CPA

C-Band Indoor Solid State Power Amplifier Series
Installation and Operation Manual

Part Number MN/CPA-IN.IOM
Revision 1

TABLE OF CONTENTS

TABLES

FIGURES

PREFACE

About this Manual

This manual gives installation and operation information for the Comtech EF Data family of C-Band Indoor Solid State Power Amplifiers (ISSPAs). This manual is an informational document intended for the persons responsible for the operation and maintenance of the CPA. This manual supports the following models:

- CPA-050   Power Rating: 47.0dBm
- CPA-100   Power Rating: 50.0 dBm
- CPA-175/CPA-200   Power Rating: 53.0 dBm

> ***The CPA-350 ISSPA is no longer in production, and is not documented in this manual as of the Revision 1 release. For information about this legacy product, see the initial release version of this manual (CEFD P/N MN/CPA-IN.IOM Rev. 0).***

Revision 1 of this manual represents a complete rewrite in which all content has been updated in its entirety to reflect the latest product functionality, and re-ordered to conform to current Comtech EF Data Technical Publications standards and practices.

Disclaimer

All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described.

Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, please contact Comtech EF Data's Customer Support Department during normal business hours.

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.

Military Standards

References to "MIL-STD-188" apply to the 114A series (i.e., MIL-STD-188-114A), which provides electrical and functional characteristics of the unbalanced and balanced voltage digital interface circuits applicable to both long haul and tactical communications. Specifically, these references apply to the MIL-STD-188-114A electrical characteristics for a balanced voltage digital interface circuit, Type 1 generator, for the full range of data rates. For more information, refer to the Department of Defense (DOD) MIL-STD-188-114A, "*Electrical Characteristics of Digital Interface Circuits.*"

Warnings, Cautions, and Notes

A <u>**WARNING**</u> *gives information about a possible hazard that MAY CAUSE DEATH or SERIOUS INJURY.*

A <u>**CAUTION**</u> *gives information about a possible hazard that MAY CAUSE INJURY or PROPERTY DAMAGE.*

A <u>**NOTE**</u> *gives important information about a task or the equipment.*

A <u>**REFERENCE**</u> *directs the user to additional information about a task or the equipment.*

Examples of Multi-Hazard Notices
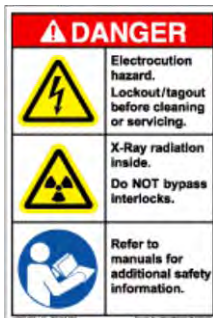
Recommended Standard Designations

The new designation of the Electronic Industries Association (EIA) supersedes Recommended Standard (RS) designations. References to the old RS designations may be shown when depicting actual text (e.g., RS-232) as displayed on the unit's Web Server Interface pages or frontpanel menus. All other references in the manual will be shown with the EIA designations.

Metric Conversion

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

The user should carefully review the following information:

Safety and Compliance

This product contains a Lithium Battery. DANGER OF EXPLOSION EXISTS if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries in accordance with local and national regulations

This equipment has been designed to minimize exposure of personnel to hazards. The operators and technicians must:

- *Know how to work around, with, and on high voltage and high RF power level equipment.*

- *Exercise every precaution to ensure personnel safety.*

- *Exercise extreme care when working near high voltages/high RF power level equipment.*

- *Be familiar with the warnings presented in this manual.*

- *Disconnect the power supply cord before servicing the ISSPA.*

Electromagnetic Compatibility (EMC) Compliance

Properly shielded cables for DATA I/O are required in order to meet the European Electromagnetic Compatibility (EMC) Directive (EN55022, EN50082-1). More specifically, these cables must be shielded from end-to-end, ensuring a continuous ground shield.

In accordance with European Directive 2004/108/EEC, the CPA family of products has been shown, by independent testing, to comply with the following standards:

Emissions:	EN 55022 Class B – Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment. (Also tested to FCC Part 15 Class B.)
Immunity:	EN 55024 – Information Technology Equipment: Immunity Characteristics, Limits, and Methods of Measurement.

European Low Voltage Directive (LVD)

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

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

International Symbols			
Symbol	**Definition**	**Symbol**	**Definition**
∿	Alternating Current	⏚	Protective Earth
⎓	Fuse	⏚	Chassis Ground

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

Warranty Policy

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

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

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

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

Limitations of Warranty

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

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

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

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

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

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

Exclusive Remedies

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

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

Getting Help

> ***Review the Warranty Policy before contacting Comtech EF Data Technical Support or Customer Service.***

Contacting Comtech EF Data

Contact Comtech EF Data for:

- *Technical Support* **–** Product support or training.

- *Customer Service* **–** Information on returning an in-warranty or out-of-warranty product for upgrade or repair. **Be prepared to provide the product model number and its serial number.**

Contact Comtech EF Data Customer & Technical Support during normal business hours (Monday through Friday, 8 A.M. to 5 P.M Mountain Standard Time (MST)):

For:		Contact:
ISSPA Technical Support and Service	**Telephone**	**+1.480.333.4357**
	Email	**techsupport@comtechefdata.com**
	Fax	**+1.480.333.2500**
Comtech EF Data Web Site	**Main Page**	**http://www.comtechefdata.com**
	Customer and Technical Support	**http://www.comtechefdata.com/support.asp**
	RMA (Return Material Authorization)	**http://www.comtechefdata.com/rmaform.asp**
Comtech EF Data Main Number		**+1.480.333.2200**
Mailing Address		**2114 West 7th Street Tempe, Arizona 85281 USA**

Returning a Product for Upgrade or Repair

Step	Task
1	Go to the Comtech EF Data **Home** page (http://www.comtechefdata.com). From the **SUPPORT** column at the bottom of the page, select the **Service** hyperlink, and read the **Return Material Authorization** section in its entirety.
2	Request a Return Material Authorization Number: • *On the Comtech EF Data **Home** page:* From the **SUPPORT** column at the bottom of the page, select the **RMA Request** hyperlink; *OR* • *On the Comtech EF Data **Support** page:* Click **[Send RMA Request]**; *OR* • *On the Comtech EF Data **Service** page*: Select the **Return Material Authorization** hyperlink; • Fill out the RMA form completely; • Click **[Send Email]**. *Alternately:* • Send an e-mail providing this same detailed information to Comtech EF Data Customer Service (**service@comtechefdata.com**). • Contact Comtech EF Data Customer & Technical Support by phone or fax.
3	Pack the product in its original shipping carton and protective packaging.
4	Ship the product back to Comtech EF Data. **Shipping charges should be prepaid.**

Chapter 1. INTRODUCTION

1.1   Introduction

> ⓘ *The CPA-350 ISSPA is no longer in production, and is not documented in this manual as of the Revision 1 release. For information about this legacy product, see the initial release version of this manual (CEFD P/N MN/CPA-IN.IOM Rev. 0).*

The Comtech EF Data CPA C-Band Indoor Solid State High Power Amplifier family of products (**Figure 1-1**) are a line of Indoor Solid State Power Amplifiers (ISSPAs) designed for use in communication systems or satellite uplink data systems. The CPA operates over the RF input frequency range of 5.845 to 6.425 GHz.

CPA-050

CPA-100

CPA-175/CPA-200

Figure 1-1. Comtech EF Data CPA Family of C-Band Indoor Solid State Power Amplifiers (ISSPAs)

1.2   Functional Description

The CPA consists of a chassis, power supplies, fan assembly, front panel assembly, **M**onitor/**C**ontrol **P**rocessor (MCP) and Comtech EF Data SSPA modules. The amplifier is designed using a Comtech EF Data low-loss combining technique and an MCP based temperature versus gain compensation. Functional Block Diagrams for each unit are provided in this section:

Figure	Description
Figure 1-2	CPA-050 Functional Block Diagram
Figure 1-3	CPA-100 Functional Block Diagram
Figure 1-4	CPA-175/CPA-200 Functional Block Diagram

Each CPA chassis consists of a power supply, fan assembly, front panel assembly, monitor/control processor (MCP), and a Comtech EF Data SSPA module. The CPA is designed using a Comtech EF Data low loss combining technique and an MCP based temperature *versus* gain compensation.

Each CPA ISSPA is constructed with highly reliable **Ga**llium **Ars**enide **F**ield **E**ffect **T**ransistor**s** (GaAs FETs). With Third-Order Intermodulation products from 4 to 6 dB better than TWT ratings, the Comtech EF Data unit replaces TWTs with saturated power levels of up to 400 Watts. These CPAs also provide a **M**ean **T**ime **B**etween **F**ailure (MTBF) that is 5 to 6 times greater than the typical TWT MTBFs.

An AC power connector and On/Off switch are located on the chassis rear panel. A six-foot AC power cord is supplied with the unit. Connectors for the external interface connections are located on the rear of the CPA chassis.

Two exhaust fans are installed internally in the chassis for cooling. Cool air is taken in through the front panel and exhausted out the rear panel.

All operator controls, indicators, and displays for local and remote operation are located on the front panel of the CPA. The front panel features:

- A Liquid Crystal Diode (LCD) menu display, displaying two lines of 20 characters each.

- A six-button cursor array, used for setting or changing operating parameters.

- Six Light-Emitting Diodes (LEDs), providing quick reference to binary status points.

- −20 dBc Input and −40 dBc output sample ports, providing easy test point access.

The CPA remote control interface is selectable between EIA-232 and EIA-485, as well as full Ethernet including Telnet, SNMP and pre-loaded Web Server Interface. All configuration control, status retrieval, and adjustments are available locally through the front panel menu, or remotely as simple ASCII commands through the serial interface. As a cost option, the remote control

command structure can be customized in order to accommodate existing network control software.

The CPA is designed to be rack-mounted in a standard 19-inch (48 cm) rack or cabinet by hard-mounting the unit to the rack's front mounting rails using the front panel mounting holes. Rack slides may be optionally installed onto the chassis, allowing servicing of the unit without its removal from the rack. Handles at the front of the unit allow ease of installation into and removal from the rack.

Each unit has the ability to function as a 1:1 or 1:2 redundancy controller in the backup mode. The optional redundancy configuration is implemented by attaching a ganged waveguide/coax transfer switch(es) to input and output connectors of the amplifiers with a combination coaxial cable and waveguide kit. When the backup CPA is commanded into the controller mode, it monitors the online CPAs for faults. A faulted online unit may be disconnected and replaced without affecting the online power amplifier. For detailed information about using the CPA in 1:1 or 1:2 redundancy, see **Appendix B. CPA REDUNDANT OPERATIONS**.
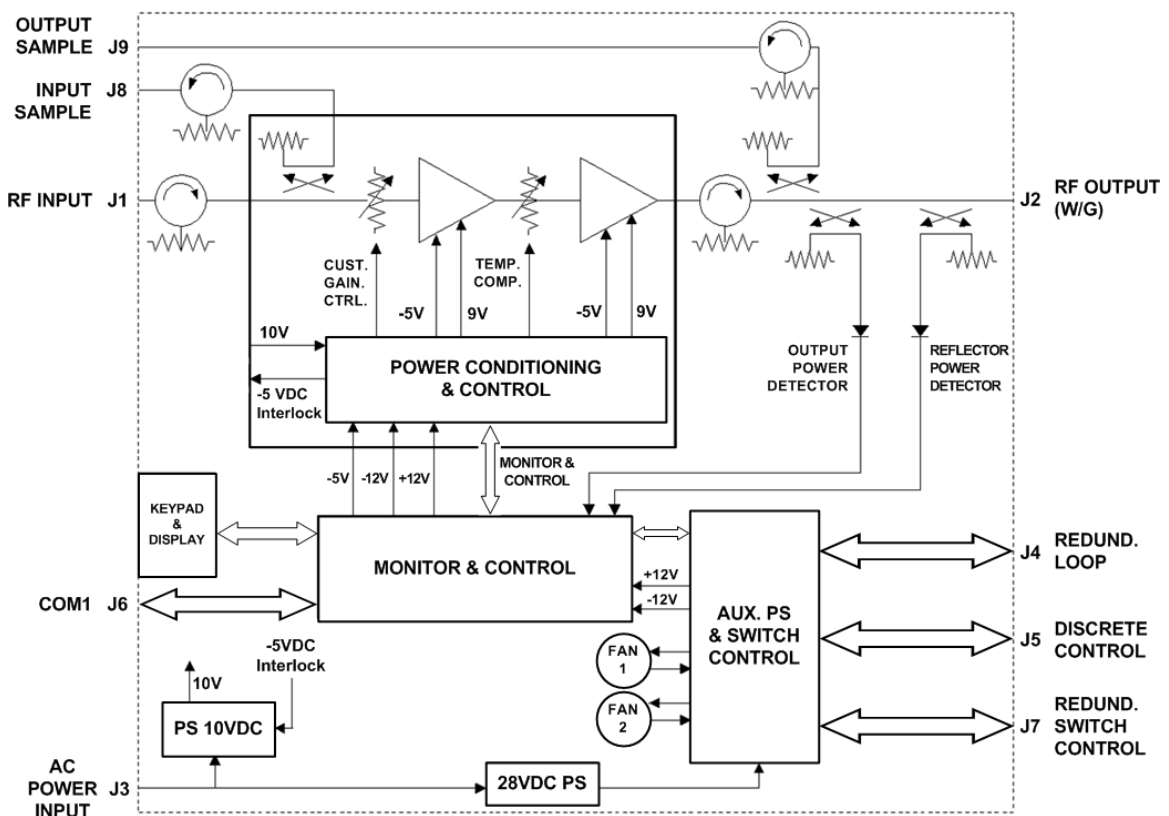
Figure 1-2. CPA-050 Functional Block Diagram
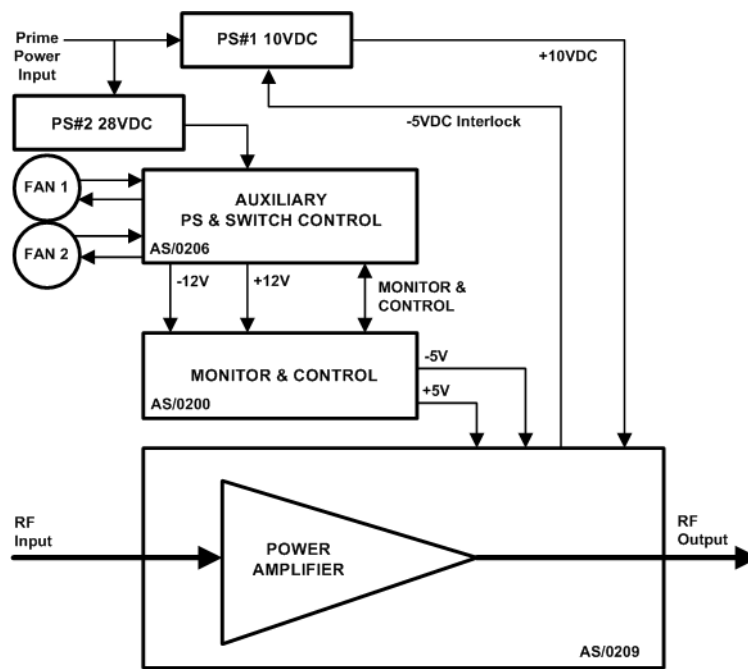
Figure 1-3. CPA-100 Functional Block Diagram
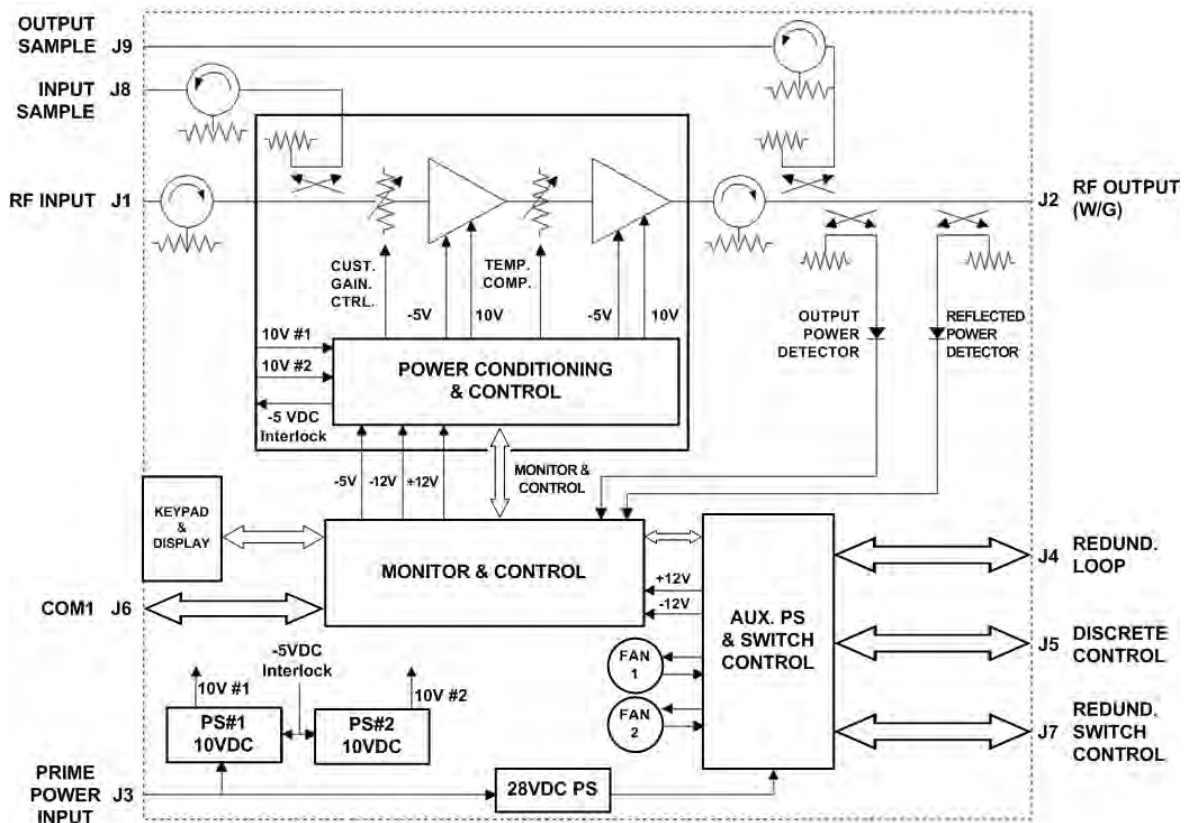
Figure 1-4. CPA-175/CPA-200 Functional Block Diagram

1.3   Summary of Specifications

Parameters		Specifications	
Input	Impedance	50Ω	
	Noise Figure	8 dB Typical, 15 dB max @ max gain	
	VSWR	1.25: 1 maximum	
	Connector	Type 'N'	
Output	Frequency	5.845 to 6.425 GHz	
	Power (@ 1 dB Compression)	**CPA-050**	47.0dBm minimum
		CPA-100	50.0 dBm minimum
		CPA-175/CPA-200	53 dBm minimum
	Mute	-60 dB	
	Impedance	50Ω	
	VSWR	1.25:1 maximum	
	Connector	CPR-137G Waveguide	
Gain	Linear	**CPA-050**	54.0 dB min, 57 dB typ.
		CPA-100, CPA-175/CPA-200	63.0 dB min., 67 dB typ.
	Adjust	20 dB in 0.25 dB steps	
	Full Band	± 0.75 dB	
	Per 40 MHz	± -0.25 dB	
	0 to +50°C (32 to 122°F)	± 0.50 dB @ center frequency ± 1.00 dB	
Third Order Modulation	Intercept	**CPA-050**	+56 dBm min., 58 dBm typ.
		CPA-100	+59 dBm min., 61 dBm typ.
		CPA-175/CPA-200	+62 dBm min., 63.5 dBm typ.
	Products	-32 dBc typ., -25 dBc max. @ 3 dB total backoff from rated P1dB (two tones, Δf+MHz)	
AM to PM Conversion	Output	1.0° typ., 2.5 max. @ rated output	
Group Delay (per 40 MHz)	Linear	± 0.03 ns/MHz	
	Parabolic	± 0.003 ns/MHz^2	
	Ripple	1.0 ns Peak-to-Peak	
Spurious	Second Harmonic	-60 dBc max @ 1 dB below rated output	
Front Panel	Display	24 x 2 LCD	
	Data Entry	Cursor Control Keypad (6 keys)	
	Output Sample	Type N female, 50Ω, –40 dBc	
	Input Sample	Type N female, 50Ω, –20 dBc	
Remote Control	COM Port	EIA-232 or EIA-485	
	Protocol	Comtech EF Data ASCII or Emulation Mode	
Alarms	Summary Fault	Form C	

Parameters			Specifications	
LEDs	Power On		Green	
	Fault		Red	
	Stored Fault		Red	
	TX On		Yellow	
	Online		Yellow	
	Remote		Yellow	
Mechanical	Dimensional Envelope (see **Figures 1-5** through **1-7**)		**CPA-050**	19W x 5.25H x 24D in (482.6W x 133.4H x 609.6D mm)
			CPA-100	19W x 8.75H x 24D in (482.6W x 222.3H x 609.6D mm)
			CPA-175/ CPA-200	19W x 10.5H x 24D in (482.6W x 266.7H x 609.6D mm)
	Weight		**CPA-050**	TBD
			CPA-100	75 lbs (34 kg)
			CPA-175/ CPA-200	75 lbs (34 kg)
Environmental	Temperature	Operating	32° to 122° F (0° to 50° C)	
		Storage	–40° to 158° F (–40° to 70° C)	
	Humidity	Operating	10 to 95% non-condensing	
		Storage	0 to 100% non-condensing	
	Altitude	Operating	15, 000 ft MSL	
		Storage	50, 000 ft	
	Shock		Normal commercial shipping and handling	
Power Requirements	VAC		**CPA-050**	90 to 135 or 180 to 270 VAC, 47 to 63 Hz, 500W (Auto Select)
			CPA-100	90 to 135 or 180 to 270 VAC, 47 to 63 Hz, 800W (Auto Select)
			CPA-175/ CPA-200	180 to 270 VAC, 47 to 63 Hz, 1300W (Auto Select)

