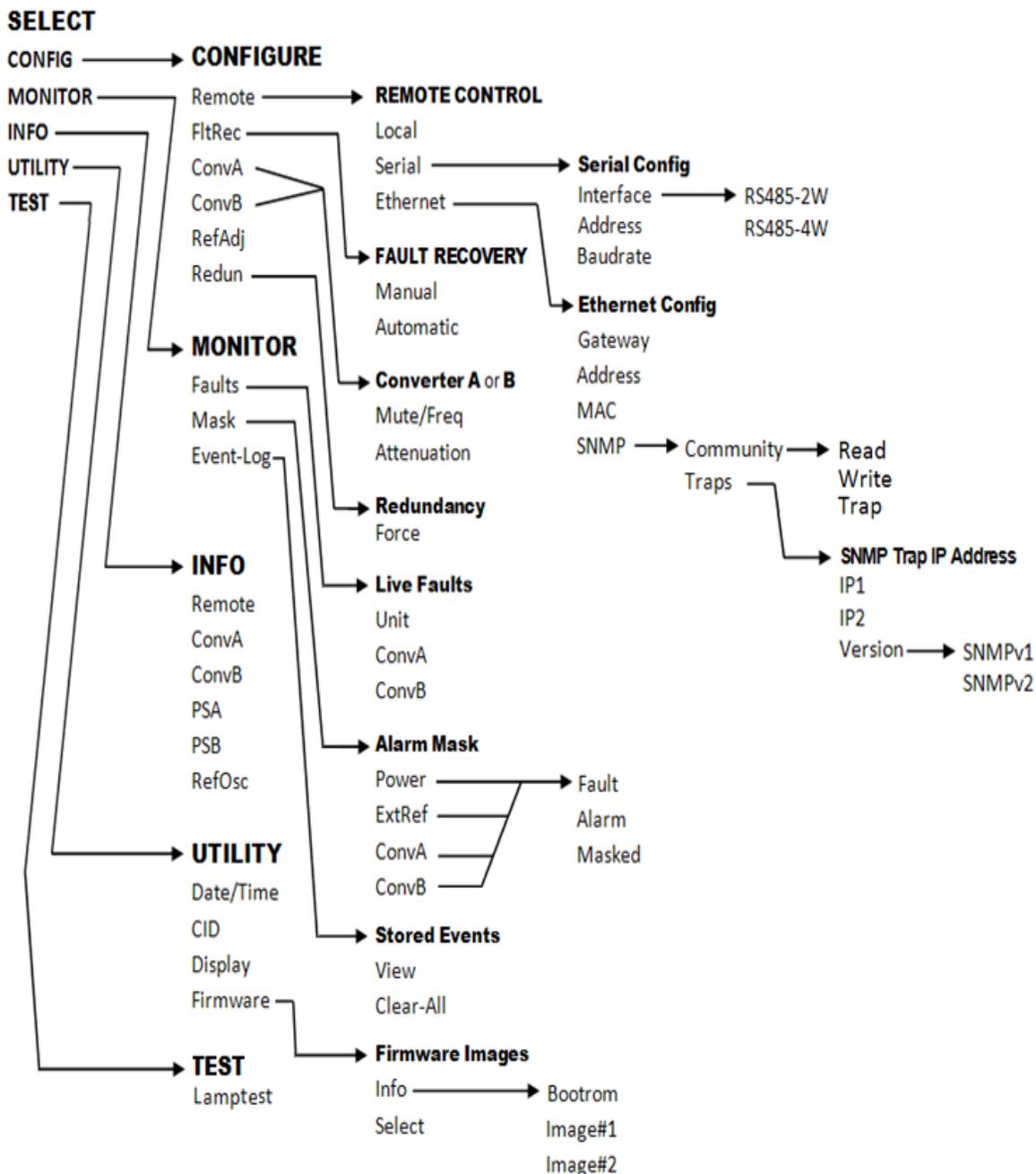
Figure 5-2. MBT-5003 Principal Menu Tree

Use the ◄ ► arrow keys to select from the choices shown, then press **ENT**. The following table identifies each menu branch available from the **SELECT:** (Main) menu, its content section in this chapter, and the functional description of each branch:

Menu Branch	Sect	Description
Config	5.3.1	**(Configuration)** Available submenus permit the user to fully configure the MBT-5003.
Monitor	5.3.2	Available submenus permit the user to monitor the alarm status of the unit, to view the log of stored events, and to display the Receive Parameters screen.
Info	5.3.3	**(Information)** Available submenus permit the user to view information on the unit, without having to go into configuration screens.
Utility	5.3.4	Available submenus permit the user to perform miscellaneous functions, such as setting the Real-time clock, adjusting the display brightness, etc.
Test	5.3.5	Runs diagnostics tests on the front panel LEDs and VFD to verify operation.

5.3.1   SELECT: Config (Configuration)

```
CONFIG: Remote FltRec
ConvA ConvB RefAdj Redun
```

Use the ◄ ► arrow keys to select from the submenu choices shown, then press **ENT**. The following table identifies each submenu available from the **SELECT: Config** menu branch – typical for Converter Unit A or Unit B – its content section in this chapter, and functional description of each submenu:

Submenu	Sect	Functional Description
Remote	5.3.1.1	**(Remote Control)** Permits the user to define whether the unit is being controlled locally or remotely, and identifies the unit address, interface type, and rate and format of the baud parameters.
FltRec	5.3.1.2	**(Fault Recovery)** Permits the user to configure Fault Recovery (AFR) in *Auto* or *Manual* mode.
ConvA ConvB	5.3.1.3	**(Converter Unit A** or **B)** Displays the current configuration of the selected converter, including the frequency, attenuation, and slope.
RefAdj	5.3.1.4	**(Ref-Osc Adjust)** Permits the user to adjust the reference oscillator.
Redun	5.3.1.5	**(Redundancy)** Permits the user to identify the redundancy state and mode (refer to **Appendix B. MBT-5003 REDUNDANCY OPERATION** for further information).

5.3.1.1   CONFIG: Remote (Remote Control)

```
Remote Control: Local
Serial Ethernet    (◄ ► E)
```

Select **Local, Serial**, or **Ethernet** using the ◄ ► arrow keys, then press **ENT**.

CONFIG: Remote Control → Local

If **Remote Control: Local** is selected, then remote control will be disabled. Remote monitoring is still possible.

CONFIG: Remote Control → Serial

If **Remote Control: Serial** is selected:

```
Serial Config: Interface
Address Baudrate
```

Select **Interface, Address,** or **Baudrate** using the ◄ ► arrow keys, then press **ENT**.

> If **Serial Config: Interface** is selected:
>
> ```
> M&C Bus Interface:
> RS485-2W RS485-4W
> ```
>
> Select **RS485-2W** (2-wire) **or RS-485** (4-wire) using the ◄ ► arrow keys, then press **ENT**.
>
> If **Serial Config: Address** is selected:
>
> ```
> Remote Address: 0001
>                 (◄ ► ▲ ▼ E)
> ```
>
> The valid range of addresses is from 1 to 9997. Use the ◄ ► arrow keys to select the character to edit, then the ▲ ▼ arrow keys to edit the value of the digit, then press **ENT**.
>
> If **Serial Config: Baudrate** is selected:
>
> ```
> Local M&C Bus Baud Rate:
> 19200 Baud        (▲ ▼ E)
> ```
>
> Edit the baud rate of the remote control bus, connected locally to the M&C computer. The value is changed using the ▲ ▼ arrow keys. Values of 2400, 4800, 9600,19200, and 38400 baud are available. Press **ENT** when done.
>
> **Note:** The asynchronous character format is **FIXED** at 8 data bits, 1 stop bit, no parity (8-N-1).

CONFIG: Remote Control → Ethernet

If **Remote Control: Ethernet** is selected:

```
Ethernet Config: Gateway
Address MAC SNMP  (◄ ► E)
```

Select **Gateway**, **Address**, **MAC**, or **SNMP** using the ◄ ► arrow keys, then press **ENT**.

If **Ethernet Config: Gateway** is selected:

```
Ethernet IP Gateway:
192.168.001.002 (◄ ► ▲ ▼)
```

To edit the IP Gateway Address for the Ethernet M&C port for this unit, first use the ◄ ► arrow keys to select the digit to edit, then the ▲ ▼ arrow keys to edit the value of that digit. Press **ENT** when done.

If **Ethernet Config: Address** is selected:

```
Ether IP Address/Range:
192.168.001.002/24(◄ ►▲ ▼)
```

To edit the IP Address and Range for the Ethernet M&C port for this unit, first use the ◄ ► arrow keys to select the digit to edit, then the ▲ ▼ arrow keys to edit the value of that digit. Press **ENT** when done.

If **Ethernet Config: MAC** is selected:

```
   M&C Port MAC Address:
     00-06-B0-00-01-06
```

This *read-only* menu shows the unit MAC address. Once the MAC address has been noted, press **ENT** or **CLR** to return to the previous menu.

If **Ethernet Config: SNMP** is selected:

```
SNMP:
Community     Traps (◄ ► E)
```

Select **Community** or **Traps** using the ▲ ▼ arrow keys, then press **ENT**.

If **SNMP: Community** is selected:

```
SNMP Community:
Read  Write  Trap  (◄ ► E)
```

Select **Read**, **Write**, or **Trap** using the ▲ ▼ arrow keys, then press **ENT**.

If **Read i**s selected:

```
Read Community: (◄ ►▲▼ E)
public
```

The user may view or edit the SNMP Read Community string. To edit, first use the ◄ ►arrows keys to select the character to edit, then the ▲ ▼ arrows keys to edit that character. Press **ENT** when done.

If **Write** is selected:

```
Write Community: (◄ ►▲▼ E)
private
```

The user may view or edit the SNMP Write Community string. To edit, first use the ◄ ►arrows keys to select the character to edit, then the ▲ ▼ arrows keys to edit that character. Press **ENT** when done.

If **Trap** is selected:

```
Trap Community: (◄ ►▲▼ E)
comtech
```

The user may view or edit the SNMP Trap Community string. To edit, first use the ◄ ►arrows keys to select the character to edit, then the ▲ ▼ arrows keys to edit that character. Press **ENT** when done.

If **SNMP: Traps** is selected:

```
SNMP Trap IP Address:
IP1 IP2 Version
```

Select **IP1**, **IP2**, or **Version** using the ◄ ► arrow keys to, then press **ENT**.

If **SNMP Trap IP Address: IP1** *or* **IP2** is selected:

```
Trap IP #1:
000.000.000.000 (◄ ►▲▼ E)
```

```
Trap IP #2:
000.000.000.000 (◄ ►▲▼ E)
```

The user may edit the Trap Destination's IP Addresses. To edit, first use the ◄ ► arrow keys to select the digit to edit, then the ▲ ▼ arrow keys to edit the value of that digit. Press **ENT** when done.

Note: If both Trap IP Addresses are 000.000.000.000, it means Traps are *disabled*.

