CRS-500

1:N Redundancy System
Installation and Operation Manual

Accessory product for use only with Comtech EF Data
CDM-625, CDM-625A, CDM-750, and CDM-760 Modems
(Modem Firmware and Hardware Requirements Apply)

Part Number MN-CRS-500
Revision 4

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

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Revision History

Rev	Date	Description
-	Unknown	Initial Release.
2	Unknown	Various updates.
3	9-2016	Updated documentation for CDM-625A and CDM-760 operation; incorporated Errata.
4	2-2018	Replaced CRS-282xx ISUs to CRS-280/280L and associated information related to ISU change.

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Acronym List

Acronym	Description
AC	Alternating Current
CnC	Carrier-in-Carrier
CSU	Control Switch Unit
DC	Direct Current
DSU	Data Switch Unit
EMC	Electromagnetic Compatibility
ERM	Electromagnetic Compatibility and Radio Spectrum Matters
GigE	Gigabit Ethernet
ISU	IF Switch Unit
LED	Light Emitting Diode
M&C	Monitor and Control
MCA	Monitor & Control Address
MIB	Management Information Base
NMS	Network Management System
OID	Object Identifiers
OUS	Offline Unit Status
PSU	Power Supply Unit
R&TTE	Radio Equipment & Telecommunications Terminal Equipment
RCA	Remote Control Address
RMI	Redundant Modem Interface
SNMP	Simple Network Management System
TMI	Traffic Modem Interface
VFD	Video Fluorescent Display

PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data CRS-500 1:N Redundancy System. This is an informational document intended for the persons responsible for the operation and maintenance of the CRS-500.

Related Documents

- Comtech EF Data CDM-625 Advanced Satellite Modem Installation and Operation Manual (CEFD P/N MN-CDM625)
- Comtech EF Data CDM-625A Advanced Satellite Modem Installation and Operation Manual (CEFD P/N MN-CDM625A)
- Comtech EF Data CDM-750 Advanced High Speed Trunking Modem Installation and Operation Manual (CEFD P/N MN-CDM750)
- Comtech EF Data CDM-760 Advanced High Speed Trunking Modem Installation and Operation Manual (CEFD P/N MN-CDM760)
- Comtech EF Data CRS-280/280L Installation and Operation Manual (CEFD P/N MN-CRS-280/280L)

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.

- DoubleTalk® is licensed from "Raytheon Applied Signal Technology".
- DoubleTalk® is a registered trademark of "Raytheon Applied Signal Technology".
- Carrier-in-Carrier® is a registered trademark of Comtech EF Data.

Warnings, Cautions, Notes, and References

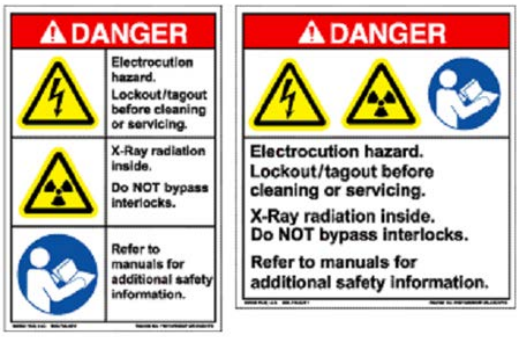
A **WARNING** indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

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

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

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

Examples of Multi-Hazard Notices



Recommended Standard Designations

The Electronic Industries Association (EIA) designations supersede the Recommended Standard (RS) designations. References to the old designations may be shown when depicting actual text (e.g., RS-232) displayed on front panel menus, Web Server pages, serial remote interfaces, Telnet Command Line Interfaces (CLIs), or component rear panels. All other references in the manual refer to EIA designations.

CAUTION

You should carefully review the following information.

Safety and Compliance

Electrical Safety and Compliance

This equipment is rated for operation over the range of 90 to 264 Volts AC (VAC), or 38 to 60 Volts DC (VDC). It has a maximum power consumption of <90 Watts. The system complies with the **EN 60950 Safety of Information Technology Equipment (Including Electrical Business Machines)** safety standard.

Electrical Installation

CAUTION

Connect the system to a power system that has separate ground, line and neutral conductors. Do not connect the system without a direct connection to ground.

Class I Pluggable Equipment Type A-Protective Earthing

The cable distribution system/telecommunication network of this product relies on protective earthing and the integrity of the protective earthing must be ensured

In Finland:

"Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan"

In Norway:

“Apparatet må tilkoples jordet stikkontakt”

In Sweden:

“Apparaten skall anslutas till jordat uttag”

Galvanic Isolator Use

Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i visa fall medföra risk för brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet.

Restricted Access Location

In Nordic Countries, equipotential bonding should be applied using the permanently connected ground stud by a qualified service person

Battery Warning

CAUTION

Risk of explosion if battery is replaced by an incorrect type.Dispose of used batteries according to the instructions.

Fuses

CAUTION

For continued operator safety, always replace fuses with the correct type and rating. Fusing for the CRS-500 1:N Redundancy System's Control Switch Unit (CSU) is as follows:

The AC-powered CSU is fitted with two fuses – one is for line connections, one is a spare. They are contained within the body of the IEC power inlet connector, inside a press-fit fuse holder:

For 230 Volts AC operation, use T2.5A 20mm fuses (contact Comtech EF Data Product Support for part ordering information).

For 115 Volt AC operation, use T2.0A slow-blow fuses (P/N 5ASB-IEC).

The DC-powered CSU is fitted with two fuses – one each for positive and negative connections. They are contained within the body of the power inlet connector, inside a press-fit fuse holder:

For 38 to 60 Volt DC operation, use T2.0A mm fuses.

Operating Environment

CAUTION

DO NOT OPERATE THE SYSTEM IN ANY OF THESE EXTREME OPERATING CONDITIONS:

AMBIENT TEMPERATURES LESS THAN 0° C (32° F) OR MORE THAN 50° C (122° F).

PRECIPITATION, CONDENSATION, OR HUMID ATMOSPHERES OF MORE THAN 95% RELATIVE HUMIDITY.

UNPRESSURIZED ALTITUDES OF MORE THAN 2000 METRES (6561.7 FEET).

EXCESSIVE DUST.

FLAMMABLE GASES.

CORROSIVE OR EXPLOSIVE ATMOSPHERES.

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

Independent testing verifies that the system complies with the European Union R&TTE Directive, its reference to EN 301 489-1 (***E**lectromagnetic compatibility and **R**adio spectrum **M**atters [ERM]; **E**lectro**M**agnetic **C**ompatibility [EMC] standard for radio equipment and services, Part 1: Common technical requirements)*, and the Declarations of Conformity for the applicable directives, standards, and practices that follow:

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

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

CAUTION

TO ENSURE THAT THE SYSTEM CABING COMPLIES WITH THESE STANDARDS, OBEY THESE INSTRUCTIONS:

- **Use coaxial cable that is of good quality for connections to the L-Band Type 'N' Rx (receive) female connector.**
- **Use Type 'D' connectors that have back-shells with continuous metallic shielding. Type 'D' cabling must have a continuous outer shield (either foil or braid, or both). The shield must be bonded to the back-shell.**
- **Operate the system with component covers on at all times.**

European Union Low Voltage Directive (LVD) (2006/95/EC)

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

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

For additional symbols, refer to Warnings, Cautions, Notes and References listed earlier in this Preface.

European Union RoHS Directive (2002/95/EC)

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

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

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

CE Mark

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

Product Support

For all product support, please call:
+1.240.243.1880
+1.866.472.3963 (toll free USA)
By email:
techsupport@comtechefdata.com

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Tempe, Arizona USA 85281
+1.480.333.2200

Warranty Policy

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

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

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

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

Limitations of Warranty

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

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

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

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

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

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

Exclusive Remedies

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

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

Notes:

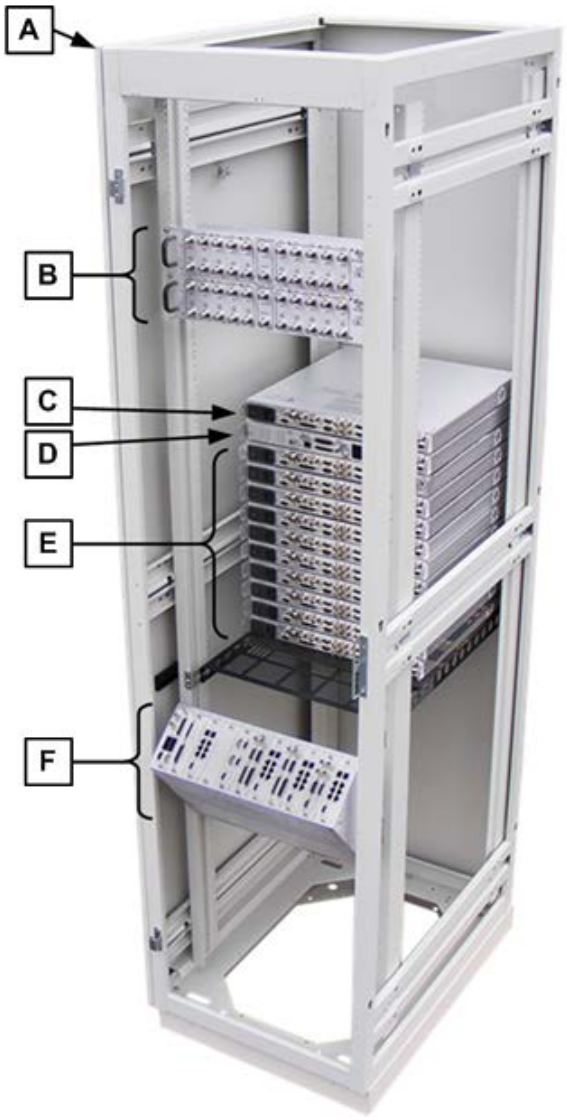
Chapter 1. INTRODUCTION

1.1 Overview

The CRS-500 1:N Redundancy Switch is an accessory product designed specifically for use with the Comtech EF Data CDM-625/625A Advanced Satellite Modems or the CDM-750 or CDM-760 Advanced High Speed Trunking Modems. Do not use this product with any other equipment.

The CRS-500 is Comtech EF Data's next generation 1:N Redundancy System. The modular CRS-500 1:N Redundancy System (Figure 1-1) comprises a Control Switch Unit (CSU), a Data Switch Unit (DSU), and an optional CRS-280 (70/140 MHz) or CRS-280L (L-Band) IF Switch Unit (ISU).

The CRS-500 is compatible for use with the Comtech EF Data CDM-625/625A modems when equipped with the optional IP Packet Processor, and the Comtech EF Data CDM-750 or CDM-760 Advanced High Speed Trunking Modems when equipped with either Copper Gigabit Ethernet (also referred to as GigE), Packet Processor (CDM-760), or Copper E3/T3/STS-1. The CRS-500 is intended for hub applications, and provides fully automatic or manual Traffic Modem protection of up to 10 Traffic (Prime) Modems with one Redundant (Standby) Modem.



Feature	Description
A	Air-cooled Rack Enclosure – **Provided by User**
B	**Optional** CRS-500 IF Switch Unit (ISU)
C	Redundant Modem – **Provided by User**
D	CRS-500 Control Switch Unit (CSU)
E	Up to 10 Traffic Modems – **Provided by User**
F	CRS-500 Data Switch Unit (DSU) (shown with **optional** KT-0000072 DSU Rack Mounting Kit)

Figure 1-1. CRS-500 1:N Redundancy System (Typical Rack View – Back Side)

Figure 1-2 shows the system level block diagram of the CRS-500 1:N Redundancy System, including the optional CRS-500 ISU. A key feature of the CRS-500 architecture is its ability to allow the Redundant Modem to 'bridge' a Traffic Modem. The CRS-500 can be configured to back up (replace) a Traffic modem when a Unit Fault and/or a Tx/Rx traffic Fault occurs. The Redundant Modem locks to the Traffic Modem's receive IF input signal, and the CRS-500 configures the Redundant Modem automatically to match the failed traffic modem's configuration.

The CRS-500 operation can be customized by selecting a specific Traffic modem as the priority channel. The operator can also program a delay interval for the Redundant Modem to wait before backing up a failed Traffic Modem.

Because live traffic is used at all times to verify performance, no external test equipment is needed to determine the health of the Redundant Modem.

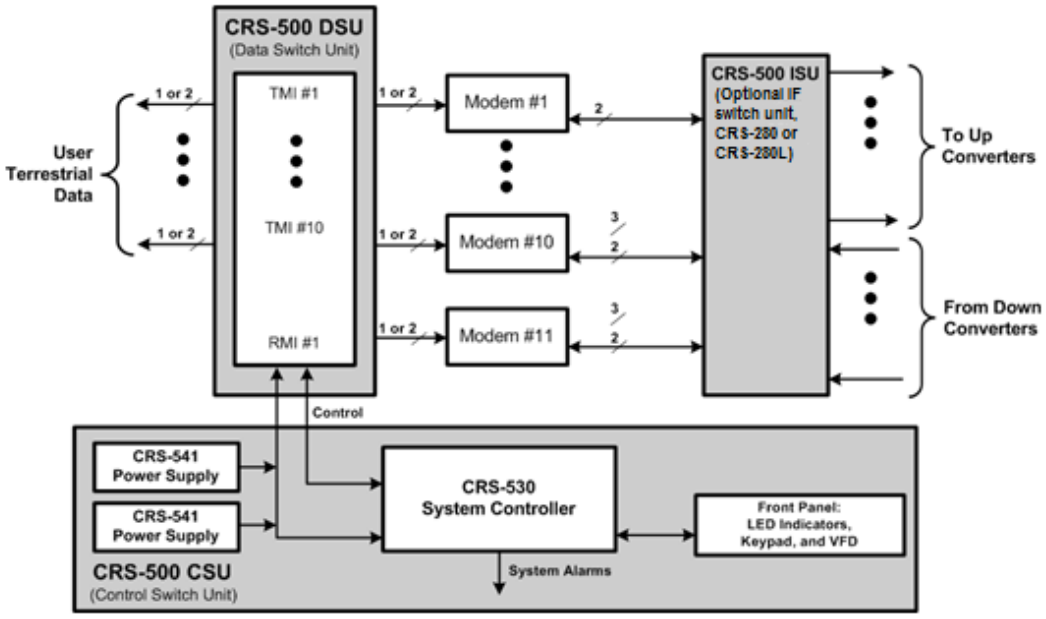


Figure 1-2. Typical CRS-500 Redundancy System – System-Level Block Diagram

1.2 CRS-500 1:N Redundancy System Features

Chapter 2. SPECIFICATIONS

Key reliability features of the CRS-500:

- Flexible configuration – 1:10 (maximum) for standard redundant operation
- Primary traffic paths are maintained, error free, when power is removed
- No interruption of traffic data when Traffic Modem Interface (TMI) modules are removed
- Dual independent & hot-swappable/uninterrupted Alternating Current (AC) or Direct Current (DC) power supplies
- Bridged (hot-standby) Traffic Modem(s) ensure quick availability for backup
- Programmable holdoff times to back up or restore
- Modem Prioritization – You may define which Traffic Modem takes operational priority
- Audible alarm – Programmable to activate based on various changes in status
- Remote (serial or Ethernet) Monitor and Control (M&C)
- Multiple user interfaces (Web/HTTP, SNMP, Telnet, EIA-232/485, front panel)
- A Light Emitting Diode (LED) summary panel shows switch and modem status, bridge and online/offline status

Construction Features:

The CRS-500 is modular in construction. The DSU utilizes a Redundant Modem Interface (RMI) and TMIs – replaceable modules that are installed into slots in the DSU front panel.

Ease of Connection:

Connection to the Traffic modems and Redundant Modem is remarkably easy – rack cabling is simplified and the number of potential failure points is reduced.

TMI Monitoring:

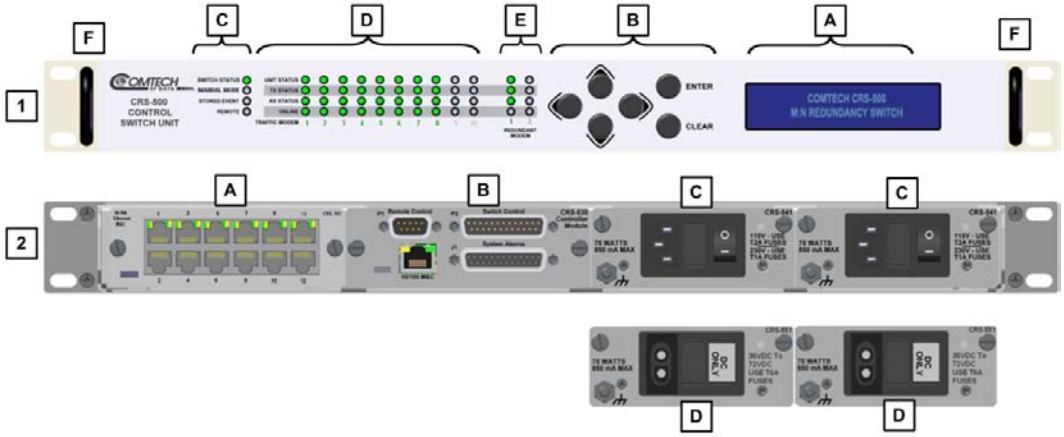
Terrestrial user clock and data signals to and from a Traffic Modem are routed through a TMI via a set of relays. This is arranged so that the de-energized (unpowered) state connects the data signals directly through to the Traffic Modem. If the power supplies to the system are lost, or if a traffic-carrying TMI is removed, no interruption of the traffic occurs.

CRS-280/280L Option:

A CRS-280/280L ISU is required when the Traffic modems within the redundancy group connects to more than one converter or with different polarizations or different satellites. The Traffic modems can also be used when one or more modems within the redundancy group connect to the other polarization of the antenna or to multiple antennas.

1.3 CRS-500 Standard and Optional Components Overview

1.3.1 Control Switch Unit (CSU)



Feature	Description	Feature	Description
1	CSU Front Panel View	2	CSU Rear Panel View
A	Video Fluorescent Display (VFD)	A	CRS-512 Ethernet M&C Interface
B	6-Button Keypad	B	CRS-530 System Controller Module
C	Switch Status LED Group	C	Standard CRS-541 AC Power Supply
D	Traffic Modem Status LED Group	D	Optional CRS-551 DC Power Supply
E	Redundant Modem Status LED Group		
F	Rack Handles		

Figure 1-3. CRS-500 Control Switch Unit

The CRS-500 CSU (Figure 1-3) is constructed as a 1RU-high, rack mount chassis, which can be free-standing, if desired. Rack handles at the front (Feature 1F) ease placement into and removal from a rack. This provides maximum control of the Redundancy System in the smallest amount of front-side rack space.

The CSU serves as the controller for the complete CRS-500 1:N Redundancy System. The switch uses Ethernet to communicate to all modems.

The CRS-530 System Controller Module (Figure 1-3, Feature 2B and Figure 1-5) stores each Traffic Modem configuration. The system uses this information to program the Redundant Modem if a Traffic Modem fails. The CSU contains an extensive M&C system and is fully controllable from the front panel or remotely via EIA-232C/EIA-485 or the 10/100 Ethernet port provided on the CRS-530. You must connect to this port to have remote control to any modem.

1.3.1.1 CSU Front Panel Operational Features

Chapter 8. CSU FRONT PANEL OPERATION

Monitor and Control (M&C) of the complete CRS-500 system is accomplished through the CSU. DO NOT DIRECTLY CONNECT TO A MODEM FOR REMOTE (SERIAL OR ETHERNET) M&C.

Refer to Figure 1-3:

Feature 1A:

The VFD is an active display showing two lines of 24 characters each. You can control the brightness of its blue light.

Feature 1B:

The **six-button keypad array** is used for local control via menu navigation. The keys “click” to give tactile feedback.

Features 1C through **1E** comprise the **LED Indicators**:

- The four LEDs in the **SWITCH STATUS** LED group (**Feature 1C**) show the operating state of the CRS-500 1:N Redundant System.
- The **TRAFFIC MODEM STATUS** LED group (**Feature 1D**) is comprised of 10 sets of four status LEDs, plus the active **TRAFFIC MODEM** number. They show the operating state of up to 10 Traffic modems.
- The **REDUNDANT MODEM STATUS** LED group (**Feature 1E)** is comprised of two sets of four status LEDs, plus the active **REDUNDANT MODEM** (RM) number. They show the operating state of the active Redundant Modem.

Only RM 1 is operational at this time. RM 2 is reserved for future 2:N functionality.

1.3.1.2 CSU Rear Panel Operational Features

- **Chapter 5. CABLES AND CONNECTIONS**
- **Appendix B. CONTROLLER/TMI CONNECTORS AND PINOUTS**

The CRS-500 power supplies and controller modules are located on the CSU rear panel (Figure 1-3). The rear panel accepts field-replaceable modules such as the CRS-512 Ethernet M&C Module (Figure 1-4), the CRS-530 System Controller (Figure 1-5), and a pair of hot-swappable CRS-541 AC or CRS-551 DC Power Supply Units (PSUs) (Figure 1-6 and Figure 1-7).

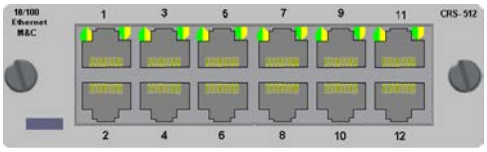


Figure 1-4. CRS-512 Ethernet M&C Module (Feature 2A)

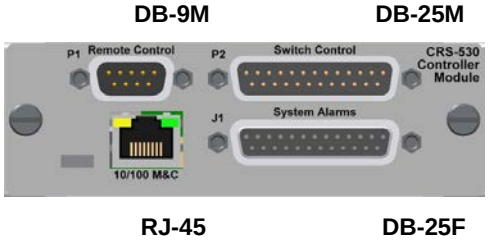


Figure 1-5. CRS-530 System Controller Module (Feature 2B)

Figure 1-6. Standard CRS-541 AC Power Supply (Feature 2C)

Figure 1-7. Optional CRS-551 DC Power Supply (Feature 2D)

1.3.2 Data Switch Unit (DSU)

- **Chapter 3. INSTALLATION**
- **Chapter 5. CABLES AND CONNECTIONS**
- **Appendix B. CONTROLLER/TMI CONNECTORS AND PINOUTS**

The front panel of the DSU can contain a maximum of 10 TMIs and one RMI. The DSU rear panel provides two connectors for connection of the DSU to the CRS-500's CSU and optional ISU.

The traffic data from the user interface to the Traffic Modem Interface passes through normally-closed relay contacts on the TMI card. In the event that both power supplies are lost, or if a traffic-carrying TMI and its cables are removed, no interruption of traffic data occurs.

The optional KT-0000072 DSU Rack Mounting Kit allows you to install the DSU into the rear or on top of the rack in any of two horizontal or two vertical positions. This allows the unit to be positioned or hinged outward, for convenient access to the RMI/TMIs when connecting cables between the DSU, CSU, ISU, and the modems.

1.3.2.1 DSU Front Panel Operational Features

Figure 1-8 shows an operational example of a CRS-500 DSU front panel, as configured for 1:3 redundancy for the CDM-625/625A.

Figure 1-8. CRS-500 DSU Front View – CDM-625/625A 1:3 Configuration Example

1.3.2.2 DSU Rear Panel Operational Features

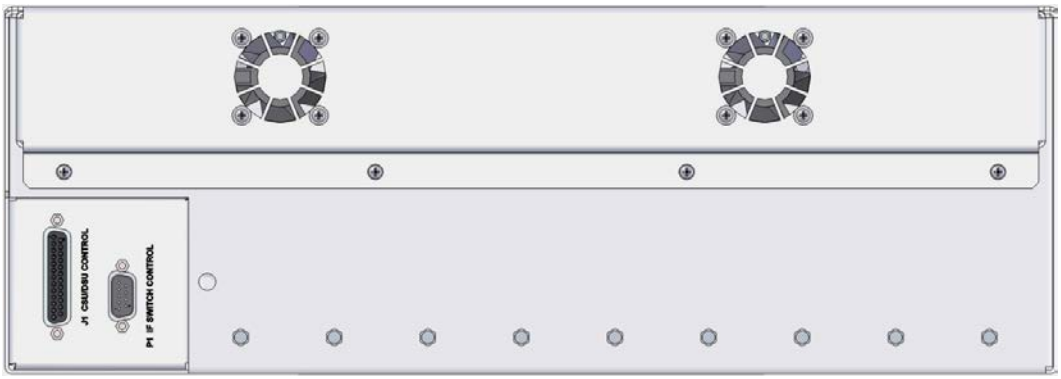


Figure 1-9. CRS-500 DSU Rear Panel

Figure 1-9 shows the rear panel of the CRS-500 DSU:

- Use the DB-25 male connector labeled “J1 CSU/DSU CONTROL” to connect the DSU, via DSU-to-CSU cable PL-0000234, to the “Switch Control” connector located on the CRS-530 System Controller card that is installed on the rear panel of the CRS-500 CSU.
- Use control cable CA-0021666 to connect the DSU connector labeled “J1” to the ISU connector labeled “P1” for either the CRS-280 or CRS-280L ISU.

1.3.2.3 Modem Compatibility

These tables indicate which TMI and RMI should be used with each modem and data interface type.

Table 1-1. CDM-625/625A Advanced Satellite Modems

Data Type	TMI Type	RMI Type
EIA-422/530, V.35, Sync EIA-232	CRS-316	CRS-510
10/100 Ethernet (Single-port Router Mode)	CRS-520	
10/100 Ethernet (Managed Switch Mode)		

Table 1-2. CDM-750 and CDM-760 Advanced High Speed Trunking Modems

Data Type	TMI Type	RMI Type
G.703 E3, T3, STS-1	CRS-345	CRS-505
10/100/1000 Ethernet (Single-port Router Mode)	CRS-516	

1.3.2.4 DSU Interface Modules

1.3.2.4.1 RMI Modules

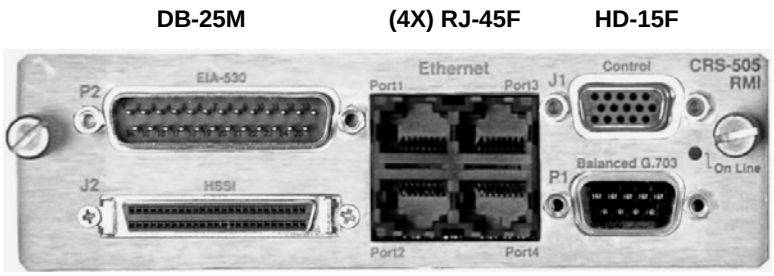


Figure 1-10. CRS-505 RMI (PL-0000293)

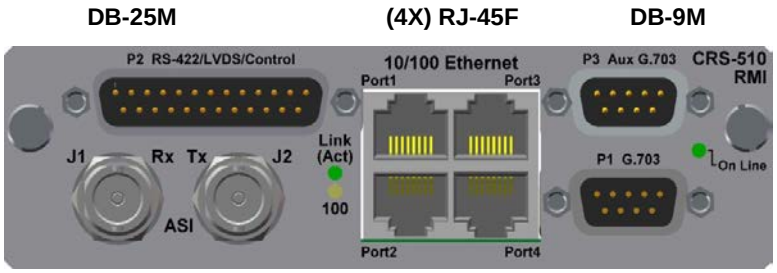


Figure 1-11. CRS-510 RMI (PL-0000642)

1.3.2.4.2 TMI Modules

DB-25F **RJ-45F**

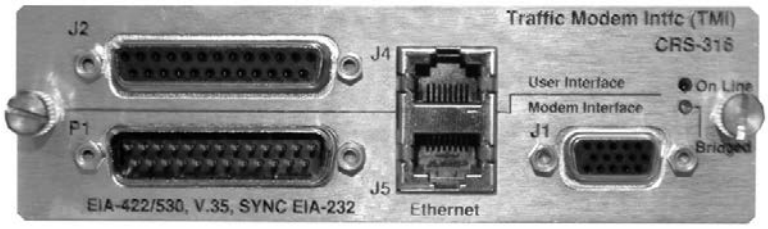


Figure 1-12. CRS-316 TMI EIA-422 (PL/12498-1)

DB-25M **RJ-45F** **HD-15F**

(4X) BNC-F **HD-15F**

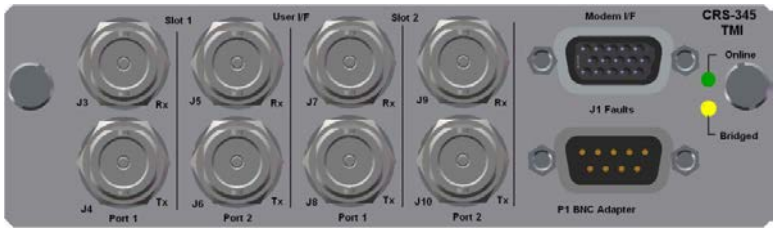


Figure 1-13. CRS-345 TMI G.703/E3/T3/STS-1 (PL/11495-1)

DB-9M

(8X) RJ-45F

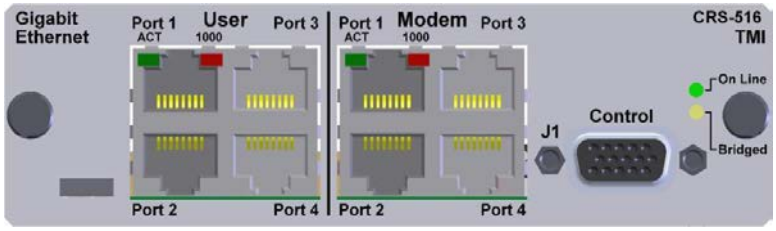


Figure 1-14. CRS-516 TMI 10/100/1000 Gigabit Ethernet (PL-0000628)

HD-15F

(8X) RJ-45F

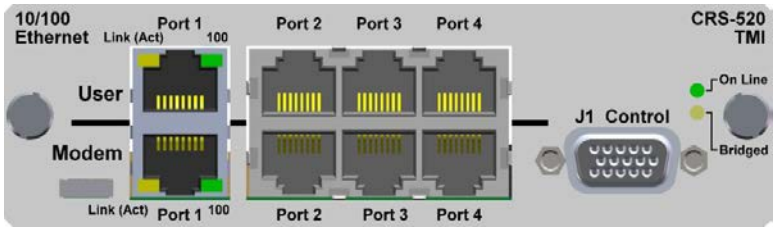


Figure 1-15. CRS-520 TMI 10/100 Ethernet (PL-0000589)

HD-15F

1.3.3 CRS-280/280L IF Switch Unit (ISU)

- **Chapter 3. INSTALLATION**
- **Chapter 5. CABLES AND CONNECTIONS**

The CRS-280/280L ISU is intended for use with modems in 1:N redundancy when the Traffic modems within the redundancy group connect to more than one converter or with different polarizations or different satellites.

See Table 1-3. Each ISU is available as a separate unit for a variety of IF Band configurations.

Table 1-3. CRS-500 1:N Redundancy System ISU Options

ISU Type	Model No.	CEFD P/N	Frequency, Impedance	Connector
70/140 MHz	CRS-280	CRS-280 (Configure to Order)	70/140 MHz, 50Ω	Type 'N' female
			70/140 MHz, 75Ω	
L-Band	CRS-280L	CRS-280L Configure to Order)	L-Band, 500 Ω	Type 'N' female

Each ISU is designed for mounting into the rear or top of a 19-inch rack. It is provided with rack handles at the front for easy removal from and placement into a rack.

When the entire group of modems is connected to the same transponder, you may bypass using the CRS-280/280L ISU and, in its place, passively combine or split the modulator outputs and demodulator inputs. In these applications, the CRS-500 mutes the offline modem's Tx carrier and enables the online modem's Tx carrier.

Note the following:

- Depending on the modem type, the Redundant Modem has *multi-band* Rx/Tx capability.
- Regardless of bandwidth, when a Traffic Modem fails, the Redundant Modem will be connected to the appropriate IF signal through the appropriate ISU.

For example, if a Traffic Modem configured for L-Band fails, the Redundant Modem automatically routes the failed Traffic Modem's signal to the CRS-280 ISU. The ISU then routes the signal to the appropriately configured Traffic Modem in the 1:N redundancy setup.

1.3.3.1 CRS-280/280L ISU Front Panel Operational Features

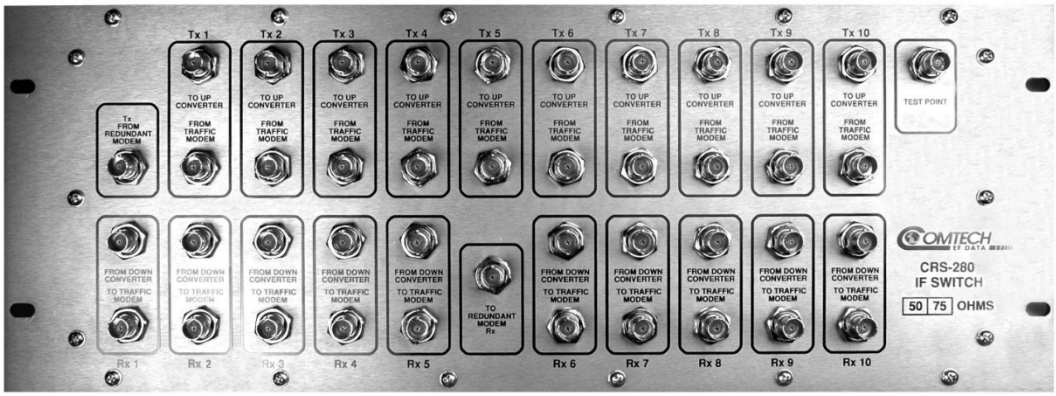


Figure 1-16. CRS-280 Front Panel

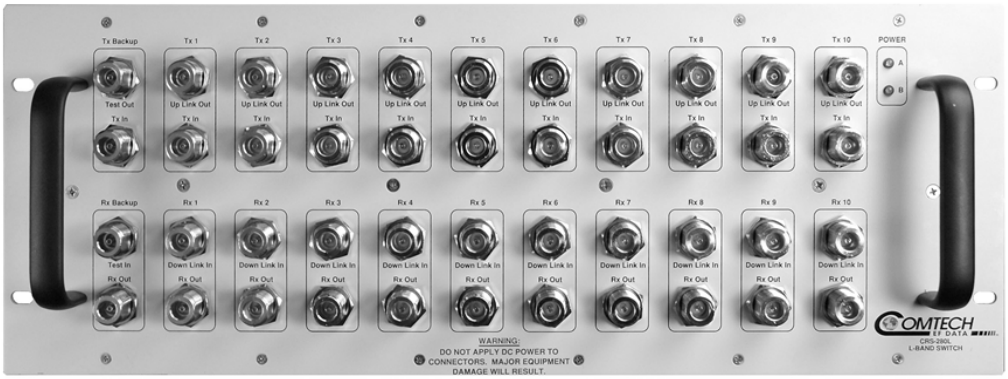


Figure 1-17. CRS-280L Front Panel

Figure 1-16 show an example of the CRS-280 ISU front panel and Figure 1-17 shows the CRS-280L ISU front panel. The appearance and configuration depends on whether the application calls for a 70/140 MHz or L-Band interface, and what type of IF connector is required for interconnection between the CRS-280 or CRS-280L ISU front panels.

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Chapter 2. SPECIFICATIONS

2.1 Environmental and Physical

For information on Environmental and Physical elements of the CRS-280/280L, see the CRS-280/280L manual.

2.1.1 Dimensional Envelopes

See Section 2.6 for Dimensional Envelope Figures.

- **Control Switch Unit (CSU):** 1RU – 1.720 (H) x 19.000 (W) x 17.725 (D) inches (43.69 (H) x 482.60 (W) x 450.22 (D) mm)
- **Data Switch Unit (DSU):** 3RU – 5.988 (H) x 19.000 (W) x 12.451 (D) inches (152.10 (H) x 482.60 (W) x 316.26 (D) mm)
- **Optional IF Switch Unit (ISU):**
  - CRS-280: 19” (48.26 cm) wide x 2.5” (6.35 cm) deep x 7” (17.78 cm) high
  - CRS-280L: 19” (48.26 cm) wide x 14” (35.56 cm) deep x 7” (17.78 cm) high

2.1.2 Weight

- **Control Switch Unit (CSU):** 9 lbs (4.1 kg)
- **Data Switch Unit (DSU):** 15 lbs (6.8 kg)
- **Optional IF Switch Unit (ISU):**
  - CRS-280: < 10 lbs (< 4.54 kg)
  - CRS-280L: < 25 lbs (<11.35 kg)

2.1.3 Prime Power (Two Independent Units)

- **AC Prime Power:** 90 to 264 VAC, 50/60 Hz, <90 watt
- **Optional DC Prime Power:** 38 to 60 VDC, <90 watts

2.1.4 Power Consumption

- 90 watts max, with (10X) CRS-5xx TMIs installed in DSU
- 40 watts max, with (10X) CRS-3xx TMIs installed in DSU
- Add additional 1 watt per installed optional ISU

2.1.5 Temperature

2.1.5.1 Operating Temperature

32 to 122°F (0 to 50°C)

2.1.5.2 Storage Temperature

122 to 212°F (50 to 100°C)

2.1.6 Humidity

95% at +122°F (+50°C), Non-condensing

2.1.7 CE Mark

EMC and Safety

2.2 General Specifications

2.2.1 Switch Type

1:10 (max): One Redundant Modem and up to 10 Traffic modems

2.2.2 Operating Mode

Automatic or Manual switching modes

2.2.3 Switching Conditions

Switchover to Redundant Modem following a modem fault (Unit, Tx traffic, or Rx traffic)

2.2.4 Switching Time

500 ms for Bridged backup

2.2.5 IF Switching

- **With Optional CRS-280/280L ISU:** All modems outputs on all the time.
- **Without Optional ISU:** IF On/Off control to modems.

2.2.6 Audible Alarm

Programmable to activate following various changes of state.

2.2.7 Common Faults

Form-C relay contacts.

2.3 Control Switch Unit (CSU) Specifications

2.3.1 CSU Front Panel

2.3.1.1 Vacuum Fluorescent Display (VFD)

Two lines @ 24 characters per line.

2.3.1.2 6-Button Keypad

- **ENT** (ENTER)
- **CLR** (CLEAR)
- **(4X) NAVIGATION** – ▲ (UP), ▼ (DOWN), ◄ (LEFT), ► (RIGHT)

2.3.1.3 Summary Status Light-Emitting Diode (LED) Indicators

- **Unit status:**
  - Switch Status
  - Manual Mode
  - Stored Event
  - Remote
- **Modem status (Traffic and Redundant):**
  - Unit Status
  - Tx Status
  - Rx Status
  - Online Status

2.3.2 CSU Rear Panel

Rear panel accepts the following plug-in interface modules:

- CRS-512 Ethernet M&C Interface Module
- CRS-530 Systemn Controller Module
- Two Power Supply Modules:
  - **Standard** CRS-541 AC Power Supply
  - **Optional** CRS-551 DC Power Supply

2.3.3 CSU Modem Configurations

2.3.3.1 CDM-625 and CDM-625A Advanced Satellite Modems

Terrestrial Interface	Mode of Operation	Comms Module (Modem to CSU)
EIA-422/530, V.35, Sync EIA-232	Any	CRS-512
IP Packet Processor	Layer 3 or Bridge	N/A (through TMI)

2.3.3.2 CDM-750 and CDM-760 Advanced High Speed Trunking Modems

Terrestrial Interface	Mode of Operation	Comms Module (Modem to CSU)
G.703 (T3, E3, STS-1)	Any	CRS-512
GigE Copper	Any	N/A (through TMI)

2.4 Data Switch Unit (DSU) Specifications

2.4.1 DSU Modem Configurations

2.4.1.1 CDM-625 and CDM-625A Advanced Satellite Modems

Terrestrial Interface	Mode of Operation	Redundant Modem Interface (RMI)	Traffic Modem Interface (TMI)
EIA-422/530, V.35, Sync EIA-232	Any	CRS-510	CRS-316
IP Packet Processor	Layer 3 or Bridge	CRS-510	CRS-520

2.4.1.2 CDM-750 and CDM-760 Advanced High Speed Trunking Modems

Terrestrial Interface	Mode of Operation	Redundant Modem Interface (RMI)	Traffic Modem Interface (TMI)
G.703 (T3, E3, STS-1)	Any	CRS-505	CRS-345
GigE Copper	Any	CRS-505	CRS-516

2.5 Optional CRS-280/280L IF Switch Unit (ISU) Specifications

For all optional ISU specifications, see the CRS-280/280L manual.

2.6 Dimensional Envelope Figures

These figures are provided for reference only and are subject to change without notice. Typical for all figures, all dimensions are in inches. Bracketed dimensions are in metric units [mm].

