UT-4500-A Series

Upconverters
Installation and Operation Manual

IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding this product. Product specifications are subject to change without prior notice.

Part Number MN-UT4500A Revision 0

Errata A

Comtech EF Data Documentation Update

UT-4500-A Series

Upconverters
Installation and Operation Manual

Part Number MN-UT4500A
Revision 0

Subject: **Add TPE and TPS Utility Commands to Appendix A. REMOTE CONTROL, Sect. A.7.1 Utility Commands:**

Original Manual Part Number/Rev: MN-UT4500A Rev 0

Errata Number/ PLM Document ID: ER-UT4500A-EA0

PLM CO Number: C-0027476

Comments: *The updated information will be incorporated into the next formal revision of the manual:*

Add TPE and TPS Utility Commands to Appendix A. REMOTE CONTROL, Sect. A.7.1 Utility Commands:

A.7.1.3 Time Protocol Enable

Use the TPE command to enable or disable the time protocol.

Command	Details
Set Time Protocol:	<DEV/TPE_x'cr' \Where: x= 0 Time protocol disabled 1 Time protocol enabled
Confirmation:	>DEV/TPE_x'cr'lf]
Retrieve TPE:	<DEV/TPE_'cr'
Confirmation:	>DEV/TPE_x'cr"lf]

A.7.1.4 Time Protocol Server

Use the TPS command to set the Time Server IP address for the Ethernet management port in the format xxx.xxx.xxx.xxx.

Command	Details
Set Time Protocol Server:	<DEV/TPS_xxx.xxx.xxx.xxx'cr' \Where: xxx.xxx.xxx.xxx is the Time server IP address.
Confirmation:	>DEV/TPS_xxx.xxx.xxx.xxx'cr'lf']
Retrieve TPS:	<DEV/TPS_'cr'
Confirmation:	>DEV/TPS_xxx.xxx.xxx.xxx'cr''lf']

(Note: Sects. A.7.1.3 through A.7.1.22 will be renumbered to A.7.1.5 through A.7.1.24 in MN-UT4500A Revision 1.)

UT-4500-A Series

Upconverters
Installation and Operation Manual

Part Number MN-UT4500A
Revision 0
February 2, 2011

Comtech EF Data, 2114 West 7th Street, Tempe, Arizona 85281 USA, 480.333.2200, FAX: 480.333.2161

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data's UT-4500-A Series Upconverters. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the UT-4500-A family of products.

Disclaimer

Comtech EF Data has reviewed this manual thoroughly 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 the equipment or the information in this manual, please 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 are 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 a statement that is associated with either information critical for proper equipment function or the task being performed.

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

The Recommended Standard (RS) designation has been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designation may be 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 designation.

Trademarks

Windows is a trademark of the Microsoft Corporation. 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.

The User should carefully review the information that follows.

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.

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

Safety Compliance

EN 60950

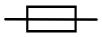
The UT-4500-A Series Upconverters have been shown to comply with safety standard EN 60950 Safety of Information Technology Equipment including Electrical Business Machines.

Applicable testing is routinely performed as a condition of manufacturing on all units to ensure compliance with safety requirements of EN 60950.

European Low Voltage Directive (LVD)

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

Symbol	Description
<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**	**Symbol**	**Definition**
	Alternating Current		Protective Earth
	Fuse		Chassis Ground

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.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

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. xiv 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

Figure 1-1. UT-4500-A Series Upconverters (UT-4505-A shown)

Comtech EF Data's UT-4500-A Series Upconverters (**Figure 1-1**) are designed for the transmission of SCPC, DAMA and TDMA signals in communication systems or satellite uplink data systems. The Upconverters can also be used in communications system applications with full transponder HDTV and analog TV.

The UT-4500-A Series Upconverter family of products comprises:

- UT-4505-A
- UT-4505/E-A
- UT-4505/F-A
- UT-4505/G-A
- UT-4505/H-A
- UT-4505/I-A
- UT-4505/J-A
- UT-4505/M-A
- UT-4514-A
- UT-4514/C-A
- UT-4514/D-A
- UT-4514/E-A
- UT-4514/F-A
- UT-4518-A
- UT-4518/E-A

Individual specifications for each model are included in this chapter.

1.2 Features

1.2.1 Physical Configuration

The UT-4500-A Series Upconverter's 1RU-high (1.75") 19-inch wide chassis is designed for rack mounting into a standard 19-inch (48.26 cm) equipment rack. Handles installed on the front panel facilitate ease of installation into and removal from the equipment rack. The unit may also be mounted into the rack using the provided slide mechanisms to allow service without removal from the rack.

Figure 1-2 depicts the isometric layout of the UT-4500-A with its top cover removed. Major chassis components are shown here. The major module assemblies are:

- Signal Path Module
- Step Loop Module
- Monitor & Control Assembly
- Transmit Switch Module (not shown – installs into rear chassis slot)
- Reference Oscillator Assembly
- Sum Loop Module
- Power Supply Assembly

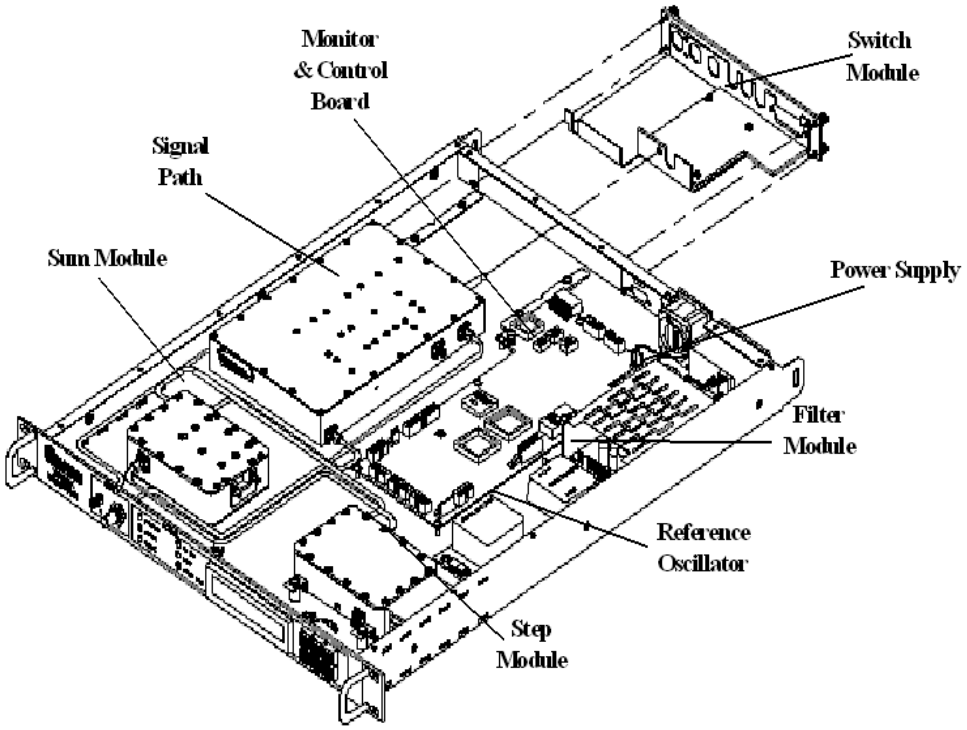


Figure 1-2. UT-4500-A Series Upconverter Physical Configuration

1.2.2 Dimensional Envelope

Dimensions are shown in both inches and centimeters.

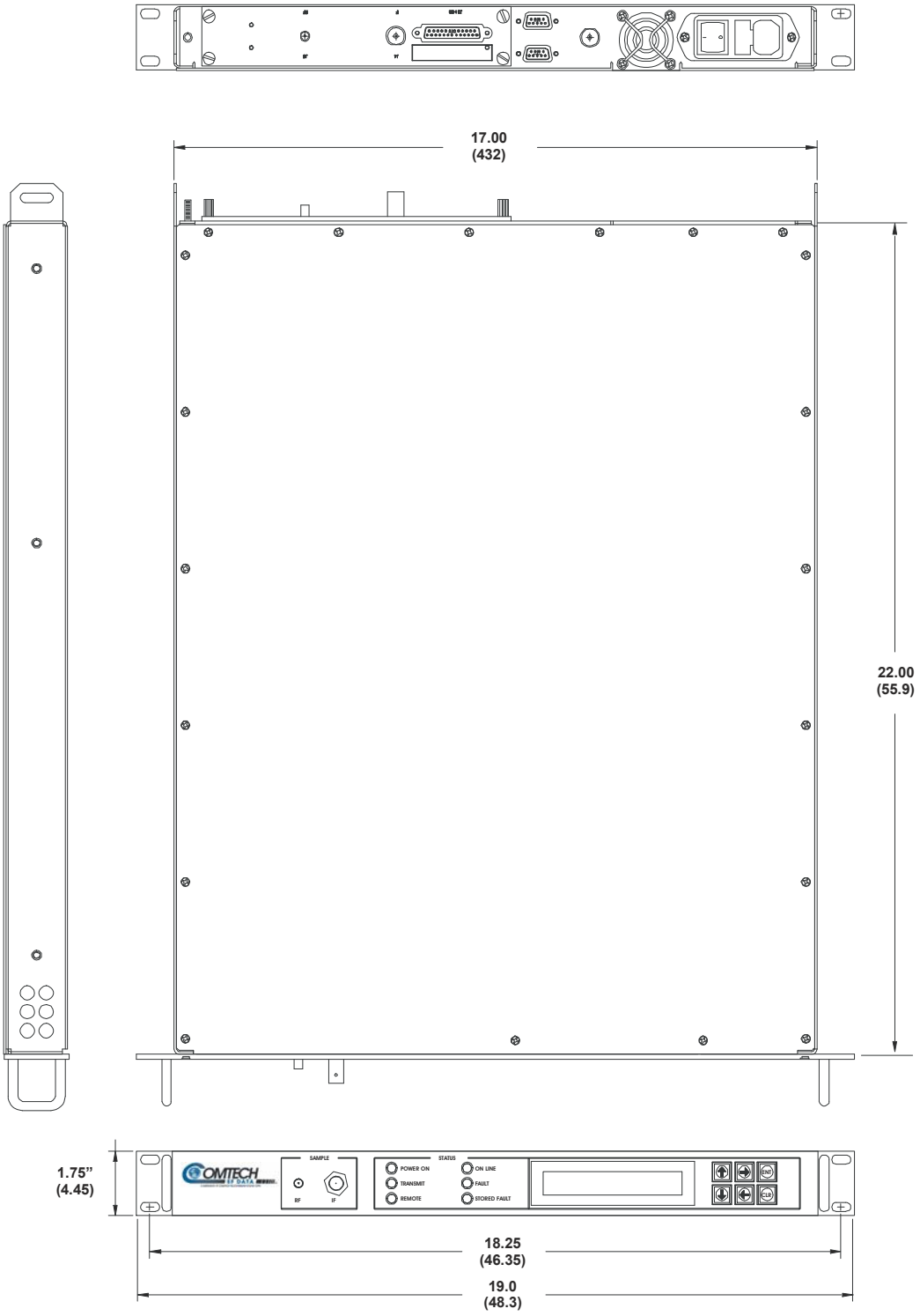


Figure 1-3. UT-4500-A Series Upconverter Dimensional Envelope

1.2.3 Front Panel

Figure 1-4. UT-4500-A Series Upconverter Front Panel

Figure 1-4 shows the typical front panel of the UT-4500-A Series Upconverters. This example depicts a UT-4505-A Upconverter. All operator controls, indicators and displays for local and remote operation are located on the front panel of the UT-4500-A. The front panel features (from left):

- **Two Test Point Sample Ports –** The test point connections are used for monitoring the RF input and the IF output. An SMA connector is provided for the RF output, and a BNC connector is provided for the IF input. There is also an optional RF LO monitor available.

- **Six Light-Emitting Diode (LED) Indicators** – The LEDs indicate, in a summary fashion, the status of the unit.

- **Vacuum Fluorescent Display (VFD)** – The VFD is an active display showing two lines of 24 characters each. Each configuration function, or operating mode, is shown on the display when the operator enters a command using the keypad.

- **Six-button Keypad –** The keypad comprises six individual keyswitches. They have a positive 'click' action, which provides tactile feedback.

1.2.4 Rear Panel

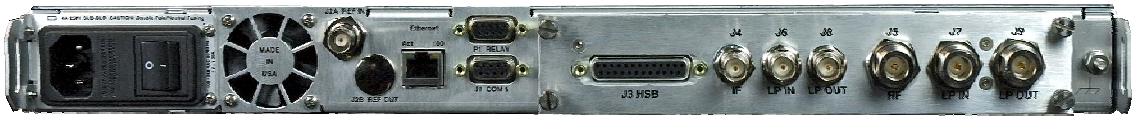


Figure 1-5. UT-4500-A Series Upconverter Rear Panel

Figure 1-5 shows the typical rear panel of the UT-4500-A Series Upconverters. This example depicts a UT-4505-A Upconverter with Transmit Switch Module (TSM) installled. The rear panel features (from left):

- **Prime Power Switch** – The on/off prime power switch is located on the rear of the chassis adjacent to the prime power input connector. The power switch contains a filter and dual fuse. The dual fuse is rated for 2 Amps.

  The UT-4500-A is provided with a six-foot AC power cord.

- **Exhaust Fan –** The internally mounted exhaust fan vents through the rear panel for chassis cooling.

- **External Interface Connectors** – Connectors are provided for operational communications, connection of external reference, redundant operation, and remote monitor and control of the UT-4500-A.

1.3 Theory of Operation

1.3.1 Applications

The upconverter operates over the RF frequency range with a typical gain of 35 dB. The RF output level is +10 dBm at 1 dB compression allowing the capability for longer cable runs to compensate for splitting networks without adding options such as external line amplifiers.

The phase noise performance exceeds the Intelsat phase noise mask for IBS and IDR services by more than 9 dB. This allows high capacity earth stations to add more demodulators and still meet transmission standards. The close-in phase noise is also very low. This makes the upconverter ideal for low bit rate digital circuits such as used in DAMA hub earth stations.

A selectable EIA-232C or EIA-485 remote control serial communications connector interface is provided on the rear panel of the upconverter. All configuration control, status retrieval and adjustments are available as ASCII commands through the serial interface, or as local operator input command to the upconverter.

A detachable Input/Output Module (IOM) can be mounted in the rear of the upconverter chassis for switching the RF output for single thread operations, or for testing the output of the unit. The connectors for the IOM are located on the rear panel.

In applications where converters are "Daisy Chained" together to provide distributed online protection switching to a backUpconverter, the IOM is replaced with a detachable Transmit Switch Module (TSM). The TSM contains RF and IF transfer switches. Type N connectors are provided for the RF loop, and 50 or 75 ohms BNC connectors are provided for the IF loop.

The "Daisy Chain" configuration is designed to chain the IF input and RF output of up to twelve (12) online converters together through TSM's terminating in a backUpconverter. When a fault occurs in an online upconverter, the TSM in the upconverter with the fault is commanded to switch to the backUpconverter.

The backUpconverter performs the fault detection, self-reconfiguration and the logical switching functions. If the backUpconverter has a fault, it will not attempt to perform the protection-switching task. If the backUpconverter does not have a fault, it will assume the frequency and attenuation of the faulted online upconverter, and compensate for the chain losses.

The backUpconverter in the "Daisy Chain" communicates with the online converters through a high speed (data interface) bus (HSB). When faults are detected, the backUpconverter re-configures itself to replace the online upconverter with the fault. The backUpconverter also uses the HSB to monitor configuration changes made to the online converters by either remote control or front panel command inputs.

Changes in frequency, attenuation or polarity are entered into the backup table as they are made, as well as information from new online units. The HSB does not interfere with the remote control communications link for access to any of the converters in the "Daisy Chain".

1.3.2 RF Signal Conversion

As a typical example of the RF signal processing, in the Model UT-4514-A Upconverter, the 70 MHz IF input is mixed in the first mixer with a 1150 MHz IFLO signal. The IFLO is locked to a 5/10 MHz reference oscillator. The first mixer is located in the Signal Path Assembly.

The intermediate IF is 1220 MHz which is mixed in the second stage mixer with 12780 to 13280 MHz synthesizer signal to provide an RF output frequency of 14000 to 1451X MHz in 125 KHz fine tuning steps. The synthesizer is also locked to the 5/10 MHz reference oscillator. The second mixer is located in the upconverter Signal Path Module, and the synthesizer consists of the Coarse/Fine Step Module and Sum Loop Module.

Figure 1-6 depicts the operational schematic for a typical UT-4500-A Series Upconverter in single thread (standalone) applications. For more information about the UT-4500-A's use in redundant applications, refer to **Appendix B. REDUNDANT SYSTEM OPERATION**.

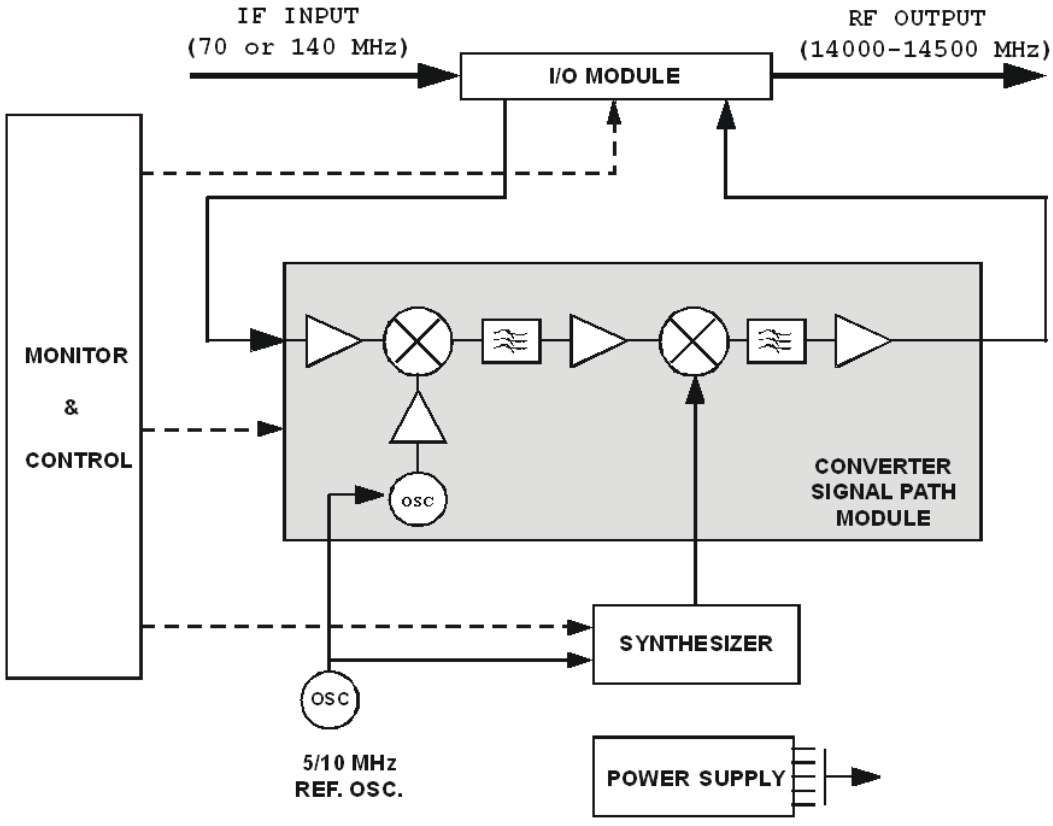


Figure 1-6. Typical Functional Block Diagram (UT-4512-A shown)

1.3.3 Monitor & Control

The Monitor & Control Assembly is designed to monitor the functions of the upconverter, and provide the control for remote and local command inputs to the upconverter.

Remote control inputs are provided through the EIA-232C or EIA-485 communications port on the rear of the panel, or by local operator inputs through the keypad on the front panel.

Local operator input commands and the status of the upconverter are displayed on the front panel Vacuum Fluorescent Display (VFD) on the front panel.

A upconverter fault is indicated by the LED indicator on the front panel. Specific fault conditions are displayed on the VFD through local keypad input commands.

1.3.4 Installation, Operation and Maintenance

Refer to **Chapter 2. INSTALLATION** for rack installation and mounting instructions.

Refer to **Chapter 5. FRONT PANEL OPERATION** for local operating instructions and procedures.

Refer to **Appendix A. REMOTE CONTROL** for remote control operating instructions and procedures.

Refer to **Appendix B. REDUNDANT SYSTEM OPERATION** for redundant system operating instructions and procedures.

Refer to **Appendix C. MAINTENANCE AND TROUBLESHOOTING** for maintenance and troubleshooting procedures.

1.4 Summary of Specifications

***Note:** Contact Comtech EF Data with specific requirements.

1.4.1 UT-4505-A C-Band Upconverter

Characteristic		Specification	
Frequency Range	UT-4505-A	5845-6425 MHz	
	Conversion	Dual, No Inversion	
	Step Size	125 kHz standard, 1kHz optional	
	Preset Channels	32 Frequencies and Gains	
	Stability over Time	± 1 x 10^{-9} /Day	
	Stability over Step	± 1 x 10^{-8} 0-50°C (32-122°F)	
IF Input	Noise Figure	12 dB Maximum at 0 dB Attenuation	
	Level	-35 dBm Typical	
	Range	+20 dBm at 1 dB Compression	
	Impedance	50Ω or 75Ω	
	Return Loss	23 dB min. with IO Module or Switch Module	
RF Output	Output Level	+17 dBm at 1 dB Compression	
	Intermodulation	-50 dBc @ 0 dBm Output SCL	
	Carrier Mute	-70 dBc	
	Non-carrier Spurious	-80 dBm	
	Carrier Spurious	-65 dBc @ 0 dBm Output	
	AM to PM	0.1º. / dB at –5 dBm Out	
	Return Loss	20 dB Minimum with IO Module 18 dB Minimum with Switch Module	
	Impedance	50Ω	
Transfer	Gain	35 dB ± 2 dB	
	Gain Adjust	0-25 in 0.25 dB Steps 0.1 dB Steps Optional	
	Gain Stability	± 0.25 dB/Day	
	Ripple	**70MHz IFCF:** ±0.25 dB (±18 MHz), optional ±20 MHz (see *Note) **140 MHz IFCF:** 0.75 dB (±36 MHz), optional ±40 MHz (see *Note)	
	Slope	0.05 dB/MHz	
	IF Bandwidth	36 or 72 MHz, (optional 40 or 80 MHz – see *Note)	
External Reference		Input 5 or 10 MHz @ +3 dBm Optional 10 MHz Rear Panel Reference Output	
Group Delay	Linear Group Delay	0.03 ns/MHz	
	Parabolic Delay	0.01 ns/MHz^2	
	Group Delay Ripple	1.0 ns Peak-to-Peak	
Phase Noise	**Parameter**	**Limit (dBc/Hz)**	**Typical (dBc/Hz)**
	100 Hz	-80	-83
	1 kHz	-89	-92
	10 kHz	-95	-97
	100 kHz	-105	-109
	1 MHz	-120	-124
Remote Control (Rear Panel)		Comm Port EIA-485 or EIA-232	

Characteristic		Specification
LED Indicators (Front Panel)	Power On	Green LED
	Transmit	Yellow LED
	Remote	Yellow LED
	On Line	Yellow LED
	Fault	Red LED
	Stored Fault	Red LED
Test Points (Front Panel)	RF Sample	Type 'SMA' Connector, -20 dBc Nominal
	IF Sample	Type 'BNC' Connector, -20 dBc Nominal
	Optional L.O. Sample	
Power	Voltage	90-250 VAC Autoranging
	Frequency	47-63 Hz
	Dissipation	60 Watts
	Power Option	-48 VDC
Environmental	Temperature	0-50°C (32-122° F)
	Altitude	10,000 Feet MSL
	Humidity	0-95% Relative
Physical	Width	19 Inches (48.26 cm)
	Height	1RU 1.75 Inches (4.44 cm)
	Depth	22 Inches(55.88 cm)
	Weight	15 Pounds (7.00 kg)
MTBF		49,740 hrs. (calculated) >100,000 hrs. (field experience)
Summary Alarm Relay Closure		Form C