If **SNMP Trap IP Address: Version** is selected:

```
Trap Version:
SNMPv1   SNMPv2        (◄ ► E)
```

Select the trap version – **SNMPv1** or **SNMPv2** – using the ▲ ▼ arrow keys, then press **ENT**.

5.3.1.2   CONFIG: FltRec (Fault Recovery)

```
Fault Recovery: Manual
Automatic
```

Select **Manual** or **Automatic** using the ◄ ► arrow keys, then press **ENT**.

5.3.1.3   CONFIG: ConvA *or* ConvB (Converter Unit 'A' *or* Converter Unit 'B')

```
Converter X
Mute/Freq Attenuation
```

Where 'X' is the selected converter – i.e., Converter (Unit) A or Converter (Unit) B – select **Mute/Freq** or **Attenuation** using the ◄ ► arrow keys, then press **ENT**.

If **Mute/Freq** is selected, and the unit is an MBT-5003-XUR Up Converter:

```
CONFIG CnvX:
 Tx=On
```

Use the ▲ ▼ arrows keys to set Tx as **ON** or **OFF** (mute), then press **ENT**.

If **Mute/Freq** is selected, and the unit is an MBT-5003-XDR Down Converter:

```
CONFIG CnvX:
 Rx=On
```

Use the ▲ ▼ arrows keys to set Rx as **ON** or **OFF** (mute), then press **ENT**.

Typical for both the MBT-5003-XUR and MBT-5003-XDR units, if **Attenuation** is selected:

```
CONFIG CnvX: Offst=+2.00
Attenuation = 00.00 dB
```

Note: Offst (Offset) will display only if the unit is an *offline* unit.

5.3.1.4   CONFIG: RefAdj (Reference Oscillator Adjustment)

```
Reference Frequency
Adjust: 087
```

Adjust the reference oscillator by using the ◄ ► arrow keys to select the digit to edit, then the ▲ ▼ arrow keys to edit the value of that digit. Press **ENT** when done.

The default Reference Frequency tuning adjustment is 087, with allowable values from 0 to 255.

5.3.1.5   CONFIG: Redun (Redundancy)

```
Redundancy:
Disable/Enable Force
```

Note: While the user may select **Disable/Enable** or **Force** using the ◄ ► arrow keys, the **Disable** option is nonfunctional with the MBT-5003.

```
Redundancy Mode:
 Disable Enable    (◄ ► E)
```

Should the user attempt to select **Disable** using this menu, the following message displays:

```
Redundancy is always
Enabled for this unit.
```

The **Disable/Enable** menu will redisplay with the cursor set to **Enable**. Press **ENT** or **CLR** to return to the previous menu.

If **Force** is selected:

```
Press ENTER to Force
Converter A to Standby
```

As the display instructs, press **ENT** to force the redundant unit into standby mode.

Refer to **Appendix B. MBT-5003 REDUNDANCY OPERATION** for further information on this feature.

5.3.2   SELECT: Monitor

Note: Low Noise Amplifier (LNA) operation is not supported by the MBT-5003. The **LPT** selection on this submenu is therefore nonfunctional.

```
Monitor: Faults Mask
Event-Log LPT
```

Use the ◄ ► arrow keys to select from the submenu choices shown, then press **ENT**. The following table identifies each submenu available from the **SELECT: Monitor** menu branch – typical for Converter Unit A or Unit B – its content section in this chapter, and functional description of each submenu:

Submenu	Sect	Functional Description
Faults	5.3.2.1	Displays the active faults for the base unit and the converters.
Mask	5.3.2.2	Permits the user to configure Alarm Mask (MSK) conditions.
Event-Log	5.3.2.3	Display stored events. Also permits the user to clear the events.

5.3.2.1   MONITOR: Faults

```
Live Faults: Unit ConvA
ConvB             (◄ ► E)
```

Select **Unit, ConvA, or ConvB** using the ◄ ► arrow keys, then press **ENT**.

If **Unit** is selected, the highest level fault for the base unit will appear. If no Unit faults exist, the message "**No Errors**" is displayed:

```
Unit Fault:
 No Errors
```

Press **ENT** to return to the previous menu.

If **ConvA or ConvB** is selected, the highest fault for the converter will appear. If no converter faults exist, the message "**No Errors**" is displayed:

```
ConvA Fault:
 No Errors
```

Press **ENT** to return to the previous menu.

5.3.2.2   MONITOR: Mask

Note: The **Power** selection on this submenu is operable only when the MBT-5003-XUR is optionally configured with the Power Monitor option. Low Noise Amplifier (LNA) operation is not supported by the MBT-5003 – the **LNA** selection is therefore nonfunctional.

```
Alarm Mask: Power ExtRef
ConvA ConvB LNA   (◄ ► E)
```

Select **Power** (when applicable), **ExtRef, ConvA**, or **ConvB** using the ◄ ► arrow keys, then press **ENT**.

For each menu selection, three typical options are available. Using the **ExtRef** menu as an example:

```
Ext Ref Lock Detect:
Fault Alarm Masked(◄ ► E)
```

Select **Fault**, **Alarm**, or **Masked** using the ◄ ► arrow keys, then press **ENT** to return to the previous menu.

5.3.2.3   MONITOR: Event-Log (Stored Events)

```
Stored Events: View
Clear-All        (◄ ► E)
```

Select **View** or **Clear-All** using the ◄ ► arrow keys, then press **ENT**.

If **View** is selected:

```
Log015 05/23/08 09:27:15
Fault – FPGA Checksum
```

The user may scroll backwards or forwards through the entries in the event log by using the ▲ ▼ arrow keys. Press **ENT** or **CLR** to return to the previous menu.

The event log can store up to 300 events. When a fault condition occurs, it is time-stamped and put into the log. Similarly, when the fault condition clears, this is also recorded, as shown per the following example:

```
Log015 05/23/08 10:45:35
Clear – FPGA Checksum
```

If **Clear-All** is selected:

```
Clear all Stored Events
No  Yes            (◄ ► E)
```

If **Clear-All** is selected, the user is prompted to choose **No** or **Yes**. Use the ◄ ► arrow keys, then press **ENT**. If the user selects **Yes**, the event log is cleared, and the user is taken directly back to the previous menu. However, if there are faults present on the unit at this time, they will be re-time-stamped, and new log entries will be generated.

5.3.3   SELECT: Info

```
INFO:Remote ConvA ConvB
PSA PSB RefOsc
```

The Info menu branch displays *read-only* information on the current configuration of the unit.

Use the ◄ ► arrow keys to select from the submenu choices shown, then press **ENT**. The following table identifies each submenu available from the **SELECT: Info** menu branch – typical for Converter Unit A or Unit B – its content section in this chapter, and functional description of each submenu:

Submenu	Sect	Functional Description
Remote	5.3.3.1	(Remote Control) Displays if the unit is in Local or Remote mode and gives details of the interface type selected, etc.
ConvA ConvB	5.3.3.2	Displays the temperature and RF power for Converter Unit A or Converter Unit B.
PSA PSB	5.3.3.3	Displays the 12V, 8V, and 5V power supplies for Power Supply A or Power Supply B.
RefOsc	5.3.3.4	Displays the raw voltage of the voltage tuning monitor, and the external reference status.

5.3.3.1   INFO: Remote (Remote Control)

This screen displays if the unit is in **Local** or **Remote** mode and gives details of the interface type selected, etc. For example:

```
Remote M&C: 100BaseTx
IP Addr: 192.168.001.004
```

Press **ENT** or **CLR** to return to the previous menu.

5.3.3.2   INFO: ConvA *or* ConvB (Converter Unit 'A' *or* Converter Unit 'B')

Where 'X' is the selected converter – i.e., Converter (Unit) A or Converter (Unit) B – this screen displays the unit temperature and, when an MBT-5003-XUR Up Converter is optionally configured with the Power Monitor feature, the RF power. For example:

```
ConvX: Temp = +34.1 C
RF Power = +10.0 dBm
```

Press **ENT** or **CLR** to return to the previous menu.

5.3.3.3   INFO: PSA *or* PSB (Power Supply 'A' or Power Supply 'B')

Where 'X' is the selected power supply – i.e., Power Supply (Unit) A or Power Supply (Unit) B – this screen displays the 12V, 8V, and 5V power supply. For example:

```
Power Supply X:
12V=12.2 8V=08.3 5V=05.3
```

Press **ENT** or **CLR** to return to the previous menu.

5.3.3.4   INFO: RefOsc (Reference Oscillator)

Note: This selection is used for debugging purposes only.

This screen displays the raw voltage of the voltage tuning monitor, and the external reference status. For example:

```
Ref Osc: Vtune = 04.7
Ext Ref: N/A
```

Press **ENT** or **CLR** to return to the previous menu.

5.3.4   SELECT: Utility

Note: Low Noise Amplifier (LNA) operation is not supported by the MBT-5003. The **LNA** selection on this submenu is therefore nonfunctional.

```
UTILITY: Date/Time CID
Display Firmware LNA
```

Use the ◄ ► arrow keys to select from the submenu choices shown, then press **ENT**. The following table identifies each submenu available from the **SELECT: Utility** menu branch – typical for Converter Unit A or Unit B – its content section in this chapter, and functional description of each submenu:

Submenu	Sect	Functional Description
Date/Time	5.3.4.1	Edits the Real-Time Clock time and date settings
CID	5.3.4.2	Edits the 24-character Circuit ID string.
Display	5.3.4.3	Adjusts the brightness level of the Vacuum Fluorescent Display (VFD).
Firmware	5.3.4.4	Displays the installed internal firmware and permits user the boot using a selected firmware image.

5.3.4.1   UTILITY: Date/Time (Set Real-time Clock)

```
Edit Real-Time Clock:
12:00:00 10/31/10(◄ ►▲ ▼ E)
```

To edit the time and date settings of the real-time clock, first select the digit to be edited using the ◄ ► arrow keys, then change the value of that digit using the ▲ ▼ arrow keys. Press **ENT** when done.

5.3.4.2   UTILITY: CID (Circuit ID)

```
Edit Circuit ID:
24 CHARACTER TST MESSAGE
```

To edit the Circuit ID string: On the bottom line, first use the ◄ ► arrow keys to select the character to edit, then change that character using the ▲ ▼ arrow keys.

A maximum of 24 characters are available, as follows:

> *[Space]* **( ) * + - , . / 0-9** *and* **A-Z.**

Once the ID string is composed, press **ENT**.

5.3.4.3   UTILITY: Display (VFD Display Brightness)

```
Display Brightness:
        100%
```

To edit the display brightness: Use the ▲ ▼ arrow keys to select a brightness value of **25%**, **50%**, **75%**, or **100%.** Press **ENT** when the brightness is suitable.

5.3.4.4   UTILITY: Firmware

IMPORTANT
THESE MENUS ARE INTENDED FOR DIAGNOSTIC PURPOSES ONLY. DO NOT CHANGE AN IMAGE UNLESS OTHERWISE INSTRUCTED BY COMTECH EF DATA CUSTOMER SUPPORT.

This series of submenus permits the user to view information about the MBT-5003 internal firmware. The converter can store two complete firmware images; either image is selectable for loading the next time the unit reboots.

```
Firmware Images:
Info Select        (◄ ► E)
```

Select either **Info** or **Select** using the ◄ ► arrow keys, then press **ENT**.

