UT-4500 Series

C- and Ku-Band Up Converters
Installation and Operation Manual
Firmware Ver. 1.3.4 and Higher

Part Number MN/UT4500.IOM / CD/UT4500.IOM
Revision 3

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/UT4500.IOM / CD/UT4500.IOM Revision 3

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data UT-4500 Series C- and Ku-Band Up Converters. This document is intended for the persons responsible for the operation and maintenance of the UT-4500 family of products.

Revision 3 of this manual represents a rewrite from Revision 2, in order to document the current production models for the UT-4500 Series products, and to update the manual to the current Comtech EF Data Technical Publications Department Standards and Practices. This manual also replaces the Comtech EF Data UT-4500-A Series Upconverters Installation and Operation Manual (CEFD P/N MN-UT4500A).

Disclaimer

Comtech EF Data has reviewed this manual thoroughly in order to provide an easy-to-use guide to this 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 there are any questions regarding this equipment or the information in this manual, please contact Comtech EF Data Product Support.

Conventions and References

Patents and Trademarks

See all of Comtech EF Data's Patents and Patents Pending at
http://patents.comtechefdata.com.

Comtech EF Data acknowledges that all trademarks are the property of the
trademark owners.

Warnings, Cautions, Notes, and References

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

A **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.

A **NOTE:** gives you important information about a task or the
equipment.

A **REFERENCE** directs you to important operational information or
details furnished elsewhere, either in the manual or in adjunct
Comtech EF Data publications.

Examples of Multi-Hazard Notices
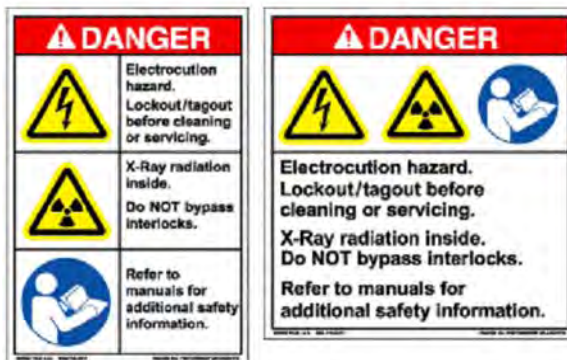
Recommended Standard Designations

Electronic Industries Association (EIA) designations supersede Recommended Standard (RS) designations. Reference to the old RS designations may appear where it might concern actual text (e.g., RS-232) displayed on the product panels and on screens or pages in the Serial Remote or HTTP (Web Server) Interfaces. All other references in the manual refer to EIA designations.

> **CAUTION**
> It is important that you review and understand the Safety and Compliance information that follows.

Safety and Compliance

Electrical Safety and Compliance

The unit complies with the **EN 60950 Safety of Information Technology Equipment (Including Electrical Business Machines)** safety standard.

Electrical Installation

> **CAUTION**
> CONNECT THE UNIT TO A POWER SYSTEM THAT HAS SEPARATE GROUND, LINE AND NEUTRAL CONDUCTORS. DO NOT CONNECT THE UNIT WITHOUT A DIRECT CONNECTION TO GROUND.
>
> **Sect 4.2.2 Unit Ground Connection**

Operating Environment

> **CAUTION**
> DO NOT OPERATE THE UNIT IN ANY OF THESE EXTREME OPERATING CONDITIONS:
> - AMBIENT TEMPERATURES LESS THAN 0° C (32° F) OR MORE THAN 50° C (122° F).
> - PRECIPITATION, CONDENSATION, OR HUMID ATMOSPHERES OF

MORE THAN 95% RELATIVE HUMIDITY.
- UNPRESSURIZED ALTITUDES OF MORE THAN 3048 METRES (10,000 FEET).
- EXCESSIVE DUST.
- FLAMMABLE GASES.
- CORROSIVE OR EXPLOSIVE ATMOSPHERES.

European Union Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive (1999/5/EC) and EN 301 489-1

Independent testing verifies that the unit complies with the European Union R&TTE Directive, its reference to EN 301 489-1 (*Electromagnetic compatibility and Radio spectrum Matters [ERM]; Electromagnetic Compatibility [EMC] standard for radio equipment and services, Part 1: Common technical requirements)*, and the Declarations of Conformity for the applicable directives, standards, and practices that follow:

European Union Electromagnetic Compatibility (EMC) Directive (2004/108/EC)

- **EN 55022 Class A** (**Emissions)** – Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.
- **EN 55024 (Immunity)** – Information Technology Equipment: Immunity Characteristics, Limits, and Methods of Measurement.
- **EN 61000-3-2** – Harmonic Currents Emission
- **EN 61000-3-3** – Voltage Fluctuations and Flicker.
- **Federal Communications Commission Federal Code of Regulation FCC Part 15, Subpart B.**

CAUTION
TO ENSURE THAT THE UNIT COMPLIES WITH THESE STANDARDS, OBEY THESE INSTRUCTIONS:

- Operate the unit with its cover on at all times.

- Use Type 'D' connectors that have back-shells with continuous metallic shielding.
- Type 'D' cabling must have a continuous outer shield (either foil or braid, or both). The shield must be bonded to the back-shell.
- Use coaxial cable that is of good quality for connections to the Switch Module Type 'N' female connectors.

European Union Low Voltage Directive (LVD) (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 Warnings, Cautions and Notes listed earlier in this Preface.

European Union RoHS Directive (2002/95/EC)

This unit satisfies (with exemptions) the requirements specified in the European Union Directive on the Restriction of Hazardous Substances in Electrical and Electronic Equipment (EU RoHS, Directive 2002/95/EC).

European Union Telecommunications Terminal Equipment Directive (91/263/EEC)

In accordance with the European Union Telecommunications Terminal Equipment Directive 91/263/EEC, the unit should not be directly connected to the Public Telecommunications Network.

CE Mark

Comtech EF Data declares that the unit meets the necessary requirements for the CE Mark.

Product Support

For all product support, please call:

+1.240.243.1880

+1.866.472.3963 (toll free USA)

Comtech EF Data Headquarters

http://www.comtechefdata.com

Comtech EF Data Corp.
2114 West 7th Street
Tempe, Arizona USA 85281
+1.480.333.2200

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.

Chapter 1. INTRODUCTION

1.1 Overview

Figure 1-1. UT-4500 Series Up Converters (UT-4505 shown)

Comtech EF Data's UT-4500 Series of C- and Ku-Band Up Converters (**Figure 1-1**) are designed for the transmission of SCPC, DAMA and TDMA signals in communication systems or satellite uplink data systems. These converters are also used in communications system applications with full transponder HDTV and analog TV.

The UT-4500 Series Up Converter family of products comprises:

- **C-Band Units:**
  UT-4505; UT-4505/E; UT-4505/F; UT-4505/G; UT-4505/H; UT-4505/I; UT-4505/J; UT-4505/K; UT-4505/M; UT-4505/N
- **Ku-Band Units:**
  UT-4514; UT-4514/C; UT-4514/D; UT-4514/E; UT-4514/F; UT-4514/G; UT-4518; UT-4518/E

> 1) See Chapter 2. SPECIFICATIONS for individual product specifications.
> 2) Comtech EF Data publication DT-4579 X-Band Up Converter Installation and Operation Manual (CEFD P/N MN/UT4579.IOM) documents the X-Band version of this product.

1.2 Functional Description

Figure 1-2 shows the UT-4500 chassis with its top cover removed. The major chassis components and module assemblies are:

- Signal Path Module
- Step Loop Module
- Monitor & Control Assembly
- Removable Module (IOM, PSM, TSM, EQM, or RSM installs into rear chassis slot)
- Reference Oscillator Assembly
- Sum Loop Module
- Power Supply Assembly
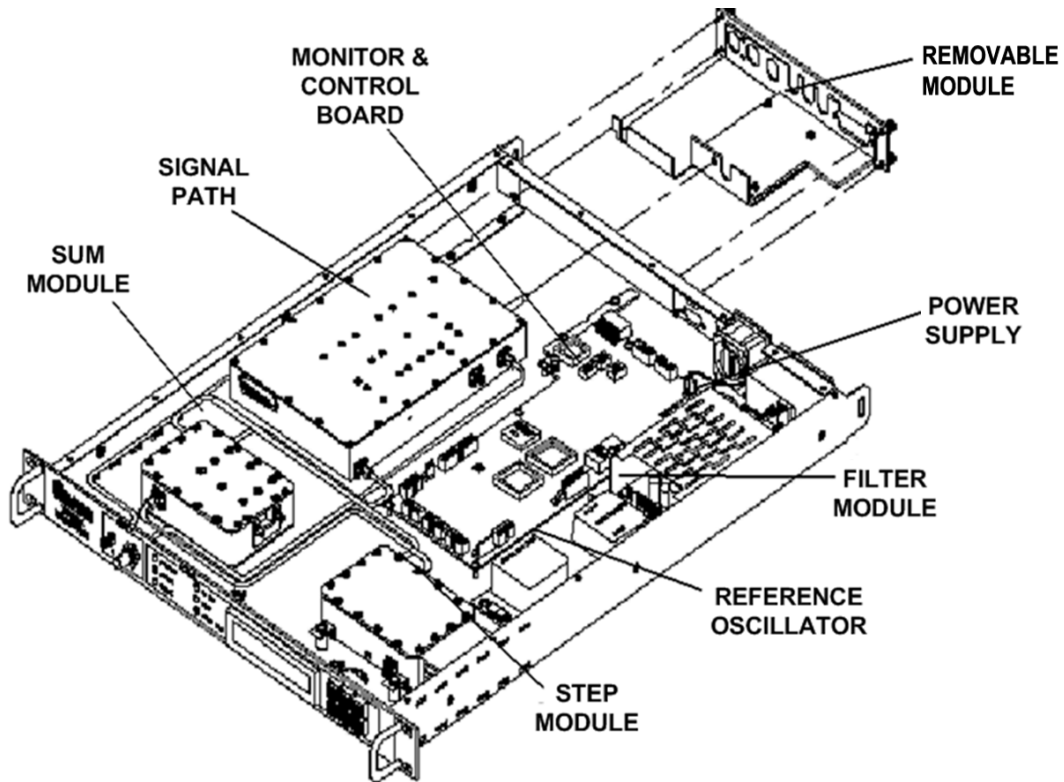
Figure 1-2. UT-4500 Series Up Converter Physical Configuration

1.2.1   Applications

The UT-4500 is an Up Converter. It translates the input IF frequency from 52 to 88 MHz (or, optionally, from 104 to 176 MHz) to an output RF frequency. The UT-4500 operates over the RF frequency range with a typical gain of 35 dB. The RF output level is +10 dBm @ 1 dB compression. This permits longer cable runs and compensates for splitting networks without requiring 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 converter ideal for low bit rate digital circuits such as those used in DAMA hub earth stations.

Depending on the application, the converter chassis rear panel module slot accepts an Input/Output Module (IOM), Polarity Switch Module (PSM), Transmit Switch Module (TSM), Equalizer Module (EQM), or Receive Switch Module (RSM). The converter RF, IF, and High-Speed Bus (HSB) connectors are integral to the installed module.

Non-redundant (also called standalone or single thread) units employ an IOM for switching the RF output. The IOM is also used for unit testing.

In redundancy applications, where converters are "Daisy Chained" to provide distributed online protection switching to a backup converter (BU), a TSM is used in place of an IOM. The TSM contains RF and IF transfer switches. Type 'N' female connectors are provided for the RF loop, and 50Ω or 75Ω BNC female 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 through TSMs terminating in a BU. When a fault occurs in an online converter, the TSM in the faulted converter is commanded to switch to the BU.

The BU in the "Daisy Chain" communicates with the online converters through the installed module's High Speed Bus (HSB data interface). When faults are detected, the BU reconfigures itself to replace the faulted online converter. The

BU also uses the HSB to monitor configuration changes made to the online converters by either remote control or front panel command inputs.

The BU performs fault detection, self-reconfiguration, and logical switching functions. If the BU has a fault, it is prevented from performing the protection-switching task. If the BU does not have a fault, it assumes the frequency and attenuation of the faulted online converter, and compensates for the chain losses.

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".

1.2.2   RF Signal Conversion
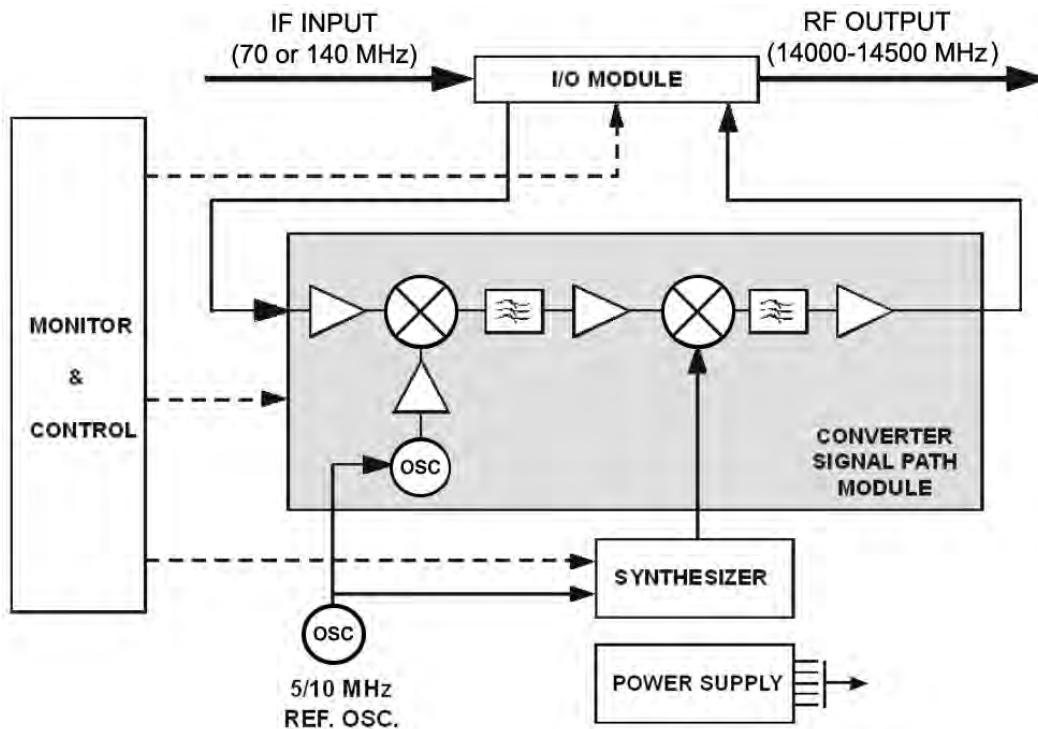
Figure 1-3. Typical Functional Block Diagram (UT-4512 shown)

Figure 1-3 depicts the operational schematic for a typical UT-4500 Up Converter in single thread (standalone) applications. See Appendix A. REDUNDANT SYSTEM

OPERATION for more information about the UT-4500's use in redundant applications. Using the example of a UT-4514 Ku-Band Up Converter:

RF signal processing is accomplished when the 70/140 MHz IF input is mixed in the first mixer with an 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 of 1220 MHz is mixed in the second stage mixer with a 12780 to 13280 MHz synthesizer signal to provide an RF output frequency of 14000 to 14500 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 converter Signal Path Module, and the synthesizer consists of the Coarse/Fine Step Module and Sum Loop Module.)

1.2.3   Monitor & Control

The Monitor & Control Assembly is designed to monitor the functions of the UT-4500, and provide the local and remote control command inputs to the converter.

For Local Monitor & Control: Local operator input commands and the status of the UT-4500 display on the front panel Vacuum Fluorescent Display (VFD). The unit indicates converter faults via the front panel "FAULT" and "STORED FAULT" LED indicators. Use the VFD and local keypad to browse and manage the stored events and faults log.

For Remote Monitor & Control: All configuration control, status retrieval and adjustments are available with connections to the converter rear panel:
- A DB-9F selectable EIA-232C/EIA-485 'J1 | COM1' female connector interface provides for serial-based remote control communications. ASCII commands and queries are issued through the serial remote interface.
- A 100BaseTX 'Ethernet' female RJ-45 port provides Ethernet-based remote monitor and control capability via SNMP, Telnet, or the HTTP (Web Server) Interface.

1.3   Up Converter Features

1.3.1   Physical Description

The UT-4500 features a 1RU-high (1.75") 19-inch wide chassis that is designed for rack mounting into a standard 19-inch (48.26 cm) equipment rack. The unit may also be mounted into the rack using the provided slide mechanisms to allow service without removal from the rack. The unit may be freestanding if desired.

For:	See:
• **Rack installation and mounting instructions**	**Chapter 3. INSTALLATION**
• **Local control operating instructions and procedures**	**Chapter 6. FRONT PANEL OPERATION**
• **Remote control operating instructions and procedures**	**Chapter 7. ETHERNET INTERFACE OPERATION and** **Chapter 8. SERIAL INTERFACE OPERATION**
• **Redundant system operating instructions and procedures**	**Appendix A. REDUNDANT SYSTEM OPERATION**
• **Maintenance and troubleshooting procedures**	**Appendix B. MAINTENANCE AND TROUBLESHOOTING**

1.3.2 Dimensional Envelope

Dimensions are shown in inches and [millimeters].
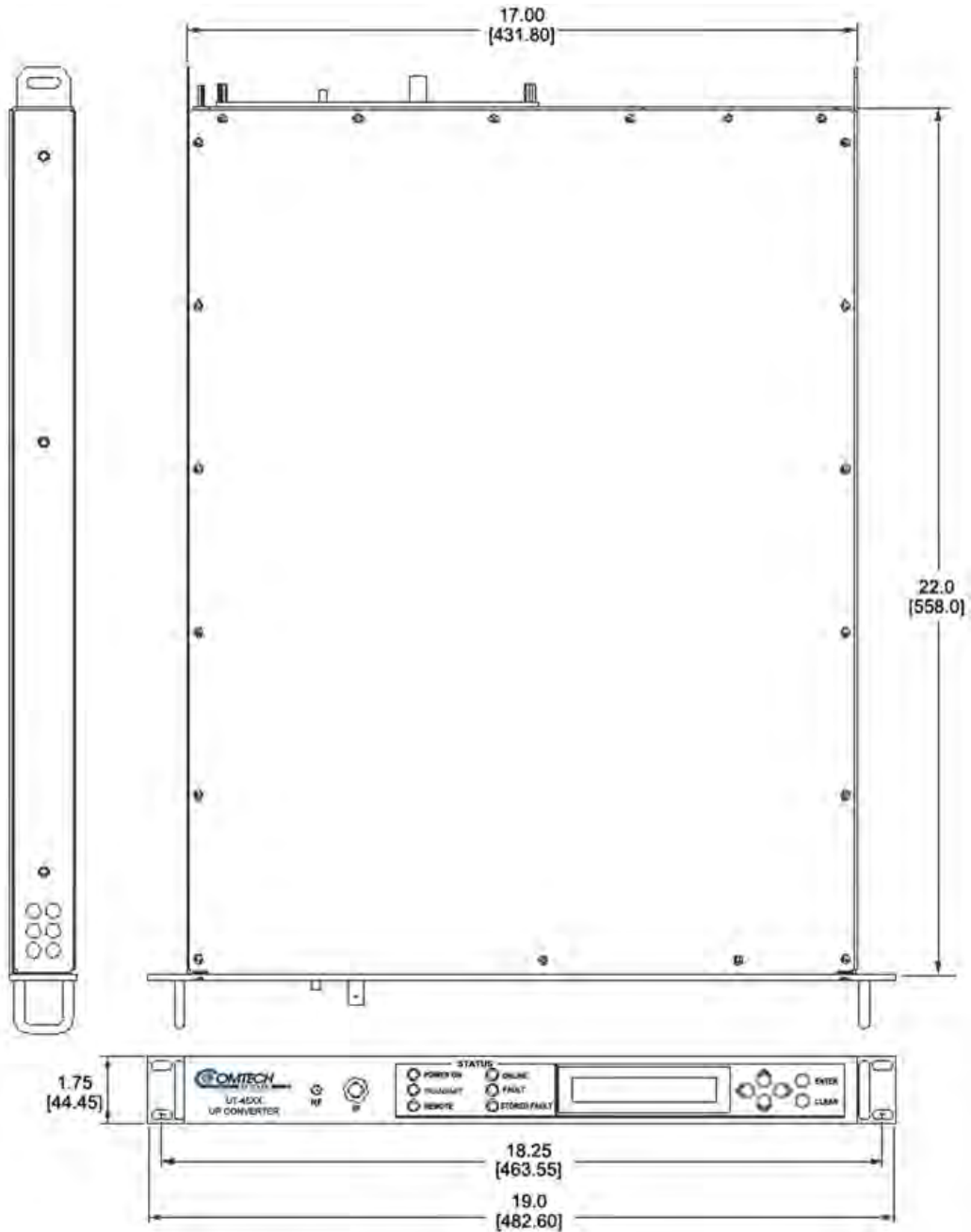
Figure 1-4. UT-4500 Series Up Converter Dimensional Envelope

1.3.3   Front Panel
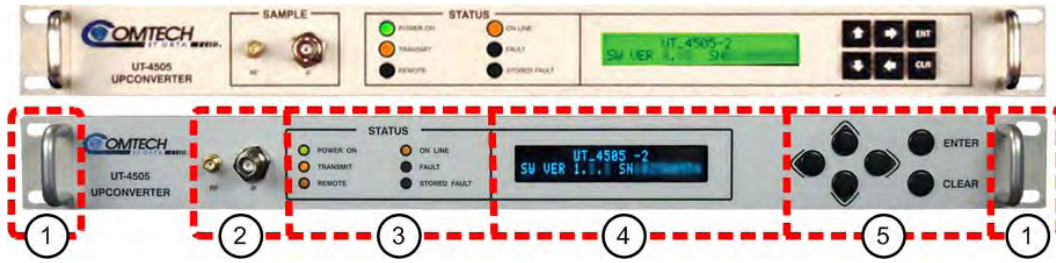
(TOP) Initially Released Chassis
(BOTTOM) Current Production Unit

Figure 1-5. Front Panel View (UT-4505 Shown)

The UT-4500 front panel (**Figure 1-5**) provides, from left to right:

Item 1 – Rack Handles
These handles ease removal and replacement of the chassis into the user-provided rack enclosure.

Item 2 – Sample Points
Use these test point connections to monitor the RF output and the IF input:
- The 'RF' Type 'SMA' female connector provides the RF output. An optional RF LO monitor is available that replaces this RF monitor connection.
- The 'IF' female BNC connector provides the IF input.

Item 3 – LED Indicators
These six Light-Emitting Diode (LED) indicators convey operational states as follows:

POWER ON
Lights GREEN when prime power is applied to the unit.

TRANSMIT
Lights AMBER when the transmit function is operational.

REMOTE

Lights AMBER when the unit is in Remote Communication Mode. Local monitoring is possible, but unit configuration is possible using either Serial or Ethernet remote control.

Remains OFF when the unit is in Local Mode. Serial or Ethernet remote monitoring is possible, but unit configuration is possible using only the front panel.

ON LINE

Lights AMBER when the unit is online and carrying traffic.

FAULT

Lights RED when a fault condition exists.

STORED FAULT

Lights RED when a fault condition has been logged and stored.

Item 3 – Vacuum Fluorescent Display (VFD)

The displays for the initially-released chassis and the current production unit differ as follows:

(LEFT) Liquid Crystal Display (LCD) – Initially Released Chassis
(RIGHT) Vacuum Fluorescent Display (VFDF) – Current Production Unit

The VFD is an active display showing two lines of 24 characters each. It produces a blue light with adjustable brightness. Nested menus display all available options and prompt you to carry out a required action.

Item 4 – Keypad

The keypads for the initially-released chassis and the current production unit differ as follows:

(LEFT) "Square" Button Keypad – Initially Released Chassis
(RIGHT) "Round" Button Keypad – Current Production Unit

The keys for the current production unit keypad have a positive 'click' action that provides tactile feedback. Enter data via the keypad. Data, prompts, and messages are displayed on the VFD.

1.3.4   Rear Panel

External cables are attached to sample point connectors located on the front panel of the unit (**Figure 1-5**), and to the operational connectors located on the rear panel of the unit (**Figure 1-6** or **Figure 1-7**).
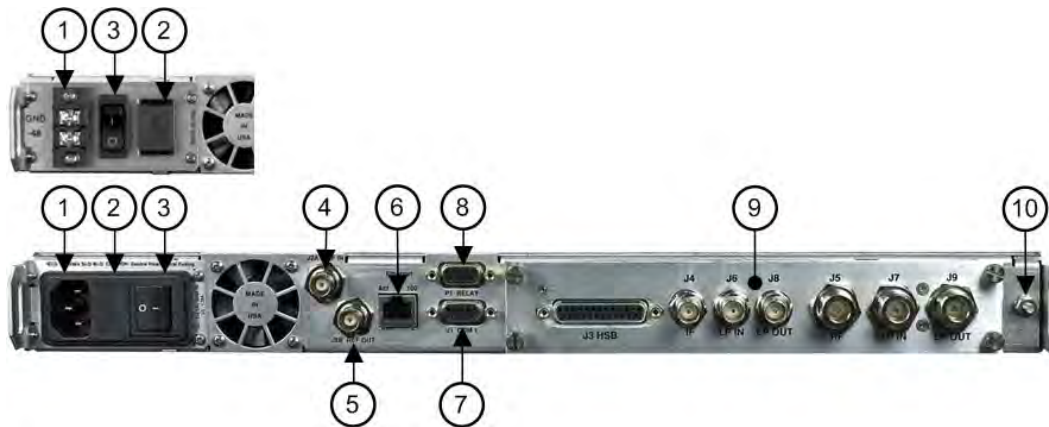
(TOP) Optional -48V DC Unit Power Interface
(BOTTOM) Standard AC Unit with Transmit Switch Module (TSM)

Figure 1-6. Rear Panel (with IOM) – Current Production Unit

The UT-4500 chassis, as initially released (**Figure 1-7**), does not provide an 'Ethernet' 100BaseTX RJ-45 port. Ethernet interface operation is not available on these legacy products.

Figure 1-7. Rear Panel (with TSM) – Initially Released Chassis (OBSOLETE)

From left to right:

Item 1 – Power Connection (part of Power Supply module)
- The standard AC unit features a 90 to 250V AC Primary Input Power Supply (IEC-60320 Type C14 three-prong male connector)
- The optional -48V DC unit features a terminal block power interface.

Item 2 – Unit Fusing (part of Power Supply module)

⚠️ **CAUTION**
FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

The unit uses two Slo-Blo fuses, one each for line and neutral fusing:

- The standard 90 to 250V AC unit retains the T2.0A 5x20 mm fuses (250V AC time lag) in a press-fit fuse holder.
- The optional -48V DC unit retains the T3.15A 20 mm fuses in a press-fit fuse holder.

Item 3 – Power Switch (part of Power Supply Module)
Use this to turn power to the unit on or off.

Item 4 – 'J2A | REF IN' Utility Connector
Use this female BNC connector to supply a 5/10 MHz master reference to the entire chassis.

Item 5 – 'J2B | REF OUT' Utility Connector (OPTIONAL)
Use this optional female BNC connector to provide a 5/10 MHz external reference for customer use.

Item 6 – 'ETHERNET' Ethernet Management Utility Port
Use this 100BaseTX Ethernet RJ-45 port for operation of the Ethernet remote control interfaces.

Item 7 – 'J1 | COM1' Serial Management Utility Connector
Use this DB-9F EIA-232/EIA-485 connector for operation of the Serial remote control interface.

Item 8 – 'P1 | RELAY' Utility Connector
Use this DB-9F connector to access the Form C Alarms (relay closures).

Item 9 – Removable Module
Depending on your application, the chassis rear panel module slot accepts an Input/Output Module (IOM), Receive Switch Module (RSM), Transmit Switch Module (TSM), Polarity Switch Module (PSM), or Equalizer Module (EQM).

Contact Comtech EF Data Product Support for further information about the available modules. Also see:

- **Chapter 2. SPECIFICATIONS**
- **Chapter 4. FRONT AND REAR PANEL CONNECTORS**
- **Appendix A. REDUNDANT SYSTEM OPERATION**

Item 10 – Unit Ground Lug

Use this #10-32 stud as the command chassis ground.

CAUTION

PROPER GROUNDING PROTECTION IS REQUIRED. You must connect the equipment to the protective earth connection at all times. Use this ground stud during installation, configuration, and operation.

Chapter 2. SPECIFICATIONS

Comtech EF Data publication UT-4579 X-Band Up Converter Installation and Operation Manual (CEFD P/N MN/UT4579.IOM) documents the X-Band version of this product.

These specifications are typical for all C- and Ku-Band versions of this product unless noted.

2.1 Physical and Environmental Specifications

2.1.1 Regulatory Compliance

- "CE" as follows:
  - o EN 50082-1 (EMC/Generic Immunity)
  - o EN 55022 Class B (Emissions)
  - o EN 55024 (Immunity)
  - o EN 60950 (Safety)
- FCC Part 15 Subpart B.
- RoHS-Compliant.

2.1.2 Physical Specifications

- Dimensions: 1.75 H x 19.00 W x 22 D inches
  (44.4 mm H x 482.6 mm W x 558.8 mm D)
- Weight: 15 lbs (6.8 kg)

2.1.3 Mean Time Between Failures (MTBF)

- 49,740 hrs as calculated
- >100,000 hrs based on field experience

2.1.4 Temperature Range

- Operating: 32° to 122 F° (0° to 50° C)
- Storage: -4° to 158 F° (-20° to 70° C)

2.1.5 Humidity (Non-condensing)

- Operating: 0 to 95% Relative maximum
- Storage: 99% maximum

2.1.6 Altitude

10,000 ft Mean Sea Level (MSL)

2.1.7 Front Panel Features

2.1.7.1 Sample Point Connectors

- (1X) 'RF' Type 'SMA'female, -20 dBc nominal
- (1X) 'IF' BNC female, -20 dBc nominal
- **OPTIONAL:** RF LO monitor available (0 dBm nominal – replaces 'RF' sample point))

2.1.7.2 LED Monitoring

Six Status LEDs:
- POWER ON (GREEN)
- TRANSMIT (AMBER)
- REMOTE (AMBER)
- ON LINE (AMBER)
- FAULT (RED)

- STORED FAULT (RED)

2.1.7.3 Keypad

Six Keys: ◀ (LEFT), ▶ (RIGHT), ▲ (UP), ▼ (DOWN), ENTER, CLEAR

2.1.7.4 Vacuum Fluorescent Display (VFD)

2 lines, 24 characters per line.

2.1.8 Rear Panel Features

2.1.8.1 Chassis Power, Fusing, and Grounding

2.1.8.1.1 Power Supply Input

- **STANDARD AC:**
  - o 90-250VAC, 47-63 Hz frequency, 60W dissipation, auto-ranging.
  - o IEC-60320 Type C14 (male) three-prong connector, for connection with an IEC-60320 Type C13 (female) three-prong plug power cord for 90-125VAC or 205-240VAC power sources.
- **OPTIONAL DC:**
  -48VDC via terminal block power interface.