1.4.2 UT-4505/E-A, /F-A /G-A, /H-A, /J-A Upconverters

Characteristic		Specification	
Frequency Range	UT-4505-A	See Sect. 1.4.1	
	UT-4505/E-A	6725-7025 MHz	
	UT-4505/F-A	6425-6725 MHz	
	UT-4505/G-A	5925-6725 MHz	
	UT-4505/H-A	5850-6650 MHz	
	UT-4505/J-A	7025-7075 MHz	
	Conversion	Dual, No Inversion	
	Step Size	125 kHz standard, 1kHz optional	
	Preset Channels	32 Frequencies and Gains	
	Stability over Time	± 1 x 10^{-9} /Day	
	Stability over Temp	± 1 x 10^{-8} 0-50°C (32-122°F)	
IF Input	Noise Figure	11 dB Maximum at 0 dB Attenuation	
	Level	-45 dBm Typical	
	Range	52 to 88 or 104 to 176 MHz (optional 50-80 MHz or 100-180 MHz – see *Note)	
	Impedance	50Ω or 75Ω	
	Return Loss	23 dB min. with IO Module of Switch Module	
RF Output	Output Level	+17 dBm at 1 dB Compression	
	Intermodulation	-60 dBc @ 0 dBm Output SCL	
	Carrier Mute	-70 dBc	
	Non-carrier Spurious	-80 dBm	
	Carrier Spurious	-65 dBc @ 0 dBm Output	
	AM to PM	0.1º. / dB at –5 dBm Out	
	Return Loss	20 dB Minimum with IO Module 18 dB Minimum with Switch Module	
	Impedance	50Ω	
Transfer	Gain	35 dB ± 2 dB	
	Gain Adjust	0-25 in 0.25 dB Steps 0.1 dB Steps Optional	
	Gain Stability	± 0.25 dB/Day	
	Ripple	**70MHz IFCF:** ±0.25 dB (±18 MHz), optional ±20 MHz (see *Note) **140 MHz IFCF:** 0.75 dB (±36 MHz), optional ±40 MHz (see *Note)	
	Slope	0.05 dB/MHz	
	IF Bandwidth	36 or 72 MHz, optional 40 or 80 MHz (see *Note)	
Slope		0.05 dB/MHz	
External Reference		Input, either 5 or 10 MHz Option @ +3 dBm Optional 10 MHz Rear Panel Reference Output	
Group Delay	Linear Group Delay	0.03 ns/MHz	
	Parabolic Delay	0.01 ns/MHz^2	
	Group Delay Ripple	1.0 ns Peak-to-Peak	
Phase Noise	**Parameter**	**Limit (dBc/Hz)**	**Typical (dBc/Hz)**
	100 Hz	-69	-72
	1 kHz	-79	-82
	10 kHz	-89	-92
	100 kHz	-99	-102
	1 MHz	-109	-112

Characteristic		Specification
Remote Control (Rear Panel)		Comm Port EIA-485 or EIA-232
LED Indicators (Front Panel)	Power On	Green LED
	Transmit	Yellow LED
	Remote	Yellow LED
	On Line	Yellow LED
	Fault	Red LED
	Stored Fault	Red LED
Test Points (Front Panel)	RF Sample	Type 'SMA' Connector, -20 dBc Nominal
	IF Sample	Type 'BNC' Connector, -20 dBc Nominal
	Optional L.O. Sample	
Power	Voltage	90-250 VAC, Autoranging
	Frequency	47-63 Hz
	Dissipation	60 Watts
	Power Option	-48 VDC
Environmental	Temperature	0-50°C (32-122° F)
	Altitude	10,000 Feet MSL
	Humidity	0-95% Relative
Physical	Width	19 Inches (48.26 cm)
	Height	1RU 1.75 Inches (4.44 cm)
	Depth	22 Inches(55.88 cm)
	Weight	15 Pounds (7.00 kg)
MTBF		49,740 hrs. (calculated) >100,000 hrs. (field experience)
Summary Alarm Relay Closure		Form C

1.4.3 UT-4505/I-A, /M-A Upconverters

Characteristic		Specification	
Frequency Range	UT-4505/I-A	5845-6725 MHz	
	UT-4505/M-A	5725-6725 MHz	
	Conversion	Dual, No Inversion	
	Step Size	125 kHz standard, 1kHz optional	
	Preset Channels	32 Frequencies and Gains	
	Stability over Time	± 1 x 10^{-9} /Day	
	Stability over Temp	± 1 x 10^{-8} 0-50°C (32-122°F)	
IF Input	Noise Figure	12 dB Maximum at 0 dB Attenuation	
	Level	-35 dBm Typical	
	Range	52-88 or 104-176 MHz	
	Impedance	50Ω or 75Ω	
	Return Loss	23 dB min. with IO Module or Switch Module	
RF Output	Output Level	+17 dBm at 1 dB Compression	
	Intermodulation	-50 dBc @ 0 dBm Output SCL	
	Carrier Mute	-70 dBc	
	Non-carrier Spurious	-80 dBm	
	Carrier Spurious	-65 dBc @ 0 dBm Output SCL	
	AM to PM	0.1º. / dB for Output up to –5 dBm	
	Return Loss	20 dB Minimum with IO Module	
	Impedance	50Ω	
Transfer	Gain	35 dB ± 2 dB	
	Attenuation Adjust	0-25 in 0.25 dB Steps 0.1 dB Steps Optional	
	Gain Stability	± 0.25 dB/Day	
	Ripple	**70MHz IFCF:** ±0.25 dB (±18 MHz) **140 MHz IFCF:** 0.75 dB (±36 MHz)	
	Slope	0.05 dB/MHz	
External Reference		Input either 5 or 10 MHz Option @ +3 dBm Optional 10 MHz Rear Panel Reference Output	
Group Delay	Linear Group Delay	0.03 ns/MHz	
	Parabolic Delay	0.01 ns/MHz^2	
	Group Delay Ripple	1.0 ns Peak-to-Peak	
Phase Noise	**Parameter**	**Limit (dBc/Hz)**	**Typical (dBc/Hz)**
	100 Hz	-69	-72
	1 kHz	-79	-82
	10 kHz	-89	-92
	100 kHz	-99	-102
	1 MHz	-109	-112

Characteristic		Specification
Remote Control (Rear Panel)		Comm Port EIA-485 or EIA-232
LED Indicators (Front Panel)	Power On	Green LED
	TRANSMIT	Yellow LED
	Remote	Yellow LED
	On Line	Yellow LED
	Fault	Red LED
	Stored Fault	Red LED
Test Points (Front Panel)	RF Sample	Type 'SMA' Connector, -20 dBc Nominal
	IF Sample	Type 'BNC' Connector, -20 dBc Nominal
	Optional L.O. Sample	
Power	Voltage	90-250 VAC Autoranging
	Frequency	47-63 Hz
	Dissipation	60 Watts
	Power Option	-48 VDC
Environmental	Temperature	0-50°C (32-122° F)
	Altitude	10,000 Feet MSL
	Humidity	0-95% Relative
Physical	Width	19 Inches (48.26 cm)
	Height	1RU 1.75 Inches (4.44 cm)
	Depth	22 Inches(55.88 cm)
	Weight	15 Pounds (7.00 kg)
MTBF		49,740 hrs. (calculated) >100,000 hrs. (field experience)
Summary Alarm Relay Closure		Form C

1.4.4 UT-4514-A, /C-A, /D-A, /E-A, /F-A Upconverters

Characteristic		Specification	
Frequency Range	UT-4514-A	14.00-14.50 GHz	
	UT-4514/C-A	12.75-13.25 GHz	
	UT-4514/D-A	13.75-14.50 GHz	
	UT-4514/E-A	14.70-15.00 GHz	
	UT-4514/F-A	12.75-14.50 GHz	
	Conversion	Dual, No Inversion	
	Step Size	125 kHz	
	Preset Channels	32 Frequencies and Gains	
	Stability over Time	± 1 x 10^{-9} /Day	
	Stability over Temp	± 1 x 10^{-8} 0-50°C (32-122°F)	
RF Output	Output Level	+20 dBm at 1 dB Compression	
	Intermodulation	-60 dBc @ 0 dBm Output SCL	
	Carrier Mute	-70 dBc	
	Non-carrier Spurious	-80 dBm	
	Carrier Spurious	-65 dBc @ 0 dBm Output	
	AM to PM	0.1º. / dB at –5 dBm Out	
	Return Loss	20 dB Minimum with RF/IF Connector Module 18 dB Minimum with Switch Module	
	Impedance	50Ω	
IF Input	Noise Figure	13 dB Maximum at 0 dB Attenuation	
	Level	-35 dBm Typical	
	Range	52-88 or 104-176 MHz (optional 50-80 MHz or 100-180 MHz – see *Note)	
	Impedance	50Ω or 75Ω	
	Return Loss	23 dB Minimum with RF/IF Connector Module or Switch Module	
Transfer	Gain	35 dB ± 2 dB	
	Gain Adjust	0-25 in 0.25 dB Steps	
	Gain Stability	± 0.25 dB/Day	
	Ripple	±0.25 dB	
	Slope	0.05 dB/MHz	
	Image Rejection	-80 dB Inband	
External Reference		5 or 10 MHz, +3 dBm Nominal	
Group Delay	Linear Group Delay	0.03 ns/MHz	
	Parabolic Delay	0.01 ns/MHz^2	
	Group Delay Ripple	1.0 ns Peak-to-Peak	
Phase Noise	**Parameter**	**Limit (dBc/Hz)**	**Typical (dBc/Hz)**
	100 Hz	-72	-79
	1 kHz	-79	-82
	10 kHz	-89	-92
	100 kHz	-98	-101
	1 MHz	-110	-114

Characteristic		Specification
Remote Control (Rear Panel)		Comm Port EIA-485 or EIA-232
LED Indicators (Front Panel)	Power On	Green LED
	Transmit	Yellow LED
	Remote	Yellow LED
	On Line	Yellow LED
	Fault	Red LED
	Stored Fault	Red LED
Test Points (Front Panel)	RF Sample	Type 'SMA' Connector, -20 dBc Nominal
	IF Sample	Type 'BNC' Connector, -20 dBc Nominal
Power	Voltage	90-250 VAC Autoranging
	Frequency	47-63 Hz
	Dissipation	60 Watts
Environmental	Temperature	0-50°C (32-122° F)
	Altitude	10,000 Feet MSL
	Humidity	0-95% Relative
Physical	Width	19 Inches (48.26 cm)
	Height	1RU 1.75 Inches (4.44 cm)
	Depth	22 Inches(55.88 cm)
	Weight	15 Pounds (7.00 kg)
Options	-1	RF/IF Connector Module
	-2	Transmit Switch Module
Summary Alarm Relay Closure		Form C

1.4.5 UT-4518-A, /E-A Upconverters

Characteristic		Specification	
Frequency Range	UT-4518-A	17.30-18.10 GHz	
	UT-4518E-A	17.30-18.40 GHz	
	Conversion	Dual, No Inversion	
	Step Size	125 kHz	
	Preset Channels	32 Frequencies and Gains	
	Stability over Time	± 1 x 10^{-9} /Day	
	Stability over Temp	± 1 x 10^{-8} 0-50°C (32-122°F)	
RF Output	Output Level	+10 dBm at 1 dB Compression	
	Intermodulation	-38 dBc @ 0 dBm Output SCL	
	Carrier Mute	-70 dBc	
	Non-carrier Spurious	-80 dBm	
	Carrier Spurious	-65 dBc @ 0 dBm Output	
	AM to PM	0.1º. / dB for Output up to –5 dBm	
	Return Loss	20 dB Minimum with IO Module 18 dB Minimum with Switch Module	
	Impedance	50Ω	
IF Input	Noise Figure	13 dB Maximum at 0 dB Attenuation	
	Level	35 dBm Typical	
	Range	52-88 or 104-176 MHz	
	Impedance	50Ω or 75Ω	
	Return Loss	23 dB Minimum with IO Module or Switch Module	
Transfer	Gain	35 dB ± 2 dB	
	Gain Adjust	0-25 in 0.25 dB Steps	
	Gain Stability	± 0.25 dB/Day	
	Ripple	±0.25 dB/MHz	
	Slope	0.05 dB/MHz	
External Reference		5 or 10 MHz @ +3 dBm Nominal	
Group Delay	Linear Group Delay	0.03 ns/MHz	
	Parabolic Delay	0.01 ns/MHz^2	
	Group Delay Ripple	1.0 ns Peak-to-Peak	
Phase Noise	**Parameter**	**Limit (dBc/Hz)**	**Typical (dBc/Hz)**
	100 Hz	-66	-69
	1 kHz	-76	-79
	10 kHz	-86	-89
	100 kHz	-96	-99
	1 MHz	-106	-109
Remote Control (Rear Panel)		Comm Port EIA-485 or EIA-232	
LED Indicators (Front Panel)	Power On	Green LED	
	Transmit	Yellow LED	
	Remote	Yellow LED	
	On Line	Yellow LED	
	Fault	Red LED	
	Stored Fault	Red LED	

Characteristic		Specification
Test Points (Front Panel)	RF Sample	Type 'SMA' Connector, -20 dBc Nominal
	IF Sample	Type 'BNC' Connector, -20 dBc Nominal
Power	Voltage	90-250 VAC Autoranging
	Frequency	47-63 Hz
	Dissipation	60 Watts
Environmental	Temperature	0-50°C (32-122° F)
	Altitude	10,000 Feet MSL
	Humidity	0-95% Relative
Physical	Width	19 Inches (48.26 cm)
	Height	1RU 1.75 Inches (4.44 cm)
	Depth	22 Inches(55.88 cm)
	Weight	15 Pounds (7.00 kg)
Options	-1	IO Module
	-2	RF/IF Switch
Summary Alarm Relay Closure		Form C

Notes:

Chapter 2. INSTALLATION

2.1 Unpacking and Inspection

The UT-4500-A Series Upconverter 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.

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 UT-4500-A Series Upconverter 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 converter.
3	**Remove** the upconverter, 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.

The equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting the up/downconverter modules.

2.2 Installation

2.2.1 Standard Rack Mount Installation

The UT-4500-A Series Upconverter 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 converter rack installation.

The converter chassis requires 1RU (1-3/4 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).

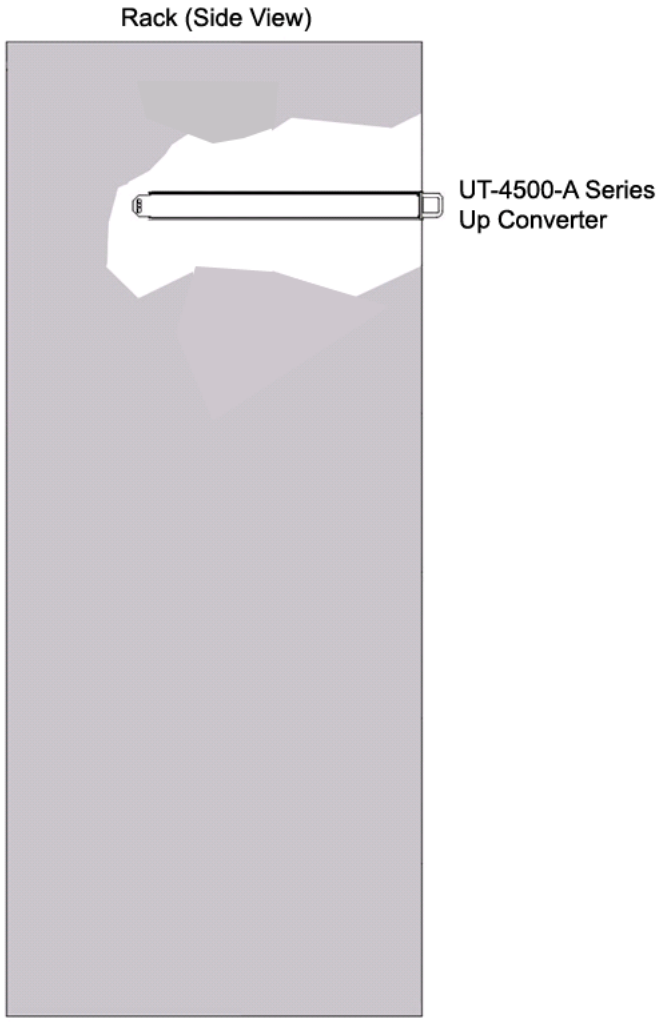


Figure 2-1. Standard Rack Cabinet Installation

2.2.2 Installation using Optional Rear-Mounting Support Brackets

Install optional rear-mounting support brackets using kits KT/6228-2 or KT/6228-3:

Quantity		Part Number	Description
KT/6228-2	KT/6228-3		
2	2	HW/10-32SHLDR	Screw, #10 Shoulder
4	4	HW/10-32FLT	Washer, #10 Flat
2	2	HW/10-32SPLIT	Washer, #10 Split
2	2	HW/10-32HEXNUT	Nut, #10 Hex
4	4	HW/10-32x1/2RK	Bolt, #10 Rack Bracket
2	–	FP/6138-2	Bracket, Rear Support – 4”
–	2	FP/6138-3	Bracket, Rear Support – 10”

The tools required for this installation are a **medium Phillips™ screwdriver**, a **5/32-inch SAE Allen™ Wrench**, and an **adjustable Crescent® wrench**.

The kit is installed as illustrated in **Figure 2-2** via the following procedure:

Step	Procedure
1	Secure the #10 shoulder screws to the unit chassis through the rear right and left side mounting slots, using the #10 flat washers, #10 split washers, and #10 hex nuts as shown.
2	Install the rear support brackets onto the equipment rack threaded rear mounting rails, using the #10 rack bracket bolts.
3	Mount the unit into the equipment rack, ensuring that the #10 shoulder screws properly engage into the slots of the rear support brackets.

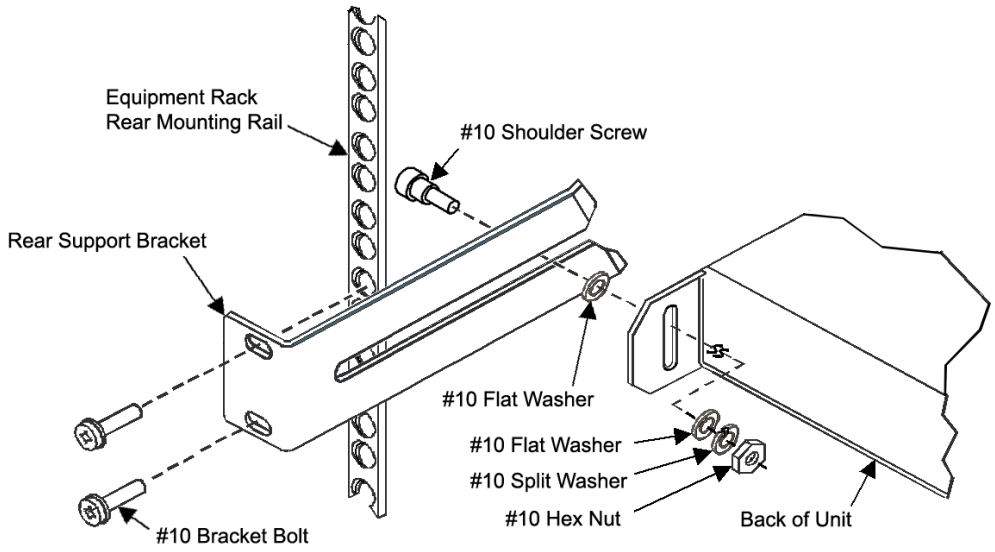


Figure 2-2. Optional Rear-Mounting Support Brackets Installation

2.2.3 Installation Using Optional Bearingless Rack Slide Sets

If the converter is to be mounted on slides, install an optional bearingless rack slide set into the rack cabinet, and onto the sides of the UT-4500-A using the hardware provided with the slide set determined to be appropriate for installation:

CEFD Part Number	Description
FP/SL0006	Bearingless Rack Slide Set – 26”
FP/SL0008	Bearingless Rack Slide Set – 24”

Per **Figure 2-3,** install any of these optional bearingless rack slide sets as follows:

Step	Procedure
1	Using the provided mounting hardware, install one slide onto each side of the UT-4500-A 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 converter into the rack cabinet until the front panel’s back surfaces abut the rack cabinet’s front mounting rails.
5	Secure the converter to the rack cabinet front mounting rails using four user-provided screws installed through the front panel mounting slots.

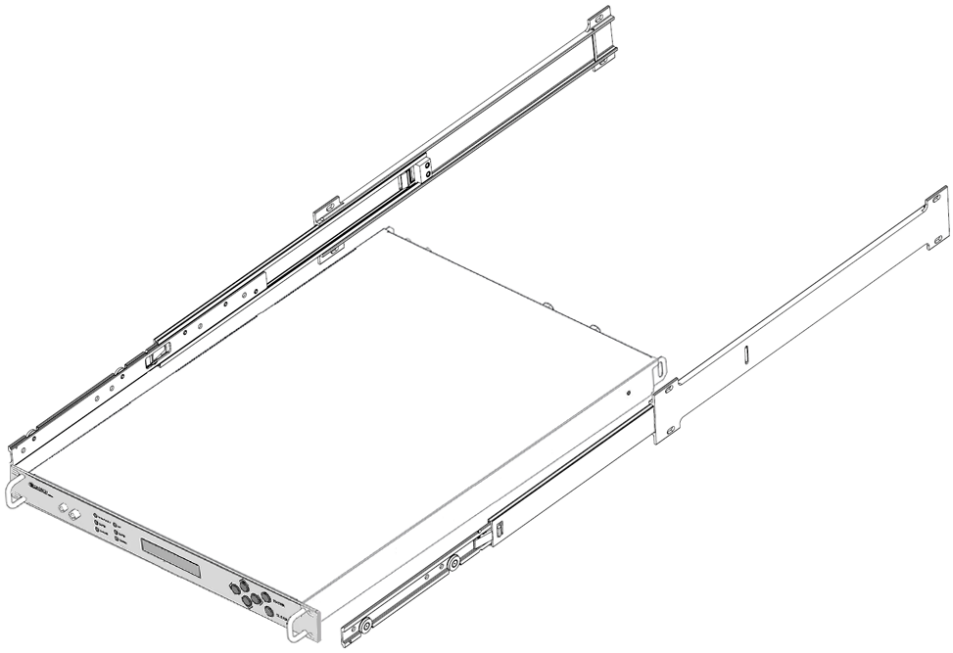


Figure 2-3. Optional Bearingless Rack Slide Installation (FP/SL000X)

2.3 Connect Prime Power Connection

The detachable power cord mates with the AC Prime power receptacle on the rear of the converter chassis. A power cord for connection to 90-125 VAC or 205-240 VAC power sources is provided with the converter.

2.4 Connect External Cables

Proceed to connect all external cables to the connectors outlined in the next chapter (**Chapter 3. REAR PANEL CONNECTIONS**). Should difficulties occur, call Comtech EF Data Customer Support for assistance.

Notes:

Chapter 3. REAR PANEL CONNECTORS

3.1 Rear Panel Overview

Figure 3-1 shows the UT-4500-A Series Upconverter rear panel and its accessible connectors. This example depicts a UT-4505-A Upconverter with a Transmit Switch Module, or TSM, installed.

Table 3-1 summarizes these connectors, which provide all necessary external connections between the upconverter and other equipment. Detailed information about each connector follows.

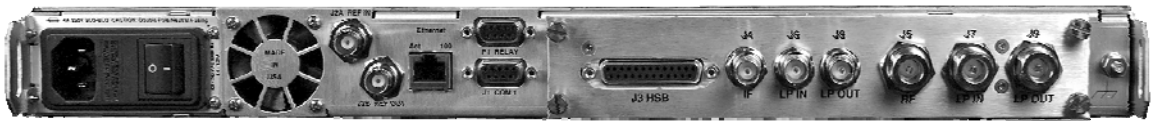


Figure 3-1. UT-4500-A Rear Panel

3.2 UT-4500-A External Connectors

Table 3-1. UT-4500-A Rear Panel External Connections

Location (Chapter Sect.)	Ref Des / Connector Name	Chapter Subsect.	Description
MAIN CHASSIS (3.2.1)	Prime Power	3.2.1.1	AC Prime Power Input (AC POWER)
		3.2.1.2	Optional –48 VDC Prime Power Input (DC POWER)
	J2A REF IN	3.2.1.3	External Reference Oscillator Input
	J2B REF OUT	3.2.1.4	Optional External Reference Oscillator Output
	Ethernet	3.2.1.5	100BASE-TX Ethernet Management & Control port (Telnet, SNMP)
	P1 RELAY	3.2.1.6	Summary Fault Output
	J1 COM1	3.2.1.7	Serial Communications Interface for EIA-485/232 COMM links
MODULE (3.2.2)	J3 HSB	3.2.2.1	High Speed Bus
	J4 | IF	3.2.2.2	Converter IF Input
	J6 | LP IN		IF TSM Switching Loop Input
	J8 | LP OUT		IF TSM Switching Loop Output
	J5 | RF		Converter RF Output

3.2.1 Chassis-mounted Connectors

3.2.1.1 IEC Line Input (AC Power) Connector

The IEC line input connector contains the ON/OFF switch for the unit. It is also fitted with two fuses, one each for line and neutral connections (or L1, L2, where appropriate). These are provided within the body of the connector, behind a small plastic flap.