UTILITY: Firmware → Info

If **Info** is selected:

```
Firmware Info: Bootrom
 Image#1   Image#2
```

Select **Bootrom**, **Image#1** or **Image#2** using the ◄ ► arrow keys, then press **ENT** to view the information.

> Each image is further broken down as follows (*where Image#X denotes Image#1 or Image#2*):
>
> ```
>  Image#X: Bulk  APP FPGA
> ```
>
> Select **Bulk**, **App**, or **FPGA** using the ◄ ► arrow key, then press **ENT**.

If, for example, **Bulk** is selected, a screen formatted similar to the following example is displayed:

```
Bulk: FW-0000303
2.#.# MM/DD/YY
```

UTILITY: Firmware → Select

If **Select** is selected:

```
Current Active Image: #1
Next Reboot Image: #1 #2
```

The top line shows the current active image. From the bottom line, select the **Next Reboot Image** (i.e., the image that will be active the next time the unit is rebooted) as **#1** or **#2** using the ◄ ► arrow keys. Press **ENT** when done.

5.3.5   SELECT: Test

```
TEST: Lamptest
```

Press **ENT** to begin the diagnostics run on the front panel's Light-Emitting Diode arrays and Vacuum Fluorescent Display. The LEDs for Unit A and Unit B will cycle, and the VFD will briefly generate a test pattern.

Once the test has run, press **CLR** to return to the **SELECT:** (Main) menu.

Chapter 6. ETHERNET MANAGEMENT

6.1   Overview

The sections that follow describe the functionality of the MBT-5003 Ethernet Interface. Refer to the Remote Commands Specifications tables found in **Appendix A. REMOTE CONTROL** for detailed descriptions of the configuration parameters featured on the individual Web pages depicted in this section.

6.2   Ethernet Management Interface Protocols

The MBT-5003 100BaseT/10BaseTx Ethernet Management Interface supports three (3) different management protocols:

- SNMP with public and private MIB

- Telnet interface for remote product M&C

- Web Server (HTTP) Interface for complete product management

IMPORTANT *For SNMP, Telnet, or Web Server operation, the MBT-5003 must be configured with the Ethernet control option. Via the front panel, select* CONFIG: Remote Control → Ethernet*. See* Chapter 5. FRONT PANEL OPERATION *for further information.*

6.3   SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an application-layer protocol designed to facilitate the exchange of management information between network devices. The MBT-5003 SNMP agent supports both **SNMPv1** and **SNMPv2c**.

IMPORTANT *For proper SNMP operation, the MBT-5003 MIB files must be used with the associated version of the MBT-5003 M&C. Refer to the MBT-5003 FW Release Notes for information on the required FW/SW compatibility.*

6.3.1 Management Information Base (MIB) Files

MIB files are used for SNMP remote management and consist of Object Identifiers (OIDs). Each OID is a node that provides remote management of a particular function. A MIB file is a tree of nodes that is unique to a particular device.

The following MIB files are associated with the MBT-5003:

MIB File/Name	Description
FW-0000235-.mib ComtechEFData Root MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data products and consists of only the following OID: Name: comtechEFData Type: MODULE-IDENTITY OID: 1.3.6.1.4.1.6247 Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247) Module: ComtechEFData
FW-0000101- .mib MBT-5003 MIB file	MIB file consists of all of the OID's for management of the amplifier functions
FW-0000102- .mib MBT-5003 Traps MIB file	Trap MIB file is provided for SNMPv1 traps common for MBT-5003.

These MIB files should be compiled in a MIB Browser or SNMP Network Monitoring System server.

Note: As noted previously, the SNMP agent supports both **SNMPv1** and **SNMPv2c**. The "**Traps"** file only needs to be compiled if **SNMPv1** traps are to be used.

6.3.2 SNMP Community Strings

The MBT-5003 uses community strings as a password scheme that provides authentication before gaining access to the MBT-5003 agent's MIBs.

In **SNMP v1/v2c**, the community string is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern. A packet sniffer can easily obtain the community string by viewing the SNMP traffic on the network.

The community string is entered into the MIB Browser or Network Node Management software and is used to authenticate users and determine access privileges to the SNMP agent.

The user defines three Community Strings for SNMP access:

- Read Community   default = public
- Write Community   default = private
- Trap Community   default = comtech

6.3.3 SNMP Traps

The MBT-5003 has the ability to send out SNMP traps when certain events occur in the unit. The MBT-5003 sends out traps when a fault occurs in the unit. A trap is sent both when a fault occurs and is cleared.

The MBT-5003 supports both **SNMPv1** traps and **SNMPv2** notifications. Which style of traps the MBT-5003 sends can be configured by the user using the MBT-5003SNMPTrapVersion OID.

The following are the MIB2 v1traps / v2 notifications that the MBT-5003 supports:

MIB2 SNMPv1 trap: Authentication Failure	5
MIB2 SNMPv2 notifications: Authentication Failure	1.3.6.1.6.3.1.1.5.5

The following tables are the Faults v1 traps / v2 notifications that the MBT-5003 supports.

Faults SNMPv1 traps:	
mbt5000BaseUnitFaultV1	6247501
mbt5000ConvAFaultV1	6247502
mbt5000ConvBFaultV1	6247503
Faults SNMPv2 notifications:	
mbt5000BaseUnitFaultEvent	1.3.6.1.4.1.6247.50.2.1.1
mbt5000ConvAFaultEvent	1.3.6.1.4.1.6247.50.2.1.2
mbt5000ConvBFaultEvent	1.3.6.1.4.1.6247.50.2.1.3

6.4 Telnet Interface

The MBT-5003 provides a Telnet interface for the purpose of Equipment M&C via the standard equipment Remote Control protocol.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level.

The example shown to the right illustrates the login procedure:

Once logged into the Telnet interface as Administrator, the user can access the standard remote control interface defined in **Appendix A. REMOTE CONTROL**, as shown in example to the right:

There is a disadvantage when using Windows DOS as Telnet Client. Since Windows DOS cannot translate a '\r' to a '\r\n' for the messages coming from Telnet Server, the multi-line command response (for example, **FRW?** response) will be displayed as one line, with the latter lines overwriting the previous lines. In order to view the full response messages, CEFD recommends using HyperTerminal configured as Telnet Client.

Configure HyperTerminal as follows:

1. Use **TCP/IP (Winsock)** nstead of COM1 or COM2 for the connection, as per the example to the near right.

2. ASCII Setup (File→ Properties →Settings→ASCII Setup):

   Check the "**Send line ends with line feeds**" option in the *ASCII Sending* section and the "**Append line feeds to incoming line ends**" option in the *ASCII Receiving* section, as per the example to the far right.
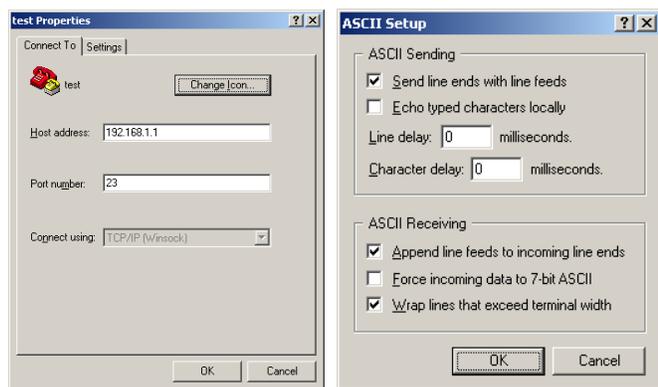
3. Login and remote command execution via HyperTerminal configured as Telnet Client appears as per the example to the right:
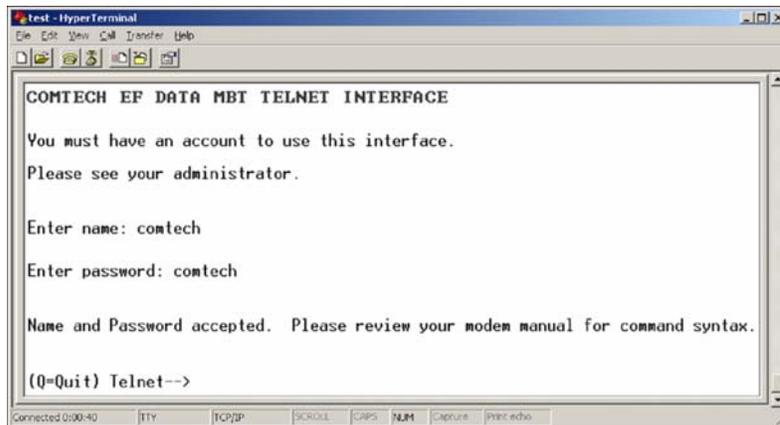
6.5 Web Server (HTTP) Interface

Refer to the Remote Commands Specifications tables found in **Appendix A. REMOTE CONTROL** for detailed descriptions of the configuration parameters featured on the individual Web pages shown in this chapter.

6.5.1 Web Server Page Introduction

The embedded Web Server application provides the user with an easy to use interface to configure and monitor all aspects of the MBT-5003. These Web pages have been designed for optimal performance when using Microsoft's Internet Explorer Version 5.5 or higher (the examples shown use Internet Explorer Version 6.0).

The user can fully control and monitor base operations of the MBT-5003 from the Web Server Interface. By rolling the cursor over the navigation tabs located at the top of each page (right), the user can select from the available nested hyperlinks.

6.5.2 Enabling the Web Server Interface

Note: The IP Address can be found by following the pathway **CONFIG: Remote Control →
Ethernet → Address.** See **Chapter 5. FRONT PANEL OPERATION** for further information.

To enable the Web Server Interface in the MBT-5003 using only a 100BaseTx remote interface (this assumes the user's PC is configured to run the Microsoft Windows OS):

1. Select **Start**, then **Run**, then type "**cmd**" to open the command prompt window:
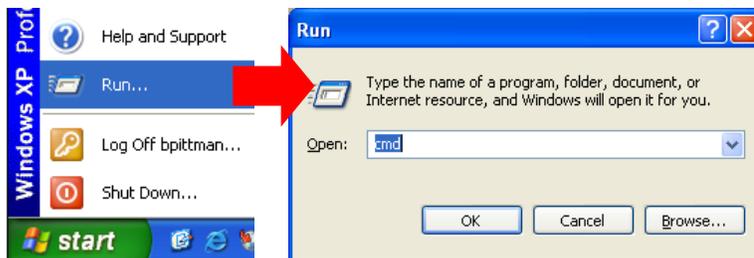
2. Start a Telnet session
    with the unit at the
    default IP address of
    192.168.1.5:

3. Enter the Telnet username
    and password (the default
    for both parameters is
    comtech):
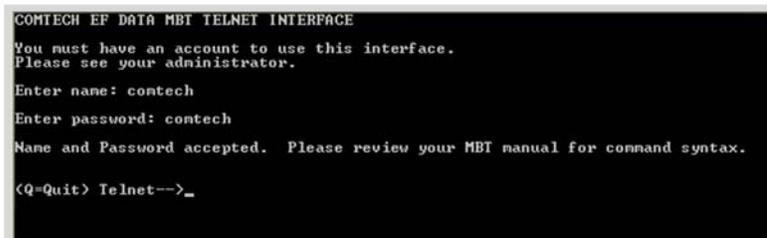
Failure to enter the correct User name and Password will return the user to a blank login
screen.

