COMTECH
EF DATA ™

LPOD

Outdoor Amplifier / Block Up Converter (BUC)
Installation and Operation Manual

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

Revision History

Rev	Date	Description
0 – 13	-	Various updates. Refer to PLM for details.
14	Mar 2016	Revise per FW Ver 1.5.6 - update OFM in Chapter 4, Config>Amplifier page in Chapter 5, 1:1 Serial Remote Operation section in Appendix A
15	Oct 2020	- Updated/Revised Sections 1.5.1, 2.2, 3.4.2, 4.5.2.1, 4.5.4.2, 4.5.4.3, 4.5.4.4, 5.4, A.3.1, and C.5 - Added Section 2.2.2 - Revised Figures 1-6, 1-7, 1-8, 1-10, 1-11 through 1-15, 2-11, A-8, and A-9 - Updated formatting to reflect current Comtech EF Data standards.
16	Dec 2020	Updated Table 2-5.
17	Nov 2021	Updated Chapter 2, section 2.3.5, to include note for compliance with MIL461E RE102 Army Ground.

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Acronym List

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AO	Assignment Operator	5-8
BUC	Block Up Converter	1-1
CEFD	Comtech EF Data	1-1
DC	Direct Current	1-1
EOL	End of Life	5-3
FET	Field Effect Transistor	4-27
FSK	Frequency Shift Keying	1-3
FTP	File Transfer Protocol	3-1
GaAs FET	Gallium Arsenide Field-effect Transistor	1-2
HTTP	Hypertext Transfer Protocol	4-1
IF	Intermediate Frequency	1-3
IPA	IP Address	4-9
LED	Light Emmiting Diode	A-8
LNB	Low Noise Block Down Converter	1-1
LO	Local Oscillator	1-6
LPOD	Low Power Outdoor	1-1
LRS	Local Remote Status	4-9
M&C	Monitor and Control	1-2
MCP	Monitor/Control Processor	1-2
MIB	Management Information Base	4-1
MTBF	Mean Time Between Failures	1-2
NIC	Network Interface Controller	A-8
NMS	Network Management System	4-1
OID	Object Identifier	4-2
OS	Operating System	3-8
OXCO	Oven-controlled Crystal Oscillator	1-3
PC	Personal Computer	3-1
QO	Query Operator	5-8
RE	Radiated Emissions	2-11
RF	Radio Frequency	1-1
SMTP	Simple Mail Transfer Protocol	4-16
SNG	Satellite News Gathering	1-2

Acronym	Description	First Use Page Numbe
SNMP	Simple Network Management Protocol	4-1
SSPA	Solid State Power Amplifier	1-2
TWT	Traveling Wave Tube	1-1
VSWR	Voltage Standing Wave Ratio	1-3

Units of Measurement

Unit / Symbol	Definition
Ω	Ohm
A	Ampere
bps	bits per second
˚C	Celsius (degrees)
Hz	Hertz
kHz	kiloHertz
dB	decibel
dBc	Decibels relative to the carrier
dBm	Decibel-milliwatts
˚F	Fahrenheit (degrees)
Kbps	Kilobit per second
kg	kilogram
ksps	Kilosymbols per second
lbs.	pounds
mA	Milli-amp
Mbps	Megabit per second
MHz	Megahertz
mm	millimeter
ms	millisecond
Msps	Megasymbols per second
mW	milliwatt
in.	inch
Ppm	Packets per minute
Pps	Packets per second
SR	Symbols per second
µF	100 micro-farads
W	Watt
V	Volt

PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data LPOD family of Outdoor Amplifiers / Block Up Converter (BUCs). This document is intended for the persons responsible for the operation and maintenance of the LPOD PS 1, PS 1.5, or PS 2.

Related Documents

- Comtech EF Data CLC-10 Handheld Terminal M&C Accessory for LPOD or SPOD PS 1, PS 1.5, PS 2 User's Guide (CEFD P/N MN-CLC10)
- Comtech EF Data LPOD*net* M&C Netbook Accessory for LPOD or SPOD PS 1, PS 1.5, PS 2 Operation Manual (CEFD P/N MN-LPODNET)
- Comtech EF Data RF Control – Transceiver/Amplifier M&C Utility User Guide (CEFD P/N MN-CRFC)

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
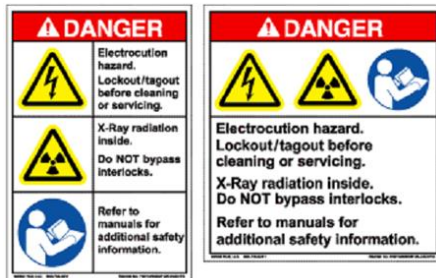
Recommended Standard Designations

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.

Safety and Compliance

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

Electrical Safety and Compliance

> **CAUTION**
> **NEUTRAL FUSING – DOUBLE POLE/NEUTRAL FUSING IS USED ON THE PRIME POWER SUPPLY INPUT.**

This equipment has been designed to minimize exposure of personnel to hazards. For further information, contact Comtech EF Data Product Support. The operators and technicians must:

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

Installation Guidelines Regarding Power Line Quality

> *Comtech EF Data has become familiar with the varying quality of the AC power grid around the world. Observing the following installation guidelines should help ensure a reliable installation.*

- **Surge suppression** – High voltage surges can cause failure of the power supply. These surges are typically caused by circuit switching on the main AC power grid, erratic generator operation, and also by lightning strikes. While the LPOD does have built in surge suppression, if the unit is to be installed in a location with questionable power grid quality, Comtech EF Data recommends installation of additional power conditioning/surge suppression at the power junction box.
- **Grounding** – The LPOD provides a grounding terminal. This is provided to allow you to ground the LPOD to the antenna's grounding network. All components installed at the antenna should be grounded to a common grounding point at the antenna.
- **Electrical welding** – If welding needs to take place at the antenna, disconnect all cables from the LPOD except for the ground wire. Cap all RF connections with terminations. This will prevent damage to the input/output circuitry of the LPOD.
- **Lightning** – Lightning strikes on or around the antenna will generate extremely high voltages on all cables connected to the LPOD. Depending on the severity of the strike, the LPOD's internal surge protection combined with the recommended external suppression may protect the LPOD's power supply. However, if the installation will be in an area with a high probability of lightning strikes, Comtech EF Data recommends the installation of surge suppression on the RF and IF cables. One source of these suppressors is PolyPhaser (www.polyphaser.com).

Product Support

For all product support, please call:

+1.240.243.1880

+1.866.472.3963 (toll free USA)

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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.

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Chapter 1. INTRODUCTION

1.1 Overview

Comtech EF Data (CEFD)s Low Power Outdoor (LPOD) family of Outdoor Amplifiers / Block Up Converters (BUCs) – referred to collectively throughout this manual as the **LPOD** – deliver their rated power, guaranteed, to the transmit waveguide flange at the 1 dB compression point. The LPOD provides a cost effective, more reliable replacement for Traveling Wave Tube (TWT) amplifiers in satellite communications.

CEFD's extensive experience in the design of outdoor RF transceivers led to the LPOD family's efficient thermal and mechanical package. Recognizing the evolution of L-Band IF systems, the LPOD is designed to eliminate the traditional requirement for the modem to supply a direct current (DC) power source and a 10 MHz reference to the BUCs and Low-noise Block (LNB)s.

LPOD PS 1   LPOD PS 1.5   LPOD PS 2

Figure 1-1. LPOD Outdoor Amplifiers / BUCs

1.2   Functional Description

The compact size and weight of the LPOD lends itself to any installation with limited available mounting space. These include ship-borne antenna systems, small "flyaway" systems, and Satellite News Gathering (SNG) installations. The addition of the optional internal reference and LNB bias T facilitates multi-carrier and redundant operations required of small-to medium-sized hub installations.

As shown in Figure 1-1, CEFD's LPOD is available in three models:

- PS 1
- PS 1.5
- PS 2

Each LPOD consists of a CEFD Solid State Power Amplifier (SSPA) module with the Monitor and Control Processor (MCP), a power supply, and a fan assembly. The amplifier features a CEFD low loss combining technique and MCP-based temperature-versus-gain compensation.

The PS 1 and PS 1.5 models are always configured as a BUC/SSPA (L-Band in, RF out) with available power levels to 100 W. The PS 2 version can be configured as an integrated BUC/SSPA or solely as an SSPA (RF in, RF out) at power levels to 250 W.

1.3   Features

1.3.1 The Solid-State Advantage

The LPOD is constructed with highly reliable gallium arsenide field-effect transistors (GaAs FETs). With third-order intermodulation products that are 4 to 6 dB better than TWT ratings, the CEFD unit replaces TWTs with saturated power levels of up to twice the LPOD's rated output. The LPODs also provide mean time between failures (MTBF) that is 4 to 5 times greater than the typical TWT MTBF.

1.3.2 Enhanced Standard Features

The LPOD comes equipped with useful features that other manufacturers offer only as options. Included in the base price are temperature compensation, sample ports (on the PS 2 only), power monitor, power factor corrected supply, and full remote monitor and control (M&C) capabilities (including Ethernet and serial).

1.3.3 Built-in Redundancy Controller

The LPOD has the ability to function as a 1:1 (one backup for one primary) redundant controller in a redundant mode without the use of an external device. The optional redundancy configuration is implemented by attaching a ganged waveguide/coax transfer switch(es) to the input and output connectors of the amplifiers, using a combination coaxial cable and waveguide kit.

When the backup LPOD is commanded into redundant mode, it monitors the online LPOD for faults and status, and automatically maintains a configuration based on the online unit.

A faulted online unit may be disconnected and replaced without affecting the online power amplifier.

1.3.4 "Smart BUC" Functionality

CEFD's unique approach to L-Band/RF frequency conversions eliminates DC and 10 MHz from the input coax. This simplifies redundant and multi-carrier operation. Full 13.75 to 14.5 GHz Ku coverage and 5850 to 6725 MHz C-band coverage is offered while supporting industry standard Frequency Shift Keying (FSK) modem/BUC communications, as well as CEFDs proprietary commands.

Both LPOD models have a self-contained power supply, eliminating the requirement for the modem to supply the BUC voltage on the center conductor of the RF cable, simplifying multi-carrier operation and modem spares maintenance.

1.3.5 Data Logging Capability

To greatly enhance system maintainability, the LPOD includes a built-in data logging capability. By recording critical operational parameters (such as temperature, output power, mute status, etc.) at time stamped intervals, the user can quickly gather intelligence not only about the unit itself, but also the unit's operational environment.

1.3.6 Optional Internal 10 MHz Reference

With the optional high stability, oven-controlled crystal oscillator (OCXO) installed, one more signal is removed from the TX Intermediate Frequency (IF) cable. This ensures optimum RF performance of the BUC by eliminating any reference degradation caused by IF combiners, interconnections, or rotary joints.

1.3.7 Optional LNB Support

The LPOD was designed with the evolution of L-band systems in mind. L-band IF topologies are no longer relegated to low power single carrier installations, and are now found in larger multi-carrier installations. A challenge presented by multi-carrier L-band systems is the presence of DC and reference components on the Tx/Rx L-band interfaces. The LPOD design, by default, eliminates the DC component from the Tx IF and can eliminate the reference requirement with the optional internal OCXO. The LNB bias/reference option completes the solution by eliminating DC and reference signal requirements from the Rx L-band interface.

1.4   Theory of Operation

1.4.1 SSPA Block Diagrams

See Figure 1-2 and Figure 1-3 for the LPOD block diagrams.

The major components of an LPOD unit are:
* The SSPA Module
* The Cooling system
* The Power Factor Corrected Power Supply
* M&C
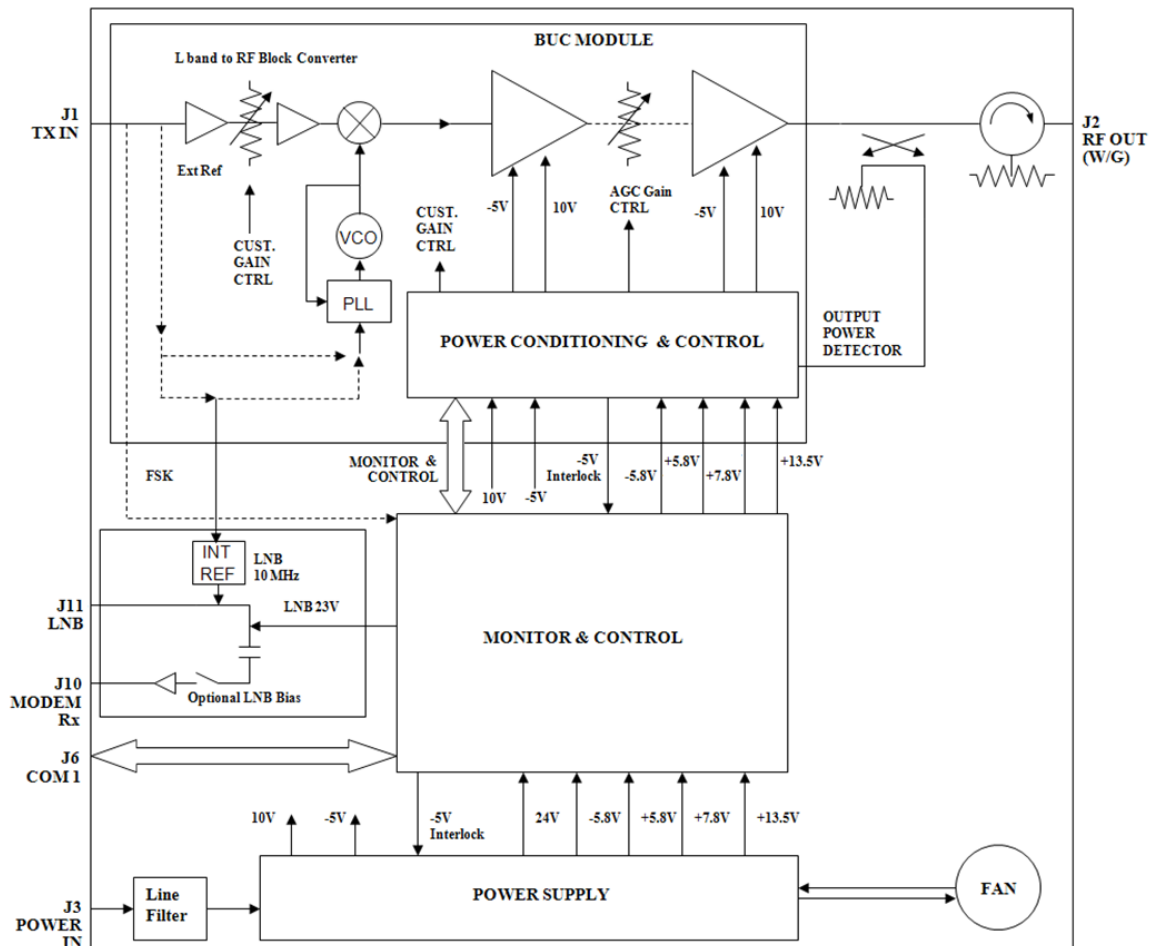
Figure 1-2. LPOD PS 1 and PS 1.5 Block Diagram
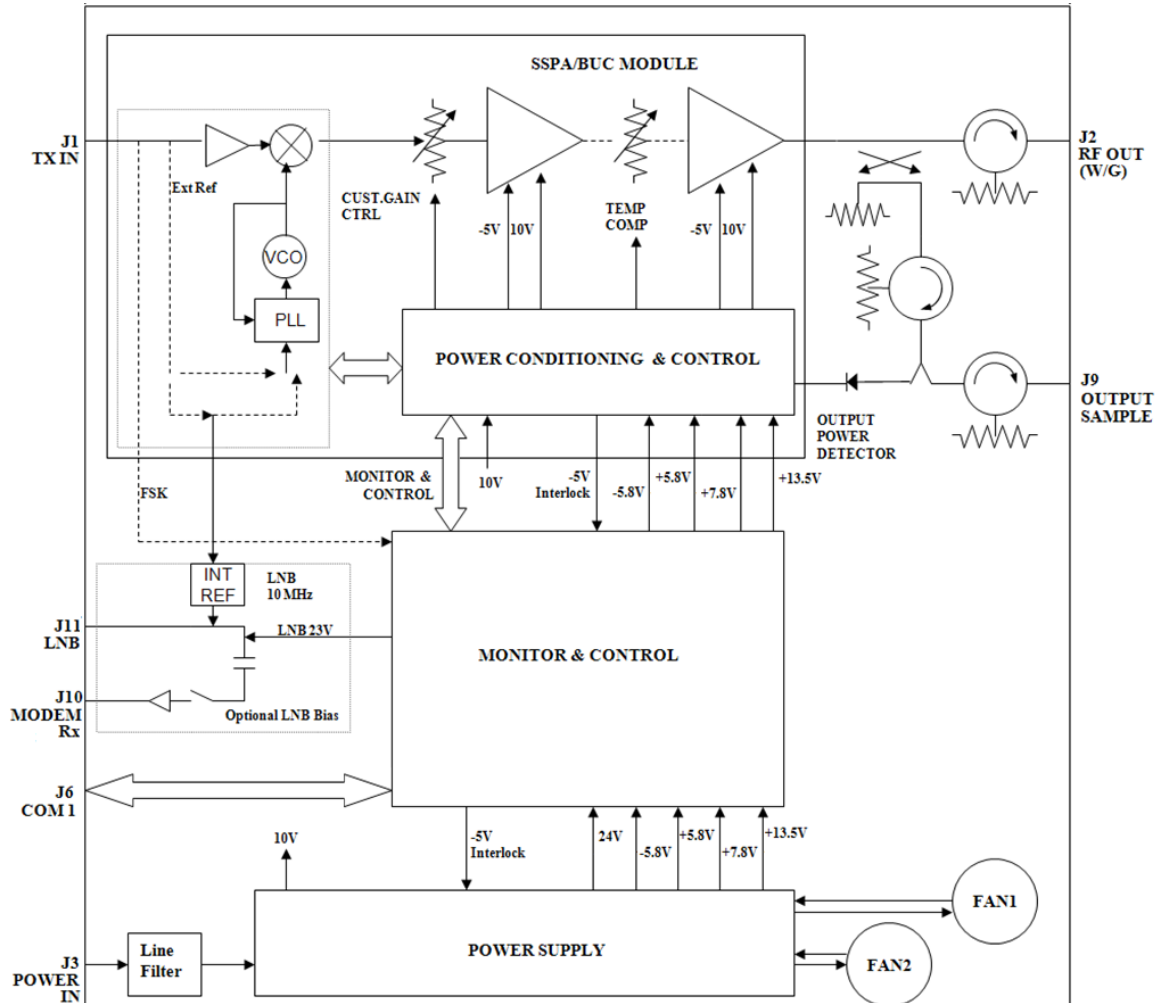
Figure 1-3. LPOD PS 2 Block Diagram

1.4.2 SSPA Module

The amplifier module performs the core function of the unit. An isolator is at the RF input to ensure good voltage standing wave ratio (VSWR). The RF signal then passes through an electronically controlled attenuator that adjusts the overall attenuation according to the user input. After some amplification, a second attenuator is automatically controlled via a look-up table to maintain the amplifier gain at a constant level over temperature variations.

The RF signal is then amplified by a multi-stage design that utilizes proprietary combining techniques to meet the rated power requirements. The output circuitry contains a coupler to provide a sampled signal for monitoring purposes. A power detector circuit also is included and the reading can be accessed via remote communication. A high power circulator and load is located at the output to provide good VSWR and protection from external mismatch.

1.4.3 Cooling System

The LPOD contains a robust heat sink and thermal design to maintain a low operating temperature. The PS 1 contains one temperature-controlled fan, and the PS 1.5 and PS 2 contain two temperature-controlled fans that are monitored by the M&C board. The fans draw cool outside air in across the power supply and specialized heat sink. The amplifier module temperature is monitored and, if for any reason the amplifier temperature exceeds a safe preset limit, the amplifier module supply is shut down to protect the unit from thermal failure.

1.4.4 Power Supply

The LPOD features a power supply that is power factor corrected. It supplies several voltages necessary for the unit to operate:

- The 10 V power supply output state is controlled by circuitry within the RF module. If the RF module does not have the –5.8 V supply for any reason, it will not allow the 10 V power supply to turn on. This protects the power transistors within the RF module from failure due to improper power supply sequencing.
- The +24 V output powers the cooling fans, is the source of power for waveguide switching when the SSPA is used in redundant configurations, and is dropped to +22 V for LNB bias.
- The +5.8 V, -5.8 V, +7.8 V and +13.5 V outputs are used to operate the M&C board and other overhead functions.

1.4.5 LNB Operation

Either LPOD package style may be ordered with an optional internal 10 MHz reference and LNB converter bias tee. With these options installed, the user has control of the bias tee enable (LNB On/Off) as well as the DC bias voltage (On/Off).

1.4.6 Block Up Converter (BUC) Input

The LPOD translates an L-Band input carrier to the desired output frequency (C-, X-, or Ku-Band). Local Oscillator (LO) frequencies are as follows:

Table 1-1. Low Oscillator (LO) Frequencies

BUC C, Ku, X LO Frequencies			
Band	Frequency	LO Frequency	Inverting
C-Band	5850 to 6650 MHz	4900 MHz	No
	5950 to 6700 MHz	5000 MHz	No
Insat C-Band	6725 to 7025 MHz	5760 MHz	No
X-Band	7900 to 8400 MHz	6950 MHz	No
Ku-Band	14.00 to 14.50 GHz	13.050 GHz	No
Ku-Band-W	13.75 to 14.50 GHz	12.800 GHz	No

Unlike most BUCs, no DC bias voltage should be provided on the center conductor of the L-Band coax. In addition, the LPOD is available with an internal 10 MHz reference. As such, no 10 MHz reference is required on the center conductor of the L-band coax. If a reference is provided on the coax, the internal reference will detect and lock to it.

1.4.7 Monitor and Control (M&C)

The LPOD includes a microprocessor-based system that provides monitoring and control of the essential parameters of the unit. The user interfaces with the unit through the M&C system via the remote control/discrete communications port.

The unit is capable of EIA-232, EIA-485, or Ethernet remote communication. A discrete mute control and relay status output is also available.

The M&C system monitors the fan speed (PS 2 only), unit temperature, all power supply voltages, power transistor currents, output power, etc. Should a critical monitored parameter fail, the unit will mute the RF signal and report a fault. The details of the fault can be accessed via remote communication.

The M&C is also capable of acting as a controller in a 1:1 redundant system. When configured as the back-up SSPA in such a system, it communicates with the other SSPA and toggles the waveguide switches as necessary.

1.5 Summary of Specifications

1.5.1 Characteristics

IF Input Frequency[1]	RF Output Frequency	
950 – 1525 MHz	5.850 – 6.425 GHz	
950 – 1750 MHz	5.850 – 6.650 GHz (optional)	
950 – 1825 MHz	5.850 – 6.725 GHz (optional)	
965 – 1265 MHz	6.725 – 7.025 GHz	
950 – 1450 MHz	7.900 – 8.400 GHz	
950 – 1450 MHz	12.75 – 13.25 GHz	
950 – 1450 MHz	14.00 – 14.50 GHz	
950 – 1750 MHz	13.75 – 14.50 GHz (optional)	
Model		Psat (Typical)	P1dB (Guaranteed) [Note 2]
Ku-Band	PS 1 – 20 Ku	43 dBm (20 W)	42 dBm (16 W)
	PS 1 – 32 Ku	45 dBm (32 W)	44 dBm (25 W)
	PS 1 – 40 Ku	46 dBm (40 W)	45 dBm (32 W)
	PS 1.5 – 50 Ku	47 dBm (50 W)	46 dBm (40 W)
	PS 1.5 – 60 Ku	48 dBm (60 W)	47 dBm (50 W)
	PS 2 – 100 Ku	50 dBm (100 W)	49 dBm (80 W)
	PS 2 – 125 Ku	51 dBm (125 W)	50 dBm (100 W)
C-Band or X-Band	PS 1 – 25 C, X	44 dBm (25 W)	43 dBm (20 W)
	PS 1 – 32 C, X	45 dBm (32 W)	44 dBm (25 W)
	PS 1 – 4 0 C, X	46 dBm (40 W)	45 dBm (32 W)
	PS 1 – 50 C, X	47 dBm (50 W)	46 dBm (40 W)
	PS 1 – 60 C, X	48 dBm (60 W)	47 dBm (50 W)
	PS 1.5 – 75 C, X	48.6 dBm (75 W)	48 dBm (60 W)
	PS 1.5 – 80 C, X	49 dBm (80 W)	48.5 dBm (70 W)
	PS 1.5 – 100 C, X	50 dBm (100 W)	49 dBm (80 W)
	PS 1.5 – 110 C, X	50.4 dBm (110 W)	49.5 dBm (90 W)
	PS 1.5 or PS 2 – 125 C, X	51 dBm (125 W)	50 dBm (100 W)
	PS 2 – 150 C, X	51.8 dBm (150 W)	51 dBm (125 W)
	PS 2 – 200 C, X	53 dBm (200 W)	52.5 dBm (175 W)
	PS 2 – 250 C, X	54 dBm (250 W)	53 dBm (200 W)
	PS 2 – 300 C	55 dBm (300 W)	54 dBm (250 W)

Notes:
1. PS 2 Models are available as SSPAs only, without internal L-Band BUC (Freq RF in = Freq RF out).
2. Allow 1 dB degradation from 13.75 to 14.0 GHz and 6425 to 6725 MHz

Gain Min (Typical)	70 (75 dB)
Input Power Supply Requirements	90-264 VAC, 47-63 Hz, Power Factor Corrected .96 (typical) (48 VDC optional)
Max IF Input level (no damage)	+10 dBm
Gain Adjust	20 dB in 0.25 dB steps
Gain Flatness	± 1.5 dB full band (optional ± 2.0 dB full band (-50 to +55°C)) ± 0.30 dB per 40 MHz (optional ± 0.50 dB per 40 MHz (-50 to +55°C)
Gain variation over temp	±1.5 dB max, -40 to +55°C (optional ± 2.0 dB max (-50 to +55°C))
Input Return Loss	15 dB
Output Return Loss	19.1 dB (1.25:1 VSWR)
Noise Figure	10-15 dB typ, 20 dB max @ min attenuation, (8 dB typ, 15 dB max PS2 configured as SSPA only)
RF Mute Isolation	-60 dBc min
AM/PM Conversion	2° typ, 3.5° max @ Rated P1dB
Third-order Intermodulation Level (2 tones, @ -3 dB Total Backoff from P1 dB (-6 dBc SCL), Δ 1MHz)	-30 dBc typ, -25 dBc Guaranteed

Spurious Level	Harmonics	-50 dBc @ Prated – 3 dB
	Carrier Related In Band	-60 dBc min @ P1dB
	Non-Carrier Related In Band	-60 dBm max (Input Terminated)
	LO Leakage	-25 dBm max

Group delay variation	Linear	± 0.03 ns/MHz
	Parabolic	±0 .003 ns/MHz^2
	Ripple	± 1.0 ns pk-pk

Data Logging Parameters	Non-Volatile RAM: Capacity 30 days @ 90-minute intervals. Includes: • RF Output Power • Mute Status • Heatsink Temperature • LNB Bias Current

Phase Noise (dBc/Hz) (with optional internal or equivalent performance external reference)		Typical (C/X/Ku) dBc/Hz	Spec (C/X/Ku) dBc/Hz
Offset	100 Hz	-79/-78/-76	-72/-72/-69
	1 KHz	-91/-87/-85	-84/-84/-82
	10 KHz	-105/-104/-98	-97/-97/-90
	100 KHz	-120/-114/-114	-107/-107/-102
	1 MHz	-132/-132/-132	-115/-115/-115

1.5.2 Optional Internal Reference

Internal Reference Oscillator Frequency	10 MHz (can lock to modem supplied reference over a range of -5 dBm to +5 dBm at IF Input)
Frequency Stability	$\pm5 \times 10^{-10}$/day
	$\pm1 \times 10^{-8}$ (-40 to 55°C)

1.5.3 Optional LNB Bias / Reference

LNB Bias Voltage	Software selectable tone on/off, 12/18 V, 450 mA max
LNB 10 MHz Reference Output Level	0 dBm ±5 dB
LNB Input / Output Return Loss	15 dB
LNB Input / Output Gain	10 dB ± 2 dB (950-1750 MHz) -1 dB ± 2 dB (optional)
LNB Input / Output Gain Flatness	± 1 dB (950-1750 MHz)
LNB input / Output Isolation (Mute condition)	55 dB min

1.5.4 Environmental

Temperature	Operating	Standard	-40 to 131°F (-40 to 55°C)
		Optional	-40 to 140°F (-40 to 60°C)
	Storage		-67 to 167°F (-55 to 75°C)
Humidity			100% condensing rain 2″ per hour
Altitude			10,000 AMSL
Shock			Normal commercial shipping and handling

1.5.5 Physical

Weight	PS 1, 1.5		17 lbs. (9.1 kg) Nominal
	PS 2		47 lbs (21.32 kg) Nominal
Dimensions (excluding connectors) See Sect. 1.6 for all dimensional envelope figures	PS 1		12.65 x 6.26 x 7.37 in. (321.3 x 159 x 187.2 mm)
	PS 1.5		12.78 x 6.14 x 7.05 in. (324.6 x 156 x 179.1 mm)
	PS 2		16.18 x 8.80 x 9.78 x in. (427 x 223.5 x 248.4 mm)
Connectors	IF/RF Input		Type 'N' Female
	RF Output	PS 1	C-Band / X-band: Type 'N' Female (standard), CPR137G (optional) Ku-Band: WR75 (No groove)
		PS 1.5	C-Band: CPR137G X-Band: CPR112G Ku-Band: WR75 (No groove)
		PS 2	C-Band: CPR137G X-Band: CPR112G Ku-Band: WR75 (No groove)
	LNB Bias		Type 'N' Female
	M&C/Ethernet/ Redundancy Switches		19-pin MS style (single integrated cable assembly available, dependent upon configuration)

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1.6   Dimensional Envelopes

- Typical for all figures in each subsection, all dimensions are in inches. Bracketed dimensions, where shown, are in metric units (mm).
- Unless otherwise noted, all figures depict AC Option, Waveguide Output units.

Product / Section	Figure	Dimensional Envelope Description
LPOD PS 1 Section 1.6.1	Figure 1-4	PS 1 C-Band Dimensional Envelope (Coaxial Output)
	Figure 1-5	PS 1 C-Band Dimensional Envelope (Coaxial Output) – Reduced Height Unit
	Figure 1-6	PS 1 C-Band Dimensional Envelope
	Figure 1-7	PS 1 X-Band Dimensional Envelope
	Figure 1-8	PS 1 Ku-Band Dimensional Envelope
	Figure 1-9	PS 1 Ku-Band Dimensional Envelope – Reduced Height Unit
LPOD PS 1.5 Section 1.6.2	Figure 1-10	PS 1.5 C-Band Dimensional Envelope (DC Option)
	Figure 1-11	PS 1.5 C-Band Dimensional Envelope (AC Option)
	Figure 1-12	PS 1.5 X-Band Dimensional Envelope
	Figure 1-13	PS 1.5 Ku-Band Dimensional Envelope
LPOD PS 2 Section 1.6.3	Figure 1-14	PS 2 C-Band Dimensional Envelope
	Figure 1-15	PS 2 X-Band Dimensional Envelope
	Figure 1-16	PS 2 Ku-Band Dimensional Envelope

1.6.1   LPOD PS 1 Dimensional Envelopes
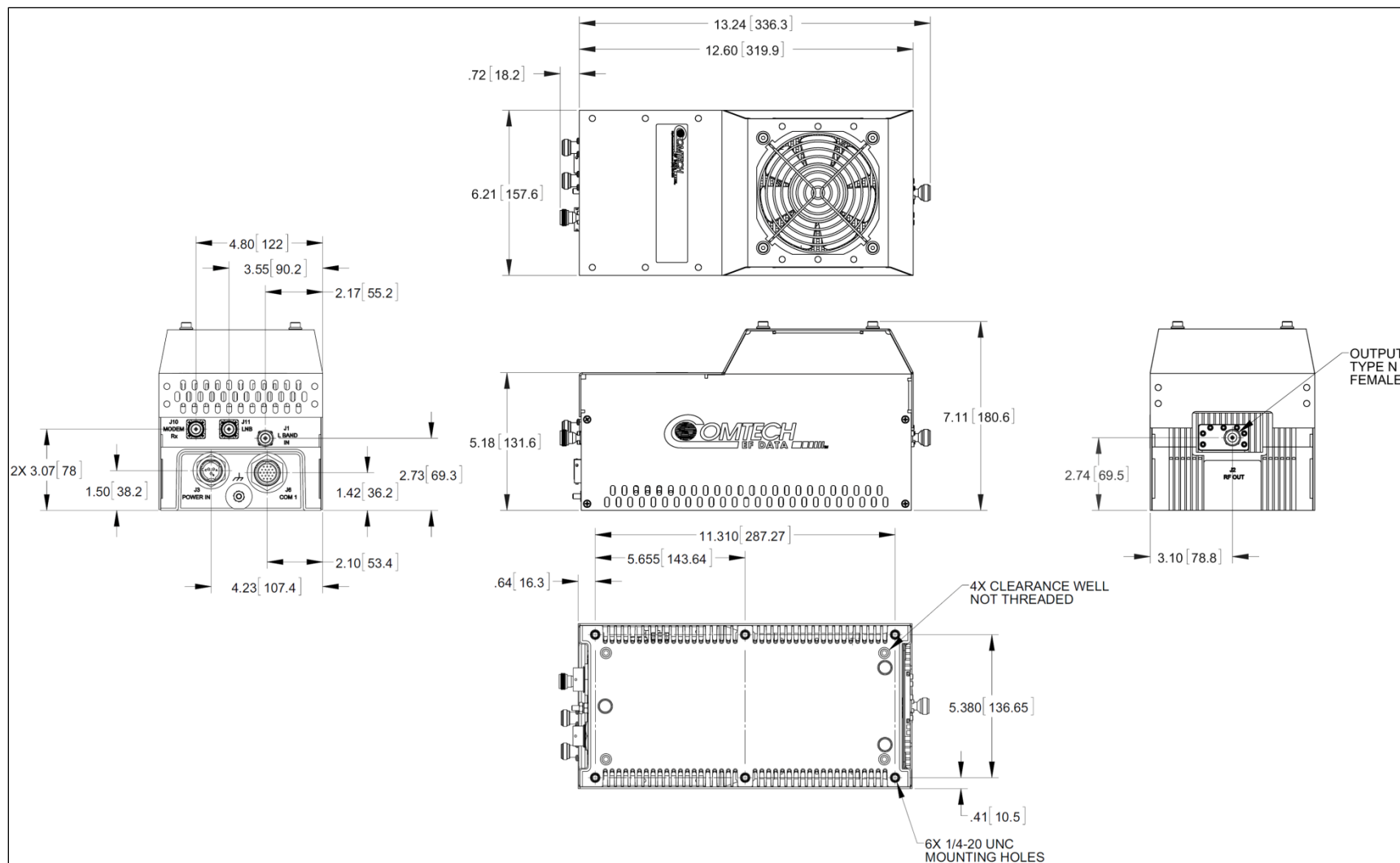
Figure 1-4. LPOD PS 1 C-Band Dimensional Envelope (Coax Output)
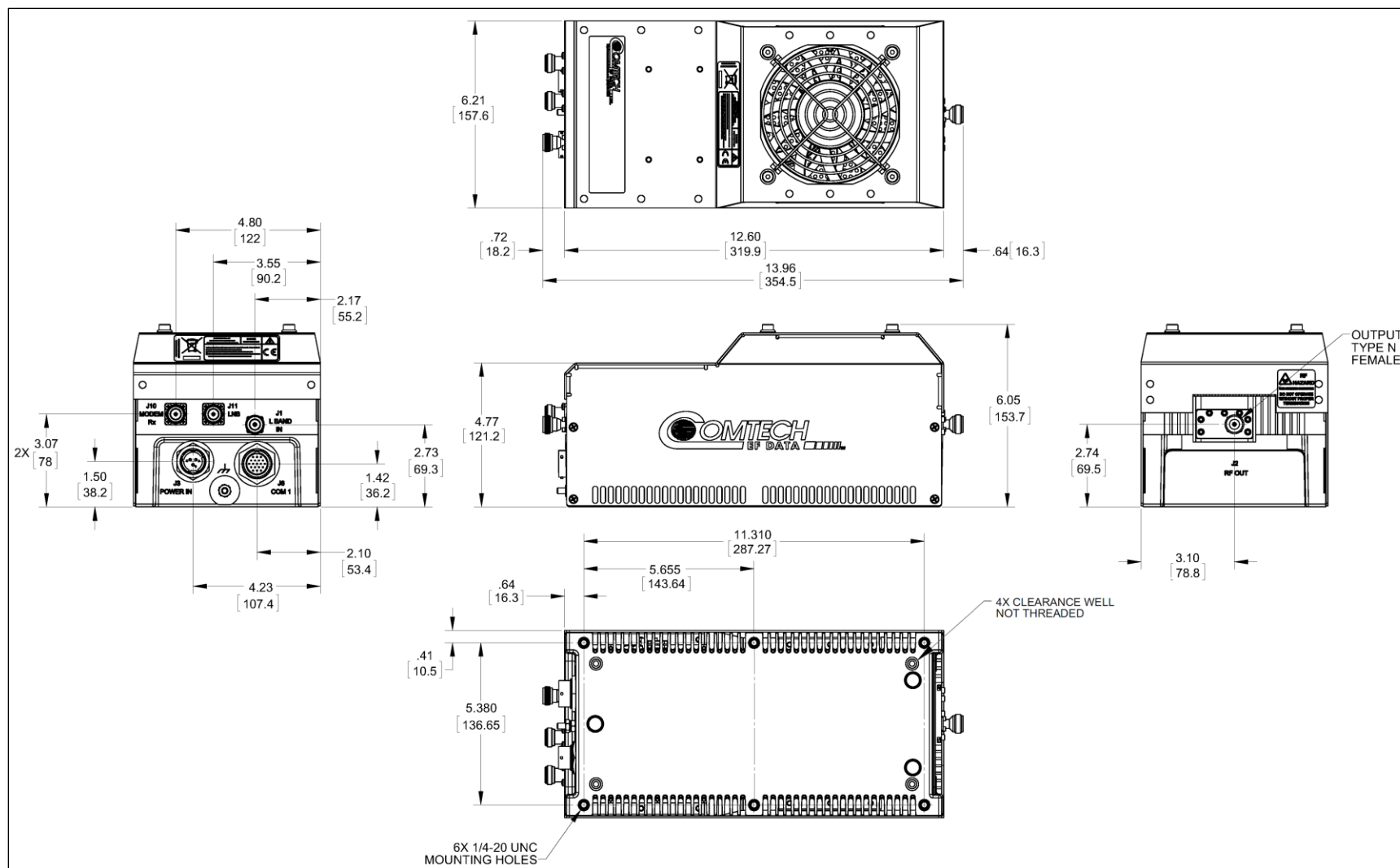
Figure 1-5. LPOD PS 1 C-Band Dimensional Envelope (Coax Output) – Reduced Height Unit
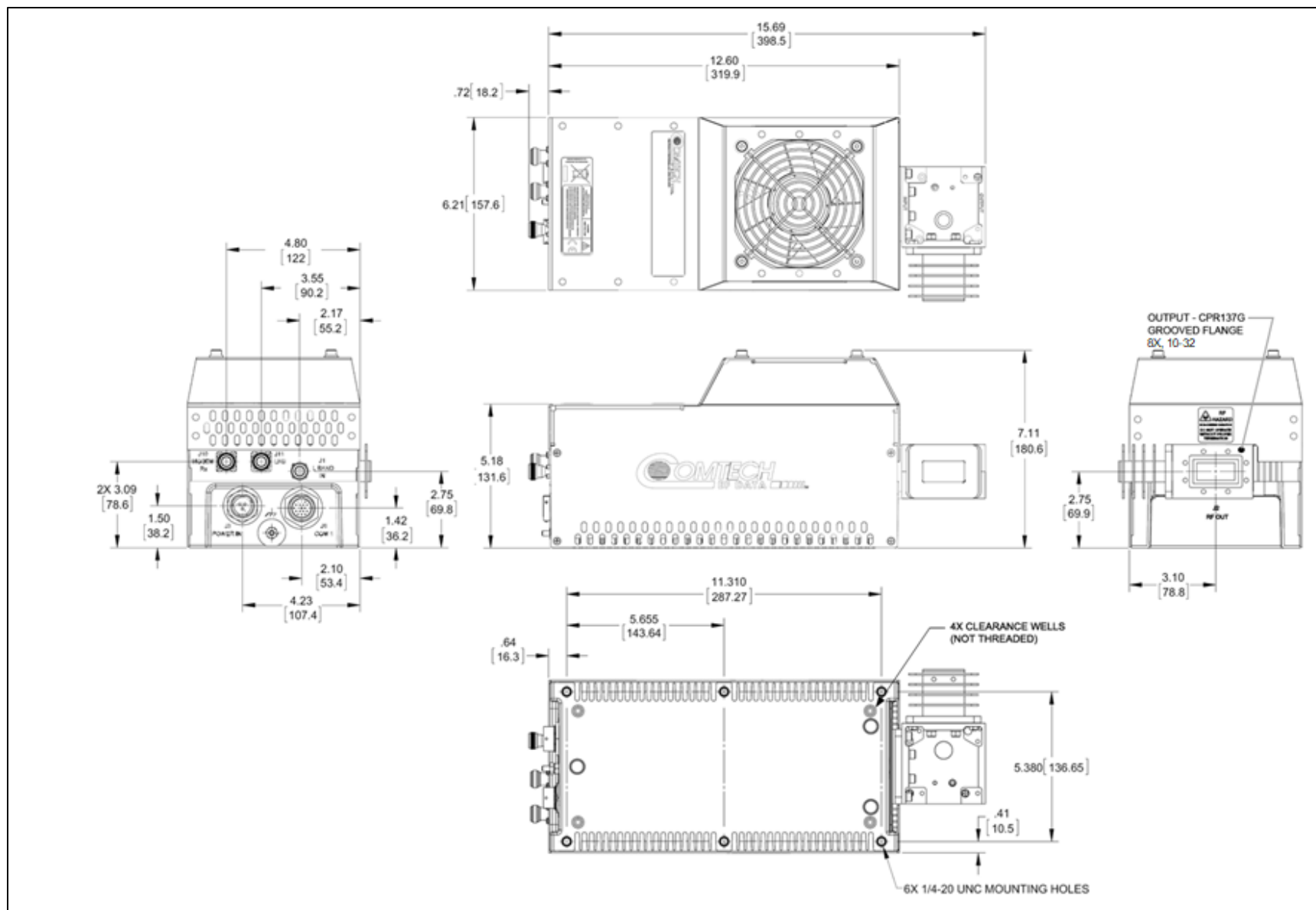
Figure 1-6. LPOD PS 1 C-Band Dimensional Envelope
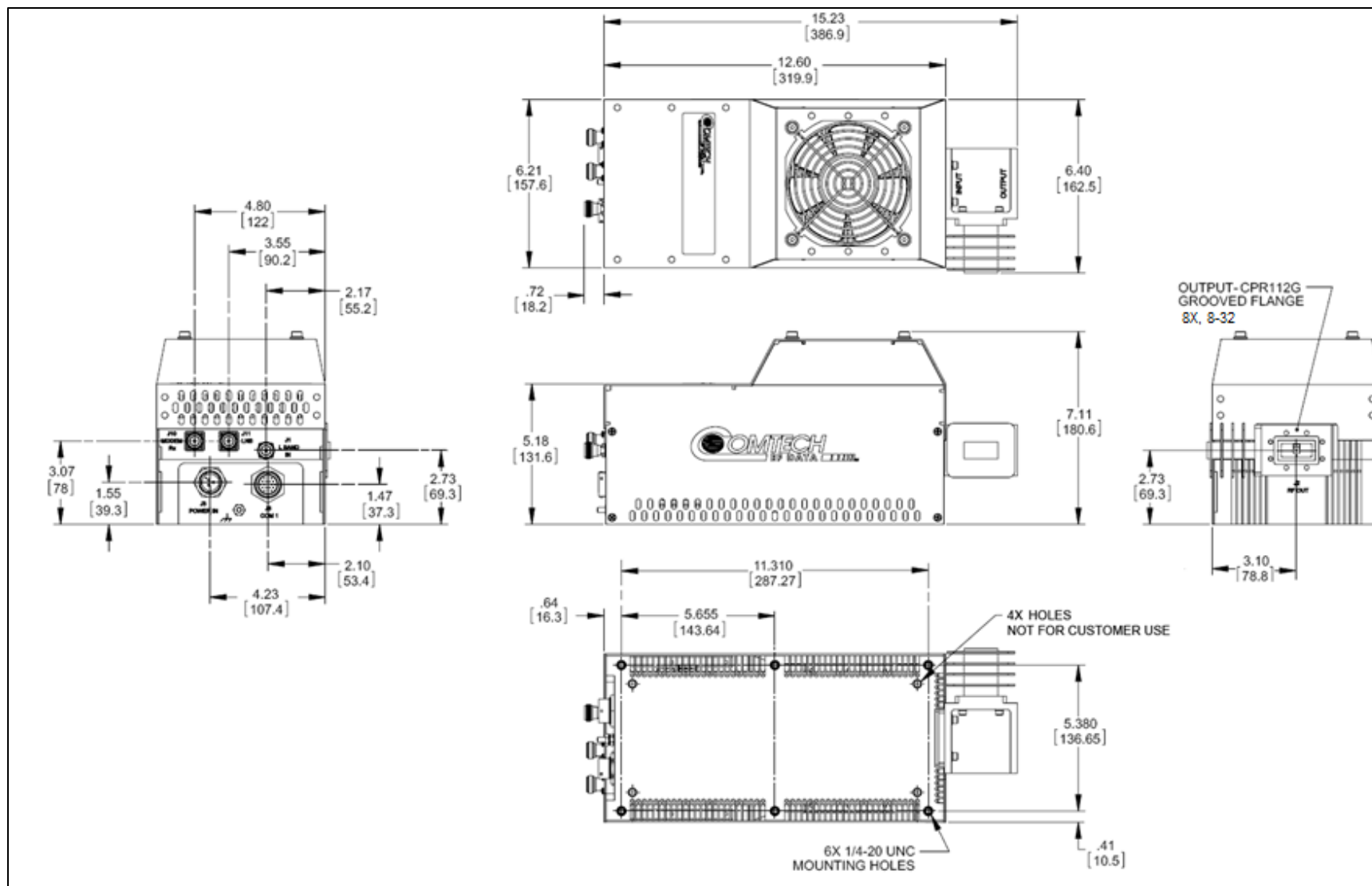
Figure 1-7. LPOD PS 1 X-Band Dimensional Envelope
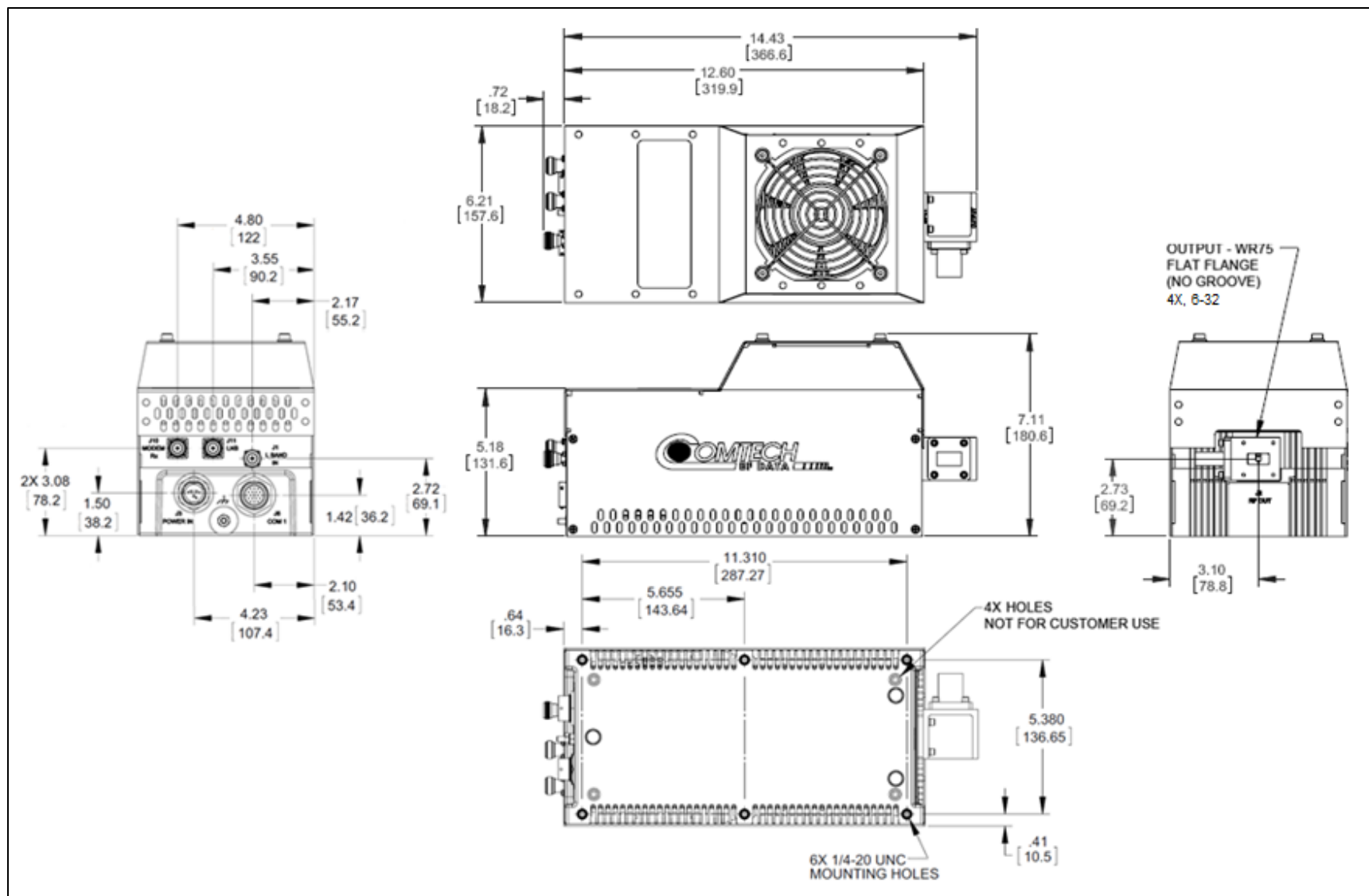
Figure 1-8. LPOD PS 1 Ku-Band Dimensional Envelope
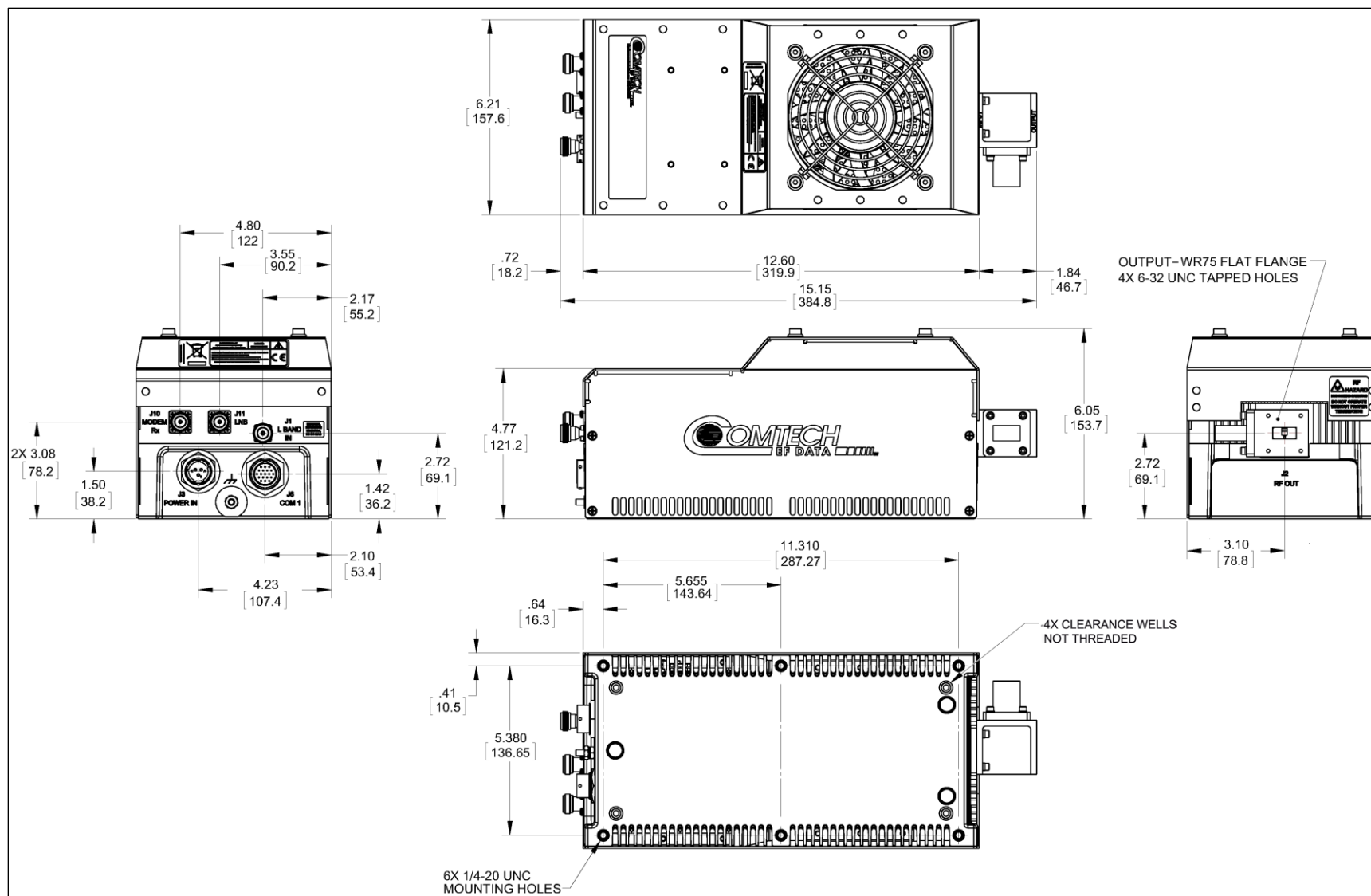
Figure 1-9. LPOD PS 1 Ku-Band Dimensional Envelope – Reduced Height Unit

1.6.2 LPOD PS 1.5 Dimensional Envelopes
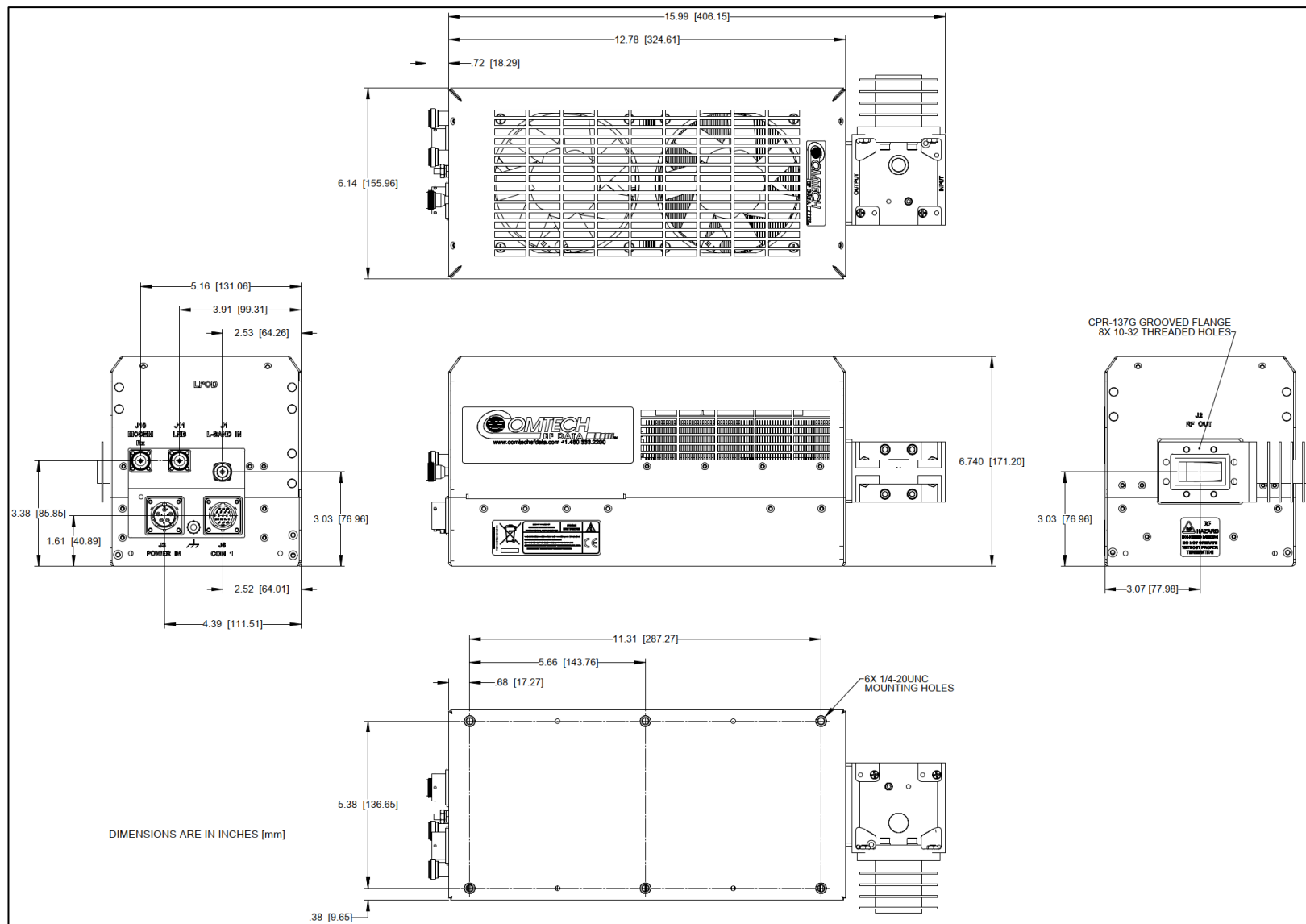
Figure 1-10. LPOD PS 1.5 C-Band Dimensional Envelope (DC Option)

Figure 1-11. LPOD PS 1.5 C-Band Dimensional Envelope (AC Option)