1.4   Dimensional Envelopes

Typical for all figures, all dimensions are in inches. Bracketed dimensions, where shown, are in metric units (mm).
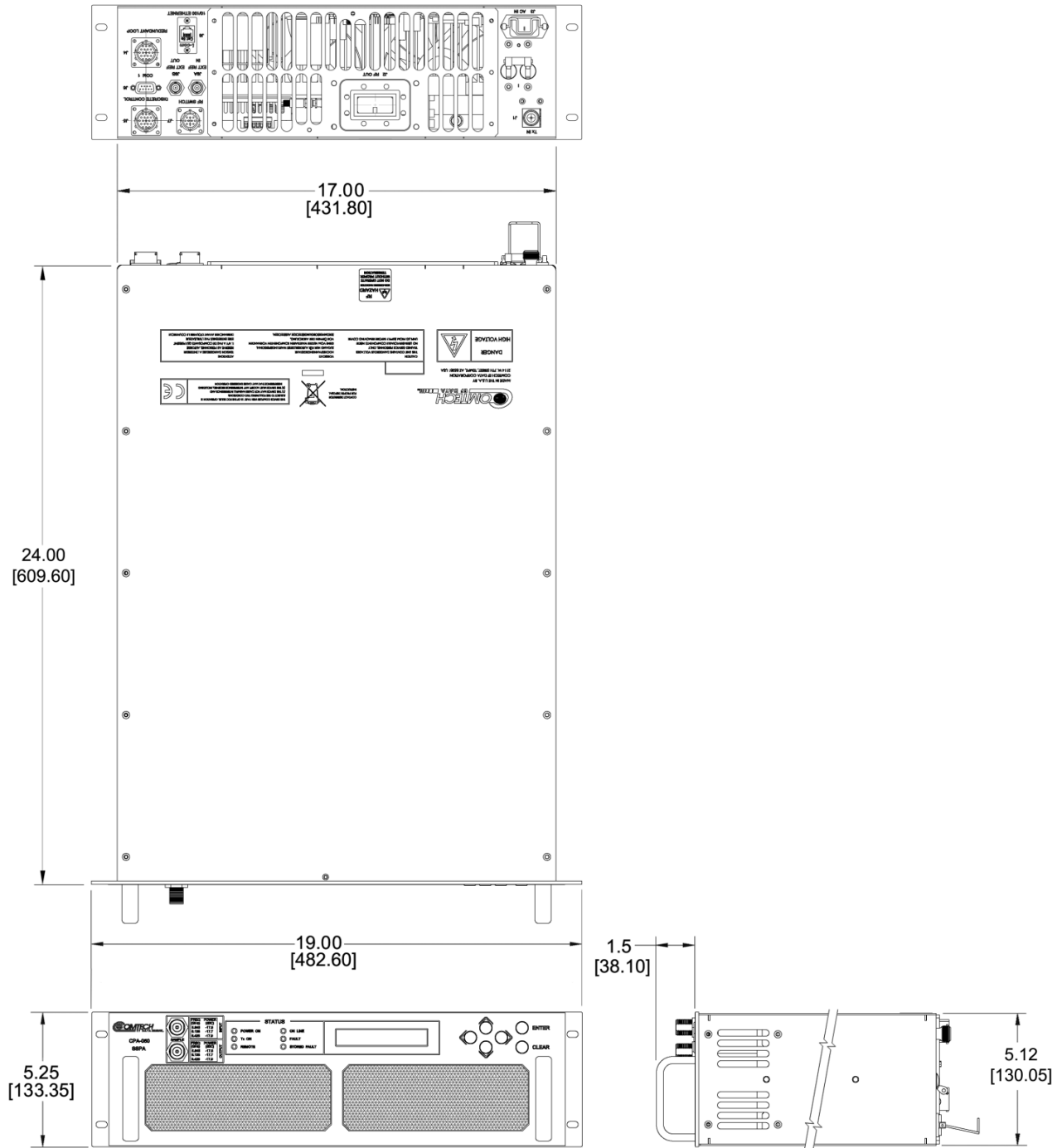
Figure 1-5. CPA-050 Dimensional Envelope
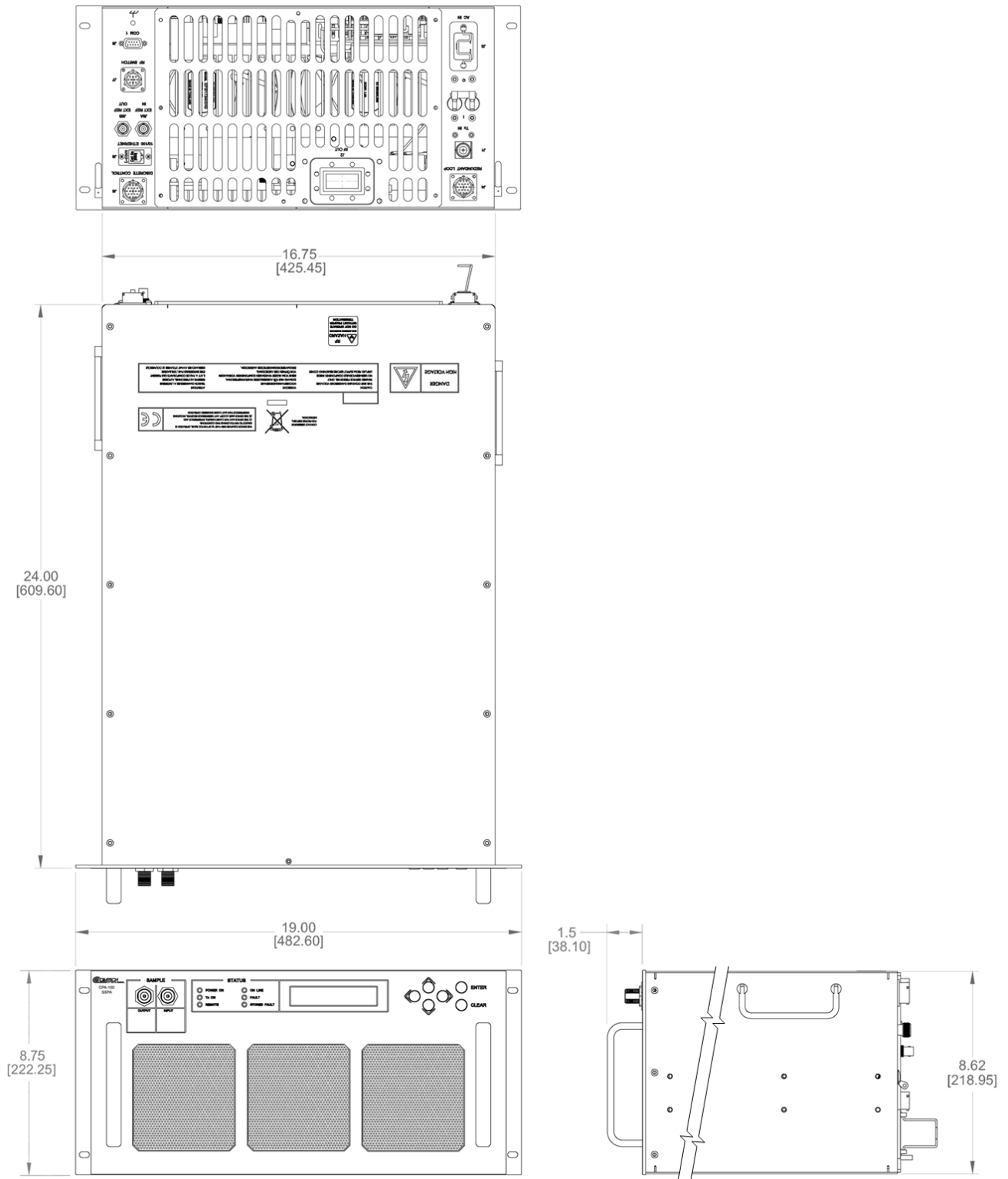
Figure 1-6. CPA-100 Dimensional Envelope
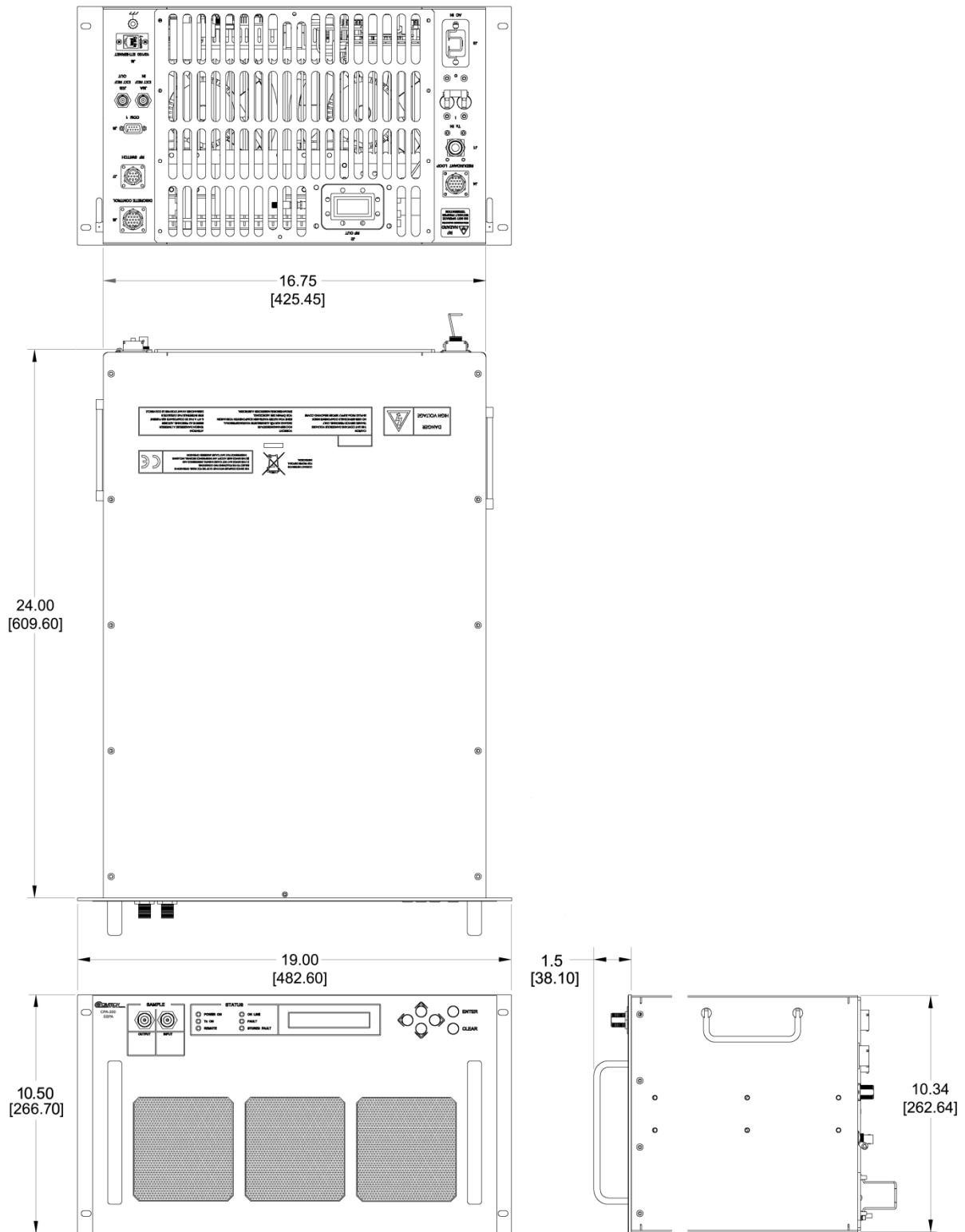
Figure 1-7. CPA-175/CPA-200 Dimensional Envelope

Notes:

Chapter 2. INSTALLATION

2.1   Unpacking and Inspecting the CPA ISSPA

The CPA ISSPA and its Installation and Operation Manual were packaged and shipped in a reusable cardboard carton containing protective foam spacing. Once opened, inspect the shipment:

Step	Task
1	Keep all shipping materials for storage or reshipment.
2	Check the packing list to ensure the shipment is complete.
3	Inspect the equipment for any possible damage incurred during shipment. Contact the carrier and Comtech EF Data immediately to submit a damage report if damage is evident.
4	*Review the* **Installation and Operation Manual** *carefully to become familiar with operation.*
5	*Proceed to* **Section 2.2 Installing the CPA ISSPA Into a Rack Enclosure.**

2.2   Installing the CPA ISSPA Into a Rack Enclosure

The CPA ISSPA is designed to be rack-mounted in a standard 19-inch (480 mm) wide rack or cabinet (**Figure 2-1**). Handles at the front of the ISSPA facilitate easy installation into and removal from the rack.

Use, as required:

- A user-supplied standard rack-mounted shelf (standalone only);

- User-supplied screws to secure the front panel to the rack enclosure threaded front mounting rails;

- Comtech EF Data's optional FP/SL0004, FP/SL0006, FP/SL0007, or FP/SL0008 Bearingless Rack Slide Set (**Figure 2-2**).

When mounting the ISSPA into a rack enclosure:

- *PROPER GROUNDING PROTECTION IS REQUIRED. The equipment must be connected to the protective earth connection at all times. It is therefore imperative that the unit is properly grounded, using the ground stud provided on the unit rear panel, during installation, configuration, and operation.*

- *PROPER AIR VENTILATION IS REQUIRED. In a rack system where there is high heat discharge, provide forced-air cooling with top- or bottom-mounted fans or blowers.*

    o *Two internally mounted exhaust fans provide cooling – cool air is taken in through the front panel and exhausted out the rear panel. Locate the CPA so that the input and output airflow paths are not obstructed or restricted – this will minimize the amplifier operating temperature.*

    o *Air temperature inside the rack enclosure should <u>never</u> exceed 50°C (122°F).*

For information about custom rack enclosures, contact Comtech EF Data Customer Support during normal business hours.
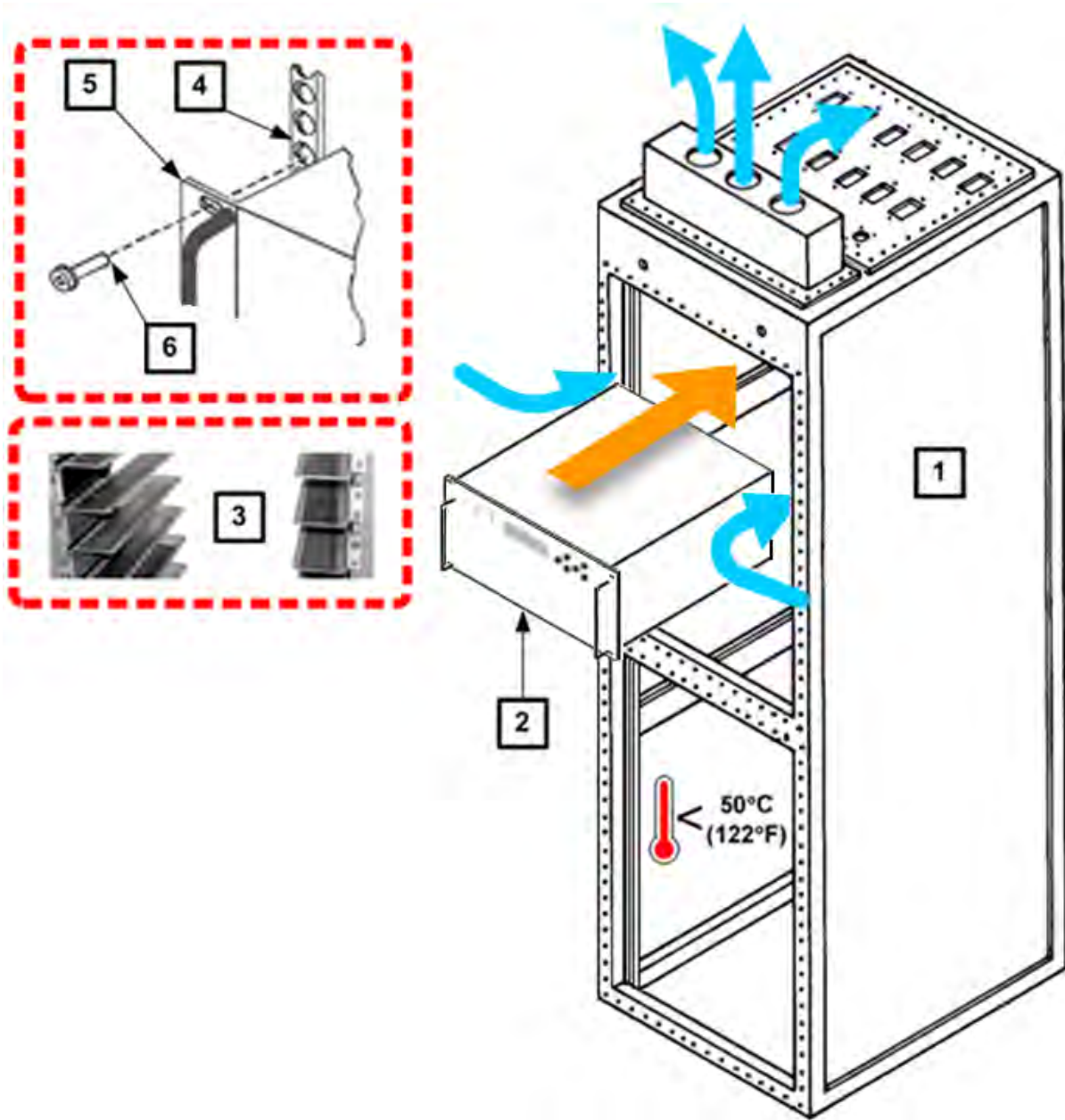
Feature	Description
1	Custom Rack Enclosure
2	CPA ISSPA
3	Standard Rack Shelving (Standalone only)
4	Rack Enclosure Threaded Front Mounting Rail (typical)
5	Unit Front Panel
6	User-supplied Screws

Figure 2-1. Installing the CPA ISSPA Into a Rack Enclosure

2.2.1 Installing the Optional Bearingless Rack Slide Sets

The rack slides options that may be purchased for use with the CPA unit are as follows (note that the CPA-100 and CPA-175/CPA-200 ISSPAs require the FP/SL0004 heavy duty, dual rail rack slide set):

CPA Unit	Rack Slide (CEFD P/N)	Description
CPA-050	FP/SL0007	22" Rack Slide Set (single rail)
	FP/SL0008	24" Rack Slide Set (single rail)
	FP/SL0006	26" Rack Slide Set (single rail)
CPA-100	FP/SL0004	24" Heavy Duty Rack Slide Set (dual rail)
CPA-175/CPA-200		

Install the single or dual rack slide sets as follows:

Step	Task
1	Typical for either side of the CPA chassis, install the "chassis section" of the rack slide to the CPA chassis side, using the pan head machine screws provided with the rack slide installation kit.
2	Typical for either side of the rack cabinet: using the mounting hardware provided with the rack slide installation kit, install the "stationary section" of the rack slide, either to the interior wall of the cabinet (for single rail rack slides) or, for the heavy-duty rack slides, to the front and rear mounting rails of the cabinet as shown in Figure 2-2.
3	Install the CPA unit into position by mating the chassis-mounted rails into the cabinet-mounted stationary portion of the rack slide. Be sure that the ball retainer for either slide has first been positioned forward before installing the chassis section. You may leave the unit free in place (to slide on the rails freely) or, alternately, bolt the unit into place via the slotted front panel mounting holes.
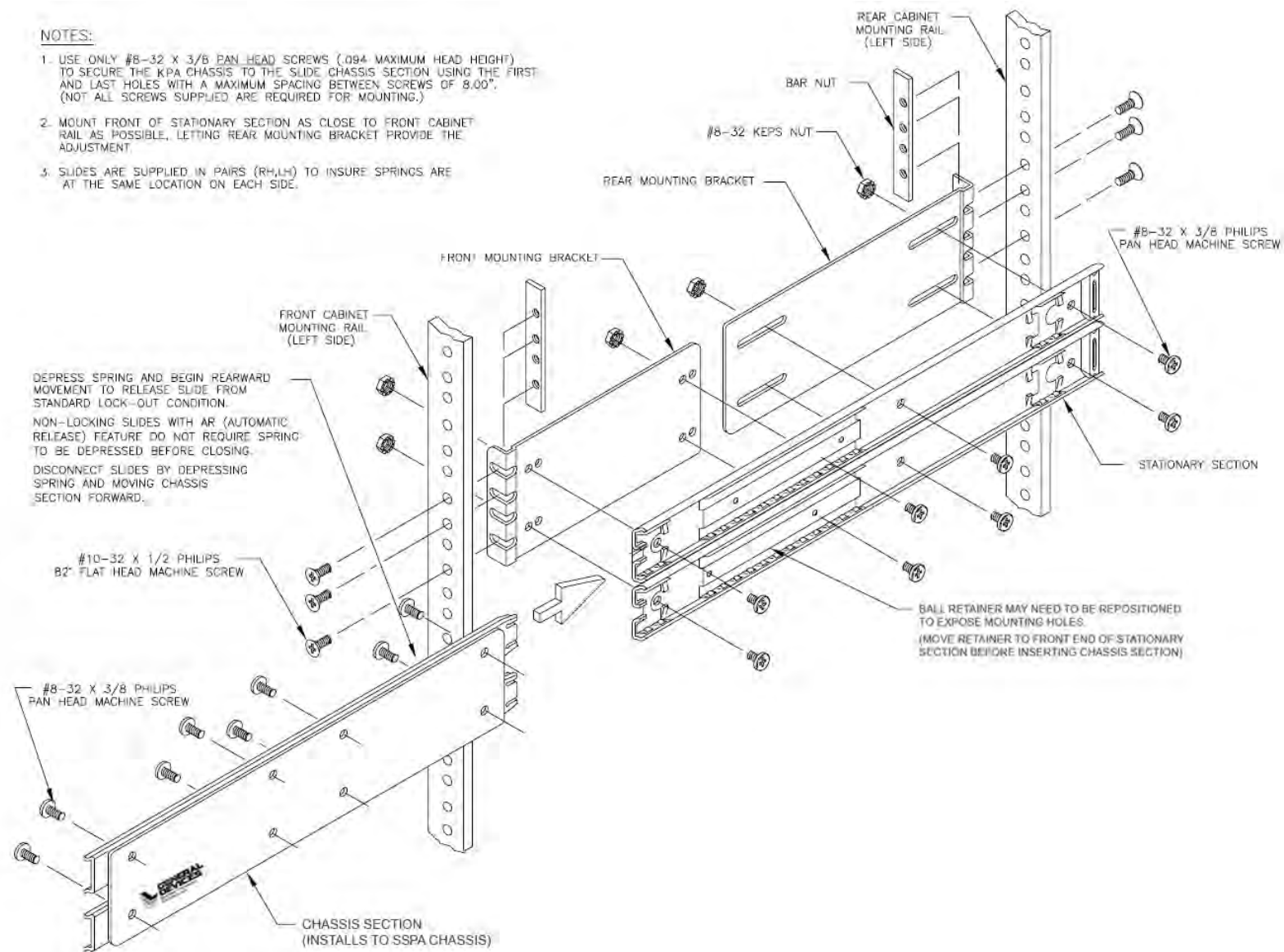
Figure 2-2. Installing the Optional Heavy-Duty Rack Slides

Notes:

Chapter 3. CONNECTORS AND PINOUTS

3.1 Connector Overview

The CPA ISSPA front and rear panel connectors provide all necessary external connections between the unit and other equipment. **Figure 3-1**, **Figure 3-2**, and **Figure 3-3** show the connectors common for all CPA units. Table 3-1 summarizes the connectors provided on the front and rear panels, grouped according to service function.

TYPICAL FRONT PANEL DETAIL

REAR PANEL VIEW

Figure 3-1. CPA-175/CPA-200 ISSPA Front and Rear Panel Views
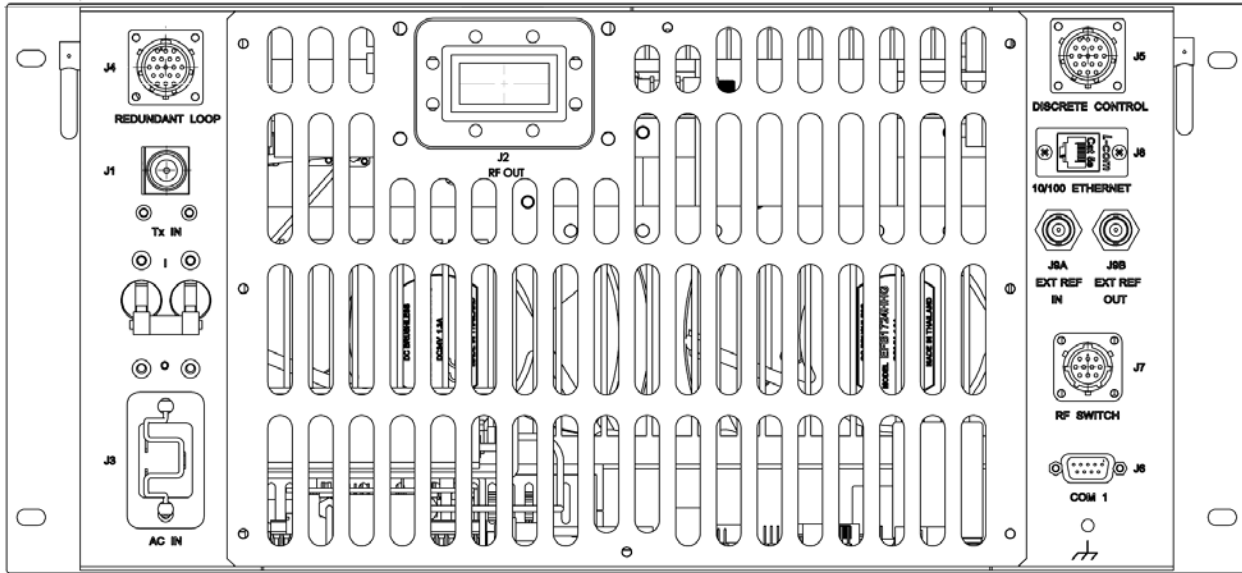
Figure 3-2. CPA-100 ISSPA Rear Panel View
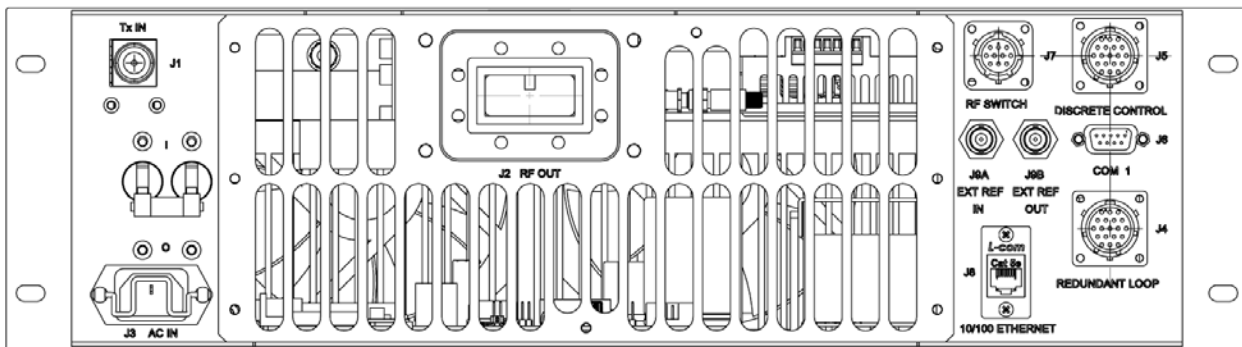
Figure 3-3. CPA-050 ISSPA Rear Panel View

Table 3-1. CPA ISSPA Interface Connectors Summary

Connector Group	Ref Des	Name	Connector Type	Function
RF Sect. 3.2	J1	Tx IN	Type 'N' Female	RF Input
	J2	RF OUT	CPR137G Waveguide Flange	RF Output
Utility Sect. 3.3	N/A	SAMPLE | INPUT	Type 'N' Female	Front Panel –20 dBc and –40 dBc test sample ports
	N/A	SAMPLE | OUTPUT		
	J4*	REDUNDANT LOOP	Type 14-19 (19-pin) Circular Conn Receptacle	Unit-to-Unit Redundant Connection
	J5	DISCRETE CONTROL	Type 14-19 (19-pin) Circular Conn Receptacle	User ISSPA M&C
	J6	COM1	9-pin Type 'D' male	Serial Remote Comms Interface (EIA-485)
	J7*	RF SWITCH	Type 12-10 (10-pin) Circular Conn Receptacle	Waveguide Switch Interface
	J8	10/100 ETHERNET	RJ-45 female	CAT5 10/100 BaseT Ethernet – Remote Product Management and Data Traffic
	J9A	EXT REF IN	BNC Female	Optional External Reference Input
	J9B	EXT REF OUT	BNC Female	Optional External Reference Output
Power/Ground Sect 3.4	J3	AC IN	See Sect. 3.4.1	Chassis prime power input
		DC IN	Sect Sect. 3.4.2	
	N/A	(Ground)	#10-32 stud	Common chassis ground

(i) ***These connectors are used in redundant operations only. See Appendix B. ISSPA REDUNDANT OPERATIONS for further information about use of the ISSPA in 1:1 or 1:2 redundant systems.***

3.2   RF Connections

3.2.1   J1 | RF IN / Tx IN Connectors
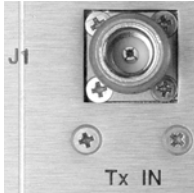
Connector Type	Description	Direction
Type 'N' Female	RF Signal	In

3.2.2   J2 | RF OUT Connector

BEFORE APPLYING POWER TO THE UNIT, MAKE SURE THAT THE WAVEGUIDE OUTPUT OF THE ISSPA IS PROPERLY LOADED OR TERMINATED. FAILURE TO DO SO COULD LEAD TO EQUIPMENT DAMAGE AND EXCESSIVE RF RADIATION LEVELS.
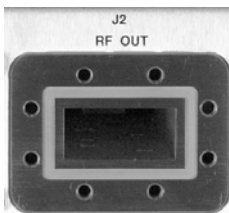
Connector Type	Description	Direction
CPR137G Waveguide Flange	RF Signal	Out

3.3   Utility Connections

3.3.1   Sample Port Connectors (Front Panel)

These ports are Type 'N' female connectors, providing easy access –20 dBc and –40 dBc test points on the ISSPA front panel.

Name	Connector Type	Description	Direction
SAMPLE | OUTPUT	Type 'N' Female	–20 dBc Sample Test Port	Input
SAMPLE | INPUT		–40 dBc Sample Test Port	Output

3.3.2   J4 | REDUNDANT LOOP Connector

Appendix B. ISSPA REDUNDANT OPERATIONS
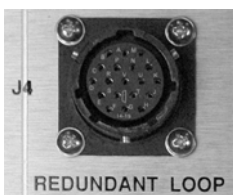
This is a 19-pin circular connector, type MS3112E14-19S. The pin-out specification is contained in **Table 3-2**. This receptacle is used only in 1:1 and 1:2 redundant configurations.