6.5.3 Web Server Interface Access

Note: The IP Address can be found by following the pathway **CONFIG: Remote Control →
Ethernet → Address.** See **Chapter 5. FRONT PANEL OPERATION** for further information.

1. From the PC, type **http://192.168.1.5** (the
    default IP address for the MBT-5003) into
    the **Address** area of the Web browser:

2. The Login window will appear, and the user is prompted to
    type a User Name and Password:

    Default User Name – **comtech**
    Default Password – **comtech**

    Type the User Name and Password, then click **[OK].**

Failure to enter the correct
User name and Password will
return the user to a blank
Login window. If multiple
invalid logins are attempted,
the browser will display the
following access error
message:
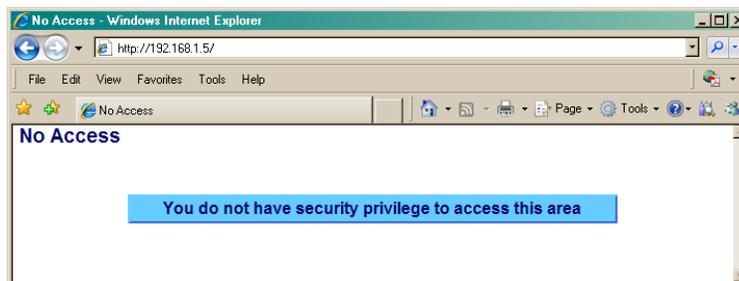
6.5.4 Web Server Interface "Splash" Page

Once the valid IP address and login information has been entered, the MBT-5003 Web Server Interface "Splash" page is displayed:
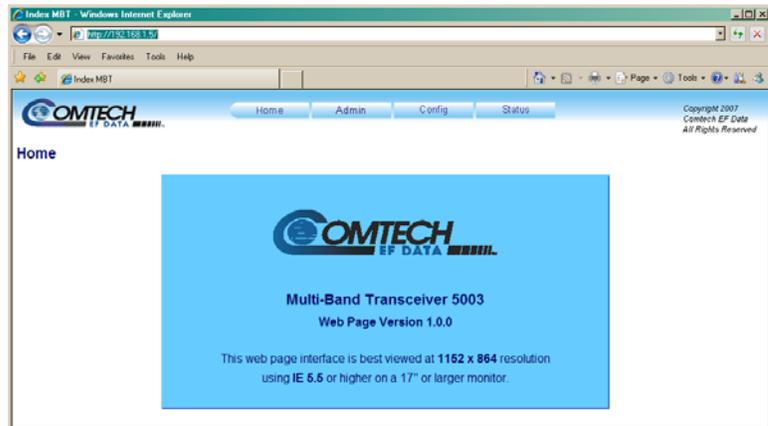
The options available through the MBT-5003 Web Server Interface are illustrated via the following menu tree:

Home	Admin	Config	Status
Home	Access	MBT	Events
Contact	SNMP	Utility	Status
Support		Redundancy	

6.5.5 Web Server Page Descriptions

The sections and subsections that follow detail the Web pages accessible via hyperlink from the "Splash" page navigation tabs shown in **Sect. 6.5.4**:

Sect. 6.5.5.1 Home Pages

Sect. 6.5.5.2 Admin (Administration) Pages

Sect. 6.5.5.3 Config (Configure MBT-5003) Pages

Sect. 6.5.5.4 Status Pages

6.5.5.1   Home Pages

Select the **Home**, **Contact**, or **Support** hyperlink to continue.

6.5.5.1.1   Home | Home
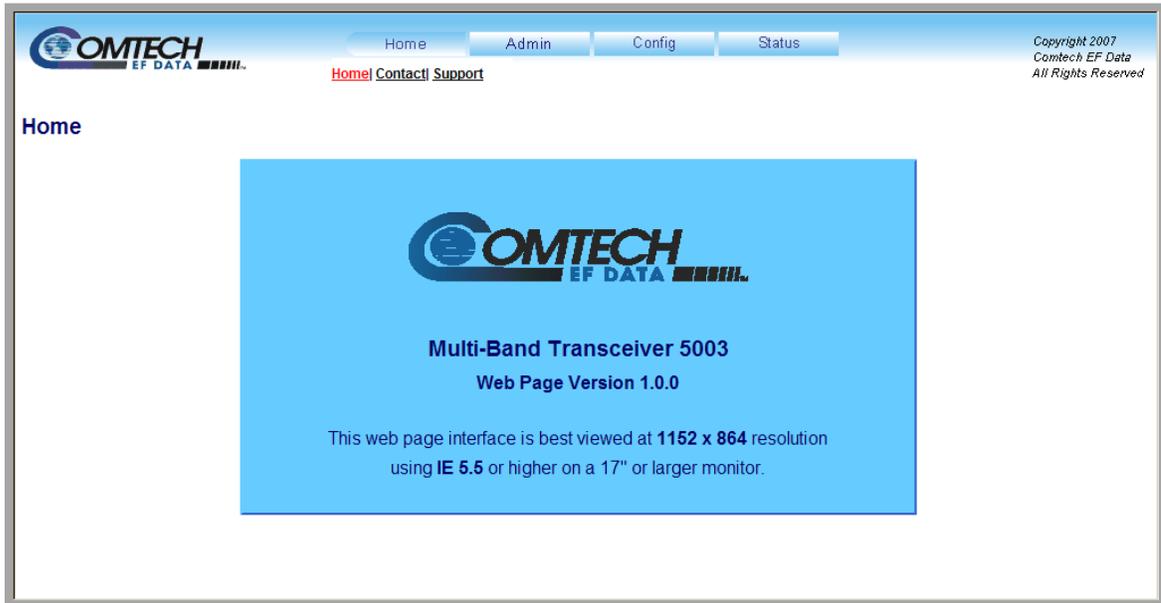
Figure 6-1. MBT-5003 Home | Home page

From any location within the Web Server Interface, the user can select the **Home** tab and/or hyperlink to return back to this page.

6.5.5.1.2   Home | Contact
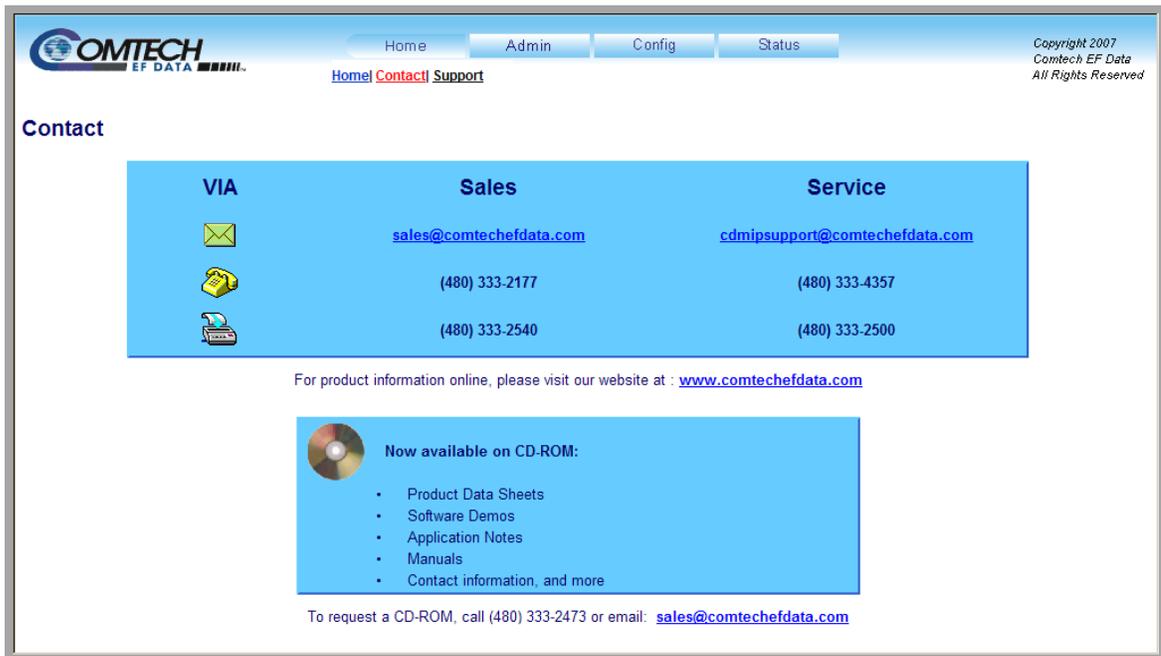
Figure 6-2. Home | Contact page

The **'Home | Contact'** page (**Figure 6-2**) provides basic contact information to reach Comtech EF Data Sales and Customer Support via phone and e-mail or Web site hyperlinks.

6.5.5.1.3   Home | Support

! **IMPORTANT**
For this page to operate correctly, the MBT-5003's administrator is required to specify the SMTP server, domain name, and destination on the **Admin | Access** *page (see Sect. 6.5.5.2.1).*

Figure 6-3. Home | Support page

The MBT-5003 **'Home | Support'** page (**Figure 6-3**) uses SMTP (Simple Mail Transport Protocol) to allow the user to e-mail questions about or problems with the MBT-5003 to Comtech EF Data IP Product Support (cdmipsupport@comtechefdata.com).

Fill in the appropriate user information as required under **Contact Information**; the **Problem Report** text window allows up to 256 characters maximum.

Once the **Contact Information** is entered and a message composed in the **Problem Report** text window, click [**Submit Email]** to send the message.

6.5.5.2   Admin Pages

Select the **Access** or **SNMP** hyperlink to continue.

> **IMPORTANT**
>
> ***The Admin pages are available only to users who have logged in using the Administrator Name and Password.***

6.5.5.2.1   Admin | Access

Figure 6-4. Admin | Access page

The '**Admin | Access'** page (**Figure 6-4**) provides the means to set up and maintain user names, passwords, the e-mail server, and the host IP addresses to facilitate communication with the MBT-5003 Web Server Interface.

Network Maintenance

- **IP Gateway, IP Address/Range:** Enter the desired IP Gateway Address and IP Address/ Range in these text boxes.

- **MAC Address** *(read-only)***:** The MAC is set at the factory to a guaranteed unique address that cannot be modified by the user.

Once the desired configuration settings have been made in this section, click **[Change IP Address]** to save these changes. If it is desired to revert back to the previously assigned IP Gateway and IP Address/Range, the user should instead click **[Reset]**.

System Account Access Information

- **Admin, Read/Write, and Read Only Names and Passwords:**

  The factory defaults for these names/passwords are:

  - o **Admin**   comtech/comtech

  - o **Read/Write**   opcenter/1234

  - o **Read Only**   monitor/1234

  Note the following:

  - o These **Name** fields can be any alphanumeric combination with a maximum length of 10 characters.