2.1.8.1.2 Power Consumption

<75W, 55W typical

2.1.8.1.3 Fusing

- **STANDARD AC:**
  (2X) T2.00A 5mm x 20 mm, 250VAC time lag
- **OPTIONAL DC:**
  (2X) T6.25A 6.3 mm x 32 mm (3AG), 250VAC time lag

2.1.8.1.4   Grounding

A #10-32 stud provides a common chassis ground connection among equipment.

2.1.8.2   External Reference Connectors

- (1X) Type BNC female 'J2A| REF IN' connector, used to supply a 5 MHz (10 MHz optional) @ +3 dBm master reference input to the entire chassis.
- **OPTIONAL** (1X) Type BNC female 'J2B| REF OUT' connector, used to supply a 5 or 10 MHz @ +3 dBm reference output for customer use.

2.1.8.3   Ethernet Connector

(1X) 100BaseTX RJ-45 female 'Ethernet' Management Utility Port for operation of the Ethernet remote control interfaces (SNMP, Telnet, HTTP).

2.1.8.4   Serial Connectors

- **Summary Alarm:** (1X) DB-9F (D-Subminiature) 'P1 | Relay' Utility Connector to access the Form C Alarms (relay closures).
- **Serial Remote Control Interface:** (1X) DB-9F (D-Subminiature) 'J1 | COM1' EIA-232/EIA-485 (2-Wire/4-Wire) connector.

2.1.8.5   Removable "Personality" Modules

Contact Comtech EF Data Product Support for information about using the available "personality" modules.

2.1.8.5.1   IOM (Input/Output Module) Assemblies

CEFD P/N	Impedance (Ohms)	Comments
AS/0101-1	75	DT-4503, UT-4505 I/O, Type 'SMA'
AS/0101-2	75	DT-4503, DT-4572, UT-4505, UT-4579 Non-switching, Type 'N'
AS/0101-9	50	DT-4503, DT-4572, UT-4505, UT-4579 Non-switching, Type 'N'
AS/0101-15	50	DT-4503 I/O, UT-4505 Type 'SMA'
AS/0101-19	75	UT-4518 w/Isolator, Type 'SMA'

CEFD P/N	Impedance (Ohms)	Comments
AS/0101-21	50	UT-4518 w/Isolator, Type 'SMA'
AS/0101-23	75	UT-4514/F w/Isolator, Type 'SMA'
AS/0101-29	50	UT-4514/F w/Isolator, Type 'SMA'
AS/0101-39	50	DT-451X w/Isolator, Type 'SMA'
AS/0101-40	75	DT-451X w/Isolator, Type 'SMA'

2.1.8.5.2   PSM (Polarity Switch Module) Assemblies

CEFD P/N	Impedance (Ohms)	Comments
AS/0101-10	75	DT-4503, DT-4572, UT-4579 Switching, Type 'N'
AS/0101-11	75	DT-4503 Switching, Type 'SMA'
AS/0101-24	50	DT-4572, UT-4579 RF Switching, Type 'N'
AS/0101-30	50	Type 'SMA'
AS/0101-35	50	DT-451X w/Isolator, Type 'SMA'
AS/0101-36	75	DT-451X w/Isolator, Type 'SMA'

2.1.8.5.3   TSM (Transmit Switch Module) Assemblies

CEFD P/N	Impedance (Ohms)	Comments
AS/0101-3	75	DT-4503, UT-4505 Switching, Up, Type 'SMA'
AS/0101-5	75	DT-4503, DT-4572, UT-4505, UT-4579 Switching, Up, Type 'N'
AS/0101-8	50	DT-4503, DT-4572, UT-4505, UT-4579 Switching, Up, Type 'N'
AS/0101-17	50	DT-4503, UT-4505 Switching, IF & RF, Type 'SMA'
AS/0101-18	75	UT-4518 Switching IF & RF w/Isolator, Type 'SMA'
AS/0101-22	75	UT-4514/F w/Isolator, Type 'SMA'
AS/0101-27	50	UT-4514/F w/Isolator, Type 'SMA'
AS/0101-28	50	UT-4518 w/Isolator, Type 'SMA'
AS/0101-42	75	DT-451X w/Isolator, Type 'SMA'
AS/0101-43	50	DT-451X, UT-4514/F w/Isolator

2.1.8.5.4   EQM (Equalizer Module) Assemblies

CEFD P/N	Impedance (Ohms)	Comments
AS/0101-13	75	DT-4503, DT-451X, DT-4572, UT-4505, UT-4579 EQM for 1:1, Type 'SMA'
AS/0101-25	50	DT-4503, DT-451X, DT-4572, UT-4505, UT-4579 1:N IF & RF Switch, Type 'SMA'

CEFD P/N	Impedance (Ohms)	Comments
AS/0101-31	75	DT-4513, UT-4514/F w/Isolator, Type 'SMA'
AS/0101-32	50	DT-4513, UT-4514/F w/Isolator, Type 'SMA
AS/0101-33	75	DT-4513, UT-4518/F w/Isolator, Type 'SMA'
AS/0101-34	50	DT-4513, UT-4518/F w/Isolator, Typr 'SMA'
AS/0101-41	50	DT-4513 1:1 Switching

2.1.8.5.5   RSM (Receive Switch Module) Assemblies

CEFD P/N	Impedance (Ohms)	Comments
AS/0101-4	75	DT-4503 Switching, Down, Type 'SMA'
AS/0101-6	75	DT-4503, DT-4572, UT-4579 Switching, Type 'N'
AS/0101-7	50	DT-4503, DT-4572, UT-4579 Switching, Type 'N'
AS/0101-16	50	DT-4503 I/O, Type 'SMA'
AS/0101-20	75	Receive Switch, RSM2
AS/0101-26	50	RSM2, Type 'N'
AS/0101-37	50	DT-451X w/Isolator, Type 'SMA'
AS/0101-38	75	DT-451X w/Isolator, Type 'SMA'

2.2 Operational Specifications

Specificiations are typical for all products unless noted.

2.2.1   Available Models / Operating Frequency Ranges

Contact Comtech EF Data Product Support for your specific requirements.

2.2.1.1   C-Band Units

- **UT-4505:** 5845 to 6425 MHz
- **UT-4505/E:** 6725 to 7025 MHz
- **UT-4505/F:** 6425 to 6725 MHz
- **UT-4505/G:** 5925 to 6725 MHz
- **UT-4505/H:** 5850 to 6650 MHz
- **UT-4505/I:** 5845 to 6725 MHz

- **UT-4505/J:** 7025 to 7075 MHz
- **UT-4505/K:** 5725 to 6425 MHz
- **UT-4505/M:** 5725 to 6725 MHz
- **UT-4505/N:** 5845 to 6475 MHz

2.2.1.2   Ku-Band Units

- **UT-4514:** 14.00 to 14.50 GHz
- **UT-4514/C:** 12.675 to 13.25 GHz
- **UT-4514/D:** 13.75 to 14.50 GHz
- **UT-4514/E:** 14.70 to 15.00 GHz
- **UT-4514/F:** 12.75 to 14.50 GHz
- **UT-4514/G:** 14.50 to 15.35 GHz
- **UT-4518:** 17.30 to 18.10 GHz
- **UT-4518/E:** 17.30 to 18.40 GHz

2.2.2   Conversion

Dual, no inversion.

2.2.3   Frequency Selection Step Size

- **STANDARD:**   125 kHz steps
- **OPTIONAL:**   1 kHz steps

2.2.4   Preset Channels

32 frequencies and gains

2.2.5   Stability Over Time

$\pm 1 \times 10^{-9}$/day

2.2.6   Stability Over Temperature

$\pm 1 \times 10^{-8}$ 32° to 122°F (0° to 50°C)

2.2.7 IF Input

2.2.7.1 Noise Figure

13 dB Maximum @ 0 dB Attenuation

2.2.7.2 Level

-35 dBm Typical

2.2.7.3 Range

Contact Comtech EF Data Product Support for your specific requirements.

- **STANDARD:** 52 to 88 MHz or 104 to 176 MHz
- **OPTIONAL:** 50 to 90 MHz or 100 to 180 MHz

2.2.7.4 Impedance

50Ω or 75Ω

2.2.7.5 Return Loss

23 dB minimum with I/O Module or Switch Module

2.2.8 RF Output

2.2.8.1 Output Level

- **C-Band:** +17 dBm @ 1 dB Compression
- **Ku-Band:** +10 dBm @ 1 dB Compression

2.2.8.2 Intermodulation

- **C-Band:** -50 dBc @ 0 dBm Output SCL
- **Ku-Band:** -38 dBc @ 0 dBm Output SCL

2.2.8.3　　Carrier Mute

-70 dBc

2.2.8.4　　Non-carrier Spurious

-80 dBm

2.2.8.5　　Carrier Spurious

-65 dBc @ 0 dBm Output

2.2.8.6　　AM to PM

0.1°/dB @ -5 dBm Out

2.2.8.7　　Return Loss

- 20 dB Minimum with I/O Module
- 18 dB Minimum with Switch Module

2.2.8.8　　Impedance

50Ω or 75Ω

2.2.9　　Transfer

2.2.9.1　　Gain

35 dB ±2 dB

2.2.9.2　　Attenuation Adjustment

- **STANDARD:** 0 to 25 dB in 0.25 dB steps
- **OPTIONAL:** 0 to 25 dB in 0.1 dB steps

2.2.9.3 Gain Stability

± 0.25 dB/day

2.2.9.4 Ripple

Contact Comtech EF Data Product Support for your specific requirements.

- ±0.25 dB (±18 MHz) – OPTIONAL ±20 MHz
- 0.75 dB (±36 MHz) – OPTIONAL ±40 MHz

2.2.9.5 Slope

0.05 dB/MHz

2.2.9.6 IF Bandwidth

Contact Comtech EF Data Product Support for your specific requirements.

- **STANDARD:** 36 or 72 MHZ
- **OPTIONAL:** 40 or 80 MHz

2.2.10 Group Delay

2.2.10.1 Linear

0.03ns/MHz

2.2.10.2 Parabolic

$0.01ns/MHz^2$

2.2.10.3 Ripple

1.0ns Peak-to-Peak

2.2.11   Phase Noise

2.2.11.1   UT-4505

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

2.2.11.2   UT-4505/E, UT-4505/F, UT-4505/G, UT-4505/H, UT-4505/I, UT-4505/J, UT-4505/K, UT-4505/M, UT-4505/N

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

2.2.11.3   UT-4514

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

2.2.11.4   UT-4514/F, UT-4518, UT-4518/E

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

Notes:

Chapter 3. INSTALLATION AND STARTUP

3.1   Unpack and Inspect the Shipment
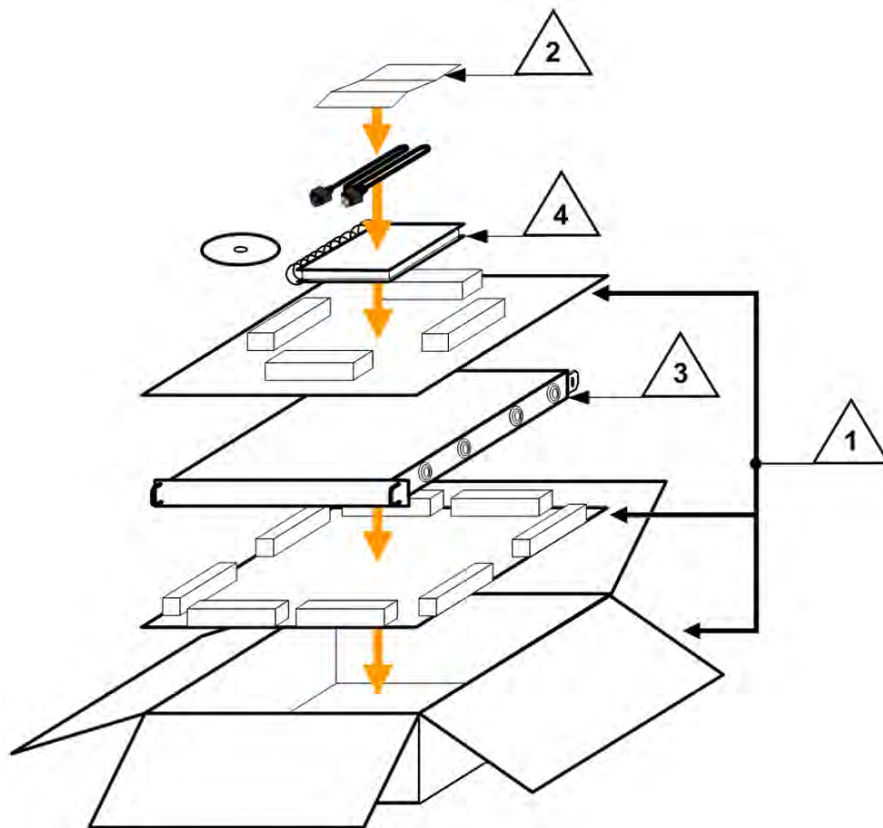
Figure 3-1. Unpack and Inspect the Shipment

The UT-4500 Series C- or Ku-Band Up Converter, its optional Installation and Operation Manual (available online at http://www.comtechefdata.com), its

bearingless rack slide set, and its power cord were packaged and shipped in a reusable cardboard carton containing protective foam spacing (**Figure 3-1**).

CAUTION

THIS EQUIPMENT CONTAINS PARTS AND ASSEMBLIES SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). USE ESD PRECAUTIONARY PROCEDURES WHEN HANDLING THE EQUIPMEN**T.**

Inspect the shipment. Do these steps:
1. Keep all shipping materials.
2. Check the packing list to make sure the shipment is complete.
3. Inspect the equipment for damage. If damage exists, immediately contact the carrier and Comtech EF Data to submit a damage report.
4. Read the manual.

3.2   Install the Unit into a Rack Enclosure

Install the unit in its assigned position in a rack enclosure (**Figure 3-2**). You must install the rack in a location with a controlled environment. Failure to obey this requirement can cause damage to the equipment, and denial of subsequent warranty claims. You may use:

- A standard rack-mounted shelf;
- User-supplied screws to secure the front panel to the rack enclosure threaded front mounting rails;
- Comtech EF Data's optional KT/6228-2 (4") or KT/6228-3 (10") Rear Support Brackets Kit (**Figure 3-3**).
- Comtech EF Data's provided Bearingless Rack Slide Set (**Figure 3-4**).
- For information about custom rack enclosures, contact Comtech EF Data Product Support.

CAUTION

CORRECT GROUNDING PROTECTION IS REQUIRED – Connect the ground stud, located on the rear panel of the unit, to a power system that has separate ground, line and neutral conductors. Do not operate the unit without a direct connection to ground.

The rack must be connected to a suitable earthing connection at all times. You must connect the rack ground bar to a suitable earthing demarcation point.

CORRECT AIR VENTILATION IS REQUIRED – Air flow must not be impeded. Make sure there is proper air ventilation. Do not block the top of the rack or the presence of a rack blower. The air temperature inside the rack must never exceed 50°C (122°F).

If there is any doubt, contact Comtech EF Data Product Support during normal business hours.
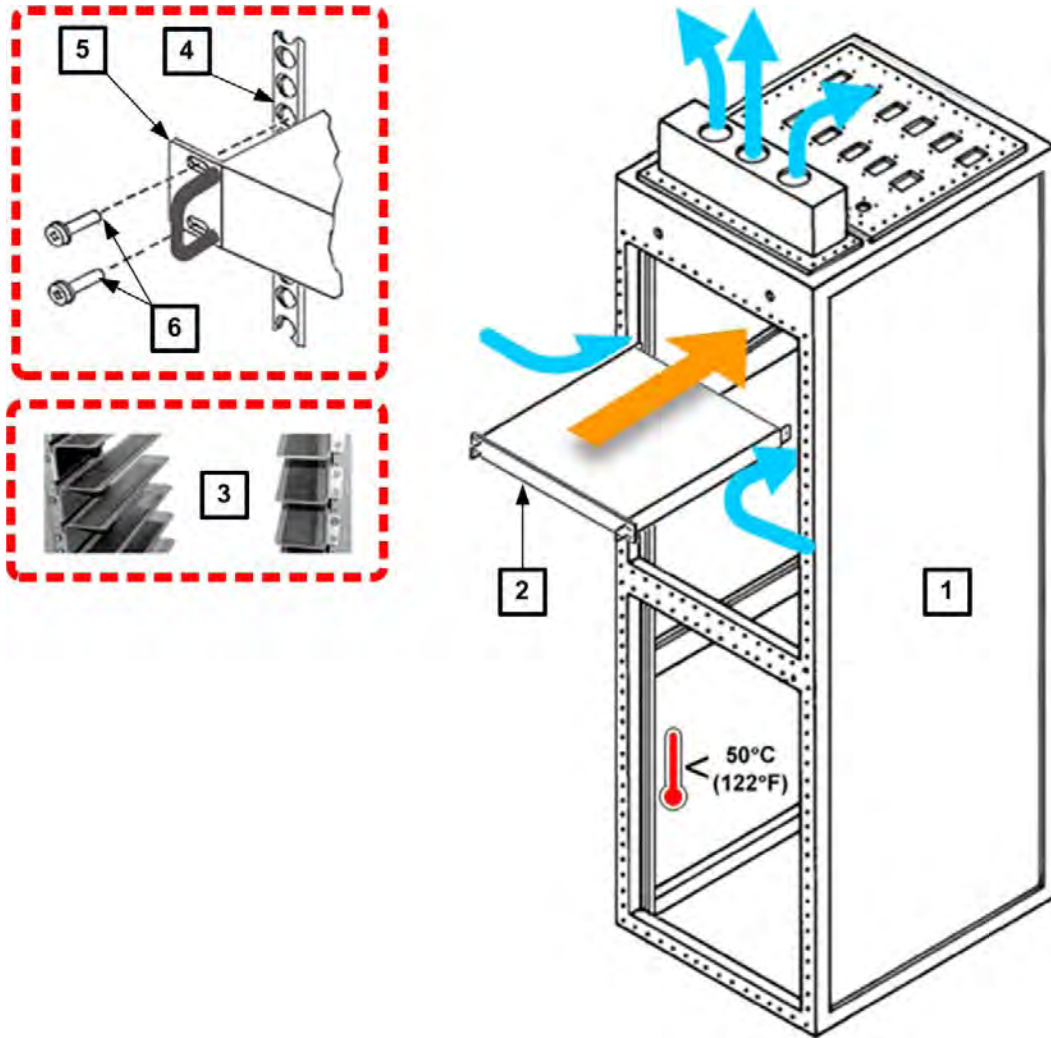
Feature	Description
1	Custom Rack Enclosure
2	UT-4500 chassis
3	Standard Rack Shelving
4	Rack Enclosure Threaded Front Rail (typical)
5	Unit Front Panel
6	User-supplied Screws

Figure 3-2. Install the Unit into a Rack Enclosure

3.2.1   Install the Optional Rear Support Brackets Kit
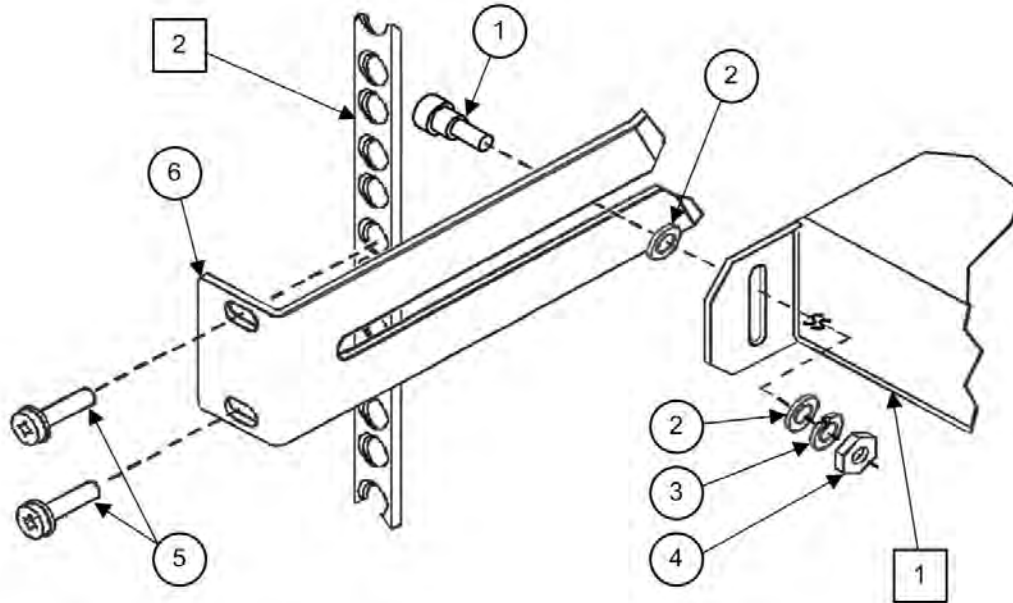
Feature	Description
1	Back of unit
2	Rack Enclosure Threaded Rear Mounting Rail (typical)

Item	Kit / Quantity		CEFD P/N	Description
	KT/6228-2	**KT/6228-3**		
1	2	2	HW/10-32SHLDR	Shoulder Screw, #10
2	4	4	HW/10-32FLT	Flat Washer, #10
3	2	2	HW/10-32SPLIT	Lock Washer, #10
4	2	2	HW/10-32HEXNUT	Hex Nut, #10
5	4	4	HW/10-32x1/2RK	Bolt, #10, Rear Support Bracket
6	2	–	FP/6138-2	Bracket, Rear Support (4")
	–	2	FP/6138-3	Bracket, Rear Support (10")

Figure 3-3. Install the Optional Rear-Mounting Support Brackets Kit

Tools needed to install the optional KT/6228-2 (4") or KT/6228-3 (10")
Brackets Kit:
- A medium Phillips™ screwdriver
- A 5/32-inch SAE Allen™ Wrench
- An adjustable Crescent™ wrench.

Do these steps to install the brackets kit (**Figure 3-3**):

1. Use the #10 flat washers, #10 split washers, and #10 hex nut to secure the #10 shoulder screws to the unit chassis through the rear right and left side mounting slots as shown.
2. Mount the Rear Support Brackets to the rack enclosure threaded rear mounting rails using the #10 Rear Support Bracket Bolts.
3. Slide the unit into the front of the rack enclosure. Make sure that the #10 Shoulder Screws properly engage into the slots of the Rear Support Brackets.

3.2.2   Install the Optional Rack Slide Set

If the converter is to be mounted on slides, install the provided bearingless rack slide set into the rack cabinet, and onto the sides of the UT-4500. Use the hardware provided with the slide set that is determined to be appropriate for installation.

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

Figure 3-4. Install the Optional Rack Slide Set

Do these steps to install the slide set (**Figure 3-4**):
1. Use the provided hardware to install one slide onto each side of the unit chassis.
2. Use the provided hardware to install the slide rail components into each interior side of the equipment rack cabinet.
3. Install the unit into the front of the equipment rack. Make sure that the slides properly engage the cabinet-mounted slide rails.

4. Continue to slide the unit into the equipment rack to its final operating position. Then, use four user-provided screws to secure the unit to the equipment rack's right and left threaded front rails (through the front panel slots).

3.3 Connect Prime Power Connection

An IEC-60320 Type C13 (female) three-prong plug power cord for 90-125VAC or 205-240VAC power sources is provided with the converter. This detachable power cord mates with the AC Prime power receptacle on the rear of the converter chassis.

3.4 Connect External Cables

Proceed to connect all external cables to the connectors outlined in the next chapter (**Chapter 4. FRONT AND REAR PANEL CONNECTIONS**). Should difficulties occur, call Comtech EF Data Customer Support for assistance.

Chapter 4. FRONT AND REAR PANEL CONNECTORS

4.1   Overview – Cabling Connection Types

Comtech EF Data's UT-4500 Series C- and Ku-Band Up Converters use a number of different cables. Each cable type is typically dedicated to a specific mode of operation.

> **1)** Not all of these operational interface types may be available.
>
> **2)** The European EMC Directive (EN55022, EN50082-1) requires using properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.

4.1.1   Coaxial Cable Connections

(TOP) Bayonet Coupling Plug and Jack (Type 'BNC' Shown)
(BOTTOM) Threaded Coupling Plug and Jack (Type 'N' Shown)

Figure 4-1. Coaxial Connector Examples

The types of coaxial cables used by Comtech EF Data are 'BNC', 'TNC', 'N', 'F', and 'SMA'. Coaxial cables (plugs) and their mating connectors (jacks/sockets) are available in two coupling styles – Bayonet or Threaded:

Bayonet Coupling Style – The jack has a pair of guideposts that accommodate the plug's lockdown slots. This lockdown design provides secure assembly without over-tightening the connection.

Threaded Coupling Style – The jack features external threads. The plug shell features internal threads, and has either a knurled outer surface to permit hand-tightening of the connection, or hex flats to accommodate torqued installation.

Connection Instructions

Bayonet Coupling Connections – Use the plug slots to guide, and then slide the plug onto the jack posts. Then, turn the plug clockwise until the jack posts are fully seated within the plug slot.

Threaded Coupling Connections – Engage the plug onto the jack threads, and then turn the plug clockwise until it is fully threaded onto the jack. Do not over-tighten the connection.

4.1.1.1   Type 'BNC'

BNC plugs and jacks feature a Bayonet Coupling design.

4.1.1.2   Type 'TNC'
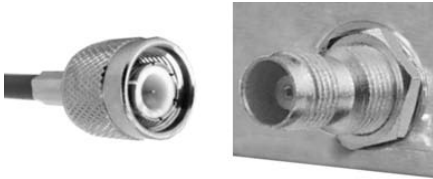
TNC plugs and jacks feature a Threaded Coupling design similar to Type 'N', Type 'F,' and Type 'SMA' connectors.

4.1.1.3   Type 'N'
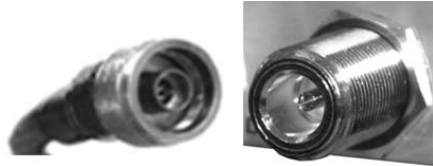
Type 'N' connectors feature a Threaded Coupling design similar to Type 'TNC', Type 'F', and Type 'SMA' connectors.

4.1.1.4   Type 'F'

Type 'F' connectors feature a Threaded Coupling design similar to Type 'TNC', Type 'N', and Type 'SMA' connectors.

4.1.1.5 Type 'SMA'
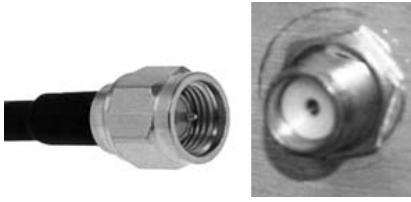
Type 'SMA' connectors feature a Threaded Coupling design similar to Type 'TNC', Type 'N', and Type 'F' connectors.

4.1.2 D-Subminiature Cable Connections

Type 'D' Cable with Jack Screws
(Female Shown)
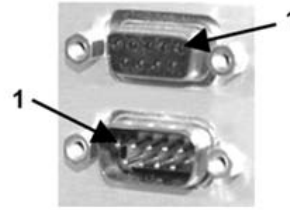
Type 'D' Chassis Receptacles with Jack Nuts:
(TOP) Female
(BOTTOM) Male

Figure 4-2. D-Subminiature Connector Examples

D-Subminiature connectors are also called Type 'D' or 'D-Sub' connectors. The cable plug and chassis receptacle each feature a D-shaped profile that interlock to ensure proper pin orientation and connector seating. The connector pair features multiple rows of pins (male side) coupled to mating sockets (female side).

Whether the gender is male or female, the cable plug features two jack screws for secure connection to the jack nuts provided on the mating chassis receptacle.

Connection Instructions

Orient the plug to the receptacle in the proper position. Press firmly into place. Hand tighten, or use a standard flat-blade screwdriver, to secure the plug jack screws to the receptacle jack nuts. Do not over-tighten.

About connector pinout tables: Figure 4-2 identifies the Pin 1 location for either gender connector.

4.1.3 RJ-45, RJ-48 Cable Connections
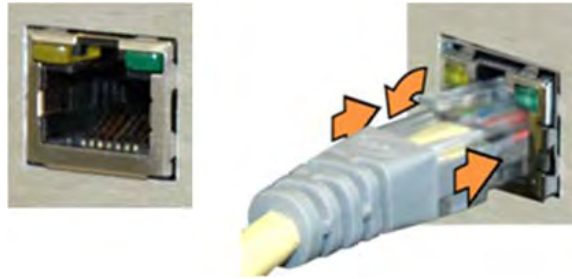
Figure 4-3. RJ-45/RJ-48 Connector Example

The plug for an RJ-45 or RJ-48 cable features a flexible tab. The RJ-45 or RJ-48 receptacle features a mating slot. This design configuration ensures a secure installation.

Connection Instructions

As shown in Figure 4-3 – Press down the tab on the cable plug and then insert the plug into the receptacle. The connection is complete when the tab 'clicks' into position inside the receptacle.

4.1.4   USB Cable Connections

(TOP) Type 'A' USB Plug and Receptacle
(BOTTOM) Type 'B' USB Plug and Receptacle

Figure 4-4. USB Connector Examples

Universal Serial Bus connectors are also called USB connectors. A USB connection is used as a bus-type communications or power interface between peripheral devices. The connector pair (**Figure 4-4**) features a plug (male side) coupled to its mating receptacle (female side).

Connection Instructions

Type 'A' Connections – Slide the plug firmly into the chassis receptacle.

Type 'B' Connections – Orient the plug to the receptacle and push in firmly. The Type 'B' cable plug and chassis receptacle each feature a D-shaped profile that interlock to ensure proper orientation and connector seating. By design, it is impossible to incorrectly insert the plug into the receptacle.

4.2   Unit Connectors

External cables are attached to connectors provided on the rear and front panels of the unit (**Figure 4-5**).

> The UT-4500 chassis, as initially released (**Figure 4-6**), does not provide an 'Ethernet' RJ-45 port. Ethernet interface operation is not available on these legacy products.