Figure 1-12. LPOD PS 1.5 X-Band Dimensional Envelope

Figure 1-13. LPOD PS 1.5 Ku-Band Dimensional Envelope
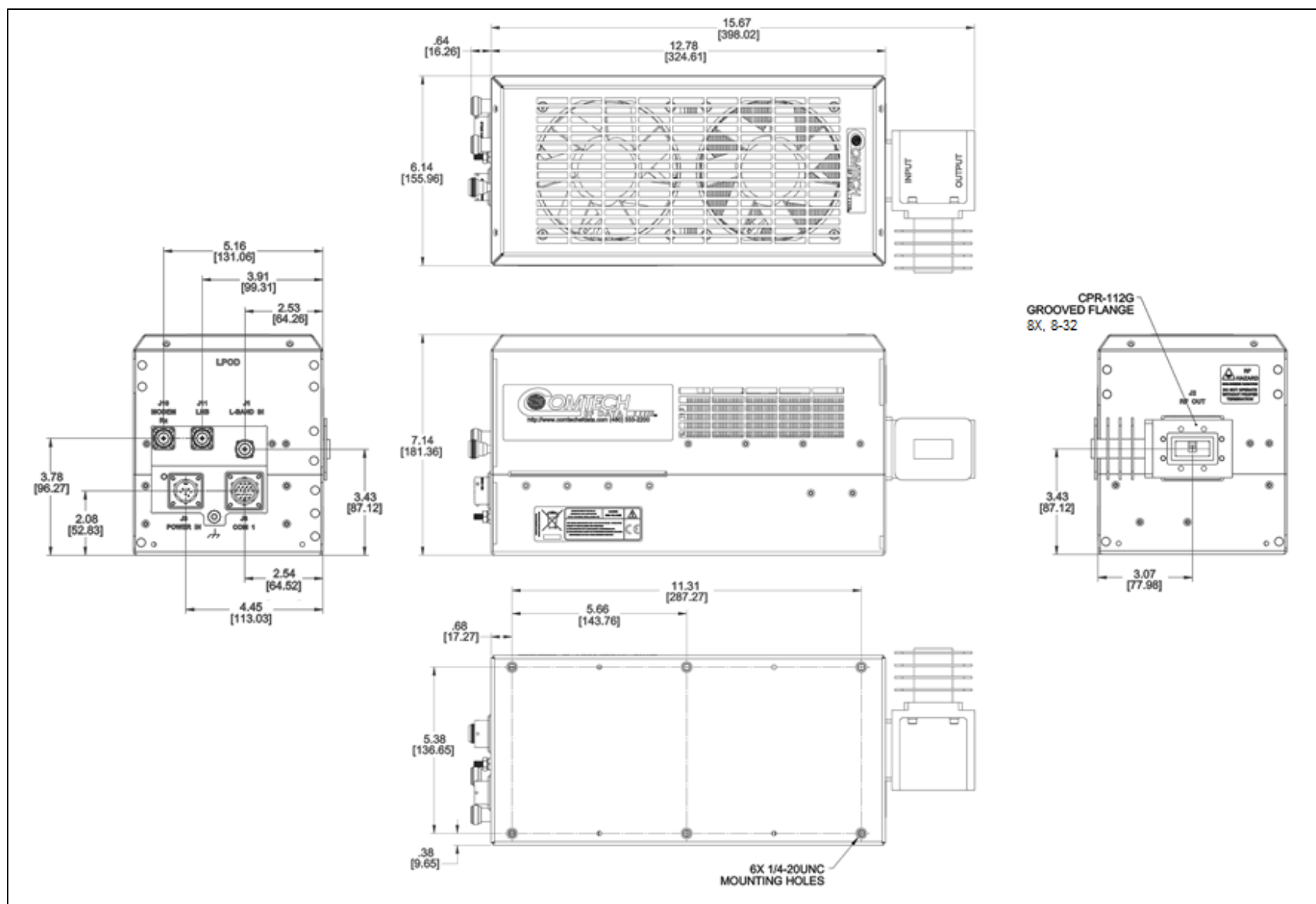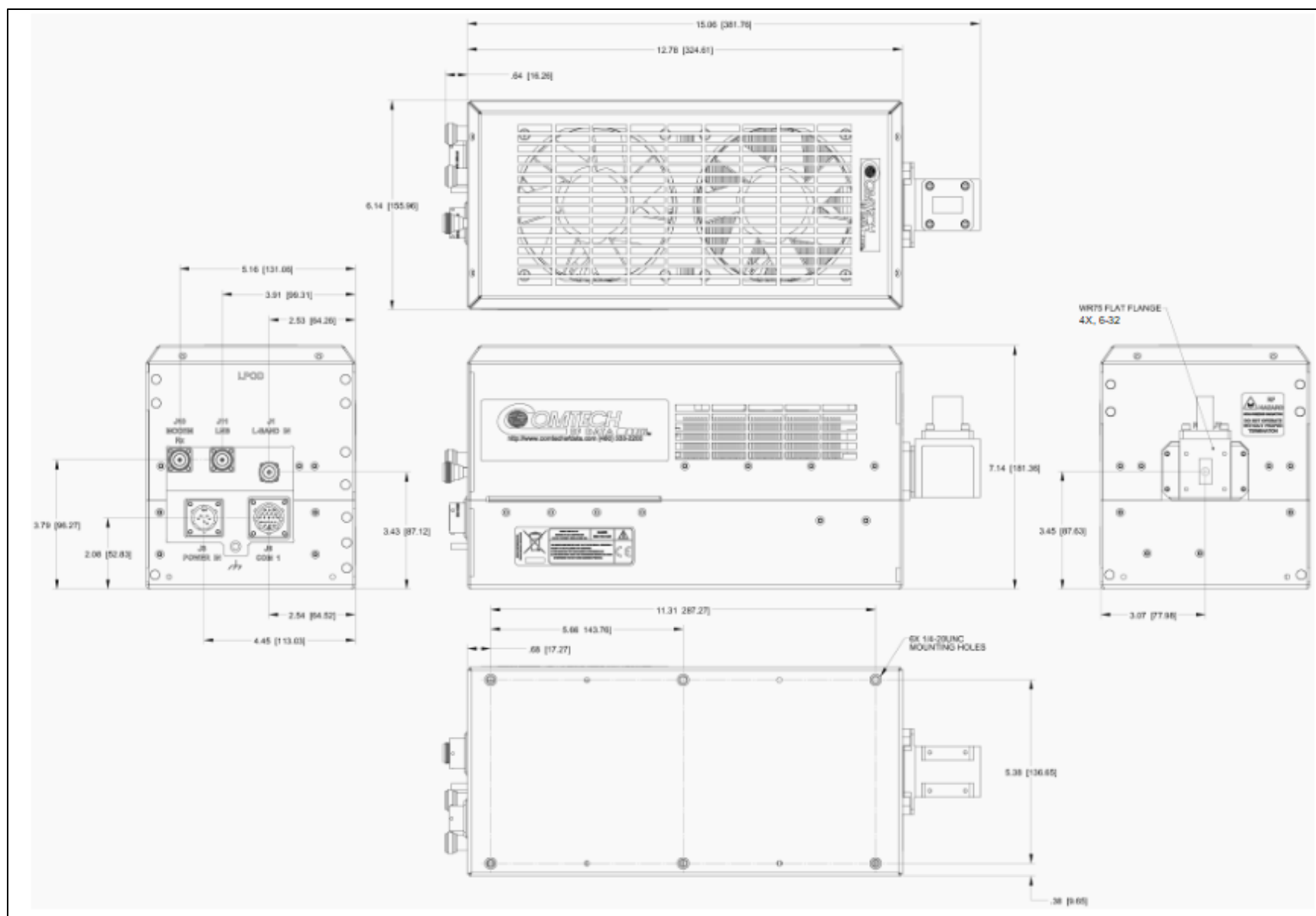
1.6.3   LPOD PS 2 Dimensional Envelopes

Figure 1-14. LPOD PS 2 C-Band Dimensional Envelope
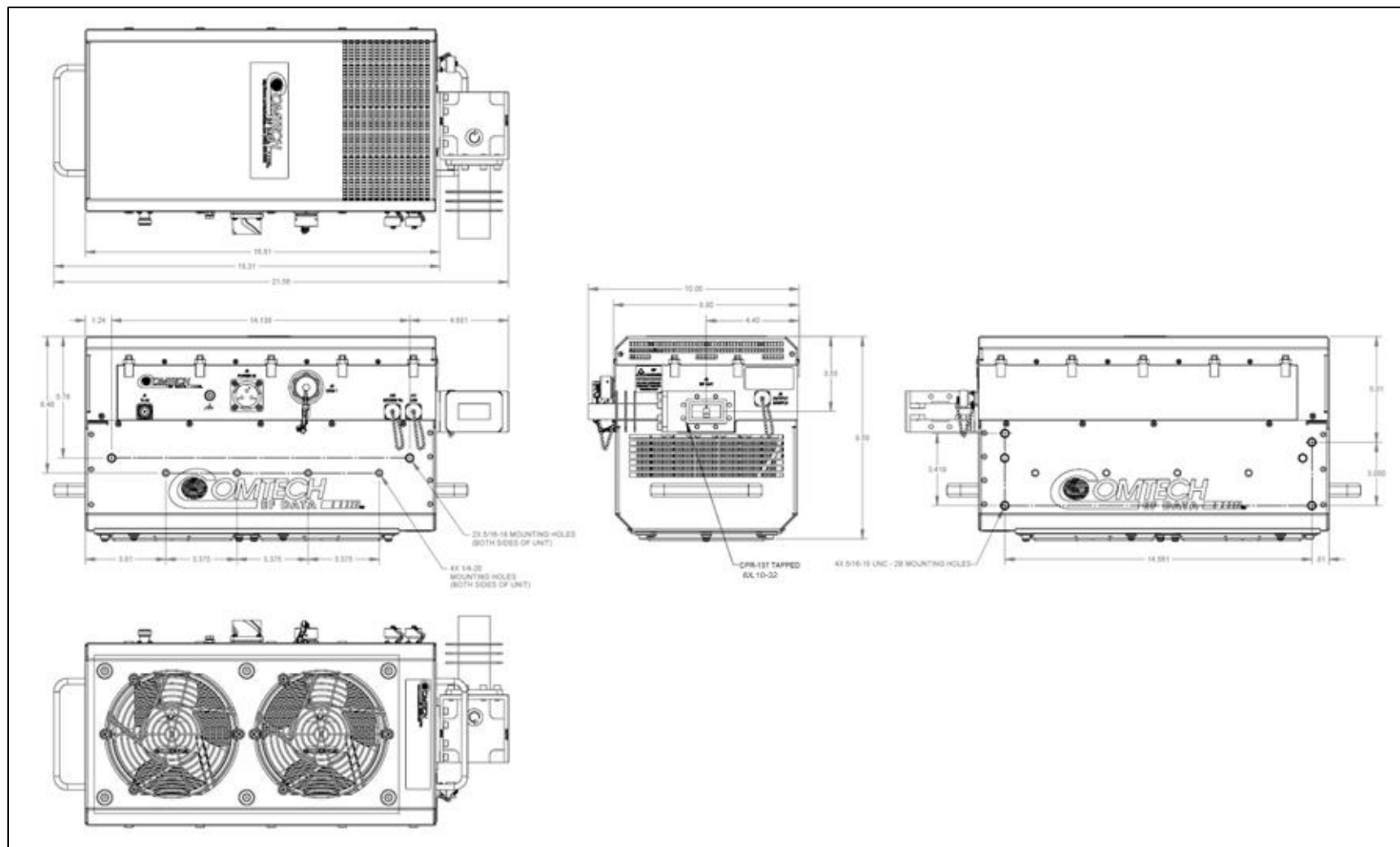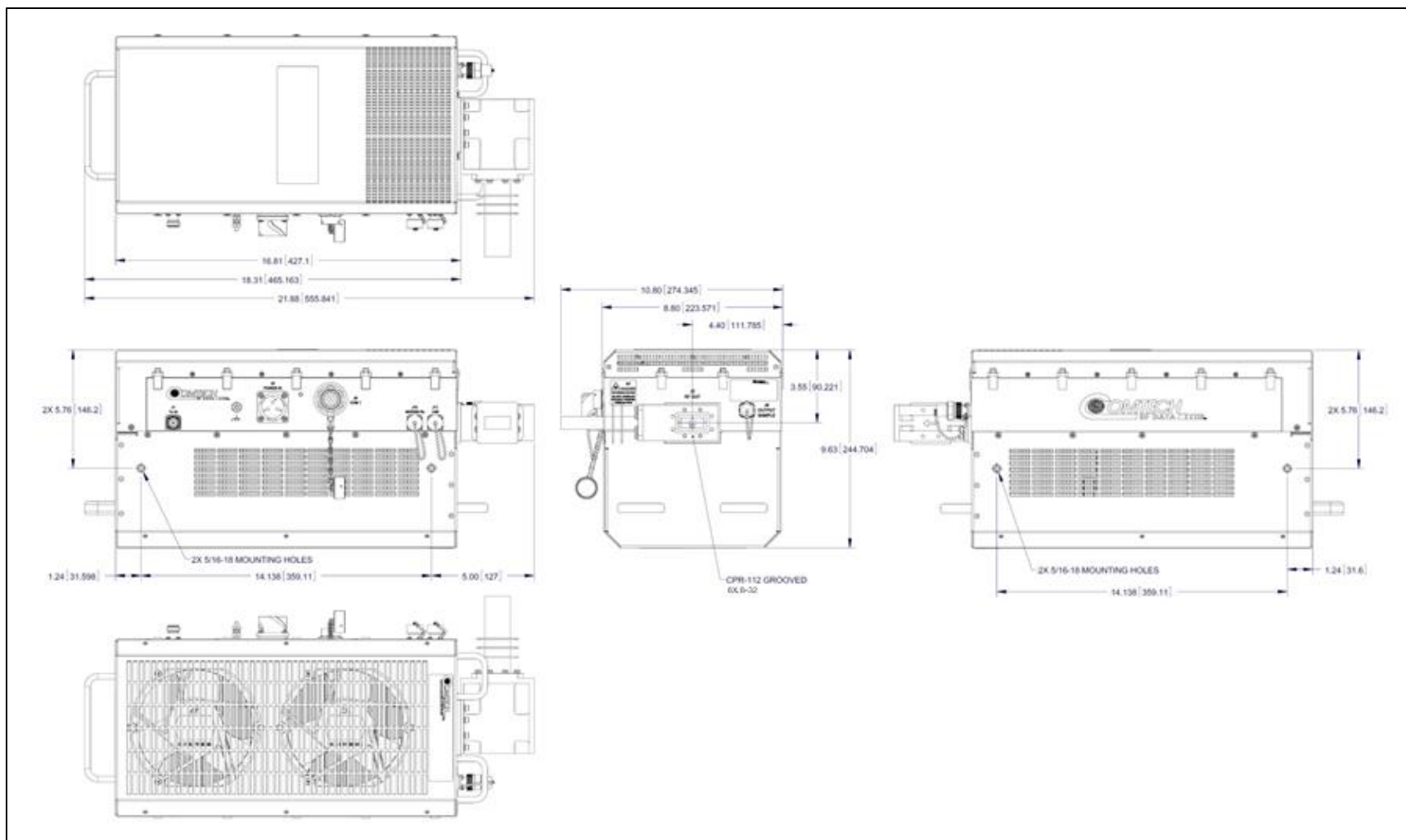
Figure 1-15. LPOD PS 2 X-Band Dimensional Envelope
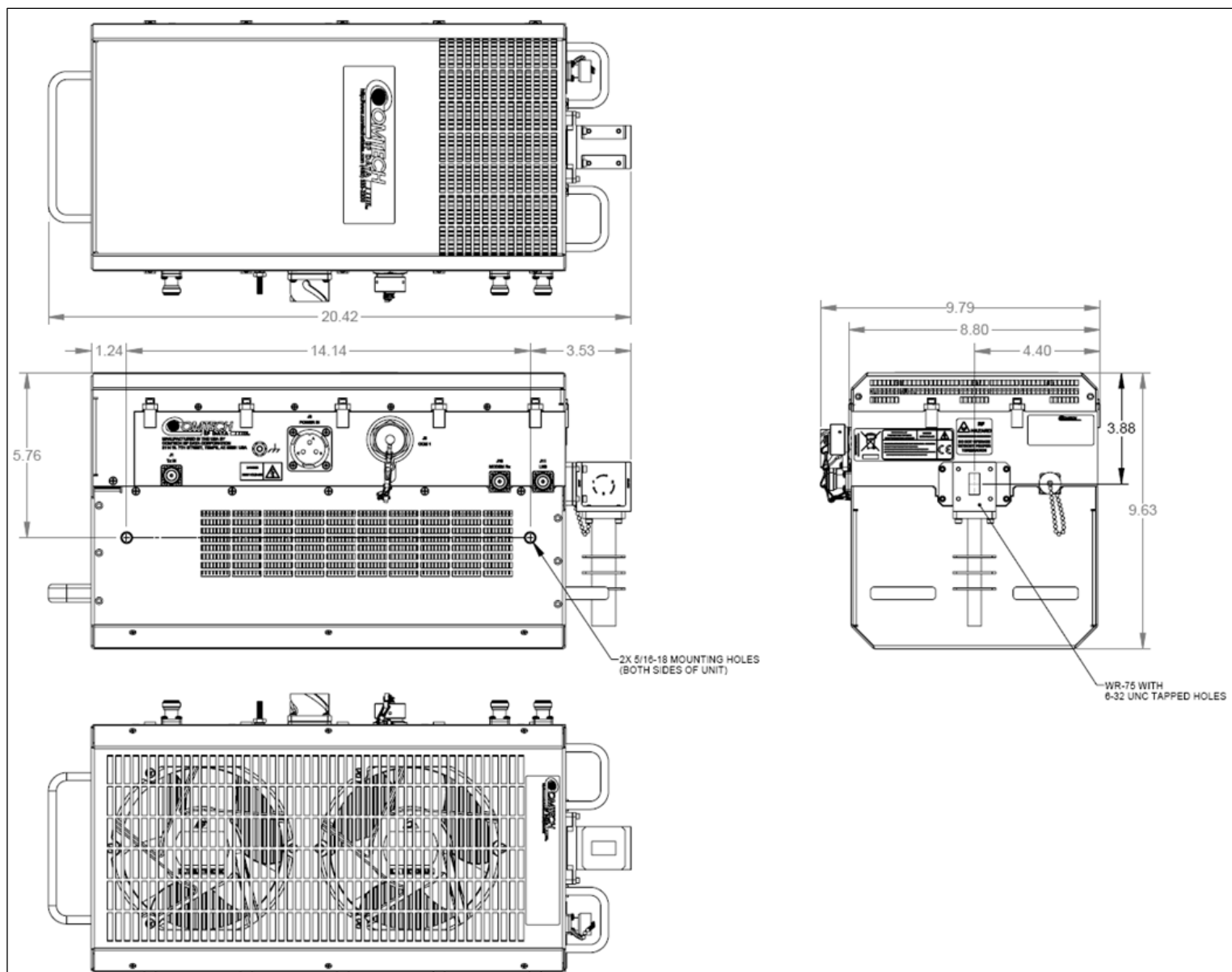
Figure 1-16. LPOD PS 2 Ku-Band Dimensional Envelope

Chapter 2. SYSTEM CONNECTORS, INSTALLATION, AND STARTUP

2.1 Overview

- See **Chapter 4. ETHERNET INTERFACE OPERATION** for information about using the LPOD's remote Ethernet M&C functionality.
- See **Chapter 5. SERIAL INTERFACE OPERATION** for information about using serial-based remote commands and queries.
- See **Appendix A. 1:1 REDUNDANCY** for detailed information for installing and using the LPODs in a 1:1 redundancy configuration.

This chapter provides user reference to the following:

- The LPOD connectors for signal input, signal output; M&C of the unit; and grounding of the unit to the antenna's grounding network.
- Available standalone installation kits.
- Instructions for installation and startup.

2.2 Cable Sealing and Wrapping

2.2.1 Water Tight Sealing

⚠ **All external cable assemblies for the outdoor equipment MUST be properly sealed to prevent water intrusion. Failure to achieve water tight sealing will result in possible performance degradation and even product failure.**

IMPORTANT: To maintain your product warranty, you must follow these guidelines and recommendations during equipment installation:

- Ensure all external connections to the equipment are hand-tightened and wrapped with a self-amalgamating tape such as **3M Type 23 Scotch Self-Amalgamating Tape** (or equivalent). The sealing must cover the external connector housing and extend beyond the end of the heatshrink that covers the connector termination of the cable assembly.
- Squeeze the self-amalgamating tape tightly and make sure both ends of the tape have formed around the connector and cable to create a water tight seal.
- ALL unused external connectors MUST be covered with caps and sealed. Make sure to inspect the connector cap rubber seal for cracks before using.

2.2.1.1 Customer Cable Water Tight Sealing

⚠ **Should you receive an accessory kit that contains only the mating cable connectors, or if you (the end-user) choose to supply your own cables and connectors, CEFD strongly recommends that you use an adhesive lined heatshrink such as *TE Connectivity #ATUM-24/6-0* (or equivalent) to cover the connector strain-relief area. Your sealed, water tight cable ends should appear as per this example:**

Figure 2-1. Water Tight Cable End Example

2.2.2 Cable Wrapping

Wrap all connections with self-amalgamating tape, as follows:

1. Wrap tape in the direction of the cable connection.

2. Pull the tape tight and use several layers. Make sure to start at the end of the connector connection.

3. Verify the tape covers all of the connector and makes contact with the unit.

2.3 Connectors and Cables

The LPOD external connectors provide all necessary connections between the PS 1 (Figure 2-2), PS 1.5 (Figure 2-3), or PS 2 (Figure 2-4) models and other equipment.
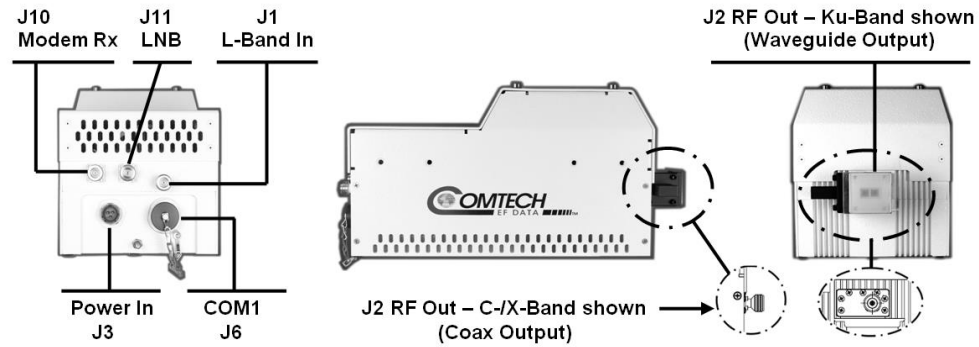
Figure 2-2. PS 1 Connectors
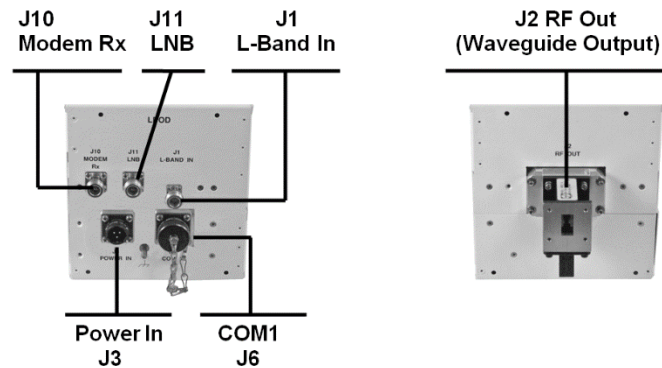
Figure 2-3. PS 1.5 Connectors
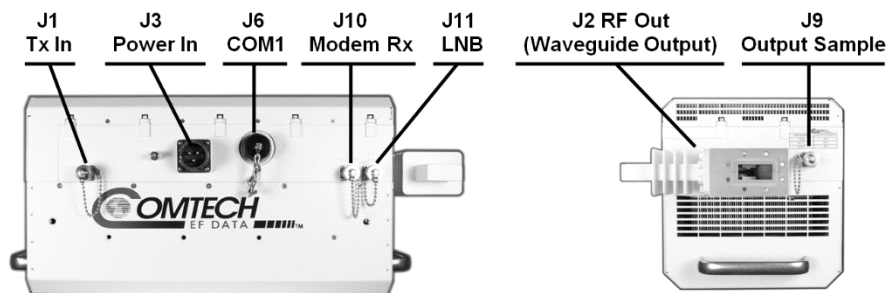
Figure 2-4. PS 2 Connectors

2.3.1 Connector 'J1 | LBAND IN' or 'J1 | Tx IN'

LPOD PS 1, PS 1.5   LPOD PS 2
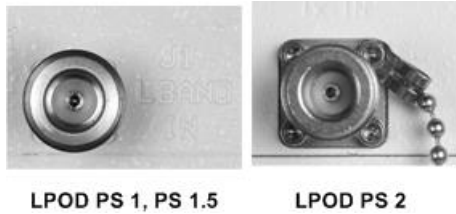
The RF input connector is a Type 'N' female connector. Labeled '**J1 | LBAND IN**' on the PS 1 and PS 1.5 models or '**J1 | Tx IN**' on the PS 2 model, typical input levels (-30 dBm), depend on desired output power and unit attenuation. To prevent damage to the LPOD, RF input levels should not exceed +15 dBm.

2.3.2 Connector 'J2 | RF OUT'

> ⚠ **FOR SAFETY REASONS, NEVER LOOK DIRECTLY INTO THE WAVEGUIDE OUTPUT.**

The '**J2 | RF OUT**' connector may be a waveguide or coaxial interface – the type of interface used depends on the LPOD model and/or frequency range of the unit. See Table 2-1 and Figure 2-2, Figure 2-3, or Figure 2-4.

Table 2-1. 'J2 | RF OUT' Interface Type

Unit	Frequency Band	Output Type	Figure
PS 1	C	Type 'N' Female (Standard) CPR137G (Optional)	2-3
	X	CPR112G (Waveguide)	
	Ku	WR75 (Waveguide)	
PS 1.5	C	CPR137G (Waveguide)	2-4
	X	CPR112G (Waveguide)	
	Ku	WR75 (Waveguide)	
PS 2	C	CPR137G (Waveguide)	2-5
	X	CPR112G (Waveguide)	
	Ku	WR75 (Waveguide)	

2.3.3   Connector 'J3 | POWER IN' AC Power Mains

⚠️ **FOR SAFETY REASONS, MAKE SURE YOU KNOW THAT THE 'J3 | POWER IN' AC POWER CONNECTION PIN ASSIGNMENTS ARE DIFFERENT FOR EACH LPOD UNIT. YOU MUST USE THE CORRECT PIN ASSIGNMENTS.**

INCORRECT USE OF PIN ASSIGNMENTS CAN RESULT IN PRODUCT DAMAGE OR PERSONAL INJURY.

For all LPOD models, the prime power input requirement is as follows:

- 90 to 264 VAC
- 47 to 63 Hz

The power supply is power factor corrected. The total power required from the prime power supply depends on the model used. See **Sect. 1.5 Summary of Specifications** for more information.

2.3.3.1   PS 1, PS 1.5 'J3 | POWER IN' AC Power Main

The mating connector specification and pin assignments specific to the PS 1 and PS 1.5 AC power interfaces are as follows:

Mating Connector:
CEFD P/N CN/MS-STPG03F02 (ITT Cannon KPT06B-12-35)

Table 2-2. PS 1/PS 1.5 'J3 | POWER IN' Pin Assignments

Pin	Description
A	LINE (L1)
B	NEUTRAL (L2)
C	GND

2.3.3.2   PS 2 'J3 | POWER IN' AC Power Main
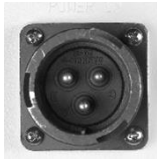
The mating connector specification and the pin assignments specific to the PS 2 AC power interface are as follows:

Mating Connector:
CEFD P/N CN/MS-STPG03F07 (Glenair ITS-3106F20-19SF7)

Table 2-3. PS 2 'J3 | POWER IN' Pin Assignments

Pin	Description
A	GND
B	NEUTRAL (L2)
C	LINE (L1)

2.3.4   Connector 'J3 | POWER IN' DC Power Mains

<table>
<tr><td>⚠️</td><td>FOR SAFETY REASONS, MAKE SURE YOU KNOW THAT THE 'J3 | POWER IN' DC POWER CONNECTION PIN ASSIGNMENTS ARE DIFFERENT FOR EACH LPOD UNIT. YOU MUST USE THE CORRECT PIN ASSIGNMENTS.

INCORRECT USE OF PIN ASSIGNMENTS CAN RESULT IN PRODUCT DAMAGE OR PERSONAL INJURY.</td></tr>
</table>

For all LPOD models, the prime power input requirement is 38 to 72 VDC. The total power required from the prime power supply depends on the model used. See **Sect. 1.5 Summary of Specifications** for more information.

2.3.4.1   PS 1 'J3 | POWER IN' DC Power Main

The mating connector specification and the pin assignments (Table 2-4) specific to the PS 1 DC power interface are as follows:

Mating Connector:
CEFD P/N CN/STPG04F01 (Glenair IPT06E-12-4-SSR-F7)

Table 2-4. PS 1 'J3 | POWER IN' Pin Assignments

Pin	Description
A	V+
B	GND
C	V-
D	NO CONNECT

2.3.4.2   PS 1.5 'J3 | POWER IN' DC Power Main
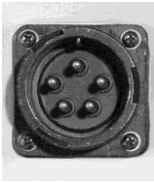
The mating connector specification and the pin assignments specific to the PS 1.5 DC power interface are as follows:

Mating Connector:
CEFD P/N CN-0020517 (MS3116E-14-5S(476), Amphenol PT06E-14-5S(476))

Table 2-5. PS 1.5 'J3 | POWER IN' Pin Assignments

Pin	Description
A	+ V
B	+ V
C	- V
D	- V
E	GND

2.3.4.3   PS 2 'J3 | POWER IN' DC Power Main
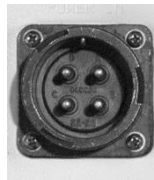
The mating connector specification and the pin assignments specific to the PS 2 DC power interface are as follows:

Mating Connector:
CEFD P/N CN/CA3106E2222SB (ITT Cannon CA3106E22-22SB)

Table 2-6. PS 2 'J3 | POWER IN' Pin Assignments

Pin	Description
A	V+
B	NO CONNECT
C	NO CONNECT
D	V-

2.3.4.4   PS 2 'J3 | POWER IN' 48 VDC Power Main Option

The connector type and mating connector specification and the pin assignments specific to the PS 2 48 VDC power interface option are as follows:

Unit Connector Type:
CEFD P/N CN-0000288 (ITT Cannon CA3102E20-15SB-F80A232)

Supplied Mating Connector:
CEFD P/N CN-0000289 (ITT Cannon CA3106E20-15SB-F80A232)

Table 2-7. PS 2 'J3 | POWER IN' 48 VDC Pin Assignments

Pin	Description
A	V+
B	V+
C	NO CONNECT
D	NO CONNECT
E	V-
F	V-
G	GROUND (Note 2)

Notes:
1. Use 12 AWG wire to each of the appropriate pins, according to the individual pin assignments.
2. As an alternative, the ground connection can be made to the unit's external ground stud.

2.3.5 Connector 'J6 | COM1' (Remote Communications and Discrete Control Port)
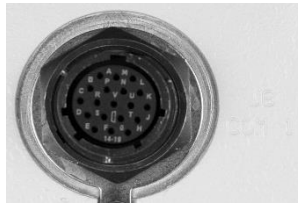
PS 1/PS 1.5   **PS 2**

The **'J6 | COM 1'** discrete control connector is the primary input for controlling and monitoring the LPOD. It is a 19-pin circular connector, type MS3112E14-19S.

Note: For use where compliance to MIL-STD-461E RE102 Army Ground is required, a shielded cable with an appropriate ferrite bead is required. Contact factory for details.

Mating connector:
MS3116J14-19P or ITT KPT06J14-19P

Table 2-8. 'J6 | COM1' Pin Assignments

Pin	Name	Description
A	RS485_+RX	
B	RS485_-RX	
C	RS485_+TX	
D	RS485_-TX	
E	RS232_RD	Pin 3 of DB9 female connector
F	Ethernet TX+	Pin 3 of RJ45 female connector
G	RS232_TD	Pin 2 of DB9 female connector
H	Ethernet TX-	Pin 6 of RJ45 female connector
J	TX/RX Switch Drive 1 Pos	Not for customer use
K	GND	Ground (also Pin 5 of DB-9F connector)
L	SUMFLT In	Open when faulted, otherwise+5 VDC
M	SUMFLT Out	When faulted, tied to Pin K, otherwise open
N	TX Switch Pos 1 Ind	Online/Offline indication
P	RX Switch Pos 1 Ind	Not for customer use
R	+24V	Not for customer use
S	System Mute Control	When AUX=1, unit is muted until this pin is tied to ground (Pin K). When tied to ground, the unit unmutes. See the AUX remote command in Chapter 5. SERIAL INTERFACE OPERATION.
T	Switch Common	GND reference for Pin N
U	Ethernet RX-	Pin 2 of RJ45 female connector
V	Ethernet RX+	Pin 1 of RJ45 female connector

2.3.5.1   Circular Connectors

The connector pairs (Figure 2-5) feature a sleeve lock configuration, with an array of pins (male side) coupled to mating sockets (female side).
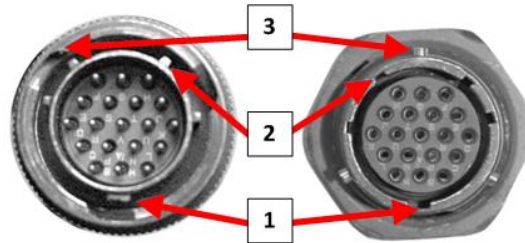
Item	Description
1	Primary Alignment features
2	Secondary Alignment features
3	Sleeve Lock features

Figure 2-5. Circular Connector Example
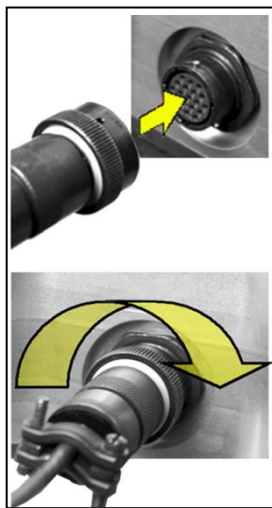
Connection Instructions – Engage all of the alignment and lock features between the male connector (on the interconnection cable) and female socket. To install the male connector into the female connector, do these steps:

Step 1 – Engage the primary and secondary alignment tabs on the male connector with the mating cutouts on the female socket.

Step 2 – Push the male connector into the female socket.

Step 3 – Turn the male connector sleeve clockwise until the sleeve lock cutouts engage fully with the female socket tabs and you hear a "click" sound.

2.3.6 Connector 'J9 | OUTPUT SAMPLE' (PS 2 Only)
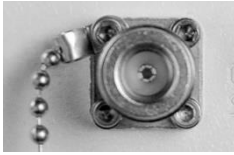
The **'J9 | OUTPUT SAMPLE'** port is a Type 'N' female connector available only on the PS 2 model. It provides a nominal -40 dB sample of the output signal. A calibration label is provided near the connector that shows the actual coupling values vs. frequency.

2.3.7 Connectors 'J10 | MODEM Rx' and 'J11 | LNB' (Optional Interfaces)

The **'J10 | MODEM Rx'** and **'J11 | LNB'** ports are both Type 'N' female connectors, providing both bias and a reference signal to an LNB, and passing the LNB's L-Band output to the modem's Rx input.
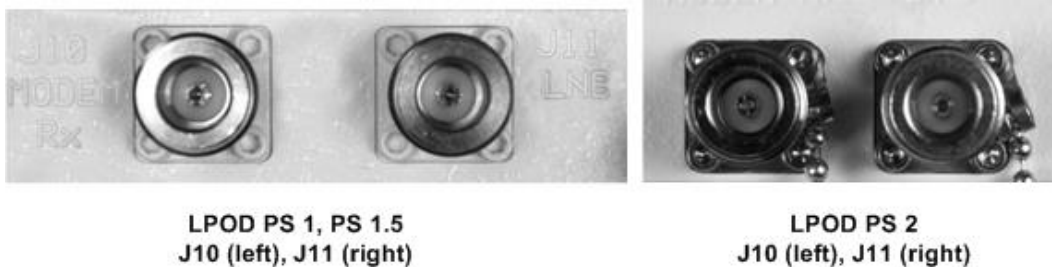
Figure 2-6. 'J10 | Modem Rx' and 'J11 | LNB' Connectors

2.3.8 Ground Connector

Use this #10-32 stud, available where shown in Figure 2-7, to connect a common chassis ground among equipment.
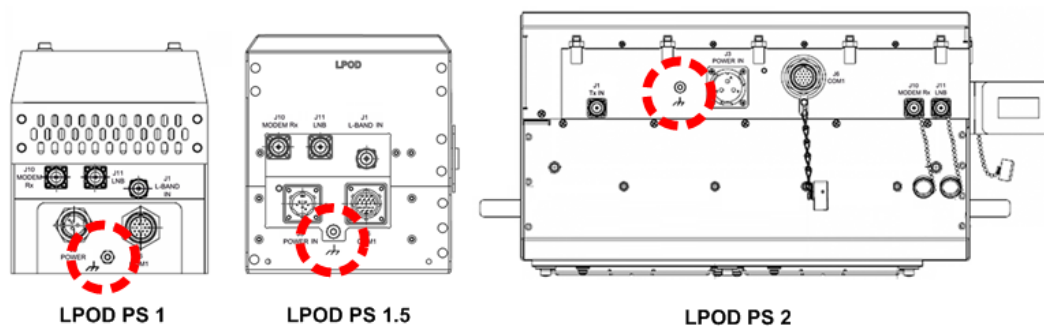
Figure 2-7. Ground Connector Locations

2.4   LPOD Standalone (Single-Thread) Installations

- See **Section 2.2 Water Tight Sealing** in this chapter for important outdoor installation considerations.
- See **Appendix A. 1:1 REDUNDANCY** for the available assembly kit options for 1:1 LPOD redundancy configurations.
- See **Appendix B. CABLE DRAWINGS** for information about the cables that are available for use with the LPOD in Standalone or 1:1 Redundancy operation.

The terms "standalone" or "single-thread" refers to applications that use a single (1) LPOD unit, whereas a 1:1 Redundancy System employs two (2) LPODs operating in redundancy.

Several kits are available from CEFD to mount and install standalone or 1:1 Redundancy LPODs, depending on the LPOD unit ordered:

- See Sect. 2.4.3 for standalone assembly and installation information for pole-mounted LPOD configurations.
- See Sect. 2.4.4 for standalone assembly and installation for spar-mounted LPOD configurations.
- See Sect. 2.4.5 for standalone assembly and installation for shelf-mounted LPOD configurations.

2.4.1   Manpower Requirements

CEFD recommends that, at a minimum, two technicians are employed to install any LPOD Standalone System.

2.4.2   Typical Required Installation Tools

CEFD recommends that, at a minimum, you use the following tools to install any LPOD Standalone System:

- Adjustable wrench;
- English *and* Metric unit box or socket wrenches (hex nuts and hex head bolts are used);
- Medium Phillips™ screwdriver (Phillips head screws are used);
- Tin snips.

2.4.3   Pole-Mounted Installations

The Universal Pole Mount Kit PL/12319-1 is used in combination with pole-mounted standalone and 1:1 Redundant LPOD installation kits. For the purpose of brevity, all further reference to this kit's usage – for either standalone or 1:1 redundant applications – directs you back to this chapter section.

Section	CEFD Part No.	Description	Refer to
2.4.3.1	PL/12319-1	Universal Pole Mounting Kit	Figure 2-9 Figure 2-10
2.4.3.2	KT-0000095	LPOD PS 1, PS 1.5 Single Unit Mounting Kit	Figure 2-11
2.4.3.3	KT-0000125	LPOD PS 2 Single Unit Mounting Kit	Figure 2-12

2.4.3.1   Universal Pole Mounting Kit (PL/12319-1)

> ⓘ *This kit accommodates a pole diameter of up to 13.00" (33.02 cm) OD maximum.*
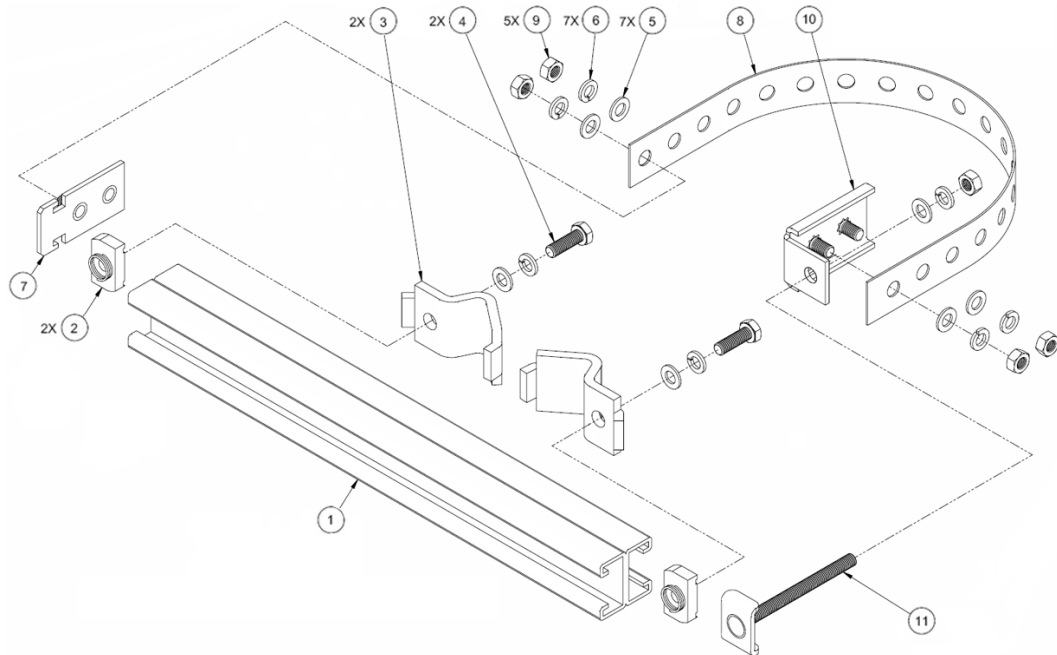
Item	Qty	CEFD Part Number	Description
1	1	N/A	DUAL CHANNEL UNISTRUT (SHOWN FOR CLARITY ONLY – P/O LPOD MOUNTING KIT)
2	2	HW/M8SPRING NUT	SPRING NUT, M8
3	2	HW/BLK-PIPE2-8	PIPE BLOCK
4	2	HW/M8X1.25X25HEXSS	SS HEX HEAD BOLT, M8, 25MM LG
5	7	HW/M8FLATSS	SS FLAT WASHER, M8
6	7	HW/M8LOCKSS	SS LOCK WASHER, M8
7	1	FP/BR0069	FLOATING STRAP BRACKET
8	1	FP/BR0071	PIPE STRAP (TRIM TO REQUIRED LENGTH)
9	5	HW/M8X1.25MMHEXNUTSS	SS HEX NUT, M8
10	1	FP/BR0070	FIXED STRAP BRACKET AND STRAP
11	1	FP/BR0072	STRAP TENSIONER BOLT

Figure 2-8. Universal Pole Mounting Kit (PL/12319-1)

Use this kit in combination with a product-specific LPOD mounting kit to secure the LPOD standalone configuration to a standard satellite dish support pole. The number of kits used depends on the weight of the unit.

Do these steps to install each kit:

1. Place the Unistrut (Item 1) on a flat surface.

2. Slide both spring nuts (Item 2) into the Unistrut channel. Make sure to seat the springs against the interior wall of the channel.

3. Loosely fasten the Pipe Blocks (Item 3) to the spring nuts using (2X each) M8 hex bolts (Item 4), flat washers (Item 5), and lock washers (Item 6).

4. Position the semi-assembled Unistrut (Item 1) and Pipe Blocks (Item 3) against the mounting pole, then slide the Pipe Blocks until they contact either side of the mounting pole. Make sure that the Pipe Blocks are centered within the Unistrut (Item 1). Tighten the mounting hardware.

5. Slide the Floating Strap Bracket (Item 7) into the Unistrut channel (Item 1). Make sure that the bracket studs face outward.

6. Loosely assemble the Floating Strap Bracket to the Pipe Strap (Item 8) with (2X each) M8 flat washers (Item 5), lock washers (Item 6), and hex nuts (Item 9).

7. Holding the kit subassembly in place against the mounting pole, slide the Fixed Strap Bracket (Item 10) into the Unistrut channel (Item 1) until it abuts the adjacent Pipe Block (Item 3).

8. Wrap the Pipe Strap (Item 8) around the pole, fitting the strap onto the Fixed Strap Bracket (Item 10) studs as snugly as possible. Score or otherwise mark a trim line on the Pipe Strap (Item 8) then, using the tin snips, trim the Pipe Strap to suit as shown in the side view provided in Figure 2-9.

9. Remove the Fixed Strap Bracket (Item 10) from the Unistrut channel (Item 1) and assemble the Strap Tensioner Bolt (Item 11) to the Fixed Strap Bracket (Item 10). Note that the bolt head will abut the interior wall of the channel.

10. Slide this subassembly back into the Unistrut channel (Item 1) until it abuts the adjacent Pipe Block (Item 3).

11. Secure the Pipe Strap (Item 8) using the Fixed Strap Bracket (Item 10), with (2X each) M8 hex nuts (Item 9), flat washers (Item 5), and lock washers (Item 6).

12. As shown in the side view provided in Figure 2-9, secure the Fixed Strap Bracket (Item 10) in place using the Strap Tensioner Bolt (Item 11) with (1X each) M8 flat washer (Item5), lock washer (Item 6), and hex nut (Item 9); tighten as needed.

The assembled kit appears as shown in the top and side view example shown in Figure 2-9. Depending on the application, you may proceed to the next phase of installation.

Pipe Strap (Item 8)
(trimmed to suit)

Side View

Top View
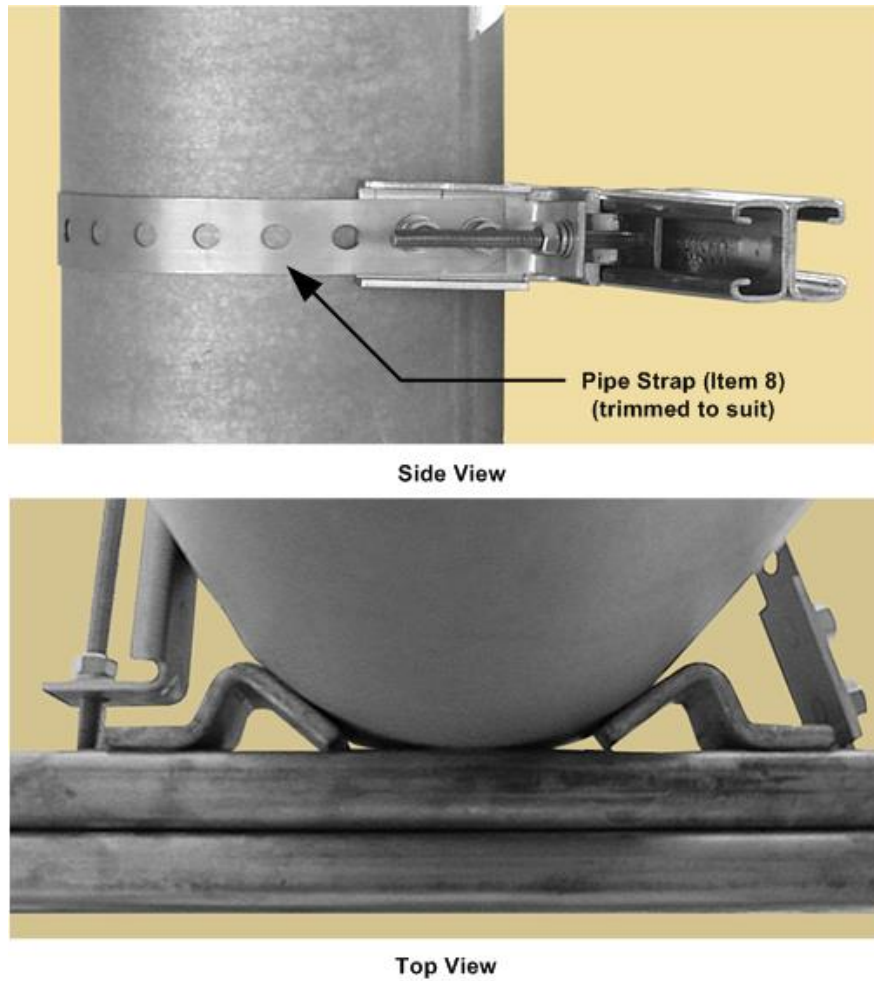
Figure 2-9. Universal Pole Mounting Kit – Final Assembly

2.4.3.2   Single Unit Mounting Kit (KT-0000095) for PS 1, PS 1.5

Use this kit in combination with the Universal Pole Mounting Kit (PL/12319-1).
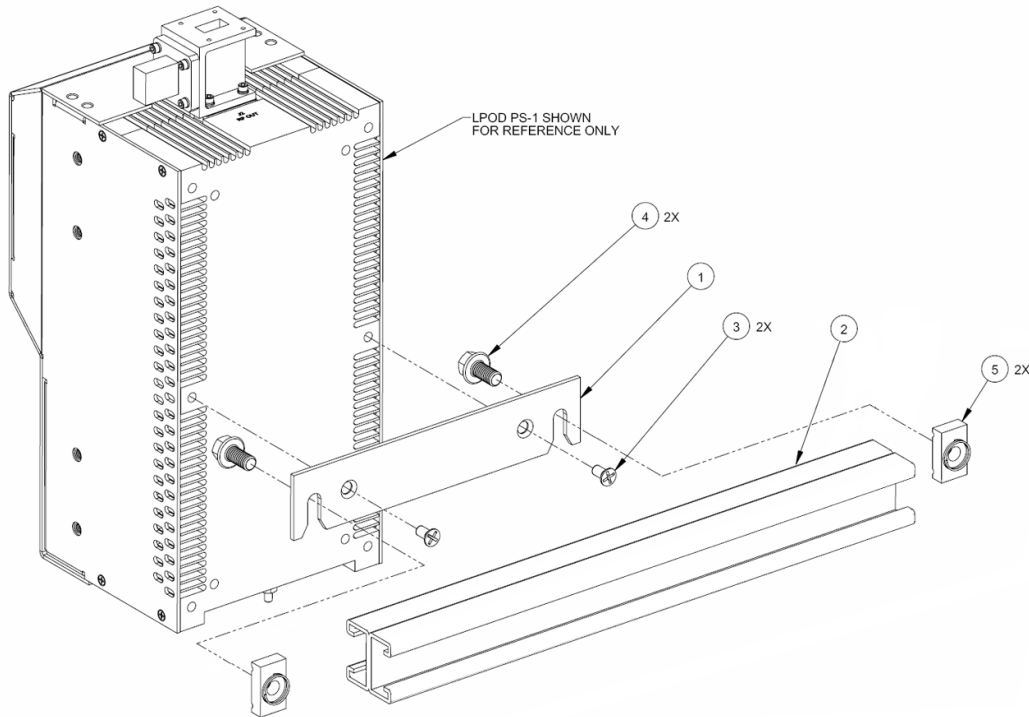
Item	Qty	CEFD Part Number	Description
1	1	FP-0000534	BRACKET, MOUNTING
2	1	FP/BR0078	UNISTRUT, DUAL CHANNEL
3	2	HW/1/4-20X1/2FH	SCREW, 82° FLAT HEAD, PHILLIPS, 1/4-20 x 1/2 LG, SS
4	2	HW-0000070	SCREW, HEX, SERRATED FLANGE HEAD, 3/8-16 x 3/4 LG, SS
5	2	HW/3/8SPRINGNUT	SPRINGNUT, SHORT SPRING, 3/8-16, SS (P3300)

Figure 2-10. Single Unit Mounting Kit (KT-0000095) for PS 1, PS 1.5

2.4.3.3   Single Unit Mounting Kit (KT-0000125) for PS 2

Use this kit in combination with the Universal Pole Mounting Kit (PL/12319-1).
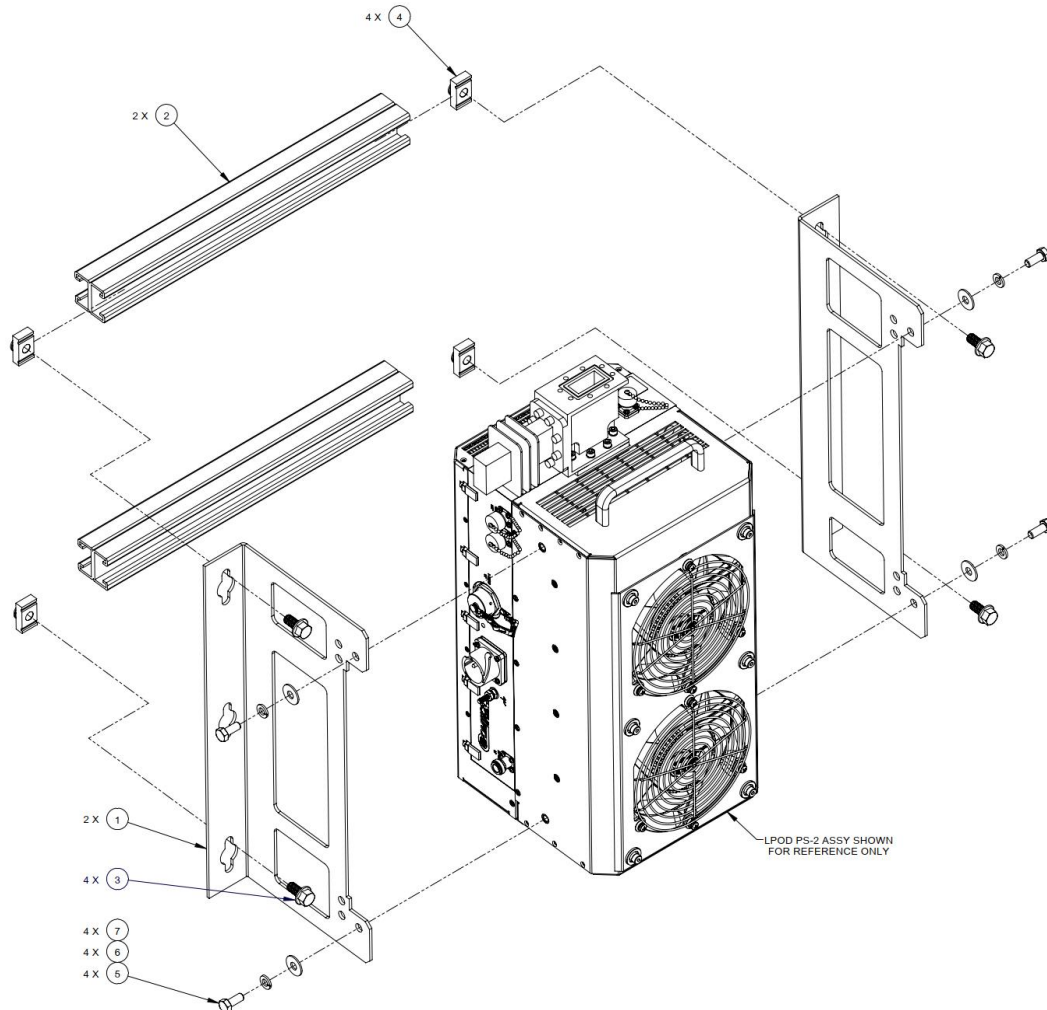
Item	Qty	CEFD Part No.	Description
1	2	FP-0000442	BRACKET, MOUNTING
2	2	FP/BR0078	UNISTRUT, DUAL CHANNEL
3	4	HW-0000070	SCREW, HEX, SERRATED FLANGE HEAD, 3/8-16 x 3/4 LG, SS
4	4	HW/3/8SPRINGNUT	SPRINGNUT, SHORT SPRING, 3/8-16, SS (P3300)
5	4	HW/5/16-18X3/4B	BOLT, HEX HEAD, 5/16-18 X 3/4 LG, SS
6	4	HW/5/16-SPLIT	LOCK WASHER, SPLIT, 5/16
7	4	HW/5/16-FLT	WASHER, FLAT, 5/16

Figure 2-11. Single Unit Mounting Kit (KT-0000125) for PS 2

2.4.4 Spar-Mounted Installations for PS 1, PS 1.5

(!) ***PS 2 units may not be spar-mounted due to weight considerations.***

PS 1 and PS 1.5 standalone configurations, in addition to satellite dish support pole mounted installations, may be installed on the antenna spar. Figure 2-12 shows a typical CEFD spar mount SSPA installation.

The kit that is required for the installation of your LPOD system (Figure 2-13) is determined by the spar that is used by the antenna's manufacturer.
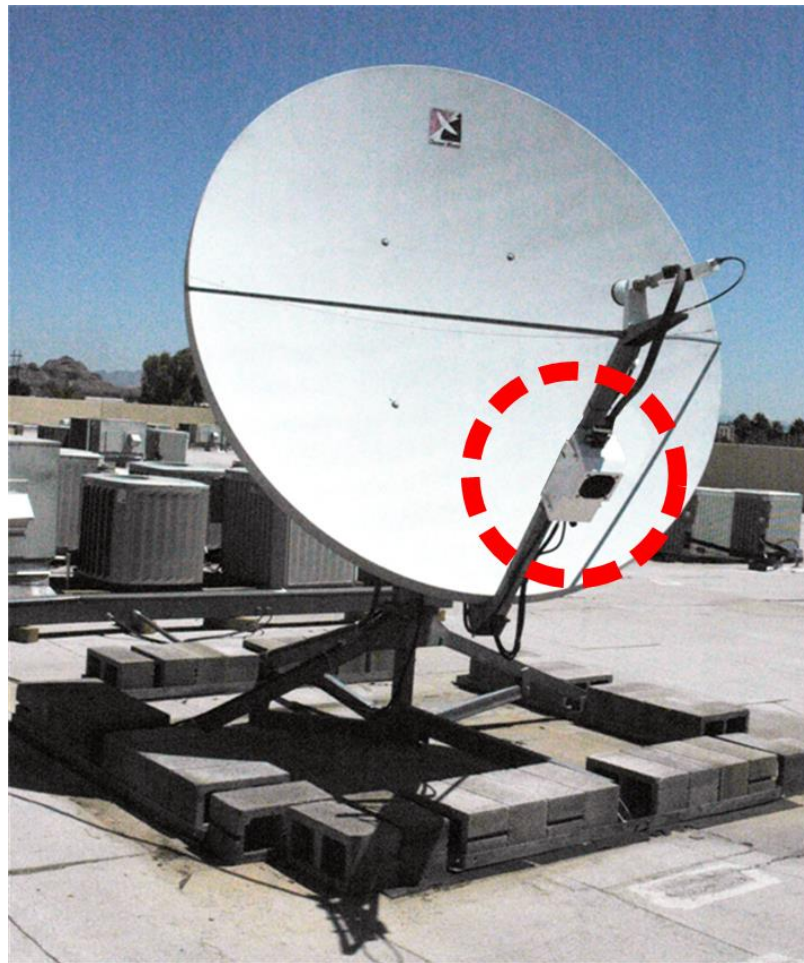
Figure 2-12. SSPA Spar Mount Installation Example
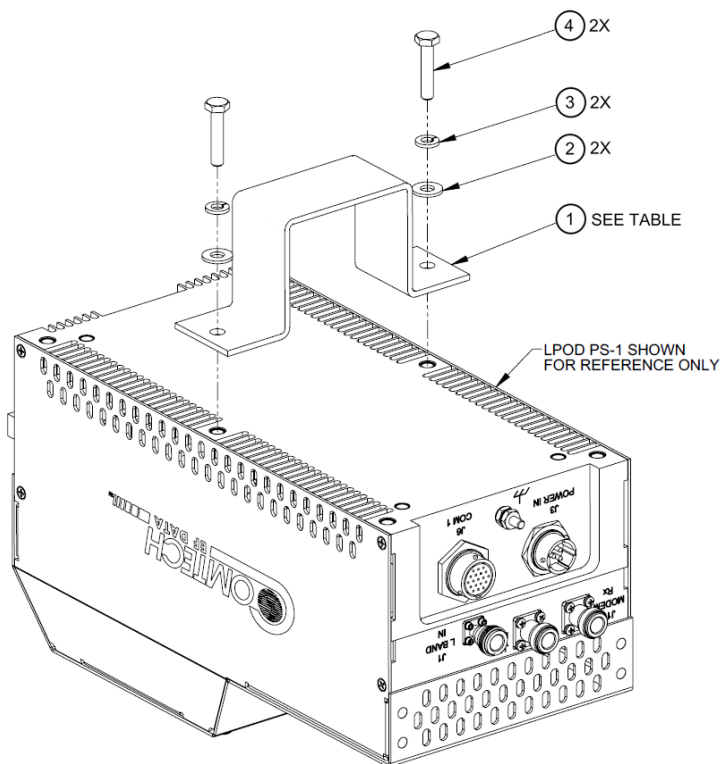
Item	CEFD KIT / QTY REQ'D				CEFD P/N	Description [dim in mm]
	KT-0000083	KT-0000084	KT-0000085	KT-0000289		
1	1	–	–	–	FP-0000547	BRACKET, MOUNTING, 1.5″ x 2.0″ [38.1 x 50.8] SPAR
	–	1	–	–	FP-0000546	BRACKET, MOUNTING, 1.75″ x 4.0″ [44.4 x 101.6] SPAR
	–	–	1	–	FP-0000545	BRACKET, MOUNTING, 1.0″ x 2.5″ [25.4 x 63.5] SPAR
	–	–	–	1	FP-0001330	BRACKET, MOUNTING, 72MM x 72MM SPAR
2	2	2	2	2	HW/1/4-FLT	FLAT WASHER, 1/4
3	2	2	2	2	HW/1/4-SPLIT	LOCK WASHER, SPLIT, 1/4
4	2	2	2	2	HW/1/4-20X1-1/4HEX	BOLT, HEX HEAD, 1/4-20 x 1-1/4″ LG

Figure 2-13. Spar Mount Installation Kits for PS 1, PS 1.5

2.4.5   Shelf-Mounted Single Unit Kit (KT-0020524) for PS 2

Use Kit KT-0020524 to install the PS 2 on a shelf.
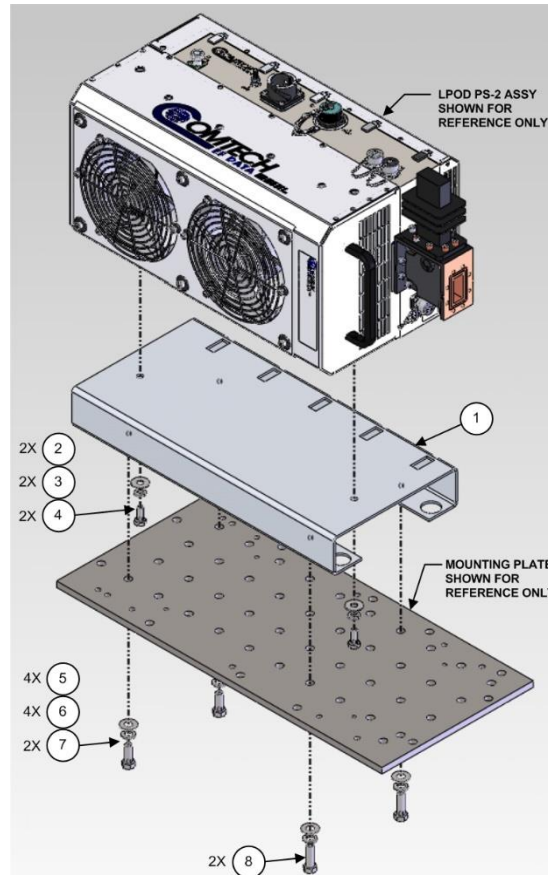
Item	Qty	CEFD Part Number	Description
1	1	FP-0020545	BRACKET, MOUNTING
2	2	HW/5/16-FLT	FLAT WASHER, 5/16
3	2	HW/5/16-SPLIT	LOCK WASHER, SPLIT 5/16
4	2	HW/5/16-18X3/4B	BOLT, HEX HEAD, 5/16-18 X 3/4 LG
5	4	HW/3/8-FLT	FLAT WASHER, 3/8
6	4	HW/3/8-SPLIT	LOCK WASHER, SPLIT 3/8
7	2	HW/3/8-16X1B	BOLT, HEX HEAD, 3/8-16 X 1 LG
8	2	HW/3/8-16X1.25B	BOLT, HEX HEAD, 3/8-18 X 1.25 LG

Figure 2-14. Shelf Mounted, Single Unit Kit (KT-0020524) for PS 2

2.5   LPOD Power Setting

> ⚠️ **FOR SAFETY REASONS, NEVER TURN THE UNIT ON WITHOUT PROPER WAVEGUIDE TERMINATION ON THE 'J2 | RF OUT' PORT. YOU MAY OTHERWISE BE EXPOSED TO DANGEROUSLY HIGH ELECTROMAGNETIC LEVELS.**

The LPOD does not have a 'Power On/Off' switch. You may power ON the unit by connecting the **'J3 | POWER IN'** connector to the appropriate prime power source. The Mute or Transmit status of the SSPA automatically comes up in the last stored state (factory default = Transmit on, not muted).