  - o These **Password** fields can be any alphanumeric combination with a maximum length of 10 characters.

- **SMTP Server:** Specify the mail server IP address from where you want to send the e-mail.

- **SMTP Domain Name / Destination:** The Administrator can assign the SMTP Domain Name and Destination. This is required if the e-mail feature of the Support Page (**Sect. 6.5.5.1.3**) is to be used.

  - o For **SMTP Domain Name**, specify the domain of the e-mail server (usually found to the right of the @ symbol in an e-mail address).

  - o For **SMTP Domain Destination**, specify the e-mail recipient name (usually found to the left of the @ symbol in an e-mail address).

Once the desired configuration settings have been made in this section, click **[Submit Access]** to save these changes. Otherwise, click **[Reset]** if it is desired to revert back to the previously assigned System Account Access Information.

6.5.5.2.2   Admin | SNMP

Figure 6-5. Admin | SNMP page

The '**Admin | SNMP'** page (**Figure 6-5**) sets and returns administration information for the MBT-5003 Simple Network Management Protocol (SNMP) feature.

Simple Network Management Operational Status: Using the drop-down menu, select the Simple Network Management operational setting as **Enabled** or **Disabled**.

The **SNMP Read** and **Write Community String** fields can be any combination of characters and a length of 0 - 20 characters:

- The factory default for the **Read Community String** parameter is *public*.

- The factory default **Write Community String** is *private*.

Enable Authentication Trap: Using the drop-down menu, select the Enable Authentication Trap operational setting as **Enabled** or **Disabled**.

The Administrator can assign up to two **SNMP Trap IP** addresses and one **SNMP Trap Community String.** The **SNMP Trap Community String** field can be any combination of characters and a length of 0 - 20 characters:

- The factory default for the **Trap Community String** is *comtech*.

Trap Version: Using the drop-down menu, select the SNMP Trap Version as **SNMPv1** or **SNMPv2**.

For details pertaining to the remaining configuration parameters available on this page, refer to **Sect. 6.3 SNMP INTERFACE**.

Once the desired SNMP assignments have been made on this page, click [**Submit SNMP]** to save these changes. Otherwise, click **[Reset]** if it is desired to revert back to the previously assigned SNMP.

6.5.5.3 Config Pages

Select the **MBT**, **Utility**, or **Redundancy** hyperlink to continue.

6.5.5.3.1 Config | MBT

Note: Low Noise Amplifier (LNA) operation is not supported by the MBT-5003. The **Converter A LNA and LPT, Converter B LNA and LPT**, and **Calibrate LNA Current** sections of this page are therefore nonfunctional.

Figure 6-6. Config | MBT page

The '**Config | MBT**' page (**Figure 6-6**) provides the means to configure the communications, operations, and alarms/faults handling for the MBT-5003 base unit and individual converters.

Serial

- **Interface Type:** Using the drop-down menu, select the operating interface type as **RS-485 2-wire** or **RS-485 4-wire**.

- **Remote Address:** Enter a valid physical remote address from **0001** to **9999**.

- **Baud Rate:** Using the drop-down menu, select the operating baud rate as **2400**, **4800**, **9600**, **19200**, or **38400** baud

Once the desired configuration settings have been made in this section, click **[Change Serial Configuration]** to save these changes. Otherwise, click **[Reset]** if it is desired to revert back to the previously assigned interface settings.

Base Unit

- **Fault Recovery:** Using the drop-down menu, select the Fault Recovery function as either **Manual** or **Automatic**.

- **Reference Frequency Adjust:** Enter a numeric value from 0 to 255 to adjust the reference oscillator tuning voltage. The default value is set to 87.

Once the desired configuration settings have been made in this section, click **[Change Base Unit Configuration]** to save these changes.

Converter A / B

Typical for both sections:

- **Attenuation (dB):** Enter a valid attenuation level (**00.00** to **20.00** dB) in 0.25 dB steps.

- **Attenuation Offset (*Converter A only*):** Enter a valid value, in dB, for the attenuation offset.

- **Mute:** Using the drop-down menu, select the Mute function as either **On** or **Off**.

- **Frequency:** This text field is fixed at **N/A** for the MBT-5003.

Once the desired configuration settings have been made in this section, click **[Change Convert *X* Configuration]** (*where 'X' designates Converter A or Converter B*) to save these changes.

6.5.5.3.2   Config | Utility

Figure 6-7. Config | Utility page

The '**Config | Utility**' page (**Figure 6-7**) is used to configure MBT-5003 base unit operating parameters.

Date and Time

- The user may enter a date in the form MM/DD/YY (where MM = month [01 to 12], DD = day [01 to 31], and YY = year [00 to 99]).
- The user may enter a time using HH:MM:SS format (where HH = hour [00 to 23], MM = minutes [00 to 59], and SS = seconds [00 to 59]).

Click **[Change Date/Time]** as needed once the desired date and time have been entered here.

Circuit ID

The user may create a Circuit ID string of up to 24 characters. Click **[Change CID]** once the desired string has been entered here.

Current Active Firmware Image *(read-only)*

The selected **Current Active Firmware Image** is identified here. In this example, **Image 2** is the **Current Active Firmware Image**.

Next Reboot Image

Using the drop-down menu, select the **Next Reboot Image** as **1** or **2**, then press **[Submit]** when done.

Perform Soft Reboot

Click **[Reboot Now]** to reboot the MBT-5003 using the **Current Active Firmware Image**.

6.5.5.3.3   Config | Redundancy

IMPORTANT

***For detailed information about 1:1 Redundant operations, see* Appendix B.
MBT-5003 REDUNDANCY OPERATION.**
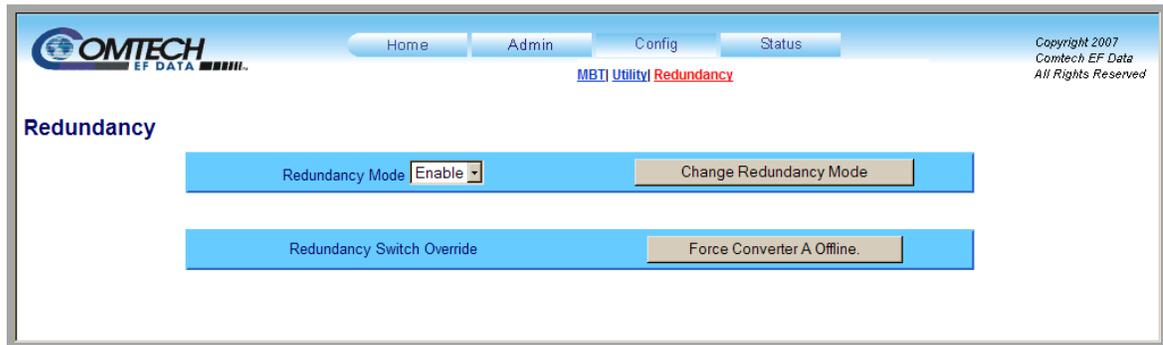
Figure 6-8. Config | Redundancy page

The '**Config | Redundancy'** page (**Figure 6-8**) is used to configure the MBT-5003's Redundancy
Switch operation.

Redundancy Mode

Use the drop-down menu to **Enable** or **Disable** Redundancy Mode, then click **[Change
Redundancy Mode]** to update MBT-5003 operation to the current Redundancy Mode status.

Redundancy Switch Override

Click **[Force Converter A Offline]** to force the Converter A into standby mode.

6.5.5.4   Status Pages

The hyperlinks available under the '**Status**' tab provide the user access to event logging, operational statistics and status windows. Select the **Events** or **Status** hyperlink to continue.

6.5.5.4.1   Status | Events

Figure 6-9. Status | Events page

The **'Status | Events'** page (**Figure 6-9**) provides the user with all pertinent information about stored events, and provides the user with a means to define the MBT-5003 alarm parameters that determine how those events are triggered.

Current Faults (Display only the highest)

This *read-only* window displays the running tally of stored events log for the entire MBT-5003 unit (i.e., Base Unit and Converters A and B).

Unread Stored Events

This *read-only* scrollable window displays the unread stored events log in sequential, date-stamped format. A running tally of the number of unread stored events is displayed in the window header. The unit returns and displays the five oldest stored events in the alarm log. All events that are read from the log are also automatically removed from the log.

The user has the ability to manage the Unread Stored Events window as follows:

- **Read Next Five Events:** Select to display the next five unread stored events in the log.

- **Clear Events Log:** Select to clear all stored events from the log.

- **Initialize Events Pointer:** Select to reset the internal pointer to allow queries to start at the beginning of the stored events log.

Once a selection has been made, click **[Submit]** to execute the choice – the window will update according to the selection made.

Alarm Mask

Note the following:

- **Low Noise Amplifier (LNA)** operation is not supported by the MBT-5003. All alarm masks associated with this feature are therefore nonfunctional.

- The **Low Forward RF Power** alarm masks are valid, when optionally configured, only for the MBT-5003-XUR Up Converter.

Using the drop-down menus, select each alarm as **Fault**, **Alarm** or **Masked** for:

- **Low Forward RF Power** (MBT-5003-XUR only)

- **Converter A Not Inserted**

- **External Reference Lock Detected**

- **Converter B Not Inserted**

Once the desired configuration settings have been made in this section, click **[Change Alarm Mask]** to save these changes. Otherwise, click **[Reset]** if it is desired to revert back to the previously assigned Alarm Mask settings, the user should instead click.