(TOP) Rear Panel with Optional -48VDC Power Interface
(CENTER) Rear Panel with Standard AC Power Interface (with TSM)
(BOTTOM) Front Panel
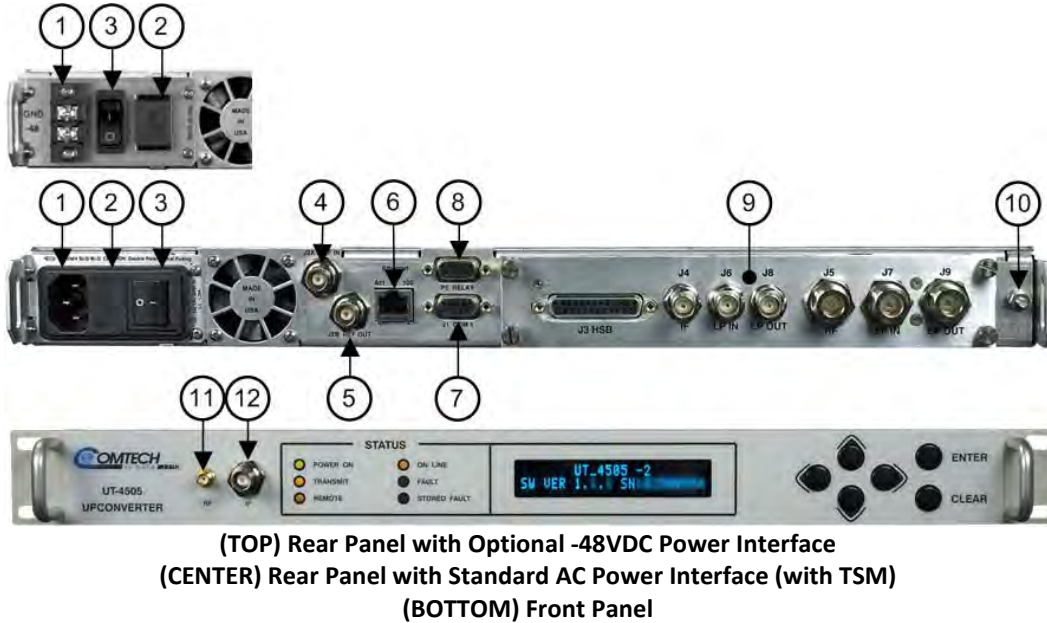
Figure 4-5. UT-4500 Series Rear and Front Panels (UT-4505 Current Production Chassis shown)

Figure 4-6. UT-4500 Series Rear Panel – Initially Released Chassis (OBSOLETE) (with TSM)

4.2.1   Power Connections

4.2.1.1   Power Interface Module – Standard AC Unit
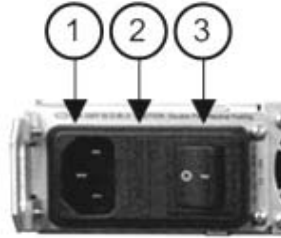
Figure 4-7. Standard AC Power Module

As shown in **Figure 4-5** and **Figure 4-7**, the AC power interface module consists of the following components:

Item 1 – AC Power Connector
This connector is an IEC-60320 Type C14 (male) three-prong connector, for connection with an IEC-60320 Type C13 (female) three-prong plug power cord. Note the following:

- Input power – 75W maximum, less than 65W typical.
- Input voltage – 90-250VAC.

Item 2 – Press-fit Fuse Holder
Install two T2.0A 20mm Slo-Blo type fuses into this fuse holder, one each for line and neutral fusing.

Item 3 – Power Switch
Use this switch to apply power to the unit.

4.2.1.1.1   AC Operation – Replace the Fuses

Figure 4-8. Replace the AC Fuses

As shown in **Figure 4-7** and **Figure 4-8**: The unit rear panel features a fuse holder that is press-fit into the body of the IEC power module.

> ⚠️ **WARNING!**
> **DISCONNECT THE POWER SUPPLY BEFORE PROCEEDING!**

> ⚠️ **CAUTION**
> FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

Do these steps to replace the AC fuses (**Figure 4-8**):
1. Unseat the fuse holder from the IEC power module.
    a. Use the slot to pry the fuse holder outward from the IEC power supply module.
    b. Pull the holder straight out, and then swing the holder away from the module.
2. Remove and replace the fuses as needed.
    - Use T2.00A 20mm fuses for AC operation.
3. Re-seat the fuse holder in the IEC power module.

4.2.1.1.2   AC Operation – Apply AC Power

Figure 4-9. Apply AC Power to the Unit

Do these steps to apply AC power to the unit (**Figure 4-9**):
1. Plug the provided AC power cord female end into the unit.
2. Plug the AC power cord male end into the user-supplied power source.
3. Switch the unit ON.

4.2.1.2   Power Interface Module – Optional -48VDC Unit
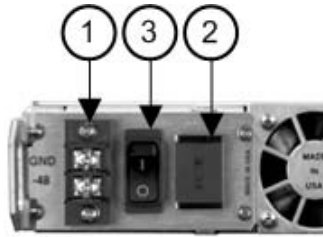
Figure 4-10. Optional DC Power Module

As shown in **Figure 4-5** and **Figure 4-10**, the DC power interface module consists of the following components:

Item 1 – Power Connection
This is a standard 2-circuit terminal block. Note the following:
- Input power – 75W maximum, less than 65W typical.
- Input voltage – 36-72VDC.

Item 2 – Press-fit Fuse Holder
Install two 3.15A 20mm Slo-Blo type fuses into this fuse holder, one each for line and neutral fusing.

Item 3 – Power Switch
Use this switch to apply power to the unit.

4.2.1.2.1   DC Operation – Replace the Fuses

⚠ **WARNING!**
DISCONNECT THE POWER SUPPLY BEFORE PROCEEDING!

⚠ **CAUTION**
FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

Do these steps to replace the DC fuses:
1. Disconnect the power supply leads.
2. Pry the fuse holder outward from the DC power supply module.
3. Remove and replace the 3.15A 20 mm Slo-Blo fuses as needed.
4. Press fit the fuse holder back into its receptacle.

4.2.1.2.2   DC Operation – Apply Power

Figure 4-11. Apply DC Power to the Unit

Do these steps to apply DC power to the unit (**Figure 4-11**):

1. Connect the user-supplied '-48' (+) and 'GND' (–) DC power leads to their respective terminals.

> ⓘ   Number 18 AWG minimum wires are recommended.

2. Connect the user-supplied DC power leads to the user power source.
3. Energize the power source.
4. Switch the unit ON.

4.2.2   Unit Ground Connection

Figure 4-12. Unit Ground Connection

⚠ **CAUTION**
PROPER GROUNDING PROTECTION IS REQUIRED. You must connect the equipment to the protective earth connection at all times. Use this ground stud during installation, configuration, and operation.

ⓘ   **The AC power interface provides the safety ground.**

As shown in **Figure 4-5** and **Figure 4-12** (**Item 10**): Use this #10-32 stud, located at the right side of the rear panel, for connecting a common chassis ground among equipment.

4.2.3   Operational Connections

See **Sect. 4.1 Overview – Cabling Connections Types** for information about each connector type and its connection instructions.
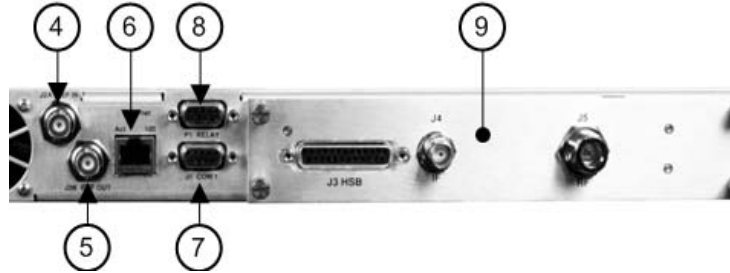
Figure 4-13. Rear Panel Operational Connections (with IOM)

As shown in **Figure 4-5** and **Figure 4-13** (Items 4 through 9):

Item 4 – 'J2A | REF IN' Utility Connector
Use this female BNC connector to supply a master reference to the entire chassis. The user-supplied input signal is used for phase-locking the internal 10MHz reference oscillator to a user-provided 5 or 10 MHz station clock. The impedance is matched for 50Ω or 75Ω, and requires an input level of 0 ±5 dBm.

Item 5 – 'J2B | REF OUT' Utility Connector (OPTIONAL)
Use this optional female BNC connector to provide a 5 or 10 MHz reference for customer use. The impedance is matched for 50Ω or 75Ω, and provides an output level of 5 ±3 dBm.

Item 6 – 'Ethernet' Ethernet Management Utility Port

The UT-4500 Series C- or Ku-Band Up Converter, as initially released, does not feature a rear panel 'Ethernet' port. Only current production units offer Ethernet Interface operation.

Use this 100BaseTX Ethernet RJ-45 port for operation of the Ethernet remote control interfaces. It is also used for updating UT-4500 firmware. This receptacle uses a CAT5 Ethernet cable for connection to an Ethernet hub, router, switch, PC, etc. See **Table 4-1** for the connector pinouts.

Table 4-1. '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

Item 7 – 'J1 | COM1' Serial Management Utility Connector
Use this D-Sub 9-pin female (DB-9F) EIA-232/EIA-485 connector for Serial
Interface operation. The mating connector is a DB-9M connector. See **Table 4-2**
for the EIA-485 2-Wire pinout specification; see **Table 4-3** for the EIA-485 4-Wire
pinout; and **Table 4-4** for the EIA-232C pinout.

Table 4-2. 'J1 | COM1' 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

Table 4-3. 'J1 | COM1' 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 4-4. 'J1 | COM1' EIA-232C Pinout

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

Item 8 – 'P1 | RELAY' Utility Connector

Use this D-Sub 9-pin female (DB-9F) connector to access the Form C Alarms (relay closures). The mating connector is a DB-9M connector.

Table 4-5. 'P1 | RELAY' Pinout

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

Item 9 – Removable "Personality" Module

See **Sect. 4.2.4** for information about these removable "personality" modules.

Item 11 – Front Panel RF Sample Test Point Connector

Figure 4-14. Front Panel Sample Test Point Connections

As shown in **Figure 4-5** and **Figure 4-14** (**Item 11**): This female Type 'SMA' connector (-20 dBc nominal) provides the user 'RF' test point interface.

An optional RF LO monitor (0 dBm nominal) is available in replace of the RF Sample Test Point.

Item 12 – Front Panel IF Sample Test Point Connector

As shown in **Figure 4-5** and **Figure 4-14** (**Item 12**): This female BNC connector (-20 dBc nominal) provides the user 'IF' test point interface.

4.2.3.1   UT-4500 Series Cable Connections
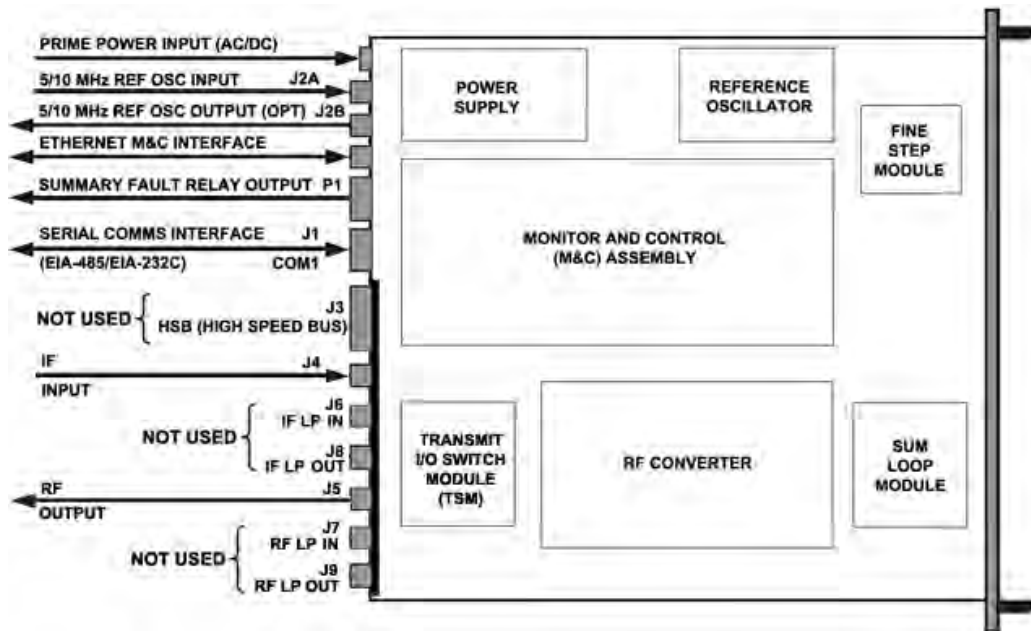
Figure 4-15. UT-4500 Series Cabling Example (with TSM)

Figure 4-15 provides a cabling connection example for the UT-4500 Series C- or Ku-Band Up Converter. This example depicts use of a Transmit Switch Module (TSM) in a standalone configuration – the module cabling requirements will vary. All other cabling to the available rear chassis connectors is identical across all applications.

> Contact Comtech EF Data Product Support for cabling instructions specific to your converter application.

4.2.4   Removable "Personality" Modules

Contact Comtech EF Data Product Support for complete details and specifications for the module(s) specific to your system.

See **Chapter 2. SPECIFICATIONS** for the listings of available switch modules for use with the DT-4500 Series Down Converters and UT-4500 Series Up Converters.
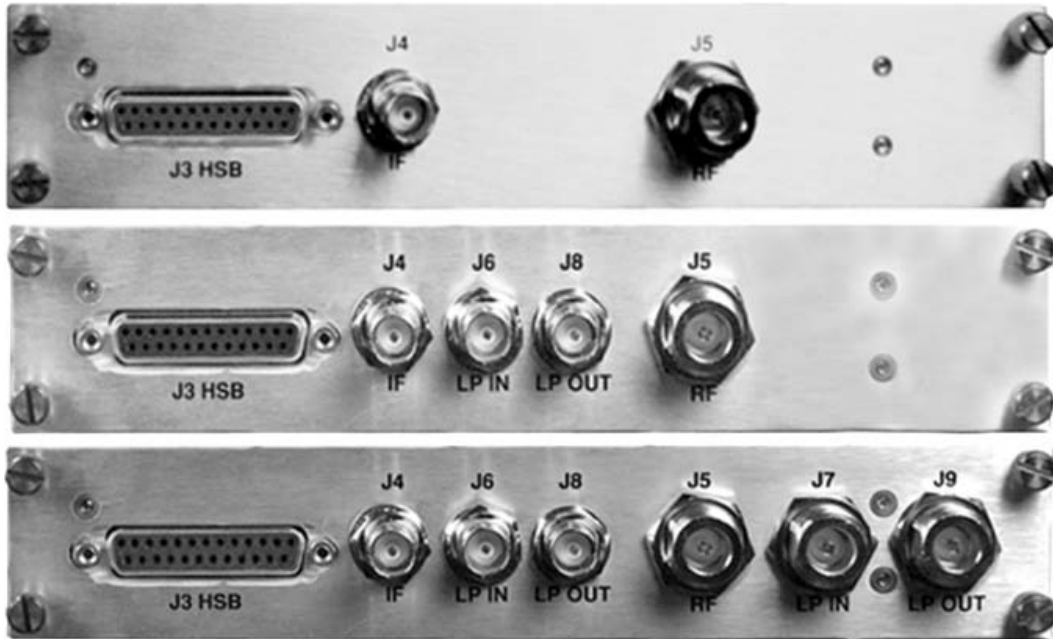
(TOP) Input/Output Switch Module (IOM)
(CENTER) Receive Switch Module (RSM)
(BOTTOM) Transmit Switch Module (TSM)

Figure 4-16. "Personality" Module Examples

Depending on the application, the converter chassis rear panel module slot accepts an Input/Output Module (IOM), Polarity Switch Module (PSM), Transmit Switch Module (TSM), Equalizer Module (EQM), or Receive Switch Module (RSM). The converter RF, IF, and High-Speed Bus (HSB) connectors are integral to the installed module.

Removable modules are available for both non-redundant (also referred to as single thread or standalone) and redundant applications.

4.2.4.1   Removable Module Connectors

The module connector types vary depending on the operating band and
impedance of the purchased unit:

- The IF Input/Output and LP (Loop) In/Out connectors are typically female
  BNC connectors.
- The RF Input/Output and LP (Loop) In/Out connectors may be female
  Type 'N' or female Type 'SMA' connectors, depending on the application.
- All switch modules feature a **'J3 | HSB'** (High Speed Bus) connector.
  Table 4-6 provides the pinout specifications for this D-Sub 25-pin female
  (DB-25F) connector. The mating connector is a DB-25M connector.

Table 4-6. 'J3 | HSB' Data Interface 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

> The 'J3 | HSB' connector does not employ a "straight-through" cable assembly. Contact Comtech EF Data Product Support for detailed cabling instructions when cabling between converters in redundant applications.

4.2.4.2   Removable Module Operation in Non-Redundant (Standalone) Applications

A converter may use a Transmit Switch Module (TSM) or a Receive Switch Module (RSM) in standalone configurations if an IOM (**Figure 4-17**) is unavailable.

Note that the High Speed Bus 'J3 | HSB' connector is not used in standalone configurations. If a module other than an IOM is used, only the 'J4 | IF' and 'J5 | RF' connectors are used to connect directly to the user input/output signal sources (**Figure 4-18**).
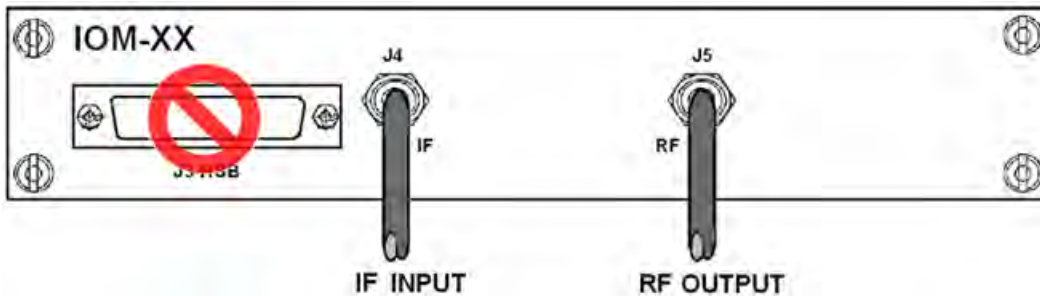
Figure 4-17. UT-4500 Standalone Cabling Example to IOM
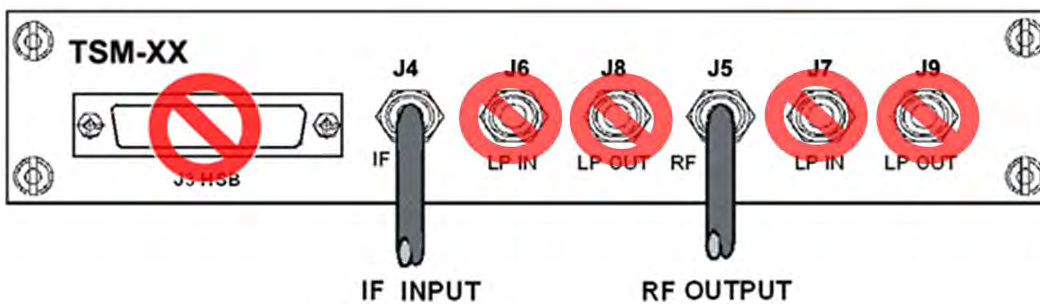
Figure 4-18. UT-4500 Standalone Cabling Example to TSM

4.2.4.3   Removable Module Operation in Redundant Applications

See **Appendix A. REDUNDANT SYSTEM OPERATION** for descriptions of the specific use of these various switch modules in redundant applications.

In subsystems where a redundant converter configuration is used, the backup converter (BU) has an Input/Output Module (IOM), while the online converters have Transmit Switch Modules (TSM). When a fault occurs in an online converter, the system commands the TSM in the faulted converter to switch to the BU (**Figure 4-19**).
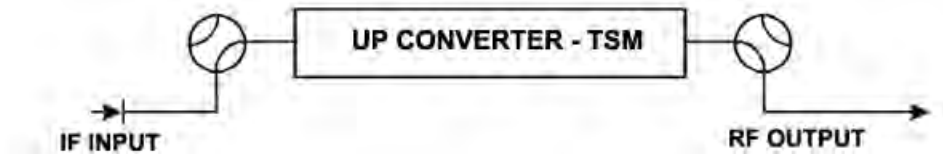
Figure 4-19. TSM Switching Schematic

Notes:

Chapter 5. FIRMWARE UPDATE

5.1 Firmware Overview

(!) Make sure to operate the UT-4500 with its latest available firmware.

The UT-4500 Series C- and Ku-Band Up Converters are factory-shipped with the latest version of operating firmware. If you need to update the firmware, you can apply the update to the UT-4500 without having to remove it from operation. You may directly acquire the download from Comtech EF Data's web site (www.comtechefdata.com), or receive the archive file by e-mail from Comtech EF Data Product Support.

5.1.1 UT-4500 Firmware Update Procedure Summary

1. Download the firmware update archive file to a user-supplied PC. The PC must be Microsoft Windows® compatible.
2. Connect a user-supplied Ethernet cable from the User PC to the RJ-45 **'Ethernet'** port.
3. Connect a user-supplied serial cable from the User PC to the DB-9F '**J1 | COM1**' port.
4. Extract the firmware update files from the archive download file. You may then use Comtech's "CReflash" utility. Otherwise, you must use the UT-4500 Management IP Address to connect the FTP client to an FTP server, and then FTP-transfer the files from the User PC to the UT-4500.

5.1.2 About Firmware Numbers, File Versions, and Formats

The Comtech EF Data Web site catalogues its firmware update archive files by product type (e.g., router, modem, etc.), the specific model, and optional hardware configurations. The UT-4500 files are provided under "Home | Support | Software Downloads | Flash & Software Update Files | Converters | DT-4500 Series & UT-4500 Series Software Downloads."

The UT-4500 firmware download hyperlink for the Ethernet-ready current production unit (i.e., Ver6x chassis) is F0000202x_v###.

The UT-4500 firmware download hyperlinks for older, non-Ethernet units (Ver5x and earlier chassis) are as follows:

- **Ver5x Units / 1 kHz Step Size:** F1611-1x_v###
- **Ver5x Units / 125 kHz Step Size:** F1610-1x_v###
- **Ver4x Units / 1 kHz Step Size:** F1604-1x_v###
- **Ver4x Units / 125 kHz Step Size:** F1603-1x_v###

Note that 'x' is the firmware revision letter, and '###' represents the firmware version number (e.g., V123 = Version 1.2.3).

Comtech EF Data provides its archive download files in two compressed formats – *.exe (self-extracting) and *.zip (compressed):

- The self-extracting *.exe file does not require use of a third-party utility program.
- Some firewalls do not allow the download of self-extracting *.exe files. You must instead download the *.zip file, and extract the firmware files from the download with a user-supplied third-party file archiver and compression utility program such as PKZIP for Windows, WinZip, ZipCentral, etc. (PKZIP for DOS is not supported due to file naming conventions). Comtech EF Data does not provide this utility program.

For detailed information on handling archived files, read your utility program's Help documentation.

5.2   Prepare for the Firmware Download

5.2.1   Required User-supplied Items

You will need a Microsoft Windows-based PC equipped with available serial and
Ethernet ports, a compatible Web browser (e.g., Internet Explorer), and a
terminal emulator program (e.g., Tera Term or HyperTerminal).

5.2.2   Configure the Terminal Emulator Program

Read your terminal emulator program user guide or HELP feature for
operating and configuration instructions.

On the User PC – Open the terminal emulator program, and then configure the
program's serial port communication and terminal display operation:

- Baud Rate = 38400 bps
- Data Bits = 8
- Stop bits = 1
- Parity = NO
- Local Echo = ON
- Port Flow Control = NONE
- Display New Line Rx/Tx = CR

5.2.3   Get the UT-4500 Management IP Address and
Firmware Information

1. On the UT-4500 – Apply power to the unit. Typical for either the standard
   AC unit or the optional DC unit, switch the power ON.
2. Use the UT-4500 front panel to identify your default Management IP
   Address. You will not be able to access the UT-4500 HTTP Interface
   without this information. See Section 5.2.3.1.
3. Get the firmware information using one these methods:
   - To use the UT-4500 front panel, see Section 5.2.3.1.
   - To use the HTTP (Web Server) Interface, see Section 5.2.3.2.
   - To use the serial remote control, see Section 5.2.3.3.

5.2.3.1 Use the UT-4500 Front Panel to Get the Management IP Address and Firmware information

🔍 **Chapter 6. FRONT PANEL OPERATION**

Using the unit front panel:

- You may view find the factory-assigned Management IP Address within the **CONFIG → REMOTE→ ETHERNET → ADDRESS** menu branch:

```
IP Address/Range:
   XXX.XXX.XXX.XXX/YY
```

- You may view the current Firmware M&C version at the top-level menu of the front panel display (press the **[CLEAR]** key several times):

```
        UT_45XX -X
 SW VER X.X.X   SN########
```

- You may view the detailed firmware information within the **UTILITY → FIRMWARE→ INFO → IMAGE#1** *or* **IMAGE#2 → BULK** menu branches:

```
Image#X: BULK APP FPGA
```

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

5.2.3.2 Use the HTTP Interface to Find the Firmware Information

Chapter 7. ETHERNET INTERFACE OPERATION

Do these steps:

1. Go to either of these pages to review the firmware information:
   - The 'Firmware Information' section of the 'Config | Utility' page provides the firmware details as Boot, Bulk1, and Bulk2, as shown in this example:
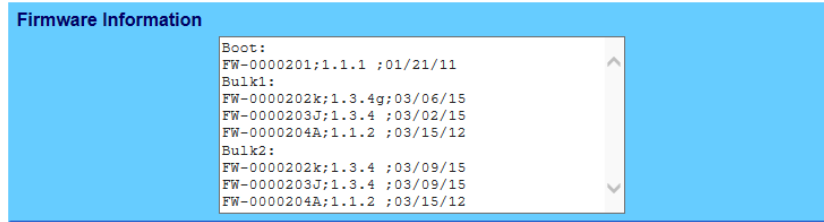
   - The 'Summary' section of the 'Status | Summary' page provides the firmware details – "FW Revision", "Active Software Image", and "Next Reboot Image" – as shown in this example:

2. Write down your firmware information for further reference or to provide to Comtech EF Data Product support.

5.2.3.3 Use the Serial Interface to Find the Firmware Information

Chapter 8. SERIAL INTERFACE OPERATION

Use your terminal emulator program to execute remote queries with the UT-4500. Use the "FRM" remote query to find the firmware information:

- **<DEV/FRM_{cr}**
  (returns the complete information of the firmwares running under Boot, Bulk1, and Bulk2 in the form FW-AAAAAAA B.B.BB DD/MM/YY, where:

o FW-AAAAAAA = the firmware part number
o B.B.BB = the firmware version number
o DD/MM/YY = the firmware release date (Day/Month/Year)

5.2.4 Make a Temporary Folder (Subdirectory) on the User PC

The temporary folder is where you store the firmware archive download. There are several ways you can make a temporary folder on a Windows PC:

- To use the Windows Desktop, see Section 5.2.4.1.
- To use Windows Explorer, see Section 5.2.4.2.
- To use the Run and Browse windows, see Section 5.2.4.3.
- To use Windows Command-line or the Command Prompt, see Section 5.2.4.4.

1) These examples specify drive letter "**c:**". You can use any valid, writable drive letter.
2) Typical for many of the tasks that follow, type the command as instructed and then press **Enter**.

After you make the temporary folder, proceed to Section 5.3 to download and extract the firmware files.

5.2.4.1 Use Windows Desktop to Make a Folder
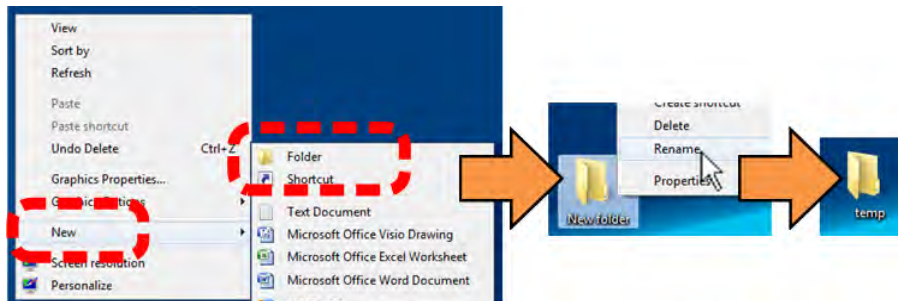
Do these steps:

1. Right-click anywhere on the desktop to open the popup submenu.
2. Select **New > Folder** to make the new, temporary folder on the desktop.
3. Right-click on the new folder and then select **Rename** from the popup submenu. Rename this folder to "temp" or some other convenient, unused name.

5.2.4.2 Use Windows Explorer to Make a Folder
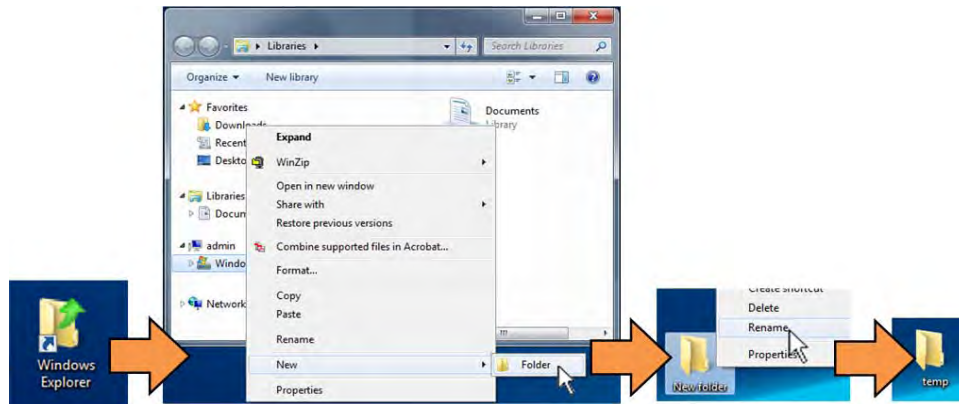
Do these steps:

1. Left-double-click the Windows Explorer icon on the Windows Desktop.
2. Depending in your Windows OS version: select **File > New > Folder**, or click your Folder Destination (e.g., **Windows (C:)** and then **New Folder** to make the new, temporary folder in the active location.
3. Right-click the **New Folder** folder name, and then **Rename** this folder to "temp" or some other convenient, unused name.

5.2.4.3 Use the Run and Browse Windows to Make a Folder
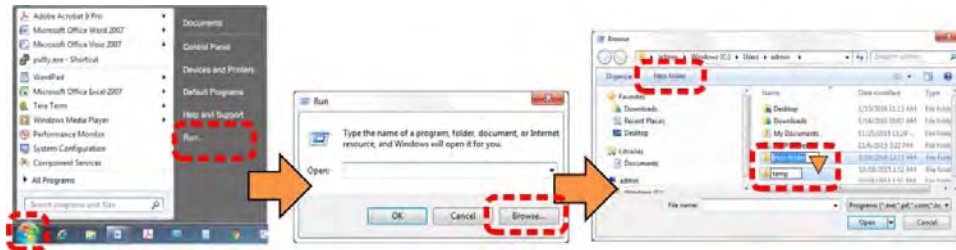
Select **Start** on the Windows taskbar and then do these steps:

1. Click **Run…** to open the **Run** window.
2. Click **Browse…** to open the **Browse** window.
3. Click **New Folder**. This can be an icon or a text label, depending on the Windows OS version.
4. Right-click the **New Folder** folder name, and then **Rename** this folder to "temp" or some other convenient, unused name.