2.6.1 CRS-500 Control Switch Unit (CSU) Dimensional Envelope

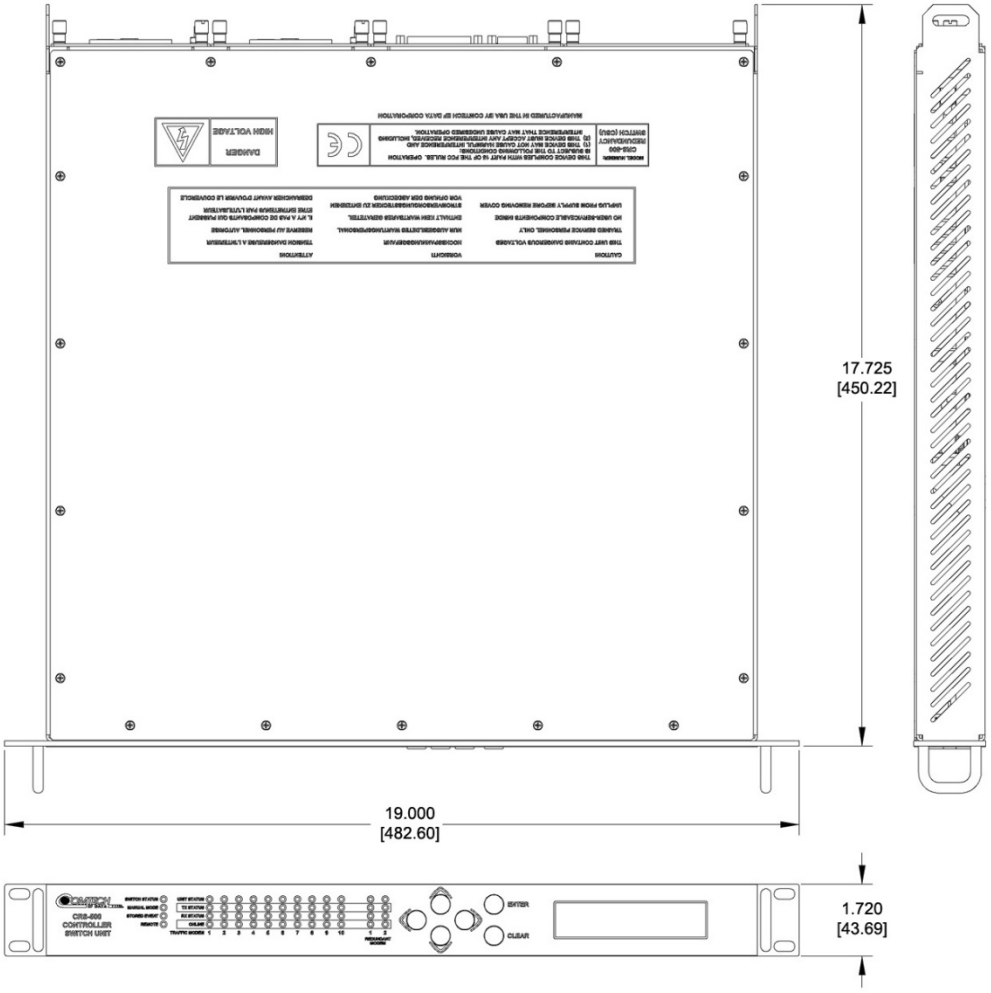


Figure 2-1. CRS-500 CSU Dimensional Envelope

2.6.2 CRS-500 Data Switch Unit (DSU) Dimensional Envelope

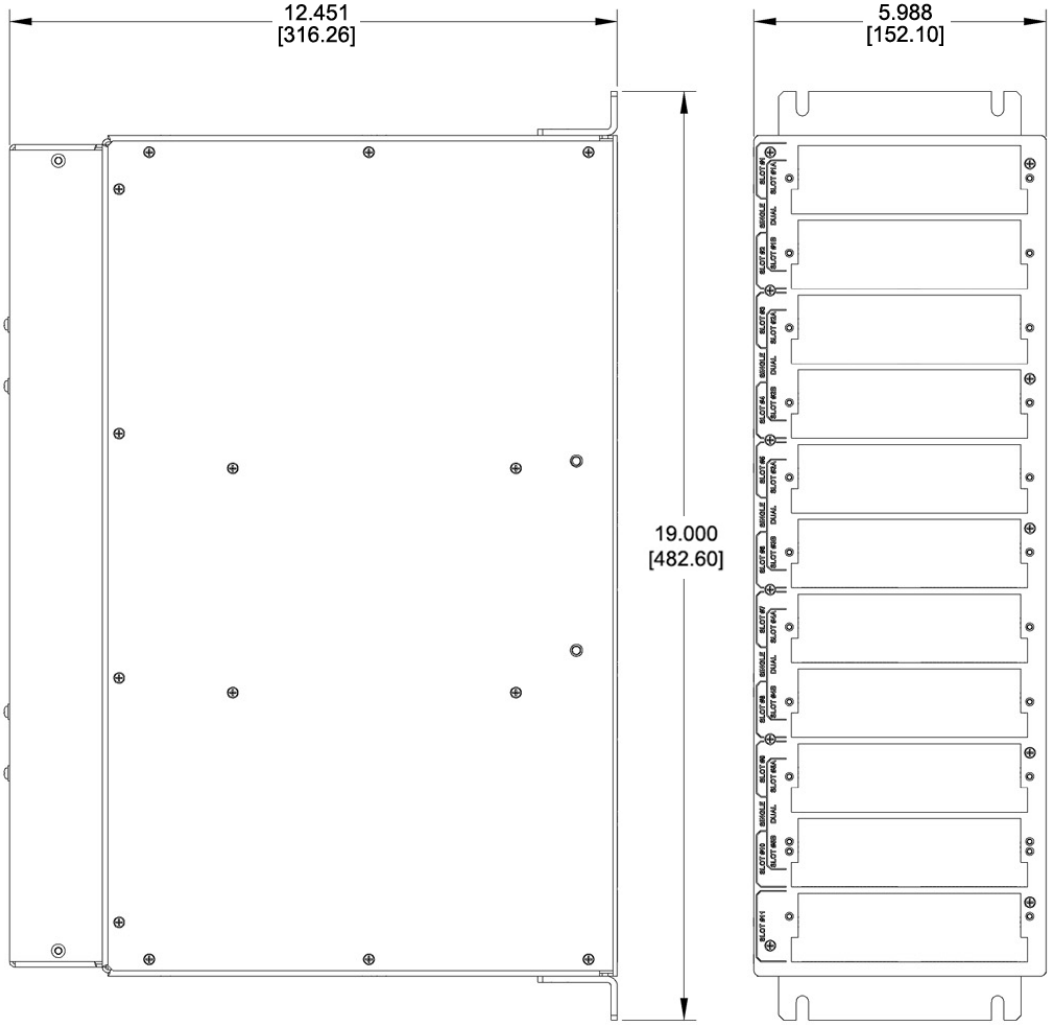


Figure 2-2. CRS-500 DSU Dimensional Envelope

2.6.3 CRS-280/280L IF Switch Unit (ISU) Dimensional Envelope

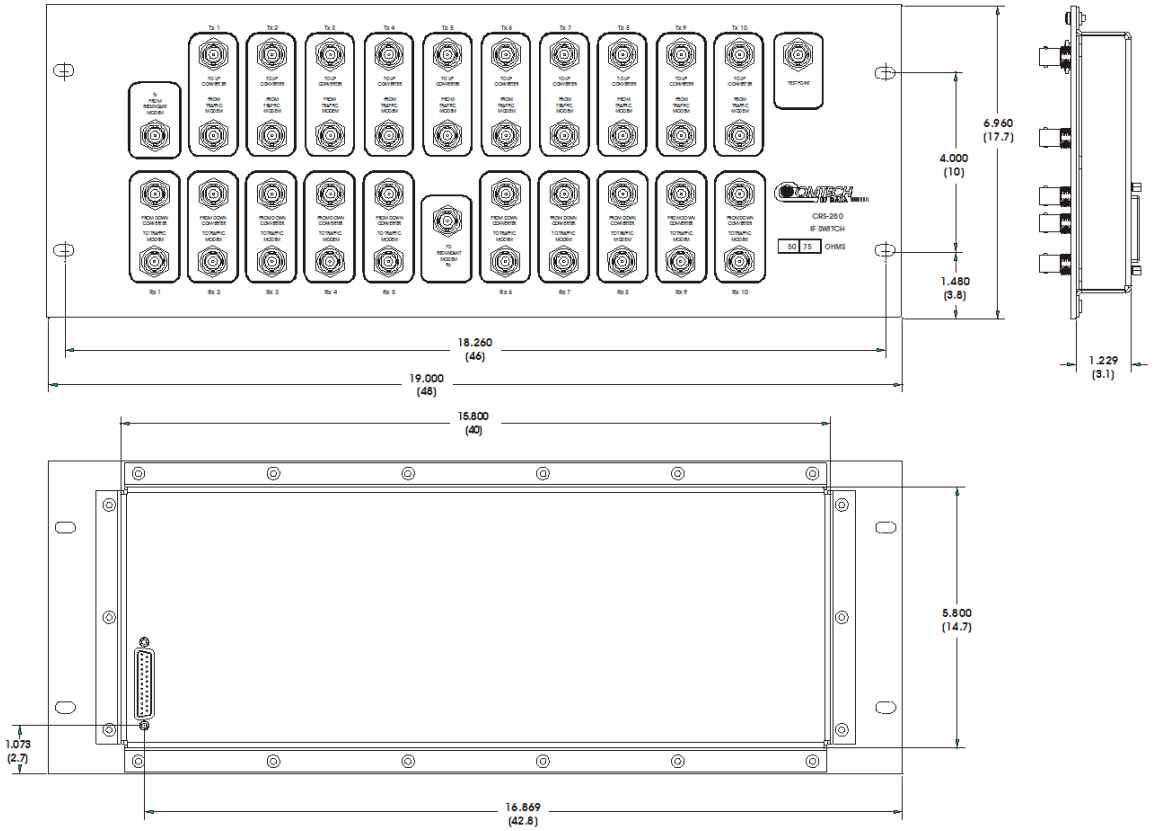


Figure 2-3. CRS-280 (70/140MHz) IF Switch

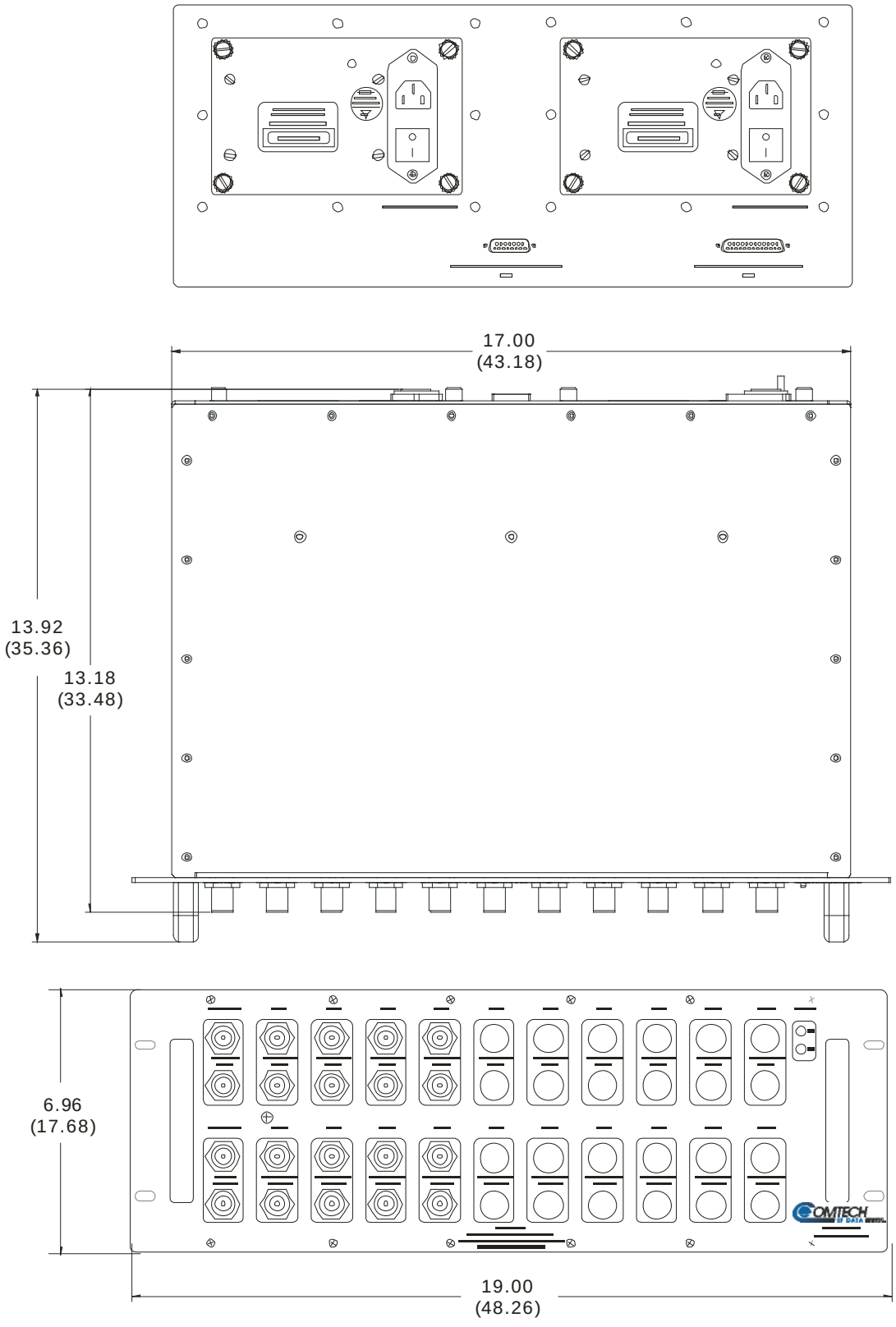


Figure 2-4. CRS-280L (L-Band) IF Switch (Standard AC Unit Shown)

Chapter 3. CHECKLISTS FOR INITIAL START-UP AND CONFIGURATION

3.1 Overview

Each checklist provides a "Chapter Reference" column. This column directs you to the manual chapter that provides in-depth content that specifically addresses that feature or function.

Use the checklists provided in this chapter to ease installation and configuration of the CRS-500 1:N Redundancy System:

Checklist for:	See Chapter 3 Section…
Initial Start-up	Section 3.2
Add a Traffic Modem to an Operating CRS-500 1:N Redundancy System	Section 3.3.1
Remove a Traffic Modem from an Operating CRS-500 1:N Redundancy System	Section 3.3.2
Verify System Operation via the CSU Front Panel	Section 3.4

3.2 Initial Start-up

Do these steps:

Step	Task (* User-provided equipment / ** Purchased Separately)	Chapter Ref
1	☐ Unpack and inspect the CRS-500 components.	4
2	☐ Install the CRS-500 components and modems** in a rack.	4
3	☐ Connect cables between the CRS-500 Switch components (CSU, DSU, ISU).	5
4	☐ Connect cables to/from the modems** and the CRS-500 components.	5
5	☐ Connect IF cables* between either the CRS-500 ISU(s) or the signal splitters, and the IF Downconverter*.	5
6	☐ Configure modems for use in the CRS-500 1:N Redundancy system. *Typical for all modems:*	7
	☐ Power on the modems.	6
	☐ Verify that modems are running the modem's most recent firmware version.	7
	☐ Enable Redundancy Mode.	7
	☐ Set IP Address (for M&C to/from the CRS-500).	7
	☐ Set Redundancy Traffic IP Address (if applicable).	7
	☐ Select Dedicated Ethernet Port (if applicable).	7
	☐ Configure PMSI (if Carrier-in-Carrier [CnC] is used).	7
7	☐ Configure the CRS-500 CSU for 1:N Operation:	
	☐ Power on the CRS-500.	6
	☐ Verify that the CRS-500 CSU is running its most current firmware version.	6
	☐ Configure the CRS-500's "Switch Management" IP address.	8
	☐ Set Operating mode to Manual Switching mode.	8
	☐ Set IP address (for M&C to/from modems)	8
	☐ Set Redundancy Mode to 1:N.	8
	☐ Activate Traffic Modem(s).	8
	☐ Select Traffic Modem(s) to Bridge.	8
	☐ Set Holdoff (Backup and Restore) times.	8
	☐ Select Alarm Masks for Switch and/or Modems.	8
	☐ Perform Redundancy System Checkout.	7
	☐ Set Operating Mode to Auto Switching Mode.	8

Step	Task (* User-provided equipment / ** Purchased Separately)	Chapter Ref
8	☐ Connect RF cables* between the RF Upconverters* and either the CRS-500 ISU(s)** or the signal combiners. DO NOT CONNECT the IF to any Upconverters UNTIL AFTER the CRS-500 1:N Redundancy System is fully cabled and configured. Do this to prevent unintended signals from reaching the satellite.	5

3.3 Add or Remove a Traffic Modem to/from an Operating CRS-500 1:N Redundancy System

If adding a Traffic Modem to or removing a Traffic Modem from an operating CRS-500 1:N Redundancy System, take care not to interfere with the existing traffic. Make sure to correctly perform the cabling and power-up or power-down sequences. Do not allow the modem Tx carrier to cause contention in the system.

3.3.1 Add a Traffic Modem to an Operating CRS-500 1:N Redundancy System

Do these steps:

Step	Task (* User-provided equipment / ** Purchased Separately)	Chapter Ref
1	☐ Unpack and inspect the modem.	4
2	☐ Install the modem into the rack* at its desired location.	4
3	☐ Connect cables between the powered OFF modem and the CRS-500 1:N Redundancy System components (CRS-500 CSU/DSU/ ISU(s)**, existing modems) and equipment * (*excluding* the Upconverter *).	5
4	☐ Configure the modem for use in the CRS-500 1:N Redundancy System. *Typical for each added modem:*	7
	☐ Power ON the modem.	6
	☐ Verify that the modem is running its most recent firmware version, and that all other modems in the system are running this same firmware version.	6
	☐ Enable Redundancy Mode.	7
	☐ Set IP Address (for M&C to/from the CRS-500).	7
	☐ Configure PMSI (if Carrier-in-Carrier [CnC] is used).	7

Step	Task (* User-provided equipment / ** Purchased Separately)	Chapter Ref
5	☐ Configure the CRS-500 CSU for 1:N Operation with the new modem:	8
	☐ Set Operating mode to Manual Switching mode.	8
	☐ Set IP address (for M&C to/from modems)	8
	☐ Set Redundancy Traffic IP address (if applicable)	8
	☐ Activate the new Traffic Modem.	8
	☐ Perform Redundancy System Checkout.	3
	☐ Set Operating Mode to Auto Switching Mode.	8
6	☐ Connect RF* cables between either the CRS-500 ISU(s)** or the signal combiners, and the RF Upconverters *.	5
	DO NOT CONNECT the IF to any Upconverters UNTIL AFTER the CRS-500 1:N Redundancy System is fully cabled and configured. Do this to prevent unintended signals from reaching the satellite.	

3.3.2 Remove a Traffic Modem from an Operating CRS-500 1:N Redundancy System

Do these steps:

Step	Task (* User-provided equipment / ** Purchased Separately)	Chapter Ref
1	☐ Use either the CSU Front Panel or the CRS-500 HTTP (Web Server) Interface to deactivate the targeted Traffic Modem.	8
2	☐ Power OFF the targeted Traffic Modem.	5
3	☐ Disconnect the cables between the powered OFF modem and the CRS-500 System components (CRS-500 CSU, DSU, and ISU(s), and other modems) and equipment *.	5
4	☐ Remove the modem from its location in the rack *.	4

3.4 Use the CSU Front Panel to Verify System Operation

Read your modem's Installation and Operation Manual for your product's detailed operational information.

Once you properly configure the connected modems and the CRS-500, you must verify that the CRS-500 is operating fault-free. Make sure that the modems' "Online" and "Bridge" functions and status are operating as intended.

Use this checklist to verify proper CRS-500 1:N Redundancy System operation. You may accomplish these M&C tasks via the CSU Front Panel operations: by observing the LED Indicator activity, and through interactive operations by using the VFD messages and keypad.

Complete all modem and switch installation and configuration tasks before proceeding.

Do these steps:

Step	Procedure	Chapter Ref
1	☐ Verify that the Switch "UNIT STATUS" LED is *green*, indicating that there are no faults. If this LED is *red*, go to either the MONITOR → ALARMS submenu (via the CSU front panel) or view the scrollable event log on the CRS-500 HTTP (Web Server) Interface's MONITOR | STATUS page to investigate further.	8 or 9
2	☐ Verify that the "UNIT STATUS", "TX STATUS", and "RX STATUS" LEDs for each active modem are *green*, indicating that there are no faults. If any LEDs are red, go to either the MONITOR → ALARMS submenu (via the Modem front panel) or view the scroll able event log on the CRS-500 HTTP (Web Server) Interface's MONITOR | STATUS page to investigate further. *Note that the LEDs on each modem front panel correspond similarly to the LEDs provided on the CSU front panel. Faults and events may also be reviewed using the front panel of the faulted modem..*	8 or 9
3	☐ Verify that the "ONLINE" LED is lit *green* for all active Traffic Modems. Traffic Modems that are being bridged will *blink* in sync with its corresponding Redundant Modem.	8
4	☐ Verify that the "ONLINE" LED is *not* lit for the Redundant Modem(s).	8

Notes:

Chapter 4. INSTALLATION

4.1 Unpack and Inspect the Shipment

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

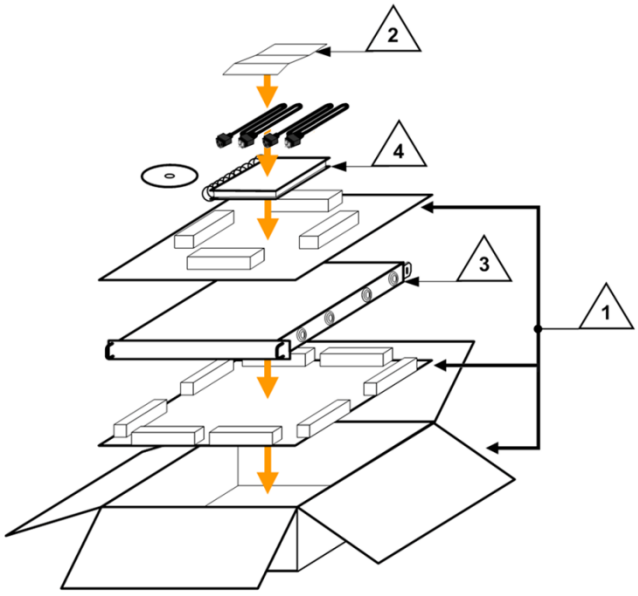


Figure 4-1. Unpack and Inspect the Shipment

The components of the CRS-500 1:N Redundancy System, the optional Installation and Operation Manual (otherwise available online at http://www.comtechefdata.com), and the CSU power cords were packaged and shipped in reusable cardboard cartons containing protective foam spacing (Figure 4-1).

To inspect the shipment, do these steps:

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

Proceed to **Section 4.2 Install the CRS-500 1:N Redundancy System Into a Rack Enclosure**.

4.2 Install the CRS-500 System Into a Rack Enclosure

Chapter 5. CABLES AND CONNECTIONS

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

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

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

Make sure there is adequate clearance inside the enclosure, especially at the sides, for air circulation and ventilation.

Air temperature inside the rack enclosure should never exceed 50°C (122°F).

If there is any doubt, contact Comtech EF Data Product Support during normal business hours.

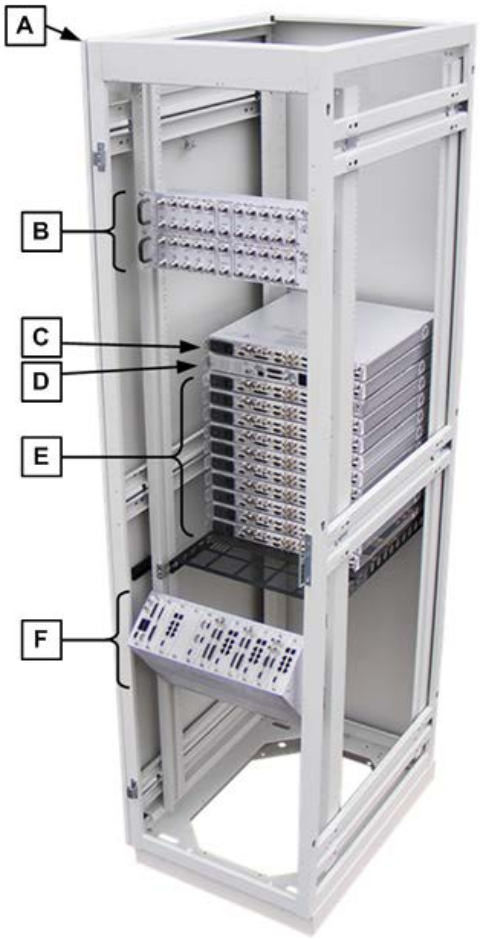
Figure 4-2 shows an example of a complete CRS-500 1:N Redundancy System rack configuration.

The standard **CRS-500 CSU** is constructed as a 1RU-high, rack-mounting chassis that may also be free standing. Rack handles are provided to facilitate removal and placement into a rack. Install the CSU, using the front panel mounting holes **only,** into the front of the rack.

The standard **CRS-500 DSU** mounts into the back or on top of the rack in one of four configurations. As shown in Figure 4-3 and Figure 4-4, the user can use the KT-0000072 CRS-500 DSU Rack Mounting Kit (Figure 4-5) to install the DSU module as needed, positioning or hinging the unit outward to permit convenient access to the RMIs/TMIs for cable connections between the DSU, CSU, ISU, and the modems.

Mount the optional **CRS-280/280L ISU** into the back or on top of the rack.

Once you install all CRS-500 1:N Redundancy System components, the configuration is now ready to be interconnected as specified in **Chapter 5. CABLES AND CONNECTIONS.**



Feature	Description
A	Air-cooled Rack Enclosure – Provided by User
B	Optional CRS-500 IF Switch Unit (ISU)
C	Redundant Modem – Provided by User
D	CRS-500 Control Switch Unit (CSU)
E	Up to 10 Traffic Modems – Provided by User
F	CRS-500 Data Switch Unit (DSU) (shown with optional KT-0000072 DSU Rack Mounting Kit)

Figure 4-2. CRS-500 1:N Redundancy System (Rack View, Back Side)

Note: This figure shows a complete CRS-500 1:N System Redundancy System, equipped with optional components and installation kits, as installed in a user-provided rack enclosure. Your system as ordered and shipped may differ.

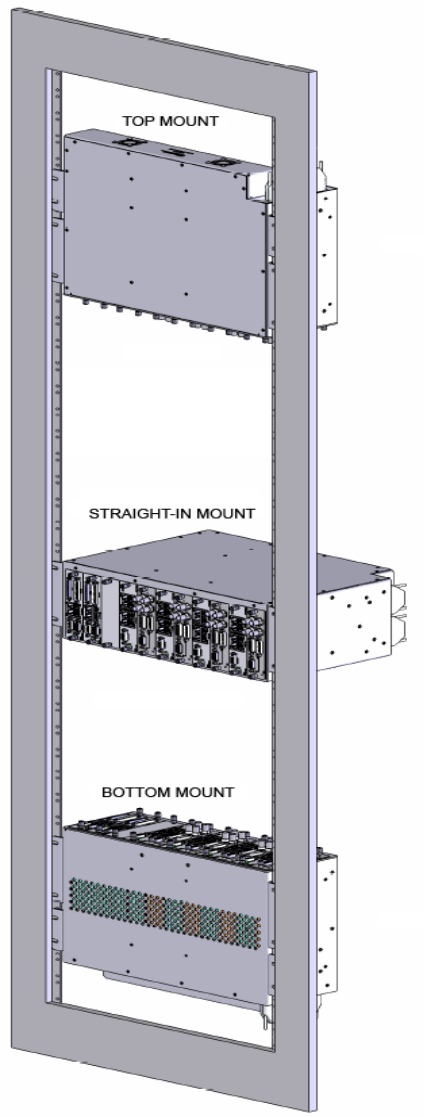
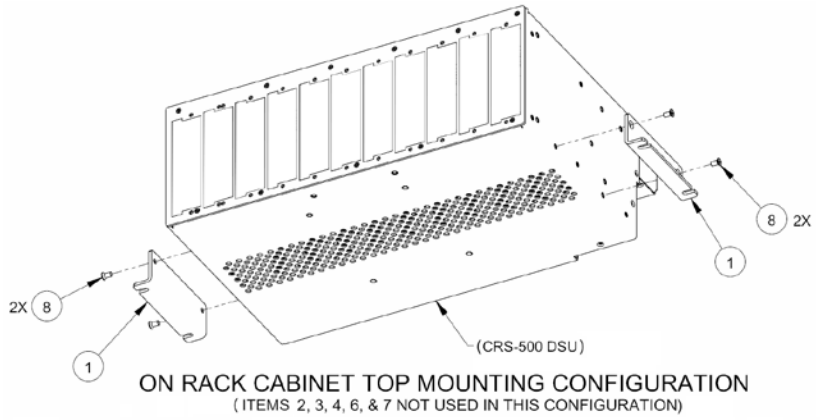
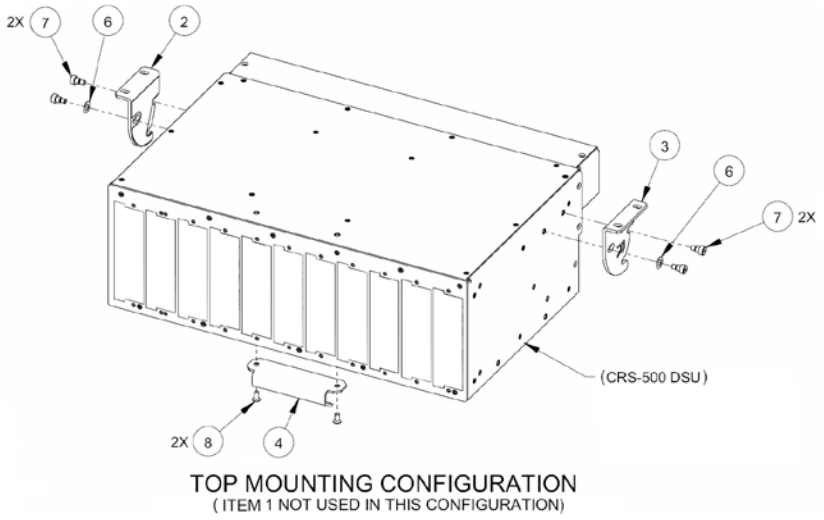
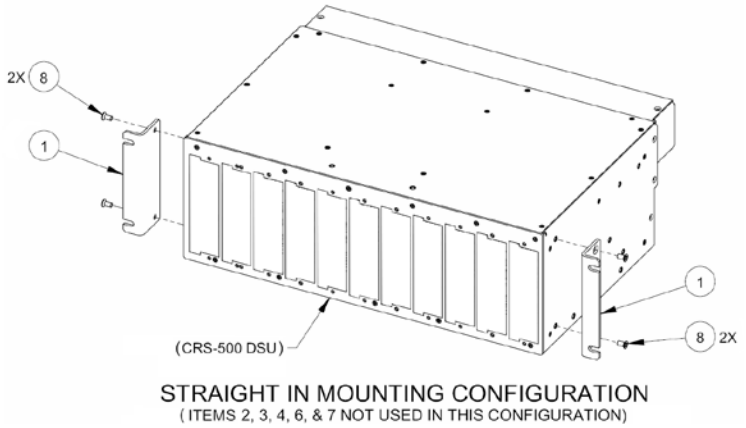
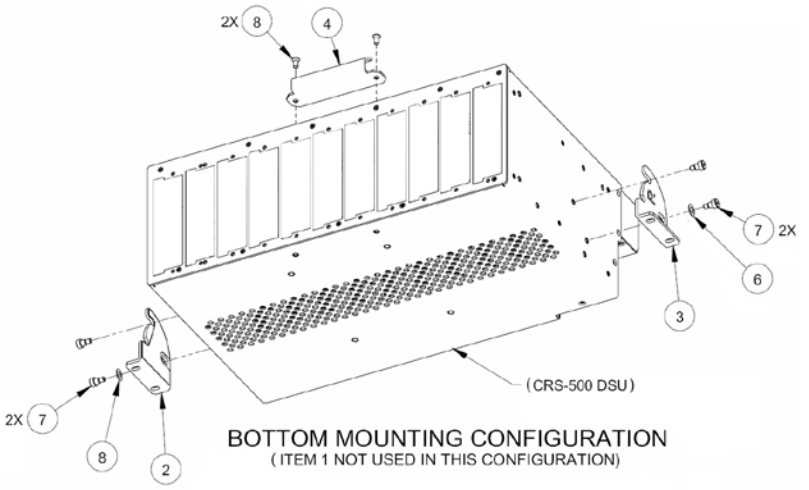


Figure 4-3. CRS-500 DSU In-Rack Mounting Examples (Uses Optional CEFD Kit KT-0000072)









KT-0000072 CRS-500 DSU RACK MOUNTING KIT			
ITEM	QTY	CEFD PART NO.	DESCRIPTION
1	2	FP-0000322	BRACKET, RACK MOUNT
2	1	PL-0000341	ASSY, L PIVOT BKT & GASKET
3	1	PL-0000342	ASSY, R PIVOT BKT & GASKET
4	1	FP-0000463	HANDLE, CHASSIS
5	4	MS-0000018	TOOL, 1/8" HEX LONG-ARM L-KEY
6	4	HW/SPC1/4F015	SPACER, 1/4 .512 OD .015 THICK,FIBER
7	4	HW-0000231	SCREW, SHOULDER, 10-32 X 3/16" LONG, SOCKET HEAD, SS
8	6	HW/1032X3/8FHMS	SCREW, 10-32 X 3/8 FHMS, 100 DEG

Figure 4-4. CRS-500 Optional DSU Rack Mounting Kit KT-0000072

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Chapter 5. CABLES and CONNECTIONS

5.1 Overview

- **Chapter 1. INTRODUCTION**
- **Appendix A. CABLE DRAWINGS or Appendix B. CONTROLLER / TMI CONNECTORS AND PINOUTS.**

The step-by-step process for connecting a variety of CRS-500 DSU and modem configurations is outlined in this chapter (in-depth content is provided in each chapter subsection):

Section	Description	For (Connections)
5.2	CRS-500 Control Connections	Basic (CSU→ DSU) Optional (CSU→ DSU→ ISU)
5.3	Modem Connections	Modem-specific cabling connections: Control, Comms, Traffic, etc.
5.4	CRS-280/280L IF Cable Connections	Same band/multi-band single or dual ISU configuration
5.5	CRS-500 Power Connections	Switch and modem power connections

All cables used for interconnecting CRS-500 1:N Redundancy System components and modems are available from Comtech EF Data. You can order these cables at the same time as placing the order for the CRS-500.

Leave the CRS-500 and all modems powered OFF until all connections are ready.

Once the CRS-500 components and all the modems are installed, properly attach all required cabling. In most cases, the modem accepts the male end of the cable while connectors on the RMI or TMI module installed at the rear panel of the CRS-500 DSU accept the female end of the cable in the section of the module labeled “Modem Interface.”

For all user-fabricated cables, the cables required between each modem and Switch plug-in RMI or TMI module should be of shielded, twisted-pair construction, with the grounded shield bonded to the back shell. Wire all data cables correctly using the connector and pinout information provided in **Appendix A. CABLE DRAWINGS** or **Appendix B. CONTROLLER / TMI CONNECTORS AND PINOUTS**.

The following illustrations featured in this chapter provide cabling configuration examples for RMI or TMI interfaces – i.e., the interconnection of the Redundant Modem to a CRS-500 DSU-mounted RMI module, or the interconnection between a CRS-500 DSU-mounted TMI module and a Traffic Modem. See **Section 1.3.2 Data Switch Unit (DSU)** in **Chapter 1. INTRODUCTION** for an overview about these interfaces.

5.1.1 Configuration and Cable Connections Summary

5.1.1.1 Control Switch Unit (CSU) Configurations

Modem	Terrestrial Interface	Mode of Operation	M&C Controller Module	Power Supply Module	CSU to DSU Cable Required	Modem to CSU Comms Module	Modem to CSU Comms Cable
CDM-625/625A	IP Packet Processor	Layer 3 or Bridge	CRS-530	CRS-541 (AC) CRS-551 (DC)	(1) CA-0000234	N/A (Through TMI)	N/A
	EIA-422/530, V.35, Sync EIA-232	Any				CRS-512	PP/CAT5FF7FTGY*
CDM-750/760	G.703 (T3, E3, STS-1)	Any	CRS-530	CRS-541 (AC) CRS-551 (DC)	(1) CA-0000234	CRS-512	PP/CAT5FF7FTGY*
	GbE Copper					N/A (Through TMI)	N/A

* Note: One cable per online modem.

5.1.1.2 Data Switch Unit (DSU) Configurations

Modem	Terrestrial Interface	Mode of Operation	RMI				TMI			
			RMI	RMI to Modem Comms	RMI to Modem Control / Fault Cable	RMI to Modem Terr Data Cable	TMI	TMI to Modem Comms	TMI to Modem Control / Fault Cable	TMI to Modem Terr Data Cable
CDM-625/625A	IP Packet Processor	Layer 3 or Bridge	CRS-510	PP/CAT5FF7FTGY	CA-0000066	PP/CAT5FF7FTGY	CRS-520*	PP/CAT5FF7FTGY*	CA-0000069*	PP/CAT5FF7FTGY*
	EIA-422/530, V.35, Sync EIA-232	Any	CRS-510	PP/CAT5FF7FTGY	CA-0000066	N/A	CRS-316*	CA-0000066	CA-0000069*	CA-0000066
CDM-750/760	G.703 (T3, E3, STS-1)	Any	CRS-505	N/A	CA-0000069	CA-0000750	CRS-345*	N/A	CA-0000069*	CA-0000703*
	GbE Copper	Any	CRS-505	PP/CAT5FF7FTGY		PP/CAT5FF7FTGY	CRS-516*	PP/CAT5FF7FTGY	CA-0000069*	PP/CAT5FF7FTGY*

* Note: One cable per online modem

5.1.1.3 IF Switch Unit (ISU) Configurations

CRS-500 1:N Modem Redundancy System – Modem-to-ISU Cabling Requirements				
ISU Type	ISU Model No.	ISU CEFD P/N	Frequency, Impedance	CEFD Cable
70/140 MHz	CRS-280	CRS-280 (Configure to Order)	70/140 MHz, 50Ω	CA-0021666 (DB9F→DB25M, 8')
			70/140 MHz, 75Ω	
L-Band	CRS-280L	CRS-280L Configure to Order)	L-Band, 500 Ω	

5.2 CRS-500 Control Connections

5.2.1 Basic CRS-500 (CSU → DSU) Unit Connection

For 1:N redundancy configurations that do not require use of the optional CRS-280/280L IF Switch Unit (ISU), use a CA-0000234 Control Cable (DB-25F to DB-25M, 8') to connect the CSU to the DSU. This is the basic setup for *all* redundancy applications. Otherwise, refer to the next section to make the Unit-to-Unit cable connections between the CRS-500 CSU, DSU, and optional CRS-280/280L ISU.

5.2.2 Optional CRS-500 (CSU → DSU→ ISU) Unit Connections

Make sure the power supply is disconnected before you connect any cables. Serious injury or death could occur if the power supply is connected while you connect any cables.

When a Tx IF ISU is not present, the CRS-500 will mute the offline modem(s)' Tx IF.

When the optional Comtech EF Data CRS-280/280L ISU is required, configured in either a 70/140 MHz (Figure 5-1) or L-Band (Figure 5-2), and make all cable connections as instructed in this chapter section.

Do these steps:

1. Connect and secure the CA-0000234 Control Cable (DB-25F to DB-25M, 8') between the CRS-500 CSU and the DSU:
    a. DB-25M connector labeled "P2 | Switch Control" on the CSU's CRS-530 System Controller, to
    b. DB-25F connector on the rear panel of the DSU labeled "J1 | CSU/DSU CONTROL".
2. Interconnect the optional ISU. Connect and secure the CA-0021666 Control Cable (DB-9F to DB-25M) between the CRS-500 DSU and the CRS-280/280L ISU.

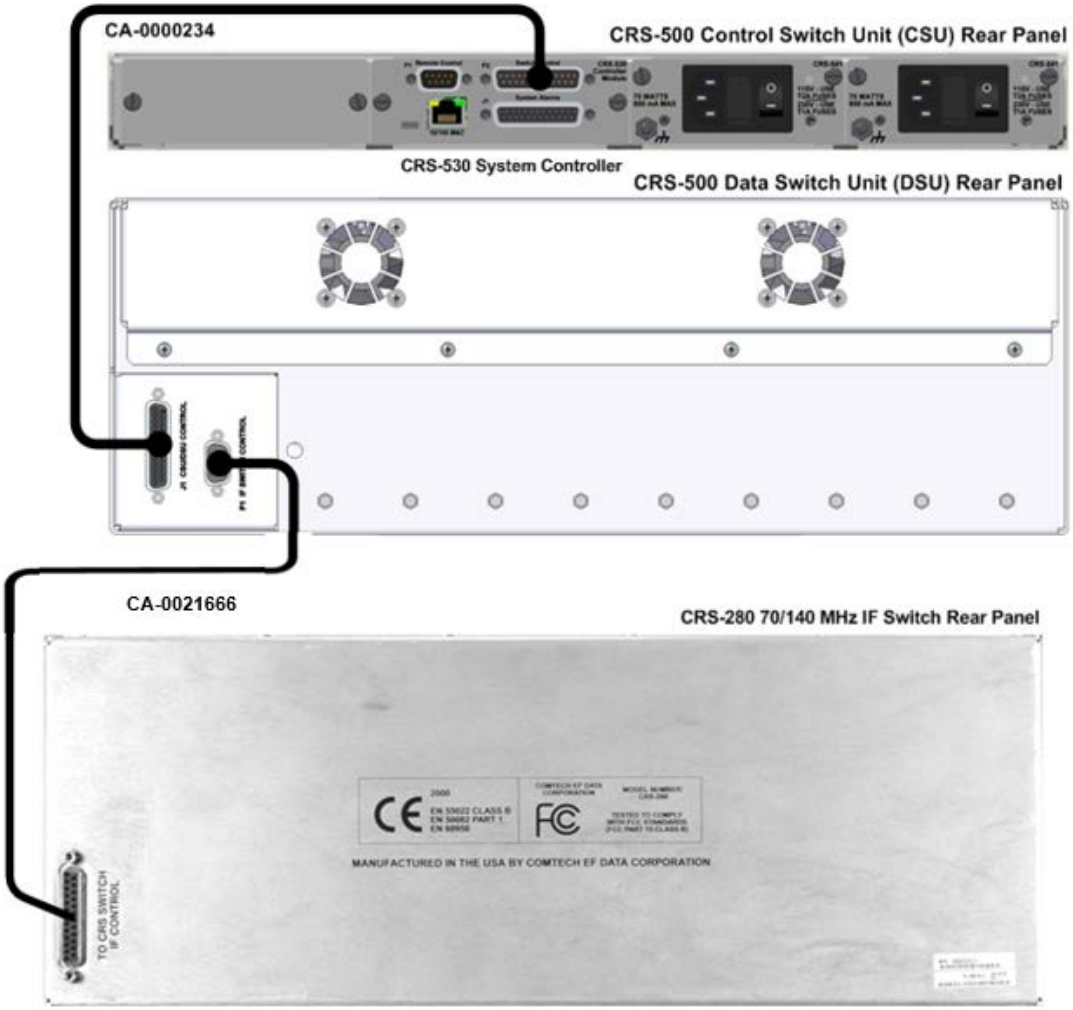


Figure 5-1. Control Cable Connection for CRS-500 to CRS-280 Example

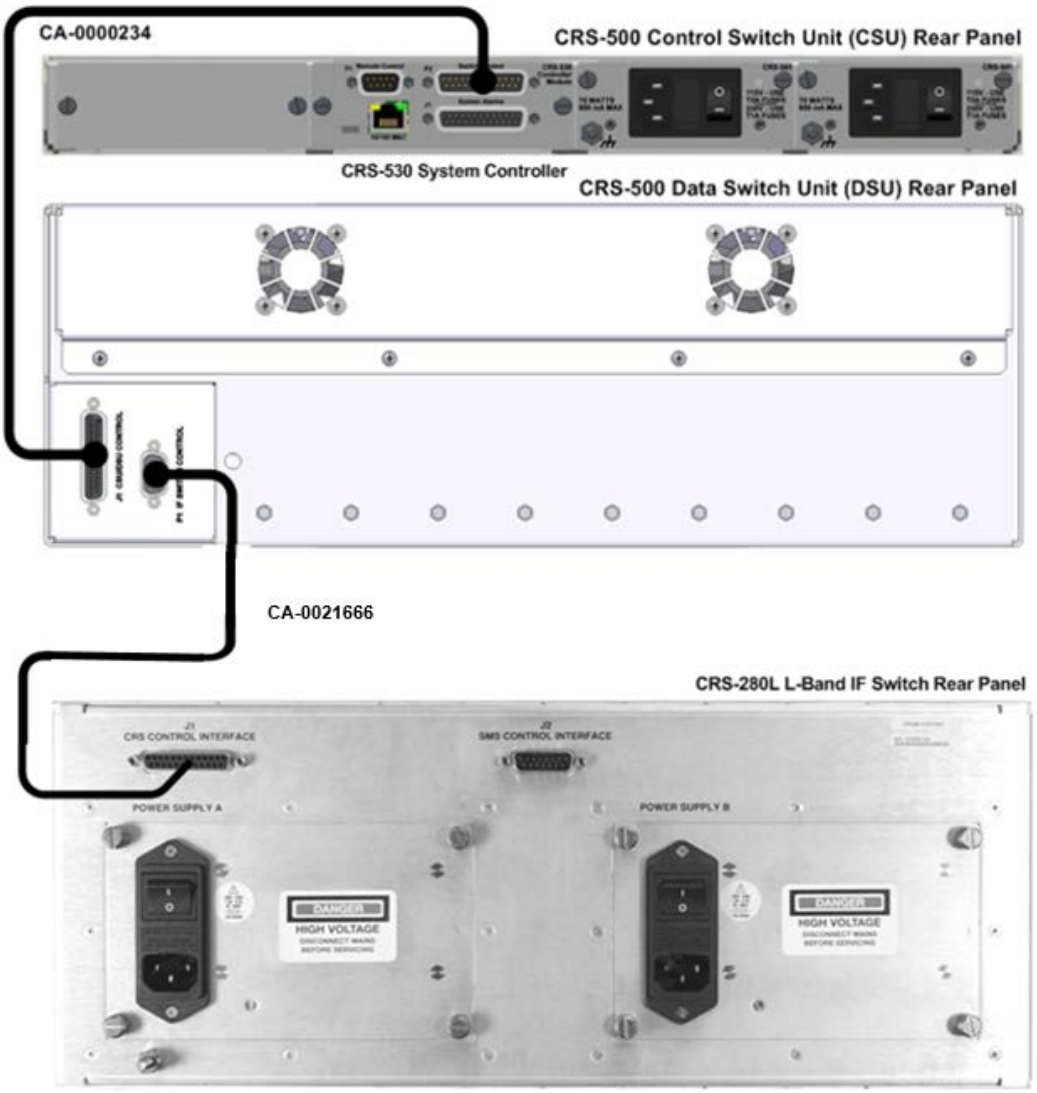


Figure 5-2. Control Cable Connection for CRS-500 to CRS-280L Example

5.3 Modem Connections

5.3.1 CDM-625/625A Modem Connections

Section	Description
5.3.1.1	CDM-625/625A Cable Connection Considerations
5.3.1.2	Control Connections
5.3.1.3	Ethernet System Communication Connections
5.3.1.4.1.1	10/100 Ethernet Traffic Data Connections (Single-port Router Mode)
5.3.1.4.2	EIA-422 Traffic Data Connections
5.3.1.5	IF Cable Connections
5.3.1.6	CRS-500 → CDM-625/625A User Data Interface Connections
5.3.1.7	Carrier-in-Carrier (CnC) Data Connections

5.3.1.1 CDM-625/625A Cable Connection Considerations

Chapter 3. CHECKLISTS FOR INITIAL START-UP AND CONFIGURATION

Read **Chapter 3. CHECKLISTS FOR INITIAL START-UP AND CONFIGURATION**. When adding a CDM-625/625A Advanced Satellite Modem to an operating 1:N system:

- Make sure the new modem does not interfere with existing traffic.
- Make sure the cabling is correct.
- Perform the power-up sequence correctly (see Section 5.5 Power Connections).
- Make sure there is no system contention from the modem Tx carrier.
- Four types of cables are used to connect the CRS-500 and the CDM-625/625A modems:
    - Control Cables
    - Ethernet System Communication Cables
    - Traffic Data Cables
    - IF Cables

The tables provided in **Section 5.1.1 Configuration and Cable Connections Summary** specify the respective cables needed for each modem and data type. Figures in the chapter sections that follow show examples of the various 1:N cable connections between the CRS-500 and the CDM-625/625A modems. For clarity, these figures typically show a limited number of installed Traffic Modems.