A standard, detachable, non-locking, 3-prong power cord (IEC plug) supplies the Alternating Current (AC) power to the UT-4500-A.

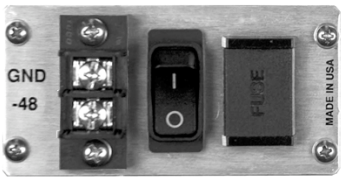
Observe the following:

AC Power Specifications	
Input Power	75W maximum, less than 65W typical
Input Voltage	90-260VAC
Connector Type	IEC-320
Fuse Protection	Use T2.0A (slow-blow) 20mm fuses.

IMPORTANT

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

3.2.1.2 DC Power Connector (Optional)



A standard 2-circuit terminal block with switch and fuse holder supplies the optional Direct Current (DC) power to the UT-4500-A.

Observe the following:

DC Power Specifications	
Input Power	75W maximum, less than 65W typical
Input Voltage	36 to 72 VDC
Connector Type	Terminal Block
Fuse Protection	Use 3.15A (slow-blow) 20mm fuses.

IMPORTANT

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

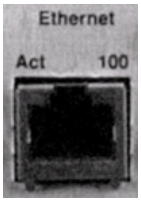
3.2.1.3 J2A | REF IN, External Reference Input Connector (BNC-F)

The **J2A REF IN (External Reference Input)** connector is a 'BNC' female 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 10MHz reference oscillator to a customer-provided 5 or 10 MHz station clock. The impedance is matched for 50/75Ω, and requires an input level of 0 ±5 dBm.

3.2.1.4 J2B | REF OUT, External Reference Output Connector (BNC-F)

The optional **J2B REF OUT (External Reference Output)** connector is a 'BNC' female connector that provides a 10 MHz reference for customer use. The impedance is matched for 50/75Ω, and provides an output level of 5 ±3 dBm.

3.2.1.5 100BASE-TX Ethernet M&C Port (RJ-45)



This is a standard RJ-45 female connector used for management via Telnet, SNMP, and HTTP (future). It is also used for upgrading UT-4500-A firmware. This receptacle uses a UTP cable to connect to an Ethernet hub, router, switch, PC, etc. The pinout specifications are provided in **Table 3-2**.

Table 3-2. Ethernet M&C Interface Connector Pinout

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

3.2.1.6 P1 RELAY, Summary Fault Output Connector (DB-9F)

The summary fault output connector, P1, is 9-pin Type "D" (DB-9F) connector. The mating connector is a DB-9M connector. The pinout specifications are provided in **Table 3-3**.

Table 3-3. P1 – Summary Fault Connector Pinout

Pin #	Description	Notes
1	Summ ary Fault NC	1. Pin 1 to Pin 6: Fault 2. Pin 2 to Pin 6: OK (No Fault) 3. Pin 7 to Pin 5: Forced Fault (typically used with external group delay equalizers)
2	Summary Fault NO	
3		
4		
5	Ground	
6	Summary Fault COM	
7	EXT_FLT_IN#	
8		
9		

3.2.1.7 J1 COM1 EIA-485/232 Interface Connector (DB-9F)

The **J1 COM1** EIA-485/EIA-232 Interface connector is a 9-pin Type "D" female (DB-9F) connector. The mating connector is a DB-9M connector. The pinout specification for EIA-485 is provided in **Table 3-4** (2-wire) and **Table 3-5** (4-wire); the specification for EIA-232 is provided in **Table 3-6**.

Table 3-4. J1 – 2-Wire EIA-485 Pinout

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

Note: Pins 8 and 9 are the loop to the next upconverter

Table 3-5. J1 – 4-Wire EIA-485 Pinout

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

Table 3-6. J1 – EIA-232C Pinout

Pin #	Description
1	
2	TD; Transmit Data
3	RD; Receive Data
4	
5	GND; Ground
6	
7	
8	
9	

3.2.1.8 Chassis Ground Connector

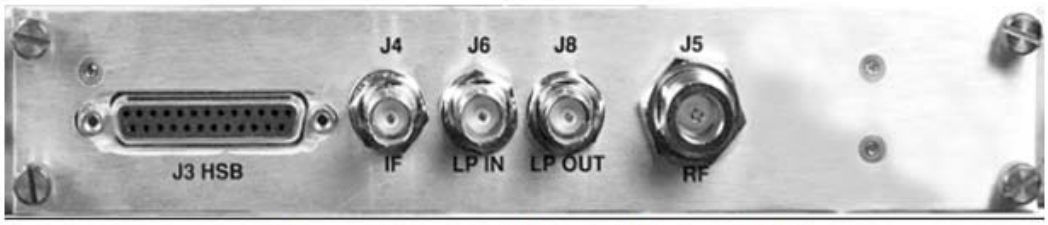
A #10-32 stud is used for connecting a common chassis ground among equipment.

Note: The AC power connector provides the safety ground.

3.2.2 Module-mounted Connectors

The information that follows pertains to the connectors provided on the available switch modules (e.g., I/O Module (IOM), Receive Switch Module (RSM), and Transmit Switch Module (TSM)). Quick reference tables listing all available modules are provided in **Section 3.2.2.2**.

Input/Output Switch Module (IOM)



Receive Transmit I/O Switch Module (RSM)

Transmit I/O Switch Module (TSM)

Figure 3-2. IOM, RSM, and TSM Switch Modules

3.2.2.1 J3 HSB (High Speed Bus) Connector (DB-25F)

The **J3 HSB** connector is a Type "D" 25-pin female (DB-25F) connector is provided on all switch modules. The mating connector is a DB-25M connector. The pinout specifications are provided in **Table 3-7**.

Note: This connection does not employ a "straight-through" cable assembly. Contact Comtech EF Data for detailed wiring drawings when cabling between converters.

Table 3-7. J3 HSB Interface Connector Pinout

Pin #	Description
1	Cntl_12
2	Cntl_10
3	Cntl_8
4	Cntl_6
5	Cntl_4
6	Cntl_2
7	Cntl_In
8	+14V Out
9	+14V In
10	Aux_3
11	Aux_1
12	-Rx/Tx
13	GND
14	Cntl_11
15	Cntl_9
16	Cntl_7
17	Cntl_5
18	Cntl_3
19	Cntl_1
20	+14V Out
21	+14V In
22	GND
23	Aux_2
24	GND
25	+Rx/Tx

3.2.2.2 Switch Module IF, RF, and Loop Connectors

The IF and RF input and output connectors, and the Loop input and output connector types vary depend on the band and impedence of the purchase unit. Modules are available for both non-redundant (also referred to as single thread or standalone) and redundanct configurations (see **Appendix B. REDUNDANT SYSTEM OPERATION** for the specific use of these various switch module).

The tables that follow provide a quick reference to the available switch modules and their switching type, operating band, connector type, etc. for the UT-4500-A Series of Upconverters as well as the DT-4500-A Series of Down Converters. Contact Comtech EF Data for details and specifications for the specific system module(s).

Table 3-8. DT-4500-A and UT-4500-A Available Switch Module Assemblies

IOM Assemblies		
CEFD P/N	**Impedance**	**Comments**
AS/0101-1	75	I/O, Type 'SMA'
AS/0101-2	75	Non-switching, C-Band
AS/0101-9	50	Non-switching, C-Band
AS/0101-15	50	I/O, Type 'SMA'
AS/0101-19	75	UT-4518-A w/isolator, Type 'SMA'
AS/0101-21	50	UT-4518-A w/isolator
AS/0101-23	75	UT-4514F-A w/isolator, Type 'SMA'
AS/0101-29	50	UT-4514F-A w/isolator, Type 'SMA'
AS/0101-39	50	w/isolator, Type 'SMA'
AS/0101-40	75	w/isolator

RSM Assemblies		
CEFD P/N	**Impedance**	**Comments**
AS/0101-4	75	Switching, Ku-Band, down
AS/0101-6	75	Switching, C-Band, Type 'N'
AS/0101-7	50	Switching, C-Band, Type 'N'
AS/0101-16	50	I/O, Type 'SMA'
AS/0101-20	75	Receive Switch, C-Band, RSM2
AS/0101-26	50	RSM2, Type 'N'
AS/0101-37	50	w/isolator, Type 'SMA'
AS/0101-38	75	w/isolator

TSM Assemblies		
CEFD P/N	**Impedance**	**Comments**
AS/0101-3	75	Switching, Ku-Band, up
AS/0101-5	75	Switching, C-Band, up, Type 'N'
AS/0101-8	50	Switching, C-Band, up
AS/0101-17	50	Switching, IF & RF, Type 'SMA'
AS/0101-18	75	Switching IF & RF w/isolator
AS/0101-22	75	UT-4514F-A w/isolator, Type 'SMA'
AS/0101-27	50	UT-4514F-A w/isolator, Type 'SMA'
AS/0101-28	50	UT-4518-A w/isolator, Type 'SMA'
AS/0101-42	75	DT-4513-A w/isolator, Type 'SMA'
AS/0101-43	50	UT-4514F-A w/isolator

PSM Assemblies		
CEFD P/N	**Impedance**	**Comments**
AS/0101-10	75	Switching, Type 'N'
AS/0101-11	75	Switching, Type 'SMA'
AS/0101-24	50	RF Switching, Type 'N'
AS/0101-30	50	Type 'SMA'
AS/0101-35	50	Type 'SMA' w/isolator
AS/0101-36	75	Type 'SMA' w/isolator

EQM Assemblies		
CEFD P/N	**Impedance**	**Comments**
AS/0101-13	75	EQM for 1:1, C- and Ku-Bands
AS/0101-25	50	1:N IF & RF Switch, Type 'SMA'
AS/0101-31	75	UT-4514F-A w/isolator
AS/0101-32	50	UT-4514F-A w/isolator
AS/0101-33	75	UT-4518F-A w/isolator
AS/0101-34	50	UT-4518F-A w/isolator
AS/0101-41	50	1:1 Switching

3.3 Cable Connections

Connect the signal cables to the connectors on the rear panel as shown in **Figure 3-3.** The cable signal functions are listed in **Table 3-1**; see **Section 3.2** for detailed information about each connector.

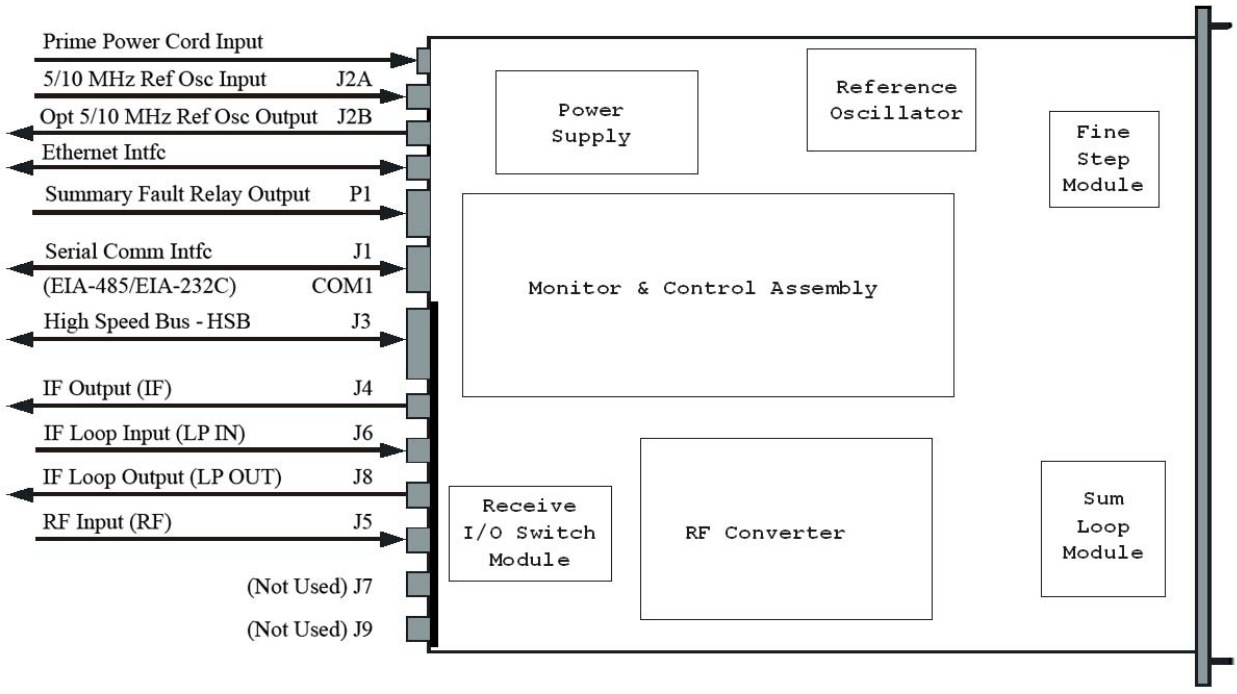


Figure 3-3. UT-4500-A Rear Panel (UT-4505-A with Receive Switch Module [RSM-XX] Shown)

3.3.1 Cable Connections – Standalone (Non-Redundant) Operation

In non-redundant (also referred to as standalone or single thread) upconverter configurations the upconverter has an Input/Output Module (IOM-XX) for the RF Input and the IF Output. An upconverter with a Transmit Switch Module (TSM-XX) may be operated in a non-redundant configuration if an IOM is unavailable.

Figure 3-4 shows a non-redundant configuration using with an IOM installed; **Figure 3-5** shows cabling accomplished with a TSM installed.

3.3.2 Cable Connections – Redundant System Operation

In subsystems where a redundant upconverter configuration is used, the backup upconverter has an Input/Output Module (IOM-XX) and the online converters have Transmit Switch Modules (TSM-XX), which switch to the backup upconverter when a fault is detected. See **Appendix B. REDUNDANT SYSTEM OPERATION** for a discussion of the upconverter's use in redundant applications.

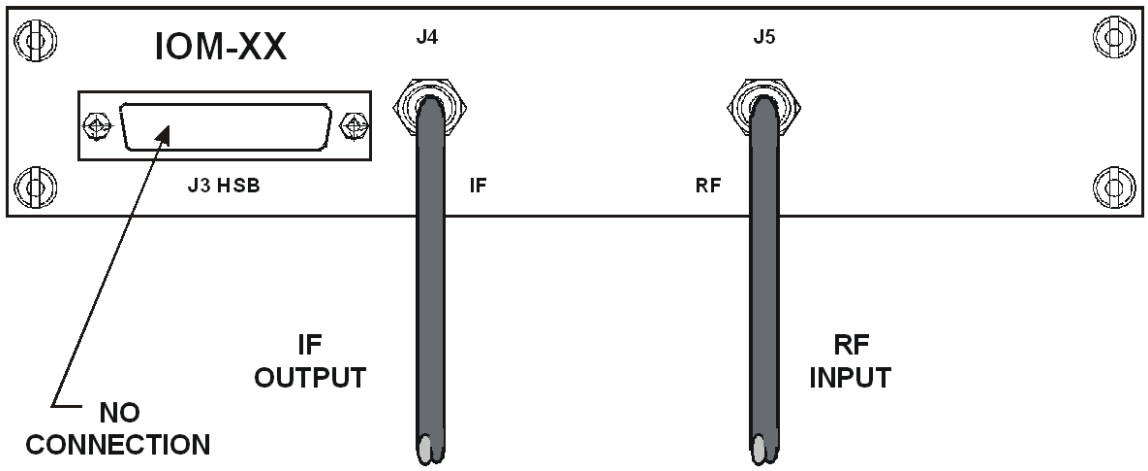


Figure 3-4. Standalone (Non-Redundant) Upconverter Configuration

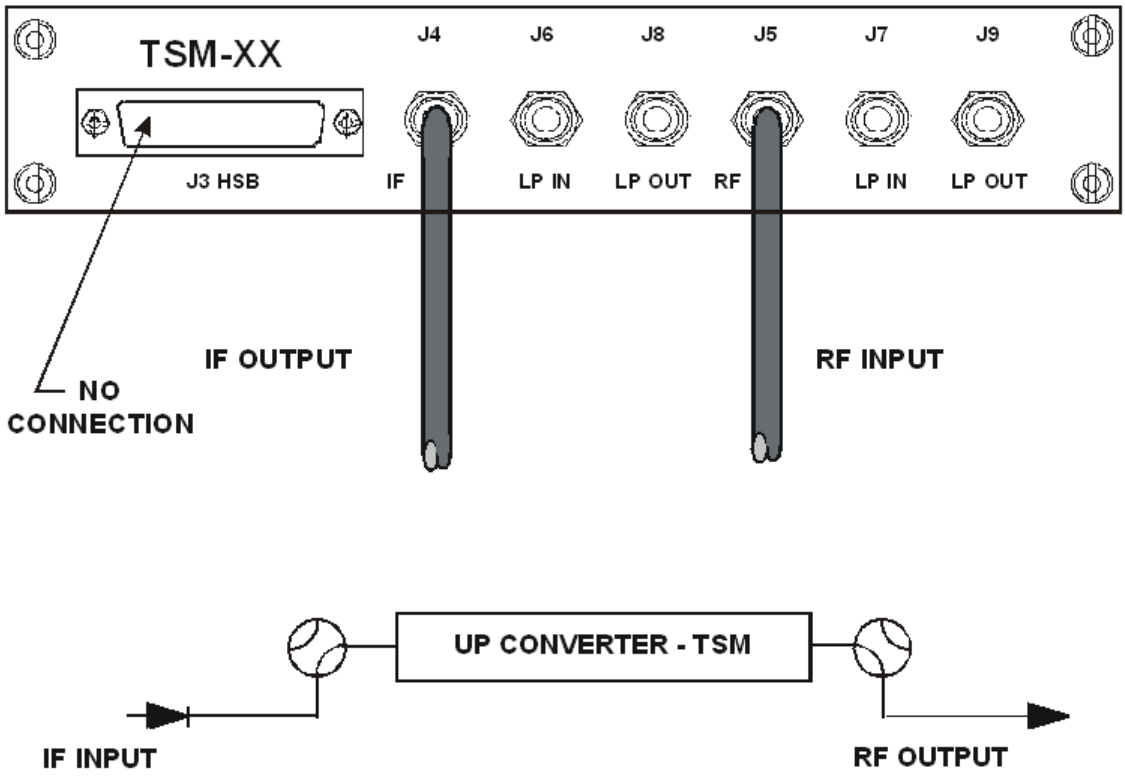


Figure 3-5. Standalone (Non-Redundant) Upconverter Configuration with Transmit Switch Module (TSM-XX) Installed

Notes:

Chapter 4. FLASH UPGRADING

4.1 Introduction

The UT-4500-A Series Upconverters use 'Flash memory' technology internally. This makes software upgrading very simple, and updates can now be sent over satellite, via 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 UT-4500-A by simply connecting the unit to the Ethernet or serial port of the external PC.
- The firmware update is transferred, via File Transfer Protocol (FTP), from the external PC to the UT-4500-A.

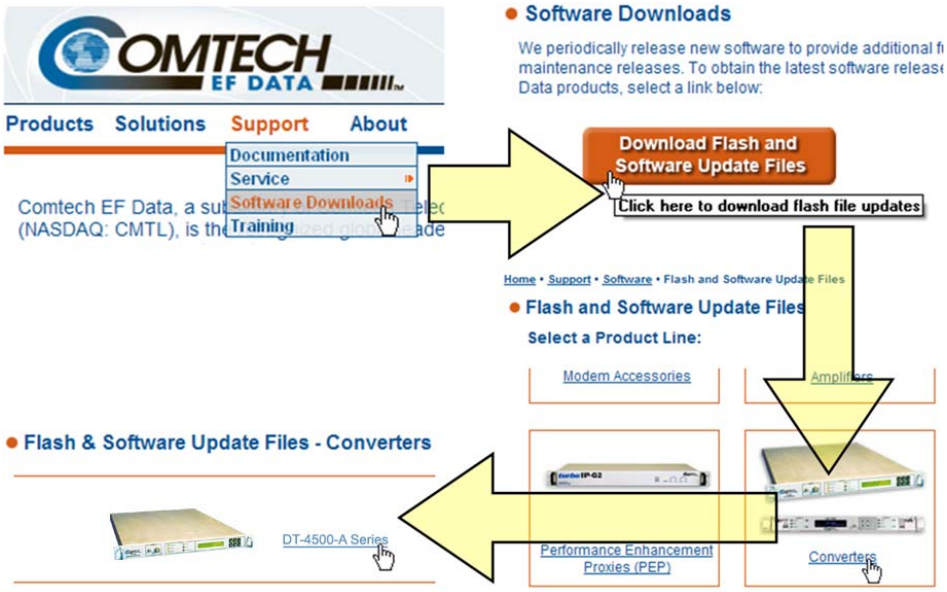


Figure 4-1. Flash Upgrade via Internet

4.2 About Firmware Files, Naming, Versions and Formats

All CEFD products are shipped configured with the current version firmware release. Firmware upgrades may be obtained from Comtech EF Data via download from the Internet to an external PC, via e-mail, or on CD.

Comtech EF Data's Web site catalogues its firmware upgrade files by product type (e.g., modem, converter, etc.) and specific model/optional configuration. For the purpose of example, the ***F0000202x_V###*** firmware download is specified in the procedural that follows, where '**x**' denotes the revision letter, and **V###** represents the firmware version.

The firmware download files are available from Comtech EF Data in two file 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. If applicable, one version prior to the current release is also available for download.

4.3 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 **UTILITY → FIRMWARE→ INFO → IMAGE#1** *or* **IMAGE#2** menu branches. Using serial remote control, the firmware revision levels may be obtained with the **<1/FRM?** query. For more information, refer to **Appendix A. REMOTE CONTROL.**
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 later than Windows 98*** – Type "**cmd**" *or* "**command**". o ***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).

Step	Procedure
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 **UT-4500-A Series** product hyperlink; g) **Select** the appropriate UT-4500-A Series Product 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 UT-4500-A firmware archive file hyperlink is **F0000202x_V###** (where **'x'** denotes the revision letter, and **V###** denotes the firmware version number). 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-0000202x.bin** – the bulk firmware file; b) **ReleaseNotes_DT4500A_V###.pdf**, or a similarly-titled file, where '**V###'** 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 UT-4500-A's 10/100 Ethernet M&C 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 UT-4500-A Front Panel: • **Via Remote Control** – Use the **<1/IPA?** command • **Via Front Panel** – Use the **CONFIG → REMOTE → ETHERNET → ADDRESS → 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.

Step	Procedure
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 UT-4500-A. 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-0000202x.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 UT-4500-A front panel menu: **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 UT-4500-A front panel, for example: **DT_4500- 2** **SW VER #.## 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

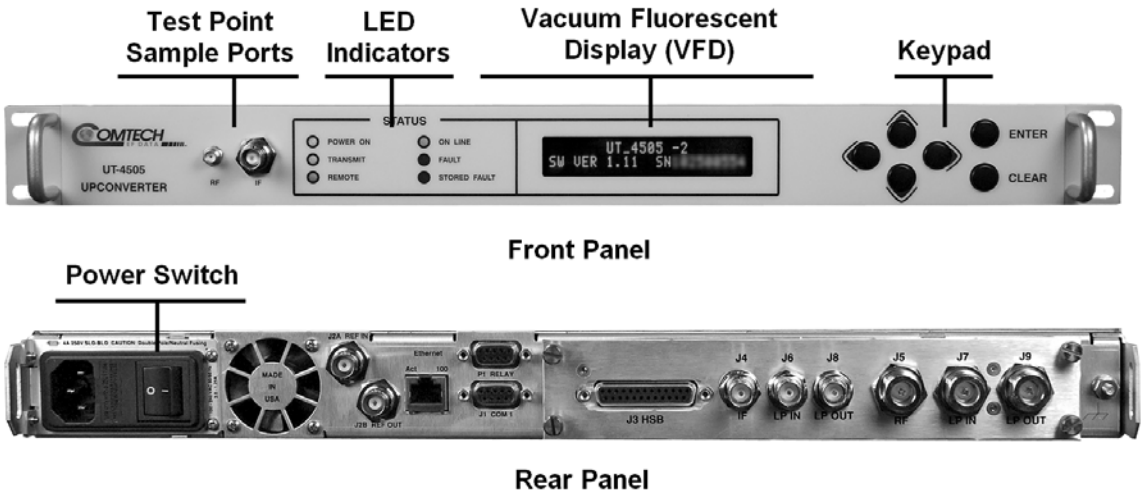


Figure 5-1. UT-4500-A Front and Rear Panel Views

Figure 5-1 identifies the key operational features of the front and rear panels of the UT-4500-A Series Upconverter. This example depicts a UT-4505-A equipped with a Transmit Switch Module, or TSM.