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

Table 3-2. J4 Redundancy Loop Connector Pinout

Pin #	Description	Pin #	Description
A	Loop In 1	L	SumFlt 2 NO
B	ADDR 2	M	SumFlt 2 Common
C	Loop In 2	N	Local Loop Out
D	Loop Out 2	P	SumFlt 1 NO
E	ADDR Common	R	SumFlt 1 Common
F	ADDR 1	S	Local SumFlt Common
G	Loop Out 1	T	Local SumFlt NC*
H	HSB +RX/TX	U	No Connect
J	HSB – RX/TX	V	No Connect
K	Local Loop In		

*Connected to Pin 'S' if unit is powered on and no fault present

3.3.3   J5 | DISCRETE CONTROL Connector

Appendix B. ISSPA REDUNDANT OPERATIONS

This is the primary input for monitoring and controlling the ISSPA. It is a 19-pin circular connector, type MS3112E14-19S. The pinout specification for Standalone or 1:1 Redundant Systems is provided in **Table 3-3**; for 1:2 Redundant Systems, refer to **Table 3-4**.

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

Table 3-3. J5 DISCRETE CONTROL Connector Pinout (Standalone or 1:1 Redundant Systems)

Pin #	Signal Name	Description
A	Auto Select	Momentary short to pin F to force entire subsystem to Auto Mode.
B	BU-1 Command	Momentary short to pin F to force backup of ISSPA #1.
C	Priority 2 Sel	Not applicable for 1:1 system
D	BU-2 Command	Not applicable for 1:1 system
E	2 Online NO	Not applicable for 1:1 system
F	Remote Common	Control – Remote Common.
G	Online Common	Online Status Common.
H	BU Online NO	Open when Online, all other conditions tied to Pin G.
J	Manual Select	Momentary short to pin F to force entire subsystem to Manual Mode.
K	1 Online NO	Open when Online, all other conditions tied to Pin G.
L	2 Fault NO	Not applicable for 1:1 system
M	Priority 1 SEL	Momentary short to pin F to set ISSPA #1 as High priority.
N	Fault Common	Fault Status Common.
P	BU Fault NO	Open when faulted, else tied to Pin N.
R	BU Offline CMD	Momentary short to pin F to force backup ISSPA Offline.
S	1 Fault NO	Open when faulted, else tied to Pin N.

Table 3-4. J5 DISCRETE CONTROL Connector Pinout (1:2 Redundant Systems)

Pin #	Signal Name	Description
A	Auto Select	Momentary short to pin F to force entire subsystem to Auto Mode.
B	BU-1 Command	Momentary short to pin F to force backup of ISSPA #1.
C	Priority 2 Sel	Momentary short to pin F to set ISSPA #2 as HIGH priority.
D	BU-2 Command	Momentary short to pin F to force backup of ISSPA #2.
E	2 Online NO	Open when Online, all other conditions tied to pin G. see Note 1.
F	Remote Common	Control – Remote Common.
G	Online Common	Online Status Common.
H	BU Online NO	Tied to pin G when Redundancy functioning correctly, all other conditions OPEN. See Note 2.
J	Manual Select	Momentary short to pin F to force entire subsystem to Manual Mode.
K	1 Online NO	Open when Online, all other conditions tied to Pin G. see Note 1.
L	2 Fault NO	Open when faulted, else tied to Pin N.
M	Priority 1 SEL	Momentary short to pin F to set ISSPA #1 as HIGH priority.
N	Fault Common	Fault Status Common.
P	BU Fault NO	Open when faulted, else tied to Pin N.
R	BU Offline CMD	Momentary short to pin F to force backup ISSPA Offline.
S	1 Fault NO	Open when faulted, else tied to Pin N.

Notes:

1. Online status subject to state of Pin H.

2. When Open, can indicate loss of power or cabling problem. Online State of unit not determinable when open.

3.3.4   J6 | COM 1 Connector

Chapter 7. SERIAL-BASED REMOTE PRODUC T MANAGEMENT

This is a 9-pin Type 'D' female (DE-9F) connector that provides the EIA-485 Interface. The pinout specifications are provided in **Table 3-5**.

Mating Connector: 9-pin Type 'D' male connector (DE-9M).

Table 3-5. J6 COM 1 Connector Pinout (EIA-485 Interface)

Pin #	EIA-485 4-Wire	EIA-485 2-Wire
1	Ground (GND)	Ground (GND)
2	No Connect	No Connect
3	No Connect	No Connect
4	+TX Signal	+RX/TX Signal Loop In
5	-TX Signal Compliment	-RX/TX Signal Complement Loop In
6	No Connect	No Connect
7	No Connect	No Connect
8	+RX Signal	+RX/TX Signal Loop Out
9	-RX Signal Complement	-RX/TX Signal Complement Loop Out

3.3.5   J7 | RF SWITCH Connector

Appendix B. ISSPA REDUNDANT OPERATIONS
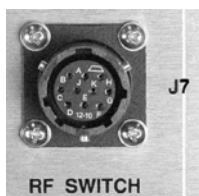
This is a 10-pin circular connector, type MS3112E12-10S. Used only in 1:1 or 1:2 redundant configurations, it functions as the waveguide switch interface connector. The pinout specification is contained in **Table 3-6**.

Table 3-6. J7 RF SWITCH Connector Pinout

Pin	Description
A	Command BU-1
B	Command Common
C	Command 1 Online
D	IND 1 Online
E	IND Common
F	IND BU Online
G	Command BU-2
H	Command BU-2
J	IND 2 Online
K	No Connect

3.3.6   J8 | 10/100 ETHERNET Connector

Chapter 6. ETHERNET-BASED REMOTE PRODUCT MANAGEMENT
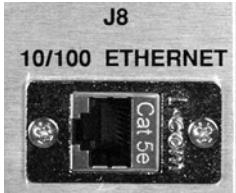
This RJ-45 connector provides the CAT5 10/100 BaseT interface for remote product management and data traffic exchange.

3.3.7   J9A | EXT REF IN / J9B | EXT REF OUT Connectors (OPTIONAL)

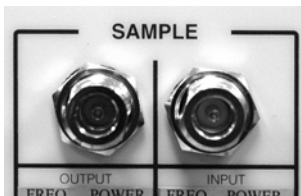| REF DES	Name	Connector Type	Description
J9A	EXT REF IN	BNC	External Reference Input
J9B	EXT REF OUT	BNC	External Reference Output

3.4   Power / Ground Connections

⚠️ *BEFORE APPLYING POWER TO THE UNIT, MAKE SURE THAT THE J2 WAVEGUIDE OUTPUT OF THE ISSPA IS PROPERLY LOADED OR TERMINATED. FAILURE TO DO SO COULD LEAD TO EQUIPMENT DAMAGE AND EXCESSIVE RF RADIATION LEVELS.*

3.4.1   Alternating Current (AC) Prime Power Switch and J3 Power Connector

The On/Off prime power switch is located on the rear of the chassis adjacent to the prime power input connector. The circuit breaker is rated for 40 Amps. The prime power input requirements are:

- 90 to 250VAC 50/60 Hz (CPA-050 and CPA-100)

- 180 to 250VAC 50/60 Hz (CPA-175/CPA-200 and legacy CPA-350)

A standard (IEC-60320) detachable, non-locking, 3-prong power cord supplies the AC power to the unit via the prime power input connector at the J3 location.

Note the following:
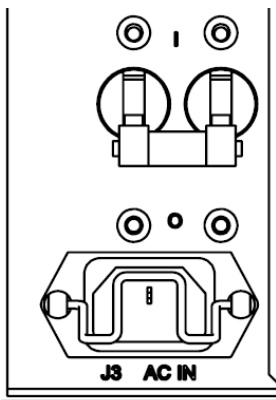
J3 rear panel, CPA-050 Units   **J3 rear panel, CPA-100, CPA-175/200 Units**

CPA Unit	IEC-60320 Connector Pair (Male Chassis Connector/Female Cord Connector)	CEFD Cord Part No.
CPA-050	IEC-60320 Type C13/C14	CA/17725
CPA-100, CPA-175/CPA-200	IEC-60320 Type C19/C20	CA/80450

3.4.1.1   J3 Power AC Connector on Legacy Product CPA-350

The J3 AC prime power input connector for the CPA-350 legacy product is a 3-inch circular connector, type CA3102E20-19PB FMLB A. A mating connector, type CA3106E20-19SB, is provided. The pinout specification for this J3 connector and its mate is as follows:

Pin #	Description
A	Ground
B	Line 2
C	Line 1

Note that Ground Pin 'A' is of the first make, last break type.

3.4.2   Optional Direct Current Operation

 MAKE SURE TO CONNECT ONLY THE CORRECT INPUT VOLTAGE AS SPECIFIED BY THE REAR PANEL LABEL (-48VDC NOMINAL OR -24VDC NOMINAL)!

One of two independent DC power offerings is available – the correct nominal voltage is indicated by a rear panel label:

- -48VDC (38 to 65V) nominal

   -OR-

- -24VDC (18 to 36V) nominal

The input receptacle is type CA3102E20-22PB. The mating connector, type CA3106E20-22SB, is provided. The pinout specifications are as follows:

Pin #	Description
A	+VDC
C	Ground
E	-VDC
B,D,F	Unused

Alternately, the ground connection can be made with the external chassis ground connector.

3.4.3   Chassis Ground Connector

The AC power connector provides the safety ground.

PROPER GROUNDING PROTECTION IS REQUIRED: The installation instructions require that the integrity of the protective earth must be ensured and that the equipment shall be connected to the protective earth connection at all times. Therefore, it is imperative during installation, configuration, and operation that the user ensures that the unit has been properly grounded using the ground stud provided on the rear panel of the unit.
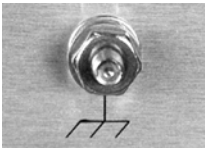
A #10-32 stud is provided for connecting a common chassis ground among equipment.

Chapter 4. UPDATING FIRMWARE

4.1   Introduction

> *TO ENSURE OPTIMAL PERFORMANCE, IT IS IMPORTANT TO OPERATE THE CPA WITH ITS LATEST AVAILABLE FIRMWARE.*

Comtech EF Data's CPA family of ISSPAs are factory-shipped with the latest version of operating firmware. Firmware updates may be applied to a CPA ISSPA system without having to remove it from operation. If you need to update the firmware, you can acquire the download from the Comtech EF Data Web site (www.comtechefdata.com) or from Comtech EF Data Customer Support during normal business hours via e-mail or on CD by standard mail delivery.

The CPA Firmware Update process is as follows:

- Acquire the firmware update archive file from Comtech EF Data Customer Support, or download the file via the Internet to a user-supplied Microsoft Windows®-compatible computer.

- Connect the ISSPA to the serial port or Ethernet port of the user PC.

- Extract the firmware update files from the archive download file, and then transfer the files from the user PC to the CPA ISSPA via File Transfer Protocol (FTP).

4.2   Getting Started: Preparing for the Firmware Download

1. **First, identify the CPA's assigned Management IP Address, and the firmware number, revision letter, and version number.**

    User-supplied items needed:

    -   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).

    -   A 9-pin serial cable to connect the PC serial port to the CPA ISSPA.

    -   A CAT5 Ethernet cable to connect the PC Ethernet port to the CPA ISSPA.

    A. **Use the 9-pin serial cable to connect the CPA 'J6 | COM 1' port to a serial port on the user PC.**
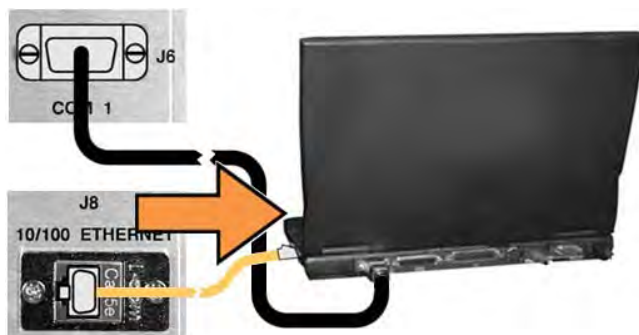
    B. **Use the CAT5 Ethernet cable to connect the CPA 'J8 | 10/100 ETHERNET' port with a user-supplied hub, switch, or a direct connection to an Ethernet port on the user PC.**

    C. **On the PC – Open the terminal emulator program.**

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

    Configure the utility program serial port communication and terminal display operation:

    -   **38400 bps (Baud Rate)**   • **8 Data Bits**   • **1 Stop Bit**
    -   **Parity = NO**   • **Port Flow Control = NONE** • **Display New line Rx/Tx: CR**
    -   **Local Echo = ON**

    D. **On the CPA – Power up the unit.**

        BEFORE APPLYING POWER TO THE UNIT:

    1. *READ* **SECT. 3.4 Power/Ground Connections** *TO FAMILIARIZE YOURSELF WITH YOUR UNIT'S CORRECT POWER CONFIGURATION.*

    2. *MAKE SURE THAT THE J2 WAVEGUIDE OUTPUT OF THE ISSPA IS PROPERLY LOADED OR TERMINATED. FAILURE TO DO SO COULD LEAD TO EQUIPMENT DAMAGE AND EXCESSIVE RF RADIATION LEVELS.*
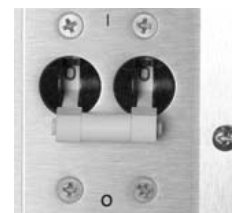
E. **Obtain the firmware information via one of the following methods:**

- *If using the CPA front panel, view the* **UTILITY: Firmware → Boot** *screen:*

```
Boot: FW-0000085
X.X.X    MM/DD/YY
```

> *See* **Chapter 5. FRONT PANEL OPERATION** *for more information on using this interface.*

- *If using the Web Server Interface, the Bootrom, Image1 and Image2 firmware loads may be viewed using the* **Firmware Information** *section of the* 'Status | Status' *page.*

Firmware Information

```
Boot: FW-0000085;2.0.0 ;02/26/08
Bulk: FW-0000086;2.1.2 ;02/24/09
App:  FW-0000087;2.1.2 ;02/24/09
FPGA: FW-0000088;2.0.0 ;10/31/07
```
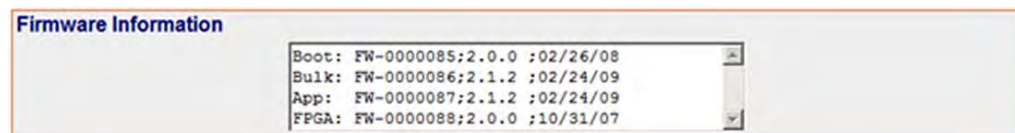
> *See* **Chapter 6. ETHERNET-BASED REMOTE PRODUCT MANAGEMENT** *for more information on using the ISSPA Web Server Interface.*

- *If using serial remote control, use the terminal emulator program to execute remote commands and queries with the CPA. The firmware revision levels can be obtained with the following remote queries:*

  - *Abbreviated:* **<0/SWR?** *(returns basic Boot, Bulk1 and Bulk2 information)*
                        -OR-
  - *Detailed:* **<0/FRW?** *(returns complete Boot, Bulk1 and Bulk2 information)*

> *See* **Chapter 7. SERIAL-BASED REMOTE PRODUCT MANAGEMENT** *for more information on remote commands/queries.*

2. **Next, create a temporary folder (subdirectory) on the user PC for the firmware archive download.**

> - *Drive letter 'c:' is used in these examples. Any valid, writable drive letter can be used.*
>
> - *Typical for all tasks: Type the command <u>without quotes</u>, and then press Enter to execute.*

There are several ways the user may use create a temporary folder on a Windows-based PC:

A. **Use the Windows Desktop to create and rename the temporary folder.**

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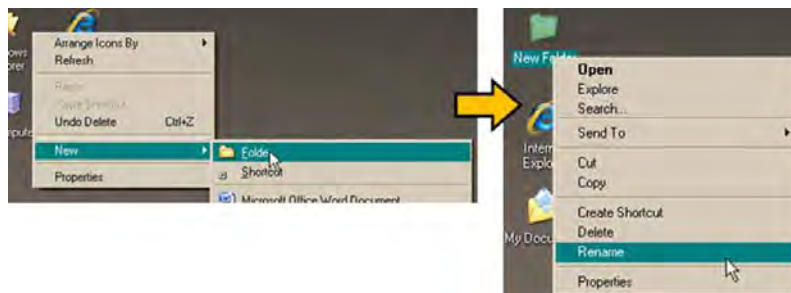
- Right-click on the new folder and then select '**Rename**' from the popup submenu. Rename this folder to "**temp**" or some other convenient, unused name.

B. Use Windows Explorer to create and rename the temporary folder.

- Select **File > New > Folder** to create the new, temporary folder in the active location.

- Right-click the '**New Folder**' folder name, and then rename this folder to "**temp**" or some other convenient, unused name.
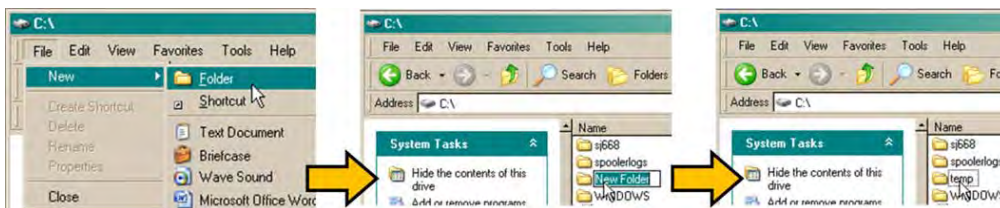
C. Use the 'Run' and 'Browse' windows to create and rename the temporary folder.

- Select **[Start]** on the Windows taskbar and then click the **Run...** icon. The '**Run**' window will open.

- Click **[Browse]** in the '**Run**' window. The '**Browse**' window will open.

- Click the **Create New Folder** icon in the '**Browse**' window to create the new folder in the active location.

- Right-click the '**New Folder**' folder name, and then rename this folder to "**temp**" or some other convenient, unused name.
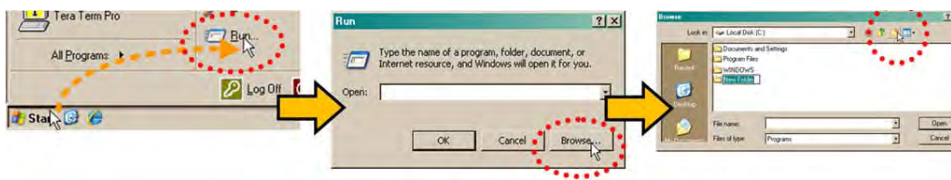
    D. Use Windows Command-line to create the temporary folder.

- **First,** click **[Start]** on the Windows taskbar, and then click the '**Run…**' icon (or, depending on Windows OS versions *prior* to Windows 95, click the '**MS-DOS Prompt**' icon from the Main Menu).

- **Next,** open a **Command-line** window…

  o For Windows 95 or Windows 98 – Type "**command**".

  o For any Windows OS versions later than Windows 98 – Type "**cmd**" or "**command**".
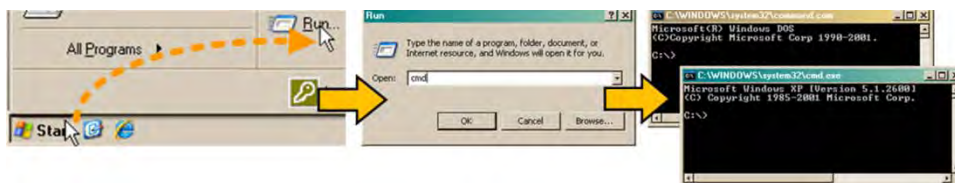
  o Alternately, from **[Start]**, select **All Programs > Accessories > Command Prompt**.

  o Finally, from the Command-line '**c:\>**' prompt, type "**mkdir temp**" or "**md temp**" (*mkdir* and *md* stand for *make directory*), and then click **[OK]**.
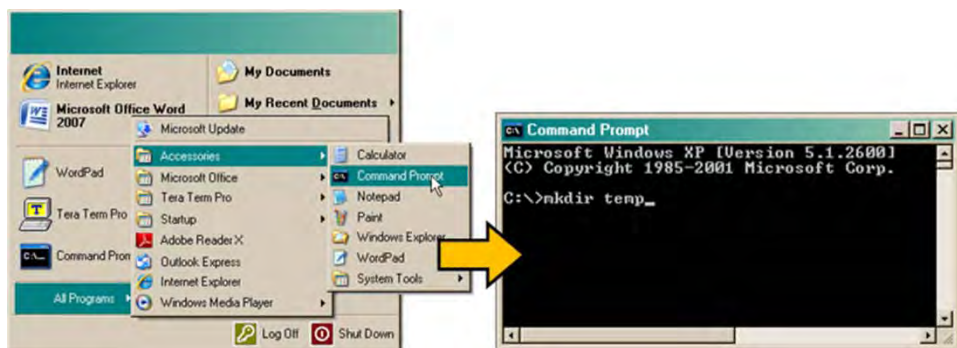
There should now be a 'temp' folder created and available for placement of the firmware file download.

4.3   Downloading and Extracting the Firmware Update

1. First, download the firmware update file from the Comtech EF Data Web site:

    A. Go online to www.comtechefdata.com.

    B. On the *Main* page – Under *Support Information* or the *Support* tab, select the **Software Downloads** hyperlink.

    C. On the *Software Downloads* page – Click **[Download Flash and Software Update Files]**.

    D. On the *Flash Updates Index* page – Select the **(Select a Product Line) Amplifiers** hyperlink.

    E. On the *Amplifiers* product page – Select the **CPA** product hyperlink;

    F. Select the appropriate firmware archive EXE or ZIP file download hyperlink.

    - **About Firmware Numbers, File Versions, and Formats:** The Comtech EF Data Web site catalogues its firmware update files by product type (e.g., router, modem, etc.), the specific model, and optional hardware configurations.

        The CPA firmware download hyperlink appears as F0000086X_V###, where 'X' denotes the revision letter, and '###' represents the firmware version number (e.g., V216 = Version 2.1.6).

    - **About File Archive Formats:** Comtech EF Data provides its downloadable files in two compressed archive formats: *.exe (self-extracting) and *.zip (compressed).

        The *.exe file does not require a file archiver and compression utility program such as *PKZIP for Windows, WinZip, ZipCentral,* etc. (*PKZIP for DOS* is not supported due to file naming conventions). Comtech EF Data does not provide this utility program.

        Some firewalls do not allow the download of *.exe files. Download the *.zip file instead, and extract the firmware files from the archive download with a user-supplied utility program. For detailed information on handling archived files, refer to the utility program Help documentation.

    G. Download the archive file to the temporary folder.

    - Once the EXE or ZIP hyperlink is selected the **'File Download'** window opens and prompts selection of **[Open]** or **[Save]**:

o Click **[Open]** to turn over file extraction to the user-supplied utility program. Be sure to extract the firmware files to the 'temp' folder created earlier.

o Click **[Save]** to open the 'Save As' window. Be sure to select and [Save] the archive *.exe or *.zip file to the 'temp' folder created earlier.

Otherwise, click **[Cancel]** to quit and exit the file download process.

2. **Next, extract the firmware files from the archive file.**

- (If not already done with **File Download > [Open]**) Extract the firmware files from the downloaded ***.exe** or ***.zip** archive file with the user-supplied utility program:

  o Double-click on the archive file name, and then follow the prompts provided by the user-supplied utility program. Extract, at a minimum, two files:

    - **FW-0000086x_ISSPA_#_#_#.bin** – The Firmware Bulk image file (where 'x' denotes the revision letter and '#_#_#' denotes the firmware version number), and

    - **ISSPA-ReleaseNotes_v#-#-#.pdf** – The Firmware Release Notes PDF file (where '#-#-#' denotes the firmware version number).

3. **Confirm availability of the firmware files in the temporary folder.**

There are several ways the user may view the contents of the temporary folder on a Windows-based PC:

A. **From the Windows Desktop:**

- Double-left-click the '**temp'** folder saved to the Windows Desktop.

- Use **Windows Explorer** to locate, and then double-left-click the '**temp**' folder.

- Use the '**Browse'** window (**[Start] > ...Run > [Browse]**) to locate, and then double-click the '**c:\temp**' folder.

B. **Using Command-line:**

- Type "**cd c:\temp**" at the Command-line prompt to change to the temporary directory created earlier using Command-line.

- Type "**dir**" to list the files extracted to the temporary directory from the downloaded archive file.

The firmware files have been successfully downloaded and are now available for transfer to the CPA.

4.4 Performing the FTP Upload Procedure

To proceed with the firmware update procedure, assumptions are made that:

- *The CPA is connected to a user-supplied, Windows-based PC as follows:*

    o *The PC serial port is connected to the CPA's '**J6 |COM1**' port*

    o *The PC Ethernet port is connected to the CPA's '**J8 10/100 ETHERNET**' port with a user-supplied hub, switch, or a direct Ethernet cable connection.*

    o *The PC is running a terminal emulation program (for operation of the CPA Serial or Telnet interfaces) and a compatible Web browser (for operation of the ISSPA Web Server Interface).*

- *The latest firmware files have been downloaded or otherwise received from Comtech EF Data and are available on the user PC in an accessible temporary folder.*

1. **Use Command-Line to send a 'PING' command to confirm proper connection and communication between the user PC and the CPA:**

- **Obtain the IP Address** of the unit by using one of the following methods:

    o *If using the CPA front panel,* view the **CONFIG: Remote → Ethernet→ Address screen**:

    ```
    Ether IP Address/Range:
    192.168.001.014/24(◄ ►,▲ ▼)
    ```

    o *If using the ISSPA Web Server Interface*, view the entry for *IP Address/Range* in the *Network Maintenance* section of the '**Admin | Access**' page:

o **If using Serial Remote Control**, type the "**<0/IPA?"** remote query (without quotes) at the command prompt. The unit returns the configured IP Address.

- **Once the IP Address is known – use Command-line to PING:** Type "**ping xxx.xxx.xxx.xxx**" at the Command-line prompt (where '**xxx.xxx.xxx.xxx**' is the unit IP Address).

  The response should confirm whether the unit is properly connected and communicating.

2. **Use Command-line to transfer (FTP) the files from the user PC to the CPA:**

- Type "**ftp xxx.xxx.xxx.xxx**" (where 'xxx.xxx.xxx.xxx' denotes the unit IP Address).

- Type "**bin**" to set the binary transfer mode.