6.5.5.4.2   Status | Status
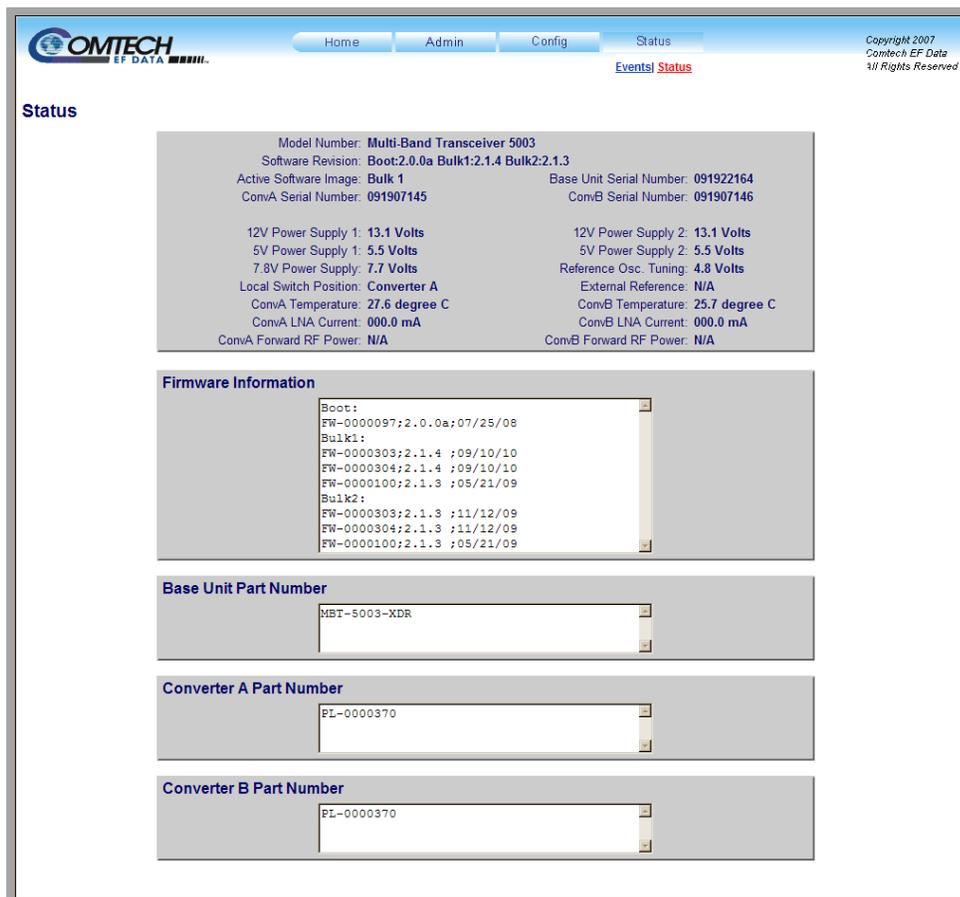
Figure 6-10. Status | Status page

The **'Status | Status'** page (**Figure 6-10**) is a *read-only* page that provides the user with all pertinent information about the MBT-5003 operating configuration:

- **General Information**, including product identification (i.e., model and serial numbers), active software image information, active operating temperature, and power readings for the Base Unit, Converter A, and Converter B.

  Note the following:

  o **Low Noise Amplifier (LNA)** operation is not supported by the MBT-5003. All parameter readings associated with this feature are therefore invalid.

  o Valid **Conv A/ConvB Forward RF Power** readings are provided only if the MBT-5003-XUR Up Converter is optionally configured with the Power Monitor feature. These parameters otherwise will display as **N/A** if the pertinent converter is an MBT-5003-XDR Down Converter.

- **Firmware Information** for Bootrom, Bulk Image#1 and Bulk Image #2.

- **Part Numbers** for the Base Unit, Converter A, and Converter B.

Appendix A. REMOTE CONTROL

A.1   Introduction

This appendix describes the protocol and message command set for remote monitor and control of the MBT-5003 L-Band Up/Down Converter System.

The electrical interface is an EIA-485 multi-drop bus for the control of many devices, and data is transmitted in asynchronous serial form, using ASCII characters. Control and status information is transmitted in packets of variable length, in accordance with the structure and protocol defined in later sections.

The Remote Control connector pinout is shown in Chapter 3.2.6 COM (EIA-485 Interface), J3 (DB-9F).

A.2   EIA-485

For applications where multiple devices are to be monitored and controlled, a full-duplex (4-wire plus ground) EIA-485 is preferred. Half-duplex (2-wire plus ground) EIA-485 is possible, but is not preferred. In full-duplex EIA-485 communication, there are two separate, isolated, independent, differential-mode twisted pairs, each handling serial data in different directions.

It is assumed that a 'Controller' device (a PC or dumb terminal) transmits data in a broadcast mode via one of the pairs. Many 'Target' devices are connected to this pair, and all simultaneously receive data from the Controller. The Controller is the only device with a line-driver connected to this pair; the Target devices have only line-receivers connected.

In the other direction: On the other pair, each Target has a tri-state line driver connected; the Controller has a line-receiver connected. All the line drivers are held in high-impedance mode until one – and *only* one – Target transmits back to the Controller. Each Target has a unique address; each time the Controller transmits, the address of the intended recipient Target is included in a framed 'packet' of data. All of the Targets receive the packet, but only one (the intended) will reply. The Target enables its output line driver and transmits its return data packet back to the Controller in the other direction on the physically separate pair.

EIA-485 (full duplex) summary:

- Two differential pairs - one pair for Controller-to-Target, one pair for Target-to-Controller.

- Controller-to-Target pair has one line driver (Controller), and all Targets have line-receivers.

- Target-to-Controller pair has one line receiver (Controller), and all Targets have tri-state drivers.

A.3   Basic Protocol

With EIA-485 mode, all data is transmitted as asynchronous serial characters, suitable for transmission and reception by a UART. The asynchronous character format is 8-N-1 (8 data bits, no parity, one stop bit). The supported baud rates are 2400, 4800, 9600, 19200, and 38400 baud.

All data is transmitted in framed packets. The Controller is assumed to be a PC or ASCII dumb terminal that is in charge of the process of monitor and control. The Controller is the only device that is permitted to initiate, at will, the transmission of data. Targets are only permitted to transmit when they have been specifically instructed to do so by the Controller.

All bytes within a packet are printable ASCII characters, less than ASCII code 127. In this context, the Carriage Return and Line Feed characters are considered printable.

All messages from Controller-to-Target require a response, with one exception: This will be either to return data that has been requested by the Controller, or to acknowledge reception of an instruction to change the configuration of the Target.

A.4   Packet Structure

Controller-to-Target						
Start of Packet	**Target Address**	**Address Delimiter**	**Instruction Code**	**Code Qualifier**	**Optional Arguments**	**End of Packet**
 < ASCII code 60 (1 character)	 (4 characters)	 / ASCII code 47 (1 character)	 (3 characters)	= or ? ASCII codes 61 or 63 (1 character)	 (n characters)	Carriage Return ASCII code 13 (1 character)

Example: <0412/MUT=1{CR}

Target-to-Controller						
Start of Packet	**Target Address**	**Address Delimiter**	**Instruction Code**	**Code Qualifier**	**Optional Arguments**	**End of Packet**
 > ASCII code 62 (1 character)	 (4 characters)	 / ASCII code 47 (1 character)	 (3 characters)	=, ?, !, or * ASCII codes 61,63, 33 or 42 (1 character)	 (From 0 to n characters)	Carriage Return, Line Feed ASCII codes 13,10 (2 characters)

Example: >0412/MUT=1{CR}{LF}

A.4.1   Start of Packet

Controller-to-Target: This is the character '<' (ASCII code 60).

Target-to-Controller: This is the character '>' (ASCII code 62).

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message.

A.4.2   Target Address

Up to 9,999 devices can be uniquely addressed; in **EIA-485** applications, the permissible range of values is 1 to 9999. The address is programmed into a Target unit using the remote control port.

Each block converter module has its own address:

Module	Address
MBT-5003	Base
Block Converter A	Base + 1
Block Converter B	Base + 2

If several devices share an EIA-485 bus, it must be noted that the MBT-5003 will require three addresses, and should be spaced apart accordingly.

> *The Controller sends a packet with the address of a Target – the destination of the packet. When the Target responds, the address used is the same address, to indicate to the Controller the source of the packet. The Controller does not have its own address.*
>
> **IMPORTANT**

A.4.3   Address Delimiter

This is the "forward slash" character '/' (ASCII code 47).

A.4.4   Instruction Code

This is a three-character alphabetic sequence that identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance. For example,

FRE is for *Operating **FRE**quency*,

FBU is for *Force **B**ackup **U**nit*, etc.

This aids in the readability of the message if seen in its raw ASCII form. Upper case and lower case alphabetic characters may be used (A-Z *and* a-z, ASCII codes 65 – 90 *and* 97-172).

A.4.5   Instruction Code Qualifier

This single character further qualifies the preceding instruction code. Code Qualifiers obey the following rules:

1.   From **Controller-to-Target**, the only permitted values are '=' and '?':

= (ASCII code 61)	The = code is used as the assignment operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) which follow it. For example, in a message from controller to target, **MUT=1** would mean 'enable the mute function'.
? (ASCII code 63)	The **?** code is used as the query operator, and is used to indicate that the target should return the current value of the parameter defined by the preceding byte. For example, in a message from controller to target, **MUT?** denotes 'return the current state of the mute function.'

2. From **Target-to-Controller**, the only permitted values are '=', '?', '!', '*', '#', and '$':

= (ASCII code 61)	The = code is used in two ways: First, if the controller has sent a query code to a target (for example: **MUT?** meaning 'is mute enabled or disabled?'), the target would respond with **MUT=**x, where x represents the state in question: **1** being *enabled*, and **0** being *disabled*. Second, if the controller sends an instruction to set a parameter to a particular value, then, providing the value sent in the argument is valid, the target will acknowledge the message by replying with **MUT=** (with no message arguments).
? (ASCII code 63)	The **?** code is only used as follows: If the controller sends an instruction to set a parameter to a particular value, then, if the value sent in the argument is not valid, the target will acknowledge the message by replying (for example) with **MUT?** (without message arguments). This indicates that there was an error in the argument of the message sent by the controller.
! (ASCII code 33)	The ! code is only used as follows: If the controller sends an instruction code that the target does not recognize, the target will acknowledge the message by echoing the invalid instruction, followed by the ! character with. **Example: XYZ!**
* (ASCII code 42)	The * code is only used as follows: If the controller sends an instruction to set a parameter to a particular value, and, if the value sent in the argument is valid, however the target is in the wrong mode (for example, standby mode in redundancy configuration) that it will not permit that particular parameter to be changed at that time, then the target will acknowledge the message by replying (for example) with **MUT*** (without message arguments).

# (ASCII code 35)	The # code is only used as follows: If the controller sends an instruction code which the target cannot currently perform because of hardware resource issues, then the target will acknowledge the message by echoing the invalid instruction, followed by the # character. This response can only occur if the operator sends two or more 'hardware configuration' type commands without allowing adequate time between commands for the hardware to be configured. For example, if the operator issued commands to change both the frequency and the attenuation with less than 100 milliseconds between commands, and if this response is returned, then the command has not been accepted and the operator must resend the command.
$ (ASCII Code 36)	The $ code is only used as follows: The target acknowledges the message indicating that this block converter is not installed.

A.4.6   Optional Message Arguments

Arguments are not required for all messages. Arguments are ASCII codes for the characters 0 to 9 (ASCII codes 48 to 57), period (ASCII code 46), and comma (ASCII code 44).

A.4.7   End of Packet

Controller-to-Target: This is the 'Carriage Return' character (ASCII code 13).

Target-to-Controller: This is the two-character sequence 'Carriage Return', 'Line Feed'. (ASCII code 13, and ASCII code 10).

Both indicate the valid termination of a packet.

A.5   Configure Mute Mode

Turns the mute mode ON or OFF. When mute mode is OFF (default), the unit will mute upon changing RF frequency. When mute mode is ON, the unit will remain whatever its mute state upon changing RF frequency.

Command	Details
Configure Mute Mode:	<DEV/MUT=y'cr' DEV = Conv A or Conv B address, y = 0 or 1
Confirmation:	>DEV/MUT='cr''lf'
Mute Mode Status:	<DEV/MUT?'cr'
Confirmation:	>DEV/MUT=y'cr''lf'

A.6 Remote Commands / Queries

Index Notes: Where **Column 'C'** = Command; **Column 'Q'** = Query; columns marked '**X**' designate instruction code as *Command only*, *Query only*, or *Command/Query*.