5.2.4.4   Use Windows Command-line or Command Prompt to Make a Folder
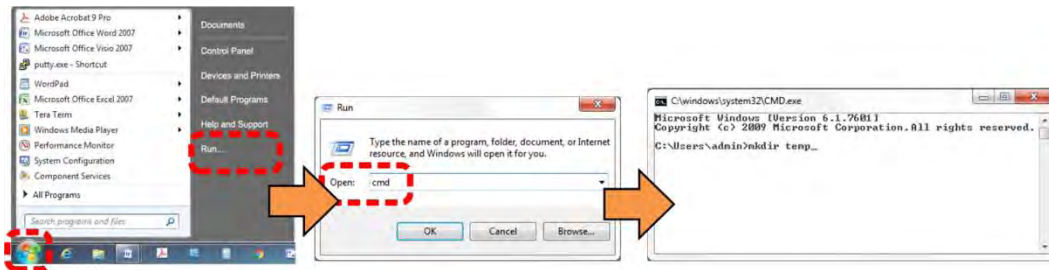
Select **Start** on the Windows taskbar and then do these steps:

1. Click **Run...** to open the **Run** window (or, depending on Windows OS version prior to Windows 95, click the **MS-DOS Prompt** icon from the Main Menu).

2. Open a Command-line window:

    *   For Windows 95 or Windows 98 – type "command".

    *   For any Windows OS versions later than Windows 98 – type "cmd" or "command".

    *   Alternately, from **Start**, select the **All Programs > Accessories** popup submenu, and then select **Command Prompt**:
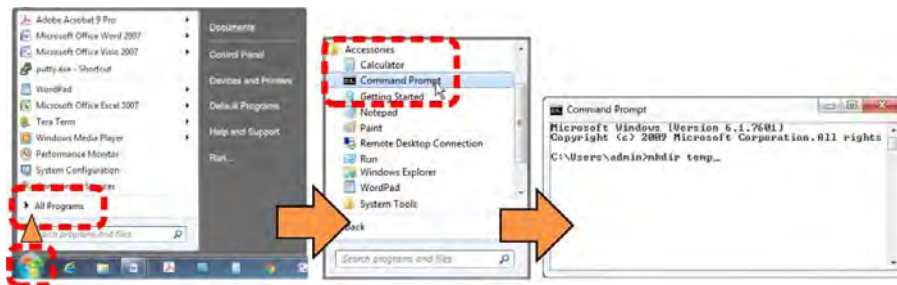
3. From the c:\> prompt, type either "mkdir temp" or "md temp" (both "mkdir" and "md" mean "make directory"), and then press **Enter**.

There will now be a "temp" folder created and available for placement of the firmware file download.

5.3   Download and Extract the Firmware Update Files

Do these steps:
1. Go online to www.comtechefdata.com.
2. On the Main page – Under **Support Information** or the **Support** tab, select the **Software Downloads** hyperlink.
3. On the **Software Downloads** page – Click **Download Flash and Software Update Files**.
4. On the **Flash Updates Index** page – Select the (**Select a Product Line**) **Converters** hyperlink.
5. On the **Converters** product page – Select the **UT-4500** product hyperlink.
6. Select the appropriate firmware archive EXE or ZIP file download hyperlink.
7. Once you select the EXE or ZIP hyperlink, the **File Download** dialogue opens on your browser and prompts an action. You may otherwise click **[Cancel]** to quit the file download process. Note the following:
   - For EXE files:
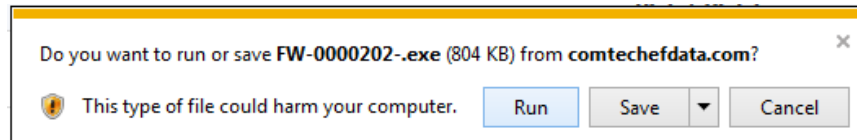
   o Click **[Run]** to open the self-extractor dialogue window. Use **[Browse]** to select your destination folder. Click **[Unzip]** to extract the files. Your results display as per this example – click **[OK]** to close. Your files are now available for transfer to the UT-4500.
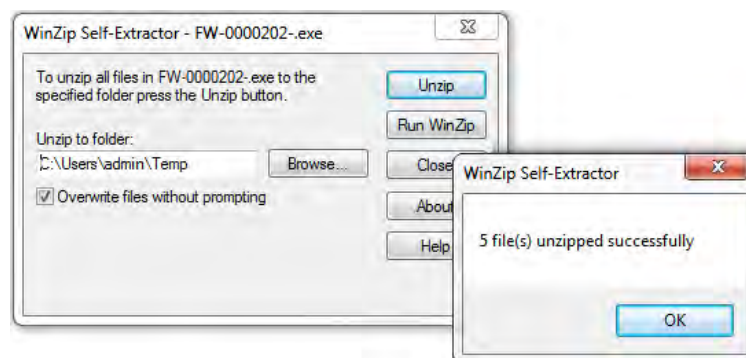
   o Click **[Save]** to download the EXE file to your Downloads folder. Once the download is complete the dialogue prompts

you to either **[Run]** the self-extracting file, or to open or view the Windows Downloads folder for further action.
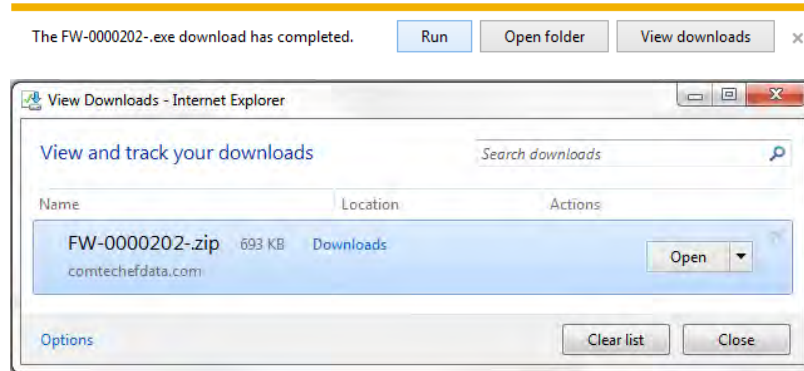
- For ZIP files:

  - Click **[Open]** to open the archive file. Use the WinZip features to select the files for extraction to your destination folder.
  - Click **[Save]** to download the ZIP file to your Windows Downloads folder. Once the download is complete the dialogue prompts you to either **[Open]** the archive file, or to open or view the Windows Downloads folder for further action.

8. If not already done with **File Download > Open**, you must extract, at a minimum, these files (filenames are subject to change):
   - FW-0000202X_45xxA_#.#.#.bin – The Firmware Bulk image file
   - ReleaseNotes_ 45xxA.v#.#.#.pdf – The Firmware Release Notes PDF file
   - CReflash.exe –The Firmware Update Utility program

   > WHERE: 'X' is the firmware revision letter, and '#._#.#' is the firmware version (e.g., FW Ver. 1.2.3)

9. Confirm availability of the firmware files in the temporary folder. There are several ways you can view the contents of the temporary folder on a Windows-based PC:
   - To use the Windows Desktop, see Section 5.3.1.1.
   - To use Windows Command-line or Command Prompt, see Section 5.3.1.2.

   After you confirm the firmware files are in the folder, proceed to Section 5.4 to upload the firmware update to the UT-4500.

5.3.1.1   Use Windows Desktop to View Folder Contents

From the Windows Desktop:
1. Double-left-click the Windows Explorer icon, and then double-left-click as needed to locate, and then open, the "temp" folder (directory) created earlier on the Windows Desktop.
2. Use the **Browse** window (**Start > ...Run > Browse**) to locate, and then double-click to open, the "temp" folder.

5.3.1.2   Use Windows Command-line to View Folder Contents

From Command-line or Command Prompt:
1. Type "**cd c:\temp**" at the Windows Command-line prompt to change to the temporary folder (directory) created earlier using Command-line.
2. Type "**dir**" to list the files extracted to the temporary folder from the downloaded archive file.

5.4   Upload the Firmware Files and Update the UT-4500 Unit

5.4.1   Important Considerations

Before you proceed with the firmware update, make sure that:
* You connect the UT-4500 **'Ethernet'** port to a Windows-based PC Ethernet port with a CAT5e Ethernet cable.
* Your PC is running a terminal emulation program for operation of the UT-4500 Telnet or serial interfaces.
* You have noted your UT-4500 Management IP Address.
* Your PC is running a compatible Web browser for operation of the UT-4500 HTTP Interface.
* You download or otherwise have Comtech's latest firmware files and the "CReflash" utility available on the User PC in an accessible temporary folder.

5.4.2   Steps to "CReflash" Upload the Firmware Files

1) The "CReflash" utility is provided with the firmware download.
2) Ver5x chassis and earlier units (i.e., non-Ethernet units) must use this procedure.

Do these steps:

1. From the temporary folder – Locate, and then double-click, the "CReflash" filename or icon. The CReflash utility opens:
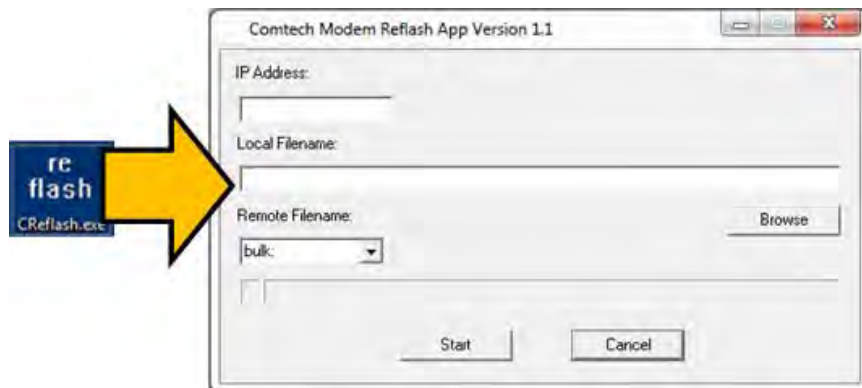
2. Enter your upload parameters information into CReflash:
    a. Left-click in the "IP Address:" text box, and enter the default Management IP Address.
    b. Left-click in the "Local Filename:" text box. Then, click **[Browse]** and navigate to the temporary folder created earlier. Click on the firmware "bin" filename, and then click **[Open]**. The filename will appear in the "Local Filename:" text box.
    c. Make sure the drop-down list remains set to "**bulk:**".
    d. Click **[Start]** to begin the upload process. If the information was correctly entered into CReflash, the utility displays an animated progress bar at the bottom of the window, along with a series of messages:
        *   "Opening FTP"
        *   "Sending data file to modem:"
        *   "Writing FLASH: # of #"
        *   "Success!"
3. When done, click **[Cancel]** to exit CReflash.

5.4.3 Steps to FTP Upload the Firmware Files

1) Typical for all steps: "xxx.xxx.xxx.xxx" represents the assigned unit Management IP Address.
2) Type all commands without quotes, and press Enter to execute.

1. To proceed, you should already have noted the Management IP Address for the UT-4500 as instructed in Section 5.2.3.1.
2. Use Windows Command-line to send a ping command. To ping the unit, type "ping xxx.xxx.xxx.xxx" at the Windows Command-line prompt. The response should confirm whether the unit is connected and communicating correctly with the User PC.
3. Use Windows Command-line to transfer the files from the User PC to the UT-4500 unit via FTP:
   a. Type "ftp xxx.xxx.xxx.xxx" to open the FTP session.
   b. Type "bin" to set the binary transfer mode.
   c. Type "prompt".
   d. Type "hash".
   e. To begin the file transfer, type "put FW-0000202X.bin bulk:"

   The destination "bulk:" must be all lower-case.

   Press **Enter**. The unit reports the update progress (e.g., first "Programming App Flash … Please wait." and then "Programming main FPGA … Please wait.")
   f. Wait for the file transfer to end.
   g. Type "bye" to close the FTP session.
   h. Close the Windows Command-line window.
4. To verify that the PC-to-unit FTP file transfer was successful, find the current firmware information via the front panel or the HTTP or Serial Interface (see Sections 5.2.3.1, 5.2.3.2, or 5.2.3.3).

5.4.4 Steps to Complete the Firmware Update Procedure

- Chapter 6. FRONT PANEL OPERATION
- Chapter 7. ETHERNET INTERFACE OPERATION

Use the UT-4500 front panel or the HTTP Interface to select the new firmware image. You must then reboot the unit for the update to take effect.

5.4.4.1   Select the Boot Image

5.4.4.1.1   Use the Front Panel to Select the Boot Image

Do these steps from the UT-4500 front panel:
1. Go to the **UTILITY** → **FIRMWARE** → **SELECT** menu branch.

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

2. On the bottom line, use the ◄ ► arrow keys to change to the other image.

> ⓘ You must be in LOCAL MODE to perform this task. If you are not in Local Mode (via the **CONFIG** → **REMOTE** menu branch), the unit will prompt you to take an action before continuing:
>
> ```
> Remote Mode: press ENTER
> For local mode, or CLEAR
> ```

3. You must cycle power to hard-reboot the unit.

5.4.4.1.2   Use the HTTP Interface to Select the Boot Image

Do these steps from the HTTP Interface 'Config | Utility' page:
1. Use the 'Next Reboot Image' drop-down list to select Image 1 or 2 as the preferred Current Active Firmware Image:

2. Click [Submit].
3. You must then hard-reboot or soft-reboot the unit.

5.4.4.2   Reboot the Unit

5.4.4.2.1   Hard-reboot the Unit from the Rear Panel

Typical for either the standard AC unit or the optional DC unit:
1. From the unit rear panel, switch the power OFF, and then turn the power back ON.

2. Verify the new firmware version has booted; for example, check the
    firmware version displayed on the UT-4500 front panel:

```
        UT_45XX -X
SW VER X.X.X  SN#########
```

5.4.4.2.2 Soft-Reboot the Unit from the HTTP Interface

Do these steps from the HTTP Interface 'Config | Utility' page:

1. In the 'Perform Soft Reboot' section, click [Reboot Now]:

2. Wait while the UT-4500 reboots with the Current Active Firmware Image.
3. To load a second image, repeat the tasks described throughout Section
    5.4.4.

The UT-4500 is now operating with its latest firmware. The firmware update
process is complete.

Notes:

Chapter 6. FRONT PANEL OPERATION

6.1 Front Panel Overview

You may fully control and monitor the UT-4500 Series C- or Ku-Band Up Converter from the front panel (**Figure 6-1**).
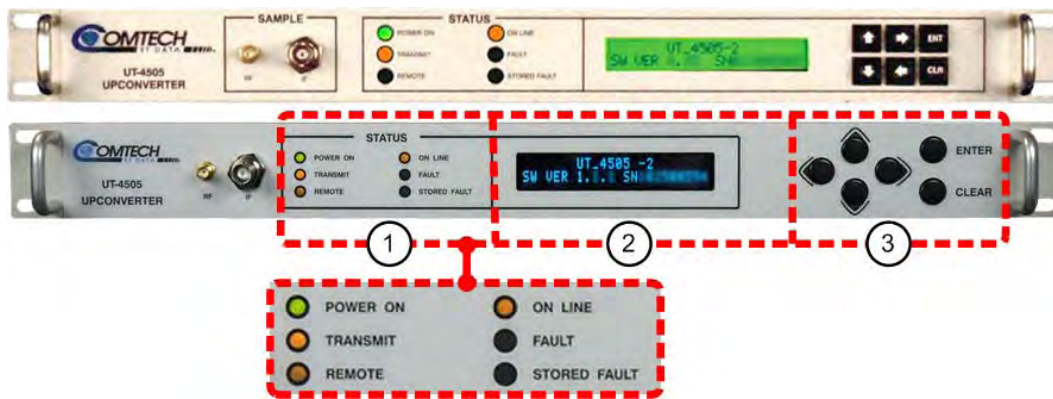
(TOP) Initially Released Chassis
(BOTTOM) Current Production Unit

Figure 6-1. Front Panel View (UT-4505 Shown)

6.1.1   Power Up the Unit

Before applying power, you should check to ensure that installation is complete. Verify that the converter is connected to the proper prime power source, RF Input, and IF Output.

(LEFT) Standard AC Chassis
(RIGHT) Optional -48VDC Chassis

Figure 6-2. Rear Panel – Standard and Optional Power Interfaces

Switch on the unit (**Figure 6-2**). Verify that the cooling fan is operational, the LED indicators illuminate as expected, and the Vacuum Fluorescent Display is readable.

6.1.2   LED Indicators

See **Figure 6-1**, **Item 1**. These six LED Indicators convey operational states as follows:

POWER ON
Lights GREEN when prime power is applied to the unit.

TRANSMIT
Lights AMBER when the transmit function is operational.

REMOTE
Lights AMBER when the unit is in Remote Communication Mode (i.e., Serial or Ethernet). Local monitoring is possible, but there is no local control.

Remains OFF when the unit is in Local Mode. Remote monitoring is possible, but no there is no remote control.

ON LINE
Lights AMBER when the unit is online and carrying traffic.

FAULT
Lights RED when a fault condition exists.

STORED FAULT
Lights RED when a fault condition is logged and stored.

6.1.3   Vacuum Fluorescent Display (VFD)

The displays for the initially-released chassis and the current production unit differ as follows:

(LEFT) Liquid Crystal Display (LCD) – Initially Released Chassis
(RIGHT) Vacuum Fluorescent Display (VFD) – Current Production Unit

```
                UT-4505
     SW VER #.#.# SN012345678
```

See **Figure 6-1**, **Item 2**. The VFD is an active display showing two lines of 24 characters each. It produces a blue light with adjustable brightness. On most menu screens, you will see a flashing, solid-block cursor that blinks at a once-per-second rate. This indicates the currently selected item, digit, or field:

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

Where this solid block cursor obscures the item under edit (e.g., a numeric field), the cursor automatically changes to an underline cursor:

```
IP Address/Range:
    192.168.001.006/24
```

To prevent the display from becoming burnt by a constant image, the unit employs a screen saver feature that activates after one hour. This message constantly scrolls and wraps across the screen. The top line displays the AID (the user-defined name for the unit); the bottom line displays the message "**Press any key…**" as shown:

```
   Circuit ID:------------
---Press any key...
```

Press any key to restore the previously active screen.

6.1.4   Keypad

The keypads for the initially-released chassis and the current production unit differ as follows:

(LEFT) "Square" Button Keypad – Initially Released Chassis
(RIGHT) "Round" Button Keypad – Current Production Unit

See **Figure 6-1**, **Item 3**. The keys for the current production unit keypad have a positive 'click' action that provides tactile feedback.

Enter data via the keypad. Data, prompts, and messages are displayed on the VFD. Operation of the individual keys is as follows:

- Use the **ENTER** key to select a displayed function or to execute a unit configuration change.
- Use the **CLEAR** key to back out of a selection or to cancel a configuration change that has not been executed using **ENTER**. Pressing **CLEAR** generally returns the display to the previous selection.
- Use the ◀ (LEFT) and ▶ (RIGHT) keys to move to the next selection or to move the cursor functions. At times, they may also used to move from one section to another.
- Use the ▲ (UP) and ▼ (DOWN) keys to change configuration data (numbers). You may also use these keys to move from one section to another.

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 the IP Address assignments.

6.2   Front Panel Operation – Menu Matrix

Chapter Sect.	Menu Screen Description	Submenu Selections
6.2.1	Opening Screen	–
6.2.2	Select (Main) Menu	CONFIG; MONITOR; FAULTS; PRE-SELECTS; UTILITY
6.2.3	CONFIG (Configuration)	OUTPUT; REMOTE; REDUNDANCY; FAULTRECOVERY
6.2.3.1	(CONFIG:) OUTPUT	Frq(MHz); Atten (dB); Rx
6.2.3.2	(CONFIG:) REMOTE	Local; Serial; Ethernet
6.2.3.2.1	(REMOTE:) LOCAL	–
6.2.3.2.2	(REMOTE:) SERIAL	Serial Mode; Address; Baudrate
6.2.3.2.3	(REMOTE:) ETHERNET	ADDRESS; GATEWAY; SNMP
6.2.3.2.3.1	(REMOTE:) ETHERNET ▶ ADDRESS	–
6.2.3.2.3.2	(REMOTE:) ETHERNET ▶ GATEWAY	–
6.2.3.2.3.3	(REMOTE:) ETHERNET ▶ SNMP	COMMUNITIES; TRAPS
6.2.3.3	(CONFIG:) REDUNDANCY	MODE; Auto/Manual; FORCE; HSB
6.2.3.3.1	(REDUNDANCY:) MODE	On/Off; BU/#01-12
6.2.3.3.2	(REDUNDANCY:) Auto/Manual	Select: A/M
6.2.3.3.3	(REDUNDANCY:) FORCE	Offset (dB); Activate BU (Yes/No)
6.2.3.3.4	(REDUNDANCY:) HSB	–
6.2.3.4	(CONFIG:) FAULTRECOVERY	Manual/Auto
6.2.3.5	(CONFIG:) COLDSTART	–
6.2.4	MONITOR	–
6.2.5	FAULTS	CURRENT; STORED; VIEW
6.2.5.1	(FAULTS:) CURRENT	–
6.2.5.2	(FAULTS:) STORED	VIEW; CLEAR-ALL
6.2.5.2.1	(FAULTS:) STORED ▶ VIEW	–
6.2.5.2.2	(FAULTS:) STORED ▶ CLEAR-ALL	–
6.2.5.3	(FAULTS:) MASK	Fault/Masked
6.2.6	PRE-SELECTS	LOAD; PROGRAM; CLEAR
6.2.6.1	(PRE-SELECTS:) LOAD	No/Yes
6.2.6.2	(PRE-SELECTS:) PROGRAM	Pre-Select Slot #; Frq (MHz); Atten (dB)
6.2.6.3	(PRE-SELECTS:) CLEAR	No/Yes
6.2.7	UTILITY	TIME; DISP; FIRMWARE; AID; REFOSC; SLOPE; LAMP-TEST
6.2.7.1	(UTILITY:) TIME	Time (HH:MM:SS); Date (MM/DD/YY)
6.2.7.2	(UTILITY:) DISP	25%/50%/75%/100%
6.2.7.3	(UTILITY:) FIRMWARE	INFO; SELECT
6.2.7.3.1	(FIRMWARE:) INFO	BOOTROM; IMAGE#1; IMAGE#2
6.2.7.3.1.1	(FIRMWARE:) INFO ▶ BOOTROM	–
6.2.7.3.1.2	(FIRMWARE:) INFO ▶ IMAGE#1/#2	BULK; APP; FPGA
6.2.7.3.2	(FIRMWARE:) SELECT	(IMAGE) #1/#2
6.2.7.4	(UTILITY:) AID	(Application ID Message)
6.2.7.5	(UTILITY:) REFOSC	(Reference Frequency Adjustment)
6.2.7.6	(UTILITY:) SLOPE	(Converter Slope Adjustment)
6.2.7.7	(UTILITY:) LAMP-TEST	No/Yes

6.2.1   Opening Screen

```
                    UT_4505-2
         SW VER. #.#.# SN012345678
```

The opening screen displays once you apply power to the unit. The top line identifies the unit model (e.g., UT-4505-2). The bottom line displays the running Firmware Version (this number may vary) and the unit serial number.

Press **ENTER** to display the Main Menu. Press **CLEAR** repeatedly from any nested screen to return to this screen.

> The screen shots provided throughout this chapter are applicable to all UT-4500 Series Up Converters. Any operational restrictions are noted.

6.2.2   Main Menu

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

Use the ◄ ► keys to move the cursor to the desired choice. Press **ENTER**. The function of each menu branch is as follows:

- CONFIG (Configuration) Menu Branch – These screens provide selections for the desired output, local/remote control, redundancy, and fault recovery operations.
- MONITOR Menu Branch – These screens provide real-time monitoring of system voltages, unit temperature, IFLO tuning, and Synth tuning.
- FAULTS Menu Branch – The converter displays up to 100 faults, date and time stamped and stored in memory as they occur.
- PRE-SELECTS Menu Branch – These screens provide configuration and recall of up to 32 pre-set operating selections.
- UTILITY Menu Branch – These screens permit you to configure such system functions as the Real-Time Clock, VFD brightness, unit ID, and firmware loading preferences.

6.2.3   (SELECT:) CONFIG (Configuration) Menu Branch

```
OUTPUT    REMOTE    REDUNDANCY
FAULTRECOVERY    COLDSTART
```

Use the ◀ ▶ keys to move the cursor to the desired choice. Press **ENTER**. The function of each CONFIG submenu is as follows:

- **OUTPUT** Submenu – The selections here allow you to define output frequency, attenuation, and set Rx operations as ON or OFF.
- **REMOTE** Submenu – The selections here allow you to select whether you control the unit locally or remotely; set the unit address; the interface type, and the operating parameters for that interface.
- **REDUNDANCY** Submenu – The selections here allow you to identify the redundancy state and mode (see **Appendix A. REDUNDANT SYSTEM OPERATION** for detailed information about redundancy operations).
- **FAULTRECOVERY** Submenu – The selections here allow you to set the Fault Recovery operation as AUTO or MANUAL.
- **COLDSTART** Submenu – The selections here allow you to mute the converter output signal for a pre-determined time after power is applied to the converter to ensure that the reference oscillator is stable. (This submenu is non-operational in redundancy systems.)

6.2.3.1   (CONFIG:) OUTPUT Submenu

```
Frq=03627.125 MHz
 Atten=19.75 dB   Rx = Off
```

On the top line, set the converter **Freq** (Frequency). You may edit the current frequency channel from RF_{Low} to RF_{High} MHz (e.g.; 05845.000 to 06725.000 MHz for Model UT-4505/I) in 125 kHz steps (1 kHz steps optional). Use the ◀ ▶ keys to select a digit, and then use the ▲▼ keys to change that digit.

On the bottom line, set the converter Atten (Attenuation). You may select an attenuation setting from **0.00** to **25.00** dB in **0.25** dB steps (0.1 dB steps optional). The default setting is **10.00** dB. Use the ◀ ▶ keys to select a digit, and then use the ▲▼ keys to change that digit.

Next, use the ▲▼ keys to set **Rx** (up converter operation) as **On** or **Off**. The default mode is **Off**. Press **ENTER**.

6.2.3.1.1   (CONFIG:) OUTPUT Submenu (OPTIONAL DUAL IF RACK MOUNT CONVERTERS)

Comtech EF Data provides the ability to switch the input IF frequency between 70 MHz and 140 MHz. For converters equipped with this optional hardware configuration, the **(CONFIG:) OUTPUT** submenu appears as follows:

```
Frq=03627.125 MHz   IF=140
Atten=02.00 dB   Rx = Off
```

On the top line, press the **ENTER** key to set the converter RF **Frq** (Frequency). You may edit the current frequency channel from RF_{Low} to RF_{High} MHz (e.g.; 05845.000 to 06725.000 MHz for Model UT-4505/I) in 125 kHz steps (1 kHz steps optional). Use the ◄ ► keys to select a digit, and then use the ▲▼ keys to change that digit.

Next, set the converter **IF** Frequency. Use the ◄ ► keys to jump to this setting, and then use the ▲▼ keys to select **70** MHz or **140** MHz. The default is **70 MHz**.

On the bottom linescreen that follows, set the converter **Atten** (Attenuation). You may select an attenuation setting from **0.00** to **25.00** dB in **0.25** dB steps (0.1 dB steps optional). The default setting is **10.00** dB. Use the ◄ ► keys to select a digit, and then use the ▲▼ keys to change that digit. Press **ENTER**.

1) The actual IF bandwidth is maintained as the standard ±18 MHz (±20 MHz) of the 70 MHz configurations.
2) The mute behavior after changing the IF frequency is the same as the normal mute behavior after changing the RF frequency.
3) You may not "mix" dual IF converters with standard converters when operating in a redundant system.

6.2.3.2   (CONFIG:) REMOTE (Remote Control) Submenu

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

Use the ◄ ► keys to select **Local**, **SERIAL**, or **ETHERNET**. Press **ENTER**.

6.2.3.2.1   (REMOTE:) Local

1) When you select Local mode, remote <u>monitoring</u> is possible, but remote <u>contro</u>l is **disabled**.
2) A number of operations are possible in Local mode only. If you are in Serial or Ethernet mode during such tasks, the unit alerts you to this remote state:

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

Press **ENTER** to switch to Local Mode to continue with your task, or press **CLEAR** to exit the task and remain in the active mode.

6.2.3.2.2   (REMOTE:) SERIAL

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

On the top line, use the ▲▼ keys to set the mode to **RS-232** or **RS-485.** Press **ENTER**. On the bottom line, set the Serial address (**Addr**). Use the ◄ ► keys to select a digit, and then use the ▲▼ keys to change that digit. The valid range of addresses is from **001** (default) to **255**.

Next, set the **Baud** rate. Use the ◄ ► keys to select a parameter, and then use the ▲▼ keys to select your desired baud rate. Available choices are **1200**, **2400**, **4800**, **9600 (default)**, **19K2**, and **38K4**.

Finally, set the asynchronous character format. Use the ◄ ► keys to select the parameter, and then use the ▲▼ keys to select the format. The 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**.

6.2.3.2.3   (REMOTE:) ETHERNET

The UT-4500 Series C- and Ku-Band Up Converters, as initially released, do not feature a rear panel 'Ethernet' port. Only current production units offer Ethernet Interface operation. See **Chapter 4. FRONT AND REAR PANEL CONNECTORS** for more information.

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

On the top line, use the ◄ ► keys to select **ADDRESS**, **GATEWAY**, or **SNMP**. The bottom line displays the *read-only* unit MAC address. Press **ENTER**.

6.2.3.2.3.1   (REMOTE:) ETHERNET➔ADDRESS

```
     IP Address/Range:
        192.168.001.002/24
```

Edit the Management IP Address and Range for the rear panel 'Ethernet' 100BaseTX port. Use the ◄ ► keys to select a digit, and then use the ▲▼ keys to change that digit. Press **ENTER**.

6.2.3.2.3.2   (REMOTE:) ETHERNET➔GATEWAY

```
     Ethernet IP Gateway:
        192.168.001.002
```

Edit the IP Gateway Address for the rear panel 'Ethernet' 100BaseTX port. Use the ◄ ► keys to select a digit, and then use the ▲▼ keys to change that digit. Press **ENTER**.

6.2.3.2.3.3   (REMOTE:) ETHERNET→SNMP

```
        COMMUNITIES   TRAPS
```

Use the ◄ ► keys to select **COMMUNITIES** or **TRAPS**. Press **ENTER**.

(REMOTE:) ETHERNET→SNMP→COMMUNITIES

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

Use the ◄ ► keys to select **READ**, **WRITE**, or **TRAP**. Press **ENTER**.

(REMOTE:) ETHERNET→SNMP→COMMUNITIES→READ

```
    Read Community:
    public
```

View or edit the SNMP Read Community string. To edit, use the ◄ ► keys to select a character, and then use the ▲▼ keys to change that character. Press **ENTER**.