- Type "**prompt**" and then type "**hash**" to facilitate the file transfers.

- Type "**put FW-0000086x_ISSPA_#_#_#.bin bulk:**" (where '**#_#_#**' denotes the firmware version number) at the Command-line prompt, without quotes, to begin the file transfer. The destination "**bulk:**" must be all lower-case.

  Wait while the file transfers. During this time, the CPA front panel will report:

  ```
  Programming APP flash…
  Please wait…
  ```

  The process sequences through several blocks – this will take several minutes. When the process is complete, the CPA front panel will display:

  ```
  CPA-XXX-XXXX-X
  Ver. X.X.X      SNXXXXXXXXX
  ```

- Type "**bye**" to terminate the FTP session, and then close the Command-line window.

3. Recycle the CPA power and wait for the unit to reboot.

4. **Using the ISSPA Web Server Interface** – View the *Firmware Information* section of the **'Status | Status'** page to verify the new firmware file is loaded:

Firmware Information

```
Boot: FW-0000085;2.0.0 ;02/26/08
Bulk: FW-0000086;2.1.2 ;02/24/09
App:  FW-0000087;2.1.2 ;02/24/09
FPGA: FW-0000088;2.0.0 ;10/31/07
```
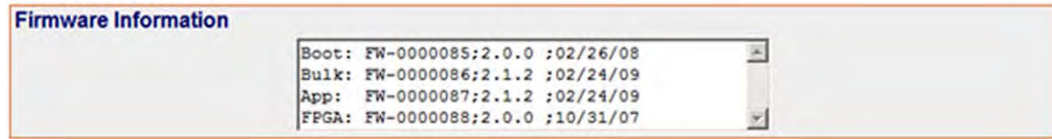
5. To load the second image, repeat **Step 2**.

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

Chapter 5. FRONT PANEL OPERATION

5.1 Introduction

You can fully control and monitor the operation of the CPA ISSPA from the front panel. **Figure 5-1** shows both the original (obsolete) and current panel layouts.

The front panel features (from left) six **L**ight-**E**mitting **D**iode (LED) Indicators, a **V**acuum **F**luorescent **D**isplay (VFD), and a six-button keypad. Data is entered via the keypad – nested menus display all available options and prompt you to carry out a required action – and messages are displayed on the VFD. The LEDs indicate, in a summary fashion, the status of the modem.

This chapter describes, in detail, the function and behavior of the LED indicators, VFD, and keypad.

Original (Obsolete) Front Panel Layout

Current Front Panel Layout
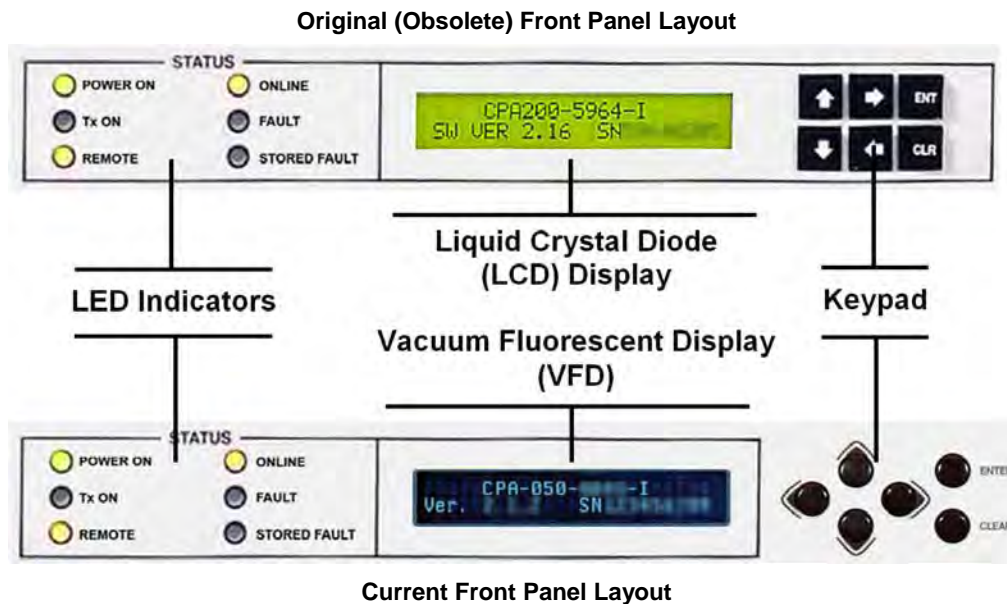
Figure 5-1. CPA Front Panel View

5.1.1   Startup Checklist

You should always perform the following checklist before operating the CPA:

Step	Task
1	☐ Check to ensure that the installation is complete.
2	☐ Verify that the CPA is connected to the proper Prime Power Source, RF input, and RF output.
3	☐ Switch on the Prime Power Switch (located on the rear panel).
4	☐ Once the Prime Power Switch has been switched on, verify that the cooling fans are operating and that the six STATUS LED indicators appear as follows: • POWER ON – ON (yellow) • Tx ON – OFF • REMOTE – ON (yellow) • ONLINE – ON (yellow) • FAULT – OFF • STORED FAULT – OFF

5.1.2   LED Indicators

The operational behaviors of the six front panel LED indicators is as follows:

LED	Color	Condition *(When Lit)*
POWER ON	Green	Indicates that power is applied to the unit.
Tx ON	Yellow	Indicates that the transmit function of the unit is **on**. This LED indicator reflects the actual condition of the transmit function.
REMOTE	Yellow	Indicates that the unit is operating in remote control mode, where commands and data are transferred via an EIA-485 (EIA-232 is optional) serial communications link.
ONLINE	Yellow	Indicates that the unit is operating online to transmit data.
FAULT	Red	Indicates that a fault condition exists.
STORED FAULT	Red	Indicates that the fault has been logged and stored. The fault may or may not be active.

5.1.3   Keypad

As the manufacturing process of the CPA has evolved, there have been two keypad layouts. As shown in **Figure 5-2**:

Layout 1: Protruding Square Button
(obsolete all units)
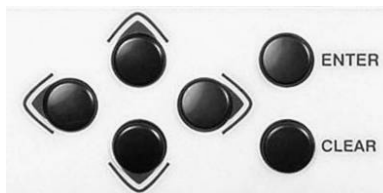
Layout 2: Protruding Round Button
(current production units)

Figure 5-2. CPA Front Panel Keypad

The function of the keypad is as follows:

ENTER (ENT)	Use this key to select a displayed function or to execute a modem configuration change. From the opening screen, pressing ENTER *once* takes you to the SELECT: (Main) menu.
CLEAR (CLR)	Use this key to back out of a selection or to cancel a configuration change which has not been executed using ENTER. Pressing CLEAR generally returns the display to the *previous selection* or, if pressed *repeatedly*, to the opening screen. From the opening screen, pressing CLEAR *once* takes you to the SELECT: (Main) menu.
◄ ► (Left, Right)	Use the ◄ ► arrow keys primarily to move to the next menu screen section. When needed, you may also use these keys to move the cursor position (e.g., when editing a parameter value or label character).
▲ ▼ (Up, Down)	Use the ▲ ▼ arrow keys primarily to move from one menu screen parameter selection to another. When needed, you may also use these keys to edit configuration value digits (numbers) or label characters (e.g., letters).

 The current production unit's keypad has an auto-repeat feature. Holding a key down for more than 1 second repeats the key action automatically at the rate of 15 keystrokes per second. This is useful particularly when editing numeric fields with many digits, such as frequency or data rate.

5.1.4   Front Panel Display

As the manufacturing process of the CPA has evolved, there have been two display layouts. As shown in **Figure 5-3**:

Layout 1: Liquid Crystal Diode (LCD)
(obsolete all units)

Layout 2: Vacuum Fluorescent Display (VFD)
(current production units)

Figure 5-3. CPA Front Panel Keypad

Display Type: Depending on the production version of the unit, older versions of the CPA feature a **L**iquid **C**rystal **D**isplay (LCD), while all current production versions feature a **V**acuum **F**luorescent **D**isplay (VFD).
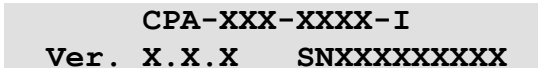
Both display versions are active displays showing two lines of 24 characters each. While you may control the brightness of either display, compared to the original LCD the blue-lit display of the current VFD provides superior viewing characteristics and does not suffer problems of viewing angle or contrast.

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

Screen Saver Feature: If you were to display the same screen for weeks at a time, the display could become 'burnt' with this image. To prevent this, the unit has a 'screen saver' feature that activates after 1 hour. The top line of the screen saver features the display message `'Circuit ID:'` and a user-input text string; the bottom line reads `'Press any key…'`.

When the screen saver activates, the message moves from right to left across the display, and then wraps around. Pressing any key restores the previous screen.

5.2   Opening Screen

```
        CPA-XXX-XXXX-I
 Ver. X.X.X    SNXXXXXXXXX
```

The opening screen displays whenever power is first applied to the unit. From any other nested menu, it is accessible by pressing **CLEAR** repeatedly. The display identifies the specific CPA model, its currently loaded firmware, and its unique serial number.

5.3   SELECT: (Main) Menu

```
SELECT: Config Monitor
Utility FrontPanel (◄ ► E)
```

The **SELECT:** menu screen is immediately accessible from the opening screen by pressing **ENTER** or **CLEAR** or, from any other nested menu, by repeatedly pressing **CLEAR** as needed, until it re-appears.

Figure 5-4 illustrates the hierarchal structure of the front panel menu system from the **SELECT:** menu on down. The ISSPA's commands are in a tree-structured menu format designed for logical access and execution of all control functions, and to prevent the execution of an invalid entry by the operator.
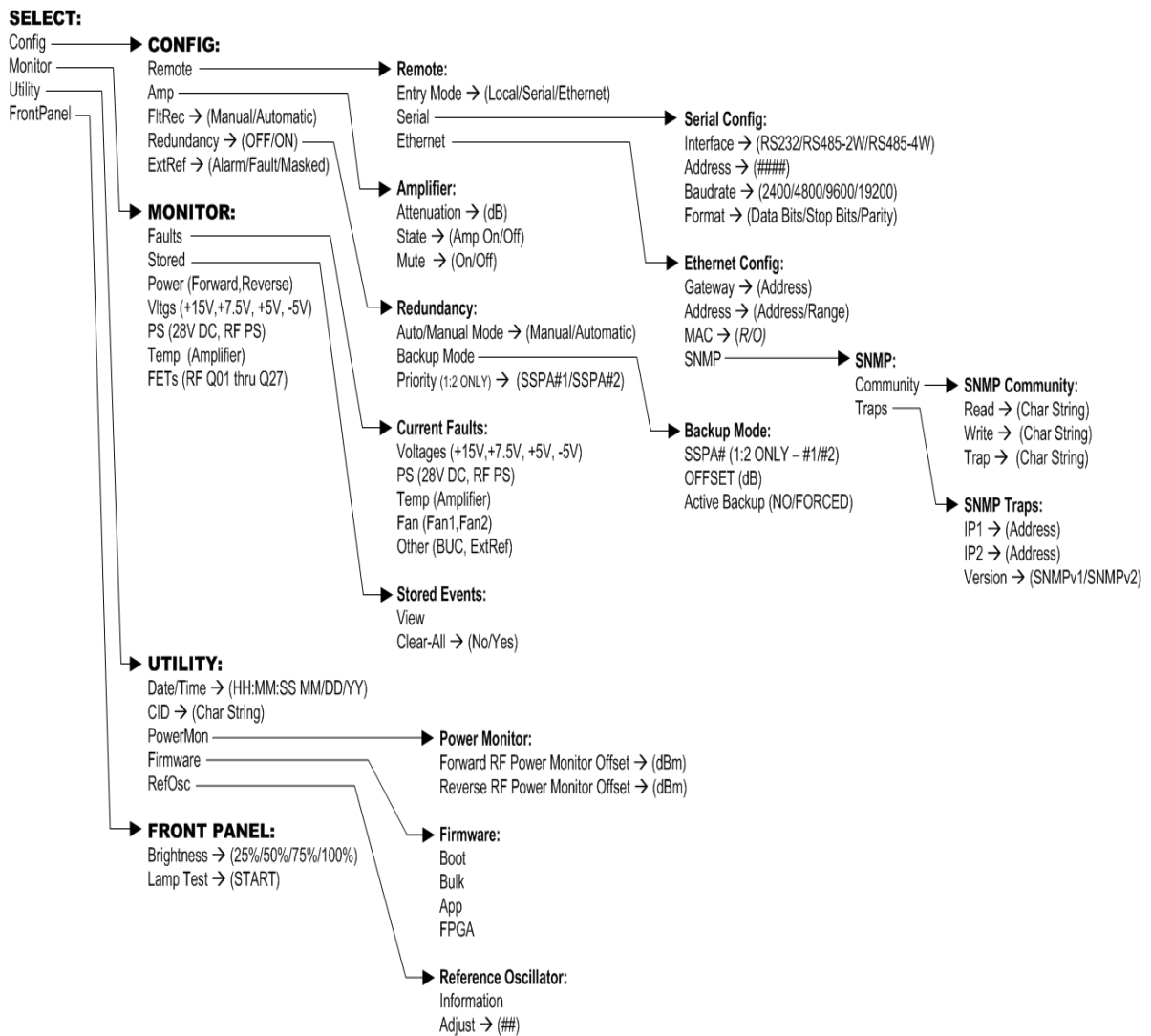
Figure 5-4. CPA Principle Menu Tree

The following table identifies each menu branch available from the **SELECT:** (Main) menu, its content section in this chapter, and the functional description of each branch:

Menu Branch	Sect	Description
Config	5.3.1	Use this menu branch to fully configure the CPA.
Monitor	5.3.2	This menu branch provides read-only displays reflecting the operational and alarm status of the CPA's power supplies, internal temperature, RF output power level, and RF FETs; allows you to read or clear stored fault logs.
Utility	5.3.3	Used this menu branch to adjust operational parameters such as the system time and date, serial communications, LCD brightness and contrast, etc.
FrontPanel	5.3.4	Used this menu branch to adjust front panel display brightness and run the LED (lamp) test.

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

5.3.1   SELECT: Config (Configuration)

```
CONFIG: Remote Amp
FltRec Redundancy ExtRef
```

Use the ◄ ► arrow keys to select **Remote**, **Amp**, **FltRec**, **Redundancy**, or **ExtRef**, and then press **ENTER** to continue.

5.3.1.1   CONFIG: Remote (Remote Control)

```
Remote: Entry Mode
Serial Ethernet   (◄ ► E)
```

Use the ◄ ► arrow keys to select **Entry Mode, Serial**, or **Ethernet**, and then press **ENTER**.

CONFIG: Remote → Entry Mode

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

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

If **Local** is selected, then remote control is disabled, although remote monitoring is still possible.

CONFIG: Remote → Serial

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

> **When in Remote → Serial mode**, *in addition to enabling Serial M&C, the Telnet connection is also allowed, which enables Telnet M&C for amplifiers configured for redundant operation*

Use the ◄ ► arrow keys to select **Interface, Address**, **Baudrate**, or **Format**, and then press **ENTER**.

If selecting **CONFIG: Remote → Serial Config →Interface**:

```
M&C Bus Interface: RS232
RS485-2W RS485-4W  (◄ ►)
```

Use the ◄ ► arrow keys to select **RS232**, **RS485-2W** (2-wire), or **RS485-4W** (4-wire) by , and then press **ENTER**.

Operation is automatically set to the selected M&C bus interface, and you are then returned to **Remote: Serial** submenu.

If selecting **CONFIG: Remote → Serial Config →Address**:

```
Remote Address: 0001
                (◄ ► ▲ ▼ E)
```

Use the ◄ ► arrow keys to first select the character to edit, and then use the ▲ ▼ arrow keys to edit the value of that digit. Press **ENTER** when done. The valid range of addresses is from **0001** to **9997**.

If selecting **CONFIG: Remote → Serial Config →Baudrate**:

```
Local M&C Bus Baud Rate:
19200 Baud        (▲ ▼ E)
```

Use the ▲ ▼ arrow keys to set the baud rate of the remote control bus connected locally to the User PC, and then press **ENTER**. Values of **2400**, **4800**, **9600**, **19200**, and **38400** baud are available.

> *The asynchronous character format is FIXED at 8 data bits, 1 stop bit, no parity (8-N-1).*

If selecting **CONFIG: Remote → Serial Config →Format** :

```
Serial Port Data Format:
 8 Data, 1 Stop, Par None
```

Use the ▲▼ arrow keys to select the serial port data format of the remote control bus connected locally to the user PC, and then press **ENTER**. Note the following:

Data Bits	Select 7 or 8.
Stop Bits	Select 1 or 2.
Parity	Select Odd, Even, or None.

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

CONFIG: Remote → Ethernet

> ⓘ **In** Remote → **Ethernet mode**, *serial monitoring is allowed; however, serial control is not allowed except for use of the LRS (Local/Remote Status) commands/queries*

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

Select the parameter to configure – **Gateway**, **Address**, **MAC**, or **SNMP** – using the ◄ ►arrow keys, then press **ENTER**.

If selecting **CONFIG: Remote → Ethernet Config→Gateway**:

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

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

If selecting **CONFIG: Remote → Ethernet Config→Address**:

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

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

If selecting **CONFIG: Remote → Ethernet Config→MAC**:

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

This *read-only* screen displays the unit MAC address. Once the MAC address has been noted, press **ENTER** or **CLEAR** to exit this screen**.**

If selecting **CONFIG: Remote → Ethernet Config→SNMP**:

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

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

If selecting **CONFIG: Remote → Ethernet Config→SNMP → Community:**

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

Use the ◄ ► arrow keys to select the **Read**, **Write**, or **Trap** community to view or edit, and then press **ENTER**.

If selecting **CONFIG: Remote →Ethernet Config→SNMP → SNMP Community → Read**:

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

To edit the SNMP Read Community string: Use the ◄ ► arrow keys to first select the character to edit, and then use the ▲▼ arrow keys to edit that character. Press **ENTER** when done.

If selecting **CONFIG: Remote →Ethernet Config→SNMP → SNMP Community → Write**:

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

To edit the SNMP Write Community string: Use the ◄ ► arrow keys to first select the character to edit, and then use the ▲▼ arrow keys to edit that character. Press **ENTER** when done.

If selecting **CONFIG: Remote →Ethernet Config→SNMP → SNMP Community → Trap**:

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

To edit the SNMP Trap Community string: Use the ◄ ► arrow keys to first select the character to edit, and then use the ▲▼ arrow keys to edit that character. Press **ENTER** when done.

> *For the preceding menus, only the first 20 characters on the bottom line are available. All printable ASCII characters are available with the exception of the backslash (ASCII code 92) and ~ (ASCII code 126). Once you have composed the string and pressed ENTER, all trailing spaces are removed from the Community string upon entry.*

If selecting **CONFIG: REMOTE → Ethernet Config → SNMP → Traps**:

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

Use the ◄ ► arrow keys to select **IP1**, **IP2**, or **Version**, and then press **ENTER**.

If selecting **Ethernet Config: SNMP → Traps → SNMP Trap IP Address IP1** *or* **IP2**:

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

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

To edit the Trap Destination's IP Addresses: Use the ◄ ► arrow keys to first select the character to edit, and then use the ▲▼ arrow keys to edit that character. Press **ENTER** when done.

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

If selecting **Ethernet Config: SNMP → Traps → SNMP Trap IP Address Version**:

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

Use the ◄ ► arrow keys to select the trap version as **SNMPv1** or **SNMPv2**, and then press **ENTER**.

5.3.1.2   CONFIG: Amp

The CONFIG: AMP commands are valid only in **Remote** → **Local** *mode. If you attempt to edit any of the AMP settings while in* **Remote** → **Serial** *or* **Remote** → **Ethernet mode***, the following message displays:*

```
        THIS UNIT IS CURRENTLY
           IN REMOTE MODE!!
```

```
 Amp: Attenuation   State
 Mute                 (◄ ► E)
```

Use the ◄ ► arrow keys to select **Attenuation**, **State**, or **Mute**, and then press **ENTER**. Note the following:

Selection	Description
Attenuation	Input and displays the CPA attenuation setting which is selected between 0.00 dB to 20.00 dB in 0.25 dB steps. The default setting is 10.00 dB.
State	Controls the operational state of the CPA amplifier. The default is ON.
Mute	Provides CPA mute control. The default is OFF.

CONFIG: Amp → Attenuation

```
 Attenuation: 10.00 dB
```

Use the ▲ ▼ arrow keys to select a CPA attenuation value between **0.00** dB to **20.00** dB (in **0.25** dB steps), and then press **ENTER**. The default setting is **10.00** dB.

CONFIG: Amp → State

```
 Amplifier: OFF   ON
                   (◄ ► E)
```

Use the ◄ ► arrow keys to select the Amplifier State as **OFF** or **ON**, and then press **ENTER**.

CONFIG: Amp → Mute

```
 Amp Mute: OFF   ON
                   (◄ ► E)
```

Use the ◄ ► arrow keys to select the Amplifier Mute control as **OFF** or **ON**, and then press **ENTER**.

5.3.1.3   CONFIG: FltRec (Fault Recovery) Menu Branches

```
Fault Recovery: Manual
Automatic          (◄ ► E)
```

Use the ◄ ► arrow keys to select Fault Recovery as **Manual** or **Automatic**, and then press **ENTER**.

5.3.1.4   CONFIG: Redundancy Menu Branches

Comtech EF Data's CPA family of SSPAs are designed to automatically sense and configure into Redundancy Mode when the redundant loop cable is connected between the two (i.e., 1:1) or three (i.e., 1:2) CPAs comprising the redundant subsystem.

The designation of each CPA in a redundant subsystem is determined automatically via the redundancy interface cable connected – polling on the dedicated redundancy bus will not begin until the redundancy loop cable is connected.

This display indicates the current operating mode – **Standalone** or **Redundancy**. When the CPA is operating in **Standalone** mode – that is, no additional CPAs are recognized as active – the display appears as follows:

```
Redundancy Mode: OFF
                      (E)
```

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

With the CPA in Standalone *mode, the nested menus that follow will not be visible/selectable*.
Otherwise, when a valid redundancy configuration is detected, a *read-only* display will first appear:

If 1:1 Redundancy is recognized:

```
Redundancy Mode: ON
SSPA #BU 1:1          (E)
```

If 1:2 Redundancy is recognized:

```
Redundancy Mode: ON
SSPA #BU  1:2  Pri=1  (E)
```

Press **ENTER** to continue to configure 1:1 or 1:2 redundant operations, or press **CLEAR** to return to the previous menu.

If 1:1 Redundancy is recognized:

```
Config: Auto/Manual Mode
Backup Mode
```

Use the ◄ ► arrow keys to select **Auto/Manual Mode** or **Backup Mode**, and then press **ENTER**.

If 1:2 Redundancy is recognized:

```
Config: Auto/Manual Mode
Backup Mode      Priority
```

Use the ◄ ► arrow keys to select **Auto/Manual Mode**, **Backup Mode**, or **Priority**, and then press **ENTER**.

The operations that follow are typical for both 1:1 and 1:2 redundant operations unless otherwise indicated.

CONFIG: Redundancy → Auto/Manual Mode

```
Operating Mode: Manual
Automatic            (◄ ► E)
```

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

CONFIG: Redundancy → Backup Mode

This submenu is enabled only in **Remote → Local** *mode, and with* **Redundancy → Auto/Manual Mode** *set to* **Manual***. If you attempt to access this submenu either while in* **Remote → Serial** *or* **Remote → Ethernet** *mode, or with* **Redundancy → Auto/Manual Mode** *set as* **Automatic***, this submenu is* **disabled** *and, in its place, the following message displays:*

```
    NOT IN MANUAL MODE OR
    NOT ACTIVE
```

Otherwise:

```
SSPA #1 OFFSET: X.XX dB
Active Backup: NO
```

For 1:2 configurations only: On the top line, use the ▲▼ arrow keys to select the desired Backup CPA (i.e., SSPA #**1** or SSPA #**2**). *For 1:1 configurations, note that this number is always fixed as '1'.*

For 1:1 and 1:2 configurations:

On the top line, set the dB offset used for Gain Equalization for the selected Backup CPA. Use the ◄ ►arrow keys to first select the numeral to edit, and then use the ▲▼ arrow keys to edit that digit. The valid range, in dB, is **-7.0**0 to **+7.00**.

On the bottom line, use the ▲▼ arrow keys to set operation of the specified Backup CPA:

- The default setting is **NO (**i.e., the Backup CPA remains in *standby mode*).

- Select **FORCED** to toggle/activate the selected Backup CPA, and then press **ENTER** to take the primary unit *OFFLINE* and take the selected Backup CPA *ONLINE*.

CONFIG: Redundancy → Priority (1:2 configurations only)

In 1:1 configurations, this submenu is not accessible, as this number is always fixed as '1'.

```
Priority SSPA: SSPA#1
SSPA#2
```

Use the ◄ ► arrow keys to select which Backup CPA in the configuration should serve as the priority unit in the 1:2 redundancy system – **SSPA#1** or **SSPA#2** – and then press **ENTER**.

5.3.1.5   CONFIG: ExtRef (External Reference)

```
ExtRef LD Alarm Mask:
Alarm Fault Masked (◄ ► E)
```

Use the ◄ ► arrow keys to select **Alarm**, **Fault**, or **Masked**, and then press **ENTER**. Note the following:

Selection	Description

Alarm	Causes an Alarm to be generated whenever the unit sees that:
	    a) External Reference is selected, and
	    b) There is no signal activity at the External Reference port.
	No action, other than event logging, will occur.

Fault	Causes a Transmit Traffic fault to be generated whenever the unit sees that:
	    a) External Reference is selected, and
	    b) There is no signal activity at the External Reference port.

Mask	No alarm or fault will be generated.

5.3.2 SELECT: Monitor

```
MONITOR: Faults Stored
Power Vltgs PS Temp FETs
```

The **Monitor** menus provide a collection of read-only status report screens, plus a management menu for the viewing and handling of stored faults.

Typical for all displays, the screen will indicate "**FT**" when a fault condition exists for a specific feature; otherwise, "**OK**" indicates that no faults are present.

From any menu, you may press **ENTER** or **CLEAR** to return to the previous menu.

Use the ◄ ► arrow keys to select **Faults**, **Stored**, **Power**, **Vltgs**, **PS**, **Temp**, or **FETs**, and then press **ENTER**.