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Chapter 3. FIRMWARE UPDATE

3.1 Firmware Update Overview

Make sure to operate the LPOD with its latest available firmware.

CEFD's LPOD family of Outdoor Amplifiers / BUCs are factory-shipped with the latest version of operating firmware. If you need to update the firmware, you can apply the update to the LPOD without having to remove it from operation. You may directly acquire the download from CEFD's web site (www.comtechefdata.com), or receive the archive file by e-mail from CEFD Product Support.

3.1.1 Firmware Update Procedure Summary

1. Download the firmware update archive file to a user-supplied PC. The user PC must be Microsoft Windows® compatible. CEFD's optional LPODnet is available for Ethernet-based remote M&C of the LPOD.

2. Use an adapter cable to directly connect the LPOD 'J6 | COM1' receptacle to the serial port of the User PC. You may also use CEFD's optional CLC-10 Handheld Terminal (left) for remote M&C over the Serial Interface.

3. Extract the firmware update files from the archive download file. Then, use the LPOD Management IP Address to connect the FTP (File Transfer Protocol) client to an FTP server, and FTP transfer the files from the User personal computer (PC) to the LPOD. You may also use CEFD's optional "CReflash" utility.

3.1.2 About Firmware Numbers, File Versions, and Formats

The CEFD website catalogues its firmware update archive files by product type (e.g., router, modem, etc.), the specific model, and optional hardware configurations. The LPOD files are provided under "Home | Support | Software Downloads | Amplifier Software Downloads | LPOD Software Downloads". The LPOD firmware download hyperlink appears as F0000078X_V###, where 'X' is the revision letter, and '###' represents the firmware version number (e.g., V156 = Version 1.5.6).

CEFD 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. 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). CEFD does not provide this utility program.

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

3.2 Prepare for the Firmware Download

3.2.1 Required User-supplied Items

The minimal requirements are 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).

3.2.1.1 LPOD Connections

For Serial connections, see Figure 3-1. A connection may consist of either a user-fabricated adapter cable connecting the LPOD to the User PC serial port or, as this example shows, use of the optional CLC-10 Handheld Terminal (part of the CEFD KT-0020518 M&C Accessory Kit).
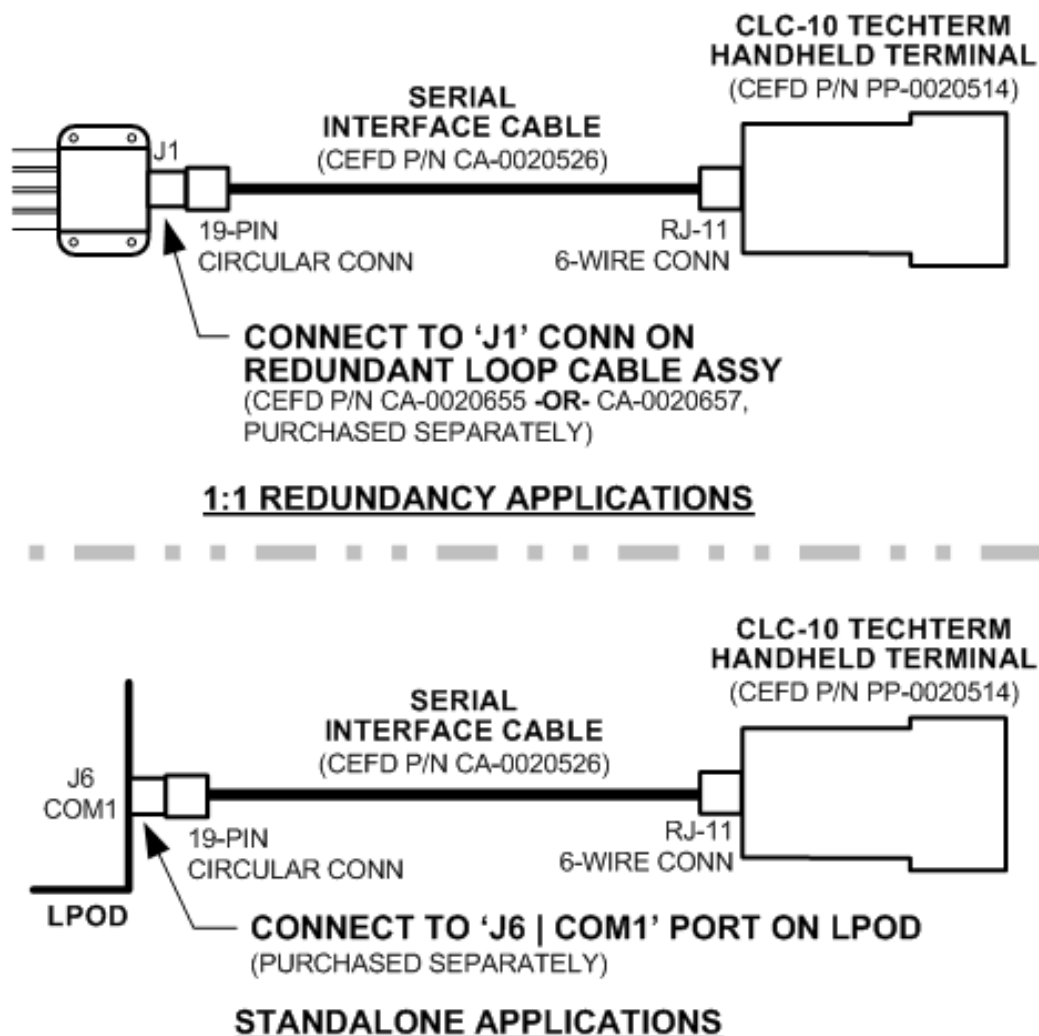
Figure 3-1. Standalone or Redundant Serial Connectio

For Ethernet connections, see Figure 3-2. A connection may consist of the CAT5e Ethernet adapter cable (CEFD P/N CA-0000352) connecting the LPOD to the User PC Ethernet port. The example provided uses the optional LPODnet (part of the CEFD KT-0000203 M&C Netbook Accessory Kit).
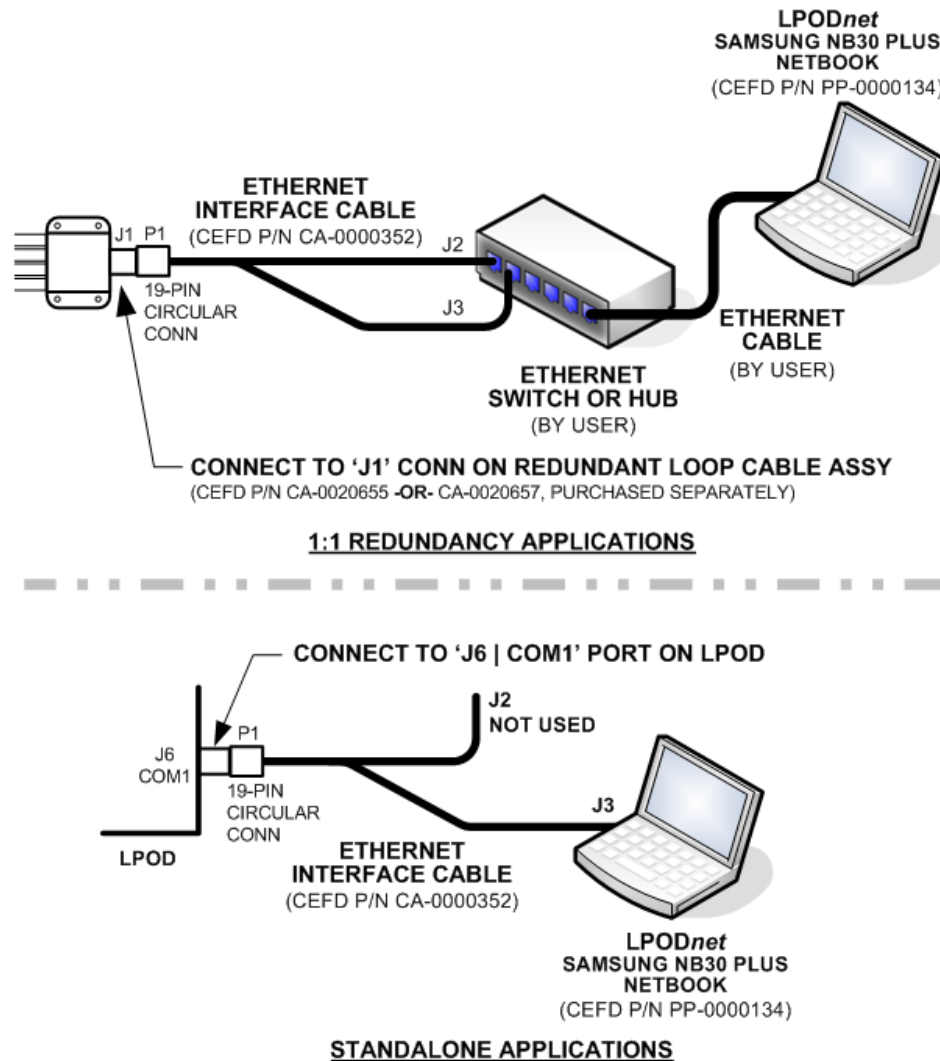
Figure 3-2. Standalone or Redundant Ethernet Connection

3.2.2 Configure the Terminal Emulator Program

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

Open the terminal emulator program on the user PC 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

3.2.3 Get the LPOD Management IP Address and Firmware Information

> *Refer to Chapter 2. SYSTEM CONNECTORS, INSTALLATION, AND STARTUP Section 2.2.3 or Section 2.2.4 to identify your specific power connector.*

Perform the following steps:

1. Apply power to the LPOD unit. Your power connection varies depending on your ordered unit.

2. Identify your default Management IP Address. You will not be able to access the LPOD HTTP (Web Server) Interface without this information.

3. Get the firmware information using either of these methods:

    - To use the HTTP Interface, see Section 3.2.3.1.
    - To use the Serial Remote Interface, see Section 3.2.3.2.

3.2.3.1 Use the HTTP Interface to Find the Firmware Information

> *Chapter 4. ETHERNET INTERFACE OPERATION*

Perform the following steps:

1. Go to one 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:
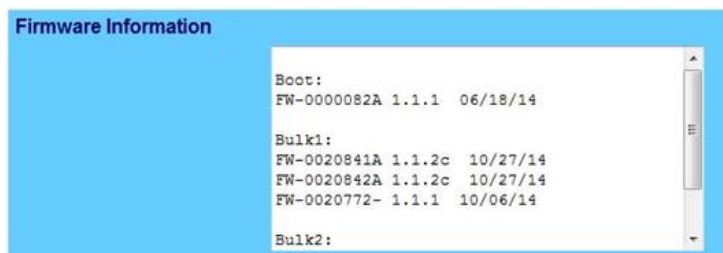
- The 'Summary' section of the 'Status | Summary' page provides the firmware details as "FW Revision", "Active Software Image", and "Next Reboot Image", as shown in this example:

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

3.2.3.2   Use the Serial Interface to Find the Firmware Information

Chapter 5. SERIAL INTERFACE OPERATION

Use your terminal emulator program or CLC-10 to execute remote queries with the LPOD. Use either of these remote queries to find the firmware information:

- Condensed : **<0/SWR?{CR}**
(returns the firmware version numbers running under Boot, Bulk1, and Bulk2, in the form B.B.BB)

- Detailed : **<0/FRW?{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)

3.2.4 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 3.2.4.1.

- To use Windows Explorer, see Section 3.2.4.2.

- To use the Run and Browse windows, see Section 3.2.4.3.

- To use Windows Command-line or the Command Prompt, see Section 3.2.4.4.

> *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 3.3 to download and extract the firmware files.

3.2.4.1 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.
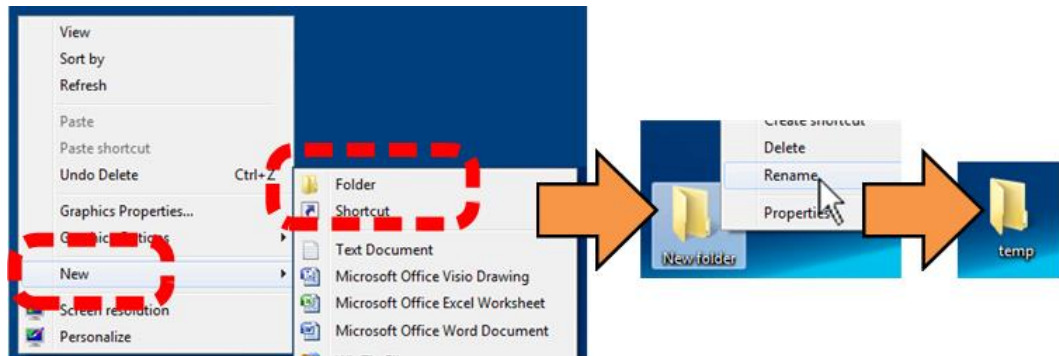
3.2.4.2　Use Windows Explorer to Make a Folder

Do these steps:

1. Left-double-click the Windows Explorer icon on the Windows Desktop.

2. Depending in your Windows operating system (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.
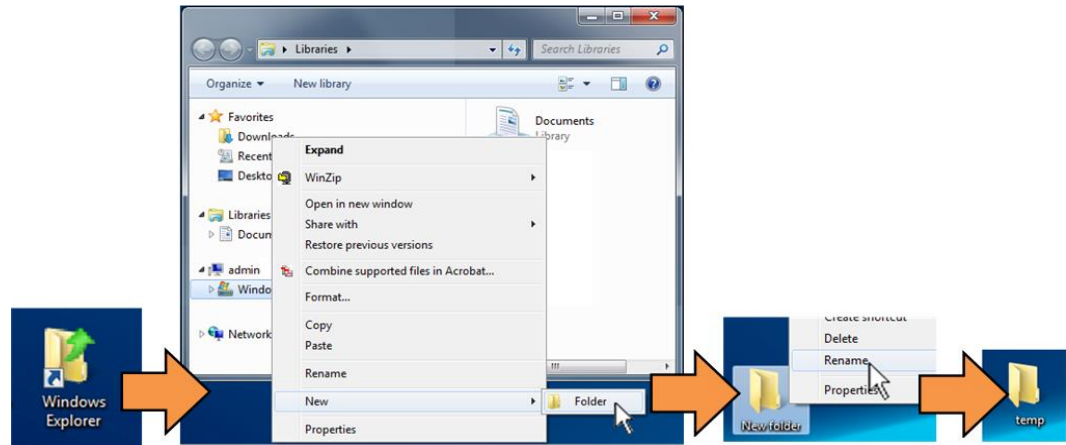
3.2.4.3　Use the Run and Browse Windows to Make a Folder

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.
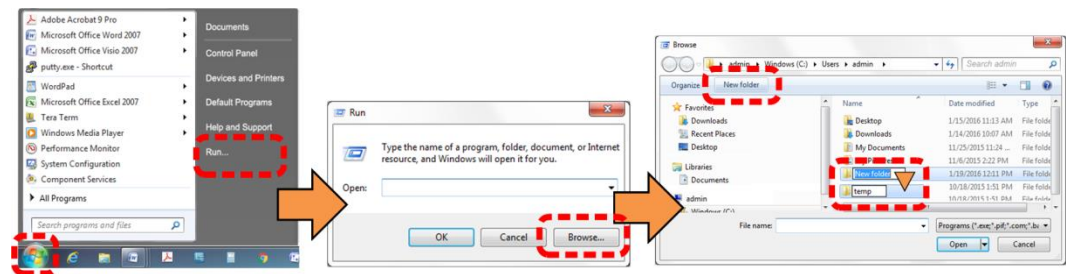
3.2.4.4   Use Windows Command-line or Command Prompt to Make a Folder

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**:
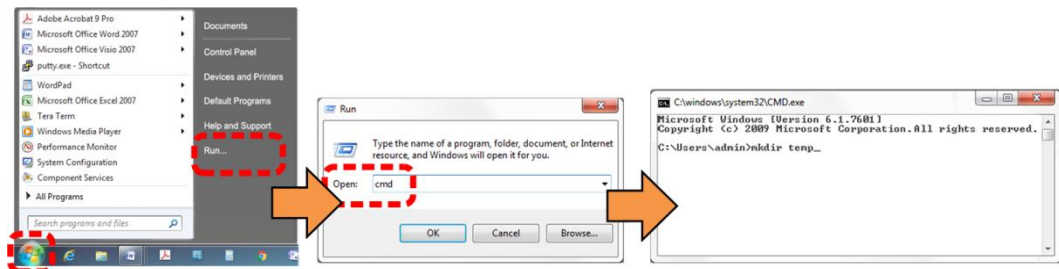
3. From the c:\> prompt, type either "mkdir temp" or "md temp" (both "mkdir" and "md" mean "make directory"), and then press **Enter**.
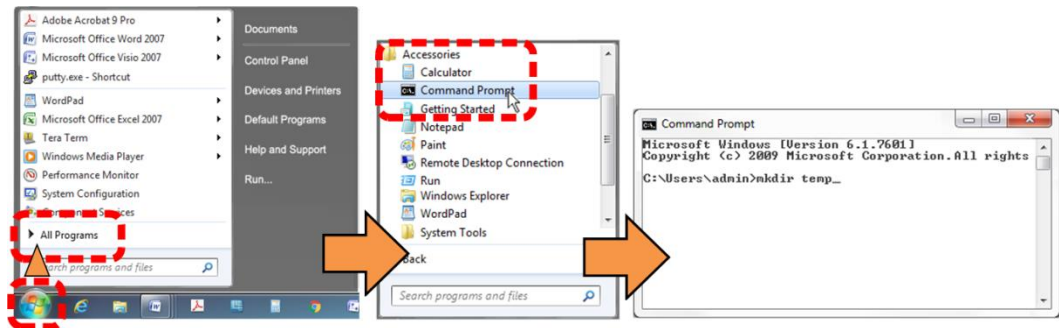
There will now be a "temp" folder created and available for placement of the firmware file download.

3.3   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**) **Amplifiers** hyperlink.

5. On the **Amplifiers** product page – Select the **LPOD** 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:
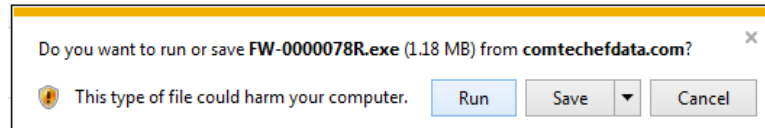
    o   Click **[Run]** to open the self-extractor dialogue window. Use **[Browse]** to select your destination folder. Click **[Unzip]** to extract the files. Your results display as per this example – click**[OK]** to close. Your files are now available for transfer to the LPOD.
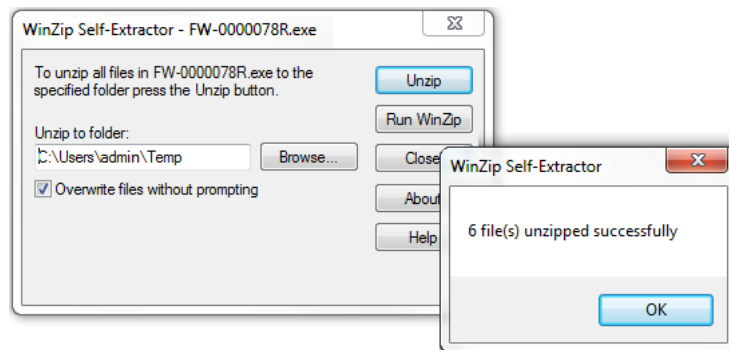
    o   Click **[Save]** to download the EXE file to your Downloads folder. Once the download is complete the dialogue prompts you to either **[Run]** the self-extracting file, or to open or view the Windows Downloads folder for further action.
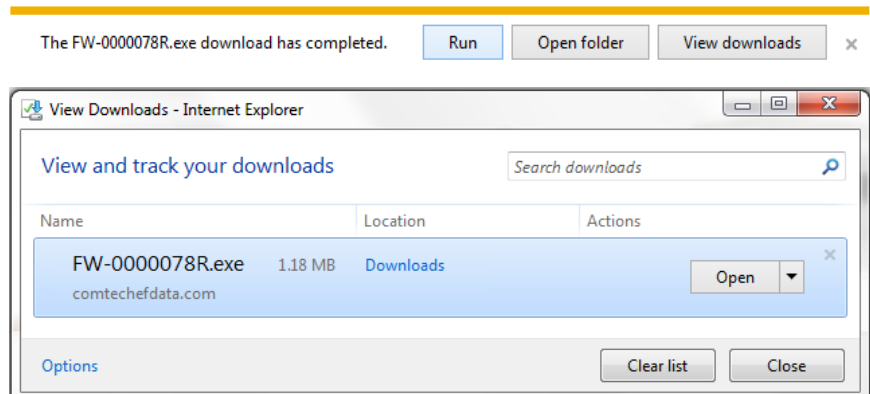
- For ZIP files:

  - 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.

Do you want to open or save **FW-0000078R.zip** (1.07 MB) from **comtechefdata.com**? | Open | Save ▼ | Cancel | ×
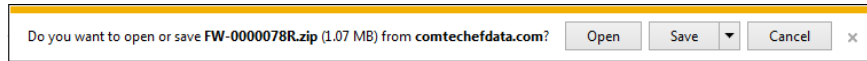
8. If not already done with **File Download > Open**, you must extract, at a minimum, these files (filenames are subject to change):

   - FW-0000078X_LPOD_bulk_v#_#_#.bin – The Firmware Bulk Image file

   - FW-0000078X_LPOD_Bulk_v#_#_#_Release Notes.pdf – The Firmware Release Notes PDF file

   > **WHERE: 'X' is the firmware revision letter, and '#_#_#' is the firmware version (e.g., FW Ver. 1.5.6 = "1_5_6")**

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 3.3.1.1.

   - To use Windows Command-line or Command Prompt, see Section 3.3.1.2.

10. After you confirm the firmware files are in the folder, proceed to Section 3.4 to upload the firmware update to the LPOD.

3.3.1.1 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.

3.3.1.2 Use Windows Command-line to View Folder Contents

Using 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.

3.4   Upload the Firmware Files and Update the LPOD Unit

3.4.1 Important Considerations

Before you proceed with the firmware update, make sure that:

- You connect the LPOD **'J6 | COM1'** receptacle to the user PC using one of the methods described in Section 3.2.1.1.

- Your PC is running a terminal emulation program for operation of the LPOD Serial or Ethernet Telnet interfaces.

- You have noted your LPOD Management IP Address.

- Your PC is running a compatible Web browser for operation of the LPOD HTTP Interface.

- You download or otherwise have Comtech's latest firmware files available on the User PC in an accessible temporary folder.

- OPTIONAL: You download or otherwise have CEFD's "CReflash" utility available on the User PC in an accessible temporary folder.

3.4.2 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. Obtain the Management IP Address for the LPOD as instructed in Section 3.2.3.

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 LPOD 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-000078X_LPOD_bulk_v#_#_#.bin bulk:"

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

    f. Wait for the file transfer to end.

    g. Type "bye" to close the FTP session.

    h. Close the Command-line window.

4. Verify that the PC-to-unit FTP file transfer was successful. Find the current firmware information via the HTTP or Serial interface (see Sections 3.3.1.1 or 3.3.1.2).

3.4.3 "CReflash" Utility Upload (Optional)

> (!) ***The "CReflash" utility is available on request from CEFD Product Support.***

To upload the "CReflash" firmware files, do these steps:

1. Obtain the CReflash utility (CReflash.exe) from CEFD. Place the application into the temporary folder that you created for the firmware update process (or some other easy-to-remember location, e.g., the Windows Desktop).

2. From the temporary folder – Locate, and then double-click, the "CReflash.exe" filename or icon. The CReflash utility opens:
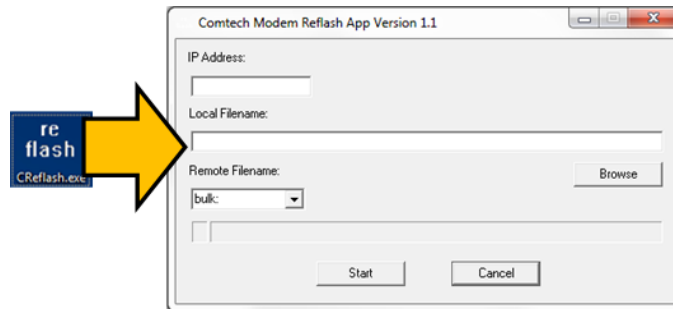
3. Enter your upload parameters information into CReflash:

   a. Left-click in the "IP Address:" text box, and enter the default Management IP Address (e.g., 192.168.1.4).

   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!"

4. When done, click **[Cancel]** to exit CReflash.

3.4.4 LPOD Unit Firmware Updates

Chapter 4. ETHERNET INTERFACE OPERATION

Use the LPOD HTTP Interface to select the new firmware and soft-reboot the unit. Go to the 'Config | Utility' page and do these steps:

1. Select the preferred Current Active Firmware Image:

    a. Use the 'Next Reboot Image' drop-down list to select Image 1 or 2.

    b. Click **[Submit]**.

    Current Active Firmware Image : 1   Next Reboot Image: 1 ▾ Submit

2. Soft-reboot the LPOD:

    a. In the 'Perform Soft Reboot' section, click **[Reboot Now]**.

    Perform Soft Reboot   Reboot Now

    b. Wait while the LPOD reboots with the Current Active Firmware Image.

3. To load a second image, repeat Steps 1 and 2.

4. After the unit has rebooted with the new firmware, you must clear the trending data. Use the terminal emulator or CLC-10 Handheld Terminal to enter serial remote command "**<0/CTD=1{CR}**", which will cear the trendind data.

The LPOD is now operating with its latest firmware. The firmware update process is complete.

Chapter 4. ETHERNET INTERFACE OPERATION

4.1 Overview

> ⚠️ **CEFD recommends use of the Ethernet-based SNMP interface for advanced users only. All other users are strongly encouraged to use the LPOD HTTP Interface for remote M&C of the LPOD.**

Operation of the LPOD Ethernet Interface is available when you connect a user-supplied, windows-based PC to the 19-pin '**J6 | COM1**' communications port on the LPOD using the appropriate adapter cable.

Three protocols are available to use 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.
- Telnet Interface. Use the serial remote control protocol for this interface. This requires use of Windows Command-line, or a user-supplied terminal emulation program such as HyperTerminal.
- Hypertext Transfer Protocol (HTTP) (Web Server) Interface. This requires a compatible user-supplied web browser such as Internet Explorer.

4.1.1 Prerequisites

Before you proceed with Ethernet remote product management, make sure the following is true:

- The LPOD is operating with the latest version firmware files.
- The User PC is running a terminal emulation program for operation of the LPOD Telnet Interface.
- The User PC is running a compatible web browser for operation of the LPOD HTTP Interface.
- The User PC is connected to the LPOD 19-pin '**J6 | COM1'** port. You may connect the User PC Ethernet port to the LPOD with the available CA-0000352 Ethernet Interface Cable (part of CEFD Kit KT-0000203).
- You have recorded the LPOD's Management IP Address.

4.2 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 the LPOD.
- The SNMP Agent. This software runs on the LPOD. The LPOD SNMP Agent supports both SNMPv1 and SNMPv2c.
- The user-supplied NMS. This software runs on the User PC.

4.2.1 MIB Files

MIB files are 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 LPOD MIB file names, the letter x represents the revision of the file.

4.2.1.1 CEFD Root MIB File

- FW-0000291x.mib
- CEFD MIB file gives the root tree for all CEFD LPOD products (PSx) and consists of only the following OID:
  - Name: comtechEFData
  - Type: MODULE-IDENTITY
  - OID: 1.3.6.1.4.1.6247
  - Full path:
    iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247)
    Module: ComtechEFData

4.2.1.2 LPOD MIB File

- FW-0000289x.mib
- MIB file consists of all of the OID's for management of the LPOD functions

4.2.1.3 LPOD Traps MIB File

- FW-0000290x.mib
- Trap MIB file provides SNMPv1 traps common for LPOD.

4.2.2 SNMP Community Strings

> **In SNMP v1/v2c, 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.**

The LPOD 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 LPOD 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.

> *For correct SNMP operation, the LPOD MIB files must be used with the associated version of the LPOD M&C. See the LPOD FW Release Notes for information on the required FW/SW compatibility.*

4.2.3 SNMP Traps

> *The LPOD SNMP agent supports both SNMPv1 and v2c. The LPOD Traps file needs to be compiled only if SNMPv1 traps are to be used.*

The LPOD has the ability to send out SNMP traps both when a fault occurs and when a fault clears in the unit. You may configure which style of traps the LPOD sends by using the *IpodSNMPTrapVersion* OID.

The LPOD supports the following MIB2 SNMPv1 traps and v2 notifications:

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

The LPOD supports the following Faults SNMPv1 traps and v2 notifications:

Faults SNMPv1 traps:	
IpodPowerSupply24V1StatusV1	62474801
IpodPowerSupply24V2StatusV1	62474802
IpodPowerSupplyLNBStatusV1	62474803
IpodPowerSupply13VStatusV1	62474804
IpodPowerSupply10VStatusV1	62474805

lpodRFPowerSupply10V1StatusV1	62474806
lpodRFPowerSupply10V2StatusV1	62474807
lpodPowerSupply7V8TStatusV1	62474808
lpodPowerSupply5V8TStatusV1	62474809
lpodPowerSupply2V5TStatusV1	62474810
lpodPowerSupply1V2TStatusV1	62474811
lpodPowerSupplyNeg5V8TStatusV1	62474812
lpodFan1StatusV1	62474813
lpodFan2StatusV1	62474814
lpodTemperatureStatusV1	62474815
lpodShutdownStatusV1	62474816
lpodI2CStatusV1	62474817
lpodForwardPowerStatusV1	62474818
lpodChecksumStatusV1	62474819
lpodFPGADoneStatusV1	62474820
lpodBUCLockDetectStatusV1	62474821
lpodRefLockDetectStatusV1	62474822
lpodLNBCSStatusV1	62474823
lpodSwitchStatusV1	62474824
Faults SNMPv2 notifications:	
lpodPowerSupply24V1Status	1.3.6.1.4.1.6247.48.1.3.1.1
lpodPowerSupply24V2Status	1.3.6.1.4.1.6247.48.1.3.1.2
lpodPowerSupplyLNBStatus	1.3.6.1.4.1.6247.48.1.3.1.3
lpodPowerSupply13VStatus	1.3.6.1.4.1.6247.48.1.3.1.4
lpodPowerSupply10VStatus	1.3.6.1.4.1.6247.48.1.3.1.5
lpodRFPowerSupply10V1Status	1.3.6.1.4.1.6247.48.1.3.1.6
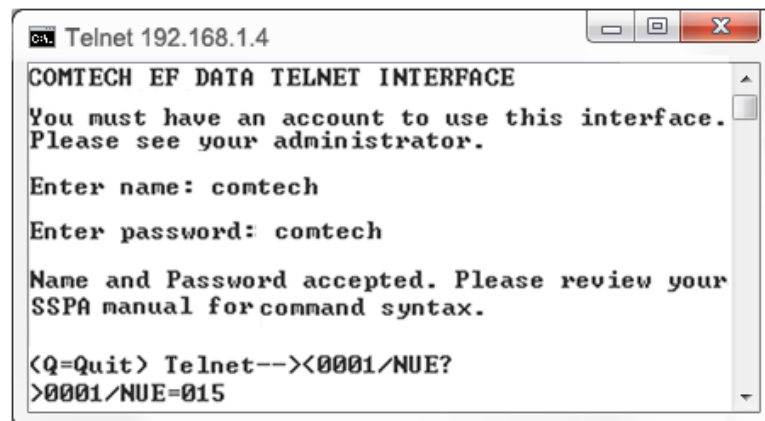
lpodRFPowerSupply10V2Status	1.3.6.1.4.1.6247.48.1.3.1.7
lpodPowerSupply7V8TStatus	1.3.6.1.4.1.6247.48.1.3.1.8
lpodPowerSupply5V8TStatus	1.3.6.1.4.1.6247.48.1.3.1.9
lpodPowerSupply2V5TStatus	1.3.6.1.4.1.6247.48.1.3.1.10
lpodPowerSupply1V2TStatus	1.3.6.1.4.1.6247.48.1.3.1.11
lpodPowerSupplyNeg5V8TStatus	1.3.6.1.4.1.6247.48.1.3.1.12
lpodFan1Status	1.3.6.1.4.1.6247.48.1.3.1.13
lpodFan2Status	1.3.6.1.4.1.6247.48.1.3.1.14
lpodTemperatureStatus	1.3.6.1.4.1.6247.48.1.3.1.15
lpodShutdownStatus	1.3.6.1.4.1.6247.48.1.3.1.16
lpodI2CStatus	1.3.6.1.4.1.6247.48.1.3.1.17
lpodForwardPowerStatus	1.3.6.1.4.1.6247.48.1.3.1.18
lpodChecksumStatus	1.3.6.1.4.1.6247.48.1.3.1.19
lpodFPGADoneStatus	1.3.6.1.4.1.6247.48.1.3.1.20
lpodBUCLockDetectStatus	1.3.6.1.4.1.6247.48.1.3.1.21
lpodRefLockDetectStatus	1.3.6.1.4.1.6247.48.1.3.1.22
lpodLNBCSStatus	1.3.6.1.4.1.6247.48.1.3.1.23
lpodSwitchStatus	1.3.6.1.4.1.6247.48.1.3.1.24

4.3   Telnet Interface

Chapter 5. SERIAL INTERFACE OPERATION

The LPOD has a Telnet interface for the purpose of equipment M&C via the optional Serial Remote Control protocol. 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. An example of the login process and remote control operation is shown in Figure 4-1.


```
Telnet 192.168.1.4

COMTECH EF DATA TELNET INTERFACE

You must have an account to use this interface.
Please see your administrator.

Enter name: comtech

Enter password: comtech

Name and Password accepted. Please review your
SSPA manual for command syntax.

<Q=Quit> Telnet--><0001/NUE?
>0001/NUE=015
```

Figure 4-1. Telnet Interface Example – Windows Command-line

4.3.1 Using HyperTerminal for Telnet Remote Control Operation

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. An example of the login process and remote control operation, when using HyperTerminal as the interface, is shown in Figure 4-2.
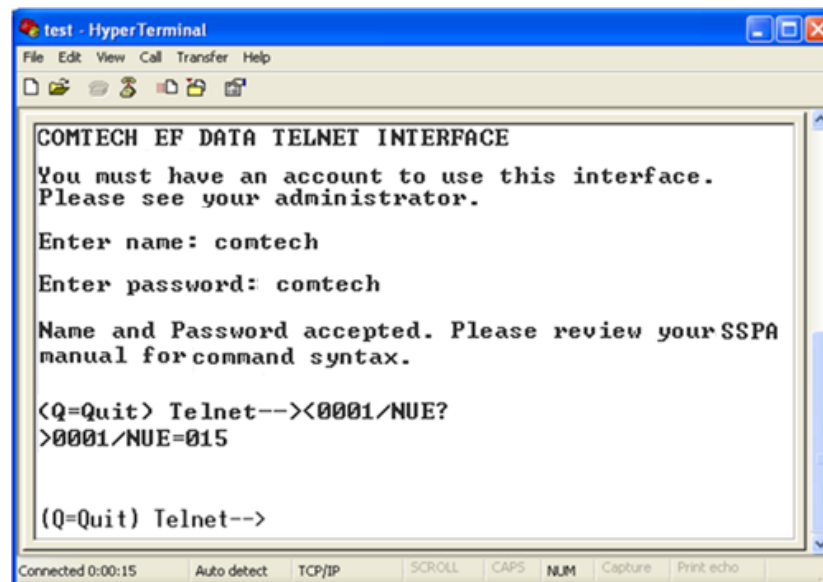
Figure 4-2. Telnet Interface Example – HyperTerminal

4.3.1.1 Configure HyperTerminal for Telnet Remote Control Operation

Do the following steps (See Figure 4-3):

1. Define the Connect To Telnet connection properties correctly (File → Properties) (Figure 4-3, left side):

    a. Enter the LPOD'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.

2. ASCII Setup (File → Properties → Settings → ASCII Setup) (Figure 4-3, right side):

    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.
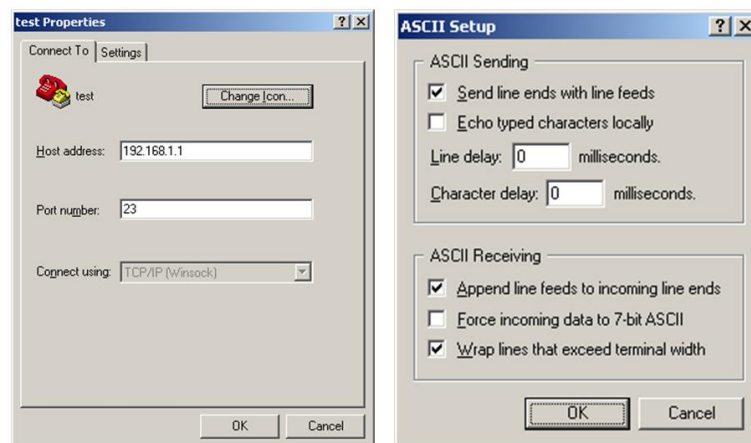
Figure 4-3. Configure HyperTerminal

4.4 HTTP (Web Server) Interface

A user-supplied web browser allows the full M&C of the LPOD through its HTTP Interface. This embedded web application is designed for use with Microsoft's Internet Explorer Version 5.5 or higher. It is a non-secure web application.

4.4.1 Enable the HTTP Interface

See Chapter 5. SERIAL INTERFACE OPERATION for more information about the Local Remote Status (LRS) and IP Address (IPA) commands.

You must assign a unique IP Address for each unit on the network before connecting to an existing network. As the IP address may need to be changed to something other than the factory default setting, use the remote command IPA=xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is a valid IP address on the network where the unit is to be installed, and yy is the range (typically, yy = 24).

Changing the IPA value requires that you cycle power on the unit, and then start a new Telnet session using the new IP address.

Do the following steps to enable the HTTP Interface in the LPOD using only a 100BaseTx remote interface (this assumes that you are running a Microsoft Windows OS).

1. Select **Start**, then **Run**, then type "**cmd**" to open the Windows Command-line window.

2. Type "**Telnet 192.68.1.4**" to start a Telnet session with the unit using the default Management IP address.
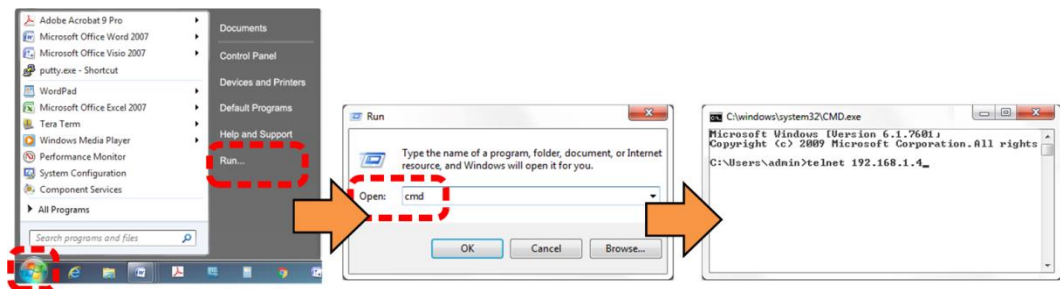
3. Enter the Telnet username and password (the default for both parameters is **comtech**):

4. Use the **LRS=2** remote command to set the remote access parameter for Ethernet remote control.

> *The LRS remote command sets or returns Local or Remote state in the form x, where x=0, 1, 2, or 3:*
> * *LRS=0 (Local)*
> * *LRS=1 (Serial)*
> * *LRS=2 (Ethernet)*
> * *LRS=3 (Serial+Ethernet) (default value)*

```
Telnet 192.168.1.4

COMTECH EF DATA TELNET INTERFACE

You must have an account to use this interface.
Please see your administrator.

Enter name: comtech

Enter password: comtech

Name and Password accepted. Please review your
SSPA manual for command syntax.

<Q=Quit> Telnet-->/0001/LRS=2
>0001/LRS=

<Q=Quit> Telnet-->
```

4.4.2 HTTP Interface User Login

Do these steps:

1. From the PC, enter the default Management IP Address for the LPOD (i.e., **http://192.168.1.4**) into the **Address** area of the browser.
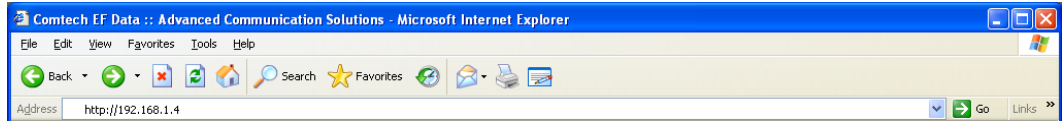
2. In the Login window, type the **User name** and **Password**, and then click **OK**. The default User Name and Password are both **comtech**.
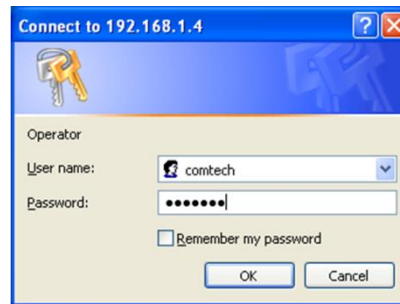
Once the valid User Name and Password is accepted, the LPOD HTTP Interface splash page shows (Figure 4-4). The unit and firmware version in this example will differ from your setup.
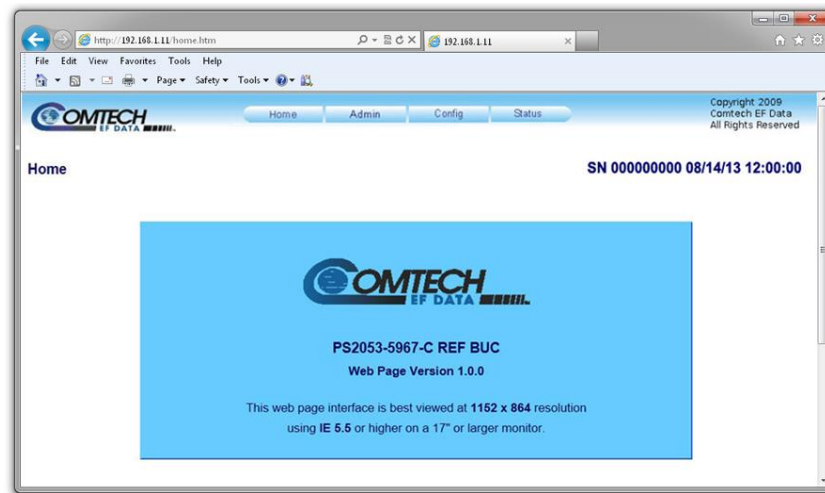
Figure 4-4. LPOD HTTP Interface "Splash" Page Example

4.4.3 HTTP Interface Features

4.4.3.1 Menu Tree

Home	Admin	Config	Status
Home	Access	Amplifier	Summary
Contact	SNMP	LNB	Status
Support		Utility	FETs
		Redundancy	Events
			Statistics
			Trending Graphs

Figure 4-5. LPOD HTTP Interface Menu Tree

Figure 4-5 shows the menus and pages in the LPOD HTTP Interface. This interface has four top level navigation tabs, shown in blue. Each top level tab has page hyperlinks (grey). These hyperlinks open individual nested Web pages.

4.4.3.2 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 click the 'Home' page hyperlink.

4.4.3.3 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.
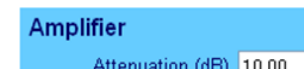
4.4.3.4 Action Buttons

Action buttons are important in the LPOD 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.
- **Submit** (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.*

4.4.3.5 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.

4.4.3.6 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.

4.5 HTTP Interface Page Examples and Descriptions

Chapter 5. SERIAL INTERFACE OPERATION

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

4.5.1 Home Pages

Click **Home**, **Contact**, or **Support** to continue.

4.5.1.1 Home | Home

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

Figure 4-6. LPOD 'Home | Home' Page (PS .5 Unit Example Shown)

4.5.1.2   Home | Contact

For all product support, please call:

+1.240.243.1880

+1.866.472.3963 (toll free USA)

Figure 4-7. 'Home | Contact' Page

4.5.1.3   Home | Support

> *For this page to operate correctly, the LPOD administrator must identify the SMTP server, domain name, and destination on the 'Admin | SNMP' page (Sect. 4.5.2.2).*

Figure 4-8. 'Home | Support' Page

Use this page to compose an e-mail message for questions or problems with the LPOD.

The **Problem Report** area of the display allows up to 256 characters maximum.

The 'Home | Support' page uses Simple Mail Transport Protocol (SMTP) to send E-mail to CEFD Product Support: cdmipsupport@comtechefdata.com

Once you enter the **Contact Information** and compose a message in the **Problem Report** text window, click [**Submit E-mail]** to send the message.

4.5.2 Admin (Administration) Pages

> **ⓘ** *These pages are available only to users who have logged in using the Administrator Name and Password.*

Use these administrator pages to set up user access. Click **Access** or **SNMP** to continue.

4.5.2.1   Admin | Access
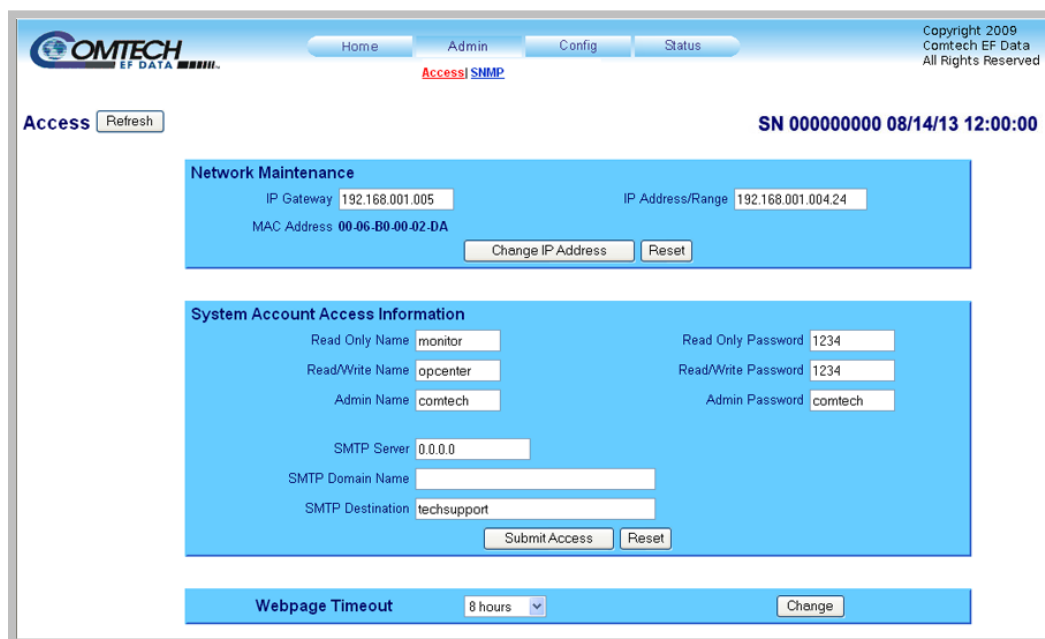
Figure 4-9. 'Admin | Access' Page

Access

Click **[Refresh]** to see the latest page data.

Network Maintenance

Name	Description
IP Gateway, IP Address/Range	Enter the desired IP Gateway Address and IP Address/Range in these text boxes.
MAC Address (read-only)	The MAC is set at the factory to a guaranteed unique address that you cannot modify.

Click **[Reset]** to restore the previously saved settings.

Click **[Change IP Address]** to save any changes.

System Account Access Information

Name fields can be any alphanumeric combination with a maximum length of 10 characters.

Password fields can be any alphanumeric combination with a maximum length of 10 characters.

Name	Description
Read Only Name	The factory default is monitor.
Read Only Password	The factory default is 1234.
Read/Write Name	The factory default is opcenter.
Read/Write Password	The factory default is 1234.
Admin Name	The factory default is comtech.
Admin Password	The factory default is comtech.
SMTP Server	Enter the mail server IP address from where you want to send the e-mail.
SMTP Domain Name	The Administrator can assign the SMTP Domain Name. This is required if you wish to use the e-mail feature of the 'Home	Support' Page (Sect. 4.5.1.3). Enter the domain of the e-mail server (usually found to the right of the @ symbol in an e-mail address).
SMTP Domain Destination	The Administrator can assign the SMTP Domain Destination. This is required if you wish to use the e-mail feature of the 'Home	Support' Page (Sect. 4.5.1.3). Enter the e-mail recipient name (usually found to the left of the @ symbol in an e-mail address).

Click **[Submit Access]** to save any changes.

Click [**Reset]** to restore the fields to the default setting.

Webpage Timeout

The Webpage Timeout sets the time period that can pass before the HTTP Interface pages time out.

Use the drop-down list to select **5 minutes** (default) or **8 hours**.

Click **[Submit]**.

The Status | Status page automatically refreshes once every ten seconds, and resets the webpage timeout counter.

4.5.2.2 Admin | SNMP

Figure 4-10. 'Admin | SNMP' Page

SNMP

Click **[Refresh]** to see the latest page data.

> ***The Community String fields can be any combination of characters and a length of 0 to 20 charaters.***

Name	Description
Simple Network Management	Use the drop-down list to select Enabled or Disabled.
Read Community String	The factory default is public.
Write Community String	The factory default is private.
SNMP Contact	Enter the contact data.
SNMP Name	Enter the name.
SNMP Location	Enter the location.
Enable Authentication Trap	Use the drop-down list to select Enabled or Disabled.
Trap IP 1	Assigned by the Administrator.
Trap IP 2	Assigned by the Administrator.
Trap Version	Use the drop-down list to select the version.
Trap Community String	The factory default is Comtech.

Click **[Reset]** to restore the previously saved settings.

Click **[Submit SNMP]** to save any changes.

4.5.3 Config Pages

Use the **Configuration** pages to configure all operating parameters for the LPOD. Click **Amplifier**, **LNB**, **Utility**, or **Redundancy** to continue.

4.5.3.1   Config | Amplifier
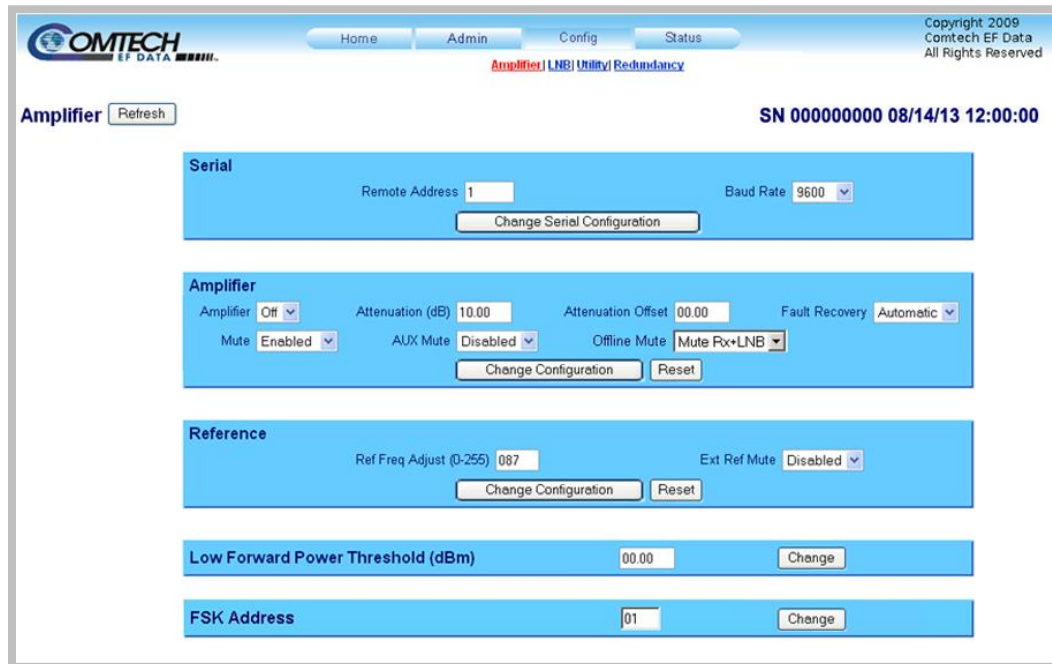
Figure 4-11. 'Config | Amplifier' Page

Amplifier

Click **[Refresh]** to see the latest page data.

Serial

Name	Description
Remote Address	Enter a valid physical remote address from 0001 to 9999.
Baud Rate	Use the drop-down list to select the operating baud rate as 2400, 4800, 9600, 19200, or 38400 baud.

Click **[Change Serial Configuration]** to save.

Amplifier

Name	Description
Attenuation (dB)	Enter a valid attenuation level (00.00 to 20.00 dB) in 0.25 dB steps.
Attenuation Offset	Enter a valid offset value, in dB.
Fault Recovery	Use the drop-down list to select Automatic or Manual.
Mute	Use the drop-down list to select Enabled or Disabled.
Aux Mute	Use the drop-down list to select Enabled or Disabled.
Offline Mute	Use the drop-down list to select Enabled, Disabled, MuteRx, MuteTx, MuteRx+LNB, MuteTx+LNB, Mute Tx+Amp, or Mute Tx+LNB+Amp.

Click **[Reset]** to restore the previously saved settings.

Click **[Change Configuration]** to save any changes.

Reference

Name	Description
Ref Freq Adjust	Enter a valid reference oscillator tuning voltage value from 0 to 255. The default value is set to 87.
Ext Ref Mute	Use the drop-down list to select the External Reference Not Present Mute Mode as either Enabled or Disabled.

Click **[Reset]** to restore the previously saved settings.

Click **[Change Configuration]** to save any changes.

Low Power Forward Threshold (dBm)

When the forward power monitor is set to **Alarm** or **Fault** instead of the factory default of **Mask**, and the forward power drops below the specified value, the alarm/fault occurs.

Set the threshold value, in dBm, for the low forward power alarm/fault.

To disable the threshold, set this parameter to the default value of 00.00.

Click **[Change]** to save any changes.

FSK Address

Set the FSK (Frequency Shift Keying) Address from **01** to **15**.

Click **[Change]** to save any changes.

4.5.3.2 Config | LNB

Figure 4-12. 'Config | LNB' Page

LNB

Click **[Refresh]** to see the latest page data.

LNB Config

Name	Description
LNB Current Source	Use the drop-down list to select Disable or 18V, tone off, band 3. ⓘ *These are the only valid selections when using LPOD LNB bias functionality with standard single-band LNBs.*
Switch Bias Tee	Use the drop-down list to select Through State (unmute LNB) or Off State (mute LNB).
LNB Current Window	Use the drop-down list to select this feature as either Enabled or Disabled.
LNB Current Window (%)	This field defines the size of the LNB Current Window, and determines the fault thresholds for the LNB current draw.

Any LNB current reading that is outside the window may generate an alarm, a fault, or may be masked entirely depending on the state of the user-configured fault mask (see the **MSK** command syntax in Chapter 5. SERIAL INTERFACE OPERATION for more information).

For example: If the LNB draws 100mA, and the LNB current fault window is set to the **default** value of **30(%)**, then the allowable current draw for the LNB will be from 70 mA minimum to 130 mA maximum because the window is ±30% centered on the calibrated LNB current draw.

Click **[Submit]** to save.

Calibrate LNB Current

ⓘ *Calibrate the LNB only when it is running at nominal operating conditions.*

The value provided here (in mA) is intended as a reference point. The alarm upper and lower thresholds are determined by this value and the LNB current window setting.

Click **[Calibrate]** to perform an LNB calibration and display the updated **read-only** value.