- For user remote serial (EIA-232 or EIA-485) or Ethernet M&C communication, connect to the CRS-500 CSU only. Do not connect directly to the Traffic or Redundant Modems.

Figure 5-3 shows the 10/100 Ethernet ports (labeled “1” through “4”) on the CDM-625/625A rear panel.

1) ***When using the CRS-316 TMI, a PP/CAT5FF7FTGY cable (CAT5 RJ-45 to RJ-45, 7’) is required for Ethernet management between each modem and the CRS-512 Ethernet M&C Interface installed in the CSU rear panel.***

2) ***Use Port 1 only for the CRS-500 Ethernet System Communication connection between the CRS-500 and the CDM-625/625A modems.***

3) ***Avoid Ethernet Networking loops. When CDM-625s are operating in IP Packet Processor Router or Managed Switch Mode, use only a single port to convey traffic data for each modem.***

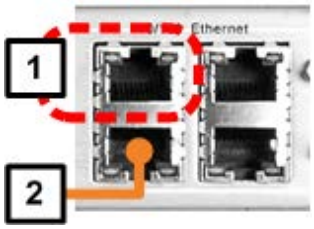


Figure 5-3. CDM-625/625A 10/100 Ethernet Ports

Figure 5-3 Notes:

1) Use Port 1 for CRS-500-to-CDM-625/625A Ethernet System Communications.
2) Use any single port (Port 2, 3, or 4) for CDM-625/625A Ethernet traffic data connection.

5.3.1.2 CRS-500 →CDM-625/625A Control Cable Connections

For 1:N connections between the CRS-500 CSU to CDM-625/625A Modems:

The CA/WR0066 Control Cable (DB-25M to DB-25F, 6’) or CA-0000069 Control Cable (HD-15M to DB-9M, 6’) provide the modem’s fault status information to the CRS-500 as well as the control path to the modem’s external Tx IF-mute (for the offline modem). Therefore, it is always required.

See **Figure 5-4**. Do these steps:

1. For the Redundant Modem, connect the CA/WR0066 Control Cable between the Redundant Modem and its corresponding RMI:
   a. DB-25F connector labeled “Data Interface” on the modem, to
   b. DB-25M connector labeled “P1” on the RMI.
2. For each Traffic Modem, connect a CA-0000069 Control Cable between each TMI and its corresponding Traffic Modem:
   a. HD-15F connector labeled “Faults” on the TMI, to
   b. DB-9F connector labeled “1:1 Control” on the modem.

5.3.1.3 CRS-500 →CDM-625/625A 10/100 Ethernet System Communication Cable Connections

1) ***The Redundant Modem 10/100 Ethernet port labeled "1" is always connected to the installed CRS-510 RMI 10/100 Ethernet port labeled "Port 1."***
2) ***The CRS-520 TMI 10/100 Ethernet port labeled "Port 1" is always connected to its respective Traffic Modem 10/100 Ethernet port labeled "1".***
3) ***Modem 10/100 Ethernet ports "2" through "4" are reserved for use as 10/100 Ethernet traffic data connections.***

For 1:N connections between the CRS-500 CSU and CDM-625/625A Modems:

The CRS-500 uses 10/100 Ethernet to communicate to all modems. It also uses 10/100 Ethernet for "pass-through" communications from the user and to/from the modems (including 10/100 Ethernet and Serial M&C).

Never directly connect to any modem for 10/100 Ethernet or Serial M&C. To access any modem in the redundancy system, connect to the CRS-500 CSU via the CRS-530 System Controller Ethernet ("10/100 M&C" port) or Serial ("P1 | Remote Control" port) interface.

See **Figure 5-4**. Do these steps:

1. For the Redundant Modem, connect a PP/CAT5FF7FTGY cable between the Redundant Modem and the CRS-510 RMI:
    a. RJ-45 10/100 Ethernet port labeled "1" on the modem, to
    b. RJ-45 10/100 Ethernet port labeled "Port 1" on the CRS-510 RMI.
2. For each Traffic Modem, 10/100 Ethernet System Communication is achieved via the TMI/Traffic Modem route. Connect a PP/CAT5FF7FTGY cable between each Traffic Modem and its corresponding CRS-520 TMI:
    a. RJ-45 10/100 Ethernet port labeled "Port 1" on the CRS-520 TMI, to
    b. RJ-45 10/100 Ethernet port labeled "1" on the modem.

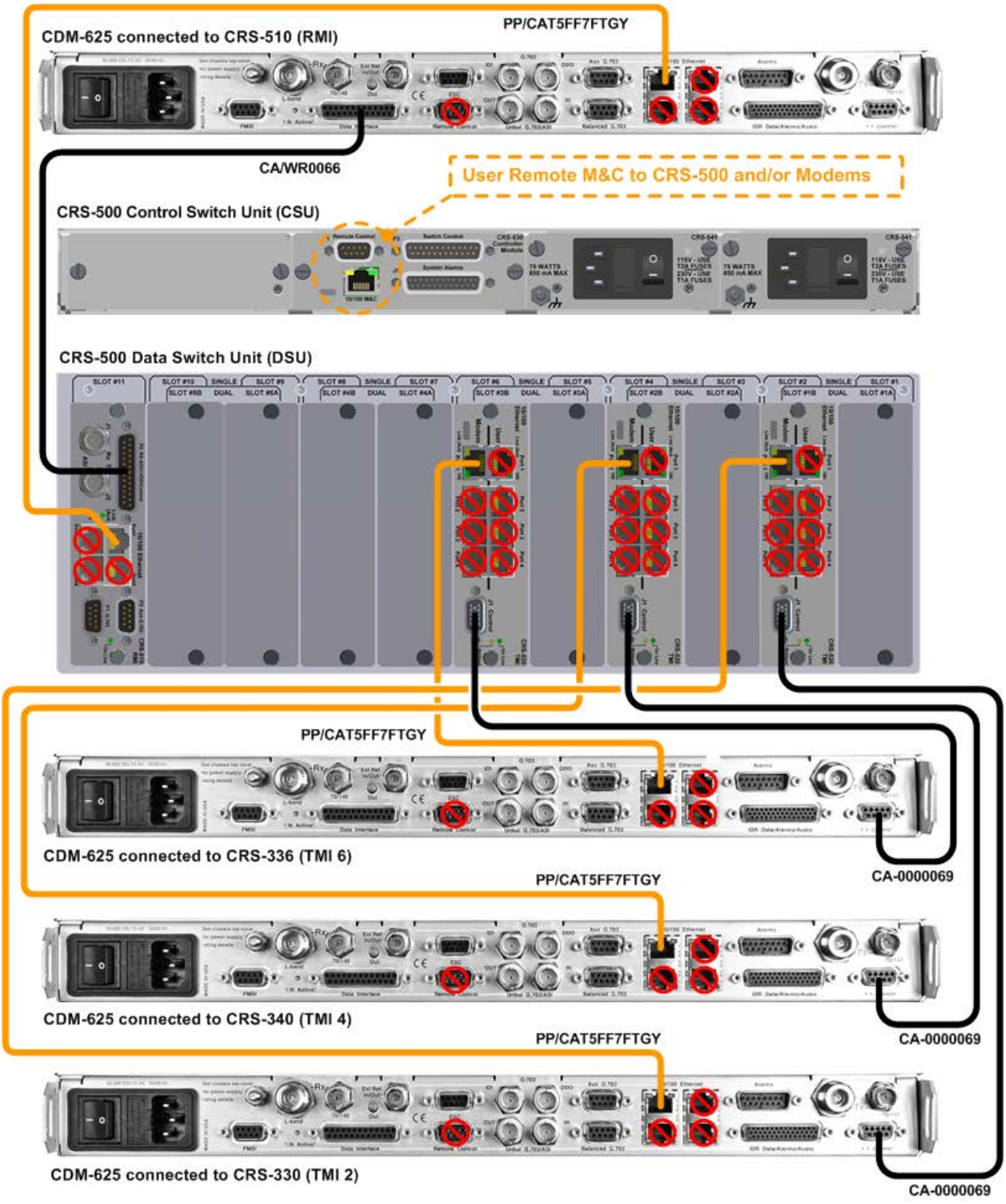


Figure 5-4. CRS-500 → CDM-625/625A Control & Ethernet System Comm Cabling Example (1:N connections shown for TMs 2, 4, and 6 only)

5.3.1.4 CRS-500 →CDM-625/625A Traffic Data Cable Connections

5.3.1.4.1 10/100 Ethernet Traffic Data Cable Connections

5.3.1.4.1.1 10/100 Ethernet using Single Port Router Mode

In this example, the 10/100 Ethernet port labeled "2" is used on the Redundant and Traffic Modems.

For 1:N connections between the CRS-500 CSU and CDM-625/625A Modems:

When using 10/100 Ethernet in Router Mode, for any Traffic Modem where only a *single port* of Ethernet Router mode traffic data is desired the modem 10/100 Ethernet port "1" connections are reserved for 10/100 Ethernet System Communication and must not carry 10/100 Ethernet traffic data.

See **Figure 5-5**. Do these steps:

1. For the Redundant Modem, connect a *single* PP/CAT5FF7FTGY cable between the Redundant Modem and the CRS-510 RMI:
    a. Any single modem RJ-45 10/100 Ethernet port labeled "2" through "4" to
    b. Any single corresponding CRS-510 RMI RJ-45 10/100 Ethernet port labeled "Port2" through "Port4".
2. For each Traffic Modem, depending on how many ports are employed for each interface, connect a *single* PP/CAT5FF7FTGY cable between each CRS-520 TMI and its designated Traffic Modem:
    a. Any **single** CRS-520 TMI RJ-45 10/100 Ethernet port labeled "Port 2" through "Port 4" to
    b. Any **single** corresponding modem RJ-45 10/100 Ethernet port labeled "2" through "4".

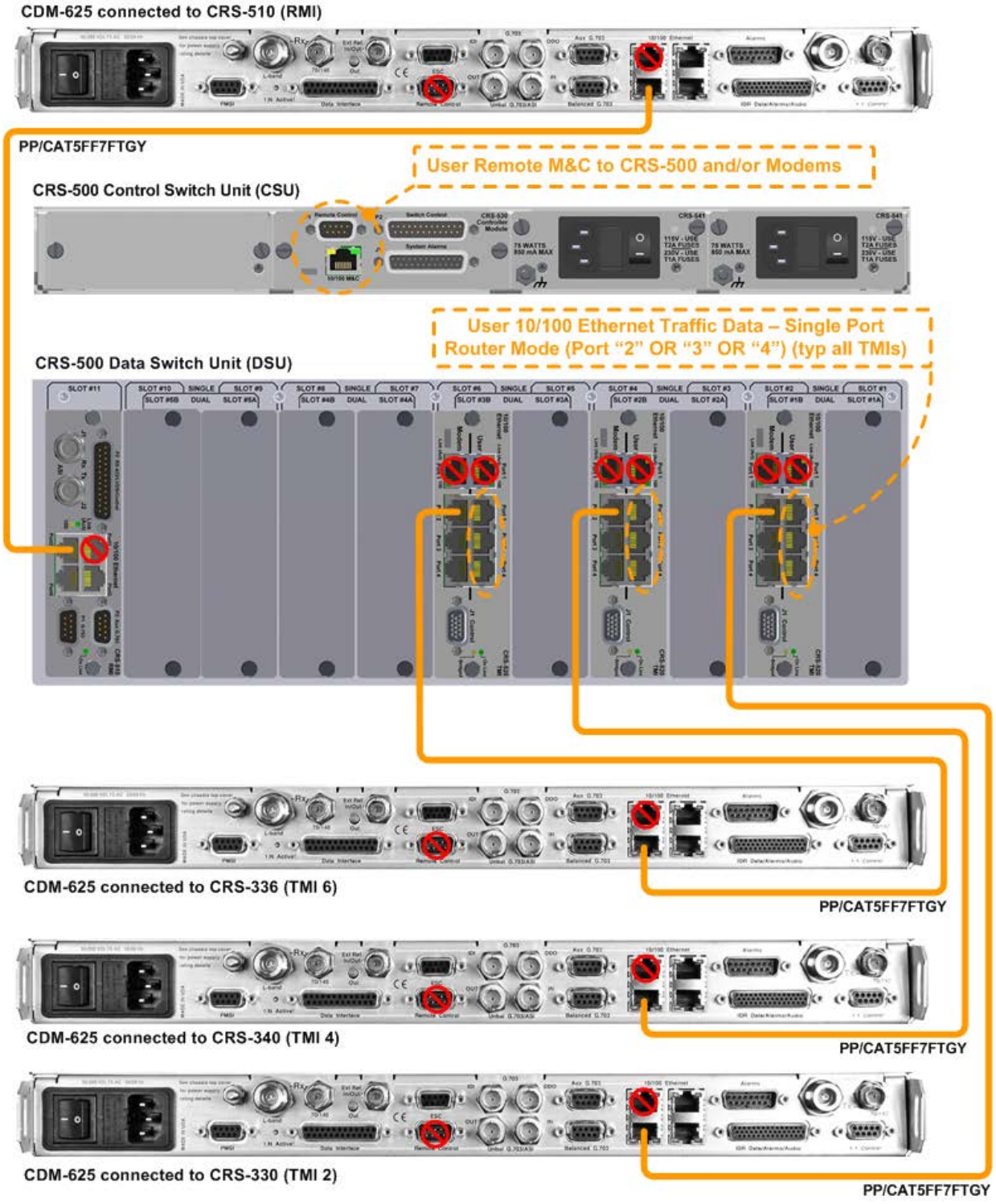


Figure 5-5. CRS-500 → CDM-625/625A 10/100 Ethernet Traffic Data Cabling Example (Single Port Router Mode, 1:N connections shown for TMs 2, 4, and 6 only)

5.3.1.4.2 EIA-422 Traffic Data Cable Connections

1) This configuration is intended for use only with CDM-625/625A modems that do not have the optional IP Packet Processor installed.

2) The Redundant Modem→DSU RMI WR/00066 and DSU TMI→Traffic Modem CA-0000069 control cable connections should have already been made, as directed in Section 5.3.2.1.

3) The Redundant Modem→DSU RMI RJ-45 10/100 Ethernet port "1" and DSU TMI→Traffic Modem 10/100 Ethernet port "1" PP/CAT5FF7FTGY M&C cable connections should have already been made for Ethernet System Communications, as directed in Section 5.3.1.3.

See **Figure 5-6** to make the Ethernet System Communication and EIA-422 traffic data cable connections for any 1:N configuration.

Do these steps:

1. Make the connections for Ethernet System Communication between the CRS-500 CSU and each Traffic Modem:
    a. Connect any single RJ-45 Ethernet port ("Port1" through "Port 12") on the CRS-512 Ethernet M&C Interface to
    b. The RJ-45 10/100 Ethernet port labeled "1" on the Traffic Modem.
2. For the traffic data connections, connect a CA/WR00066 cable between each CRS-500 DSU TMI and its designated Traffic Modem:
    a. The CRS-316 TMI port labeled "P1 | EIA-422/530, V.35, SYNC EIA-232" to
    b. The CDM-625/625A Traffic Modem port labeled "Data Interface".

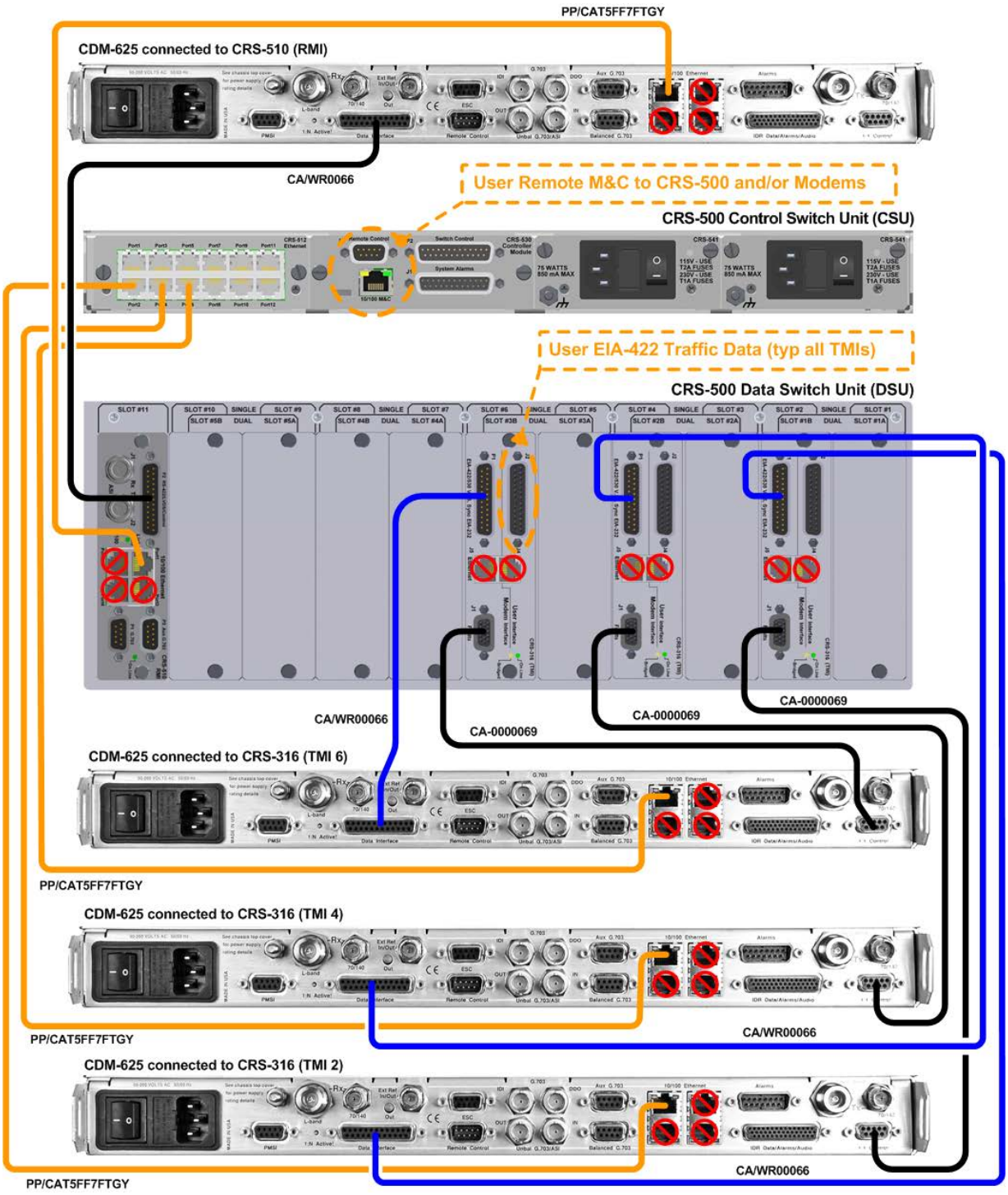


Figure 5-6. CRS-500 → CDM-625/625A EIA-422 Traffic Data Cabling Example (1:N connections shown for TMs 2, 4, and 6 only)

5.3.1.5 CDM-625/625A IF Cable Connections

See **Section 5.4** for information and examples for the establishment of IF cabling for single and multiple transponder configurations, with or without the use of the CRS-500's CRS-280/280L ISU.

5.3.1.6 CRS-500 DSU → CDM-625/625A User Data Interface Connections

Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.

Connect the traffic data from an external router, switch, or test data generator to the TMI connectors labeled "User Data Interface." This interface replaces the direct connection to the Traffic CDM-625/625A's "Data Interface" connectors.

5.3.1.7 CDM-625/625A Carrier-in-Carrier® (CnC) Data Connections

The CDM-625/625A's DoubleTalk™ Carrier-in-Carrier® (CnC) option uses a patented signal processing algorithm. CnC uses adaptive cancellation to allow both the forward and reverse carriers of a full duplex link to share the same segment of transponder bandwidth.

See Figure 5-7. For any Traffic Modem using CnC, connect and secure the CA-0000275 PMSI Multi-drop CnC® Plus Cable ([11X] DB-9M, 8.25') between the Redundant Modem and any *CnC-enabled Traffic Modem(s)*:

1. DB-9F connector labeled "PMSI" on the Redundant Modem, to
2. DB-9F connector labeled "PMSI" on each CnC-enabled Traffic Modem.

The CA-0000275 cable bypasses the CRS-500 1:N Redundancy System.

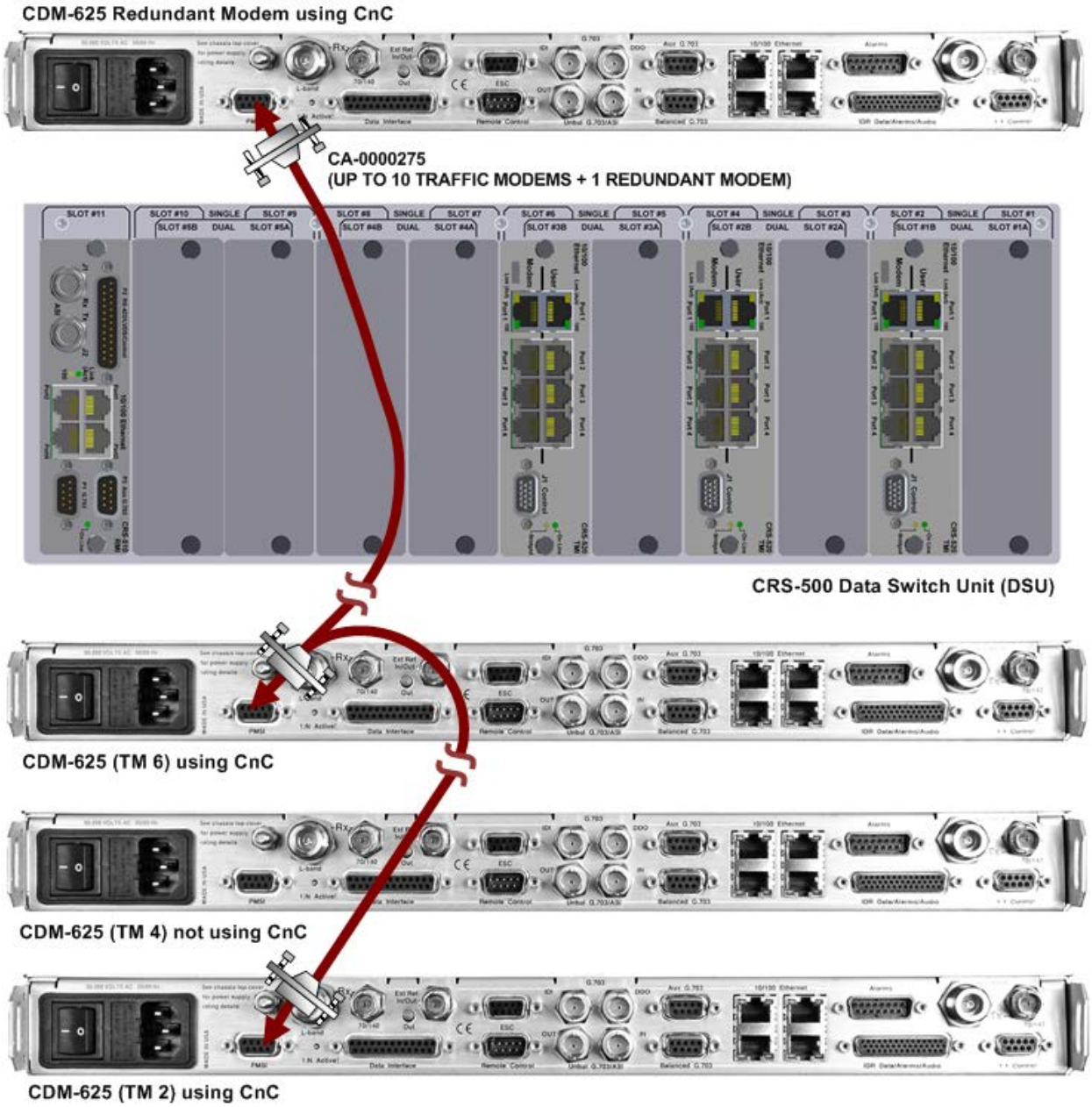


Figure 5-7. CDM-625/625A → CDM-625/625A CnC® Cable Connection Example (Connections shown for Redundant Modem and TMs 2 and 6 only)

5.3.2 CDM-750 and CDM-760 Modem Connections

Section	Description
5.3.2.1	CDM-750/760 Cable Connection Considerations
5.3.2.2	Control Connections
5.3.2.3.1	Ethernet System Communication Connections – 10/100/1000 GbE
5.3.2.3.2	Ethernet System Communication Connections – Unbalanced G.703
5.3.2.4.1	10/100/1000 Ethernet Traffic Data Connections
5.3.2.4.2	Unbalanced G.703 Traffic Data Connections
5.3.2.5	IF Cable Connections
5.3.2.6	CRS-500 → CDM-750/760 User Data Interface Connections
5.3.2.7	Carrier-in-Carrier (CnC) Data Connections

5.3.2.1 CDM-750/760 Cable Connection Considerations

Chapter 3. CHECKLISTS FOR INITIAL START-UP AND CONFIGURATION

Read **Chapter 3. CHECKLISTS FOR INITIAL START-UP AND CONFIGURATION**. When adding a CDM-750 or CDM-760 Advanced High Speed Trunking Modem to an operating 1:N system:

- Make sure the modem uses only the CRS-505 Redundant Modem Interface (RMI).
- Make sure the new modem does not interfere with existing traffic.
- Make sure the Traffic Modems have the same traffic data types within the same CRS-500 1:N Redundancy System.
- Make sure the cabling is correct.
- Perform the power-up sequence correctly (see **Section 5.5 Power Connections**).
- Make sure there is no system contention from the modem Tx carrier.
- Four types of cables are used to connect the CRS-500 and the modems:
    - Control Cables
    - Ethernet System Communication Cables
    - Traffic Data Cables
    - IF Cables
- The tables provided in **Section 5.1.1 Configuration and Cable Connections Summary** specify the respective cables needed for each modem and data type.
- Figures provided in the chapter sections that follow show examples of the various 1:N cable connections between the CRS-500 and the modems. For clarity, these figures typically show a limited number of installed Traffic Modems.

5.3.2.2 CRS-500 →CDM-750/760 Control Cable Connections

For 1:N connections between the CRS-500 CSU and CDM-750 or CDM-760 Modems:

The CA-0000069 Control Cable (HD-15M to DB-9M, 6') provides the modem's fault status information to the CRS-500 as well as the control path to the modem's external Tx IF-mute (for the offline modem). Therefore, it is always required.

1. The modem's "J3 | REMOTE" port is not used in CRS-500 operations.
2. Do not connect directly to any modem for User Remote M&C Connections. All User Remote M&C connections should use the CSU rear panel CRS-530 System Controller Serial "Remote Control" or Ethernet "10/100 M&C" ports.
3. G.703 Unbalanced traffic is possible only when the modem is equipped with the optional G.703 Plug-In Interface Cards (PIIC). This traffic data type requires the CRS-345 TMI.

See Figure 5-8 (for GbE Ethernet Traffic Data Control/Comm) or Figure 5-9 (for G.703 Unbalanced Traffic Data Control/Comm). Do these steps:

1. For the Redundant Modem, connect the CA-0000069 Control Cable between the Redundant Modem and the CRS-505 RMI:
    a. Redundant Modem DB-9F connector labeled "J2 | REDUNDANCY" to
    b. CRS-505 RMI HD-15F connector labeled "J1 | Control".
2. For each Traffic Modem, connect a CA-0000069 Control Cable between each TMI and its corresponding Traffic Modem:
    a. HD-15F connector labeled "J1 Control" on CRS-516 TMI *or* "J1 Faults" on CRS-345 TMI to
    b. Modem DB-9F connector labeled "J2 | REDUNDANCY".

5.3.2.3 CRS-500 →CDM-750/760 10/100 Ethernet System Communication Cable Connections

1. The modem “J4 | MGMT” port is reserved for use as the M&C interface in CRS-500 operations.
2. Do not connect directly to any modem for User Remote M&C connections. All User Remote M&C connections should use the CSU rear panel CRS-530 System Controller Serial “Remote Control” or Ethernet “10/100 M&C” ports.

For 1:N connections between the CRS-500 CSU and CDM-750/760 Modems:

10/100 Ethernet is used by the CRS-500 to communicate to all modems. It is also used for “pass-through” communications from the user and to/from the modems (including 10/100 Ethernet and Serial M&C).

5.3.2.3.1 Ethernet System Communication Cable Connections – 10/100/1000 Gigabit Ethernet (GbE) Traffic Data

1. Make sure that the modem **CONFIG: REMOTE CONTROL > Inband** (Inband Modem Control) is disabled.
2. The Redundant Modem RJ-45 port labeled “J4 | MGMT” is always connected to the installed CRS-505 RMI Ethernet port labeled “Port 1.” Do not use the “J4 | MGMT” port for any GbE traffic data connections.
3. Modem RJ-45 ports labeled “J5 | DATA” and “J6 | DATA” are intended for use as the GbE traffic data connections.

See Figure 5-8. Do these steps:

1. For the Redundant Modem, connect the PP/CAT5FF7FTGY cable between the Redundant Modem and the CRS-505 RMI:
    a. Redundant Modem RJ-45 ports labeled “J5 |DATA” or “J6 | DATA” to
    b. CRS-505 RMI RJ-45 Ethernet connectors labeled “Port 2” through “Port 4”.
2. For each Traffic Modem, connect a PP/CAT5FF7FTGY cable between each CRS-516 TMI and its corresponding Traffic Modem:
    a. CRS-516 TMI RJ-45 port labeled “Port 2” through “Port 4” to
    b. Traffic Modem RJ-45 port labeled “J5 | DATA” or “J6 | DATA”.

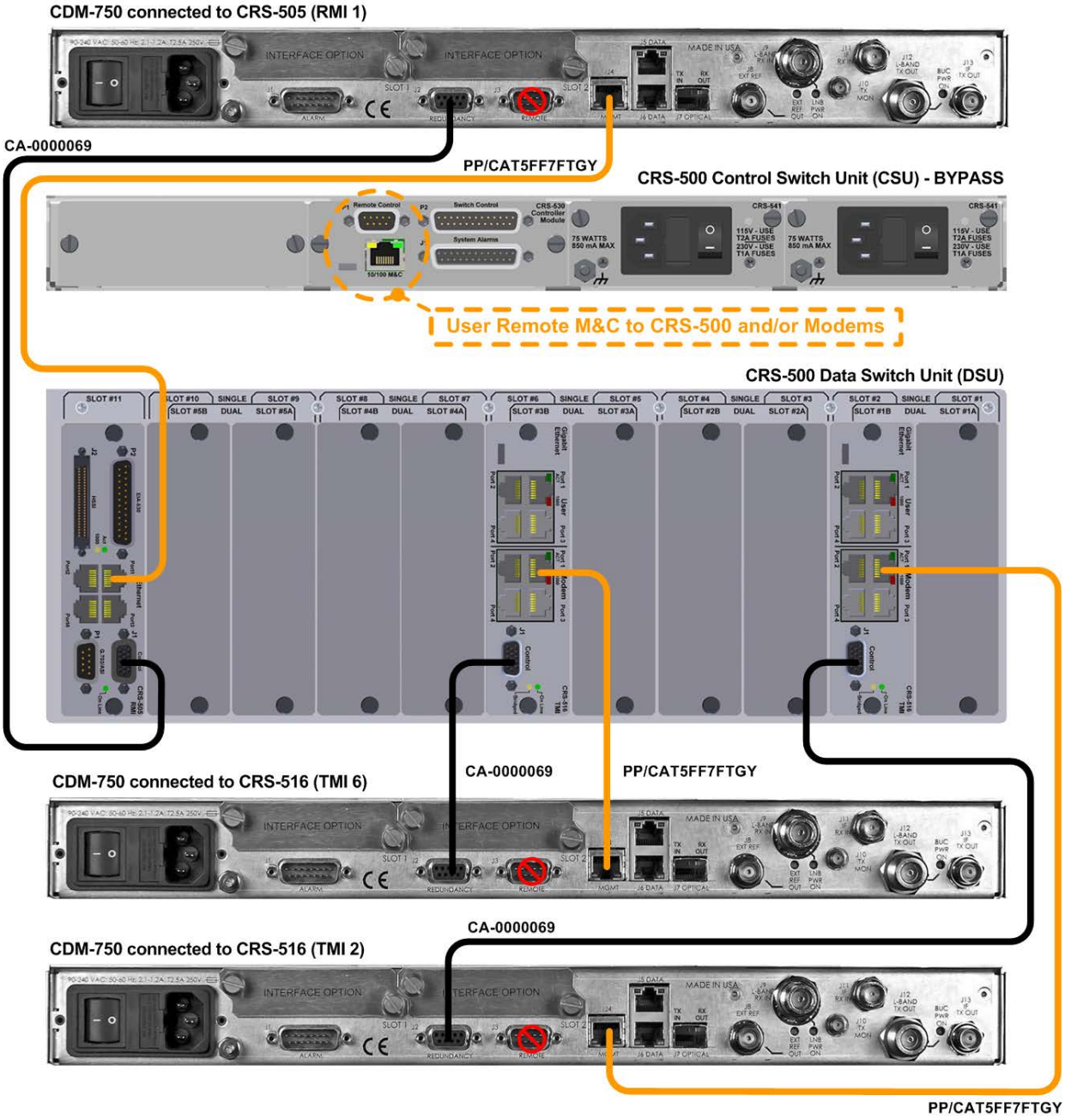


Figure 5-8. CRS-500 → CDM-750/760 Control & Ethernet System Comm Cabling Example – 10/100/1000 GbE Traffic Data (1:N connections shown for TMs 2 and 6 only)

5.3.2.3.2 Ethernet System Communication Cable Connections – Unbalanced G.703 Traffic Data

See Figure 5-9. Do these steps:

1. For the Redundant Modem, connect the PP/CAT5FF7FTGY cable between the Redundant Modem and the CSU rear panel CRS-512 Ethernet Interface:
    a. Redundant Modem RJ-45 port labeled “J4 |MGMT to
    b. Any unused RJ-45 port (i.e., “Port 1” through “Port 12” on the CSU rear panel CRS-512 Ethernet Interface.
2. For each Traffic Modem, connect a PP/CAT5FF7FTGY cable between the CSU CRS-512 Ethernet Interface and an installed Traffic Modem:
    a. Any unused RJ-45 port (i.e., “Port 1” through “Port 12” on the CSU rear panel CRS-512 Ethernet Interface to
    b. Traffic Modem RJ-45 port labeled “J4 |MGMT”.

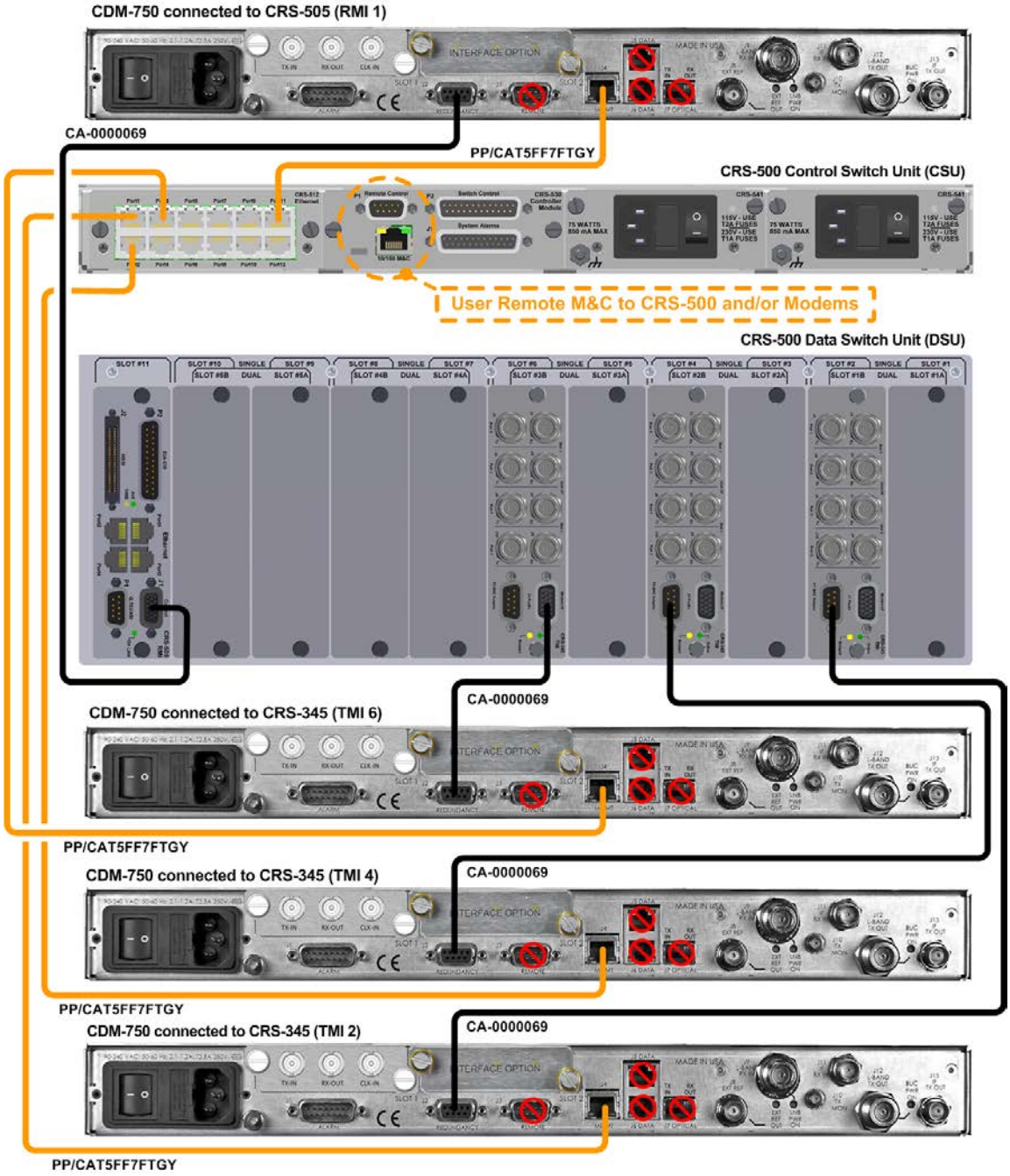


Figure 5-9. CRS-500 → CDM-750/760 Control & Ethernet System Comm Cabling Example – Unbalanced G.703 Traffic Data (1:N connections shown for TMs 2, 4, and 6 only)

5.3.2.4 CRS-500 → CDM-750/760 Traffic Data Cable Connections

5.3.2.4.1 10/100/1000 Gigabit Ethernet (GbE) Traffic Data Cable Connections

1. Make sure that the modem **CONFIG: REMOTE CONTROL > Inband** (Inband Modem Control) is disabled.
2. The Redundant Modem→DSU RMI and DSU TMI→Traffic Modem CA-0000069 control cable connections should have already been made, as directed in **Section 5.3.2.2**.
3. The Redundant Modem→DSU RMI and DSU TMI→Traffic Modem PP/CAT5FF7FTGY Ethernet Comm cable connections should have already been made, as directed in **Section 5.3.2.3.1**.
4. The Redundant Modem RJ-45 port labeled “J4 | MGMT” is always connected to the installed CRS-505 RMI Ethernet port labeled “Port 1.” Do not use the “J4 | MGMT” port for any GbE traffic data connections.
5. Modem RJ-45 ports labeled “J5 | DATA” and “J6 | DATA” are intended for use as the GbE traffic data connections.

See Figure 5-10. Do these steps:

1. For the Redundant Modem, connect PP/CAT5FF7FTGY cable(s) between the Redundant Modem and the CRS-505 RMI:
    a. Redundant Modem RJ-45 port labeled “J5 |DATA” or “J6 | DATA” to
    b. CRS-505 RMI RJ-45 port labeled “Port 2” through “Port 4”.
2. For each Traffic Modem, connect PP/CAT5FF7FTGY cable(s) between each CRS-516 TMI and its respective Traffic Modem:
    a. CRS-516 TMI RJ-45 port labeled “Port 2” through “Port 4” to
    b. Traffic Modem RJ-45 port labeled “J5 |DATA” or “J6 | DATA”.

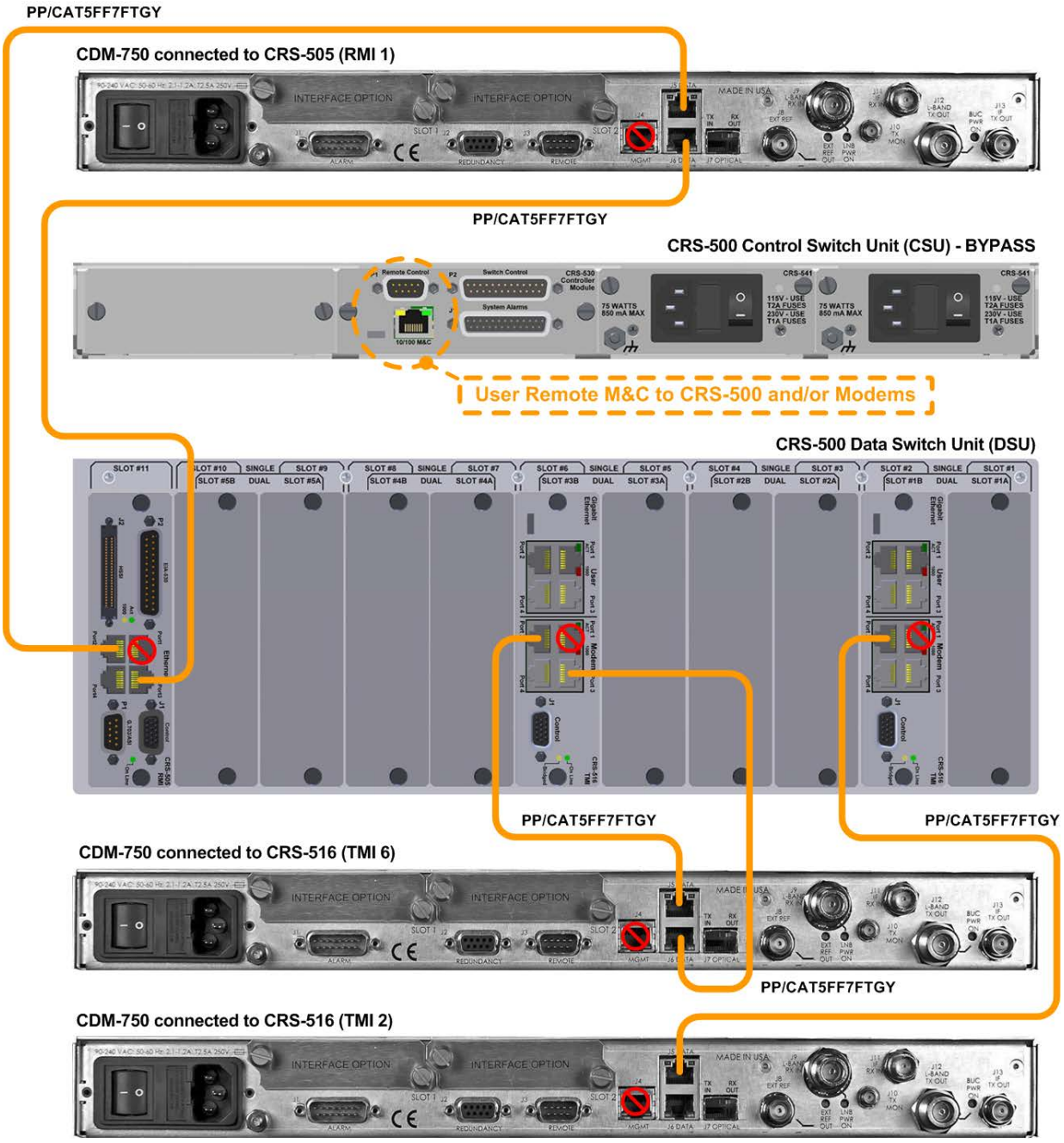


Figure 5-10. CRS-500 → CDM-750/760 10/100/1000 GbE Traffic Data Cabling Example (1:N connections shown for TMs 2 and 6 only)

5.3.2.4.2 Unbalanced G.703 Traffic Data Cable Connections

1. G.703 Unbalanced traffic is possible only when the modem is equipped with the optional G.703 Plug-In Interface Cards (PIIC). This traffic data type requires use of the CRS-345 TMI.
2. The Redundant Modem→DSU RMI and DSU TMI→Traffic Modem CA-0000069 control cable connections should have already been made, as directed in **Section 5.3.2.2**.
3. The Redundant Modem→CSU CRS-512 and DSU TMI→Traffic Modem PP/CAT5FF7FTGY Ethernet Comm cable connections should have already been made, as directed in **Section 5.3.2.3.2**.