The screen examples that follow are intended for reference only. Your actual screens will vary depending on the active, operating configuration.

5.3.2.1 MONITOR: Faults

```
Current Faults: Voltages
PS Temp Fan Other(◄ ► E)
```

Use the ◄ ► arrow keys to select **Voltages**, **PS**, **Temp**, Fan, or **Other**, and then press **ENTER**.

MONITOR: Faults → Voltages

```
+15V = OK +7.5V = OK
+5V  = OK  -5V  = OK (E)
```

MONITOR: Faults → PS (Power Supply)

```
      28VDC PS = OK
 RF Power Supply = OK
```

MONITOR: Faults → Tempo (Temperature)

```
      TEMP = OK
                    (E)
```

MONITOR: Faults → Fan

```
FAN1  =  OK
FAN2  =  OK           (E)
```

MONITOR: Faults → Other

```
BUC = OK
 ExtRef = OK              (E)
```

5.3.2.2   MONITOR: Stored

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

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

MONITOR: Stored → View

```
Log05: 10/11/10 10:37:32
Info  -  Log CLEAR (▲ ▼)
```

Use the ▲ ▼ arrow keys to scroll backwards or forwards through the entries in the stored events log. Press **ENTER** or **CLEAR** to return to the previous menu.

The stored events log can store up to 255 events. The top line of the display indicates the log entry number, and the date and time of the entry.

Note that in accordance with European convention, the date is shown in **DAY-MONTH-YEAR** *format.*

The bottom line of the display provides a description of the logged and stored event.

MONITOR: Stored → Clear-All

```
Clear All Stored Events:
No Yes              (◄ ► E)
```

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

If **Yes** is selected, the stored events log is cleared, and you are taken directly back to the previous menu.

5.3.2.3   MONITOR: Power

```
Forward Power: <19.0 dBm
Reverse Power: <12.0 dBm
```

5.3.2.4   MONITOR: Vltgs

```
+15V=14.6    +7.5V=7.9
+5V=5.0      -5V=-5.0 (E)
```

5.3.2.5   MONITOR: PS (Power Supply)

```
        28VDC PS = 27.2
  RF Power Supply = 9.1
```

5.3.2.6   MONITOR: Temp

```
  Amplifier Temp = 45 C
```

5.3.2.7   MONITOR: FETs

```
  RF FET Q01   :   20mA
  RF FET Q02   :   72mA (▲ ▼)
```

Use the ▲ ▼ arrow keys to scroll backwards or forwards through the displayed RF Power **F**ield **E**ffect **T**ransistor**s** (FETs). Note the following:

- **For CPA-050 –** RF FET Q01 through Q07.

- **For CPA-100 –** RF FET Q01 through Q11.

- **CPA-175/CPA-200 –** RF FET Q01 through Q18.

5.3.3   SELECT: Utility

```
  UTILITY:  Date/Time  CID
  PowerMon Firmware RefOsc
```

Use the arrow keys to select **Date/Time**, **CID**, **PowerMon**, **Firmware**, or **RefOsc**, and then press **ENTER**.

5.3.3.1   UTILITY: Date/Time

```
  Edit Real-Time Clock:
  12:00:00 24/09/10(◄ ►▲▼E)
```

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

> *Note that in accordance with European convention, the date is shown in* **DAY-MONTH-YEAR** *format.*

5.3.3.2   UTILITY: CID (Circuit ID)

```
Edit Circuit ID:(◄ ►,▲ ▼)
24 CHARACTER TST MESSAGE
```

Only the bottom line is available (24 characters). To edit the Circuit ID string: First, use the ▲▼ arrow keys to set the cursor position to the bottom line. Next, use the ◄ ► arrow keys to select the character to be edited, and then use the ▲▼ arrow keys to change that character.

The following characters are available:

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

Compose the Circuit ID string, and press **ENTER** when done.

5.3.3.3   UTILITY: PowerMon

```
Forward Power Mon Offset
Reverse Power Mon Offset
```

This function allows you to calibrate (fine tune) the *RF Power Monitor* for a specific carrier frequency. The *RF Power Monitor* is factory-calibrated at the CPA center frequency. You can adjust (offset) the display level using this function.

Select **Forward Power Mon Offset** or **Reverse Power Mon Offset** using the ◄ ► arrow keys, then, press **ENTER**.

UTILITY: PowerMon → Forward Power Mon Offset

```
Forward RF Power Monitor
  Offset = +5.8 dBm
```

Use the ◄ ► arrow keys to set the cursor position on the bottom line, and then edit the numeric value using the ▲▼ arrow keys. The range is from -6.0 to +6.0 dBm, in 0.1 dBm steps.

UTILITY: PowerMon → Reverse Power Mon Offset

```
Reverse RF Power Monitor
  Offset = -5.8 dBm
```

Use the ◄ ► arrow keys to set the cursor position on the bottom line, and then edit the numeric value using the ▲▼ arrow keys. The range is from -6.0 to +6.0 dBm, in 0.1 dBm steps.

5.3.3.4   UTILITY: Firmware

⚠️ *THESE MENUS ARE INTENDED FOR DIAGNOSTIC PURPOSES ONLY. DO __NOT__ CHANGE AN IMAGE UNLESS OTHERWISE INSTRUCTED BY COMTECH EF DATA CUSTOMER SUPPORT.*

```
Firmware Info: Boot Bulk
 App FPGA
```

Use this set of submenus to view information about the CPA internal firmware. Use the ◄ ► arrow keys to select **Boot**, **Bulk**, **App**, or **FPGA,** and then press **ENTER**.

UTILITY: Firmware → Boot

```
Boot: FW-0000085
 X.X.X    MM/DD/YY
```

UTILITY: Firmware → Bulk

```
Bulk: FW0000392
 X.X.X    MM/DD/YY
```

UTILITY: Firmware → App

```
 App: FW00000393
 X.X.X    MM/DD/YY
```

UTILITY: Firmware → FPGA

```
Boot: FW-0000088
 X.X.X    MM/DD/YY
```

5.3.3.5   UTILITY: RefOsc

⚠️ *THIS MENU IS INTENDED FOR DEBUGGING PURPOSES ONLY.*

```
Reference Oscillator:
 Information Adjust (◄ ► E)
```

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

UTILITY: RefOsc → Information

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

```
Ref Osc: Vtune = 04.8
ExtRef: N/A
```

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

UTILITY: RefOsc → Adjust

```
Reference Frequency
    Adjust    87
```

Use this menu to manipulate the reference oscillator adjustment. First, use the ◄ ► arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER** when done.

The default Reference Frequency tuning adjustment is 87, with allowable values from 0 to 255.

5.3.4   SELECT: Front Panel

```
Front Panel: Brightness
Lamp Test           (◄ ► E)
```

Select **Brightness** or **Lamp Test** using the ◄ ► arrow keys, then press **ENTER**.

5.3.4.1   Front Panel: Brightness

```
Display Brightness:
        100%
```

Use the ▲▼ arrow to adjust the display brightness. The selectable values of brightness are **25%**, **50%**, **75%**, or **100%.** Press **ENTER** when the brightness is suitable.

5.3.4.2   Front Panel: Lamp Test

```
Lamp Test:
    START
```

The Lamp Test menu runs a performance diagnostic on the front panel LED Indicator array. Press **ENTER** to begin the test – as the LEDs cycles through the Lamp Test, the following message displays:

```
Lamp Test:
    TESTING
```

This test does not otherwise affect CPA operations while running.

Chapter 6. ETHERNET-BASED REMOTE PRODUCT MANAGEMENT

6.1   Introduction

Ethernet-based remote management and control of the CPA ISSPA is available using the rear panel **'J8 | 10/100 ETHERNET'** port.

1. TO PROCEED WITH ETHERNET-BASED REMOTE PRODUCT MANAGEMENT, ASSUMPTIONS ARE MADE THAT:

- *The CPA is operating with the latest version firmware files.*

- *The CPA is connected to a user-supplied Windows-based PC as follows:*

   o *The PC's serial port is connected to the CPA rear panel 'J6 | COM1' port with a user-supplied serial cable.*

   o *The PC's Ethernet port is connected to the CPA rear panel 'J8 |10/100 ETHERNET' port with a user-supplied hub, switch, or direct Ethernet cable connection.*

   o *The PC is running a terminal emulation program (for operation of the ISSPA Telnet or serial remote control interface) and a compatible web browser (for operation of the ISSPA Web Server Interface).*

- *The CPA's Management IP Address has been noted using the CPA Front Panel.*

2. USE OF THE ETHERNET-BASED SNMP INTERFACE IS RECOMMENDED ONLY FOR ADVANCED USERS. ALL OTHER USERS ARE STRONGLY ENCOURAGED TO USE THE ISSPA WEB SERVER INTERFACE FOR REMOTE MONITOR AND CONTROL (M&C) OF THE CPA.

6.1.1   Ethernet Management Interface Protocols

> **For SNMP, Telnet, or HTTP operation, the CPA must be configured with the Ethernet control option. From the front panel, select CONFIG: REMOTE → ETHERNET.** *See* **Chapter 5. FRONT PANEL OPERATION** *for further information.*

The user PC provides access to Ethernet-based remote Monitor and Control (M&C) of the CPA through three separately operated protocols:

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

- **ISSPA Telnet Interface.** This requires use of a user-supplied terminal emulation program such as HyperTerminal.

- **ISSPA Web Server (HTTP) Interface.** This requires a compatible user-supplied web browser such as Internet Explorer.

6.2   SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an Internet-standard protocol for managing devices on IP networks. An SNMP-managed network consists of three key components:

- **The managed device.** This includes the CPA.

- **The SNMP Agent.** This is the software that runs on the CPA. The ISSPA SNMP Agent supports both **SNMPv1** and **SNMPv2c**.

- **The user-supplied Network Management System (NMS).** This is the software that runs on the manager.

6.2.1   Management Information Base (MIB) Files

MIB files are used for SNMP remote management of a unique device. A MIB file consists of a tree of nodes called Object Identifiers (OIDs). Each OID provides remote management of a particular function. Compile these MIB files in a user-supplied MIB Browser or SNMP Network Monitoring System server.

The following MIB files are associated with the CPA:

MIB File/Name (where 'x' is the revision letter)	Description
FW-0000141x.mib Comtech EF Data Root MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data SSPA products and consists of only the following OID: Name: comtechEFData Type: MODULE-IDENTITY OID: 1.3.6.1.4.1.6247 Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247) Module: ComtechEFData
FW-0000139x.mib ISSPA MIB	MIB file consists of all of the OID's for management of the CPA functions
FW-0000140x.mib ISSPA Traps MIB	Trap MIB file is provided for SNMPv1 traps common for the CPA.

6.2.2   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 CPA uses Community Strings as a password scheme that provides authentication before gaining access to the CPA agent's MIBs. They are used to authenticate users and determine access privileges to the SNMP agent.

Type the SNMP Community String into the user-supplied MIB Browser or Network Node Management software. You may define three Community Strings for SNMP access:

- Read Community   default = public

- Write Community   default = private

- Trap Community   default = comtech

For proper SNMP operation, the CPA MIB files must be used with the associated version of the CPA Series Downconverter M&C. Refer to the CPA FW Release Notes for information on the required FW/SW compatibility.

6.3 ISSPA Telnet Interface

The CPA provides a Telnet interface for the purpose of Equipment M&C via the standard equipment Remote Control protocol. The Telnet interface requires user login at the **Administrator** level and **Read/Write** level. An example of the login process is shown here:
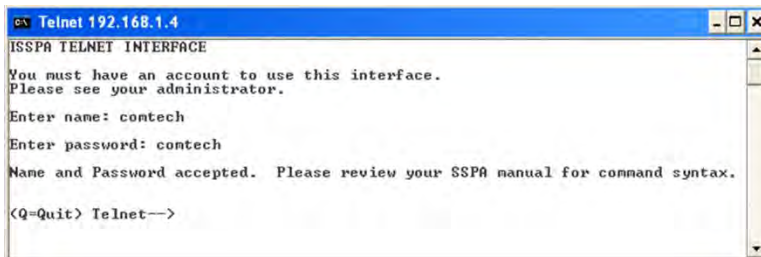
Once logged into the Telnet interface as Administrator, you can access the standard remote control interface defined in **Chapter 7. SERIAL-BASED REMOTE PRODUCT MANAGEMENT**.

6.3.1 Telnet Operation via HyperTerminal

There is a disadvantage when using Windows Command-line as a Telnet client. Since Command-line cannot translate a '\r' (i.e., carriage return or "CR") to a '\r\n' (i.e., CR+line feed "LF") for the messages coming from Telnet Server, any multi-line Target-to-Controller response (e.g., the response to the FRW? query) will be displayed as one line, with the latter lines overwriting the previous lines. In order to view the full response messages, Comtech EF Data recommends use of the HyperTerminal terminal emulation program, configured as a Telnet client.

Configure HyperTerminal as follows:

1. Ensure that the connection is made using **TCP/IP (Winsock)** instead of COM1 or COM2, as shown at the near right.

2. ASCII Setup (File → Properties → Settings → ASCII Setup): Check the **"Send line ends with line feeds"** option in the *ASCII Sending* section, and the **"Append line feeds to incoming line ends"** option in the *ASCII Receiving* section, as shown at the far right.
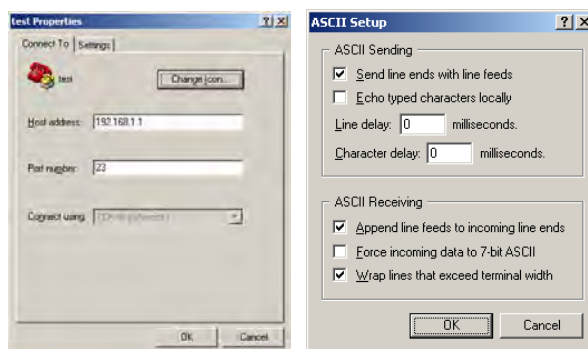
An example of login and remote command/query execution, when using HyperTerminal as the interface, is shown here:
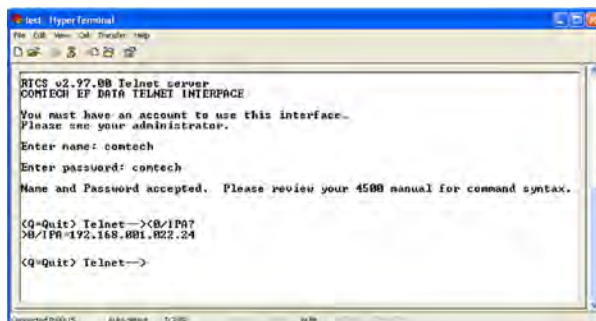
6.4   ISSPA Web Server (HTTP) Interface

A user-supplied web browser allows the full monitor and control (M&C) of the CPA through its ISSPA Web Server Interface. This embedded web application is designed for, and works best with, Microsoft's Internet Explorer Version 5.5 or higher (the examples shown use Internet Explorer Version 9.0).

See **Chapter 5. FRONT PANEL OPERATION** or the Remote Commands Specifications tables found in **Chapter 7. SERIAL-BASED REMOTE PRODUCT MANAGEMENT** for detailed descriptions of many of the functions depicted throughout **Sect. 6.4.5 Web Server Page Descriptions**.

6.4.1   User Login

1. From the PC, type the default IP address for the CPA into the Address area of the browser (this example uses http://192.168.1.4):

2. At the prompt, type in a valid User name and Password, similar to the dialog box shown to the right. For all interfaces, the default for both is **comtech**.

    Type the User name and Password, and then click [OK].
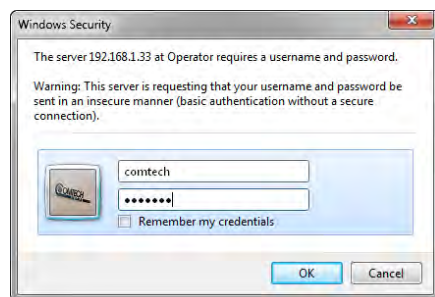
Failure to enter the correct User name and Password will return you to the Login window. Should you continue to specify an invalid User name or Password, the message "You do not have security privilege to access this area." displays. Otherwise, upon entry of the valid IP address and login information ISSPA Web Server Interface "splash" page displays, similar to the example shown here:

6.4.2   ISSPA Web Server Interface Operational Features

6.4.2.1   Navigation

The ISSPA Web Server Interface features navigation tabs located at the top of each page. After you click a navigation tab, you may click an available page hyperlink.

This manual uses a naming format for all Web pages to indicate the depth of navigation needed to view the subject page: "**Top Level Tab | Web page hyperlink**".

For example: "**Home | Support**" is interpreted to mean "*first* click the top-level '**Home**' navigation tab; *then*, click the '**Support**' page hyperlink.

6.4.2.2   Page Sections

Each page features one or more sections. The title at the upper-left corner of each page or page section provides indicates its operational features. Each section can feature editable fields, action buttons, and **read-only** displays that are specific to that section.

This manual explains the purpose and operation for each Web page on a **per-page, per-section** basis.

6.4.2.3   Action Buttons

Action buttons are important in the Web Server Interface. Click an action button to do one of these tasks:
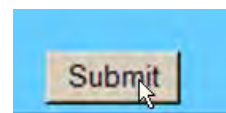
- Reset changed parameters to remove **unsaved** changes.

- Permanently save changes.

- Refresh the page with current data.

> *If you edit a field, make sure to click the action button before you leave the page. If you go to another page without first clicking the action button, your changes are* <u>not</u> *saved.*

6.4.2.4   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.
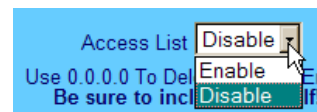
6.4.2.5   Text or Data Entry

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

System Account Access Information
Read Only Name mon
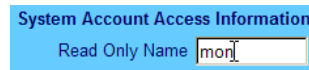
Click the related action button to save the data.

> *If you edit any field, make sure to click the action button before you leave the page. If you go to another page without first clicking the action button, your changes are <u>not</u> saved.*

6.4.3   ISSPA Web Server Interface Menu Tree

The ISSPA Web Server Interface features four navigation tabs (shown in blue) located at the top of each page. Nested page hyperlinks (gray) grant access to individual Web pages.

Home (Sect. 6.4.4.1)	Admin (Sect. 6.4.4.2)	Config (Sect. 6.4.4.3)	Status (Sect. 6.4.4.4)
Home	Access	Amplifier	Events
Support	SNMP	Utility	Status
		Redundancy	FETs

Click any tab or hyperlink to continue.

6.4.4 ISSPA Web Server Interface Page Descriptions

6.4.4.1   Home Pages

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

6.4.4.1.1   Home | Home

Use this page to identify the product and its current operating firmware version. Click the **Home** tab and/or the nested **Home** hyperlink to return to this page from anywhere in the Web Server Interface.
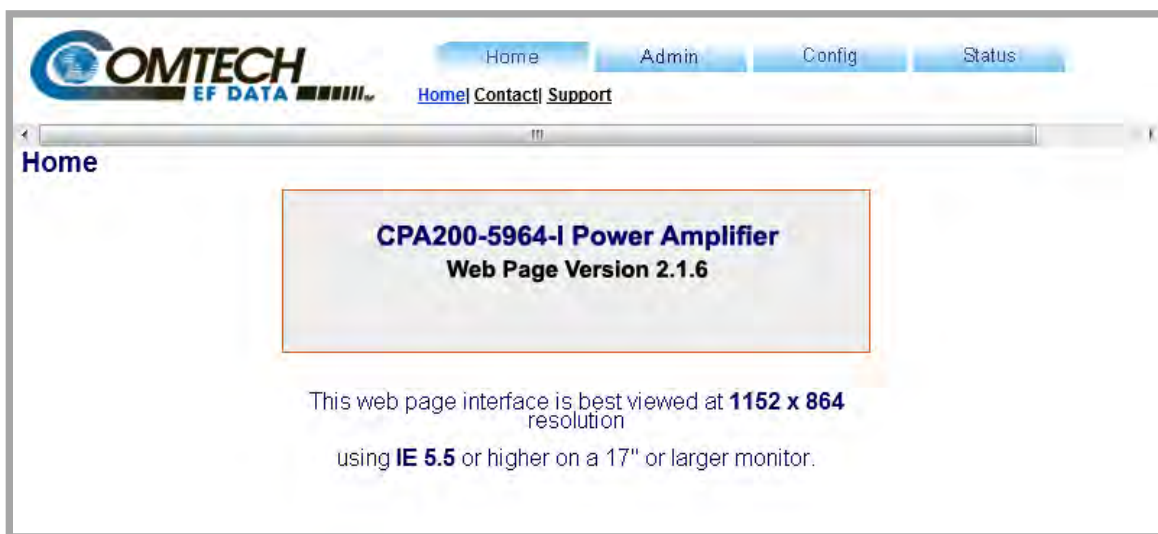
Figure 6-1. Home | Home page

6.4.4.1.2   Home | Contact

Use this page to see the contact information (phone, fax, or Web/e-mail hyperlinks) for
Comtech EF Data Sales or Customer Support.

Figure 6-2. Home | Contact page

6.4.4.1.3   Home | Support

> ⚠️ *For this page to operate correctly, the Administrator must define the SMTP server, domain name, and destination on the* **Admin | Access** *page (see Sect. 6.4.5.2.1).*

This page uses SMTP (Simple Mail Transport Protocol) to compose and send an e-mail message to Comtech EF Customer Support (techsupport@comtechefdata.com). Use this communications portal for questions about or problems with the unit.

Figure 6-3. Home | Support page

Contact Information

Provide your contact information – **Name**, **Company**, **Telephone** and **E-mail** – to Comtech EF Data here.

Problem Report

Use this section to compose the required message of up to a maximum of 256 characters.

After providing your **Contact Information** and composing your message in the **Problem Report** section, click **[Submit Email]** to send the message.

6.4.4.2   Admin Pages

The Administrator must use these pages to set up user access.

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

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

6.4.4.2.1   Admin | Access

The Administrator must use this page to manage the ISSPA Web Server Interface user access settings.

Figure 6-4. Admin | Access page

Click **[Refresh] t**o update the page with its latest operating parameters.

Network Maintenance

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

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

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

System Account Access Information

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

  The factory defaults for these names/passwords are:

  - **Admin**   comtech/comtech

  - **Read/Write**   opcenter/1234

  - **Read Only**   monitor/1234

  Note the following:

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

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

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

- **SMTP Domain Name / Destination** – The Administrator can assign the SMTP Domain Name and Destination. This is required if the e-mail feature of the **Home | Support** page (**Sect. 6.4.5.1.3**) is to be used.

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

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

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

Webpage Timeout

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

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

6.4.4.2.2   Admin | SNMP

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

Figure 6-5. Admin | SNMP page

SNMP

- **Simple Network Management** (Operational Status) **–** Use the drop-down list to select the operational setting as **Enabled** or **Disabled**.

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

    o   The factory default **Read Community String** is *public*.

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

- **Enable Authentication Trap** (Operational Status) **–** Use the drop-down list to select the operational setting as **Enabled** or **Disabled**.

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

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

- **Trap Version –** Use the drop-down list to select the SNMP Trap Version as **SNMPv1** or **SNMPv2c**.

See **Sect. 6.3 SNMP INTERFACE** for details pertaining to the remaining configuration parameters available on this page.

Click [**Submit SNMP]** to save. Otherwise, click **[Reset]** to revert to the previously assigned SNMP designations.

6.4.4.3   Config Pages

Click the **Config** tab, and then select the **Amplifier, Utility**, or **Redundancy** hyperlink to continue.

6.4.4.3.1   Config | Amplifiers

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

Figure 6-6. Config | Converter page

Amplifier

- **Attenuation –** Enter an attenuation value (in dB) between **0.00** and **20.00**.

- **Mute –** Use the drop-down list to select Mute as **On** or **Off**.

- **Amplifier –** Use the drop-down list to select Amplifier operation as **On** or **Off**.

- **Fault Recovery –** Use the drop-down list to select Fault Recovery as **Automatic** or **Manual**.

Click [**Change Configuration]** to save any changes. Otherwise, click **[Reset]** to cancel any changes and restore the previously saved parameters.
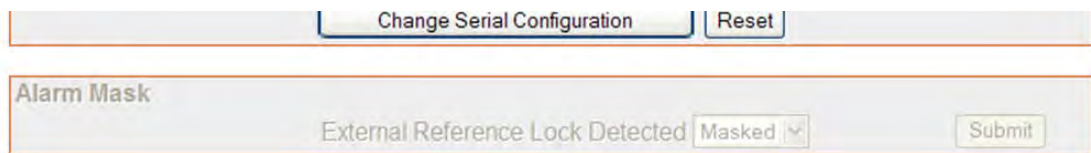
Serial

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

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

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

- **Data bits / Stop Bits / Parity –** Use the drop-down lists to select the asynchronous character format as:

  - 8-N-1 (8 data bits, no parity, 1 stop bit)

  - 7-O-2 (7 data bits, odd parity, 2 stop bits)

  - 7-E-2 (7 data bits, even parity, 2 stop bits).

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

Alarm Mask

Note that, when the External Reference hardware option is not installed, this section is dimmed and non-functional:

Otherwise, when the External Reference hardware option is installed, use the drop-down list to define the **External Reference Lock Detected** alarm as **Masked** or **Active**, and then click **[Submit]** to save.