4.5.3.3 Config | Utility

Use this page to configure additional LPOD operating parameters.
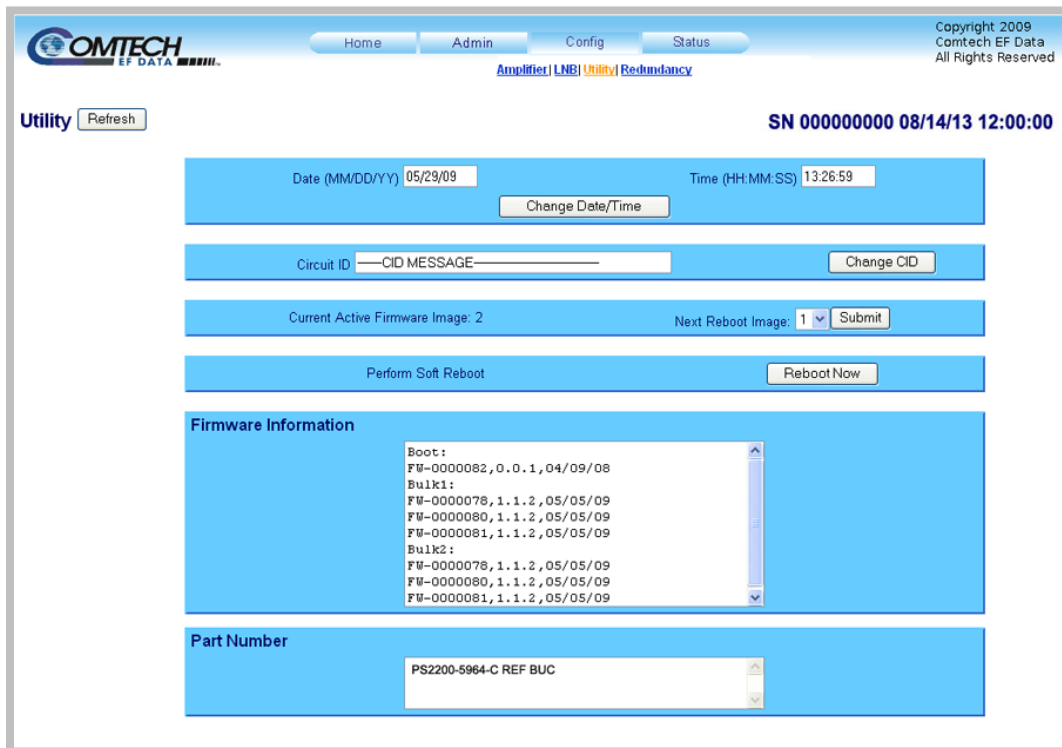
Figure 4-13. 'Config | Utility' Page

Utility

Click **[Refresh]** to see the latest page data.

Name	Description
Date (MM/DD/YY)	Enter a date using international format in the form DD/MM/YY (where DD = day [01 to 31], MM = month [01 to 12], and YY = year [00 to 99]). Click [Change Date/Time] to save the changes.
Time (HH:MM:SS)	Enter a time using HH:MM:SS format (where HH = hour [00 to 23], MM = minutes [00 to 59], and SS = seconds [00 to 59]). Click [Change Date/Time] to save the changes.
Circuit ID	Enter a Circuit ID (unit identification label) string of up to 48 characters. This is the identification label for the unit. Click [Change CID] to save the change.
Current Ative Firmware Image	This read-only window shows the Current Active Firmware Image. In this example, Image 1 is the Current Active Firmware Image.
Next Reboot Image	Use the drop-down list to select the Next Reboot Image as Image 1 or 2. Click [Submit] to save the change.
Perform Soft Reboot	Click [Reboot Now] to reboot the LPOD using the Current Active Firmware Image.

Firmware Information (read only)

This **read-only** window shows information about the currently loaded Bootrom. For the complete Bulk1 and Bulk2 information, scroll through all the constituent firmware blocks that make up the bulk

Part Number (read only)

This **read-only** window shows factory assigned part number for the unit.

4.5.3.4 Config | Redundancy

Appendix A. 1:1 REDUNDANCY
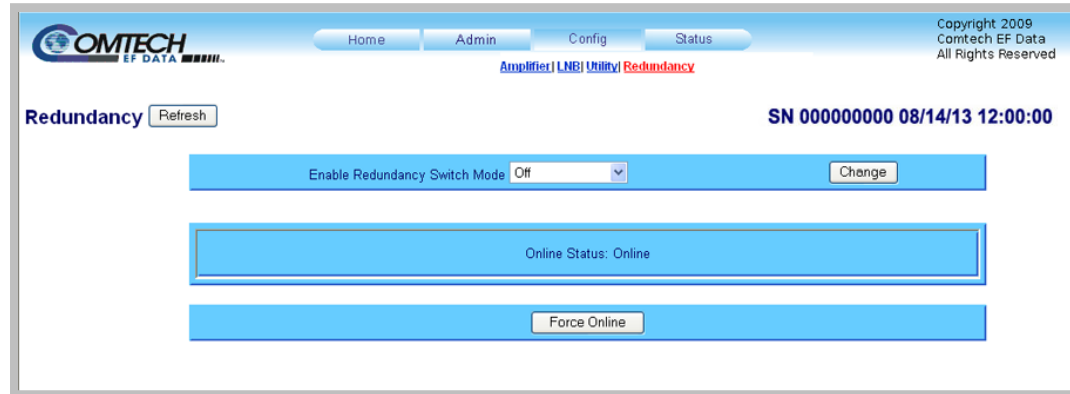
Figure 4-14. 'Config | Redundancy' Page

Redundancy

Click **[Refresh]** to see the latest page data.

Name	Description
Enable Redundancy Switch Mode	Use the drop-down list to select the Switch Mode as follows: • Off disables redundancy • 1:1 Red TX enables 1:1 redundancy with transmit switch control. • 1:1 Red TX+RX enables 1:1 redundancy with transmit and receive switch control. • Manual enables manual redundancy mode. Click [Change] to save.
Online Status (read-only)	The active status for the unit displays Online or Offline.
Force Online	Click [Force Online] to force a unit to go active (online).

4.5.4 Status Pages

Use these pages to access to event logging, operational statistics, status, FET windows, and operational trending graphs. Click the **Status** tab, and then click the **Summary**, **Status**, **FETs**, **Events**, **Statistics**, or **Trending Graphs** hyperlink to continue.

4.5.4.1   Status | Summary
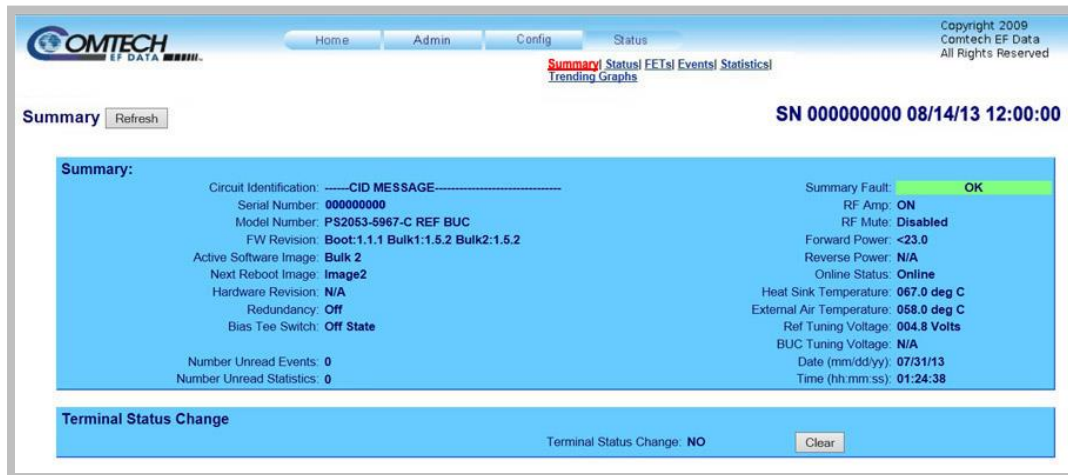
Figure 4-15. 'Status | Summary' Page

Summary

Click **[Refresh]** to see the latest page data.

Summary:

The **Summary Fault** line indicates that no faults are present with "**OK**" on green background. If a fault exists, the **Summary Fault** message changes to "**FAULT**" on a red background. Should this occur, review the logged faults and alarms on the **Status | Events** page (see **Sect. 4.5.4.4**).

Terminal Status Change

This section alerts you to any configuration changes that were made to the unit since the last time the Terminal Status Change flag was reset (i.e., you click **[Clear]** to reset the message):

- If the status displays **NO**, no changes have been made to the unit.

- If the status displays **YES**, then a status change has occurred for one or more of the following reasons:

    o   An operating parameter is changed, e.g., when a command that changes an operational value is executed successfully;

    o   A fault condition is triggered;

    o   A redundant switchover occurs.

4.5.4.2 Status | Status

Use this read-only page see general status data for the LPOD.

Unlike the pages that you must refresh manually, the Status | Status page updates automatically once every 10 seconds. You can still refresh the page manually, if desired.

Figure 4-16. 'Status | Status' page

Status

Click **[Refresh]** to see the latest page data.

4.5.4.3 Status | FETs

Use this **read-only** page to monitor the current operating status of the LPOD's Q01 through Q09 RF Power Field Effect Transistors (FETs) that are installed in the RF amplifier.
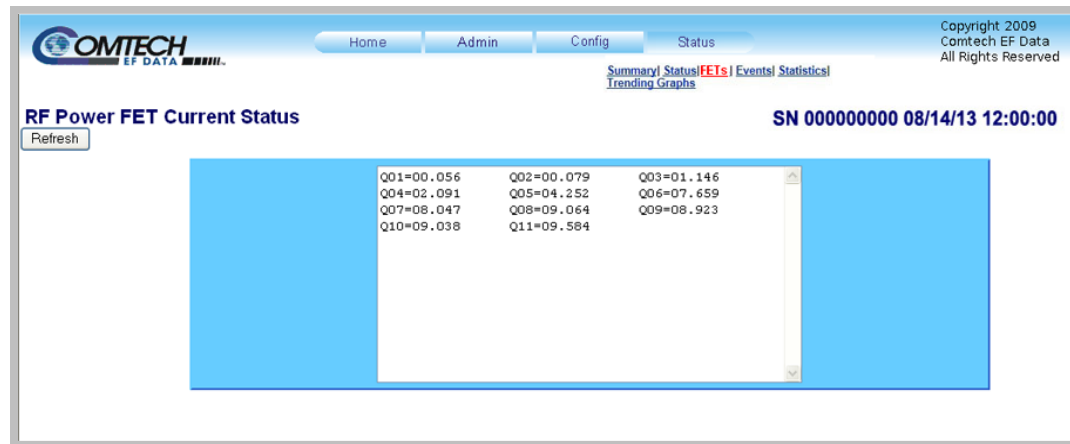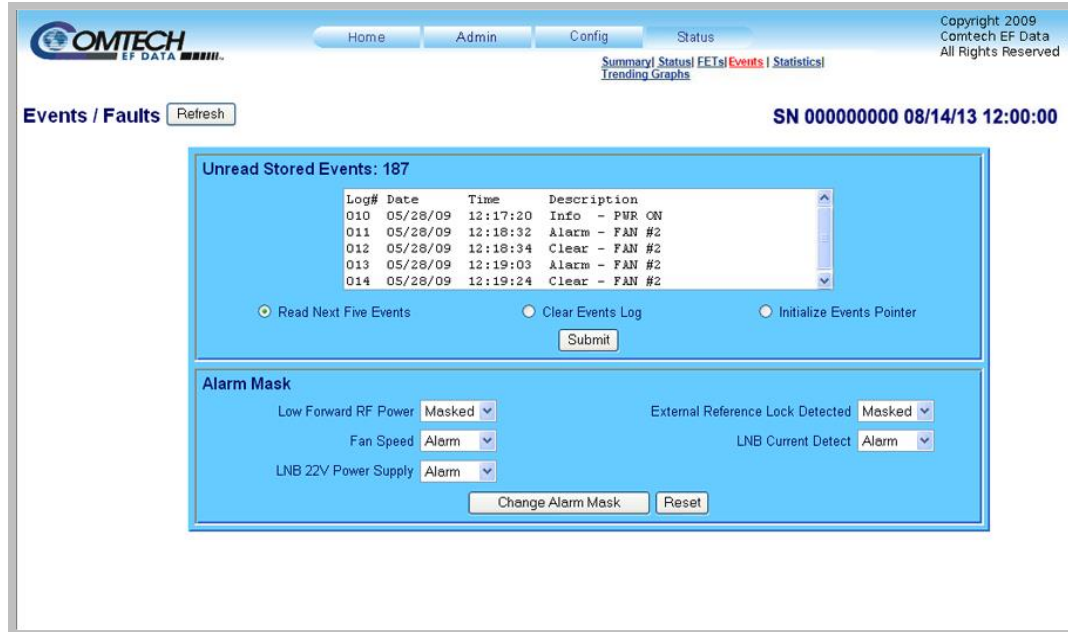
Figure 4-17. 'Status | FETs' Page

RF Power FET Current Status

Click **[Refresh]** to see the latest page data.

4.5.4.4 Status | Events

Use this page to see stored events data. Additionally, use it to set the parameters for how the LPOD triggers events and alarms.

Figure 4-18. 'Status | Events' Page

Events/Faults

Click **[Refresh]** to see the latest page data.

Unread Stored Events

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

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

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

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

Click **[Submit]** to update the window according to your selection.

Alarm Mask
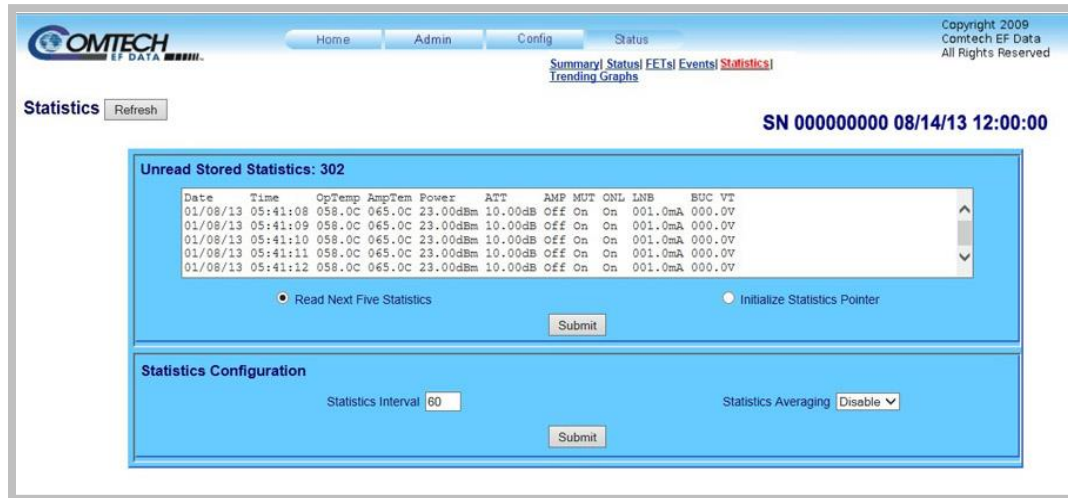
Name	Description
Low Forward RF Power	Use the drop-down lists to select an alarm as Fault, Alarm, or Masked.
Fan Speed	Use the drop-down lists to select an alarm as Fault, Alarm, or Masked.
LNB 22V Power Supply	Use the drop-down lists to select an alarm as Fault, Alarm, or Masked.
Extenal Reference Lock Detected	Use the drop-down lists to select an alarm as Fault, Alarm, or Masked.
LNB Current Detect	Use the drop-down lists to select an alarm as Fault, Alarm, or Masked.

Click **[Reset]** to restore your previous settings.

Click **[Change Alarm Mask]** to save these settings.

4.5.4.5   Status | Statistics

This page shows all unread, stored statistics. Use it to configure how the LPOD handles and shows statistics.

Figure 4-19. 'Status | Statistics' Page

Statistics

Click **[Refresh]** to see the latest page data.

Unread Stored Statistics:

This window shows the unread stored statistics log in sequential, date-stamped format. This page shows a running tally of the number of unread stored statistics in the window header. The unit shows the five oldest stored statistics. All events that are read from the log are removed from the log automatically.

- Select **Read Next Five Statistics** to cause the unit to return the oldest five unread stored statistics that remain unread in the log. If fewer than five events are available for retrieval, the remaining positions are padded with zeros. If there are no new events, the counter in the header reads **000**.

- Select **Initialize Statistics Pointer** to reset the internal pointer to allow queries to start at the beginning of the statistics log.

Click **Submit** to update the window according to your selection.

Statistics Configuration

- **Statistics Interval** – Enter the interval at which statistics are logged. The interval is set in minutes. Minimum resolution is 1 minute (001); maximum is 99 minutes (099). Default is 90 minutes (090).

- **Statistics Averaging** – Select **Enable** or **Disable** to set the **Statistics Averaging** function:

  o If **Enabled**, statistics data is averaged at a rate of once per second for 10 seconds.

  o If **Disabled**, burst values are logged instead of averaged values.

Click **[Submit]** to save the changes.

4.5.4.6   Status | Trending Graphs

Figure 4-20. 'Status | Trending Graphs' Page

Graphs

Click **[Refresh]** to see the latest graph data.

This scrolling page provides graphs that show trends over time for the following operating parameters:
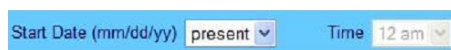
- Amplifier Temperature
- Amplifier Output Power
- LNB Current
- Operating Status
- Rx Mute Status
- Online Status
- Minimum Fan Speed

Trending Graph Time Settings

Start Date (mm/dd/yy) present ▾   Time 12 am ▾   Duration 30 minutes ▾   Submit

Choose the time, date, and duration of the trending information displayed on the graphs.

- **Start Date (mm/dd/yy):** Once a unit has been in operation for 24 hours or more, use the drop-down list to select a date – up to a maximum of 28 days, including the present date – from which to compile data. If a unit has *not* been in operation for 24 hours, only **present** will be available.

- **Time:** Once a unit has been in operation for 24 hours or more, use this drop-down list to select the time on the hour – 24 hours, from **12 am** to **11 pm**, are available. Note that, for the first 24 hours of operation (or beyond if the time has accrued), if you select **present** as the **Start Date**, then the **Time** drop-down list becomes unavailable for selection and dims as shown here.

  Start Date (mm/dd/yy) present ☑   Time 12 am ☑

- **Duration:** Use the drop-down list to select the block of time in which data is compiled for the graphs. Select **30 minutes**, **1 hour**, **2 hours**, **4 hours**, **6 hours**, **8 hours**, **12 hours**, **24 hours**, or **48 hours**.

> *The LPOD stores the trending data to flash memory once per hour. If you power down the unit before the data can be written to memory, the last 60 minutes of data will be lost.*

Click **[Submit]** to execute your settings choices.

The graphs are all tied to the same 'x' scale so that you can more easily correlate data between the graphs.

Temperature Graph
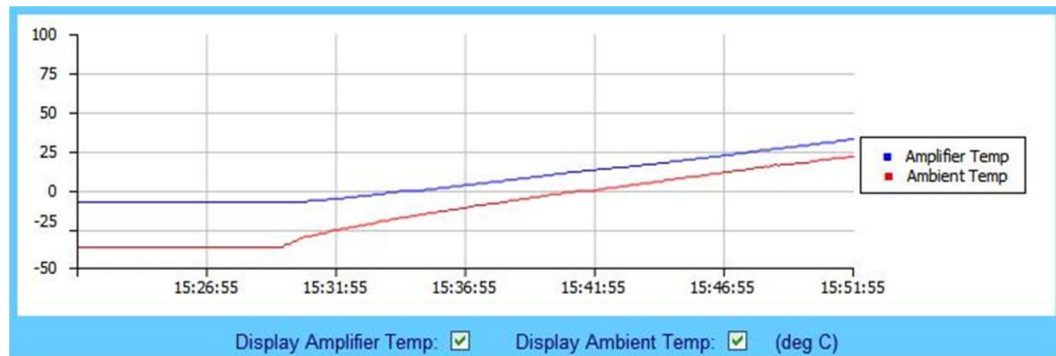
As per the legend:

- The blue line graphs the unit's Amplifier (heat sink) temperature

- When you install the available sensor in the unit, the red line graphs the Ambient (outdoor) temperature.

Check or uncheck a checkbox to control the graphing of either temperature. The graph will update dynamically after the next polling cycle (every five seconds).

Power Graph
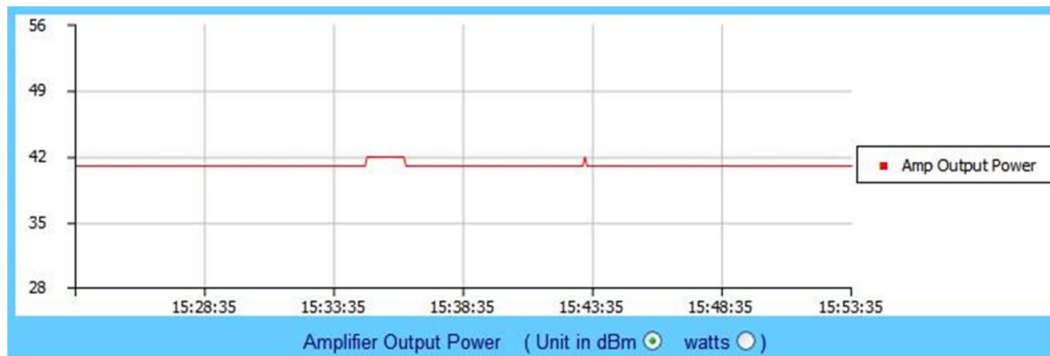
This graph displays the unit's output power with 1dB resolution. You may set this information to display as **dBm** (the default setting) or **watts.** The graph will update dynamically after the next polling cycle (every five seconds).

> *When you click the [Refresh] tab, the graph reverts to the default display (Unit in dBm).*

LNB Current Graph
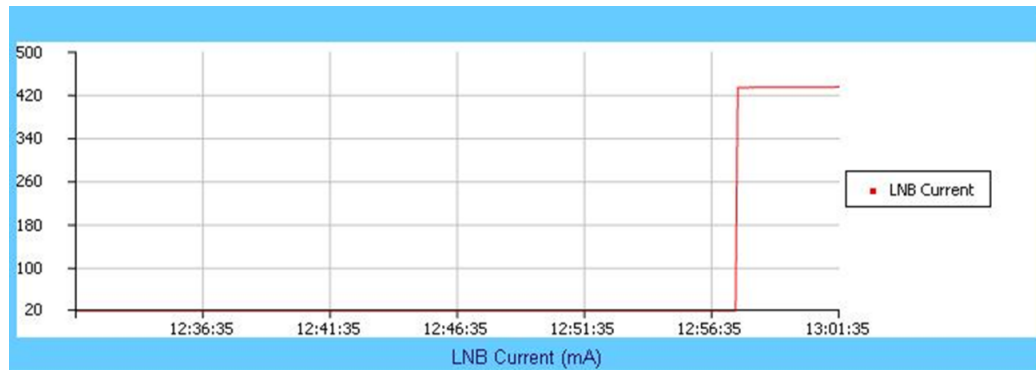
This graph displays the LNB current only if an LNB is connected to the system and is drawing current from the LNB current source.

Amplifier Status Graph
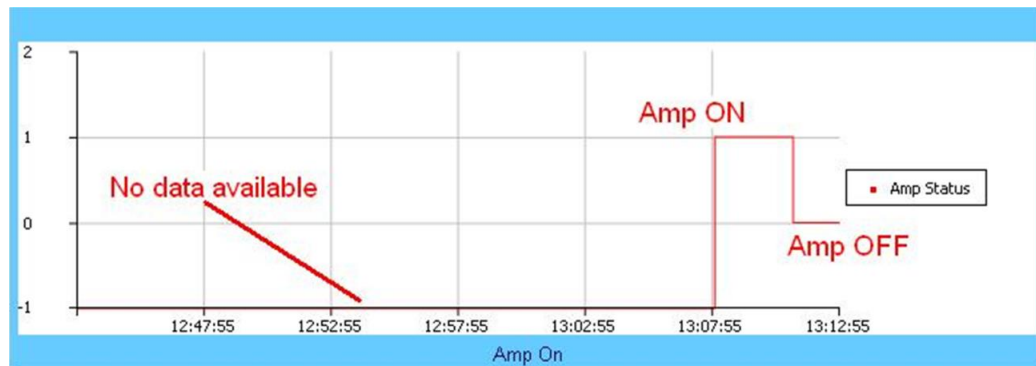
This graph displays the state of the RF amplifier (**On/Off**). As per this example:

- **On** is represented by a **1** (one)
- **Off** is represented by a **0** (zero)
- If no data is available, then the graph displays **-1** (negative one)

Mute State Graph
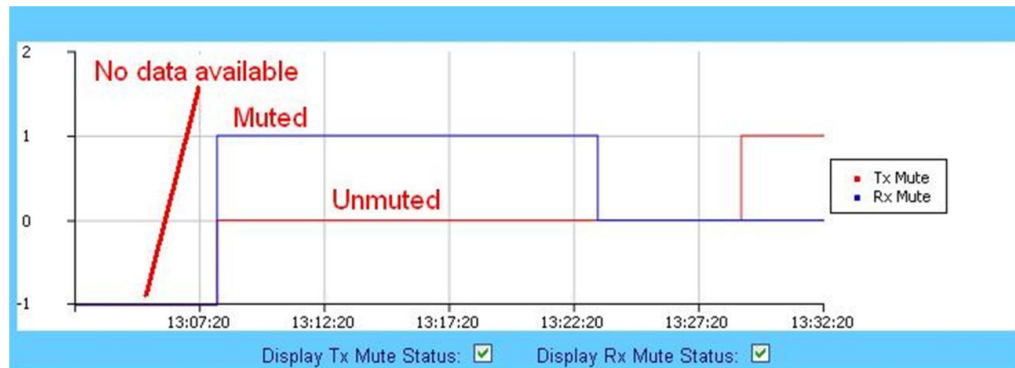
This graph displays the mute state (i.e., bias tee switch state as open = *muted*, or through path = *unmuted*) for the Tx Mute (red line) and the Rx Mute (blue line). Note that:

- A logic high on the graph equals a *muted* condition;
- A logic at **0** (zero) indicates an *unmuted* condition;
- A logic at **-1** (negative one) displays when data is *unavailable.*

Check or uncheck a checkbox to control the graphing of either muting function. The graph will update dynamically after the next polling cycle (every five seconds).

Online Status Graph
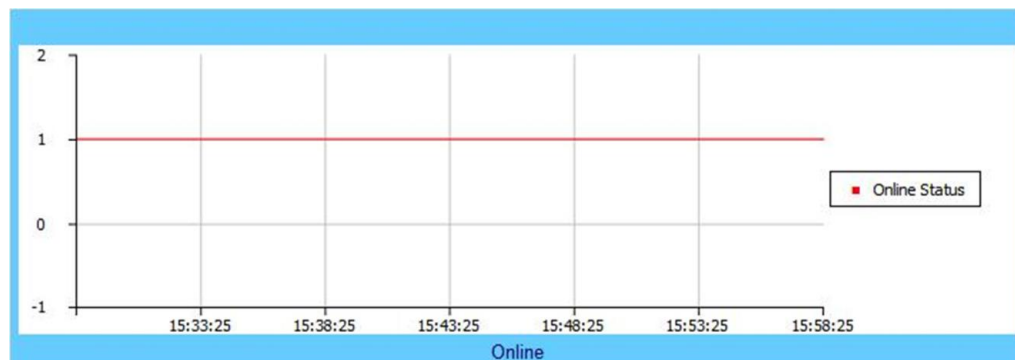
This graph displays the unit's online state. Note that:

- A logic of **1** (one) indicates the unit is *online*;
- A logic of **0** (zero) indicates the unit is *offline*;
- A logic of **-1** (negative one) displays when data is *unavailable.*

Minimum Fan Speed Graph
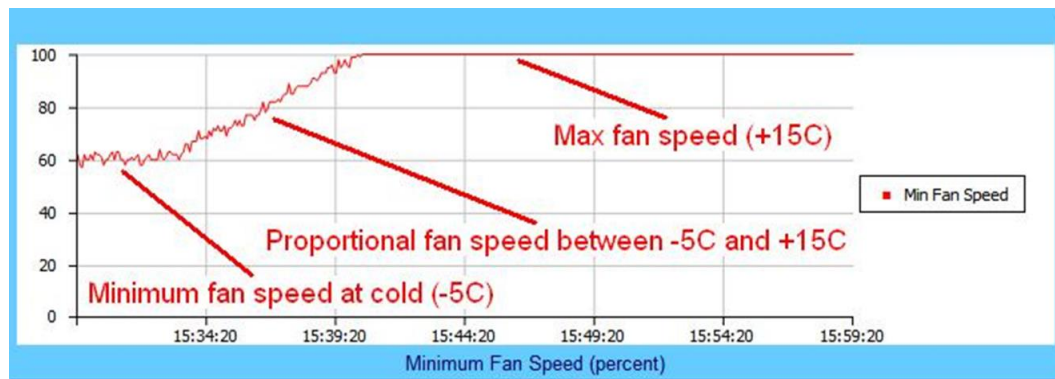
This graph displays the slowest fan speed of any of the fans installed in the system. This example demonstrates the fan running at minimum, proportional, and maximum speeds. Note that:

- The fan speed is proportional to the unit's heat sink temperature from -5 to +15°C.

- At temperatures at or below -5°C, the LPOD minimizes its fan speed

- At temperatures at or above +15°C, the LPOD maximizes its fan speed.

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Chapter 5. SERIAL INTERFACE OPERATION

5.1 Overview

> ⓘ *To achieve optimal performance and to access the most current remote control commands and queries, make sure to operate the LPOD with its latest available firmware.*

Serial-based remote management of CEFD's LPOD family of Outdoor Amplifiers / BUCs is available using the '**J6 | COM1'** port. This chapter summarizes key parameters and procedures and their associated remote commands and queries, and provides detailed instructions for use of the optional serial remote control commands and queries interface.

5.2 Key Operational Parameters / Common Commands and Queries

5.2.1 RF Input Level

The required RF input level to reach the full rated output power of the SSPA is determined by the individual amplifier temperature compensated gain and specified power rating. For example, if the test data of an SSPA rated for 250W (54 dBm) indicated a temperature compensated gain of 75 dB, then a signal of **54 dBm – 75 dB = -21 dBm** would yield the approximate rated output power. Increasing input power beyond this level would result in an output signal with increasingly higher levels of distortion. When you use LPOD attenuation control, the LPOD may accommodate a higher-level input signal level. **The maximum input level should never exceed 15 dBm, or permanent damage to the unit may occur.**

5.2.2 Attenuator Control

You may use the **ATT** command to attenuate the LPOD gain over its specified range. Full details are available in Section 5.4.

5.2.3 Mute Control

You may mute the LPOD via software or discrete control:

- Software – Using the **MUT=1** command will "software" mute the unit.

- Discrete Control – When using the **AUX=1** command, the LPOD will be muted until Pin 'S' (on the '**J6 | COM1**' Discrete Control Connector) is pulled to ground (Pin 'K'). At that time, the unit unmutes.

The Mute command provides over 60 dB of RF on/off isolation. However, the Mute command only turns off the first few low power stages of the amplifier while the high power stages remain on. By allowing the higher power transistors to stay on, the LPOD remains in more thermally stable state should the mute condition be removed.

If you wish to completely turn off the bias to the entire amplifier (perhaps to conserve energy in a redundancy system), both the **MUT=1** and **AMP=0** commands should be executed. For normal transmit operation, **MUT=0** and **AMP=1** are required.

5.2.4 Faults

The M&C system monitors certain key functions of the LPOD for proper operation. Should any of these parameters exceed predetermined limits, the M&C system will declare a fault. The conditions that trigger a fault are:

- Any power supply more than ± 10% outside its nominal value.

- Fan less than 25% of maximum speed.

- I2C internal bus communications fault.

- Thermal Shutdown – A temperature fault is indicated if the unit is +>90°C. This creates a summary fault and will cause the unit to mute itself and switch to the back-up unit (if in a redundancy system). However, the 10V supply to the FET transistors will remain on until the unit reaches the thermal shutdown temperature of ≥ >95°C. For protection reasons, the unit will shut down the 10 V supply to the power transistors at temperatures >95°C.

- Firmware checksum error at power up.

- FPGA done indicator error at power up.

- *BUC unlocked.

- Redundancy waveguide switch position fault (applies to redundancy mode operation only).

- Redundancy inter-unit link fault (applies to redundancy mode operation only).

- LNB current over limit.

The following parameters can be user defined to report an alarm condition, a fault condition, or the parameter can be ignored completely by masking it:

- RF amplifier low output power (user adjustable value).

- Internal reference oscillator unlocked.

- *LNB current outside specified window.

- *LNB voltage out of tolerance.

> **(!)** ***If this parameter generates a fault condition, the RF output will be muted.***

5.2.5 Power Detector

A power detector is provided to monitor the output power. It has a useful range of over 20 dB, referenced to the unit's rated P1dB point. Its value can be read by executing the RMS query. The test data supplied with each unit gives an indication of the accuracy and flatness of the power monitor over the frequency band of operation.

5.2.6 Common Queries

The most common queries are:

- **RMS** (Retrieve Maintenance Status) – Returns voltages, fan speeds, heatsink temperature, output power monitor reading, etc.

- **RCS** (Retrieve Configuration Status) – Returns current attenuation, mute, amplifier, online, etc. status.

- **RAS** (Retrieve Alarm Status) – Returns current alarm or fault status.

Full details are available in Section 5.4.

5.2.7 End-of-Life Commands/Queries

Certain commands/queries are marked by CEFD as End-of-Life (EOL). Noted with an asterisk (*) in the **Parameter Type** column (full details are available in Section 5.4), these commands are fully supported in this product, although CEFD strongly recommends that you use the equivalent new commands for new implementations:

EOL-designated Command/Query	New Command/Query / Comment
CAA	CAE
CUS	Functionality not included in any other remote command/query
DAT	DAY
LNA	RNE
RET	PNM. New query provides more exact unit hardware information.
RSN	SNO
SFS	Functionality not included in any other remote command/query.
TNA	TNE

5.3 Remote Control Protocol and Structure

The electrical interface is either an EIA-232 connection (for the control of a single device) or an EIA-485 multi-drop bus (for the control of many devices). 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 this chapter.

5.3.1 EIA-232

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

5.3.2 EIA-485

For applications where multiple devices are to be monitored and controlled, full-duplex (or 4-wire) EIA-485 is preferred. Half-duplex (2-wire) 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 there is a 'Controller' device (a PC or dumb terminal), which transmits data, in a broadcast mode, via one of the pairs. Many 'Target' devices are connected to this pair, which all simultaneously receive data from the Controller. The Controller is the only device with a line-driver connected to this pair – the Target devices only have line-receivers connected. In the other direction, on the other pair, each Target has a Tri-Stateable line driver connected, and 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, and each time the Controller transmits, in a framed 'packet' of data, the address of the intended recipient Target is included. All of the Targets receive the packet, but only one (the intended) will reply. The Target enables its output line driver, and transmits its return data packet back to the Controller, in the other direction, on the physically separate pair.

EIA-485 (Full Duplex) operation is summarized by its two differential pairs – one pair for Controller-to-Target, one pair for Target-to-Controller:

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

- Target-to-Controller pair – Pair has one line receiver (Controller), and all Targets have Tri-State drivers.

5.3.3 Basic Serial Protocol

Serial data can be transmitted and received by a Universal Asynchronous Receiver/Transmitter (UART).

Serial data is transmitted as asynchronous serial characters:

- Asynchronous character format is 8-N-1 (8 data bits, no parity, 1 stop bit)

- Baud rate can vary from 1200 through 57600 baud.

Serial data is transmitted in framed packets. All bytes within a packet are printable ASCII characters less than ASCII code 127 (DELETE). The Carriage Return and Line Feed characters are considered printable.

The Controller device manages the monitor and control processes. It is the only device that can start data transmission at will. Messages sent from the Controller to the Target require responses, except in these cases:

- Acknowledging receipt of a "command" – an instruction message issued by the Controller – to change the configuration of the Target.

- Returning data that was requested by the Controller – response to a "query" message – that requests information from the Target.

Target devices can transmit data only when the Controller tells them to.

5.3.4 Basic Protocol

All data is transmitted in framed packets. The host controller is assumed to be a PC or ASCII dumb terminal, which 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.

5.3.5 Packet Structure

Controller-to-Target						
Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
< ASCII code 60 (1 character)	0-9 ASCII codes 48-57 (4 characters)	/ ASCII code 47 (1 character)	A-Z, a-z ASCII codes 65-90, 97-122 (3 characters)	= *or* ? ASCII codes 61 or 63 (1 character)	 (n characters)	Carriage Return {CR} ASCII code 13 (1 character)

Controller-to-Target examples: (COMMAND) <0135/MUT=1{CR}

                                             (QUERY) <0135/MUT?{CR}

Target-to-Controller						
Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
> ASCII code 62 (1 character)	0-9 ASCII codes 48-57 (4 characters)	/ ASCII code 47 (1 character)	A-Z, a-z ASCII codes 65-90, 97-122 (3 characters)	=, ?, !, *or* * ASCII codes 61,63,33, or 42 (1 character)	(From 0 to n characters)	Carriage Return {CR}, Line Feed {LF} ASCII codes 13,10 (2 characters)

Target-to-Controller example: (QUERY RESPONSE) >0135/MUT=1{CR}{LF}

5.3.5.1   Start of Packet

These characters are used to provide a reliable indication of the start of packet. They must not appear anywhere else in the body of the message:

- **Controller-to-Target:** This is the "<" character (ASCII code 60). It is also known as the "less than" character.
- **Target-to-Controller:** This is the ">" character (ASCII code 62). It is also known as the "greater than" character.

5.3.5.2   Target Address

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

5.3.5.3   Address Delimiter

This is the forward slash character: **/** (ASCII code 47)

5.3.5.4 Instruction Code

This three-character alphabetic sequence is intended to be a mnemonic of its operational function. This aids in the readability of the message, should you display it in its raw ASCII form. For example, "GAC" means "Global Amplifier Configuration"; "IPA" means "IP Address", etc. Both upper case and lower case alphabetic characters may be used (A-Z *and* a-z, ASCII codes 65-90 *and* 97-122).

5.3.5.5 Instruction Code Qualifier

This single character further qualifies the preceding instruction code. Instruction Code Qualifiers obey specific rules.

5.3.5.5.1 Controller-to-Target Rules

From Controller-to-Target, the permitted qualifiers are = or ? (ASCII codes 61 or 63):

= (ASCII code 61)

This qualifier is the Assignment Operator (AO). It means that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. For example: MUT=1 means "set the Mute function to Enabled".

? (ASCII code 63)

This qualifier is the Query Operator (QO). It means that the Target should return the value of the parameter(s) defined by the preceding byte. For example: SWR? means "return the firmwares installed in the Active and Standby images".

5.3.5.5.2 Target-to-Controller Rules

From Target-to-Controller, the Target transmits the symbol =, ?, !, *, or # (ASCII codes 61, 63, 33, 42, or 35) to the Controller:

= (ASCII code 61)

 "=" displays in two ways:

- If the Controller sends a command to set a parameter's value, and the value is valid, the Target accepts the command by replying with no message arguments. For example: >0001/MUT={CR}{LF}

- If the Controller sends a query to a Target, the Target responds with the configured setting. For example, the query MUT? means "is Muting enabled or disabled?"); the Target responds with >0001/MUT=x{CR}{LF} (where 'x' represents the configured state – '1' being 'enabled' and '0' being 'disabled').

? (ASCII code 63)

"?" displays when the Controller sends a command to set a parameter's value, and the value is not valid. The Target rejects the message by echoing the valid instruction, followed by this character. For example: >0001/MUT=?{CR}{LF}

! (ASCII code 33)

"!" displays when the Controller sends an instruction code that the Target does not recognize. The Target rejects the message by echoing the invalid instruction, followed by this character. For example: >0001/XYZ!{CR}{LF}

* (ASCII code 42)

"*" displays when the Controller sends a command to set a parameter's value, and the value is valid but the Target cannot permit that parameter to be changed at that time. The Target rejects the command by echoing the prohibited instruction, followed by this character with no message arguments. For example: >0001/MUT*{CR}{LF} (with message arguments).

(ASCII code 35)

"#" displays only if the Controller sends an instruction code that the Target cannot currently perform due to hardware resource issues – specifically, if you issue two or more 'hardware configuration' type commands without allowing adequate time, between commands, for the hardware to be configured. If this happens, the Target rejects the instruction code and responds to the error by echoing the invalid instruction, followed by the # character. For example, if you issue commands to change both the frequency (FRQ=) and the attenuation (ATT=) with less than 100 milliseconds between the commands, and the Target responds with >0001/ATT#{CR}{LF}, this means that the attenuation command was rejected and you must resend that command.

5.3.5.6   Optional Message Arguments

Arguments are not required for all messages. Arguments include these ASCII codes:

- Characters "0" through "9" (ASCII codes 48 through 57)

- Period "." (ASCII code 46)

- Comma "," (ASCII code 44)

5.3.5.7   End of Packet

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

- Target-to-Controller: This is the two-character sequence of Carriage Return and Line Feed {CR}{LF} (ASCII codes 13 and 10). This pairing shows the valid end of a packet.

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5.4   Remote Commands and Queries

Index Columns – Where Column 'C'=Command, and **Column 'Q'**=Query, columns marked '**X**' designate the instruction code as *Command only*, *Query only*, or *Command or Query*. Where **CODE=XXX**, this indicates a priority command.

CODE	C	Q	PAGE
AFR	X	X	5–12
AMP	X	X	5–12
AOF	X	X	5–12
ATT	X	X	5–13
AUX	X	X	5–13
CAA	X	-	5–13
CAE	X	-	5–13
CAS	-	X	5–14
CCS	-	X	5–15
CFS	-	X	5–16
CID	X	X	5–16
CLC	X	X	5–16
CMS	-	X	5–17
CSL	X	-	5–17
CTD	X	-	5–17
CUS	-	X	5–18
CWE	X	X	5–18
DAT	X	X	5–18

CODE	C	Q	PAGE
DAY	X	X	5–18
ESA	X	X	5–19
ESL	X	X	5–19
ESW	X	X	5–19
FMN	X	X	5–19
FRW	-	X	5–20
GAC	X	X	5–20
IEP	X	-	5–21
IMG	X	X	5–21
IPA	X	X	5–22
IPG	X	X	5–22
ISP	X	-	5–22
LCS	X	X	5–23
LCW	X	X	5–23
LNA	-	X	5–24
LPT	X	X	5–24
LRS	X	X	5–25
MAC	-	X	5–25

CODE	C	Q	PAGE
MOP	-	X	5–26
MSK	X	X	5–27
MUT	X	X	5–27
NUE	-	X	5–27
NUS	-	X	5–28
OFM	X	X	5–28
ONL	X	X	5–29
PNM	-	X	5–29
RAS	-	X	5–29
RBT	X	-	5–30
RCS	-	X	5–31
RED	X	X	5–31
REF	X	X	5–32
RET	-	X	5–32
RFS	-	X	5–32
RMS	-	X	5–33
RNE	-	X	5–34
RNS	-	X	5–35

CODE	C	Q	PAGE
RSN	-	X	5–36
RUS	-	X	5–36
SBR	X	X	5–36
SBT	X	X	5–37
SFA	X	X	5–37
SFS	X	X	5–37
SNA	X	X	5–37
SNM	X	X	5–38
SNO	-	X	5–38
SPA	X	X	5–38
SRC	X	X	5–38
SSC	X	X	5–38
SSI	X	X	5–38
SSL	X	X	5–39
SSN	X	X	5–39
STA	X	X	5–39
STB	X	X	5–39
STV	X	X	5–39

CODE	C	Q	PAGE
SWC	X	X	5–40
SWR	-	X	5–40
TIM	X	X	5–40
TMP	-	X	5–40
TNA	-	X	5–40
TPE	X	X	5–41
TPS	X	X	5–41
TSC	-	X	5–41
XRM	X	X	5–42

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Auto Fault Recovery	AFR=	AFR?	1 byte	Command or Query. Sets or returns automatic fault recovery in the form x, where: 0=Disabled 1=Enabled (DEFAULT) NOTES: 1) If auto fault recovery is enabled, it causes the output to return to its pre-fault mute condition if all faults are cleared. If disabled, the output remains muted even if all faults are cleared. The LPOD output automatically mutes if one of the following fault conditions occur: • BUC lock detect fault • LNB current fault • LNB voltage fault 2) These faults can be user defined as faults, alarms, or masked (see MSK command for more info). COMMAND EXAMPLE: <0001/AFR=1{CR}	AFR= AFR? AFR*	AFR=x
RF Power Amplifier State	AMP=	AMP?	1 byte	Command or Query. Sets or returns the RF power amplifiers status in the form x, where: 0=Off (DEFAULT) 1=On NOTE: Turning the amplifier off disables the +10V supply, and masks it during fault checking. COMMAND EXAMPLE: <0001/AMP=1{CR}	AMP= AMP? AMP*	AMP=x
Attenuation Offset	AOF=	AOF?	5 bytes	Command or Query. Sets or returns the attenuation offset level in the form xx.xx, where: xx.xx=00.00 (DEFAULT) to 20.00, in dB, in 0.25 dB steps NOTE: This value is not copied to the offline unit in a redundancy system, but is added to the attenuation value upon a switchover. This provides a unit-specific fine-tune to maintain power levels appropriately in a redundancy system. COMMAND EXAMPLE: <0001/AOF=12.25{CR}	AOF= AOF? AOF*	AOF=xx.xx

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Attenuation	ATT=	ATT?	5 bytes	Command or Query. Sets or returns the attenuation level in the form xx.xx, where: xx.xx=00.00 to 20.00, in dB, in 0.25 dB steps Default value: 10.00 COMMAND EXAMPLE: <0001/ATT=12.25{CR}	ATT= ATT? ATT*	ATT=xx.xx
Auxiliary Mute Enable	AUX=	AUX?	1 byte	Command or Query. Sets or returns the auxiliary mute mode in the form x, where: 0=Disabled (DEFAULT) 1=Enabled NOTES: 1) When enabled, the mute control input on the remote com connector must be grounded to UN-MUTE the unit. Otherwise, the unit will be muted, and if a mute query is given (MUT?) the response will be MUT=2 to indicate a hardware controlled mute is present. 2) Aux mute is one of several hardware mute states that can cause a MUT=2 to be reported. See the MUT command for more info on mute states. 3) Aux mute supersedes the user mute state so if the command MUT=1 is sent, then AUX=1 is sent, and the user shorts Pin K to Pin S on the discrete control connector; the RF mute will then be disabled (MUT=0). COMMAND EXAMPLE: <0001/AUX=1{CR} (enables Aux Mute)	AUX= AUX? AUX*	AUX=x
Clear All Stored Alarms*	CAA=	N/A	None	Command only. Instructs the LPOD to Clear All stored Alarms. This command takes no arguments. EXAMPLE: <0001/CAA={CR}	CAA= CAA*	N/A
Clear All Stored Events	CAE=	N/A	None	Command only. Instructs the LPOD to Clear All stored Events. This command takes no arguments. EXAMPLE: <0001/CAE={CR}	CAE= CAE*	N/A

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Concise Alarm Status	N/A	CAS?	44 bytes	Query only. Returns the alarm status of the unit, response is semicolon-delimited. EXAMPLE: <1/CAS?{CR} >0001/CAS=a;b;c;d;e;f;g;h;i;j;k;l;m;n;o;p;q;r;s;t;u;v;w;x;y;{CR}{LF} where: a thru z where 0=FT, 1=OK, 2=AL, 3=NO, 4=YS, 5=MS, 6=??, or 7=NA (SEE NOTES 2 AND 3) a=+24V Power Supply b=+24V Switch Power Supply c=+13/18V LNB Power Supply (SEE NOTE 4) d=+13.5V Power Supply e=+10V Power Supply f=+10V1 Amplifier Power Supply g=+10V2 Amplifier Power Supply (SEE NOTE 4) h=+7.8V Power Supply i=+5.8V Power Supply j=+2.5V Power Supply k=+1.2V Power Supply l=-5.8V Power Supply m=Fan#1 State n=Fan#2 State (SEE NOTE 4) o=Heatsink Temp p=Overtemp Shutdown q=IIC Status r=Forward Power Alarm s=Flash Checksum t=FPGA Done u=BUC Lock Detect (SEE NOTE 4) v=External Ref Lock Detect (SEE NOTE 4) w=LNB Current (SEE NOTE 4) x=Redundancy Switch Condition (SEE NOTE 4)	CAS=	CAS=a;...z

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Concise Alarm Status (cont)				y=Redundancy Link Status (SEE NOTE 4) z=Terminal Status Change NOTES: 1) This is the condensed version of the RAS query. 2) ?? is an invalid fault condition because hardware failed to respond to query (this value is accompanied by an I2C fault). 3) NA=not applicable. The unit does not include hardware support for this parameter. 4) c, g, n, u, v, w, x, and y appear if the appropriate model/options have been selected/installed.		
Concise Configuration Status	N/A	CCS?	26 bytes	Query only. Returns the configuration status of the unit, in the form aa.aa;b;c;d;e;ff.ff;g;hhh, where: aa.aa=attenuation in dB (ATT) b=RF power amplifier state where 0=Off, 1=On (AMP) c=mute state where 0=unmuted, 1=muted (MUT) d=online status (ONL) e=redundancy state and mode (ESW) ff.ff=Attenuator offset in dB (AOF) g=auto fault recovery mode (AFR) hhh=External reference status where N/A=no external reference, 05M=5 MHz, 10M=10 MHz (SEE NOTE 2) NOTES: 1) This is the condensed version of the RCS query. 2) hhh will always be N/A (not applicable) if the internal reference oscillator option is not installed. EXAMPLE: <1/CCS?{CR} >0001/CCS=aa.aa;b;c;d;e;ff.ff;g;hhh; {CR}{LF}	CCS=	CCS=aa.aa;...hhh

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Concise RF Power FET Current Status	N/A	CFS?	Length varies depending on the number of installed FETs	Query only. Returns the power values of installed FETs, comma-delimited, in concise format. NOTE: This is the condensed version of the RFS query. EXAMPLE: <0001/CFS?{CR} >0001/CFS=xxx,xxx,x.x,x.x,..........,x.x,{CR}{LF}	CFS=	CFS=x;..... x
Circuit Identification	CID=	CID?	48 bytes	Command or Query. Sets or returns the user-defined label for the unit or station. NOTE: The 48-character string is entered as one line, but it is read back from the unit as two 24-byte lines of information. Default Setting: ------CID MESSAGE------- ----------------------- COMMAND EXAMPLE: <0001/CID= Station #001--SSPA #01--{CR} >0001/CID={CR}{LF} QUERY EXAMPLE: <0001/CID?{CR} >0001/CID={CR} Station #001{CR} --SSPA #01--{CR}{LF}	CID= CID? CID*	CID=x;...x
Calibrate LNB Current	CLC=	CLC?	none	Command or Query. Sets or returns, as a reference point, the value of the LNB Current Supply (in mA) in the form xxx.x. Default value: 000.0 NOTES: 1) This command returns a mode error if the LNB current source output has not been enabled first (see LCS command). 2) The LNB current alarm point is then determined by the calibrated LNB reference point, and the LNB current window setting (see LCW command). 3) The CLC query returns the value that was stored during the LNB current calibration. COMMAND EXAMPLE: <1/CLC=xxx.x{CR} (where xxx.x is the calibrated LNB current value in mA) QUERY EXAMPLE: <1/CLC?{CR} >0001/CLC=xxx.x{CR}{LF}	CLC= CLC? CLC*	CLC=xxx.x

Concise Maintenance Status	N/A	CMS?	95 bytes	Query only.
				Returns the Maintenance status of the unit, response is semicolon-delimited, in the form
				aaa.a;bbb.b;ccc.c;ddd.d;eee.e;fff.f;ggg.g;hhh.h;iii.i;jjj.j;kkk.k;lll.l;mmm.m;nnn.n;
				ooo.o;ppp.p;qqq.q;rrr.r;sss.s;ttt.t where:
				aaa.a=P24V1
				bbb.b=P24V2
				ccc.c=LNBVT (SEE NOTE 2)
				ddd.d=P13VT
				eee.e=P10V1
				fff.f=A10V1
				ggg.g=A10V2 (SEE NOTE 2)
				hhh.h=P7V8T
				iii.i=P5V8T
				jjj.j=P2V5T
				kkk.k=P1V2T
				lll.l=N5V8T
				mmm.m=FANR1 (SEE NOTE 2)
				nnn.n=FANR2 (SEE NOTE 2)
				ooo.o=BUCVT (SEE NOTE 2)
				ppp.p=FWPWR
				qqq.q=REFVT (SEE NOTE 2)
				rrr.r=LNBCS (SEE NOTE 2)
				sss.s=ATEMP
				ttt.t=OTEMP (SEE NOTE 2)
				NOTES:
				   1) This is the concise version of the RMS command.
				   2) ccc.c, ggg.g, mmm.m, nnn.n, ooo.o, qqq.q, rrr.r, and ttt.t will appear if the appropriate model/options have been selected/installed. Otherwise, the unused fields will display XXXXX.
				EXAMPLE: <1/CMS?{CR}
				>0001/CMS=aaa.a;bbb.b;ccc.c;ddd.d;eee.e;fff.f;ggg.g;hhh.h;iii.i;jjj.j;kkk.k;lll.l;mmm.m;nnn.n;ooo.o;ppp.p;qqq.q; rrr.r;sss.s;ttt.t{CR}{LF}
					CMS=	CMS=x….x

Clear Statistics Log	CSL=	N/A	1 byte	Command only. Clears the statistics log entries in the form x, where x=1. EXAMPLE: <0001/CSL=1{CR}	CSL= CSL? CSL*	CSL=
Clear Trending	CTD=	N/A	1 byte	Command only.	CTD=	CTD=

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Data				Clears the trending data in the form x, where: x=1 EXAMPLE: <0001/CTD=1{cr}	CTD? CTD*	
Concise Utility Status*	N/A	CUS?	15 bytes	Query only. Returns the Maintenance status of the unit, in the form aaaa;bbbbb;ccc, response is semicolon-delimited, where: aaaa=Remote Unit Address bbbbb=Remote Baud Rate ccc=Reference oscillator tuning voltage DAC value (present only if a reference oscillator is installed) EXAMPLE: <0001/CUS?{CR} >0001/CUS=aaaa;bbbbb;ccc{CR}{LF}	CUS=	CUS=x....x
LNB Current Window Enable	CWE=	CWE?	1 bytes	Command or Query. Sets or returns the LNB current window alarm in the form x, where: 0=Disabled (DEFAULT) 1=Enabled (SEE NOTE) NOTE: If disabled, the LCW value will be retained, but unused. COMMAND EXAMPLE: <0001/CWE=0{CR}	CWE = CWE? CWE *	CWE =x
Set RTC Date (by Month)*	DAT=	DAT?	6 bytes	Command or Query. Sets or returns the Real-Time-Clock date in the form mmddyy, where: mm=month of the year (01 to 12) dd=day of the month (01 to 31) yy=year (00 to 96) (2000 to 2096) COMMAND EXAMPLE (date=April 25, 2016): <0001/DAT=042516{CR}	DAT= DAT? DAT*	DAT=mmddyy
Set RTC Date (by Day)	DAY=	DAY?	6 bytes	Command or Query. Sets or returns the Reasl-Time-Clock date in the form ddmmyy, where: dd=day of the month (01 to 31) mm=month of the year (01 to 12) yy=year (00 to 99) (2000 to 2099) COMMAND EXAMPLE (date=April 25, 2016): <0001/DAY=250416{CR}	DAY= DAY? DAY*	DAY=ddmmyy

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Enable Statistics Averaging	ESA=	ESA?	1 byte	Command or Query. Enables or Disables averaging of statistics data, at a rate of once per second every 10 seconds, in the form x, where: 0=Disable (DEFAULT – SEE NOTE) 1=Enable NOTE: If Disabled, burst values will be logged instead of averaged values. COMMAND EXAMPLE: <0001/ESA=0{CR}	ESA= ESA? ESA*	ESA=x
Enable Statistics Logging	ESL=	ESL?	1 byte	Command or Query. Sets or returns the statistics logging function in the form x, where: 0=Disable (DEFAULT) 1=Enable COMMAND EXAMPLE: <0001/ESL=1{CR}	ESL= ESL? ESL*	ESL=x
Enable Redundancy Switch Mode	ESW=	ESW?	1 byte	Command or Query. Sets or returns the redundancy state in the form x, where: 0=Off (DEFAULT) 1=1:1 Redundancy Tx (Only Tx switch installed) 2=1:1 Redundancy Tx + RX (Tx and RX switch installed) 5=1:1 Manual redundancy mode (used for debugging, or redundancy system setup) (SEE NOTE) NOTE: Manual redundancy does not support automatic switching, and the offline unit will not poll the online unit to update its configuration. COMMAND EXAMPLE: <0001/ESW=1{CR}	ESW= ESW? ESW *	ESW=x
Fan Model Number	FMN=	FMN?	3 bytes	Command or Query. Sets or returns the fan model number in the form xxx, where: 1=Comair Rotron, 255=ADDA Default value: 255 Example: <0001/FMN=1{CR} (sets the fan model number to Comair Rotron)	FMN= FMN?	FMN=xxx

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Retrieve Firmware Number	N/A	FRW?		Query only. Returns the Boot, Bulk1, and Bulk2 firmwares loaded into the unit, each firmware load [a,b,c] is in the form FW-AAAAAAA B.B.BB DD/MM/YY where: FW-AAAAAAA=the firmware part number B.B.BB=the version number DD/MM/YY=Day/Month/Year firmware released EXAMPLE: <0001/FRW?{CR} >0001/FRW={CR} Boot: {CR} FW-0000082 0.0.1a 04/09/08{CR} Bulk1: {CR} FW-0000078 0.0.1a 04/09/08{CR} FW-0000080 0.0.1a 04/09/08{CR} FW-0000081 0.0.1a 04/09/08{CR} Bulk2: {CR} FW-0000078 0.0.1a 04/09/08{CR} FW-0000080 0.0.1a 04/09/08{CR} FW-0000081 0.0.1a 04/09/08{CR}{LF}	FRW=	FRW=Boot:[a]:{CR}Bulk1:{CR}[a]{CR}[b]{CR}[c]{CR}Bulk2:{CR}[a]{CR}[b]{CR}[c]{CR}{LF}
Global Amplifier Configuration Global Amplifier Configuration (Cont)	GAC=	GAC?	43 bytes	Command or Query. Sets or returns the global status of the LPOD, semicolon delimited, in the form aa.aa;b;ccccc;d;e;f;g;h;j;k;l;m;n;o where: a=redundancy mode (ESW) b=online status (ONL) cc.cc=Attenuation Offset (AOF) dd.dd=Customer Attenuation(ATT) e=Auto Fault Recovery (AFR) fffff=Unit Alarm Mask (MSK) g=LNB Current Source (LCS) hh=LNB Current Window (LCW) i=LNB Current Window Enable (CWE) j=Enable Statistics Averaging (ESA)	GAC= GAC* GAC? GAC#	GAC=x….x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
				k=Set Statistics Interval (SSI) l=Enable Statistics Logging (ESL) m=Auxiliary Mute (AUX) n=user mute state (MUT) o=RF power amplifier state (AMP) COMMAND EXAMPLE: <0001/GAC=a;b;cc.cc;dd.dd;e;fffff;g;hh;l;j;k;l;m;n;o;{CR}		
Initialize Events Pointer	IEP=	N/A	None	Command only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log. This command takes no arguments. EXAMPLE: <0001/IEP={CR}	IEP= IEP? IEP*	N/A
Software Image	IMG=	IMG?	1 byte	Command or Query. Sets or returns the Current Active Software Image in the form x, where: 1=Bulk Image # 1 currently active 2=Bulk Image # 2 currently active COMMAND EXAMPLE: <0001/IMG=1{CR} (instructs the unit to load firmware from image #1 at the next reset / power up). QUERY EXAMPLE: <0001/IMG?{CR} (queries the image number that the firmware loaded during bootup) NOTE: If you send the IMG command and then query the IMG value, the numbers may not be equal because the command tells the firmware which image to boot from at the next bootup, while the query reports the image that the firmware booted from on the previous bootup.	IMG= IMG? IMG* IMG#	IMG=x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Management IP Address	IPA=	IPA?	18 bytes	Command or Query. Sets or returns the Management IP Address and network prefix for the 'J6 | COM1' 10/100 BaseT Ethernet management port, in the form xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx=the IP Address yy=the network prefix (8 to 30) Default value: 192.168.001.004.24 COMMAND EXAMPLE: <0001/IPA=192.168.001.004.24{CR} CAUTION: Changing the Management IP Address through the Telnet interface requires you to power cycle the unit, and then restart a new Telnet session with the new IP Address. The IP Address that you type into the Telnet client software does not include the range parameter so it would be: 192.168.1.4	IPA= IPA? IPA* IPA#	IPA=xx.xxx .xxx.xxx.yy
Gateway IP Address	IPG=	IPG?	15 bytes	Command or Query. Sets or returns the Gateway IP address for the 10/100 Base Tx Ethernet management port, in the form xxx.xxx.xxx.xxx. Default value: 192.168.001.005 COMMAND EXAMPLE: <0001/IPG=192.168.001.005{CR}	IPG= IPG? IPG*	IPG=xxx.xx x.xxx.xxx
Initialize Statistics Pointer	ISP=	N/A	None	Command only. Resets the internal pointer to allow RNS? queries to start at the beginning of the stored statistics log. This command takes no arguments. EXAMPLE: <0001/ISP={CR}	ISP= ISP? ISP*	N/A