See Figure 5-11. Do these steps:

1. For the Redundant Modem, connect the CA-0000750 Cable (4X BNC to DB-9F, 6') between the Redundant Modem G.703 PIIC and the CRS-505 RMI:
    a. First, connect cable BNC connector '1' to the PIIC "RX-OUT" port, and cable BNC Connector '2' to the PIIC "TX-IN" port; then, connect to
    b. CRS-505 RMI DB-9M connector labeled "P1 | G.703/ASI".
2. For each Traffic Modem, connect the CA-0000703 Cable (4X BNC to DB-9F, 6') between each CRS-345 TMI and its respective Traffic Modem PIIC:
    a. For single module connections (see Figure 5-11 for TMs 2 and 4):
        - CRS-516 TMI DB-9M port labeled "P1 | BNC Adapter" to
        - (Slot 1 PIIC) Cable BNC Connector '1' to the PIIC "RX-OUT" port, and cable BNC Connector '2' to the PIIC "TX-IN" port.
    b. For dual module connections (see Figure 5-11 for TM 6):
        - CRS-516 TMI DB-9M port labeled "P1 | BNC Adapter" to
        - (Slot 1 PIIC) cable BNC Connector '1' to the PIIC "RX-OUT" port, and cable BNC Connector '2' to the PIIC "TX-IN" port, and
        - (Slot 2 PIIC) cable BNC Connector '3' to the PIIC "RX-OUT" port, and cable BNC Connector '4' to the PIIC "TX-IN" port.

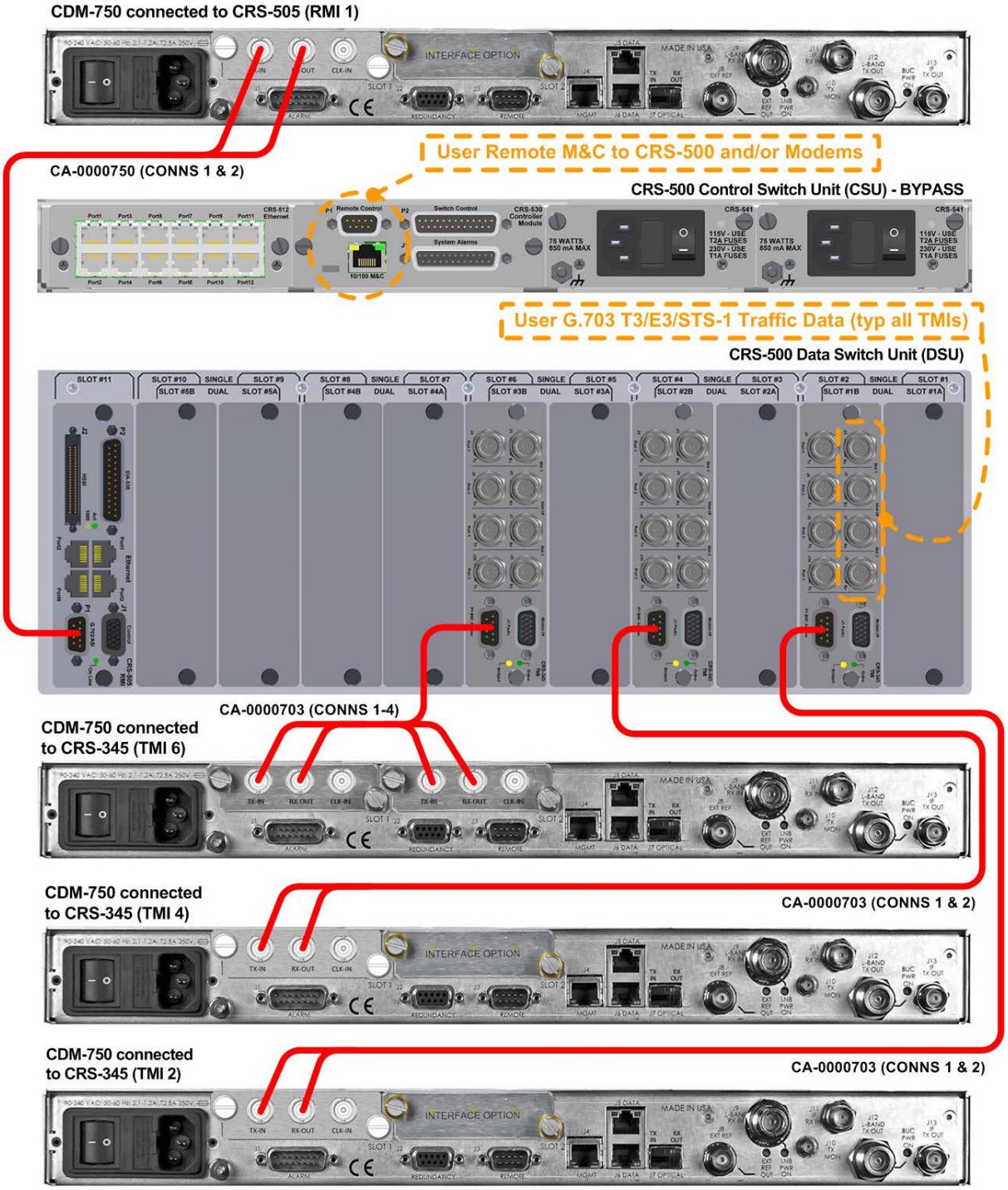


Figure 5-11. CRS-500 → CDM-750/760 G.703 Unbalanced Traffic Data Cabling Example (1:N connections shown for TMs 2, 4, and 6 only)

5.3.2.5 CDM-750/760 IF Cable Connections

See **Section 5.4** for information and examples for the establishment of IF cabling for single and multiple transponder configurations, with or without the use of the CRS-500's CRS-280/280L ISU.

5.3.2.6 CRS-500 DSU → User Traffic Data Connections

The user traffic data from an external router, multiplexing equipment or test data generator should connect to the TMI connectors labeled "User Data Interface." This interface replaces the direct connection to the Traffic Modem's "J5 | DATA" or "J6 | DATA" ports.

Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.

5.3.2.7 Carrier-in-Carrier® (CnC) Operation

No external cabling is required for the CDM-750/760's optional DoubleTalk™ Carrier-in-Carrier® (CnC) operation.

5.4 IF Cable Connections

5.4.1 IF Cabling Overview

For hub applications, there are two basic IF configurations – *single transponder* or *multiple transponders*.

For a single transponder configuration, connect all modems to the same Up/Down Converter. This configuration eliminates the need for an IF Switch Unit (ISU) because the CRS-500 mutes (shuts off) the offline modem's Tx IF carrier.

For a multiple transponder configuration, you may group and connect the modems in various combinations to multiple transponders. This configuration requires the use of ISU.

For either configuration, once all CRS-500 1:N Redundancy System connections have been made and proper system operation has been verified, you should then connect the user-provided Up and Down Converters.

To prevent unintended signals from reaching the satellite, do <u>not</u> connect the IF to any Up Converters until the CRS-500 1:N Redundancy System is fully cabled and configured.

5.4.2 IF Cable Connections – Single Transponder (No ISU)

To prevent problems resulting from impedance mismatch, ensure that the impedance for the modem's cables and combiner are the same.

Figure 5-12 shows an example of a single transponder IF configuration (L-Band operation is depicted in this example). Connect the user-provided IF cables. Do these steps:

1. Make your Transmit (Tx) IF Connections:
    a. Connect the appropriate user-provided IF cables from each modem's "Tx IF" connector (BNC for 70/140 MHz, Type 'N' for L-Band) to a single user-provided power combiner.
    b. Connect the output of the power combiner to the user-provided Up converter.
2. Make your Receive (Rx) IF Connections:
    a. Connect the appropriate user-provided cables from each modem's "Rx IF" connector (BNC for 70/140 MHz, Type 'N' for L-Band) to the output ports of a single user-provided signal splitter.
    b. Connect the input of the signal splitter to the output of the user-provided Down Converter.
    c. When a modem is taken offline, its Tx IF is automatically muted (shut down) by the CRS-500.

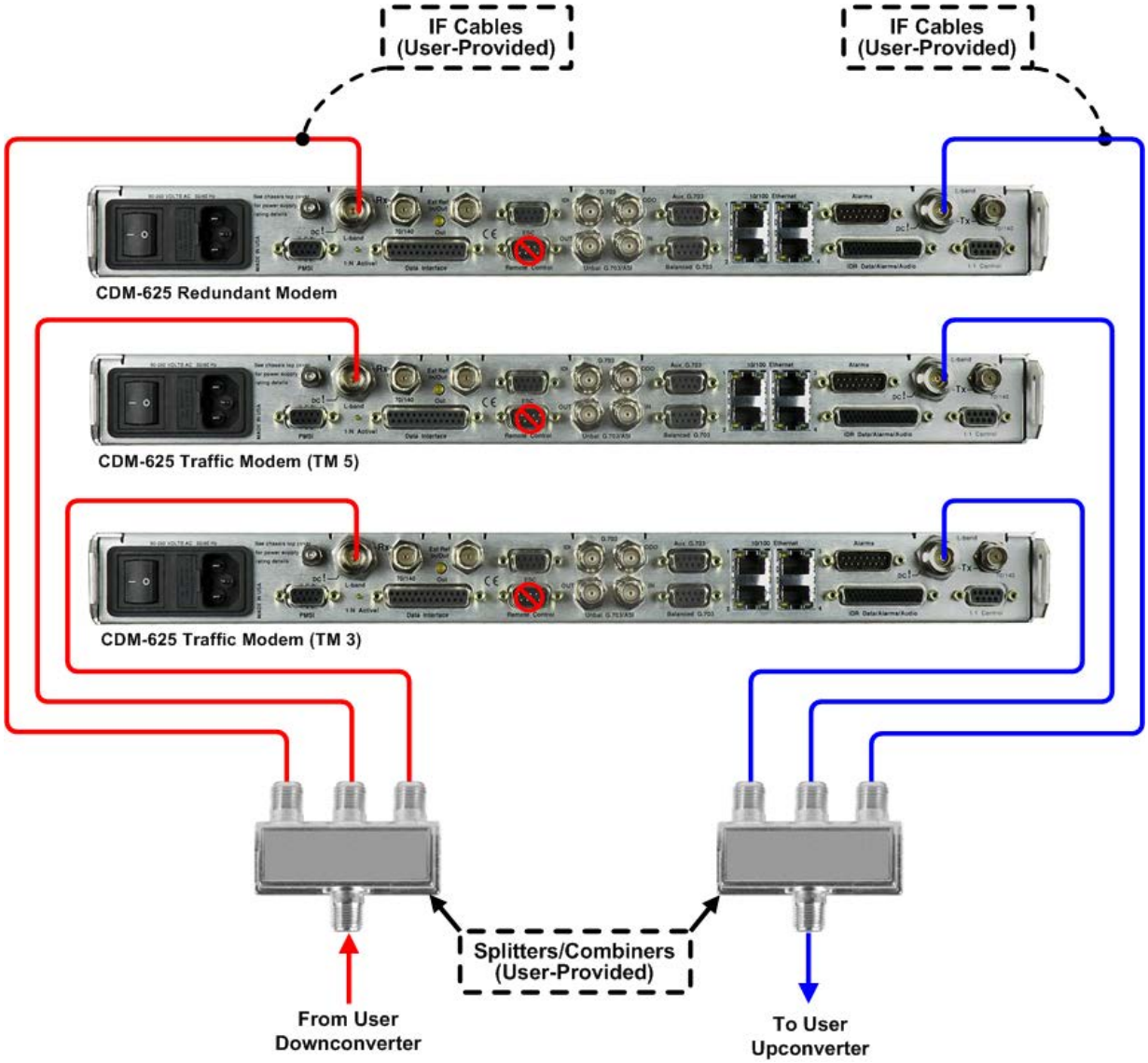


Figure 5-12. CRS-500 1:N IF Cabling Example 1 – Single Transponder Configuration (No ISU) (Connections shown for TMs 3 and 5 and 8 only)

5.4.3 IF Cable Connections – Multiple Transponders (Using ISU)

When Traffic Modems use multiple transponders, the CRS-500's CRS-280/280L ISU provides routing, control and isolation of all the modems' IF signals – all Traffic and Redundant Modem IF signals are routed through the ISUs.

Because relays on the CRS-280/280L ISU isolate any unwanted signals, non-faulted modems are always connected to the correct up/down converters (transponders); furthermore, as the CRS-500 automatically senses the presence of a CRS-280/280L ISU, the offline modem's Tx IF remains on.

Each ISU is available as a separate unit by bandwidth, accommodating either 70/140 MHz Band or L-Band operation. Each ISU has a modular design permits different ISU combinations as needed to cover multiple transponders operating either on the same IF-Band or on different IF-Bands.

The table provided under **Section 5.1.1.3 IF Switch Unit (ISU) Configurations** lists the available ISU and the pertinent CEFD IF cables. Figures in the sections that follow show 1:N IF cable connections between Redundant and Traffic Modems and select CRS-280/280L ISU. Cabling requirements are dependent on the ISU in each configuration.

5.4.3.1 Same Band (Tx/Rx)

One CRS-280/280L is required for all Traffic Modems in the CRS-500 1:N Redundancy System.

Figure 5-13 shows an example of a 70/140 MHz IF-Band same band / multiple transponder Tx/Rx configuration with a 1:N redundancy setup, using a CRS-280 ISU and CDM-625/A modems.

Figure 5-14 shows an example of an L-Band same band / multiple transponder Tx/Rx configuration with a 1:N redundancy setup, using a CRS-280L ISU and CDM-625/A modems.

Modem-to-ISU IF Cable

There are two cables per interface, one for Tx and the other for Rx.

- For 75/140 MHz, 50 ohms, use cable PL/0946-2 (BNC → BNC, 8')
- For 75/140 MHz, 75 ohms, use cable PL/0813-8 (BNC → BNC, 8')
- For L-Band, 500 ohms, use cable CA/RF10453-8 (Type 'N' → 'N', 8')

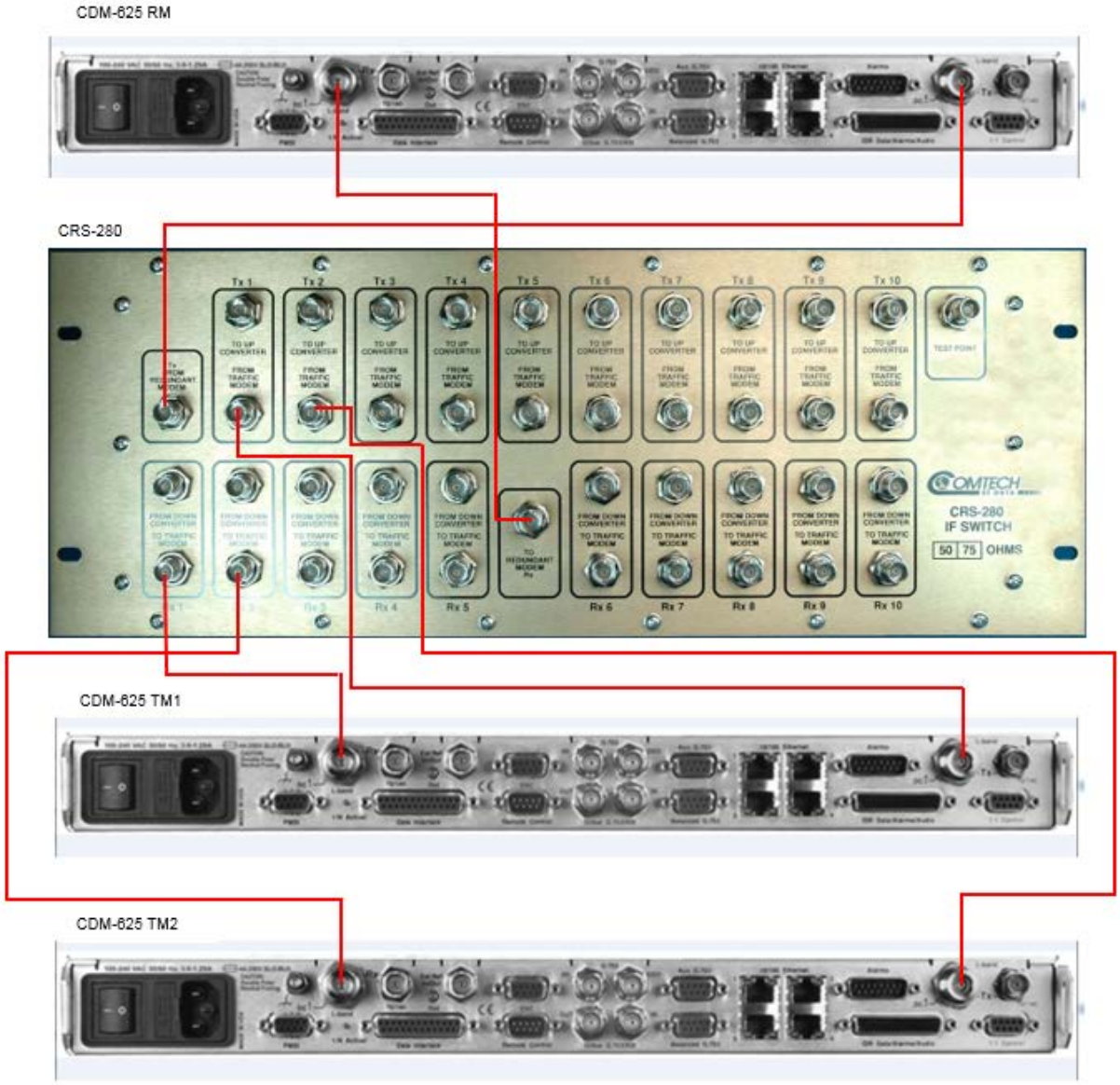


Figure 5-13. CRS-500 1:N IF Cabling Example 2 – CRS-280 → CDM-625/A (Connections shown for TMs 1 and 2 only)

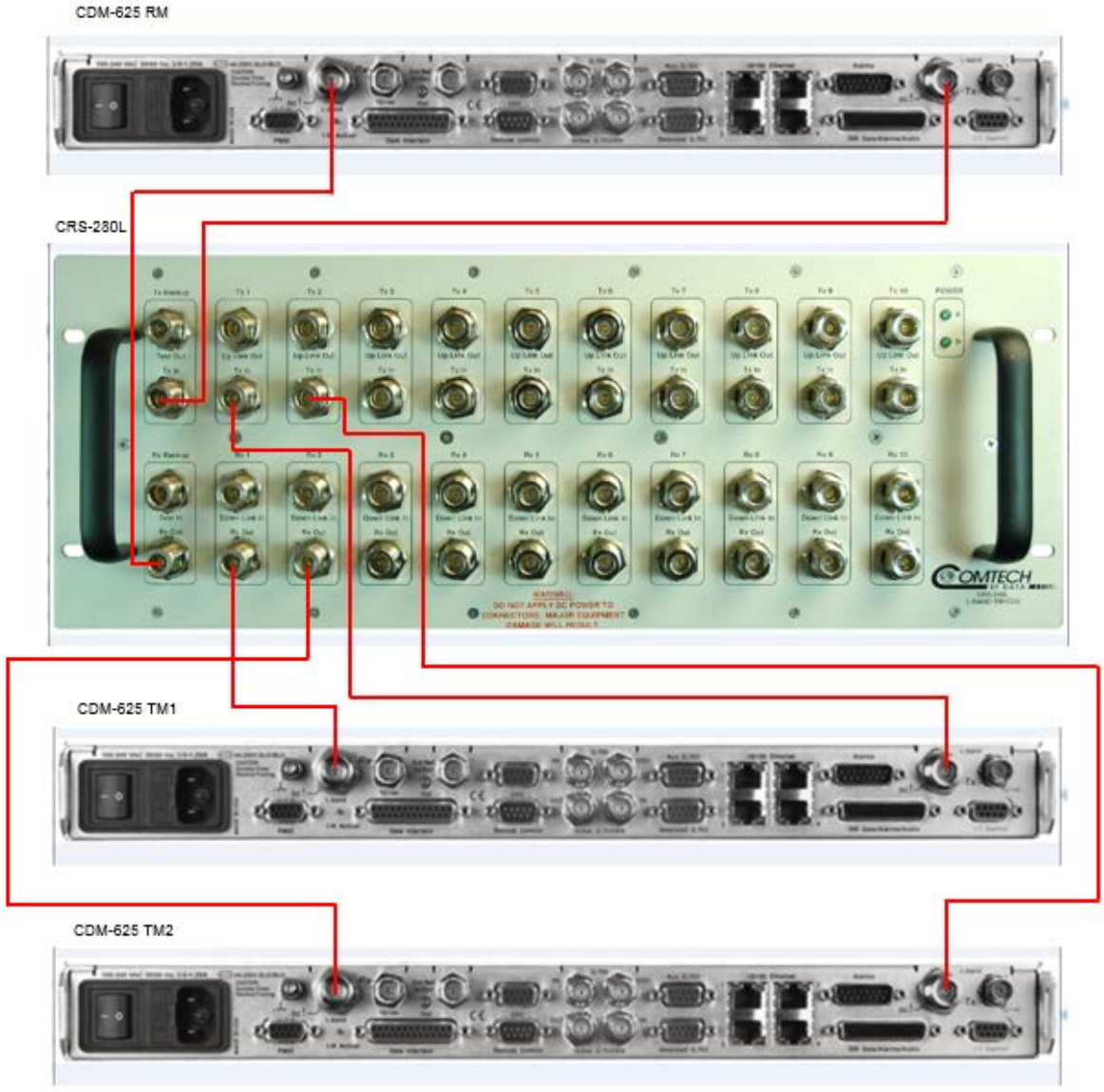


Figure 5-14. CRS-500 1:N IF Cabling Example 3 – CRS-280L → CDM-625/A (Connections shown for TMs 1 and 2 only)

5.5 Power Connections

Section	Description
5.5.1	Overview
5.5.2	Modem Power Connections
5.5.3	CRS-500 Power Connections
5.5.4	CRS-500 1:N Redundancy Power-up Sequence

5.5.1 Overview

Once the CRS-500 1:N Redundancy System and its accompanying components (switch units, modems, etc.) have been properly cabled as directed in this chapter, depending on the state of operation the system may be powered up for initial configuration or for general operation.

5.5.2 Modem Power Connections

AC Power/Switch Module Example **DC Power/Switch Module Example**

Figure 5-15. Modem Power Interface Examples

Connect the power cord for each modem. Do these steps:

1. Ensure that all modem power switches are in the OFF position before connecting the power supply power cords. See **Figure 5-16.** The design of the switch module may vary according to product.
2. Each modem is supplied with a power supply cord. Connect the female end of the power cord into the power input module.
3. Plug the male end of the power cord into the power source. It is recommended that every other modem is connected to an alternate power source.

The auto-sensing power supplies do not require any adjustments.

4. Do not turn the modem power switches ON until instructed to.

5.5.3 CRS-500 Power Connections

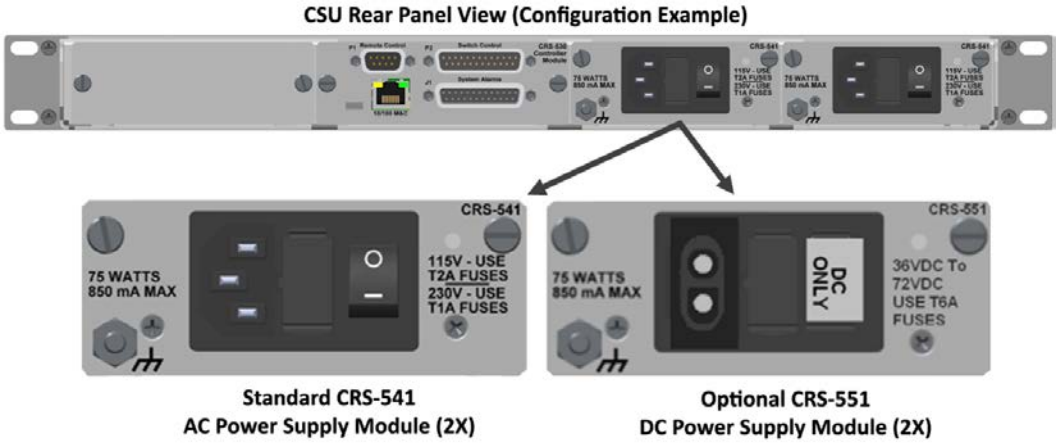


Figure 5-16. CRS-500 Power Connections (CSU Rear Panel)

Figure 5-17 Notes:

1. ***Each CRS-500 is shipped with two power supply modules installed in the rear panel of the CSU – the AC IEC line input connector for each power supply module contains the ON/OFF switch for that module. It is recommended that both power supplies, connected to individual power sources, are used for maximum reliability.***
2. ***Each power supply module contains two fuses, one each for line and neutral connections (or L1, L2 where appropriate). These are seated in a fuse holder that is press-fit into the body of the module.***
3. ***For continued operator safety, always replace the fuses with the correct type and rating. For 115/230 volt AC operation, use T1A (slow-blow) 20 mm fuses.***
4. ***Comtech EF Data products' auto-sensing power supplies do not require any adjustments.***

Connect the power cord. Do these steps:

1. Ensure that both power supply switches are in the OFF position before connecting the power supply power cords.
2. Connect the female end of each supplied power cord into its power input (one to each power input module).
3. Plug the male end of each power cord into its power source. Comtech EF Data recommends that you connect each power cord to an alternate power source.
4. Do NOT turn the CRS-500 power switches ON until instructed to.

5.5.4 CRS-500 1:N Redundancy System Power-up Sequence

The system is ready for operations ONLY AFTER you successfully power ON all components and you configure the modems for 1:N redundant operations. Further operational information is available in the following chapters:

- **Chapter 6. CONFIGURE MODEMS for 1:N REDUNDANCY**
- **Chapter 8. CSU FRONT PANEL OPERATION**
- **Chapter 9. ETHERNET INTERFACE OPERATION (for SNMP, Telnet, and HTTP (Web Server) operation)**
- **Chapter 10. SERIAL INTERFACE OPERATION (for serial remote control operation)**

Once you make all cabling and power connections, you must power-up the CRS-500 1:N Redundancy System in the order listed here. Do these steps:

1. CRS-280L IF SWITCH POWER: If the CRS-280L IF Switch is included in the setup, turn both power switches ON.

   If the CRS-280L is not used, skip this step and proceed to turn power ON to all modems.

2. MODEM POWER: Turn the power switches ON for all modems.
3. MODEM CONFIGURATION: Configure all modems for 1:N redundant operations as required per **Chapter 6. CONFIGURE MODEMS for 1:N REDUNDANCY**.
4. CRS-500 POWER: Turn both power switches (located on the rear panel on the CSU) ON.

Chapter 6. FIRMWARE UPDATE

6.1 Firmware Update Overview

Make sure to operate the Comtech EF Data CRS-500 1:N Redundant System with its latest available firmware.

The CRS-500 1:N Redundancy System is factory-shipped with the latest version of operating firmware. If you need to update the firmware, you can apply the update to the system without having to remove it from operation. You may directly acquire the download from Comtech EF Data's Web site or receive the archive file by e-mail from Comtech EF Data Product Support.

6.1.1 Firmware Update Procedure Summary

1. Download the modem-specific firmware update archive file to a user-supplied PC. The User PC must be Microsoft Windows® compatible.
2. Connect the User PC serial and Ethernet ports to the CRS-500 1:N Redundancy System.
3. Use the CRS-500 HTTP Interface to automatically upload the extracted firmware files from the User PC to the system's standby firmware image.
4. Use the CSU front panel or the CRS-500 HTTP Interface to configure the system to operate using the updated firmware image.

6.1.2 About Firmware Numbers, File Versions, and Formats

Comtech EF Data's Web site catalogues its firmware update files by product type (e.g., modem, converter, etc.) and specific model/optional configuration. The CRS-500's files are provided under "**Home | Support | Software Downloads | Flash & Software Update Files |Modem Accessories | CRS-500**."

Note that firmware is modem-specific. The firmware download hyperlink appears either as:

- **F0000389X_V### (for the CDM-625 or CDM-625A);**
- **F0000476X_V### (for the CDM-750 or CDM-760).**

Typical for either, 'X' is the revision letter, and '###' represents the firmware version number – e.g., V126 = Version 1.2.6.

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

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

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

6.2 Prepare for the Firmware Download

6.2.1 Required User-supplied Items

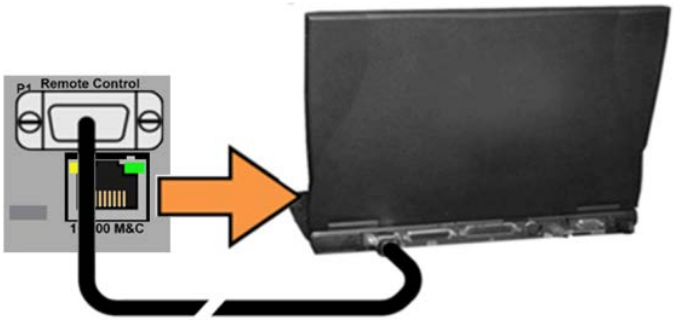
- A Microsoft Windows-based PC, equipped with available serial and Ethernet ports.
- A 9-pin serial cable and an RJ-45 CAT5 Ethernet cable to connect the User PC to the system.
- A terminal emulator program (e.g., Tera Term or HyperTerminal).
- A compatible Web browser (e.g., Internet Explorer).

6.2.1.1 CSU Connections

Chapter 5. CABLES AND CONNECTIONS

Connect the User PC to the system:

- Connect the 9-pin serial cable from the CSU's CRS-530 System Controller Module 'P1 | Remote Control' port to a serial port on the user PC.



- Connect the CAT5 Ethernet cable from the CRS-500 system to an Ethernet port on the User PC via a hub or a switch, or direct connection. Note that the location for this M&C connection depends both on the deployed modem model and the mode of Ethernet in use. See **Chapter 5. CABLES AND CONNECTIONS** for details.

6.2.2 Configure the Terminal Emulator Program

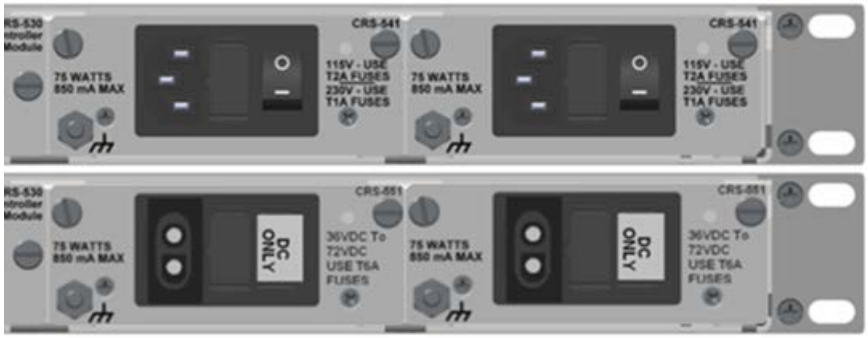
Read your terminal emulator program user guide or HELP feature for operating and configuration instructions.

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

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

6.2.3 Apply Power to the CRS-500 System

Be sure to power on all modems installed in your CRS-500 1:N Redundancy System. Apply power to the CRS-500 system components through the CSU rear panel power modules. The CSU will be equipped with either a pair of standard CRS-541 AC Modules, or the optional CRS-551 DC Modules.



(TOP) CSU Rear Panel with Standard CRS-541 AC Modules

(BOTTOM) CSU Rear Panel with Optional CRS-551 DC Modules

Figure 6-1. CRS-500 Power Connections

6.2.4 Management IP Address and Firmware Information

- ***Chapter 8. CSU FRONT PANEL OPERATION***
- ***Chapter 9. ETHERNET INTERFACE OPERATION***
- ***Chapter 10. SERIAL INTERFACE OPERATION***

Do these steps:

1. Identify your default Management IP Address. You will not be able to access the HTTP Interface without this information. See Section 6.2.4.1.
2. Get the firmware information using one of these methods:
   - Use the CSU Front Panel. See Section 6.2.4.2.
   - Use the Serial Remote Interface. See Section 6.2.4.3.
   - Use the HTTP Interface. See Section 6.2.4.4.

6.2.4.1 Use Front Panel Operation to Find the Management IP Address

```
Management IP Address:
000.000.000.000
```

View the assigned Management IP Address on the **SELECT: Config→ IP → Mgt-IP** screen.

6.2.4.2 Use Front Panel Operation to Find the Firmware Information

View the CRS-500 running M&C version at the top level screen. Press the **CLEAR** key several times to view this information. The detailed firmware information can be found within the **SELECT: Util → Firmware → Info → Bulk1** or **Bulk2** nested submenus.

```
Comtech  CRS-500 Switch
for CDM-XXX      V#.#.#
```

```
Bulk1:           MM/DD/YY
FW-0000389          #.#.#
```

When done, press **ENTER** or **CLEAR** to return to the previous menu.

6.2.4.3 Use the Serial Interface to Find the Firmware Information

Use your terminal emulator to execute remote queries with the CRS-500. Use the “SWR” or “FRW” remote queries to find the firmware information:

- **Condensed** (query the firmware version number):

  EXAMPLE: <0/SWR?{CR}

  >0/SWR=1.2.6{CR}{LF}

- **Detailed** (query the firmware information in the form FRW?X where X=1 (Bulk1/Image#1), 2 (Bulk2/Image#2), or 3 (bootrom)).

  EXAMPLE: <0/FRW?1{CR}

  >0/FRW?1=F0000389X #.#.# MM/DD/YY{CR}{LF}

6.2.4.4 Use the CRS-500 HTTP Interface to Find the Firmware Information

Do these steps:

1. The ‘**Bulk Information**’ section of the ‘**Utility | Info**’ page provides the firmware information details as **Bootrom**, **Bulk 1**, and **Bulk 2**, as shown in this example:

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

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

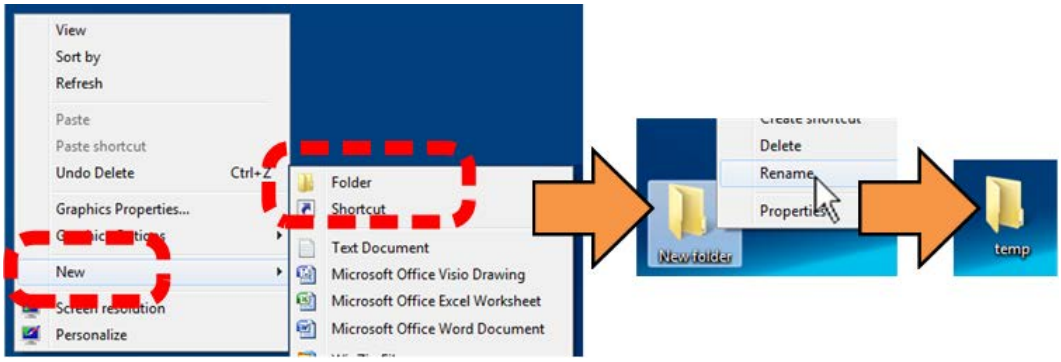
The temporary folder is where you store the firmware archive download. There are several ways you can make a temporary folder on a Windows PC:

- To use the Windows Desktop, see Section 6.2.5.1.
- To use Windows Explorer, see Section 6.2.5.2.
- To use the Run and Browse windows, see Section 6.2.5.3.
- To use Windows Command-line or the Command Prompt, see Section 6.2.5.4.

After you make the temporary folder, proceed to Section 6.2.6 to download and extract the firmware files.

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

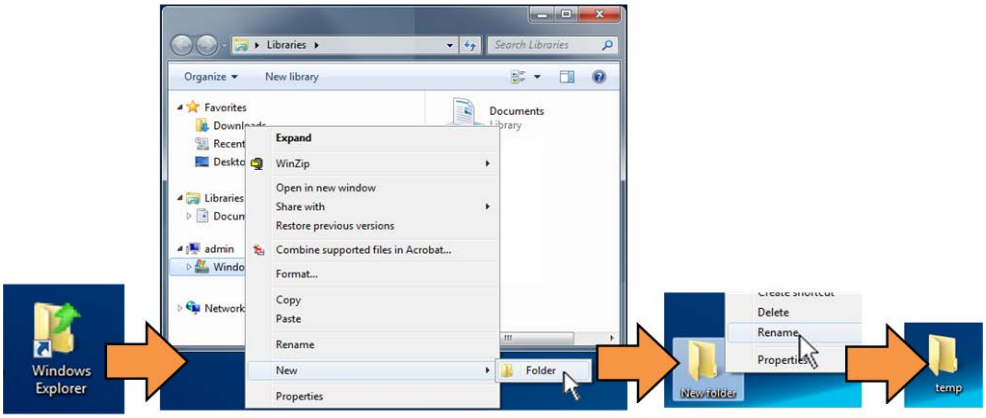
6.2.5.1 Use Windows Desktop to Make a Folder



Do these steps:

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

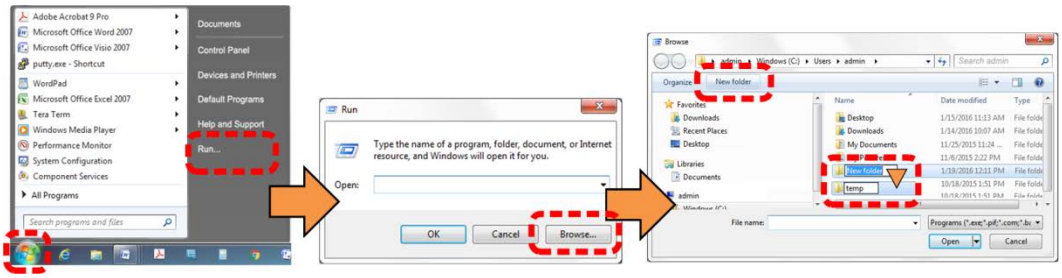
6.2.5.2 Use Windows Explorer to Make a Folder



Do these steps:

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

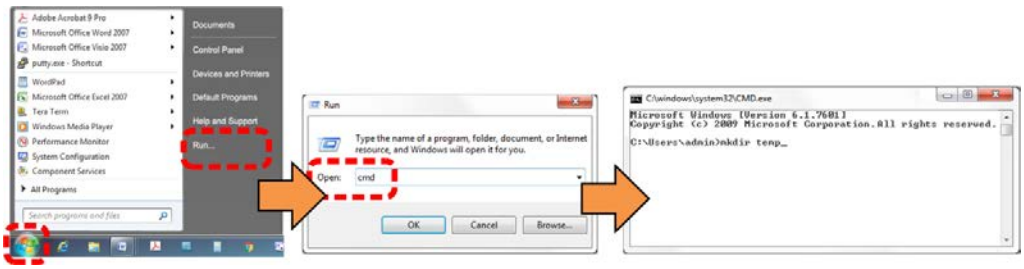
6.2.5.3 Use the Run and Browse Windows to Make a Folder



Select **Start** on the Windows taskbar and then do these steps:

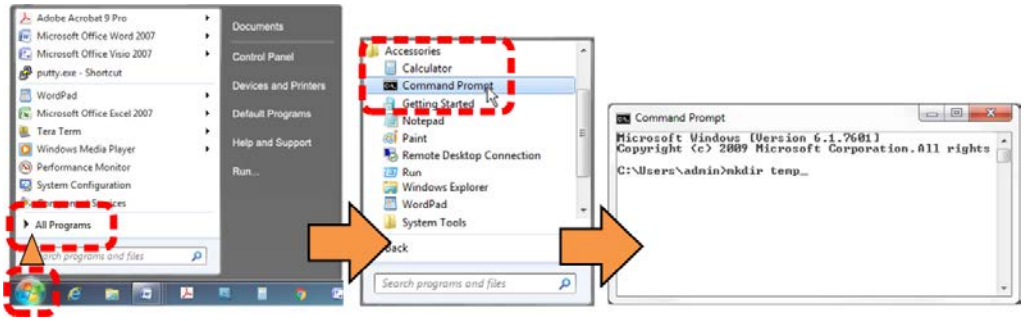
1. Click **Run…** to open the **Run** window.
2. Click **Browse…** to open the **Browse** window.
3. Click **New Folder**. This can be an icon or a text label, depending on the Windows OS version.
4. Right-click the **New Folder** folder name, and then **Rename** this folder to “temp” or some other convenient,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

6.2.5.4 Use Windows Command-line or Command Prompt to Make a Folder



Select **Start** on the Windows taskbar and then do these steps:

1. Click **Run...** to open the **Run** window (or, depending on Windows OS version prior to Windows 95, click the **MS-DOS Prompt** icon from the Main Menu).
2. Open a Command-line window:
   - For Windows 95 or Windows 98 – type “command”.
   - For any Windows OS versions later than Windows 98 – type “cmd” or “command”.
   - Alternately, from **Start**, select the **All Programs > Accessories** popup submenu, and then select **Command Prompt**:



3. From the c:\> prompt, type either “mkdir temp” or “md temp” (both “mkdir” and “md” mean “make directory”), and then press **Enter**.

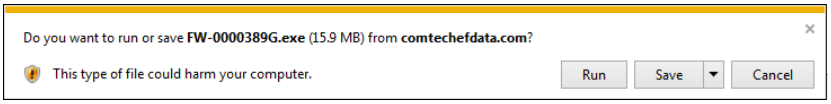
There will now be a “temp” folder created and available for placement of the firmware file download.

6.2.6 Download and Extract the Firmware Update Files

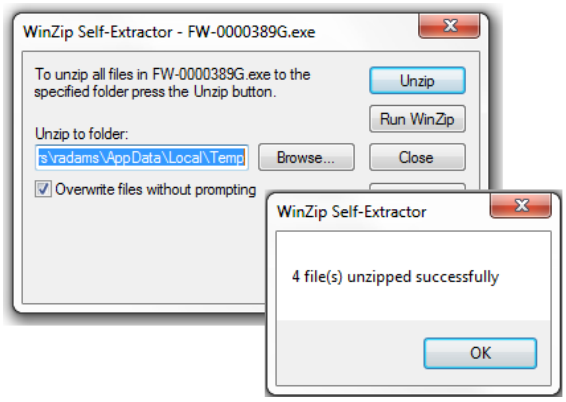
The example figures in this section are provided for reference only. Your firmware information will be different.

Do these steps:

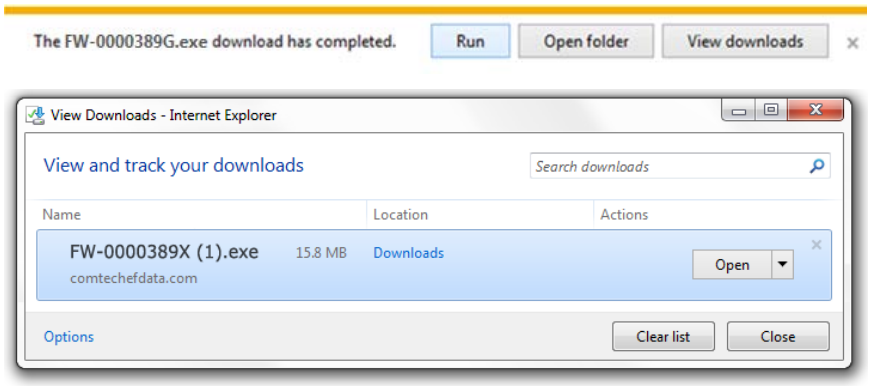
1. Go online to www.comtechefdata.com.
2. On the Main page – Under **Support Information** or the **Support** tab, select the **Software Downloads** hyperlink.
3. On the **Software Downloads** page – Click **Download Flash and Software Update Files**.
4. On the **Flash Updates Index** page – Select the **Modem Accessories** hyperlink.
5. On the **Modem Accessories** product page – Select the modem-specific **CRS-500** product hyperlink;
6. Select the appropriate firmware archive EXE or ZIP file download hyperlink.
7. Once you select the EXE or ZIP hyperlink, the **File Download** dialogue opens on your browser and prompts an action. You may otherwise click **[Cancel]** to quit the file download process. Note the following:
   - For EXE files:



     o Click **[Run]** to open the self-extractor dialogue window. Use **[Browse]** to select your destination folder. Click **[Unzip]** to extract the files. Your results display as per this example – click **[OK]** to close. Your files are now available for transfer to the CRS-500.



     o Click **[Save]** to download the EXE file to your Downloads folder. Once the download is complete the dialogue prompts you to either **[Run]** the self-extracting file, or to open or view the Windows Downloads folder for further action.