The front panel features (from left): Two Test Point Sample Ports, Six Light-Emitting Diode (LED) Indicators, a Vacuum Fluorescent Display (VFD); and a six-button keypad.

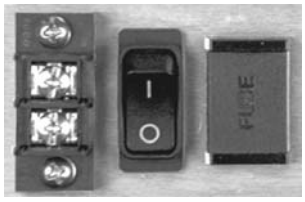
The Prime Power Switch, located on the rear panel, is an integral component of the IEC Line Input (AC Power) Connector.

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 use the keypad and display to fully control and monitor the operation of the UT-4500-A from the front panel. The user enters data via the keypad, and messages are displayed on the VFD. Nested menus display

all available options and prompt the user to carry out a required action. The LEDs indicate, in a summary fashion, the status of the unit.

5.1.1 Switch Power On (Rear Panel)

UT-4500-A AC Power Switch (Standard)



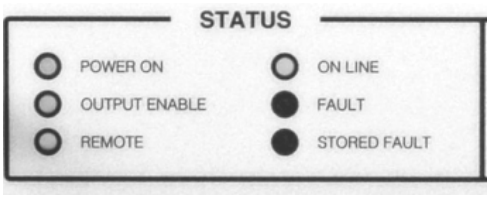
UT-4500-A DC Power Switch (Optional)

Prior to turning on power to the unit, check to ensure that installation is complete, and verify that the UT-4500-A is connected to the proper prime power source, RF Input, and IF Output.

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

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

5.1.2 LED Indicators



The following table defines the operational condition, when lit, of the six front panel LED indicators:

LED	Color	Operational Condition (When Lit)
POWER ON	**Green**	Prime power is applied when the light is on.
OUTPUT ENABLE	**Yellow**	Transmit function operating when the light is on.
REMOTE	**Yellow**	In Remote Control Mode when the light is on.
ON LINE	**Yellow**	Operating on-line to transmit data when the light is on.
FAULT	**Red**	Fault condition exists when the light is on.
STORED FAULT	**Red**	Faults stored and logged when the light is on.

5.1.3 Keypad

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

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

The **CLEAR** key is used to back out of a selection or to cancel a configuration change which has not been executed since **ENTER** was last pressed. Pressing **CLEAR** generally returns the display to the previous selection.

(Up, Down)

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.

(Left, Right)

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.

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 UT-4500-A 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 1 hour. The top line of the display 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

```
        UT_45XX -X
SW VER X.X.X  SNXXXXXXXXX
```

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 upconverter model number – e.g., 'UT_4505 - 2' – 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 UT-4500-A menu structure by pressing the **CLEAR** key repeatedly**.** Otherwise, press any key to access the main menu.

5.3 Main Menu

```
CONFIG  MONITOR  FAULTS
 PRE-SELECTS  UTILITY
```

The upconverter command menus are provided in a structured tree format designed for logical access and execution of all control functions, and to prevent the execution of an invalid entry by the operator.

The following table identifies each menu branch available from the main menu, its content section in this chapter, and the functional description of each branch:

Menu Branch	Sect	Description
CONFIG	**5.3.1**	**(Configuration)** Allows full configuration of the UT-4500-A.
MONITOR	**5.3.2**	Allows the real-time monitoring of system voltages, unit temperature, IFLO tuning, and Synth tuning,
FAULTS	**5.3.3**	The upconverter displays a total of one hundred (100) faults, which are date and time stamped and stored in memory as they occur. The stored faults remain in memory until a clear command is entered. When the number of faults reaches 100, the 100th fault will display **ER**.
PRE-SELECTS	**5.3.4**	Allows configuration and recall of up to 32 pre-set operating selections.
UTILITY	**5.3.5**	Allows configuration of such system functions as the Real-Time Clock, VFD brightness, unit ID, and firmware loading preferences.

Use the ◄ ► arrow keys to select **CONFIG**, **MONITOR, FAULTS**, **PRE-SELECTS**, or **UTILITY**, and then press **ENTER**.

5.3.1 CONFIG (Configuration)

```
OUTPUT REMOTE REDUNDANCY
FAULTRECOVERY COLDSTART
```

Use the ◄ ► arrow keys to select from the submenu choices shown, and then press **ENTER**. Note the following:

Submenu	Sect	Functional Description
OUTPUT	**5.3.1.1**	Allows user to define output frequency, attenuation, and set Rx operations as on or off.
REMOTE	**5.3.1.2**	**(Remote Control)** Allows definition of whether the unit is being controlled locally or remotely, and identifies the unit address, interface type, and rate and format of the baud parameters.
REDUNDANCY	**5.2.1.3**	**(Redundancy)** Permits the user to identify the redundancy state and mode (refer to **Appendix B. UT-4500-A REDUNDANCY OPERATION** for further information).
FAULTRECOVERY	**5.3.1.4**	Allows configuration of Fault Recovery in *Auto* or *Manual* mode.
COLDSTART	**5.3.1.5**	Allows user to mute the upconverter output signal for a pre-determined time after power is applied to the upconverter to ensure that the reference oscillator is stable.

5.3.1.1 CONFIG: OUTPUT

```
Frq=14500.000 MHz
Atten=00.00 dB  Tx = Off
```

Typical for each parameter, use the ◄ ► arrow keys to first navigate to a parameter to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit or setting.

Freq (Frequency): Displays the current upconverter frequency in MHz, and allows the selection of a new frequency channel between RF_{Low} to RF_{High} MHz in 125 KHz steps.

Atten (Attenuation): Displays the upconverter attenuation setting, and allows the selection of a new setting from 0.00 to 25.00 dB in 0.25 dB steps. The default setting is 10.00 dB.

Tx: Use the ▲ ▼ arrow keys to set upconverter operation as **On** or **Off**. The default mode is **Off**.

Press **ENTER** when done.

5.3.1.2 CONFIG: REMOTE (Remote Control)

```
Remote Control: Local
SERIAL  ETHERNET
```

Use the ◄ ► arrow keys to select **Local, SERIAL**, or **ETHERNET**, and then press **ENTER**.

CONFIG: Remote Control → Local

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

CONFIG: Remote Control → SERIAL

```
Serial Mode = RS-232
Addr=001 Baud=9600 8-N-1
```

On the top line: To set the Serial Mode, use the ▲ ▼ arrow keys to select **RS-232** or **RS-485,** and then press **ENTER**.

On the bottom line: To edit the Serial address, first use the ◄ ► arrow keys to navigate to the digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. The valid range of addresses is from **001** (default) to **255**.

To edit the Baud Rate, first use the ◄ ► arrow keys to navigate to the parameter, and then use the ▲ ▼ arrow keys to select a different baud rate. Available choices are **1200**, **2400**, **4800**, **9600** (default), **19K2**, and **38K4**.

To edit the asynchronous character format, first use the ◄ ► arrow keys to navigate to the parameter, and then use the ▲ ▼ arrow keys to select a different format. Available choices (i.e., number of data bits; odd, even, or no parity; number of stop bits) are **8-N-1**, **7-E-2**, or **7-O-2**.

Press **ENTER** when done.

CONFIG: Remote Control → ETHERNET

```
  ADDRESS GATEWAY SNMP
MAC = 00-06-B0-00-00-0F
```

On the bottom line: The unit MAC address is displayed here. This ***read-only*** menu shows the. Once the MAC address has been noted, exit this menu by pressing **ENTER** or **CLEAR.**

On the top line: Use the ◄ ► arrow keys to select the parameter to configure – **ADDRESS**, **GATEWAY**, or **SNMP** – and then press **ENTER** to continue.

CONFIG: Remote Control → ETHERNET → ADDRESS

```
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, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

CONFIG: Remote Control → ETHERNET → GATEWAY

```
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, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

CONFIG: Remote Control → ETHERNET → SNMP

```
   COMMUNITIES  TRAPS
```

Use the ◄ ► arrow keys to select the parameter to configure: **COMMUNITIES** or **TRAPS**.

CONFIG: Remote Control → ETHERNET → SNMP → COMMUNITIES

```
SNMP Communities:
    READ  WRITE  TRAP
```

Use the ◄ ►arrow keys to select **READ**, **WRITE**, or **TRAP,** and then press **ENTER**.

CONFIG: Remote Control → ETHERNET → SNMP → COMMUNITIES →READ

```
Read Community:
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, and then use the ▲ ▼ arrows keys to edit that character. Press **ENTER** when done.

CONFIG: Remote Control → ETHERNET → SNMP → COMMUNITIES →WRITE

```
Write Community:
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, and then use the ▲ ▼ arrows keys to edit that character. Press **ENTER** when done.

CONFIG: Remote Control → ETHERNET → SNMP → COMMUNITIES →TRAP

```
Trap Community:
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, and then use the ▲ ▼ arrows keys to edit that character. Press **ENTER** when done.

CONFIG: Remote Control → ETHERNET → SNMP → TRAPS

```
TRAPIP1 TRAPIP2 VERSION
IP1 IP2 Version
```

Use the ◄ ► arrow keys to select **TRAPIP1**, **TRAPIP2**, or **VERSION**, and then press **ENTER**.

CONFIG: Remote Control → ETHERNET → SNMP → TRAPS → TRAPIP1/TRAPIP2

```
TRAP IP ADDRESS #1:
 000.000.000.000
```

```
TRAP IP ADDRESS #2:
 000.000.000.000
```

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

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

CONFIG: Remote Control → ETHERNET → SNMP → TRAPS → VERSION

```
Trap Version:
     SNMPv1  SNMPv2
```

Use the ▲ ▼ arrow keys to select the trap version – **SNMPv1** or **SNMPv2** – and then press **ENTER**.

5.3.1.3 CONFIG: REDUNDANCY

1:1 Redundancy is an optional feature for the UT-4500-A. If the user attempts to select any feature from this menu branch, and either Redundancy Configuration is ***off*** or the upconverter is the primary operating unit, the Redundancy menu branch appears as follows:

```
Redundancy: MODE
```

Otherwise:

```
Redundancy: MODE
Auto/Manual FORCE HSB
```

Use the ◄ ► arrow keys to select **MODE**, **Auto/Manual**, **FORCE**, or **HSB (High Speed Bus),** and then press **ENTER**.

Note: If any submenu is selected from this menu branch when the unit is not in **Local Mode** (i.e., the unit is in either Serial or Ethernet Remote Mode), the system prompts the user to switch or Local Mode as follows:

```
Remote Mode: press ENTER
for local mode, or CLEAR
```

Operations may continue once **Local Mode** is established.

CONFIG: REDUNDANCY → MODE

```
Redundancy Config = On
CONVERTER = #BU   1:01
```

On the top line: First, use the ◄ ► arrow keys to navigate to the **Redundancy Config** setting, and then use the ▲ ▼ arrow keys to set operation as **On** or **Off.**

On the bottom line: First, use the ◄ ► arrow keys to navigate to the Converter Selection setting, and then use the ▲ ▼ arrow keys to toggle the upconverter operational preference as **#BU** or **#01**. Note the following:

- With **CONVERTER = #BU**, the unit is set as the *standby*, or *backup* unit. This mode of operation is indicated on the right-hand side of the bottom line as **1:01**.

- With **CONVERTER = #01**, the unit is set as the primary operating unit. The mode of operation is indicated on the right-hand side of the bottom line as **POL=1**.

CONFIG: REDUNDANCY →Auto/Manual

```
CONVERTER 123456789ABC
AUTO/MAN  A----------
```

Use this submenu to define backup as **Automatic** or **Manual**. This command provides for automatic switching by the backup upconverter if both units are in the Redundancy Mode. This command is only accepted by the backup upconverter. If a chain upconverter is set in Manual Mode, the backup upconverter will log the occurrence and not act upon further information from the upconverter until put into Automatic Mode.

On the top line: The unit in use and its Application ID (identification label) are displayed here.

On the bottom line: First, use the ◄ ► arrow keys to navigate to the **AUTO/MAN** setting, and then use the ▲ ▼ arrow keys to set toggle switchover as **A** (Automatic) or **M** (Manual).

CONFIG: REDUNDANCY →FORCE

```
CONV 01 OFFSET=+00.00 DB
ACTIVATE BACKUP = NO
```

On the top line: First, use the ◄ ► arrow keys to navigate to the **OFFSET** operational threshold setting (i.e., the limit defined to automatically trigger switchover to the backup unit), and then use the ▲ ▼ arrow keys to set that value in 0.25 dB increments.

On the bottom line: First, use the ◄ ► arrow keys to navigate to the **ACTIVATE BACKUP** setting, and then use the ▲ ▼ arrow keys to set toggle switchover as **NO** (i.e., no backup will occur at the defined operational threshold), or **FORCE** (i.e., switchover will take place automatically if operation exceeds the predefined operational threshold.

Note that this submenu is operational only with a backup unit assigned, and with the switchover set as **Automatic.** In the absence of a designated backup unit and/or switchover set as Manual, the following message displays:

```
   NO UNITS CURRENTLY
 BACKED UP OR IN MANUAL
```

Press **ENTER** or **CLEAR** to return to the previous menus, and then reconfigure the system to operate as intended.

CONFIG: REDUNDANCY →HSB

```
  CONV# 01  FRQ= 3625.000
ATTN=00.00  AUTO    OK
```

In the "Daisy Chain" configuration, the backup upconverter communicates with the online units through the high-speed interface bus (HSB). The backup upconverter is able to detect faults and reconfigure itself to replace the faulted upconverter. The HSB interface is also

used in the backup Upconverter to monitor configuration changes made to an online upconverter. Changes in frequency, gain, or polarity are immediately entered into the backup table as well as information from new online units. The high-speed bus does not interfere with the remote serial communication link access to any of the converters in the chain.

The HSB (High Speed Bus) submenu is used to configure operation of the J3 HSB connector provided on the optional Receive Switch Module (RSM) and Transmit Switch Module (TSM). When an RSM or TSM is not configured for operation, the following message displays:

```
CONV #01 – NO DATA
  HSB NO RESPONSE
```

Press **ENTER** or **CLEAR** to continue.

See **Appendix B. REDUNDANT SYSTEM OPERATION** for detailed information about use of the front panel menus for redundancy configuration and operation.

5.3.1.4 CONFIG: FAULTRECOVERY

```
Fault Recovery: Auto
```

Use the ▲ ▼ arrow keys to select Fault Recovery as **Manual** or **Automatic**, and then press **ENTER**. The default operation is **Auto**.

5.3.1.5 CONFIG: COLDSTART

```
Cold Start = Disabled.
```

When redundancy is *not* active, use the ▲ ▼ arrow keys to select Cold Start as **Enabled** or **Disabled**, and then press **ENTER**. The default operation is **Disabled**.

Cold Start Mode, if enabled, mutes the upconverter output signal for a pre-determined time after power is applied to the upconverter – 15 minutes – to ensure that the reference oscillator is stable.

Note the following:

- The user must be in **Local** or **Remote Mode** to use this command. (Default is **Remote**.)
- This function is **disabled** in redundant systems.

5.3.2 MONITOR

Three *read-only* information screens are provided to monitor a number of operating voltage, temperature and tuning parameters. Use the ▲ ▼ arrow keys to page between screens.

The following examples are provided for informational purposes only – the data displayed here for each parameter will vary depending on the operating conditions for the system in use:

```
15VDC=15.6V 14VDC=14.0V ▲
VCC=0.5V  5VDis=0.50V   ▼
```

```
Converter Temp = +30.0C ▲
    IFLO Tuning = 0.38V ▼
```

```
Synth Tuning: Sum=0.32V ▲
Coarse=06.0V Fine=03.5V ▼
```

Press **ENTER** or **CLEAR** to continue.

5.3.3 FAULTS

```
   CURRENT     STORED
```

Use the ◄ ► arrow keys to select **CURRENT** or **STORED**, and then press **ENTER**.

5.3.3.1 FAULTS: CURRENT

Four *read-only* information screens are provided to monitor a number of operating parameters and return back whether the parameters are OK – i.e., operating within normal ranges, or **FT** – i.e., currently faulted. Use the ▲ ▼ arrow keys to page between screens.

The following examples are provided for information purposes only – the data displayed here will vary depending on the operating conditions for the system in use:

```
 Power Faults: 15VDC=OK ▲
       14VDC=OK VCC=OK  ▼
```

```
  IFLO Lock Detect = OK ▲
                        ▼
```

```
Synth Faults: SumLD=OK  ▲
FineLD=OK  CoarseLD=OK  ▼
```

```
 Conv Temperature = OK ▲
  High Speed Bus = OK  ▼
```

Press **ENTER** or **CLEAR** to continue.

5.3.3.2 FAULTS: STORED (Stored Faults Log)

```
     VIEW  CLEAR-ALL
```

Use the ◄ ► arrow keys to select **View** or **Clear-All**, and then press **ENTER**.

FAULTS: STORED →VIEW

If **View** is selected and no faults exist, the system displays the following message:

```
No Stored Faults.
```

The faults log can store up to **100** faults. When a fault condition occurs, it is date- and time-stamped, and stored in the faults log with a number assigned in the order received. The fault information displays as per the following example:

```
Log05 01/23/11 09:27:15▲
 Fault – HSB           ▼
```

When the fault condition clears, this is also recorded in the same fashion as the fault was originally recorded, as shown per the following example:

```
Log09 01/23/11 10:45:35▲
 Clear – HSB           ▼
```

The stored faults remain in memory until the **CLEAR-ALL** command is entered. When the number of faults reaches 100, the 100th fault will display **ER**.

The user may use the ▲ ▼ arrow key to scroll backwards or forwards through the faults log.

Press **ENTER** or **CLEAR** to return to the previous menu.

FAULTS: STORED →CLEAR-ALL

```
Clear All Stored Faults
No  Yes
```

Use the ◄ ► arrow keys to choose **No** or **Yes** as prompted, and then press **ENTER**.

If **Yes** is selected, the faults log is cleared and the user is returned to the previous menu. However, if there are faults present on the unit at this time, they will be re-stamped and new log entries will be generated.

5.3.4 PRE-SELECTS

```
#03 LOAD PROGRAM CLEAR ▲
```

```
03625.125 MHz 01.25 dB ▼
```

The user may create (program) up to 32 operating configurations, and recall them as needed. If any pre-selects exist, use the ▲ ▼ arrow keys browse through the available pre-selects (i.e., **#01** through **#32**), and then press **ENTER**.

Note: Upon initial selection – i.e., prior to the creation of any pre-selects – this menu branch appears as follows:

```
#XX LOAD PROGRAM CLEAR
No Pre-Select Programmed
```

Use the ◄ ► arrow keys to select one of the following actions, and then press **ENTER**.

Selection	Functional Description
LOAD	Recalls a previously defined pre-select from memory.
PROGRAM	Stores a defined set of operating parameters into memory for future recall.
CLEAR	Clears a previously defined pre-select from memory.

5.3.4.1 PRE-SELECTS: LOAD

```
Load this pre-select
Into converter? No Yes
```

LOAD is operable when pre-selects have previously been programmed into the unit via the **PROGRAM** submenu. Use the ◄ ► arrow keys to select **No** or **Yes**, and then press **ENTER**.

5.3.4.2 PRE-SELECTS: PROGRAM

```
Program pre-select? #XX
04200.000 MHz 01.25 dB
```

Select **PROGRAM** when it is desired to save an operational configuration for recall at a later date.

On the top line, first use the ◄ ► arrow keys to navigate to the pre-select designator (**#XX**), and then use the ▲ ▼ arrow keys to select a number from **01** to **32**.

The *read-only* bottom line displays the operating parameters that will be stored into the designated slot (via this submenu), and then recalled via the **LOAD** submenu.

5.3.4.3 PRE-SELECTS: CLEAR

```
Clear this pre-select?
No Yes
```

Use the ◄ ► arrow keys to select **No** or **Yes** to clear a previously saved parameter from memory. This will free up the slot for future pre-select programming needs. Press **ENTER** when done.

5.3.5 UTILITY

```
TIME DISP FIRMWARE AID
REFOSC SLOPE LAMP-TEST
```

Use the ◄ ► arrow keys to select from the submenu choices shown, and then press **ENTER**. Note the following:

Submenu	Sect	Functional Description
TIME	5.3.5.1	Allows configuration of the Real-Time Clock.
DISP	5.3.5.2	(Display) Allows adjustment of the Video Fluorescent Display (VFD) brightness level.
AID	5.2.5.3	Allows definition of a unit identifier (label).
REFOSC	5.3.5.4	(External Reference Oscillator) Allows adjustment of the upconverter reference frequency.
SLOPE	5.3.5.5	Allows adjustment of the upconverter slope settings.
LAMP-TEST	5.3.5.6	Performs a diagnostic test of the front panel LEDs and VFD.

5.3.5.1 UTILITY: TIME (Real-Time Clock)

```
Edit Real-Time Clock:
12:00:00 01/23/11
```

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

Note: 24-hour Military time format is used.

5.3.5.2 UTILITY : DISP (VFD Display)

```
VFD Display Brightness:
100%
```

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

5.3.5.3 UTILITY: AID (Application Identification String)

```
Edit AID Message?
No Yes
```

The Application Identification (AID) command allows a free form message to be created. It is intended to identify the satellite, either transponder, beam, destination or other aspects of the application that may be significant to operations. The AID display alternates with the Equipment type display by use of the **CLEAR** key. The default is "AID MESSAGE".

To edit the AID message: First, use the ◄ ► arrow keys to select **No** or **Yes**, and then press **ENTER**. Then, to edit the Application ID string: For both the top and bottom lines of the display, first use the ◄ ► arrow keys to select the character to edit, and then use the ▲ ▼ arrow keys to edit that character.

A maximum of 24 characters are available on each line (48 characters in all), as follows:

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

```
   UT-4500-A SERIES
48 CHAR MAX TST MESSAGE
```

Once the Application ID string is composed as per the above example, press **ENTER**.

5.3.5.4 UTILITY: REFOSC (Reference Oscillator Adjustment)

```
Reference frequency
adjustment = 087
```

The reference oscillator adjustment may be manipulated with this submenu. Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

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

5.3.5.5 UTILITY: SLOPE

```
Converter slope
```

```
adjustment = 0.0
```

The upconverter slope adjustment may be manipulated with this submenu. Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done.

The default upconverter slope adjustment is **0.0**, with allowable values from **0.0** to **1.0**.

5.3.5.6 UTILITY: LAMP-TEST

```
Start Lamp Test?
No Yes
```

To start the lamp test, use the ◄ ► arrow keys to select **No** or **Yes**, and then press **ENTER**. The test begins with the following message:

```
Lamp Test in Progress
     Please Wait
```

The front panel will then run through a series of diagnostics: the LED array will cycle, and then the VFD will generate a series of test patterns. The VFD will return to the previous menu upon successful completion of the test.

Once the test has run, press **CLEAR** to return to the main menu. .

5.3.5.7 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 UT-4500-A internal firmware. The upconverter can store two complete firmware images, and the user can select which image will be loaded the next time the unit reboots.