6.4.4.3.2   Config | Utility

Use this page to configure CPA operating parameters.
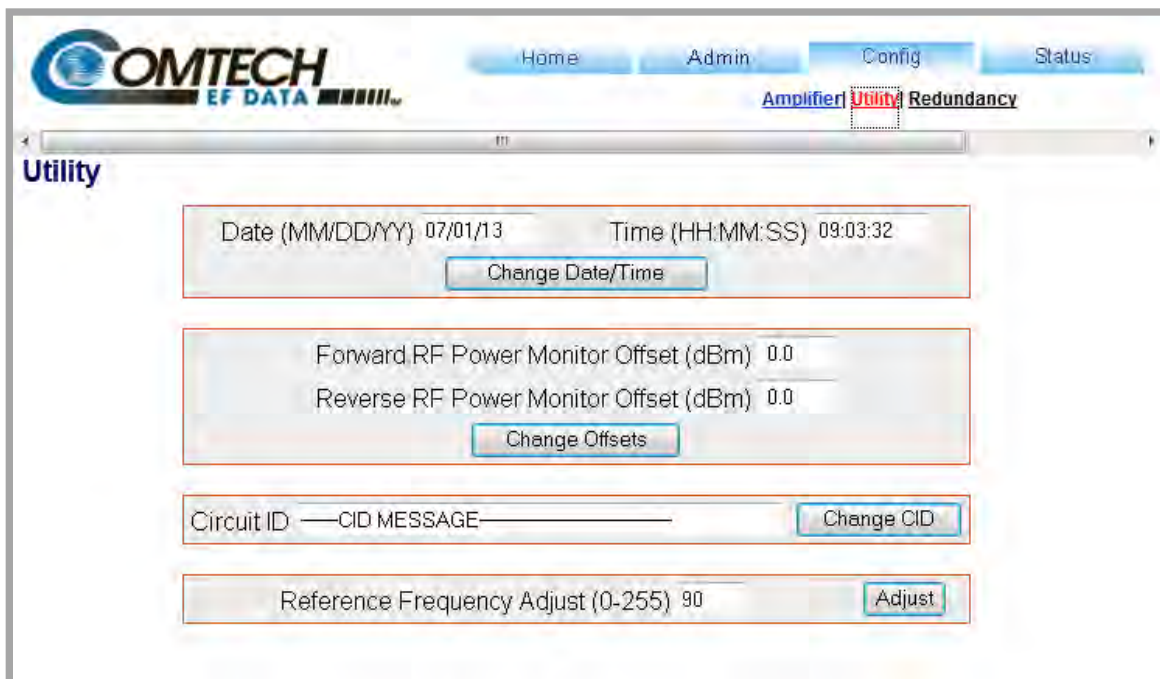
Figure 6-7. Config | Utility page

Click **[Refresh] t**o update the page with its latest operating parameters.

Date

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

Time

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

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

Forward / Reverse RF Power Monitor Offset (dBm)

For either, enter an offset value (in dBm) from **-6.0** to **+6.0**, and then click **[Change Offsets]** to save.

Circuit ID

Enter a Circuit ID string of up to 48 characters, and then click **[Change CID]** to save.

Reference Frequency Adjust (0-255)

> *This section is not available when the External Reference hardware option is not installed.*

Enter an adjustment value from **0** to **255.**, and then click **[Adjust]** to save.

6.4.4.3.3   Config | Redundancy

> *Comtech EF Data SSPAs are designed to automatically sense and configure into Redundancy Mode when the redundant loop cable is connected between the two (i.e., 1:1) or three (i.e., 1:2) SSPAs comprising the redundant subsystem. The designation of each CPA in a redundant subsystem is determined automatically via the redundancy interface cable connected – polling on the dedicated redundancy bus will not begin until the redundancy loop cable is connected.*

Use this page to control the operational parameters for redundant operations. The page identifies the active Redundancy Mode as "**OFF**", **"ON, SSPA Backup Unit, 1:1"** or **"ON, SSPA Backup Unit, 1:2"**, and the appearance of the page itself varies depending on its Operating Mode.
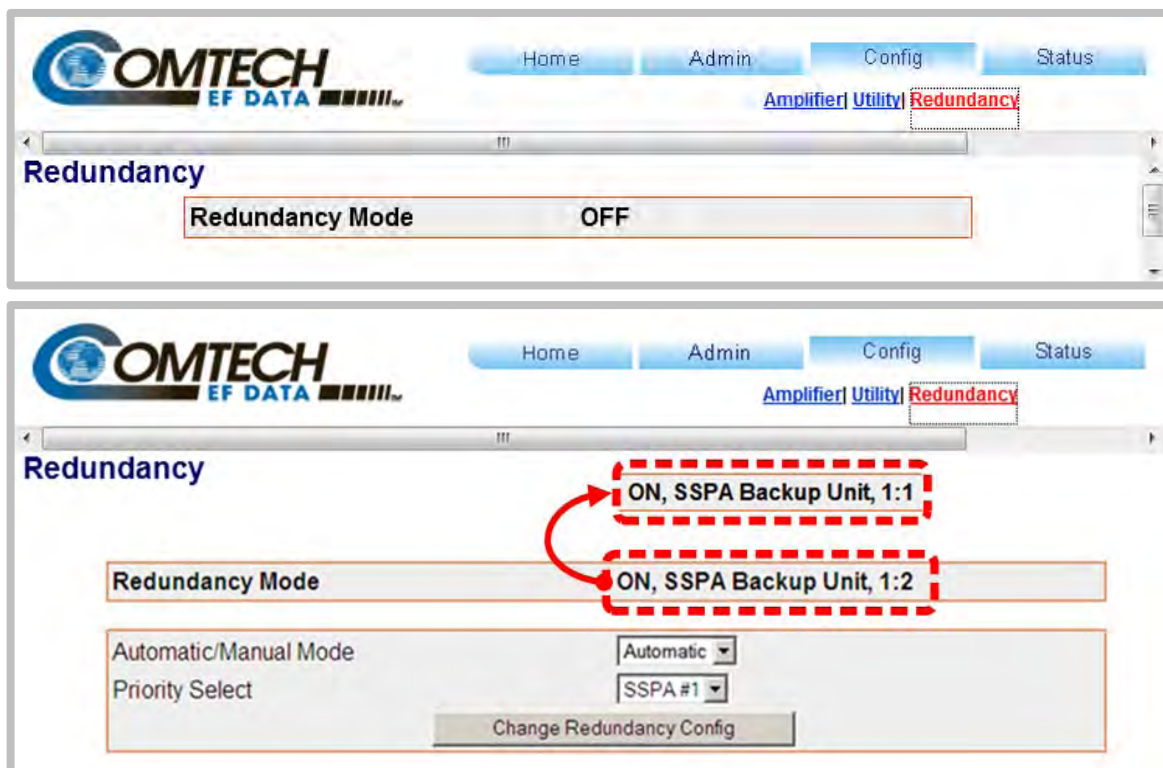
Figure 6-8. Config | Redundancy page

(Top) Page in Standalone Configuration (no redundant units recognized by system)
(Bottom) Page with Automatic Redundancy Mode selected
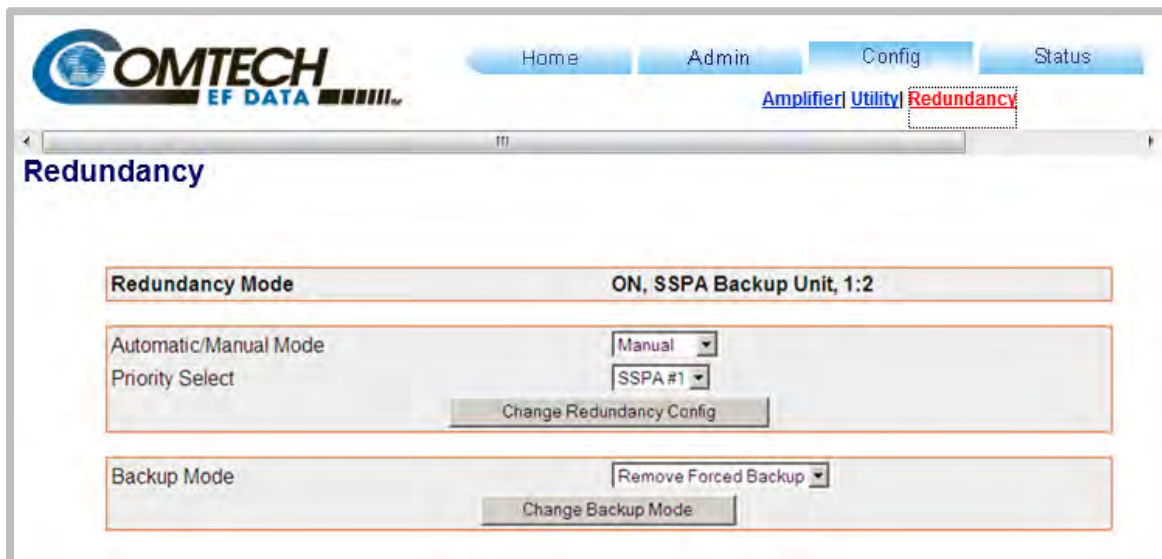
Figure 6-9. Config | Redundancy page (cont.)

Page with Manual Redundancy Mode selected

Redundancy Mode

This *read-only* section provides the following information:

- The active system operating status is identified as **ON** or **OFF.**

> *When OFF, the configuration sections that follow on this page are not accessible*

- The active operating unit – i.e., the Primary SSPA or Backup SSPA – is identified.

- The active redundancy configuration – **1:1** or **1:2** – is identified.

Automatic/Manual Mode (1:1 or 1:2 Redundancy)

Use the drop-down list to select the backup operation mode as **Automatic** or **Manual**.

Priority Select (1:2 Redundancy only)

Use the provided drop-down list to select the desired Backup SSPA as **SSPA#1 or SSPA#2**.
*Note that, for 1:1 configurations, the priority unit number is always fixed as **SSPA#1**.*

Set the desired operating mode and backup priority (1:2 redundancy only), and then click
[Change Redundancy Config] to save these settings.

Backup Mode (1:1 or 1:2 Redundancy, Manual Mode only)

> *When Automatic Mode has been selected as the Operating Mode, this section of
> the Redundancy page is inaccessible.*

Use the drop-down list to force **SSPA#1** or, for 1:2 redundancy only, **SSPA#2** to replace the active operating SSPA as the primary unit.

> ⓘ *For 1:1 configurations, the Backup SSPA is always fixed as* SSPA#1*.*

Select the desired Backup SSPA, and then click **[Change Backup Mode]** to bring the primary unit *OFFLINE* and take the selected Backup SSPA *ONLINE*.

6.4.4.4   Status pages

Use the '**Status**' pages to monitor operations, review and manipulate the stored events, review configuration parameters, etc.

Select the **Events**, **Status**, or **FETs** hyperlink to continue.

6.4.4.4.1   Status | Events

Use this page to monitor the current operating state (i.e., **OK** or *faulted*) of a variety of features, and provides a scrollable stored events window showing the logged system faults and events.

Figure 6-10. Status | Events page

Current Faults

This **read-only** section provides the current operating state of the SSPA. The information provided may vary based on the SSPA's active/optional operating features.

Unread Stored Events:

This header displays the total number of *unread* stored events in the scrollable events window. As stored event groups are displayed, this number adjusts downward accordingly.

- **Read Next Five Events** – Click to buffer the next group of five stored events into the scrollable events window.

- **Clear Events Log** – Click to wipe clean the stored events log.

- **Initialize Events Pointer** – Click to reset the log's internal pointer.

Click **[Submit]** to execute update of this section.

6.4.4.4.2   Status | Status

This **read-only** page:

- Monitors the current operating status of a variety of features;

- Provides identification parameters for the unit itself (e.g., part number, model number, etc.);

- Identifies the currently running firmware (i.e., the software revision, and the individual firmware part numbers, versions, revision letters, and release dates).
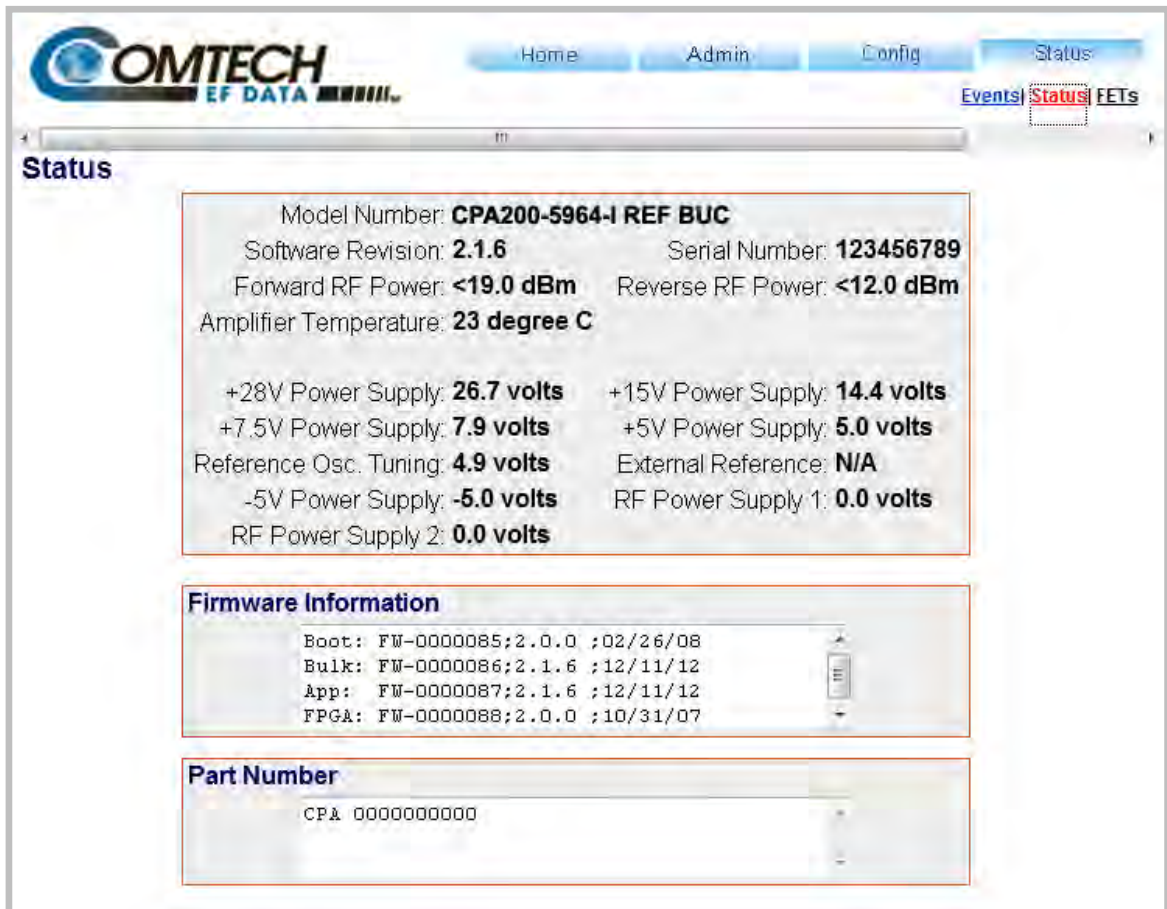
Figure 6-11. Status | Status page

6.4.4.4.3   Status | FETs

Use this *read-only* page to monitor the current operating status of the SSPA's Q01 through Q18 RF Power **F**ield **E**ffect **T**ransistor**s** (FETs).
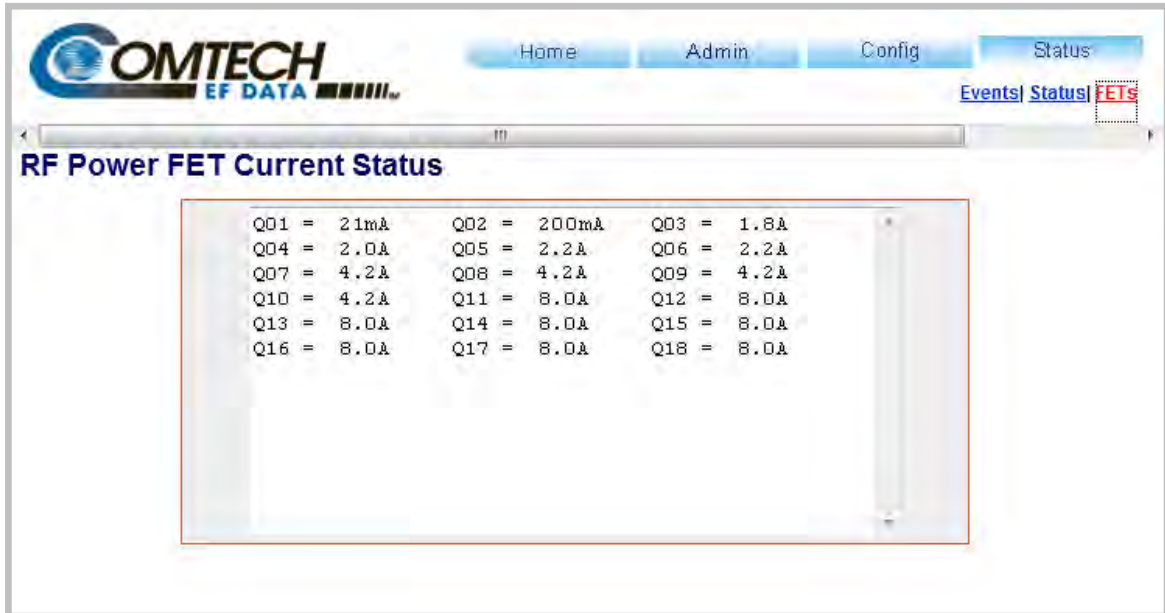
Figure 6-12. Status | FETs page

Note the following:

- **For CPA-050** – RF FET Q01 through Q07.

- **For CPA-100** – RF FET Q01 through Q11.

- **CPA-175/CPA-200** – RF FET Q01 through Q18.

Notes:

Notes:

Chapter 7. SERIAL-BASED REMOTE PRODUCT MANAGEMENT

7.1   Overview

The serial-based remote product management interface for the CPA C-Band ISSPA consists of 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 later sections.

The default port is EIA-485 (4-wire); selection is made via the front panel **CONFIG: Remote → Serial → Interface** menu. See **Chapter 5. FRONT PANEL OPERATION** for further information.

7.2   EIA-485

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

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

In the other direction, on the other pair each Target has a tri-state line driver connected, 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, the address of the intended recipient Target is included in a framed 'packet' of data.

All of the Targets receive the packet, but only one (the intended) will reply. The Target enables its output line driver and transmits its return data packet back to the Controller in the other direction, on the physically separate pair.

EIA-485 (full duplex) summary:

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

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

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

7.3   Basic Protocol

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

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

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

All messages from Controller-to-Target require a response (with one exception). This will be either to return data that has been requested by the Controller, or to acknowledge reception of an instruction to change the configuration of the Target. The exception to this is when the Controller broadcasts a message (such as Set Time/Date) using Address 0, when the Target is set to EIA-485 mode.

7.4   Packet Structure

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

Example: <0412/MUT=1{CR}

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

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

If it is an error message or an old remote command, ']' will show at the end.
Example: >1?ATT_INVALID PARAMETER'cr''lf']

7.4.1 Start of Packet

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

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

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message. The only exceptions are in command RMS and CMS where the response is "FWPWR=<19.0".

7.4.2 Target Address

Up to 9,999 devices can be uniquely addressed. In EIA-485 applications, the permissible range of values is 1 to 9999. It is programmed into a target unit using the remote control port.

> *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.*

7.4.3 Address Delimiter

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

7.4.4 Instruction Code

This is a three-character alphabetic sequence that identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance. This aids in the readability of the message if seen in its raw ASCII form. Both upper and lower case alphabetic characters may be used (A-Z ASCII codes 65-90 and a-z ASCII codes 97-122).

7.4.5 Instruction Code Qualifier

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

1. *From Controller-to-Target*, the only permitted values are:

Symbol	Definition
= (ASCII code 61)	The = code is used as the assignment operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. Example: In a message from Controller to Target, MUT=1 would mean 'enable the mute function.'
? (ASCII code 63)	The ? (ASCII code 63) is used as the query operator, and is used to indicate that the Target should return the current value of the parameter defined by the preceding byte. Example: In a message from Controller to Target, MUT? would mean 'return the current state of the mute function.'

2. ***From Target-to-Controller***, the only permitted value is:

Symbol	Definition
= (ASCII code 61)	The = code is used in two ways: First, if the controller has sent a query code to a target (for example MUT?, meaning 'is mute enable or disable?'), the target would respond with MUT=x, where x represents the state in question: 1 being 'enable' and 0 being disable. Second, if the controller sends an instruction to set a parameter to a particular value, then, providing the value sent in the argument is valid, the target will acknowledge the message by replying with MUT= (with no message arguments).

3. The SSPA will display the following error messages:

```
>DEV?COM_COMMAND UNRECOGNIZED'cr''lf']
>DEV?COM_INVALID PARAMETER'cr''lf']
>DEV?COM_DEVICE IN LOCAL MODE'cr''lf']
>DEV?COM_DEVICE IN AUTO MODE'cr''lf']
>DEV?COM_COMMAND NOT AVAILABLE'cr''lf']
>DEV?COM_DEVICE IS NOT IN SERIAL MODE'cr''lf']
>DEV?COM_DEVICE IS NOT IN ETHERNET MODE'cr''lf']
```

7.4.6 Optional Message Arguments

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

7.4.7 End of Packet

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

- **Target-to-Controller:** This is the two-character sequence 'Carriage Return', 'Line Feed' (ASCII codes 13 and 10). Both indicate the valid termination of a packet.

For the error message or the old remote command, it is the three-character sequence 'Carriage Return', 'Line Feed', ']' (ASCII codes 13, 10, and 93). All indicate the valid termination of a packet.

7.5   Remote Control Commands and Queries

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

Instr Code	C	Q	Page	Instr Code	C	Q	Page
AFR	X	X	7-7	PNM		X	7-11
AMP	X	X	7-7	PRI	X	X	7-11
ATT	X	X	7-7	RAS		X	7-11
CAE	X		7-7	RBT	X		7-11
CAS		X	7-7	RCS		X	7-12
CFS		X	7-7	RED		X	7-12
CID	X	X	7-8	REF	X	X	7-12
CMS		X	7-8	RET		X	7-12
DAT	X	X	7-8	RFS		X	7-13
DAY	X	X	7-8	RMS		X	7-13
ESW	X	X	7-8	RNE		X	7-14
FBU	X	X	7-9	SBR	X	X	7-14
FRW		X	7-9	SNO		X	7-14
GAC	X	X	7-9	SPA	X	X	7-15
IEP	X		7-9	TIM	X	X	7-15
IPA	X	X	7-9	TMP		X	7-15
IPG	X	X	7-9	TPE	X	X	7-15
LCD	X	X	7-10	TPS	X	X	7-15
LRS	X	X	7-10				
MAC		X	7-10				
MSK	X	X	7-10				
MUT	X	X	7-10				
NUE		X	7-10				

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
Auto Fault Recovery	AFR=	1 byte, value of 0, 1	Command or Query. The SSPA output will automatically be muted in the event of detected fault. If auto fault recovery is enabled, it will cause the output to go active (un-mute) if all faults are cleared. If disabled, the output will remain muted even if all faults are cleared.	AFR?	AFR=x (same format as command arguments)
RF Power Amplifier State	AMP=	1 byte, value of 0, 1	Command or Query. Turns ON or OFF the RF power amplifiers. 0 = Off 1 = On **Example:** AMP=1	AMP?	AMP=x (same format as command arguments)
Attenuation	ATT=	5 bytes, numerical	Command or Query. Valid attenuation level, in dB, at 0.25-dB step size as factory default. **Example:** ATT=12.25	ATT?	ATT=xx.xx (same format as command arguments)
Clear All Stored Events	CAE=	None	Command only. Instructs the SSPA to clear all Stored Events This command takes no arguments. **Example:** <1/CAE='cr'	N/A	N/A
Concise Alarm Status	N/A	variable length, alpha numerical	Query only. Used to Query the Alarm status of the unit. **Example:** <0001/CAS? >0001/CAS=a;b;c;d;e;f;g;h;i;j;k;l;m;n;o;'cr''lf' where: 0 = OK, 1 = Fault, 3 = Not Applicable, 4 = Alarm, 5 = Masked a = 28V Power Supply b = 15V Power Supply c = 7.5V Power Supply d = 5V Power Supply e = -5V Power Supply f = 9V or 10V RF Power Supply 1 g = 9V or 10V RF Power Supply 2 h = Heat-Sink Temperature 1 i = Heat-Sink Temperature 2 j = Isolator Load Temperature k = Shutdown l = Fan 1 m = Fan 2 n = BUC o = External Reference	CAS?	CAS=x....x (see Description of Arguments)
Concise RF Power FET Current Status	N/A	variable length	Query only. Concise version of RFS. **Example:** CFS=xx.x;xx.x;xx.x;xx.x;..........;xx.x;	CFS?	CFS=x.....x (see description of RFS. Note that each argument is separated by a semicolon)

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
Circuit Identification	CID=	48 bytes, alphanumeric	Command or Query. Used to identify or name the unit or station. First line is limited to 24 characters. Second line is also limited to 24 characters. No carriage return between first line and second line. **Example:** CID='cr' --Earth Station 1— ---Converter #1----	CID?	CID=x…x (see Description of Arguments)
Concise Maintenance Status	N/A	variable length, alpha numerical	Query only. Query the Maintenance status of the unit in concise format. Response is semicolon delimited. **Example:** <0001/CMS? >0001/CMS=aa.a;bb.b;c.c;d.d;ee.e;ff.f;gg.g;hhh.h;iii.i;jjj.j;kkk.k;lll.l;mmm.m where, aa.a = 28V Power Supply bb.b = 15V Power Supply c.c = 7.5V Power Supply d.d = +5V Power Supply ee.e = -5V Power Supply ff.f = 9V or 10V RF Power Supply 1 gg.g = 9V or 10V RF Power Supply 2 hhh.h = Unit temperature 1 in deg. C iii.i = Unit temperature 2 in deg. C jjj.j = Isolator Load Temperature kkk.k = Forward RF output power, in dBm lll.l = Reverse RF output power, in dBm mmm.m = Ref. Osc. Tuning voltage If it is not applicable, it will display x.x	CMS?	CMS=x….x (see Description of Arguments)
Set RTC(Real-Time-Clock) Date US format	DAT=	6 bytes, numerical	Command or Query. A command in the form mmddyy, where; dd = day of the month, between 01 and 31, mm = month of the year, between 01 and 12 and yy = year, between 00 and 99 (2000 to 2099) **Example** (date = April 25, 2003): <0001/DAT=042503'cr' >0001/DAT='cr''lf'	DAT?	DAT=xxxxxx (same format as command arguments)
Set RTC(Real-Time-Clock) Date	DAY=	6 bytes, numerical	Command or Query. A command in the form ddmmyy, where; dd = day of the month, between 01 and 31, mm = month of the year, between 01 and 12 and yy = year, between 00 and 99 (2000 to 2099) **Example** (date = April 25, 2003): <0001/DAY=250403'cr' >0001/DAY='cr''lf'	DAY?	DAY=xxxxxx (same format as command arguments)
Enable Redundancy Switch Mode	ESW=	1 byte, value of 0, 1, 2	Command or Query (backup unit only). Turns ON or OFF the redundancy state, where: 0 = Off (Manual Mode) 1 = 1:1 Redundancy (Auto Mode) 2 = 1:2 Redundancy (Auto Mode) **Example:** <1/ESW=1'cr' >0001/ESW='cr''lf'	ESW?	ESW=x