- For ZIP files:

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

8. If not already done with **File Download > Open**, you must extract, at a minimum, these files (filenames are subject to change):
   - **FW-0000389X-#.#.#.bin** (bulk image file for the CDM-625 or CDM-625A)

     –OR– FW-0000476X.bin (bulk image file for the CDM-750 or CDM-760)
   - **CRS-500 Switch Controller for CDM-XXX #.#.# Release Notes.pdf** (modem-specific firmware release notes).
9. Confirm availability of the firmware files in the temporary folder. There are several ways you can view the contents of the temporary folder on a Windows-based PC:
   - To use the Windows Desktop, see Section 6.2.6.1.
   - To use Windows Command-line or Command Prompt, see Section 6.2.6.2.
   - After you confirm the firmware files are in the folder, proceed to Section 6.3 to upload the firmware update to the CRS-500.

6.2.6.1 Use Windows Desktop to View Folder Contents

From the Windows Desktop:

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

6.2.6.2 Use Windows Command-line to View Folder Contents

Using Command-line or Command Prompt:

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

6.3 Upload the Bulk Firmware Files and Update the CRS-500

6.3.1 Prepare for the Automated Firmware Update

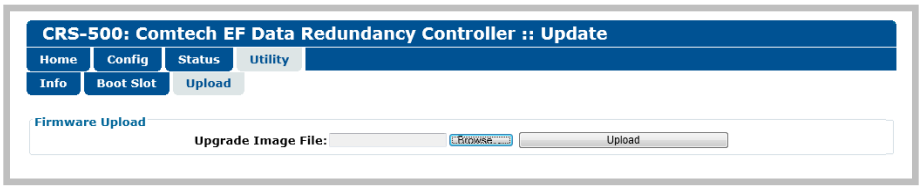
Before you proceed with the firmware update, make sure that:

- You connect the modem M&C Ethernet port to the User PC as described in Section 6.2.1.1.
- Your PC is running a terminal emulation program for operation of the CRS-500 Serial or Ethernet Telnet interfaces.
- You have noted the CRS-500 Management IP Address.
- Your PC is running a compatible Web browser for operation of the CRS-500 HTTP Interface.
- You download or otherwise have Comtech's latest firmware files available on the User PC in an accessible temporary folder.

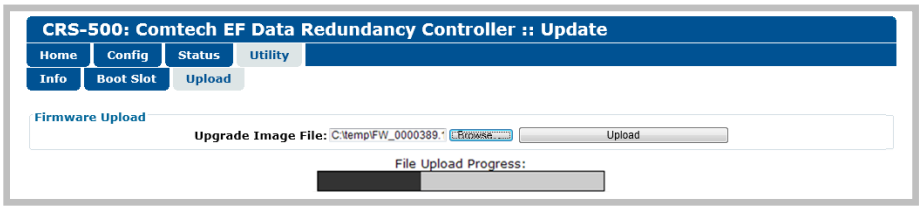
6.3.2 Perform the Automated Firmware Update

Do these steps:

1. From the CRS-500 HTTP Interface, click '**Utility |Upload**.'

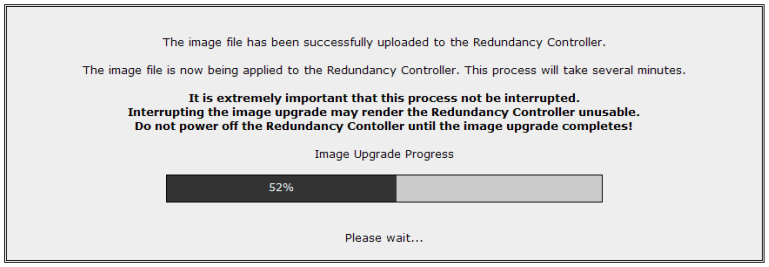


2. To upload the firmware update file: Click **[Browse]** to locate and select the firmware file downloaded previously into the User PC's temporary folder. Click **[Upload]** to begin the update process, and then wait while the scrolling "**File Upload Progress:**" status bar displays the upload progress:

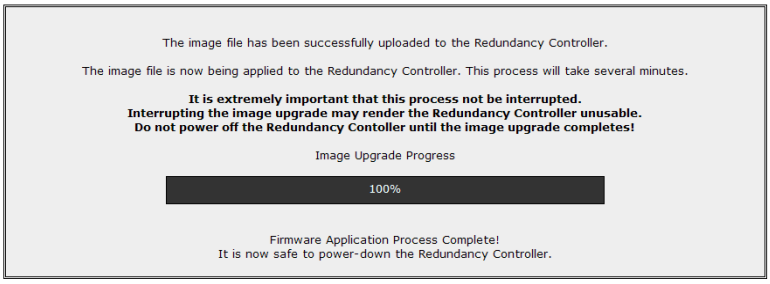


3. Once the file uploads to CSU flash memory, the Bulk Image file *that is not currently selected as the* '**Boot From:***' image will be overwritten* (that is, if you select **Image#1** as the current boot image then, accordingly, the **Image#2** file slot is automatically chosen for replacement).

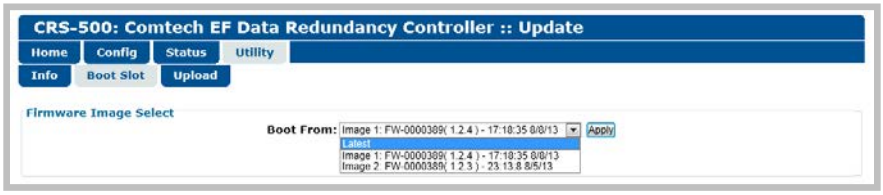
The Image Upgrade Progress status window appears and displays, by scrolling percentage of completion, the file transfer progress:



Once the transfer has completed (i.e., 100%), the “Firmware Application Process Complete!” message appears:



4. Open the **‘Utility | Boot Slot’** page. Use the ‘**Boot From:**’ drop-down list to verify that the new firmware is reported in the unselected Image slot (depending on how the ‘**Boot From:**’ setting was defined prior to the firmware file upload process):

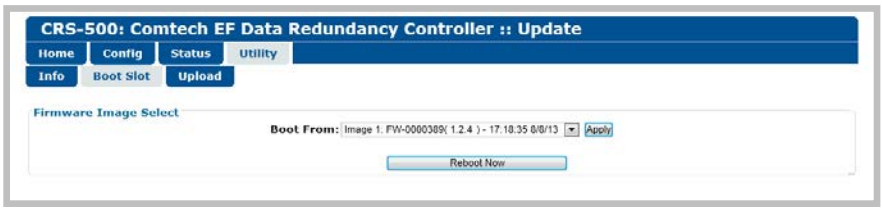


Select the desired ‘**Boot From:**’ preference. Note the following:

- **Latest –** Automatically chooses the Image containing the most recent firmware upload;
- **Image #1 –** Chooses the Image loaded into Slot 1;
- **Image #2 –** Chooses the Image loaded into Slot 2.

Click **[Apply]** to commit the selection to memory. From this point forward, the system will reboot using this selection, until you choose otherwise.

5. **Reboot the system.** Open the '**Utility | Boot Slot'** page, and click **[Reboot Now]** to power cycle the system:



A 5-second countdown window appears before the system reboots:

During this time you may click **[click to cancel]** to abort the process. Should you allow reboot to proceed, the following messages appear during the reboot process:

6. If needed, update the alternate firmware image. Should you desire to update the originally-selected image slot – i.e., the slot that was **in use** at the time the file upgrade was applied to the slot **not in use** – then do these steps:
    a. As per **Step 4**, open the '**Utility | Boot Slot**' page and use the '**Boot From:**' drop-down list to select the *newly-upgraded image* as the designated image from which to boot, and then click **[Update]**.
    b. Reboot the system as per **Step 5**. Once the reboot is complete, click **[click to continue]** to return to the '**Utility | Boot Slot'** page.
    c. With the *newly-upgraded* image now selected and active, repeat **Steps 1 through 5** to automatically upload the firmware file upgrade to the *alternate image slot*.

To verify that the PC-to-unit FTP file transfer was successful, find the current firmware information via the CSU Front Panel, Serial Interface, or the HTTP Interface (see Sections 6.2.4.2, 6.2.4.3, or 6.2.4.4).

The CRS-500 is now operating with its latest firmware. The firmware update process is now complete.

Chapter 7. CONFIGURE MODEMS for 1:N REDUNDANCY

7.1 Overview

This chapter provides the information needed to configure modems for operation in a CRS-500 1:N Redundancy System. This chapter assumes user familiarity with the modem's menu navigation and configuration parameter selection methods. Read your applicable modem's Installation and Operation Manual for detailed, product-specific instructions on changing configuration settings.

For the CRS-500 1:N Redundancy System to operate correctly, it is important that all modems must be the same model, and firmware revision. The Redundant Modem must also be the most capable modems in terms of installed optional hardware and FAST options.

Comtech EF Data recommends that all modems and the CRS-500 use the latest firmware available from the Comtech EF Data Web site. Firmware update files are free and may be acquired by download from the Comtech EF Data Web site (www.comtechefdata.com); they may also be obtained from Comtech EF Data Customer Support during normal business hours via e-mail or on CD by standard mail delivery. See **Chapter 6. FIRMWARE UPDATE** for more information.

7.2 Modem Firmware Requirements

As noted previously, Comtech EF Data strongly recommends that you make sure that the CRS-500 and its integrated modems are operating with their latest firmware. Check Comtech EF Data's Web site for available firmware downloads. For detailed instructions on updating modem firmware, see your applicable modem's Installation and Operation Manual.

Permitted modem models and their oldest compatible firmware versions are as follows:

Modem	Modem Firmware Version
CDM-625 without optional IP Packet Processor or with optional IP Packet Processor installed but disabled	2.2.0 or later (Base Modem)
CDM-625 with optional IP Packet Processor	1.3.4 or later (Packet Processor)
	2.2.0 or later (Base Modem)
CDM-625A with or without the optional IP Packet Processor	1.1.1 or later
CDM-750 with GigE or G.703 E3/T3/STS-1	1.4.3 or later
CDM-760 with GigE or G.703 E3/T3/STS-1	1.1.1 or later

7.3 Modem Remote M&C Communication

CAUTION – You MUST NOT connect any remote M&C (serial or Ethernet) directly to any modem connected to the 1:N Redundancy system. All modem M&C connections (serial or Ethernet) must be made directly to the CRS-500 CSU.

For User-to-Switch or User-to-Modem serial communications addressing schemes, see Appendix C. ADDRESSING SCHEME INFORMATION.

Figure 7-1. CRS-500 CSU Rear Panel – M&C Interfaces

Figure 7-1 shows the interfaces for establishing M&C communications between the modems and the CRS-500 1:N Redundancy System. These connectors are provided on the CRS-530 System Controller Module, located on the rear panel of the CRS-500 CSU:

- Ethernet remote M&C communication between the user and modems is possible via direct user connection to the CRS-530 RJ-45 “10/100 M&C” port.
- Serial remote (EIA-232/485) M&C communication between the user and modems is possible via direct user connection from a user PC serial port to the CRS-530 DB-9M “P1 | Remote Control” connector.

7.4 Configure Modem Operation

Refer to your applicable modem's Installation and Operation Manual to configure each Traffic Modem for the proper Rx and Tx IF, power settings, modulation, code rates, and traffic data settings.

7.5 Configure Modems for 1:N Redundancy

UNLESS OTHERWISE NOTED: Make sure to complete the procedures outlined in this section for each modem that is installed within the CRS-500 1:N Redundancy System.

To ensure proper 1:N Redundancy operations, it is important that you not only refer to the sections that follow, but to also refer to your applicable modem's Installation and Operation Manual for detailed information.

7.5.1 Configure CDM-625/A Advanced Satellite Modems

1. **Do these steps for each CDM-625/A Advanced Satellite Modem:**

   a. Enable 1:N Mode for each modem – from each modem front panel:

   SELECT: Utility→Redundancy→1:N→(Set to **Enabled**)

   b. Assign a unique Management IP Address to each modem – from each modem front panel:

   SELECT: Configuration→IP→Address→Add/Range→(Set address)

   c. (Router Mode only) Assign a unique Redundancy Traffic IP Address to each modem – from each modem front panel:

   SELECT: Utility→Redundancy→Traffic-IP-Addr/Range →(Set address)

   The Redundancy Traffic IP Address parameter is only applicable to CDM-625/A systems where the optional IP Packet Processor is installed and enabled, and where the working mode is set to one of the router modes.

   d. Set the Dedicated Management Port to Port 1 – from each modem front panel:

   SELECT: Configuration→IP→Setup→DDMgmtPt→ Dedicated Mgmt Port

   Dedicated Management Port Mode is only configurable when the optional IP Packet Processor is either not installed or is installed but disabled.

e. Enable Packet Processor Redundancy mode for each modem. Typical for each modem: In the 'Redundancy Config' section of the CDM-625/A HTTP (Web Server) Interface 'Redundancy' page, use the drop-down menu to select 'Packet Processor Redundancy' as "Enabled." Click **[Submit]**.

1. ***Packet Processor Redundancy mode is applicable only to and must be selected in CDM-625/A systems where the optional IP Packet Processor is installed and enabled.***
2. ***It is recommended that only one of the available four 10/100 Ethernet Ports is used for traffic for each CDM-625/A at any given time to prevent Ethernet loops. Refer to the CDM-625/A Advanced Satellite Modem Installation and Operation Manual for further information about using this operational mode.***

2. Complete these steps ONLY if you use the DoubleTalk® Carrier-in-Carrier® (CnC) option with any CDM-625/A Traffic Modem:

a. The Pre-Mapped Symbol Interface (PMSI) is an EIA-485 multi-drop bus system where **one** CDM-625/A *transmits*, and **all other** CDM-625/As on the multidrop bus are configured to *receive*. Each CnC-enabled CDM-625/A's PMSI connector must be properly cabled using a CA-0000275 PMSI Multi-drop CnC® Plus Cable.

b. Each CnC-enabled CDM-625/A must be properly configured to ensure proper operation within the CRS-500 1:N Redundancy System. To set PMSI for each CnC-enabled Traffic Modem – from each modem front panel:

SELECT: Configuration→CnC→PMSI-control→ Redundancy

7.5.2 Configure CDM-750 or CDM-760 Advanced High Speed Trunking Modems

Do these steps:

1. **Enable 1:N Mode for each modem.** Because there are dual-purpose pins on the modem's redundancy connector, you must use the modem front panel to enable 1:N Mode:

   SELECT: Utility→1:N→(set to **Enable**)

2. **Set up a unique IP Address for each modem.** From the modem front panel menu:

   SELECT: Configuration→IP→Address→Add/Range→ (Set address)

7.6 Complete Modem Configuration

Be sure to review Chapter 3. CHECKLISTS FOR INITIAL START-UP AND CONFIGURATION. Once you successfully configure all modems for 1:N redundancy, the CRS-500 1:N Redundancy System is now ready to assume normal operations. Further information is available in the following chapters:

Chapter 8. CSU FRONT PANEL OPERATION

Chapter 9. ETHERNET INTERFACE OPERATION

Chapter 10. SERIAL INTERFACE OPERATION (for serial remote control operation)

Chapter 8. CSU FRONT PANEL OPERATION

8.1 Overview

Operation of the CRS-500 1:N Redundant System is also available via the Ethernet Interface (through SNMP, Telnet, or the HTTP (Web Server) Interface) and the Serial Remote Interface (by issuing remote commands and queries). See Chapter 9. ETHERNET INTERFACE OPERATION or Chapter 10. SERIAL INTERFACE OPERATION for further information.

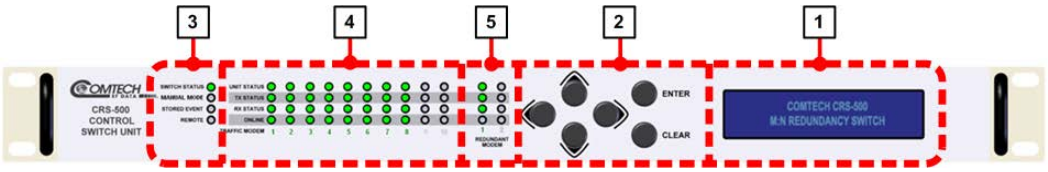


Figure 8-1. CRS-500 CSU Front Panel – M&C Features

The CRS-500 Control Switch Unit (CSU) allows you to locally monitor the 1:N Redundancy System operating status and to monitor and control Traffic and Redundant Modem parameters. The CSU front panel (Figure 8-1) provides these operational features:

- **Feature 1** – The Vacuum Fluorescent Display (VFD) provides viewing of two lines (at 24 characters per line) of messages, menus, and prompts. See **Section 8.1.1**.
- **Feature 2** – Use this six-button keypad array for local control via menu navigation. See **Section 8.1.2**.
- **Feature 3** – These four Light-Emitting Diodes (LEDs) provide overall switch system status monitoring at a glance. See **Section 8.1.3.1**.
- **Feature 4** – This group of LEDs provide Traffic Modem status monitoring (up to 10 modems) at a glance. See **Section 8.1.3.2**.
- **Feature 5** – This set of LEDs provides Redundant Modem status monitoring (only 1 RM in current production units) at a glance. See **Section 8.1.3.3**.

8.1.1 Vacuum Fluorescent Display (VFD)

Shown as **Feature 1** in Figure 8-1, the Front Panel Vacuum Fluorescent Display (VFD) is an active display showing two lines of 24 characters each. The VFD produces a blue light with adjustable brightness. Compared to a Liquid Crystal Display (LCD), it has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

```
 Comtech  CRS-500 Switch
 for CDM-XXX      VX.X.X
```

The CRS-500 “splash” screen appears once power is applied to the unit. The second line of the display indicates switch operations, as configured to the specific Comtech EF Data modem in use, and the version of the CRS-500’s installed firmware.

Press any key to display the top-level **SELECT:** menu. On most menu screens, you will see a solid-block cursor that blinks at a once-per-second rate. This indicates the currently selected feature, character, or digit:

```
M:N MODE:
1:N
```

Where a solid block cursor would obscure the numeral or character under edit, the block cursor automatically changes to an underline cursor:

```
ACTIVE MODEMS:  (ENTER)
 1 2 3 – 5 6 – 8 - 10
```

If you were to leave the unit displaying 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 and constantly scrolls a message across the screen. The top line of this message shows the user-created Switch ID; the bottom line shows the status of the Switch followed by the message “Press any key…”:

```
---------------
Press any key...
```

The message moves from right to left across the display, then wraps around. Press any key to restore the previous display.

8.1.2 Six-Button Keypad

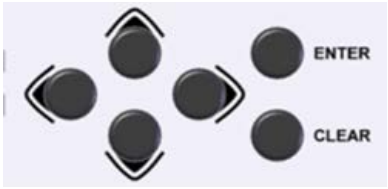


Figure 8-2. CRS-500 CSU Front Panel – Six-Button Keypad

Shown in Figure 8-2 and as **Feature 2** in Figure 8-1**,** the function of these keys, and their reference throughout this chapter, is as follows:

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

The keypad has an auto-repeat feature. If you hold down a key for more than 1 second, the key action repeats automatically at the rate of 15 keystrokes per second. This feature is useful when editing a numeric field with many digits, such as frequency or data rate.

8.1.3 LED Indicator Groups

Depending on the user application, most of the LED indicator functions are accessible remotely via SNMP (Simple Network Management Protocol). "crs500SlotStatusTable" contains the Unit/Tx/Rx status indicator array. See Section 9.3 SNMP Interface for information about using this Ethernet-based remote product management protocol.

Figure 8-3. CRS-500 CSU Front Panel – LED Groups

The front panel LEDs (**Figure 8-3**) provide Switch Status, Traffic Modem Status, and Redundant Modem Status at a glance.

8.1.3.1 Switch Status LED Group

Shown as **Feature 3** in Figure 8-1, these four LEDs convey the operating state of the CRS-500 System:

SWITCH STATUS

- Lights GREEN when the system is operating normally (i.e., there are no Switch Faults)
- Lights RED when there is a Switch Fault (e.g., PSU Fault or COMMS Failure)

MANUAL MODE

- Flashes ORANGE when the system is in MANUAL mode.
- Remains OFF when the system is in AUTO Mode.

STORED EVENT

- Lights GREEN where there are events stored in the Event Log.
- Remains OFF when there are no events stored in the Event Log (i.e., the log is **clear**).

REMOTE

- Lights ORANGE when the Switch is in **Remote Mode**. Local monitoring is possible, but configuration changes through the front panel keypad are disabled.
- Remains OFF when the Switch is in **Local Mode**. Remote monitoring is possible, but configuration changes are possible only through the front panel keypad. Remote configuration is disabled.

8.1.3.2 Traffic Modem Status LED Group

Shown as **Feature 4** in Figure 8-1, these 10 sets of four LEDs, plus the active Traffic Modem number, convey the operating state of up to 10 Traffic modems.

TRAFFIC MODEM (NUMERICAL INDICATORS 1-10)

- Lights GREEN when the Traffic Modem is active and communicating with the CRS-500.
- Flashes GREEN when the Traffic Modem is bridged or backed up by Redundant Modem 1.
- Lights ORANGE when a TMI is present but is not ACTIVE.

The Traffic Modem UNIT STATUS, TX STATUS, RX STATUS, and ONLINE LEDs will not be lit in this state.

- Flashes RED when there is an Ethernet communication error between the CRS-500 and the Traffic Modem.

UNIT STATUS

- Lights GREEN when the modem is operating normally (there are no Unit, Tx, or Rx Faults).
- Lights RED when there is a Unit Fault.

TX STATUS

- Remains GREEN when the modem is operating normally (i.e., there are no Tx faults).
- Turns OFF when there is a Tx Fault.

RX STATUS

- Remains GREEN when the modem is operating normally (i.e., there are no Rx faults).
- Turns OFF when there is an Rx Fault.

ONLINE

- Remains GREEN when the modem is operating normally (i.e., there is active modem traffic to and from the user).
- Turns OFF when User Traffic is routed through Redundant Modem 1 (RM1).

8.1.3.3 Redundant Modem Status LED Group

At present, only RM1 is available: 1:2 Redundancy is a future offering.

Shown as **Feature 5** in Figure 8-1, these two sets of four LEDs, plus the active Redundant Modem number, show the operating state of the Redundant Modem.

REDUNDANT MODEM (ONLY NUMERICAL INDICATOR 1 IS OPERATIONAL)

- Flashes GREEN when Redundant Modem 1 is bridging or backing up a Traffic Modem.
- Flashes RED when there is an Ethernet communication error between the CRS-500 and Redundant Modem 1.

UNIT STATUS

- Lights GREEN when Redundant Modem 1 is operating normally (there are no Unit, Tx, or Rx Faults).
- Lights RED when there is a Unit Fault.

TX STATUS

- Remains GREEN when Redundant Modem 1 is operating normally (i.e., there are no Tx faults).
- Turns OFF when there is a Tx Fault.

RX STATUS

- Remains GREEN when Redundant Modem 1 is operating normally (i.e., there are no Rx faults).
- Turns OFF when there is an Rx Fault.

ONLINE

- Lights GREEN when traffic is routed through Redundant Modem 1.
- Lights ORANGE when the backup operation is in progress.
- Remains OFF when Redundant Modem 1 in Standby Mode.

8.2 CRS-500 Front Panel Operation

Figure 8-4 provides a diagram of the CRS-500 Front Panel Operation configuration and operation menus, and the hierarchal structure of the nested branches and submenus.

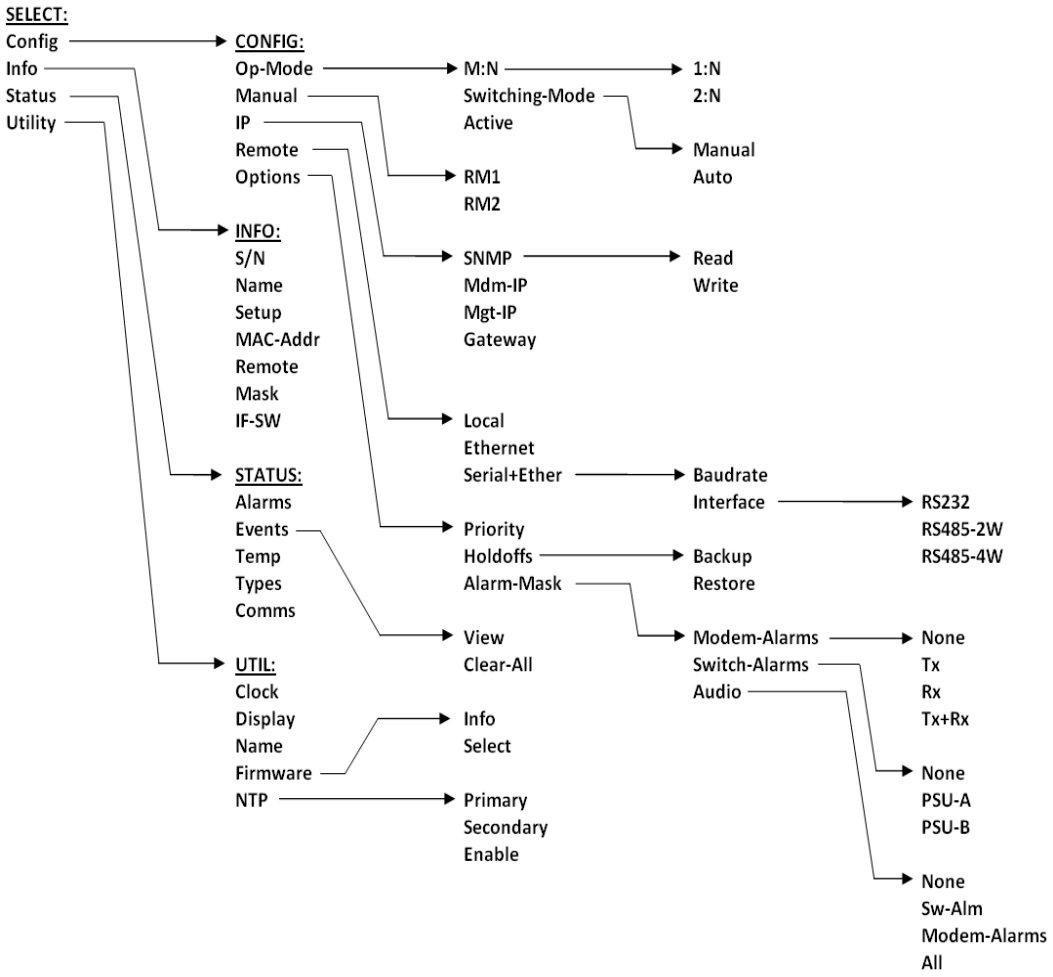


Figure 8-4. CRS-500 Menu Tree (Firmware Ver. 1.2.4)

8.2.1 Main SELECT (Top-Level) Menu

```
SELECT:  Config   Info
Status   Utility
```

Use the ◄ ► arrow keys to select **Config**, **Info**, **Status,** or **Utility.** Press **ENTER**. The function of each menu branch and its pertinent chapter section are as follows:

- **Config (Configuration) Menu Branch** – These screens allow you to fully configure Switch operations. See **Section 8.2.1**.
- **Info Menu Branch** – These screens allow you to view summary Switch operations information, without requiring you to access the nested Configuration screens. See **Section 8.2.2**.
- **Status Menu Branch** – These screens allow you to monitor the status of the Switch and to view the log of stored events for both the Switch and its attached modems. See **Section 8.2.3**.
- **Utility Men u Branch** – These screens allow you to perform miscellaneous functions such as setting the Real-time clock, adjusting the display brightness, etc. See **Section 8.2.4**.

8.2.2 (SELECT:) Config (Configuration) Menu Branch

The switch may be monitored over the remote control bus at any time. When in Local Mode, however, configuration parameters may only be changed through the CSU front panel. Conversely, when in Remote Mode, the unit may be monitored from the front panel, but configuration parameters may only be changed via the remote control bus.

```
CONFIG:  Op-Mode   Manual
IP   Remote   Options
```

Use the ◄ ► arrow keys to select **Op-Mode**, **Manual**, **IP**, **Remote**, or **Options**, and then press **ENTER**.

8.2.2.1 CONFIG: Op-Mode (Operational Mode)

```
Operational Mode:  M:N
Switching-Mode  Active
```

Use this menu to enable or disable switching of the Traffic Modems. Use the ◄ ► arrow keys to select **M:N**, **Switching-Mode**, or **Active.** Press **ENTER.**

8.2.2.1.1 CONFIG: Op-Mode→M:N

```
M:N Mode:  1:N
```

1:N is the only selectable configuration at this time. Press ENTER or CLEAR to return to the previous menu.

8.2.2.1.2 CONFIG: Op-Mode→Switching-Mode

```
Switching Mode:
Manual  Auto
```

Use the ◄ ► arrow keys to select **Manual** or **Auto**. Press **ENTER**. The underline cursor's position indicates the current selected operating mode.

When you select **Manual**, the switch does not respond automatically to any modem faults, and executes the manual setting configured via the **MANUAL** selection.

Comtech EF Data recommends that you configure an unattended CRS-500 1:N Redundancy System to operate in Auto Mode. When you enable Auto Mode, the first active traffic Modem that fails is first bridged, then backed up by a fault-free Redundant Modem.

8.2.2.1.3 CONFIG: Op-Mode→Active

```
Config Active Modems:
1 2 3 – 5 6 – 8 9 10
```

A modem must be "Active" in order for it to be available to bridge or back up. Once you "activate" a modem, the switch will expect the modem to be attached, and will poll the modem for status information.

To select which Traffic Modems to activate, first use the ◄ ► arrow keys to select the modem, and then use the ▲▼ arrow keys to activate or deactivate that modem.

A hyphen (–) appears in place of the modem number if that modem is deactivated or is not plugged into that slot. If a Traffic Modem interface is not plugged into a slot, that position cannot be activated.

8.2.2.2 CONFIG: Manual

```
Manually Configure:
RM1
```

Use this menu to select which Traffic Modem the Redundant Modem will use for bridging and backup operations. **RM1** (Redundant Modem 1) is the sole selection at this time. Press **ENTER** to continue to configure Redundant Modem 1.

8.2.2.2.1 CONFIG: Manual→RM1

```
RM1:  Bridge TM:01
      Backup TM:--
```

Select which Traffic Modem that the Redundant Modem will bridge or back up (RM1 is the default selection at this time).

RM1 is available when the switch is in **MANUAL MODE** (as shown above). Use the ◄ ► arrow keys to select between Bridge or Backup. Then, for either selection, use the ▲▼ arrow keys to scroll through all active Traffic Modems (inactive modem slots are skipped). Press **ENTER** to configure.

The switch learns and retains the configuration of all of the active modems in the setup. The Switch uses this configuration information to program the Redundant Modem to match the configuration of the modem being bridged.

Settings may not be changed in this menu when the switch is in **AUTOMATIC MODE**. Press **CLEAR** or **ENTER** to return to the previous menu.

8.2.2.3 CONFIG: IP

```
 IP Config:  SNMP  Sw-IP
 Mdm-IP  Mgt-IP  Gateway
```

Use the ◄ ► arrow keys to select **SNMP**, **Mdm-IP**, **Mgt-IP**, or **Gateway**. Press **ENTER**. For each selection, you may define what the IP address will be for each modem, and the corresponding Switch IP address for that modem.

Sw-IP is not functional at this time.

8.2.2.3.1 CONFIG: IP→SNMP

```
SNMP Communities:
Read   Write
```

Use the ◄ ► arrow keys to select **Read** or **Write**. Press **ENTER**.

Typical for either community string:

1. ***Only the first 20 characters on the bottom line of each community screen are available.***
2. ***All printable ASCII characters are available with the exception of the backslash '/' (ASCII code 92) and tilde '~' (ASCII code 126).***
3. ***All trailing spaces are removed from the community string upon entry.***
4. ***You must reboot the system in order for changes to the Read and/or Write Community strings to take effect.***

CONFIG: IP → SNMP→ Read

```
SNMP Read Community:
public
```

Use this menu to view or edit the SNMP Read Community string.

Edit the Read Community string: Use the ◄ ► arrow keys to select a character. Then, use the ▲▼ arrow keys to change that character. Press **ENTER**.

CONFIG: IP → SNMP→ Write

```
SNMP Write Community:
private
```

Use this menu to view or edit the SNMP Write Community string.

Edit the Write Community string: Use the ◄ ► arrow keys to select a character. Then, use the ▲▼ arrow keys to change that character. Press **ENTER**.

8.2.2.3.2 CONFIG: IP→Mdm-IP (Modem IP Address)

```
Mdm IP Addr for slot 01:
000.000.000.000/00
```

Use this menu to view or edit the Modem IP Address for Switch-to-modem communication.

Edit the Modem IP Address:

- On the top line, use the ◄ ► arrow keys to select the Slot (modem) to edit (01 through 11).
- Next, use the ◄ ► arrow keys to navigate to the bottom line. To compose the IP Address, use the ◄ ► arrow keys once more to select a digit. Then, use the ▲▼ arrow keys to change that digit.
- Press **ENTER.**

8.2.2.3.3 CONFIG: IP→Mgt-IP (Management IP Address)

```
Management IP Address:
000.000.000.000/00
```

Use this menu to view or edit the Management IP Address for Monitor and Control (M&C) communication.

Edit the Management IP Address: On the bottom line, use the ◄ ► arrow keys to select a digit. Then, use the ▲▼ arrow keys to change that digit. Press **ENTER.**

8.2.2.3.4 CONFIG: IP→Gateway (Gateway IP Address)

```
Gateway IP Address:
000.000.000.000/00
```

Use this menu to view or edit the Gateway IP Address for the Ethernet M&C port for this unit.

Edit the Gateway IP Address: On the bottom line, use the ◄ ► arrow keys to select a digit. Then, use the ▲▼ arrow keys to change that digit. Press **ENTER.**

8.2.2.4 CONFIG: Remote

```
Remote Config:  Local
Ethernet  Serial+Ether
```

Use the ◄ ► arrow keys to select **Local**, **Ethernet**, or **Serial+Ether**. Press **ENTER**.

8.2.2.4.1 CONFIG: Remote→Local

When you select Local Mode, reconfiguration via Ethernet or Serial+Ether(net) is not allowed. Remote monitoring is still possible.

8.2.2.4.2 CONFIG: Remote→Serial+Ether

```
Serial Config:
Baudrate   Interface
```

Use the ◄ ► arrow keys to select **Baudrate** or **Interface**. Press **ENTER**.

CONFIG: Remote → Serial+Ether→ Baudrate

This setting does not affect the internal communications between the Switch and the modems.

```
Serial Baudrate:    19200
```

Select the baud rate of the remote control bus connected locally to the M&C computer.

Use the ◄ ► arrow keys to change the rate. Baud rates of **300**, **1200**, **2400**, **4800**, **9600** and **19200** are available. Press **ENTER**.

CONFIG: Remote → Serial+Ether → Interface

This setting does not affect the internal communications between the Switch and the modems.

```
Serial Interface:   RS232
RS485-2W  RS485-4W
```

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

If you select **RS232**, the bus address is fixed at **0000**:

```
In RS232 mode, the bus
address is fixed at 0000
```

If you select either **RS485-2W** (2-wire) or **RS485-4W** (4-wire), the system further prompts you to enter the bus address:

```
Edit Switch bus address:
3000
```

Use the ▲▼ arrow keys to select the address value. The only valid addresses are **1000**, **3000**, **5000**, and **7000** (see **Chapter 10. SERIAL INTERFACE OPERATION**). Press ENTER.

8.2.2.5 CONFIG: Options

```
Options Config: Priority
Holdoffs Alarm-Mask
```

These options define how the Switch reacts to various faults. Use the ◄ ► arrow keys to select **Priority**, **Holdoffs**, or **Alarm-Mask**. Press **ENTER**.

8.2.2.5.1 CONFIG: Options→Priority

```
Priority:    2
(Press UP/DOWN, ENTER)
```

If one link is considered more important than all others are, this feature enables you to prioritize that link. For example, if the Switch is in **Auto Mode** – and it is already backing up a link that is not a priority link – if the priority link now fails, the link will be restored regardless of its fault state. The priority link will be bridged and then backed up.

Only activated TMI slots will be available for selection as you use the ▲▼ arrow keys. Up to 10 TMs are available for 1:N configurations.

8.2.2.5.2 CONFIG: Options→Holdoffs

```
Backup Holdoff:  05 sec.
Restore Holdoff: 10 sec.
```

You may set the Holdoffs (delay times) between the Switch's modem alarm detection and its reaction to the event. These Holdoffs are only applicable when the Switch is in **Auto Mode**. When an active modem exhibits an unmasked fault, the Switch bridges it with the Redundant Modem and checks that the latter is not also faulted. If there is no fault, the **Backup Holdoff** determines how long the Switch will wait before performing the actual backup, or Switchover of traffic to the Redundant Modem.

When the Switch is currently backing up a Traffic Modem, and that offline modem's fault clears, the Switch will continue to back it up unless another active modem becomes faulted. In this case, the **Restore Holdoff** is the length of time that the originally faulted modem must stay unfaulted before the Switch will automatically put it back online so that the Redundant Modem is available to bridge the newly faulted modem.

Use the ◄ ► arrow keys to select **Backup Holdoff** or **Restore Holdoff**, and then use the ▲▼ arrow keys to adjust the time (in seconds). Press **ENTER** to configure.

Both Holdoffs can be set from 1 to 99 seconds, the exception being that if the configuration includes Carrier-in-Carrier®, this Holdoff time should be no less than 8 seconds.

8.2.2.5.3 CONFIG: Options→Alarm-Mask

```
Alarm Mask: Modem-Alarms
Switch-Alarms  Audio
```

The Switch logs and reacts to both its own faults and modem faults. Use this submenu to mask either type of faults. In addition, an audible buzzer can be enabled as an additional indicator.

Use the ◄ ► arrow keys to select **Modem-Alarms**, **Switch-Alarms**, or **Audio**. Press **ENTER**.

CONFIG: Options→Alarm-Mask→Modem-Alarms

This menu operation is global for <u>all</u> modems in the system. Should you desire to mask individual modem faults, you should do so directly from that modem's front panel. Unmasked modem faults are logged on active modems <u>only</u>.

```
Modem Alarm Mask:
None  Tx  Rx  Tx+Rx
```

Use the ◄ ► arrow keys to select **None**, **Tx, Rx, or Tx+Rx**. Press **ENTER**.

You may select **Tx** to mask Transmit Traffic Faults, **Rx** to mask Receive Traffic faults, or **Tx+Rx** to mask both Traffic and Receive Faults from being reacted to by the Switch. This not only prevents the Switch from performing Auto Mode functions when these modem faults are sensed, but also keeps the faults from being logged by the Switch.

CONFIG: Options→Alarm-Mask→ Switch-Alarms

```
Switch Alarm Mask: None
PSU-A  PSU-B
```

Select a plug-in power supply unit to mask. You may mask only one unit at a time. You would normally mask a PSU if you choose to run with only one PSU, or if you need to remove a bad PSU for service or replacement.

Use the ◄ ► arrow keys to select **None**, **PSU-A** or **PSU-B**. Press **ENTER**.

CONFIG: Options → Alarm-Mask → Audio

```
Audio Mask:  None  Sw-Alm
Modem-Alarms  All
```

For all unmasked Switch or modem alarms, you may select which alarm types should force the Switch to react with an audible buzzer (located behind the CSU front panel). In addition, a relay closure to ground activates on Pin 20 of the "J1 | System Alarms" DB-25F connector (located on the CRS-530 System Controller module) so that you may attach other indicators.

Use the ◄ ► arrow keys to select **None**, **Sw-Alm**, **Modem-Alarms**, or **All**. Press **ENTER**.

8.2.3 (SELECT:) Info (Information) Menu Branch

The **Info** submenus provide *read-only* information screens that display current Switch configurations without risking inadvertent alterations. Typical for any INFO screen, you may press **ENTER** or **CLEAR** to return to the previous menu.

```
INFO:  S/N  Name  Setup
MAC  Remote  Mask IF-Sw
```

Use the ◄ ► arrow keys to select **S/N**, **Name**, **Setup**, **MAC**, **Remote**, **Mask**, or **IF-Sw**. Press **ENTER**.

8.2.3.1 INFO: S/N

```
Serial Number:
------------------------
```

This screen displays the unique serial number assigned to this unit by Comtech EF Data.

8.2.3.2 INFO: Name

```
Unit Name:
------------------------
```

This screen displays the user-defined Switch name that is created using the **UTILITY: Name** submenu.

8.2.3.3 INFO: Setup

```
TM:  1 2 3 4 5 - 7 - 9 10
AUTO  Bkup:05  Rest:20
```

This screen displays some of the settings configured in the **CONFIG: OPTIONS** menu:

- The top line displays the Active Traffic Modems (**TM**).
- The bottom line displays the **AUTO** mode; the Backup (**Bkup**) holdoff time in seconds; and the Restore (**Rest**) holdoff time in seconds.

8.2.3.4 INFO: MAC (Ethernet MAC Address)

```
Ethernet MAC Address:
############
```

This screen displays the unit's factory-assigned Ethernet MAC Address.

8.2.3.5 INFO: Remote (Remote Control Info)

```
Rem Cntl: Ser+Eth 485-2W
Addr:1000     19200 Baud
```

This screen displays if the unit is in **LOCAL** or **REMOTE** mode, and specifies the active electrical interface type, unit address, and baud rate.

8.2.3.6 INFO: Mask (Alarm Mask Info)

```
Alarms Masked:  Tx
 PSU-B      All-Audio
```

This screen displays currently masked alarms. If an alarm is not masked, its relevant screen position appears blank.

8.2.3.7 INFO: IF-SW

```
IF Switch:
Present
```

This screen indicates the presence or absence of a CRS-280/280L IF Switch Unit (ISU):

- If there is an ISU present in the CRS-500 1:N Redundancy System, this screen displays "**Present**."
- If there is no ISU present, this screen displays "**Absent**."

8.2.4 (SELECT:) Status Menu Branch

```
STATUS:  Alarms Events
Temp Types Comms
```

Use the ◄ ► arrow keys to select **Alarms**, **Events**, **Temp**, **Types**, or **Comms. Press ENTER**.

8.2.4.1 STATUS: Alarms

This section refers to the four-LED SWITCH STATUS Group on the CSU Front Panel (shown as Feature 3 in Figure 8-1).

The following are examples of possible **SWITCH STATUS** LED states, along with suggestions to assist you in diagnosing the reason for the fault.

Example 1:

```
Switch Alarm:      NONE
```

There are no faults. The front panel **SWITCH STATUS** LED should be **GREEN**.

Example 2:

```
Switch Alarm:
PSA 12V under/over
```

There is a fault. Power Supply "A" is under/over voltage. The front panel active **SWITCH STATUS** LED will be **RED**.

Suggestions:

- Ensure the power supply cord is connected and the power switch is ON.
- Replace the defective power supply module.
- If the second power supply module is not needed, you can mask this alarm.

Example 3:

```
Switch Alarm: RM Problem
          RM I/O Timeout
```

There is a fault. Communication has been lost to the Redundant Modem. The front panel **SWITCH STATUS** LED will be **RED**.

Suggestions:

- Check cable connections – see **Chapter 5. CABLES and CONNECTIONS.**
- Check modem configurations – see **Chapter 7. CONFIGURE MODEMS for 1:N REDUNDANCY**.

Example 4:

```
Switch Alarm: RM Problem
MGC refused, code:12 TFT
```

There is a fault. COMMs are good to the Redundant Modem, but the configuration of the bridged Traffic Modem cannot be configured into the Redundant Modem. The front panel **SWITCH STATUS** LED will be **RED.**

Suggestion: Ensure that the most capable modem – with regard to FAST options, installed options, etc. (e.g. Turbo card, firmware version, and hardware revision) – is used as the Redundant Modem. The code indicates the parameter within the MGC configuration string that is causing rejection by the Redundant Modem. The three-letter instruction code is indicated also to assist you in decoding the problem parameters.