Instr Code	C	Q	Page	Instr Code	C	Q	Page	Instr Code	C	Q	Page
AFR	X	X	A-8	IPG	X	X	A-11	SBR	X	X	A-15
ATT	X	X	A-17	ISP	X		A-11	SNO		X	A-16, A-18
								SPA	X	X	A-16
				LRS	X	X	A-11	SSI	X	X	A-16
CAE	X		A-8					SWR		X	A-6
CID	X	X	A-8								
				MAC		X	A-11				
DAY	X	X	A-8	MSK	X	X	A-12	TIM	X	X	A-16
				MUT	X	X	A-17	TMP		X	A-18
ESA	X	X	A-9								
ESL	X	X	A-9	NUE		X	A-12				
ESW	X	X	A-9	NUS		X	A-12				
FLT		X	A-10	PNM		X	A-12, A-18				
FRE	X	X	A-17								
FRW		X	A-10								
				RBT	X		A-12				
				RCS		X	A-13				
GCC	X	X	A-17	RED	X	X	A-18				
				REF	X	X	A-13				
IEP	X		A-10	RMS		X	A-13, A-18				
IMG	X	X	A-10	RNE		X	A-14				
IPA	X	X	A-11	RNS		X	A-15				

NOTE – Instruction Code Qualifiers, as defined in **Sect. A.5.5**, are used as follows in the command/query tables' 'Response to Command' columns:

=	Message OK	*	Message OK, but not permitted in current mode
?	Received OK, but invalid arguments found	#	Message OK, but unit is not in Remote mode

A.6.1 MBT-5003 Base Unit Remote Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Auto Fault Recovery	AFR=	1 byte,	Command or Query. The BUC/BDC output will automatically be muted in the event of detected fault. If auto fault recovery is enabled, it will cause the output return to its pre-fault mute condition if all faults are cleared. If disabled, the output will remain muted even if all faults are cleared. The clearing of the fault condition will not cause a switch over in a redundant system unless the currently online unit is faulted. In which case the newly un-faulted unit will be brought online. **Default Value:** 1 **Example:** <1/AFR=1'cr' >0001/AFR='cr''lf'	AFR = AFR? AFR*	AFR?	AFR=x (Same format as command arguments)
Clear All Stored Events	CAE=	None	Command only. Instructs the MBT to clear all Stored Events This command takes no arguments. **Example:** <1/CAE='cr' >0001/CAE='cr''lf'	CAE=	N/A	N/A
Circuit Identification	CID=	24 bytes,	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. **Default value:** ----------------------- Valid characters include: Space ( ) * + − . / 0 9 and A thru Z	CID= CID?	CID?	CID=x…x (See Description of Arguments)

Set RTC (Real-Time-Clock) Date	DAY=	6 bytes	Command or Query.
			A command in the form **ddmmyy**, where; dd = day of the month, between 01 and 31, mm = month of the year, between 01 and 12 and yy = year, between 00 and 99 (2000 to 2099)
			
			Example: <1/DAY=240403'cr'
			        >0001/DAY='cr''lf'
			        (date = April 24, 2003):
				DAY=
				DAY?
				DAY*
					DAY?	DAY=xxxxxx
						
						(Same format as command arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Enable Statistics Averaging	ESA=	1 byte	Command or Query. Enables or Disables averaging of statistics data at a rate of once per second for 10 second. If Disabled, burst values will be logged instead of averaged values. 0 = Disabled 1 = Enabled **Default Value:** 0 **Example:** <1/ESA=0'cr' >0001/ESA='cr''lf'	ESA= ESA?	ESA?	ESA=x (Same format as command arguments)
Enable Statistics Logging	ESL=	1 byte	Command or Query. Enables or Disables the statistics logging function. 0 = Disable 1 = Enable **Default Value:** 0 **Example:** <1/ESL=1'cr' >0001/ESL='cr''lf'	ESL= ESL?	ESL?	ESL=x (Same format as command arguments)
Enable Redundancy Switch Mode	ESW=	1 byte	Command or Query. Turns ON or OFF the redundancy state, where: 0 = Off 1 = On **Default value:** 1 **Example:** <1/ESW=1'cr' >0001/ESW='cr''lf'	ESW= ESW? ESW *	ESW?	ESW=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)

Faults and Status	N/A	4 bytes	Query Only.
			Unit returns the current fault and status codes for the Base Unit, Converter A and B, in the form abcd, where:
			a = Base Unit Faults:
			  0 = No faults
			  1 = +12V Power Supply 1
			  2 = +12V Power Supply 2
			  3 = +5V Power Supply 1
			  4 = +5V Power Supply 2
			  5 = +7.8V Power Supply
			  6 = Flash Checksum
			  7 = FPGA Done
			  8 = External Ref Lock Detect
			  9 = Converter A Not Inserted
			  A = Converter B Not Inserted
			  B = Switch Fault
			b, c = Converter A and B Faults:
			  0 = No faults
			  1 = Synthesizer Lock Detect
			  2 = Heat-sink Temperature
			  3 = Low Forward RF Power (BUC only)
			d = New Faults:
			  0 = No change in fault status since last check
			  1 = Change in fault status, since last check
				N/A	FLT?	FLT=abcd
						
						d=Change in fault status since last poll.
						
						Note: Each section has faults listed in order of priority. For each section, only the highest priority fault is returned. There may be multiple faults for each section, but only the highest fault is returned.

Retrieve Firmware Number	N/A	variable length	Query only. Returns the firmware type loaded into the unit. i = Bulk Image Number (1 or 2) a = Firmware Image b = Firmware Revision c = Firmware Date	N/A	FRW?i	FRW={CR}Boot:{CR}abc{CR}Bulki:{CR}abc{CR}abc (See Description of Arguments)
Initialize Events Pointer	IEP=	None	Command only. Resets internal pointer to allow RNE? Queries to start at the beginning of the stored events log. **Example:** IEP=	IEP= IEP? IEP*	N/A	N/A
Software Image	IMG=	1 byte	Command or Query. Current Active software image, where: 1=Bulk Image # 1 currently active 2=Bulk Image # 2 currently active **Example:** IMG=1 (which is Image #1 active)	IMG= IMG? IMG* IMG#	IMG?	IMG=x (See description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseT Ethernet management port, in the format xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (8-30) **Default Value:** 192.168.001.004.24 **Example:** IPA=-192.168.001.004.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xx.xxx.xxx.xxx.yy (See Description of Arguments)
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP address for the 10/100 Base Tx Ethernet management port, in the format: xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address **Default Value:** 192.168.001.005 **Example:** IPG=192.168.001.005	IPG= IPG? IPG *	IPG?	IPG = xxx.xxx.xxx.xxx
Initialize Statistics Pointer	ISP=	None	Command only. Resets internal pointer to allow RNS? Queries to start at the beginning of the stored statistics log. **Example:** ISP=	ISP= ISP? ISP*	N/A	N/A
Local/Remote State	LRS=	1 byte	Command or Query. Set Local or Remote 0 = Local, 1=Serial, 2=Ethernet\ **Default value:** 0 **Example:** LRS=1 **Note:** The customer will always have query access in either mode. Also, the LRS command is available in all modes as a means of acquiring control. The intent of this command is to limit changes from being made on multiple interfaces at the same time.	LRS= LRS?	LRS?	LRS=x (Same format as command arguments)
Unit MAC Address	N/A	17 bytes	Query only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=00-06-B0-00-D2-A7	MAC= MAC*	MAC?	MAC=xx-xx-xx-xx-xx-xx (See Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Unit Alarm Mask	MSK=	5 bytes	Command or Query. Alarm mask conditions. If an alarm is masked, neither an alarm or a fault is set, and the user will not know of a problem. Form of abcd, where: 0 = Alarm, 1 = Fault, 2 = Masked a = Low Forward RF Power b = External Reference Lock detect c = Converter A Not Inserted d = Converter B Not Inserted **Default value:** 2200. There could be a variable delay in the time it takes for the internal reference to lock to an external reference, due warm-up characteristics and frequency differences between the references. Therefore, the default setting is "masked" for the reference lock detect. This setting may be changed if the customer so desires. The delay should be less than 1 s after 30 minutes of warm-up time.	MSK= MSK? MSK*	MSK?	MSK=abcde (See Description of Arguments)
Number of Unread stored Events	N/A	3 bytes	Query only. Unit returns the Number of stored Events, which remain Unread in the form of xxx. **Example:** NUE=126	N/A	NUE?	NUE=xxx
Number of Unread stored Statistics	N/A	3 bytes	Query only. Unit returns the Number of stored Statistics, which remain Unread in the form of xxx. **Example:** NUS=126	N/A	NUS?	NUS=xxx
Part Number	N/A	Various 1-96 bytes	Query only. Returns the Comtech EF Data part number of the unit. This part number is the unit's DOTCODE at the time it was manufactured. The DOTCODE may be up to 96 printable ASCII characters long. **Example:** <1/PNM?'cr' >0001/PNM=MBT5003.350WRSW00'cr''lf'	N/A	PNM?	PNM=x….x (See Description of Argumen ts for return string details)
Reboot	RBT=	1 byte	Command only. Soft Reboot 1 = Reboot System	RBT = RBT? RBT*	N/A	RBT=x (See Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)		Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Retrieve Configuration Status	N/A	variable length	Query only. Used to Query the Configuration status of the unit		N/A	RCS?	RCS=x….x (See Description of Arguments)
			Example: <1/RCS?'cr' >0001/RCS='cr' ESW=1'cr' AFR=1'cr' XRF=N/A'cr''lf'	Description: Redundancy Mode Auto Fault Recovery			
			XRF = External reference status, N/A = no external reference, 05M for 5 MHz, and 10M for a 10 MHz **Note:** XRF will always be N/A if the internal reference oscillator option is not installed.				
Reference Oscillator Tuning	REF=	3 bytes	Command or Query. Adjusts the reference oscillator tuning voltage by sending a DAC value in the following format: REF=xxx, where xxx is a numeric value from 0 to 255.		REF= REF? REF*	REF?	REF=xxx (Same format as command arguments)
			Default value: 087				
			Example: <1/REF=087'cr' >0001/REF='cr''lf'				
			Note: This command sets the DAC value, but the actual Reference Oscillator tuning voltage can be monitored using the RMS command.				
Retrieve Maintenance Status	N/A	variable length	Query only. Used to Query the Maintenance status of the unit.		N/A	RMS?	RMS=x….x (See Description of Arguments)
			Example: <1/RMS?'cr' >0001/RMS='cr' P12V1=12.1'cr' P12V2=12.3'cr' P05V1=04.9'cr' P05V2=05.1'cr' P7V8T=07.8'cr' REFVT=01.2'lf' SWITC=A'cr''lf'	Description: +12V power supply 1 +12V power supply 2 +5V power supply 1 +5V power supply 2 +7.8V power supply Ref. Osc. Tuning RF switch			