```
Firmware Images:
      INFO  SELECT
```

Use the ◄ ► arrow keys to select **INFO** or **SELECT**, and then press **ENTER**.

UTILITY: FIRMWARE → INFO

```
Firmware Info: BOOTROM
    IMAGE#1  IMAGE#2
```

Use the ◄ ► arrow keys to select **BOOTROM**, **IMAGE#1** or **IMAGE#2**, and then press **ENTER** to view the information.

The **BOOTROM** screen displays information similar to the example that follows:

```
Bootrom: FW-0000200
X.X.X    MM/DD/YY
```

For **IMAGE#1** and **IMAGE#2**, each image is further broken down as follows (*where **IMAGE#X** denotes **IMAGE#1** or **IMAGE#2***):

```
IMAGE#X: Bulk  APP FPGA
```

Use the ◄ ► arrow keys to select **Bulk**, **App**, or **FPGA**, and then press **ENTER**. The screens display information in a format similar to the examples that follow:

```
Bulk#X: FW-0000202
X.X.X   MM/DD/YY
```

```
App#X:  FW-0000203
X.X.X   MM/DD/YY
```

```
FPGA#X: FW-0000204
X.X.X   MM/DD/YY
```

UTILITY: Firmware → SELECT

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

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

If the image selected is already designated as the Next Reboot Image, the following message displays:

```
 THAT IMAGE IS ALREADY
CURRENT. NO CHANGE MADE.
```

Chapter 6. ETHERNET MANAGEMENT

6.1 Overview

This chapter describes the functionality of the UT-4500-A Series Upconverter Ethernet Interface. Refer to the Remote Commands Specifications tables found in **Appendix A. REMOTE CONTROL** for detailed descriptions of the configuration parameters available through these interfaces.

6.2 Ethernet Management Interface Protocols

The UT-4500-A's 100BASE-TX Ethernet Management Interface supports two management protocols:

- SNMP with public and private MIB
- Telnet interface for remote product M&C

For SNMP or Telnet operation, the UT-4500-A must be configured with the Ethernet control option. Via the front panel, select* CONFIG: REMOTE → 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 UT-4500-A SNMP agent supports both **SNMPv1** and **SNMPv2c**.

For proper SNMP operation, the UT-4500-A MIB files must be used with the associated version of the UT-4500-A M&C. Refer to the UT-4500-A 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 (OID's). 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 UT-4500-A:

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-0000205- .mib UT-4500-A MIB file	MIB file consists of all of the OID's for management of the amplifier functions
FW-0000206- .mib UT-4500-A Traps MIB file	Trap MIB file is provided for SNMPv1 traps common for UT-4500-A.

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 UT-4500-A uses community strings as a password scheme that provides authentication before gaining access to the UT-4500-A 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 UT-4500-A has the ability to send out SNMP traps when certain events occur in the unit. The UT-4500-A sends out traps when a fault occurs in the unit. A trap is sent both when a fault occurs and is cleared.

The UT-4500-A supports both **SNMPv1** traps and **SNMPv2** notifications. Which style of traps the UT-4500-A sends can be configured by the user using the conv4500ASNMPTrapVersion OID.

The following are the MIB2 v1traps / v2 notifications that the UT-4500-A 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 UT-4500-A supports.

Faults SNMPv1 traps:	
conv4500APowerSupply15VFaultEventV1	62476401
conv4500APowerSupply14VFaultEventV1	62476402
conv4500AVccFaultEventV1	62476403
conv4500ATemperatureFaultEventV1	62476404
conv4500AIFLOLockFaultEventV1	62476405
conv4500ASumLockFaultEventV1	62476406
conv4500ACoarseLockFaultEventV1	62476407
conv4500AFineLockFaultEventV1	62476408
conv4500AHSBFaultEventV1	62476409
conv4500AEqualizerFaultEventV1	62476410
conv4500AExtRefOscFaultEventV1	62476411
conv4500ASummaryFaultV1	62476412
Faults SNMPv2 notifications:	
conv4500APowerSupply15VFaultEvent	1.3.6.1.4.1.6247.64.2.1.1
conv4500APowerSupply14VFaultEvent	1.3.6.1.4.1.6247.64.2.1.2
conv4500AVccFaultEvent	1.3.6.1.4.1.6247.64.2.1.3
conv4500ATemperatureFaultEvent	1.3.6.1.4.1.6247.64.2.1.4
conv4500AIFLOLockFaultEvent	1.3.6.1.4.1.6247.64.2.1.5

conv4500ASumLockFaultEvent	1.3.6.1.4.1.6247.64.2.1.6
conv4500ACoarseLockFaultEvent	1.3.6.1.4.1.6247.64.2.1.7
conv4500AFineLockFaultEvent	1.3.6.1.4.1.6247.64.2.1.8
conv4500AHSBFaultEvent	1.3.6.1.4.1.6247.64.2.1.9
conv4500AEqualizerFaultEvent	1.3.6.1.4.1.6247.64.2.1.10
conv4500AExtRefOscFaultEvent	1.3.6.1.4.1.6247.64.2.1.11
conv4500ASummaryFaultEvent	1.3.6.1.4.1.6247.64.2.1.12

6.4 Telnet Interface

The UT-4500-A 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 screen capture to the right shows the login process:

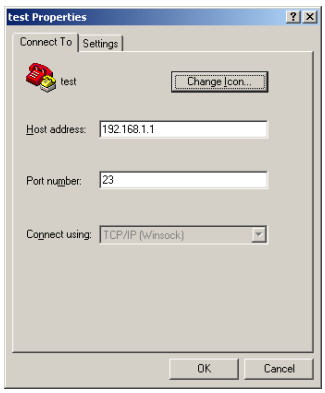
Once logged into the Telnet interface as Administrator, the user can access the standard remote control interface defined in **Appendix A. REMOTE CONTROL**.

6.4.1 HyperTerminal as Telnet Client

There is a disadvantage when using Windows Command-line as Telnet Client. Since Command-line 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.

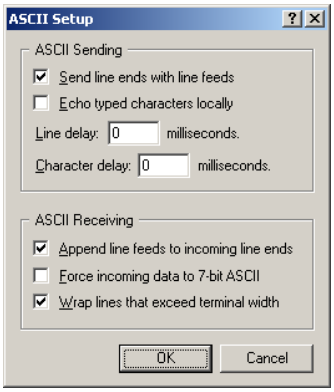
Configure HyperTerminal as follows:

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

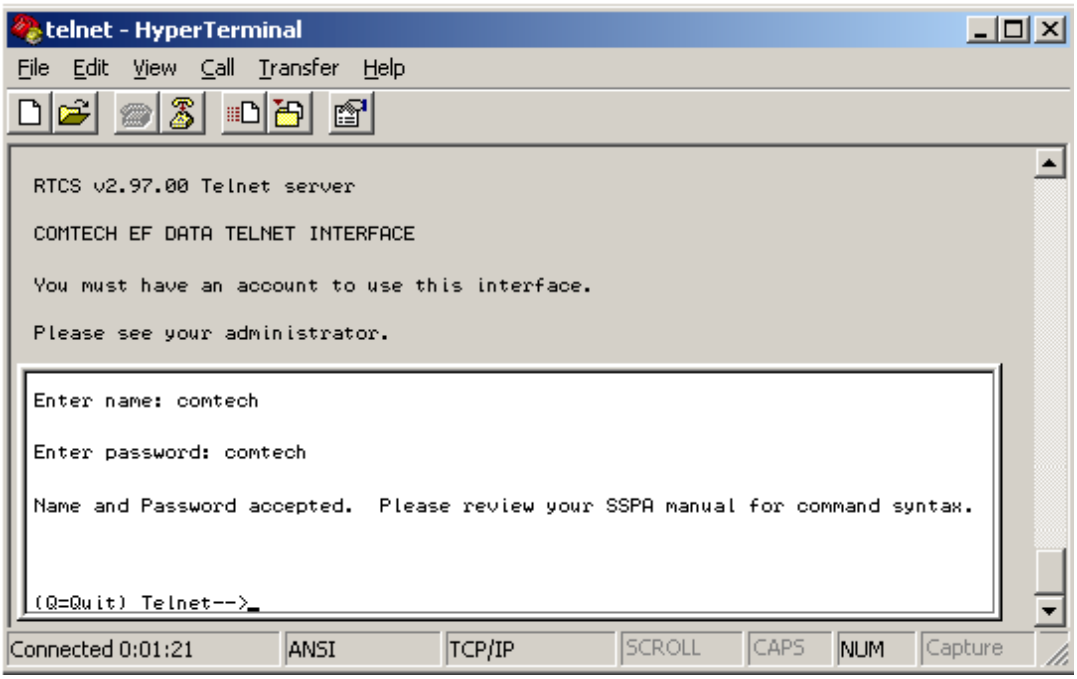


2. ASCII Setup (File→ Properties →Settings→ASCII Setup):

   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 at right.



Login and remote command execution via HyperTerminal configured as Telnet Client appears as per the following example:



Notes:

Appendix A. REMOTE CONTROL

A.1 Introduction

This appendix describes the protocol and message command set for remote monitor and control of Comtech EF Data's UT-4500-A Series Upconverters.

The electrical interface is either an EIA-485 multi-drop bus (for the control of many devices) or an EIA-232 connection (for the control of a single device), 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 3.2.1.7 J1 COM1 EIA-485/232 Interface Connector (DB-9F)**

A.2 Communication Interfaces

A.2.1 TIA/EIA-485 (RS-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.2.2 TIA/EIA-232 (RS-232)

This is a much simpler configuration in which the Controller device is connected directly to the Target via a two-wire-plus-ground connection. Controller-to-Target data is carried, via EIA-232 electrical levels, on one conductor, and Target-to-Controller data is carried in the other direction on the other conductor.

A.2.3 Ethernet (100BASE-TX)

The unit implements a Telnet server that will accept Telnet terminal connections using Transmission Control Protocol (TCP) on port 23. After entering the username (default: comtech), and the password (default: comtech) the Telnet server will accept the same syntax used by the serial interfaces.

A.3 Access Methods

Downconverters may be accessed directly by using a physical address or indirectly through a backup downconverter by using a virtual address.

A.3.1 Direct Access

Converters may be directly accessed by the EIA-232 interface or by the EIA-485 interface in a bus configuration.

In this control network, all converters including the backup converter are paralleled on a common EIA-485 cable. Both up and down converters can be mixed on the cable as long as each converter has a unique physical address. Only one EIA-485 port is required on the system's monitor and control computer. If a change is initiated directly to a converter in a redundancy subsystem, the backup converter will detect the change via the High Speed Bus and update its backup tables.

For EIA-232 control, a direct EIA-232 cable connection is made to each converter to be accessed. If an external Monitor and Control Computer is used, one EIA-232 port per converter is required. This mode is commonly used with an ASCII terminal for bench testing.

A.3.2 Indirect Access

Converters in Redundancy Mode may be addressed indirectly by adding a virtual address to the backup converter's physical address. The virtual address corresponds to the converter's position in the redundant subsystem. The backup converter recognizes the virtual address and executes the command via the high speed bus.

To control by using the EIA-485 interface, one or more backup converters are connected to a system's monitor and control computer or ASCII terminal with a common EIA-485 bus cable. Both up and down backup converters may be mixed on the cable as long as each has a unique device address. In order to indirectly address an online converter in the subsystem, a virtual address must be provided. The virtual address corresponds to the converter's position in the chain beginning with number 1. Virtual addressing is only recognized by a backup converter. Only one EIA-485 port is required on the monitor and control computer.

To control by using the EIA-232 interface, one EIA-232 port on the monitor and control computer is required for each backup converter. Virtual addressing must be established by command. All converters including the backup converter must be in the Redundancy Mode.

A.4 Addresses

All converters are addressed in a command by the Device Address. The Device Address consists of a physical address or a physical address plus a virtual address.

A.4.1 Physical Address

Each converter in the system must have a unique physical address regardless of the access method used. The physical address consists of a string of 1, 2 or 3 numbers from 1 to 255. The physical address is entered into a converter via the front panel. For Direct Access, the physical address is the only address required to command a converter. A backup converter or a standalone converter can only be accessed with a physical address.

Example: 10 (Addresses converter whose physical address is 10.)

A.4.2 Virtual Address

In order to access a converter controlled by a backup converter indirectly, a virtual address is required. A virtual address is appended to the physical address of the backup converter with a "V". The virtual address is a number from 1 to 12 and corresponds to the position of the active converter from the backup converter and is assigned by a configuration command.

Example: 10V3 (Addresses the third converter controlled by the backup converter whose physical address is 10.)

A.4.3 IP Address

The IP address is a unique address on a network that supports Internet Protocol (i.e., IPv4). An example of a network address using IPv4 is **192.168.1.4** (factory default IP address). This value must be configured correctly to allow a Telnet session to control the unit.

A.5 Basic Protocol

Whether in EIA-232 or EIA-485 mode, all data is transmitted as asynchronous serial characters, suitable for transmission and reception by a UART.

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. The exception to this is when the Controller broadcasts a message (such as Set Time/Date) using Address 0, when the Target is set to EIA-485 mode.

A.5.1 Transmission Mode

The transmission mode is half duplex implemented in Command/Response convention. This method requires the external system monitor and control unit to initiate all communications by command and all converters to respond with either confirmation or an error message. The confirmation may contain status information.

A.5.2 Baud Rate

The supported baud rates are **1200**, **2400**, **4800**, **9600** (default), **19200**, and **38400** baud.

A.5.3 Asynchronous Character Format

The asynchronous character format is **8-N-1** (i.e., 8 data bits; no parity; 1 stop bit).

A.5.4 Character Set

The command syntax uses the printable ASCII character set.

A.5.5 Response Timeout

A minimum of 500 milliseconds is provided before declaring a “no response” instance, at which time the command is re-transmitted.

A.5.6 Bus Inactivity Requirement

Comtech EF Data recommends that a minimum of 50 milliseconds bus inactivity be provided by the user between the receipt of a response from an addressed converter and issuing the next command on the serial bus.

A.6 Message Structure

The structure of a Command, Response, or Error Message is as follows:

- Start Character
- Device Address
- Command or Response
- End of Message String

A.6.1 Start Character

The Start Character begins each message:

Example: < Start of a user Command.
> Start of a converter response.

A.6.2 Device Address

The Device Address consists of a Physical Address or a Physical Address and an appended Virtual Address. For this document DEV is used for the generic case examples.

Example: <3V12

A.6.3 Command

A Command is a variable length character string beginning with a forward slash "/"' and containing either an instruction or an instruction and data for a converter to act upon. If data is passed by command it is appended to the instruction by an underscore "_". If data is retrieved by command underscore follows the instruction flagging the converter to supply data in a response.

Note: In this appendix, "**/COM**" is used for the generic case examples.

Example: <DEV/COM_xxx'cr' (Sends data to a converter.)
Example: <DEV/COM_'cr' (Requests information from a converter.)

A.6.4 Confirmation Response

A confirmation will change the start character, and echo the Device Address and Command. Any requested data will be appended to the Command.

Example: >DEV/COM_xxx'cr"lf']

A.6.5 Error Response

If a converter cannot execute a Command or detects a protocol violation, an error response is generated. An error is flagged by changing the "/" command designator in the response to a "?".

Following the "?" error symbol are two characters which are unique error symbols useful for computer analysis. The two error symbols are followed by a text string explaining the error for the convenience of a human operator. For this appendix, "**ER**" is used for the generic case examples response.

Example: >DEV?COM ER Error Message 'cr"lf']

A.6.6 End of Message

End of message strings were devised in such a way that an orderly screen presentation would result when converters are controlled by simple ASCII terminals.

A.6.6.1 Command Ending

The end of message for a command is a carriage return. For this appendix, "**cr**" is used for the carriage return.

Example: <DEV/COM_'cr'

A.6.6.2 Response Ending

End of message for a response is a carriage return, line feed and a bracket: "**'cr"lf']**".

Example: >DEV/COM_'cr"lf']

A.7 Command / Response Pairs

A.7.1 Utility Commands

A.7.1.1 Time

Command	Details
Set Time:	<DEV/TIM_hh:mm:ss'cr' Where: hh=Hour mm=Minutes ss=Seconds
Confirmation:	>DEV/TIM_hh:mm:ss'cr"lf']
Retrieve Time:	<DEV/TIM_'cr'
Confirmation:	>DEV/TIM_hh:mm:ss'cr"lf']

A.7.1.2 Date

Command	Details
Set Date:	<DEV/DAT_mm/dd/yy'cr' Where: mm=Month dd=Day yy=Year
Confirmation:	>DEV/DAT_mm/dd/yy'cr'lf']
Retrieve Date:	<DEV/DAT_'cr'
Confirmation:	>DEV/DAT_mm/dd/yy'cr"lf']

A.7.1.3 Local / Remote Status

The LRS command is used to enable or disable remote communications interfaces. The factory default setting is **3** (Ethernet and Serial remote control enabled).

Command	Details
Set Local / Remote Status:	<DEV/LRS_x'cr' Where: x= 0 for front panel control only (remote control disabled) 1 for serial remote control 2 for Ethernet control 3 for Ethernet and serial remote control
Confirmation:	>DEV/LRS_x'cr'lf']
Retrieve LRS:	<DEV/LRS_'cr'
Confirmation:	>DEV/LRS_x'cr"lf']

A.7.1.4 Media Access Control (MAC) Address

The MAC command is used to query the unique MAC address of the unit's Ethernet management port.

Command	Details
Retrieve MAC:	<DEV/MAC_'cr'
Confirmation:	>DEV/MAC_xx-xx-xx-xx-xx-xx'cr''lf'] Where: xx=MAC address byte in hexadecimal

A.7.1.5 IP Address

The IPA command is used to set the IP address and network prefix for the 100BASE-TX Ethernet management port. The factory default value is **192.168.1.4.24**.

Command	Details
Set IP Address:	<DEV/IPA_aaa.bbb.ccc.ddd.yy'cr' Where: aaa = 0-223 bbb = 0-255 ccc = 0-255 ddd = 0-255, but they cannot all be zero. yy is the Subnet Mask Length (range: 8 to 30)
Confirmation:	>DEV/IPA_ aaa.bbb.ccc.ddd.yy'cr'lf']
Retrieve IP Address:	<DEV/IPA_'cr'
Confirmation:	>DEV/IPA_ aaa.bbb.ccc.ddd.yy'cr''lf']

A.7.1.6 IP Gateway

The IPG command is used to set the IP gateway address for the Ethernet management port. The factory default value is **192.168.1.5**.

Command	Details
Set IP Gateway:	<DEV/IPG_aaa.bbb.ccc.ddd'cr' Where: aaa = 0-223 bbb = 0-255 ccc = 0-255 ddd = 0-255, but they cannot all be zero.
Confirmation:	>DEV/IPG_ aaa.bbb.ccc.ddd'cr'lf']
Retrieve IP Gateway:	<DEV/IPG_'cr'
Confirmation:	>DEV/IPG_ aaa.bbb.ccc.ddd'cr''lf']

A.7.1.7 Physical Address

The default physical address is **001**.

Command	Details
Set Physical Address:	<DEV/SPA_xxx'cr' xxx = 1 to 255
Confirmation:	>DEV/SPA_xxx'cr"lf']
Retrieve Phys. Addr:	<DEV/SPA_'cr'
Confirmation:	>DEV/SPA_xxx'cr"lf']

A.7.1.8 Baud Rate

The default baud rate is **9600**.

Command	Details
Set Baud Rate:	<DEV/SBR_xxxx'cr' xxxx = 1200, 2400, 4800, 9600, 19K2, or 38K4
Confirmation:	>DEV/SBR_xxxx'cr"lf']
Retrieve Baud Rate:	<DEV/SBR_xxxx'cr'
Confirmation:	>DEV/SBR_xxxx'cr"lf']

A.7.1.9 LCD Contrast

This legacy command does not control any hardware, but its syntax is still supported to allow backwards compatibility with existing monitor and control applications. The default LCD contrast is 15.

Command	Details
Set Contrast:	<DEV/CON_xx'cr' xx = 0 to 30
Confirmation:	>DEV/CON_xx'cr"lf']
Retrieve Contrast:	<DEV/CON_'cr'
Confirmation:	>DEV/CON_xx'cr"lf']

A.7.1.10 LCD Brightness

This legacy command does not control any hardware, but its syntax is still supported to allow backwards compatibility with existing monitor and control applications. The default LCD brightness is 15.

Command	Details
Set Brightness	<DEV/LCD_xx'cr' xx = 0 to 30
Confirmation:	>DEV/LCD_xx'cr"lf']
Retrieve Brightness:	<DEV/LCD_'cr'
Confirmation:	>DEV/LCD_xx'cr"lf']

A.7.1.11 Screen Saver Mode

This legacy command does not control any hardware, but its syntax is still supported to allow backwards compatibility with existing monitor and control applications. The default screen saver mode is 0.

Command	Details
Set SSM:	<DEV/SSM_x'cr' Where: x=0 to 5
Confirmation:	>DEV/SSM_x'cr"lf']
Retrieve SSM:	<DEV/SSM_'cr'
Confirmation:	>DEV/SSM_x'cr"lf']

A.7.1.12 Screen Saver Timeout

This legacy command does not control any hardware, but its syntax is still supported to allow backwards compatibility with existing monitor and control applications. The default screen saver timeout is 05.

Command	Details
Set SST:	<DEV/SST_xx'cr' xx = 00 to 99
Confirmation:	>DEV/SST_xx'cr"lf']
Retrieve SST:	<DEV/SST_'cr'
Confirmation:	>DEV/SST_xx'cr"lf']

A.7.1.13 VFD Brightness

The VFD command allows the front panel brightness to be adjusted from 0% to 100% in 25% steps. The default VFD brightness is 100.

Command	Details
Set VFD:	<DEV/VFD_xxx'cr' xx = 000 to 100 (in 025 steps)
Confirmation:	>DEV/VFD_xxx'cr"lf']
Retrieve VFD:	<DEV/LCD_'cr'
Confirmation:	>DEV/VFD_xxx'cr"lf']

A.7.1.14 Reference Oscillator Tuning

The default reference oscillator tuning value is 087.

Command	Details
Set Oscillator:	<DEV/SRO_xxx'cr' xxx = 0 to 255
Confirmation:	>DEV/SRO_xxx'cr"lf']
Retrieve Tuning:	<DEV/SRO_'cr'
Confirmation:	>DEV/SRO_xxx'cr"lf']

A.7.1.15 Converter Slope Adjustment

The default slope adjustment value is 0.3.

Command	Details
Set Slope Adjust:	<DEV/SSA_xxx'cr' xxx = 0.0 to 1.0
Confirmation:	>DEV/SSA_xxx'cr"lf']
Retrieve Slope Adjust:	<DEV/SSA_'cr'
Confirmation:	>DEV/SSA_xxx'cr"lf']

A.7.1.16 Equipment Type

Equipment type is a query that retrieves the model number and the software revision of the unit. This data is read-only.

Command	Details
Retrieve Equipment Type:	<DEV/RET_'cr'
Confirmation:	>DEV/RET_xxxxxxxxxx yyyyyyy'cr"lf'] xxxxxxxxxx = Model Number yyyyyyy = Software Version.

A.7.1.17 Part Number

The PNM command retrieves the unit's part number information. This data is read-only.

Command	Details
Retrieve Part Number:	<DEV/PNM_'cr'
Confirmation:	>DEV/PNM_xx…xx'cr"lf'] Where: xx…xx = up to 96 bytes of part number information

A.7.1.18 Legacy Firmware Information