8.2.4.2 STATUS: Events (Stored Events)

```
Stored Events: View
Clear-all
```

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

If **Clear-All** is selected, the event log is cleared and you are taken directly back to the previous menu. However, if there are faults present on the unit at this time, new log entries will be generated for those faults.

8.2.4.2.1 STATUS: Events → View

```
001: 26/01/15 10:37:32
FT-06 RX ALARM (UP/DN)
```

The event log can store up to 255 events. When a fault (FT) condition occurs, it is date- and time-stamped and put into the log (note that the date is shown in **DAY/MONTH/YEAR** format, in accordance with international convention).

Next to the FT/OK indicator is a number/code for the faulted unit: the TM slot number (01 through 10), RM (for Redundant Modem 1) or SW (for the Switch).

Similarly, when the fault condition clears (OK), this is also recorded, as shown in this example:

```
024: 26/01/15 10:37:35
OK-06  RX ALARM  (UP/DN)
```

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

8.2.4.2.2 STATUS: Events → Clear-all

```
  Stored Events Cleared.
       Press ENTER
```

If you select **Clear-all**, the asystem clears the event log and displays the message "**Stored Events Cleared. Press ENTER.**" Press **ENTER** or **CLEAR** to return to the previous menu.

8.2.4.3 STATUS: Temp (Temperature)

```
Temperature:
+37 degrees Celsius
```

This is a 'status only' display. Press **ENTER** or **CLEAR** to return to the previous menu.

8.2.4.4 STATUS: Types (Interface Card Types)

```
Card Types: slot 01
  none
```

This screen displays the available Traffic Modem Interfaces (TMIs) and Redundant Modem Interfaces (RMIs), as installed on a per-slot basis.

8.2.4.5 STATUS: Comms (Communications State)

```
Comms OK with:
1 2 3 - 5 - 7 8 – 10 11
```

This screen displays that the Switch has good monitoring I/O communications with the indicated modems.

8.2.5 SELECT: UTILITY Menu Branch

```
UTIL: Clock   Display
 Name   Firmware  NTP
```

Use the ◄ ► arrow keys to select utility functions **Clock**, **Display**, **Name**, **Firmware**, or **NTP**. Press **ENTER**.

8.2.5.1 UTIL: Clock (Set Real-Time Clock)

```
Edit time and date:
12:00:00  24/04/12  (ENT)
```

Edit the time and date settings of the real-time clock: Typical for both, use the ◄ ► arrow keys to select a digit. Then, use the ▲▼ arrow keys to change that digit. Press **ENTER**.

- ***The date displays in DAY/ MONTH/YEAR (dd/mm/yy) format in accordance with European convention.***
- ***The time is displays per Coordinated Universal Time standard (UTC+0) in HOURS/MINUTES/SECONDS (hh:mm:ss) format.***

8.2.5.2 UTIL: Name (Unit Name)

```
Edit Unit Name:
---- SWITCH 11 ----
```

Edit the Switch Unit Name string: On the bottom line, use the ◄ ► arrow keys to select the cursor position. Then, use the ▲▼ arrow keys to choose an alphanumeric character. Press **ENTER**.

1. ***Only the first 24 characters on the bottom line are available.***
2. ***The following characters are available:***

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

8.2.5.3 UTIL: Firmware

```
Firmware:  Info  Select
```

To display the firmware information or allow selection of Bulk firmware:

Use the ◄ ► arrow keys to select **Info** or **Select**. Press **ENTER.**

8.2.5.3.1 UTIL: Firmware → Info

```
 Firmware Info:  Boot
 Bulk1  Bulk2
```

Use the ◄ ► arrow keys to select **Boot**, **Bulk1**, or **Bulk2**. Press **ENTER**.

The example that follows shows the information that displays with **Bulk1** as the selection:

```
 Bulk1:          09/30/09
 FW-0000208         1.1.1
```

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

8.2.5.3.2 UTIL: Firmware → Select

```
Current FW Image: #1
Next Image: Latest #1 #2
```

This submenu selects which Bulk firmware image the Switch will use after the next reboot. The top line indicates which image is currently selected.

To reboot from a different firmware image:

Use the ◄ ► arrow keys to select **Latest** (i.e., the firmware with the most current release date), #**1,** or **#2**. Press **ENTER**.

8.2.5.4 UTIL: NTP (Network Time Protocol)

```
NTP: Primary Secondary
     Enable
```

Use the ◄ ► arrow keys to select **Primary**, **Secondary**, or **Enable**. Press **ENTER.**

8.2.5.4.1 UTIL: NTP → Primary / Secondary

```
NTP Primary Server IP:
 192.168.050.001
```

Edit the NTP Primary or Secondary Server IP Address:

On the bottom line, use the ◄ ► arrow keys to select a digit. Then, use the ▲▼ arrow keys to chan ge that digit. Press **ENTER**.

8.2.5.4.2 UTIL: NTP → Enable

```
NTP:  Disable  Enable
```

Use the ◄ ► arrow keys to (select) **Disable** or **Enable** Network Time Protocol. Press **ENTER.**

Chapter 9. ETHERNET INTERFACE OPERATION

9.1 Overview

Ethernet-based management of the 'parent/host' CRS-500 1:N Redundancy System and its 'child' Redundant and Traffic Modems is available using the '**10/100 M&C**' RJ-45 port located on the CSU rear panel CRS-530 System Controller Module.

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

- ***Your CRS-500 and its Redundant and Traffic Modems are interconnected and are operating with the latest version firmware files.***
- ***You are using a Windows-based PC (user-provided) that is connected to the CRS-500 as follows:***
  - ***The User PC serial port is connected with a user-supplied serial cable to the 'P1 \| Remote Control' DB-9M port located on the CSU rear panel CRS-530 System Controller Module.***
  - ***The User PC Ethernet port is connected via a user-supplied hub, switch, or direct Ethernet CAT5 cable connection to the CRS-500.***
  - ***The User PC is running a terminal emulation program (for operation of the CRS-500 Serial or Telnet Interface) and a compatible Web browser (for operation of the CRS-500 HTTP (Web Server) Interface).***
  - ***The CRS-5000 Management IP Address has been noted using the CRS-500 Serial Interface or HTTP Interface.***

9.1.1 Ethernet Management Interface Protocols

The User PC provides access to Ethernet-based management of the CRS-500 1:N Redundancy System through three separately operated protocols:

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

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

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

9.2 Simple Network Management Protocol (SNMP) Interface

The 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 CRS-500.
- **The SNMP Agent.** This is the software that runs on the CRS-500. The SNMP Agent supports both **SNMPv1** and **SNMPv2c**.
- **The user-supplied Network Management System (NMS).** This is the software that runs on the manager.

9.2.1 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. These MIB files should be compiled in a user-supplied MIB Browser or SNMP Network Monitoring System server. In these modem MIB file names, the letter ‘x’ represents the revision of the file.

9.2.1.1 ComtechEFData Root MIB File

- FW-0000326x.mib
- ComtechEFData MIB file gives the root tree for all Comtech EF Data modem 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

9.2.1.2 CRS-500 Common MIB File

- FW-0000327x.mib
- MIB file consists of all of the OID's for management of the mode-specific switch functions

9.2.2 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.

For proper SNMP operation, the MIB files must be used with the associated version of the CRS-500 M&C. Refer to the CRS-500 FW Release Notes for information on the required FW/SW compatibility.

The CRS-500 uses Community Strings as a password scheme that provides authentication before gaining access to the CRS-500 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. Two Community Strings are defined for SNMP access:

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

9.3 Telnet Interface

Chapter 10. SERIAL INTERFACE OPERATION

The CRS-500 provides a Telnet interface for the purpose of Equipment M&C using the standard serial interface remote command and query protocol. See **Chapter 10. SERIAL INTERFACE OPERATION** for detailed information about using remote command and queries.

9.3.1 Using the Telnet Interface for Remote Control Operation

Figure 9-1. Telnet Interface Example – Windows Command-line

Telnet is implemented in the Ethernet M&C in a "Telnet wrapper." When the user ‘Telnets’ to the unit, it emulates a local EIA-232 or EIA-485 serial connection. You can then type the same command or query syntax that you would use from a serial remote terminal and the Ethernet M&C "unwraps" the Telnet packet and sends it on to the CRS-500 system, which responds to it as if it was a serial remote command.

The Telnet interface requires user login. The default user name and password are comtech. Upon login, you have access to the serial-based Remote Control Interface. Figure 9-1 shows an example of the login process and remote control operation.

9.3.2 Using HyperTerminal for Telnet Remote Control Operation

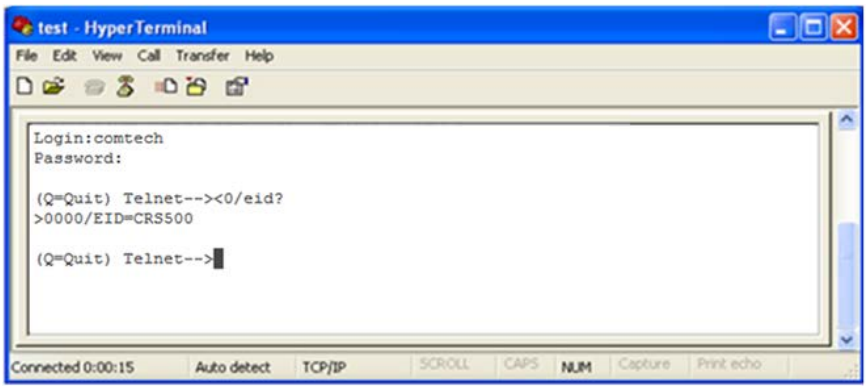


Figure 9-2. Telnet Interface Example – HyperTerminal

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

To see the full response messages, you can use the HyperTerminal terminal emulation program configured as a Telnet client. Figure 9-2 shows an example of the login process and remote control operation, when using HyperTerminal as the Telnet interface.

9.3.2.1 Configure HyperTerminal for Telnet Remote Control Operation

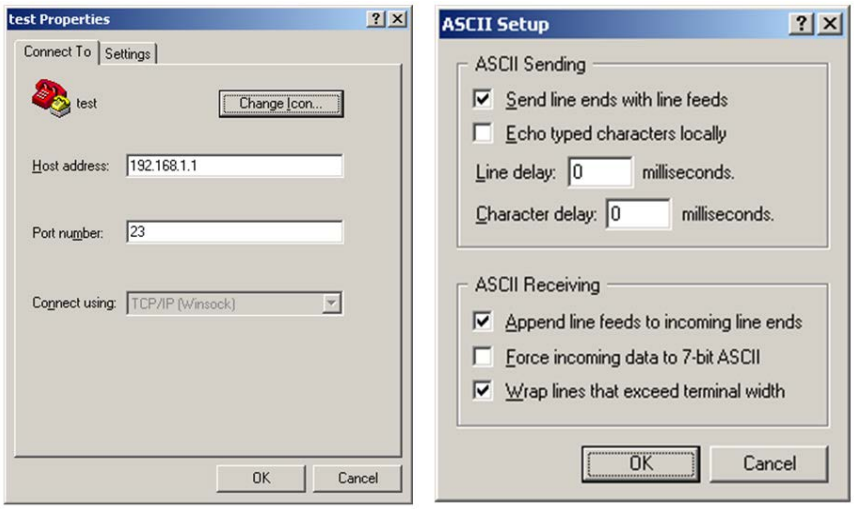


Figure 9-3. Configure HyperTerminal

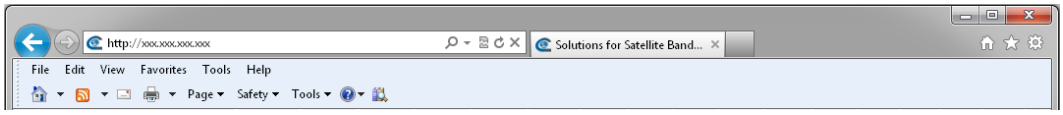
See Figure 9-3. Do these steps:

1. Make sure to define the Connect To Telnet connection properties correctly (File → Properties) (Figure 9-3, left):
    a. Enter the unit's Traffic/Management IP Address as the "Host address" (e.g., 192.168.1.1).
    b. Enter TCP Port 23 as the "Port number".
    c. Set "Connect using" to TCP/IP (Winsock) instead of COM1 or COM2.
    d. Click [OK] to save your settings.
2. For ASCII Setup (File → Properties → Settings → ASCII Setup) (Figure 9-3, right):
    a. Check the "Send line ends with line feeds" option in the 'ASCII Sending' section.
    b. Check the "Append line feeds to incoming line ends" option in the 'ASCII Receiving' section.
    c. Click [OK] to save your settings.

9.4 HTTP (Web Server) Interface

A user-supplied Web browser allows the full monitoring and control (M&C) of the CRS-500 from its HTTP Interface. This non-secure embedded Web application is designed for, and works best with, Microsoft Internet Explorer Version 7.0 or higher.

To log in to the HTTP Interface, type the CRS-500 Management IP Address (shown here as http://xxx.xxx.xxx.xxx) into the “Address” area of the User PC Web browser:

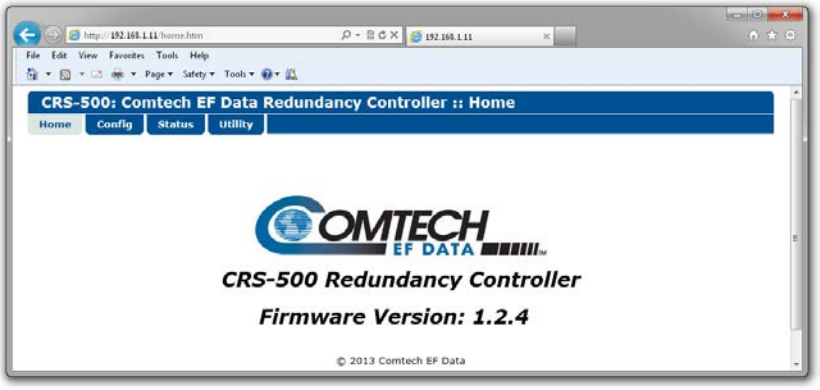


The Login window will appear, similar to the example shown here, opens. Enter the assigned **User name** and **Password**. The HTTP Interface default user names and passwords are as follows:

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

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

The CRS-500 HTTP Interface Home page, similar to the example shown here, appears:



9.4.1 HTTP Interface – Operational Features

9.4.1.1 Page Navigation

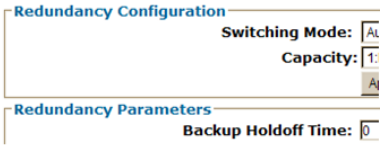
The HTTP Interface features navigation tabs at the top of each page. Once you click a navigation tab, you may click an available primary page tab. In turn, any nested tabs appear for further selection.

This manual uses a naming format for all Web pages to indicate the depth of navigation needed to view the subject page: 'Navigation Tab | Nested Tab'.

For example: Interpret 'Config | Redundancy' to mean "First, click the top-level 'Config' navigation tab; then, click the nested 'Redundancy' page tab".

9.4.1.2 Page Sections

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

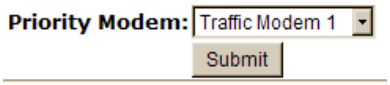


This manual explains the purpose and operation for each Web page on a per-page, per-section basis.

9.4.1.3 Action Buttons

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

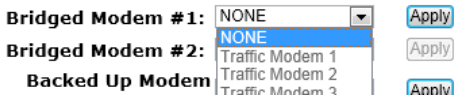
- Refresh the page with current data.
- Reset changed parameters to remove unsaved changes.
- Submit (permanently save) changes.



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 not saved.

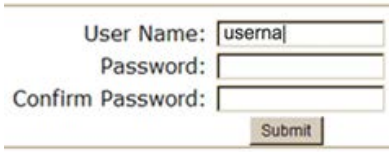
9.4.1.4 Drop-down Lists

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.



9.4.1.5 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 QoS Group of text boxes.



Click the related action button to save the 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.

9.4.2 HTTP Interface Menu Tree

Table 9-1 lists the features available through the CRS-500 HTTP Interface. This interface features four navigation tabs (shown in blue). The nested page tabs (grey) provide access to individual web pages.

Table 9-1. HTTP Interface Menu Tree (FW Ver. 1.2.4)

Home	Config	Status	Utility
Home	Redundancy	Monitor	Info
	Modem	Event Log	Boot Slot
	Remote Management		Upload

9.5 HTTP Interface Page Descriptions

Chapter 8. CSU FRONT PANEL OPERATION

The HTTP Interface pages as shown in the figures that follow depict operational examples that will vary from your actual implemented network. These figures are provided for reference purposes only.

See **Chapter 8. CSU FRONT PANEL OPERATION** for detailed information about the functionality of features provided throughout this interface

9.5.1 Home Page

Use this page to identify the CRS-500 HTTP Interface and its current operating firmware version.

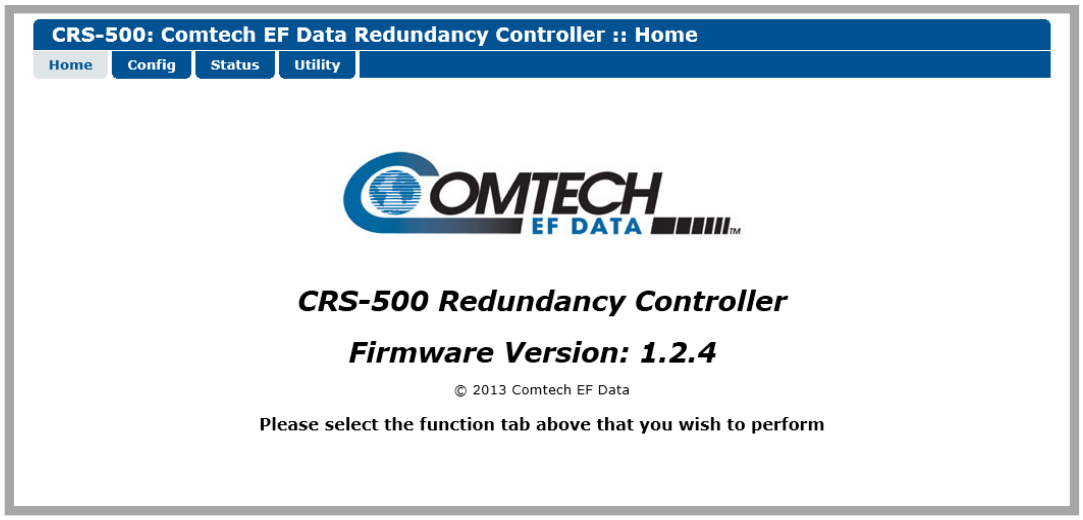


Figure 9-4. CRS-500 'Home' Page

9.5.2 Config (Configuration) Pages

Select the **Redundancy**, **Modem**, or **Remote Management** tab to continue.

9.5.2.1 Config | Redundancy

Use this page to configure the Switch communications, operations, and alarms/faults handling for 1:N redundancy.

2:N redundancy is a future product offering.

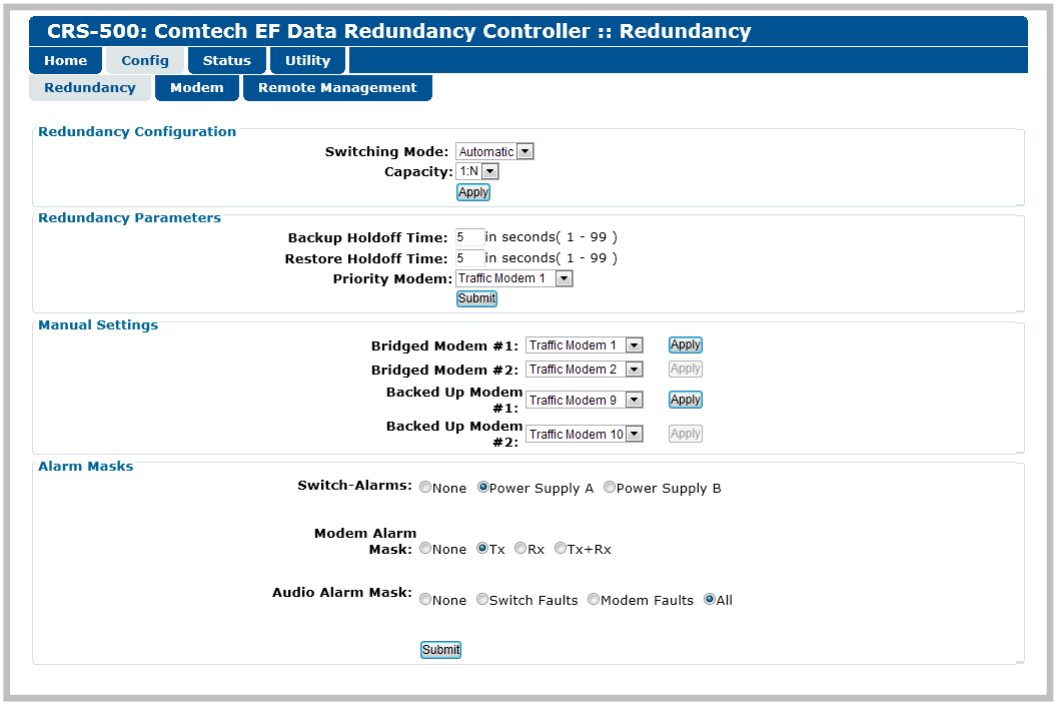


Figure 9-5. 'Config | Redundancy' Page

Redundancy Configuration

- **Switching Mode** – Use the drop-down list to select the Switching mode as **Manual** or **Automatic**.
- **Capacity –1:N** is the only valid selection at this time.

Click **[Apply]** to save.

Redundancy Parameters

Backup / Holdoff Times – Enter a valid time, in seconds, for the **Backup Holdoff Time** and the **Restore Holdoff Time**. The valid range for either is **1** to **99** seconds.

Priority Modem – If one link is considered more important than all others are, this feature allows you to prioritize that link.

Use the drop-down list to select the Priority Modem as **None**; **Traffic Modem 1**; **Traffic Modem 2**; **Traffic Modem 3**; **Traffic Modem 4**; **Traffic Modem 5**; **Traffic Modem 6**; **Traffic Modem 7**; **Traffic Modem 9**; **Traffic Modem 9**; **and Traffic Modem 10**.

Click **[Submit]** to save.

Manual Settings

In **Manual Switching Mode** (as selected in the **Redundancy Configuration** section of this page), the Switch does not automatically respond to modem faults. Use this section to configure the Manual Switching Mode settings.

To assign the **Bridged Modem** or **Backed Up Modem:** Use the drop-down lists to select the modem as **None**; **Traffic Modem 1**; **Traffic Modem 3**; **Traffic Modem 4**; **Traffic Modem 5**; **Traffic Modem 6**; **Traffic Modem 7**; **Traffic Modem 9**; **Traffic Modem 9**; **and Traffic Modem 10**.

Click **[Apply]** as needed to save each selection.

Modem availability is determined by the selected Capacity (i.e., 1:N) as designated in the Redundancy Configuration section. With Capacity set by default to 1:N, Bridged Modem #2 and Backed-up Modem #2 are non-configurable/non-selectable.

Alarm Masks

Switch-Alarms – Select **None**, **Power Supply A**, or **Power Supply B**.

Modem Alarm Mask – Select **None**, **Tx**, **Rx,** or **Tx+Rx**.

Audio Alarm Mask – Select **None**, **Switch Faults**, **Modem Faults**, or **All**.

Click **[Submit]** to save.

9.5.2.2 Config | Modem

The appearance of this page is driven by the default 1:N Capacity (2:N is a future offering), as designated in the Redundancy Configuration section of the 'Config | Redundancy' page.

This page provides a heads-up display for the configuration of the CRS-500 Data Switch Unit (DSU). Use this page to configure or monitor the IP communications of, and to obtain operational status information on, the Traffic Modem Interfaces (TMIs) and Redundant Modem Interfaces (RMIs) that comprise the CRS-500 1:N Redundancy System.

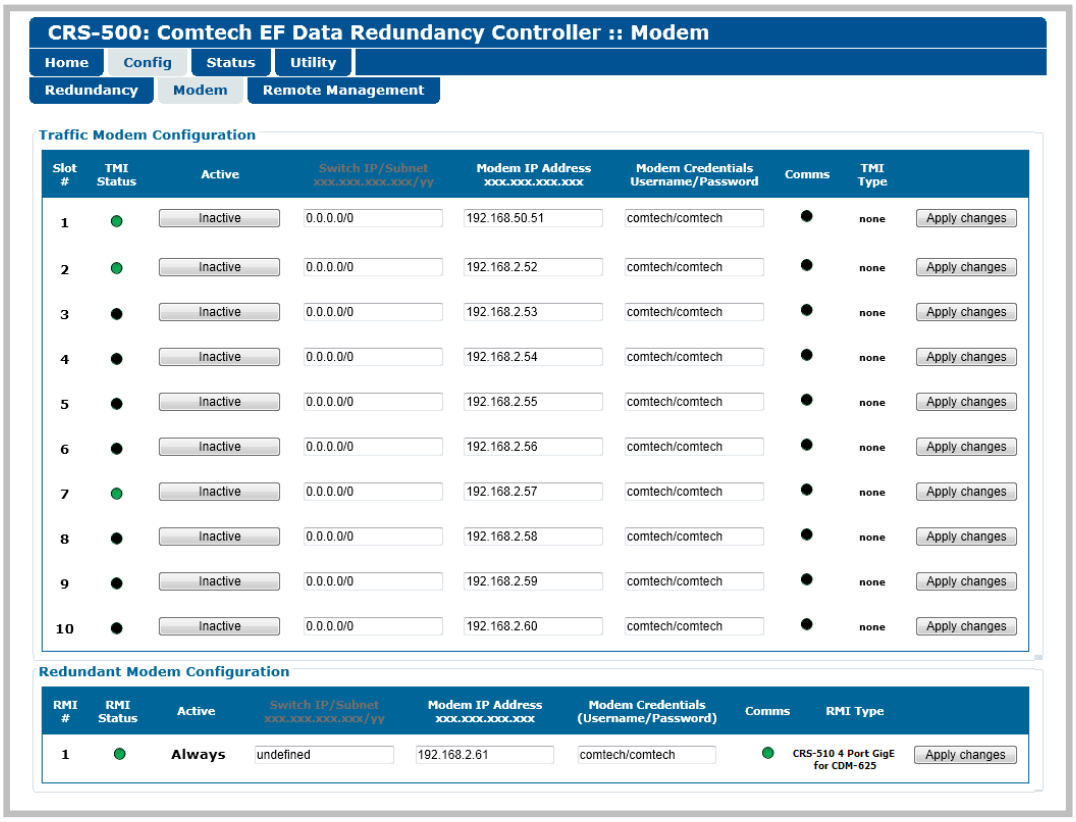


Figure 9-6. Config | Modem Page

Traffic Modem Configuration or Redundant Modem Configuration

1. ***With 1:N set as the default Capacity, Traffic Modems 1 through 10 are available, while RMI #1 is the default Redundant Modem.***
2. ***For the descriptions that follow: A "status column" provides read-only information. A "configuration column" requires user input/action. Make sure to click [Apply changes] after making any changes.***

- The "**Slot#**" and "**RMI#**" status columns identify the chassis slot position.
- The "**TMI Status**" status column "Virtual LED" lights **GREEN** to indicate the physical presence of a TMI or RMI in that designated DSU slot. The LED remains **dark** if the DSU slot is empty.
- Use the button in the "**Active**" configuration column to toggle the Traffic Modem assigned to that slot as **[Active]** or **[Inactive]**. Click **[Apply changes]** to save.

RMIs, by default, are always [ACTIVE].

- The "**Switch IP/Subnet**" status column is non-functional at this time.
- Typical for any Traffic Modem or the Redundant Modem, type in the IP Address of the modem into the "Modem IP Address" configuration column for that specific **Slot #**. Click **[Apply changes]** to save.
- Enter login permissions for each modem in the "**Modem Credentials Username/Password**" configuration column. These credentials are needed to access the modem's HTTP Interface. Click **[Apply changes]** to save.
- Use the "**Comms**" status column to monitor the status of communications for the designated DSU slot. The "Virtual LED" lights **GREEN** when communications are active. The LED lights **RED** when a communications fault is detected.
- The "**TMI Type**" and "**RMI Type**" status columns identify (by its model number) the Comtech EF Data module that is installed in that designated slot. For example, "CRS-520" specifies that a CRS-520 10/100 Ethernet TMI is present.

9.5.2.3 Config | Remote Management

Use this page to set up and maintain usernames and passwords needed for communication with the CRS-500 HTTP Interface.

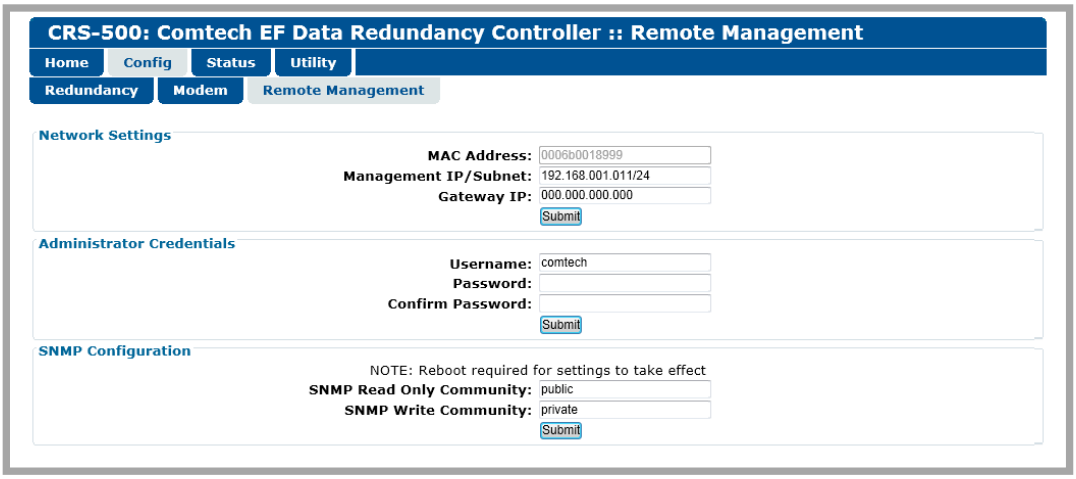


Figure 9-7. 'Config | Remote Management' Page

Network Settings

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

Management IP/Subnet, Gateway IP – Enter the desired Management IP Address and Subnet, and the Gateway IP Address as needed.

Click **[Submit]** to save.

Administrator Credentials

Enter the desired Administrator **Username** and **Password.** Both can be any alphanumeric combination with a maximum length of 10 characters. Re-enter the designated password in the **Confirm Password** field.

Click **[Submit]** to save.

SNMP Configuration

This section displays administration information for the CRS-500 Simple Network Management Protocol (SNMP) feature.

The default **SNMP Read Only Community** string is ***public***.

The default **SNMP Write Community** string is ***private***.

Click **[Submit]** to save.

You must reboot the system in order to implement any SNMP Configuration changes.

9.5.3 Status Pages

Select the **Monitor** or **Event Log** tab to continue.

9.5.3.1 Status | Monitor

Use this page to view ***read-only*** status windows for the active 1:N redundancy system.

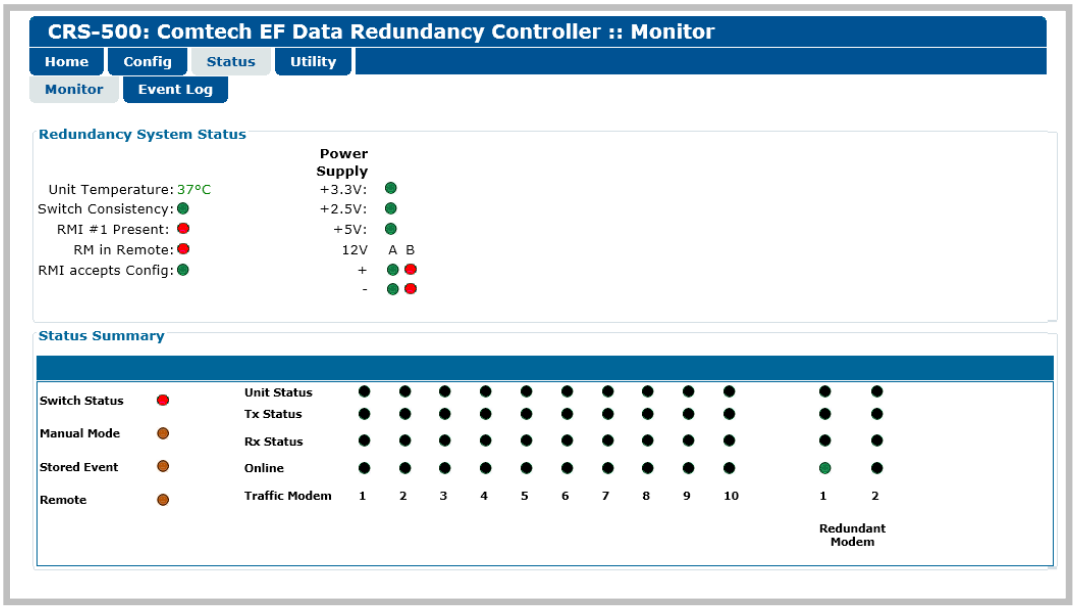


Figure 9-8. 'Status | Monitor' Page

Redundancy System Status

This section monitors the CRS-500 Data Switch Unit (DSU) operating status. The "Virtual LEDs" light GREEN to indicate normal operation. The LED will light RED to indicate fault conditions for the operating temperature, switch operation parameters, configured redundant modem(s), and the dual power supplies.

Status Summary

This section emulates operation of the CRS-500 Control Switch Unit (CSU) front panel LED Groups. See Section 8.1.3 for detailed information about the front panel LED functions.

9.5.3.2 Status | Event Log

This page provides a visual record of stored events.

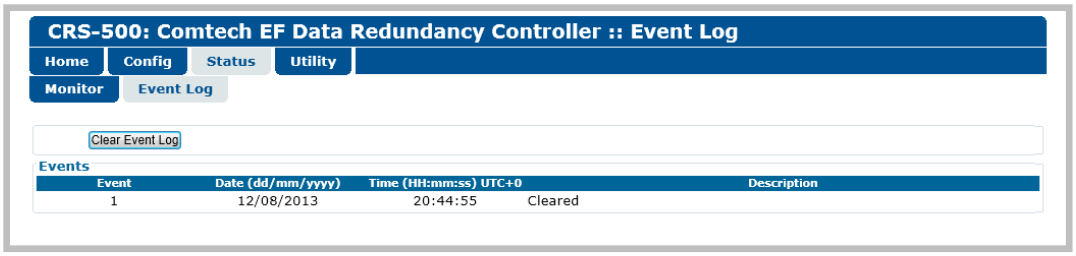


Figure 9-9. 'Status | Event Log' Page

To purge the system of events, click **[Clear Event Log]**. The log clears, and the **Events** section refreshes with **Event 1**, noted as "Cleared" in the **Description** column.

Events

Up to 255 events may be displayed in this scrollable section, sorted by order of occurrence (**Event**) and **Date** and **Time**; the **Description** column summarizes the event.

- ***The date displays in DAY/MONTH/YEAR (dd/mm/yy) format in accordance with European convention.***
- ***The time displays in HOURS/MINUTES/SECONDS (hh:mm:ss) format as per Coordinated Universal Time standard (UTC+0).***

9.5.4 Utility Pages

Select the **Info, Boot Slot,** or **Upload** tab to continue.

9.5.4.1 Utility | Info

Use this page to configure a variety of CRS-500 general operating parameters. This page also provides status-only information on the operating firmware.

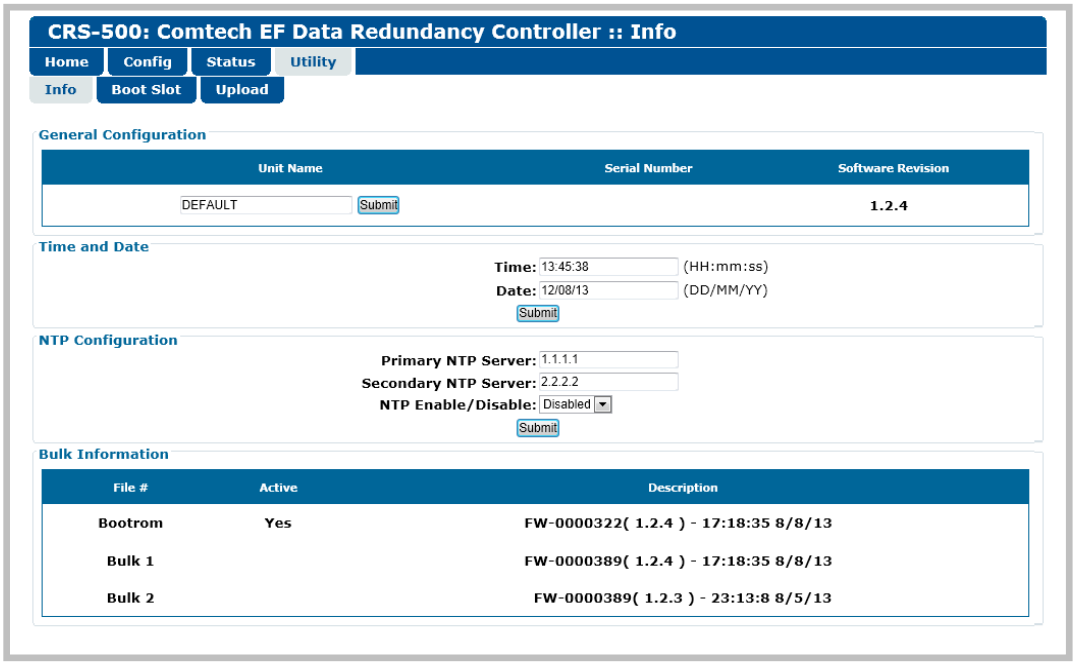


Figure 9-10. 'Utility | Info' Page

General Configuration

Unit Name – Enter a Unit Name string of up to 24 characters. Once the desired string is entered in this section, click **[Submit]** to save this setting.

Serial Number (*read-only*) **–** The factory-assigned unit serial number is provided here for user reference.

Software Revision (*read-only*) **–** The version of the *Current Active Firmware Image* is provided here for user reference.

Time and Date

Unit Time (hh:mm:ss) – Enter a time using hh:mm:ss format in ***Coordinated Universal Time*** UTC+0 (where hh = hour [00 to 23], mm = minutes [00 to 59], and ss = seconds [00 to 59]).

Unit Date (dd/mm/yy) – Enter a date using the European convention in the form dd/mm/yy (where dd = day [01 to 31], mm = month [01 to 12], and yy = year [00 to 99]).

Click **[Submit]** to save.

NTP Configuration

Primary/Secondary NTP Server – Enter the IP address of the primary and secondary NTP (Network Time Protocol) server.

The secondary NTP server feature may be disabled by entering an invalid IP address such as 0.0.0.0.

NTP Enable/Disable – Select Enabled or Disabled from the drop-down list to enable or disable the NTP feature.

Click **[Submit]** to save.

Bulk Information *(read-only)*

Bootrom – The selected *Current Active Firmware Image* is identified here by its **Description** (i.e., its part number, e.g. **FW-0000322**); its **Version** (e.g., 1.2.4); and its (release) **Time** and **Date** (e.g., **17:18:35 8/8/13**).

Bulk 1 / **Bulk 2** – The Bulk Firmware is identified as it is loaded into the **Bulk #1** and **Bulk #2** image slots, in the same format as the active Bootrom listing.

9.5.4.2 Utility | Boot Slot

Chapter 6. FIRMWARE UPDATE

Use this page to specify which *current, active firmware image* is to be loaded for operation upon initial power-up or soft reboot.

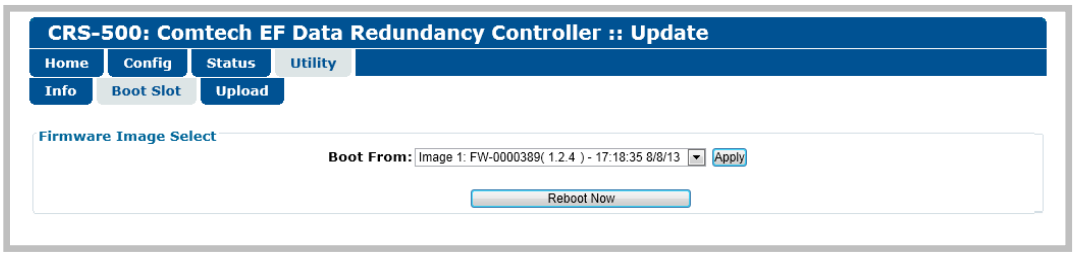


Figure 9-11. 'Utility | Boot Slot' Page

Firmware Image Select

Boot From – Use the drop-down list to select **Latest, Image 1, or Image 2**. In this example, Image 1 is selected as the active loaded Bootrom.

Select **Latest** to direct the unit to automatically select and load the image that contains the most current firmware.

Click**[Apply]** when done.

Click **[Reboot Now]** to perform a soft reboot of the CRS-500 using the *selected active (current) firmware Image*.

9.5.4.3 Utility | Upload

Chapter 6. FIRMWARE UPDATE

Use this page to upload a firmware update file from the User PC into the CRS-500 controller's flash memory.

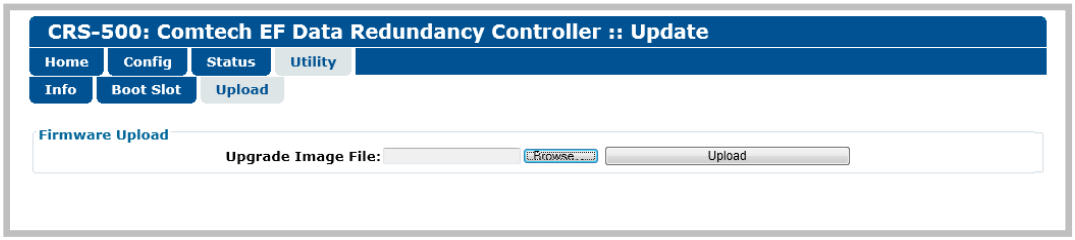


Figure 9-12. 'Utility | Upload' Page

Firmware Upload

Do these steps:

1. **Upgrade Image File** – Click **[Browse]** to locate and select the firmware file that was obtained from the Comtech EF Data Web site (or provided by Comtech EF Data Product Support). The firmware file should be extracted from the archive file upon download and stored on the User PC in a temporary folder (directory).
2. Click **[Upload]** to complete the upgrade process. The file will first upload to the controller's flash memory; the firmware upgrade bulk image file then loads into the *non-active* image – that is, the image that is not currently selected as the active firmware image (as it appears in the "**Boot From:"** field on the '**Utility | Boot Slot'** page).

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Chapter 10. SERIAL INTERFACE OPERATION

10.1 Overview

See Section B.3.1.1 in Appendix B. CONTROLLER / TMI CONNECTORS AND PINOUTS for the EIA-232/485 Interface connector pinout table.

Serial remote product management of Comtech EF Data's CRS-500 1:N Redundancy System is available using the '**P1 | Remote Control**' DB-9M port located on the CSU rear panel CRS-530 System Controller Module. This chapter summarizes key parameters and procedures and their associated remote commands and queries, and provides detailed instructions for use of the serial remote interface.

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

- ***Your CRS-500 and its Redundant and Traffic Modems are interconnected and are operating with the latest version firmware files.***
- ***You are using a Windows-based PC (user-provided) that is connected to the CRS-500 as follows:***
  - ***The User PC serial port is connected with a user-supplied serial cable to the 'P1 | Remote Control' DB-9M port located on the CSU rear panel CRS-530 System Controller Module.***
  - ***The User PC Ethernet port is connected via a user-supplied hub, switch, or direct Ethernet CAT5 cable connection to the CRS-500.***
  - ***The User PC is running a terminal emulation program (for operation of the CRS-500 Serial or Telnet Interface) and a compatible Web browser (for operation of the CRS-500 HTTP (Web Server) Interface).***
- ***The CRS-5000 Management IP Address has been noted using the CRS-500 Serial Interface or HTTP Interface.***

10.2 Remote Control Protocol and Structure

The electrical interface is either an EIA-232 connection (for the control of a single device) or an EIA-485 multi-drop bus (for the control of many devices). Data is transmitted in asynchronous serial form using ASCII characters. Control and status information is transmitted in packets of variable length in accordance with the structure and protocol defined in this chapter.

10.2.1 EIA-232

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

10.2.2 EIA-485

For applications where multiple devices are to be monitored and controlled, a full-duplex (or 4-wire) EIA-485 is preferred. Half-duplex (2-wire) EIA-485 is possible, but is not preferred.