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query

LNB Current Source	LCS=	LCS?	1 byte	Command or Query.
				Sets or returns the LNB current source in the form x, where:
				x=0,1,2,3, or 4:
				0=Disable (DEFAULT)
				1=Enable (18V 22kHz Disabled – SEE NOTE 2)
				2=18V 22kHz Enabled (SEE NOTE 2)
				3=13V 22kHz Disabled (SEE NOTE 2)
				4=13V 22kHz Enabled (SEE NOTE 2)
				NOTES:
				  1) LCS must be enabled before the LNB current can be calibrated
				  2) This feature is available on multi-band units only.
				COMMAND EXAMPLE: <0001/LCS=1{CR}
					LCS=
					LCS?
					LCS*
						LCS=x

LNB Current Window	LCW=	LCW?	2 bytes	Command or Query. Sets or returns the alarm window in ±% of the calibrated LNB Current in the form xx, where: xx=20 to 50, in increments of 1(%); set to 99 to disable (SEE NOTE). Default value: 30 NOTE: A query return value of 99 indicates that the current window is disabled. This method is due to become obsolete. Comtech recommends that you use the CWE command/query instead of specifying 99 here. COMMAND EXAMPLE: <0001/LCW=30{CR} (sets the alarm window to ±30%)	LCW= LCW? LCW*	LCW=xx

| Parameter Type (* indicates End-of-Life) | Controller-to-Target Instruction Code and Qualifier | | Arguments for Command or Query | Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57) | Target-to-Controller (see Description of Arguments) | |
	Command	Query			Response to Command	Response to Query
Retrieve Next 5 Unread Stored Alarms*	N/A	LNA?	145 bytes	Query only. Returns the five oldest stored events in the alarm log, in the reply format: YYYYYYYYYY ZZ mmddyy hhmmss{CR} YYYYYYYYYY ZZ mmddyy hhmmss{CR} YYYYYYYYYY ZZ mmddyy hhmmss{CR} YYYYYYYYYY ZZ mmddyy hhmmss{CR} YYYYYYYYYY ZZ mmddyy hhmmss{CR}{LF} Where: YYYYYYYYYY is the fault description. ZZ is the event type FT=Fault; OK=Clear; or IF=Information mmddyy hhmmss=date / time stamp. NOTE: If there are no events in the log the unit will reply with LNA*. All events that are read from the log are also automatically removed from the log. EXAMPLE: <0001/LNA?{CR} >0001/LNA={CR} LOG CLR IF 175503 052307{CR} FAN #1 FT 175504 052307{CR} OVR TMP FT 175504 052307{CR} FAN #1 OK 175504 052307{CR} IIC BUS FT 175504 052307{CR}{LF}	LNA=	LNA=YY..ss
Low Power Forward Threshold	LPT=	LPT?	5 bytes	Command or Query. Sets or returns the threshold for the low forward power alarm/fault in the form xx.xx: Default value: 00.00 NOTES: 1) If the forward power drops below the specified value, the alarm/fault will be indicated. 2) Setting this parameter to 00.00 effectively disables the threshold. COMMAND EXAMPLE: <0001/LPT=00.00{CR}	LPT = LPT? LPT *	LPT=xx.x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Local/Remote State	LRS=	LRS?	1 byte	Command or Query. Sets or returns Local or Remote state for Indoor SSPA (always in remote mode for Outdoor SSPA) in the form x, where x=0, 1, 2, or 3:: 0=Local 1=Serial 2=Ethernet 3=Serial+Ethernet (DEFAULT) NOTE: You will always have LRS query access in any mode. The LRS command is available in all modes as a means of acquiring control so as to limit changes from being made on multiple interfaces at the same time. Units without a front panel (e.g., the LPOD) treat an entry of 0 as "reserved" and refuse the command by returning a mode error. The HTTP Interface prohibits connections unless you set LRS to accept Ethernet remote control. COMMAND EXAMPLE: <0001/LRS=3{CR}	LRS= LRS?	LRS=x
Unit MAC Address	N/A	MAC?	17 bytes	Query only. Returns the read-only MAC address of the unit, in hexadecimal format xx-xx-xx-xx-xx-xx EXAMPLE: <0001/MAC?{CR} >0001/MAC=00-06-B0-00-D2-A7{CR}{LF}	MAC=	MAC=xx-xx-xx-xx-xx-xx

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Maximum Operating Point	N/A	MOP?	272 bytes	Query only. Returns the maximum operating point of the unit along with its timestamp in the reply format: MAXFET=sYYYC mmddyy hhmmss{CR} MINFET=sYYYC mmddyy hhmmss{CR} MAXPFT=sYYYC mmddyy hhmmss{CR} MAXDTP=sYYYC mmddyy hhmmss{CR} MAXHTS=sYYYC mmddyy hhmmss{CR} MINHTS=sYYYC mmddyy hhmmss{CR} MAXOST=sYYYC mmddyy hhmmss{CR} MAXRFP=sZZ.ZZ mmddyy hhmmss{CR} MINRFP=sZZ.ZZ mmddyy hhmmss{CR} Where: sYYYC is the temperature sZZ.ZZ is the power NOTE: Not all LPODs have outside temperature monitor. In which case MAXOST and MINOST report XXXXX XXXXXX XXXXXX EXAMPLE: <0001/MOP?{CR} >0001/mop={CR} MAXFET=+000C 010208 180729{CR} MINFET=+000C 010208 180729{CR} MAXPFT=+000C 010208 180659{CR} MAXDTP=+000C 010208 180729{CR} MAXHTS=+050C 010208 180729{CR} MINHTS=+050C 010208 180729{CR} MAXOST=XXXXX XXXXXX XXXXXX{CR} MINOST=XXXXX XXXXXX XXXXXX{CR} MAXRFP=+00.00 010208 180659{CR} MINRFP=+00.00 010208 180659{CR}	MOP=	

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Unit Alarm Mask	MSK=	MSK?	5 bytes	Command or Query. Sets or returns the alarm mask conditions in the form abcde where: a=Low Forward RF Power b=External Reference Lock detect c=Fan Speed d=LNB Current Detect e=LNB 22V Power Supply TYPICAL FOR EACH PARAMETER: 0=Fault, 1=Alarm, 2=Masked NOTES: 1) Default value: 22111 2) If the value is set to 'Fault' (MSK=0) for a parameter, then the fault condition will be logged as a fault if specified hardware conditions are not met. 3) If the mask value is set to 'Alarm' (MSK=1), then the fault condition will only log as an alarm. 4) If the mask value is set to 'Masked' (MSK=2), then the fault condition will not be reported to the user. COMMAND EXAMPLE: <0001/MSK=22111{CR}	MSK= MSK? MSK*	MSK=abcde
Mute State	MUT=	MUT?	1 byte	Command or Query. Sets or returns the unit muting in the form x, where: 0=Disable (Not Muted) 1=Enable (Muted) (DEFAULT) 2=Unit muted due to HW mute signal (SEE NOTE) NOTE: This value is only shown in the response to a query, and cannot be issued as a command. When MUT=2 this means that one of the "hardware" mute conditions is present. Additionally, certain faults can generate a hardware mute, e.g., BUC Lock Detect. If MUT=2, you must check the active faults and the status of the auxiliary mute. COMMAND EXAMPLE: <0001/MUT=1{CR}	MUT= MUT? MUT*	MUT=x
Number of Unread Stored Events	N/A	NUE?	3 bytes	Query only. Unit returns the Number of Unread stored Events in the form xxx. EXAMPLE: <0001/NUE?{CR} >0001/NUE=126{CR}{LF}	NUE=	NUE=xxx

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Number of Unread Stored Statistics	N/A	NUS?	3 bytes	Query only. Unit returns the Number of Unread stored Statistics in the form xxx. EXAMPLE: <0001/NUS?{CR} >0001/NUS=126{CR}{LF}	NUS=	NUS=xxx
Offline Mute	OFM=	OFM?	1 byte	Command or Query. Sets or returns offline mute in the form x, where: 0=Disable (Not Muted) 1=Enable (Muted) 2=Mute RX 3=Mute Tx 4=Mute Rx+LNB 5= Mute Tx+LNB 6=Mute Tx+AMP 7=Mute Tx+LNB+AMP NOTE: LNB Voltage of Online unit shows on Status page of Offline unit when Offline Mute is set to 4 or 5. This is caused by voltage feedback from Online unit to Offline unit via RF splitter. EXAMPLE: <1/OFM=1{CR} >0001/OFM={CR}}{IF}	OFM= OFM?	OFM=x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Online Status	ONL=	ONL?	1 byte	Command or Query. Sets or returns the Redundancy Online status in the form x, where: 0=Offline (Query only) (SEE NOTE 2) 1=Online NOTES: 1) The ONL query always returns an online response if the unit is not running in redundancy mode. If redundancy is enabled then the query will indicate the position of the Tx waveguide switch that enables one of the units to be connected to the antenna. 2) Sending ONL=0 will not generate a syntax error; however setting ONL to zero will not cause the unit to go offline. The online status is determined by the Tx waveguide redundancy switch position, and only the offline unit may drive the switches. Instead of sending ONL=0 to the online unit the ONL=1 command should be sent to the offline unit to generate a redundancy switchover. COMMAND EXAMPLE: <0001/ONL=1{CR}	ONL= ONL? ONL*	ONL=x
Part Number	N/A	PNM?	96 bytes alphanumeric	Query only. Returns the Comtech EF Data part number of the unit. This part number is the unit's DOTCODE at the time of manufacture. The DOTCODE may be up to 96 printable ASCII characters long. EXAMPLE: <0001/PNM?{CR} >0001/PNM=HPODC0.350WRSW00{CR}{LF}	PNM= PNM? PNM *	PNM=x....x
Retrieve Alarm Status	N/A	RAS?	168 bytes	Query only. Returns the Alarm status of the unit, where: OK=No fault condition; FT=Faulted; AL=Alarm; YS=Yes; NO=No; MS=Masked. EXAMPLE: <0001/RAS?{CR} >0001/RAS={CR} P24V1=OK{CR} (+24V power supply) P24V2=NA{CR} (+24V switch power supply) LNBVT=XXXXX{CR} (+13/18V LNB power supply) (SEE NOTE) P13VT=OK{CR} (+13.5V power supply) P10V1=OK{CR} (+10V power supply)	RAS=	RAS=x....x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Retrieve Alarm Status (Cont)				A10V1=OK{CR} (+10V1 RF supply) (SEE NOTE) A10V2=NA{CR} (+10V2 RF supply) (SEE NOTE) P7V8T=OK{CR} (+7.8V power supply) P5V8T=OK{CR} (+5.8V power supply) P2V5T=OK{CR} (+2.5V power supply) P1V2T=OK{CR} (-1.2V power supply) N5V8T=OK{CR} (-5.8V power supply) FANR1=OK{CR} (Fan 1 speed) (SEE NOTE) FANR2=OK{CR} (Fan 2 speed) (SEE NOTE) ATEMP=OK{CR} (Amplifier temperature) SHTDN=OK{CR} (Over-temp shutdown) IICST=OK{CR} (I2C bus status) FWPWR=OK{CR} (Forward power in dBm) CHKSM=OK{CR} (Flash checksum) FPGAD=NA{CR} (FPGA done status) BUCLD=OK{CR} (BUC lock detect) (SEE NOTE) REFLD=NA{CR} (Reference lock detect) (SEE NOTE) LNBCS=XXXXX{CR} (LNB current status) (SEE NOTE) SWITC=NA{CR} (Waveguide switch position status) (SEE NOTE) RDLNK=NA{CR} (Redundancy link status) (SEE NOTE) TRMST=YS{CR}{LF} (Terminal Status) NOTE: LNBVT, A10V1, A10V2, FANR1, FANR2, BUCLD, REFLD, LNBCS, SWITC and RDLNK only appear in the list if the appropriate model/options have been selected/installed.		
Reboot	RBT=	N/A	1 byte	Command only. Soft Reboots the unit in the form x where: 1=Reboot System	RBT = RBT? RBT*	RBT=x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Retrieve Configuration Status	N/A	RCS?	45 bytes	Query only. Returns the configuration status of the unit. EXAMPLES: <0001/RCS?{CR} ATT=12.75{CR} AMP=1{CR} MUT=1{CR} ONL=1{CR} ESW=1{CR} AOF=00.00{CR} AFR=1{CR} XRF=NA{CR}{LF} (SEE NOTE) Where: ATT= attenuation in dB AMP= RF power amplifier state where 0=OFF, 1=ON MUT=RF mute state where 0=unmuted, 1=muted RED=Online status for redundancy ESW=Redundancy and mode states where 0=OFF, 1=ON Tx only, 2=ON Tx & Rx AOF=Attenuator Offset in dB AFR= auto fault recovery where 0=manual, 1=auto XRF=External reference status where NA=no external reference, 05M=5 MHz, and 10M=10 MHz NOTE: XRF will always be NA if the internal reference oscillator option is not installed.	RCS=	RCS=x....x
Online Status	RED=	RED?	1 byte	Command or Query. Sets or returns Redundancy Online status in the form x, where: 0=Offline 1=Online NOTE: This command is functionally identical to the ONL command. COMMAND EXAMPLE: <0001/RED=1{CR}	RED= RED? RED*	RED=x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Reference Oscillator Tuning	REF=	REF?	3 bytes	Command or Query. Sets or returns the reference oscillator tuning voltage adjustment by sending a DAC value in the form xxx, where: xxx=is a numeric value from 0 to 255. Default value: 087 NOTE: This command sets the DAC value, but the actual Reference Oscillator tuning voltage can be monitored using the RMS command. COMMAND EXAMPLE: <0001/REF=087{CR}	REF= REF? REF*	REF=xxx
Retrieve Equipment Type*	N/A	RET?	22 bytes	Query only. Returns the Model Number and the installed M&C firmware version. EXAMPLE: <0001/RET?{CR} >0001/RET=CPA-300 VER: 1.0.3{CR}{LF}	RET=	RET=x....x
RF Power FET Current Status	N/A	RFS?	Length varies depending on the number of installed FETs	Query only. Returns currents, in amps, for all installed FETs. EXAMPLE: <0001/RFS? {CR} >0001/RFS={CR} Q01=.xxx{CR} Q02=.xxx{CR} Q03=xx.x{CR} Q04=xx.x{CR} Q05=xx.x{CR} Q06=xx.x{CR} Q07=xx.x{CR} Q08=xx.x{CR} Q09=xx.x{CR} Q10=xx.x{CR} Q11=xx.x{CR} Q12=xx.x{CR} Q13=xx.x{CR} Q14=xx.x{CR} Q15=xx.x{CR}	RFS=	RFS=x....x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
RF Power FET Current Status (Cont)				Q16=xx.x{CR}{LF} NOTE: If the reported value is ≥1A, the format is xx.x; if the value is <1A, the format is .xxx		
Retrieve Maintenance Status	N/A	RMS?	213 bytes, alphanumeric	Query only. Returns maintenance status as per the following example: <0001/RMS?{CR} >0001/RMS={CR} P24V1=024.1{CR} +24V power supply P24V2=024.1{CR} +24V switch power supply LNBVT=018.2{CR} +13/18V LNB power supply (SEE NOTE) P13VT=013.4{CR} +13.5V power supply P10V1=010.1{CR} +10V1 power supply A10V1=010.1{CR} 10V1 on RF Module A10V2=010.1{CR} 10V2 on RF Module (SEE NOTE) P7V8T=007.8{CR} +7.8V power supply P5V8T=005.8{CR} +5.8V power supply P2V5T=002.5{CR} +2.5V power supply P1V2T=001.2{CR} +1.2V power supply N5V8T=-05.7{CR} -5.8V power supply FANR1=100.0{CR} Fan 1 speed in percent FANR2=100.0{CR} Fan 2 speed in percent (SEE NOTE) BUCVT=008.3{CR} BUC tuning voltage (SEE NOTE) FWPWR=+53.2{CR} Forward power in dBm REFVT=001.8{CR} Reference osc. tuning voltage (SEE NOTE) LNBCS=380.2{CR} LNB current supply in mA (SEE NOTE) ATEMP=+40.0{CR} Heatsink temperature in Celsius OTEMP=+25.0{CR}{LF} Outdoor temperature in Celsius (SEE NOTE) NOTE: LNBVT, FANR2, A10V2, BUCVT, REFVT, LNBCS, and OTEMP appear if the appropriate options are installed; otherwise, the values will report XXXX.	RMS=	RMS=x….x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Retrieve Next 5 Unread Stored Events	N/A	RNE?	75 bytes	Query only. Returns the oldest 5 Stored Events that have not yet been read over the remote interface, in the form {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body is in the form ABCCddmmyyhhmmss: A=Fault/clear indicator where F=Fault, C=Clear, I=Info B=Fault type where 1=Unit, 2=RF, 3=Log CC=Fault Code numbers, as in RAS? or Info Codes: RAS FAULT CODES MAP AS FOLLOWS: 1) P24V1 2) P13VT 3) A10V1 4) A10VPS 5) P5V8T 6) P2V5T 7) P1V2T 8) N5V8T 9) P7V8T 10) FANR1 11) FANR2 12) ATEMP 13) SHTDN 14) IICST 15) FWPWR 16) CHKSM 17) FPGAD 18) BUCLD 19) CHKSUM 20) FPGAD 21) BUCLD 22) REFLD 23) LNBCS	RNE=	RNE={CR}ABCCddmmyyhhmmss{CR}ABCCddmmyyhhmmss{CR}ABCCddmmyyhhmmss{CR}ABCCddmmyyhhmmss{CR}ABCCddmmyyhhmmss

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Retrieve Next 5 Unread Stored Events (Cont)				24) SWIT INFO CODES REPORT AS FOLLOWS: 0=Power Off; 1=Power On; 2=Log Cleared; 3=Global Config Change; 4=Redundancy Config Change ddmmyy=Date in day/month/year format hhmmss=Time in hour:minutes:seconds format NOTES: 1) If less than 5 events are retrieved, the remaining positions are padded with zeros. 2) If there are no new events, the response is RNE*. 3) A Global Config Change is defined as any time a command is successfully executed. 4) A query does not set the status change flag. The status change flag is cleared after being read. No other events toggle a status change.		
Retrieve Next 5 Unread Stored Statistics	N/A	RNS?	75 bytes	Query only. Returns the oldest 5 unread stored statistics entries in the reply format: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where: Sub-body= ddmmyyhhmmssaaa.abbb.bccc.cdd.ddefghhh.hiii.i ddmmyy=day/month/year hhmmss=hour:minute:second aaa.a=Operating Temperature (e.g., +40.0) bbb.b=Amp Temperature (e.g., +40.0) ccc.c=RF Power output dd.dd=Attenuation Setting e=Amp On/Off f =Mute On/Off g=Online/Offline Status hhh.h=LNB Current (mA) iii.i=BUC Tuning Voltage NOTE: If there are less than 5 entries to be retrieved, the remaining positions are padded with zeros. If there are no new entries, the response is RNS*.	RNS=	RNS={CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Serial Number*	N/A	RSN?	9 bytes	Query only. Returns the unit's nine-digit serial number in the form xxxxxxxxx. EXAMPLE: <0001/RSN?{CR} >0001/RSN=0123445678{CR}{LF}	RSN=	RSN=xxxxx xxxx
Retrieve Utility Status	N/A	RUS?	23 bytes, alphanumeric	Query only. Returns the utility status of the unit. EXAMPLE: <0001/RUS?{CR} >0001/RUS={CR} ADR=0001{CR} BDR=9600{CR} REF=087{CR}{LF} (REF displays only if a reference oscillator is installed)	RUS=	RUS=x….x
Remote Baud Rate	SBR=	SBR?	4 bytes	Command or Query. Sets or returns the remote baud rate in the form xxxx, where: 2400=2400 baud 4800=4800 baud 9600=9600 baud (DEFAULT) 19K2=19200 baud 38K4=38400 baud NOTE: When changing baud rates remotely the response to the command will be returned using the same baud rate as that used to send the command. COMMAND EXAMPLE: <0001/SBR=19K2{CR} QUERY EXAMPLE: <0001/SBR?{CR} >0001/SBR=9600{CR}{LF}	SBR= SBR? SBR*	SBR=xxxx

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Switch Bias Tee	SBT=	SBT?	1 byte numeric	Command or Query. Sets or returns switching of the bias tee into the through state or into the off state, in the form x, where: 0=Off State (mute LNB) (DEFAULT) 1=Through State (unmute LNB) NOTES: 1) The bias tee provides a means of muting the LNB. The SBT state will be controlled by the amplifier mute state while running in redundancy mode, but while the unit is not in redundancy mode the bias tee may be set independently of the amplifier mute state. 2) To send this command the unit must have the bias tee option installed; otherwise, a mode error will result. A mode error will also result if this command is sent while the unit is running in redundancy mode. COMMAND EXAMPLE: <0001/SBT=1{CR}	SBT= SBT? SBT*	SBT=x
Set FSK Address	SFA=	SFA?	2 bytes, numeric	Command or Query. Sets or returns the FSK Address in the form xx, where: xx=Address value from 01 (DEFAULT) to 15. COMMAND EXAMPLE: <0001/SFA=01{CR}	SFA = SFA? SFA*	SFA=xx
Summary Fault Status*	N/A	SFS?	1 byte	Query only. Returns the summary fault state in the form x, where: 0=Not Faulted (SumFLT_COM J6 pin K is not connected to SumFLT_NC J6 pin M) 1=Faulted (SumFLT_COM J6 pin K is connected to SumFLT_NC J6 pin M) EXAMPLE: <0001/SFS?{CR} >0001/SFS=0{CR}{LF}	SFS=	SFS=x
SNMP Authentication Trap Enable	SNA=	SNA?	1 byte	Command or Query. Sets or returns the SNMP Authentication Trap in the form x, where: 0=Disabled 1=Enabled COMMAND EXAMPLE: <0001/SNA=0{CR}	SNA= SNA?	SNA=x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
SNMP Enable	SNM=	SNM?	1 byte	Command or Query. Sets or returns SNMP in the form x, where: 0=Disabled 1=Enabled COMMAND EXAMPLE: <0001/SNM=0{CR}	SNM= SNM?	SNM=x
Serial Number	N/A	SNO?	9 bytes	Query only. Returns the unit's nine-digit serial number in the form xxxxxxxxx. NOTE: This query is functionally identical to RSN. EXAMPLE: <0001/SNO?{CR} >0001/SNO=012345678{CR}{LF}	SNO=	SNO=xxxxx xxxx
Set Physical remote Address	SPA=	SPA?	4 bytes	Command or Query. Sets or returns the Physical Address in the form xxxx where: xxxx=Address value from 0001 (DEFAULT) to 9999. COMMAND EXAMPLE: <0001/SPA=0412{CR}	SPA= SPA? SPA*	SPA=xxxx
SNMP Read Community	SRC=	SRC?	16 bytes, characters, no spaces	Command or Query. Sets or returns the SNMP Read Community string. NOTE: An empty string is not allowed. COMMAND EXAMPLE: <0001/SRC=public{CR}	SRC = SRC!	SRC=x
SNMP System Contact	SSC=	SSC?	255 bytes, characters	Command or Query. Sets or returns the SNMP System Contact string. COMMAND EXAMPLE: <0001/SSC=Joe Net Admin{CR} NOTE: When not configured, the target returns an empty string: <0001/SSC={CR}{LF}	SSC = SSC!	SSC=x [1..128]
Set Statistics Interval	SSI=	SSI?	2 bytes	Command or Query. Sets or returns the time interval, in minutes, at which statistics are logged in the form xx, where: xx=interval, from 01 to 99 minutes (SEE NOTE) Default value: 90 minutes. COMMAND EXAMPLE: <0001/SSI=90{CR}	SSI= SSI?	SSI=xx

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
SNMP System Location	SSL=	SSL?	255 bytes, characters	Command or Query. Sets or returns the SNMP System Location string. COMMAND EXAMPLE: <0001/SSL=Upstairs back right. NOTE: When not configured, the target returns an empty string. <0001/SSL={CR}{LF}	SSL = SSL!	SSL=x[1..1 28]
SNMP Unit Name	SSN=	SSN?	16 bytes, characters	Command or Query. Sets or returns the SNMP Unit Name string. COMMAND EXAMPLE: <0001/SSN=Remote1{CR} NOTE: When not configured, the target returns an empty string. <0001/SSC={CR}{LF}	SSN = SSN!	SSN=x[1..1 28]
SNMP Trap Destination IP Address 1	STA=	STA?	15 bytes, Numerical	Command or Query. Sets or returns the IP Address of the SNMP Trap Destination IP Address 1 (where traps will be sent first) in the form xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx=IP Address COMMAND EXAMPLE: <0001/STA=010.006.030.001{CR} NOTE: When not configured, the target returns >0001/STA=0.0.0.0{CR}{LF}	STA = STA!	STA=xxx.x xx.xxx.xxx
SNMP Trap Destination IP Address 2	STB=	STB?	15 bytes, Numerical	Command or Query. Sets or returns the IP Address of the SNMP Trap Destination IP Address 2 in the form xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx=IP Address COMMAND EXAMPLE: <0001/STB=010.006.030.002{CR} NOTE: When not configured, the Target returns >0001/STB=0.0.0.0{CR}{LF}	STB = STB!	STB=xxx.x xx.xxx.xxx
SNMP Trap Version	STV=	STV?	1 byte	Command or Query. Sets or returns the SNMP Trap Version that will be used to send traps in the form x, where: 1=SNMP Trap Version 1 2=SNMP Trap Version 2 COMMAND EXAMPLE: <0001/STV=0{CR}	STV = STV!	STV=x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
SNMP Write Community	SWC=	SWC?	16 bytes, characters, no spaces	Command or Query. Sets or returns the SNMP Write Community string. COMMAND EXAMPLE: <0001/SWC=private{CR} NOTE: An empty string is not allowed.	SWC = SWC!	SWC=x
Software Revision	N/A	SWR?	34-37 bytes	Query only. Returns the value of the internal software revision installed in the unit, in the form: Boot:x.y.z Bulk1:x.y.z Bulk2:x.y.z -or- Boot:x.y.zz Bulk1:x.y.zz Bulk2:x.y.zz	SWR=	SWR=Boot :x.y.zz Bulk1:x.y.z z Bulk2:x.y.z
Set RTC Time	TIM=	TIM?	6 bytes	Command or Query. Sets or returns the Real-Time-Clock time in the form hhmmss, where: hh=hours, from 00 to 23; mm=minutes, from 00 to 59, ss=seconds, from 00 to 59 COMMAND EXAMPLE (time=23 hours, 12 minutes and 59 seconds since midnight – i.e., 11:12:59 PM): <0001/TIM=231259{CR}	TIM = TIM? TIM *	TIM=xxxxx x
Temperature	N/A	TMP?	5 bytes	Query only. Returns the temperature of the Heatsink in the form sxxxx, where: s=sign byte, positive or negative (+ or –) xxxx=temperature (including decimal point) EXAMPLE: <0001/TMP?{CR} <0001/TMP=+26.0{CR}{LF}	TMP=	TMP=sxxx x
Retrieve Number of Unread Stored Alarms*	N/A	TNA?	2 bytes	Query only. Returns the number of stored events that remain unread in the alarm log in the form xx, where: xx=number from 00 to 99. NOTE: Although a maximum of 255 events may be stored in the alarm log, event tallies greater than 99 are reported as 99. EXAMPLE: <0001/TNA?{CR} >0001/TNA=14{CR}{LF}	TNA=	TNA=xx

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Time Protocol Enable	TPE=	TPE?	1 byte, numerical	Command or Query. Sets or returns Time Protocol in the form x, where: 0=Disable 1=Enable COMMAND EXAMPLE: <0001/TPE=1{CR} (Enables Time protocol)	TPE= TPE?	TPE=x
Time Protocol Server	TPS=	TPS?	15 bytes, alphanumeric	Command or Query. Sets or returns the Time Server IP Address for the unit's Tx Ethernet management port, in the form xxx.xxx.xxx.xxx. Default value: 255.255.255.255 COMMAND EXAMPLE: <0001/TPS=192.168.001.005{CR}	TPS= TPS?	TPS=xx.xx x.xxx.xxx
Terminal Status Change	N/A	TSC?	1 byte	Query only. Indicates if there has been a change in the configuration since the last time the command was given, in the form x, where: 0=No status change. 1=Status change has occurred. NOTES: 1) A "status change" is defined as any time a parameter is changed, e.g., when a command is successfully executed that changes a value. A status change also results when there is a fault condition. 2) A query does not set the status change flag. The status change flag is cleared after being read. EXAMPLE: <0001/TSC?{CR} >0001/TSC=0{CR}{LF}	TSC=	TSC=x

Parameter Type (* indicates End-of-Life)	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 to 57)	Target-to-Controller (see Description of Arguments)	
	Command	Query			Response to Command	Response to Query
External Reference Mute	XRM=	XRM?	1 byte numeric	Command or Query. Sets or returns the external reference mute state in the form x, where: 0=Disable 1=Enable (SEE NOTE) NOTE: To enable this command, the internal reference oscillator option must be installed; otherwise, a mode error will result. A hardware mute condition generated by the XRM mute is one of the conditions that can cause the MUT command to return MUT=2. When enabled, the unit mutes when an external reference oscillator is not detected. EXAMPLE: <0001/XRM=1{CR}	XRM= XRM? MSK*	XRM=x

Appendix A. 1:1 REDUNDANCY

A.1   LPOD Redundancy Operation Overview

Chapter 2. SYSTEM CONNECTORS, INSTALLATION AND STARTUP

The LPOD Outdoor Amplifier / Block Up Converter can configured for 1:1 redundancy by connecting the appropriate 1:1 Redundancy Cable to the **'J6 | COM1'** connector (see **Chapter 2. SYSTEM CONNECTORS, INSTALLATION AND STARTUP**).

Once you set up a 1:1 Redundancy System, use the proper serial remote commands or HTTP Interface page controls to place the units into Redundancy Mode. The system automatically configures the backup (offline) unit by copying the configuration from the active (online) unit.

A.2   1:1 Redundancy Mode

In 1:1 Redundancy Mode, the unit that is currently not the active (online) unit (as determined by the switch position) becomes the controlling backup (offline) unit.

A.2.1 Ethernet-based Monitor and Control

- **Chapter 4. ETHERNET INTERFACE OPERATION**
- **LPODnet Operation Manual (CEFD P/N MN-LPODNET)**
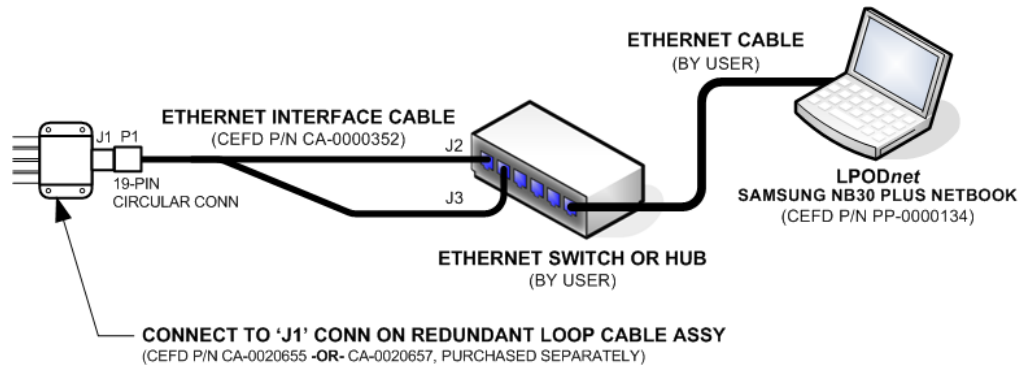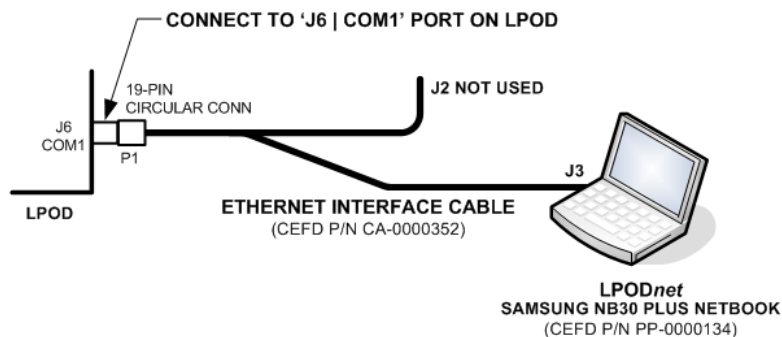
Figure A-1. Ethernet-based M&C using CEFD Kit KT-0000203

Ethernet-based remote M&C of any LPOD Standalone or 1:1 Redundancy application is available through use of the optional LPODnet M&C Netbook Accessory Kit (CEFD Kit KT-0000203). This kit provides you with on-site access to the LPOD's remote Telnet, SNMP, or HTTP (Web Server) interfaces. For detailed information about this optional accessory, see the **LPODnet M&C Accessory for LPOD/SPOD PS 1, PS 1.5, PS 2 Operation Manual (CEFD P/N MN-LPODNET)**.

A.2.1.1　　　1:1 Redundancy System Setup (Using a Single Ethernet Interface)

- **Chapter 5. SERIAL INTERFACE OPERATION**
- **Chapter 4. ETHERNET INTERFACE OPERATION**

Do these steps to set up a 1:1 Redundancy System using a single Ethernet interface:

Step	Description
1	Turn both units off, and then connect them to the 1:1 Redundancy System hardware using the proper cables.
2	Turn on Unit #2 and change its serial remote address from 1 (factory default) to a valid unique value (typically 2) so that it does not conflict with any other unit in the system.
3	Change Unit #2's IP address from the factory default (192.168.1.4/24) to a valid unique value (typically 192.168.1.3/24) so that it does not conflict with any other unit in the system.
4	Enable redundancy mode by setting the ESW serial remote command (typically ESW=1 or ESW=2). You may hear the waveguide switch(es) throw once you enable redundancy mode. Unit #2 is now the online unit.
5	Turn on Unit #1.
6	Change Unit #1's serial remote address / IP address if necessary (typically the factory default values are correct).
7	Enable redundancy mode by setting the ESW serial remote command (typically ESW=1 or ESW=2). You may hear the waveguide switch(es) throw once you enable redundancy mode. Unit #1 is now the online unit.
8	Set up all parameters for Unit #1 so that the configuration can be copied to Unit #2 (AMP, MUT, ATT, etc.).

A.2.2 Serial-based Monitor and Control

- **Chapter 5. SERIAL INTERFACE OPERATION**
- **Chapter 4. ETHERNET INTERFACE OPERATION**
- **CLC-10 Comtech LPOD Controller User's Guide (CEFD P/N MN-CLC10)**

The EIA-232 Interface is not available for 1:1 Redundancy.
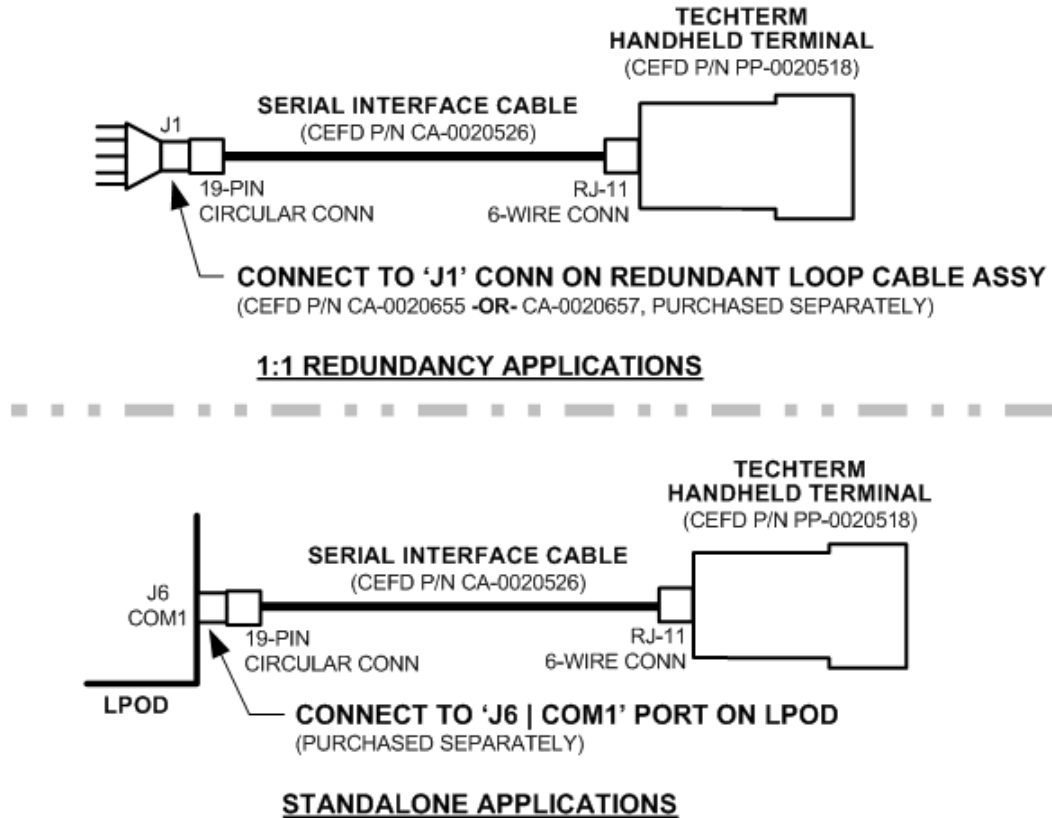
Figure A-2. Serial-based M&C using CEFD Kit KT-0020518

Serial-based remote M&C of any LPOD Standalone or 1:1 Redundancy application is available through use of the optional **CLC-10 Handheld Terminal M&C Accessory Kit (CEFD Kit KT-0020518)**. This kit provides you with on-site access to the LPOD's serial remote-control interface. For detailed information about this optional accessory, see the **CLC-10 Comtech LPOD Controller User's Guide (CEFD P/N MN-CLC10)**.

Serial command **ESW** determines system operation. Currently, 1:1 redundancy is supported with either *transmit switching (Tx only)* or *transmit+receive switching (Tx+Rx)*. If **ESW=1** (Tx Only) or **ESW=2** (Tx+Rx) is executed in both units, the system will be in Automatic Redundancy mode. In this mode, if a fault is detected with the active (online) unit – either by loss of communications between the backup (offline) and active units, or via the summary fault – the backup unit will trigger the waveguide switch and, assuming the backup unit is not faulted, will become the active unit. The backup unit will also poll the active unit at regular intervals in an attempt to maintain configuration compatibility with the active unit; this ensures that, should a fault occur, the backup unit is configured exactly the same as the active unit.

Redundancy Mode allows the backup (offline) unit to take control of the 1:1 Redundancy System and force a redundant switchover when there is a problem with the active (online) unit. The backup unit controls the waveguide switches and polls the active unit through the inter-unit redundancy link, so that it will be ready to take over for the active unit if necessary.

LPOD Redundancy Mode does not specify which unit must be the backup (offline) unit. Instead, the status of the backup (offline) and active (online) units are determined by the waveguide switch position. The advantage to using this redundancy method is that, after a failure is detected and the backup unit causes a redundant switchover to occur, the failed unit can be replaced without forcing a second switchover to occur. This is because the backup unit becomes the active unit, and when *another* unit is installed in the system it automatically becomes the *new* backup unit.

Because the inter-unit redundancy link uses the EIA-232 interface to communicate, the user remote commands to the 1:1 Redundancy System must instead be sent through one of the other remote communications interfaces (i.e., EIA-485, Telnet, HTTP, or SNMP). The inter-unit redundancy link is not used when the units are in Manual redundancy mode or when they are in Standalone (redundancy disabled).

The following parameters are updated via the inter-unit redundancy link (the equivalent remote command is shown in parentheses):

* Auto Fault Recovery (**AFR**)
* Amplifier state (**AMP**)
* Attenuation (**ATT**)
* Auxiliary Mute (**AUX**)
* LNB Current Window Enable (**CWE**)
* *Date (**DAY**)
* Enable Statistics Averaging (**ESA**)
* Enable Statistics Logging (**ESL**)
* LNB Current Source enable (**LCS**)
* LNB Current Window (**LCW**)

* Low Power Threshold (**LPT**)
* Local / Remote Setting (**LRS**)
* User fault mask (**MSK**)
* RF mute (**MUT**)
* Offline Mute (**OFM**)
* Remote LNB Control (**RLC**)
* Set Baud Rate (**SBR**)
* Set Statistics Interval (**SSI**)
* *Time (**TIM**)
* External Reference Mute (**XRM**)

🛈 **** Day and Time are updated only when the inter-unit redundancy link is either established or re-established.***

The position of the Tx Waveguide Switch determines the **online status** of a unit in a 1:1 Redundancy System. When the switch is oriented to allow a unit to send RF power to the antenna (as determined by the switch's failsafe indicator), the unit is considered to be **online**. Otherwise, the unit is considered to be **offline**.

When redundancy mode is disabled (**ESW=0**), the unit always reports that it is online. This is because, in standalone mode, there are no waveguide switches monitored and controlled by the unit. Standalone mode does not use the Tx waveguide switch position to determine online status.

Only the offline unit is allowed to initiate a redundant switchover by throwing the waveguide switches. The offline unit will initiate a redundant switchover if any of the following conditions are met:

- Online unit faulted, and offline unit is not faulted.
- Inter-unit redundancy link established, and then timed out.
- Mismatched waveguide switch condition is detected.
- Unit is forced online through a remote command.

If you enable Offline Mute (**OFM**), then the unit will mute the RF Output when it is offline. The **OFM** state also affects the LNB Bias Tee Switch position, because the switch serves as the unit's Rx path mute, so it is therefore tied to the Mute State (**MUT**) of the unit while the unit is running in redundancy mode (i.e., if **MUT=1** then **SBT=0**, and if **MUT=0** then **SBT=1**). If you try to change the LNB Bias Tee switch position while redundancy mode is enabled, a mode error will result. See **Table A-1** for a matrix of how **OFM** use affects operations.

Table A-1. OFM Online-to-Offline Operational Settings Conveyance

OFM=	Control: Online Unit Settings					Control: Offline Unit Settings				
	AMP=	MUT=	AUX=	SBT=	LCS=	AMP=	MUT=	AUX=	SBT=	LCS=
0 Disable	0/1	0/1	0/1	0/1 DRIVEN BY MUT	0/1-4	FOLLOW	FOLLOW	FOLLOW	FOLLOW	FOLLOW
1 Enable	0/1	0/1	0/1	1	0/1-4	FOLLOW	1	FOLLOW	0	FOLLOW
2 Mute Rx	0/1	0/1	0/1	0	0/1-4	FOLLOW	FOLLOW	FOLLOW	0	FOLLOW
3 Mute Tx	0/1	0/1	0/1	1	0/1-4	FOLLOW	1	FOLLOW	1	FOLLOW
4 Mute Rx+LNB	0/1	0/1	0/1	1	0/1-4	FOLLOW	FOLLOW	FOLLOW	0	0
5 Mute Tx+LNB	0/1	0/1	0/1	1	0/1-4	FOLLOW	1	FOLLOW	1	0
6 Mute Tx+AMP	0/1	0/1	0/1	1	0/1-4	0	1	FOLLOW	1	FOLLOW
7 Mute Tx+LNB+AMP	0/1	0/1	0/1	1	0/1-4	0	1	FOLLOW	1	0

This table applies to LPOD 1:1 Redundancy System operation when the Redundancy State is set to Tx+Rx (ESW=2).

The operational settings in this table – i.e., "0-7 (for the OFM command), and "0/1" or "0/1-4" for the Online Unit entries, and "0" or "1" for the Offline Unit entries – conform to the "Description of Arguments" format for remote command and query operations as they are tabulated in **Chapter 5. SERIAL INTERFACE OPERATION**.

The available operational settings for the Online Unit or Offline Unit serial remote commands are as follows:

- AMP=0 (the Rx power amplifier is turned OFF), or 1 (the Rx power amplifier is turned ON)

- MUT=0 (disabled, i.e., the Tx is NOT MUTED), or 1 (enabled, i.e., the Tx is MUTED – no data is transmitted). Note that, in the Online Unit, the Tx Mute setting (MUT) drives that unit's LNB Bias Tee setting (SBT) – if MUT=0, then SBT=1; if MUT=1, then SBT=0.

- AUX=0 (disabled, meaning that the Auxiliary Mute Mode is turned OFF, or NOT MUTED), or 1 (enabled, i.e., the Auxiliary Mute Mode is turned ON, or MUTED)

- SBT=0 (LNB Bias Tee in **Off State**, i.e., MUTED – no data is received), or 1 (LNB Bias Tee is in **Through State**, i.e., NOT MUTED). Note that, in the Online Unit, the LNB Bias Tee setting is driven by that unit's Tx Mute setting (MUT) – If MUT=0, then SBT=1; if MUT=1, then SBT=0.

- LCS=0 (the LNB Current Source is DISABLED – no voltage transmitted), or, if so equipped, 1-4 (where the selected LNB Current Source is 1=18V 22 kHz Disabled; 2=18V 22 kHz Enabled; 3=13V 22 kHz Disabled; or 4=13V 22 kHz Enabled).

For the Offline Unit tabulation: The Offline Unit monitors the Online Unit control settings and updates its settings every few seconds. As tabulated, "FOLLOW" means that this Offline Mute control setting "follows" the Online Unit's corresponding Offline Mute control. However, when an Offline Unit control setting is listed as either "0" (disabled/OFF) or "1" (enabled/ON), this means the Offline Mute selection "forces" this value and does not follow the Online Unit's configuration.

A.2.2.1 Applicable Serial-Based Redundancy Commands and Queries

These serial remote commands and queries apply to redundancy operations:

Remote Command	Meaning	Functional Description
RED	Redundancy Online/Offline	Reports the appropriate unit's online/offline status. Also used to force a unit to go active (online).
ESW	Enable Switch Mode	Puts the unit into redundancy or standalone (manual) mode.
AFR	Auto Fault Recovery	Sets the latching state of faults. Either they will latch to the faulted state or they will recover automatically.
AOF	Attenuation Offset	Individual attenuation command, used to adjust out small differences in power levels of different amplifier.

A.2.3 Troubleshooting Connectivity Issues

Each network is unique, and network configuration and management are outside the scope of this manual. This information is provided as a helpful troubleshooting tool, but trained network specialists may be required to make an Ethernet-enabled product work in a specific network. This section offers common solutions to network connectivity issues experienced by CEFD technical support personnel while developing or testing Ethernet-enabled products using the Windows XP operating system.

The most common connectivity issue is neglecting to properly connect the LPOD to the external PC Ethernet interface.

Check for link and activity Light Emitting Diode (LED)s to light up on the Network Interface Controller (NIC) or network switch where the LPOD is connected to the Ethernet network. If the link LED is lit, validate the Ethernet connection by pinging the LPOD at its IP address using the Windows Command-line interface:

- To access the Command-line interface, click **Start → Run…** from the external PC's Taskbar.
- Type "**CMD**" (without the quotes) into the **Run** dialog box, and then click **OK**.
- At the Command-line prompt (typically **C:\>**), type "**ping 192.168.1.4**" (without the quotes).

If the IP address of the unit is not set to factory default (192.168.1.4), then use the unit's user-assigned IP address. If the ping command responds with the "**Request timed out.**" error message, then the LPOD cannot be seen by the computer. Otherwise, if there is a time listed in milliseconds, then the LPOD properly responded to the ping command and it is visible to the computer at the IP address that was pinged.

Another common connection problem is due to conflicts in the Address Resolution Protocol (ARP) table caused when a user connects two different pieces of hardware (with unique MAC addresses) to a single Ethernet port while both pieces of hardware are configured with the same Ethernet address.

This often happens when configuring new units set to the factory default IP address with a laptop that has a single Ethernet port (e.g., CEFD's LPOD*net* M&C Netbook Accessory product). If there are multiple units to be configured that are all set to the factory default IP address, then turn on one unit at a time, and reinitialize the Address Resolution Protocol (ARP) table each time a new unit is connected to the network as follows:

1. Check the values in the ARP table on the computer. This can be accomplished using the Windows Command-line interface:
   a. To access the Command-line interface, click **Start → Run…** from the external PC's Taskbar.
   b. Type "**CMD**" (without the quotes) into the **Run** dialog box, and then click **OK**.
2. From the Command-line interface window, type "**ARP -a**" (without the quotes), and then press the Enter key.
   a. If the LPOD IP address is not displayed in the ARP table, then re-initialize the ARP table by typing "ARP -d" at the Command-line window prompt. The LPOD IP address should now be displayed when the ARP table is queried again.
   b. If the unit's IP address is still not shown and the ping test has failed, then verify the Ethernet settings of the unit using another remote-control interface that is not dependant on the Ethernet port (e.g., EIA-485, EIA-232, or FSK).

A.3   1:1 Redundancy System Cabling and Installation

- **Chapter 2. SYSTEM CONNECTORS, INSTALLATION, AND STARTUP**
- **Appendix B. CABLE DRAWINGS**

Figure A-3 shows the schematic diagram for cabling 1:1 Redundancy applications. For any 1:1 Redundancy System setup, care should be exercised in cable installation:

- Install the cables using the most direct route – avoid all sharp bends.
- Secure all cables with clamps and ties.

For details about the cables used in both Standalone and 1:1 Redundancy applications, see **Appendix B. CABLE DRAWINGS**.

A.3.1   Cable Sealing and Wrapping

Before you operate your equipment, you MUST make sure that all external cable assemblies for the outdoor equipment are properly sealed to prevent water intrusion. Failure to achieve water tight sealing will result in possible performance degradation and even product failure.

To maintain your product warranty, you must follow the guidelines and recommendations provided in Section 2.2 Cable Seaing and Wrapping (Chapter 2. SYSTEM CONNECTORS, INSTALLATION, AND STARTUP).

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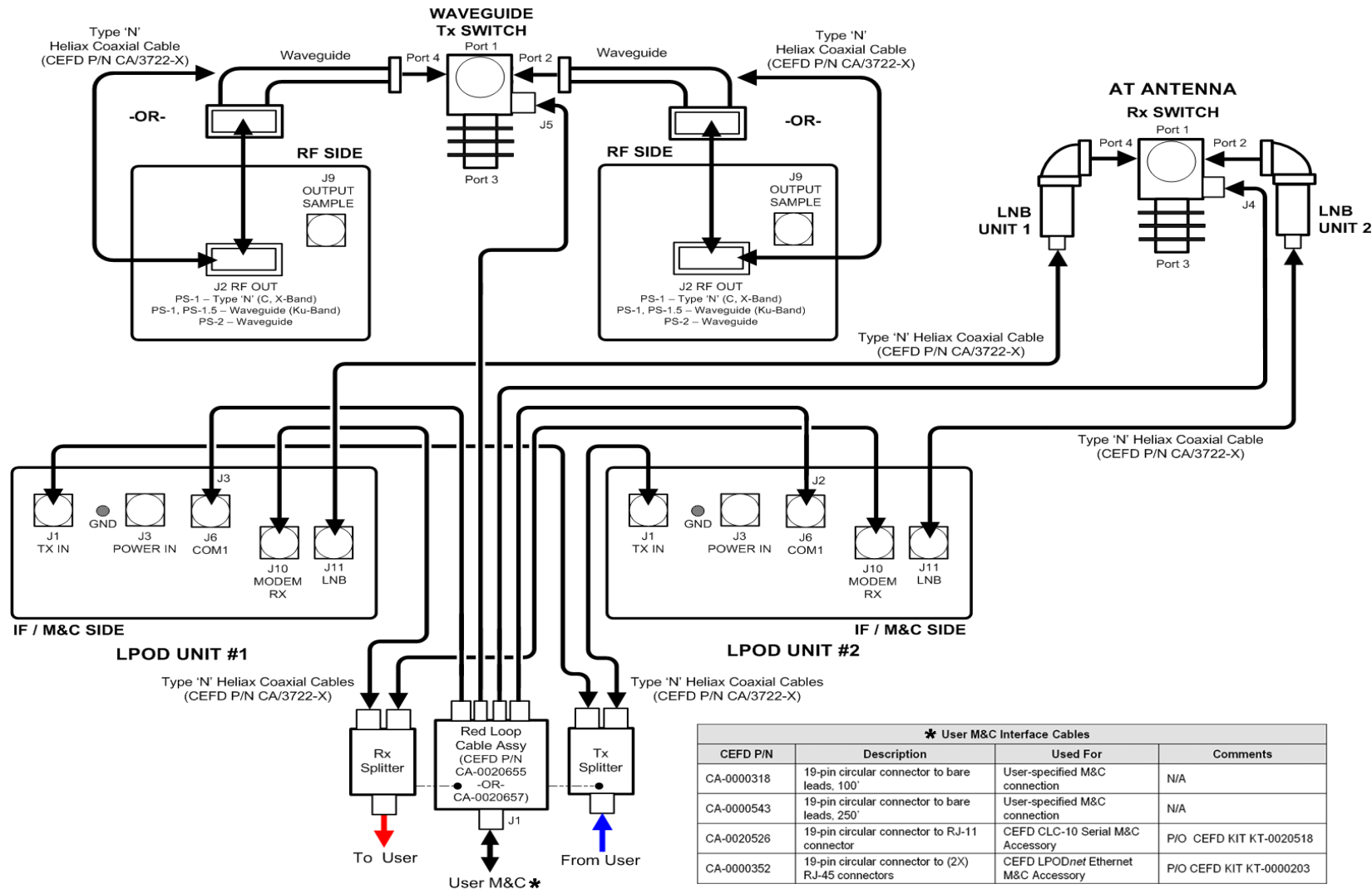
Figure A-3. Typical LPOD 1:1 Redundancy System Cabling Schematic

A.4   1:1 Redundancy System Assembly Kit Examples

Chapter 2. SYSTEM CONNECTORS, INSTALLATION, AND STARTUP

The illustrations provided in this appendix are intended as reference examples only. The dimensions shown in these example figures are subject to change and may not reflect your installed configuration.

Several kits are available from CEFD to mount and install standalone or redundant LPODs, depending on the type of unit ordered and its operational frequency.

The figures and tables provided in the subsections that follow illustrate the CEFD kits currently available for assembling LPOD PS 1, PS 1.5 or PS 2 1:1 Redundancy Systems. Unless otherwise noted, all 1:1 Redundancy Kit figures depict use of AC Option, Waveguide Output LPODs. Refer to **Chapter 2. SYSTEM CONNECTORS, INSTALLATION AND STARTUP** for the available assembly kit options for LPOD Standalone configurations.