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
Force Back-Up State	FBU=	1 byte, value of 0, 1, 2	Command or Query (backup unit only). When ESW is off, force one of the online units to be a back-up for maintenance and test purposes, where: 0 – no force back-up 1 – force SSPA 1 to go offline 2 – force SSPA 2 to go offline	FBU?	FBU=x (see description)
Retrieve Firmware Number	N/A	variable length, alpha numerical	Query only. Gets the Firmware Number of the unit. Example: >0001/FRW= Boot: FW-0000085;2.0.0a;02/21/08 Bulk: FW-0000086;2.0.0a;02/21/08 FW-0000087;2.0.0a;02/21/08 FW-0000088;2.0.0a;02/21/08	FRW?	(see Description of Arguments)
Global Amplifier Configuration	GAC=	variable length, alpha numerical	Command or Query. Used to set up and query the global status of the amplifier. Example: GAC=aa.aabcdef'cr' where: aa.aa = Customer Attenuation (ATT) b = RF power amplifier state (AMP) c = mute state (MUT) d = online status (RED) e = redundancy mode (ESW) f = Auto Fault Recovery (AFR) NOTE: If it is not applicable, it will display x.	GAC?	GAC=x….x (see Description of Arguments)
Initialize Events Pointer	IEP=	None	Command only. Resets internal pointer to allow RNE? Queries to start at the beginning of the stored events log. Example: IEP=	N/A	N/A
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseTx Ethernet management port, in the format xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (8..30) Example: IPA=010.006.030.001.24	IPA?	IPA= xxx.xxx.xxx.xxx.yy
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP address for the 10/100 Base Tx Ethernet management port, in the format xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address Example: IPG = 010.006.030.001	IPG?	IPG = xxx.xxx.xxx.xxx

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
Front Panel LCD Brightness	LCD=	2 bytes 00 to 30	Command or Query. Front Panel LCD Brightness 00 to 09 : LCD Brightness 25% 10 to 19 : LCD Brightness 50% 20 to 29: LCD Brightness 75% 30: LCD Brightness 100% **Example:** LCD=30	LCD?	LCD=xx
Local/Remote State	LRS=	1 byte, value of 0, 1, 2	Command or Query. Set Remote Entry Mode. 0 = Local, 1=Serial, 2=Ethernet **Example:** LRS=1 **NOTE:** The customer will always have query access when using serial and telnet. Also, the LRS command is available in all modes as a means of acquiring control. The intent of this command is to limit changes from being made on multiple interfaces at the same time.	LRS?	LRS=x (see Description of Arguments)
Unit MAC Address	N/A	17 bytes	Query only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=00-06-B0-00-D2-A7	MAC?	MAC=AA-BB-CC-DD-EE-FF
Unit Alarm Mask	MSK=	1 byte, Value of 0, 1, 2	Command or Query. Alarm mask conditions. If an alarm is masked, neither an alarm or a fault is set, and the user will not know of a problem. Form of a, where: 0 = Alarm, 1 = Fault, 2 = Masked a = External Reference Lock detect The default value is 2 There could be a variable delay in the time it takes for the internal reference to lock to an external reference, due warm-up characteristics and frequency differences between the references. Therefore, the default setting is "masked" for the reference lock detect. This setting may be changed if the customer so desires. The delay should be less than 1 s after 30 minutes of warm-up time.	MSK?	MSK=a (see Description of Arguments)
Mute State	MUT=	1 byte, value of 0,1	Command or Query. Mute the unit, where: 0 = Disabled, 1 = Enabled **Example:** MUT=1	MUT?	MUT=x (same format as command arguments)
Number of Unread stored Events	N/A	3 bytes, numerical	Query only. Returns the number of Stored Events which remain unread, in the form xxx. **Example reply:** NUE=018	NUE?	NUE=xxx (see Description of Arguments)

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
Part Number	N/A	Various 1-96 bytes, alpha-numeric	Query only. Returns the Comtech EF Data part number of the unit. This part number is the unit's DOTCODE at the time it was manufactured. The DOTCODE may be up to 96 printable ASCII characters long. **Example:** <1/PNM?'cr' 　　　　　　　>0001/PNM=HPODC0.350WRSW00'cr''lf'	PNM?	PNM=x....x (see Description of Arguments for return string)
Priority Select	PRI=	1 byte, value of 1, 2	Command or Query (backup unit only). This command allows the user to assign priority when operating in a 1:2 redundant subsystem. This command provides arbitration in the event that both primary SSPAs are faulted simultaneously. **Example:** PRI=1	PRI?	PRI=x (same format as command arguments)
Retrieve Alarm Status	N/A	variable length, alpha numerical	Query only. Used to Query the Alarm status of the unit. **Example:**　<0001/RAS? 　　　　　　　>0001/RAS= 　　　　　　　+28=FT 　　　　　　　+15=OK 　　　　　　　+7.5=OK 　　　　　　　+5=OK 　　　　　　　-5=OK 　　　　　　　RF_PS1=OK 　　　　　　　RF_PS2=xx 　　　　　　　TEMP1=OK 　　　　　　　TEMP2=xx 　　　　　　　LTEMP=xx 　　　　　　　SHTD=OK 　　　　　　　FAN1=OK 　　　　　　　FAN2=OK 　　　　　　　BUCLD=OK 　　　　　　　XRFLD=OK 　　　　　　　TRMST=YS If it is not applicable, it will display xx. FT – fault　AL – alarm　MS – masked　YS – yes	RAS?	RAS=x....x (see Description of Arguments)
Reboot	RBT=	1 byte	Command only. Soft Reboot 1 = Reboot System **Example:** RBT=1	N/A	N/A

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)

Retrieve Configuration Status	N/A	variable length, alpha numerical	Query only.
			
			Used to Query the configuration status of the unit.
			Example: RCS='cr'
			      ATT=10.00
			      AMP=1
			      MUT=0
			      RED=1
			      ESW=0
			      AFR=1
			      XRF=N/A
			
			NOTES:
			XRF = External reference status, where:
			  N/A = no external reference
			  05M = 5 MHz
			  10M = 10 MHz
			  XRF will always be N/A if the internal reference oscillator option is not installed.
			If a parameter it is not applicable, it will display x. **Example:** ESW=x
				RCS?	RCS=x....x
					(see Description of Arguments)

Online Status	N/A	1 byte, value of 0, 1	Query only. Online status (applies only to redundancy), where: 0 = Offline 1 = Online **Example:** <0001/RED?'cr' >0001/RED=1'cr''lf'	RED?	RED=x
Reference Oscillator Adjust	REF=	3 bytes, numerical	Command or Query. Ref Osc Adjust, between 000 and 255. Resolution 001. (Optional installation) **Example:** REF=087 Note: REF cannot be adjusted when the unit is locked to an external reference source.	REF?	REF=x (same format as command arguments)
Retrieve Equipment Type	N/A	variable length, alphanumerical	Query only. The unit returns a string indicated the Model Number and the value of internal software revision installed. **Example:** RET=AR1481457-80 REF BUC VER: 2.1.3	RET?	RET=x....x (see Description of Arguments)

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
FET Current status	N/A	variable length	Query only. Used to display all the FET currents. Q01 and Q02 are in mA. All other FETs are in Amps. If it is not applicable, it will display xx.x. **Example:** RFS? Q01=xx.x'cr' Q02=xx.x'cr' Q03=xx.x'cr' Q04=xx.x'cr' … Q32=xx.x'cr' Q33=xx.x'cr' Q34=xx.x'cr''lf'	RFS?	RFS=x….x (see Description of Arguments)
Retrieve Maintenance Status	N/A	variable length, alpha numerical	Query only. Used to query the maintenance status of the unit. **Example:** <0001/RMS? >0001/RMS= V+28=+27.8 V+15=+15.0 V+7.5=+7.8 V+5=+5.0 V-5=-5.0 RF_PS1=09.9 RF_PS2=10.0 TEMP1=+09.0 TEMP2=-10.0 LTEMP=+10.0 FWPWR=029.0 RVPWR=<12.0 REFVT=+04.3 If it is not applicable, it will display xx.x – **Example:** TEMP2=xxx.x	RMS?	RMS=x….x (see Description of Arguments)

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
Retrieve Next 5 unread stored Events	N/A	variable length	Query only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control. Reply format: {CR}Subbody{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Subbody, where Sub-body= ABCddmmyyhhmmss, A being the fault/clear indicator. F=Fault C=Clear I=Info B being the fault type where: 1=Unit 2=RF 3=Log C is Fault Code 0=+5V Power Supply 1=+7.5V Power Supply 2=+15V Power Supply 3=Reserved 4=Reserverd 5=RF Power Supply 1 6=RF Power Supply 2 7=Fan #1 8=Fan #2 9=BUC LD A=External Reference B=Over Temperature C=Temp Shutdown D=+28V Power Supply E=-5V Power Supply If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is >DEV?RNE_COMMAND NOT AVAILABLE'cr''lf'] RNE?	RNE?	RNE={CR}ABCddmmyy hhmmss{CR}ABCddmm yyhhmmss{CR}ABCdd mmyyhhmmss{CR}ABC ddmmyyhhmmss{CR}A BCddmmyyhhmmss (see Description of Arguments)
Remote Baud Rate	SBR=	4 bytes, alpha-numeric	Command or Query. Set remote baud rate as follows: 2400 = 2400 baud 4800 = 4800 baud 9600 = 9600 baud 19K2 = 19200 baud 38K4 = 38400 baud	SBR?	SBR=xxxx (same format as command arguments)
Serial Number	N/A	9 bytes, numerical 000000000 to 999999999	Query only. Used to Query the units 9 digit serial number. Slave returns its S/N, in the form xxxxxxxxx. **Example:** SNO=000000165	SNO?	SNO=xxxxxxxxx (see Description of Arguments)

Parameter Type	Command (Instr Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes, i.e., ASCII codes between 48 and 57)	Query (Instr Code and Qualifier)	Response to Query (Target to controller)
Remote Address	SPA=	4 byte, numerical	Command or Query. Set Physical Address-between 0001 to 9999. Resolution 0001 **Example:** SPA=0412	SPA?	SPA=xxxx (same format as command arguments)
Set RTC Time	TIM=	6 bytes, numerical	Command or Query. A command in the form hhmmss, indicating the time from midnight, where hh = hours, between 00 and 23; mm = minutes, between 00 and 59, and ss = seconds, between 00 and 59 **Example:** TIM=231259 would be 23 hours, 12 minutes and 59 seconds from midnight.	TIM?	TIM=xxxxxx (same format as command arguments)
Temperature	N/A	4 bytes	Query Only. Returns the temperatures of the heat sink in the form of a sign byte followed by 3 bytes for the temperature. **Example:** TMP=+26.0	TMP?	TMP=sxxx (see Description of Arguments)
Time Protocol Enable	TPE=	1 byte	Command or Query. Used to enable or disable the Time Protocol, where: 0 = Time protocol disabled 1 = Time protocol enabled **Example:** TPE=1 (Time protocol enabled)	TPE?	TPE=x (see Description of Arguments)
Time Protocol Server	TPS=	15 bytes	Command or Query. Used to set the Time Server IP address for the Unit Tx Ethernet management port, in the format: xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the Time server IP address **Example:** TPS=192.168.001.005	TPS?	TPS= xx.xxx.xxx.xxx.yy (see Description of Arguments)

Notes:

Appendix A. MAINTENANCE AND TROUBLESHOOTING

A.1 Introduction

This Installation and Operation Manual organizes information about the CPA C-Band Indoor Solid State Power Amplifier (ISSPA) operational features and overall functionality as follows:

For information about:	See:
ISSPA operation, including block diagrams, functional descriptions, summary of specifications, dimensional envelopes	Chapter 1. INTRODUCTION
Initial installation and setup of ISSPA in Standalone configurations	Chapter 2. INSTALLATION
ISSPA external user interfaces	Chapter 3. CONNECTORS and PINOUTS
Updating ISSPA operational firmware	Chapter 4. UPDATING FIRMWARE
M&C (Monitor and Control) using the ISSPA Front Panel	Chapter 5. FRONT PANEL OPERATION
M&C using the ISSPA Web Server Interface	Chapter 6. ETHERNET-BASED REMOTE PRODUCT MANAGEMENT
M&C using the ISSPA Serial Remote Control Interface	Chapter 7. SERIAL-BASED REMOTE PRODUCT MANAGEMENT
Maintenance and Troubleshooting Tips	This appendix (Appendix A)
Installation, setup, and operation of the ISSPA in 1:1 and 1:2 Redundant Operations	Appendix B. ISSPA REDUNDANT OPERATIONS

A.2   Maintenance Testing

The CPA ISSPA operates over the RF input frequency range of 5.845 to 6.425 GHz and has an RF output level of +53.0 dBm (minimum) at 1 dB compression.

A.2.1   Test Point Samples

The RF input and output can be monitored at the front panel's RF Sample Test Points (Type 'N' Input and Output connectors are provided). The sample RF input level is –20 dBc nominal, and the RF output level is –40 dBc nominal. Actual measured data for these sample ports is located on the front panel.

A.3   Troubleshooting

Operating problems can be identified by first observing the STATUS LED indicators on the CPA front panel. When a fault condition is indicated, the specific fault or faults can be further investigated by viewing the information provided via the front panel or, where applicable, the Web Server Interface:

- **From the front panel** – Review the pertinent **SELECT: MONITOR → Faults** submenus; further information can be obtained by viewing the stored events logs using the **SELECT: MONITOR → Stored → View** menu.

  Chapter 5. FRONT PANEL OPERATION

- **From the ISSPA Web Server Interface** – Select the '**Status | Events**' page.

  Sect. 6.4.4.4.1 in **Chapter 6. ETHERNET-BASED REMOTE PRODUCT MANAGEMENT**

You should also check the status of the mute condition, either by using the front panel **SELECT: CONFIG → Amp → Mute** menu, or viewing the Web Server Interface's '**Config | Amplifier**' page (i.e., 'Mute = On' means that the amplifier will be muted).

A.3.1   Troubleshooting Guide

Issue	Possible Cause(s)	Solution(s)
Unit does not turn on (No front panel display, no front panel LEDs lit, no fans)	1. Check power cord connections. 2. Faulty wiring to 28V power supply. 3. 28V power supply fault.	1. Ensure power cord is connected. 2. With input power cord disconnected, check wiring and connections to 28V power supply. Reconnect power cord. 3. Check output of 28 VDC power supply. Remove and replace 28V power supply.
Fan(s) do not turn On.	Faulty wiring or bad connections.	At power-up, the fans are sequenced on. In normal operation, the second fan does not turn on until 3 seconds (approximately) after the first fan: 1. Check AS/0206 PCB to ensure connections at P4 and P5 are not loose. 2. Check cable connection at the fans. There should be 24 VDC (approximately) between the two pins at the fan. 3. Check cable wiring if faulty or return to factory for repair.
	Firmware not properly seated.	Fans are microprocessor controlled and monitored: 1. Ensure U11 and U12 on AS/0200 are properly seated. 2. Remove and replace AS/0200 PCB if damaged.
	Faulty 28V power supply.	Check the output voltage of the 28V power supply: 1. Either via the front panel SELECT: Monitor → PS menu, Web Server Interface 'Status	Status' page, or by using a voltmeter. 2. Ensure that 28V is present.
	Failed fan or faulty control circuitry.	Fan defective: 1. Replace fan. 2. Return to factory for repair re replacement.
Display not turning on, missing text, or incorrect backlighting.	1. Firmware not properly seated. 2. Faulty wiring or bad connections. 3. Failed display or display control card. 4. Circuitry on AS/0200 or AS/0206 PCB.	1. Ensure U11 and U12 on AS/0200 are properly seated. 2. Ensure good cable connections from M&C cards AS/0200 and AS/0206 to display card located behind front panel. Check cable wiring and if required return cables to factory. 3. Return to factory for repair. 4. Return to factory for repair.

Issue	Possible Cause(s)	Solution(s)
No RF output or ≤ output level.	1. Mute function activated. 2. Amplification = Off feature activated. 3. Large customer attenuation values selected. 4. Input power level not correct. 5. Faulty input connections from 9V supplies. 6. Fault SSPA control cable or connection.	1. Check the Configuration menu to determine if mute function has been activated. Mute = On Means that the unit is muted. Turn Mute feature to Off to allow RF amplification of the input signal. 2. The Amplification = Off feature allows for lower current draw from the prime power source under standby conditions. To obtain RF output, ensure that this feature is set to Amplification = On. 3. Check the Attenuation = XX setting in the Configuration menu. Lower value to get more gain. 4. Use the input sample port on the front panel to determine that the input power level is as specified. Remove and replace the input cable. 5. Use the Monitor menu to check the internal level of the PS1 and PS2. The levels should be near 9V. If not correct, use a voltmeter to measure the voltage where the #8 wires enter the amplifier unit. With Unit Off, tighten connections if necessary. 6. Check the 25-pin ribbon cable connection at the amplifier module and at AS/0200 PCB. Tighten as necessary.
Failed SSPA amplifier module.	This can usually be determined by using the Monitor menu to check the DC current levels being drawn by each transistor inside the amplifier module. Any transistor (QX) current that is 50% more or less than normal would probably indicate a failure.	Nominal Values: Q1 = 20mA Q2 = 100 mA Q3, Q4 = 1.0 A Q5, Q6, Q7 = 2.0 A Q8 to Q18 = 2.25 A There are no user serviceable parts inside the amplifier module. Return to factory for repair.
No remote control communication	1. Incorrect cable connections. 2. Improper communication settings between ISSPA and controlling terminal. 3. Entry mode of unit set to LOCAL.	1. Ensure cable is connected properly. 2. Check settings of ISSPA along with remote control terminal software. 3. Change entry mode setting in Configuration menu to Remote.

Issue	Possible Cause(s)	Solution(s)
Amplifier Temperature Fault	1. Operating temperature limits exceeded. 2. Air intake or air exhaust paths obstructed. 3. Fan failed. 4. Defective transistors in amplifier module.	1. Do not exceed 50°C (122°F) ambient input air temperature. 2. Remove obstructions to ensure adequate air flow and proper amplifier cooling. 3. Check fan operation. Remove and replace fan(s) as required. 4. Use Monitor menu to check transistor currents. Compare readings with the specified nominal values. Report excessive readings to the manufacturer for repair. *There are no user serviceable parts inside the SSPA amplifier module.*
	Note: The SSPA amplifier module contains an internal temperature monitor that will shut off the unit (i.e. turn off the 9V supplies) if the heat sink temperature becomes excessive. This prevents the overheating and destruction of the transistors. After cooling down below the trip point, the unit will automatically restart.	
9V power supply fault (PS1 and/or PS2)	1. Faulty wire or connection. 2. Excessive current draw from transistor inside amplifier module. 3. Faulty power supply.	1. Check cable and connections from PS1 and PS2 to amplifier module. On outside of module, measure voltage. Reading should be = 9.0 ± 0.5 VDC. 2. Use Monitor menu to check transistor currents. Record excessive values and return entire unit to manufacturer for repair. 3. Return failed power supply for repair. Replace with the new power supply.

Faulty/Improper Redundancy Switch Operation	1. Faulty wiring or connections.
	2. Improper settings.
		1. Ensure that the RF and control cables are connected. Poor RF performances would tend to indicate a faulty SSPA cable/connector.
		  a. Improper switch control would indicate a problem with the control cables.
		  b. Ensure the ends of the cables labeled backup are connected to the backup unit.
		2. Check redundancy setup in Configuration menu.

Notes:

Appendix B. ISSPA REDUNDANT OPERATIONS

B.1   Introduction

> *Comtech EF Data's CPA ISSPAs are designed to automatically sense and configure into Redundancy Mode when the redundant loop cable is connected. Polling on the dedicated redundancy bus will not begin until the redundancy loop cable is connected. Each ISSPA's designation in a redundant subsystem is determined automatically via the redundancy interface cable connected between the two (i.e., 1:1) or three (i.e., 1:2) ISSPAs in the redundant configuration.*

All Comtech EF Data CPA ISSPAs are designed to operate in both standalone and redundant configurations. The ISSPA has the ability to automatically detect whether it is in a standalone or redundancy system. This feature greatly simplifies redundancy configurations from both the cost and operational complexity standpoints.

Every ISSPA contains the circuitry and logic necessary to perform all the functions of a backup controller for either a 1:1 or a 1:2 configuration. This includes the ability to monitor and control up to two RF waveguide switch assemblies.

In a redundant configuration, the Backup SSPA in the redundancy subsystem automatically monitors the configuration and status for each of the Primary (chained) ISSPAs. This information is communicated via the dedicated serial interface between the ISSPAs.

If a Primary SSPA fails, the backup detects this event and automatically reconfigures itself to the proper attenuation setting, and positions the waveguide switch to provide minimal loss of traffic.
A result of this design is to greatly lessen the throughput requirements (i.e., the polling rate) of earth station monitor and control systems. The Backup SSPA handles all of the time-critical tasks, allowing the earth station monitor and control system to focus on less intelligent subsystems.

B.2   Redundancy Kit Installation

> *Redundancy kits are available for 1:2 configurations and provide all required cabling and switches. Because each kit is typically designed to a customer's unique specifications,* **Figure B-4** *and* **Figure B-6** *are provided for the purpose of example only. Contact Comtech EF Data Customer Support for 1:2 Redundancy Kits and their pertinent installation diagrams and assembly instructions.*

Comtech EF Data's CPA ISSPAs are easily configured for optional redundant operation by using an optional redundancy kit. Each kit includes all the necessary control, semi-rigid, and waveguide cabling, and the appropriate waveguide/coax switches and terminations.

B.2.1   Redundancy Kit Component Assembly

> 1. *The configuration of the dual Waveguide Coax Switch requires that the uppermost ISSPA always serves as the "Backup" unit.*
>
> 2. *A gasket must be installed between each waveguide interface. If both waveguide surfaces are grooved, use a thick gasket. If only one surface is grooved, use a thin gasket.*

The Primary and Backup SSPAs are typically installed adjacent to one another in a standard 19-inch (480 mm) wide equipment rack. **Figure B-1** and **Figure B-2** show typical 1:1 redundant system assemblies. **Figure B-3** shows an exploded assembly detail, and its associated parts list is provided in **Table B-1**.

Perform the installation as follows:

| Step	Task
1	Assemble the waveguide load and bend to the proper port of the switch.
2	Attach the rigid lower waveguide arm, using the supplied screws. The switch should be installed with "Port 1" facing outward.
3	The upper Waveguide (flexible arm) along with the isolator bracket should be installed next.
4	Complete the installation by attaching the coaxial cables, coaxial load, and control cables.
5	Note that the installation of the control cables determines which unit functions as the Backup SSPA. Due to the nature of the dual WG-coax switch, this is always the upper unit. Therefore, the end of the redundant loop cable (Item 40, Figure B-3) labeled "BU SSPA," should be connected to 'J4	REDUNDANT LOOP' of the upper (Backup) unit.
6	The appropriate end of the control cable attaching to the Waveguide Switch (Item 50, Figure B-3) should also be attached to the Backup Unit at the 'J7	RF SWITCH' connector.
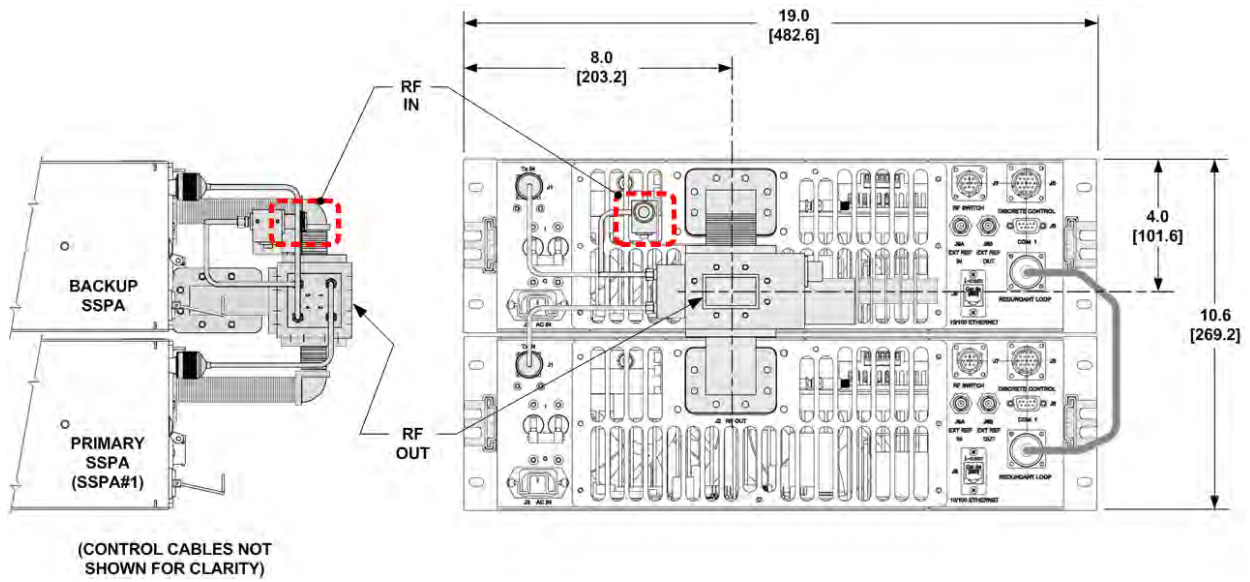
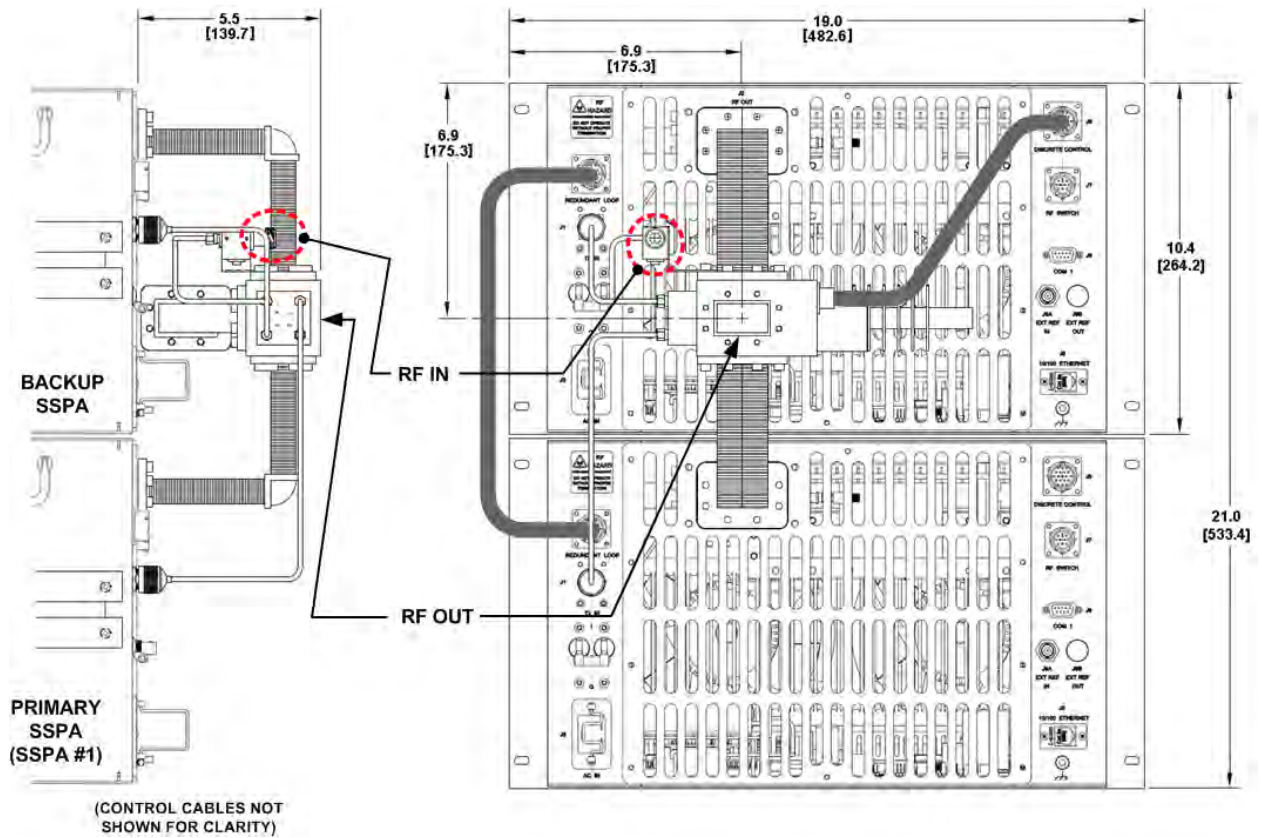**Figure B-1. CPA-050 1:1 Redundancy Installation Example**