In full-duplex EIA-485 communication there are two separate, isolated, independent differential-mode twisted pairs, each handling serial data in different directions. It is assumed that there is a ‘Controller’ device (a PC or dumb terminal), which transmits data in a broadcast mode via one of the pairs. Many ‘Target’ devices are connected to this pair, which all simultaneously receive data from the Controller. The Controller is the only device with a line-driver connected to this pair – the Target devices only have line-receivers connected.

In the other direction, on the other pair each Target has a Tri-Stateable line driver connected, and the Controller has a line-receiver connected. All the line drivers are held in high-impedance mode until one – and only one – Target transmits back to the Controller.

Each Target has a unique address, and each time the Controller transmits in a framed ‘packet’ of data, the address of the intended recipient Target is included. All of the Targets receive the packet, but only one – the intended – will reply. The Target enables its output line driver and transmits its return data packet back to the Controller in the other direction, on the physically separate pair.

EIA-485 (full duplex) 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 Target s have line-receivers.
- Target-to-Controller pair has one line receiver (Controller), and all Targets have Tri-State drivers.

10.2.3 Basic Serial Protocol

Serial data can be transmitted and received by a Universal Asynchronous Receiver/Transmitter (UART). Serial data is transmitted as asynchronous serial characters:

- Asynchronous character format is 8-N-1 (8 data bits, no parity, 1 stop bit)
- Baud rate can vary from 300 through 19,200 baud.

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

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

- Acknowledging receipt of a “command” – an instruction message issued by the Controller – to change the configuration of the Target.
- Returning data that was requested by the Controller – response to a “query” message – that requests information from the Target.

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

10.2.4 Rules for Remote Serial Communications with the CRS-500

1. Always wait for a response (up to 15 seconds) from the CRS-500 before sending the next query or command.
2. If a "time-out" response ('~') is sent from the CRS-500, the user must resend the previous command. The ‘~’ response indicates that a pass-through command to a modem/transceiver attached to the CRS-500 has "timed-out" and there was no response from the other device. During this wait, do not communicate with the CRS-500. After the '~' response is sent by the CRS-500, it is now ready to receive a message again. The CRS-500 knows to wait different times for the different messages it is sending to modems:
    - Status queries (no commands) are fast, (typically less than 333 ms).
    - Configuration changes (commands) take longer and vary by modem type.
    - Individual commands responses are faster than those to global commands (MGC). More parameters require more time.
    - A pass-through command is passed with little inspection by the switch, but keep in mind that the modem being addressed may be at the distant end of an EDMAC link! Types of pass-through commands:
        - To a local modem;
        - To a modem at the distant end (EDMAC);
        - To a local BUC or transceiver connected to a local modem;
        - To a distant end BUC or transceiver through the distant end modem.

10.2.5 Packet Structure

Table 10-1. Controller-to-Target Packet Structure

	Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
Character	<		/		= or ?		Carriage Return {CR}
ASCII Code	60		47		61 or 63		13
# Characters	1	4	1	3	1	n	1

Controller-to-Target Examples: (COMMAND) <0000/RSH=30{CR}

(QUERY) <0000/RSH?{CR}

Table 10-2. Target-to-Controller Packet Structure

	Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
Character	>		/		=, ?, !, or *		Carriage Return {CR}, Line Feed {LF}
ASCII Code	62		47		61, 63, 33 or 42		13, 10
# Characters	1	4	1	3	1	From 0 to n	2

Target-to-Controller EXAMPLE: (QUERY RESPONSE) >0135/RSH=30{CR}{LF}

10.2.5.1 Start of Packet

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

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

10.2.5.2 Target Address

While up to 9,999 devices can be uniquely addressed, the CRS-500 imposes some limitations:

- In EIA-232 applications, this value is set to 0000.
- In EIA-485 applications, the Switch may be set to an address of 1000, 3000, 5000 or 7000. This allows up to four Switches to be connected on the same bus.
- The 11 modems that may be connected to the Switch may be accessed for remote monitor & control through the Switch via *virtual* addresses. See **Appendix C. ADDRESSING SCHEME INFORMATION** for details.
- Valid remote commands and queries that can be sent to the modems via the Switch depend upon the modem protocol and the installed options. Consult the appropriate modem *Installation and Operation Manual* for further information.

Note that, regardless of the Switch COMs being set up for either EIA-232 or EIA-485 mode, the Switch communicates with the modems via Telnet.

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.

The Comtech SatMac application software (Version 3.6 or higher) can monitor and control a CRS-500 1:N Redundancy System. See **Appendix C. ADDRESSING SCHEME INFORMATION** for details.

There also are address restrictions for distant-end modems (being accessed by EDMAC) and Comtech transceivers, connected either locally or at the distant-end of a link. See **Appendix C. ADDRESSING SCHEME INFORMATION** for details.

10.2.5.3 Address Delimiter

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

10.2.5.4 Instruction Code

This three-character alphabetic sequence is intended to be a mnemonic of its operational function. This aids in the readability of the message, should you display it in its raw ASCII form. For example, “BKH” means “Backup Holdoff; “SID” means “Switch ID”, etc. You may use only upper case alphabetic characters (A-Z, ASCII codes 65-90).

10.2.5.5 Instruction Code Qualifier

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

10.2.5.5.1 Controller-to-Target Rules

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

= (ASCII code 61)

This qualifier is the Assignment Operator (AO). It means that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. For example: <0000/BKH=12{CR} means "set the Backup Holdoff time to 12 seconds."

? (ASCII code 63)

This qualifier is the Query Operator (QO). It means that the Target should return the value of the parameter(s) defined by the preceding byte. For example: <0000/BKH?{CR} means "query the value of the current Backup Holdoff time setting."

10.2.5.5.2 Target-to-Controller Rules

From Target-to-Controller, the Target transmits the symbol =, ?, !, #, *, or ~ (ASCII codes 61, 63, 33, 35, 42, or 126) to the Controller:

= (ASCII code 61)

"=" displays in two ways:

1. If the Controller sends a command to set a parameter's value, and the parameter value is valid, the Target accepts the command by replying with no message arguments. For example: >0000/BKH={CR}{LF}
2. If the Controller sends a query to a Target, the Target responds with the configured setting. For example, the query <0000/BKH?{CR} means "query the current value of the Backup Holdoff setting" – the Target responds with >0000/BKH=12{CR}{LF}, where "12" represent the Backup Holdoff time setting, in seconds.

? (ASCII code 63)

"?" displays if the Controller sends a command to set a parameter to a particular value, and that value is not valid, the Target rejects the command by echoing the instruction code, with no message arguments, followed by this character. For example: >0000/BKH?{CR}{LF}. This indicates that there was an error in the instruction code argument sent by the Controller.

! (ASCII code 33)

"!" displays when the Controller sends a command that the Target does not recognize. The Target rejects the command by echoing the invalid instruction code, followed by this character. For example: >0000/XYZ!{CR}{LF}

(ASCII code 35)

"#" displays if the Controller sends a command to set a parameter that is correctly formatted, but the modem is not in Remote mode, the modem will not permit that parameter to be changed at that time. The Target will reject the instruction by responding with this character, with no message arguments. For example: >0001/BKH#{CR}{LF}.

* (ASCII code 42)

"*" displays if the Controller sends a command to set a parameter to a particular valid value, but the modem will not permit that parameter to be changed at that time. The Target will reject the instruction by responding with this character, with no message arguments. For example: >0000/BKH*{CR}{LF}.

~ (ASCII code 126)

"~" displays if the Controller sends a command transparently through the Switch to an attached modem or ODU. In the event that the other device does not respond, the Switch generates this response. For example: >0100/MGC~{CF}{LF} indicates that the Switch has finished waiting for a response and is now ready for further COMMs.

10.2.5.6 Optional Message Arguments

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

- Comma "," (ASCII code 44)
- Period "." (ASCII code 46)
- Characters "0" through "9" (ASCII codes 48 through 57)

10.2.5.7 End of Packet

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

10.3 Remote Commands and Queries

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

Unless otherwise noted – In the tables that follow, these codes are used in the 'Response to Command' column

= Message ok
? Received ok, but invalid arguments were found
* Message ok, but not permitted in current mode

10.3.1 Redundancy Commands and Queries

CODE	C	Q	PAGE
AAM	X	X	10–9
ACT	X	X	10–9
AMQ	—	X	10–9
BB1	X	X	10–9

CODE	C	Q	PAGE
BKH	X	X	10–9
MAM	X	X	10–10
MFN	X	X	10–10
MIP	X	X	10–10

CODE	C	Q	PAGE
PRI	X	X	10–10
RSH	X	X	10–10
SAM	X	X	10–11
SIP	X	X	10–11

CODE	C	Q	PAGE
SWM	X	X	10–11
XMI	—	X	10–11

10.3.2 Unit Parameters Commands and Queries

CODE	C	Q	PAGE
BFR	X	X	10–13
IMG	—	X	10–13

CODE	C	Q	PAGE
IPA	X	X	10–13
IPG	X	X	10–13

CODE	C	Q	PAGE
LRS	X	X	10–14
MAC	—	X	10–14

CODE	C	Q	PAGE
SRC	X	X	10–14
SWC	X	X	10–14

10.3.3 Unit Information Commands and Queries

CODE	C	Q	PAGE
CAE	X	—	10–16
DAY	X	X	10–16
EID	X	—	10–16
FLT	—	X	10–15
FRW	—	X	10–16

CODE	C	Q	PAGE
MOD	—	X	10–16
NEN	X	X	10–16
NSP	X	X	10–17
NSS	X	X	10–17
NUE	—	X	10–17

CODE	C	Q	PAGE
RNE	—	X	10–17
SGC	X	X	10–18
SID	X	X	10–18
SNO	—	X	10–18
SWR	—	X	10–18

CODE	C	Q	PAGE
TIM	X	X	10–19
TMP	—	X	10–19

10.3.1 Redundancy Commands and Queries

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Audio Alarm Mask	AAM=	AAM?	1 byte	Command or Query. Sets or returns the audio alarm mask in the form x, where: 0 = No faults masked (audio enabled in response to any fault) 1 = Switch faults masked 2 = Modem faults masked 3 = All faults masked (audio never enabled)	AAM= AAM? AAM*	AAM=x
Configure Active Modems	ACT=	ACT?	10 bytes	Command or Query. Sets or returns the active state of all 10 Traffic Modems in the form xxxxxxxxxx, where: 0 = de-activate Traffic Modem (except if in backup) 1 = activate Traffic Modem NOTE: Redundant modems are always active.	ACT= ACT? ACT*	ACT=xxxxxxxxxx
Active Modem Status	N/A	AMQ?	10 bytes	Query only. Returns the state of all 10 Traffic Modems in the form xxxxxxxxxx, where: 0 = TMI not present. Modem cannot be activated. 1 = TMI present, but modem not activated. 2 = TMI present, modem activated and responding. 3 = TMI present, modem activated but not responding.	N/A	AMQ=xxxxxxxxxx
Bridged or Backed-up Modem Number (Redundant Modem 1)	BB1=	BB1?	3 byte	Command or Query. Sets or returns the bridge/backup state for RM1, followed by the selected TM to be acted on, in the form xyy where: x = 0 or 1, where 0 = RM1 to Bridge; 1 = RM1 to Back Up (valid only in Manual Switching Mode) yy = TM 01 through 10 (modem number in 1:N mode)	BB1= BB1? BB1*	BB1=xyy
Backup Holdoff Time	BKH=	BKH?	2 bytes	Command or Query. Sets or returns the backup holdoff time, in seconds, in the form xx, where: xx = 01 through 99 NOTE: This is the number of seconds in time delay that Auto Mode inserts, before online swap actually takes place, after Redundant Modem 1 has acquired the faulted Traffic Modem's configuration.	BKH= BKH? BKH*	BKH=xx

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Modem Alarm Mask	MAM=	MAM?	1 byte	Command or Query. Sets or returns the modem alarm mask in the form x, where: 0 = No faults masked 1 = Tx faults masked 2 = Rx faults masked 3 = Both Tx and Rx faults masked	MAM= MAM? MAM*	MAM=x
M:N Mode	MFN=	MFN?	1 byte	Command or Query. Sets or return the redundancy operation in the form x, where: x = indicates the M:N mode (# of backups), where 0 = 1:N redundancy NOTE: ONLY 1:N REDUNDANCY OPERATION IS CURRENTLY AVAILABLE.	MFN= MFN? MFN*	MFN=x
Modem IP Addresses	MIP=	MIP?uu	17 bytes	Command or Query. Sets or returns the IP Address and network prefix for the 10/100 BaseTx Ethernet management port of traffic and backup modems, in the form uuxxx.xxx.xxx.xxx, where: uu = unit #, where: 01-09 = IP Address for Traffic Modem 1 through 9. 11 = IP Address for Redundant Modem 1 10 = IP Address for Traffic Modem 10 xxx.xxx.xxx.xxx = IP Address of the modem NOTE: The IP Address used by the CRS-500 to communicate with the modem must be on the same subnet.	MIP= MIP? MIP* MIP#	MIP=uuxxx.xxx.xxx.xxx
Priority Modem	PRI=	PRI?	2 byte	Command or query. Sets or returns the Priority modem in the form xx, where: 00 = Priority disabled 01 through 10 = priority link number NOTE: The Switch will back up the priority link if a fault occurs on the priority link, even if it is already backing up another (non-priority) link.	PRI= PRI? PRI*	PRI=xx
Restore Holdoff Time	RSH=	RSH?	2 bytes	Command or Query. Sets or returns the restore holdoff time, in seconds, in the form xx, where: xx = 01 through 99 NOTE: This is the number of seconds in time delay that Auto Mode inserts before returning a Traffic Modem (previously faulted, now OK) back online due to a different Traffic Modem's failure, in order to allow Redundant Modem 1 to bridge the newly faulted Traffic Modem.	RSH= RSH? RSH*	RSH=xx

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Switch Alarm Mask	SAM=	SAM?	1 byte	Command or Query. Sets or returns the Switch alarm mask in the form x, where: 0 = No faults masked 1 = Power Supply A faults masked 2 = Power Supply B faults masked	SAM= SAM? SAM*	SAM=x
Switch IP Addresses	SIP=	SIP?uu	20 bytes	Command or Query. Sets or returns the IP Address and Subnet Mask for the 10/100 BaseTx Ethernet Management Port of traffic and backup modems, in the form uuxxx.xxx.xxx.xxxyy, where: uu = Unit #, where: 01-09 = IP Address for Traffic Modem 1 through 9 11= IP Address for Redundant Modem 1 10 = IP Address for Traffic Modem 10 xxx.xxx.xxx.xxx = IP Address of the modem yy = Subnet Mask (00 through 31)	SIP= SIP? SIP* SIP#	SIP=uuxxx.xxx.xxx.xxx yy
Switching Mode	SWM=	SWM?	1 byte	Command or Query. Set or returns the switching mode in the form x, where: 0 = Manual Mode 1 = Auto Mode	SWM= SWM? SWM*	SWM=x
TMI/RMI Types	N/A	XMI?	11 bytes	Query only. Returns the TMI type detected in each slot position in the form xxxxxxxxxxy, where: x = 0 through 9 or A through M, where: 0 = None present 1 = CRS-320 Rev A 2 = CRS-330 3 = CRS-340 Rev A 4 = CRS-340 Rev B 6 = CRS-320 Rev C 7 = Undefined 8 = CRS-341 9 = CRS-316 A = CRS-336 B = Undefined C = CRS-315 (TMI) D = CRS-325 (TMI)	N/A	XMI=xxxxxxxxxxy

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
TMI/RMI Types (cont.)				E = CRS-335 (TMI) F = CRS-345 G = CRS-365 Quad E1 for CDM-Qx H = CRS Quad E1 D-sub for CDM-625 K = CRS-515 L = CRS-520 M = CRS-516 N = CRS-517 y = indicates the RMI type detected in slot II, where: 0 = none present 7 = CRS-310 D = CRS-307 E = CRS-306 F = CRS-305 I = CRS-505 J = CRS-510 NOTE: NOT ALL TMIs/RMIs ARE VALID FOR OPERATION IN PRESENT CRS-500 CONFIGURATION (SYSTEM AT PRESENT IS COMPATIBLE ONLY WITH CDM-625, CDM-625A, CDM-750, CDM-760 MODEMS) QUERY RESPONSE EXAMPLE: >0000/XMI=21000000007{CR}{LF}		

10.3.2 Unit Parameters Commands and Queries

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Firmware Boot From Slot	BFR=	BFR?	1 byte	Command or Query. Sets or returns the bulk firmware slot to boot from in the form x, where: 1 = Firmware is Slot #1 2 = Firmware is Slot #2 3 = Latest Firmware (most recent release date)	BFR= BFR? BFR* BFR#	BFR=x
Current Firmware Image	IMG=	IMG?	1 byte	Query Only. Returns the active firmware image in the form x, where: 1 = Bulk Image #1 currently active 2 = Bulk Image #2 currently active	IMG= IMG? IMG* IMG#	IMG=x
Management IP Address	IPA=	IPA?	20 bytes	Command or Query. Sets or returns the IP Address and Subnet Mask for the 10/100 BaseTx Ethernet Management Port in the form xxx.xxx.xxx.xxxyy, where: xxx.xxx.xxx.xxx = IP Address, and yy = Subnet Mask (00 through 31) COMMAND EXAMPLE: <0000/IPA = 010.006.030.001/24{CR} means set the Management IP Address for the Switch to 10.6.30.1 with a Subnet Mask of 24.	IPA= IPA? IPA* IPA#	IPA=xxx.xxx.xxx.xxxyy
Gateway IP Address	IPG=	IPG?	15 bytes	Command or Query. Sets or returns the IP Gateway Address for the Ethernet Management Port in the form aaa.bbb.ccc.ddd, where (permitted ranges are specified, but they cannot all be zero): aaa = 0-223 bbb = 0-255 ccc = 0-255 ddd = 0-255 NOTES: The Gateway IP Address must be on the same subnet as the Management IP Address. The Gateway IP Address can be cleared by setting it to 0.0.0.0 COMMAND EXAMPLE: <0000/IPG = 010.006.030.002	IPG= IPG? IPG* IPG#	IPG=xxx.xxx.xxx.xxx

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Local/Remote Status	LRS=	LRS?	1 byte	Command or Query. Sets or returns the local/remote status of the Switch in the form x, where: 0 = Local (CSU Front Panel) 1 = Ethernet 2 = Serial + Ethernet	LRS= LRS?	LRS=x
MAC Address	N/A	MAC?	12 bytes	Query only. Returns the unique MAC Address for the Switch. QUERY RESPONSE EXAMPLE: >0000/MAC = 0006B00001CA{CR}{LF}	N/A	MAC=aabbccddeeff
SNMP Read Community	SRC=	SRC?	Up to 20 bytes	Command or Query. Sets or returns the SNMP Read Community string. NOTES: Empty string is not allowed. 20 characters maximum are permitted. Reboot is required in order for changes to the Read Community string to take effect. COMMAND EXAMPLE: <0000/SRC=public{CR}	SRC = SRC!	SRC=x…x
SNMP Write Community	SWC=	SWC?	Up to 20 bytes	Command or Query. Sets or returns the SNMP Write Community string. NOTES: Empty string is not allowed. 20 characters maximum are permitted. Reboot is required in order for changes to the Write Community string to take effect. COMMAND EXAMPLE: <0000/SWC=private{CR}	SWC = SWC!	SWC=x…x

10.3.3 Unit Information Commands and Queries

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Faults and Status	N/A	FLT?	12 bytes	Query only. Unit returns the current fault and status codes for the Switch itself in the form xyABCDEFGmit, where: x = RM1 status (0, 1, 2, 4) where: 0=OK 1=RM not present 2=RM comm loss 4=RM rejecting configuration string y= RM2 status (reserved for future use; RM2 is not supported yet, so this will always be '*') A = +3.3v power supply (where 0 = OK, 1 = FAULT) B = +2.5v power supply (where 0 = OK, 1 = FAULT) C = +5v power supply (where 0 = OK, 1 = FAULT) D = +12v power supply module "A" (where 0 = OK, 1 = FAULT) E = +12v power supply module "B" (where 0 = OK, 1 = FAULT) F = -12v power supply module "A" (where 0 = OK, 1 = FAULT) G = -12v power supply module "B" (where 0 = OK, 1 = FAULT) m = Position of TMI with mismatched data type (where 0 = OK, 1..A = FAULT) i = Position of TMI with comm loss (where 0 = OK, 1..A = FAULT) t = Temperature fault (where 0 = OK, 1 = FAULT) NOTES: 1) It is possible to get the fault status of each CDM-625/A by querying the CDM-625/A itself through the unit-addressable remote strings (see the CDM-625/A manuals for the CDM-625/A FLT query description). 2) The CRS-500 ties up the Telnet connection on each CDM-625/A, so it is necessary to execute these queries through the CRS-500 remote control interface (Serial or Telnet). For example: <0000/FLT?{CR} = Fault status of CRS-500 controller <0100/FLT?{CR} = Fault status of TM1 <0200/FLT?{CR} = Fault status of TM2 <1000/FLT?{CR} = Fault status of TM10 <1100/FLT?{CR} = Fault status of RM1	N/A	FLT=xABCDEFGmit

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Clear All Stored Events	CAE=	N/A	N/A	Command only. Instructs the unit to clear all Stored Events. NOTE: THIS COMMAND TAKES NO ARGUMENTS.	CAE= CAE*	N/A
Date	DAY=	DAY?	6 bytes	Command or Query. Sets or returns the date, in the international date convention form ddmmyy, where: dd = day of the month, from 01 to 31, mm = month of the year, from 01 to 12, and yy = year, from 97 to 96 (1997 to 2000, then 2000 to 2096) COMMAND EXAMPLE: <0000/DAY=240457{CR} (Sets date to April 24, 2057)	DAY= DAY? DAY*	DAY=ddmmyy
Equipment ID	N/A	EID?	4 bytes	Query only. Returns equipment identification information in the form xxxx. QUERY RESPONSE EXAMPLE: >0000/EID=S500{CR}{LF}	N/A	EID=xxxx
Firmware Information	N/A	FRW?1 FRW?2 FRW?3	100 bytes	Query only. Returns firmware information for Image 1 (bulk1), Image 2 (bulk2), and Image 3 (bootrom): EXAMPLE: <0000/FRW?1{CR} >0000/FRW=F0000389X,1.2.6,MM/DD/YY{CR}{LF}	N/A	FRW=xxx…xxx
Managed Modem Type	N/A	MOD?	4 bytes	Query only. Returns information concerning the model of the Redundant Modem attached in the form xxxx, where: 0625 = CDM-625 625A = CDM-625A 0750 = CDM-750 0760 = CDM-760	N/A	MOD=xxxx
NTP Enable/Disable	NEN=	NEN?	1 byte	Command or Query. Sets or returns the NTP (Network Time Protocol) operating status in the form x, where: 0 = Disabled 1 = Enabled COMMAND EXAMPLE: <0000/NEN=1{CR} (enables NTP)	NEN= NEN?	NEN=x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
NTP Primary Server	NSP=	NSP?	15 bytes	Command or Query. Sets or returns the NTP (Network Time Protocol) Primary Server Address in the form aaa.bbb.ccc.ddd, where: aaa = 000 to 223 bbb = 000 to 255 ccc = 000 to 255 ddd = 000 to 255 NOTES: 1) Permitted ranges as specified above CANNOT BE ALL ZEROES. 2) The NTP Primary Server Address can be cleared by setting it to 0.0.0.0 COMMAND EXAMPLE: <0000/NSP=010.006.030.001{CR}	NSP= NSP? NSP* NSP#	NSP=xxx.xxx.xxx.xxx
NTP Secondary Server	NSS=	NSS?	15 bytes	Command or Query. Sets or returns the NTP Secondary Server Address in the form aaa.bbb.ccc.ddd where: aaa = 000 to 223 bbb = 000 to 255 ccc = 000 to 255 ddd = 000 to 255 NOTES: 1) Permitted ranges as specified above CANNOT BE ALL ZEROES. 2) The NTP Secondary Server Address can be cleared by setting it to 0.0.0.0 COMMAND EXAMPLE: <0000/NSS=010.006.030.002{CR}	NSS= NSS? NSS* NSS#	NSS=xxx.xxx.xxx.xxx
Number of Unread Stored Events	N/A	NUE?	3 bytes	Query only. Sets or returns the number of Stored Events that remain unread, in the form xxx. NOTE: This means unread over the remote control. Viewing the stored events from the CSU front panel does not affect this value. QUERY RESPONSE EXAMPLE: >0000/NUE=098{CR}{LF}	N/A	NUE=xxx
Read Next 5 Unread Stored Events	N/A	RNE?	80 bytes	Query only. Returns the oldest 5 Stored Events that have not yet been read over the remote control in the form [cr]Sub-body[cr]Sub-body[cr]Sub-body[cr]Sub-body[cr]Sub-body, where: Sub-body = KLMddmmyyhhmmss, where: K = Fault/clear indicator, where F = Fault; C = Clear; I = Info L = Faulting/clearing unit, where value = 1 through 9 (TM 1 through TM 9), A (TM 10), B (RM1), C (Switch), or D (Info)	N/A	RNE=[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Read Next 5 Unread Stored Events (cont.)				M = Fault code, where value depends on faulting item: SWITCH codes are 1 to 9 or A to F, indicating the position (1-15) of the fault within the Switch FLT string. MODEM codes are 1 (Unit), 2 (Rx traffic), or 3 (Tx traffic). INFO codes are 0 (Power off), 1 (Power On), or 2 (Log cleared). ddmmyy = date of the event (in international format) hhmmss = time of the event NOTES: 1) If there are no new events, the unit responds with RNE*. 2) If fewer than 5 events remain, the last positions are filled with zeroes.		
Switch Global Configuration	SGC=	SGC?	29 bytes	Command or Query. Sets or returns Global configuration of the Switch, in the form smaaaaaaaaaaBBBbbbHHRRMSAPP, where: s = Switching Mode (same as SWM) (1 byte) m = M:N Mode (same as MFN) (1 byte) aaaaaaaaaa = Active Modems 0-10 (same as ACT) (10 bytes) BBB = Bridge/Backup State 1 (same as BB1) (3 bytes) bbb = don't care – set to 000 (3 bytes) HH = Backup Holdoff Time in seconds (same as BKH) (2 bytes) RR= Restore Holdoff Time in seconds (same as RSH) (2 bytes) M = Modem Alarm Mask (same as MAM) (1 byte) S = Switch Alarm Mask (same as SAM) (1 byte) A = Audio Alarm Mask (same as AAM) (1 byte) PP = Priority modem (same as PRI) (2 bytes)	SGC= SGC? SGC*	SGC=smaaaaaaaaaaBBBbbbHHRRMSAPP
Switch Unit Name	SID=	SID?	24 bytes	Command or Query. Sets or returns a user-defined Switch Unit Name, which is a fixed length of 24 characters. NOTE: Valid characters include Space ( ) * + - , . / 0-9 and A-Z.	SID= SID? SID*	SID=x…x
Serial Number	N/A	SNO?	9 bytes	Query only. Returns the unit's 9-digit serial number. QUERY RESPONSE EXAMPLE: >0000/SNO=123456789{CR}{LF}	N/A	SNO=xxxxxxxxx
Software Revision	N/A	SWR?	5 bytes	Query only. Returns the value of the unit's installed internal software revision in the form x.x.x. QUERY RESPONSE EXAMPLE: >0000/SWR=1.0.3 (Ver. 1.0.3)	N/A	SWR=x.x.x

Parameter Type	Controller-to-Target Instruction Code and Qualifier		Arguments for Command or Query	Description of Arguments (Note that all arguments are ASCII numeric codes – i.e., ASCII codes between 48 and 57)	Target-to-Controller	
	Command	Query			Response to Command	Response to Query (see Description of Arguments)
Time	TIM=	TIM?	6 bytes	Command or Query. Sets or returns the time from midnight, in the form hhmmss, where: hh = hours, between 00 and 23, mm = minutes, between 00 and 59, and ss = seconds, between 00 and 59 COMMAND EXAMPLE: <0000/TIM=231259{CR} (Sets time as 23 hours, 12 minutes, 59 seconds from midnight, i.e., 11:12:49 P.M.)	TIM= TIM? TIM*	TIM=hhmmss
Temperature	N/A	TMP?	4 bytes	Query only. Returns the unit's internal temperature, in the form sxxx, where: s = sign (positive [+] or negative [-]) xxx = temperature in degrees C. QUERY RESPONSE EXAMPLE: >0000/TMP=+026{CR}{LF)	N/A	TMP=sxxx

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Appendix A. CABLE DRAWINGS

A.1 Overview

This appendix identifies the cables used with the CRS-500 1:N Redundancy System. The appendix summaries cable use under three categories (sections):

- **A.2 User/Utility Cables**
- **A.3 Control Cables**
- **A.4 Data Cables**

The tables provided in these sections cross-reference to the system cabling figures provided in **Chapter 5. CABLES AND CONNECTIONS**.

1. The European EMC Directive (EN55022, EN50082-1) requires that you use properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.
2. All dimensions, where specified in the figures provided in this appendix, are in inches. They are provided for reference only and are subject to change.

A.2 User/Utility Cables

App. A FIG	Ch. 5 FIG REF	CEFD CABLE P/N	DESCRIPTION	USED WITH CRS-500 → ...	USED FOR (DATA TYPE)
A-1	N/A	N/A	DB-9M → DB-9F	User EIA-232 Switch M&C / Firmware Update	CRS-500 Remote → User PC Serial Port

A.2.1 Switch M&C / Firmware Update Cable

Use the EIA-232 connection cable (**Figure A-1**) for serial-based M&C of the CRS-500 and for the firmware update process. Connect this cable from the CRS-530 System Controller Module "**P1 | Remote Control**" port (located on the CSU rear panel) to a User PC serial port.

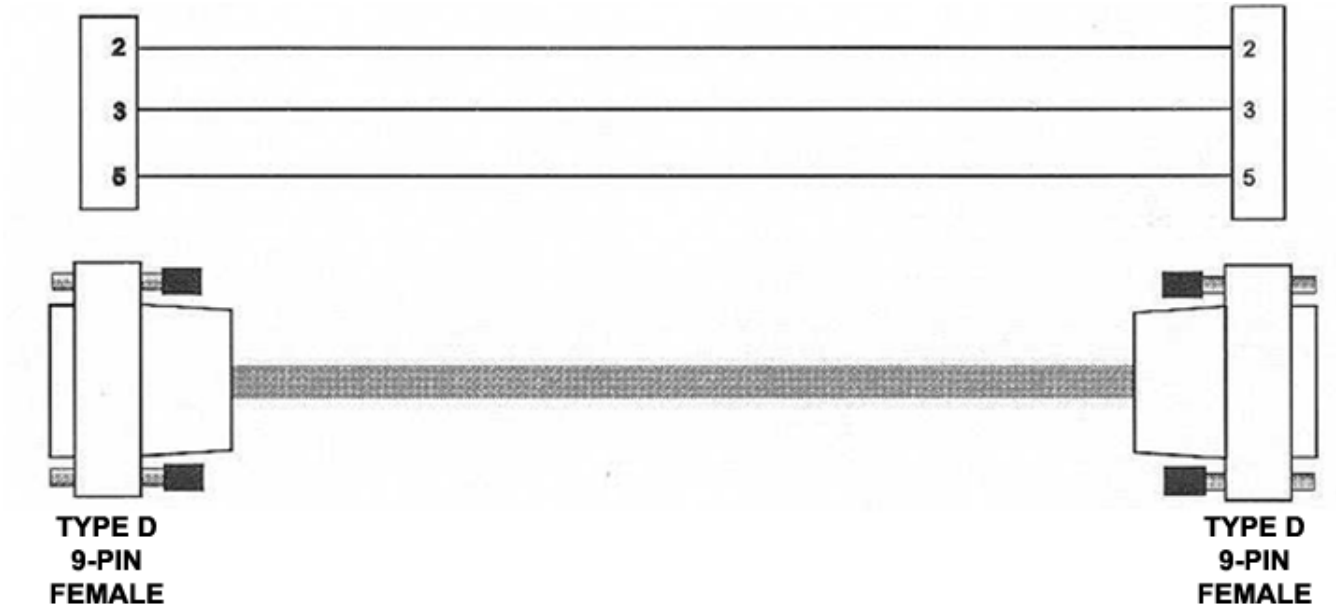


Figure A-1. Switch M&C / Firmware Update Cable

A.3 Control Cables

App. A FIG	Ch. 5 FIG REF	CEFD CABLE P/N	DESCRIPTION	USED WITH	USED FOR (TYPE)
A-2	5-1 5-2	CA-0000234	DB-25F → DB-25M, 8’	CSU → DSU	Control
A-3	5-1 5-2	CA-0000386	DB-9F → [4X] DB-9F, 11’	DSU → ISU	Control
A-4	5-4	CA/WR0066	DB-25F → DB-25M, 6’	CDM-625/A ←→ DSU (RMI)	Control
A-5	5-4 5-8 5-9	CA-0000069	HD-15M → DB-9M, 6’	DSU (TMI) → CDM-625/A, CDM-750/760	Control

A.3.1 Control Cable for CRS-500 CSU → DSU

Use this control cable to connect the CRS-500 Control Switch Unit (CSU) to the Data Switch Unit (DSU).

WIRE LIST			
FROM	WIRE COLOR	NOTES	TO
P1-1	BLACK	TWISTED PAIR	J1-1
P1-14	RED		J1-14
N/C	SHIELD		N/C
P1-2	BLACK	TWISTED PAIR	J1-2
P1-15	WHITE		J1-15
N/C	SHIELD		N/C
P1-3	BLACK	TWISTED PAIR	J1-3
P1-16	GREEN		J1-16
N/C	SHIELD		N/C
P1-4	BLACK	TWISTED PAIR	J1-4
P1-17	BLUE		J1-17
N/C	SHIELD		N/C
P1-5	BLACK	TWISTED PAIR	J1-5
P1-18	YELLOW		J1-18
P1-11	SHIELD		J1-11
P1-11	SHIELD	TWISTED PAIR	J1-11
P1-6	BLACK		J1-6
P1-19	BROWN		J1-19
P1-7	BLACK	TWISTED PAIR	J1-7
P1-20	ORANGE		J1-20
P1-13	SHIELD		J1-13
P1-13	SHIELD	TWISTED PAIR	J1-13
P1-8	RED		J1-8
P1-8	WHITE		J1-8
P1-9	RED	TWISTED PAIR	J1-9
P1-21	GREEN		J1-21
P1-23	SHIELD		J1-23
P1-23	SHIELD	TWISTED PAIR	J1-23
P1-10	RED		J1-10
P1-10	BLUE		J1-10
P1-22	RED	TWISTED PAIR	J1-22
P1-22	YELLOW		J1-22
P1-25	SHIELD		J1-25
P1-25	SHIELD	TWISTED PAIR	J1-25
P1-12	RED		J1-12
P1-24	BROWN		J1-24

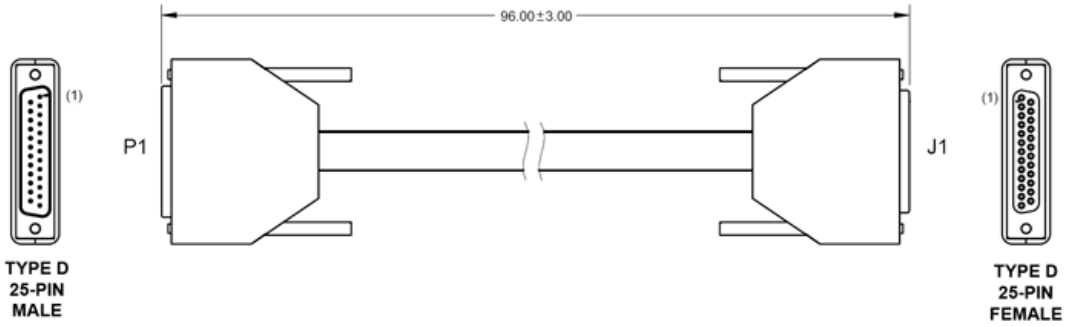
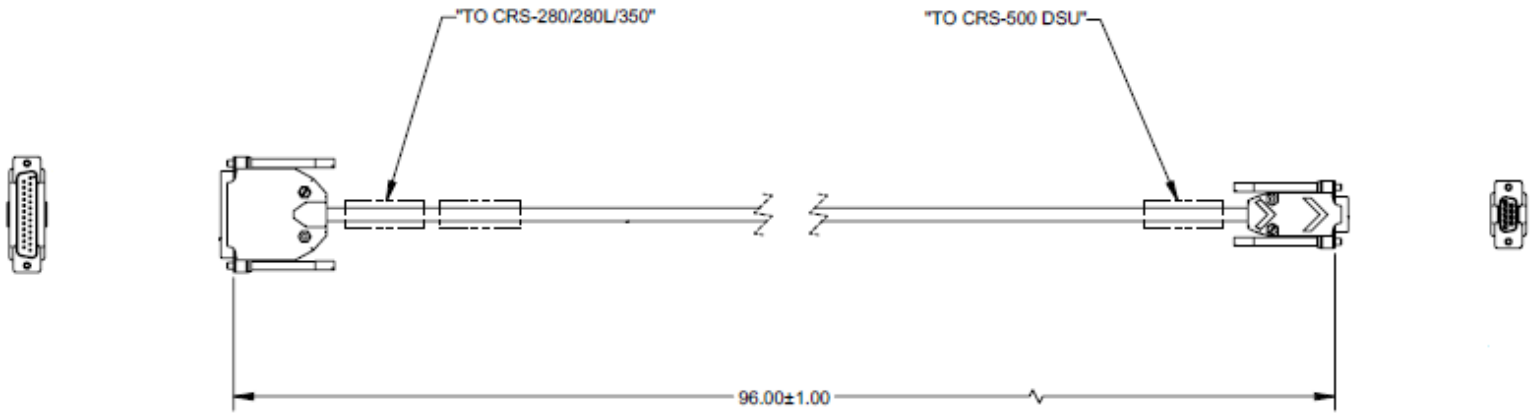


Figure A-2. CRS-500 CSU → DSU Control Cable (CEFD P/N CA-0000234)

A.3.2 Control Cable for CRS-500 DSU → ISU

Use this cable to connect the CRS-500 DSU to the CRS-280/280L IF Switch Unit (ISU). This is an optional cable, purchased separately.



WIRE LIST			
FROM	TO	WIRE COLOR	NOTES
P1-11	J1-1	SHIELD WIRE/BACKSHELL	ALSO SEE DETAIL A
P1-21	J1-2	RED	TWISTED PAIR
P1-17	J1-3	BLK	
P1-2	J1-4	BLU	TWISTED PAIR
P1-10	J1-5	BLK	
P1-5	J1-6	GRN	TWISTED PAIR
P1-4	J1-7	BLK	
P1-16	J1-8	WHT	TWISTED PAIR
P1-12	J1-9	BLK	

Figure A-3. CRS-500 DSU → ISU Control Cable (CEFD P/N CA-0021666)

A.3.3 RMI Control Cable for CDM-625/A Only

Use this cable as a control connection between a Redundant Modem and a CRS-500 DSU (RMI).

INDICATORS		
25M	NOTES	25F
1	TO	1
2	TO	2
3	TO	3
4	TO	4
5	TO	5
6	TO	6
7	TO	7
8	TO	8
9	TO	9
10	TO	10
11	TO	11
12	TO	12
13	TO	13
14	TO	14
15	TO	15
16	TO	16
17	TO	17
18	TO	18
19	TO	19
20	TO	20
21	TO	21
22	TO	22
23	TO	23
24	TO	24
25	TO	25

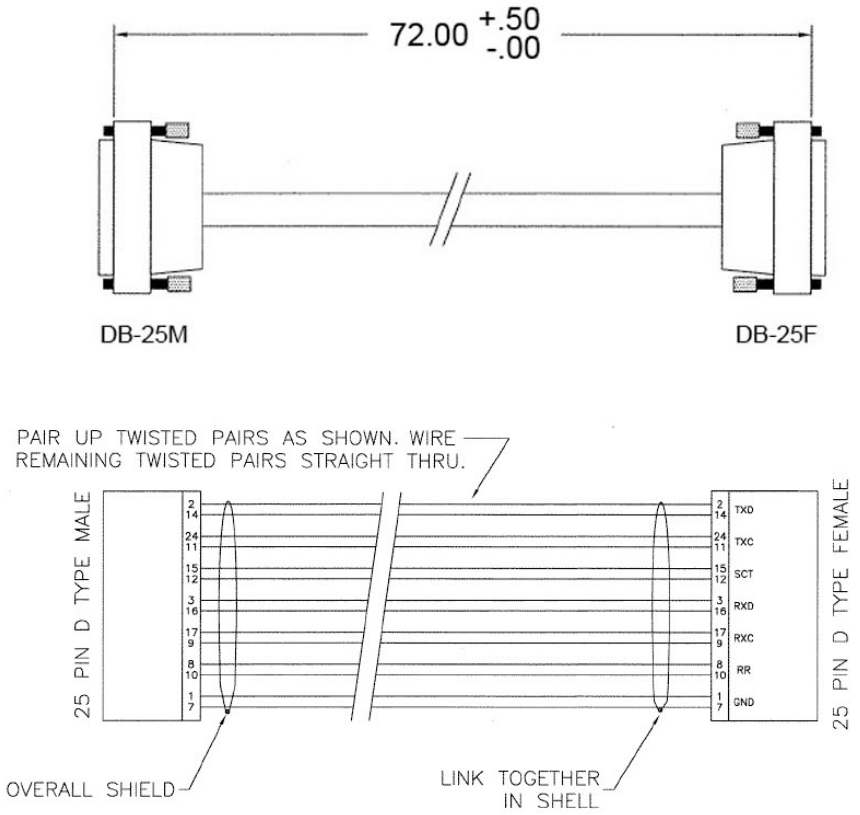
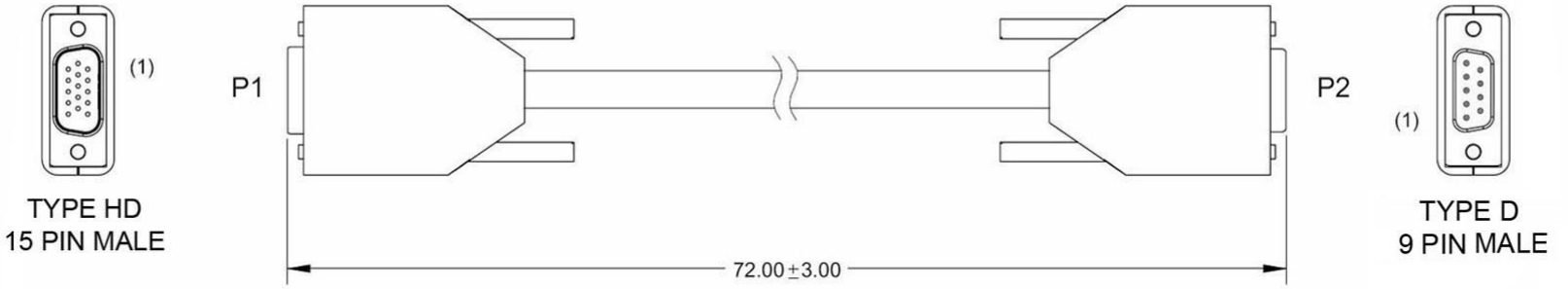


Figure A-4. RMI Control Cable (CEFD P/N CA/WR0066)

A.3.4 Control Cable for CDM-625/A and CDM-750/CDM-760

Use this control cable to connect the modem to the CRS-500 DSU (RMI/TMI).