Sect. / Product	Section	Figure	CEFD Part No.	Description
A.4.1 Common Kits	A.4.1.1	Figure A-4	KT-0020827	FREE STANDING 1:1 UNISTRUT KIT
	A.4.1.2	Figure A-5	KT-0000116	Rx SPLITTER & CABLES KIT
	A.4.1.3	Figure A-6, Figure A-7	KT-0000098	Rx SWITCH, LPOD C-BAND KIT
	A.4.1.4	Figure A-8, Figure A-9	PL/7596-1	Rx SWITCH, LPOD Ku-BAND KIT
	A.4.1.5	Figure A-10, Figure A-11	KT-0000191	Rx SWITCH, Ku-BAND, METRIC KIT
A.4.2 LPOD PS 1	A.4.2.1	Figure A-12, Figure A-13	KT-0000104	PS 1 C-BAND 1:1 KIT, MTG & CABLE, Tx SWITCH
	A.4.2.2	Figure A-14, Figure A-15	KT-0000090	PS 1 C-BAND COAX OUTPUT1:1 KIT, MTG & CABLE, Tx SWITCH
	A.4.2.3	Figure A-16, Figure A-17	KT-0000089	PS 1 Ku-BAND 1:1 KIT, MTG & CABLE, Tx SWITCH
	A.4.2.4	Figure A-18, Figure A-19	KT-0000170	PS 1 X-BAND 1:1 KIT, MTG & CABLE, Tx SWITCH
A.4.3 LPOD PS 1.5	A.4.3.1	Figure A-20, Figure A-21	KT-0020526	PS 1.5 C-BAND DC OPTION 1:1 KIT, MTG & CABLE, Tx SWITCH
	A.4.3.2	Figure A-22, Figure A-23	KT-0000060	PS 1.5 Ku-BAND 1:1 KIT, MTG & CABLE, Tx SWITCH
A.4.4 LPOD PS 2	A.4.4.1	Figure A-24, Figure A-25	KT-0020827	PS 2 C-BAND 1:1 FREE STANDING MOUNTING KIT
	A.4.4.2	Figure A-26, Figure A-27	KT-0000091	PS 2 C-BAND 1:1 KIT, MTG & CABLE, Tx SWITCH
	A.4.4.3	Figure A-28, Figure A-29	KT-0000254	PS 2 Ku-BAND 1:1 KIT, MTG & CABLE, Tx SWITCH

A.4.1 Common Kit Examples

A.4.1.1   KT-0020827 1:1 Free Standing Unitstrut Kit
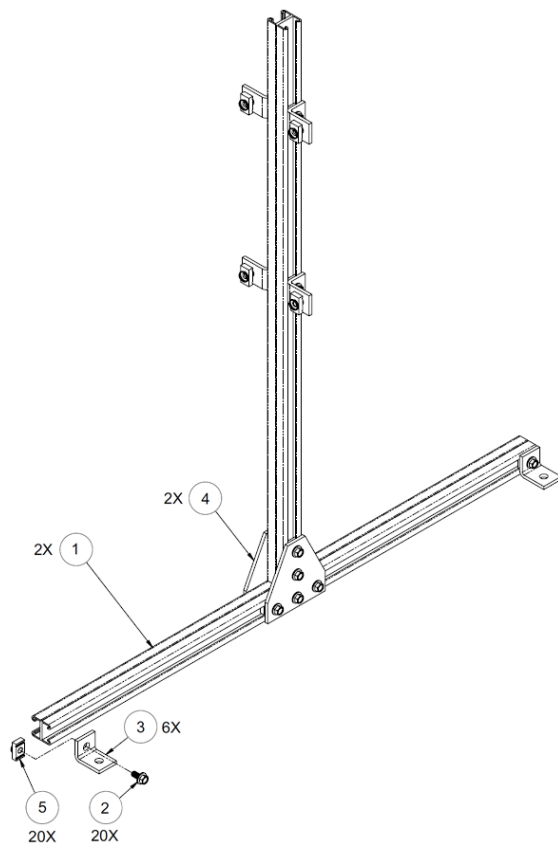
Item	Qty	CEFD P/N	Description
1	2	FP/BR11931-1	Bracket, Unistrut
2	20	HW-0000070	Screw, Hex, Flanged Head 0.3
3	6	HW-0020764	Bracket, Unistrut, 90°
4	2	HW-0020765	Bracket, Flat, Unistrut
5	20	HW/3/8SPRINGNUT	Springnut

Figure A-4. KT-0020827 1:1 Free Standing Unitstrut Kit

A.4.1.2　　KT-0000116 LPOD Rx Splitter / Cable Kit
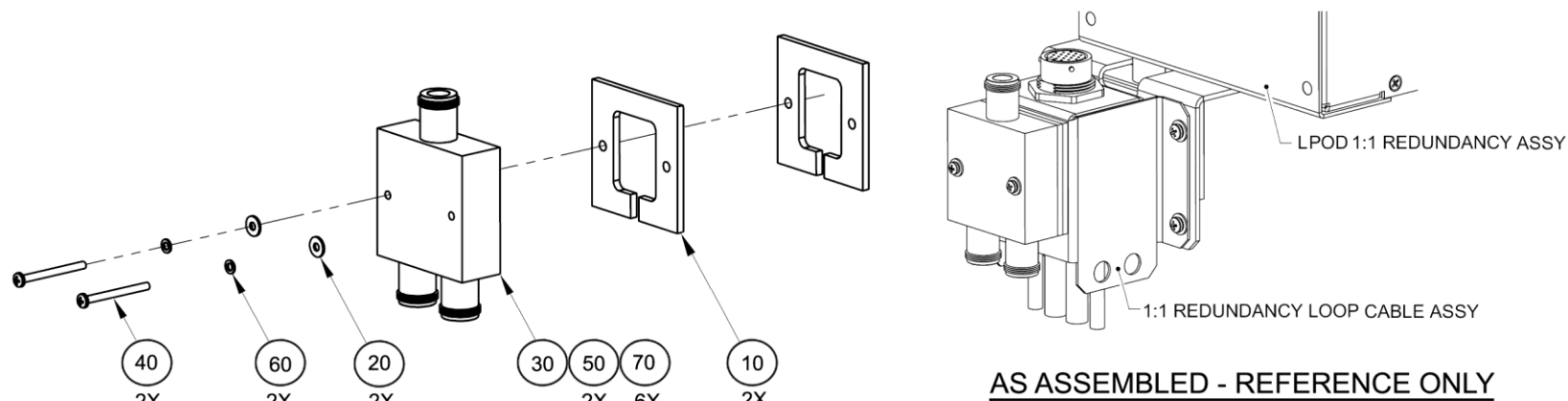
Item	Qty	CEFD Part No.	Description
10	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
20	2	HW/4-FLT	#4 FLAT WASHER, SS
30	1	RF-0000105	RF POWER SPLITTER/COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
40	2	HW/4-40X1.25PH	#4-40 x 1.25 LG PAN HD PHILLIPS SCREW, SS
50	2	CA/RF0097	CABLE ASSY, CONNECTOR, CSAT-7075 OUTPUT RF, ROHS
60	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
70	6	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK

Figure A-5. KT-0000116 LPOD Rx Splitter / Cable Kit Example – Exploded and Assembled Isometric Views

A.4.1.3   KT-0000098 LPOD C-Band Rx Switch Kit
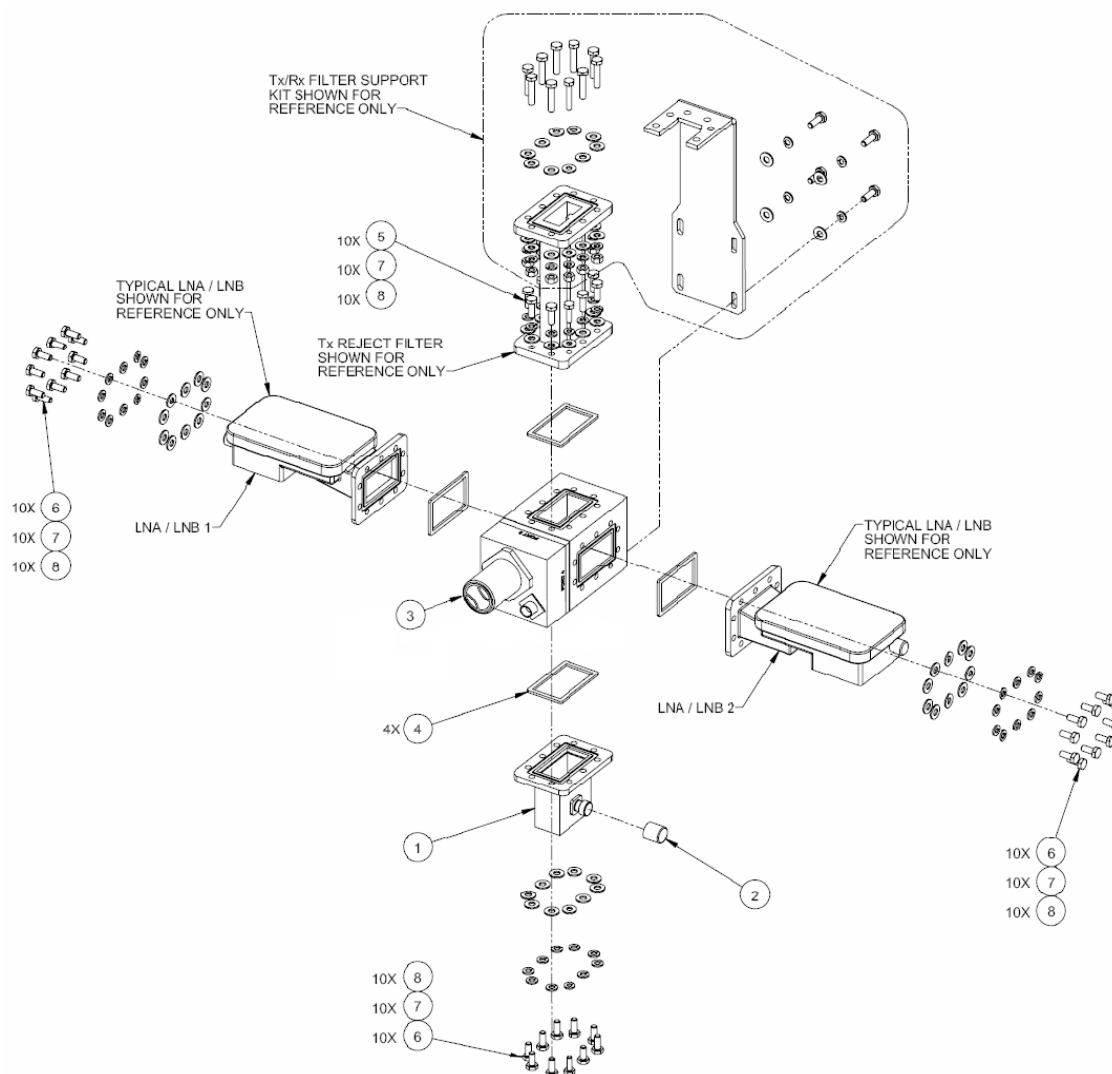
Item	Qty	CEFD Part No.	Description
1	1	28P1084	QP RF ADAPTER, N (FEM) TO CPRG229 W/G GROOVED FOR 1/2 GASKET
2	1	CN/CX50NMALE	CONNECTOR, CN-50-OHM,N, MALE TERMINATION
3	1	SW/WGS28V-229SM	SWITCH, WAVEGUIDE, CPR229 GROOVED, +28V SEALED (MS3116F10-6S MATING CONN)
4	4	GA/GSKTCPR229FULL	GASKET, CPR229, FULL THK
5	12	03P1078	1/4-20 x 3/4 LG HEX BOLT, SS
6	32	HW/1/4-20X5/8HEX	1/4-20 x 5/8 LG HEX HD SCREW, SS
7	42	HW/1/4-FLT	1/4" FLAT WASHER
8	42	HW/1/4-SPLIT	1/4" SPLIT WASHER

Figure A-6. KT-0000098 LPOD C-Band Rx Switch Kit Example – Exploded Isometric View
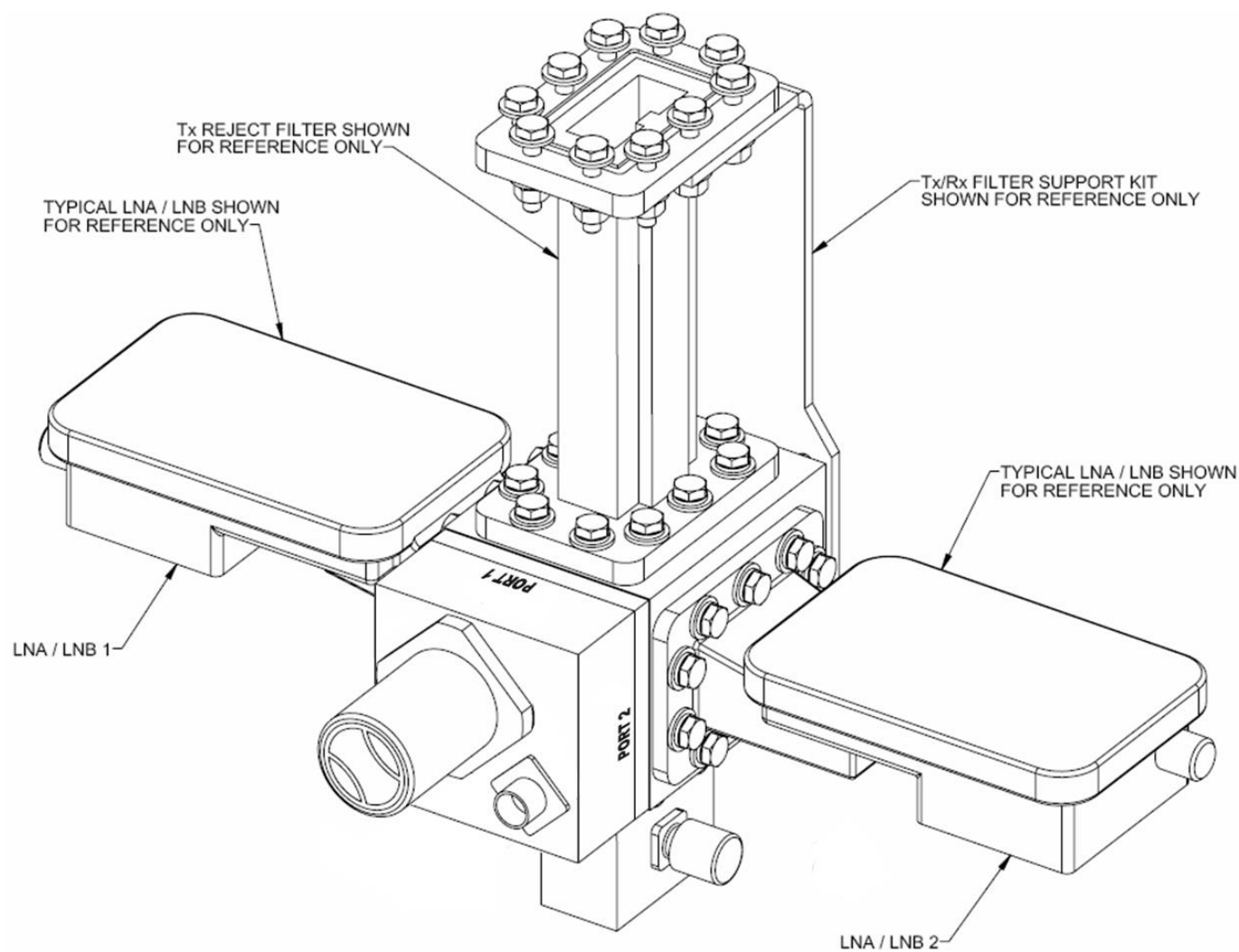
Figure A-7. KT-0000098 LPOD C-Band Rx Switch Kit Example – Assembled Isometric View

A.4.1.4 PL/7596-1 LPOD Ku-Band Rx Switch Kit
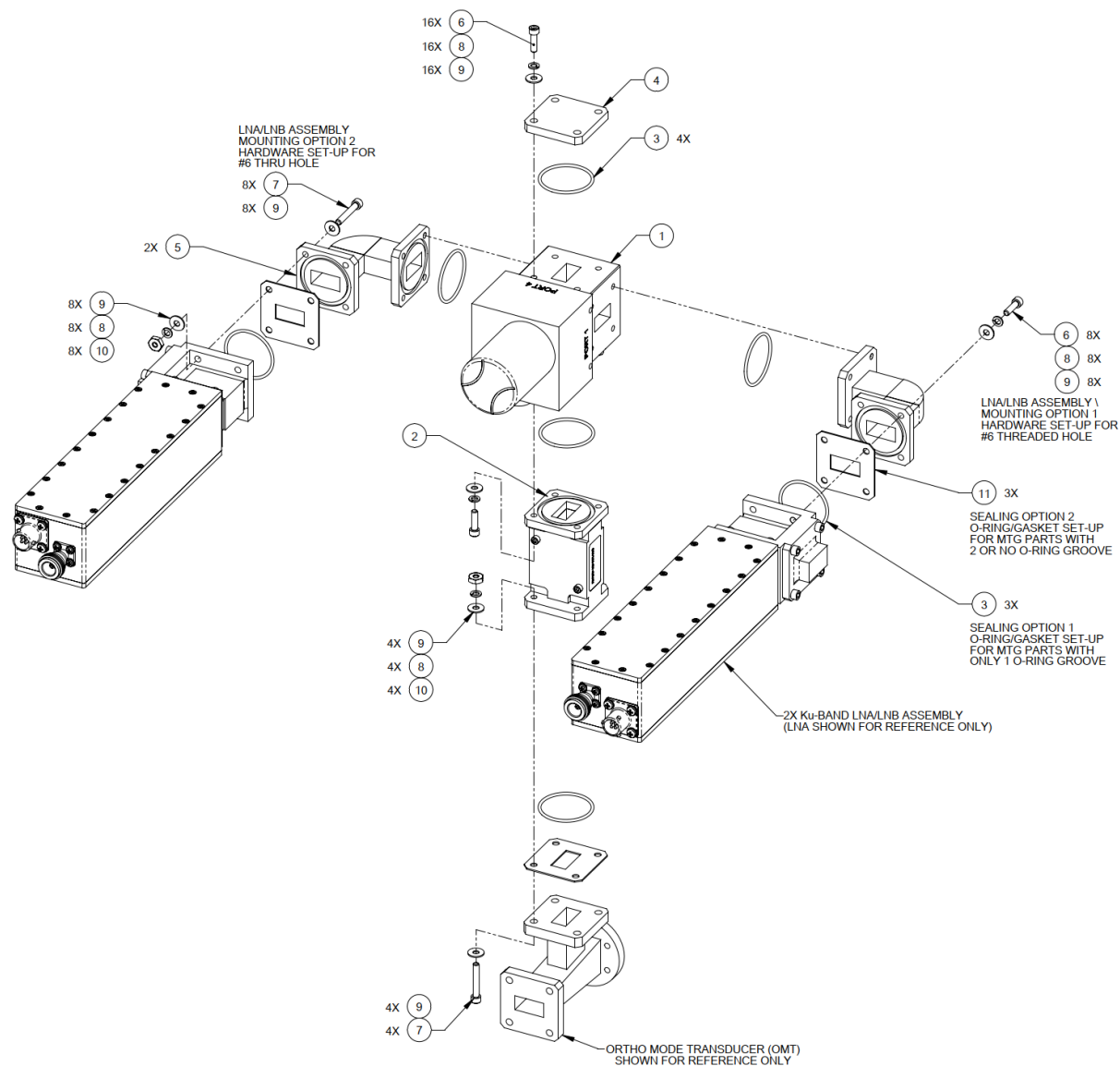
Item	Qty	CEFD Part No.	Description
1	1	SW/WGS28V-75SB	SWITCH, WAVEGUIDE, WR75, +28VDC, SEALED, SIDE & BOTTOM MNT
2	1	RF/TRF-KU-WR75G	RF TRANSMIT REJECT, WR75, GROOVED
3	7	GA/GSKTWR75HALF	GASKET, WR75, HALF THK
4	1	FP/6072	PLATE, SHORTING, WR75G
5	2	99D1483	ASSY, WAVEGUIDE WR75
6	24	HW/6-32X1/2SHCS	#6-32 x 1/2 LG SOCKET HD CAP SCREW, SS
7	12	HW/6-32X7/8SHCS	#6-32 x 7/8 LG SOCKET HD CAP SCREW, SS
8	28	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
9	40	HW/6-FLT	#6 FLAT WASHER, SS
10	12	HW/6-32HEXNUT	#6-32 HEX NUT, SS
11	3	HW-0000313	GASKET, WR75, FLAT, CONDUCTIVE

Figure A-8. PL/7596-1 LPOD Ku-Band Rx Switch Kit Example – Exploded Isometric View
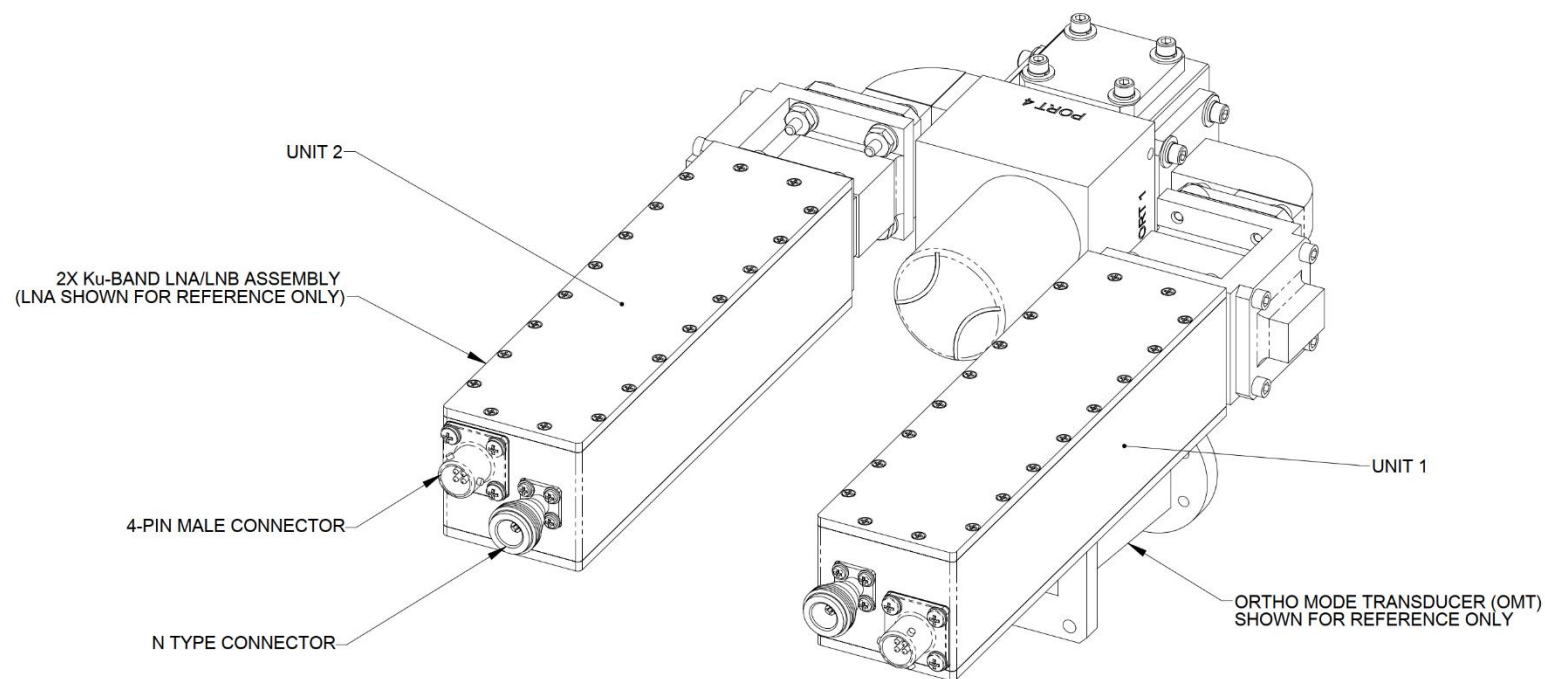
Figure A-9. PL/7596-1 LPOD Ku-Band Rx Switch Kit – Assembled Isometric View

A.4.1.5　　KT-0000191 Ku-Band Rx Switch Kit Example, OMT-Mounted, Metric
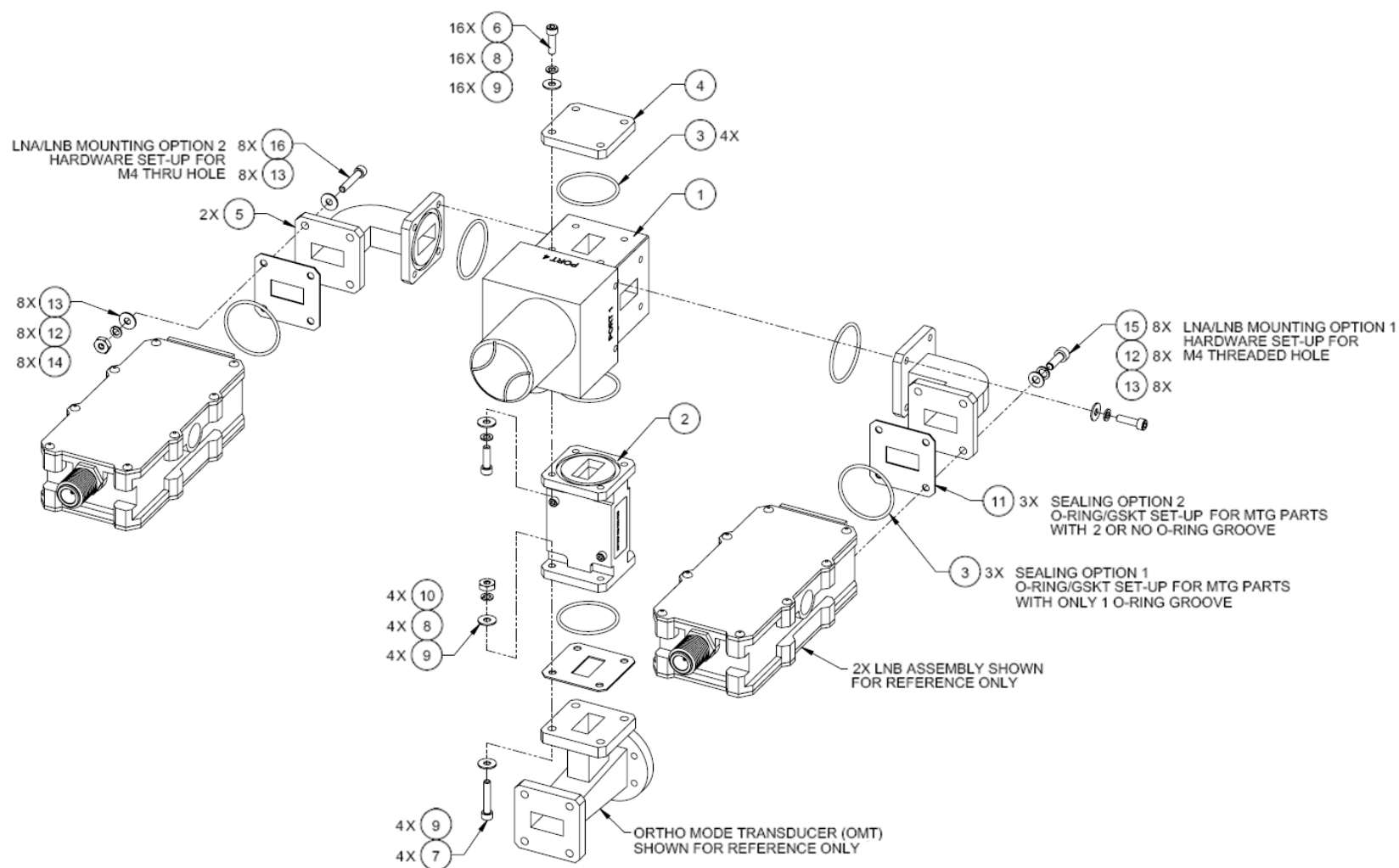
Item	Qty	CEFD Part No.	Description
1	1	SW/WGS28V-75SB	SWITCH, WAVEGUIDE, WR75, +28VDC, SEALED, SIDE & BOTTOM MNT
2	1	RF/TRF-KU-WR75G	RF TRANSMIT REJECT, WR75, GROOVED
3	7	GA/GSKTWR75HALF	GASKET, WR75, HALF THK
4	1	FP/6072	PLATE, SHORTING, WR75G
5	2	FP-0001006	WAVEGUIDE, WR-75, 90-DEG ELB, #6/M4 FLANGE CLEARANCES
6	16	HW/6-32X1/2SHCS	#6-32 x 1/2 LG SOCKET HD CAP SCREW, SS
7	4	HW/6-32X7/8SHCS	#6-32 x 7/8 LG SOCKET HD CAP SCREW, SS
8	20	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
9	24	HW/6-FLT	#6 FLAT WASHER, SS
10	4	HW/6-32HEXNUT	#6-32 HEX NUT, SS
11	3	HW-0000313	GASKET, WR75, FLAT, CONDUCTIVE
12	8	HW/M4LOCK	M4 SPLIT LOCK WASHER, SS
13	16	HW/M4FLAT	M4 FLAT WASHER, SS
14	8	HW/M4X.07HEX	M4 x .07 HEX HUT, SS
15	8	HW/M4X12SHCS	M4 x 12 LG SOCKET HEAD CAP SCREW, SS
16	8	HW/M4X25SHCS	M4 x 25 LG SOCKET HEAD CAP SCREW, SS

Figure A-10. KT-0000191 Ku-Band Rx Switch Kit Example, OMT-Mounted, Metric – Exploded Isometric View
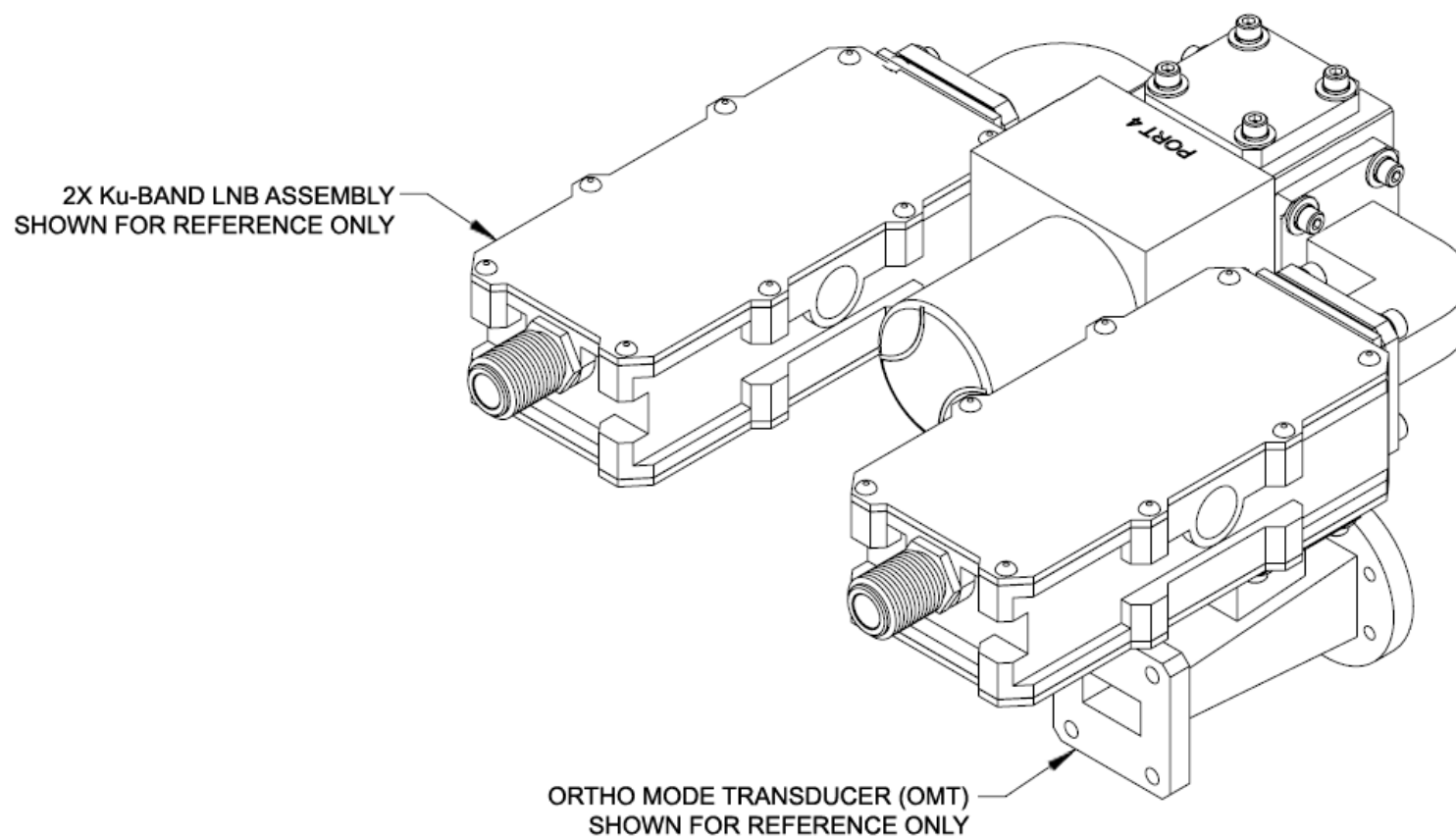
Figure A-11. KT-0000191 Ku-Band Rx Switch Kit Example, OMT-Mounted, Metric – Assembled Isometric View

A.4.2 LPOD PS 1 1:1 Redundancy Kit Examples

A.4.2.1   KT-0000104 LPOD PS 1 C-Band 1:1 Redundancy Kit
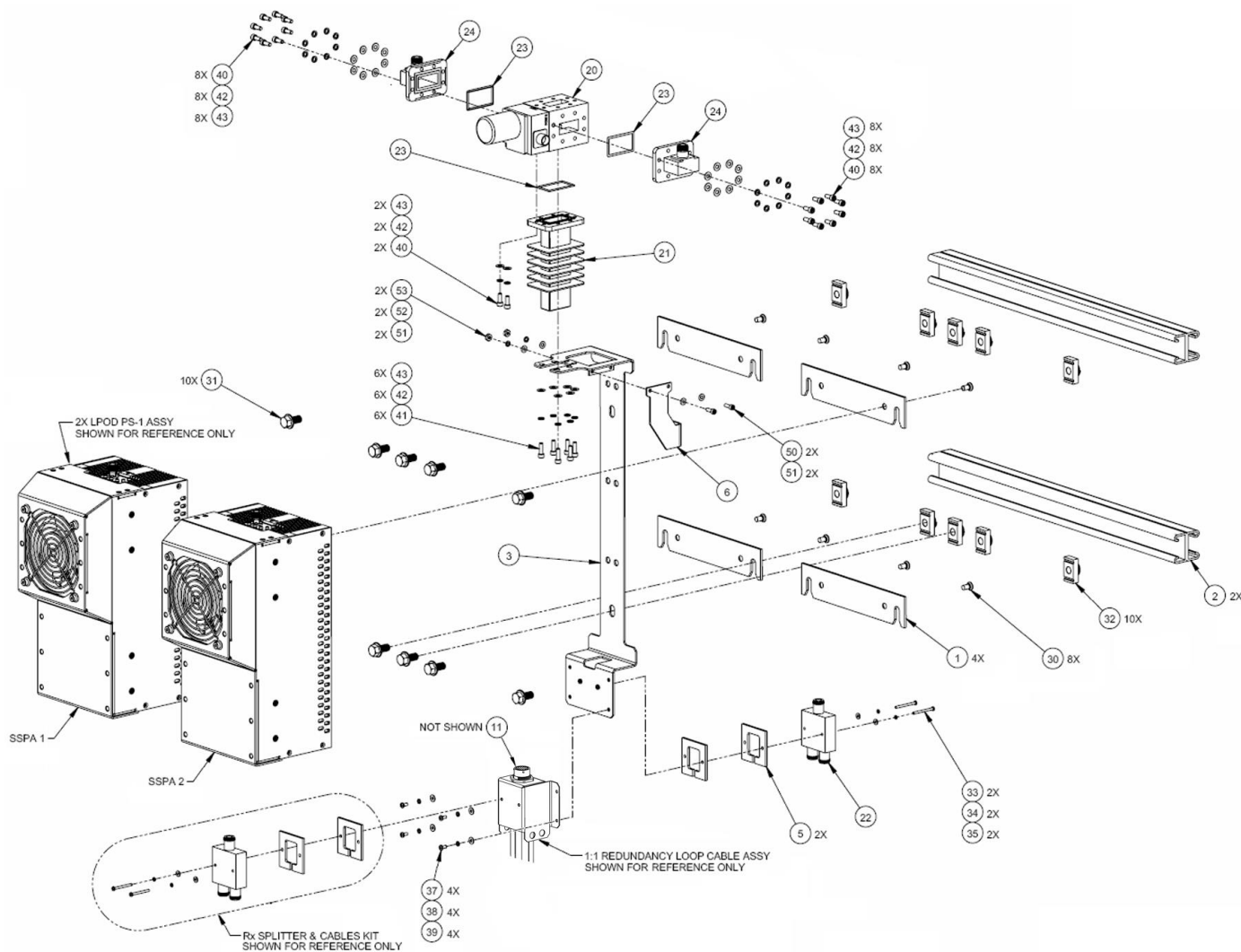
Item	Qty	CEFD Part No.	Description
1	4	FP-0000534	BRACKET, MOUNTING, LPOD PS 1
2	2	FP-0000542	CHANNEL, DUAL, UNISTRUT, 1:1 RDNT, LPOD PS 1
3	1	FP-0000537	BRACKET, UNIVERSAL, 1:1 RDNT, LPOD PS 1
5	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
6	1	FP-0000645	BRACKET, SUPPORT, 1:1 RED., LPOD PS 1
10	2	CA/RF0097	CABLE ASSY, ROHS CONNECTOR, CSAT-7075 OUTPUT RF
11	1	HW/CAP-SS14	DUST COVER, RECEPTACLE W/CHAIN & RING, NON-SHORTING, SIZE 14, SS
12	2	CA/6357-2	CABLE, ROHS TX (2FT)
20	1	SW/WGS28V-137S	SWITCH, WAVEGUIDE, CPR137, +28V SEALED
21	1	FP/WG0034	PNQ, WAVEGUIDE TERMINATION, SMALL FINS
22	1	RF-0000105	RF POWER SPLITTER/COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
23	4	GA/CPR-137-R-H-C	GASKET, D SHAPE, CPR-137, HALF THICKNESS, CONDUCTIVE
24	2	FP/5683	WELDMENT, WAVEGUIDE ADAPTER CPRG137 TO N
30	8	HW/1/4-20X1/2FH	1/4-20 x 1/2 LG FH PHILLIPS SCREW, 82°, UCUT, SS
31	10	HW-0000070	3/8-16 x 3/4 LG SERR HD FLNG HEX SCREW
32	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
33	2	HW/4-40X1.38PH	#4-40 x 1-3/8 LG PHILLIPS HD SCREW, SS
34	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
35	2	HW/4-FLT	#4 FLAT WASHER, SS
37	4	HW/6-32X5/16P.H	#6-32 x 5/16 LG PHILLIPS HD SCREW, SS
38	4	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS S
39	4	HW/6-FLT	#6 FLAT WASHER, SS
40	26	HW/#10-32X1/2SH	#10-32 x 1/2 LG SOCKET HD CAP SCREW
41	14	HW/#10-32X5/8SHC	#10-32 x 5/8 LG SOCKET HD CAP SCREW
42	32	HW/10-SPLIT	#10 SPLIT LOCK WASHER, SS
43	32	HW/10-FLT	#10 FLAT WASHER, SS
49	12	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK
50	2	HW/8-32X1/2SHCS	#8-32 x 1/2 LG SOCKET HD CAP SCREW, SS
51	4	HW/8-FLT	#8 FLAT WASHER, SS
52	2	HW/8-SPLIT	#8 SPLIT LOCK WASHER, SS
53	2	HW/8-32HEXNUT	#8-32, HEX NUT, SS

Figure A-12. KT-0000104 LPOD PS 1 C-Band 1:1 Redundancy Kit Example – Exploded Isometric View

SSPA 1

PORT 2

SSPA 2

2X LPOD PS-1 ASSY
SHOWN FOR REFERENCE ONLY

Rx SPLITTER & CABLES KIT
SHOWN FOR REFERENCE ONLY

1:1 REDUNDANCY LOOP CABLE ASSY
SHOWN FOR REFERENCE ONLY
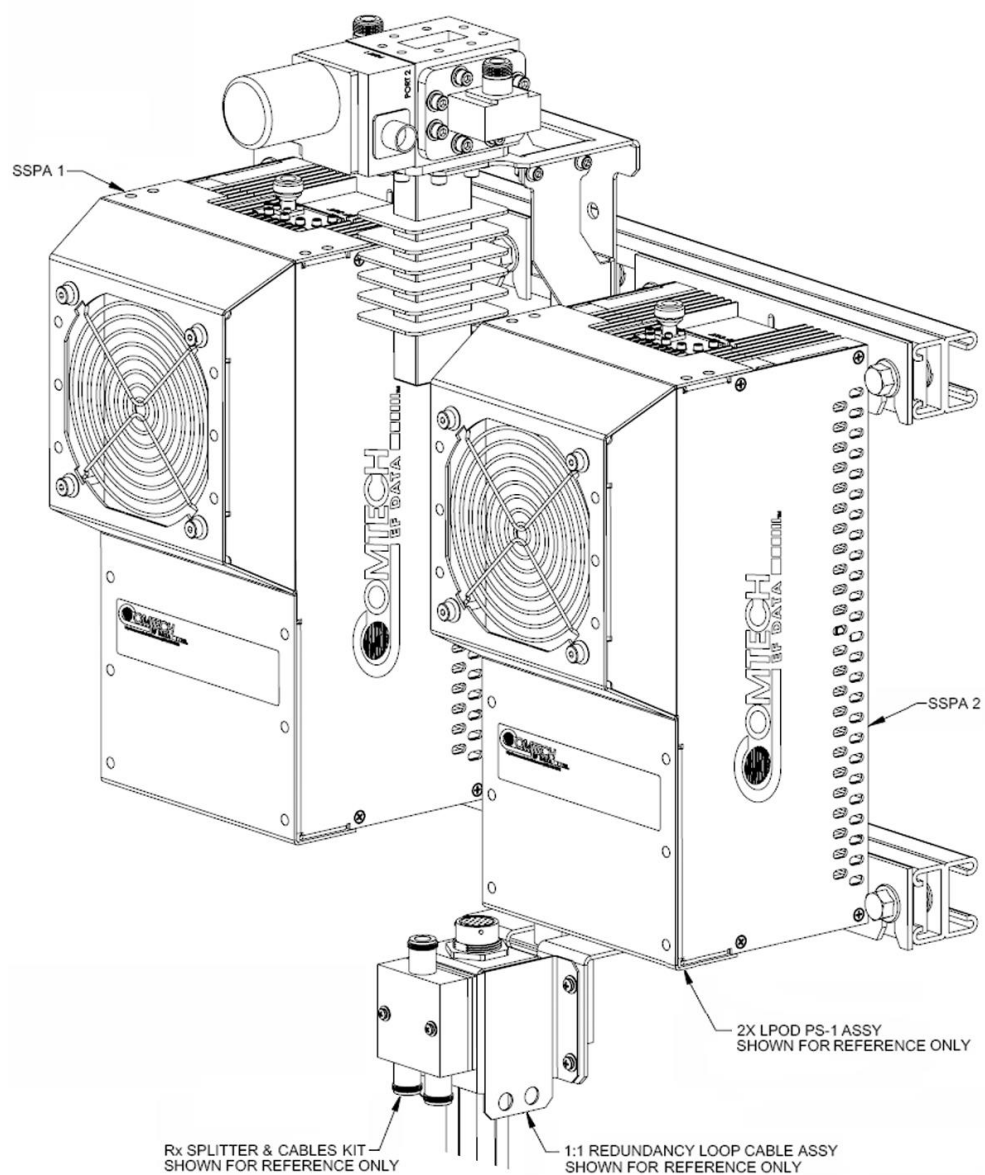
Figure A-13. KT-0000104 LPOD PS 1 C-Band 1:1 Redundancy Kit Example – Assembled Isometric View

A.4.2.2   KT-0000090 LPOD PS 1 C-Band Coax Output 1:1 Redundancy Kit
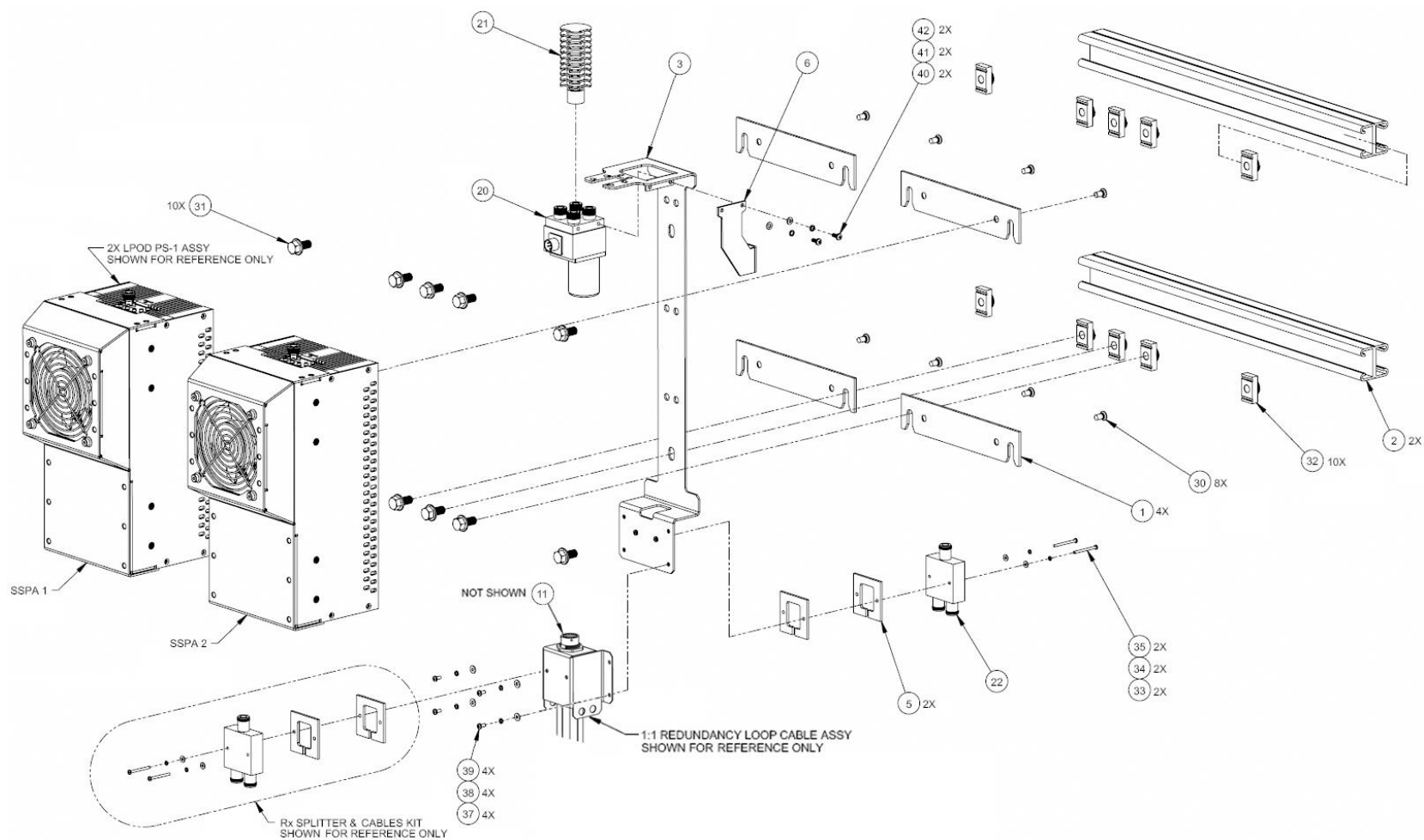
Item	Qty	CEFD Part No.	Description
1	4	FP-0000534	BRACKET, MOUNTING, LPOD PS 1
2	2	FP-0000542	CHANNEL, DUAL, UNISTRUT, 1:1 RDNT, LPOD PS 1
3	1	FP-0000537	BRACKET, UNIVERSAL, 1:1 RDNT, LPOD PS 1
5	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
10	4	CA/6357-2	CABLE, ROHS, TX, 2FT
11	1	HW/CAP-SS14	DUST COVER,RECEPTACLE,NON-SHORTING,SIZE 14,SS,W/CHAIN & RING
20	1	SW/COAX-N-F-SEALED	SWITCH COAX N-FEMALE, 25VDC 5.9-6.5 SEALED
21	1	RF-0000104	TERMINATION, MOD, TYPE N, M, 50 W, DC-8.5 GHz
22	1	RF-0000105	SPLITTER/COMBINER, RF POWER, 2-WAY, 0 DEGREES, 1-2GHZ
30	8	HW/1/4-20X1/2FH	1/4-20 x 1/2 LG FH PHILLIPS SCREW, 82, UCUT, SS
31	10	HW-0000070	3/8-16 x 3/4 LG HEX, FLNG, SERR SCREW, SS
32	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
33	2	HW/4-FLT	#4 FLAT WASHER, SS
34	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
35	2	HW/4-40X1.38PH	#4-40 x 1/38 P.H. PHIILIPS SCREW, SS
37	4	HW/6-FLT	#6 FLAT WASHER, SS
38	4	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
39	4	HW/6-32X5/16P.H	#6-32 x 5/16 LG PHILLIPS SCREW
40	2	HW-0000170	M4X0.7 x 8 LG PAN HD PHILLIPS SCREW, SS
41	2	HW/M4LOCK	M4 LOCK WASHER, SS
42	2	HW/M4FLAT	M4 FLAT WASHER, SS
43	12	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK

Figure A-14. KT-0000090 LPOD PS 1 C-Band Coax Output 1:1 Redundancy Kit Example – Exploded Isometric View
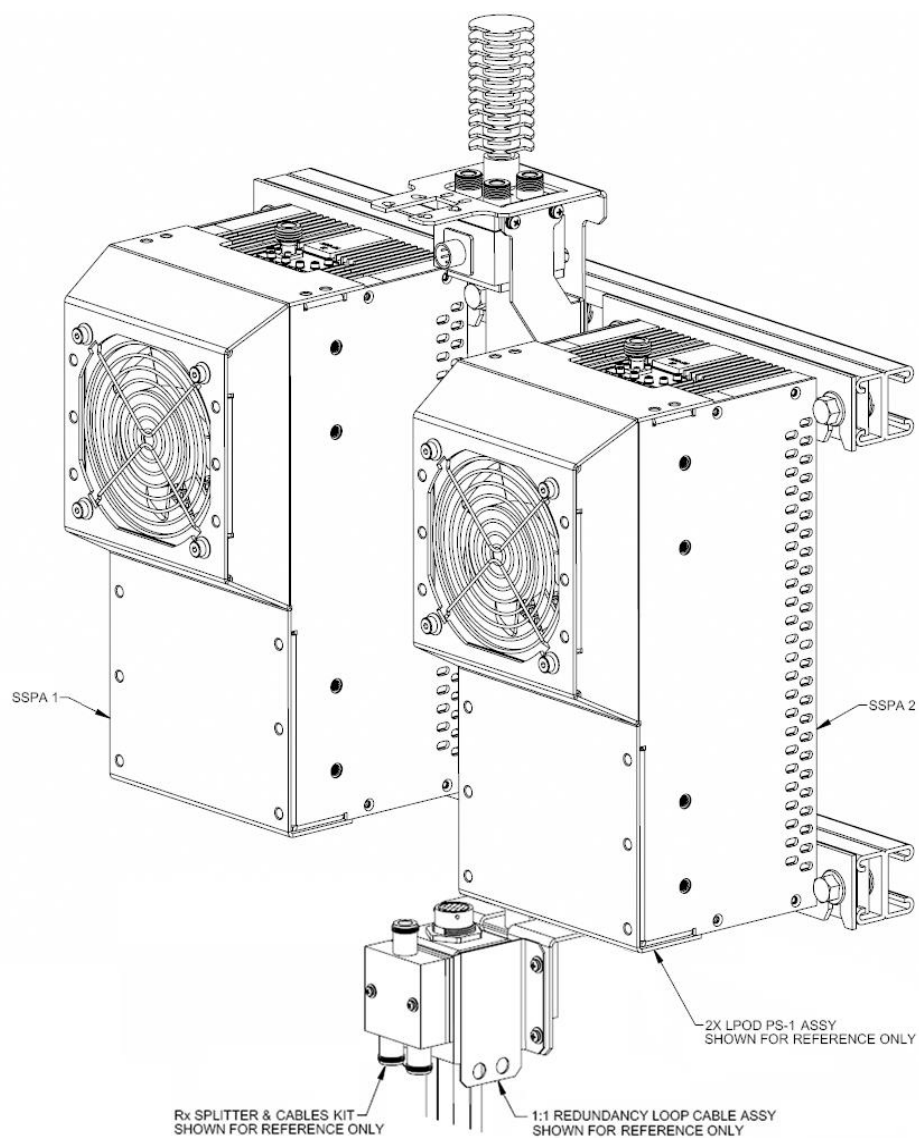
Figure A-15. KT-0000090 LPOD PS 1 C-Band Coax Output 1:1 Redundancy Kit Example – Assembled Isometric View

A.4.2.3   KT-0000089 LPOD PS 1 Ku-Band 1:1 Redundancy Kit
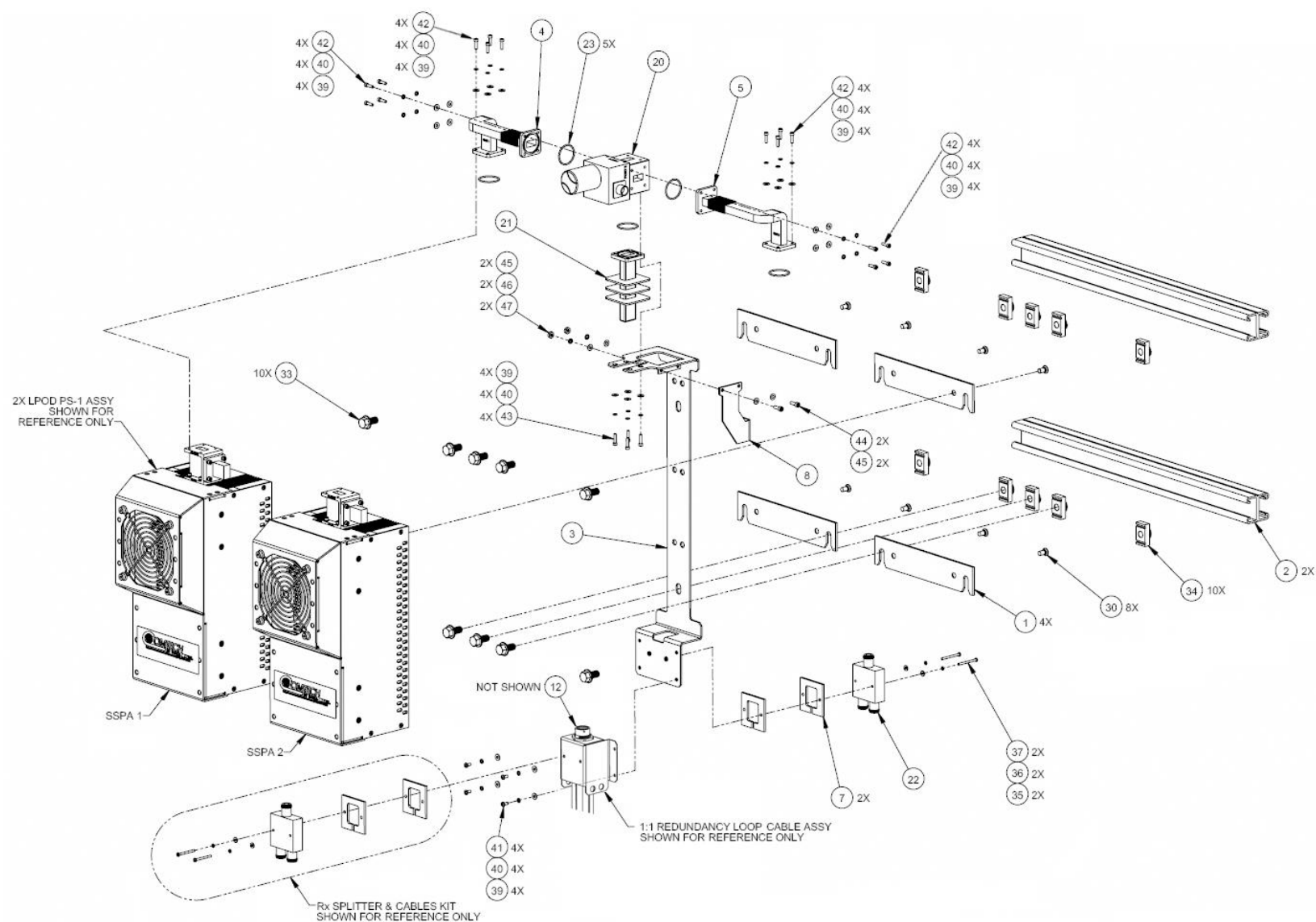
Item	Qty	CEFD Part No.	Description
1	4	FP-0000534	BRACKET, MOUNTING, LPOD PS 1
2	2	FP-0000542	CHANNEL, DUAL, UNISTRUT, 1:1 RDNT, LPOD PS 1
3	1	FP-0000537	BRACKET, UNIVERSAL, 1:1 RDNT, LPOD PS 1
4	1	FP-0000548	WAVEGUIDE, Ku, WR-75, GRVD FLGS, E TO H TO FLEX, LH, 1:1, PS 1
5	1	FP-0000549	WAVEGUIDE, Ku, WR-75, GRVD FLGS, E TO H TO FLEX, RH, 1:1, PS 1
7	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
8	1	FP-0000645	BRACKET, SUPPORT, 1:1 RED., LPOD PS 1
11	2	CA/RF0097	CABLE ASSY, ROHS CONNECTOR, CSAT-7075 OUTPUT RF, ROHS
12	1	HW/CAP-SS14	DUST COVER,RECEPTACLE,NON-SHORTING,SIZE 14,SS,W/CHAIN & RING
20	1	SW/WGS28V-75SB	SWITCH, WAVEGUIDE, WR75, +28VDC, SEALED, SIDE & BOTTOM MNT
21	1	RF/TERM-11923-5	RF TERMINATION, WR75G, 14-14.5GHz, 1.05:1 VSWR, 150W
22	1	RF-0000105	RF POWER SPLITTER/COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
23	6	GA/WR75-R-H-C	GASKET, O RING, WR-75, HALF THICKNESS, CONDUCTIVE
24	12	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK
30	8	HW/1/4-20X1/2FH	1/4-20 x 1/2 FLAT HD PHILLIPS SCREW, 82°, UCUT, SS
33	10	HW-0000070	3/8-16 x 3/4 LG SCREW, HEX, FLNG, SERR, SS
34	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
35	2	HW/4-FLT	#4 FLAT WASHER, SS
36	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
37	2	HW/4-40X1.38PH	#4-40 x 1-3/8 LG PAN HD PHILLIPS SCREW, SS
39	28	HW/6-FLT	#6 FLAT WASHER, SS
40	28	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
41	4	HW/6-32X5/16P.H	#6-32 x 5/16 LG PHILLIPS SCREW
42	20	HW/6-32X1/2SHCS	#6-32 x 1/2 LG SOCKET HD CAP SCREW, SS
43	4	03P1111	#6-32 x 9/16 LG SOCKET HD SCREW, SS
44	2	HW/8-32X1/2SHCS	#8-32 x 1/2 LG SOCKET HD CAP SCREW, SS
45	4	HW/8-FLT	#8 FLAT WASHER, SS
46	2	HW/8-SPLIT	#8 SPLIT LOCK WASHER, SS
47	2	HW/8-32HEXNUT	#8-32 HEX NUT, SS

Figure A-16. KT-0000089 LPOD PS 1 Ku-Band 1:1 Redundancy Kit Example – Exploded Isometric View