(REMOTE:) ETHERNET→SNMP→COMMUNITIES→WRITE

```
    Write Community:
    private
```

View or edit the SNMP Write Community string. To edit, use the ◄ ► keys to select a character, and then use the ▲▼ keys to change that character. Press **ENTER**.

(REMOTE:) ETHERNET→SNMP→COMMUNITIES→TRAP

```
    Trap Community:
    comtech
```

View or edit the SNMP Trap Community string. To edit, use the ◄ ► keys to select a character, and then use the ▲▼ keys to change that character. Press **ENTER**.

(REMOTE:) ETHERNET→SNMP→TRAPS

```
TRAPIP1 TRAPIP2 VERSION
```

Use the ◄ ► keys to select **TRAPIP1**, **TRAPIP2**, or **VERSION**. Press **ENTER**.

(REMOTE:) ETHERNET→SNMP→TRAPS→TRAPIP1/TRAPIP2

> If both Trap IP Addresses are 000.000.000.000, it means that Traps are **disabled**.

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

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

Typical for both submenus: View or edit the Trap Destination IP Address. To edit, use the ◄ ► keys to select a digit, and then use the ▲▼ keys to change that digit. Press **ENTER**.

(REMOTE:) ETHERNET→SNMP→TRAPS→VERSION

```
Trap Version:
      SNMPv1   SNMPv2
```

Use the ▲▼ keys to set the trap version as **SNMPv1** or **SNMPv2.** Press **ENTER**.

6.2.3.3   (CONFIG:) REDUNDANCY Submenu

See **Appendix A. REDUNDANT SYSTEM OPERATION** for detailed information about using the front panel menus for redundancy configuration and operation.

This menu branch is functional in LOCAL MODE ONLY.

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

```
Redundancy: MODE
```

Otherwise:

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

Use the ◀ ▶ keys to select **MODE**, **Auto/Manual**, **FORCE**, or **HSB** (High Speed Bus). Press **ENTER**.

6.2.3.3.1   (REDUNDANCY:) MODE

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

On the top line, use the ◀ ▶ keys to select the **Redundancy Config** setting, and then use the ▲▼ keys to toggle operation as **On** or **Off.**

On the bottom line, when Redundancy Mode = On, use the ◀ ▶ keys to navigate to the **Converter Selection** setting, and then use the ▲▼ keys to toggle the converter operational preference as **#BU** (the backup up converter) or online converter **#01** through **#12**.

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 **1:0#** (e.g., 1:01 or 1:03).
- With **CONVERTER = #01-12**, the selected 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**.

6.2.3.3.2   (REDUNDANCY:) Auto/Manual

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

Use this submenu to define backup as **Auto** (Automatic) or **MAN** (manual). This setting allows automatic switching by the BU if both units are in Redundancy Mode.

This command is only accepted by the BU. If a chain converter is set to Manual Mode, the BU logs the occurrence and does not act upon further information from the converter until it is returned to Auto Mode.

On the top line, this line displays the unit in use and its Application ID (identification label).

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

6.2.3.3.3   (REDUNDANCY:) FORCE

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

On the top line, use the ◄ ► 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 ▲▼ keys to set that value in 0.25 dB increments.

On the bottom line, use the ◀ ▶ keys to navigate to the **ACTIVATE BACKUP** setting, and then use the ▲▼ keys to set toggle switchover as **NO** (i.e., no backup occurs at the defined operational threshold), or **FORCE** (i.e, switchover occurs 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 **Auto**matic**.** In the absence of a designated backup unit and/or switchover set as **Man**ual, this 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.

6.2.3.3.4   (REDUNDANCY:) HSB

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

In the "Daisy Chain" configuration, the BU communicates with the online units through the HSB (high-speed bus data interface). The BU detects faults and reconfigures itself to replace the faulted converter. The BU also uses the HSB to monitor configuration changes made to an online converter. Changes in frequency, gain, or polarity are immediately entered into the backup table as well as information from new online units. The HSB does not interfere with the remote serial communication link access to any of the converters in the chain.

Use the HSB submenu to configure operation of the 'J3 | HSB' connector that is provided on the optional Receive Switch Module (RSM) and Transmit Switch Module (TSM). When an RSM or TSM is not configured for operation, this message displays:

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

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

6.2.3.4   (CONFIG:) FAULTRECOVERY Submenu

```
Fault Recovery: Auto
```

Use the ◄ ► keys to select Fault Recovery as **Manual** or **Auto** (automatic). Press **ENTER**. The default operation is **Auto**.

6.2.3.5   (CONFIG:) COLDSTART Submenu

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

This function is **disabled** in redundant systems.

```
Cold Start = Disabled.
```

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

6.2.4   (SELECT:) MONITOR Menu Branch

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

These examples are provided for reference only – the data that displays will vary depending on your actual operating conditions:

```
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.

6.2.5   (SELECT:) FAULTS Menu Branch

The **MASK** selection is **disabled** in redundancy systems.

```
    CURRENT   STORED      MASK
```

Use the ◀ ▶ keys to select **CURRENT**, **STORED, or MASK**. Press **ENTER**.

6.2.5.1   (FAULTS:) CURRENT

Four *read-only* information screens are provided to monitor a number of operating parameters and return back whether the parameters are **OK** (operating within normal ranges), or **FT** (currently faulted). These examples are provided for reference only – the data varies 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  ▼
```

Use the ▲▼ keys to page between screens. Press **ENTER** or **CLEAR** to return to the previous menu.

6.2.5.2   (FAULTS:) STORED

```
            VIEW   CLEAR-ALL
```

Use the ◄ ► keys to select **View** or **Clear-All**. Press **ENTER**.

6.2.5.2.1   (FAULTS:) STORED →VIEW

If you select **View** and no faults exist in the stored faults log, the system displays this message:

```
      No Stored Faults.
```

Otherwise, stored faults log entries display as per this example:

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

Use the ▲▼ keys to page between screens. The faults log can store up to **100** faults. When a fault condition occurs, the unit assigns a number to the fault (in the order received), date- and time-stamps the fault, and provides a condensed description of the issue. When the fault condition clears, this action is recorded in the same fashion as the fault was originally recorded, as shown per this example:

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

Once the number of faults reaches 100, the 100th fault displays as "**ER**." The stored faults remain in memory until you execute the **CLEAR-ALL** command.

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

6.2.5.2.2 (FAULTS:) STORED➔CLEAR-ALL

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

Use the ◄ ► keys to select **No** or **Yes**. Press **ENTER**.

When you select **Yes**, the unit clears the faults log and returns you to the previous menu. However, if there are faults present on the unit at this time, the unit will re-stamp the faults and generate new log entries.

6.2.5.3 (FAULTS:) MASK

ⓘ The MASK selection is **disabled** in redundancy systems.

```
Ext Ref Lock Detect:
Fault Masked
```

Set the fault handling for the External Reference, when applicable. Use the ◄ ► keys to select **Fault** or **Masked.** Press **ENTER**.

6.2.6 (SELECT:) PRE-SELECTS Menu Branch

You may create (program) up to 32 operating configurations and recall them as needed via the LOAD submenu. If your unit does not contain any pre-selects, the screen initially appears as follows:

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

Otherwise, when pre-selects are programmed and available, entries display as per this example:

```
#03 LOAD PROGRAM CLEAR  ▲
03625.125 MHz 01.25 dB  ▼
```

Use the ▲▼ keys to browse through the stored pre-selects (**#01** through **#32**, as available). Then, use the ◀▶ keys to select **LOAD**, **PROGRAM**, or **CLEAR**. Press **ENTER**.

6.2.6.1   (PRE-SELECTS:) LOAD

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

LOAD recalls the stored pre-select from the active memory slot. It is functional when pre-selects have previously been programmed into the unit using the PROGRAM submenu. Use the ◀▶ keys s to select **No** or **Yes**. Press **ENTER**.

6.2.6.2   (PRE-SELECTS:) PROGRAM

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

PROGRAM saves a defined set of operating parameters into the available memory slot as a PRE-SELECT.

On the top line, use the ▲▼ keys to select the desired pre-select slot (from **#01** to **#32**).

On the bottom line, typical for the frequency and attenuation values, use the ◀ ▶ keys to select a digit, and then use the ▲▼ keys to change that digit. Press **ENTER**. The unit stores these edited values into the active pre-select slot, where they may be recalled later via the **LOAD** submenu.

6.2.6.3   (PRE-SELECTS:) CLEAR

CLEAR deletes a previously programmed pre-select from the active memory slot. If a pre-select is present in the active memory slot, once you select **CLEAR** this message displays:

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

Use the ◀ ▶ keys to select **No** to reject the **CLEAR** command. Otherwise, select **Yes** to free up the slot for future pre-select programming needs. If the active memory slot is empty, this message displays before returning you to the PRE-SELECTS menu branch:

```
This Pre-Select has
Never Been Programmed!
```

6.2.7   (SELECT:) UTILITY Menu Branch

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

Use the ◀ ▶ keys to move the cursor to the desired choice. Press **ENTER**. The function of each UTILITY submenu is as follows:

* TIME Submenu – This allows configuration of the Real-Time Clock.
* DISP Submenu – This allows adjustment of the Video Fluorescent Display (VFD) brightness level.
* AID Submenu – This allows you to create a unit label.
* REFOSC Submenu – This allows adjustment of the converter External Reference Oscillator frequency.
* SLOPE Submenu – This allows adjustment of the converter slope settings.
* LAMP-TEST Submenu – this executes a diagnostic test of the front panel LEDs and VFD.

6.2.7.1   (UTILITY:) TIME (Real-Time Clock) Submenu

(!)   This function follows Military time format (00 to 24 hours).

```
Edit Real-Time Clock:
HH:MM:SS MM/DD/YY
```

Edit the time and date settings of the real-time clock. Use the ◄ ► keys to select a digit to edit, and then use the ▲▼ keys to change that digit. Press **ENTER**.

6.2.7.2   (UTILITY:) DISP (VFD Display) Submenu

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

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

6.2.7.3   (UTILITY:) FIRMWARE Submenu

(!)   THESE MENUS ARE INTENDED FOR DIAGNOSTIC PURPOSES ONLY. DO NOT CHANGE AN IMAGE UNLESS OTHERWISE INSTRUCTED BY COMTECH EF DATA PRODUCT SUPPORT.

This series of submenus permits you to view information about the UT-4500 internal firmware. The converter can store two complete firmware images, and you can select which image will be loaded the next time the unit reboots.

```
Firmware Images:
      INFO   SELECT
```

Use the ◄ ► keys to select **INFO** or **SELECT**. Press **ENTER**.

6.2.7.3.1 (FIRMWARE:) INFO

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

Use the ◄ ► keys to select **BOOTROM**, **IMAGE#1** or **IMAGE#2**. Press **ENTER**. to view the information.

Typical for all nested screens, the top line identifies the firmware number. Where applicable, 'x' denotes the firmware revision letter. The bottom line identifies the Firmware Version Number (e.g., 1.2.3) and the firmware build date in month/day/year format.

6.2.7.3.1.1 (FIRMWARE:) INFO➔BOOTROM

```
Bootrom: FW-0000201
X.X.X    MM/DD/YY
```

6.2.7.3.1.2 (FIRMWARE:) INFO➔IMAGE#1/#2

Where '#X' denotes the IMAGE#1 or IMAGE#2 firmware load, the IMAGE#1 and IMAGE#2 firmware load info screens are nested as follows:

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

Use the ◄ ► keys to select **Bulk**, **App**, or **FPGA**. Press **ENTER**.

(FIRMWARE:) INFO➔IMAGE#1/#2➔BULK

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

(FIRMWARE:) INFO→IMAGE#1/#2→APP

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

(FIRMWARE:) INFO→IMAGE#1/#2→FPGA

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

6.2.7.3.2   (FIRMWARE:) SELECT

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

Use this submenu to select the Current Active Firmware Image.

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

If the image that you select is already set as the designated Next Reboot Image, this message displays:

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

You may repeat the task by instead selecting the alternate image.

6.2.7.4   (UTILITY:) AID (Application Identification String) Submenu

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

The Application Identification (AID) submenu allows you to create a customized message. The AID may serve to identify the satellite, either transponder, beam,

destination or other aspects of the application that may be significant to operations. The default AID is "AID MESSAGE".

At the "Edit AID Message?" prompt, use the ◀ ▶ keys to select **No** or **Yes**. Press **ENTER**.

Typical for the top and bottom lines of the message, use the ◀ ▶ keys to select a character, and then use the ▲▼ keys to change that character. A maximum of 24 characters are available on each line – 48 characters in all. Permissible characters are: **[Space]( )* + -** , **.** / **0-9** *and* **A-Z.**

An example of an AID message is as follows:

```
        UT-4500 SERIES
  48 CHARS MAX TST MESSAGE
```

Press **ENTER** once you have composed your message. At the top level splash screen (which identifies the product in use), you may use the **CLEAR** key to toggle between the splash screen and the AID message.

6.2.7.5   (UTILITY:) REFOSC (Reference Oscillator Adjustment) Submenu

```
  Reference frequency
  adjustment = 087
```

Set your reference oscillator adjustment value. Use the ◀ ▶ keys to select a digit, and then use the ▲▼ keys to change that digit. The default adjustment value is **087**, with allowable values from **0** to **255**. Press **ENTER**.

6.2.7.6   (UTILITY:) SLOPE Submenu

```
Converter slope
adjustment = 0.0
```

Set your converter slope adjustment value. Use the ◄ ► keys to select a digit, and then use the ▲▼ keys to change that digit. The default converter slope adjustment is **0.0**, with allowable values from **0.0** to **1.0**. Press **ENTER**.

6.2.7.7   (UTILITY:) LAMP-TEST Submenu

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

Use the ◄ ► keys to select **No** or press **CLEAR** to exit this submenu. Otherwise, select **Yes** and press **ENTER** to continue. The test begins with this message:

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

The front panel runs through a series of diagnostics: the LED array cycles, and then the VFD generate a series of test patterns.

The LEDs and VFD return to their previous display state upon successful completion of the test. Once the test has run, press **CLEAR** to return to the main menu.

Notes:

Chapter 7. ETHERNET INTERFACE OPERATION

7.1 Overview

Operation of the Ethernet Interface is available when you connect a user-supplied, Windows-based PC to the UT-4500 rear panel 'Ethernet' RJ-45 100BaseTX Ethernet port.

> The UT-4500 Series C- or Ku-Band Up Converter, as initially released, does not feature a rear panel 'Ethernet' port. Only current production units offer Ethernet Interface operation. See **Chapter 4. FRONT AND REAR PANEL CONNECTORS** for more information.

Three protocols are available for Ethernet remote M&C. Operate these protocols separately.

- Simple Network Management Protocol (SNMP). This requires a user-supplied Network Monitoring System (NMS) and a user-supplied Management Information Base (MIB) File Browser.

  > **CAUTION**
  > Comtech EF Data recommends use of the Ethernet-based SNMP interface for advanced users only. All other users are strongly encouraged to use the HTTP (Web Server) Interface for remote Monitor and Control (M&C) of the unit.

- Telnet Interface. You may use the serial remote control protocol via this interface. This requires use of Windows Command-line, or a user-supplied terminal emulation program such as HyperTerminal.
- HTTP Interface. This requires a compatible user-supplied web browser such as Internet Explorer.

7.1.1   Prerequisites

Before you proceed with Ethernet remote product management, make sure the following is true:
- The converter is operating with the latest version firmware files.
- The User PC is running a terminal emulation program for operation of the unit Telnet Interface.
- The User PC is running a compatible web browser for operation of the unit HTTP Interface.
- The User PC is connected to the unit's RJ-45 'Ethernet' port.
- You have recorded the unit's Management IP Address.

7.2   SNMP Interface

SNMP is an Internet-standard protocol for managing devices over IP networks. An SNMP-managed network has three key components:
- The managed device. This includes this unit.
- The SNMP Agent. This software runs on the converter. The unit SNMP Agent supports both SNMPv1 and SNMPv2.
- The user-supplied Network Management System (NMS). This software runs on the User PC.

7.2.1   Management Information Base (MIB) Files

An MIB file is used for SNMP remote management of a unique device, and consist of a tree of nodes called Object Identifiers (OIDs). Each OID provides remote management of a particular function. These MIB files should be compiled in a user-supplied MIB Browser or SNMP Network Monitoring System server. In these unit MIB file names, the letter 'x' represents the revision of the file.

7.2.1.1   ComtechEFData Root MIB File

- FW-0000235x.mib
- 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

o OID: 1.3.6.1.4.1.6247
o Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).
  comtechEFData(6247)
o Module: ComtechEFData

7.2.1.2   DT-45xx Common MIB File

- FW-0020205x.mib
- MIB file consists of all of the OID's for management of the unit functions.

7.2.1.3   DT-45xx Traps MIB File

- FW-0020206x.mib
- Trap MIB file provides SNMPv1 traps common for the unit.

7.2.2   SNMP Community Strings

CAUTION
In SNMP v1/v2, the SNMP 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.

For correct SNMP operation, the converter MIB files must be used with the associated version of the unit M&C. See the DT-45xx FW Release Notes for information on the required FW/SW compatibility.

The UT-4500 uses Community Strings as a password scheme that provides authentication before gaining access to the router agent's MIBs. They are used to authenticate users and determine access privileges to the SNMP agent. The UT-4500 defines three Community Strings for SNMP access:
- Read Community   default = public
- Write Community   default = private
- Trap Community   default = comtech

Type the SNMP Community String into the user-supplied MIB Browser or Network Node Management software.

7.2.3   SNMP Traps

> (!) The DT-45xx SNMP agent supports both SNMPv1 and v2. The Traps
> file needs to be compiled only if SNMPv1 traps are to be used.

The UT-4500 has the ability to send out SNMP traps when certain events occur in
the unit. For example, the unit sends out traps when an alarm or a fault occurs
or clears. Which style of traps the UT-4500 sends are configured using the
DT-45xxSNMPTrapVersion OID.

The UT-4500 supports MIB2 SNMPv1 traps and SNMPv2 notifications.

7.3   Telnet Interface

> (🔍) See Chapter 8. SERIAL INTERFACE OPERATION for detailed information
> about using remote command and queries.
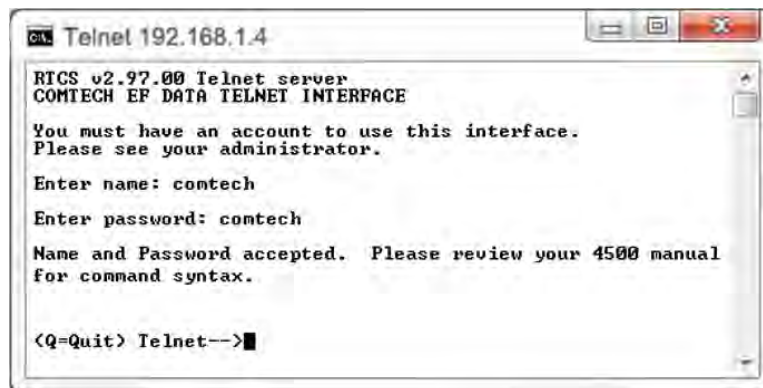
Figure 7-1. **Telnet Interface Example – Windows Command-line**

The UT-4500 provides a Telnet interface for equipment M&C via the standard
equipment Remote Control protocol.

Telnet is implemented in the Ethernet M&C in a "Telnet wrapper". When the
user Telnets to the unit, it emulates a local EIA-232C or EIA-485 serial connection
to the unit. You can then type the same command syntax that he would use from
a serial remote terminal and the Ethernet M&C "unwraps" the Telnet packet and
sends it on to the base unit processor, which responds to it as if it was a serial
remote command.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level. Once logged into the Telnet interface as the Administrator, you have access to the optional serial-based Remote Control Interface. **Figure 7-1** shows an example of the login process for remote control operation.

7.3.1   Using HyperTerminal for Telnet Remote Control Operation
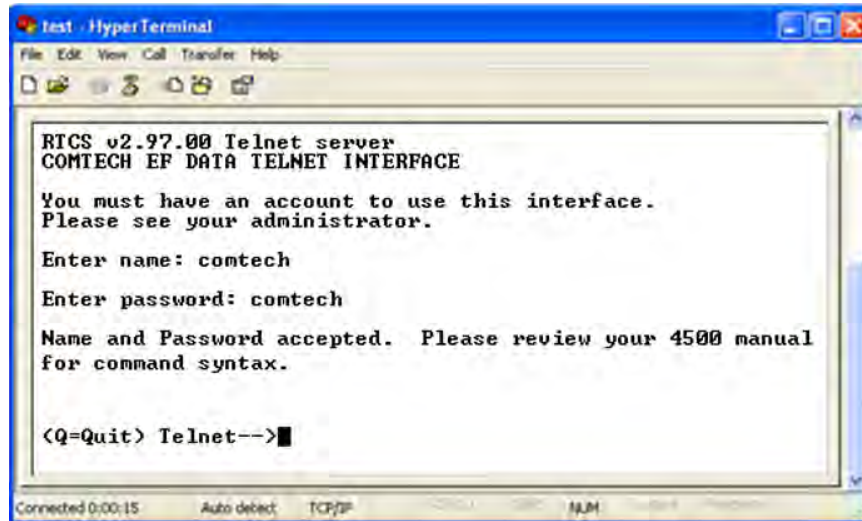
Figure 7-2. **Telnet Interface Example – HyperTerminal**

There is a disadvantage when using Windows Command line as a Telnet client with the optional Remote Control protocol. For the messages coming from the Telnet Server, Command line cannot translate a carriage return command (**\r**) to a carriage return + line feed command (**\r\n**). Therefore, any multi-line Target-to-Controller response (e.g., the response to the FRW? query) shows as one line, with the latter lines overwriting the previous lines.

To see the full response messages, you can use the HyperTerminal terminal emulation program configured as a Telnet client. Figure 7-2 shows an example of the login process when using HyperTerminal as the Telnet interface.

7.3.1.1 Configure HyperTerminal for Telnet Remote Control Operation
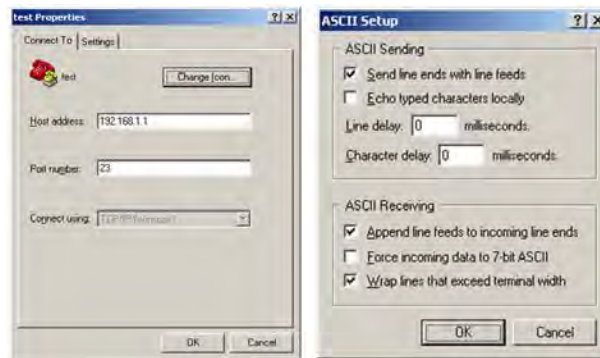
Figure 7-3. **Configure HyperTerminal**

See **Figure 7-3**. Do these steps:

- Make sure to define the Connect To Telnet connection properties correctly (File → Properties) (Figure 7-3, left):
    a. Enter the unit's Traffic/Management IP Address as the "Host address" (e.g., 192.168.1.1).
    b. Enter TCP Port 23 as the "Port number".
    c. Set "Connect using" to TCP/IP (Winsock) instead of COM1 or COM2.
    d. Click [OK] to save your settings.
- For ASCII Setup (File → Properties → Settings → ASCII Setup) (Figure 7-3, right):
    a. Check the "Send line ends with line feeds" option in the 'ASCII Sending' section.
    b. Check the "Append line feeds to incoming line ends" option in the 'ASCII Receiving' section.
    c. Click [OK] to save your settings.

7.4 HTTP (Web Server) Interface

A user-supplied web browser allows the full monitoring and control (M&C) of the UT-4500 from its HTTP Interface. This non-secure embedded web application is designed for, and works best with, Microsoft Internet Explorer Version 5.5 or higher.

7.4.1 HTTP Interface User Login

1) You must use UT-4500 Front Panel operation to select "Ethernet" as your mode of operation prior to login. Failure to configure the unit accordingly will cause the Login dialogue box to return you to a blank web page.

2) You must retrieve the assigned Management IP Address from the UT-4500 Front Panel menu:

(SELECT:) CONFIG→Remote→Ethernet→Address

See Chapter 6. **FRONT PANEL OPERATION** for further details. You may also need to consult with your network administrator to determine the appropriate Management IP address assignment for your converter.

Do these steps:
1. From the PC, enter the default Management IP Address for the unit (e.g., **http://192**.**168**.**1**.**4**) into the **Address** area of the browser.

2. In the Login window, type the **User name** and **Password**, and then click **OK**.

The factory defaults for these names/passwords are:

- **Admin**   comtech/comtech
- **Read/Write**   opcenter/1234
- **Read Only**   monitor/1234

Failure to enter the correct User name and Password will return you to the Login window. Should you continue to specify an invalid User name or Password, the message "You do not have security privilege to access this area." displays.

Otherwise, upon entry of the valid IP address and login information UT-4500 Web Server Interface "splash" page displays, similar to the example shown in **Figure 7-4**. The unit and firmware version in this example will differ from your setup.

Figure 7-4. **HTTP Interface "Splash" Page Example**

The appearance and function of all UT-4500 Series HTTP Interface pages are, for all purposes, identical to that of the DT-4503C HTTP Interface page examples that are featured throughout this chapter.

7.4.2   HTTP Interface Features

7.4.2.1   Menu Tree

Figure 7-5 Illustrates the menu hierarchy for the HTTP Interface. It features four navigation tabs (shown in blue). Primary page hyperlinks (grey) grant access to individual web pages.

Home	Admin	Config	Status
Home	Access	Converter	Summary
Contact	SNMP	Ref	Faults
Support		Pre-Selects	
		Utility	
		Redundancy	

Figure 7-5. **HTTP Interface Menu Tree (FW Ver**. **1**.**3**.**4)**

7.4.2.2   Page Navigation

The HTTP Interface has four navigation tabs at the top of each page. Click a navigation tab to see its page hyperlinks. Click a page hyperlink to open a page.

This manual uses a convention for all web pages to show you how to navigate to the featured page: Navigation Tab | Page Hyperlink. For example, "Home | Home" instructs you to click the 'Home' navigation tab, and then select the 'Home' page hyperlink.
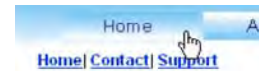
7.4.2.3   Page Sections

This manual explains the purpose and operation for each Web page and its sections. Each page has one or more sections. The title at the upper-left corner of each page or section describes its operational features. Each section can have editable fields, action buttons and **read-only** displays for a specific function.

7.4.2.4　Action Buttons

Action buttons are important in the HTTP Interface. Click an action button to do one of these tasks:

- Click **[Refresh]** to see the latest page data.
- Reset changed parameters to remove **unsaved** changes.
- Click **[Submit]** to save changes.

If you change any parameters, make sure to click the related action button before you leave the page. If you go to another page without first clicking the action button, your changes are not saved.

7.4.2.4.1　Page Refresh

Many of the pages feature a **[Refresh]** action button located adjacent to the uppermost Page Section label. You may click **[Refresh]** at any time to update the page with its latest reported operational data and current configured settings.
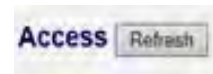
7.4.2.5　Drop-down Lists

A drop-down list lets you choose from a list of selections.

Left-click the drop-down button to open the list. Then, left-click on an item to select that choice.

7.4.2.6　Text or Data Entry

Text boxes let you type data into a field. An action button can be associated with a single text box, or a group of text boxes. For any text box, left-click anywhere inside the box and type the desired data into that field. Make sure to press **ENTER** when done typing.

Click the related action button to save the data.

7.5   HTTP Interface Page Examples and Descriptions

See Chapter 6. FRONT PANEL OPERATION for detailed descriptions of the configuration and monitoring features available throughout this interface.

The page figures provided in this section are intended for reference only. Your setup will differ.

7.5.1   Home Pages

Click the **Home** tab, and then select the **Home**, **Contact**, or **Support** hyperlink to continue.

7.5.1.1   Home | Home

Use this page to identify the product in use. Click the **Home** navigation tab or the nested hyperlink to return to this page from anywhere in the HTTP Interface.

Figure 7-6. '**Home | Home**' **Page**

7.5.1.2   Home | Contact

For all product support, please call:

+1.240.243.1880

+1.866.472.3963 (toll free USA)

Figure 7-7. **'Home | Contact' Page**

7.5.1.3   Home | Support

![!] The Administrator must configure the SMTP server, domain name, and destination on the 'Admin | Access' page (Sect. 7.5.2.1) in order to use this page.

Use this page to compose an e-mail message when you have questions about or problems with the unit.

Figure 7-8. '**Home | Support**' **Page**

The '**Home | Support**' page (**Figure 7-8**) uses Simple Mail Transport Protocol (SMTP) to send e-mail to Comtech EF Data Product Support:

cdmipsupport@comtechefdata.com

Enter the **Contact Information** and compose a message in the **Problem Report** text window. The **Problem Report** section allows up to 256 characters maximum.

Click **[Submit Email]** to send the message.

7.5.2   Admin (Administration) Pages

(!) The 'Admin' pages are available only to users who have logged in using the Administrator Name and Password.

Click the **Admin** tab, and then select the **Access** or **SNMP** hyperlink to continue.

7.5.2.1   Admin | Access

The Administrator must use this page as the means to set up user names, passwords, the E-mail server, and the host IP addresses as needed to facilitate communication with the HTTP Interface.

Figure 7-9. 'Admin | Access' Page

Network Maintenance

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

MAC Address – The MAC Address is *read-only*. It is set at the factory to a guaranteed unique address. It cannot be changed.

Click **[Change IP Address]**. Click **[Reset]** to revert to the previously assigned IP Gateway and IP Address/Range,

System Account Access Information

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

The User name and Password can be any alphanumeric combination with a maximum length of 10 characters. The factory defaults for these names/passwords are:
- Admin   comtech/comtech
- Read/Write   opcenter/1234
- Read Only   monitor/1234

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

SMTP Domain Name / Destination – The Administrator can assign the SMTP Domain Name and Destination. This is required if the e-mail feature of the '**Home | Support'** page (**Sect**. **7.5.1.3**) is to be used.
- For **SMTP Domain Name**, specify the domain of the e-mail server (usually found to the right of the @ symbol in an e-mail address).
- For **SMTP Domain Destination**, specify the e-mail recipient name (usually found to the left of the @ symbol in an e-mail address).

Click **[Submit Access]**. Click **[Reset]** to revert to the previously assigned System Account Access Information.

Webpage Timeout

To set an automatic timeout to safeguard access to an already logged-in unit, use the drop-down list to set the time value as **5 minutes** or **8 hours**, and then click **[Change]**.

The active session terminates if the unit remains idle (i.e., when no user activity occurs) beyond the assigned Webpage Timeout. A valid user name and password is then required to resume the HTTP Interface session.

7.5.2.2   Admin | SNMP

(!)   **Sect**. **7**.**2 SNMP Interface**

The Administrator must use this page to manage the SNMP (Simple Network Management Protocol) settings.