WIRE LIST		
FROM	TO	COMMENTS
P1-1	N/C	-
P1-2	N/C	-
P1-3	N/C	-
P1-4	P2-4	-
P1-5	P2-1	SHIELD, ITEM 8
P1-6	N/C	-
P1-7	N/C	-
P1-8	N/C	-
P1-9	P2-9	-
P1-10	P2-3	-
P1-11	P2-2	-
P1-12	P2-6	-
P1-13	P2-8	-
P1-14	P2-7	-
P1-15	P2-5	-

Figure A-5. CDM-625/A, CDM-750/760 Control Cable (CEFD P/N CA-0000069)

A.4 Data / IF Cables

App. A FIG	Ch. 5 REF FIG	CEFD CABLE P/N	DESCRIPTION	USED WITH	USED FOR (TYPE)
A-6	5-4 5-6	PP/CAT5FF7FTGY	CAT5 RJ-45 → RJ45, 7'	CDM-625/A←→ CSU, DSU (RMI/TMI)	Ethernet System Communications, 10/100 Ethernet Router Mode Traffic Data
	5-5			CDM-625/A←→ CSU, DSU (RMI/TMI)	10/100 Ethernet Router Mode Traffic Data
	5-8 5-9			CDM-750/760←→ CSU, DSU (RMI/TMI)	Ethernet System Communications
	5-10			CDM-750/760 ←→ CSU, DSU (RMI/TMI)	10/100/1000 GbE Traffic Data
A-7	5-7	CA-0000275	[11X] DB-9M, 8.25'	CDM-625/A ←→ CDM-625/A	PMSI (CnC+)
A-8	5-11	CA-0000750	DB-9F → [4X] BNC	CRS-505 RMI ←→ CDM-750/760	G.703 S1 and S2 data
A-9		CA-0000703	DB-9F → [4X] BNC	CRS-345 TMI ←→ CDM-750/760	
A-10	5-13 5-14 5-15 *Note	PL/0813-8	75Ω BNC → BNC, 8'	70/140 MHz ISU ←→ Modems	IF
A-11	5-13 5-14 5-15 *Note	CA/RF10453-8	50Ω Type 'N' → Type 'N', 8'	L-Band ISU ←→ Modems	
A-12	5-13 5-14 5-15 *Note	PL/0946-2	50Ω BNC → BNC, 8'	70/140 MHz ISU ←→ Modems	

***NOTE:** See the **Section 5.1.1.3 IF Switch Unit (ISU) Configurations** table in **Chapter 5. CABLES AND CONNECTIONS** for conditional cable use.

A.4.1 Ethernet Data Cable (CAT5 RJ-45)

Use this CAT5 RJ-45 cable for Ethernet communications and 10/100 Ethernet connections between the modems and the CRS-500 CSU and/or the DSU (RMI/TMI).

T568B Wiring Diagram		
Pair No.	**Wire**	**Pin No.**
1	Blue/White tracer	5
	Blue	4
2	Orange/White tracer	1
	Orange	2
3	Green/White tracer	3
	Green	6
4	Brown/White tracer	7
	Brown	8

350 MHz Category 5E Patch Cable Specs:

- EIA/TIA TSB-40A ETL Verified
- Contact Gold Plating 50µ" (Short body)
- Assembly Strain Relief
- Stranded 50dB
- RoHS Compliant
- Length: 7 ft.

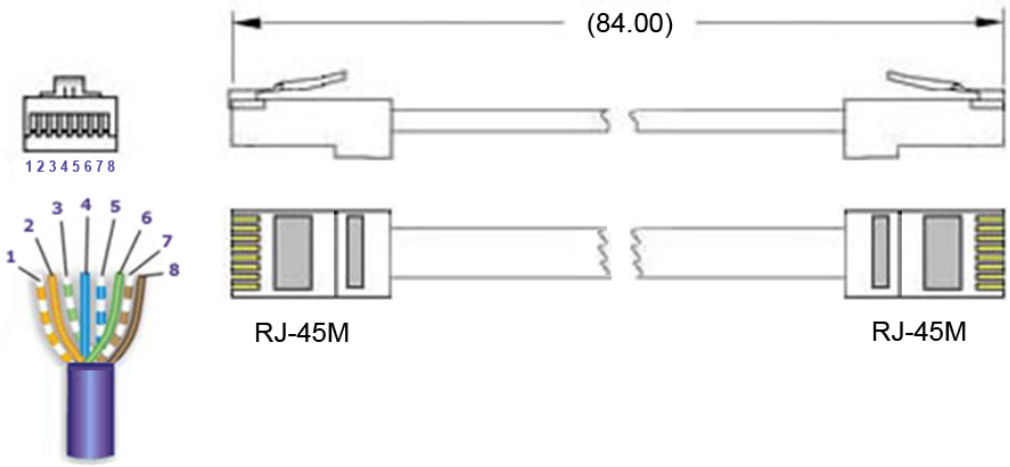
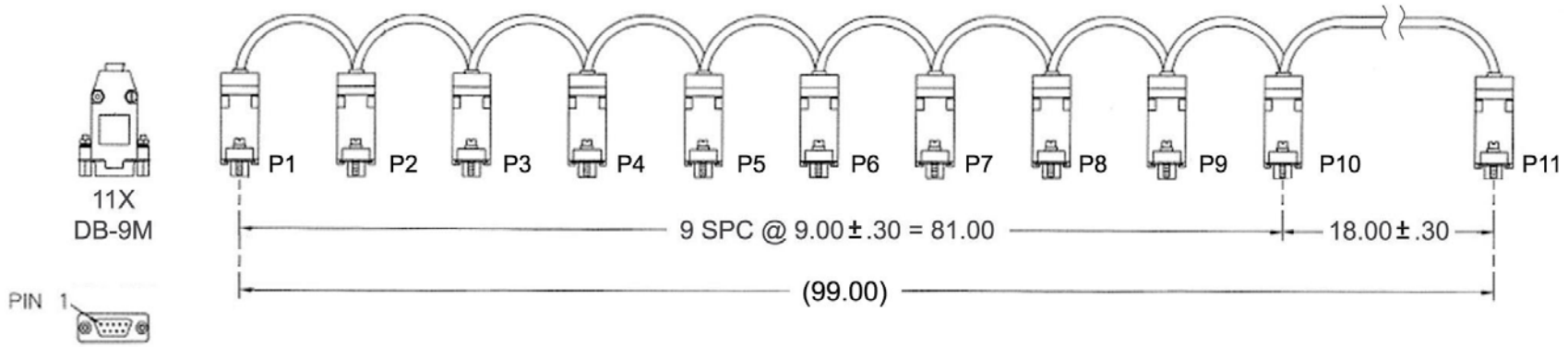


Figure A-6. Ethernet Data Cable (CEFD P/N PP/CAT5FF7FTGY)

A.4.2 Multi-drop CnC® Plus Shielded Data Cable for CDM-625/A

This cable bypasses all components of the CRS-500 1:N Redundancy System. Use this cable for modem-to-modem connections only.

Use this multi-drop shielded data cable to interconnect all ***CnC®-enabled*** CDM-625/A modems in a CRS-500 1:N Redundancy System.



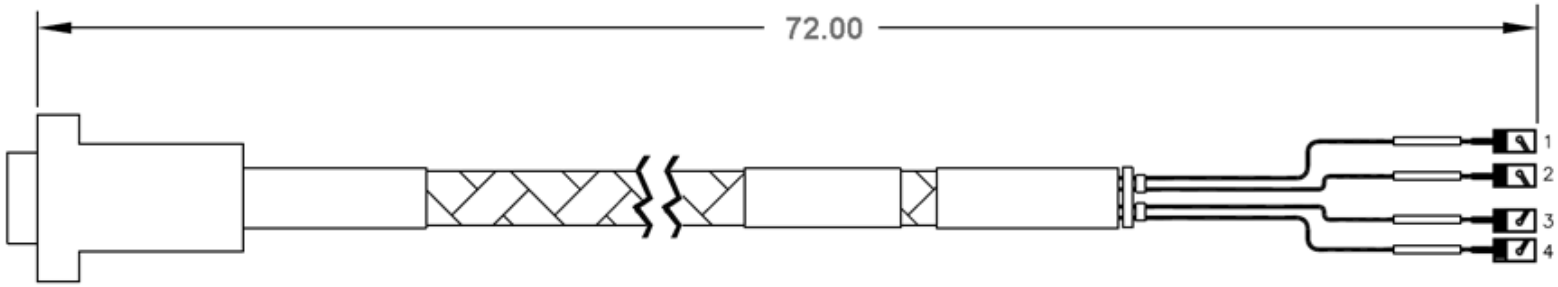
RESISTOR JUMPER WIRING		
FROM	TO	JUMPER
P1-2	P1-6	ITEM 7 (SEE BOM, CEFD DWG NOTE 6)
P1-3	P1-7	
P1-4	P1-8	
P1-5	P1-9	
P11-2	P11-6	
P11-3	P11-7	
P11-4	P11-8	
P11-5	P11-9	

WIRE LIST												
FROM	TO	TO	TO	TO	TO	TO	TO	TO	TO	TO	COLOR	PAIR
P1-2	P2-2	P3-2	P4-2	P5-2	P6-2	P7-2	P8-2	P9-2	P10-2	P11-2	BLU	X
P1-6	P2-6	P3-6	P4-6	P5-6	P6-6	P7-6	P8-6	P9-6	P10-6	P11-6	BLK	
P1-3	P2-3	P3-3	P4-3	P5-3	P6-3	P7-3	P8-3	P9-3	P10-3	P11-3	RED	X
P1-7	P2-7	P3-7	P4-7	P5-7	P6-7	P7-7	P8-7	P9-7	P10-7	P11-7	BLK	
P1-4	P2-4	P3-4	P4-4	P5-4	P6-4	P7-4	P8-4	P9-4	P10-4	P11-4	GRN	X
P1-8	P2-8	P3-8	P4-8	P5-8	P6-8	P7-8	P8-8	P9-8	P10-8	P11-8	BLK	
P1-5	P2-5	P3-5	P4-5	P5-5	P6-5	P7-5	P8-5	P9-5	P10-5	P11-5	WHT	X
P1-9	P2-9	P3-9	P4-9	P5-9	P6-9	P7-9	P8-9	P9-9	P10-9	P11-9	BLK	

Figure A-7. CDM-625/A Multi-drop CnC® Plus Shielded Data Cable (CEFD P/N CA-0000275)

A.4.3 G.703 S1 / S2 RMI Data Cable (DB-9F to 4X BNC)

Use this DB-9F -to- 4X BNC cable to connect the modem to the CRS-505 Redundant Modem Interface (RMI).

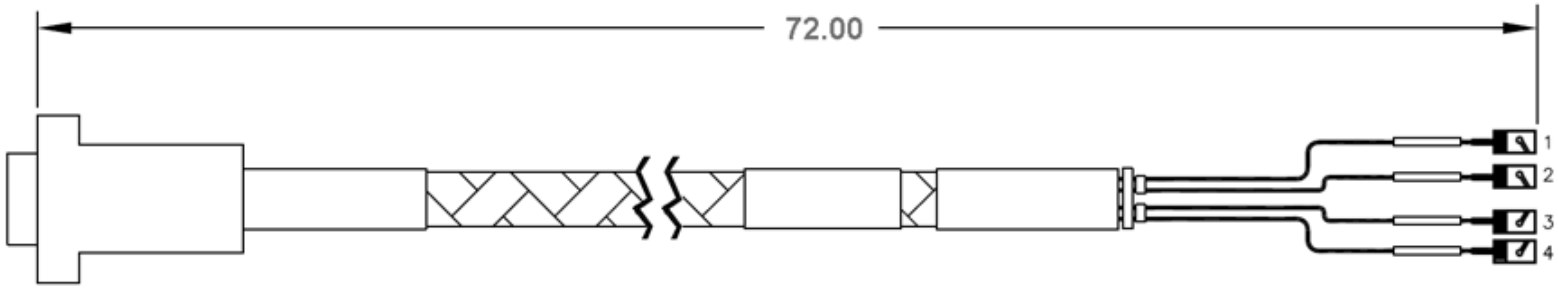


BNC LABELS			
DB-9 PIN NO.	LABEL TEXT	BNC CONN.	PAIRS
6	RM, Rx, SLOT 1	1	1
5	RM, Tx, SLOT 1	2	
1	RM, Rx, SLOT 2	3	2
9	RM, Tx, SLOT 2	4	

Figure A-8. DB-9F to 4X BNC G.703 S1 / S2 RMI Data Cable (CEFD P/N CA-0000750)

A.4.4 G.703 S1 / S2 TMI Data Cable (DB-9F to 4X BNC)

Use this DB-9F -to- 4X BNC cable to connect the modem to the CRS-345 Traffic Modem Interface (TMI).



BNC LABELS			
DB-9 PIN NO.	LABEL TEXT	BNC CONN.	PAIRS
1	TM, Rx, SLOT 1	1	1
2	TM, Tx, SLOT 1	2	
3	TM, Rx, SLOT 2	3	2
4	TM, Tx, SLOT 2	4	

Figure A-9. DB-9F to 4X BNC G.703 S1 / S2 TMI Data Cable (CEFD P/N CA-0000703)

Appendix B. CONTROLLER / TMI CONNECTORS and PINOUTS

B.1 Overview

Operational settings are factory-set for each TMI (Traffic Modem Interface) card shipped with the CRS-500 1:N Redundancy system. This appendix provides reference information for cabling, verification, and troubleshooting applications.

Once the CRS-500 components and all the modems have been rack-mounted, you must properly attach all required cabling. **Chapter 5. CABLES AND CONNECTIONS** provides a variety of control, traffic data, and IF configuration examples on a system-level or per-modem basis. In most cases, the modem accepts the male end of the cable, while connectors on the TMI card installed at the rear panel of the CRS-500 Data Switch Unit (DSU) accept the female end of the cable in the section of the card labeled “Modem Interface.”

All cables for interconnecting the CRS-500 1:N Redundancy System components and modems are available from Comtech EF Data. You can order these cables at the same time the CRS-500 1:N Redundancy System is ordered. For user-fabricated cables, all cabling between each modem and TMI should be of shielded, twisted-pair construction, with the grounded shield bonded to the back shell. Use the connector type and pinout specifications provided in this appendix and in **Appendix A. CABLE DRAWINGS** to wire all data cables correctly.

Leave the CRS-500 and all modems powered OFF until all connections are ready.

B.2 Cabling Connection Types

Comtech EF Data Switches and Satellite Modems use a number of different cables. Each cable type is typically dedicated to a specific mode of operation.

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

B.2.1 Coaxial Cable Connections

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

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

Figure B-1. Coaxial Connector Examples

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

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

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

Connection Instructions:

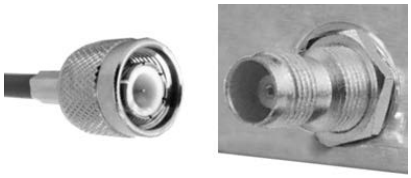
Bayonet Coupling Connections – Use the plug slots to guide, and then slide the plug onto the jack posts. Then, turn the plug clockwise until the jack posts are fully seated within the plug slot.

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

B.2.1.1 Type ‘BNC’

BNC plugs and jacks feature a Bayonet Coupling design.

B.2.1.2 Type ‘TNC’



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

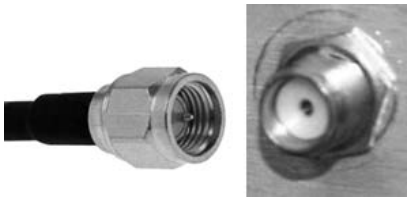
B.2.1.3 Type ‘N’

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

B.2.1.4 Type ‘F’

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

B.2.1.5 Type ‘SMA’

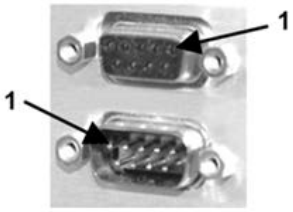


Type ‘SMA’ connectors feature a Threaded Coupling design similar to Type ‘TNC’, Type ‘N’, and Type ‘F’ connectors.

B.2.2 D-Subminiature Cable Connections

Type ‘D’ Cable with Jack Screws

(Female Shown)



Type ‘D’ Chassis Receptacles with Jack Nuts:

(TOP) Female

(BOTTOM) Male

Figure B-2. D-Subminiature Connector Examples

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

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

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

About connector pinout tables: Figure B-2 identifies the Pin 1 location for either gender connector. The connector pinout tables provided in this manual base the order of information (i.e., the “Pin #” column) on this orientation, except where noted.

B.2.3 RJ-45, RJ-48 Cable Connections

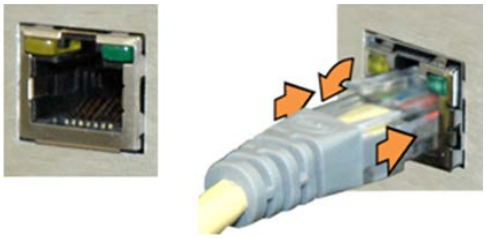


Figure B-3. RJ-45/RJ-48 Connector Example

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

Connection Instructions (Figure B-3): Press down the tab on the cable plug and then insert the plug into the receptacle. The connection is complete when the tab 'clicks' into position inside the receptacle.

B.2.4 USB Cable Connections

(TOP) Type 'A' USB Plug and Receptacle

(BOTTOM) Type 'B' USB Plug and Receptacle

Figure B-4. USB Connector Examples

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

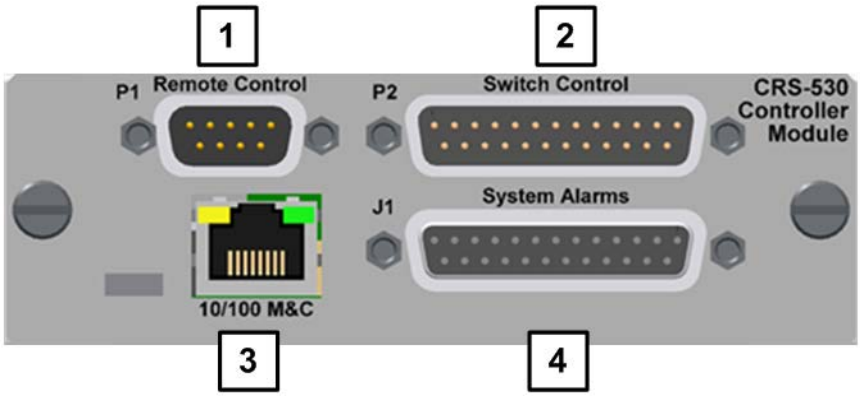
Connection Instructions:

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

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

B.3 CRS-500 CSU Connectors and Pinouts

B.3.1 CRS-530 System Controller Module



CRS-530 System Controller Module			
Feature	Connector	Connector Type	See Chapter Sect.
1	P1 | Remote Control	DB-9M	B.2.1.1
2	P2 | Switch Control	DB-25M	B.2.1.2
3	10/100 M&C	RJ-45	B.2.1.3
4	J1 | System Alarms	DB-25F	B.2.1.4

Figure B-5. CRS-530 System Controller Module

B.3.1.1 CRS-530 "P1 | Remote Control" Connector (DB-9M)

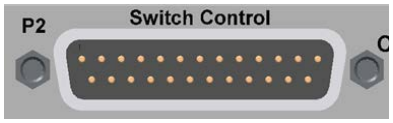
This 9-pin Type 'D' male connector provides both EIA-232 and EIA-485 access to the remote control ports of the CRS-500.

Table B-1. P1 | Remote Control Connector Pinouts

Pin #	Description	Direction
1	Ground	–
6	EIA-485 Receive Data B (see Note)	In
2	EIA-232 Transmit Data	Out
7	EIA-485 Receive Data A (see Note)	In
3	EIA-232 Receive Data	In
8	EIA-485 Transmit Data B	Out
4	Reserved - do not connect to this pin	–
9	EIA-485 Transmit Data A	Out
5	Ground	–

Note: Use for 2-wire EIA-485 operation.

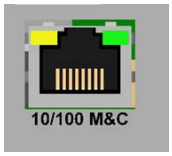
B.3.1.2 CRS-530 “P2 | Switch Control” Connector (DB-25M)



This 25-pin Type ‘D’ male connector uses the CA-0000234 Control Cable (DB-25F to DB-25M, 8’) to directly connect the CRS-500 CSU to the “J1 CSU/DSU CONTROL” connector on the CRS-500 Data Switch Unit (DSU).

Contact Comtech EF Data Product Support for information about the pinouts for this connector.

B.3.1.3 CRS-530 “10/100 M&C” Ethernet Connector (RJ45F)

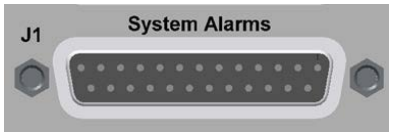


The “**10/100 M&C**” connector is an RJ-45F connector that serves as an Ethernet 10/100 user interface.

Table B-2. “10/100 M&C” Ethernet Connector Pinouts

Pin	Signal Function	Direction
1	Tx+	Tx only
2	Tx-	Tx only
3	Rx+	Rx only
4	N/C	–
5	N/C	–
6	Rx-	Rx only
7	N/C	–
8	N/C	–

B.3.1.4 CRS-530 "J1 | System Alarms" Connector (DB-25F)



This is a 25-pin, Type 'D' female connector.

Table B-3. "J1 | System Alarms" Connector Pinouts

Pin Description by Mode of Operation		
PIN #	"Show Fault" when Switch loses power (Default)	"Show No-Fault" when Switch loses power
13	Modem Summary DFM Fault – Normally Open	Modem Summary DFM Fault – Normally Closed
25	Modem Summary DFM Fault – Normally Closed	Modem Summary DFM Fault – Normally Open
12	Modem Summary Rx Traffic Fault – Normally Open	Modem Summary Rx Traffic Fault – Normally Closed
24	Modem Summary Rx Traffic Fault – Normally Closed	Modem Summary Rx Traffic Fault – Normally Open
11	Modem Summary Tx Traffic Fault – Normally Open	Modem Summary Tx Traffic Fault – Normally Closed
23	Modem Summary Tx Traffic Fault – Normally Closed	Modem Summary Tx Traffic Fault – Normally Open
10	Modem Summary Unit Fault – Normally Open	Modem Summary Unit Fault – Normally Closed
22	Modem Summary Unit Fault –Normally Closed	Modem Summary Unit Fault –Normally Open
9	Switch Unit Fault – Normally Open	Switch Unit Fault – Normally Closed
21	Switch Unit Fault – Normally Closed	Switch Unit Fault – Normally Open
8	Form C Fault Relay – Common Common for pins 9-13 and 21-24	Unchanged
20	Audio Indicator (Gnd = Auto On / Float = Audio Off)	Unchanged
7	Ground	Unchanged
19	No Connection	Unchanged
6	Traffic Modem #1 Online Status – Normally Open (Note 2)	Unchanged
18	Traffic Modem #2 Online Status – Normally Open (Note 2)	Unchanged
5	Traffic Modem #3 Online Status – Normally Open (Note 2)	Unchanged
17	Traffic Modem #4 Online Status – Normally Open (Note 2)	Unchanged
4	Traffic Modem #5 Online Status – Normally Open (Note 2)	Unchanged
16	Traffic Modem #6 Online Status – Normally Open (Note 2)	Unchanged

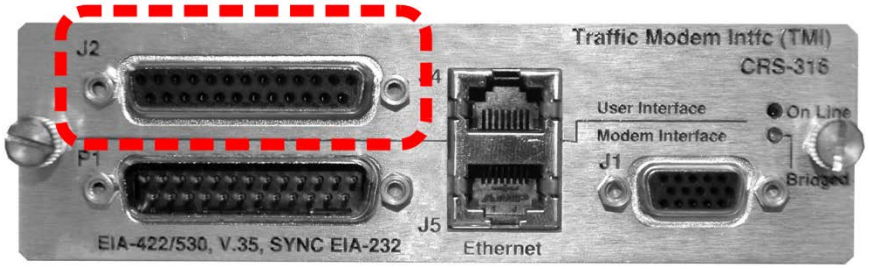
Pin Description by Mode of Operation		
PIN #	"Show Fault" when Switch loses power (Default)	"Show No-Fault" when Switch loses power
3	Traffic Modem #7 Online Status – Normally Open (Note 2	Unchanged
15	Traffic Modem #8 Online Status – Normally Open (Note 2	Unchanged
2	Traffic Modem #9 Online Status – Normally Open (Note 2)	Unchanged
14	Traffic Modem #10 Online Status – Normally Open (Note 2)	Unchanged
1	Traffic Modem Online Status – Common Common for pins 2-6 and 14-18	Unchanged

Table B-3 NOTES:

1. "Normally" refers to the NON-FAILED state.
2. Traffic Modem Online Status (Open = Online, Closed = Backup).

B.3.2 CRS-500 DSU TMI User Data Connectors

B.3.2.1 CRS-316 TMI – EIA-422/530, V.35, Sync EIA-232 Connector (DB-25F)



This 25-pin Type 'D' female connector provides the **EIA-232/422/V.35** User Data Interface on the CRS-316 TMI.

Table B-4. "J2" EIA-422/530 / V.35 / Sync EIA-232 User Data Connector

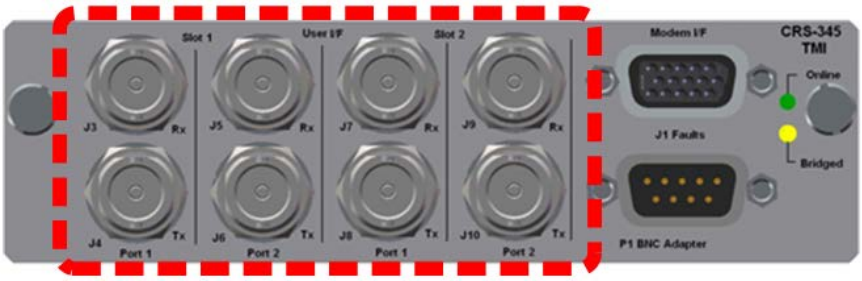
PIN #	Generic Signal Description	Direction	EIA-422/ EIA-530	V.35	EIA-232	Circuit No.
13	Not Used	-	-	-	-	-
25	Not used	-	-	-	-	-
12	Internal Transmit Clock B	Modem to DTE	ST B	SCT B	-	114
24	Transmit Clock A	DTE to Modem	TT A	SCTE A	DA	113
11	Transmit Clock B	DTE to Modem	TT B	SCTE B	-	113
23	Not Used	-	-	-	-	-
10	Receiver Ready B	Modem to DTE	RR	B	-	109
22	DCE Ready B	Modem to DTE	DM_B	DM_B		
9	Receive Clock B	Modem to DTE	RT B	SCR B	-	115
21	Not used	-	-	-	-	-
8	Receiver Ready A	Modem to DTE	RR A	RLSD *	CF	109
20	Not Used	-	-	-	-	-
7	Signal Ground	-	SG	SG	AB	102
19	Request to Send B / Ready for Receiving B	DTE to Modem	RS B	RS B	-	-
6	DCE Ready A	Modem to DTE	DM_A	DM_A	-	-
18	Not used	-	-	-	-	-
5	Not used	-	-	-	-	-
17	Receive Clock A	Modem to DTE	RT A	SCR A	DD	115
4	Request to Send A / Ready for Receiving	DTE to Modem	RS A	RS A		

PIN #	Generic Signal Description	Direction	EIA-422/ EIA-530	V.35	EIA-232	Circuit No.
	A					
16	Receive Data B	Modem to DTE	RD B	RD B	-	104
3	Receive Data A	Modem to DTE	RD A	RD A	BB	104
15	Internal Transmit Clock A	Modem to DTE	ST A	SCT A	DB	114
2	Transmit Data A	DTE to Modem	SD A	SD A	BA	103
14	Transmit Data B	DTE to Modem	SD B	SD B	-	103
1	Shield	-	Shield	FG	AA	101

Table B-4 Notes:

1. Receiver-Ready is an EIA-232-level control signal on a V.35 interface.
2. 'B' signal lines are not used for EIA-232 applications.
3. For X.21 operation, use the EIA-422 pins, but ignore Receive Clock if the modem is DTE, and ignore Transmit clocks if the modem is DCE.

B.3.2.2 CRS-345 TMI – G.703/E3/T3/STS-1 Connectors (BNC)

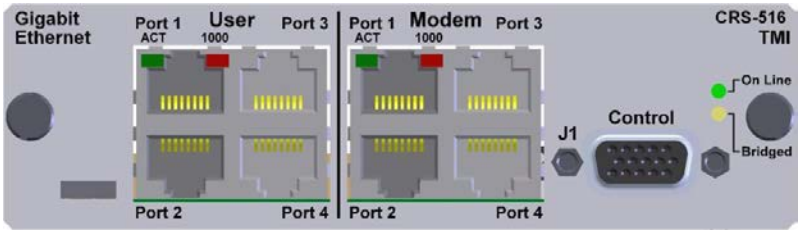


The CRS-345 TMI BNC connectors group provides a multiport Unbalanced G.703 User Data Interface.

Table B-5. Unbalanced G.703 BNC Connectors

BNC Connector	Slot 1		Slot 2		Description	Direction
	Port 1 Ref Des	Port 2 Ref Des	Port 1 Ref Des	Port 2 Ref Des		
Rx	J3	J5	J7	J9	Rx, G.703	Out
Tx	J4	J6	J8	J10	Tx, G.703	In

B.3.2.3 CRS-516 TMI – 10/100/1000 Gigabit Ethernet (GbE) Connectors (RJ-45F)



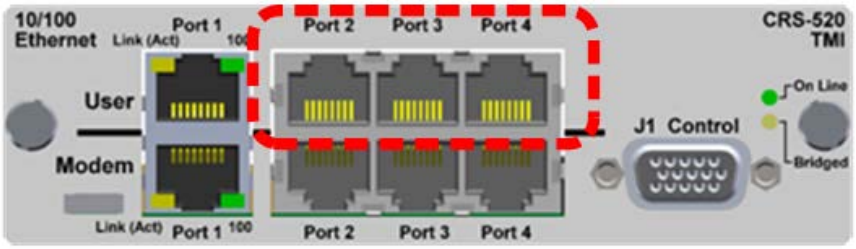
The CRS-516 TMI provides four standard RJ-45F User Interface ports, operating at 10/100/1000 Mbps, full and half duplex, auto-negotiating for Base-T Gigabit Ethernet (GbE).

Table B-6 indicates the typical pinout for each of these connectors (10/100/1000 Gigabit Ethernet User “Port 1” through “Port 4”).

Table B-6. GigE Connector Pinout (Typical)

Pair No.	Pin
1	5
	4
2	1
	2
3	3
	6
4	7
	8

B.3.2.4 CRS-520 TMI – 10/100 Ethernet Connectors (RJ-45F)



The CRS-520 TMI provides four standard RJ-45F User Interface ports, operating at 10/100 Mbps, half and full duplex, auto-negotiating for Ethernet Router Modes.

Table B-7 indicates the typical pinout for each of these connectors (10/100 Ethernet User "Port 1" through "Port 4").

User Port 1 is reserved for use as the CRS-500 Ethernet System Communication connection between the CRS-500 and the modems.

To avoid Ethernet Networking loops, CDM-625/As operating in IP Packet Processor Router Mode use only a single port of the CDM-625/A's remaining available ports (i.e., "Port 2" OR "Port 3" OR "Port 4") to convey traffic data for each modem at any given time.

Table B-7. 10/100 Ethernet Connector Pinout (Typical)

Pin #	Signal Function	Direction
1	Tx+	Tx only
2	Tx-	Tx only
3	Rx+	Rx only
4	N/C	–
5	N/C	–
6	Rx-	Rx only
7	N/C	–
8	N/C	–

Appendix C. ADDRESSING SCHEME INFORMATION

C.1 Addressing Overview

A CRS-500 1:N Redundancy System provides 1:N redundant operations – that is, it is capable of controlling up to 10 Traffic modems and one Redundant Modem in up to a 1:10 configuration.

The user can remotely communicate to the Switch or any of the modems via the DB-9, EIA-232, or EIA-485 Remote connector on the CRS-530 Switch Controller card (installed in rear panel of the CRS-500 Control Switch Unit – CSU). A direct User-to-modem connection is not permissible in this configuration – master operation is restricted to the Switch in a redundancy system.

For Switch to modem communications with the CDM-625/A modems, the Switch uses serial communications via a DB-25 data cable or an HD-15 Control Cable that is connected between each modem and the Switch-installed TMIs.

For the modems that are configured for EDMAC framing, Monitor & Control (M&C) information may be communicated to the modems and transceivers at the distant-end of the link. In order for an M&C application to be able to communicate with the various devices connected to the Switch, the correct addresses must be used.

This appendix provides details of the address requirements to allow M&C of the Switch, various modems, and transceivers that may be included in a CRS-500 1:N Redundancy System.

C.2 Switch Addresses

The permitted Switch remote control addresses are limited:

- **For EIA-232**, the only permitted address is 0000.
- **For EIA-485** connections, the only permitted addresses are 1000, 3000, 5000, and 7000.

1. ***The Switch settings for external communications are totally independent from the internal communication between Switch and Traffic Modems.***
2. ***2:N Redundancy is a future offering. At present, the CRS-500 operates only as a 1:N redundant switching product. Therefore, only RM 1 (Redundant Modem 1) is functional.***

C.2.1.1 Modem and Transceiver Addresses

To monitor and control modems and transceivers at the distant-end of the communication link, EDMAC must be enabled, via the modem front panel, in local mode. Set the Tx and Rx parameters to establish the link on the modems on each end of the link. Then, an M&C application can be used.

Examples of EIA-232 and EIA-485 addressing schemes are shown in the diagrams that follow. Included in these diagrams is the following terminology:

- **MCA (Monitor & Control Address)** – This address is to be entered as the address of a unit into an M&C application, e.g., SatMac. Modem addresses are automatically assigned by the TMI/RMI slot positions to which they are associated within a Switch. When using EIA-485 multi-drop, the Switch bus address be changed on the Switch by the User to 1000, 3000, 5000, 7000, or 9000 (7000 is shown in the figures in this appendix as an example only).
- **RCA (Remote Control Address)** – This address is to be configured, via the unit front panel (CONFIG:REMOTE).
- **ESA (EDMAC Slave Address (Range))** – Configure the local modem as the **EDMAC Master**; the Distant-end modem is an **EDMAC Slave.**

The CDM-625/A modems utilize a point-to-point internal serial communication bus to the Switch within the DB-25 or DB-9 cable. **Figure C-1** illustrates an external EIA-232 addressing scheme for these modems; **Figure C-2** depicts an external EIA-485 connection.

C.2.1.2 CRS-500 Addressing Scheme Examples

These figures depict a typical 1:10 Redundancy configuration, where up to 10 Traffic modems and one (1) Redundant Modem are employed.

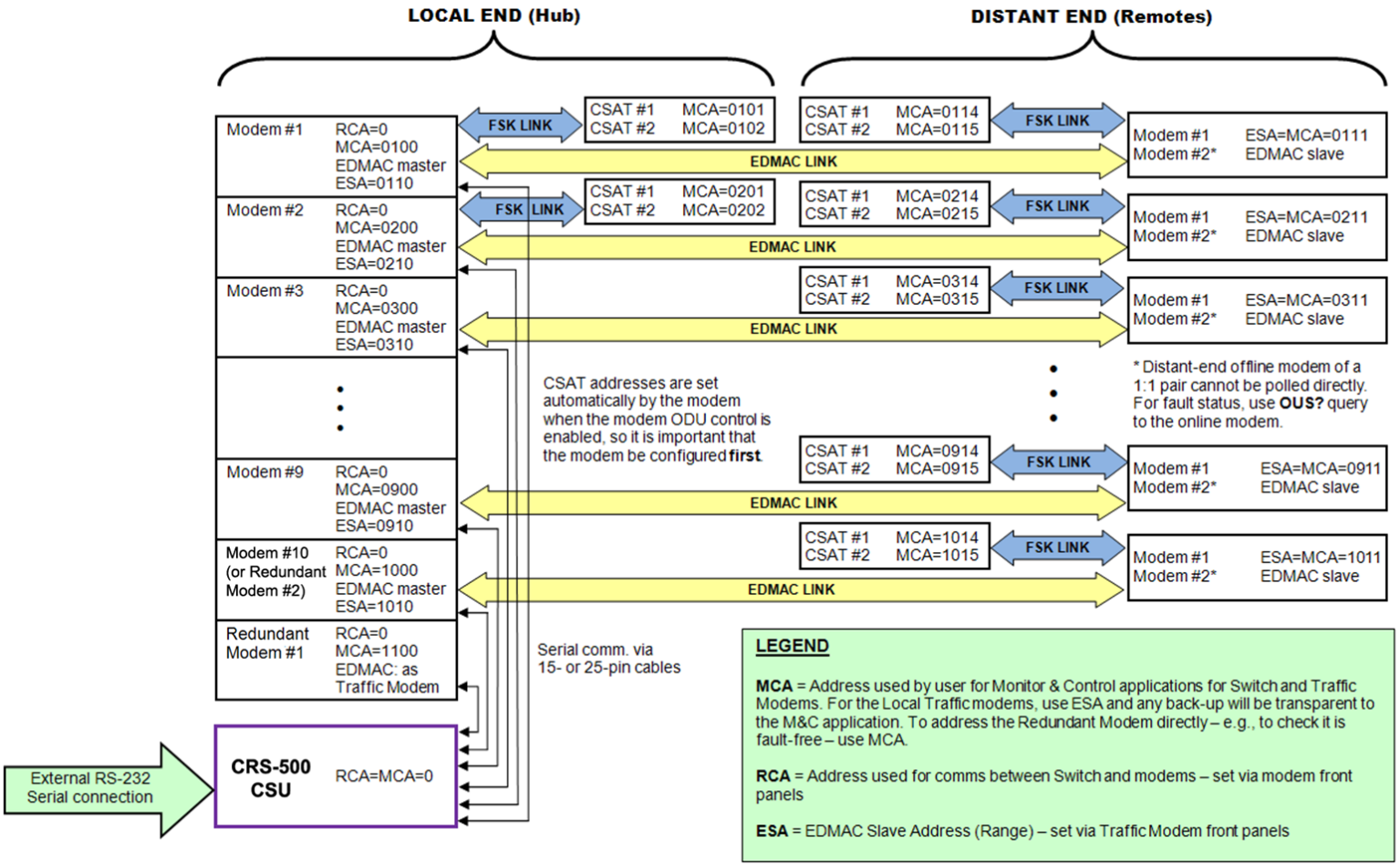


Figure C-1. External EIA-232 with CDM-625/A Modems

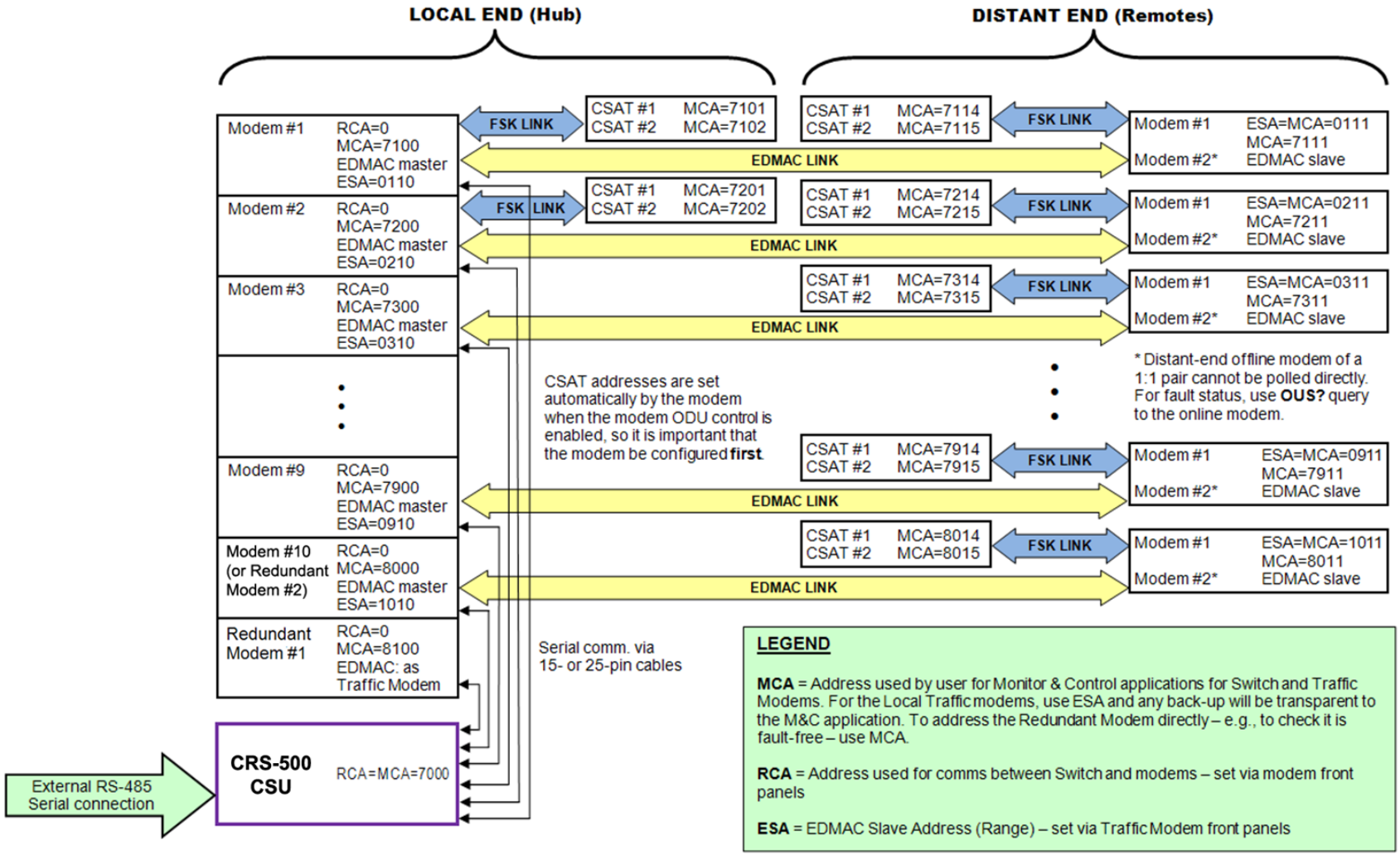


Figure C-2. External EIA-485 with CDM-625/A Modems

C.2.2 Set Up Modems

Refer to the appropriate modem's Installation and Operation Manual for additional information.

- **Local Modem *m***, where ***m*** is modem position number (1 through 10) on Switch:
  - MCA = (Switch RCA) + (100 x ***m***)
  - Set EDMAC Framing ON.
  - Set as EDMAC master.
  - Set with EDMAC Slave Address Range, ESA = (Modem RCA) + 10
- **Distant Modem 1** (attached to the Distant end of link to Modem ***m***):
  - Remote control address: no setting required (Remote control not used).
  - Set EDMAC Framing ON.
  - Set as an EDMAC slave.
  - Set Slave Address, ESA = (Master ESA) + 1
  - MCA = ESA
- **Two Distant Modems** in a 1:1 configuration:

Set up the on-line modem as for Distant Modem 1, described previously in this section. The offline modem is automatically configured to match the on-line modem. M&C can only be achieved to the online modem.

It is not possible for the offline modem of a 1:1 pair to respond to EDMAC messages directly as it is not transmitting. Using the internal 1:1 link, the online modem polls and retains the off-line modem status. Depending on the modem, this information can be obtained as follows:

Use OUS (Offline Unit Status) – OUS? for queries. This command/query is available in the following modems/firmware versions:

Modem	*Firmware Version*
CDM-625/A	*1.1.1 or later*
CDM-750	*1.4.3 or later*
CDM-760	*1.1.1 or later*

C.2.3 Set Up Transceivers

Configure the modems first for EDMAC operation, setting up the Remote Control Address (RCA) for local units, and ESA (EDMAC addresses) for EDMAC modems. A transceiver's address will be set automatically by its controlling modem if connected via the FSK link when the ODU enable is configured.

- **Local Transceiver 1** (linked to Modem ***m*** on the Switch):
  - First, set up the modem RCA, as described in Section C.2.2.
  - On the modem, key to **Enable ODU.** The modem automatically sets the transceiver address:

    Transceiver MCA = (Modem RCA) + 1.
- **Local Transceivers 1 & 2** (1:1 configuration, attached to Modem ***m*** on the Switch):
  - First, set up the modem RCA, as described in Section C.2.2.
  - On the online modem, key to **Enable ODU**. The modem automatically sets the transceiver addresses:

    MCA of Transceiver #1=(Modem RCA)+1

    MCA of Transceiver #2=(Modem RCA)+2
- **Distant Transceiver 1** (standalone):
  - First, set up the modems, first, as described earlier in this section. .
  - On the modem, key to **Enable ODU**. The modem automatically sets the transceiver address:

    Transceiver MCA=(Master ESA)+4=(Slave ESA)+3
- **Distant Transceivers 1 & 2** (1:1 configuration):
  - First, set up the modem, as described earlier in this section.
  - On the modem, key to **Enable ODU**. The modem automatically sets the transceiver addresses:

    MCA of Transceiver #1 = (Master ESA) + 4

    MCA of Transceiver #2 = (Master ESA) + 5

C.3 M&C Applications

The system is set up such that it may be communicated to by an M&C application, e.g., SatMac or CMCS. In the SatMac application, go to the **Link Edit Mode** screen to enter the Monitor & Control Addresses (MCA).

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