This legacy firmware command no longer provides information about the unit's firmware type. It is included only to provide backwards compatibility with existing monitor and control software applications. To query the unit's firmware information refer to the FRM command.

Command	Details
Retrieve Firmware Information:	<DEV/FRW_'cr'
Confirmation:	>DEV/FRW_'cr' BULK= FWnnnn-nr Ver=x.xx'cr' M&C = FWnnnn-nr Ver=x.xx'cr' FPGA= FWnnnn-nr Ver=x.xx'cr"lf'] Where: nnnn-n firmware number r firmware revision x.xx firmware version **Note:** BULK, M&C, and FPGA have different firmware numbers, revisions, and versions among each other.

A.7.1.19 Firmware Information

This command returns information about the firmware loaded in the unit including firmware numbers, versions, and release dates. This command replaces the legacy FRW command.

Command	Details
Retrieve Firmware Information:	<DEV/FRM_'cr'
Confirmation:	>DEV/FRM_'cr' Boot: 'cr' FW-AAAAAAA B.B.BB DD/MM/YY'cr' Bulk1: 'cr' FW-AAAAAAA B.B.BB DD/MM/YY'cr' FW-AAAAAAA B.B.BB DD/MM/YY'cr' FW-AAAAAAA B.B.BB DD/MM/YY'cr' Bulk2: 'cr' FW-AAAAAAA B.B.BB DD/MM/YY'cr' FW-AAAAAAA B.B.BB DD/MM/YY'cr' FW-AAAAAAA B.B.BB DD/MM/YY'cr"lf'] Where: FW-AAAAAAA = the firmware part number B.B.BB = the version number DD/MM/YY = Day/Month/Year firmware released

A.7.1.20 Firmware Image

This command allows a valid bulk image to be selected as the next active image during boot-up.

Command	Details
Set Next FW Image:	<DEV/IMG_x'cr' x = 1 to 2
Confirmation:	>DEV/IMG_x'cr"lf']
Retrieve Active FW Image:	<DEV/IMG_'cr'
Confirmation:	>DEV/IMG_x'cr"lf']

A.7.1.21 Application Identification

The Application Identification (AID) command allows a free form message to be created. It is intended to identify either the satellite, transponder, beam, destination or other aspects of the application that may be significant to operations.

The message length corresponds to capability of the LCD and is 48 characters in total. The second line begins at character 25, therefore, blanks must be used after line 1 information in order to space to line 2. A carriage return ends the command. Trailing blanks will be generated to fill the LCD field. The AID display will alternate with the Equipment type display by use of the clear function key on the front panel. The default is "AID MESSAGE".

Command	Details
Application ID:	<DEV/AID_xxxxxxx ... xxxxx'cr'
Confirmation:	>DEV/AID_'cr' xxxxxxxxxxxxxxxxxxxxxxx'cr' xxxxxxxxxxxxxxxxxxxxxxx'cr"lf']
Retrieve ID:	<DEV/AID_'cr'
Confirmation:	>DEV/AID_'cr' xxxxxxxxxxxxxxxxxxxxxxx'cr' xxxxxxxxxxxxxxxxxxxxxxx'cr"lf']

Note: xxxxxxx ... xxxxx = Your message, maximum 48 characters.

A.7.1.22 Force Reboot

The FRB command allows the unit to be forced to reboot after five seconds. This value is write-only.

Command	Details
Force Reboot:	<DEV/FRB_YES'cr'
Confirmation:	>DEV/FRB_YES'cr"lf']

A.7.2 Configuration Commands

A.7.2.1 Frequency

The default RF frequency of the unit is equal to its minimum operating frequency (RF_{Low}).

Command	Details
Set Frequency:	<DEV/FRE_xxxxx.xxx'cr'
Confirmation:	>DEV/FRE_xxxxx.xxx'cr"lf']
Retrieve Frequency:	<DEV/FRE_'cr'
Confirmation:	>DEV/FRE_xxxxx.xxx'cr"lf']

Note: For example, xxxx.xxx = 14000.000 to 14500.000 MHZ in 125 KHz steps for Model UT-4514-A

A.7.2.2 Attenuator

The default attenuation value is 10.00 dB.

Command	Details
Set Attenuator:	<DEV/ATT_ yy.yy'cr'
Confirmation:	>DEV/ATT_yy.yy'cr'lf']
Retrieve Attenuator:	<DEV/ATT_'cr'
Confirmation:	>DEV/ATT_ yy.yy'cr"lf']

Note: yy.yy = 00.00 to 25.00 dB in 0.25 dB steps.

A.7.2.3 Cold Start

The cold start function, if enabled, mutes the output signal for a predetermined time following Power-Up to ensure a stable reference oscillator (15 minutes). The default is OFF. This command is disabled in redundant systems (i.e., COMMAND NOT AVAILABLE).

Command	Details
Set Cold Start:	<DEV/CLD_xxx'cr' xxx = ON or OFF
Confirmation:	>DEV/CLD_xxx'cr''lf']
Retrieve Status:	<DEV/CLD_'cr'
Confirmation:	>DEV/CLD_xxx'cr''lf']

A.7.2.4 Mute

The default RF mute state is ON (output is muted).

Command	Details
Mute Output:	<DEV/MUT_xxx'cr' xxx = ON or OFF
Confirmation:	>DEV/MUT_xxx'cr''lf']
Retrieve Mute Status:	<DEV/MUT_'cr'
Confirmation:	>DEV/MUT_yyy'cr''lf'] yyy = ON/OFF/COLD

A.7.2.5 Carrier Mute Mode

The carrier mute mode determines the mute state of the unit during frequency changes. The default carrier mute mode state is OFF (output is muted during frequency changes).

Command	Details
Mute Mode:	<DEV/CMM_xxx'cr' xxx = ON or OFF
Confirmation:	>DEV/CMM_xxx'cr''lf']
Retrieve CMM Status:	<DEV/CMM_'cr'
Confirmation:	>DEV/CMM_xxx'cr''lf']

A.7.2.6 Redundant Mute Mode

The redundant mute mode determines how the backup unit handles the mute state during a redundant switchover condition. If the redundant mute mode is ON then the backup unit's mute state will be the same as the primary unit that it is backing up. Otherwise, if the redundant mute mode is off the backup unit will unmute its output any time a redundant switchover occurs.

The default redundant mute mode state is OFF (backup unit's output automatically unmutes when a redundant switchover occurs).

Command	Details
Set CRM:	<DEV/CRM_xxx'cr' xxx = ON or OFF
Confirmation:	>DEV/CRM_xxx'cr"lf']
Retrieve CRM:	<DEV/CRM_'cr'
Confirmation:	>DEV/CRM_xxx'cr"lf']

A.7.2.7 Auto Fault Recovery

The converter output is automatically muted in the event of a detected fault. Auto Fault Recovery, if enabled, will cause the output signal to go active (unmuted) if all faults clear. If disabled, the output will remain muted even after all faults clear until a MUT_OFF command is received (see 4.8.2.4). If Auto Fault Recovery is enabled and the converter detects the same fault more than five times in a five minute interval (ex: multiple IFLO lock detect faults) the function reverts to DISABLED and the converter remains muted. The default is ON.

Command	Details
Set Fault Recovery:	<DEV/AFR_xxx'cr' xxx = ON or 0FF
Confirmation:	>DEV/AFR_xxx'cr"lf']
Retrieve Status:	<DEV/AFR_'cr'
Confirmation:	>DEV/AFR_xxx'cr"lf']

A.7.2.8 Program Preset

This command Is used to store up to 32 preset frequency and attenuation settings.

Command	Details
Program Preset:	<DEV/PGM_nn_xxxxx.xxx_yy.yy'cr'
Confirmation:	>DEV/PGM_nn_xxxxx.xxx_yy.yy'cr"lf']

Note: nn = Preset Number = 01 to 32.
xxxx.xxx = Frequency = RFLow to RFHigh (for example, 14000.000 to 14500.000 MHZ for Model UT-4514).
yy.yy = Attenuator = 00.00 to 25.00.

A.7.2.9 Display All Presets

This command is used to display all of the programmed preset values.

Command	Details
Display Presets:	<DEV/DPS_'cr'
Confirmation:	>DEV/DPS_'cr'
	P01 xxxxx.xxx yy.yy'cr' to P32 xxxxx.xxx yy.yy'cr"lf'] Where: xxxxx.xxx = Frequency yy.yy= Attenuator

Note: Only programmed preset numbers are returned. If no preset(s) is programmed, "No Pre-Selects Programmed" is returned.

A.7.2.10 Clear Preset Configuration

This command is used to clear a single preset value.

Command	Details
Clear a Preset:	<DEV/CLR_nn'cr'
Confirmation:	>DEV/CLR_nn_Cleared'cr''lf']

Note: nn = Preset Number = 01 to 32.

A.7.2.11 Select Preset Configuration

This command is used to configure the converter to the frequency and attenuation data assigned to a given preset number.

Command	Details
Select Preset:	<DEV/SEL_nn'cr'
Confirmation:	>DEV/SEL_nn_Selected'cr''lf']

Note: nn = Preset Number = 01 to 32.
Only programmed preset numbers are available.

A.7.3 Modes

There are two modes of operation that may intersect: Redundant Mode and Automatic Mode.

A.7.3.1 Redundant Mode

Since the default mode is OFF, each converter including the backup converter must be commanded into the Redundant Mode.

Polling on the high speed bus will not begin until the position assignments are made.

Command	Details
Redundant Mode:	<DEV/RED_xxx'cr' xxx = ON or OFF
Confirmation:	>DEV/RED_xxx'cr''lf']
Redundant Status:	<DEV/RED_'cr'
Confirmation:	>DEV/RED_xxx'cr''lf']

Note: The primary units must all be configured properly in redundant mode before redundant mode is enabled on the backup unit.

Each converter's chain position must be initialized including the backup converter. The following redundancy initialization command is only allowed if Redundancy Mode has been selected.

Command	Details
Initialize Command:	<DEV/ICT_xx_yy'cr'
Confirmation:	>DEV/ICT_xx_yy'cr"lf']
Initialize Status:	<DEV/ICT_'cr'
Confirmation:	>DEV/ICT_xx_yy'cr"lf'] xx = chain position = 01 to 12, or BU. Where BUselects the converter as the backup. yy = chain length for xx = BU (i.e. Backup converter) 01 to 12. yy = unused if xx = 01 to 12 (i.e. chain converter)

Example 1: The following command assigns the converter chain position "1".

<DEV/ICT_01'cr'
>DEV/ICT_01'cr"lf']

Example 2: The following command assigns the receiving converter as the backup converter in a 1:8 system.

<DEV/ICT_BU_08'cr'
>DEV/ICT_BU_08'cr"lf']

Important: It should be reiterated that only the converter physically located at the top of a redundant rack should be assigned as the Backup unit. Likewise, assignment of chain positions in a redundant rack should be made according to the physical allocation of each converter in the rack (i.e. The top converter should be the Backup, the second converter should be assigned chain position 1, the third converter position 2, etc.).

A.7.3.2 Automatic/Manual Mode

This command provides for automatic switching by the backup converter if both units are in the Redundancy Mode. This command is only accepted by the backup converter. If a chain converter is set in Manual Mode, the backup converter will log the occurrence and not act upon further information from the converter until put into Automatic Mode. The default is off.

Command	Details
Automatic Mode:	<DEV/SAM_xx_y'cr'
Confirmation:	>DEV/SAM_xx_y'cr"lf']
Automatic Status:	<DEV/SAM_xx_'cr'
Confirmation:	>DEV/SAM_xx_y'cr"lf'] Where: xx = 01 to 12, converter number y = A for Auto; M for Manual

A.7.3.3 Backup Mode

This command allows the user to force a backup condition for maintenance and test purposes. This command must be sent to the converter designated as the backup converter (i.e., “BU”). When activated this command forces the backup converter to assume the state of the specified chain converter and forces the chain converter offline.

Command	Details
Initiate a Backup:	<DEV/FBU_xx_y'cr'
Confirmation:	>DEV/FBU_xx_y'cr''lf'] Where: xx = 01 to 12, converter number y = 'F' to force a backup 'N' to remove a backup
Retrieve Backup Status:	<DEV/FBU_'cr'
Confirmation:	>DEV/FBU_xx_zzzzz'cr''lf'] Where: xx = 01 to 12, converter number. If zzzzz = NONE, converter number is not displayed. zzzzz = 'NONE' if no backup active = 'ACTIVE' if an automatic backup has occurred = 'FORCED' if a forced backup is active

A.7.4 Status Commands

Status commands retrieve configuration, maintenance and alarm status in summary form.

A.7.4.1 Configuration Status

Command	Details	
Configuration Status:	<DEV/RCS_'cr'	
Confirmation:	>DEV/RCS_'cr'	
	FRE_xxxxx.xxx'cr'	Frequency
	ATT_yy.yy'cr'	Attenuator
	TX_nnn'cr'	Transmitter - ON/OFF/COLD
	ONL_nnn'cr'	Online - ON/OFF
	RED_xx_yy_z'cr'	See Note
	CLD_nnn'cr'	Cold Start - ON/OFF
	AFR_nnn'cr'	Auto Flt Recovery-ON/OFF
	EXT_xxx'cr''lf']	Ext. Ref. - YES/NO

Note: If Redundancy OFF xx_yy_z = OFF, else if Redundancy ON and converter selected as backup controller xx_yy_z = BU_yy where yy is the number of converters in the chain (i.e. 01 to 12), else if Redundancy ON and converter selected as a chain unit xx is the converter number (01 to 12), and z = A if Auto Mode or M if Manual Mode.

A.7.4.2 Maintenance Status

Command	Details	
Maintenance Status:	<DEV/RMS_'cr'	
Confirmation:	>DEV/RMS_'cr'	
	P15_xx.x'cr'	15 Vdc Supply
	P14_xx.x'cr'	14 Vdc Supply
	VCC_x.x'cr'	VCC Supply
	5VD_x.x'cr'	Display 5 Vdc
	TEM_xx'cr'	Temperature
	IFL_xx.x'cr'	IFLO Tuning
	SUM_xx.x'cr'	Sum Loop Tuning
	COR_xx.x'cr'	Coarse Loop Tune
	FIN_xx.x'cr''lf']	Fine Loop Tuning.

A.7.4.3 Utility Status

Command	Details
Utility Status:	<DEV/RUS_'cr'
Confirmation:	>DEV/RUS_'cr'
	COMM_aaaaaa'cr' RS-232 or RS-485 ADD_xxx'cr' Address (001 to 255) BR_nnnn'cr' Baud Rate (1200, 2400, 4800, 9600, 19K2, or 38K4) FMT_x-y-z'cr' Data Format x=data, y=parity, z=stop bit (8-N-1, 7-E-2, 7-O-2) REF_xxx'cr' Osc. Adjust (000 to 255) SLP_x.x'cr' Slope Adjust (0.0 to 1.0) CON_xx'cr' LCD Contrast (0 to 30) LCD_xx'cr"lf'] LCD Brightness (0 to 30).

A.7.4.4 Alarm Status

Command	Details
Alarm Status:	<DEV/RAS_'cr'
Confirmation:	>DEV/RAS_'cr'
	P15_xx'cr' 15 Vdc Fault P14_xx'cr' 14 Vdc Fault VCC_xx'cr' VCC Fault 5VD_xx'cr' 5VD Fault TEM_xx'cr' Temperature Fault IFL_xx'cr' IFLO Lock Fault SUM_xx'cr' Sum Lock Fault COR_xx'cr' Coarse Lock Fault FIN_xx'cr'Fine lock Fault HSB_xx'cr' High Speed Bus Fault *REF_xx'cr"lf'] Ref. Lock Fault xx = OK or FT

Note: REF_xx is only returned if an external reference is present.

A.7.4.5 Summary Alarm Status

Summary alarm is set to Fault (FT) if any items in Sect. A.7.4.4 are faulted.

Command	Details
Summary Alarm:	<DEV/SAS_'cr' xx = OK or FT
Confirmation:	>DEV/SAS_xx'cr"lf']

A.7.4.6 Terminal Status Change

The TSC_ command can be used to determine if the status of the terminal has changed since it was last polled. If any of the parameters listed in the RCS or RUS commands have changed as a result of user front panel operations or remote operations or if any new fault condition occur the TSC_ command will return YES. The TSC_ command will then continue to return YES until any

of the following commands are received: RCS_, RUS_, RAS_, PACRCS_, PACRUS_, or PACRAS.

Command	Details
Configuration Status:	<DEV/TSC_'cr'
Confirmation:	>DEV/TSC_nnn'cr"lf'] nnn=YES/NO

A.7.4.7 Packed Configuration Status

Configuration Status: <DEV/PACRCS_'cr'
Confirmation: >DEV/PACRCS_aaaabbbcdeffgghijkl'cr"lf']

where:

aaaa = # of 125kHz steps above base frequency[1]
bbb = # of 0.25 dB steps above 0.00 dB[2]
c = 1 if Transmitter ON, 0 if OFF, 2 if Cold
d = 1 if unit ONLINE, 0 if OFFLINE
e = 1 if Redundancy ON, else 0
ff = converter # (01-12,BU or 00 if e = 0)
gg = 00 if 'ff' is 00 (redundancy OFF)
gg = chain length (01-12) if 'ff' is BU
gg = XX if 'ff' = 01 - 12
h = A if Auto Mode, M if Manual[3]
I = 1 if Cold Start Enabled, else 0
j = 1 if Auto recovery enabled, else 0
k = 1 if an Ext. Ref is present, else 0
l = 1 if Remote Mode, 0 if Local Mode

Notes:

1. If the converter is 1 kHz step size, this will be the number of 1 kHz steps above the base frequency
2. If the converter is 0.1 -dB step size, this will be the number of 0.1 -dB steps above the base frequency
3. If it is a backup converter, it is always 'A'

A.7.4.8 Packed Maintenance Status

Packed Maintenance Status: <DEV/PACRMS_'cr'
Confirmation: >DEV/PACRMS_aabbccddeeeffgghhii'cr"lf']

where:

aa = V15 scaled 123mV per count (0x00 - 0xFF)
bb = V14 scaled 123mV per count (0x00 - 0xFF)
bc = VCC scaled 39mV per count (0x00 - 0xFF)
dd = V5D scaled 39mV per count (0x00 - 0xFF)
eee = signed Temperature in degrees C (-10 to +60)
ff = IFLO tune scaled 67mV per count (0x00 - 0xFF)
gg = SUM tune scaled 54mV per count (0x00 - 0xFF)
hh = COARSE tune scaled 78mV per count(0x00 - 0xFF)
ii = FINE tune scaled 89mV per count (0x00 - 0xFF)

A.7.4.9 Packed Utility Status

Packed Utility Status: <DEV/PACRUS_'cr'
Confirmation: >DEV/PACRUS_abbcdeeffghhii'cr"lf']

where:

a = 0=EIA-232, 1=EIA-485
bb = Address in hex (01 to FF)
c = 0 if Baud Rate 38400
= 1 if Baud rate 19200
= 2 if Baud rate 9600
= 3 if Baud rate 4800
= 4 if Baud rate 2400
= 5 if Baud rate 1200
d = 0 if Data Format 8-N-1
= 1 if Data Format 7-E-2
= 2 if Data Format 7-O-2
ee = Osc. Adjust in hex (00 to FF)
ff = Slope Adjust times by 10 (00 to 10)
g = Always 0, unused
hh = LCD Contrast (0 to 30)
ii = LCD Brightness (0 to 30)

A.7.4.10 Packed Alarm Status

Packed Alarm Status: <DEV/PACRAS_'cr'
Confirmation: >DEV/PACRAS_abcdefghijk'cr"lf']

where:

a = 1 if V15 Fault, else 0
b = 1 if V14 Fault, else 0
c = 1 if VCC Fault, else 0
d = 1 if V5D Fault, else 0
e = 1 if TEMP Fault, else 0
f = 1 if IFLO Fault, else 0
g = 1 if SUM Fault, else 0
h = 1 if COARSE Fault, else 0
I = 1 if FINE Fault, else 0
j = 1 if HSB Fault, else 0
k = 1 if EXT REF Fault, else 0

A.7.5 Stored Alarms

Up to 100 alarms are date/time stamped and stored in memory as they occur. The alarm entry is also updated with its date/time of clearance. The entry remains in memory until it is cleared by command.

A.7.5.1 Total Stored Alarms

This command retrieves the total number of stored alarms and the time and date of the most recent alarm.

Retrieve Total Alarms: <DEV/TSA_'cr'
Confirmation: >DEV/TSA_TOTAL:nn'cr'
LAST:hh:mm:ss mm/dd/yy'cr"lf']

where:
nn = 0 to 99; the 100th alarm will be ER
hh.mm.ss = time in hour:minute:second
mm/dd/yy = date in month/day/year

A.7.5.2 Clear All Stored Alarms

Clear Alarms: <DEV/CAA_YES'cr'
Confirmation: >DEV/CAA_CLEARED'cr"lf']

A.7.5.3 List All Alarms

This command retrieves a list of the stored alarms. This command is currently unavailable when using virtual addressing mode.

List All Alarms: <DEV/LAA_'cr'
Confirmation: >DEV/LAA_'cr'
xx yyyyyyyyyyy hh:mm:ss mm/dd/yy'cr'

" " " "
" " " "

xxx yyyyyyyyyyy hh:mm:ss mm/dd/yy'cr"lf']

Where:
xx = stored fault number
yyyyyyyyyyy = fault description
hh:mm:ss = fault time
mm/dd/yy = fault date

A.7.6 Error Processing

A.7.6.1 General Errors

The following Error Responses may be generated by any command instead of a confirmation:

>DEV?COM CU CMD UNRECOGNIZED'cr"lf']
>DEV?COM IP INVALID PARAM'cr"lf']
>DEV?COM PE PARITY ERROR'cr"lf']

A.7.6.2 Configuration Errors

The following Error Responses may be generated by configuration commands:

>DEV?COM LO DEVICE IN LOCAL MODE'cr"lf']

A.7.6.3 Mode Errors

The following Error Responses may be generated by Mode selection:

>DEV?COM AE ONLY VALID WHEN BACKUP'cr"lf']
>DEV?COM OE OFFLINE NOT AVAILABLE'cr"lf']
>DEV?COM CN COMMAND NOT AVAILABLE'cr"lf']

A.7.6.4 Time-Outs

A time-out should be assumed if there is no response in 500 milliseconds. The station monitor and control computer should try at least three times.

A.7.7 Command Summaries

A.7.8 User Remote Command Summary

Utility	Commands
Set Time	<DEV/TIM_hh:mm:ss'cr'
Set Date	<DEV/DAT_mm/dd/yy'cr'
Set Local / Remote Status	<DEV/LRS_x'cr'
Get MAC Address	<DEV/MAC_ 'cr'
Get IP Address	<DEV/IPA_'cr'
Get IP Gateway	<DEV/IPG_'cr'
Set Physical Address	<DEV/SPA_xxx'cr'
Set Baud Rate	<DEV/SBR_xxxx'cr'
Set LCD Contrast	<DEV/CON_xx'cr'
Set LCD Brightness	<DEV/LCD_xx'cr'
Set Screen Saver Mode	<DEV/SSM_x'cr'
Set Screen Saver Timeout	<DEV/SST_xx'cr'
Set VFD Brightness	<DEV/VFD_xxx'cr'
Set Reference Oscillator	<DEV/SRO_xxx'cr'
Set Converter Slope Adj.	<DEV/SSA_xxx'cr'
Get Equipment Type	<DEV/RET_'cr'
Get Part Number	<DEV/PNM_'cr'
Get Legacy Firmware Information	<DEV/FRW_'cr'
Get Firmware Information	<DEV/FRM_'cr'
Set Firmware Image	<DEV/IMG_x'cr'
Set Application ID Message	<DEV/AID_xxxxx...xxxxx'cr'