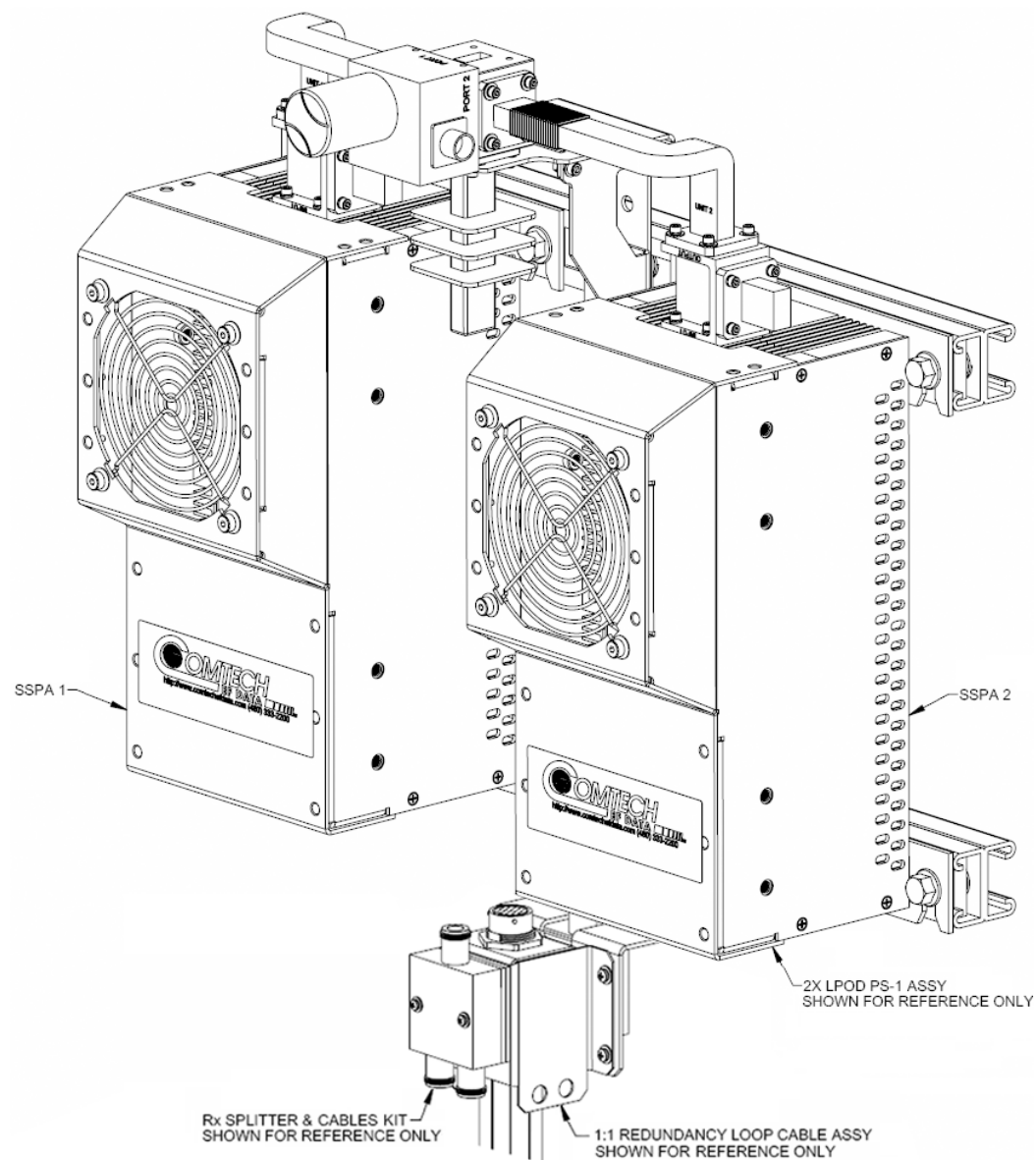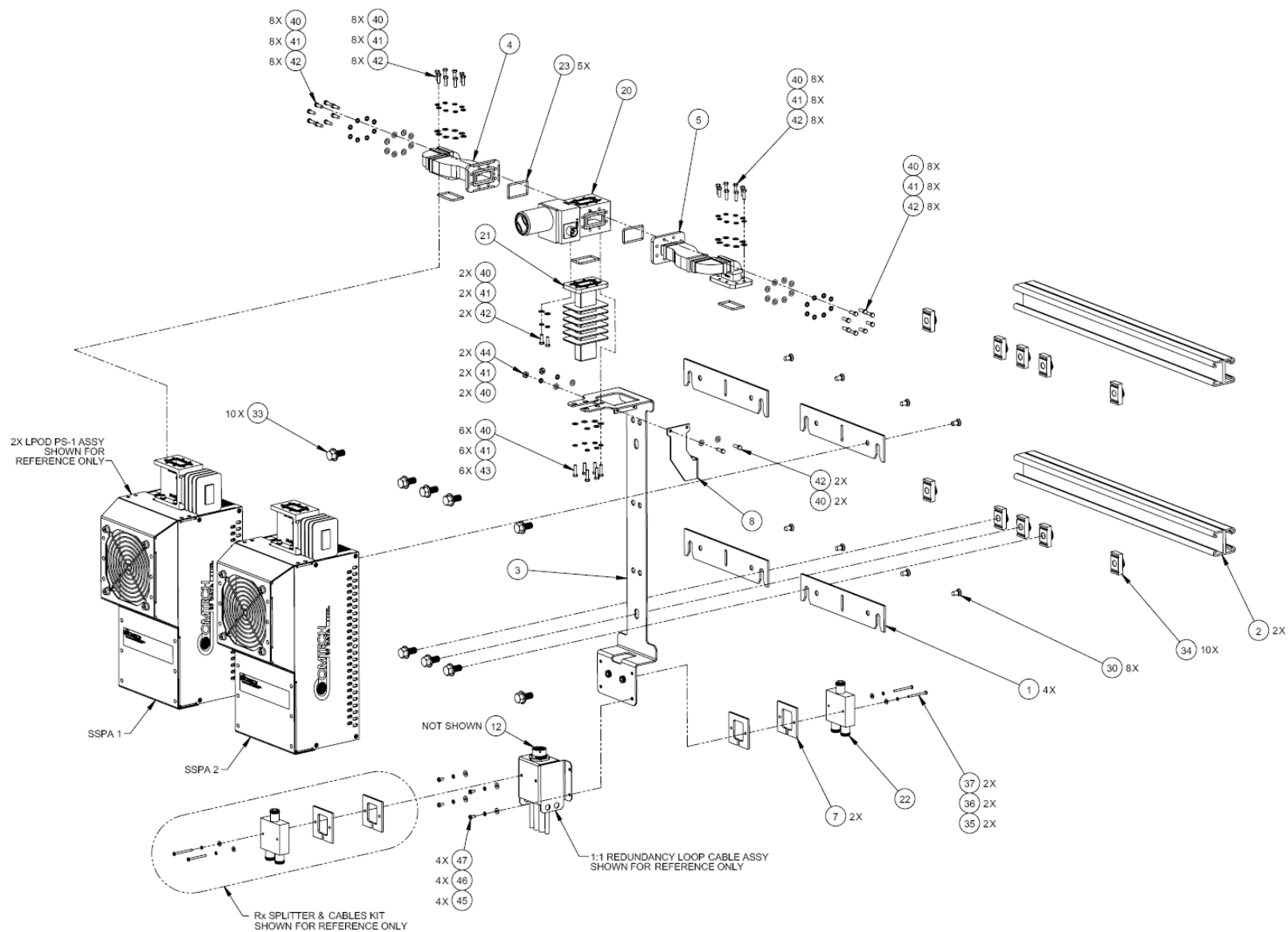**Figure A-17. KT-0000089 LPOD PS 1 Ku-Band 1:1 Redundancy Kit Example – Assembled Isometric View**

A.4.2.4   KT-0000170 LPOD PS 1 X-Band 1:1 Redundancy Kit

Item	Qty	CEFD Part No.	Description
0	2	CA-0000348	CABLE ASSY, RF, 2 FT
0	12	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK
1	4	FP-0000534	BRACKET, MOUNTING, LPOD PS 1
2	2	FP-0000542	CHANNEL, DUAL, UNISTRUT, 1:1 RDNT, LPOD PS 1
3	1	FP-0000537	BRACKET, UNIVERSAL, 1:1 RDNT, LPOD PS 1
4	1	FP-0000948	WAVEGUIDE, PREFORMED SEAMLESS FLEX, X, CPRG-112, LH, 1:1, PS 1
5	1	FP-0000949	WAVEGUIDE, PREFORMED SEAMLESS FLEX, X, CPRG-112, RH, 1:1, PS 1
7	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
8	1	FP-0000645	BRACKET, SUPPORT, 1:1 RED., LPOD PS 1
12	1	HW/CAP-SS14	DUST COVER,RECEPTACLE,NON-SHORTING,SIZE 14,SS,W/CHAIN & RING
20	1	SW/WG-HAGS	SWITCH, WR112G, +24V, SEALED, STANDARD THREAD, COLD TEMP RATING
21	1	FP/WG0039	CNTRC, WAVEGUIDE FP - WAVEGUIDE, TERMINATION, 250W, CPR-112
22	1	RF-0000105	RF POWER SPLITTER/COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
23	6	GA/CPR112-R-F-C	GASKET, ROUND, CPR112, FULL THICKNESS, CONDUCTIVE
30	8	HW/1/4-20X1/2FH	1/4-20 x 1/2 LG FLAT HD PHILLIPS SCREW, 82°, UCUT, SS
33	10	HW-0000070	3/8-16 x 3/4 LG SCREW, HEX, FLNG, SERR, SS
34	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
35	2	HW/4-FLT	#4 FLAT WASHER, SS
36	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
37	2	HW/4-40X1.38PH	#4-40 x 1-3/8 LG PAN HD PHILLIPS SCREW, SS
40	44	HW/8-FLT	#8 FLAT WASHER, SS
41	42	HW/8-SPLIT	#8 SPLIT LOCK WASHER, SS
42	36	HW-0000325	#8-32 x 1/2 LG SCREW, HEX HD, SS
43	6	HW-0000326	#8-32 x 5/8 LG SCREW, HEX HD, SS
44	2	HW/8-32HEXNUT	#8-32 HEX NUT, SS
45	4	HW/6-FLT	#6 FLAT WASHER, SS
46	4	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
47	4	HW/6-32X5/16P.H	#6-32 x 5/16 LG PHILLIPS SCREW

Figure A-18. KT-0000170 LPOD PS 1 X-Band 1:1 Redundancy Kit Example – Exploded Isometric View

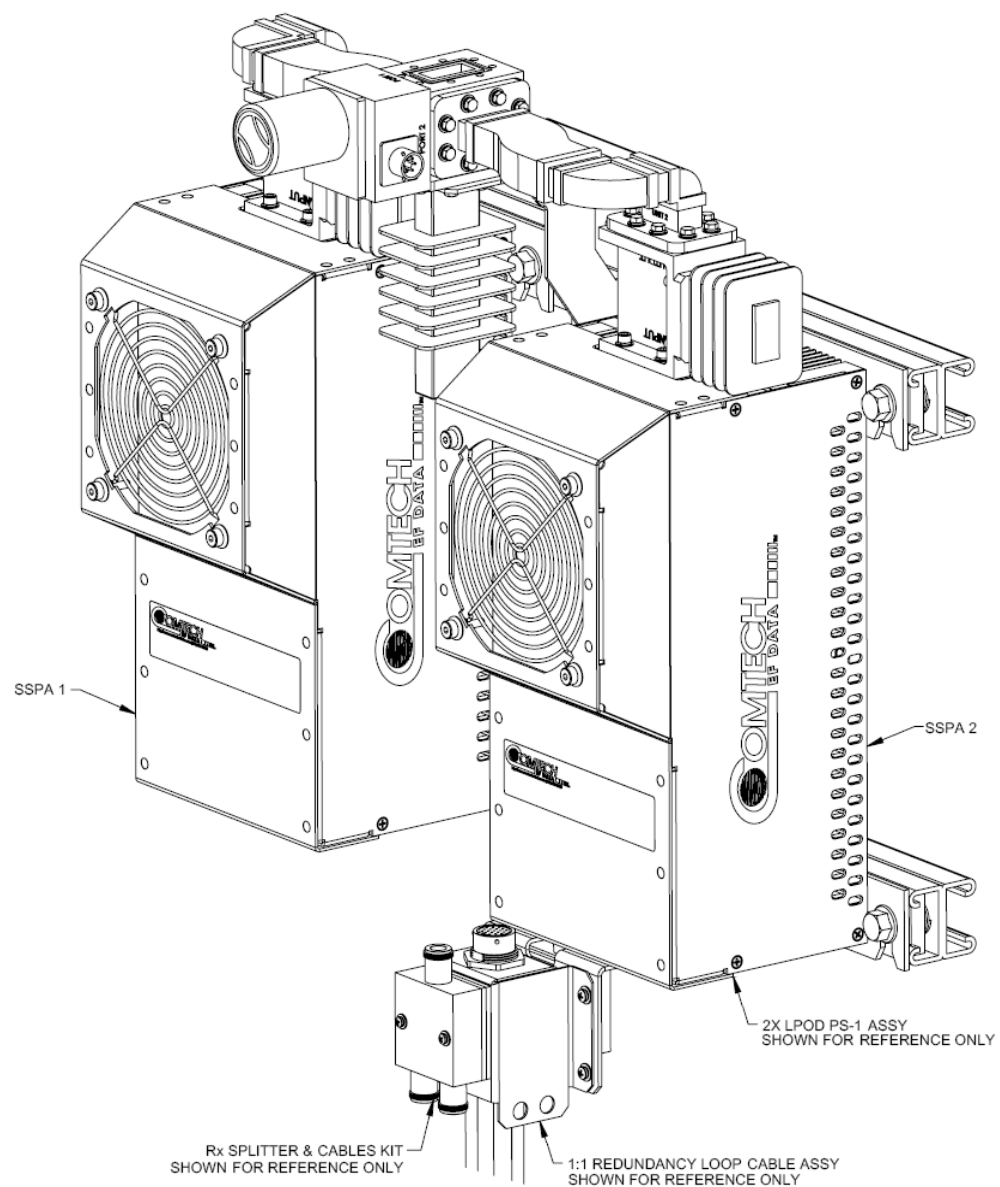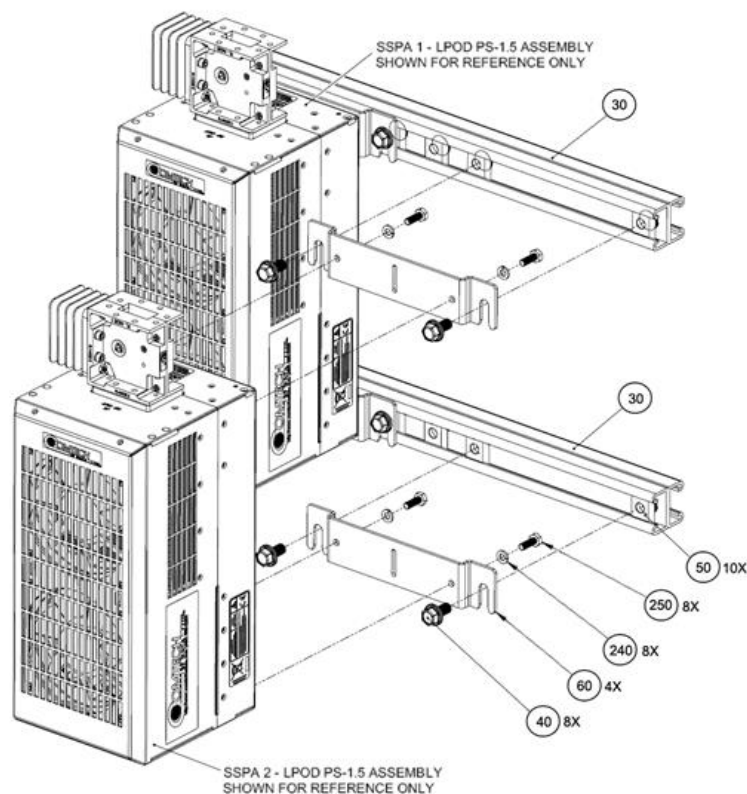**Figure A-19. KT-0000170 LPOD PS 1 X-Band 1:1 Redundancy Kit Example – Assembled Isometric View**
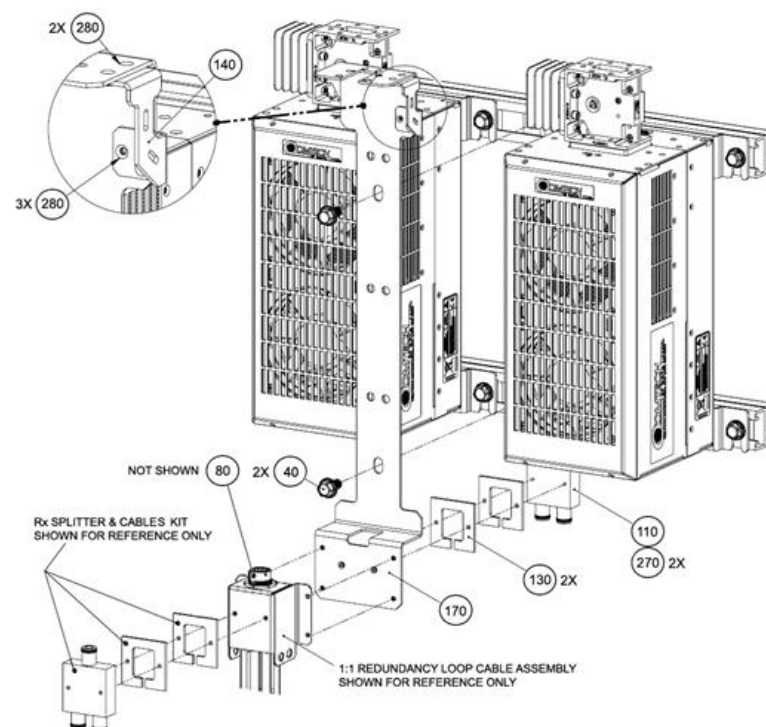
A.4.3 LPOD PS 1.5 1:1 Redundancy Kit Examples

A.4.3.1   KT-0020526 LPOD PS 1.5 C-Band DC Option 1:1 Redundancy Kit

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STEP 3: WAVEGUIDE INSTALLATION
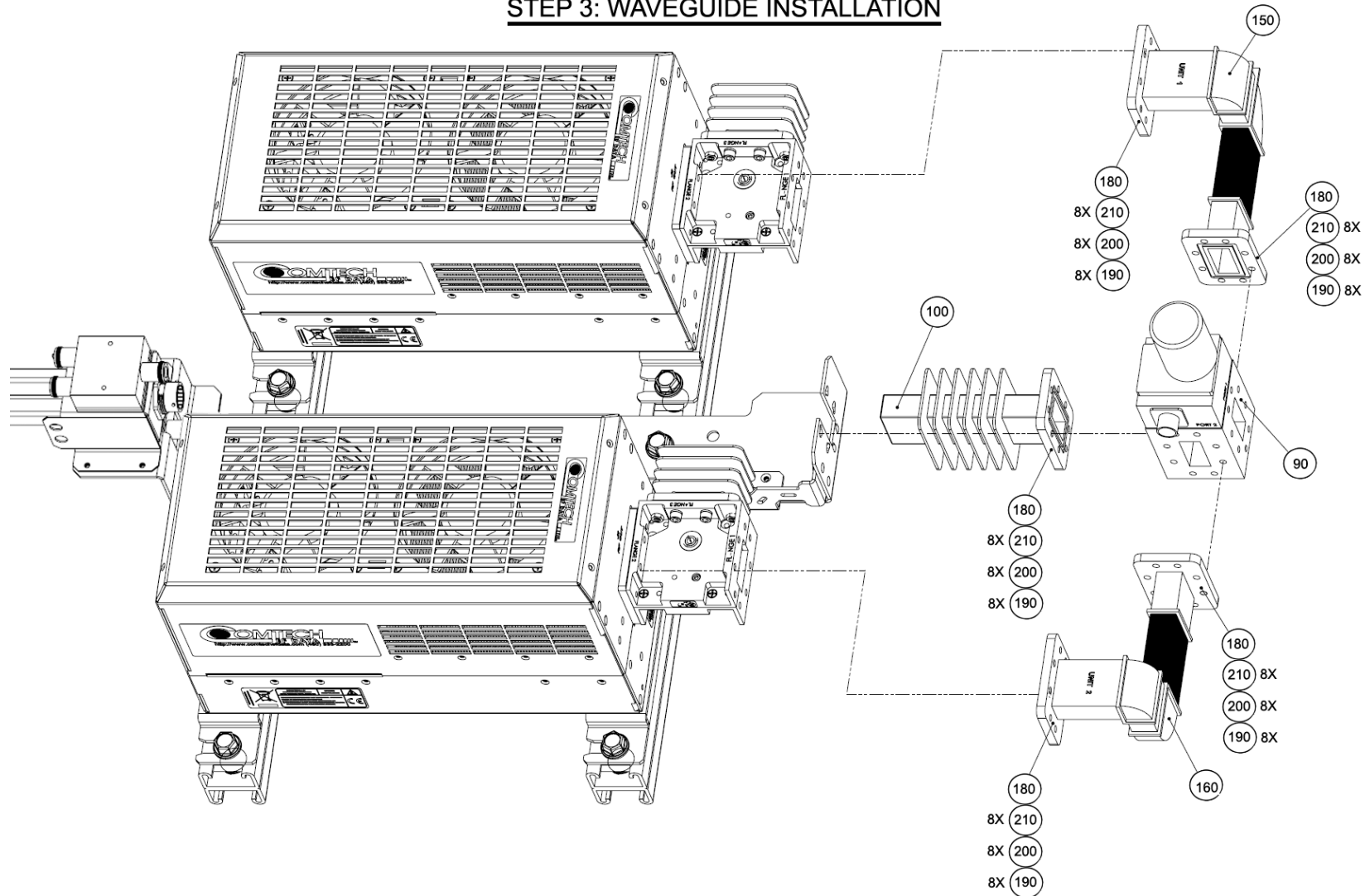
Item	Qty	CEFD Part No.	Description
30	2	FP-0000542	CHANNEL, DUAL, UNISTRUT
40	10	HW-0000070	SCREW, HEX, FLNG, 0.375-16 x 0.750, SS, SERR
50	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
60	4	FP-0020593	BRACKET, MOUNTING, DC LPOD
70	4	CA-0000348	CABLE ASSY, RF, 2 FT
80	1	HW/CAP-SS14	DUST COVER,RECEPTACLE,NON-SHORTING,SIZE 14,SS,W/CHAIN & RING
90	1	SW/WGS28V-137S	SWITCH, WAVEGUIDE, CPR137
100	1	FP/WG0034	MPS, BLANKET FP TERM
110	1	RF-0000105	RF POWER SPLITTER/COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
130	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
140	1	FP-0020594	SUPPORT BRACKET
150	1	FP-0020595	OUTPUT WAVEGUIDE, UNIT 1 TO PORT 4
160	1	FP-0020596	OUTPUT WAVEGUIDE UNIT 2 TO PORT 2
170	1	FP-0020592	BRACKET, MOUNTING, LPOD PS 1.5
180	5	GA/GSKTCP137HLF	GASKET, CP137, HALF THK
190	40	HW/10-FLT	#10 FLAT WASHER, SS
200	40	HW/10-SPLIT	#10 SPLIT WASHER, SS
210	40	HW/#10-32X5/8SHC	#10-32 x 5/8 LG SOCKET HD CAP SCREW, SS
220	4	HW/SEM632X5/16PH	#6-32 x 5/16 LG PHILLIPS HD SCREW, SS
230	1	PP-0020512	BALL DRIVER
240	8	HW/1/4-SPLIT	1/4" SPLIT WASHER., SS
250	8	HW/1/4-20X3/4BT	1/4-20 x 3/4 LG BOLT
260	12	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK
270	2	HW/SEM440X3/8PH	#4-40 x 3/8 LG PAN HD SCREW
280	5	HW/632X5/16FHMS	#6-32 x 5/16 FLAT HD MACHINE SCREW

Figure A-20. KT-0020526 LPOD PS 1.5 C-Band DC Option 1:1 Redundancy Kit Example – Exploded Isometric Views

Figure A-21. KT-0020526 LPOD PS 1.5 C-Band DC Option 1:1 Redundancy Kit Example – Assembled Isometric View

A.4.3.2 KT-0000060 LPOD PS 1.5 Ku-Band 1:1 Redundancy Kit

| Item	Qty	CEFD Part No.	Description
0	2	CA-0000348	CABLE ASSY, RF, 2 FT
0	12	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK
1	4	FP-0000534	BRACKET, MOUNTING, LPOD PS 1
2	2	FP-0000542	CHANNEL, DUAL, UNISTRUT, 1:1 RDNT, LPOD PS 1
3	1	FP-0000537	BRACKET, UNIVERSAL, 1:1 RDNT, LPOD PS 1
4	1	FP-0000939	WAVEGUIDE, FORMED BENDS, Ku, WR-75, LH, 1:1, PS 1.5
5	1	FP-0000940	WAVEGUIDE, FORMED BENDS, Ku, WR-75, RH, 1:1, PS 1.5
7	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
8	1	FP-0000645	BRACKET, SUPPORT, 1:1 RED., LPOD PS 1
12	1	HW/CAP-SS14	DUST COVER,RECEPTACLE,NON-SHORTING,SIZE 14,SS,W/CHAIN & RING//(RE
20	1	SW/WGS28V-75SB	SWITCH, WAVEGUIDE, WR75, +28VDC, SEALED SIDE & BOTTOM MNT
21	1	RF/TERM-11923-5	RF TERMINATION, WR75G, 14-14.5GHz, 1.05:1 VSWR, 150W, FLAT BLACK, G
22	1	RF-0000105	RF POWER SPLITTER/COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
23	5	GA/GSKTWR75HALF	GASKET, WR75, HALF THK
30	8	HW/1/4-20X1/2FH	1/4-20 x 1/2 LG FLAT HD PHILLIPS SCREW, 82°, UCUT, SS
33	10	HW-0000070	3/8-16 x 3/4 LG SCREW, HEX, FLNG, SS, SERR
34	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
35	2	HW/4-FLT	#4 FLAT WASHER, SS
36	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
37	2	HW/4-40X1.38PH	#4-40 x 1/38 P.H. PHIILIPS SCREW, SS
39	24	HW/6-FLT	#6 FLAT WASHER, SS
40	24	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
41	4	HW/6-32X5/16P.H	#6-32 x 5/16 LG PHILLIPS SCREW
42	16	HW/6-32X1/2SHCS	#6-32 x 1/2 LG SOCKET HD CAP SCREW, SS
43	4	03P1111	#6-32 x 9/16 LG, SOCKET HD CAP SCREW, SS
44	2	HW/8-32X1/2SHCS	#8-32 x 1/2 LG SOCKET HD CAP SCREW, SS
45	4	HW/8-FLT	#8 FLAT WASHER, SS
46	2	HW/8-SPLIT	#8 SPLIT LOCK WASHER, SS
47	2	HW/8-32HEXNUT	#8-32 HEX NUT, SS

Figure A-22. KT-0000060 LPOD PS 1.5 Ku-Band 1:1 Redundancy Kit Example – Exploded Isometric View
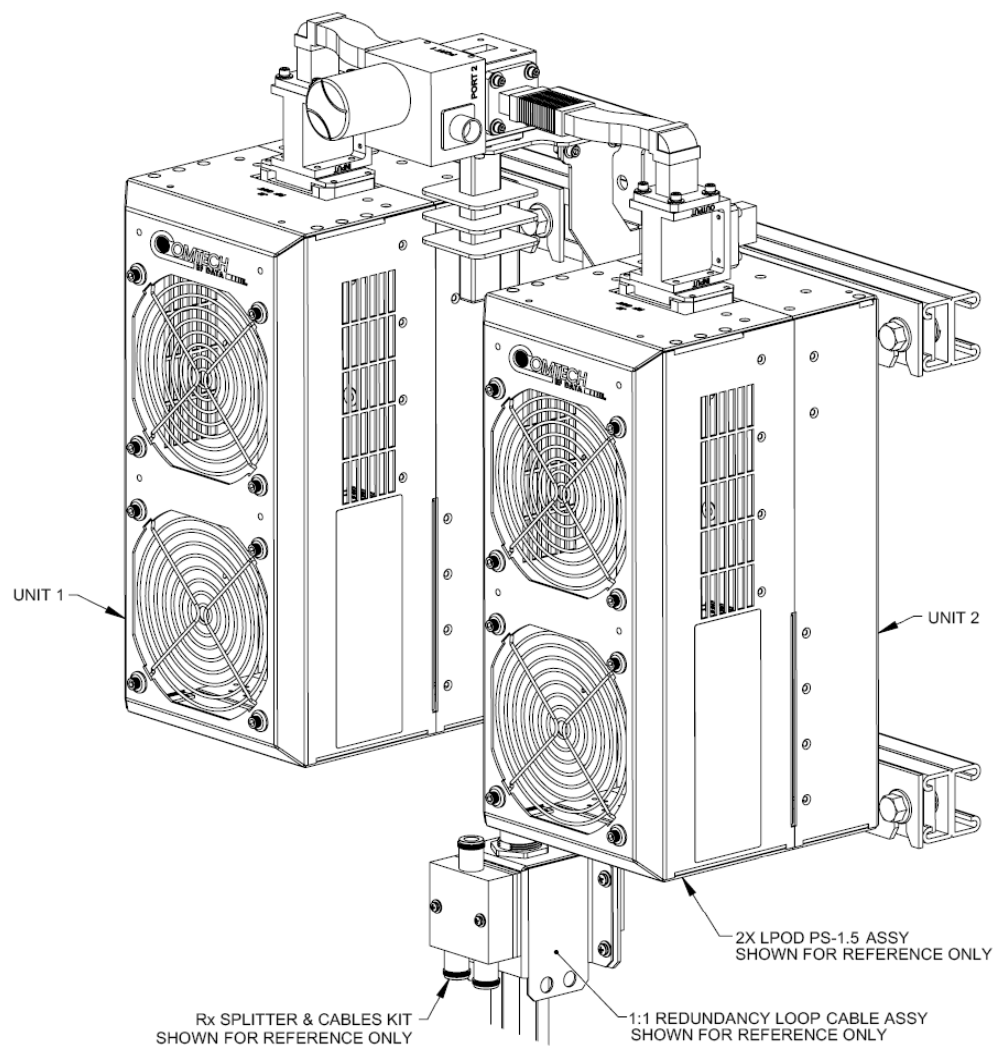
Figure A-23. KT-0000060 LPOD PS 1.5 Ku-Band 1:1 Redundancy Kit Example – Assembled Isometric View

A.4.4 LPOD PS 2 1:1 Redundancy Kit Examples

A.4.4.1   KT-0020827 PS 2 C-Band 1:1 Redundancy Free Standing Kit

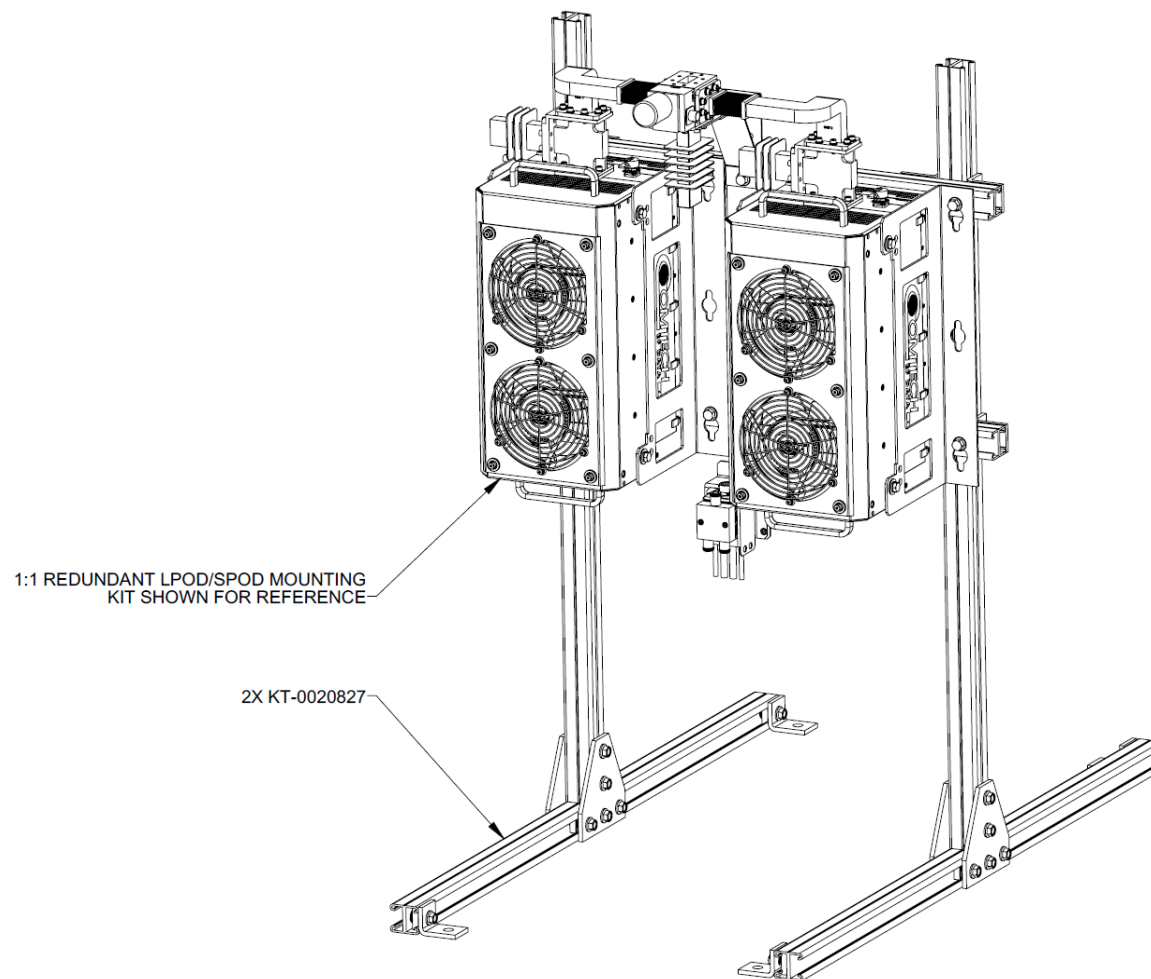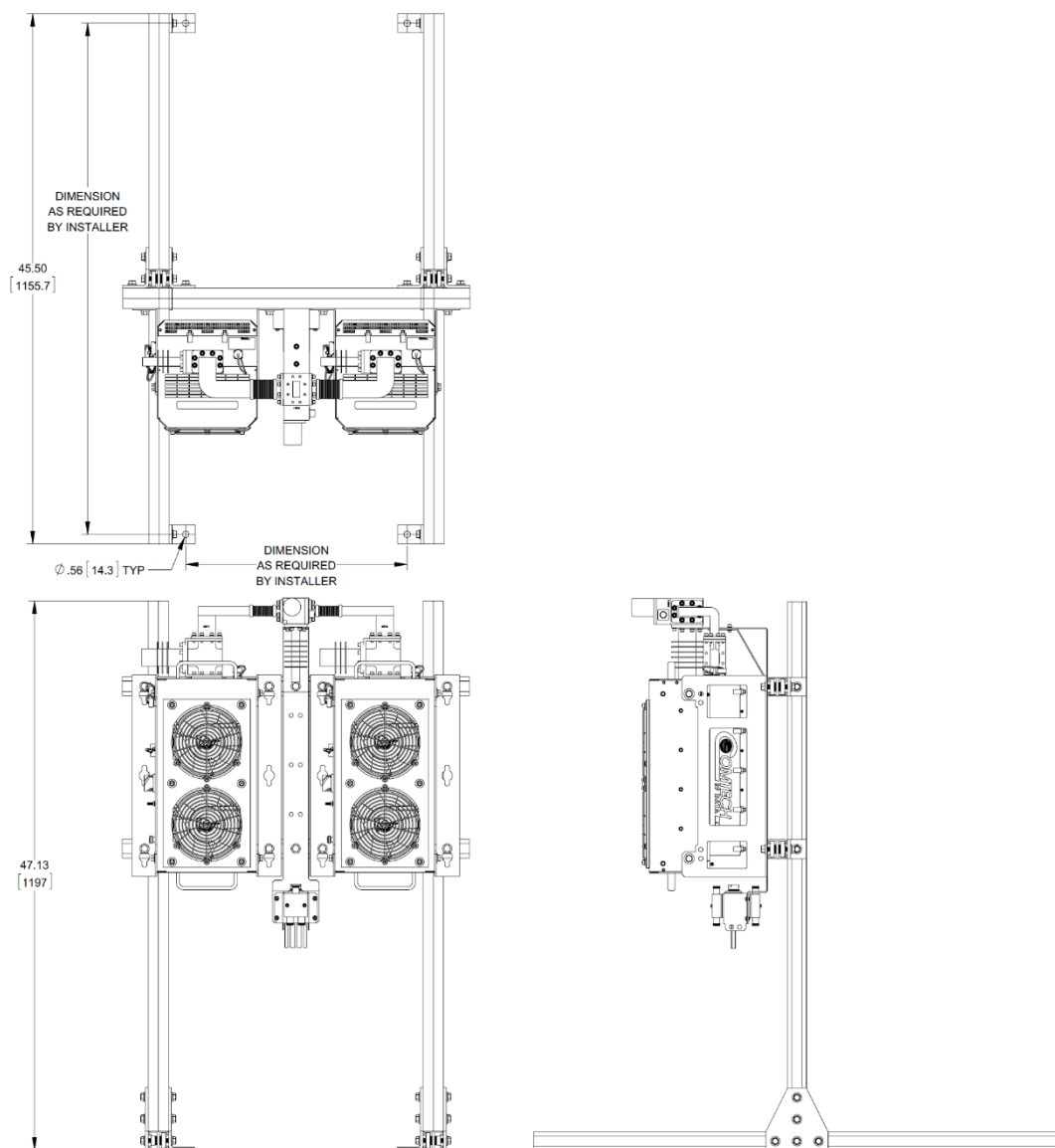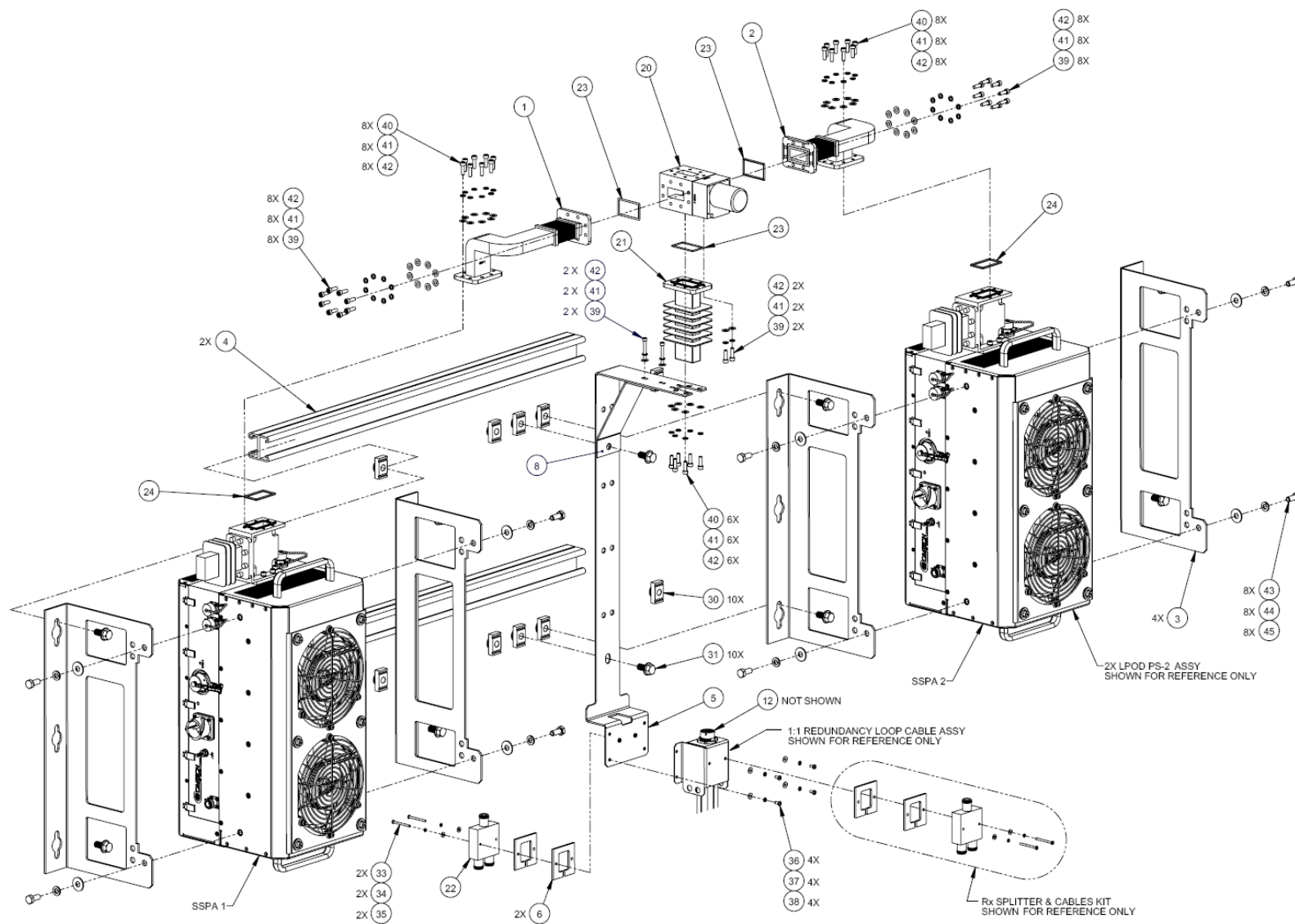**Figure A-24. PS 2 C-Band 1:1 Redundancy Free Standing Kit Example Using KT-0020827 – Assembled Isometric View**
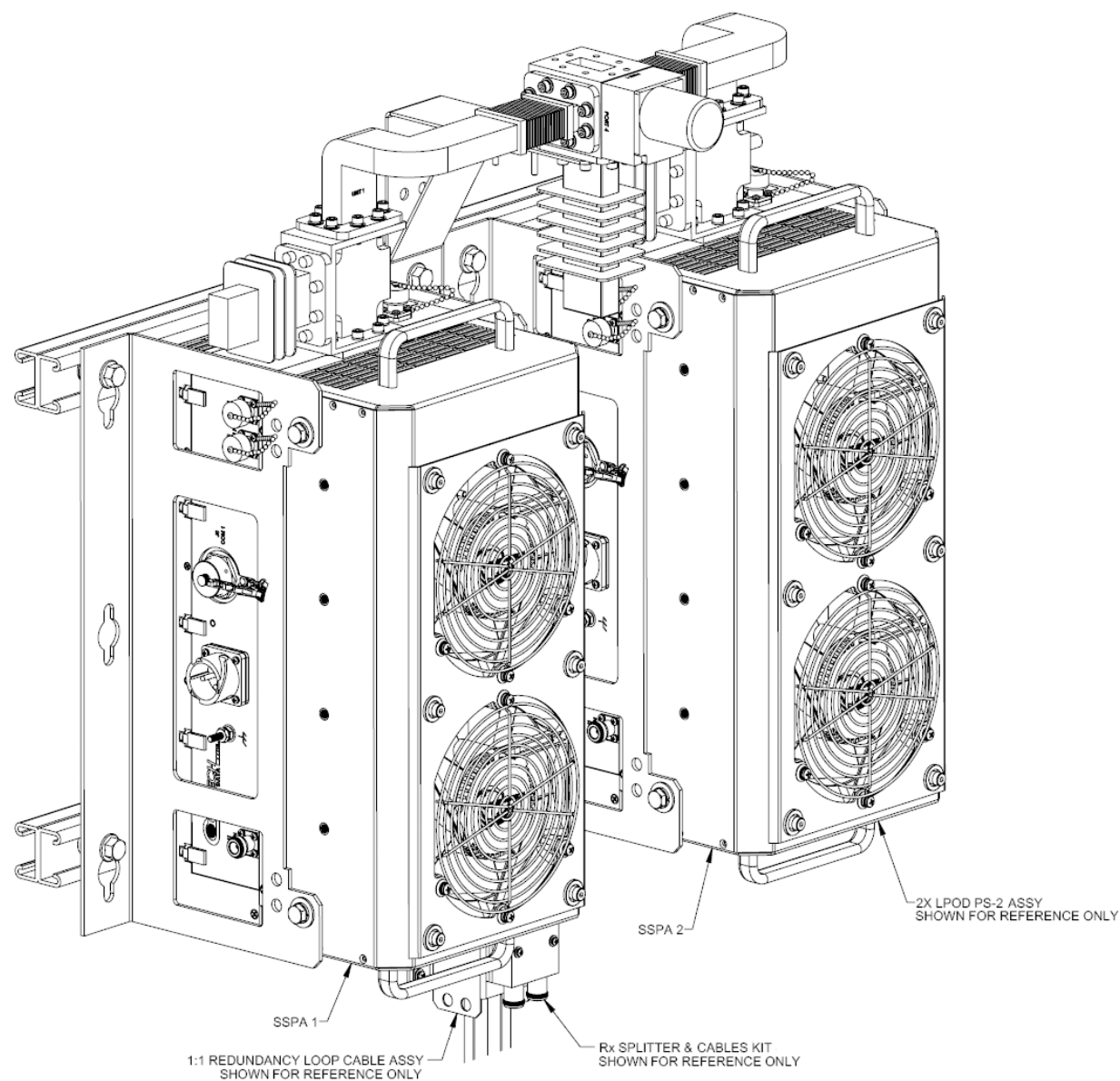
Figure A-25. PS 2 C-Band 1:1 Redundancy Free Standing Kit Example Using KT-0020827 – Assembled Views

A.4.4.2   KT-0000091 LPOD PS 2 C-Band 1:1 Redundancy Kit

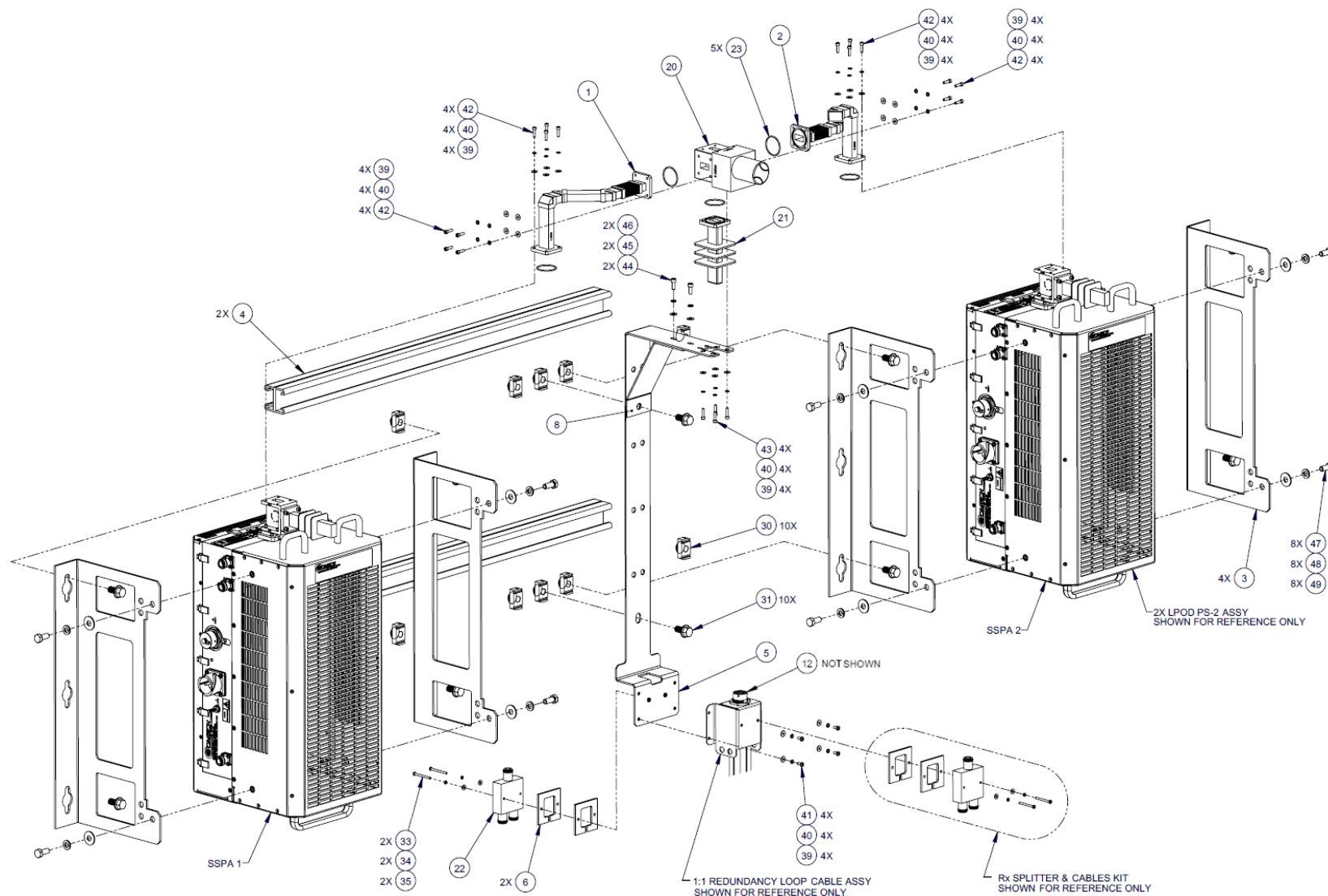| Item	Qty	CEFD Part No.	Description
1	1	FP-0000552	WAVEGUIDE, C-BAND, CPR-137 G, E TO H TO FLEX, LH, 1:1, PS 2
2	1	FP-0000553	WAVEGUIDE, C-BAND, CPR-137 G, E TO H TO FLEX, RH, 1:1, PS 2
3	4	FP-0000442	BRACK, MOUNTING, HPOD-LPOD PS 2
4	2	FP-0000543	CHANNEL, DUAL, UNISTRUT, 1:1 RDNT, LPOD PS 2
5	1	FP-0000626	BRACKET, RF SW, UNIVERSAL, 1:1 RED., LPOD PS 2
6	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
11	2	CA/RF0097	ASSY CABLE, ROHS CONNECTOR, CSAT-7075 OUTPUT RF, ROHS
12	1	HW/CAP-SS14	DUST COVER,RECEPTACLE,NON-SHORTING,SIZE 14,SS,W/CHAIN & RING
20	1	SW/WGS28V-137S	SWITCH, WAVEGUIDE, CPR137, +28V SEALED
21	1	FP/WG0034	PNQ, WAVEGUIDE TERMINATION, SMALL FINS
22	1	RF-0000105	RF POWER SPLITTER/COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
23	4	GA/CPR-137-R-H-C	GASKET, D SHAPE, CPR-137, HALF THICKNESS, CONDUCTIVE
24	2	GA/CPR137-R-F-C	GASKET, ROUND, CPR137, FULL THICKNESS, CONDUCTIVE
25	12	HW/TW14.5HDBLK	CABLE TIE, 14.5", HEAVY DUTY, BLACK
30	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
31	10	HW-0000070	3/8-16 x 3/4 LG SCREW, HEX, FLNG, SERR, SS
33	2	HW/4-40X1.38PH	#4-40 x 1-3/8 LG PAN HD PHIILIPS SCREW, SS
34	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
35	2	HW/4-FLT	#4 FLAT WASHER, SS
36	4	HW/6-32X5/16P.H	#6-32 x 5/16 PHILLIPS SCREW
37	4	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
38	4	HW/6-FLT	#6 FLAT WASHER, SS
39	26	HW/#10-32X1/2SH	#10-32 x 1/2 LG SOCKET HD CAP SCREW, SS
40	30	HW/#10-32X5/8SHC	#10-32 x 5/8 LG SOCKET HD CAP SCREW, SS
41	48	HW/10-SPLIT	#10 SPLIT LOCK WASHER, SS
42	48	HW/10-FLT	#10 FLAT WASHER, SS
43	8	HW/5/16-18X3/4B	5/16-18 x 3/4 LG HEX HD BOLT, SS
44	8	HW/5/16-SPLIT	5/16" SPLIT LOCK WASHER
45	8	HW/5/16-FLT	5/16" FLAT WASHER

Figure A-26. KT-0000091 LPOD PS 2 C-Band 1:1 Redundancy Kit Example – Exploded Isometric View

Figure A-27. KT-0000091 LPOD PS 2 C-Band 1:1 Redundancy Kit Example – Assembled Isometric View
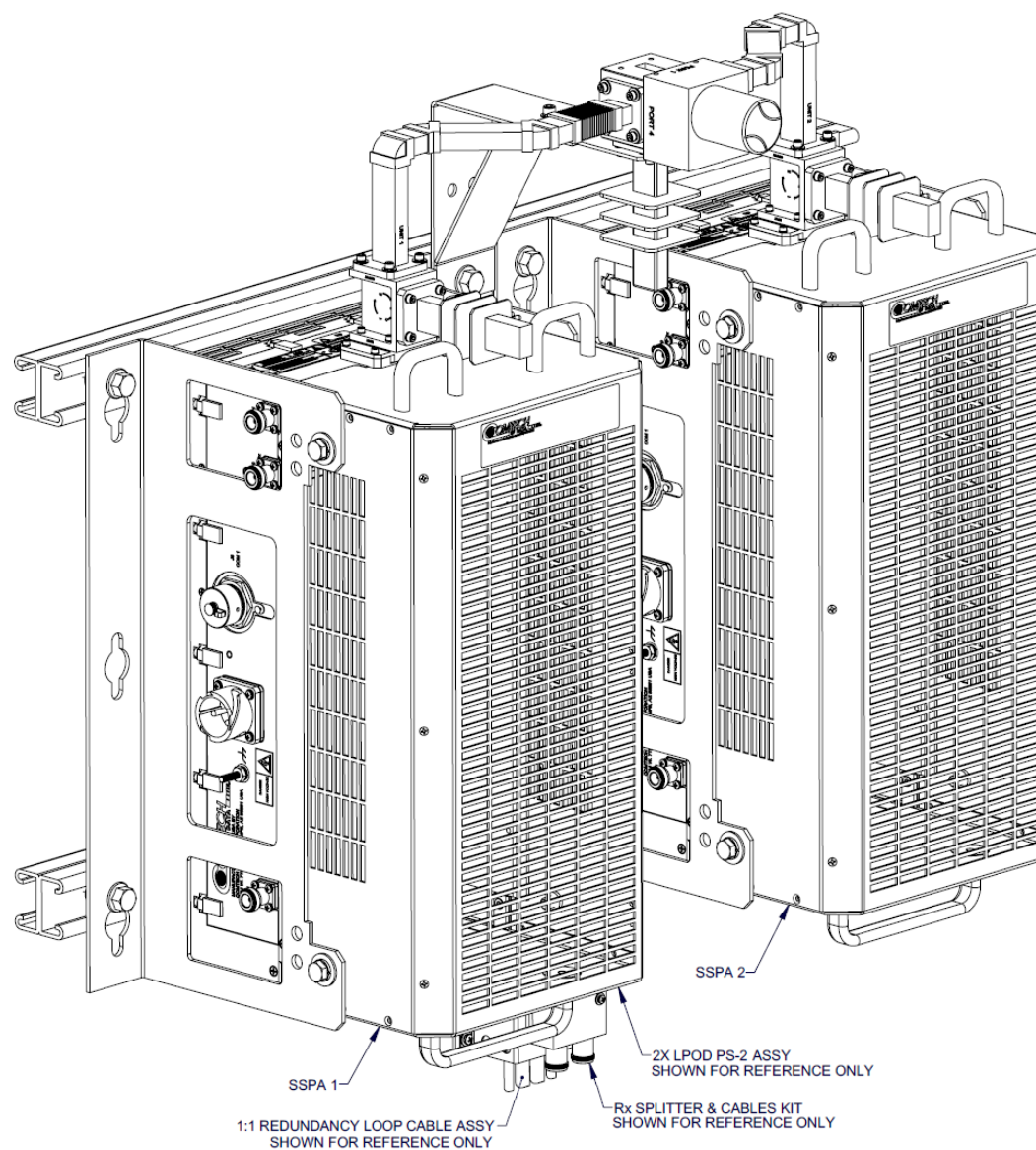
A.4.4.3   KT-0000254 LPOD PS 2 Ku-Band 1:1 Redundancy Kit

Item	Qty	CEFD Part No.	Description
1	1	FP-0001170	WAVEGUIDE, Ku-BAND, WR-75, LH, 1:1, LPOD PS 2
2	1	FP-0001171	WAVEGUIDE, Ku-BAND, WR-75, RH, 1:1. LPOD PS 2
3	4	FP-0000442	BRACK, MOUNTING, HPOD & LPOD PS 2
4	2	FP-0000543	CHANNEL, DUAL, UNISTRUT, 1:1 RDNT, LPOD PS 2
5	1	FP-0000626	BRACKET, RF SW, UNIVERSAL, 1:1 RED., LPOD PS 2
6	2	FP-0000580	SPACER PLATE, RF SPLITTER / COMBINER
8	1	FP-0000762	SUPPORT BRACKET, 1:1 REDUNDANCY, LPOD PS 2
12	1	HW/CAP-SS14	DUST COVER,RECEPTACLE,NON-SHORTING, SIZE 14, SS,W/CHAIN & RING
20	1	SW/WGS28V-75SB	SWITCH, WAVEGUIDE, WR75, +28VDC, SEALED, SIDE & BOTTOM MOUNT
21	1	RF/TERM-11923-5	RF TERMINATION, WR75G, 14-14.5GHz, 1.05:1 VSWR, 150W, FLAT BLACK, G
22	1	RF-0000105	RF POWER SPLITTER / COMBINER, 2-WAY, 0 DEGREES, 1-2GHZ
23	5	GA/GSKTWR75HALF	GASKET, WR75, HALF THICK
30	10	HW/3/8SPRINGNUT	SPRINGNUT, 3/8-16, SHORT SPRING, SS (P3300)
31	10	HW-0000070	3/8-16 x 3/4 LG SCREW, HEX, SERR FLNG HD, SS
33	2	HW/4-40X1.38PH	SCREW #4-40 x 1-3/8 LG PHILLIPS HD, SS
34	2	HW/4-SPLIT	#4 SPLIT LOCK WASHER, SS
35	2	HW/4-FLT	#4 FLAT WASHER, SS
39	24	HW/6-FLT	#6 FLAT WASHER, SS
40	24	HW/6-SPLIT	#6 SPLIT LOCK WASHER, SS
41	4	HW/6-32X5/16P.H	#6-32 x 5/16 LG PHILLIPS SCREW
42	16	HW/6-32X1/2SHCS	#6-32 x 1/2 LG SOCKET HD CAP SCREW, SS
43	4	03P1111	#6-32 x 9/16 LG SCREW, SOCKET HD, SS
44	2	HW/#10-32X1/2SH	#10-32 x 1/2 LG SOCKET HD CAP SCREW, SS
45	2	HW/10-SPLIT	#10 SPLIT LOCK WASHER, SS
46	2	HW/10-FLT	#10 FLAT WASHER, SS
47	8	HW/5/16-18X3/4B	5/16-18 x 3/4 LG HEX HD BOLT, SS
48	8	HW/5/16-SPLIT	5/16" SPLIT LOCK WASHER
49	8	HW/5/16-FLT	5/16" FLAT WASHER

Figure A-28. KT-0000254 LPOD PS 2 Ku-Band 1:1 Redundancy Kit Example – Exploded Isometric View

Figure A-29. KT-0000254 LPOD PS 2 Ku-Band 1:1 Redundancy Kit Example – Assembled Isometric View

Appendix B. CABLE DRAWINGS

B.1   Overview

This appendix provides line details for the cables available for use with the LPOD in Standalone or 1:1 Redundancy applications. Each figure illustrates the cable's technical specifications – e.g., connector types used, cable labeling, wiring lists, etc.

The tables in this appendix cross-reference cable use in LPOD Standalone applications as well as the various 1:1 Redundancy application examples provided in Appendix A. 1:1 REDUNDANCY.

The European EMC Directive (EN55022, EN50082-1) requires that you use properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.

B.2   Control and Data Cables

Figure	CEFD Cable P/N	Description	Used For:	REF App A Figure
Figure B-1	CA-0020526	Serial Interface Cable (19-pin circular connector to RJ-11)	Connecting 1:1 Redundant Loop Cable 'J1' receptacle or Standalone LPOD 'J6 | COM1' receptacle to CLC-10 RJ-11 communications jack *(Cable and CLC-10 are furnished as part of optional CEFD KIT KT-0020518)*	A-2, A-3, A-12 through A-29
Figure B-2	CA-0000352	Ethernet Interface Cable (19-pin circular connector to <2X> RJ-45)	Connecting 1:1 Redundant Loop Cable 'J1' receptacle or Standalone LPOD 'J6 | COM1' receptacle to LPOD*net* Ethernet jack *(Cable and LPODnet are furnished as part of optional CEFD KIT KT-0000203)*	A-1, A-3, A-12 through A-29
Figure B-3	CA-0000318	100' COMMS Cable (19-pin circular connector to bare end)	Connecting 1:1 Redundant Loop Cable 'J1' receptacle or Standalone LPOD 'J6 | COM1' receptacle to user-specified M&C interface	A-3, A-12 through A-29
Figure B-4	CA-0000543	250' COMMS Cable (19-pin circular connector to bare end)		A-3, A-12 through A-29
Figure B-5	CA-0020655	Rx / Tx Redundant Loop Cable (19-pin circular receptacle to <2X> Type 'N' connectors, <2X> 19-pin circular connectors)	Interconnecting 1:1 Redundancy System LPOD units, Rx / Tx switches, and user M&C interface	A-3, A-12 through A-29
Figure B-6	CA-0020657	Tx-only Redundant Loop Cable (19-pin circular receptacle to <1X> Type 'N' connector, <2X> 19-pin circular connectors)	Interconnecting 1:1 Redundancy System LPOD units, Tx switch, and user M&C interface	A-3, A-12 through A-29

B.2.1 Serial Interface Cable

The CEFD CLC-10 Serial M&C Accessory Kit (CEFD P/N KT-0020518) includes the CA-0020526 Serial Interface Cable. This kit is optionally available to provide serial-based monitor and control of 1:1 Redundancy or Standalone LPOD applications using the CLC-10 CEFD LPOD Controller (a preconfigured Two Technologies, Inc. TechTerm Handheld Terminal). The circular connector installs onto the Redundant Loop Cable 'J1' connector in 1:1 LPOD Redundant applications, or the 'J6 | COM 1' connector on a Standalone LPOD. The RJ-11 connector plugs directly into the CLC-10.