Figure B-2. CPA-175/CPA-200 1:1 Redundancy Installation Example

Table B-1. ISSPA 1:1 Redundancy Kit Parts List (CEFD P/N AS/0348)

ITEM	QTY	CEFD P/N	Description
10	1	CA/RF0086	Cable, SW P3 to Upper J1
20	1	CA/RF0044	Cable, SW P4 to Isolator
30	1	CA/RF0087	Cable, SW P1 to Lower J1
40	1	CA/WR0006	Cable, Redundant Loop
50	1	CA/WR0007	Cable, Waveguide Switch to B-UP J7
60	1	CN/CX2001-6501-00	Connector, OSM, SMS, Plug Termination
70	1	FP/BR0029	Bracket, Mounting, Isolator
80	1	FP/WG0014	Waveguide, Elbow, 90°
90	1	FP/WG0034	Waveguide, Termination
100	1	FP/WG0035	Waveguide, Lower, 90°
110	1	FP/WG0036	Waveguide, Upper, 90°
120	7	GA/GSKTCP137FUL	Gasket, CPR137, Full THK
130	2	HW/02LOCK	#2 Lock Washer, SS
140	56	HW/1032X1/2SHCS	Screw, 10-32 x 1/2 SHCS, SS
150	56	HW/10LOCK	#10 Lock Washer, SS
160	2	HW/256X3/16PHMS	Screw, 2-56 x 3/16, PHMS, SS
170	1	RF/ISHF094-037665	RF-ISO N F/SMA-M 5.9-6.4G
180	1	SW/WG-3SAG	WR137 Waveguide/SMA Switch
190	AR	XX/P-SUPER O-LUBE	Parker Super, O-Lube, 2 oz (apply to each item 120)

Kits providing the cabling and switches for a 1:2 redundant configuration are available, but are usually designed to a particular customer's specifications.
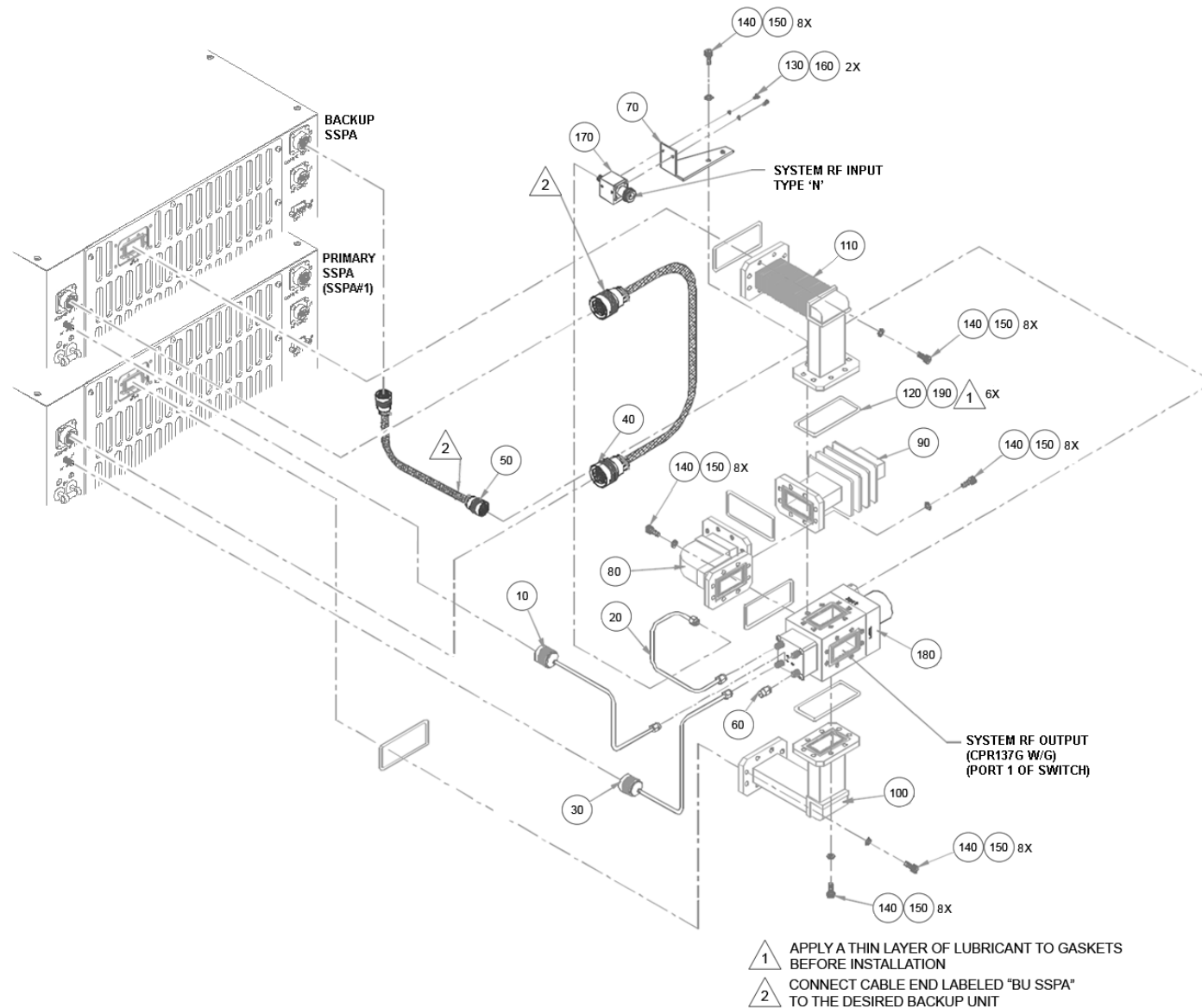
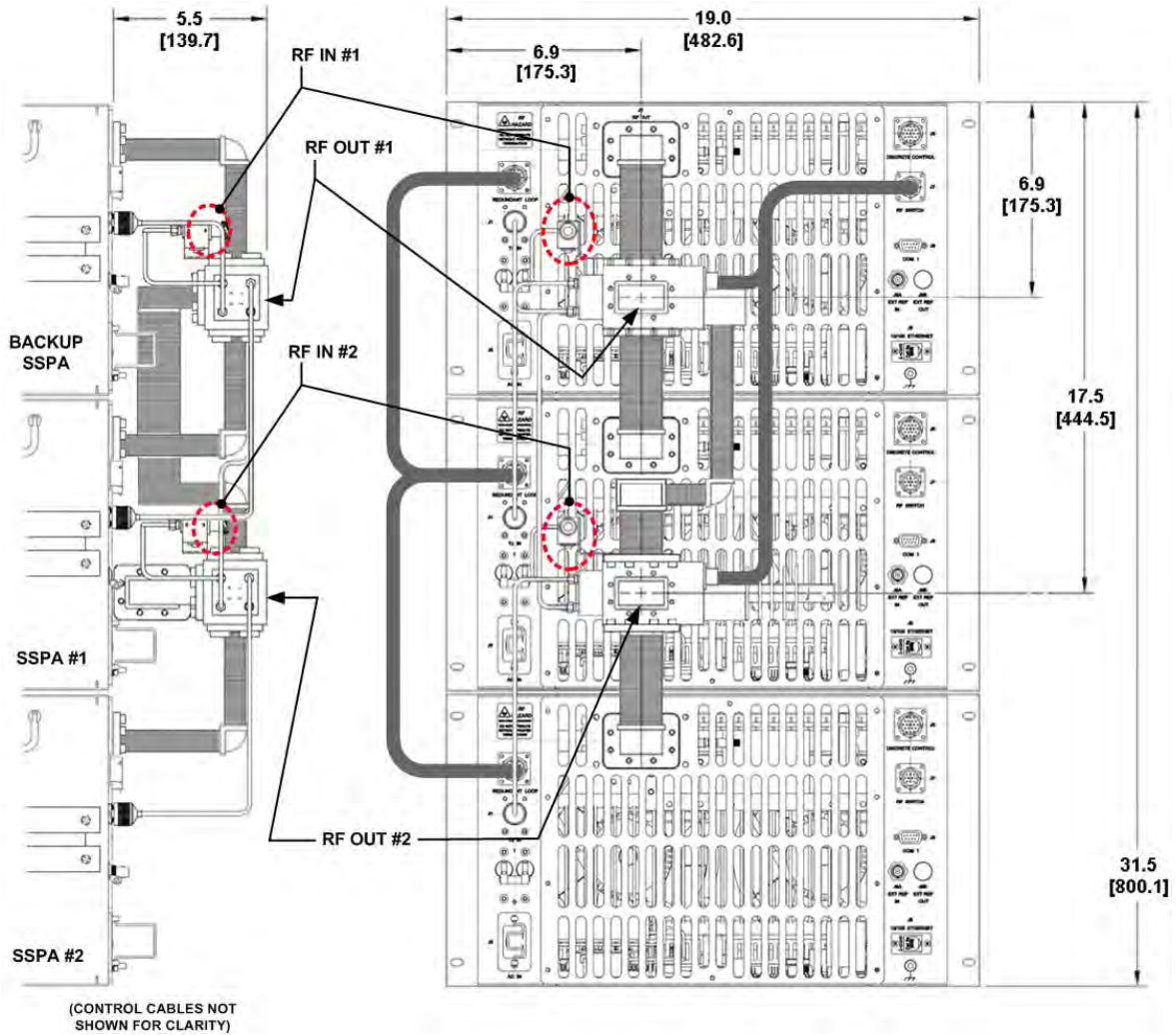**Figure B-3. ISSPA 1:1 Redundancy Kit Assembly – Exploded View (CEFD P/N AS/0348)**

Figure B-4. CPA-175/CPA-200 1:2 Redundancy Installation Example

B.2.2　　Redundancy Kit Control Cabling

For either a 1:1 or a 1:2 redundant system, two control cable assemblies are required for setup as shown in the **Figure B-5** cabling schematics. Other RF coaxial cables and waveguides are required as listed in **Table B-1** and shown in **Figure B-3**.
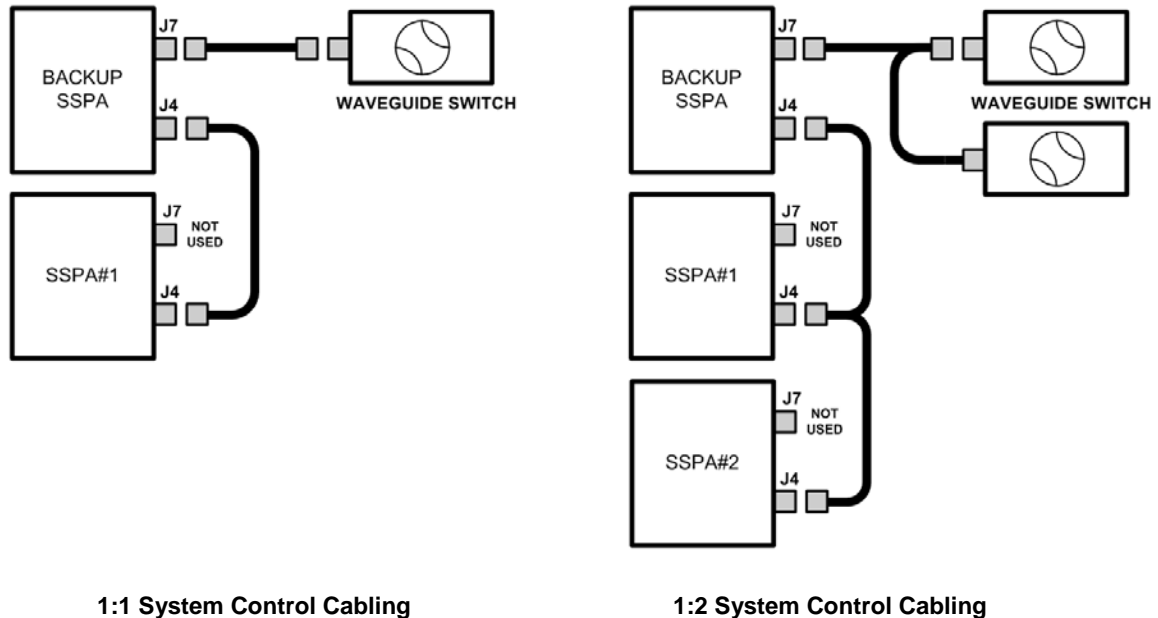
| 1:1 System Control Cabling | 1:2 System Control Cabling |

Figure B-5. ISSPA Redundancy System – Control Cabling Schematics

The redundant loop cable, used for interconnection of the ISSPAs via their '**J4 | REDUNDANT LOOP**' connectors, has the following characteristics:

- The cable assembly is not a "straight through" cable.

- The cable assembly is labeled "**BACKUP**" on one end, and "**SSPA#1**" on the other end.

- The cable assembly is wired so that, when connected to two ISSPAs, one ISSPA will automatically configure itself as the Backup Controller and the other ISSPA will automatically configure itself as the 'PRIMARY SSPA'.

- The 'BACKUP SSPA' communicates to the 'PRIMARY SSPA' via a serial interface that is also provided by this cable assembly. The Backup SSPA uses this interface to acquire configuration information from SSPA #1. This interface additionally provides the link for virtual addressing as described in this manual in **Chapter 7. SERIAL-BASED REMOTE PRODUCT MANAGEMENT**.

- Summary fault relay contacts, which are used by the Backup SSPA as an input to its switching logic, are also included in this cable assembly.

For 1:2 redundancy systems, note that the functionality described for the 1:1 cable assembly also applies to the 1:2 cable assembly; as shown in **Figure B-5** and **Figure B-6**, the only difference is that there is now a third connector, labeled "**SSPA#2**", daisy-chained onto the cable assembly. When a third Comtech EF Data ISSPA is connected via this cable assembly, it automatically configures itself as 'PRIMARY SSPA #2.'

A second six-wire cable assembly connects the Backup Unit's '**J7 | RF SWITCH'** connector to the Waveguide Switch.


Figure B-6. ISSPA 1:2 Redundancy Installation – Control Cabling Example

B.3   Redundancy Operation

Figure B-7 shows the typical block diagrams for 1:1 and 1:2 redundant systems. Regardless of which redundancy system is deployed, note the following:

Normal Operation	Incoming RF signals are routed through the Primary online ISSPA (for 1:1 systems), or ISSPA(s) (for 1:2 systems) to the system output(s) by the combination waveguide/coax switch(es).
Controller Mode	With the Backup SSPA in the controller mode, it monitors the Online Unit(s) for faults.
Fault	When a fault occurs in an Online Unit, the Backup SSPA automatically configures itself with the settings of the faulted Online Unit. (These now-active settings have also incorporated any user-defined offsets that may have been programmed into the Backup Unit.)
Waveguide	The position of the waveguide/coax switch also changes automatically to route the signal through the Backup Unit, thereby minimizing the loss of traffic.
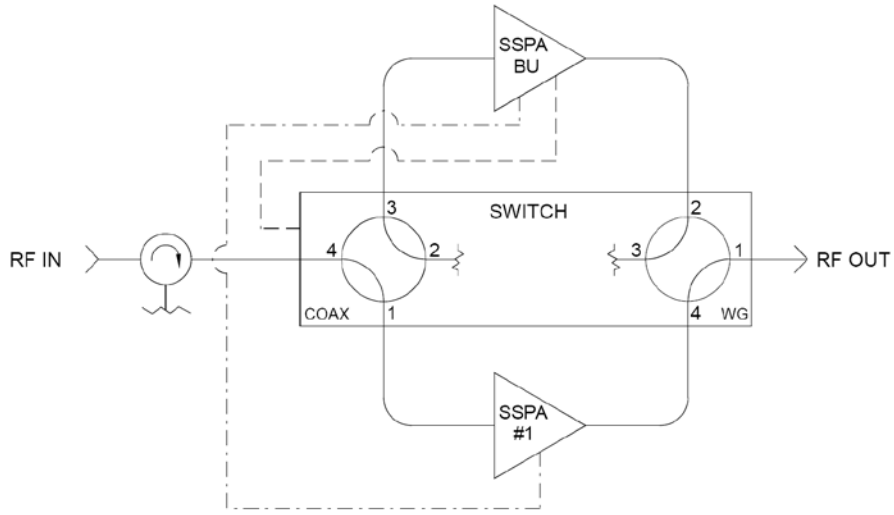
1:1 Redundancy Block Diagram
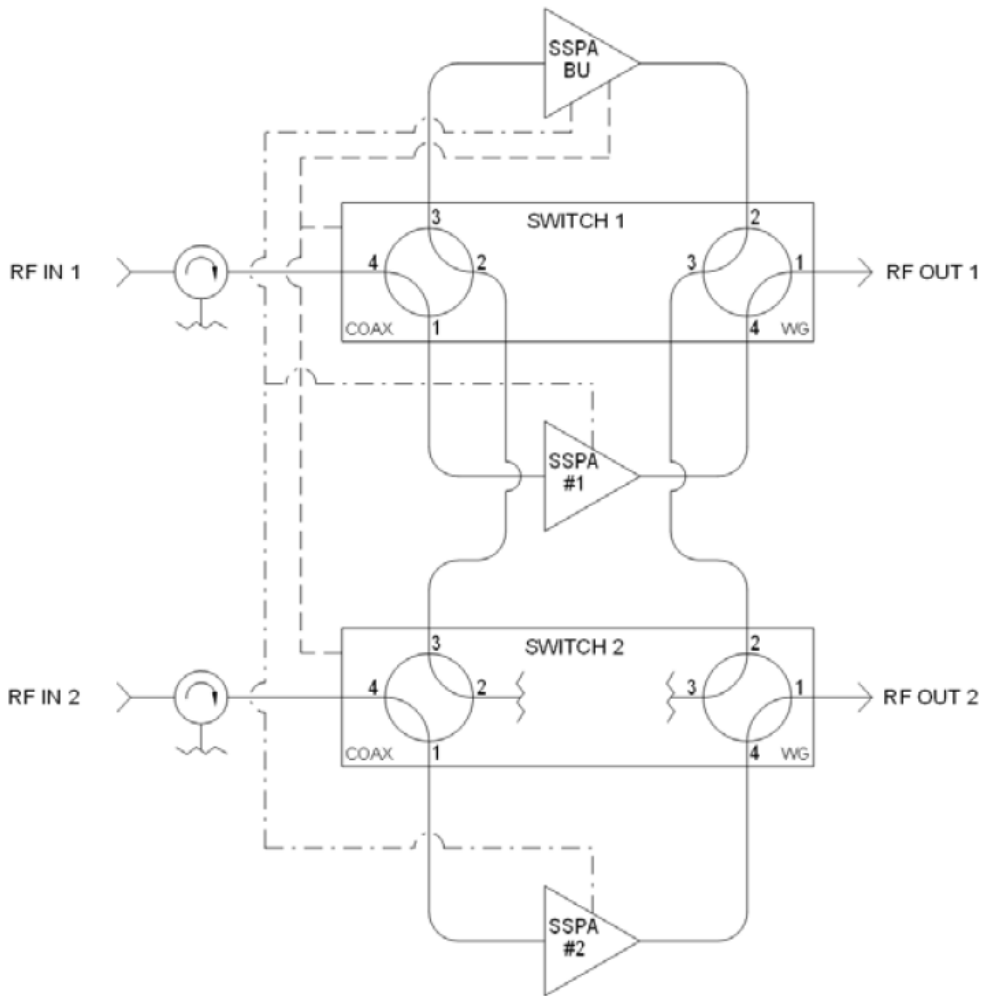
1:2 Redundancy Block Diagram

Figure B-7. ISSPA Redundancy Block Diagrams

B.4   Gain Equalization of Redundant Units

Chapter 5. FRONT PANEL OPERATION

To equalize the gain between the Backup Unit and the Online Unit(s), Gain Offset adjustment is accomplished via the Backup Unit.

Before continuing, make sure that:

1. *All external interface connections have been completed as outlined in Sect. B.2, and*

2. *The Online Unit is <u>online and transmitting</u> – this can be verified by observing the Online Unit's front panel LEDs, and through the pertinent configuration menus.*

To determine the relative gain of the Backup Unit *versus* the Online unit(s):

Step	Task
1	Apply an RF signal to the RF redundancy input isolator. Monitor the output power level at the waveguide switch output. (Make sure not to apply too large of an input signal which will saturate the amplifiers. Also be sure to have a properly rated load to measure the output power.)
2	Adjust the input signal power level and attenuation of the Online Unit to arrive at the desired output power level.
3	Record the output level of the Online Unit in dBm.
4	Force the Backup Unit to be the active path as outlined in the CONFIG: menu. Ensure the Offset Value at this point is 0.0 dBm. Record the output level in dBm of the Backup Unit.
5	If the output levels are equal, no more adjustment is necessary. Otherwise proceed as follows.

B.4.1   Case Examples

Case 1. Backup ← Online unit(s)

1. Ensure the <u>Online Unit</u> attenuation is set to a value in dB greater than or equal to (≥) the difference in levels measured above.

2. With the Backup Unit forced to be the *active* unit, adjust the OFFSET value in the **CONFIG: Redundancy → SSPA#1** menu to approximately the difference measured previously. This will be a <u>negative</u> (-) number.

3. Toggle between the Online and Backup units as being the active path by forcing and un-forcing a backup through the Backup Unit's **CONFIG: Redundancy → SSPA#1** menu. Ensure the output levels measured are equal. If necessary, re-adjust the Offset Value until equal levels are measured. (Note that the Backup Unit's total attenuation level as now indicated in the **CONFIG: Amp → Attenuation** menu will be equal to the setting of the Online Unit <u>less</u> the OFFSET value.)

For Example:	Online Unit Output Level	47.00 dBm
	Backup Unit Output Level	45.25 dBm
	Backup Unit Offset Value	0.00 dBm
	Online Attenuation Setting	3.00 dB (must be >1.75 dB)

AFTER TOGGLING AND ADJUSTING:	
Backup Offset Value	-1.75 dB
New Equalized Output Level	47.0 dBm
Backup Attenuation Setting	1.25 dB (3+(-1.75) = 1.25)

Case 2. Backup → Online unit(s)

1. With the Backup Unit forced to be the active unit, adjust the Offset Value in the **CONFIG: Redundancy** menu to roughly the difference measured previously. This will be a <u>positive</u> (+) number.

2. Toggle between the online and Backup Units as being the active path by forcing and un-forcing a backup through the Backup Unit's **CONFIG: Redundancy → SSPA#1** menu. Make sure the output levels measured are equal. If necessary, re-adjust the Offset Value until equal levels are measured. (Note that the Backup Unit's total attenuation level as now indicated in the **CONFIG: Amp → Attenuation** menu will be equal to the setting of the Online Unit <u>plus</u> the Offset Value.)

For Example:

Online Unit Output Level	47.00 dBm
Backup Unit Output Level	48.75 dBm
Backup Unit Offset Value	0.00 dBm
Online Attenuation Setting	3.00 dB

AFTER TOGGLING AND ADJUSTING:	
Backup Offset Value	+1.75 dB
New Equalized Output Level	47.00 dBm
Backup Attenuation Setting	4.75 dB (3+(+1.75) = 4.75)

Notes:

METRIC CONVERSIONS

Units of Length

Unit	Millimeter	Centimeter	Inch	Foot	Yard	Meter	Kilometer	Mile
1 millimeter	1	0.1	0.0394	0.0033	0.0011	0.001	1×10^{-6}	6.214×10^{-7}
1 centimeter	10	1	0.3937	0.0328	0.0109	0.01	1×10^{-5}	6.214×10^{-6}
1 inch	25.4	2.54	1	0.0833	0.0278	0.0254	2.54×10^{-5}	1.578×10^{-5}
1 foot	304.8	30.48	12	1	0.3333	0.3048	3.048×10^{-4}	1.894×10^{-4}
1 yard	914.4	91.44	36	3	1	0.9144	9.144×10^{-4}	5.682×10^{-4}
1 meter	1000	100	39.37	3.2808	1.0936	1	0.001	6.214×10^{-4}
1 kilometer	1×10^{6}	1×10^{5}	3.938×10^{4}	3.281	1093	1000	1	0.6214
1 mile	1.609×10^{6}	1.609×10^{5}	6.336×10^{4}	5280	1760	1609	1.609	1

Temperature Conversions

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

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

Units of Weight

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