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Retrieve Next 5 unread stored Events	N/A	75 bytes	Query only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control. Reply format: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss: A being the fault/clear indicator. F = Fault C = Clear I = Info B being the fault type where: 1 = Base Unit 2 = Converter A 3 = Converter B C is Fault Code numbers If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is **RNE***.	N/A	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss (See Description of Arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Retrieve Next 5 unread stored Statistics	N/A	variable length	Query only. Unit returns the oldest 5 Stored Statistics entries which have not yet been read over the remote control. Reply format: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ddmmyyhhmmssaaa.abbb.bccc.cddd.dee.eeff.ffghijkk.kll.l ddmmyy = day/month/year hhmmss = hour:minute:second aaa.a = Conveter A Operating Temperature bbb.b = Conveter B Operating Temperature ccc.c = Converter A RF Power output ddd.d = Converter B RF Power output ee.ee = Converter A Attenuation Setting ff.ff = Converter B Attenuation Setting g = Converter A Mute On/Off h = Converter B Mute On/Off i = Converter A Online/Offline Status j = Converter B Online/Offline Status kk.k = Converter A Tuning Voltage ll.l = Converter B Tuning Voltage If there are less than 5 entries to be retrieved, the remaining positions are padded with zeros. If there are no new entries, the response is RNS*.	N/A	RNS?	RNS={CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body (See Description of Arguments)
Remote Baud Rate	SBR=	4 bytes	Command or Query. Set remote baud rate as follows: 2400 = 2400 baud 4800 = 4800 baud 9600 = 9600 baud 19K2 = 19200 baud 38K4 = 38400 baud **Default Value:** 9600 **Example:** <1/SBR=9600'cr' >0001/SBR=9600'cr''lf' **Note:** When changing baud rates remotely the response to the command will be returned using the same baud rate as that used to send the command.	SBR= SBR?	SBR?	SBR=xxxx (Same format as command arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Serial Number	N/A	9 bytes	Query only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143	N/A	SNO?	SNO=xxxxxxxxx (See Description of Arguments)
Remote Address	SPA=	4 bytes	Command or Query. Set Physical Address-between 0001 to 9997. Resolution 0001 **Default Value:** 0001 **Example:** <1/SPA=0412'cr' >0001/SPA='cr''lf' **Note:** 9998 and 9999 are reserved for the block converter A and B if the base address is 9997.	SPA= SPA?	SPA?	SPA=xxxx (Same format as command arguments)
Set Statistics Interval	SSI=	2 bytes	Command or Query. Sets the interval at which statistics are logged. Minimum resolution is 10 minutes, maximum is 90 minutes in 10 minute intervals. **Default Value:** 90 **Example:** <1/SSI=90'cr' >0001/SSI='cr''lf'	SSI= SSI?	SSI?	SSI=xx (Same format as command arguments)
Software Revision	N/A	variable length	Query only. Unit returns the value of the internal software revision installed in the unit, in the form : Boot:x.y.z Bulk1:x.y.z Bulk2:x.y.z -or- Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz	N/A	SWR?	SWR=Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz (See description of arguments)

Set RTC Time	TIM=	6 bytes	Command or Query.
			A command in the form **hhmmss**, indicating the time from midnight, where hh = hours, between 00 and 23; mm=minutes between 00 and 59, and ss= seconds between 00 and 59
			Example: <1/TIM=231259'cr'
			      >0001/TIM='cr''lf'
			   (time = 23 hours, 12 minutes and 59 seconds since midnight)
				TIM =
				TIM?
				TIM *
					TIM?	TIM=xxxxxx
						
						(Same format as command arguments)

A.6.2   Block Converter (BUC/BDC) Remote Commands and Queries

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)	Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Attenuation	ATT=	5 bytes,	Command or Query. Valid attenuation level (00.00 to 50.00 for x-band BUC units, 00.00 to 20.00 for all other), in dB, in 0.25 dB steps as factory default. **Default Value:** 00.00 **Example:** <2/ATT=12.25'cr' >0002/ATT='cr''lf' **Note:** Attenuation cannot be changed for the offline unit when in redundancy mode.	ATT= ATT? ATT*	ATT?	ATT=xx.xx (Same format as command arguments)
Operating RF Frequency	FRE=xxxxx.xxx	9 bytes	Command or Query. Valid Operating RF frequency, in MHz. For Ku BDCs only: FRE values: 10950-11700 MHz an LO of 10000 MHz is activated FRE values: 11700-12250 MHz an LO of 10750 MHz is activated FRE values: 12250-12750 MHz an LO of 11300 MHz is activated **Example:** FRE=11300.000'cr' **Note:** Operating Frequency cannot be changed for the offline unit when in redundancy mode.	FRE= FRE? FRE*	FRE?	FRE=x….x (See Description of Arguments)
Global Converter Configuration	GCC=	variable length	Command or Query. Used to set up and query the global status of the BUC/BDC. **Example:** GCC=aa.aa;b;ccccc.cc; 'cr' where: aa.aa = attenuation in dB (ATT) b = mute state, 0 = un-muted, 1 = muted (MUT) ccccc.ccc = frequency in MHz (FRE, Ku BDC only, other units will display xxxxx.xxx) **Note:** This command can only be queried for the offline unit when in redundancy mode.	GCC= GCC? GCC*	GCC?	GCC=x….x (See Description of Arguments)
Mute State	MUT=	1 byte	Command or Query. Mute the unit, where: 0 = Disabled (Not Muted) 1 = Enabled (Muted) **Default Value:** 0 **Example:** <2/MUT=1'cr' >0002/MUT=1'cr''lf' **Note:** Mute State cannot be changed for the offline unit when in redundancy mode.	MUT= MUT? MUT*	MUT?	MUT=x (same format as command arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes between 48 and 57)		Response to Command (Target to controller)	Query (Instruction Code and qualifier)	Response to query (Target to controller)
Part Number	N/A	Various 1-96 bytes	Query only. Returns the Comtech EF Data part number of the unit. This part number is the unit's DOTCODE at the time it was manufactured. The DOTCODE may be up to 96 printable ASCII characters long. **Example: <**2/PNM?'cr' >0002/PNM=BUCC0.350WRSW00'cr''lf'		N/A	PNM?	PNM=x....x (See Description of Arguments for return string details)
Redundancy Online Status	RED=	1 byte	Command or Query. When this command is used it will force the unit to throw the switches causing the unit to go offline (if it is currently online). The unit cannot be forced online, and sending a 1 will have no effect. 0 = Offline 1 = Online (query only) **Default value:** 0 **Example:** <2/RED=0'cr' >0002/RED='cr''lf'		RED= RED? RED*	RED?	RED=x
Retrieve Maintenance Status	N/A	variable length	Query only. Used to Query the Maintenance status of the unit.		N/A	RMS?	RMS=x....x (See Description of Arguments)
			Example	**Description**			
			<2/RMS?'cr' >0002/RMS='cr' SYNVT=001.2'cr' HSTMP=+12.3'cr' FWPWR=004.9'cr'lf'	Synthesizer Voltage Temperature Forward Power			
			Note: If the converter does not support power monitor, will display FWPWR=xxx.x				
Serial Number	N/A	9 bytes	Query only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143		N/A	SNO?	SNO=xxxxxxxxx (See Description of Arguments)
Temperature	N/A	4 bytes	Query Only. Returns the temperatures of the heat sink in the form of a sign byte followed by 3 bytes for the temperature. **Example:** TMP=+26.0		N/A	TMP?	TMP=sxxx (See Description of Arguments)

Appendix B. MBT-5003 REDUNDANCY OPERATION

B.1   Introduction

The Comtech EF Data MBT-5003 L-Band Up/Down Converter System is designed to operate in redundant configuration.

Figure B-1 depicts the redundant signal path for the MBT-5003 L-Band Up/Down Converter System. The cables, switches, circuitry and logic necessary to perform all the functions of redundancy operation are self-contained within the MBT-5003 chassis.
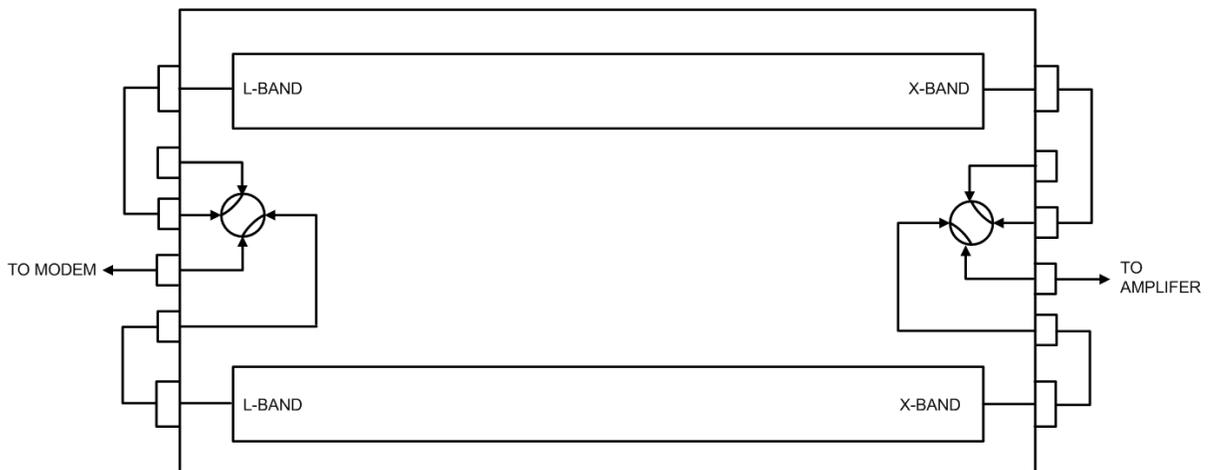

Figure B-1. MBT-5003 Operational Schematic

B.2   Redundant Operation

Refer to **Appendix A. REMOTE CONTROL** for further information about the remote commands mentioned in this section.

B.2.1   Auto Mode

In this mode, one converter is always online (determined by the switch position and indicated on the front panel), and the other converter is always offline and muted. If a fault is detected on the online converter, either by loss of communications between the base unit and the online converter, or via the summary fault, the base unit will switch the RF and IF switches and the offline converter then become the active (online) unit (assuming the offline unit is not faulted).

B.2.2   Force Switchover

The online converter can be forced to become the offline unit (assuming the offline unit is not faulted) either via the remote command (RED) or by front panel operation (**CONFIG ► REDUN ► FORCE**).

B.2.3   Gain Equalization of Redundant Units

Both converters are temperature compensated at same gain level, so the gain will stay the same during a switchover.

B.2.4   Operational Configuration Commands

The attenuation command (ATT) sent to the online unit will be mirrored in the offline unit. The commands sent to the offline unit will be rejected.

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^5	6.336×10^4	5.280×10^3	1.760×10^3	—	1.609×10^3	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Unit	° Fahrenheit	° Centigrade
32° Fahrenheit	—	0 (water freezes)
212° Fahrenheit	—	100 (water boils)
-459.6° Fahrenheit	—	273.1 (absolute 0)

Formulas
C = (F - 32) * 0.555
F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^3	35.27	32.15	2.205	2.679	—