Figure 7-10. 'Admin | SNMP' Page

Simple Network Management – Use the drop-down list to set the Simple Network Management operational setting as **Enabled** or **Disabled**.

The **Read**, **Write**, and **Trap Community Strings** can be any combination of characters and a length of 0 to 20 characters:

- The factory default **Read Community String** is *public*.
- The factory default **Write Community String** is *private*.
- The factory default **Trap Community String** is *comtech*.

SNMP Contact / SNMP Location / SNMP Name – Enter this identity information in any alphanumeric combination with a length of 0 to 20 characters.

Enable Authentication Trap – Use the drop-down list to set Trap operation as **Enabled** or **Disabled**.

The Administrator can assign up to two **Trap IP** addresses.

Trap Version – Use the drop-down list to set the Trap Version as **SNMPv1** or **SNMPv2**.

7.5.3   Config (Configuration) Pages

Click the **Config** tab, and then select the **Converter**, **Ref**, **Pre-selects**, **Utility**, or **Redundancy** hyperlink to continue.

7.5.3.1   Config | Converter

Use this page to configure the communications, operations, and alarms/faults handling for the unit.

Figure 7-11. 'Config | Converter' Page

Converter

Frequency in MHz – Enter an operating RF Frequency in MHz, in 125 kHz steps (1 kHz steps optional); otherwise, this field displays as **N/A**.

Attenuation (dB) – Enter a valid attenuation level (**00.00** to **20.00** dB) in 0.25 dB steps (0.1 dB steps optional).

Click **[Change Configuration]**. Click **[Reset]** to revert to the previously assigned parameters.

Mute

Use the drop-down list to set the Configuration Mute Mode as **On** or **Off**. Click **[Change]**.

Carrier Mute Mode

Use the drop-down list to set the Carrier Mute Mode as **On** or **Off**. Click **[Change]**.

Cold Start Mute

Use the drop-down list to set the Cold Start Mute function as **On** or **Off.** Click **[Change]**.

Fault Recovery

Use the drop-down list to set the Fault Recovery function as **MANUAL** or **AUTOMATIC**. Click **[Change]**.

Channel Slope Adjustment

Enter a slope value (**0.0** to **1.0**) in 0.1 steps. Click **[Change]**.

Serial

Interface Type – Use the drop-down list to set the operating serial mode as **RS-485** or **RS-232**.

Remote Address – Enter a valid remote control address from **0001** to **9999**.

Baud Rate – Use the drop-down list to set the operating baud rate as **100**, **2400**, **4800**, **9600**, **19200** or **38400** baud.

Data bits-Parity-Stop Bits – Use the drop-down list to set the asynchronous character format as:
- 8-N-1 (8 data bits, no parity, 1 stop bit)
- 7-O-2 (7 data bits, odd parity, 2 stop bits
- 7-E-2 (7 data bits, even parity, 2 stop bits).

Click **[Change Serial Configuration]**.

7.5.3.2   Config | Ref

Use this page for monitor and control of the optional external reference oscillator.

Figure 7-12. 'Config | Ref' Page

Reference Oscillator

External Reference Freq – This *read-only* item displays the operational value of the external reference oscillator (i.e., 5 MHz or 10 MHz) is displayed here.

Reference Tuning (VDC) – This *read-only* item displays the currently defined Reference Frequency tuning adjustment value.

External Reference Lock – This *read-only* item displays the External Reference Lock state.

Tuning Adjustment (0-255) – Enter a numeric value for the reference oscillator tuning voltage here. The default value is **087**, with allowable values from **0** to **255**.

Click **[Submit]**.

External Reference Lock Detect Mask

Use the drop-down list to set the External Reference Lock Detect Mask function as **FAULT** or **MASKED**. Click **[Submit]**.

7.5.3.3 Config | Pre-selects

Use this page to manage the converter operational pre-selects.

Figure 7-13. 'Config | Pre-selects' Page

Pre-Selects

You may create (program) up to 32 operating configurations, and load (recall) them as needed.

> Prior to the creation of any pre-selects, the Frequency and Attenuation columns are populated with null values.

To program any pre-select (Numbers **01** through **32**), enter an operating RF frequency, in MHz, in 125 kHz steps (1 kHz steps optional), and an attenuation level from **00.00** to **20.00** dB in **0.25** dB steps (0.1 dB steps optional). Click **[Change Configuration]** to save (program) the pre-select for future loading (selection).

Load Pre-Select

Use the drop-down list to load (select) a previously defined pre-select from memory. Click **[Change]**.

7.5.3.4 Config | Utility

Use this page to configure a variety of converter operating parameters.

Figure 7-14. 'Config | Utility' Page

Date

Enter a date in the form MM/DD/YY (where MM = month **[01** to **12]**, DD = day **[01** to **31]**, and YY = year **[00** to **99]**).

Time

Enter a time in the form HH:MM:SS (where HH = hour **[00** to **23]**, MM = minutes **[00** to **59]**, and SS = seconds **[00** to **59]**).

Click **[Change Date/Time]**.

Circuit ID

Enter a Circuit ID string of up to 48 characters – 24 characters per line. Click **[Change CID]**.

Current Active Firmware Image

This *read-only* section identifies the selected **Current Active Firmware Image**. In this example, **Image 2** is the **Current Active Firmware Image**.

Next Reboot Image – Use the drop-down list to select Image **1** or **2**. Click **[Submit]**.

Perform Soft Reboot

Click **[Reboot Now]** to reboot the unit using the **Current Active Firmware Image**.

Firmware Information

This *read-only* scrollable window identifies the Bootrom, Bulk Image#1 and Bulk Image #2 firmware information.

Part Number

This *read-only* section displays the part number for the unit.

7.5.3.5   Config | Redundancy

See **Appendix A. REDUNDANT SYSTEM OPERATION** for the functional description of this page.

Use this page to configure the UT-4500's Redundancy Switch Mode.

(TOP) Page with Redundancy Mode OFF
(BOTTOM) Page with Redundancy Mode ON

Figure 7-15. 'Config | Redundancy' Page

7.5.4   Status Pages

Use these pages to review operational statistics, status windows, and the stored faults table.

Click the **Status** tab, and then select the **Summary** or **Faults** hyperlink to continue.

7.5.4.1   Status | Summary

Use this **read-only** page to review pertinent information about the configured setup of the converter, its current operating parameters, and the operational status of the unit.

Figure 7-16. 'Status | Summary' Page

Typical for all sections, when operating parameters are within acceptable limits for any parameter, the STATUS box color is GREEN and reads "**OK**."

If a fault condition exists, the item's STATUS box color changes to RED and reads "**FAULT**."

Terminal Status Change reads "**YES**" if the unit identifies any configuration settings updates since the last reboot. Click **[Clear]** to reset this monitoring feature (**Terminal Status Change** changes to read "**NO**").

7.5.4.2   Status | Faults

Use this *read-only* page to review the current stored faults.
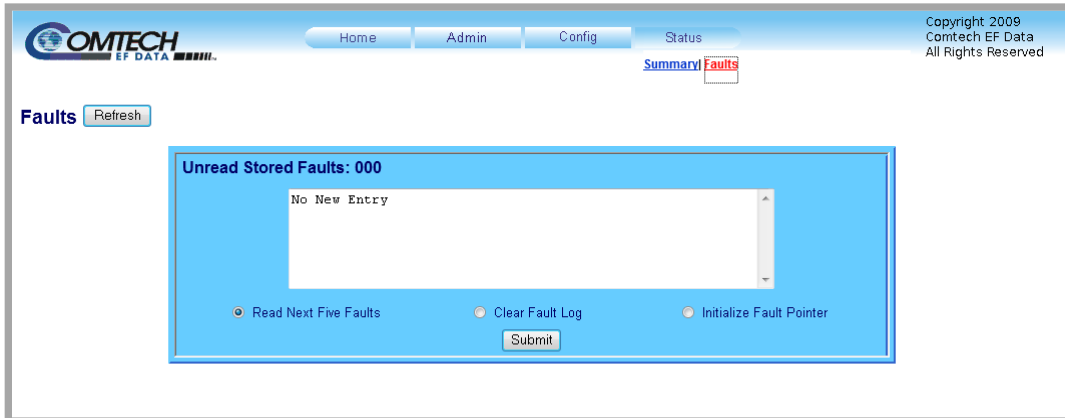
Figure 7-17. 'Status | Faults' Page

This page features a scrollable window that displays the unread stored faults log in sequential, date-stamped format.

Unread Stored Faults:

The section header displays the running tally of unread stored faults.

The event log displays the five oldest stored faults in the event log. The tally decrements as events are transferred from the stored events log for display in this window.

The bottom of the section provides the following management functions:

- **Read Next Five Faults – S**elect this to display the next five unread stored faults in the log.
- **Clear Fault Log –** Select this to clear all stored faults from the log.
- **Initialize Faults Pointer –** Select this to reset the internal pointer. This allows queries to start at the beginning of the stored faults log.

Click **[Submit]**.

Notes:

Chapter 8. SERIAL INTERFACE OPERATION

8.1 Overview

1) Use of the word "converter" throughout this chapter applies to either the Comtech EF Data DT-4500 Series C- or Ku-Band Down Converter or the UT-4500 Series C- or Ku-Band Up Converter.
2) The pinout table for the rear panel '**J1 | COM1**' connector is provided in **Sect. 4.2.3 Operational Connections**.

Serial-based remote monitor and control (M&C) of the UT-4500 Series C- or Ku-Band Up Converter is possible by connecting the rear panel EIA-485/EIA-232C 'J1 | COM1' port to the serial port of a Windows-based User PC.

8.2 Communication Interfaces

The electrical interface is either an EIA-485 multi-drop bus (for the control of many devices) or an EIA-232C 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.

8.2.1 TIA/EIA-485 (RS-485)

For applications where you intend to monitor and control multiple devices, 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) replies. 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.

To summarize EIA-485 (Full Duplex) operation:
- 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.

8.2.2   TIA/EIA-232C (RS-232C)

This is a much simpler configuration in which you directly connect the Controller device to the Target via a two-wire-plus-ground connection. One conductor carries Controller-to-Target data via EIA-232C electrical levels, while the other conductor carries Target-to-Controller data in the other direction.

8.2.3   Ethernet (100BASE-TX)

The unit implements a Telnet server that accepts Telnet terminal connections using Transmission Control Protocol (TCP) on port 23. After you enter the

username (default: comtech) and the password (default: comtech), the Telnet
server accepts the same operands used by the serial remote interface.

8.3   Access Methods

You may access a converter directly by using a physical address, or indirectly
through a backup converter by using a virtual address.

8.3.1   Direct (Physical) Access

You may directly access a converter via the EIA-232C interface, or 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 M&C PC. If you directly execute a
configuration change to a converter in a redundant system, the backup
converter detects the change via the High Speed Bus and updates its backup
tables.

For EIA-232C control, a direct EIA-232 cable connection is required for each
accessible converter. When using an external M&C PC, one EIA-232C port per
converter is required. This mode is commonly used with an ASCII terminal for
bench testing.

8.3.2   Indirect (Virtual) Access

You may indirectly address a converter in Redundancy Mode 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.

For control via the EIA-485 interface, you must use a common EIA-485 bus cable
to connect one or more backup converters to the system's M&C PC or ASCII
terminal. Only one EIA-485 port is required on the M&C PC. The 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, you must provide a virtual address. The virtual address corresponds to the converter's position in the chain, beginning with the number 1. Only a backup converter can recognize virtual addressing.

For control via the EIA-232C interface, your M&C PC must have one EIA-232C port for each backup converter. You must establish virtual addressing by remote command. All converters, including the backup converter, must be in the Redundancy Mode.

8.4   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.

8.4.1   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.)

8.4.2   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.)

8.4.3   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.

8.5   Basic Protocol

Whether in EIA-232C 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.

8.5.1   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.

8.5.2 Baud Rate

The supported baud rates are 1200, 2400, 4800, 9600, 19200, and 38400 baud. The default baud rate is 9600.

8.5.3 Asynchronous Character Format

The default asynchronous character format is 8-N-1: 8 data bits; no parity; 1 stop bit.

8.5.4 Character Set

The command syntax uses the printable ASCII character set.

8.5.5 Response Timeout

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

8.5.6 Bus Inactivity Requirement

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

8.6   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

8.6.1   Start Character

The Start Character begins each message:

> < = Start of a user command or query.
> > = Start of a converter response.

8.6.2   Device Address

The Device Address consists of a Physical Address or a Physical Address and an appended Virtual Address. This chapter uses "DEV" for the generic case examples.
- **EXAMPLE:**   <DEV

8.6.3   Commands/Queries

A Command or Query is a variable length character string beginning with a forward slash " / " – it contains either an instruction or an instruction with data for a converter to act upon.

If data is passed by command, it is appended to the instruction by an underscore "_".

For a Query, data is retrieved by command. The underscore follows the instruction, flagging the converter to supply data in a response.
- **COMMAND EXAMPLE:** <DEV/COM_xxx{cr} (Sends command data to a converter)
- **QUERY EXAMPLE:** <DEV/COM_{cr} (Queries information from a converter)

8.6.4   Confirmation Response

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

- **EXAMPLE:** >DEV/COM_xxx{cr}{lf}]

8.6.5   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. This document uses "ER" for the generic case examples response.

- **EXAMPLE:**   >DEV?COM ER Error Message {cr}{lf}]

8.6.6   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.

8.6.6.1   Command Ending

The end of message for a command is a carriage return. This document uses "{cr}" for the carriage return.

- **EXAMPLE:**   <DEV/COM_{cr}

8.6.6.2   Response Ending

End of message for a response is a carriage return ({cr}), line feed ({lf}), and a right bracket (]): "{cr}{lf}]"

- **EXAMPLE:**   >DEV/COM_{cr}{lf}]

8.7 Remote Operation – Commands/Queries

8.7.1 Command/Query Quick References

8.7.1.1 Utility Commands/Queries Quick Reference

Sect.	Item	Description	Syntax
8.7.2.1	TIM	Set Time	<DEV/TIM_hh:mm:ss{cr}
8.7.2.2	DAT	Set Date	<DEV/DAT_mm/dd/yy{cr}
8.7.2.3	TPE	Set Time Protocol	<DEV/TPE_x{cr}
8.7.2.4	TPS	Set Time Protocol IP Address	<DEV/TPS_xxx.xxx.xxx.xxx{cr}
8.7.2.5	LRS	Set Local / Remote Status	<DEV/LRS_x{cr}
8.7.2.6	MAC	Get MAC Address	<DEV/MAC_ {cr}
8.7.2.7	IPA	Get IP Address	<DEV/IPA_{cr}
8.7.2.8	IPG	Get IP Gateway	<DEV/IPG_{cr}
8.7.2.9	SPA	Set Physical Address	<DEV/SPA_xxx{cr}
8.7.2.10	SBR	Set Baud Rate	<DEV/SBR_xxxx{cr}
8.7.2.11	CON	Set LCD Contrast	<DEV/CON_xx{cr}
8.7.2.12	LCD	Set LCD Brightness	<DEV/LCD_xx{cr}
8.7.2.13	SSM	Set Screen Saver Mode	<DEV/SSM_x{cr}
8.7.2.14	SST	Set Screen Saver Timeout	<DEV/SST_xx{cr}
8.7.2.15	VFD	Set VFD Brightness	<DEV/VFD_xxx{cr}
8.7.2.16	SRO	Set Reference Oscillator	<DEV/SRO_xxx{cr}
8.7.2.17	SSA	Set Converter Slope Adjustment	<DEV/SSA_xxx{cr}
8.7.2.18	RET	Get Equipment Type	<DEV/RET_{cr}
8.7.2.19	PNM	Get Part Number	<DEV/PNM_{cr}
8.7.2.20	FRW	Get Legacy Firmware Information	<DEV/FRW_{cr}
8.7.2.21	FRM	Get Firmware Information	<DEV/FRM_{cr}
8.7.2.22	IMG	Set Firmware Image	<DEV/IMG_x{cr}
8.7.2.23	AID	Set Application ID Message	<DEV/AID_xxxxx...xxxxx{cr}
8.7.2.24	FRB	Set Force Reboot	<DEV/FRB_YES{cr}

8.7.1.2   Configuration Commands/Queries Quick Reference

Sect.	Item	Description	Syntax
8.7.3.1	FRE	Set Frequency	<DEV/FRE_xxxxx.xxx{cr}
8.7.3.2	IFF	Set IF Frequency	<DEV/IFF_xxx{cr}
8.7.3.3	ATT	Set Attenuation	<DEV/ATT_xx.xx{cr}
8.7.3.4	CLD	Select Cold Start Mode	<DEV/CLD_xxx{cr}
8.7.3.5	MUT	Mute/Unmute Converter	<DEV/MUT_xxx{cr}
8.7.3.6	CMM	Configure Mute Mode	<DEV/CMM_xxx{cr}
8.7.3.7	CRM	Set Redundant Mute Mode	<DEV/CRM_xxx{cr}
8.7.3.8	AFR	Set Fault Recovery Mode	<DEV/AFR_xxx{cr}
8.7.3.9	PGM	Set a Preset	<DEV/PGM_nn_xxxxx.xxx_yy.yy{cr}
8.7.3.10	DPS	Get All Presets	<DEV/DPS_{cr}
8.7.3.11	CLR	Clear a Preset	<DEV/CLR_nn{cr}
8.7.3.12	SEL	Select a Preset	<DEV/SEL_nn{cr}

8.7.1.3   Redundancy Commands/Queries Quick Reference

Sect.	Item	Description	Syntax
8.7.4.1	RED	Set Redundancy Mode ON/OFF	<DEV/RED_xxx{cr}
8.7.4.2	ICT	Configure Redundant Converter	<DEV/ICT_xx_yy{cr}
8.7.4.3	SAM	Select Auto/Manual Mode	<DEV/SAM_xx_y{cr}
8.7.4.4	FBU	Forced Backup Mode	<DEV/FBU_xx_y{cr}

8.7.1.4   Status Commands/Queries Quick Reference

Sect.	Item	Description	Syntax
8.7.5.1	RCS	Return Configuration Status	<DEV/RCS_{cr}
8.7.5.2	RMS	Return Maintenance Status	<DEV/RMS_{cr}
8.7.5.3	RUS	Return Utility Status	<DEV/RUS_{cr}
8.7.5.4	RAS	Return Alarm Status	<DEV/RAS_{cr}
8.7.5.5	SAS	Summary Alarm Status	<DEV/SAS_{cr}
8.7.5.6	TSC	Terminal Status Change	<DEV/TSC_{cr}
8.7.5.7	PACRCS	Packed Configuration Status	<DEV/PACRCS_{cr}
8.7.5.8	PACRMS	Packed Maintenance Status	<DEV/PACRMS_{cr}
8.7.5.9	PACRUS	Packed Utility Status	<DEV/PACRUS_{cr}
8.7.5.10	PACRAS	Packed Alarm Status	<DEV/PACRAS_{cr}

8.7.1.5 Stored Alarm Queries Quick Reference

Sect.	Item	Description	Syntax
8.7.6.1	TSA	Return Total Stored Alarms	<DEV/TSA_{cr}
8.7.6.2	CAA	Clear All Stored Alarms	<DEV/CAA_YES{cr}
8.7.6.3	LAA	List All Stored Alarms	<DEV/LAA_{cr}

8.7.2 Utility Commands/Queries

8.7.2.1 TIM (Time)

Use TIM to set or return the time.

Description	Details
Set Time:	<DEV/TIM_hh:mm:ss{cr} where: hh=Hour mm=Minutes ss=Seconds
Confirmation:	>DEV/TIM_hh:mm:ss{cr}{lf}]
Return Time:	<DEV/TIM_{cr}
Confirmation:	>DEV/TIM_hh:mm:ss{cr}{lf}]

8.7.2.2 DAT (Date)

Use DAT to set or return the date.

Description	Details
Set Date:	<DEV/DAT_mm/dd/yy{cr} where: mm=Month dd=Day yy=Year
Confirmation:	>DEV/DAT_mm/dd/yy{cr}{lf}]
Return Date:	<DEV/DAT_{cr}
Confirmation:	>DEV/DAT_mm/dd/yy{cr}{lf}]

8.7.2.3   TPE (Time Protocol Enable)

Use TPE to set or return the Time Protocol.

Description	Details
Set Time Protocol:	<DEV/TPE_x{cr} where: x=0 Time protocol disabled 1 Time protocol enabled
Confirmation:	>DEV/TPE_x{cr}{lf}]
Return TPE:	<DEV/TPE_{cr}
Confirmation:	>DEV/TPE_x{cr}{lf}]

8.7.2.4   TPS (Time Protocol Server)

Use TPS to set or return the Time Server IP address for the rear panel 'Ethernet' M&C port.

Description	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}]
Return TPS:	<DEV/TPS_{cr}
Confirmation:	>DEV/TPS_xxx.xxx.xxx.xxx{cr}{lf}]

8.7.2.5   LRS (Local / Remote Status)

Use LRS to enable or disable remote communications interfaces. The factory default setting is "3" (Ethernet+Serial remote control enabled).

Description	Details
Set Local / Remote Status:	<DEV/LRS_x{cr} where: x=0 LOCAL mode (front panel control only, remote control disabled) 1 Serial remote mode 2 Ethernet remote mode 3 Ethernet+Serial remote mode
Description LRS:	>DEV/LRS_x{cr}{lf}]
Return LRS:	<DEV/LRS_{cr}
Confirmation:	>DEV/LRS_x{cr}{lf}]

8.7.2.6   MAC (Media Access Control Address)

Use MAC to return the unique MAC address of the rear panel 'Ethernet' M&C port.

Description	Details
Return MAC:	<DEV/MAC_{cr}
Confirmation:	>DEV/MAC_xx-xx-xx-xx-xx-xx{cr}{lf}] where: xx=MAC address byte in hexadecimal

8.7.2.7   IPA (IP Address)

Use IPA to set or return the Management IP Address and network prefix for the rear panel 'Ethernet' M&C port. The factory default value is 192.168.1.4.24.

Description	Details
Set IP Address:	<DEV/IPA_aaa.bbb.ccc.ddd.yy{cr} where: aaa = 0 to 223* bbb = 0 to 255* ccc = 0 to 255* ddd = 0 to 255* *Values cannot all be zeroes. yy = Subnet Mask Length (8 to 30)
Confirmation:	>DEV/IPA_ aaa.bbb.ccc.ddd.yy{cr}{lf}]
Return IP Address:	<DEV/IPA_{cr}
Confirmation:	>DEV/IPA_ aaa.bbb.ccc.ddd.yy{cr}{lf}]

8.7.2.8   IPG (IP Gateway)

Use IPG to set or return the IP Gateway Address for the rear panel 'Ethernet' M&C port. The factory default value is 192.168.1.5.

Description	Details
Set IP Gateway:	<DEV/IPG_aaa.bbb.ccc.ddd{cr} where: aaa = 0 to 223* bbb = 0 to 255* ccc = 0 to 255* ddd = 0 to 255* *Values cannot all be zeroes.
Confirmation:	>DEV/IPG_ aaa.bbb.ccc.ddd{cr}{lf}]
Return IP Gateway:	<DEV/IPG_{cr}
Confirmation:	>DEV/IPG_ aaa.bbb.ccc.ddd{cr}{lf}]

8.7.2.9   SPA (Set Physical Address)

Use SPA to set the physical address of the unit. The default address is 001.

Description	Details
Set Physical Address:	<DEV/SPA_xxx{cr} where: xxx = 1 to 255
Confirmation:	>DEV/SPA_xxx{cr}{lf}]
Return Physical Address:	<DEV/SPA_{cr}
Confirmation:	>DEV/SPA_xxx{cr}{lf}]

8.7.2.10   SBR (Set Baud Rate)

Use SBR to set the serial interface baud rate. The default baud rate is 9600.

Description	Details
Set Baud Rate:	<DEV/SBR_xxxx{cr} where: xxxx = 1200, 2400, 4800, 9600, 19K2, or 38K4
Confirmation:	>DEV/SBR_xxxx{cr}{lf}]
Return Baud Rate:	<DEV/SBR_xxxx{cr}
Confirmation:	>DEV/SBR_xxxx{cr}{lf}]

8.7.2.11   CON (Set LCD Contrast)

The CON legacy command does not control any current production unit hardware. Its syntax is still supported to allow backwards compatibility with initially released chassis monitor and control applications. The default LCD contrast is 15.

Description	Details
Set Contrast:	<DEV/CON_xx{cr} where: xx = 0 to 30
Confirmation:	>DEV/CON_xx{cr}{lf}]
Return Contrast:	<DEV/CON_{cr}
Confirmation:	>DEV/CON_xx{cr}{lf}]

8.7.2.12   LCD (Set LCD Brightness)

The LCD legacy command does not control any current production unit hardware. Its syntax is still supported to allow backwards compatibility with initially released chassis existing monitor and control applications. The default LCD brightness is 15.

Description	Details
Set Brightness	<DEV/LCD_xx{cr} where: xx = 0 to 30
Confirmation:	>DEV/LCD_xx{cr}{lf}]
Return Brightness:	<DEV/LCD_{cr}
Confirmation:	>DEV/LCD_xx{cr}{lf}]

8.7.2.13   SSM (Screen Saver Mode)

The SSM legacy command does not control any current production unit hardware. Its syntax is still supported to allow backwards compatibility with initially released chassis existing monitor and control applications. he default screen saver mode is 0.

Description	Details
Set SSM:	<DEV/SSM_x{cr} where: x = 0 to 5
Confirmation:	>DEV/SSM_x{cr}{lf}]
Return SSM:	<DEV/SSM_{cr}
Confirmation:	>DEV/SSM_x{cr}{lf}]

8.7.2.14   SST (Screen Saver Timeout)

The SST legacy command does not control any current production unit hardware. Its syntax is still supported to allow backwards compatibility with initially released chassis existing monitor and control applications. The default screen saver timeout is 05.

Description	Details
Set SST:	<DEV/SST_xx{cr} xx = 00 to 99
Confirmation:	>DEV/SST_xx{cr}{lf}]
Return SST:	<DEV/SST_{cr}
Confirmation:	>DEV/SST_xx{cr}{lf}]

8.7.2.15   VFD (VFD Brightness)

Use VFD to set or return the front panel brightness from 0% to 100% in 25% steps. The default VFD brightness is 100.

Description	Details
Set VFD:	<DEV/VFD_xxx{cr} where: xx = 000 to 100 (in 025 steps)
Confirmation:	>DEV/VFD_xxx{cr}{lf}]
Return VFD:	<DEV/LCD_{cr}
Confirmation:	>DEV/VFD_xxx{cr}{lf}]

8.7.2.16   SRO (Set Reference Oscillator Tuning)

Use SRO to set or return the reference oscillator tuning. The default value is 087.

Description	Details
Set Oscillator:	<DEV/SRO_xxx{cr}where: xxx = 0 to 255
Confirmation:	>DEV/SRO_xxx{cr}{lf}]
Return Tuning:	<DEV/SRO_{cr}
Confirmation:	>DEV/SRO_xxx{cr}{lf}]

8.7.2.17   SSA (Converter Slope Adjustment)

Use SSA to set or return the slope adjustment value. The default value is 0.3.

Description	Details
Set Slope Adjust:	<DEV/SSA_xxx{cr} where: xxx = 0.0 to 1.0
Confirmation:	>DEV/SSA_xxx{cr}{lf}]
Return Slope Adjust:	<DEV/SSA_{cr}
Confirmation:	>DEV/SSA_xxx{cr}{lf}]

8.7.2.18   RET (Equipment Type)

Use RET to query the read-only model number and software revision of the unit.

Description	Details
Return Equipment Type:	<DEV/RET_{cr}
Confirmation:	>DEV/RET_xxxxxxxxxx yyyyyyy{cr}{lf}] where: xxxxxxxxxx = Model Number yyyyyyy = Software Version

8.7.2.19   PNM (Part Number)

Use PNM to query the unit's read-only part number information.

Description	Details
Return Part Number:	<DEV/PNM_{cr}
Confirmation:	>DEV/PNM_xx…xx{cr}{lf}] where: xx…xx = up to 96 bytes of part number information

8.7.2.20   FRW (Legacy Firmware Information)

The FRW legacy query no longer provides information about the unit's firmware type. It provide backwards compatibility with the initially released chassis monitor and control software applications. Use FRM to query the current production unit's firmware information.

Description	Details
Return 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 letter
	              x.xx firmware version number
	Note: The BULK, M&C, and FPGA firmware have different numbers, revisions, and versions.

8.7.2.21   FRM (Firmware Information)

Use FRM to query the firmware loaded in the current production unit. This includes firmware numbers, versions, and release dates. This query replaces the legacy FRW query.

Description	Details
Return 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

8.7.2.22   IMG (Firmware Image)

Use IMG to set or return selection of a valid bulk image as the next active boot image.

Description	Details
Set Next FW Image:	<DEV/IMG_x{cr} where: x = 1 or 2
Confirmation:	>DEV/IMG_x{cr}{lf}]
Return Active FW Image:	<DEV/IMG_{cr}
Confirmation:	>DEV/IMG_x{cr}{lf}]

8.7.2.23   AID (Application Identification)

Use AID to create a "free form" message. The intent is to identify 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 display (LCD or VFD). The message may be up to 48 characters in total. Blanks must be used after line 1 information in order to space to line 2 – the second line begins at character 25. A carriage return ends the command. Trailing blanks will be generated to fill the display 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".

Description	Details
Application ID:	<DEV/AID_xxxxxxx ... xxxxx{cr} where: xxxxxxx ... xxxxx = Your message, maximum 48 characters.
Confirmation:	>DEV/AID_{cr} xxxxxxxxxxxxxxxxxxxxxxxx{cr} xxxxxxxxxxxxxxxxxxxxxxxx{cr}{lf}]
Return ID:	<DEV/AID_{cr}
Confirmation:	>DEV/AID_{cr} xxxxxxxxxxxxxxxxxxxxxxxx{cr} xxxxxxxxxxxxxxxxxxxxxxxx{cr}{lf}]

8.7.2.24   FRB (Force Reboot)

Use FRB to force the unit to reboot after five seconds.

Description	Details
Force Reboot:	<DEV/FRB_YES{cr}
Confirmation:	>DEV/FRB_YES{cr}{lf}]

8.7.3   Configuration Commands / Queries

8.7.3.1   FRE (Frequency)

Use FRE to set or return the operating frequency. The default RF frequency of the unit is equal to its minimum operating frequency (RF_{LOW}).