WIRING CHART	
FROM CIRCULAR CONN	TO RJ-11 CONN
R	1
C	2
A	3
D	4
B	5
K	6
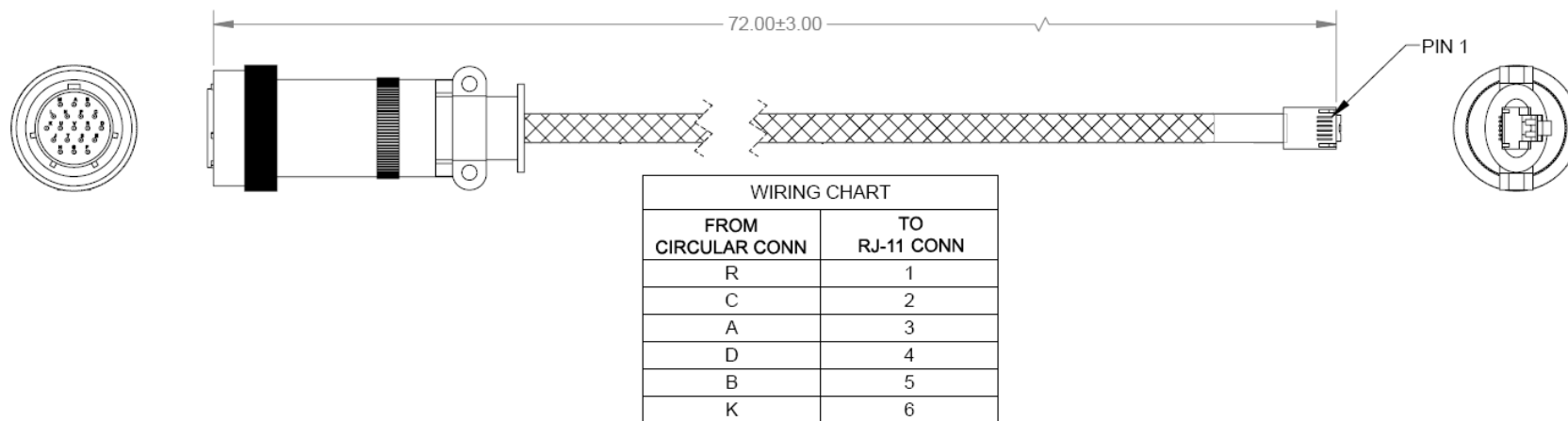
Figure B-1. Serial Interface Cable (CEFD P/N CA-0020526, part of KT-0020518)

B.2.2 Ethernet Interface Cable

The CEFD Ethernet Utility Kit (CEFD P/N KT-0000203) includes the CA-0000352 Ethernet Interface Cable. This kit is optionally available to provide Ethernet-based M&C of 1:1 Redundancy or Standalone LPOD applications using a Samsung NB30 Plus Netbook (LPOD*net*). The '**P1**' circular connector installs onto the Redundant Loop Cable '**J1**' connector in 1:1 LPOD Redundant applications, or the '**J6 | COM 1**' connector on a Standalone LPOD. Use the '**J2**' and '**J3**' RJ-45 connectors to either connect directly to the LPOD*net*'s Ethernet network jack (for Standalone use) or via a user-provided Ethernet switch or hub (for 1:1 Redundancy use).

WIRE LIST

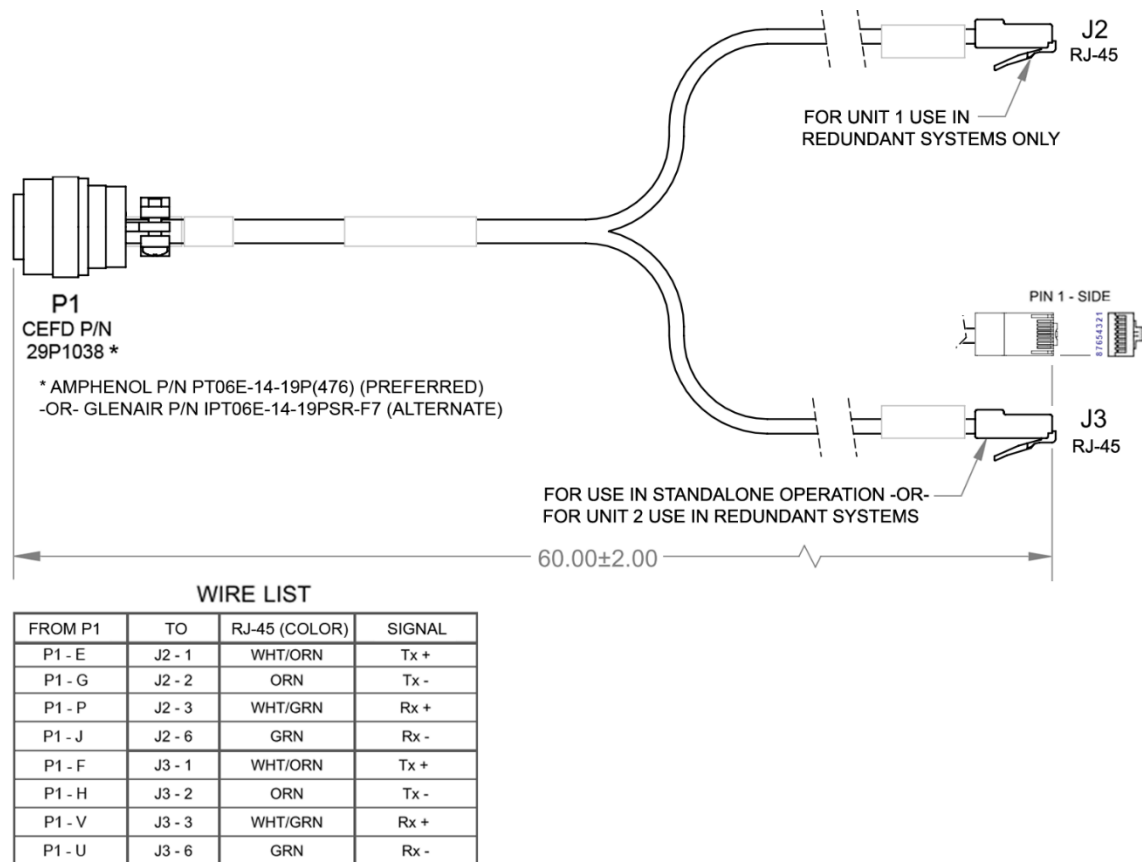| FROM P1	TO	RJ-45 (COLOR)	SIGNAL
P1 - E	J2 - 1	WHT/ORN	Tx +
P1 - G	J2 - 2	ORN	Tx -
P1 - P	J2 - 3	WHT/GRN	Rx +
P1 - J	J2 - 6	GRN	Rx -
P1 - F	J3 - 1	WHT/ORN	Tx +
P1 - H	J3 - 2	ORN	Tx -
P1 - V	J3 - 3	WHT/GRN	Rx +
P1 - U	J3 - 6	GRN	Rx -

Figure B-2. Ethernet Interface Cable (CEFD P/N CA-0000352, part of KT-0000203)

B.2.3 19-Pin COMMS Cable (100')

This cable connects between your designated data interface and the Redundant Loop Cable's '**J1**' connector in 1:1 Redundancy applications, or the '**J6 | COM 1**' port on a Standalone LPOD.
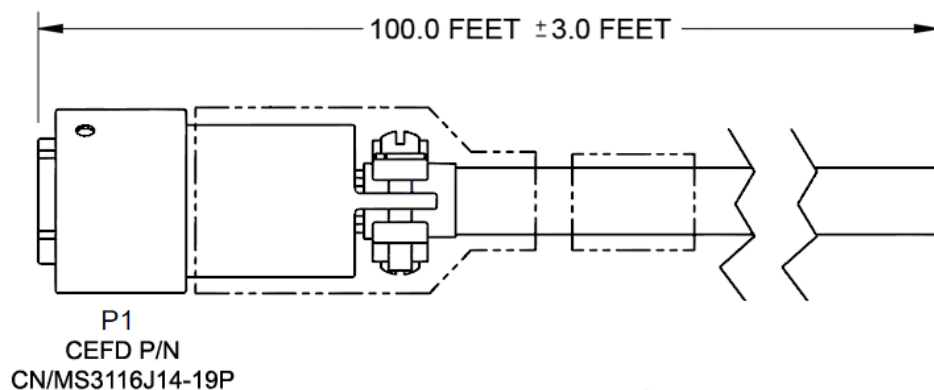
WIRE LIST

PIN	COLOR	SIGNAL
A	RED/BRN	RS485_+RX
B	BRN/RED	RS485_-RX
C	WHT/BLU	RS485_+TX
D	BLU/WHT	RS485_-TX
E	WHT/ORN	ENET_TX+_UNIT1
F	RED/ORN	ENET_TX+_UNIT2
G	ORN/WHT	ENET_TX-_UNIT1
H	ORN/RED	ENET_TX-_UNIT2
J	GRN/WHT	ENET_RX-_UNIT1
K	GRY/RED	GND
L	WHT/BRN	UNIT1_OK
M	BRN/WHT	UNIT2_OK
N	RED/BLU	TX_SW_POS1_LOW
P	WHT/GRN	ENET_RX+_UNIT1
R	RED/GRY	+24V
S	GRY/WHT	AUX_MUTE_LOW
T	BLU/RED	SWITCH_COM
U	GRN/RED	ENET_RX-_UNIT2
V	RED/GRN	ENET_RX+_UNIT2

Figure B-3. COMMS Cable, 100' (CEFD P/N CA-0000318)

B.2.4 19-Pin COMMS Cable (250')

This cable connects between your designated data interface and the Redundant Loop Cable's **'J1'** connector in 1:1 Redundancy applications, or the **'J6 | COM 1'** port on a Standalone LPOD.
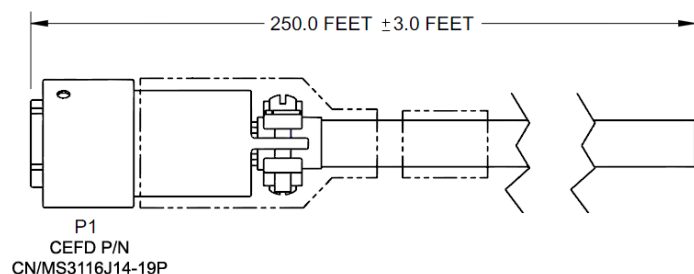
WIRE LIST

FROM	COLOR	LPOD / SPOD SINGLE UNIT	LPOD / SPOD REDUNDANT
P1-A	RED/BRN	RS485 +RX	RS485 +RX
P1-B	BRN/RED	RS485 -RX	RS485 -RX
P1-C	WHT/BLU	RS485 +TX	RS485 +TX
P1-D	BLU/WHT	RS485 -TX	RS485 -TX
P1-E	WHT/ORN	RS232 RD	10BASE-T TX+(B)
P1-F	RED/ORN	ETHERNET TX+	10BASE-T TX+(A)
P1-G	ORN/WHT	RS232 TD	10BASE-T TX-(B)
P1-H	ORN/RED	ETHERNET TX-	10BASE-T TX-(A)
P1-J	GRN/WHT	TX / RX SWITCH DRIVE 1 POS	10BASE-T TX-(B)
P1-K	GRY/RED	GROUND	GROUND
P1-L	WHT/BRN	SUM FAULT IN	CUST COMM UNIT A STATUS
P1-M	BRN/WHT	SUM FAULT OUT	CUST COMM UNIT B STATUS
P1-N	RED/BLU	TX SWITCH POS 1 IND	TX SWITCH POS 1 IND
P1-P	WHT/GRN	RX SWITCH POS 1 IND	10BASE-T TX+(B)
P1-R	RED/GRY	+24V	+24V
P1-S	GRY/WHT	SYSTEM MUTE CONTROL	SYSTEM MUTE
P1-T	BLU/RED	SWITCH COMMON	SWITCH COMMON
P1-U	GRN/RED	ETHERNET RX-	10BASE-T RX-(A)
P1-V	RED/GRN	ETHERNET RX+	10BASE-T RX+(A)

Figure B-4. COMMS Cable, 250' (CEFD P/N CA-0000543)

B.2.5 Redundant Loop Cable – Rx / Tx

Use the CA-0020657 Redundant Loop Cable for interconnection of 1:1 Redundancy *Rx / Tx* applications. Use the **'J1'** connector to connect to your M&C interface. See the CONNECTOR LIST table in **Figure B-5** for routing the remaining connectors.

WIRE LIST

FROM	TO	DESCRIPTION
J1-A	J2-A, J3-A	RS485_+RX
J1-B	J2-B, J3-B	RS485_-RX
J1-C	J2-C, J3-C	RS485_+TX
J1-D	J2-D, J3-D	RS485_-TX
J1-E	J3-F	10BASE-T_TX+(B)
J1-F	J2-F	10BASE-T_TX+(A)
J1-G	J3-H	10BASE-T_TX-(B)
J1-H	J2-H	10BASE-T_TX-(A)
J1-J	J3-U	10BASE-T_RX-(B)
J1-K	J2-K, J3-K	GND
J1-L	J2-L, J3-M	CUST. COMM. UNIT A STATUS
J1-M	J2-M, J3-L	CUST. COMM. UNIT B STATUS
J1-N	J2-N, J5-D	TX SWITCH POS. 1 IND.
J1-P	J3-V	10BASE-T_RX+(B)
J1-R	J2-R, J3-R	+24V
J1-S	J2-S, J3-S	SYSTEM MUTE
J1-T	J2-T, J3-T, J4-B, J4-E, J5-B, J5-E	SWITCH COMMON
J1-U	J2-U	10BASE-T_RX-(A)
J1-V	J2-V	10BASE-T_RX+(A)
J2-E	J3-G	RS232_RD/RS232_TD
J2-G	J3-E	RS232_TD/RS232_RD
J2-J	J4-A, J5-A	TX/RX SWITCH DRIVE POS. 1
J2-P	J4-D	RX SWITCH POS. 1 IND.
J3-J	J4-C, J5-C	TX/RX SWITCH DRIVE POS. 2
J3-N	J5-F	TX SWITCH POS. 2 IND.
J3-P	J4-F	RX SWITCH POS. 2 IND.

CONNECTOR LIST

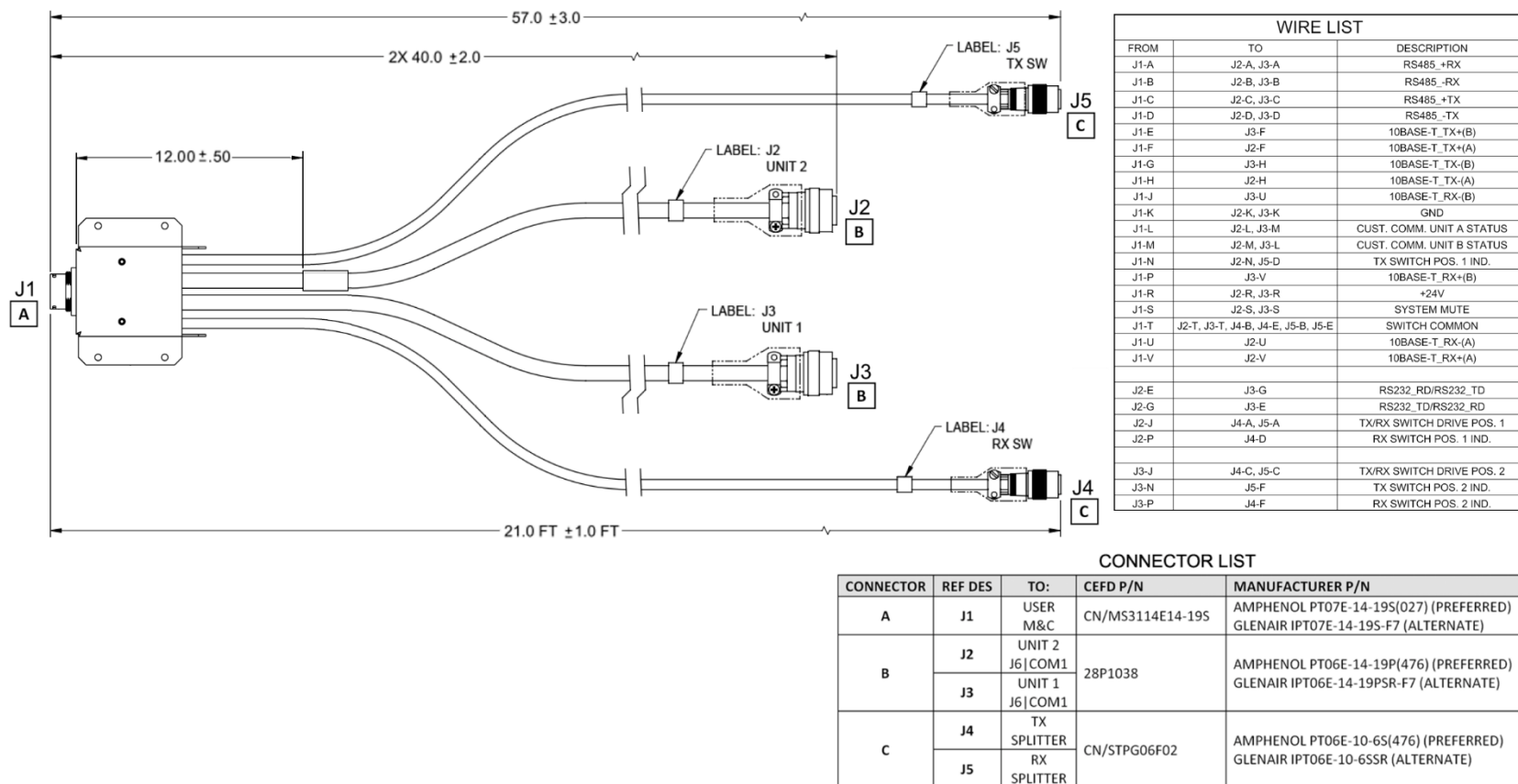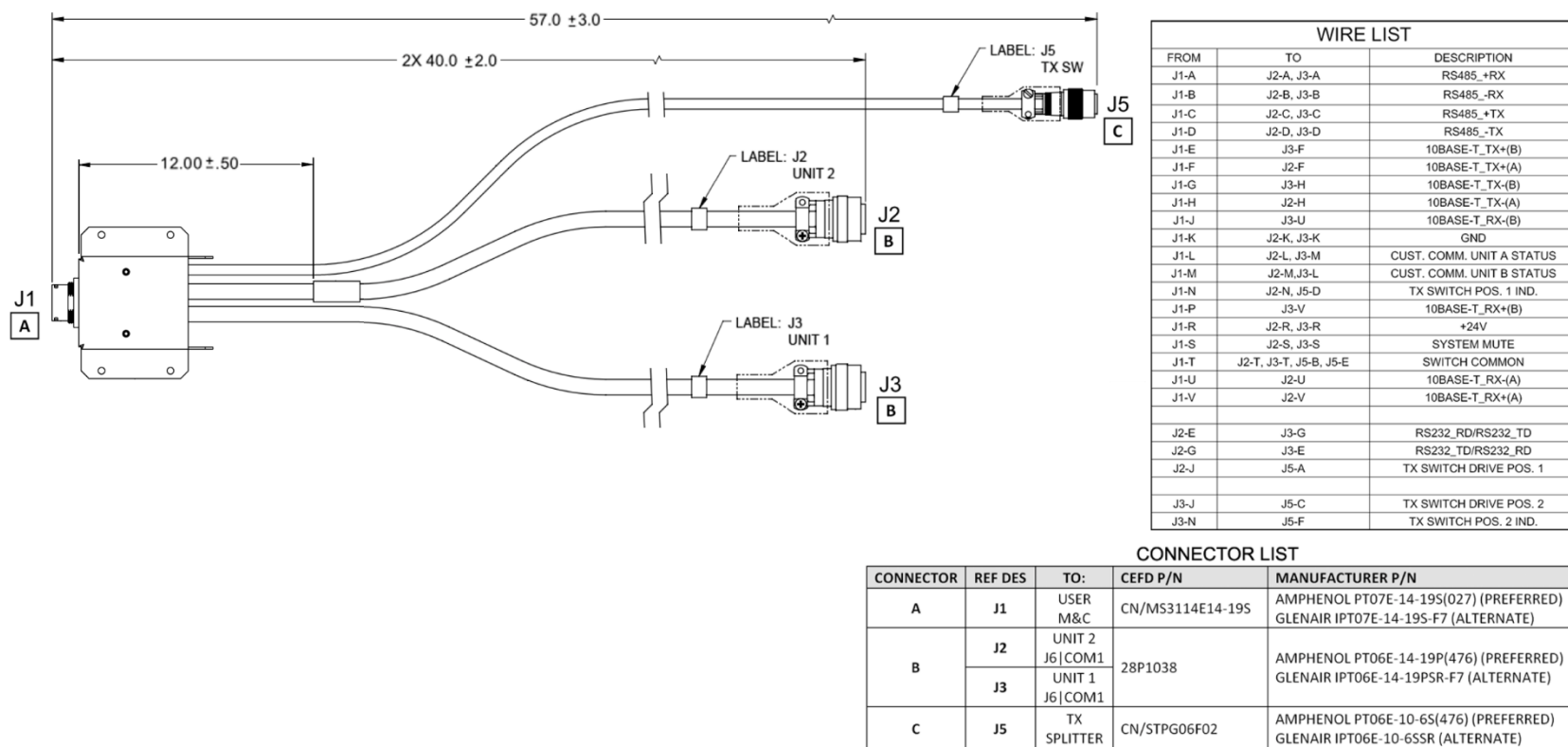| CONNECTOR	REF DES	TO:	CEFD P/N	MANUFACTURER P/N
A	J1	USER M&C	CN/MS3114E14-19S	AMPHENOL PT07E-14-19S(027) (PREFERRED) GLENAIR IPT07E-14-19S-F7 (ALTERNATE)
B	J2	UNIT 2 J6|COM1	28P1038	AMPHENOL PT06E-14-19P(476) (PREFERRED) GLENAIR IPT06E-14-19PSR-F7 (ALTERNATE)
	J3	UNIT 1 J6|COM1		
C	J4	TX SPLITTER	CN/STPG06F02	AMPHENOL PT06E-10-6S(476) (PREFERRED) GLENAIR IPT06E-10-6SSR (ALTERNATE)
	J5	RX SPLITTER		

Figure B-5. Redundant Loop Cable – Rx / Tx (CEFD P/N CA-0020657)

B.2.6 Redundant Loop Cable – Tx Only

Use the CA-0020655 Redundant Loop Cable for interconnection of 1:1 Redundancy *Tx-only* applications. Use the **'J1'** connector to connect to your M&C interface. See the CONNECTOR LIST table in **Figure B-6** for routing the remaining connectors.

WIRE LIST

FROM	TO	DESCRIPTION
J1-A	J2-A, J3-A	RS485_+RX
J1-B	J2-B, J3-B	RS485_-RX
J1-C	J2-C, J3-C	RS485_+TX
J1-D	J2-D, J3-D	RS485_-TX
J1-E	J3-F	10BASE-T_TX+(B)
J1-F	J2-F	10BASE-T_TX+(A)
J1-G	J3-H	10BASE-T_TX-(B)
J1-H	J2-H	10BASE-T_TX-(A)
J1-J	J3-U	10BASE-T_RX-(B)
J1-K	J2-K, J3-K	GND
J1-L	J2-L, J3-M	CUST. COMM. UNIT A STATUS
J1-M	J2-M, J3-L	CUST. COMM. UNIT B STATUS
J1-N	J2-N, J5-D	TX SWITCH POS. 1 IND.
J1-P	J3-V	10BASE-T_RX+(B)
J1-R	J2-R, J3-R	+24V
J1-S	J2-S, J3-S	SYSTEM MUTE
J1-T	J2-T, J3-T, J5-B, J5-E	SWITCH COMMON
J1-U	J2-U	10BASE-T_RX-(A)
J1-V	J2-V	10BASE-T_RX+(A)
J2-E	J3-G	RS232_RD/RS232_TD
J2-G	J3-E	RS232_TD/RS232_RD
J2-J	J5-A	TX SWITCH DRIVE POS. 1
J3-J	J5-C	TX SWITCH DRIVE POS. 2
J3-N	J5-F	TX SWITCH POS. 2 IND.

CONNECTOR LIST

CONNECTOR	REF DES	TO:	CEFD P/N	MANUFACTURER P/N
A	J1	USER M&C	CN/MS3114E14-19S	AMPHENOL PT07E-14-19S(027) (PREFERRED) GLENAIR IPT07E-14-19S-F7 (ALTERNATE)
B	J2	UNIT 2 J6|COM1	28P1038	AMPHENOL PT06E-14-19P(476) (PREFERRED) GLENAIR IPT06E-14-19PSR-F7 (ALTERNATE)
	J3	UNIT 1 J6|COM1		
C	J5	TX SPLITTER	CN/STPG06F02	AMPHENOL PT06E-10-6S(476) (PREFERRED) GLENAIR IPT06E-10-6SSR (ALTERNATE)

Figure B-6. Redundant Loop Cable –Tx Only (CEFD P/N CA-0020655)

B.3 RF Cables

Figure	CEFD Cable P/N	Description	Used For:	REF App A Figure
Figure B-7	CA/3722-X	Type 'N' to Type 'N' 1/4" Heliax Coaxial Cable (lengths vary)	LPOD Rx or Tx connections in 1:1 Redundancy or Standalone LPOD applications	A-3

B.3.1 RF Cable (Type 'N')

Use this Type 'N' cable for the Rx or Tx connections in LPOD Standalone or 1:1 Redundancy applications:

- For LPOD PS 1 C-Band and X-Band applications – For Standalone use, the cable connects the unit's '**J2 | RF OUT**' port directly to your Rx signal destination. For 1:1 Redundancy applications, use the cable to connect each LPOD's '**J2 | RF OUT**' port to the Tx Waveguide switch.

- For all LPOD applications – For Standalone use, the cable connects directly from these LPOD interfaces to your Rx signal destination or Tx signal source. For 1:1 Redundancy applications, use the cable to connect the '**J1 | LBAND IN / Tx IN**' or '**J10 | MODEM Rx**' ports in 1:1 Redundancy applications to the system's respective signal splitters.

PART NO.	DIM A
CA/3722	144.00 ± 4.00
CA/3722-1	48.00 ± 1.50
CA/3722-2	60.00 ± 2.00
CA/3722-3	90.00 ± 2.00
CA/3722-4	264.00 ± 4.00
CA/3722-5	288.00 ± 4.00
CA/3722-6	72.00 ± 2.00
CA/3722-7	240.00 ± 4.00
CA/3722-8	120.00 ± 4.00
CA/3722-9	180.00 ± 4.00
CA/3722-10	192.00 ± 12.00
CA/3722-11	108.00 ± 4.00

NOTE: CABLE MUST MEET VSWR 10.96-12.75 ≤ 1.40:1
WITH INSERTION LOSS AS FOLLOWS:

FREQUENCY MHz	ATTENUATION db/100ft	ATTENUATION db/100 M	AVERAGE POWER kW
10000	21.8	71.5	0.054
12000	24.3	79.7	0.049
14000	26.7	86.3	0.044
16000	29.0	95.2	0.040

LABEL BOTH ENDS
HEAT SHRINK BOTH ENDS
CONNECTOR: TYPE "N" MALE
ANDREW P/N FIPNM-HR OR EQUIVALENT
CABLE: 1/4" SUPER FLEXIBLE HELIAX
ANDREW P/N FSJ1P-50A-4B OR EQUIVALENT
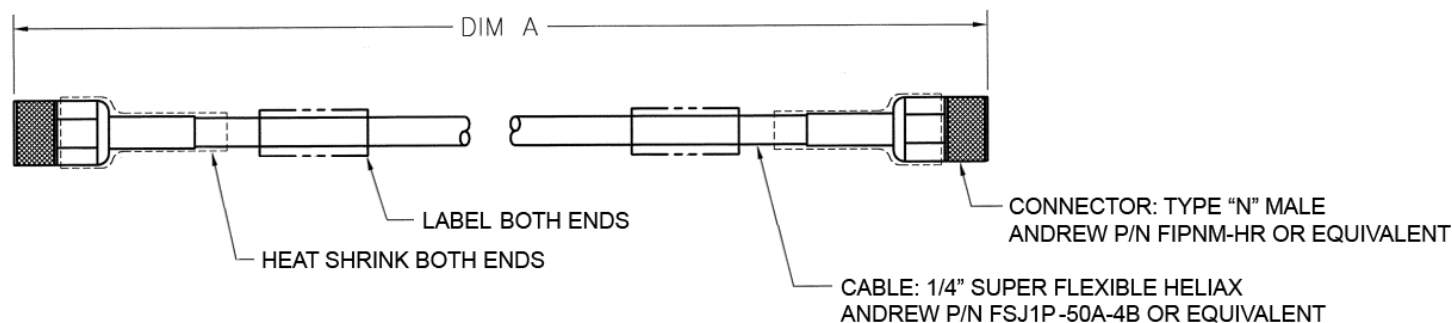
Figure B-7. 1/4" Heliax Coaxial Cable (CEFD P/N CA/3722-X)

Appendix C. MAINTENANCE

C.1   Overview

Chapter 4. ETHERNET INTERFACE OPERATION Sect. 4.5.4.6 Status | Trending Graphs

LPOD PS 1   LPOD PS 1.5   LPOD PS 2

Figure C-1. Comtech EF Data LPOD Outdoor Amplifiers / BUCs

The fans used by CEFD's LPOD family of Outdoor Amplifiers / BUCs (Figure C-1) are designed for long life, even in harsh environments. Still, they are mechanical devices, subject to wear, and may need replacement after several years.

In most environments, CEFD recommends clearing the heat sinks of dust and debris approximately once per year to ensure optimal fan life. This appendix outlines the procedures for uninstalling the LPOD PD 1, PS 1.5, or PS 2 fan shroud, inspecting and cleaning the heat sinks, and then re-installing the fan shroud.

Use the temperature trending data, available from the LPOD HTTP Interface '**Status | Trending Graphs**' page (**Figure C-2**) as a guide to determine if more or less frequent preventative maintenance is required.
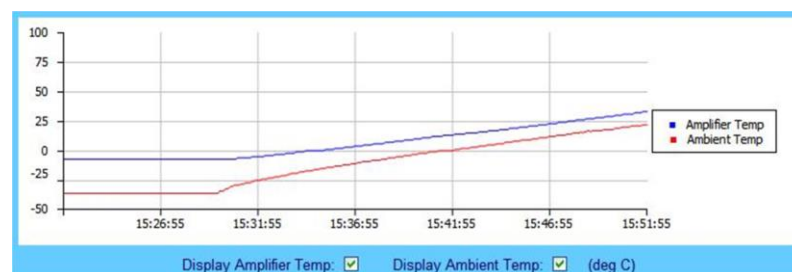
Figure C-2. LPOD HTTP Interface 'Status |Trending Graphs' Page – Temperature Graph Example

C.2   Clean the LPOD PS 1 Heat Sinks

To clean the LPOD PS 1 Heatsinks, do these steps:

Step	Task
1	Disconnect power from the LPOD.
2	Remove the eight screws – four on either side of the fan shroud – see Figure C-3. ⓘ *Make sure that you use the correct screwdriver to avoid damaging the screws.*
3	Lift the fan shroud assembly far enough off the chassis to expose the heat sinks and access the fan's power supply connection – see Figure C-4.
4	Disconnect the fan power supply. First, depress the connector's locking mechanism, and then pull apart the mated components – see Figure C-5.
5	Visually inspect the exposed LPOD heat sinks, located on the top and either side of the chassis, for any accumulated debris or blockage that may be obstructing airflow. Use compressed air to clear and clean the heat sinks as needed – see Figure C-6. ⓘ *Make sure that you blow <u>between</u> the heat sink fins to remove any foreign object accumulation.*
6	Reconnect the fan power supply by pressing the male and female connectors together until the locking mechanism snaps and locks – see Figure C-7.
7	Re-install the fan shroud onto the chassis – make sure that you keep the fan power supply cable clear of the fan and heat sink surfaces. Then, re-install the eight screws as described in Step 2. ⓘ *Torque the screws to 11 ±2 inch lbs.*
8	Reconnect the power source to the LPOD.
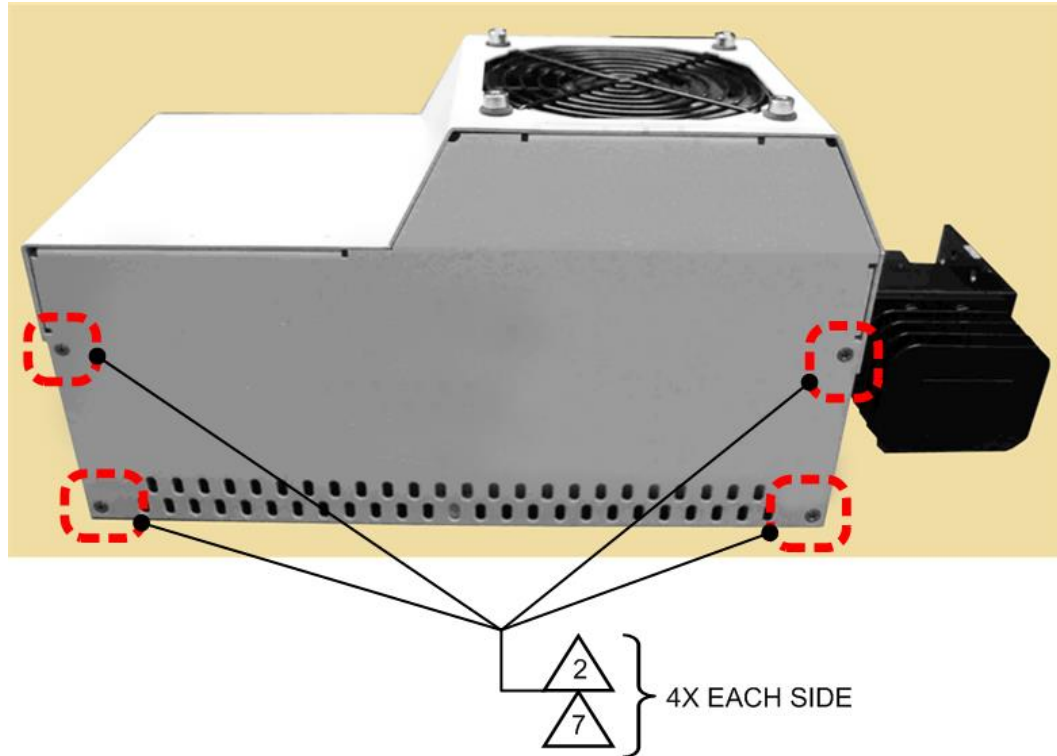
Figure C-3. LPOD PS 1 Shroud Screw Locations
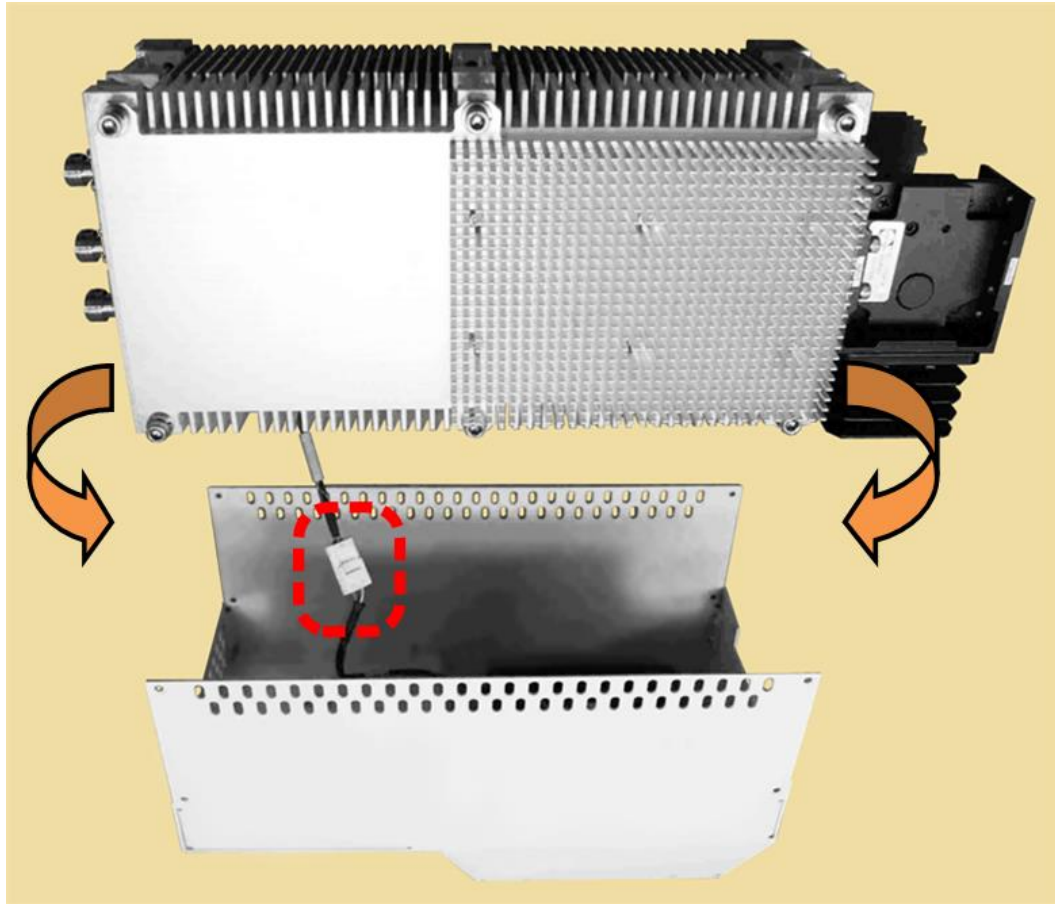
Figure C-4. Fan Shroud Removal
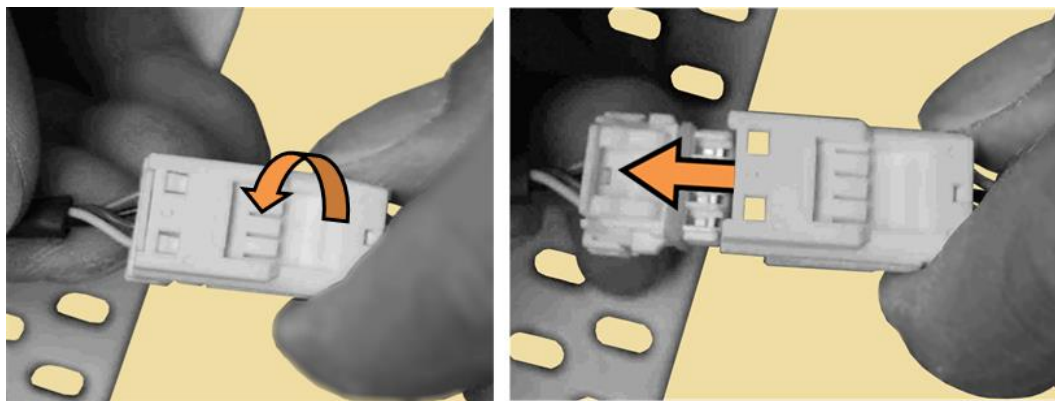
Figure C-5. Fan Power Supply Disconnection
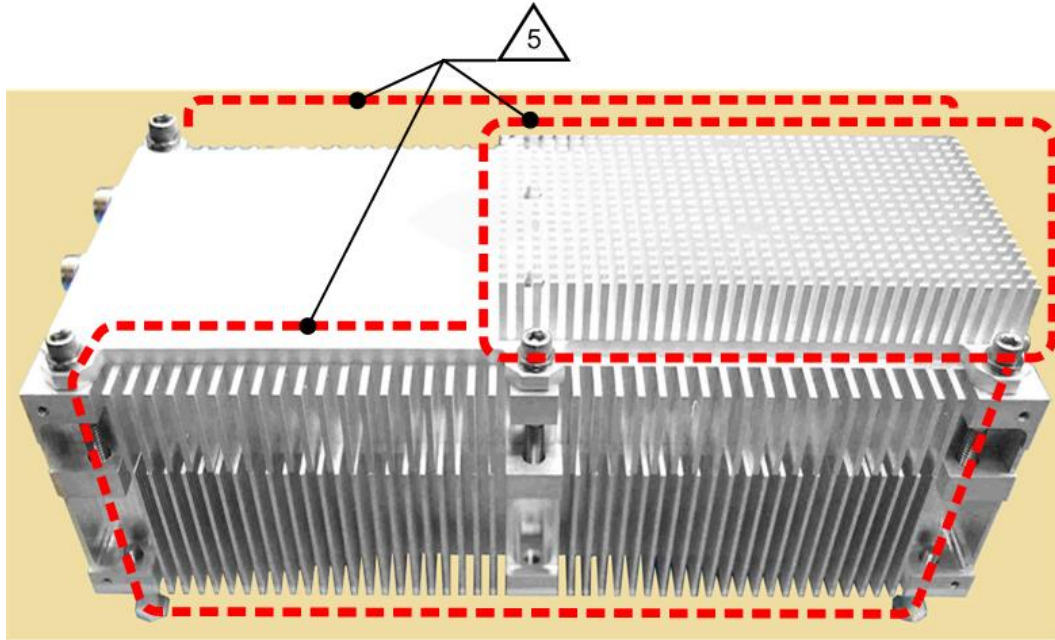
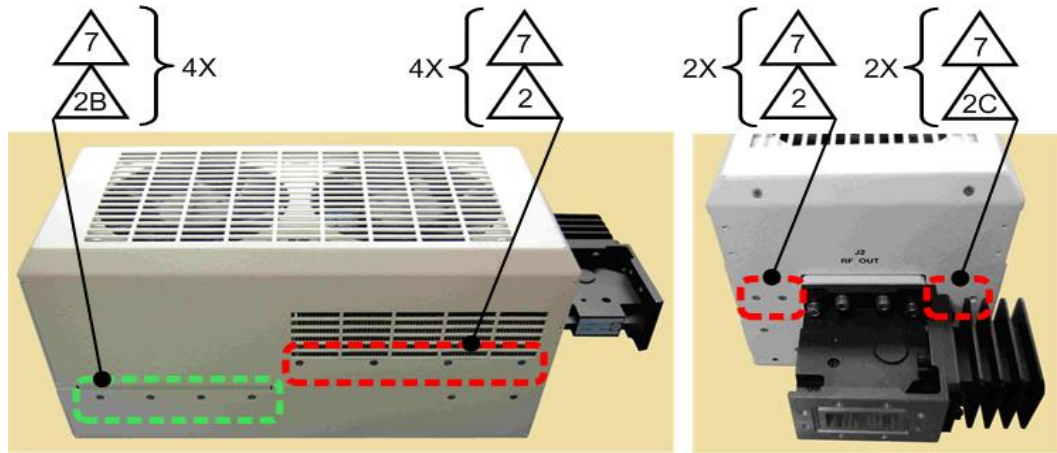**Figure C-6. LPOD PS 1 Heat Sink Locations**
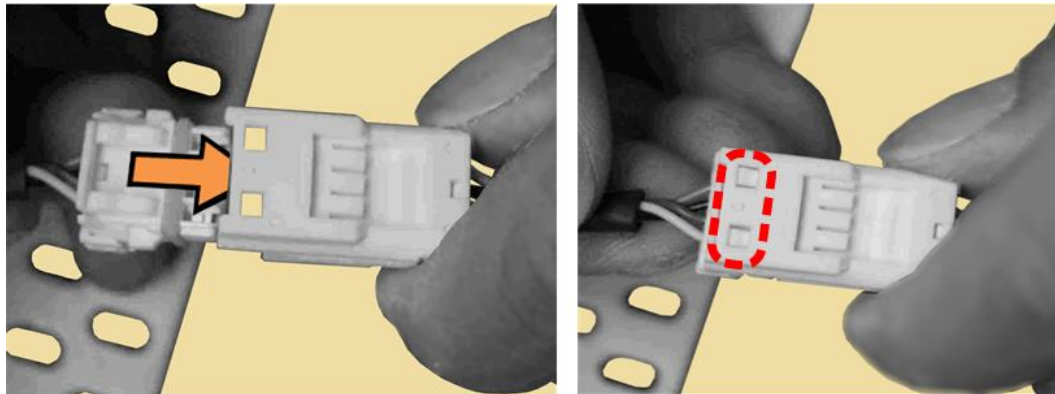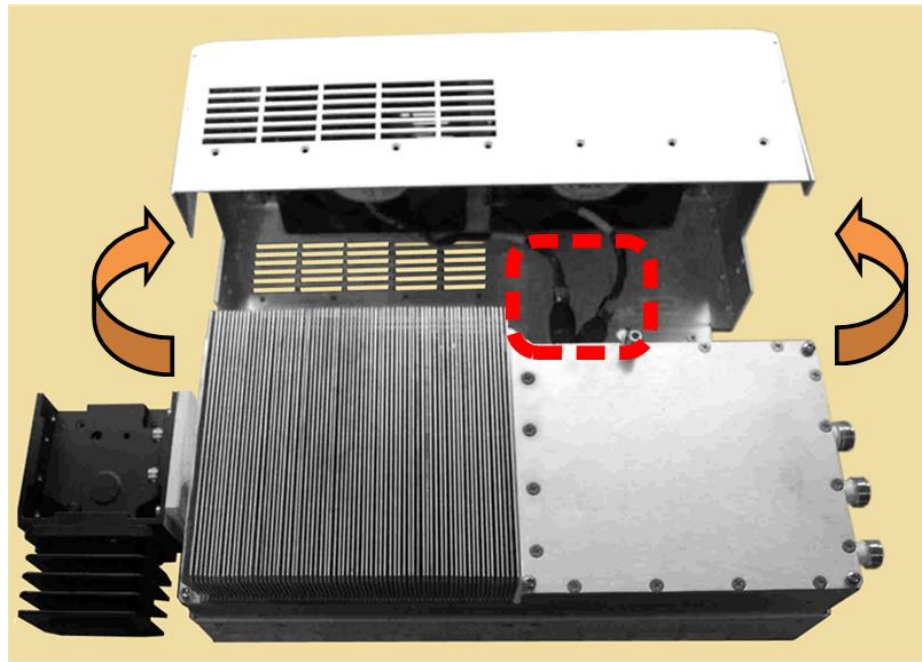

Figure C-7. Fan Power Supply Reconnection

C.3 Clean the LPOD PS 1.5 Heat Sinks

To clean the LPOD PS 1.5 Heatsinks, do these steps:

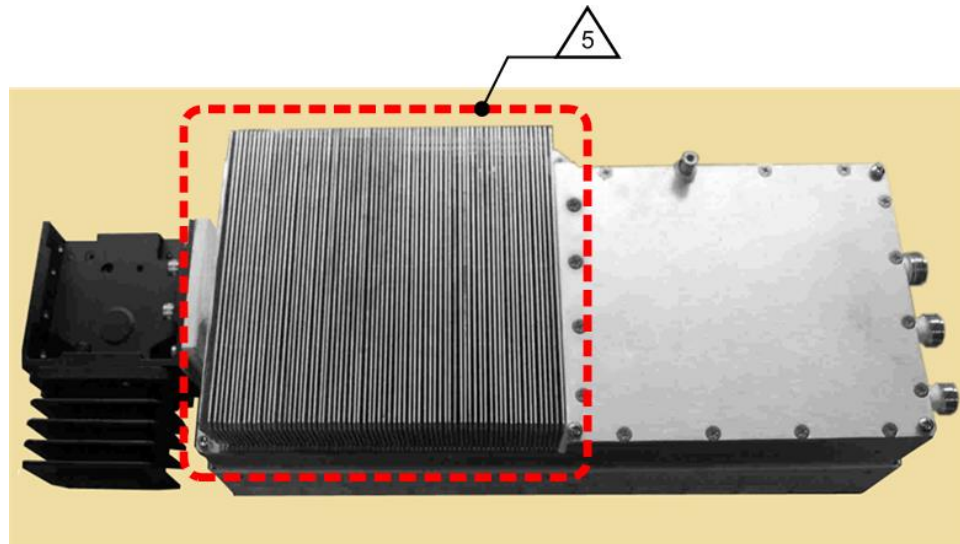| Step	Task
1	Disconnect power from the LPOD.
2	Remove the screws from all four sides of the LPOD as needed – see Figure C-8. *Make sure that you use the correct screwdriver to avoid damaging the screws.* *The length of the four screws indicated in green are longer than those indicated elsewhere. Make sure that you re-install these longer screws at the same locations.* *The two screws located behind the waveguide may be difficult to remove without first removing the waveguide from the chassis.*
3	Lift the fan shroud assembly far enough off the chassis to expose the heat sink and access the fan power supply connections – see Figure C-9.
4	Disconnect each fan power supply by carefully pulling the mated connector components straight apart – see Figure C-10. *Do not twist the mated cable connection when disconnecting the cable assemblies.*
5	Visually inspect the exposed LPOD heat sink, located on the top of the chassis, for any accumulated debris or blockage that may be obstructing airflow. Use compressed air to clear and clean the heat sink as needed – see Figure C-11. *Make sure that you blow <u>between</u> the heat sink fins to remove any foreign object accumulation.*
6	Reconnect each fan power supply. First, align the male and female connector's tabs. Then, push the connectors together until the connection locks – see Figure C-12. *Do not twist the mated cable connections when reconnecting the fan power supplies.* *The fan power supply cables are labeled <u>Fan 1</u> and <u>Fan 2</u>. Make sure that you connect the chassis <u>Fan 1</u> cable to the fan shroud <u>Fan 1</u> cable, and the chassis <u>Fan 2</u> cable to the fan shroud <u>Fan 2</u> cable.*
7	Re-install the fan shroud onto the chassis – take care to keep the fan power supply cables clear of the fan and heat sink surfaces. Then, re-install all screws as described in Step 2 – make sure that you re-install the four longer screws at their same locations. *Torque the screws to 8 ±1 inch lbs.*
8	Reconnect the power source to the LPOD.

Figure C-8. LPOD PS 1.5 Shroud Screw Locations

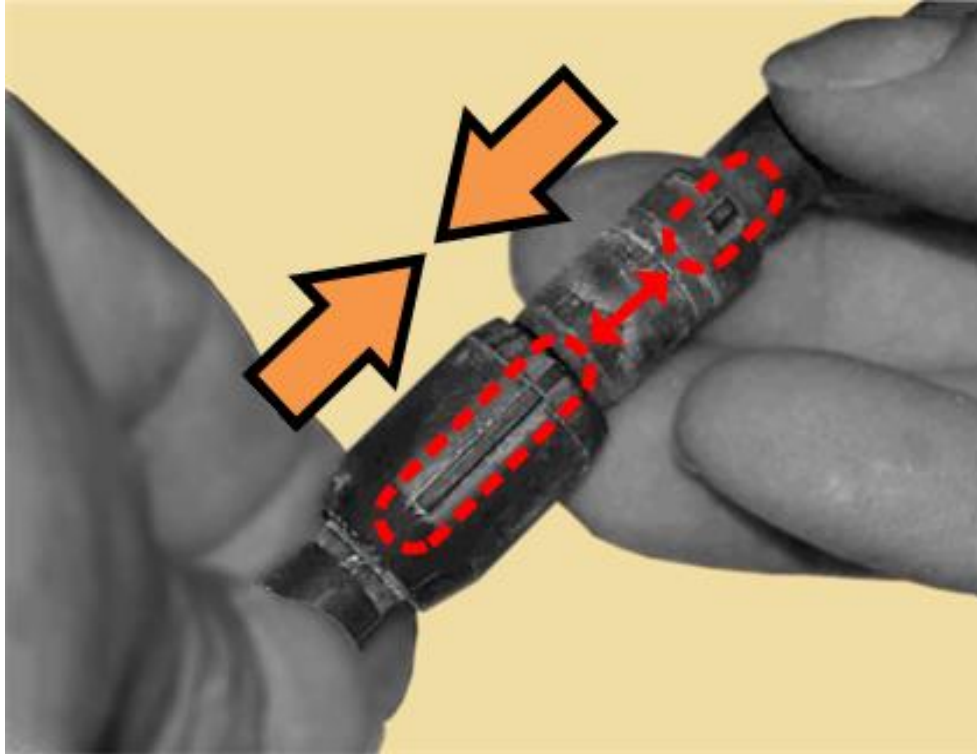
Figure C-9. Fan Shroud Removal

Figure C-10. Fan 1 / Fan 2 Power Supplies Disconnection

Figure C-11. LPOD PS 1.5 Heat Sink Location

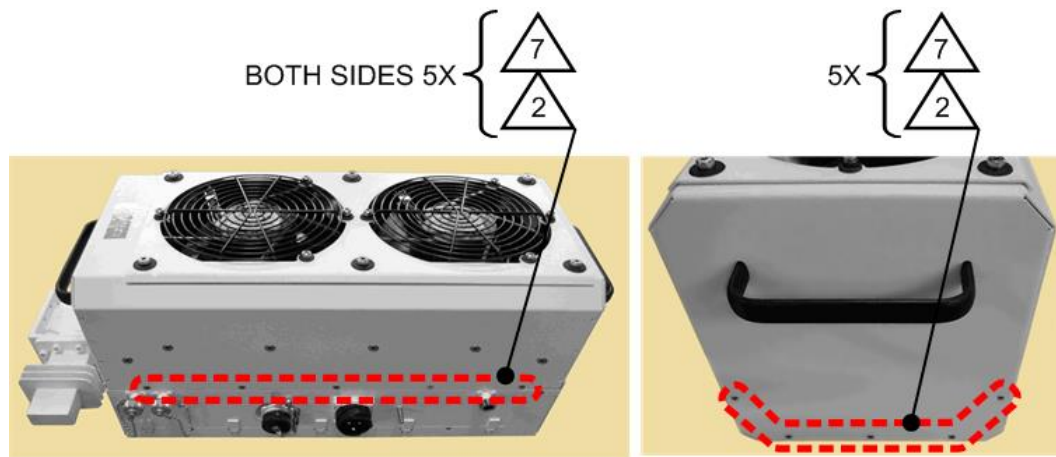**Figure C-12. Fan 1 / Fan 2 Power Supplies Reconnection**
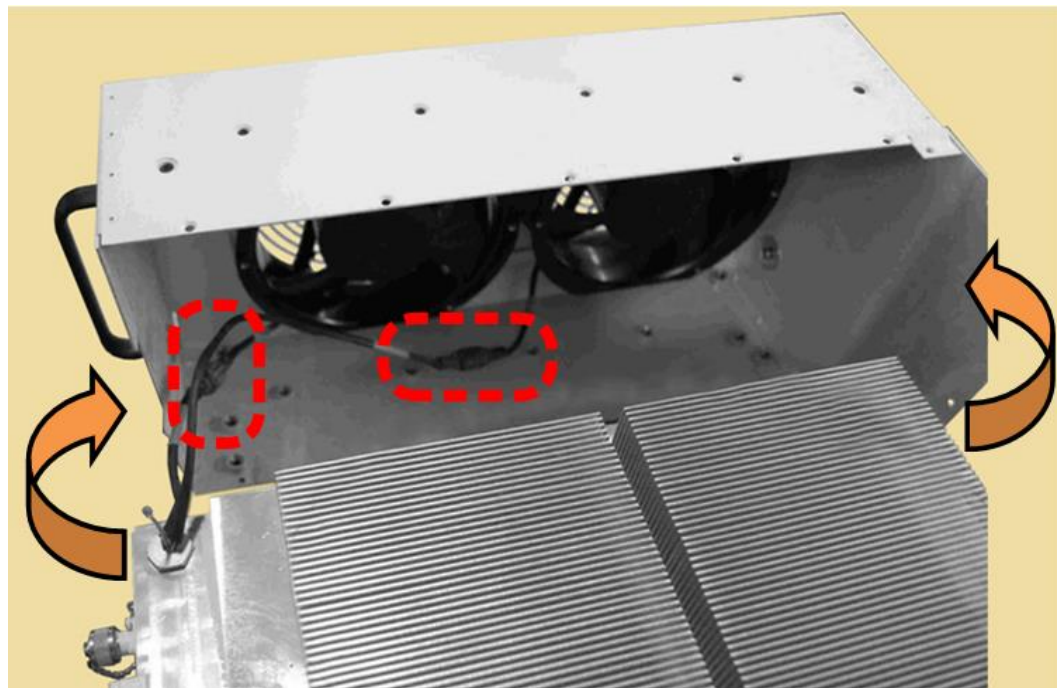
C.4   Clean the LPOD PS 2 Heat Sinks

To clean the LPOD PS 2 Heatsinks, do these steps:

| Step	Task
1	Disconnect the power source from the LPOD.
2	Remove the screws from the sides and end of the LPOD as needed – see Figure C-13. 🛈 *Make sure that you use the correct screwdriver to avoid damaging the screws.*
3	Lift the fan shroud assembly far enough off the chassis to expose the heat sink and access the fan power supply connections – see Figure C-14.
4	Disconnect each fan power supply by carefully pulling the mated connector components straight apart – see Figure C-15. 🛈 *Do not twist the mated cable connection when disconnecting the cable assemblies.*
5	Visually inspect the exposed LPOD heat sinks, located on the top of the chassis, for any accumulated debris or blockage that may be obstructing airflow. Use compressed air to clear and clean the heat sink as needed – see Figure C-16. 🛈 *Make sure that you blow <u>between</u> the heat sink fins to remove any foreign object accumulation.*
6	Reconnect each fan power supply. First, align the male and female connector's tabs. Then, push the connectors together until the connection locks – see Figure C-17. 🛈 *Do not twist the mated cable connections when reconnecting the fan power supplies.* *The fan power supply cables are labeled <u>Fan 1</u> and <u>Fan 2</u>. Make sure that you connect the chassis <u>Fan 1</u> cable to the fan shroud <u>Fan 1</u> cable, and the chassis <u>Fan 2</u> cable to the fan shroud <u>Fan 2</u> cable.*
7	Re-install the fan shroud onto the chassis – take care to keep the fan power supply cables clear of the fan and heat sink surfaces. Then, re-install all screws as described in Step 2. 🛈 *Torque the screws to 8 ±1 inch lbs.*
8	Reconnect the power source to the LPOD.

Figure C-13. LPOD PS 2 Shroud Screw Locations

Figure C-14. Fan Shroud Removal

Figure C-15. Fan 1 / Fan 2 Power Supplies Disconnection
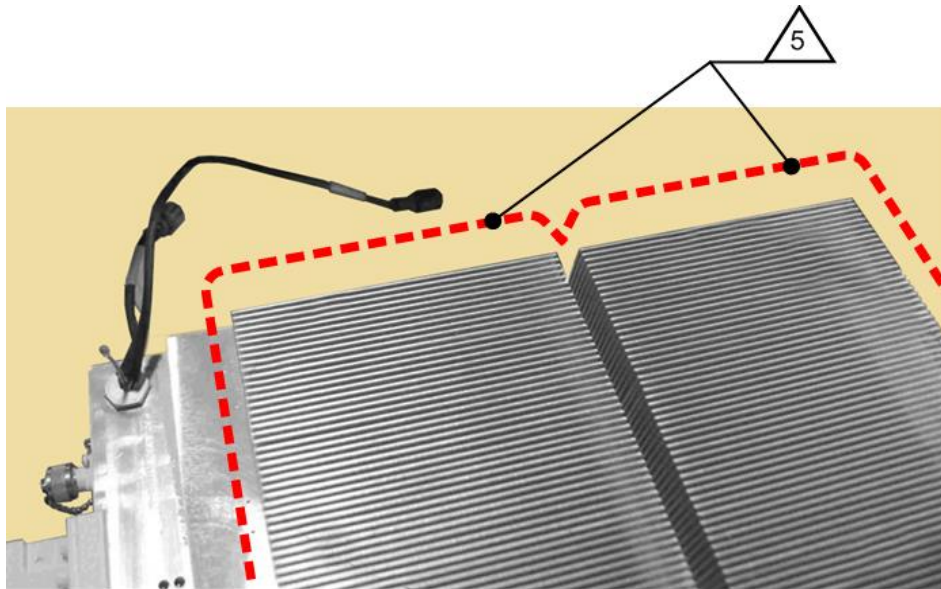
Figure C-16. LPOD PS 2 Heat Sink Locations

Figure C-17. Fan 1 / Fan 2 Power Supplies Reconnection

C.5   Cable Sealing and Wrapping

Before you resume operation of your equipment, you MUST make sure that all external cable assemblies for the outdoor equipment are properly sealed and wrapped to prevent water intrusion. Failure to achieve water tight sealing and wrapping will result in possible performance degradation and even product failure.

Chapter 2. SYSTEM CONNECTORS, INSTALLATION, AND STARTUP, Section 2.2 Cable Sealing and Wrapping To maintain your product warranty, you must follow the guidelines and recommendations provided in this section.