Set Force Reboot	<DEV/FRB_YES'cr'

Configuration	Commands
Set Frequency	<DEV/FRE_xxxxx.xxx'cr'
Set Attenuation	<DEV/ATT_xx.xx'cr'
Select Cold Start Mode	<DEV/CLD_xxx'cr'
Mute/Unmute Converter	<DEV/MUT_xxx'cr'
Set Carrier Mute Mode	<DEV/CMM_xxx'cr'
Set Redundant Mute Mode	<DEV/CRM_xxx'cr'
Set Fault Recovery Mode	<DEV/AFR_xxx'cr'
Set a Preset	<DEV/PGM_nn_xxxxx.xxx_yy.yy'cr'
Get All Presets	<DEV/DPS_'cr'
Clear a Preset	<DEV/CLR_nn'cr'
Select a Preset	<DEV/SEL_nn'cr'

Redundancy Mode	Commands
Select Redundancy ON/OFF	<DEV/RED_xxx'cr'
Configure Redundant Converter	<DEV/ICT_xx_yy'cr'
Select Auto/Manual Mode	<DEV/SAM_xx_y'cr'
Forced Backup Mode	<DEV/FBU_xx_y'cr'

Status	Commands
Retrieve Configuration Status	<DEV/RCS_'cr'
Retrieve Maintenance Status	<DEV/RMS_'cr'
Retrieve Utility Status	<DEV/RUS_'cr'
Retrieve Alarm Status	<DEV/RAS_'cr'
Summary Alarm Status	<DEV/SAS_'cr'
Terminal Status Change	<DEV/TSC_'cr'
Packed Configuration Status	<DEV/PACRCS_'cr'
Packed Maintenance Status	<DEV/PACRMS_'cr'
Packed Utility Status	<DEV/PACRUS_'cr'
Packed Alarm Status	<DEV/PACRAS_'cr'

Stored Alarm	Commands
Retrieve Total Stored Alarms	<DEV/TSA_'cr'
Clear All Stored Alarms	<DEV/CAA_YES'cr'
List All Stored Alarms	<DEV/LAA_'cr'

Notes:

Appendix B. REDUNDANT SYSTEM OPERATION

B.1 Introduction to Redundancy Operation

The Comtech EF Data UT-4500-A Series Upconverters are configured for redundant system operation using distributed protection switching in an active "Daisy Chain" configuration.

Comtech EF Data's proprietary "Daisy Chain" configuration distributes the upconverter protection switching functions in the upconverters. This provides a system capability to backup from 1 to 12 online upconverters.

A High Speed Bus (HSB) provides the communications interface between the backup and online upconverters to detect faults and reconfigure the subsystem to replace the failed upconverter. When a faulted upconverter is removed from active operation, it is detached from the active upconverter chain by separating the upconverter from its switch module, leaving the active online upconverter chain intact through the switch module. The chain can be extended without affecting the online upconverter operation.

The active "chained" upconverters in a redundancy subsystem can also be indirectly controlled through the backup upconverter using the remote serial communication link – this capability is discussed in **Appendix A. REMOTE CONTROL**.

B.2 Backup Upconverter

The "Daisy Chain" terminates in the backup upconverter. The backup upconverter has a microprocessor, which performs fault detection, self-reconfiguration and the logical switching functions. If the backup upconverter does not have a fault, it will assume the frequency and attenuation of the faulted upconverter and compensate for the chain losses. This capability is accomplished through the operation of the HSB and the online upconverter detachable switch modules.

B.2.1 High Speed Bus (HSB)

In the "Daisy Chain" configuration, the backup upconverter communicates with the online units through the HSB. The backup upconverter is able to detect faults and reconfigure itself to replace

the faulted upconverter. The HSB interface is also used in the backup converter to monitor configuration changes made to an online upconverter. Changes in frequency, gain, or polarity are immediately entered into the backup table as well as information from new online units. The high-speed bus does not interfere with the remote serial communication link access to any of the upconverters in the chain.

B.2.2 Detachable Modules

Comtech EF Data's upconverters are designed with a detachable Input/Output Module (IOM) which contains the signal path connectors. The IOM is utilized for single thread operation, or for testing of the unit.

For redundant "Daisy Chain" operations, the online upconverters are provided with a detachable Transmit Switch Module (TSM) replacing the IOM.

Refer to **Chapter 3. REAR PANEL CONNECTORS**, **Sect. 3.2.2.2** for quick reference tables for the modules available to both the UT-4500-A Series Upconverters and the DT-4500-A Series Downconverters.

B.2.2.1 Upconverter Switching

Upconverter switching is implemented with a detachable TSM. The TSM contains IF and RF transfer switches for input/output looping of the signal. Options for the TSM include Type 'SMA' connectors for the RF output signal, and 50 or 75Ω BNC connectors for the IF.

B.3 Redundant Configurations

Comtech EF Data UT-4500-A Series Upconverters can be configured in several different redundant subsystem "Daisy Chain" configurations to meet the reliability requirements of a communication system. These configurations include:

- **1:1 Redundant Systems**
    - **Single Source IF Input Configuration:** The online upconverter uses an IF & RF transfer switch to switch the IF input and RF output signals. A single switched IF input and RF output is provided to and from the online upconverter. The transfer switches are contained in the TSM installed in the online upconverter. When a fault occurs in the online upconverter, the TSM is de-activated to switch out the online upconverter, and switch the IF input and RF output to the backup upconverter. **Figure B-1** depicts the cable connections between the upconverters. **Figure B-2** shows the block diagram of this 1:1 redundant upconverter configuration.
    - **Dual Source IF Input Configuration:** Two IF inputs – IF Input #1 (priority) and IF Input #2 – are switched in the TSM to provide redundant operation of the upconverters. The upconverters provide two switched RF outputs – RF Output #1 (priority) and RF Output #2. If Upconverter #1 faults, Upconverter #2 backs up the priority channel when IF Signal #2 and RF Signal #2 are not operational.

Figure B-5 depicts the cable connections between the upconverters. **Figure B-6** shows the block diagram of the 1:1 redundant, dual source RF input, upconverter configuration.

- **1:N Redundant Systems**

  - IF and RF switches in the TSM are used to switch the IF input and RF output of a faulted online upconverter to the backup upconverter. The IF input and RF output to the redundant upconverter subsystem is connected to online upconverter #N. **Figure B-7** depicts the cable connections between the upconverters. **Figure B-8** shows the block diagram for this 1:N redundant "Daisy Chain" upconverter configuration.

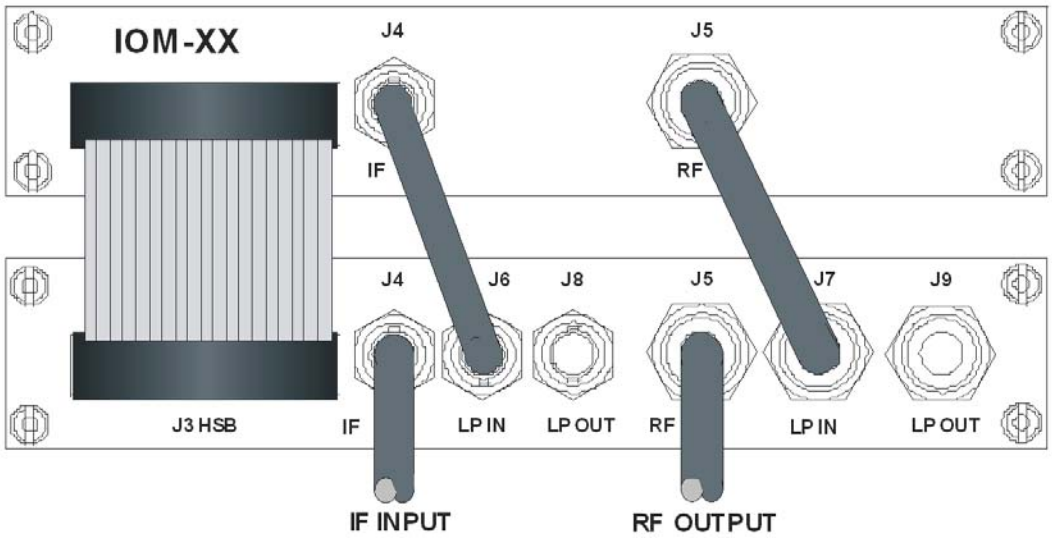


Figure B-1. 1:1 Redundant Configuration –Single Source IF Input with IOM-XX and TSM-XX Installed

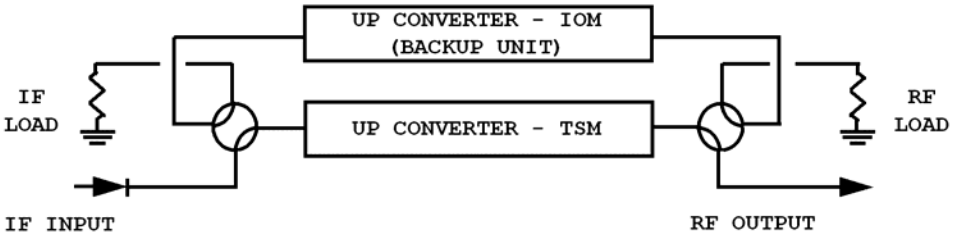


Figure B-2. 1:1 Redundant Configuration Diagram – Single Source RF Input with IOM-XX and TSM-XX Installed

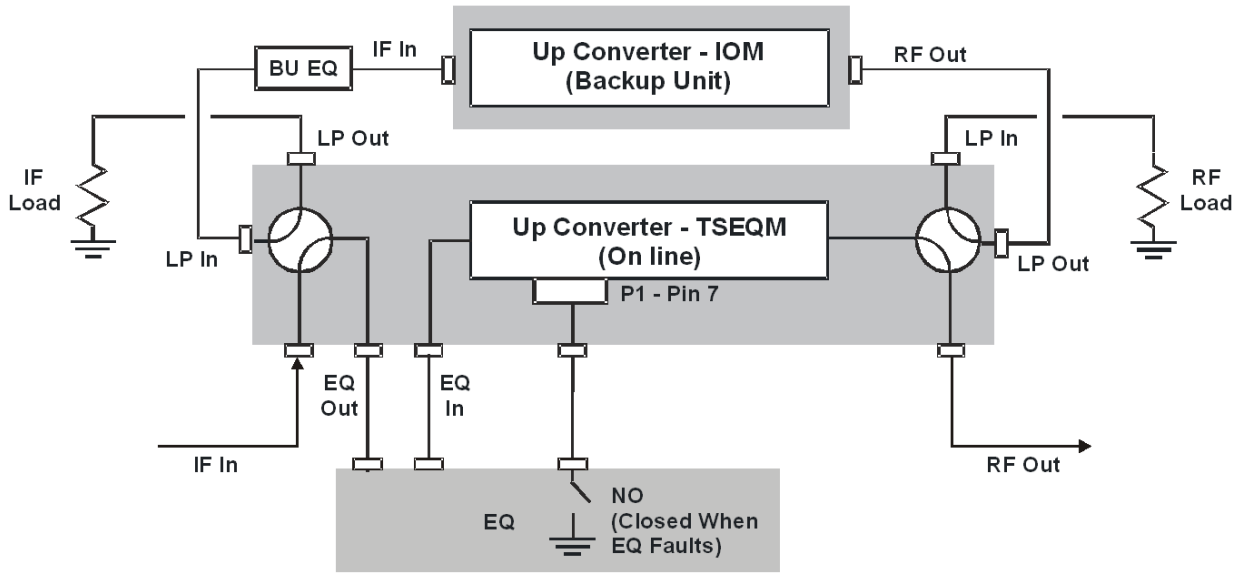


Figure B-3. 1:1 Redundant Configuration Diagram – Single Source RF Input with IOM-XX and TSEQM-XX Installed

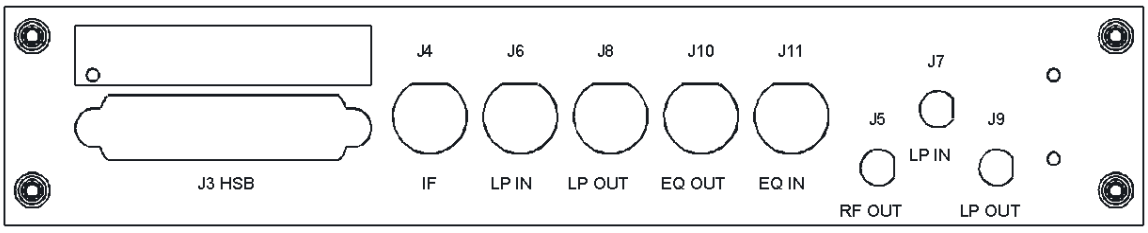


Figure B-4. TSEQM Connection Locations

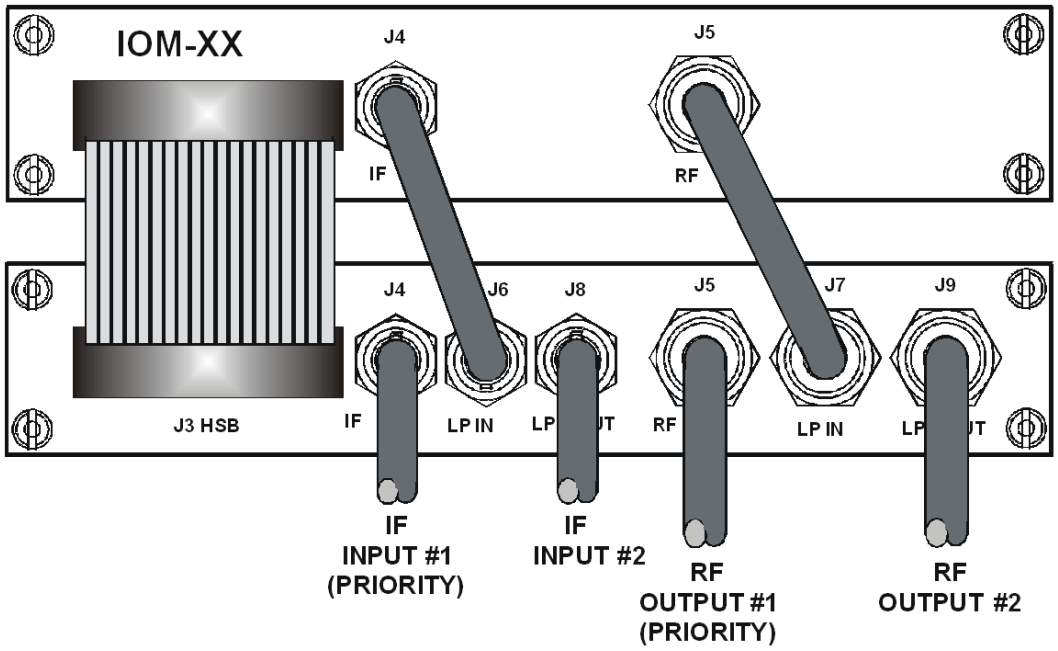


Figure B-5. 1:1 Redundant Configuration - Dual Source IF Input

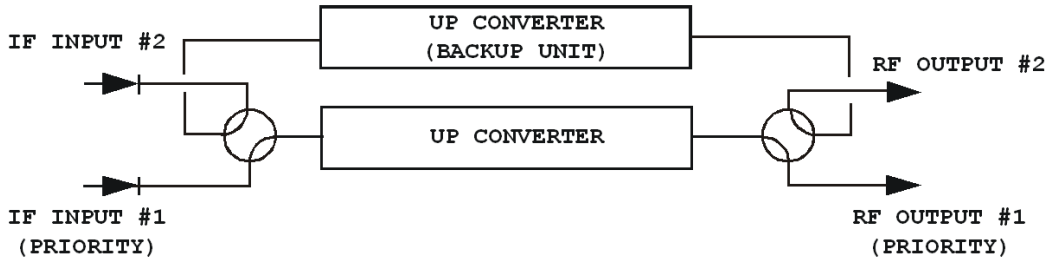


Figure B-6. 1:1 Redundant Configuration Diagram – Dual Source IF Input with IOM-XX and TSM-XX Installed

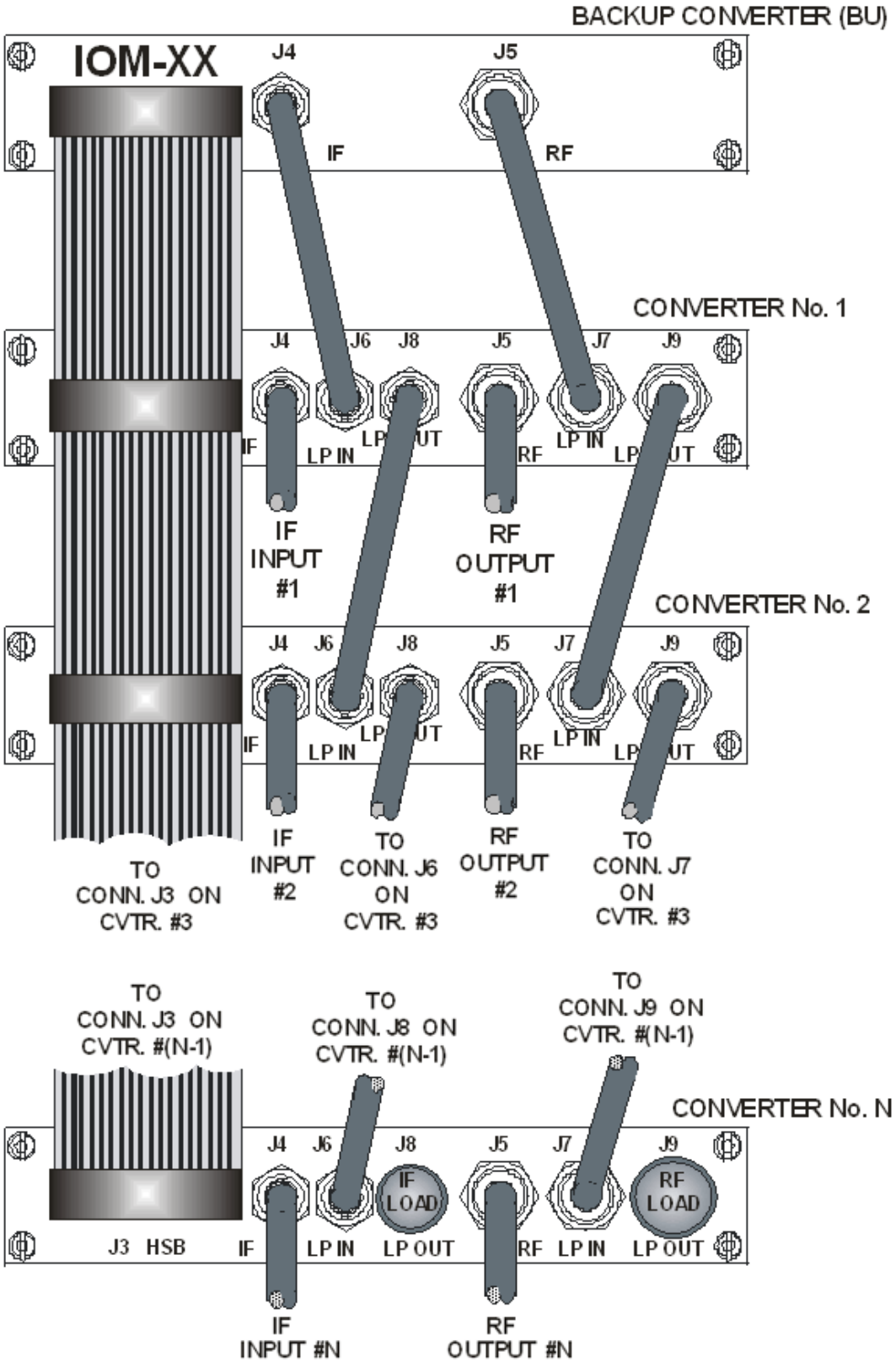


Figure B-7. 1:N Redundant Configuration with IOM-XX and TSM-XX Installed

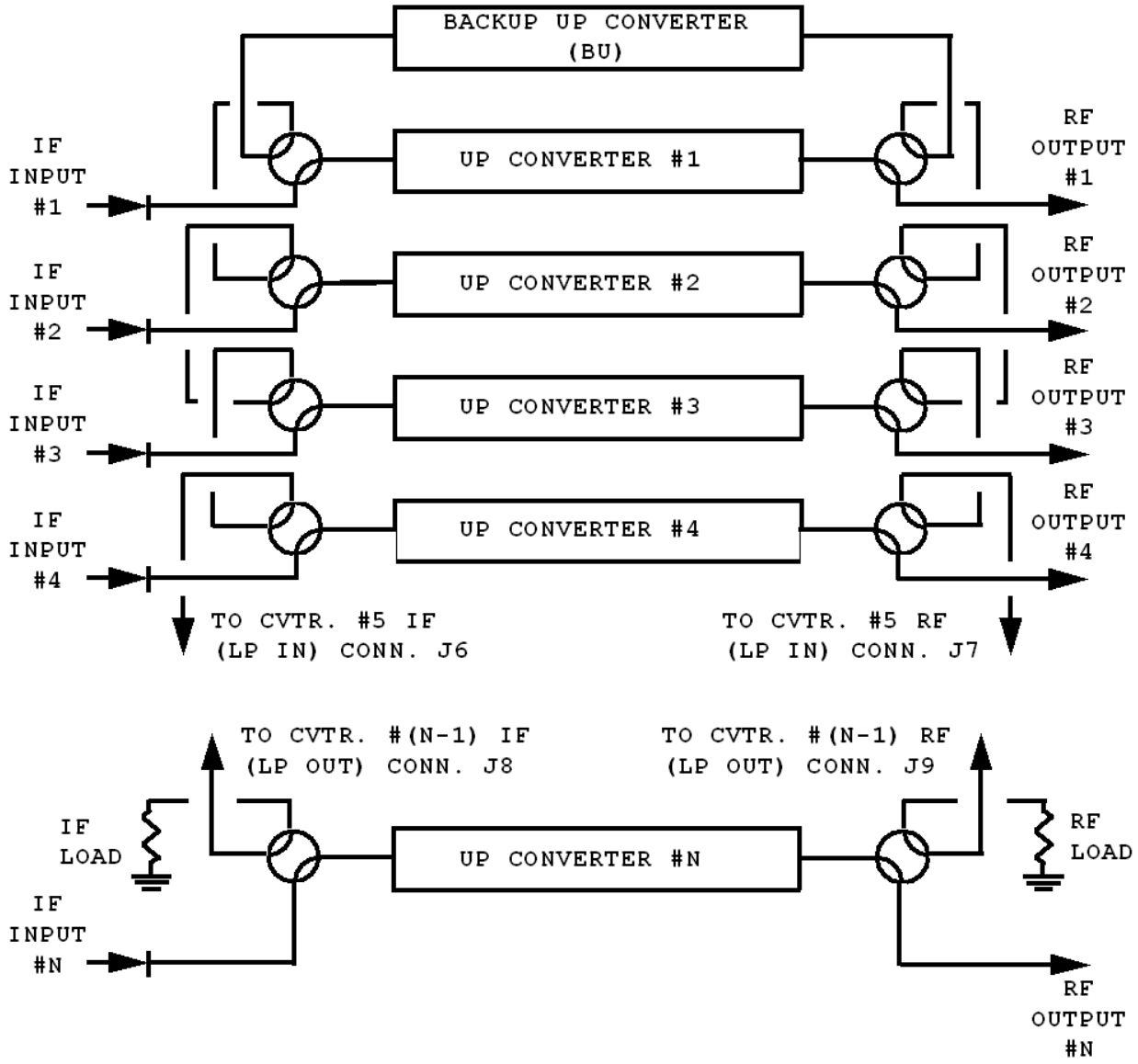


Figure B-8. 1:N Redundant Configuration Diagram with IOM-XX and TSM-XX Installed

B.4 Redundant System Configuration

B.4.1 Initial Configuration

Redundant system configuration is controlled from the upconverter's front panel configuration menu. Each online unit is assigned a redundancy configuration address. This address is dependent on the location of the online upconverter with reference to the backup. The unit closest to the backup must be Upconverter # 1. The next unit down must be Upconverter # 2. **Figure B-9** shows the appropriate entries for a 1:3 system.

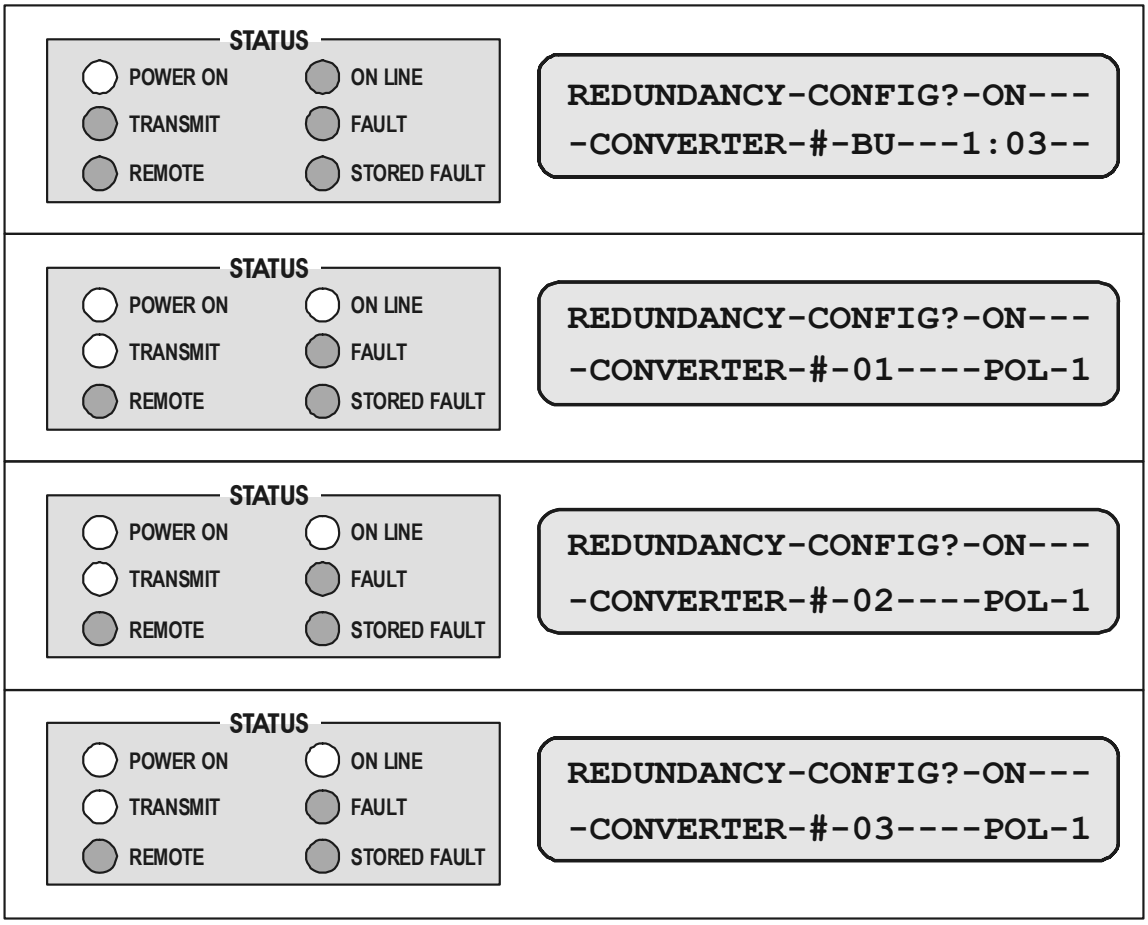


Figure B-9. Front Panel Displays

Configure the online units first, and then configure the backup unit. Redundant polling starts when the backup is configured. If this polling starts before the online units are configured, a high-speed bus fault will result. This fault should clear when configuration is completed. At this point, control of the redundant system is performed from the backup upconverter.

B.4.2 Automatic Configuration Verification

The backup upconverter has a menu that allows the operator to choose, on a unit-by-unit basis, manual (M) or automatic (A) operating mode.

Figure B-10 shows the system configured for automatic (A) operation. In this mode, failure of an online upconverter will automatically cause a switchover to the redundant unit to occur. In the field, the simplest way to test this mode is to turn off an online unit. The AUTO/MANUAL selection is made in the upconverter. The online units will report their status as shown in **Figure B-10**.

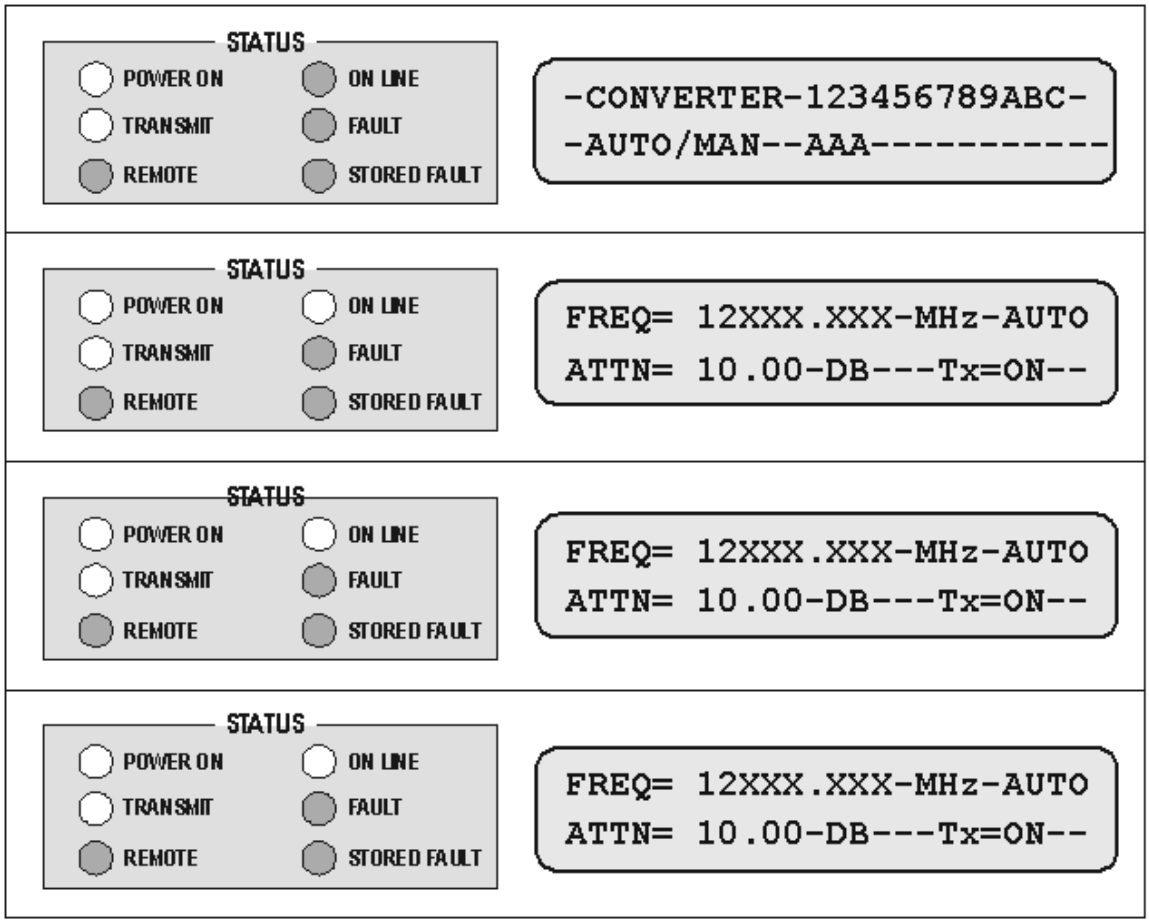


Figure B-10. System in Auto Redundant Mode

Figure B-11 depicts the front panel displays after power has been turned off on Upconverter #1. Note the **ON LINE** LED is illuminated on the backup upconverter. This indicates that the backup is now providing the frequency translation in place of the online unit. As soon as power is restored, Upconverter #1 will come back online.

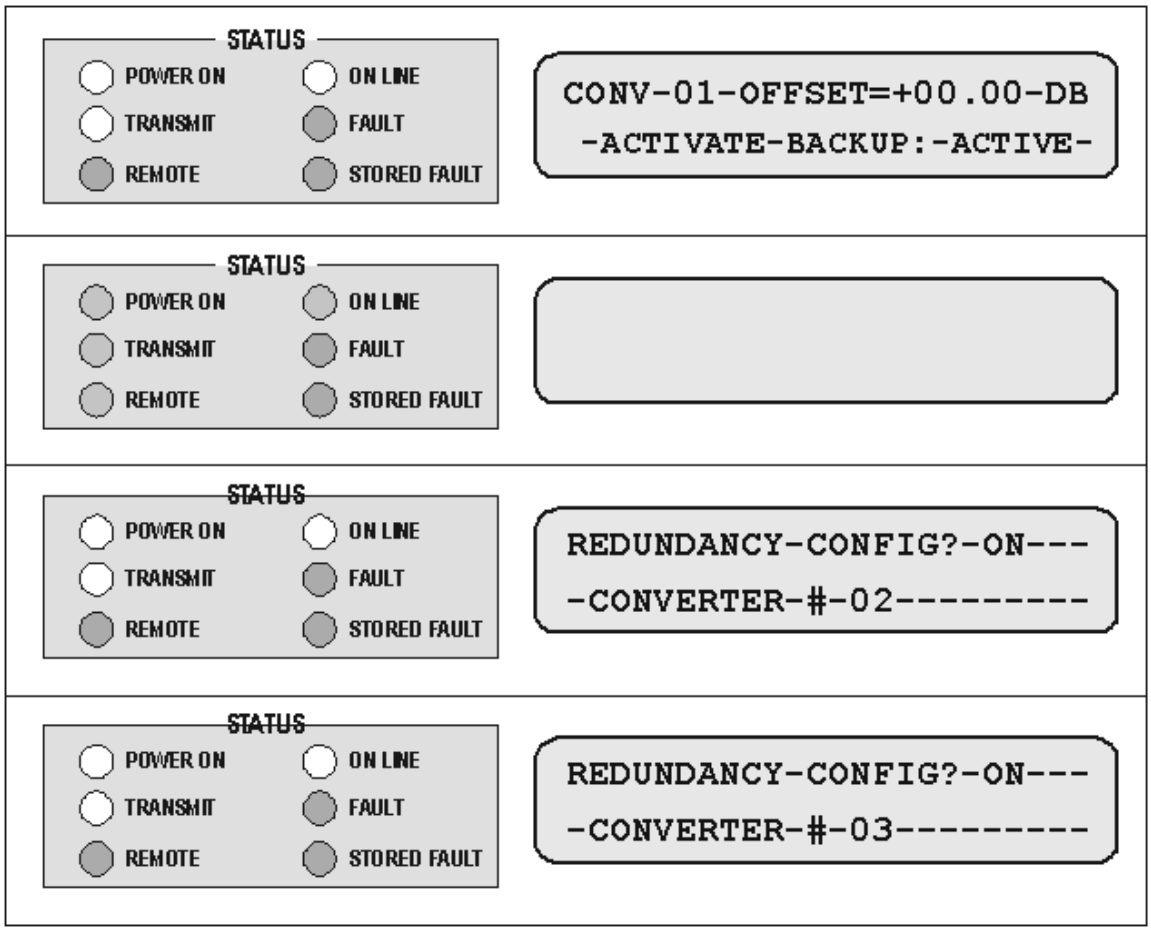


Figure B-11. Backup of Converter #1

B.4.3 Manual Configuration and Verification

Figure B-12 shows the system with Upconverter #1 configured for manual (M) operation. In this mode, the backup upconverter can force switchover of an online unit. This mode also overrides fault status detection of the online units performed by the backup upconverter. If an online unit is configured to manual mode and this unit faults, no switchover will occur.

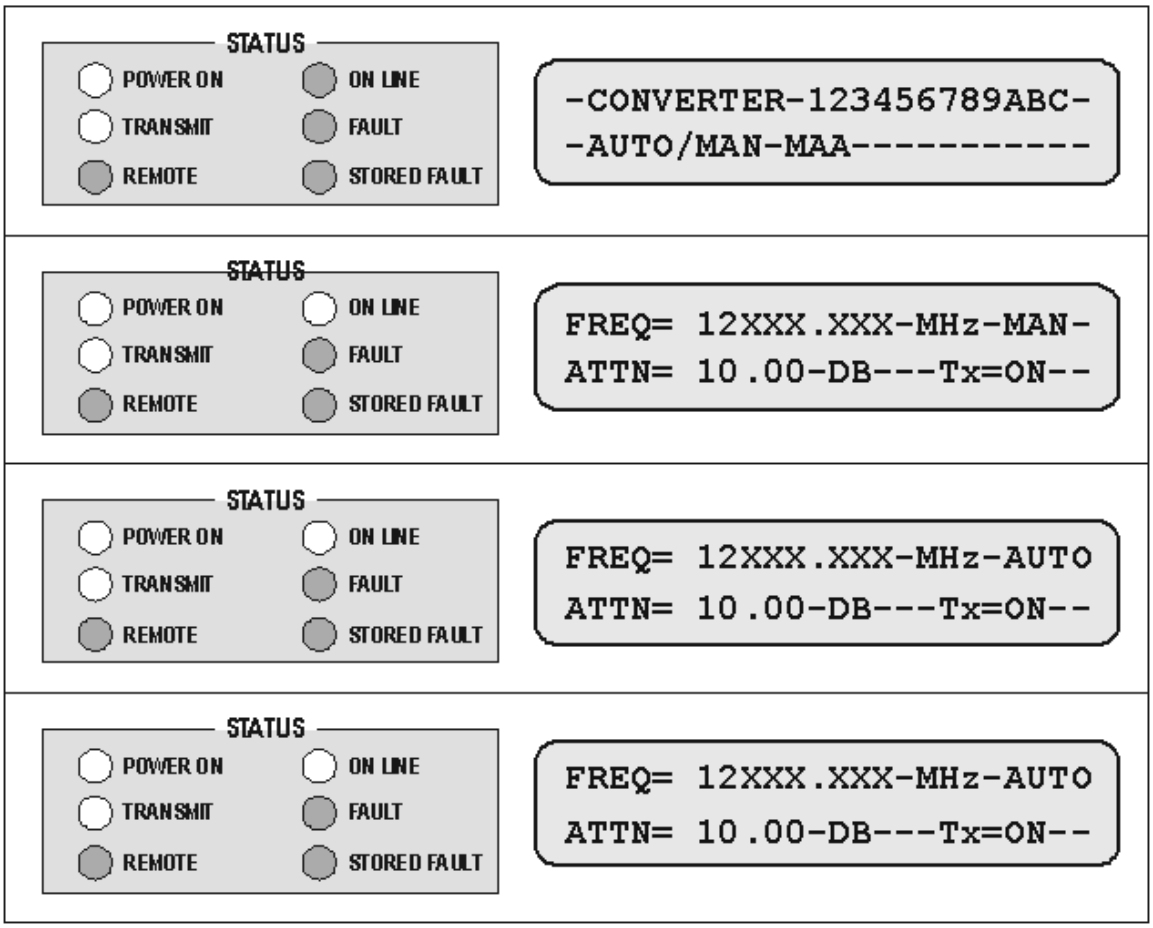


Figure B-12. Converter #1 in MANUAL, Others in AUTO

Figure B-13 shows the front panel displays after the backup has forced upconverter 1 offline. Note that the **ON LINE** LED allows the user to tell whether the backup is currently active and which upconverter is being bypassed.

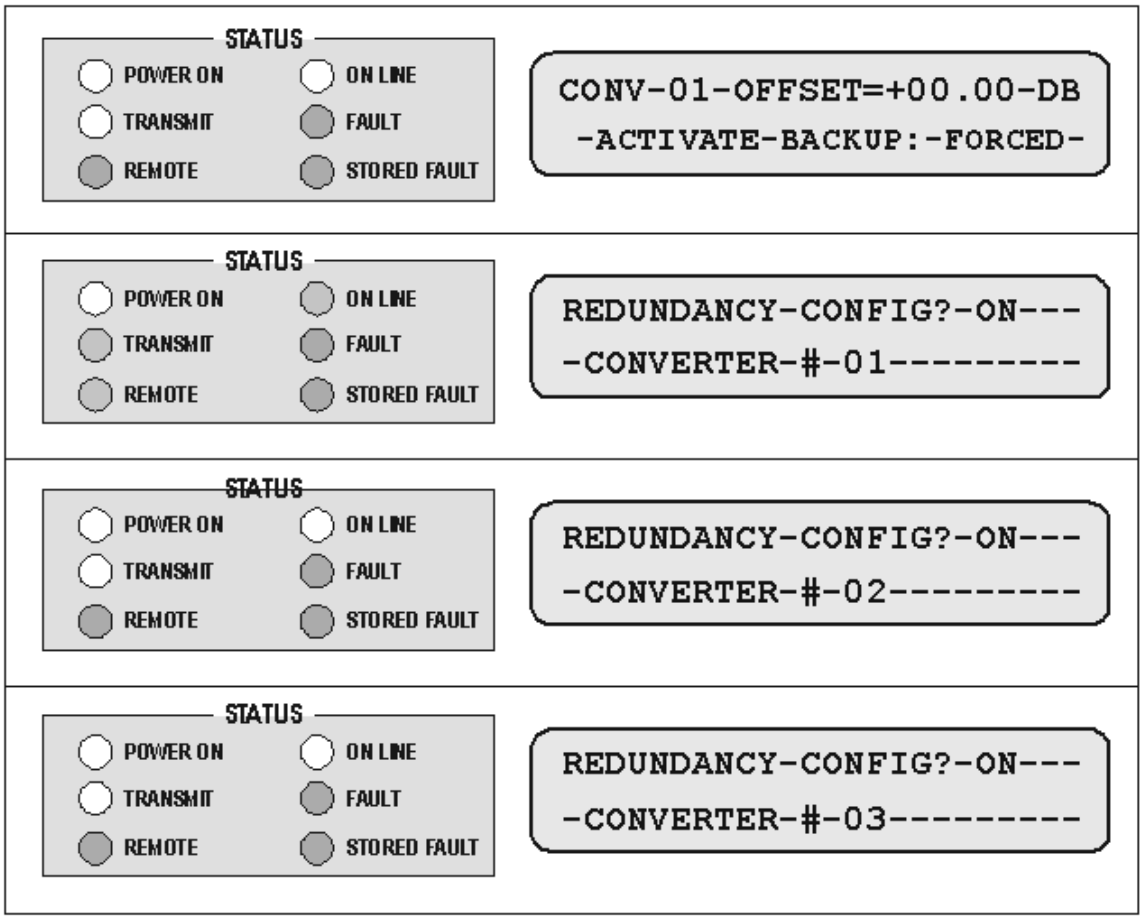


Figure B-13. Forced Backup of Converter #1

B.4.4 Offset Adjustment

The offset is used to compensate for cable and switch losses. When the system is initially set up and tested, each upconverter needs to be forced to backup and the offset adjusted to minimize gain mismatch between the normal and bypassed mode. This offset will be different for each upconverter and is stored in a table in the backup unit. Follow these steps to set the offset:

Step	Description
1	Connect a signal source to the input and a power meter or spectrum analyzer to the output of the first online upconverter.
2	Record the output power.
3	Force a backup of the first online unit and adjust the offset until the output power matches what was recorded in Step 2.
4	Restore the online unit and repeat for the other online units.

B.4.5 Redundancy Systems – Upconverter Removal and Replacement

In a redundancy system, to remove an "inline" upconverter for repair, the following procedure must be used:

Step	Description
1	Force backup of faulted unit.
2	Turn the power switch on the inline upconverter rear panel to OFF, and remove the power cord from the upconverter. DO NOT disconnect the RF and IF cables from the TSM.
3	Unscrew the mounting screws on the TSM first, and then unscrew the rack mounting screws on the front panel of the upconverter.
4	From the rear of the inline upconverter, hold the TSM and push the upconverter to the front of the rack until TSM is free of the upconverter chassis.
5	Remove the inline upconverter from the front of the rack.

To install the replacement unit, the following procedure must be used.

Step	Description
1	Power up the new unit on the bench.
2	Configure the new unit for the correct redundancy settings (Redundant = ON, Address = match old unit).
3	Power off the new unit.
4	Remove existing personality module from the new unit.
5	Carefully install the new unit into the rack. The existing module in the rack will be plugged into the new unit.
6	Power up the new unit and un-force the backup.

To remove a “Backup” upconverter for repair, the following procedure must be used:

Step	Description
1	Turn the power switch on the backup upconverter rear panel to OFF, and remove the power cord from the upconverter. Disconnect the RF and IF cables from the IOM.
2	Unscrew the rack mounting screws on the front panel of the backup upconverter.
3	Remove the backup upconverter from the front of the rack.

Appendix C. MAINTENANCE AND TROUBLESHOOTING

C.1 Overview

This appendix serves to assist operator and maintenance personnel in the checkout, maintenance and troubleshooting of the UT-4500-A Series Upconverters.

Comtech EF Data recommends that spare replacement converters be used to replace converters removed from the system for maintenance. Troubleshooting procedures are provided for fault isolation to the module level.

The input and output signals, the interconnecting cables and the location of the modules are as shown in **Figure C-1**.

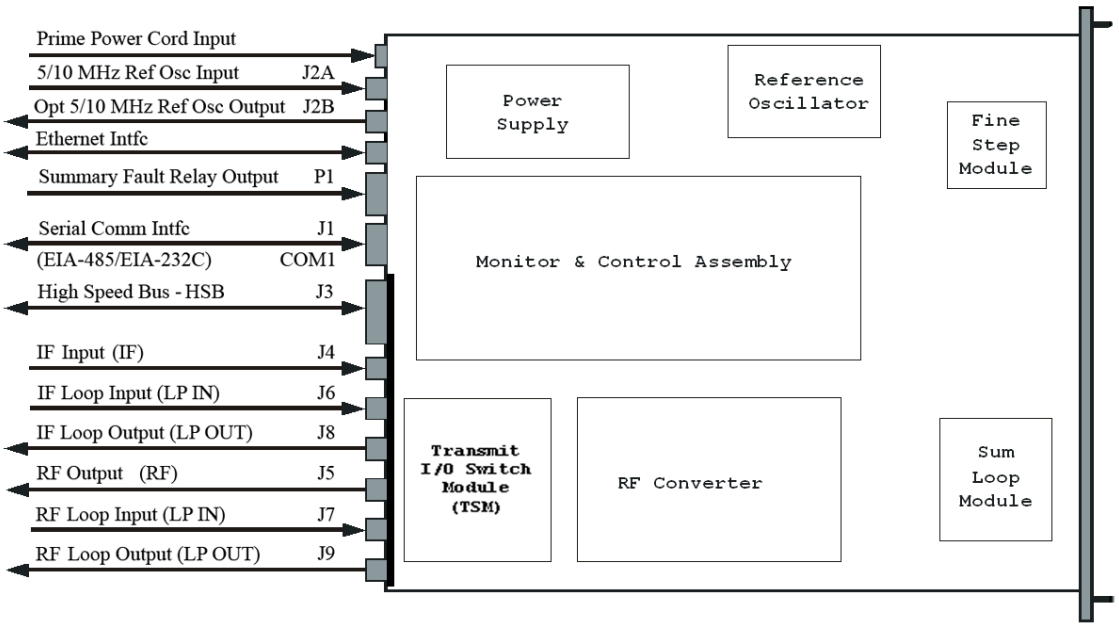


Figure C-1. Upconverter Signal and Interconnecting Cable Diagram (with Transmit Switch Module [TSM])

C.2 Maintenance Testing

The UT-4500-A Series Upconverters translate the input IF frequency from 52 to 88 MHz (or optional 104 to 176 MHz) to an output RF frequency. For example, the RF output frequency of the Model UT-4514-A is 14000 to 14500 MHz. The IF input level is -35 dBm (typical), and the RF output level is +10 dBm at 1 dB compression.

To prepare for checkout, review the rack mounting information provided in **Chapter 2. INSTALLATION**. Operations via the front panel (i.e., use of the menu system, keypad, and VFD) are explained in detail in **Chapter 5. FRONT PANEL OPERATION**.

C.2.1 Test Point Samples

The IF output and RF input can be monitored at the RF Sample Test Points on the front panel. A BNC female connector is provided for the IF sample and a Type 'SMA' female connector is provided for the RF output. The RF sample output level is -20 dBc nominal, and the IF sample input level is -20 dBc nominal.

C.2.2 Troubleshooting

Upconverter operating problems can be identified by first observing the LED status indicators on the front panel. When a fault condition is indicated, or and marginal performance tolerance condition exists, the specific fault or faults can be identified via the **FAULTS** menu branch, accessible via front panel operation. See **Sect. 5.3.3 FAULTS** in **Chapter 5. FRONT PANEL OPERATION** for more information about viewing current or stored faults.

Upconverter operational status screens are available via the **MONITOR** menu branch. See **Sect. 5.3.2 MONITOR** in **Chapter 5. FRONT PANEL OPERATION** for more information.

C.2.3 Upconverter Faults

C.2.3.1 Prime Power

Check the dual fuses on the rear panel. The required prime power is 100 to 125 VAC, or 205 to 240 VAC @ 1 Amp. The optional DC prime power is -48 VDC.

C.2.3.2 DC Power Supply Module

15 VDC: A fault ("FT") indicates a voltage level exceeding ± 10% of the power supply voltage. Check the output of the DC Power Supply Module. The typical current output level is 3.0 amps. Check all connections to make sure they are secure. If the voltage exceeds ± 10%, or the power supply module current is not approximately 3.0 amps, or the fault still exists, remove the power supply and return it to Comtech EF Data for repair.

14 VDC: A fault ("FT") indicates a voltage level exceeding ± 10% of the power supply voltage. The 14 VDC is developed in the modules. Check the output of the 15 VDC Power Supply

Module, check for other module faults, and check all connections. If the fault still exists, remove the converter and return it to Comtech EF Data for repair.

VCC (+5 VDC): A fault ("FT") indicates a voltage level exceeding ± 10% of the power supply voltage. The 5 VDC is developed in the modules. Check the output of the 15 VDC Power Supply Module, check for other module faults, and check all connections. If the fault still exists, remove the converter and return it to Comtech EF Data for repair.

C.2.3.3 RF Converter Module

IFLO Lock Detect: A fault ("FT") indicates that the IFLO is not locked. Check all connections to the converter module to make sure they are secure. If the fault still exists, remove the Converter Module and return it to Comtech EF Data for repair.

C.2.3.4 Synthesizer Sum Loop Module

Sum Loop Detect: A fault ("FT") indicates that the sum loop is not locked. Check all connections to the converter module to make sure they are secure. If the fault still exists, remove the Sum Loop Module and return it to Comtech EF Data for repair.

C.2.3.5 Synthesizer Fine Step Module

Coarse Loop Detect: A fault ("FT") indicates that the coarse loop is not locked. Check all connections to the converter module to make sure they are secure. If the fault still exists, remove the Fine Step Module and return it to Comtech EF Data for repair.

Fine Loop Detect: A fault ("FT") indicates that the fine loop is not locked. Check all connections to the converter module to make sure they are secure. If the fault still exists, remove the Fine Step Module and return it to Comtech EF Data for repair.

C.2.3.6 Reference Oscillator Module

Reference Lock Detect: A fault ("FT") indicates that the reference oscillator detected an external reference, but could not lock to it. Disconnect the external reference. If the fault still exists, remove the Reference Module and return it to Comtech EF Data for repair.

C.2.3.7 Temperature Fault

Upconverter Over Temperature Fault: A fault ("FT") indicates that the converter is over temperature. Turn the prime power switch off and return the converter to Comtech EF Data for repair.

C.2.4 Converter I/O Modules

The Converter I/O Modules (IOM or TSM) are installed into the rear panel of the converter.

The thumbscrews used for installing the modules into the converter rear panel are designed to be hand-tightened only. When installing an I/O Module DO NOT use a screwdriver to tighten the module mounting screws – install screws "hand tight" only.

C.3 Spares

Comtech EF Data recommends field maintenance replacement at the RF converter level, and that the converter is returned to Comtech EF Data for repairs. However, for field replacement of the converter modules, contact Comtech EF Data for the correct spares for and particular converter.

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

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-459.69	-273.16

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	—

2114 WEST 7TH STREET TEMPE ARIZONA 85281 USA
480 • 333 • 2200 PHONE
480 • 333 • 2161 FAX