Description	Details
Set Frequency:	<DEV/FRE_xxxxx.xxx{cr} where: xxxx.xxx = Frequency in MHz (RF_{LOW} to RF_{HIGH}), in 125 kHz steps (1 kHz steps optional), dependent upon unit in use. EXAMPLE: 5845 to 6425 MHz for Model UT-4505 (see Chapter 2. SPECIFICATIONS for product-specific frequency ranges)
Confirmation:	>DEV/FRE_xxxxx.xxx{cr}{lf}]
Return Frequency:	<DEV/FRE_{cr}
Confirmation:	>DEV/FRE_xxxxx.xxx{cr}{lf}]

8.7.3.2   IFF (IF Frequency)

For units featuring the DUAL IF hardware option: Use IFF to switch the input IF frequency from 70 MHz to 140 MHz, or from 140 MHz to 70 MHz.

Description	Details
Set Frequency:	<DEV/IFF_xxx{cr} where: xxx = Frequency in MHz, either 140 or 70. No leading zero is required.
Confirmation:	>DEV/IFF_xxx{cr}{lf}]
Return Frequency:	<DEV/IFF_{cr}
Confirmation:	>DEV/IFF_xxx{cr}{lf}] where xxx = Frequency in MHz, either 140 or 70. No leading zero is required.

1) The default selection is 70 MHz.
2) The actual IF bandwidth is maintained as the standard ±18 MHz (±20 MHz) of the 70 MHz configurations.
3) The mute behavior after changing the IF frequency is the same as the normal mute behavior after changing the RF frequency.
4) You may not "mix" dual IF converters with standard converters when operating in a redundant system.

8.7.3.3   ATT (Attenuation)

Use ATT to set or return the attenuation value. The default value is 10.00 dB.

Description	Details
Set Attenuation:	<DEV/ATT_ yy.yy{cr} where: yy.yy = 00.00 to 25.00 dB in 0.25 dB steps.
Confirmation:	>DEV/ATT_yy.yy{cr}{lf}]
Return Attenuation:	<DEV/ATT_{cr}
Confirmation:	>DEV/ATT_ yy.yy{cr}{lf}]

8.7.3.4   CLD (Cold Start)

(!)   This command is NOT AVAILABLE in redundant systems.

Use CLD to mute the output signal for a predetermined time – 15 minutes –
following Power-Up to ensure a stable reference oscillator. The default is OFF.

Description	Details
Set Cold Start:	<DEV/CLD_xxx{cr} where: xxx = ON or OFF
Confirmation:	>DEV/CLD_xxx{cr}{lf}]
Return Status:	<DEV/CLD_{cr}
Confirmation:	>DEV/CLD_xxx{cr}{lf}]

8.7.3.5   MUT (RF Mute)

Use MUT to set or return the RF mute state. The default is ON (output is muted).

Description	Details
Mute Output:	<DEV/MUT_xxx{cr} where: xxx = ON or OFF
Confirmation:	>DEV/MUT_xxx{cr}{lf}]
Return Mute Status:	<DEV/MUT_{cr}
Confirmation:	>DEV/MUT_yyy{cr}{lf}] yyy = ON/OFF/COLD

8.7.3.6   CMM (Configure Mute Mode)

Use CMM to set or return the mute state of the unit during frequency changes. The default state is OFF (output is muted during frequency changes). When mute mode is ON, the unit will retain its mute state upon changing RF frequency.

Description	Details
Configure Mute Mode:	<DEV/CMM_xxx{cr} where: xxx = ON or OFF
Confirmation:	>DEV/CMM_xxx{cr}{lf}]
Return CMM Status:	<DEV/CMM_{cr}
Confirmation:	>DEV/CMM_xxx{cr}{lf}]

8.7.3.7   CRM (Redundancy Mute Mode)

Use CRM to set or return the redundancy mute mode. This function determines how the backup unit handles the mute state during a redundant switchover condition. If CRM=ON, the backup unit's mute state is the same as that of the primary unit that it is backing up. Otherwise, if CRM=OFF, the backup unit unmutes its output any time a redundant switchover occurs. The default state is OFF (backup unit's output automatically unmutes when a redundant switchover occurs).

Description	Details
Set CRM:	<DEV/CRM_xxx{cr} where: xxx = ON or OFF
Confirmation:	>DEV/CRM_xxx{cr}{lf}]
Return CRM:	<DEV/CRM_{cr}
Confirmation:	>DEV/CRM_xxx{cr}{lf}]

8.7.3.8   AFR (Auto Fault Recovery)

Use AFR to automatically mute the converter output in the event of a detected fault. AFR causes the output signal to go active (unmuted) if all faults clear. If you disable AFR, the output remains muted even after all faults clear until a MUT_OFF command is received. The default is ON.

If you enable AFR and the converter detects the same fault more than five times in a five minute interval (e.g., multiple IFLO lock detect faults) the function reverts to DISABLED and the converter remains muted.

Description	Details
Set Fault Recovery:	<DEV/AFR_xxx{cr} where: xxx = ON or 0FF
Confirmation:	>DEV/AFR_xxx{cr}{lf}]
Return Status:	<DEV/AFR_{cr}
Confirmation:	>DEV/AFR_xxx{cr}{lf}]

8.7.3.9   PGM (Program Pre-select)

Use PGM to store up to 32 preset frequency and attenuation settings.

Description	Details
Program Pre-select:	<DEV/PGM_nn_xxxxx.xxx_yy.yy{cr} where: nn = Preset Number = 01 to 32. xxxx.xxx = Frequency in MHz (RF$_{LOW}$ to RF$_{HIGH}$) in 125 kHz steps (1 kHz steps optional), dependent upon unit in use. EXAMPLE: 5845 to 6425 MHz for Model UT-4505 (see Chapter 2. SPECIFICATIONS for product-specific frequency ranges) yy.yy = Attenuation value in dB from 00.00 to 25.00 in 0.25 dB step sizes (0.1 dB step size optional)
Confirmation:	>DEV/PGM_nn_xxxxx.xxx_yy.yy{cr}{lf}]

8.7.3.10   DPS (Display All Pre-selects)

Use DPS to return all 32 of the programmed pre-select values.

Description	Details
Display Pre-selects:	<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 = Attenuation **Note:** Only programmed pre-select numbers are returned. If no pre-select(s) is programmed, "No Pre-Selects Programmed" is returned.

8.7.3.11   CLR (Clear Pre-select Configuration)

Use CLR to clear a single pre-select value.

Description	Details
Clear a Preset:	<DEV/CLR_nn{cr} where: nn = Pre-select Number (01 to 32)
Confirmation:	>DEV/CLR_nn_Cleared{cr}{lf}]

8.7.3.12   SEL (Select Pre-select Configuration)

Use SEL to load a pre-select number configuration.

Description	Details
Select Pre-select:	<DEV/SEL_nn{cr} where: nn = Pre-select Number (01 to 32) **NOTE:** Only programmed pre-select numbers are available.
Confirmation:	>DEV/SEL_nn_Selected{cr}{lf}]

8.7.4   Operating Modes

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

8.7.4.1   RED (Redundant Mode)

Each converter, including the backup converter, must be active in the Redundant Mode. The default mode is OFF.

Description	Details
Redundant Mode:	<DEV/RED_xxx{cr} where: xxx = ON or OFF
Confirmation:	>DEV/RED_xxx{cr}{lf}]
Redundant Status:	<DEV/RED_{cr}
Confirmation:	>DEV/RED_xxx{cr}{lf}]

1) The primary units must all be configured properly in redundant mode before you can enable redundant mode on the backup unit.
2) Polling on the high speed bus will not begin until the position assignments are made.

8.7.4.2   ICT (Initialize Chain Command)

Use ICT to initialize each converter's chain position, including the backup converter. This command is allowed only when you are active in Redundancy Mode.

Description	Details
Initialize Chain **Description**:	<DEV/ICT_xx_yy{cr}
Confirmation:	>DEV/ICT_xx_yy{cr}{lf}]
Initialize Status:	<DEV/ICT_{cr}

Confirmation:	>DEV/ICT_xx_yy{cr}{lf}] where:
	xx = chain position = 01 to 12, or BU. Where BU selects 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: <DEV/ICT_01{cr}
	                    >DEV/ICT_01{cr}{lf}]
	(**Description** assigns the converter chain position "1")
	
	EXAMPLE 2: <DEV/ICT_BU_08{cr}
	                    >DEV/ICT_BU_08{cr}{lf}]
	(**Description** assigns the receiving converter as the backup converter in a 1:8 system.)

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 (BU).

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 Unit; the second converter should be assigned chain position 1, the third converter position 2, etc.).

8.7.4.3   SAM (Switching Automatic/Manual Mode)

Use SAM to set the switching mode for the backup converter if both units are in 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.

Description	Details
Switching 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 = converter number 01 to 12 y = A for Auto; M for Manual

8.7.4.4   FBU (Force Backup)

Use FBU to force a backup condition for maintenance and test purposes. This command is only accepted by the backup converter (i.e., "BU"). When activated, this command forces the chain converter offline, and forces the backup converter to assume the state of the specified chain converter.

Description	Details
Force a Backup:	<DEV/FBU_xx_y{cr}
Confirmation:	>DEV/FBU_xx_y{cr}{lf}] where: xx = converter number 01 to 12 y = 'F' to force a backup, 'N' to remove a backup
Return Backup Status:	<DEV/FBU_{cr}

Confirmation:	>DEV/FBU_xx_zzzzz{cr}{lf}] where:
	xx = converter number 01 to 12
	zzzzz = 'NONE' if no backup active (converter number is not displayed);
	        'ACTIVE' if an automatic backup has occurred;
	        'FORCED' if a forced backup is active

8.7.5   Status Queries

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

8.7.5.1   RCS (Configuration Status)

Description	Details
Configuration Status:	<DEV/RCS_{cr}
Confirmation:	>DEV/RCS_{cr} FRE_xxxxx.xxx{cr} Frequency ATT_yy.yy{cr} Attenuation 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

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

8.7.5.2   RMS (Maintenance Status)

Description	Details
Maintenance Status:	<DEV/RMS_{cr}
Confirmation:	>DEV/RMS_{cr} P15_xx.x{cr} 15V DC Supply P14_xx.x{cr} 14V DC Supply VCC_x.x{cr} VCC Supply 5VD_x.x{cr} Display 5V DC 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

8.7.5.3 RUS (Utility Status)

Description	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).

8.7.5.4 RAS (Alarm Status)

Description	Details
Alarm Status:	<DEV/RAS_{cr}
Confirmation:	>DEV/RAS_{cr} where:
	xx = OK or FT
	P15_xx{cr} 15V DC Fault
	P14_xx{cr} 14V DC 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 (See Note)

(!) The unit returns REF_xx only when an external reference is present.

8.7.5.5 SAS (Summary Alarm Status)

Summary alarm is set to Fault (FT) if any of the RAS Alarm Status items (Sect. 8.7.4.4) are faulted.

Description	Details
Summary Alarm:	<DEV/SAS_{cr}
Confirmation:	>DEV/SAS_xx{cr}{lf}] where:
	xx = OK or FT

8.7.5.6   TSC (Terminal Status Change)

Use the TSC query 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 queries have changed as a result of user front panel operations or remote operations, or if any new fault conditions occur, the TSC command returns YES. The TSC query then continues to return YES until any of the following queries are received: RCS, RUS, RAS, PACRCS, PACRUS, or PACRAS.

Description	Details
Configuration Status:	<DEV/TSC_{cr}
Confirmation:	>DEV/TSC_nnn{cr}{lf}] where: nnn=YES/NO

8.7.5.7   PACRCS (Packed Configuration Status)

Description	Details
Configuration Status:	<DEV/PACRCS_{cr}
Confirmation:	>DEV/PACRCS_aaaaaaabbbcdeffgghijkl{cr}{lf}] where: aaaaa or aaaaaa = # of 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) g = 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

PACRCS NOTES:
1) If frequency selection is optional 1 kHz step size, the number of 1 kHz steps above the base frequency is 7 bytes in length (aaaaaaa). For DT-4513X converters with 125 kHz frequency step size, the number of 125 kHz steps above the base frequency is 5 bytes in length (aaaaa).
2) If the attenuation is optional 0.1 dB step size, this is the number of 0.1 dB steps above the base frequency
3) If the converter is a backup converter, it is always 'A'.

4) If the converter is the primary converter, gg=P1 or P2 (single or dual polarity system).

8.7.5.8   PACRMS (Packed Maintenance Status)

Description	Details
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) l = 1 if Remote Mode, 0 if Local Mode

8.7.5.9   PACRAS (Packed Alarm Status)

Description	Details
Alarm Status:	<DEV/PACRAS_{cr}
Confirmation:	>DEV/PACRAS_abcdefghijk{cr}{lf}] where: a = 1 if V15 Fault, else 0 if No Fault b = 1 if V14 Fault, else 0 if No Fault c = 1 if VCC Fault, else 0 if No Fault d = 1 if V5D Fault, else 0 if No Fault e = 1 if TEMP Fault, else 0 if No Fault f = 1 if IFLO Fault, else 0 if No Fault g = 1 if SUM Fault, else 0 if No Fault h = 1 if COARSE Fault, else 0 if No Fault I = 1 if FINE Fault, else 0 if No Fault j = 1 if HSB Fault, else 0 if No Fault k = 1 if EXT REF Fault, else 0 if No Fault

8.7.5.10   PACRUS (Packed Utility Status)

Description	Details
Utility Status:	<DEV/PACRUS_{cr}
Confirmation:	>DEV/PACRUS_ abbcdeeffghhii{cr}{lf}] where:
	a = 0 (RS-232) or 1 (RS-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

8.7.6   Stored Alarms

Up to 100 alarms are date- and 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 the CAS command.

8.7.6.1   TSA (Total Stored Alarms)

Use TSA to retrieve the total number of stored alarms and the time and date of the most recent alarm.

Description	Details
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:minutes:seconds mm/dd/yy = date in month/day/year

8.7.6.2   CAS (Clear All Stored Alarms)

Description	Details
Clear All Alarms:	<DEV/CAA_YES{cr}
Confirmation:	>DEV/CAA_CLEARED{cr}{lf}]

8.7.6.3   LAA (List All Alarms)

Use LAA to retrieve a list of the stored alarms. This query is unavailable when using virtual addressing mode.

Description	Details
List All Alarms:	<DEV/LAA_{cr}
Confirmation:	>DEV/LAA_{cr} xx yyyyyyyyyy hh:mm:ss mm/dd/yy{cr} " " " " xxx yyyyyyyyyy hh:mm:ss mm/dd/yy{cr}{lf}] where: xx = stored fault number yyyyyyyyyy = fault description hh:mm:ss= fault time mm/dd/yy= fault date

8.8   Error Processing

8.8.1.1   General Errors

Any command or query may generate the following Error Responses 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}]

8.8.1.2   Configuration Errors

A Configuration command may generate the following Error Response:

>DEV?COM LO DEVICE IN LOCAL MODE{cr}{lf}]

8.8.1.3   Mode Errors

A Mode selection may generate the following Error Responses:

>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}]

8.8.1.4   Time-Outs

The station M&C computer should attempt to execute any instruction at least three times. The system assumes a time-out if there is no response within 500 milliseconds.

Notes:

Appendix A. REDUNDANT SYSTEM OPERATION

A.1 Redundancy Overview

> (!) Use of the word "converter" throughout this appendix applies to either the Comtech EF Data DT-4500 Series C- or Ku-Band Down Converter or the UT-4500 Series C- or Ku-Band Up Converter.

Comtech EF Data UT-4500 Series C- and Ku-Band Up Converters function in a redundant system using distributed protection switching in an active "Daisy Chain" configuration. This proprietary configuration distributes the converter protection switching functions in the converters. This provides a system capability to back up from 1 to 12 online converters.

A High Speed Bus (HSB) provides the communications interface between the backup and online converters. The HSB detects faults and reconfigures the subsystem to replace the failed converter. When a faulted converter is removed from active operation, it detaches from the active converter chain by separating the converter from its switch module. This leaves the active online converter chain intact via the switch module. You can expand the chain without affecting online converter operation.

You may also indirectly control the active chained converters in a redundancy subsystem through the backup converter (BU) via the remote serial communication link – see Chapter 8. SERIAL INTERFACE OPERATION for more information.

A.2   Backup Converter (BU)

The "Daisy Chain" terminates in the BU. The BU has a microprocessor that performs fault detection, self-reconfiguration, and the logical switching functions. If the BU does not have a fault, it assumes the frequency and attenuation of the faulted converter and compensates for the chain loss. The BU accomplishes this via operation of the HSB and the online converter's removable switch module.

A.2.1   High Speed Bus (HSB)

In the "Daisy Chain" configuration, the BU communicates with the online units through the High Speed Bus interface (HSB). This allows the BU to detect faults and reconfigure itself to replace the faulted converter. The BU also uses the HSB to monitor configuration changes made to an online converter. Changes in frequency, gain, or polarity – as well as information from new online units – are immediately entered into the backup table. The HSB does not interfere with the remote serial communication link access to any of the converters in the chain.

A.2.2   Removable "Personality" Modules

See Chapter 2. SPECIFICATIONS or contact Comtech EF Data Product support for the listing of modules available to both the DT-4500 Series Down Converters and the UT-4500 Series Up Converters.

Depending on the application, the converter chassis rear panel module slot accepts an Input/Output Module (IOM), Polarity Switch Module (PSM), Transmit Switch Module (TSM), Equalizer Module (EQM), or Receive Switch Module (RSM). The converter RF, IF, and High-Speed Bus (HSB) connectors are integral to the installed module.

The converter employs an IOM for non-redundant (also called standalone or single thread) operation. The IOM is also used for unit testing.

A.2.2.1   Converter Switching

In redundancy applications where converters are "Daisy Chained" to provide distributed online protection switching to a BU, a TSM is used in place of an IOM.

The TSM contains IF and RF transfer switches for input/output looping of the signal. Options for the TSM include Type 'SMA' female connectors for the RF output signal, and 50Ω or 75Ω BNC female connectors for the IF input.

The "Daisy Chain" configuration is designed to chain the IF input and RF output of up to twelve (12) online converters through TSMs terminating in a BU. When a fault occurs in an online converter, the system commands the TSM in the faulted converter to switch to the BU.

A.3   Redundant Configurations

You may configure the UT-4500 Series Up Converter in a variety of subsystem "Daisy Chain" configurations to suit the reliability requirements of your communication system. These configurations include 1:1 or 1:N Redundant Systems.

A.3.1   1:1 Redundant Systems

A 1:1 Redundant System can be either a Single Source or a Dual Source IF Output Configuration.

In a Single Source IF Output Configuration: Figure A-1 shows the cable connections between the converters. **Figure A-2** shows the diagram for this 1:1 redundant converter configuration.

The online converter uses an RF and IF 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 converter. The transfer switches are contained in the TSM installed in the online converter. When a fault occurs in the online converter, the TSM is de-activated to switch out the online converter, and switch the IF input and RF output to the BU.

In a Dual Source IF Output Configuration: Figure A-5 shows the cable connections between the converters. **Figure A-6** shows the diagram for the 1:1 redundant/dual source RF input/converter configuration.

Two IF inputs – IF Input #1 (priority) and IF Input #2 – are switched in the TSM to provide redundant operation of the converters. The converters provide two

switched RF outputs – RF Output #1 (priority) and RF Output #2. If Converter #01 faults, Converter #02 backs up the priority channel and IF Signal #2 and RF Signal #2 are not operational.
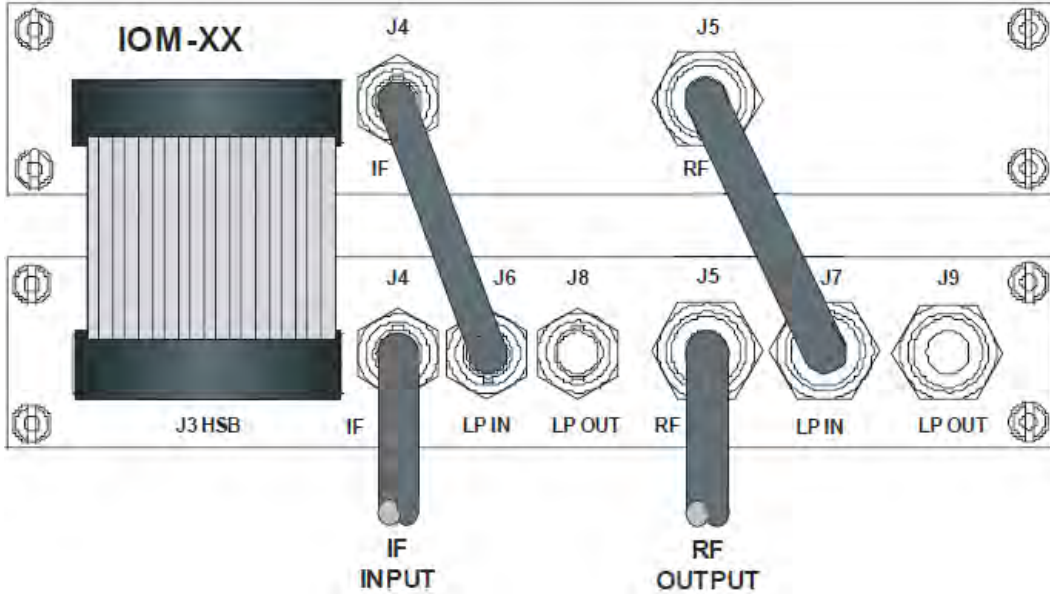

Figure A-1. 1:1 Redundant Configuration –Single Source IF Input (with IOM and TSM)
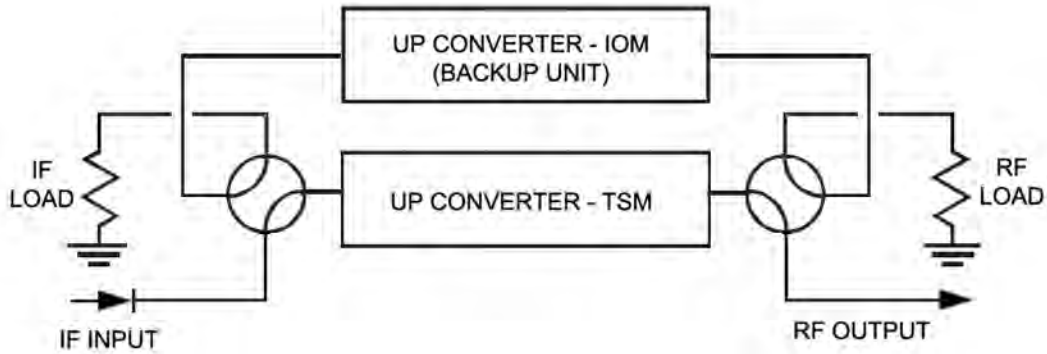

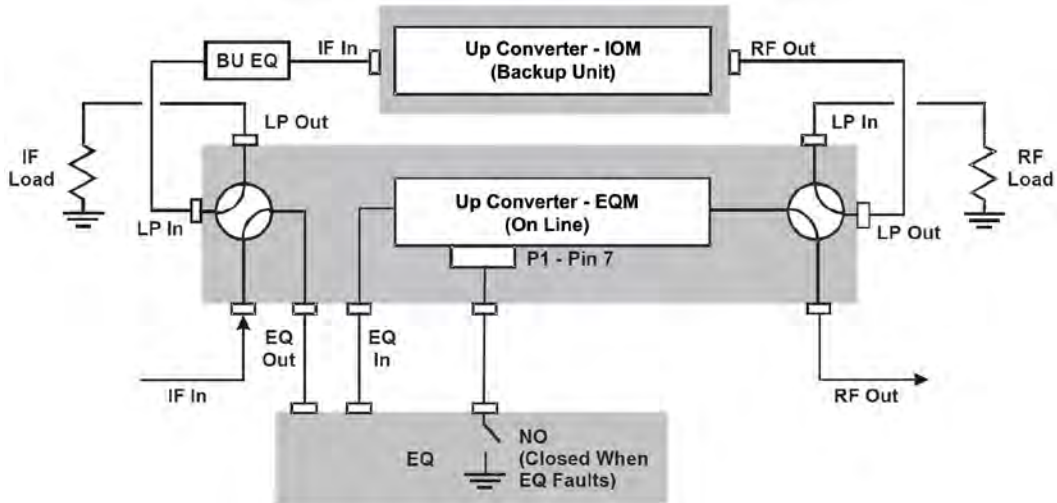**Figure A-2. 1:1 Redundant Configuration Diagram – Single Source RF Input (with IOM and TSM)**

Figure A-3. 1:1 Redundant Configuration Diagram – Single Source RF Input (with IOM and EQM)
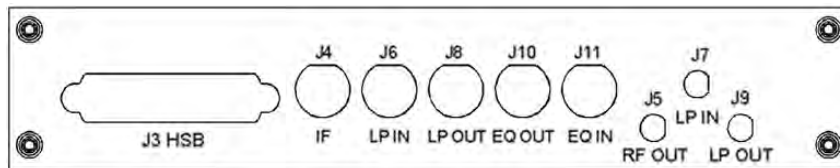

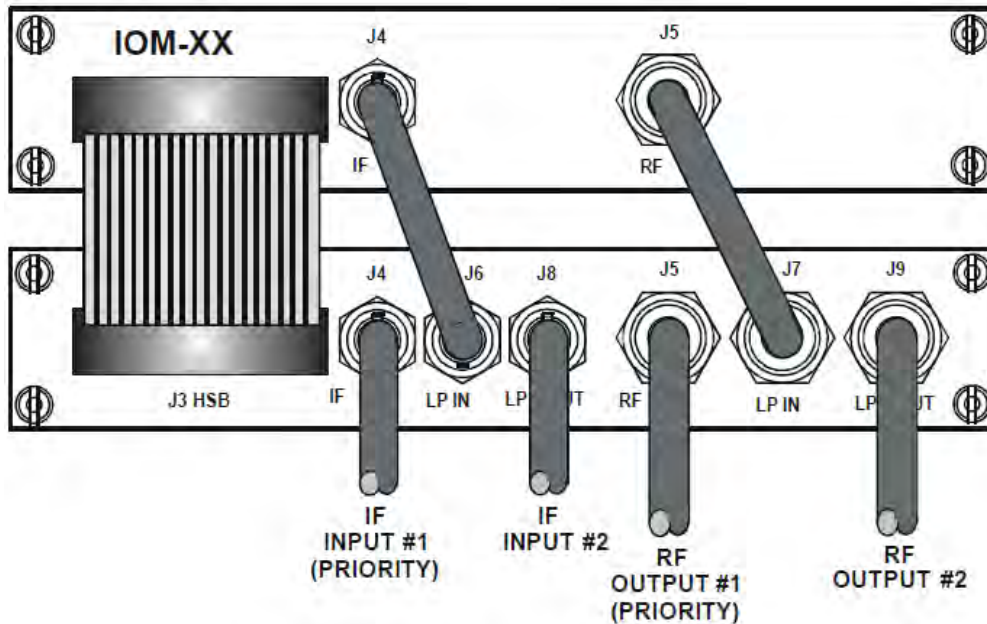**Figure A-4. EQM Panel – Connector Locations**

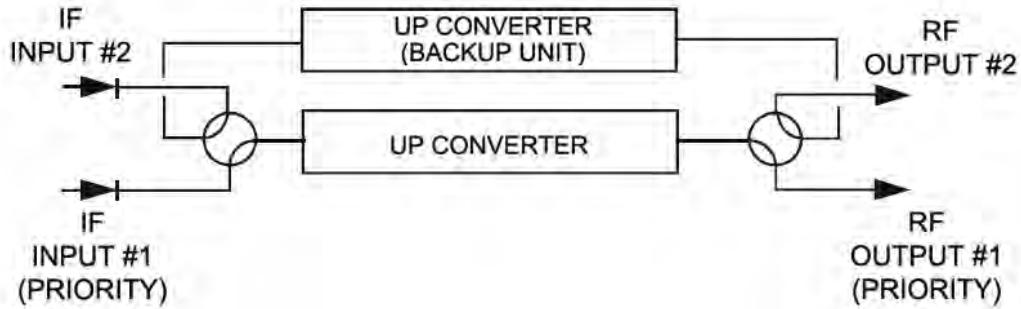**Figure A-5. 1:1 Redundant Configuration – Dual Source IF Input**

**Figure A-6. 1:1 Redundant Configuration Diagram – Dual Source IF Input
(with IOM and TSM)**

A.3.2   1:N Redundant Systems

IF and RF transfer switches in the TSM switch the IF input and RF output of a faulted online converter to the BU. **Figure A-7** shows the cable connections between the converters. The IF input and RF output to the redundant converter subsystem is connected to online converter '#N'. **Figure A-8** shows the diagram for this 1:N redundant "Daisy Chain" converter configuration.
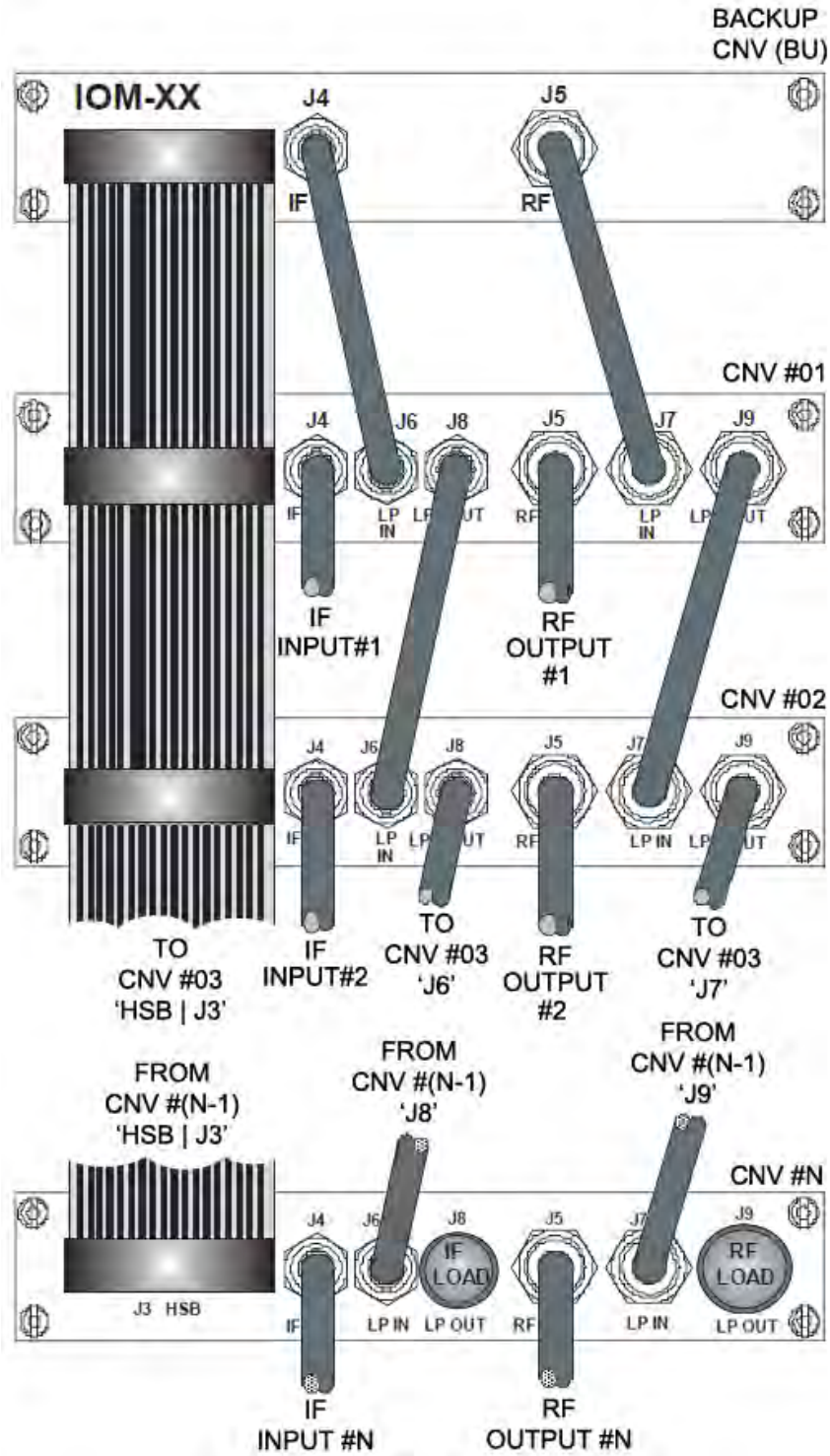
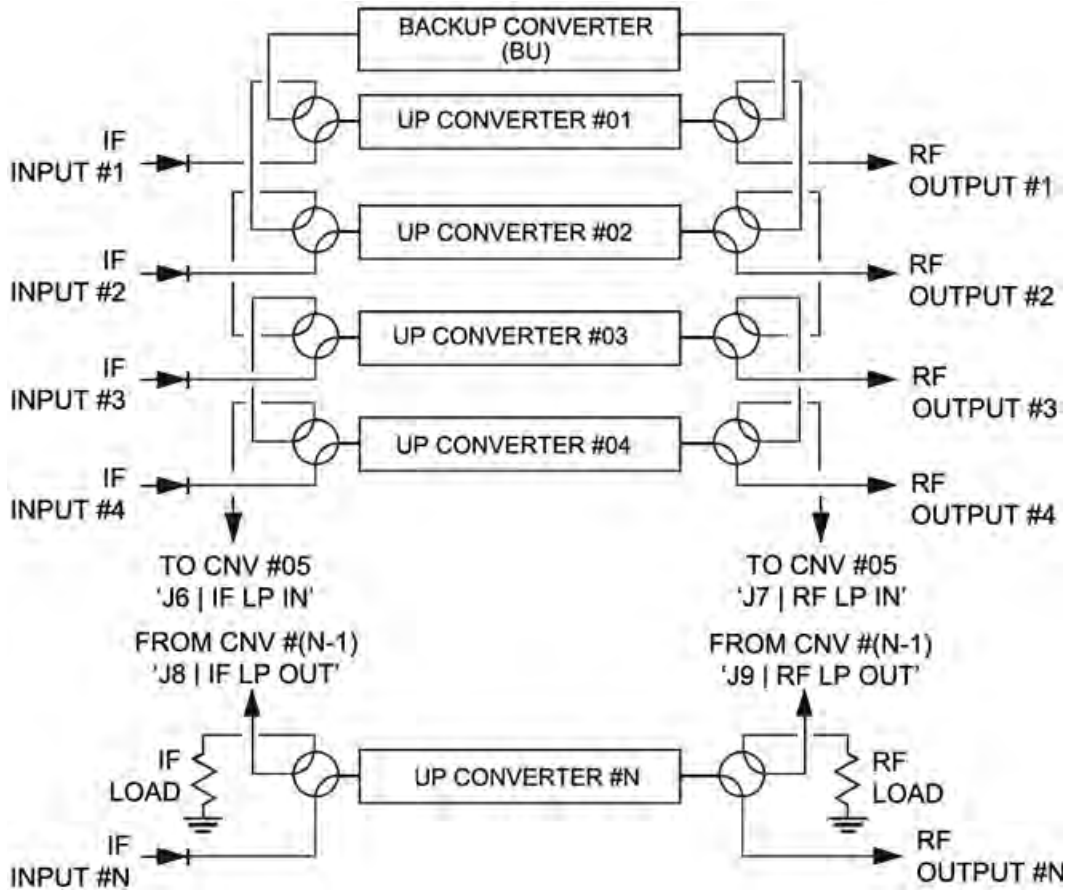**Figure A-7. 1:N Redundant Configuration (with IOM and TSM)**

Figure A-8. 1:N Redundant Configuration Diagram (with IOM and TSM)

A.4   Redundant System Configuration

A.4.1   Redundant System Configuration Using the Front Panel

Chapter 6. FRONT PANEL OPERATION

A.4.1.1   Initial Configuration

Use the UT-4500 front panel **CONFIG➔REDUNDANCY** menu branch to configure your redundant system. Assign a redundancy configuration address (01 to 12) to each online unit. Make sure that you assign the online converter address relative to its proximity to the backup unit (BU); i.e., the unit closest to the BU must be Converter #01, the next unit down must be Converter #02, etc. **Figure A-9** shows the proper address assignments for a 1:3 system (chain).
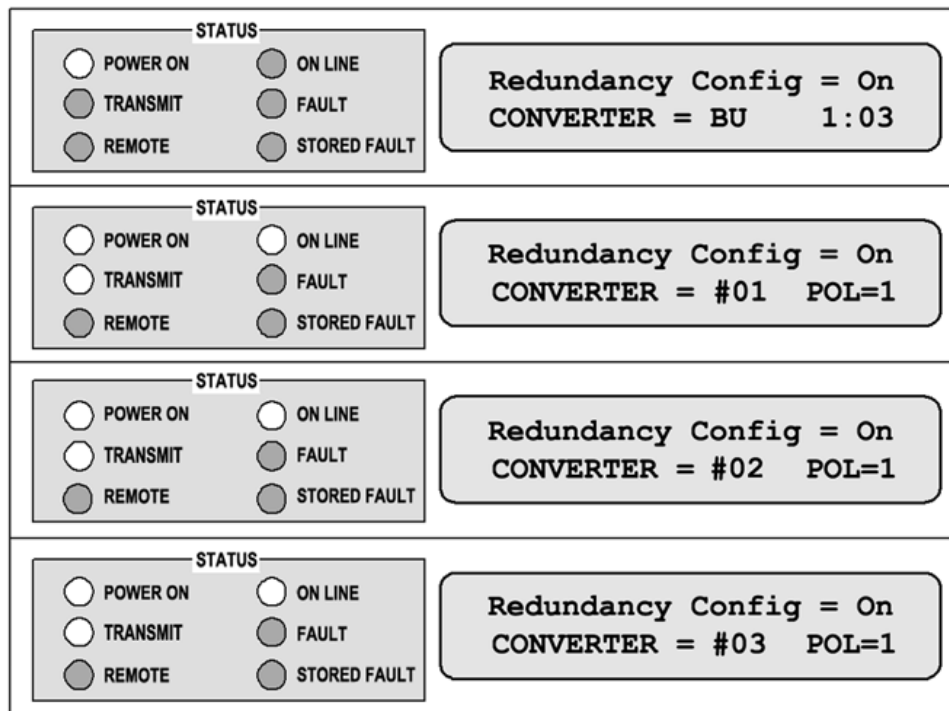

Figure A-9. Front Panel Example – 1:3 System Configuration

Configure the online units first, and then configure the backup unit. Redundant polling starts once you configure the backup. If this polling starts before you configure the online units, this results in an HSB fault. This fault should clear once you complete configuration. At this point, the BU will control the redundant system.

In a single polarity system, set "POL=1" on all online units. In a dual polarity system where the BU has a Polarity Switch Module (PSM) installed, configure each unit to represent the RF feed as it is connected to "POL=1" or "POL=2". See **Figure A-7**.

A.4.1.2   Automatic Configuration Verification

Use the UT-4500 front panel **CONFIG➔ FAULTRECOVERY** menu branch to select fault recovery operation as **Auto**. In AUTO mode, failure of an online converter automatically causes switchover to the BU. The easiest way for you to test AUTO mode in the field is to turn off an online unit. The online units report their status as shown in **Figure A-10**. The BU VFD displays each installed unit as "A" or "M". This example shows the entire 1:3 chain configured for AUTOMATIC operation.
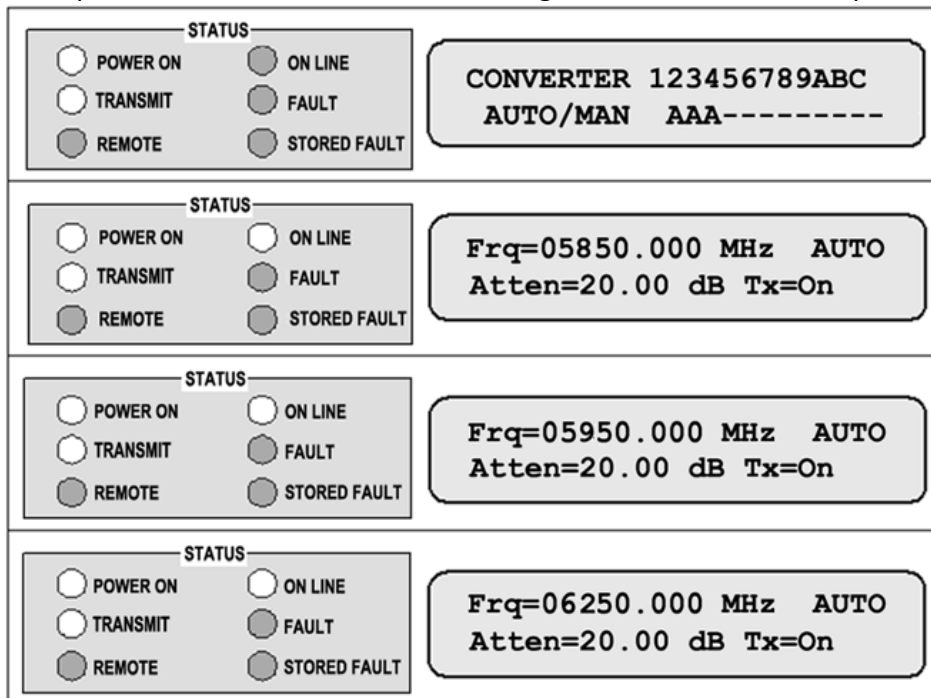
Figure A-10. Front Panel Example – System in AUTO Redundancy Mode

Figure A-11 shows the front panel displays after power has been turned off on Converter #01. Note the **ON LINE** LED is lit on the BU. This indicates that the BU is now providing the frequency translation in place of the faulted unit. Converter #01 will not come back online until power is restored.
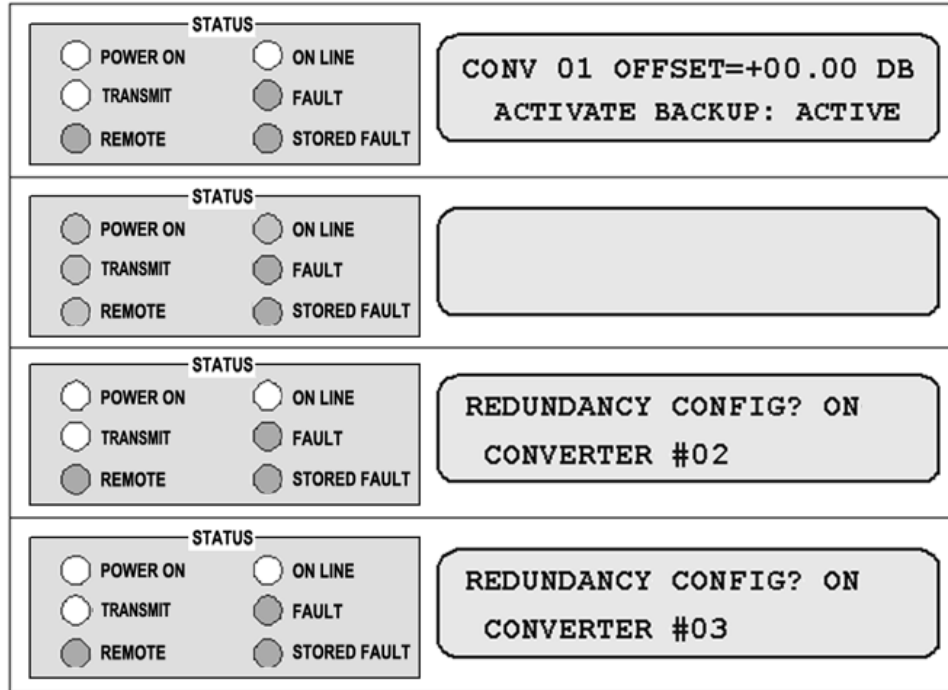

Figure A-11. Front Panel Example – Up Converter #01 Backup

A.4.1.3   Manual Configuration and Verification

Use the UT-4500 front panel **CONFIG➔ FAULTRECOVERY** menu branch to select fault recovery operation as **Manual**. In MANUAL mode, the BU can force switchover of an online unit. This mode also overrides fault status detection of the online units as performed by the BU. If an online unit is configured to manual mode and this unit faults, no switchover occurs. The online units report their status as shown in **Figure A-12**. The active configuration BU displays each installed unit as "A" or "M". This example shows Converter #01 configured for MANUAL (M) operation.
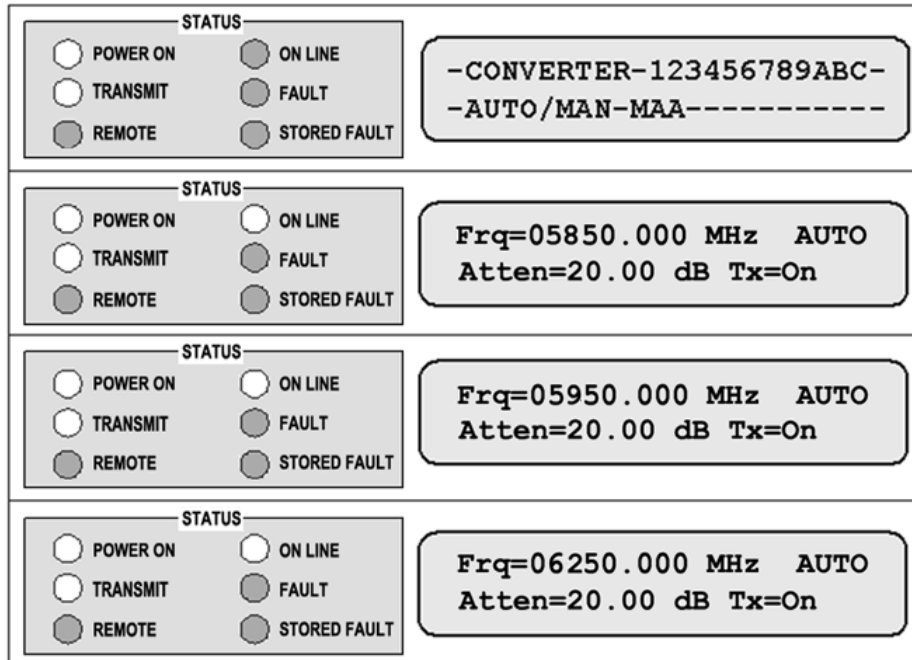

Figure A-12. Front Panel Example – Up Converter #01=MAN, Others=AUTO

Figure **A-13** shows the front panel displays after the BU forces Converter #01 offline. Note the **ON LINE** LED allows you to tell whether the BU is currently active and which converter is being bypassed.
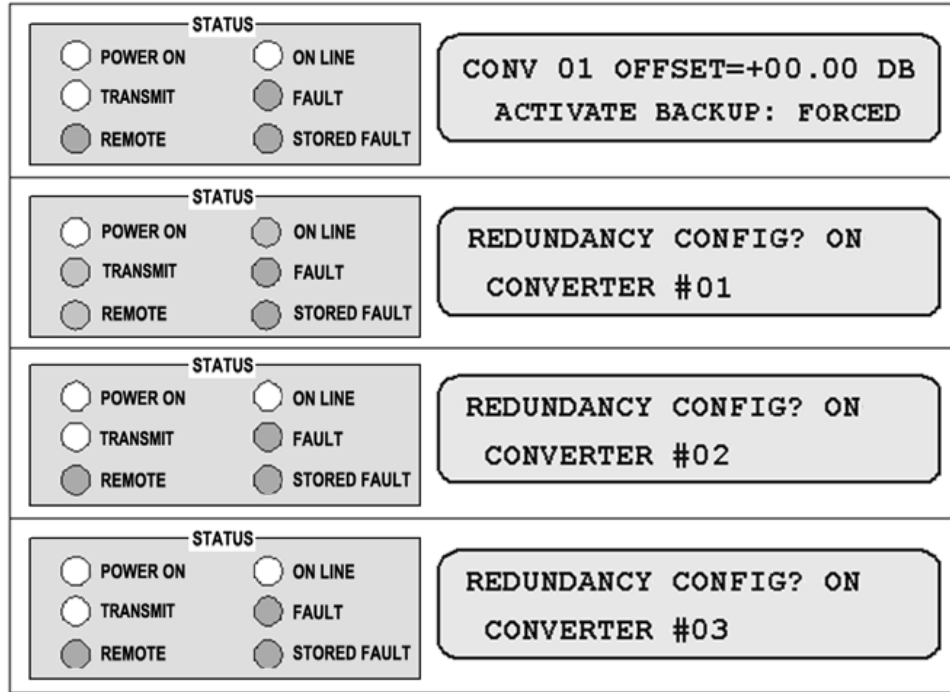

Figure A-13. Front Panel Example – Up Converter #01 Forced Backup

A.4.2   Redundant System Configuration Using the UT-4500 HTTP Interface

Chapter 7. ETHERNET INTERFACE OPERATION

You may use the UT-4500 HTTP Interface to configure and monitor redundancy operations. Log onto the HTTP Interface. Click the **Config** navigation tab, and then select the **Redundancy** hyperlink.

Figure A-14. 'Config | Redundancy' Page

Click **[Refresh]** to update the page with its latest operating parameters.

Online Status

This *read-only* section identifies the unit's status as **ONLINE** or **OFFLINE**.

Redundancy Mode

Use the drop-down list to select Redundancy Mode as **OFF** or **ON**. Click **[Change]**.

Chain Position

Use the drop-down list to assign the unit's Chain Position as the **Backup Unit**, or **Unit 01** through **Unit 12**.

Chain Length (Backup Unit) – Use the drop-down list to select **N/A**, or **1:1** through **1:12**.

Polarity (Primary Up Converter) – Use the drop-down list to select **N/A**, **Single**, or **Dual**.

Click **[Change]** to continue.

Forced Backup

Use the drop-down list to set the Forced Backup as **NONE**, or **Unit 01** through **Unit 12**. Click **[Change]**.

Redundancy Mute Mode

Use the drop-down list to set the Redundancy Mute Mode as **OFF** or **ON**. Click **[Change]**.

Primary Unit Status

This section is populated on a per-unit basis as the "Daisy Chain" is configured. Information is provided for each unit's Online Status (Online or Offline), Operating RF Frequency, Attenuation, Mute status, and Polarity.

Additionally:

Auto Mode – Use the drop-down list to select a unit's switching mode as **Manual** or **Automatic**.

Offset – Enter an offset adjustment value here. See **Sect. A.4.3** for further instructions.

Click **[Change]** to save.

A.4.3   Offset Adjustment

Use the offset to compensate for cable and switch losses. When you initially set up and test the system, you must force each converter to backup, and adjust the offset to minimize gain mismatch between the normal and bypassed mode. This offset will be different for each converter and is stored in a table in the backup unit.

Do these steps to configure the offset adjustment:
1. Connect a signal source to the input and a power meter or spectrum analyzer to the output of the first online converter.
2. Record the output power.
3. Force a backup of the first online unit.
4. Adjust the offset until the output power matches what was recorded in Step 2.
5. Restore the online unit, and then repeat these steps for the other online units.

A.5   Redundancy Systems – Converter Management

See Appendix B. MAINTENANCE AND TROUBLESHOOTING for information about managing the backup and inline converters that comprise your redundancy system.

Appendix B. MAINTENANCE AND TROUBLESHOOTING

B.1 Overview

This appendix serves to assist operator and maintenance personnel in the checkout, maintenance, and troubleshooting of the UT-4500 Series C- and Ku-Band Up Converters. Troubleshooting procedures are provided for fault isolation to the switch module level.
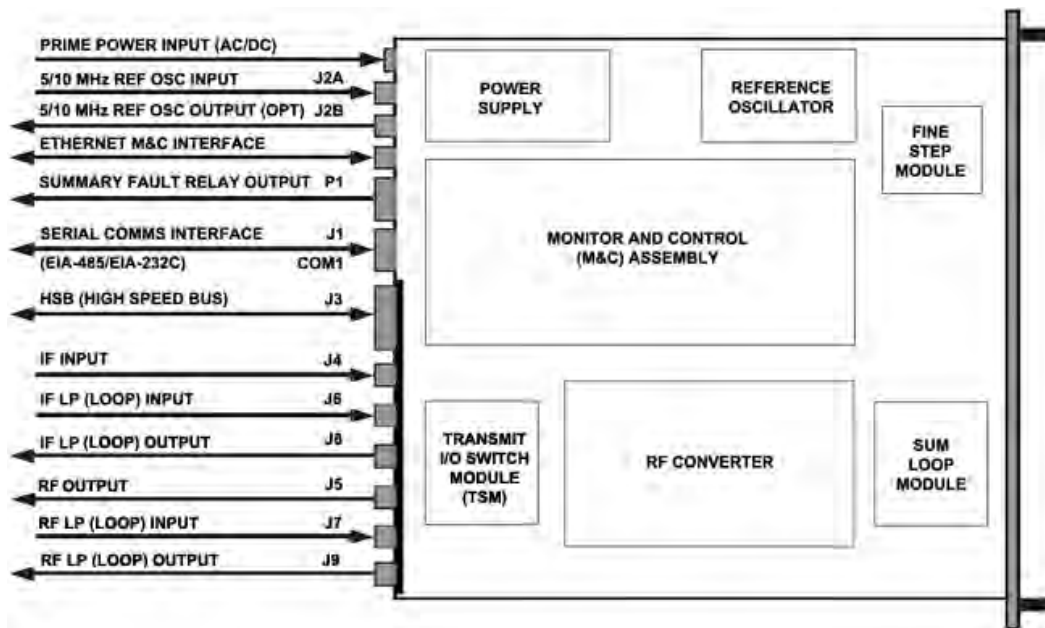

Figure B-1. UT-4500 Signal and Interconnecting Diagram – 1:N Redundancy "Inline" Unit Example (with TSM)

Figure B-1 shows the rear panel input and output signal routing, cabling interconnections, and switch module location.

B.2   Maintenance Testing

The UT-4500 is an Up Converter. It translates the input IF frequency from 52 to 88 MHz (or, optionally, from 104 to 176 MHz) to an output RF frequency. (For example, the Model UT-4505 RF output frequency range is from 5845 to 6425 MHz.) The IF input level is -35 dBm (typical), and the RF output level is+10 dBm @ 1 dB compression.
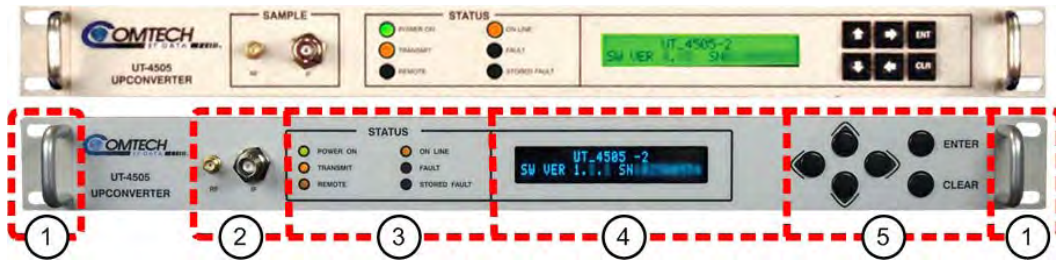
(TOP) Initially Released Chassis
(BOTTOM) Current Production Unit

Figure B-2. UT-4500 Front Panel (UT-4505 Shown)

Figure B-2 identifies the UT-4500 front panel features:
- **Item 1** – Rack handles. See **Chapter 3. INSTALLATION AND SETUP** to review the installation information and to prepare for checkout.
- **Item 2** – Sample Test Points. See **Sect. B.2.1** for details.
- Front panel operations – See **Chapter 6. FRONT PANEL OPERATION** for details about using the LEDs (**Item 3**), VFD (**Item 4**) and its menu system, and the keypad (**Item 5**).

B.2.1   Sample Test Points

Use these test point connections to monitor the IF input and the RF output:
- The 'IF' BNC female connector provides the IF input.
- The 'RF' Type 'SMA' female connector provides the RF output. An optional RF LO monitor is available that replaces this RF monitor connection.

The sample output level for both connectors is -20 dBc nominal.

B.2.2   Troubleshooting

When a fault condition is indicated or a marginal performance tolerance condition exists, you may use the front panel LEDs and VFD to identify the specific faults and events:

- The LED status indicators alert you to operating problems.
- You may use the VFD to view stored events and faults. See **Sect. 6.2.5 (SELECT:) FAULTS Menu Branch** for information about viewing and managing the stored events log.
- See **Sect. 6.2.4 (SELECT:)MONITOR Menu Branch** for information about viewing the unit's operational status screens.

B.2.3   Converter Faults

B.2.3.1   Prime Power

Check the dual fuses on the rear panel. The required prime power is 90-250VAC @ 1 Amp. The optional DC prime power is -48VDC.

B.2.3.2   DC Power Supply Module

15 VDC: A fault ("FT") indicates a voltage level exceeding $\pm$ 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 14VDC 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 5VDC 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.

B.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 module and return it to Comtech EF Data for repair.

B.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.

B.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.

B.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.

B.2.3.7   Temperature Fault

Converter 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.

B.2.4   Removable "Personality" Modules

See Sect. 2.3 in Chapter 2. SPECFICIATIONS and Contact Comtech EF Data Product Support for information about the module(s) specific to your system.

Depending on the application, the rear panel module slot accepts an Input/Output Module (IOM), Polarity Switch Module (PSM), Transmit Switch Module (TSM), Equalizer Module (EQM), or Receive Switch Module (RSM). The converter RF, IF, and High-Speed Bus (HSB) connectors are integral to the installed module. These "personality" modules (**Figure B-3**) are available for both non-redundant (also referred to as single thread or standalone) and redundant applications.
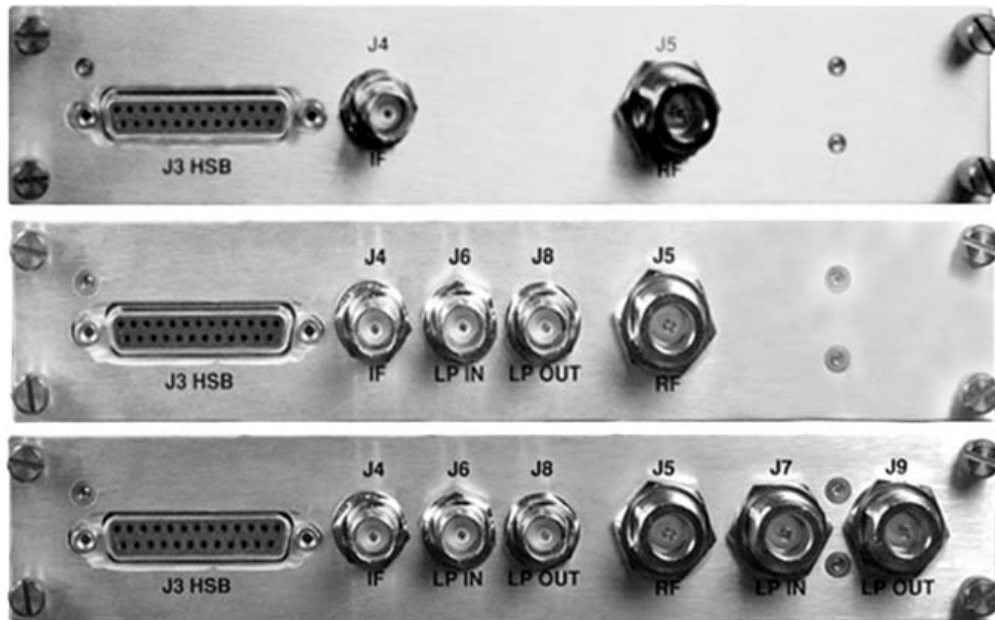
(TOP) Input/Output Switch Module (IOM)
(CENTER) Receive Switch Module (RSM)
(BOTTOM) Transmit Switch Module (TSM)

Figure B-3. "Personality" Module Examples

⊕ When you install a removable module into the rear panel module slot, DO NOT use a screwdriver to tighten the module mounting thumbscrews – these screws are designed to be hand-tightened only.

B.3 Spares

Comtech EF Data recommends that you have spare replacement converters on hand at the RF converter level to replace any converter(s) removed from the system for any reason.

If sparing at a lower level is desired, contact Comtech EF Data Product Support for the correct spares for your particular converter.

B.4 Redundancy Systems – Converter Management

B.4.1 Remove a Faulted Converter

To remove a faulted "inline" converter for repair, do these steps:
1. Force a backup of the faulted unit.
2. Turn OFF the power to the faulted unit at its rear panel power switch and disconnect the power cord. (DO NOT disconnect the RF and IF cables from the Transmit Switch Module (TSM).)
3. Unscrew the faulted unit TSM thumbscrews. Then, remove the rack mounting screws at the front panel of the faulted unit.
4. From the rear of the faulted unit, hold the TSM, and push the chassis towards the front of the rack until the module fully detaches from the unit. Leave the TSM "dangle" by its connected cables.
5. Remove the faulted unit from the front of the rack.

To remove a faulted "backup" converter for repair, do these steps:
1. Turn OFF the power to the faulted BU at its rear panel power switch.
2. Remove the power cord from the faulted BU.
3. Disconnect the RF and IF cables from the faulted BU's IOM.
4. Remove the rack mounting screws at the front panel of the faulted BU.
5. Remove the faulted BU from the front of the rack.

B.4.2   Install a Replacement Converter

To install a replacement converter into your redundancy system, do these steps:

1. With the replacement unit on the bench, turn ON the unit power.
2. Configure the new unit for the correct redundancy settings:
   a. Set Redundant Mode = ON;
   b. Set the Address (Chain Position) to match the faulted unit;
   c. Set the correct frequency and attenuation.
3. Turn OFF the replacement unit power and disconnect the power cord.
4. Remove the existing module (IOM, RSM, TSM, etc.) from the new unit.
5. Carefully install the new unit into the rack.
6. Plug the existing TSM in the rack into the replacement unit, and finger-tighten the module thumbscrews.
7. Plug the power cord back into the replacement unit, and turn the power ON.
8. Un-force the backup.

Notes: