COMTECH EF DATA™

CRS-311

1:1 Redundancy Switch
Installation and Operation Manual

Accessory Product for use only with Comtech EF Data
CDM-Qx/QxL *and* SLM-5650/5650A Modems
(Modem Firmware and Hardware Requirements Apply)

TABLE OF CONTENTS

APPENDIX E. CRS-311 RETROFIT FOR SLM-5650/5650A NP INTERFACE OPERATION.... E–1

TABLES

FIGURES

This page is intentionally blank

PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data CRS-311 1:1 Redundancy Switch. This is an informational document intended for the persons responsible for the operation and maintenance of the CRS-311.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Comtech EF Data Technical Publications Department:

TechnicalPublications@comtechefdata.com

Related Documents

This manual assumes user familiarity with the Comtech EF Data products listed here. The information presented in this manual does not serve as replacement documentation for these products.

- *Comtech EF Data CDM-Qx Multi-Channel Satellite Modem Installation and Operation Manual (CEFD P/N MN/CDMQX.IOM)*
- *Comtech EF Data SLM-5650 Satellite Modem Installation and Operation Manual (CEFD P/N MN/SLM5650.IOM)*
- *Comtech EF Data SLM-5650A Satellite Modem Installation and Operation Manual (CEFD P/N MN-SLM5650A)*

Conventions and References

Patents and Trademarks

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

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

Warnings, Cautions, and Notes

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

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

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

*A **REFERENCE** directs the user to additional information about a task or the equipment.*

Examples of Multi-Hazard Notices
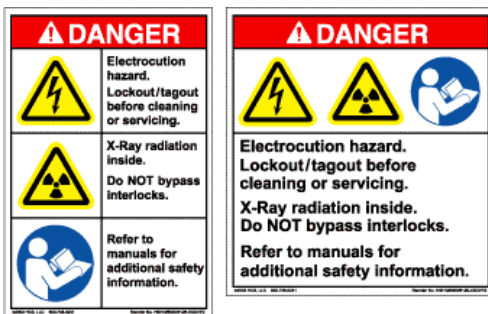
Recommended Standard Designations

Electronic Industries Association (EIA) designations supersede Recommended Standard (RS) designations. Reference to the old RS designations (e.g., RS-232) may appear where it might concern actual text displayed on the unit's rear panel, Serial Interface, or Web Server Interface pages. All other references in the manual use the EIA designations.

Metric Conversion

Metric conversion information is provided on the inside back cover of this manual. Comtech EF Data provides this information to assist the user in cross-referencing non-Metric to Metric conversions.

The user should carefully review the following information:

Safety and Compliance

Electrical Safety and Compliance

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

IF THE UNIT IS OPERATED IN A VEHICLE OR MOVABLE INSTALLATION, MAKE SURE THE UNIT IS STABLE. OTHERWISE, EN 60950 SAFETY IS NOT GUARANTEED.

Electrical Installation

CONNECT THE UNIT TO A POWER SYSTEM THAT HAS SEPARATE GROUND, LINE AND NEUTRAL CONDUCTORS. DO NOT CONNECT THE UNIT WITHOUT A DIRECT CONNECTION TO GROUND.

- *Sect 3.2.2 CTOG-250 Power and Ground Connections*
- *Sect 3.3.2 CDM-800 Power and Ground Connections*

Operating Environment

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

- *AMBIENT TEMPERATURES LESS THAN 10° C (50° F) OR MORE THAN 35° C (95° 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 unit complies with the European Union R&TTE Directive, its reference to EN 301 489-1 (*Electromagnetic compatibility and Radio spectrum Matters [ERM]; ElectroMagnetic Compatibility [EMC] standard for radio equipment and services, Part 1:*

Common technical requirements), and the Declarations of Conformity for the applicable directives, standards, and practices that follow:

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

- **Emissions: EN 55022 Class A** – 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.**

> ⚠️ *TO ENSURE THAT THE UNIT COMPLIES WITH THESE STANDARDS, OBEY THESE INSTRUCTIONS:*

- Use coaxial cable that is of good quality for connections to L-Band Type 'N' Rx (receive) female connectors.

- 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 all units with their 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 and Notes listed earlier in this Preface.

European Union RoHS Directive (2002/95/EC)

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

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

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

CE Mark

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

Warranty Policy

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

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

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

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

Limitations of Warranty

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

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

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

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

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

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

Exclusive Remedies

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

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

Getting Help

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

Contacting Comtech EF Data

Contact Comtech EF Data for:

- *Technical Support –* Product support or training.

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

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

For:		Contact:
CRS-311 Technical Support and Service	**Telephone**	**+1.480.333.4357**
	Email	**cdmipsupport@comtechefdata.com**
	Fax	**+1.480.333.2500**
Comtech EF Data Web Site	**Main Page**	**http://www.comtechefdata.com**
	Customer and Technical Support	**http://www.comtechefdata.com/support.asp**
	RMA (Return Material Authorization)	**http://www.comtechefdata.com/rmaform.asp**
Comtech EF Data Main Number		**+1.480.333.2200**
Mailing Address		**2114 West 7th Street Tempe, Arizona 85281 USA**

Returning a Product for Upgrade or Repair

Step	Task
1	Go to the Comtech EF Data **Home** page (http://www.comtechefdata.com). From the **SUPPORT** column at the bottom of the page, select the **Service** hyperlink, and read the **Return Material Authorization** section in its entirety.

2	Request a Return Material Authorization Number:
	
	 • *On the Comtech EF Data **Home** page:* From the **SUPPORT** column at the bottom of the page, select the **RMA Request** hyperlink;
	
	     OR
	
	 • *On the Comtech EF Data **Support** page:* Click **[Send RMA Request]**;
	
	     OR
	
	 • *On the Comtech EF Data **Service** page*: Select the **Return Material Authorizaion** hyperlink;
	
	 • Fill out the RMA form completely;
	
	 • Click **[Send Email]**.
	
	 • *Alternately:*
	
	     o Send an e-mail providing this same detailed information to Comtech EF Data Customer Service (**service@comtechefdata.com**).
	
	     o Contact Comtech EF Data Customer & Technical Support by phone or fax.

3	Pack the product in its original shipping carton and protective packaging.
4	Ship the product back to Comtech EF Data. **Shipping charges should be prepaid.**

Notes:

Chapter 1. INTRODUCTION

1.1   Overview

⚠️ *The CRS-311 1:1 Redundancy Switch is an accessory product designed specifically for the Comtech EF Data CDM-Qx/QxL or SLM-5650/5650A modems. Do not use this product with any other equipment.*

Figure 1-1. CRS-311 1:1 Redundancy Switch

The Comtech EF Data CRS-311 1:1 Redundancy Switch (**Figure 1-1**) – also referred to throughout this manual as "the Switch" – is a companion product for use with the Comtech EF Data CDM-Qx/QxL or SLM-5650/5650A Satellite Modems.

The CRS-311 is designed to continuously monitor a pair of modems in a 1:1 redundant configuration. A 1:1 system comprises a Traffic Modem, a Redundant Modem, and the CRS-311 1:1 Redundancy Switch. The CRS-311 automatically switches data and IF signals from a failed Traffic Modem to the Redundant Modem in the event of an equipment failure or undesired traffic condition – traffic paths are fully protected, ensuring that such failures do not adversely affect system availability.

ⓘ *For the CRS-311 to operate correctly, the Traffic Modem and the Redundant Modem must be of the same model, equipped with the same hardware options and modules, the same firmware versions, and the same FAST features.* **Chapter 4. MODEM, RMI/TMI, AND SWITCH CONFIGURATION** *addresses permitted firmware version combinations.*

Figure 1-2 shows the system-level block diagram of the CRS-311 1:1 Redundancy Switch, including the CRS-281 IF Switch. A key feature of the CRS-311 architecture is its ability to allow

the Redundant Modem to 'bridge' the Traffic Modem. The Switch automatically configures the Redundant Modem to match the configuration of the Traffic Modem. The Switch also copies the Traffic Modem's terrestrial transmit clock/data and routes it to the Redundant Modem, along with the Traffic's Modem's Rx IF, via use of the CRS-281x IF Switch Module – see **Sect. 1.3.6 CRS-281x IF Switch Modules**. Because of this, no external test equipment is needed to determine the health of the Redundant Modem – live traffic is used at all times to verify performance.
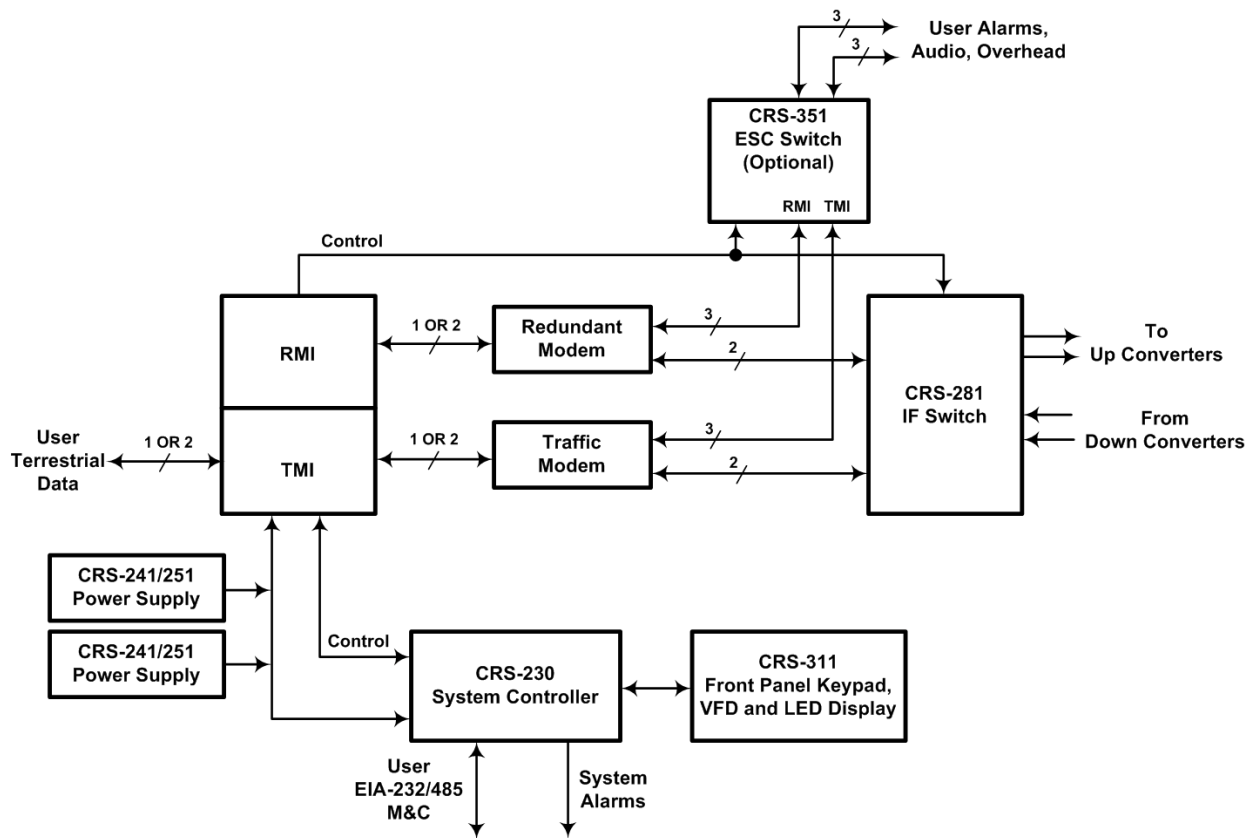
Figure 1-2. CRS-311 System-Level Block Diagram

Construction Features: The CRS-311 is modular in construction. All replaceable modules are installed into slots provided at the rear panel – this includes the CRS-230 System Controller; Traffic Modem Interface (TMI); Redundant Modem Interface (RMI); Overhead Module; IF Modules; and Power Supply Units (PSUs).

Power consumption is below 25 watts for a fully populated Switch; no fan cooling is required.

CRS-311 Key Reliability Features:

- Twin, independent, AC or DC power supplies.

- Primary traffic paths are maintained, error-free, when power is removed.

- The TMI can be completely removed from the CRS-311, with cables still attached, and traffic is not interrupted or affected.

Ease of Connection: Connection to the Traffic and Redundant Modems is simple. One cable connected to the HD-15 port on the TMI or RMI carries the Switch-to-Modem communications, fault indications, and remote control.

- ***For the CDM-Qx/QxL:*** These modems require an additional EIA-485 multi-drop cable from the Switch to all modems to provide remote control interface capability.

- ***For EIA-232/485 M&C User connections:*** A direct user-to-modem serial EIA-232/485 communication connection is not permissible when connected to the CRS-311. You must instead connect to the DB-9 "Remote" connector on the CRS-230 System Controller (installed on the CRS-311). For detailed information on remote addressing schemes, see **Appendix C. ADDRESSING SCHEME INFORMATION**.

TMI Monitoring: Terrestrial user clock and data signals to and from a Traffic Modem are routed through the 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 the TMI carrying traffic is removed, no interruption of the traffic occurs. Note also that, in normal circumstances where the Redundant Modem is not in service, no data is carried through the CRS-311 backplane – all data is routed via the TMI.

Data Interfaces: The CRS-311 supports all of the standard and optional data interface types available on the CDM-Qx/QxL or the SLM-5650/5650A modems, via the following TMIs:

- CRS-316 – EIA-530 or Ethernet (via Ethernet Bridge Mode)

- CRS-325 – G.703 (Balanced or Unbalanced)

- CRS-336 – HSSI or Ethernet (via Ethernet Bridge Mode)

- CRS-365 – Quad E1

- CRS-515 – 4-Port Ethernet (via Ethernet Bridge Mode, Ethernet Router Mode, or Ethernet BPM (Bridge Point-to-Multipoint) Mode)

See **Sect. 1.3.4.2 TMI Modules** and **Sect. 1.4.1 CRS-311 Specifications** for more information on these interface modules and their specifications.

CRS-281x Selection: The CRS-281x switch module connects the online modulator's Tx IF signal to the RF Up Converter. It also passively splits the Rx IF signal to provide both demodulators with the same IF signal coming from the LNB, thus reducing switching time.

Three CRS-281x switch modules are compatible for use with the CDM-Qx/QxL modem:

- CRS-281 (70/140 MHz IF) with Type 'BNC' (50Ω) connectors

- CRS-281 (70/140 MHz IF) with Type 'BNC' (75Ω) connectors

- CRS-281L (L-Band IF) with Type 'N' (50Ω) connectors

Two CRS-281x switch modules are compatible for use with the SLM-5650/5650A modem:

- CRS-281 (70/140 MHz IF) with Type 'TNC' (50Ω) connectors.

- CRS-281L (L-Band IF) with Type 'N' (50Ω) connectors.

> *The SLM-5650/5650A modem permits simultaneous operation of the Tx IF and Rx IF bands at 70/140 MHz and L-Band frequencies, independent of one another. If you want the Tx and Rx to be of different IF bands, the CRS-281x module must be selected based on the* <u>Tx IF band.</u> *An external splitter is then used for the Rx IF band when that side differs from the Tx IF band – see* **Figure 3-19** *and* **Figure 3-20** *in* **Sect. 3.3.6 IF Connections – User to CRS-281x to Modems** *for configuration examples.*

See **Sect. 1.3.6 CRS-281x IF Switch Modules** and **Sect. 1.4.2 CRS-281x IF Switch Module Specifications** for more information on these switch modules and their specifications.

CRS-351 Option: Where protection of the overhead signals (backward alarms, audio ESC, data ESC, etc.) is desired, the CRS-351 Overhead Module may be added.

1.2   CRS-311 Switch/Modem Compatibility

Table 1-1 shows the Comtech EF Data modems that are compatible for use with the CRS-311 1:1 Redundancy Switch:

Table 1-1. CRS-311 Switch/Modem Compatibility

Modem	Optional Switch Modules
CDM-Qx	CRS-281 IF Switch Module (70/140 MHz) - 50Ω or 75Ω BNC ⊙ ***Up to one modulator and one demodulator allowed per CDM-Qx/QxL.***
CDM-QxL	CRS-281A IF Switch Module (L-Band) ⊙ ***Up to one modulator and one demodulator allowed per CDM-Qx/QxL.***
SLM-5650 SLM-5650A	CRS-281 IF Switch Module (70/140 MHz) - 50Ω TNC CRS-281L IF Switch Module (L-Band) CRS-351 ESC Switch Module (IDR Overhead)

COMPATIBILITY NOTE: The CiM-25, Comtech EF Data's low-cost Internet Protocol (IP) Monitor & Control (M&C) interface for existing CEFD modems, is not compatible for use on modems operating within a CRS-311 1:1 redundancy system. Taking this prohibition of use under further consideration, the CiM-25 should not, <u>*under any*</u> <u>*circumstances*</u>*, be connected to the "Remote Control" port on the CRS-311's CRS-230 System Controller module for control of the Switch and modems.*

1.3   CRS-311 Physical Features

1.3.1 Dimensional Envelopes

Figure 1-3 shows the dimensional envelope for the CRS-311 1:1 Redundancy Switch.
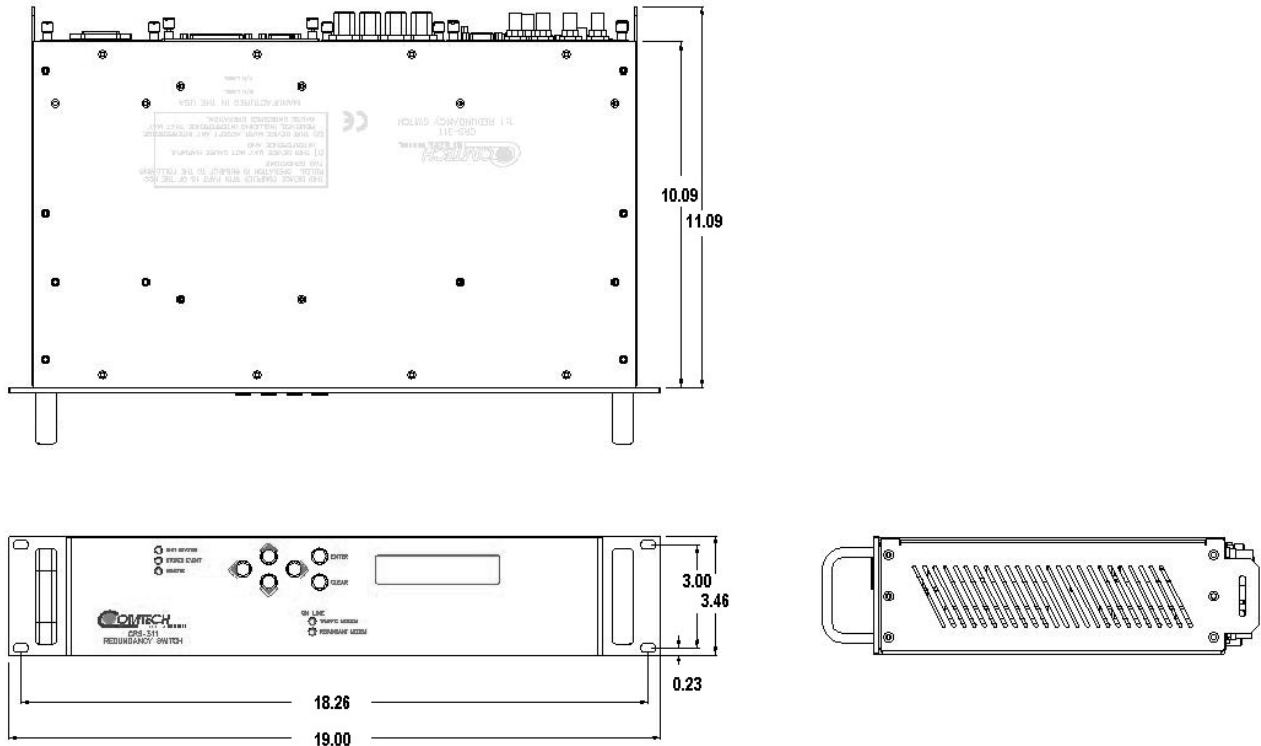
Figure 1-3. CRS-311 Dimensional Envelope

1.3.2 Front Panel

Figure 1-4 shows the CRS-311 front panel. The CRS-311 is constructed as a 2RU-high, rack-mounting chassis that can be freestanding if desired. Handles afford easy placement into and removal from a rack.
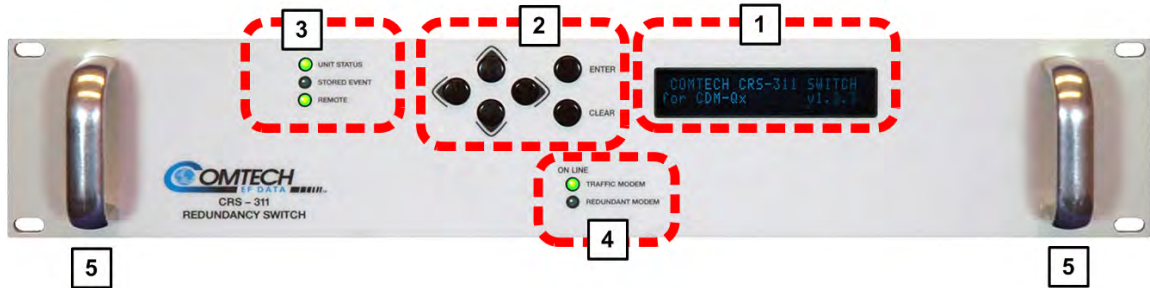
Feature	Description	Function
1	Vacuum Fluorescent Display (VFD)	Displays menus, prompts, and messages
2	6-button keypad	Menu navigation
3	(3) Light-Emitting Diodes (LEDs)	Switch status monitoring
4	(2) Light-Emitting Diodes (LEDs)	Modem status monitoring
5	Rack Handles	Installation into / removal from a rack

Figure 1-4. CRS-311 Front Panel

1.3.3 Rear Panel

Figure 1-5 shows the rear panel of a typical CRS-311 operational configuration.
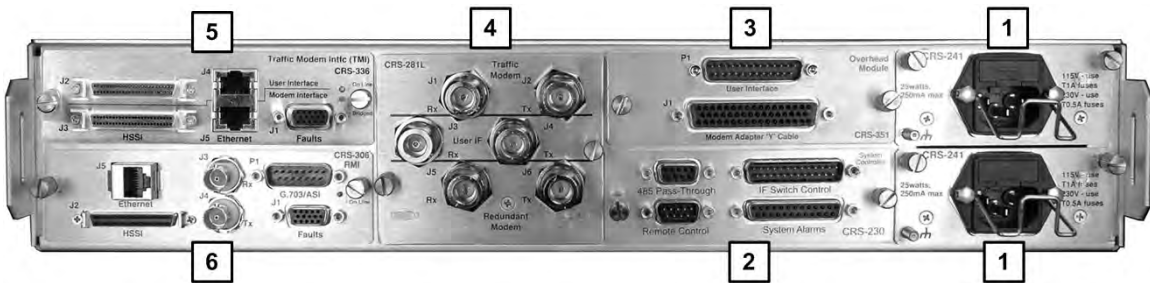
Feature	Description	Feature	Description
1	CRS-241 AC Power Supply	4	CRS-281L IF Switch Module
2	CRS-230 System Controller	5	CRS-336 TMI
3	CRS-351 Overhead Module	6	CRS-306 RMI

Figure 1-5. CRS-311 Rear Panel Configuration Example

1.3.4 CDM-Qx/QxL, SLM-5650/5650A Modem Interface Modules

The following tables indicate which TMI (Traffic Modem Interface) and RMI (Redundant Modem Interface) should be used with each modem and data interface type:

CDM-Qx/QxL Modem		
Data Type	TMI Type	RMI Type
EIA-530/422/V.35, EIA-232	CRS-316	CRS-305
G.703 T1/E1 Bal D&I , Unbal	CRS-325	
HSSI	CRS-336	
Quad E1	CRS-365	

SLM-5650/5650A Modem		
Data Type	TMI Type	RMI Type
EIA-530/422 or GbE (Single-port Ethernet Bridge Mode)	CRS-316 Note 1	CRS-307 Note 1
G.703 Bal/UnBal	CRS-325	CRS-306
HSSI or GbE (Single-port Ethernet Bridge Mode)	CRS-336 Note 1	CRS-306/307 Note 1
Vipersat (or Single-port Ethernet Router Mode)	CRS-316 Note 1	CRS-307 Note 1
	CRS-515	CRS-505
3-Port Ethernet (Ethernet Bridge Mode)	CRS-515 (Ports 2,3,4)	CRS-505 (Ports 2,3,4)
4-Port Ethernet See Note 2 (Ethernet Router Mode)	CRS-515 (all 4 ports) Note 2	CRS-515 (all 4 ports) Note 2

Important Notes:

1. Gigabit Ethernet (referred to as either GbE or GigE), when associated with the CRS-316/336 TMI modules can mean either:

    (a) The Gigabit Ethernet interface provided by the optional single-port 10/100/1000 Base-T (GbE) Interface Module, or

    (b) A single port ("**Port 1**") of the 4-port Network Processor (NP) Interface Module, configured for Ethernet Bridge Mode (*not* Ethernet Router Mode) operation. The 4-port Ethernet data type is always associated with the Network Processor module in the SLM-5650/5650A, and can be configured in either Ethernet Bridge Mode or Ethernet Router Mode.

    1:1 Redundancy is supported for Vipersat remote terminals, without the need for hardware upgrades to the CRS-505 RMI and CRS-515 TMI modules, by using the CRS-307 RMI and CRS-316 TMI modules.

    For the CRS-307 RMI and CRS-316 TMI modules to work, it is required to connect the primary and backup Network Processor Modules via Ethernet. This can be accomplished by connecting the primary and backup NPs via a crossover Ethernet cable, or via a separate external Ethernet Switch.

When configuring the overall system using the CRS-305 RMI and CRS-316 TMI modules, however, you must be careful to avoid networking loops. For example, either of the following configurations is supported:

- **Configuration #1:**

  o Connect port "1" of each Network Processor to the appropriate RMI/TMI Modem side "Ethernet" port.

  o Connect the traffic data to the CRS-316 User side "Ethernet" port. Connect port "2" of the primary NP to port "2" of the backup NP via a crossover cable.

  o No other connections are required for NP ports "3" and "4".

- **Configuration #2:**

  o Connect port "1" of each Network Processor to the appropriate RMI/TMI Modem side "Ethernet" port.

  o Connect the traffic data to the CRS-316 User side "Ethernet" port, as per Configuration #1.

  o Connect port "2" of the primary NP and port "2" of the backup NP to a common Ethernet switch, which in turn shares a connection to an external network management device.

  o Use the external network management device to monitor both modems and to make configuration changes to the primary modem.

Other variations of the above configurations are possible. However, a configuration that is not allowed is the connection between the two NPs via a crossover cable while also connecting both NPs to a common external switch. This would result in a networking loop.

2. **CRS-311 with 4-Port (Multi-port) Ethernet:** The CRS-311, using SLM-5650/5650A modems equipped with the optional Network Processor (NP) Interface Module, may be configured with the CRS-505 RMI and CRS-515 TMI for multi-port (1 to 4 ports) Ethernet traffic. **Figure 1-6** shows the block diagram for this configuration.

Note the following restrictions, depending on the Ethernet traffic mode employed:

- In **Ethernet Router Mode**, Ethernet "Port 1" on the CRS-311 **must be used** as a minimum. This is a mandatory requirement, since "Port 1" on the CRS-311 RMI/TMI allows the modems to share parameters. Optionally, "Port 2" through "Port 4" can be used, as needed, for additional user traffic connections.

- In **Ethernet Bridge Mode**, Ethernet "Port 2" through "Port 4" on the CRS-311 can be used. However, "Port 1" **MUST NOT** be used, since "Port 1" is designated specifically for Ethernet Router Mode.

- In **Ethernet BPM (Bridge Point-to-Multipoint) Mode**, the CRS-311 uses Ethernet "Port 1" for *Ethernet Router Mode* traffic, while Ethernet "Port 2" through "Port 4" on the CRS-311 are used for *Ethernet Bridge Mode* traffic.

3. For detailed information about cabling the CRS-311 1:1 Redundancy Switch for multi-port Ethernet traffic – as well for *single-port* Ethernet traffic (when the SLM-5650/5650A modems are equipped with the optional 10/100/1000 Base-T (GbE) Interface), see **Chapter 3. CABLES AND CONNECTIONS**.
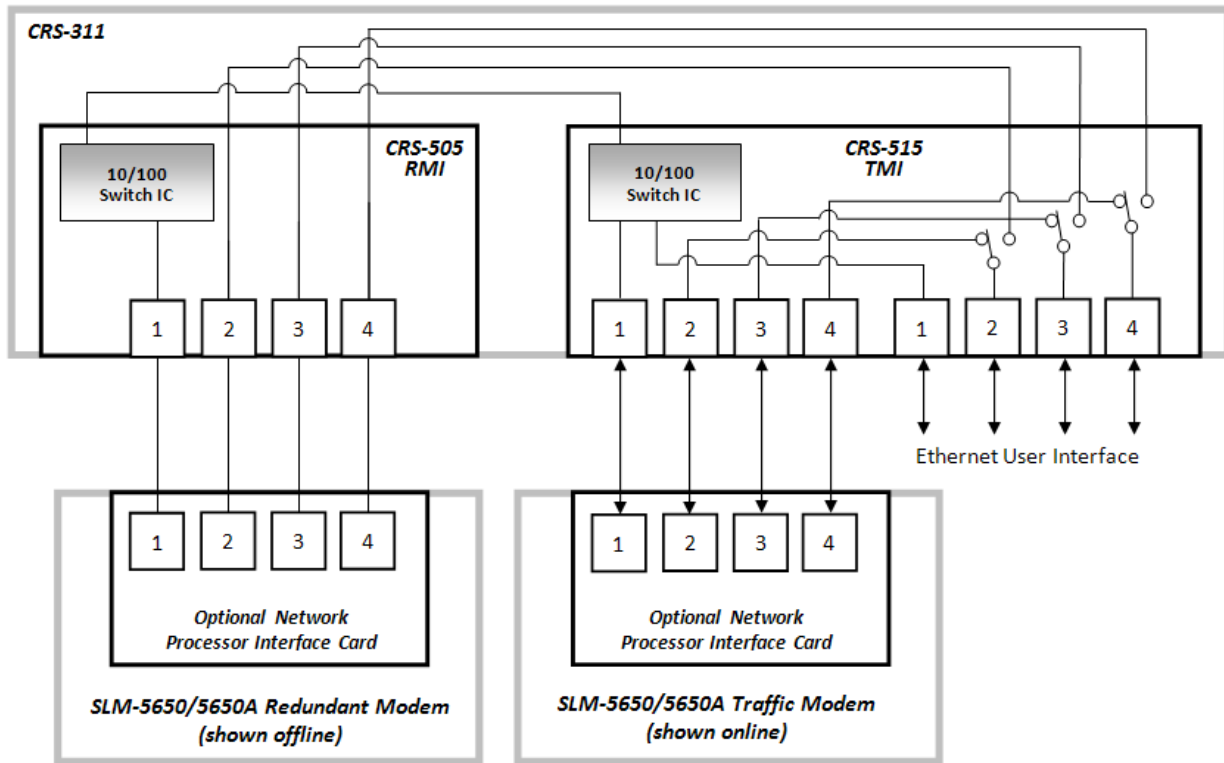
Figure 1-6. CRS-311 Multi-port Ethernet Using the SLM-5650/5650A

1.3.4.1   RMI Modules

**Figure 1-7.
CRS-305 RMI
(PL/11494-1)**
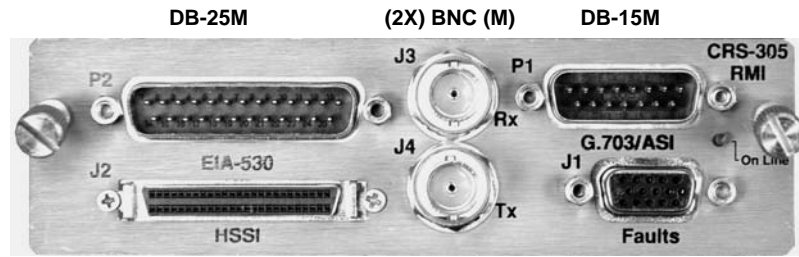
**Figure 1-8.
CRS-306 RMI
(PL/11494-2)**
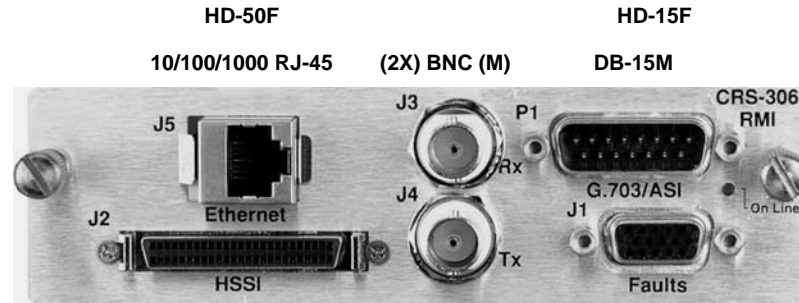
**Figure 1-9.
CRS-307 RMI
(PL/11494-3)**
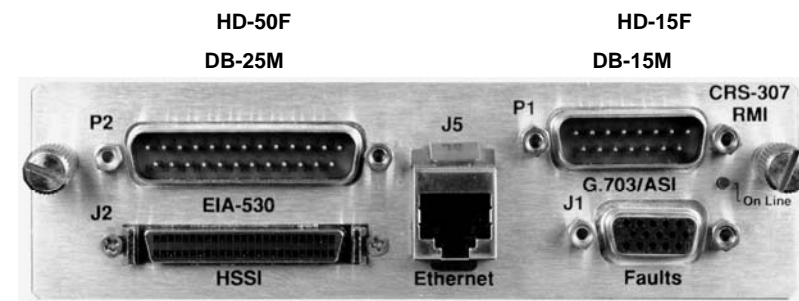
**Figure 1-10.
CRS-505 RMI
(PL-0000293)**
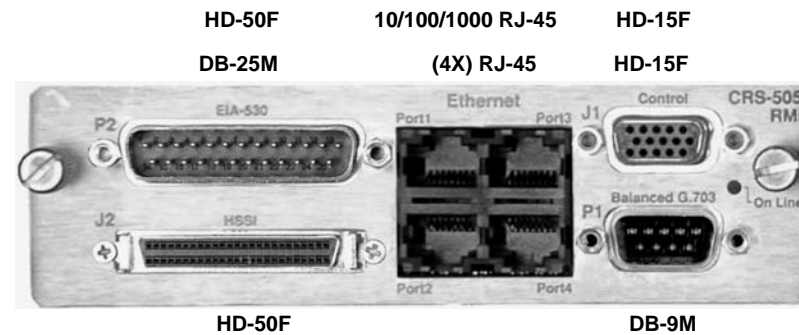
1.3.4.2   TMI Modules

**Figure 1-11.
CRS-316 TMI
RS422 or GbE
(PL/12498-1)**
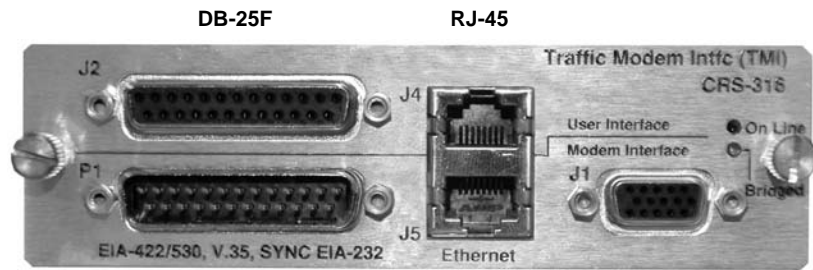
**Figure 1-12.
CRS-325 TMI
G.703
(PL/11492-1)**
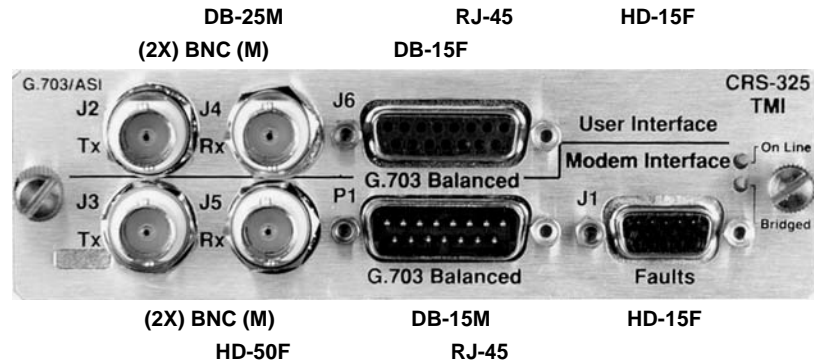
**Figure 1-13.
CRS-336 TMI
HSSI or GbE
(PL/12499-1)**
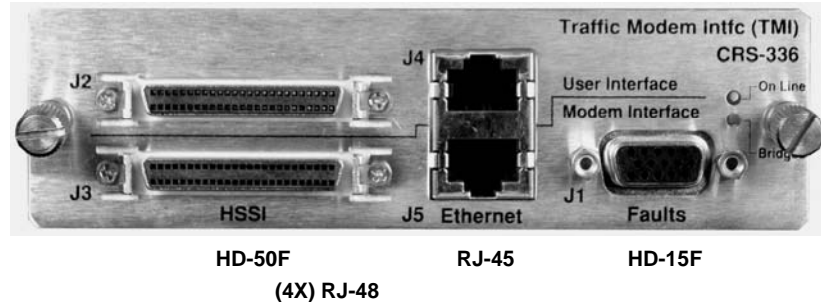
**Figure 1-14.
CRS-365 TMI
Quad E1 (1-4
ports)
(PL/12985-1)**
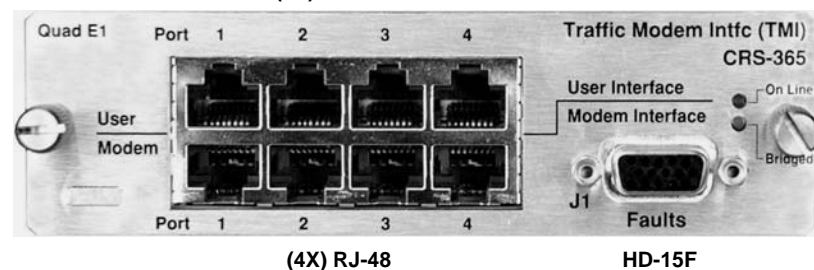
**Figure 1-15.
CRS-515 TMI
4-Port Ethernet
(PL-0000294)**
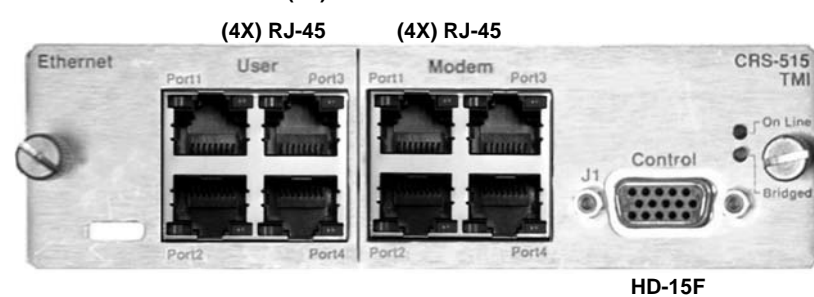
1.3.5 CRS-311 System Controller and Power Supply Modules

DB-9F   **DB-25M**

**Figure 1-16.
CRS-230
System Controller
(AS/0377)**

DB-9M   **DB-25F**
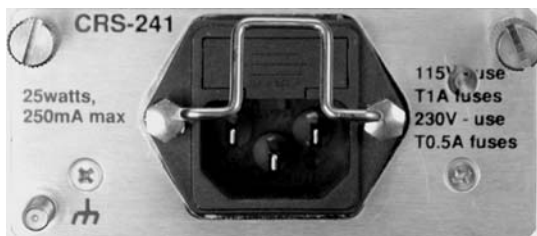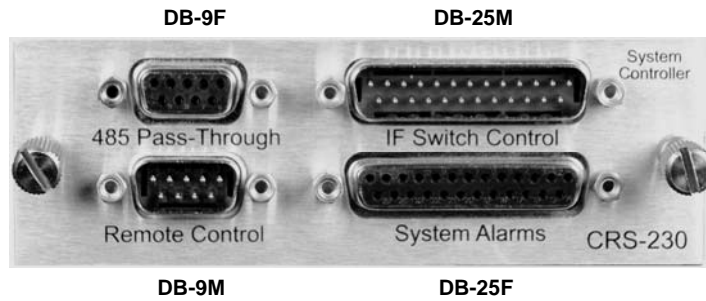
**Figure 1-17. CRS-241 AC Power Supply
(PL/12067-1)**

**Figure 1-18. CRS-251 DC Power Supply
(PL-0000157)**

1.3.6 CRS-281x IF Switch Modules

Each CRS-281/281x IF Switch Module connects the Tx IF signal on the Up Converter to the appropriate online modulator, and passively splits the Rx IF signal to provide both demodulators with the same IF signal from the LNB, thus reducing switching time.

Additionally, the CRS-281A IF Switch Module switches all of the BUC and LNB interface signals that are multiplexed onto the Tx and Rx coaxial cables:

- Tx and Rx L-Band signals
- DC Power to BUC and LNB
- 10 MHz reference to BUC and LNB
- FSK signaling to the BUC

1.3.6.1 CRS-281x IF Switch Modules for the CDM-Qx/QxL
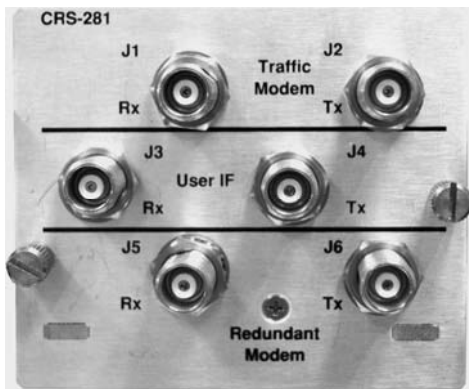
Figure 1-19. CRS-281 IF Switch Module: 70/140 MHz Type 'BNC' (PL/12040-3 [75Ω] or PL/12040-4 [50Ω])
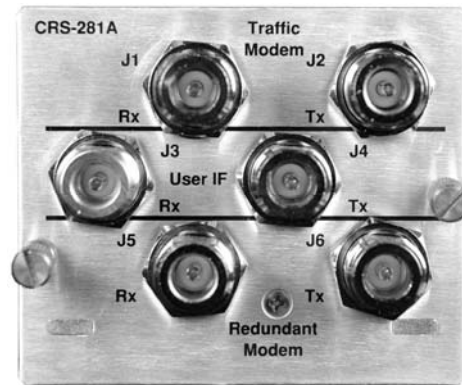
Figure 1-20. CRS-281A IF Switch Module: L-Band Type 'N' 50Ω (PL/13017-1)

1.3.6.2 CRS-281x IF Switch Modules for the SLM-5650/5650A
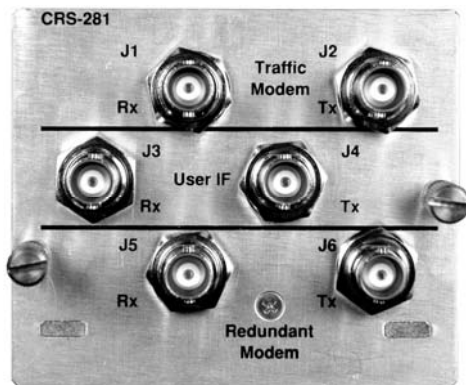
Figure 1-21. CRS-281 IF Switch Module: Type 'TNC' 50Ω (PL/12040-2)
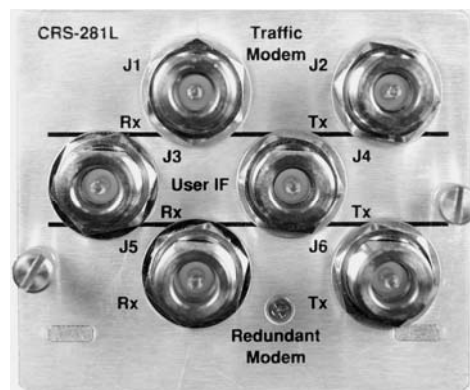
Figure 1-22. CRS-281L IF Switch Module: L-Band Type 'N' 50Ω (PL/12040-1)

1.3.7 CRS-351 Overhead Switch Module

The CRS-351 Overhead Switch Module (**Figure 1-23**) allows for connection of EIA-422, EIA-485 and EIA-232 data interfaces for use with **Overhead Framing**. It also supports signaling for tactical applications.

As explained in detail in the pertinent modem sections of **Chapter 3. CABLES AND CONNECTIONS**, your equipment should be connected directly to the module "P1 User Interface" port instead of connecting directly to the SLM-5650/5650A Traffic Modem's "P1 Overhead Data" port.

**Figure 1-23.
CRS-351
Overhead
Switch Module
(PL/13154-1)**
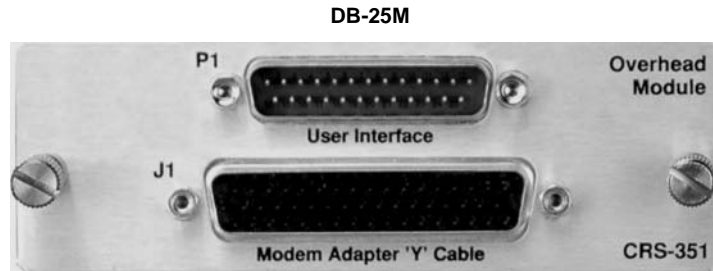
1.4   Summary of Specifications

1.4.1 CRS-311 Specifications

Feature	Specification
Switch Type	• 1:1 Redundancy Switch system • Bridging architecture • C161 control processor
Compatible Modems	• SLM-5650 • SLM-5650A • CDM-Qx • CDM-QxL
Operating Modes	• Fully automatic or manual • Force Traffic Modem to Redundant Modem • Programmable holdoff-to-backup and holdoff-to-restore times (from 1 to 99 seconds)
Switching Conditions	Switch to Redundant Modem following a Unit fault, Tx traffic fault, or Rx traffic fault
Switching Time	6 seconds max. (Delay interval set to minimum, 1 sec)
IF Switching	CRS-311 with CRS-281 IF Module: all modems outputs ON all the time
Temperature	• 0 to +50°C (32 to 122°F) Operating • 50 to 100°C (122 to 212°F) Storage
Humidity	95% at +50°C (122°F), Non-condensing
Environmental	Operating temperature range 0° to 50°C (32° to 122°F)
Redundant Modem Signal Source	The traffic paths (bridge mode) (both Rx IF and Tx data)

Front Panel	• Vacuum Fluorescent Display (VFD): 2 lines @ 24 characters/line
	• 6-button Keypad: ENTER, CLEAR, (4X) navigation
	• LED system status display showing:
	    o Operational status indicators: Unit, Remote, Stored Event
	    o Online status indicators: Traffic or Redundant Modem

Audible Alarm	Programmable to activate following various changes of state
Common faults	Dry relay contacts
AC Prime Power	Two independent inputs: 90 to 264 VAC, 50/60 Hz, at 25 Watts
DC Power	Two independent inputs: -48 VDC, at 25 Watts
Dimensional Envelope	19W x 11.2D x 3.75H inch (2RU) (48.26W x 28.4D x 8.9H cm)
Weight	~ 10 lbs (~ 9.07kg)
CE Mark	EMC and Safety

Feature	Specification			
Supported User Data Interfaces (by TMI)	TMI		Connector	Data Type
	CRS-316		DB-25M	EIA-530/422/V.35, EIA-232
			RJ-45	GbE
	CRS-325		DB-15F	G.703 Balanced
			(2X) BNC	G.703 Unbalanced or ASI
	CRS-336		HD-50F	HSSI
			RJ-45	GbE
	CRS-365		(4X) RJ-45	E1 Bal (only)
	CRS-515		(4X) RJ-45	10/100/1000 Ethernet
Supported User Data Interfaces (To TMI/RMI by Modem)	Modem	Data Interface	TMI	RMI
	CDM-Qx/QxL	EIA-530/422/V.35, EIA-232	CRS-316	CRS-305
		G.703 Bal / Unbal	CRS-325	CRS-305
		HSSI	CRS-336	CRS-305
		Quad E1	CRS-365	CRS-305
	SLM-5650/5650A	EIA-530/422	CRS-316	CRS-307
		GbE (Single-port Ethernet Bridge Mode)	CRS-316 *or* CRS-336	CRS-306 *or* CRS-307
		G.703 Bal / UnBal	CRS-325	CRS-306
		HSSI	CRS-336	CRS-306 *or* CRS-307
		Vipersat	CRS-316	CRS-307
		3-Port Ethernet (in Ethernet Bridge Mode)	CRS-515 (Ports 2-4)	CRS-505 (Ports 2-4)
		4-Port Ethernet (in Ethernet Router Mode)	CRS-515 (Ports 1-4)	CRS-505 (Ports 1-4)

1.4.2 CRS-281x IF Switch Module Specifications

Feature	Specification CRS-281 (70/140MHz)	Specification CRS-281A/CRS-281L (L-Band)
Tx/Rx Operating Freq	50 to 180 MHz	950-2000 MHz
Tx/Rx Connectors	• TNC (female) with 50Ω path • BNC (female) with 50Ω or 75Ω path	N-Type (female) with 50Ω path
Return Loss	18 dB	> 10 dB on external IF ports

Transmit IF Loss/Flatness:
    Tx In to Tx Uplink Out
    BU In to Any Uplink Out
	< 1.5 dB over operating frequency
	< 1.5 dB over operating frequency
		Tx IF note: Switched by RF relay (1.5 dB max loss, 40 dB min ON/OFF isolation)

Receive IF Loss/Flatness:
    Rx Downlink In to Rx Out
    Any Downlink In to BU Out
	< 5 dB over operating frequency
	< 5 dB over operating frequency
		Rx IF note: Passive power splitting (7 dB max loss)

Tx to Tx Channel Isolation	> 50 dB	> 50 dB
Tx to Rx Channel Isolation	> 60 dB	90dB min
IF Switch Power	From CRS-311 chassis	From CRS-311 chassis
IF, BUC/LNB DC, 10 MHz and BUC FSK Switching	N/A	CRS-281A (CDM-QxL only)

Chapter 2. INSTALLATION

2.1   Unpacking and Inspecting the Shipment
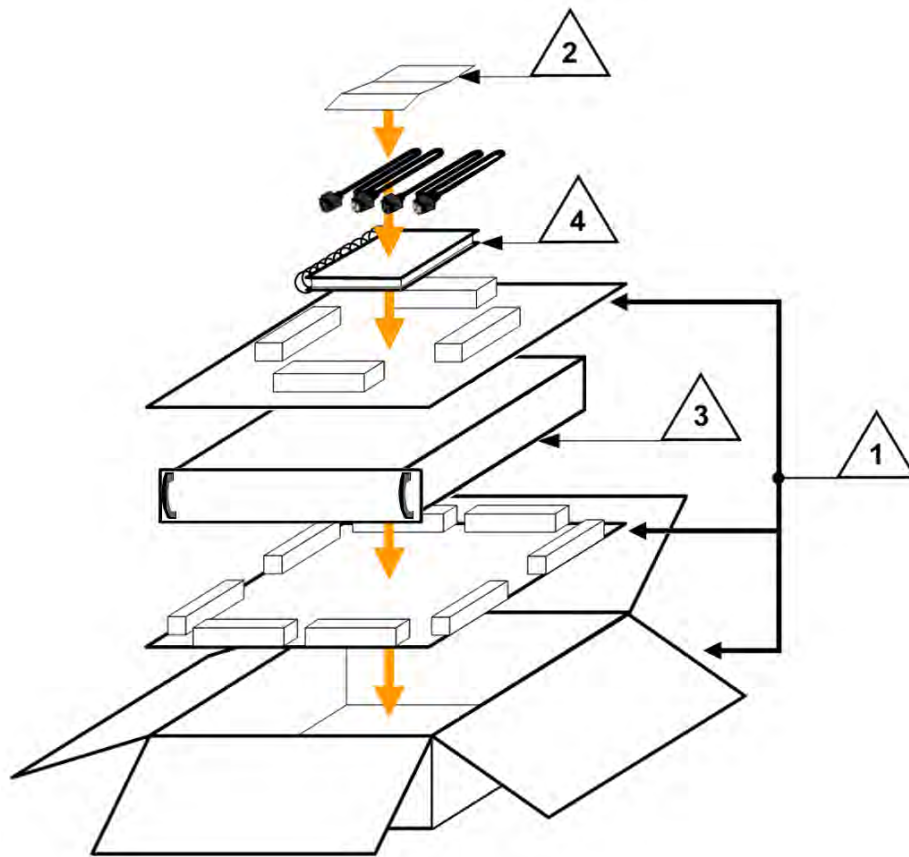
Figure 2-1. Unpacking and Inspecting the Shipment

The CRS-311 1:1 Redundancy Switch is packaged and shipped, along with its Installation and Operation Manual and power cords, in a reusable cardboard carton containing protective foam spacing.

	This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when handling the equipment.
	Once opened, inspect the shipment (Figure 2-1):

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

2.2   Installing into a Rack Enclosure

The CRS-311 is constructed as a 2RU-high, rack-mounting chassis. Rack handles are provided to facilitate removal and placement into a rack. When mounting the CRS-311 into a rack enclosure (Figure 2-2):

- ***PROPER GROUNDING PROTECTION IS REQUIRED. The equipment must be connected to the protective earth connection at all times. It is therefore imperative that the setup is properly grounded – e.g., use the ground studs provided on the modem rear panels – during installation, configuration, and operation.***

- ***PROPER AIR VENTILATION IS REQUIRED. The CRS-311 <u>CANNOT</u> have rack slides mounted to the sides of the chassis – air flow must not be impeded. 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 ventilation.***

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

    For information about custom rack enclosures, contact Comtech EF Data Customer Support during normal business hours or visit Comtech EF Data's Web site (www.comtechefdata.com/support.asp).

Feature	Description
1	Custom Rack Enclosure
2	Traffic Modem
3	CRS-311 1:1 Redundancy Switch
4	Redundant Modem
5	Standard Rack Shelving
6	Rack Enclosure Threaded Front Mounting Rail (typical)
7	Unit Front Panel
8	User-supplied Screws
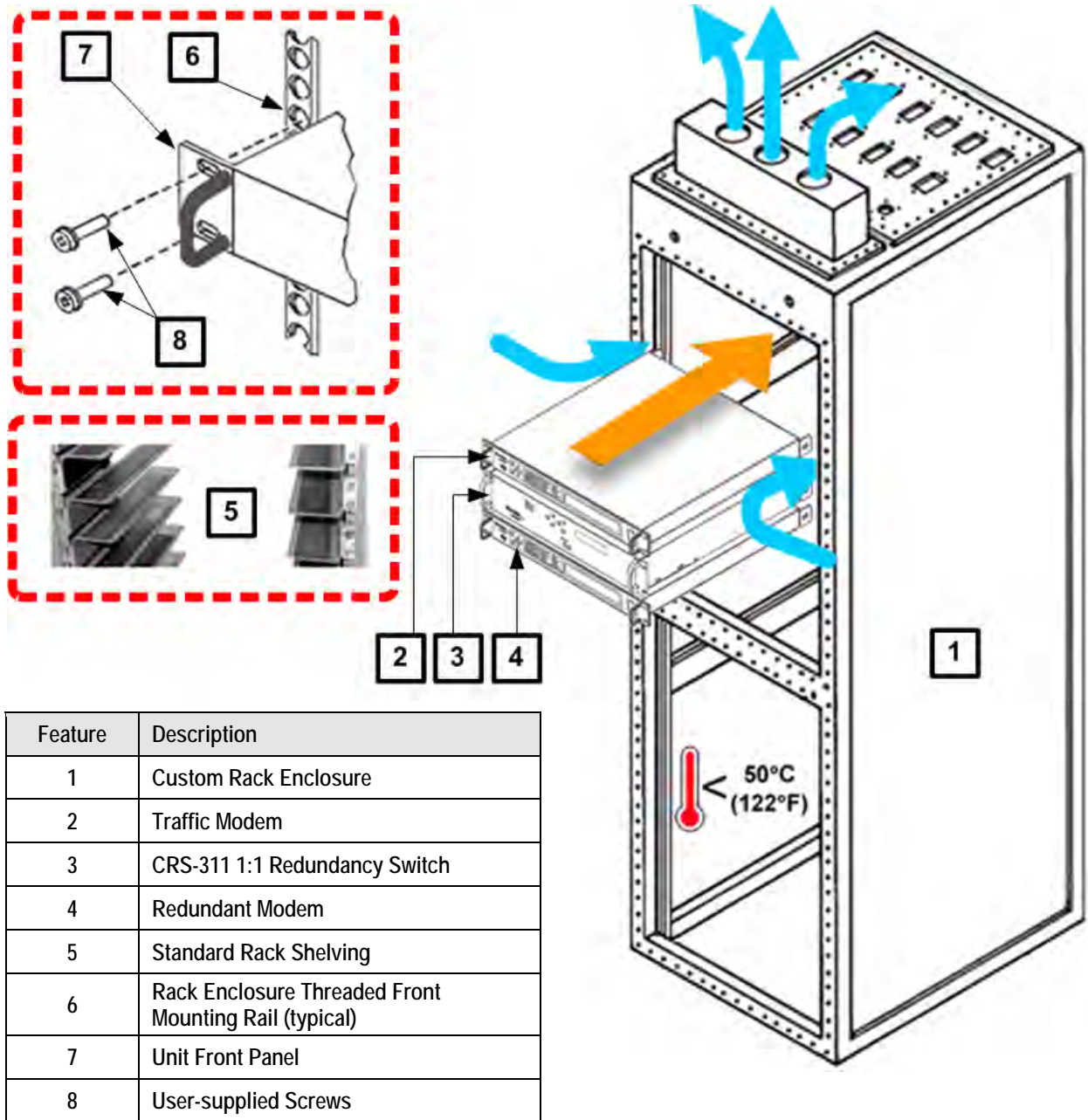
Figure 2-2. Installing into a Rack Enclosure

Mount the CRS-311, Traffic and Redundant Modems into their assigned positions in the rack enclosure. Use, as required:

- Standard rack shelving

- User-supplied screws to secure the unit front panels to the rack enclosure threaded front mounting rails

- Comtech EF Data's optional KT/6228-2 (4") or KT/6228-3 (10") Rear-Mounting Support Brackets Kit (**Figure 2-3**), typical for use with the CRS-311 and the CDM-Qx/QxL or SLM-5650/A modems

- Comtech EF Data's optional FP/SL0006 Side-Mounting Bearingless Rack Slide Set (**Figure 2-4**), typical for use with the CDM-Qx/QxL or SLM-5650/A modems

2.2.1   Installing the Optional Rear-Mounting Support Brackets Kit
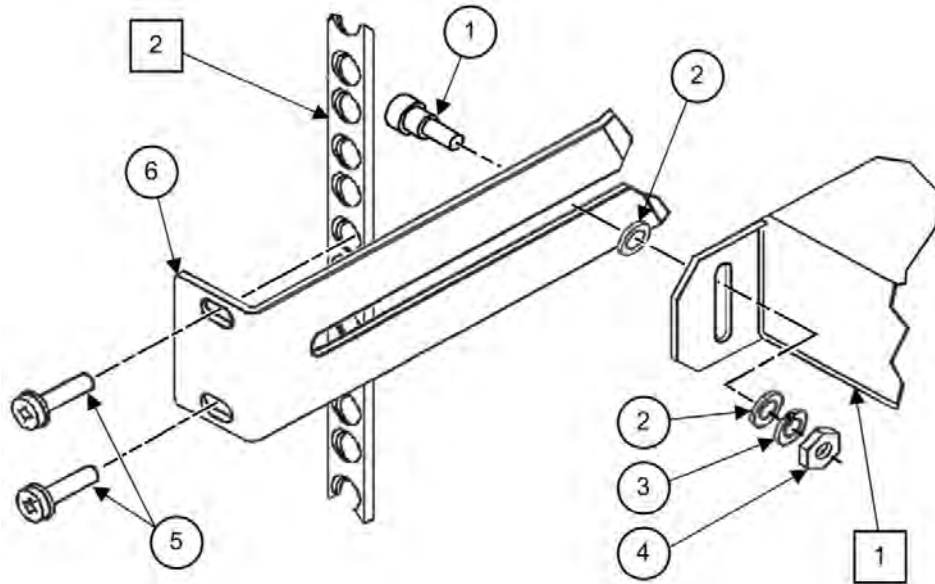
Feature	Description
1	Back of Unit
2	Rack Enclosure Threaded Rear Mounting Rail (typical)

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

Figure 2-3. Installing the Optional Rear-Mounting Support Brackets Kit

Tools needed to install the KT/6228-2 (4") or KT/6228-3 (10") Bracket Kit (Figure 2-3):

- A medium Phillips™ screwdriver

- A 5/32-inch SAE Allen™ Wrench

- An adjustable Crescent™ wrench

Typical for all products, follow these steps to install the Rear-Mounting Support Brackets Kit:

Step	Task
1	Use the #10 flat washers, split washers, and hex nuts (Items 2, 3, and 4) to secure the shoulder screws (Item 1) to the modem chassis through the rear right and left side mounting slots.
2	Use the #10 rear support bracket bolts (Item 5) to install the rear support brackets (Item 6) onto the rack enclosure threaded rear mounting rails.
3	Mount the modem into the rack enclosure: First ensure that the shoulders of the #10 shoulder screws properly engage into the rear support bracket slots. Then, slide the unit into its stored position.
4	If needed, secure the front panel to the rack enclosure threaded front mounting rails with user-suppllied screws as shown in **Figure 2-2**.

2.2.2 Installing the Modem Optional Side-Mounting Bearingless Rack Slide Set

The optional FP/SL0006 Bearingless Rack Slide Set may be installed into the equipment rack cabinet and onto the sides of each CDM-Qx/QxL or SLM-5650/A as shown in **Figure 2-4** and per the following procedure:

Step	Task
1	Use the provided mounting hardware to install one slide onto each side of the modem chassis.
2	Use the provided mounting hardware to install the slide rail components into each interior side of the equipment rack cabinet.
3	Mount the unit into the front of the equipment rack. Ensure that the slides properly engage the cabinet-mounted slide rails.
4	Continue to slide the modem into the equipment rack to its final operating position. Then, use four user-provided screws to secure the modem to the equipment rack's right and left threaded front mounting rails (through the front panel mounting slots).
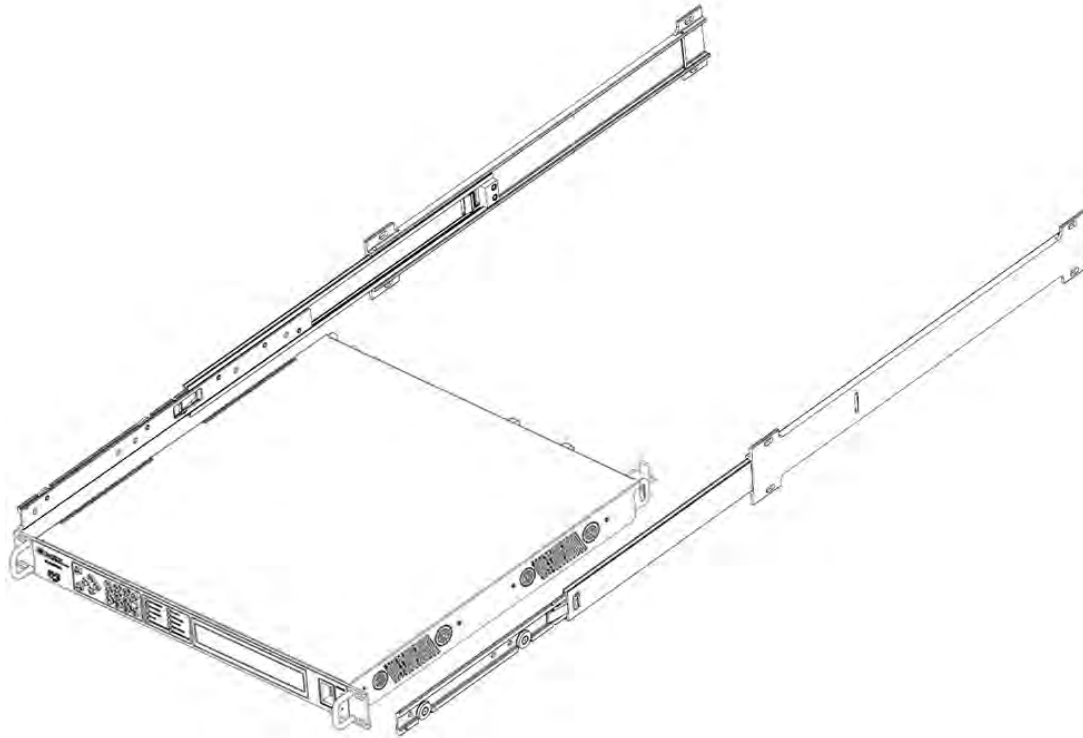
CEFD Part Number	Description
FP/SL0006	Bearingless Rack Slide Set – 26″

Figure 2-4. Installing the Modem Optional Bearingless Rack Slide Set

Chapter 3. CABLES AND CONNECTIONS

3.1   Overview

All cables for connecting the CRS-311 1:1 Redundancy Switch within the system or to the CDM-Qx/QxL and SLM-5650/5650A modems are available from Comtech EF Data. These cables can be ordered at the same time the order is placed for the CRS-311.

⚠️ ***Leave the CRS-311 and all modems powered off until all connections are ready.***

The illustrations featured throughout this chapter provide cabling configuration examples for RMI or TMI interfaces – i.e., the interconnection of a Redundant Modem to a Switch RMI module, or the interconnection between a Switch TMI module and a Traffic Modem. This chapter also outlines the step-by-step process for connecting a variety of CRS-311 and modem control, M&C, or data traffic configurations.

You must properly attach all required cabling once the CRS-311 and all the modems are mounted. In most cases the modem accepts the male end of the cable, while connectors on the RMI or TMI module accepts the female end of the cable in the module section labeled "Modem Interface." See the subsections in **Sect. 1.3 CRS-311 Physical Features** for detailed information on these interfaces.

When fabricated by the user, the cables required between each modem and CRS-311 RMI or TMI plug-in module should be of shielded, twisted-pair construction, with the grounded shield bonded to the back shell. Use the pinout and connection information specified in **Appendix A. CABLE DRAWINGS** to correctly wire all control or data cables.

Notes:

3.2   CDM-Qx/QxL Modem Connections

Sect.	Description
3.2.1	CDM-Qx/QxL Cable Connection Considerations
3.2.2	RS-485 Connections – CRS-311 to Modems
3.2.3	Control 'Y' Cable Connections – CRS-311 to Modems
3.2.4.1	EIA-530 V.35/EIA-232 Data Traffic Cable Connections
3.2.4.2	Balanced G.703 Data Traffic Cable Connections
3.2.4.3	Unbalanced G.703 Data Traffic Cable Connections
3.2.4.4	HSSI Data Traffic Cable Connections
3.2.4.5	Quad E1 Data Traffic Cable Connections
3.2.5	User Data Connections – CRS-311 to Users
3.2.6	IF Connections – User to CRS-281x Module to Modems

3.2.1   CDM-Qx/QxL Cable Connection Considerations

- If adding a new CDM-Qx/QxL Multi-Channel Satellite Modem to an *operating* 1:1 system, make sure that the new modem does not interfere with existing traffic.

- Make sure the cabling is correct. The following types of cable connections may be used to connect the CRS-311 to the CDM-Qx/QxL modems and/or the user:

  o RS-485 Comms

  o Control

    ▪ The CA-0000009 Control 'Y' Cable provides fault information from the modem and IF-Mute to the modem, and is therefore always required.

  o Data Traffic

  o User Data

  o IF

- Perform the power-up sequence correctly.

- Make sure there is no system contention from the modem Tx carrier.

3.2.2   RS-485 Connections – CRS-311 to Modems

The DB-9 RS-485 Multi-drop Cable provides the communication path between the CRS-311 and the CDM-Qx/QxL modems. There are two RS-485 cables – both are available from Comtech EF Data:

- The standard CA-0000096 shielded cable to guard against EMC (Electromagnetic Compatibility) concern, or

- The optional CA-0000095 ribbon cable..

Referring to Figure 3-1, connect and secure the standard CA-0000096 or optional CA-0000095 RS-485 Multi-drop Cable between the CRS-311 and each CDM-Qx/QxL as follows:

- Connect and secure a CA/WR11418-1 RS-485 Terminator to the RS-485 Multi-drop Cable far-end connector.

- Connect and secure one end of the CA/WR11419-1 9-pin Null Modem Cable to the DB-9F connector labeled "485 Pass-Through" on the CRS-311 CRS-230 System Controller module.

- Connect and secure the appropriate RS-485 Multi-drop Cable to the CDM-Qx/QxL and to the Null Modem Cable DB-9M connector.

3.2.3   Control 'Y' Cable Connections – CRS-311 to Modems

All Data Traffic configurations require that the CA-0000009 Control 'Y' Cable must be connected between the CRS-311 and to each CDM-Qx/QxL as follows:

Referring to Figure 3-2 through Figure 3-6:

- From the HD-15F connector labeled "J1" on the RMI or TMI, to

- The DB-15M connectors labeled "Alarms" on the CDM-Qx/QxL modulator and demodulator modules (located on the modem chassis rear panel).

    Further:

- From the Control 'Y' Cable connector labeled "J1" to

- The modulator "Alarms" connector.

      -and-

- From the Control 'Y' Cable connector labeled "J2" to

- The demodulator "Alarms" connector.

3.2.4   Data Traffic Connections – CRS-311 to Modems

3.2.4.1   EIA-530 V.35/EIA-232 Data Traffic Connections

Referring to Figure 3-2, connect and secure the CA/WR0066-4 25-pin Control and Data Cable between the CRS-311 and each CDM-Qx/QxL as follows:

- From the DB-25M connector labeled "P2" on the RMI or "P1" on the TMI, to

- The DB-25F connector labeled "EIA-530" on the demodulator.

3.2.4.2   Balanced G.703 Data Traffic Connections

Referring to Figure 3-3, connect and secure the CA/WR9038-4 15-pin Data Cable between the CRS-311 and each CDM-Qx/QxL as follows:

- From the DB-15M connector labeled "P1" on the RMI or TMI, to

- The DB-15F connector labeled "G.703" on the demodulator.

3.2.4.3   Unbalanced G.703 Data Traffic Connections

Referring to Figure 3-4:

- **First,** connect and secure the CA/WR0813-4 BNC Tx Cable between the CRS-311 and each CDM-Qx/QxL as follows:

  o From the BNC connector labeled "J4" on the RMI or "J3" on the TMI, to

  o The BNC connector labeled "Tx" on the demodulator.

- **Next,** connect and secure the CA/WR0813-4 BNC Rx Cable between the CRS-311 and each CDM-Qx/QxL as follows:

  o From the BNC connector labeled "J3" on the RMI or "J5" on the TMI, to

  o The BNC connector labeled "Rx" on the demodulator.

3.2.4.4   HSSI Data Traffic Connections

Referring to Figure 3-5, connect and secure the CA/WR9189-4 HSSI Data Cable between the CRS-311 and each CDM-Qx/QxL as follows:

- From the HSSI connector labeled "J2" on the RMI or "J3" on the TMI, to

- The HSSI connector labeled "HSSI" on the demodulator.

3.2.4.5   Quad E1 Data Traffic Connections

Referring to Figure 3-6:

- **First**, connect and secure the CA/WR13018-2 Quad E1 RMI Data Cable between the CRS-311 and each CDM-Qx/QxL as follows:

  o From the DB-15M connector labeled "P1" on the RMI, to

  o The <4X> RJ-48 connectors labeled "Port 1" through "Port 4" on the Redundant Modem.

- **Next,** connect and secure the <4X> PP/CAT5FF3FTGY Quad E1 TMI Data Cables between the CRS-311 and each CDM-Qx/QxL as follows:

  o From the RJ-48 connectors labeled "Port 1" through "Port 4" on the TMI, to

  o The RJ-48 connectors labeled "Port 1" through "Port 4" on the Traffic Modem.

3.2.5   User Data Connections – CRS-311 to User

See Sect. 1.3.4 CDM-Qx/QxL, SLM-5650/5650A Modem Interface Modules for detailed information on the RMI and TMI modules available for use with the CDM-Qx/QxL modems.

The Data Traffic from your multiplexing equipment or test data generator should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

Because the Redundant Modem's function is to replace a faulted terrestrial modem, the RMI does not have a User Data Interface.
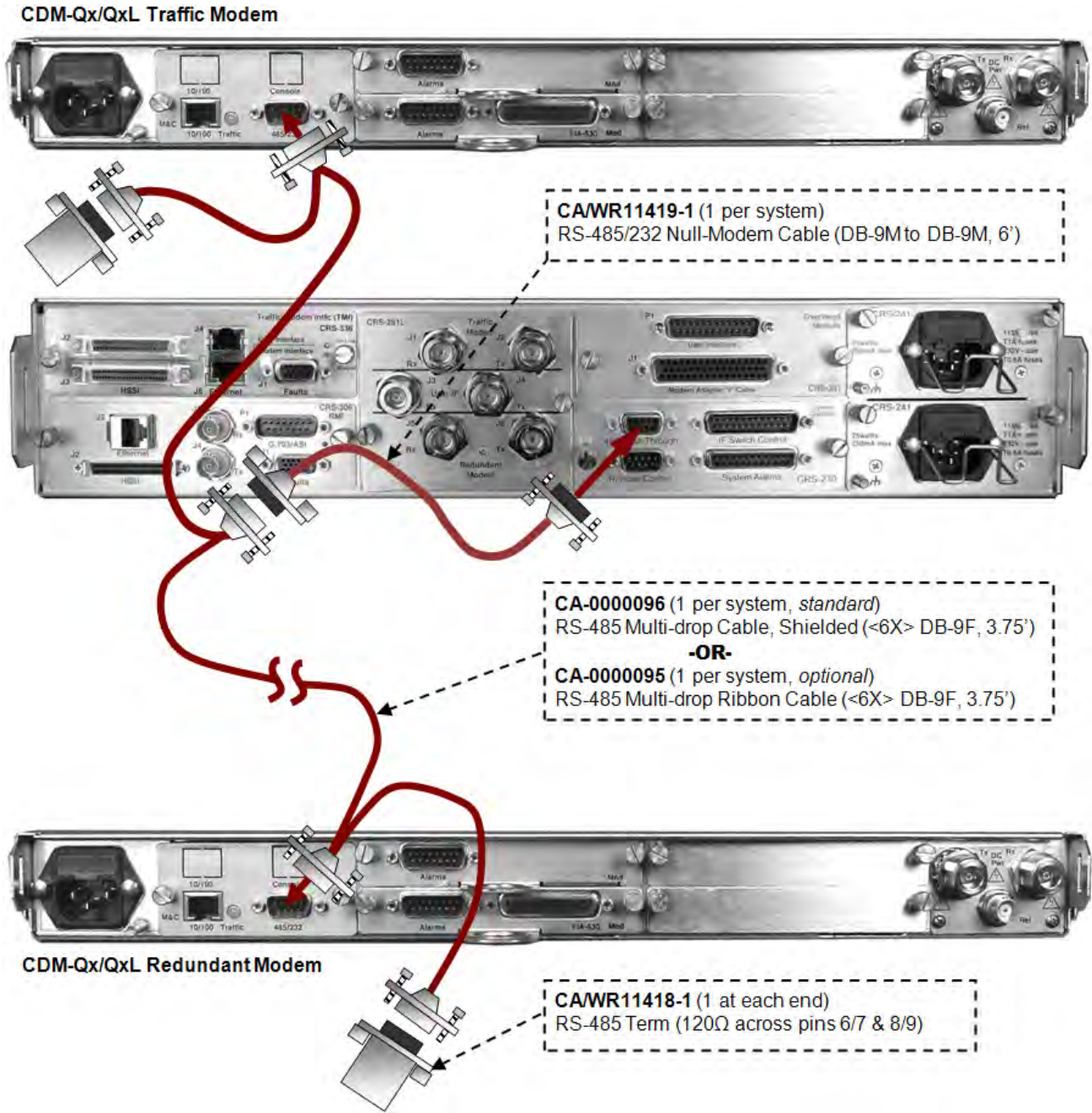
Figure 3-1. CDM-Qx/QxL Cabling Example – RS-485 Multi-drop Cable
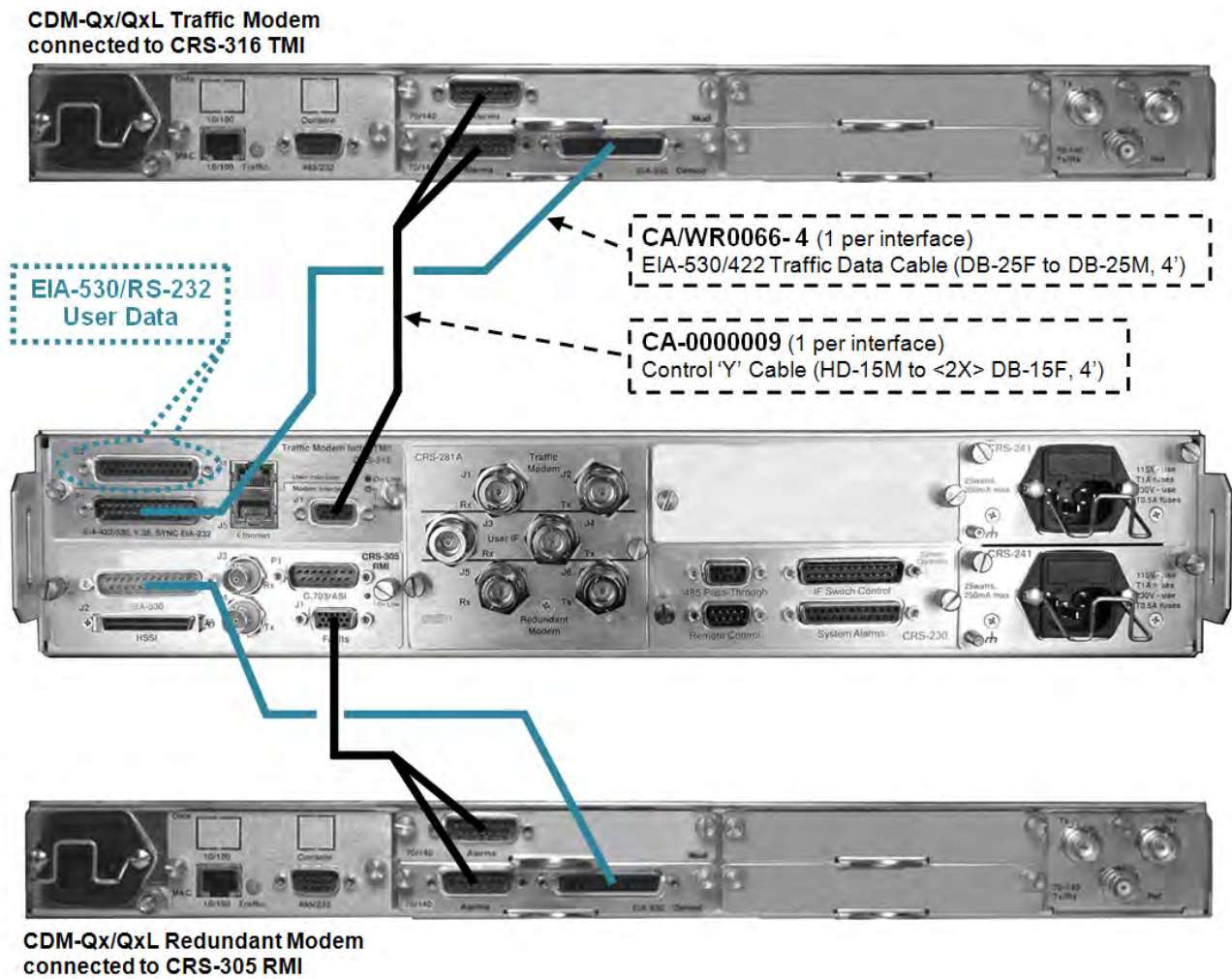
Figure 3-2. CDM-Qx/QxL Control 'Y' and EIA-530/RS-232 Data Traffic Cables
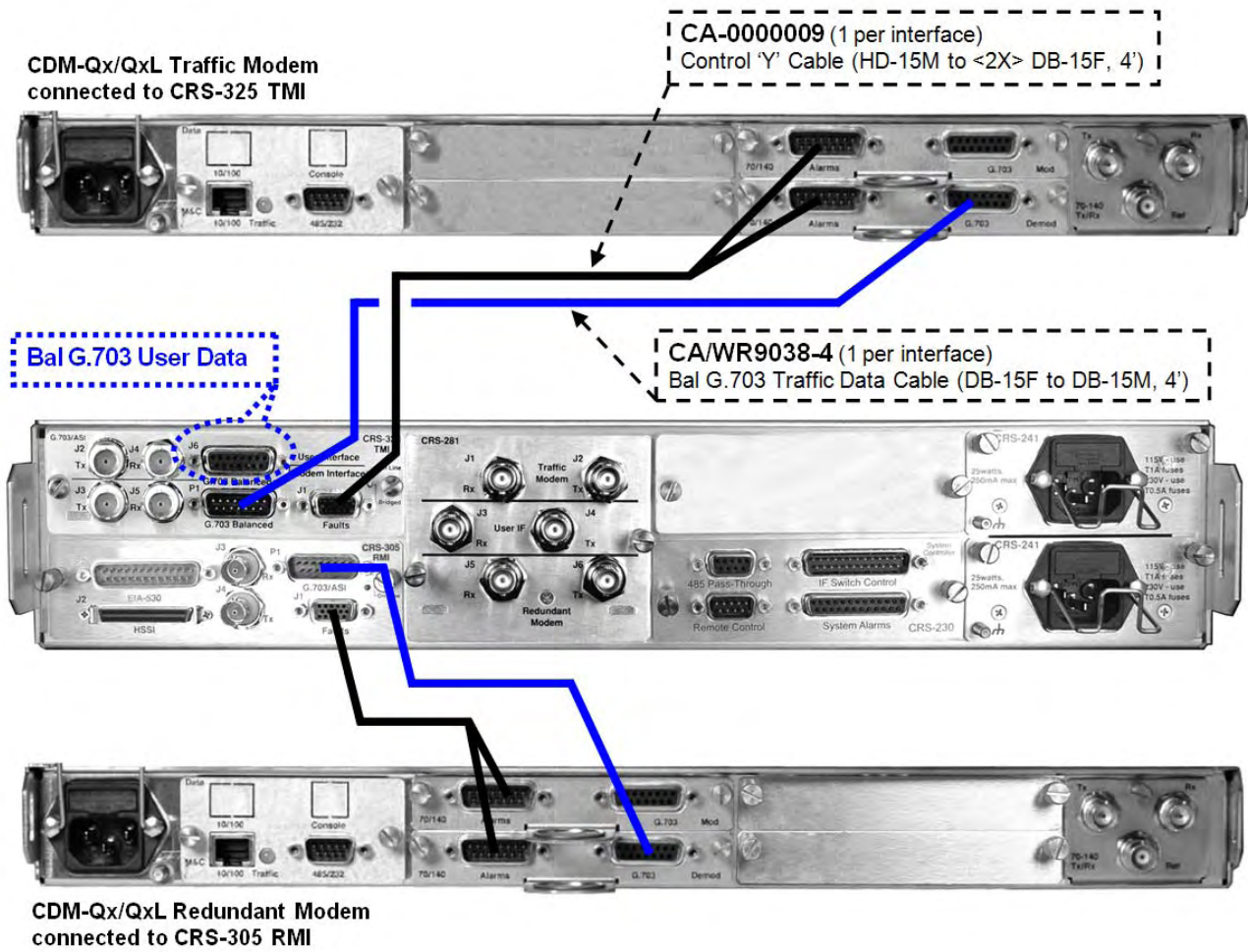
Figure 3-3. CDM-Qx/QxL Control 'Y' and Balanced G.703 Data Traffic Cables
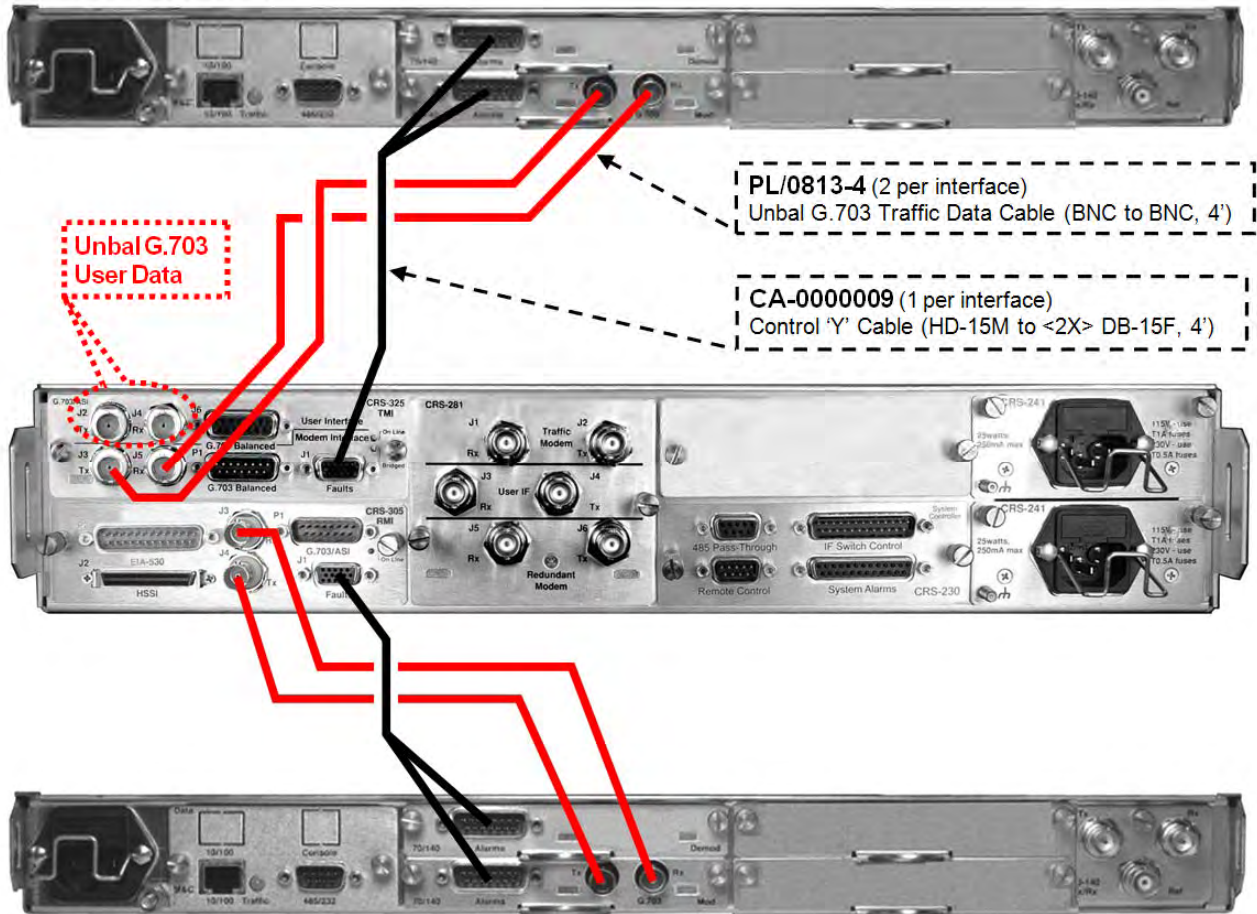
Figure 3-4. CDM-Qx/QxL Control 'Y' and Unbalanced G.703 Data Traffic Cables
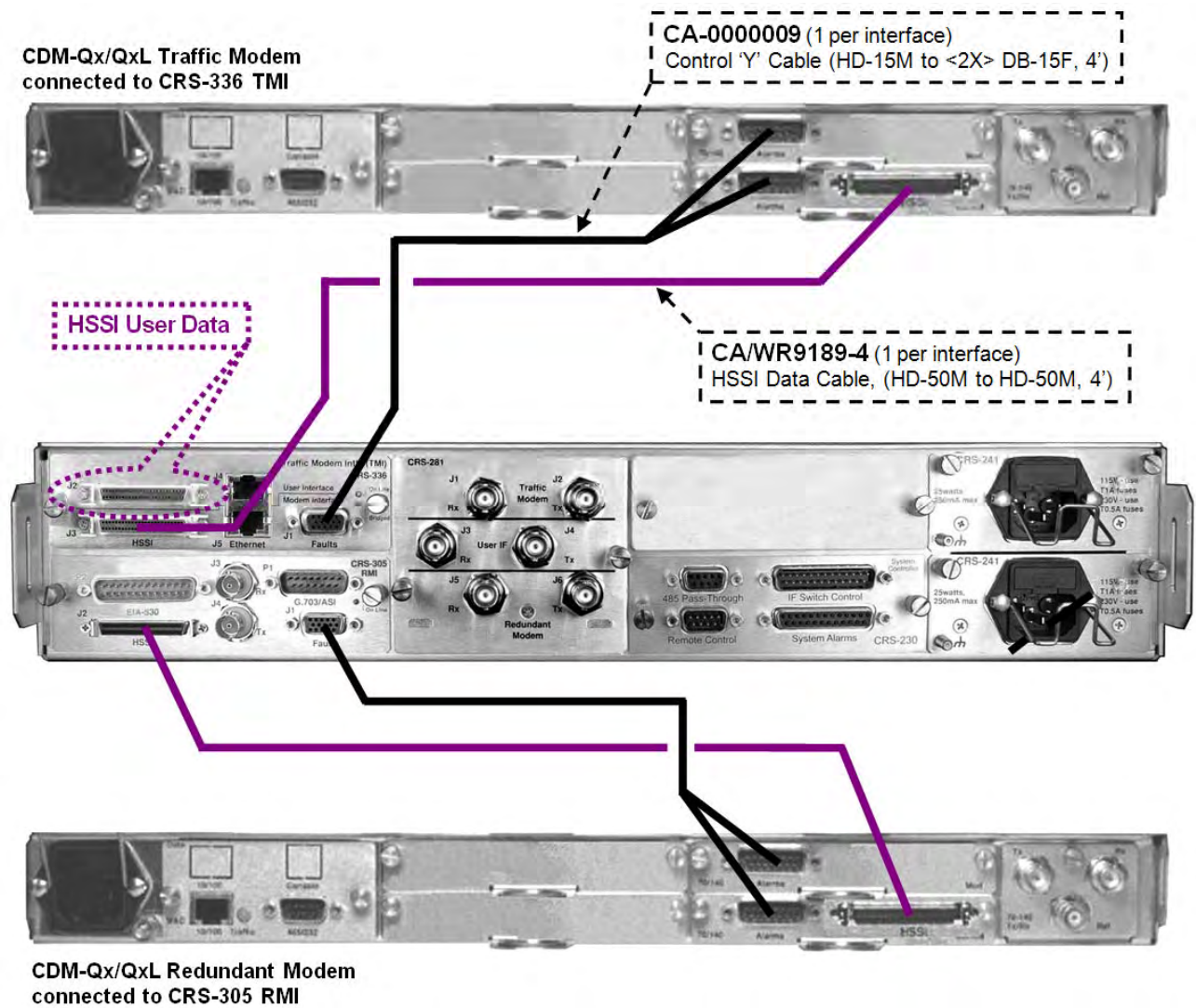
Figure 3-5. CDM-Qx/QxL Control and HSSI Data Traffic Cables
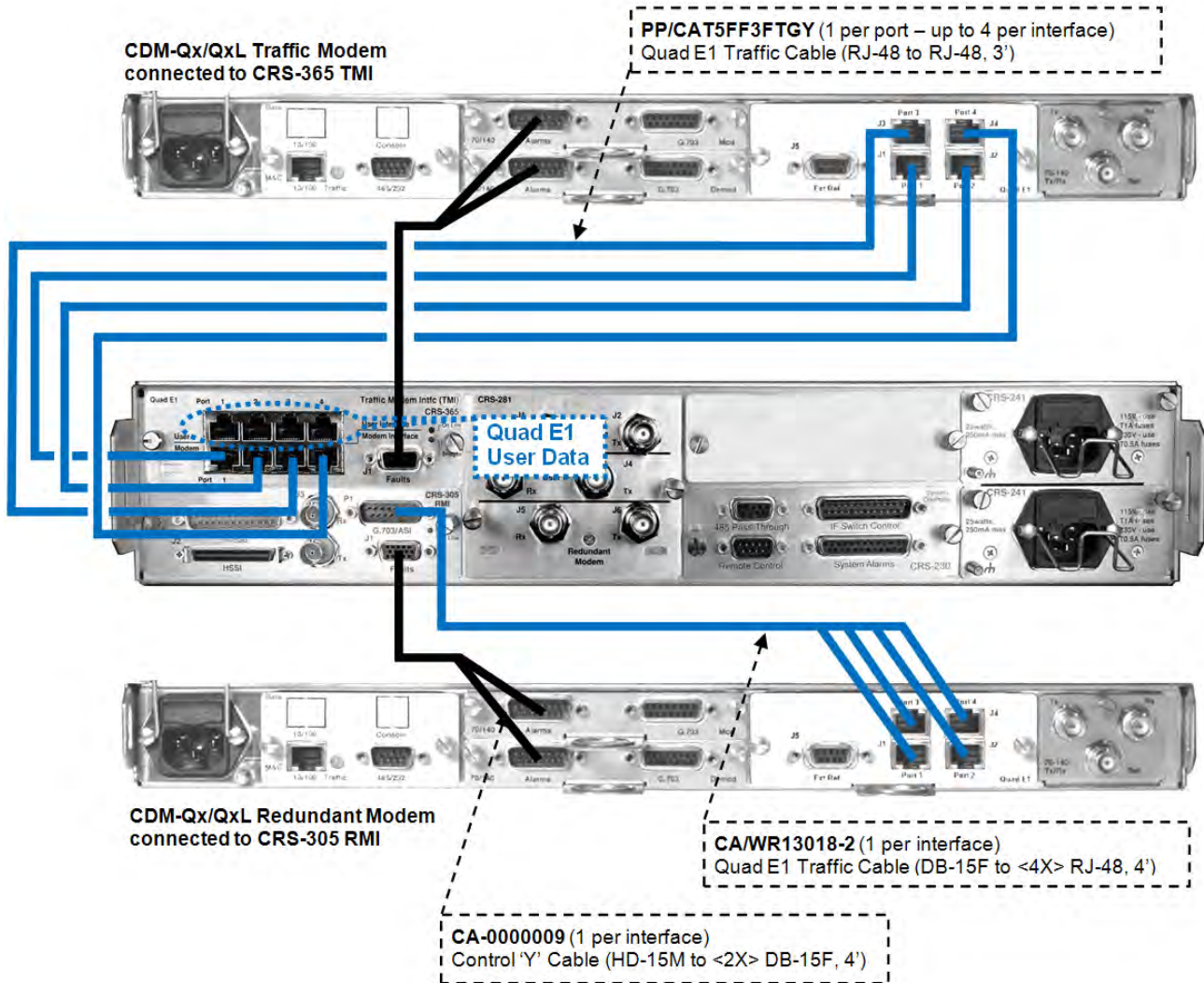
Figure 3-6. CDM-Qx/QxL Control and Quad E1 Data Traffic Cables

3.2.6   IF Connections – User to CRS-281x Module to Modems

The CRS-281x module connects the online modulator's Tx IF signal to your RF Up Converter. It also passively splits the receive IF signal to provide both demodulators with the same IF signal coming from the LNB, thus reducing switching time.

For 70/140MHz IF switching, the CDM-Qx uses the CRS-281 IF Switch Module with either 50Ω or 75Ω BNC connectors

The CRS-281A IF Switch Module is intended for use with the CDM-QxL for L-Band with Type 'N' connectors. This model also switches all of the BUC and LNB interface signals that are multiplexed onto the transmit and receive coaxial cables, including:

- Tx and Rx L-Band signals

- 10 MHz reference to BUC and LNB

- DC Power to BUC and LNB

- FSK signaling to the BUC

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

Referring to Figure 3-7 and Figure 3-8, connect and secure the IF cable pairs – PL/0946-1 50Ω or PL/0813-4 75Ω Type 'BNC' or CA/RF10453-4 Type 'N' – between your Up/Down Converters, CRS-311, and CDM-Qx/QxL modems as follows:

Traffic Modem Connections:

- From the CDM-Qx/QxL connector labeled "Rx", to the CRS-281x Switch Module connector labeled "J1 Rx", and

- From the CDM-Qx/QxL connector labeled "Tx", to the CRS-281x Switch Module connector labeled "J2 Tx".

User Connections:

- From your Down Converter, to the CRS-281x Switch Module connector labeled "J3 Rx", and

- From your Up Converter, to the CRS-281x Switch Module connector labeled "J4 Tx".

Redundant Modem Connections:

- From the CDM-Qx/QxL connector labeled "Rx". to the CRS-281x Switch Module connector labeled "J5 Rx", and

- From the CDM-Qx/QxL connector labeled "Tx", to the CRS-281x Switch Module connector labeled "J6 Tx".

Figure 3-7. CDM-Qx IF Cabling Example – CRS-281 (70/140 MHz, 50Ω or 75Ω BNC)
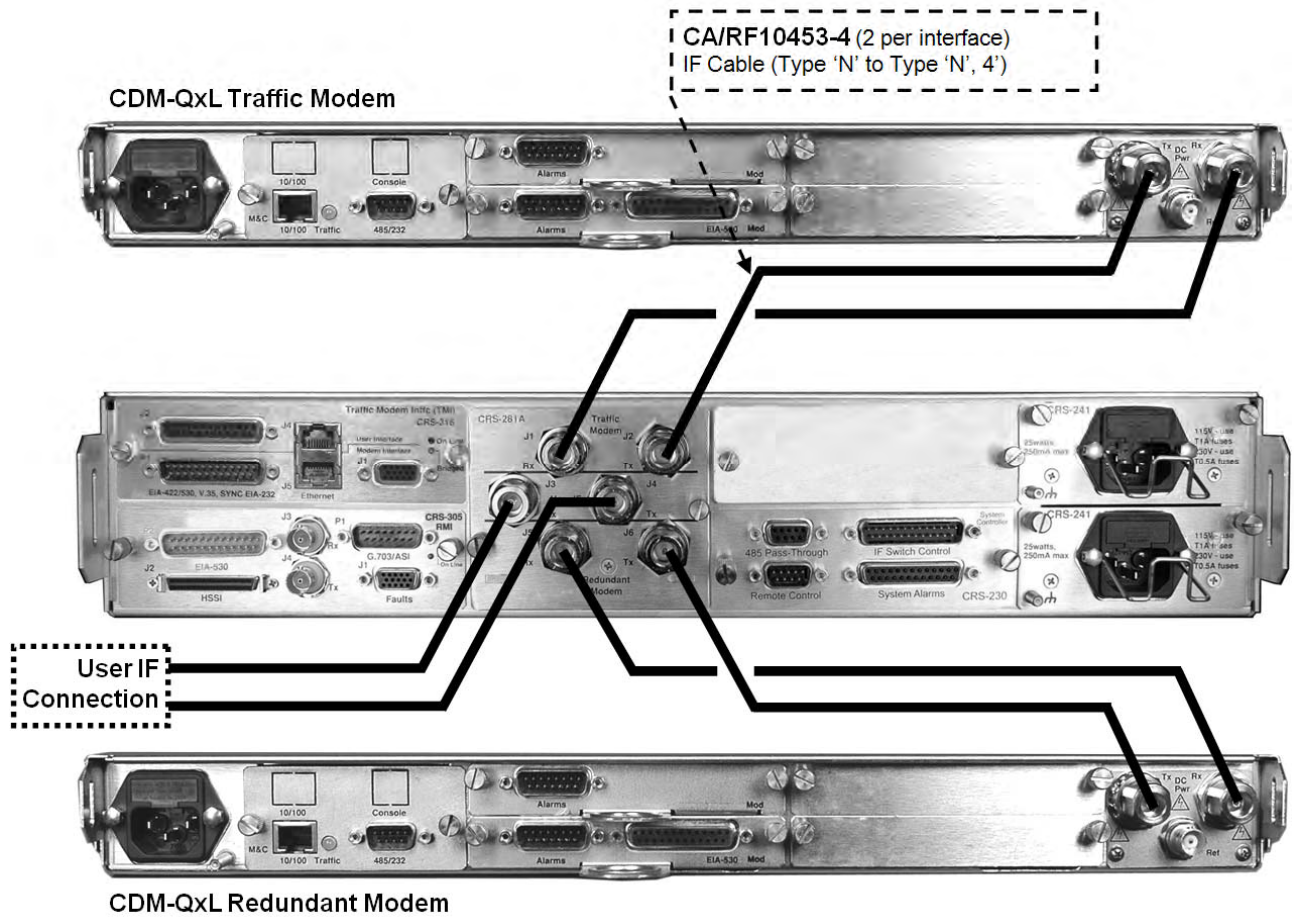
Figure 3-8. CDM-QxL IF Cabling Example – CRS-281A (L-Band)

Notes:

3.3   SLM-5650/5650A Modem Connections

Sect.	Description
3.3.1	SLM-5650/5650A Cable Connection Considerations
3.3.2	System Control Cable Connections – CRS-311 to Modems
3.3.3.1	EIA-530 V.35/EIA-232 Serial Data Traffic Cable Connections
3.3.3.2	Balanced G.703 Serial Data Traffic Cable Connections
3.3.3.3	Unbalanced G.703 Serial Data Traffic Cable Connections
3.3.3.4	HSSI Serial Data Traffic Cable Connections
3.3.4	Serial User Data Connections – CRS-311 to User
3.3.5.1	Ethernet Bridge Mode M&C via the Optional GbE Interface
3.3.5.2	Ethernet Bridge Mode M&C via the Optional Network Processor (NP) Interface
3.3.5.3	Ethernet Router Mode M&C via the Optional Network Processor (NP) Interface
3.3.5.4	Ethernet BPM Mode M&C via the Optional Network Processor (NP) Interface
3.3.6.1	Ethernet Bridge Mode Data Traffic via the Optional GbE Interface
3.3.6.2	Ethernet Bridge Mode Data Traffic via the Optional Network Processor (NP) Interface
3.3.6.3	Ethernet Router Mode Data Traffic ia the Optional Network Processor (NP) Interface
3.3.6.4	Ethernet BPM Mode Data Traffic via the Optional Network Processor (NP) Interface
3.3.7	Overhead Data Connections – CRS-351 Module to Modems
3.3.8	IF Connections – User to CRS-281x to Modems

3.3.1   SLM-5650/5650A Cable Connection Considerations

- If adding a new SLM-5650/5650A Satellite Modem to an **operating** 1:1 system, make sure the new modem does not interfere with existing traffic.

- Make sure the cabling is correct. The following types of cable connections may be used to connect the CRS-311 to the SLM-5650/5650A modems and/or the user:

  o System Control

    ▪ The CA/WR12136-2 Control Cable provides the serial communication path between the CRS-311 and the modems and controls the modem's external Tx IF-mute control line, and is therefore always required.

  o Serial Data Traffic

  o Serial User Data

  o Ethernet M&C

  o Ethernet Data Traffic

  o IF

- Perform the power-up sequence correctly.

• Make sure there is no system contention from the modem Tx carrier.

3.3.2   System Control Cable Connections – CRS-311 to Modems

The CA/WR12136-2 Control Cable provides the serial communication path between the CRS-311 and the modems and controls the modem's external Tx IF-mute control line, and is therefore always required.

In order to provide user access to the AGC and I&Q outputs of the modem, the CA/WR12842-4 (4' length) and CA/WR12842-6 (6' length) Control 'Y' Cables, sold separately, are available for use in place of the CA/WR12136-2 Control Cable.

See **Appendix A. CABLE DRAWING***S* *for detailed information about these optional cable assemblies.*

Referring to Figure 3-9 through Figure 3-21:

Connect and secure the CA/WR12136-2 Control Cable (or the CA/WR12842-4 Control 'Y' Cables, if used) between the CRS-311 and each SLM-5650/5650A as follows:

• From the HD-15F connector labeled "J1" on the RMI or TMI, to

• The HD-15F connector labeled "J9 Auxiliary" on the SLM-5650/5650A.

3.3.3   Serial Data Traffic Cable Connections – CRS-311 to Modems

3.3.3.1   EIA-530 Data Traffic Connections

Referring to Figure 3-9:

Connect and secure the CA/WR0066-4 Data Cable between the CRS-311 and each SLM-5650/5650A as follows:

• From the DB-25M connector labeled "P2" on the RMI or "P1" on the TMI, to

• The DB-25F connector labeled "J6 EIA530" on the SLM-5650/5650A.

3.3.3.2   Balanced G.703 Data Traffic Connections

Referring to Figure 3-10

Connect and secure the CA/WR9038-4 Balanced G.703 Data Cable between the CRS-311 and each SLM-5650/5650A (via the optional G.703 Interface Module) as follows:

- From the DB-15M connector labeled "P1" on the RMI or TMI, to the DB-15F connector labeled "J1 Bal Data" on the SLM-5650/5650A.

3.3.3.3   Unbalanced G.703 Data Traffic Connections

Referring to Figure 3-10:

Connect and secure the pair of PL/0813-4 Data Cables between the CRS-311 and each SLM-5650/5650A (via the optional G.703 Interface Module) as follows:

- From the BNC connectors labeled "J4 Tx" on the RMI or "J3 Tx"on the TMI, to

- The SLM-5650/5650A BNC connectors labeled "J3 Rx".

    -and-

- From the BNC connectors labeled "J3 Rx" on the RMI or "J5 Rx" on the TMI, to

- The SLM-5650/5650A BNC connectors labeled "J2 Tx".

3.3.3.4   HSSI Data Traffic Connections

Referring to **Figure 3-11**:

Connect and secure the CA/WR9189-4 HSSI Data Cable between the CRS-311 and each SLM-5650/5650A as follows:

- From the HD-50F HSSI connector labeled "J2" on the RMI or "J3" on the TMI, to the HD-50F HSSI connector labeled "J7 HSSI" on the SLM-5650/5650A.

3.3.4   Serial User Data Connections – CRS-311 to User

See Sect. 1.3.4 CDM-Qx/QxL, SLM-5650/5650A Modem Interface Modules for detailed information on the RMI and TMI modules available for use with the SLM-5650/5650A modems.

Your Data Traffic from an external router, multiplexing equipment or test data generator should connect to the connectors on the TMI labeled "User Data Interface". This interface replaces the direct connection to the Traffic Modem's "Data Interface" connectors.

Because the Redundant Modem's function is to replace a faulted Traffic Modem, the RMI does not have a User Data Interface.
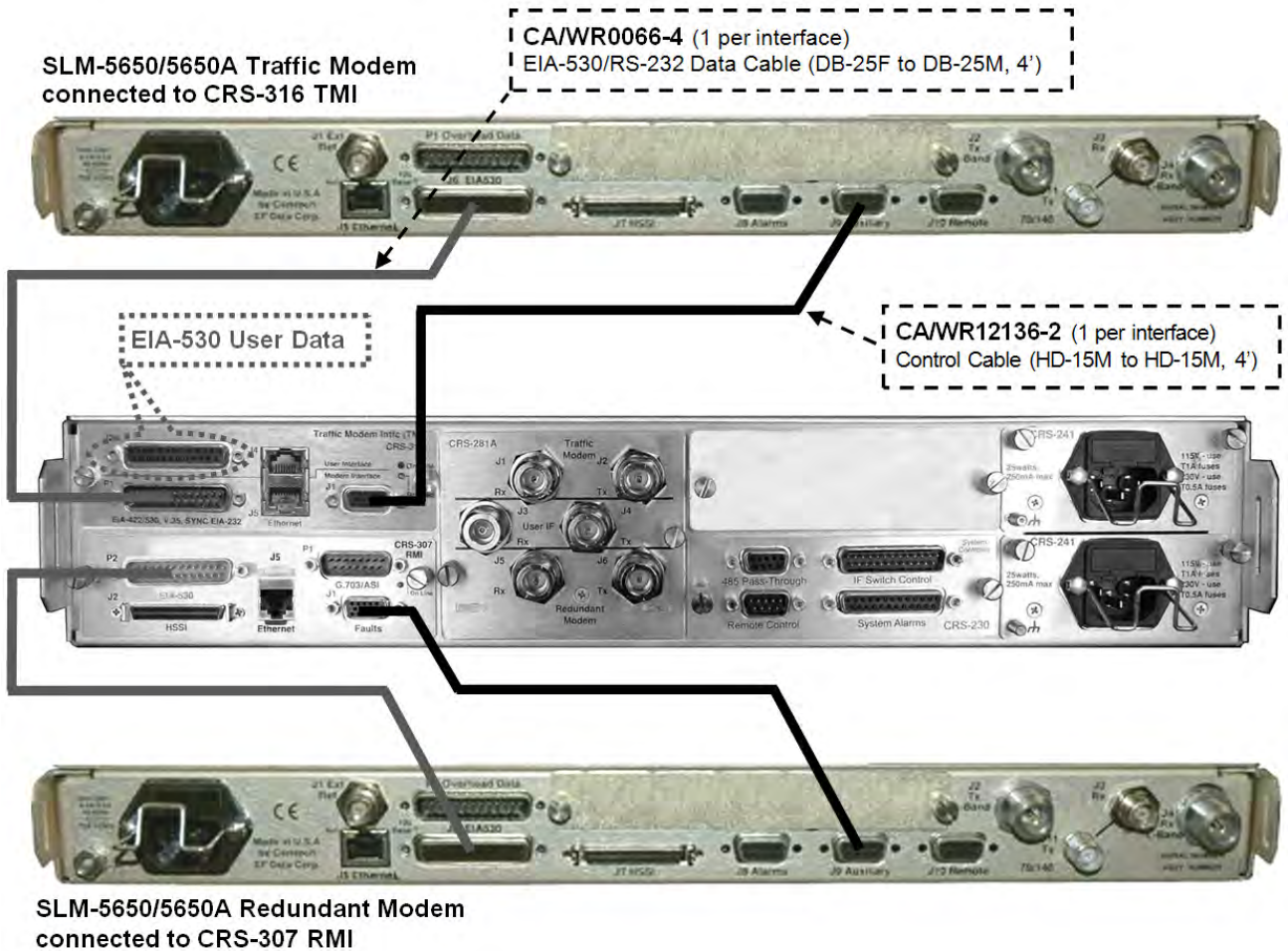
Figure 3-9. SLM-5650/5650A Control and EIA-530 Data Traffic Cables
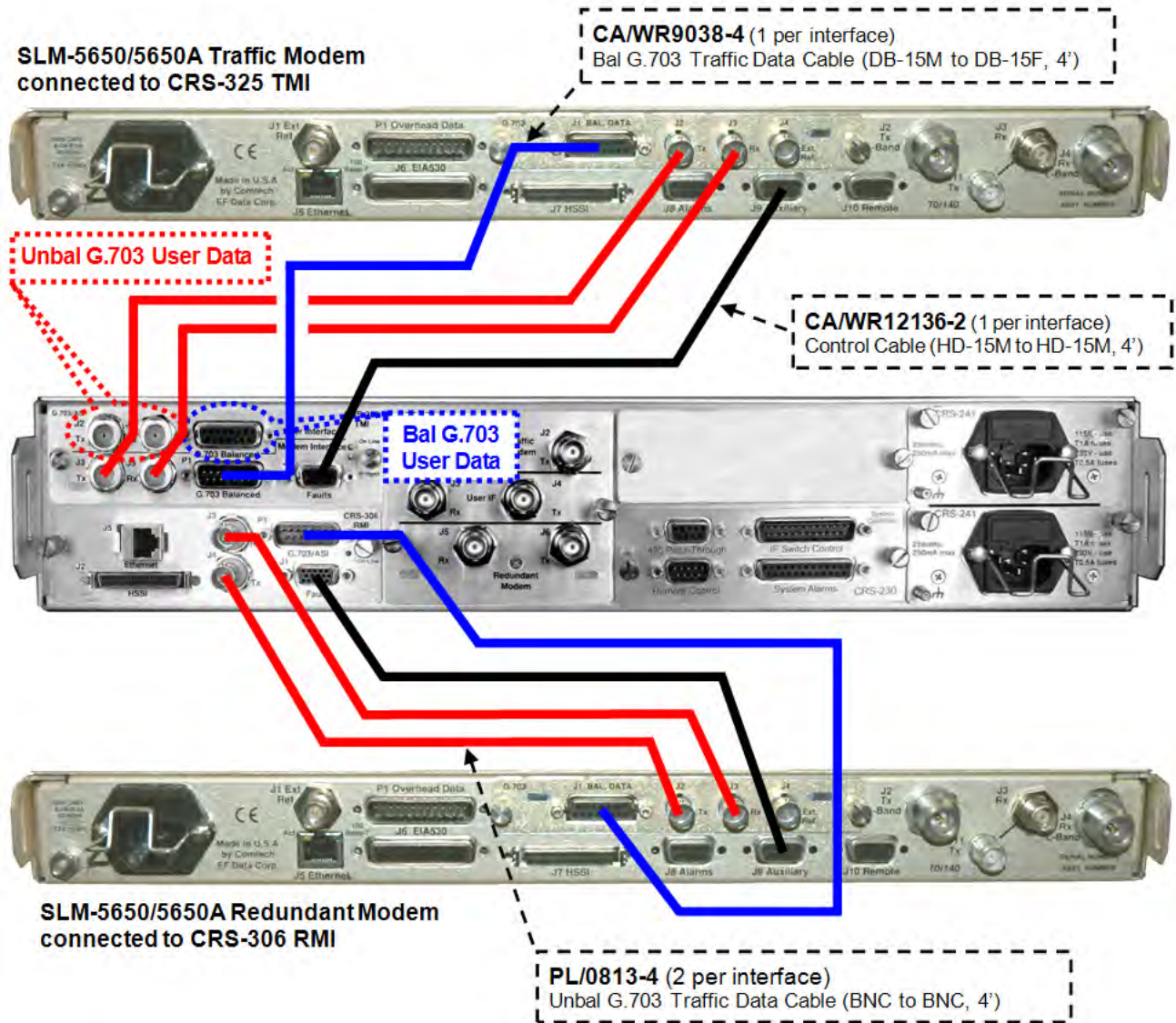
Figure 3-10. SLM-5650/5650A Control and G.703 Data Traffic Cables
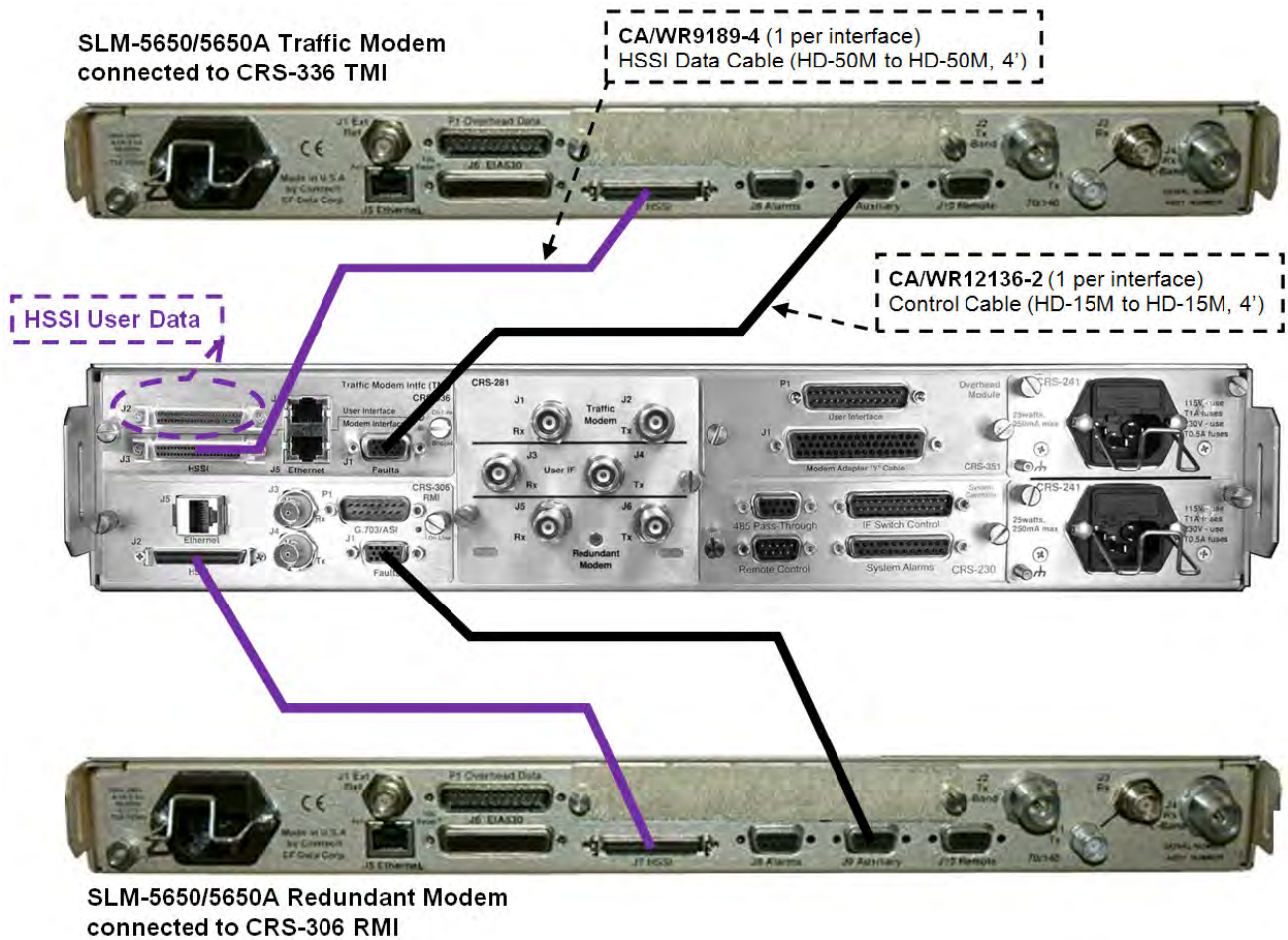
Figure 3-11. SLM-5650/5650A Control and HSSI Data Cables

3.3.5   Ethernet M&C Connections – CRS-311 to User

The Ethernet Monitor and Control (M&C) Connection differs depending on which optional Ethernet Interface Module and Ethernet Traffic Mode is used with the SLM-5650/5650A:

- *The single-port 10/100/1000 BaseT (GbE) Interface Module, or*

- *The multi-port Network Processor (NP) Interface Module.*

3.3.5.1   Single-Port Ethernet Bridge Mode M&C Using the GbE Interface Module

Referring to **Figure 3-12***:*

If the **single-port 10/100/1000 BaseT (GbE) Interface Module** is installed for use in **Single-Port Ethernet Bridge Mode** (see **Sect. 3.3.6.1**) and the CRS-311 is configured with the CRS-306 or CRS-307 RMI, and CRS-316 or CRS-336 TMI, you must connect **only** to the "J5 Ethernet" port on the Redundant and Traffic modems.

You can have a single-point connection via use of user-provided CAT5 cables and a user-provided Layer 2 Ethernet switch.

Referring to **Figure 3-13***:*

If the **single-port 10/100/1000 BaseT (GbE) Interface Module** is installed for use in **Single-Port Ethernet Bridge Mode** (see **Sect. 3.3.6.1**) and the CRS-311 is configured with the CRS-505 RMI and CRS-515 TMI, you must connect **only** to the "J5 Ethernet" port on the Redundant and Traffic modems. Be sure to use the *same port number* that was used for all corresponding interfaces (User Data/RMI/TMI) – in the example shown, "Port 3" is used.

You can have a single-point connection via use of user-provided CAT5 cables and a user-provided Layer 2 Ethernet switch.

3.3.5.2   Multi-Port Ethernet Bridge Mode M&C Using the Network Processor (NP) Interface Module

Referring to **Figure 3-14***:*

If the **multi-port Network Processor (NP) Interface Module** is installed for use in **Multi-Port Ethernet Bridge Mode** (see **Sect. 3.3.6.2**), you must connect **only** to the "J5 Ethernet" port on the Redundant and Traffic modems. You can have a single-point connection via use of user-provided CAT5 cables and a user-provided Layer 2 Ethernet switch.

> *Because "Port 1" on the TMI/RMI incorporates a Gigabit Ethernet switch, it is important* **not** *to use this port.*

3.3.5.3   Multi-Port Ethernet Router Mode M&C Using the Network Processor (NP) Interface Module

Referring to **Figure 3-15***:*

If the **multi-port Network Processor (NP) Interface Module** is installed for use in **Multi-Port Ethernet Router Mode** (see **Sect. 3.3.6.3**), you must **only** connect to any one of the NP Interface Module's four Ethernet ports on the Redundant and Traffic modems. *The "J5 Ethernet" port is not used with this configuration*.

You can have a single-point connection for both Ethernet M&C and Ethernet Data via use of user-provided CAT5 cables and a user-provided Layer 2 Ethernet switch.

> *Because "Port 1" on the TMI/RMI incorporates a Gigabit Ethernet switch, it is* **important** *to use this port for the Ethernet M&C connection.*

3.3.5.4   Multi-Port Ethernet BPM Mode M&C Using the Network Processor (NP) Interface Module

Referring to **Figure 3-16:**

If the **multi-port Network Processor (NP) Interface Module** is installed for use in **Multi-Port Ethernet BPM (Bridge Point-to-Multipoint) Mode** (see **Sect. 3.3.6.4**), you can have a single-point connection for both Ethernet M&C and Ethernet Data via use of user-provided CAT5 cables and a user-provided Layer 2 Ethernet switch.

> *Because "Port 1" on the TMI/RMI incorporates a Gigabit Ethernet switch, it is* **important** *to use this port for the Ethernet M&C connection.*
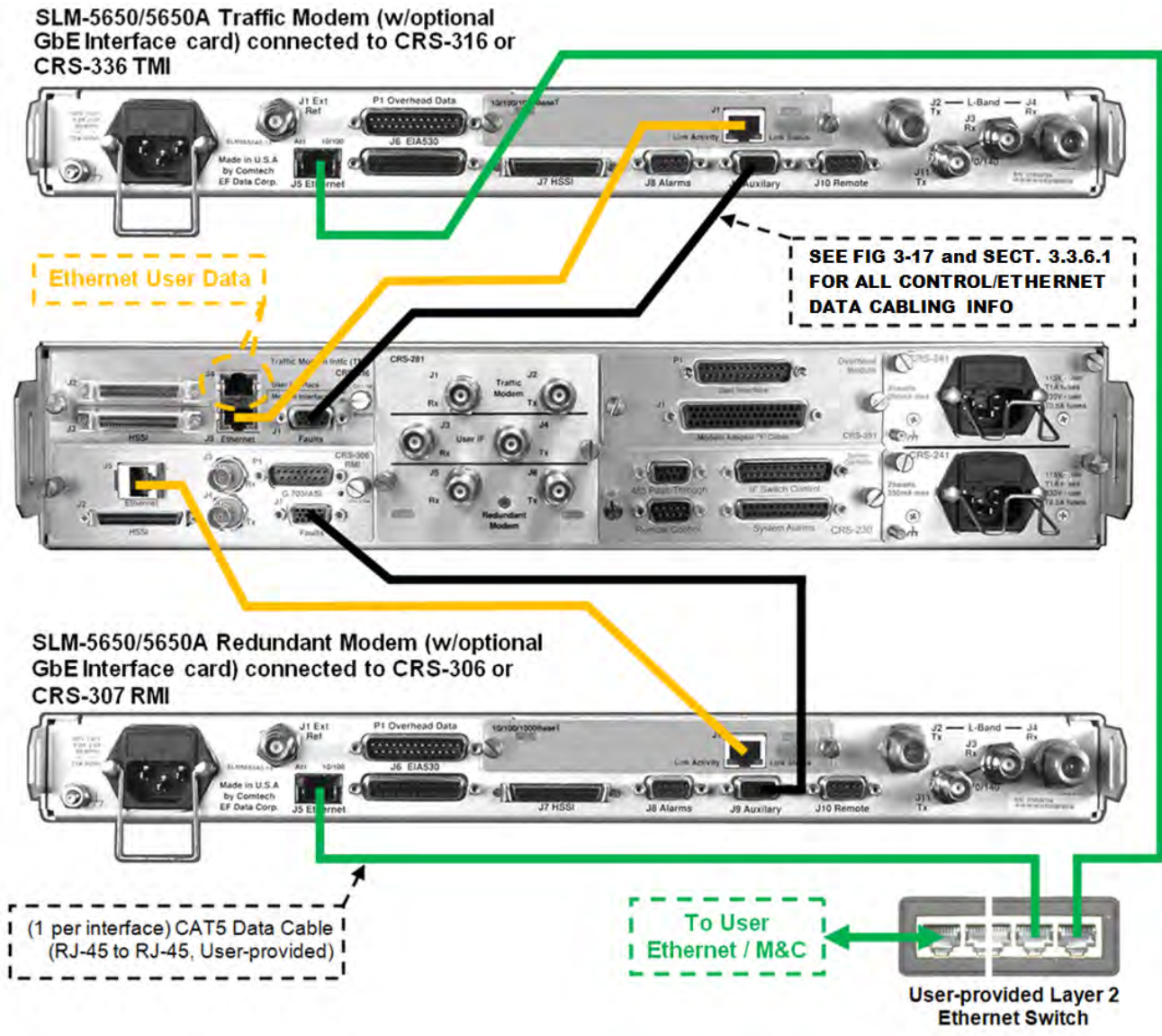
Figure 3-12. SLM-5650/5650A Ethernet M&C Cabling – Optional GbE Interface Using Single-Port Ethernet Bridge Mode (Configuration 'A')
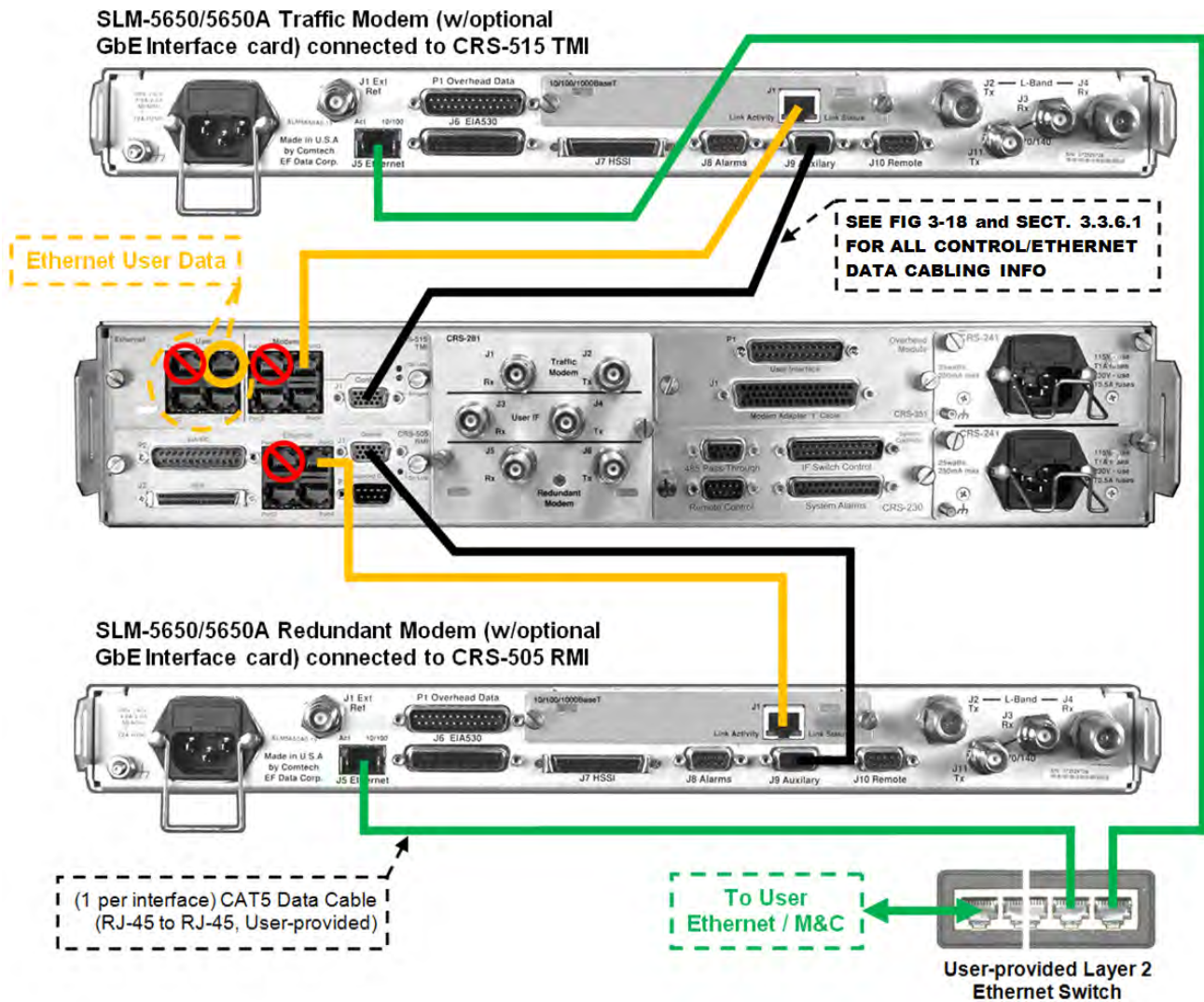
Figure 3-13. SLM-5650/5650A Ethernet M&C Cabling – Optional GbE Interface Using Single-Port Ethernet Bridge Mode (Configuration 'B')
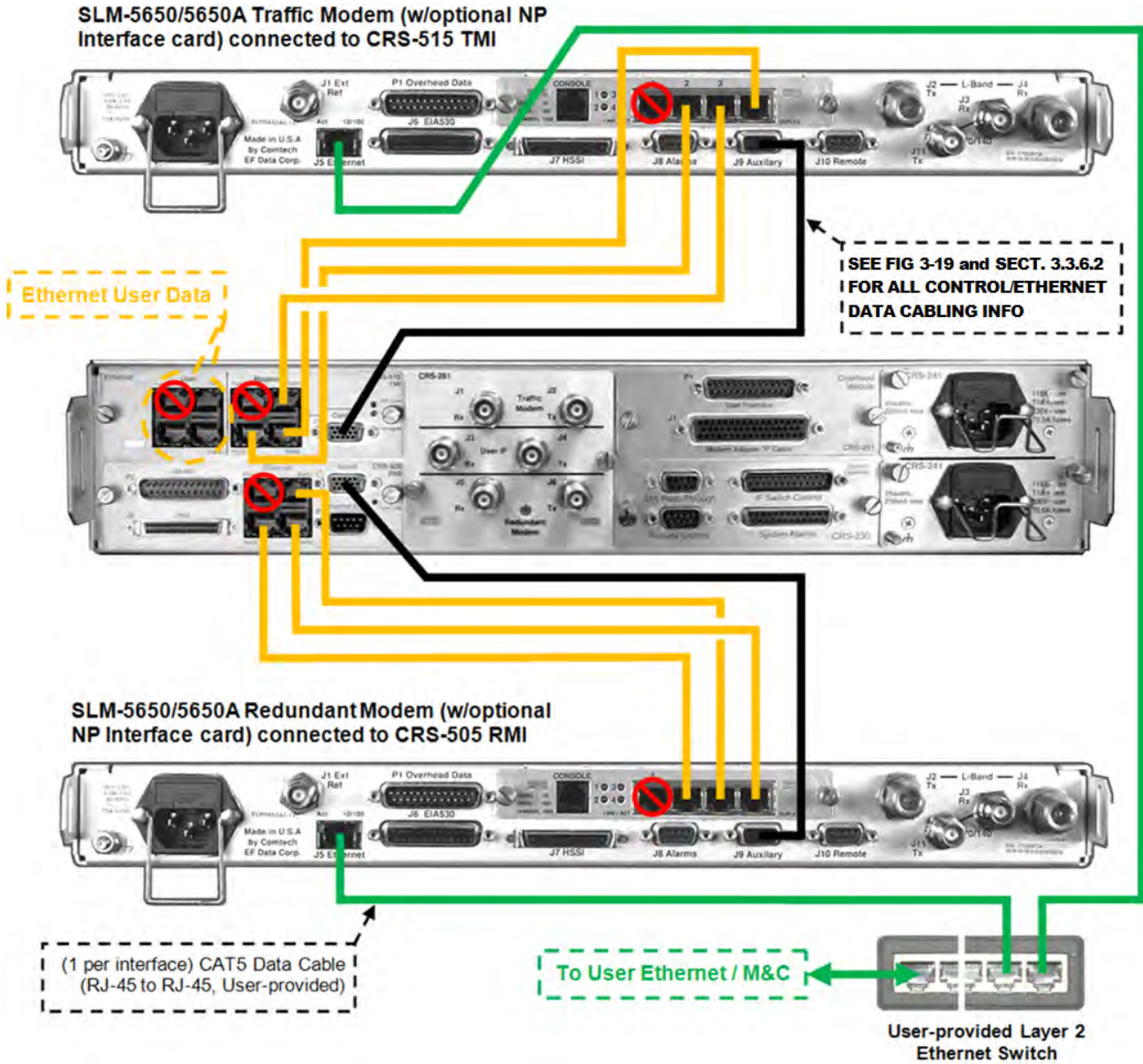
Figure 3-14. SLM-5650/5650A Ethernet M&C Cabling – Optional NP Interface Using Multi-Port Ethernet Bridge Mode

Figure 3-15. SLM-5650/5650A Ethernet M&C Cabling – Optional NP Interface Using Multi-Port Ethernet Router Mode
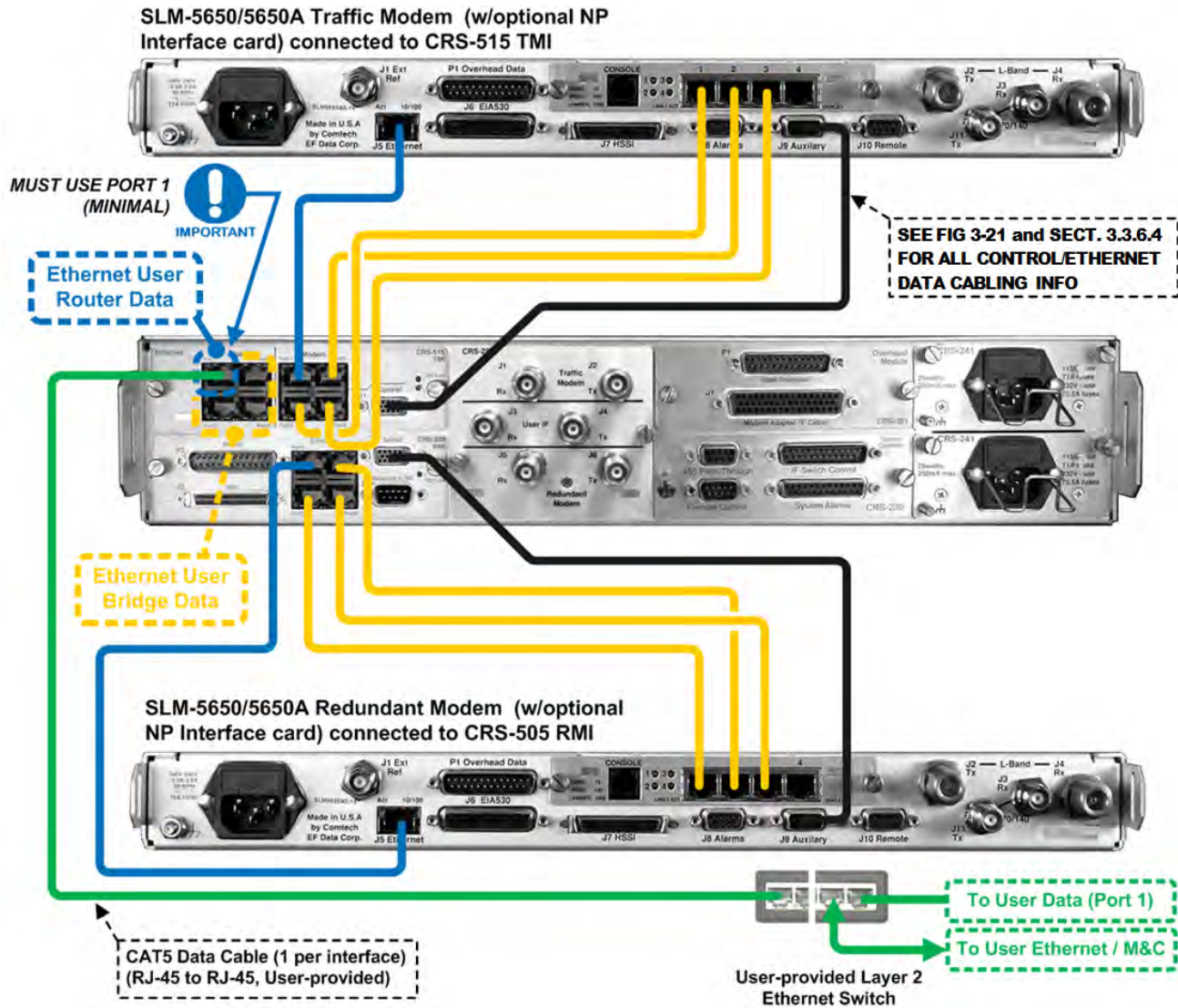
Figure 3-16. SLM-5650/5650A Ethernet M&C Cabling – Optional NP Interface Using Multi-Port Ethernet BPM Mode

3.3.6   Ethernet Data Traffic Connections – CRS-311 to Modems

3.3.6.1   Ethernet Bridge Mode Data Traffic via the Optional GbE Interface

When the SLM-5650/5605A modems are equipped with the optional single-port 10/100/1000 BaseT (GbE) Interface Module, **Single-Port Ethernet Bridge Mode** is possible:

- **Configuration 'A'** – Referring to **Figure 3-17**, when the CRS-311 is configured with the CRS-306 or CRS-307 RMI and CRS-316 or CRS-336 TMI, connect and secure all PP/CAT5FF3FTGY CAT5 Data Cables as follows:

    o From the RJ-45 connector labeled "J5" on the RMI or TMI, to the RJ-45 connector labeled "J1" on the Redundant or Traffic Modem optional GbE Interface Module.

- **Configuration 'B'** – Referring to **Figure 3-18**, when the CRS-311 is configured with the CRS-505 RMI and CRS-515 TMI, connect and secure all PP/CAT5FF3FTGY CAT5 Data Cables as follows:

    o From the RJ-45 connector labeled "Port 2" on the RMI or TMI to the RJ-45 connector labeled "J1" on the Redundant or Traffic Modem optional GbE Interface Module.

> ***Do not connect to Port 1 on the RMI or TMI when operating in Single-Port Ethernet Bridge Mode.***

3.3.6.2   Ethernet Bridge Mode Data Traffic via the Optional Network Processor (NP) Interface

When the SLM-5650/5605A modems are equipped with the optional multi-port Network Processor (NP) Interface Module, **Multi-Port Ethernet Bridge Mode** is possible.

Referring to **Figure 3-19**, connect and secure all PP/CAT5FF3FTGY CAT5 Data Cables as follows:

- From the RJ-45 connectors labeled "Port 2" through "Port 4" on the RMI or TMI, to the RJ-45 connectors labeled "Port 2" through "Port 4" on the Redundant or Traffic Modem optional Network Processor (NP) Interface Module.

> ***Do not connect to "Port 1" on the RMI, TMI, or to Port "1" on the optional Network Processor (NP) Interface when operating in Multi-Port Ethernet Bridge Mode.***

3.3.6.3 Ethernet Router Mode Data Traffic via the Optional Network Processor (NP) Interface

When the SLM-5650/5605A modems are equipped with the optional multi-port Network Processor (NP) Interface Module, **Multi-Port Ethernet Router Mode** is possible.

Referring to **Figure 3-20**, connect and secure all PP/CAT5FF3FTGY CAT5 Data Cables as follows:

- From the RJ-45 connectors labeled "Port 1" through "Port 4" on the RMI or TMI, to the RJ-45 connectors ports labeled "1" through "4" on the Redundant or Traffic Modem optional Network Processor (NP) Interface Module.

3.3.6.4 Ethernet BPM Mode Data Traffic via the Optional Network Processor (NP) Interface

Appendix E, Sect. E.3 Network Processor (NP) Interface BPM (Bridge Point-to-Multipoint) Mode *in the* **SLM-5650A Satellite Modem Installation and Operation Manual** *(CEFD P/N MN-SLM5650A)*

When the SLM-5650/5605A modems are equipped with the optional multi-port Network Processor (NP) Interface Module, **Ethernet BPM Mode** is possible.

Referring to **Figure 3-21** , connect and secure all PP/CAT5FF3FTGY CAT5 Data Cables as follows:

- From the RJ-45 connector labeled "Port 1" on the RMI or TMI, to the RJ-45 connector labeled "J5 Ethernet" port on the Redundant or Traffic Modem.

- From the RJ-45 connectors labeled "Port 2", "Port 3", and "Port 4" on the RMI or TMI, to the RJ-45 connectors ports labeled "1", "2", and "3" on the Redundant or Traffic Modem optional Network Processor (NP) Interface Module.
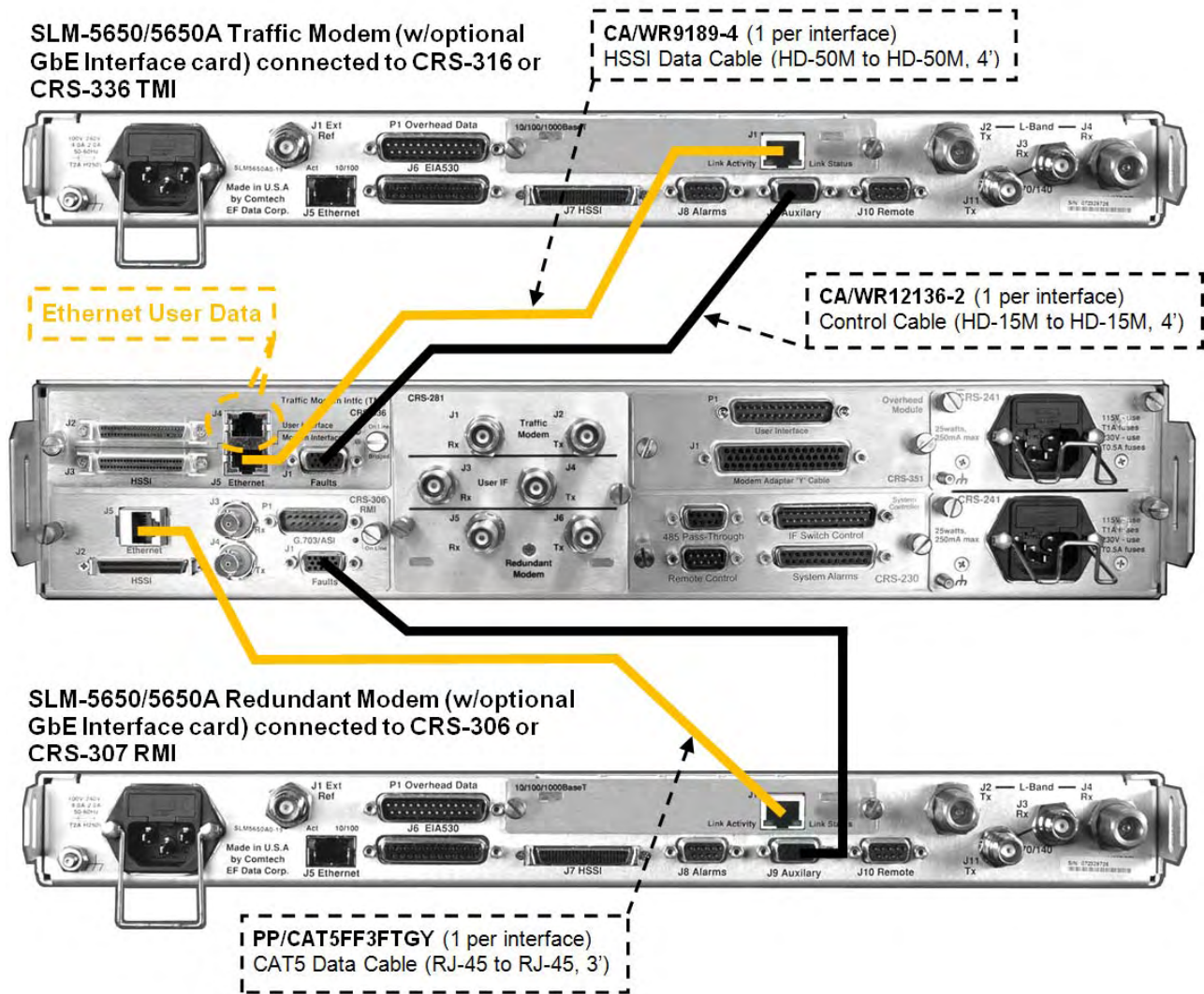
Figure 3-17. SLM-5650/5650A Control and Ethernet Data Traffic Cables – Optional GbE Interface Using Single-Port Ethernet Bridge Mode (Configuration 'A')
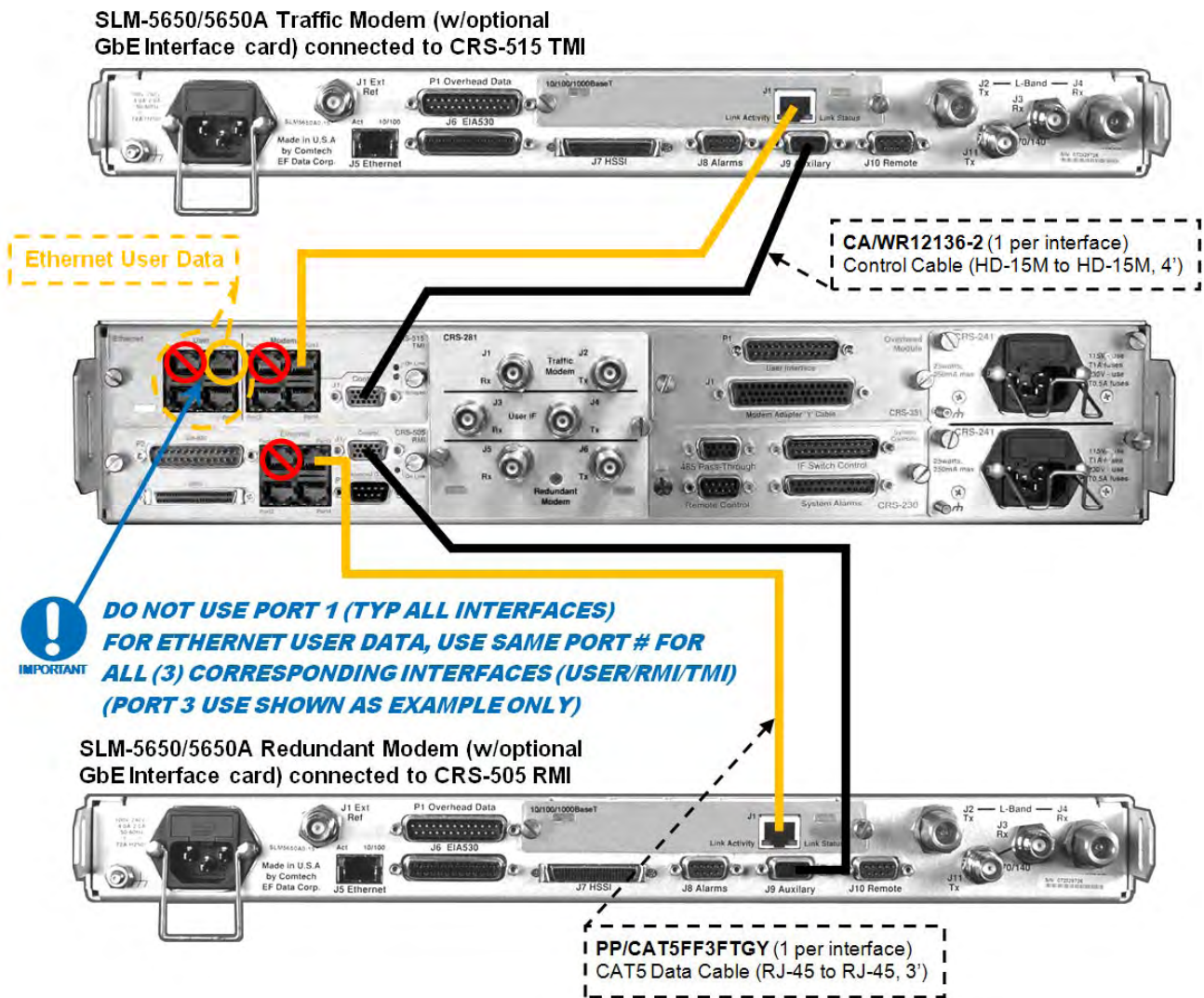
Figure 3-18. SLM-5650/5650A Control and Ethernet Data Traffic Cables – Optional GbE Interface Using Single-Port Ethernet Bridge Mode (Configuration 'B')
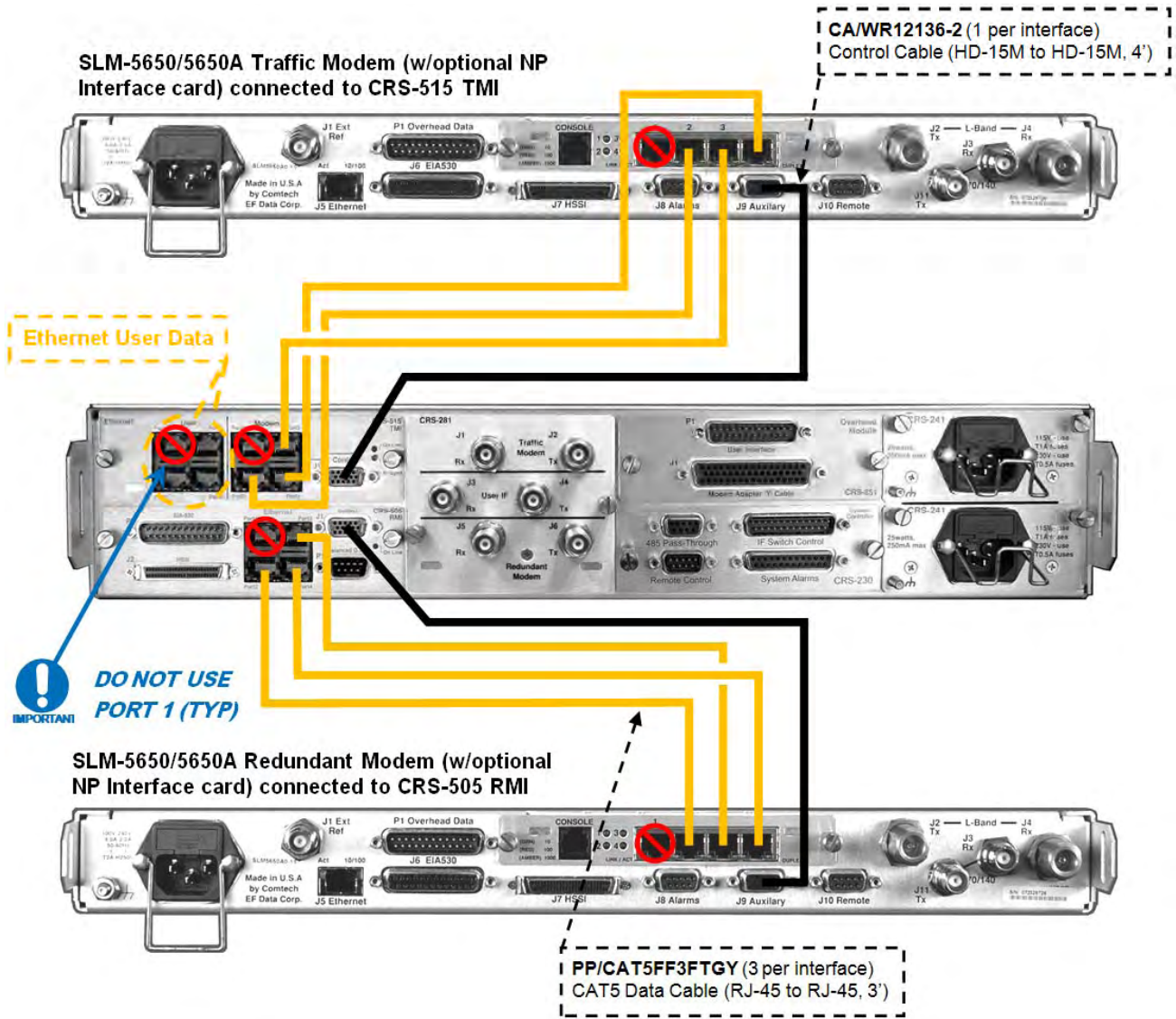
Figure 3-19. SLM-5650/5650A Control and Ethernet TrafficData Cables – Optional NP Interface Using Multi-Port Ethernet Bridge Mode
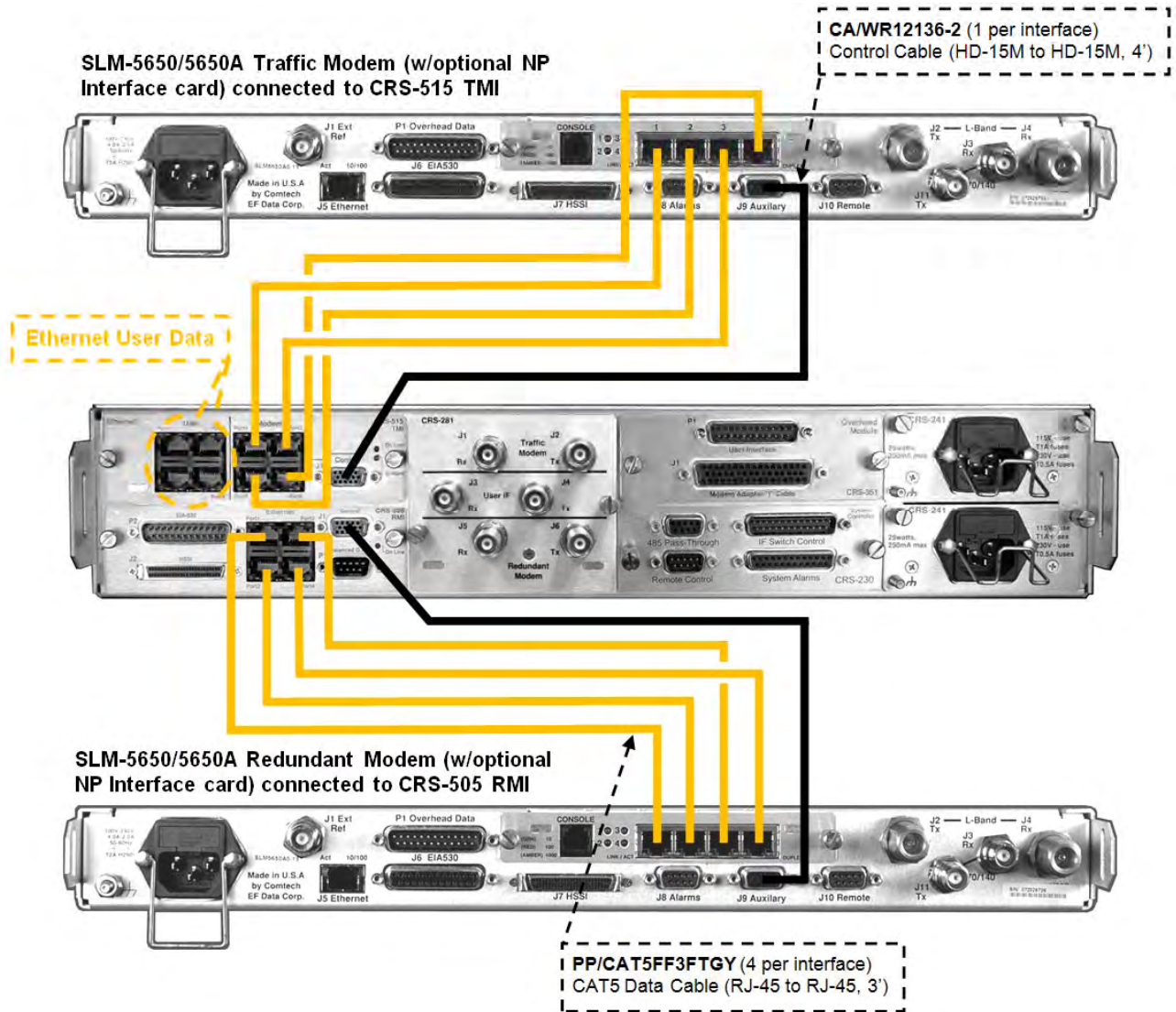
Figure 3-20. SLM-5650/5650A Control and Ethernet Data Traffic Cables – Optional NP Interface Using Multi-Port Ethernet Router Mode
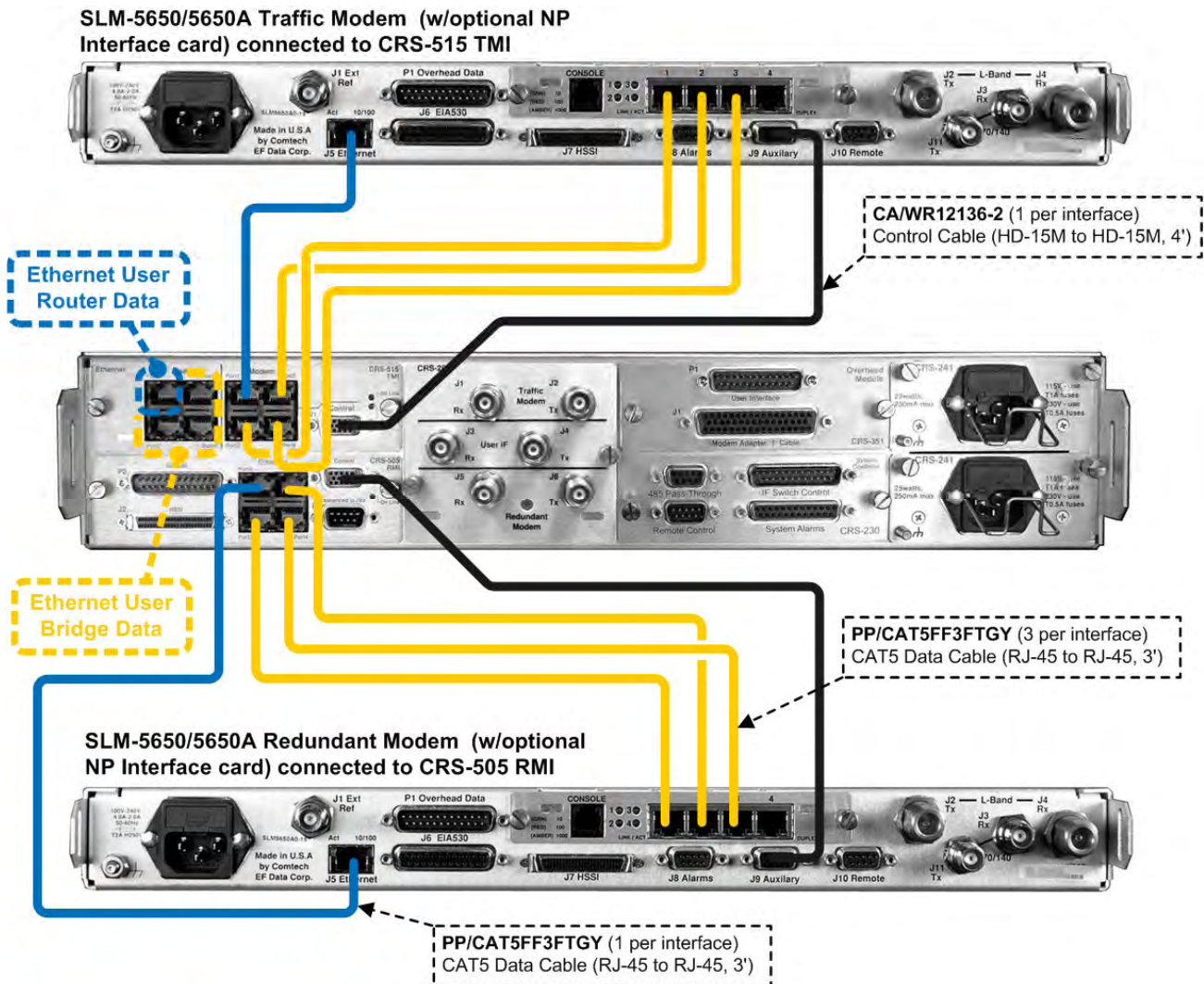
Figure 3-21. SLM-5650/5650A Control and Ethernet Data Traffic Cables – Optional NP Interface Using Multi-Port Ethernet BPM Mode

3.3.7 Overhead Data Connections – CRS-351 Module to Modems

Your equipment should be connected to the "P1 User Interface" port on the CRS-351 Overhead Switch Module. This replaces the direct connection to the Traffic Modem's "P1 Overhead Data" port.

Referring to **Figure 3-22***:*

Connect and secure the CA-0000006 Control 'Y' Cable between the CRS-351 module and the SLM-5650/5650A modems as follows:

- DB-50F connector labeled "J1 Modem Adapter 'Y' Cable" on the CRS-351 module, and

- DB-25M "P1 Overhead Data" connectors on the SLM-5650/5650A Traffic and Redundant modems.
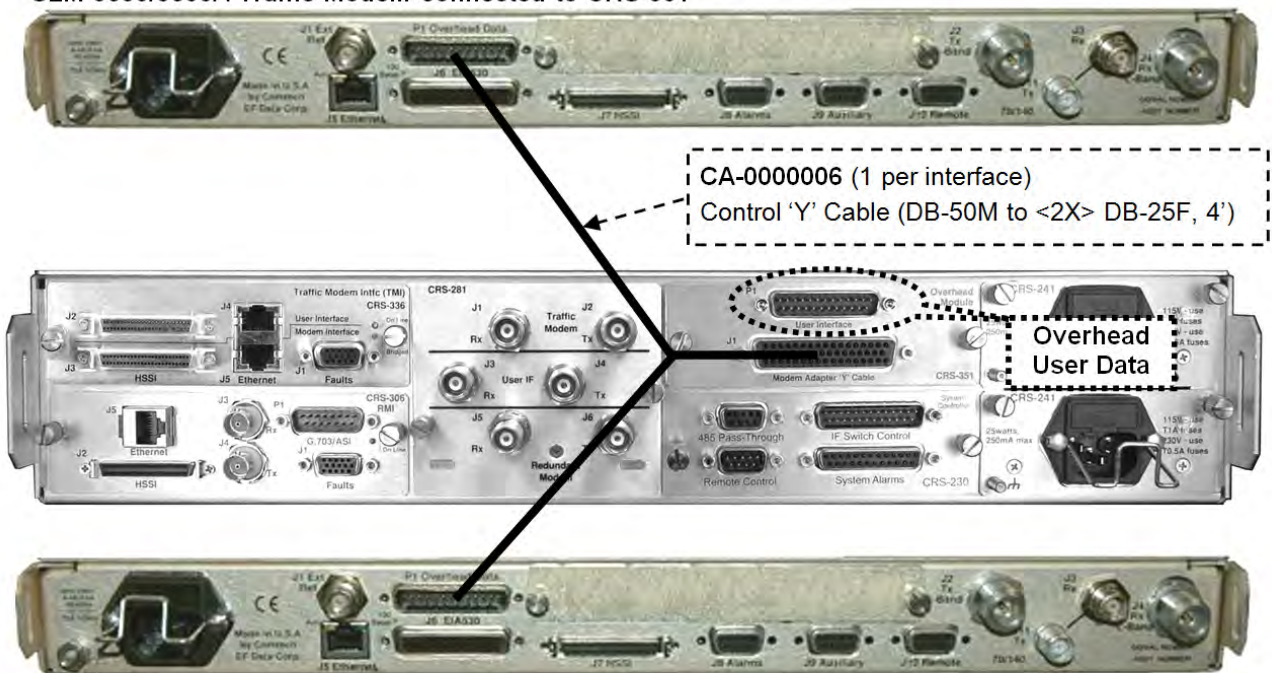
Figure 3-22. SLM-5650/5650A Overhead Data Cables

3.3.8   IF Connections – User to CRS-281x to Modems

The CRS-281x modules connect the online modulator's Tx IF signal to your RF Up Converter. It also passively splits the receive IF signal to provide both demodulators with the same IF signal coming from the LNB, thus reducing switching time.

- ***Referring to Figure 3-23,*** the SLM-5650/5650A uses the CRS-281 IF Switch Module with 50Ω TNC connectors for 70/140MHz IF switching.

- ***Referring to Figure 3-24,*** the SLM-5650/5650A uses the CRS-281L IF Switch Module for L-Band with Type-N connectors.

- ***Referring to Figure 3-23 and Figure 3-24,*** connect and secure the IF cable pairs (CA/3005-3 TNC or CA/RF10453-4 Type-N) between your Up/Down Converters, CRS-311, and SLM-5650/5650A modems as follows:
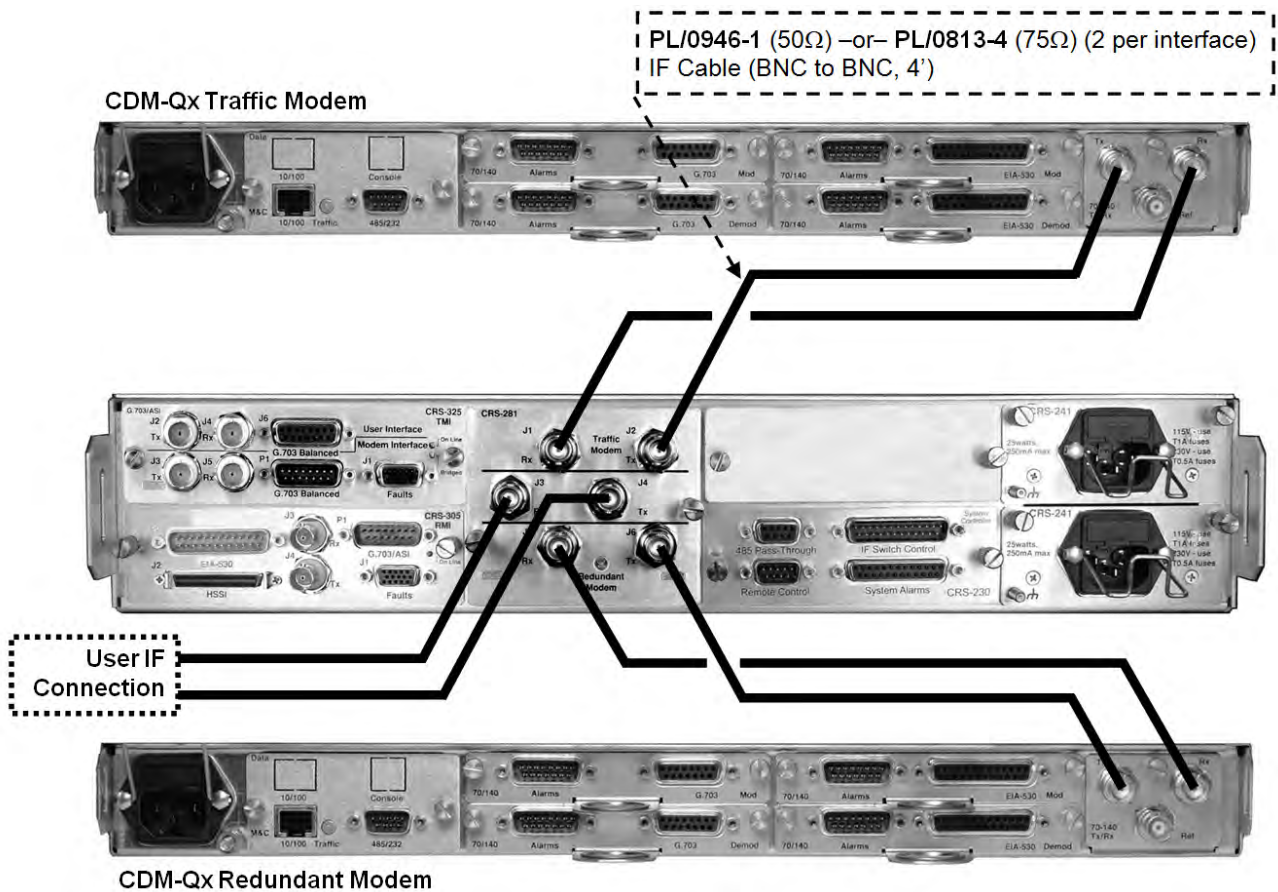
Traffic Modem Connections:

- From the SLM-5650/5650A "J3 Rx" (70/140 MHz) or "J4 Rx" (L-Band) connector, to the CRS-281x Switch Module connector labeled "J1 Rx", and

- From the SLM-5650/5650A "J1 Tx" (70/140 MHz) or "J2 Tx" (L-Band) connector, to the CRS-281x Switch Module connector labeled "J2 Tx".

User Connections:

- From your Down Converter to the CRS-281x Switch Module connector labeled "J3 Rx", and

- From your Up Converter to the CRS-281x Switch Module connector labeled "J4 Tx".

Redundant Modem Connections:

- From the SLM-5650/5650A "J3 Rx" (70/140 MHz) or "J4 Rx" (L-Band) connector, to the CRS-281x Switch Module connector labeled "J5 Rx", and

- From the SLM-5650/5650A "J1 Tx" (70/140 MHz) or "J2 Tx" (L-Band) connector, to the CRS-281x Switch Module connector labeled "J6 Tx".

Mixed IF Bands for Tx/Rx:

*The SLM-5650/5650A modem permits simultaneous operation of the Tx IF and Rx IF bands at 70/140 MHz and L-Band frequencies, independent of one another. If you want the Tx and Rx to be of different IF bands, the CRS-281x module must be selected based on the <u>Tx IF band.</u> An external splitter is then used for the Rx IF band when that side differs from the Tx IF band – See **Figure 3-25** and **Figure 3-26** for these mixed-use configuration examples.*
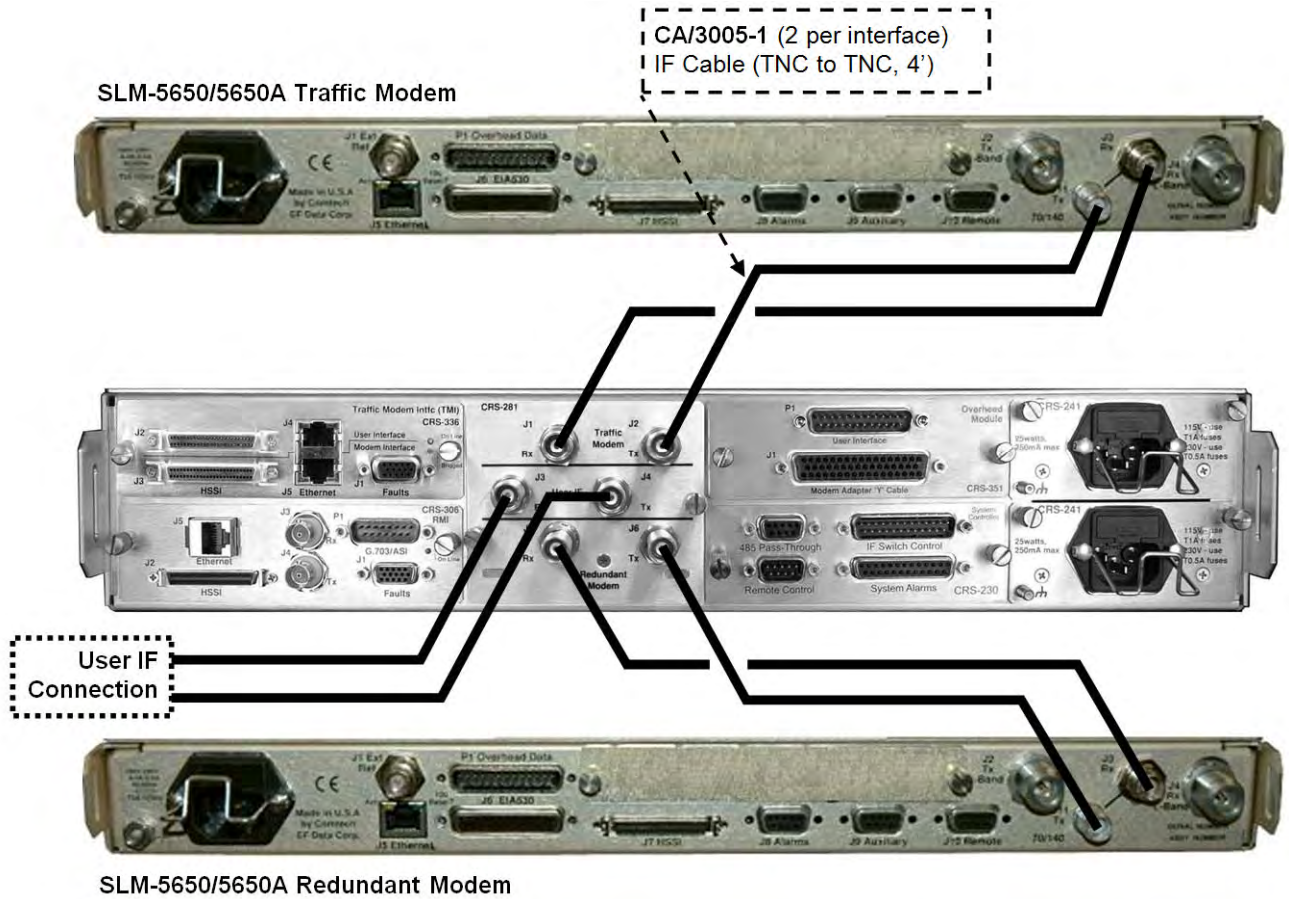
Figure 3-23. SLM-5650/5650A IF Cabling Example – CRS-281 (70/140 MHz)
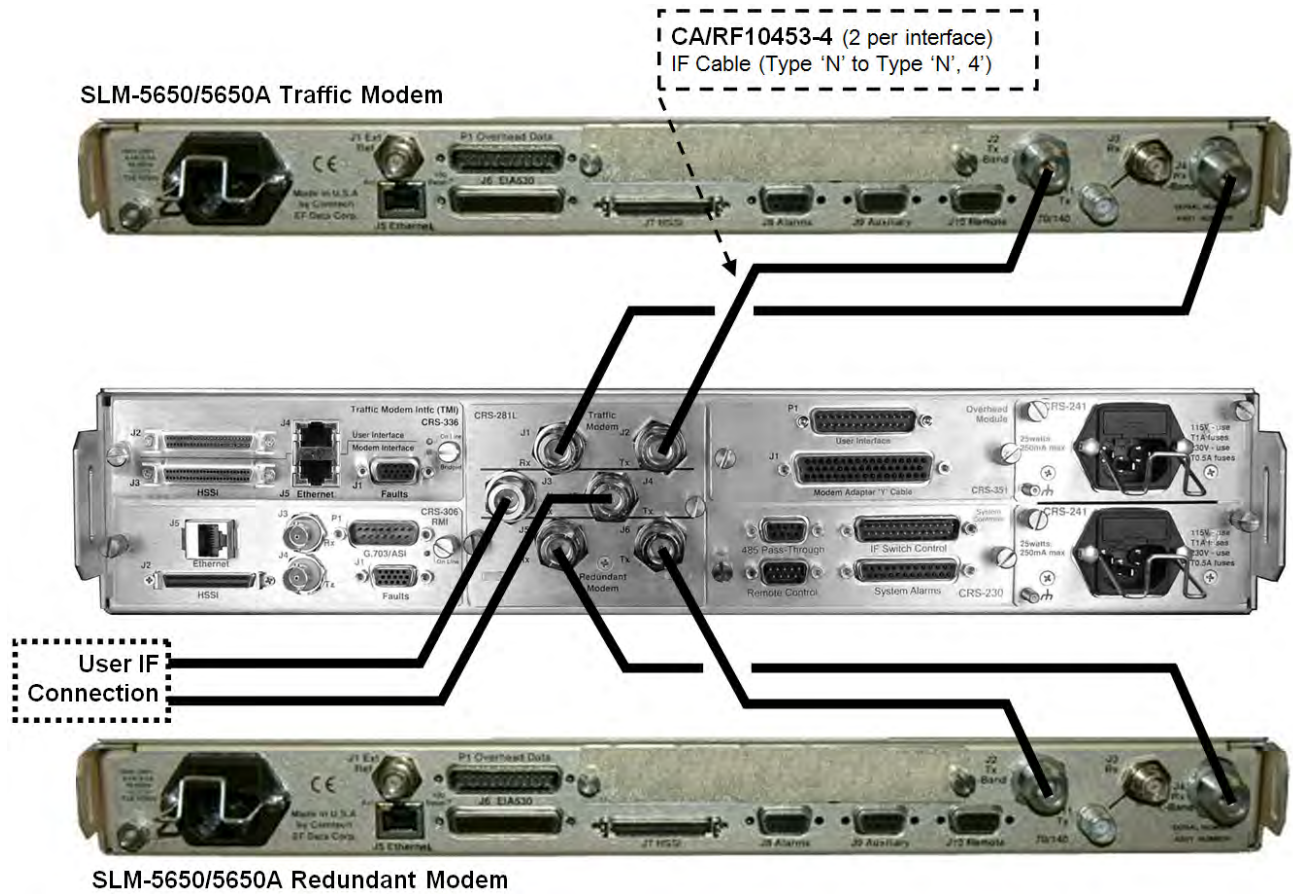
Figure 3-24. SLM-5650/5650A IF Cabling Example – CRS-281L (L-Band)
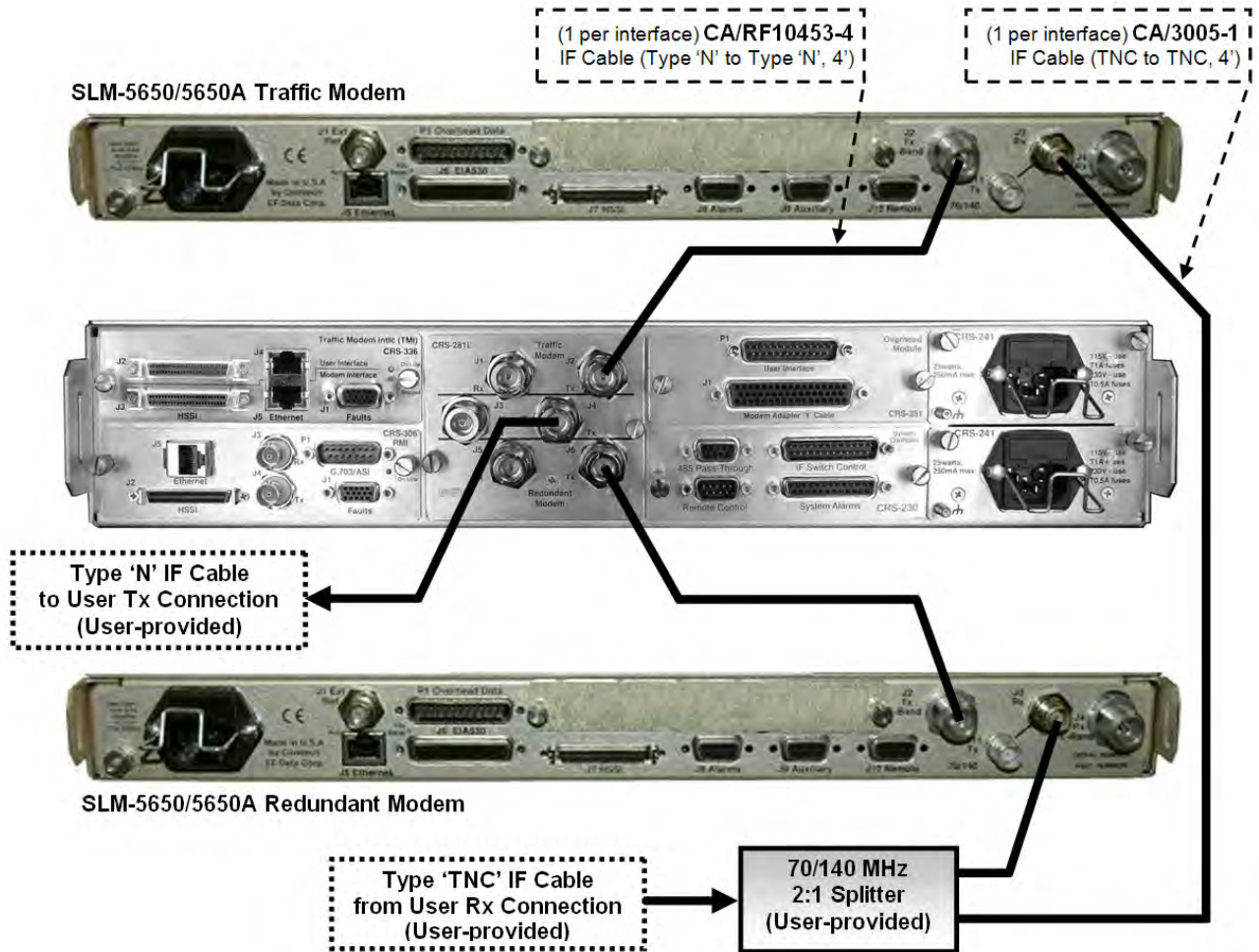
**Figure 3-25. SLM-5650/5650A Mixed IF Band Cabling Example – CRS-281 'TNC'
(70/140 MHz Tx, L-Band Rx)**
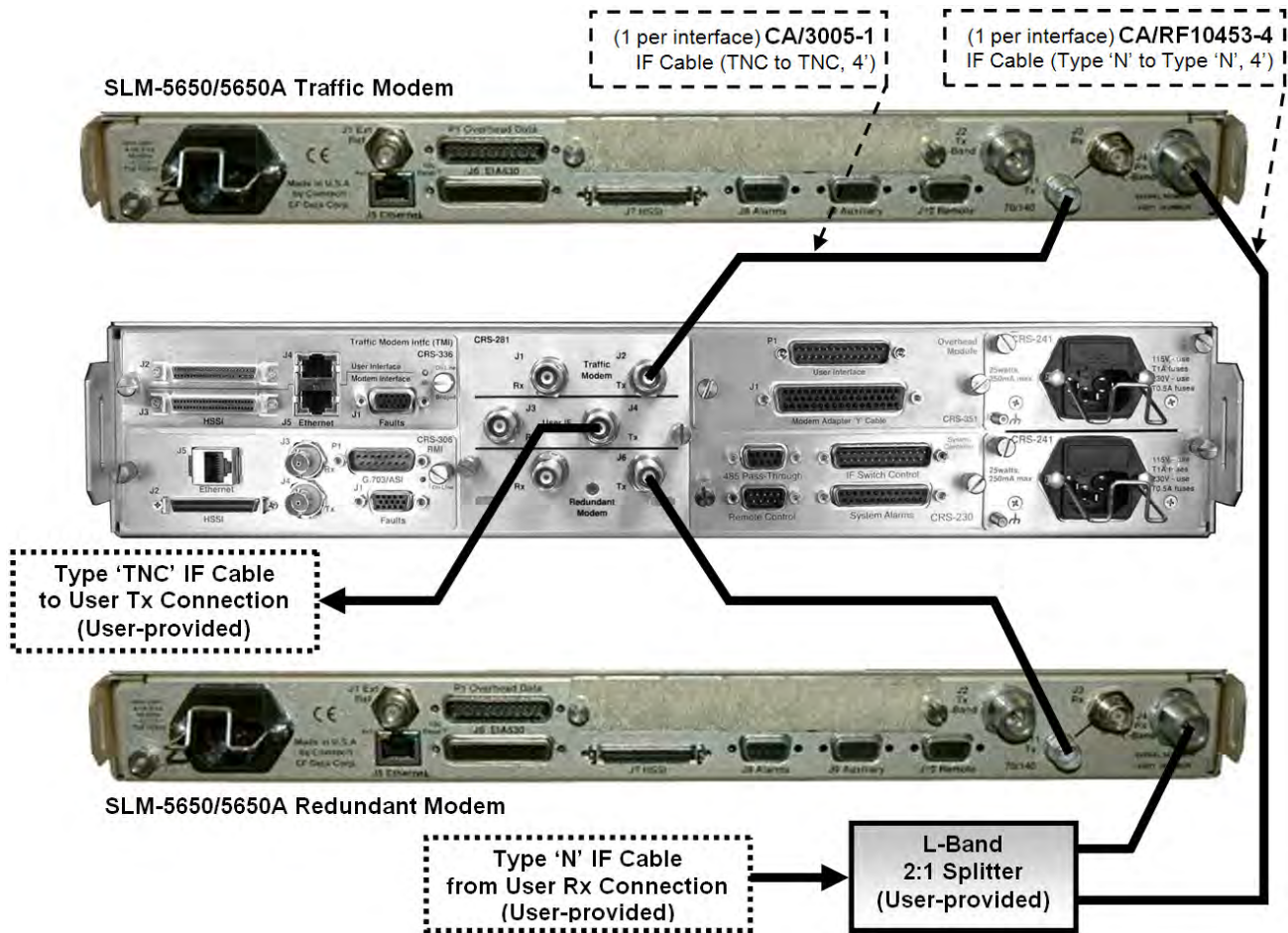
Figure 3-26. SLM-5650/5650A Mixed IF Band Cabling Example – CRS-281L (70/140 MHz Tx, L-Band Rx)

Chapter 4. MODEM, RMI/TMI, AND SWITCH CONFIGURATION

4.1   Overview

In order to avoid damage to the modems and the CRS-311 1:1 Redundancy Switch, it is important that you follow this sequence of configuration:

- **First**, *connect cables between the (powered OFF) modems and Switch as outlined in* Chapter 3. CABLES AND CONNECTIONS.

- **Second**, *configure the modems for 1:1 redundant operation as outlined in this chapter in* Sect. 4.2 Modem Configuration.

- **Third**, *when using SLM-5650/5650A modems for 1:1 redundant operation: If needed, configure the Switch RMI/TMI modules as outlined in this chapter in* Sect. 4.3 RMI Jumper Configuration Reference (CRS-505) *and* Sect. 4.4 TMI Jumper Configuration Reference (CRS-515).

- **Fourth**, *once you properly configure the modems and Switch RMI/TMI modules for 1:1 redundant operation, you should then set the CRS-311 for proper operation via the front panel, as outlined in this chapter in* Sect. 4.5. Switch Configuration.

4.2   Modem Configuration

4.2.1 Modem Power

Connect the power cords of each modem to a power supply and turn both modems **ON**.

4.2.2 Modem Firmware and Hardware Requirements

For the CRS-311 to operate correctly when configured for use with the CDM-Qx/QxL or SLM-5650/5650A modems, the Traffic Modem and the Redundant Modem must be of the same model having identical hardware configurations, equipped with the same option modules – all with the same firmware versions. This is mandatory for the Redundant Modem to properly mimic operation of the Traffic Modem upon switchover.

CDM-Qx/QxL Firmware and Hardware Requirements: For proper redundant operation, regardless of data interface, CDM-Qx/QxL **Firmware Version 1.1.4 or later** must be used.

SLM5650/5650A Firmware and Hardware Requirements: In order to support the desired redundancy, the appropriate firmware must be loaded in the SLM-5650/5650A base modem, Network Processor (if applicable) and CRS-311. Higher versions of the firmware continue support for the given interface (i.e. the highest version supports all interfaces); the lowest firmware versions, required to support a given interface type, are as follows:

Interface Type	SLM-5650 Base Modem	SLM-5650A Base Modem	10/100/1000 Base-T (GbE) Interface Module	Network Processor Module	CRS-311
Serial (EIA-232/HSSI)	1.2.4	1.1.1	N/A	N/A	1.2.5
Ethernet (Single-port Ethernet Bridge Mode using 10/100/1000 Base-T Module)	1.2.4	1.1.3	1.1.2	N/A	1.2.5
Ethernet (Single-port Ethernet Bridge Mode using Port 1 of 4-port NP Module)	1.5.1	1.1.8	N/A	1.5.1	1.2.5
Ethernet (Ethernet Bridge or Router Mode using 4-port NP Module)	1.5.1	1.1.8	N/A	1.5.1	1.2.6
Ethernet (Vipersat mode, or Single-port Ethernet Router Mode)	1.5.1	1.1.8	N/A	1.5.1	1.2.6

4.2.2.1   Flash Upgrading

For detailed instructions on upgrading modem firmware via flash upgrade, See the pertinent modem's *Installation and Operation Manual*.

4.2.3 Modem Operational Configuration

This chapter assumes user familiarity with the individual modems' front panel menu navigation, and their configuration parameter selection methods. For detailed instructions on changing configuration settings using the front panel keypad and menus, see the *Front Panel Operation* chapter in the pertinent modem's *Installation and Operation Manual*.

Using the modem's manual, configure the Traffic Modem for the proper Rx and Tx IF, power settings, modulation, code rates, and traffic data settings.

> *If the modem does not meet these listed requirements, contact Comtech EF Data. Firmware upgrades are free and you may download these files from the CEFD Web page. Hardware revision upgrades must be performed at CEFD.*

For User-to-Switch or User-to-Modem addressing schemes, see **Appendix C. Addressing Scheme Information**.

4.2.4 Modem Redundancy Configuration

4.2.4.1 Switch to CDM-Qx/QxL Redundancy Configuration

The CRS-311-to-CDM-Qx/QxL redundancy configuration uses an external EIA-485 multi-drop communication cable.

The CDM-Qx/QxL can be configured in many different ways, but for a CRS-311 application, the CDM-Qx/QxL should be configured only as one modem – i.e., containing one modulator and one demodulator module, which must be *grouped* to act as a modem. See the *CDM-Qx/QxL Installation and Operation Manual* for more information.

As shown in **Figure 4-1**, Modem 1 resides in Slots 1 and 2. Modem 2 is contained in Slots 3 and 4. The Switch can use either modem.

(Top) Front Panel
(Bottom) Rear Panel Schematic
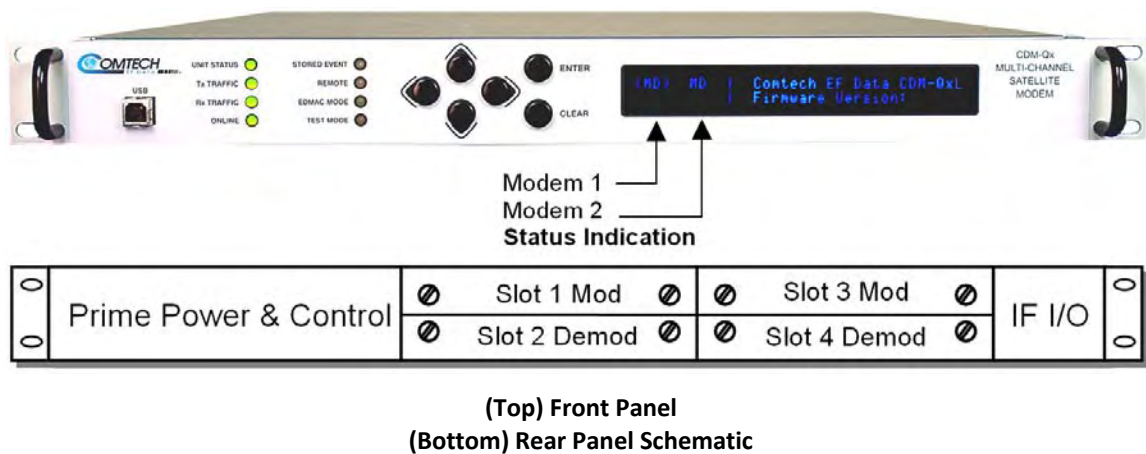
Figure 4-1. CDM-Qx/QxL Serial Communication Configuration

The CDM-Qx/QxL chassis has a configurable EIA-485 base address – which applies for Modem 1 – and an offset, which is added to the base-address if addressing Modem 2. The EIA-485 addresses are selected via the front panel menu: **CONFIG → REMOTE**.

The Switch addresses each CDM-Qx/QxL modem based on which TMI it is attached to, with addresses at increments of 100. For example, with a Switch with address 0, the Qx/QxL Traffic

Modem has address 0100, and the Redundant Modem uses address 1100. See **Figure 4-2** and **Appendix C. Addressing Scheme Information** for more information.

Once the addressing scheme is understood, proceed as follows:

Step	Task
1	Configure COMMs on each modem via the *modem* front panel menu as follows: CONFIG ➔ REMOTE: RS-485-4W, 9600 baud, format 8-N-1.
2	Set the EIA-485 base address and offset, per **Appendix C. Addressing Scheme Information**.

See the *CDM-Qx Installation and Operation Manual* for detailed configuration information.
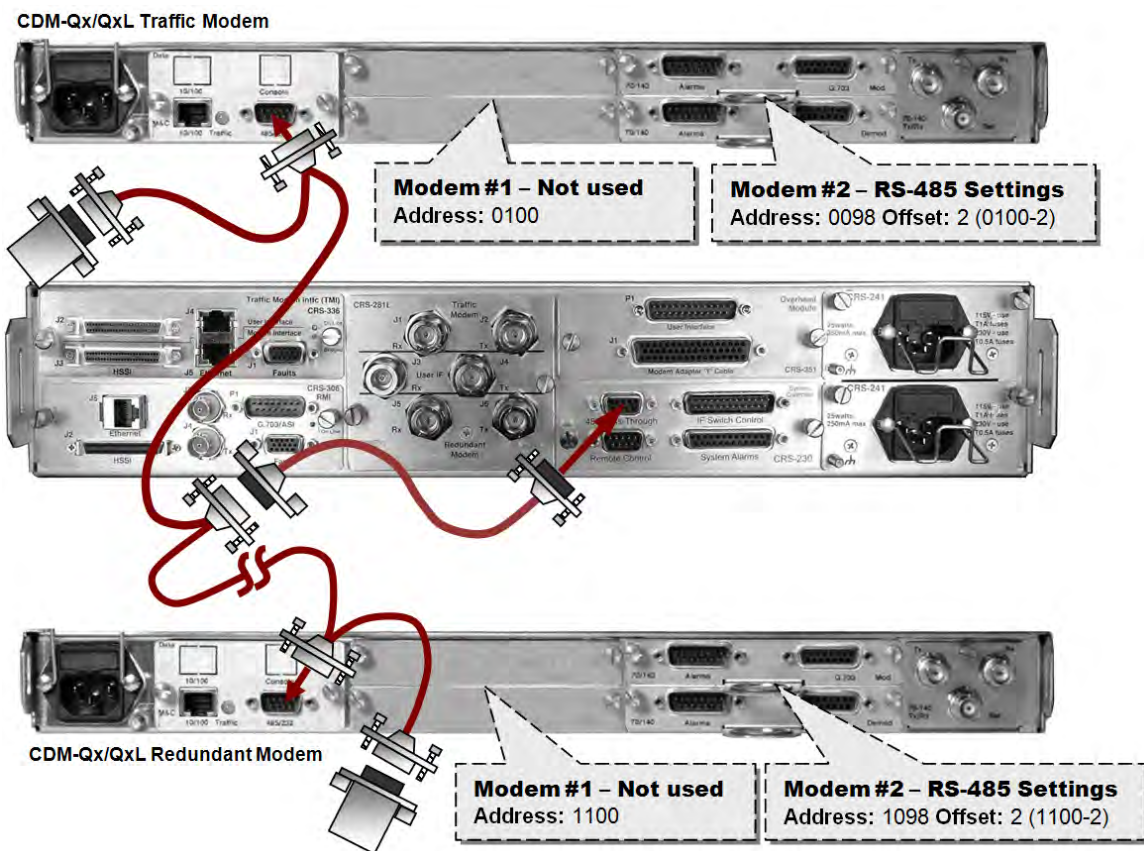
Figure 4-2. CDM-Qx/QxL / CRS-311 EIA-485 Scheme

In this example, the EIA-485 offset address does not affect Modem #1, so the offset can be 1-99 without affecting other Modem's EIA-485 addresses.

4.2.4.2   Switch to SLM-5650/5650A Redundancy Configuration

4.2.4.2.1   TTL (Switch) Configuration (For All Traffic Data Types)

The CRS-311 communicates to the Redundant and Traffic modems via a serial TTL bus contained within the HD-15 "J9 Auxiliary" connector on the modem's rear panel. An HD-15M to HD-15F Control Cable connects each modem to the CRS-311.

To use 1:1 redundancy, the SLM-5650/5650A must have communications configured to TTL (Switch) in order to communicate with the CRS-311.

Follow these steps to set the serial interface:

Step	Task
1	From the SLM-5650/5650A front panel menu, navigate to **Config: Remote → SerialConfig**.
2	Set **Interface** to **TTL (SWITCH)**.
3	Set **Format** to **8N1**.
4	Set **Baudrate** to **9600** Baud.
5	Verify that Traffic Modem is **ONLINE** and the Redundant Modem is **OFFLINE**.

For detailed information on using the front panel menus, see **Chapter 5. FRONT PANEL OPERATION** in the *SLM-5650 or the SLM-5650A Installation and Operation Manual*.

4.2.4.2.2   Ethernet Router Mode Configuration via Optional Network Processor (NP) Interface

Ethernet Router Mode redundancy, when using SLM-5650/5650A modems equipped with the optional Network Processor (NP) Interface, is provided by a Dual IP Addresses scheme. In Ethernet Router Mode, a Single IP Address should NOT be used and will be automatically overwritten by the modem. You must verify that the modems are in Dual IP Address Mode.

Follow these steps to verify the Dual IP Address Mode on the Online Modem:

Step	Task
1	From the SLM-5650/5650A front panel, navigate to **Config: Remote → EthernetConfig → Option Card Addr →Network Proc**.
2	Verify that the **Mode** is set to **DUAL**.

A traffic IP Address is used as the gateway for networked devices. The traffic IP address always "floats" with whichever modem is online. The traffic IP address on the Offline Modem is inactivated.

Follow these steps to enter the "shared" traffic IP address on the Online Modem:

Step	Task
1	From the SLM-5650/5650A front panel, navigate to **Config: Remote** ➔ **EthernetConfig** ➔ **Option Card Addr** ➔**Network Proc**.
2	Set the **Traffic IP** Address of the **Online** Modem *only.*
3	Verify that the **Traffic IP** Address also appears on the **Offline** Modem.

> ***The Traffic IP Address for both modems is "shared", but only the Online Modem activates the Traffic IP Address. In addition, each modem must be given a unique Management IP Address that does not float with Online/Offline status.***

The modem uses the Management IP Addresses to mirror parameters. Upon boot up, the Offline Modem requests a parameter update from the Online Modem. The Online Modem sends the parameter update to the Offline Modem using the LAN. In addition, when you save the online Network Processor parameters, the Online Modem sends parameter updates to the Offline Modem. The Offline Modem receives parameter updates, updates itself, and then saves those updated parameters in Flash memory.

Follow these steps to enter the Management IP Address on the **Online** Modem:

Step	Task
1	From the SLM-5650/5650A front panel, navigate to **Config: Remote** ➔ **EthernetConfig** ➔ **Option Card Addr** ➔**Network Proc**.
2	Set the Management IP Address (**Mgmt IP**) of the **Online** Modem.

Follow these steps to enter the Management IP Address on the **Offline** Modem:

Step	Task
1	From the SLM-5650/5650A front panel, navigate to **Config: Remote** ➔ **EthernetConfig** ➔ **Option Card Addr** ➔**Network Proc**.
2	Set the Management IP Address (**Mgmt IP**) of the **Offline** Modem.

> ***The Management IP Addresses must be unique for both modems, but must be on the same subnet.***

The Online Modem always sends a gratuitous ARP for the Traffic IP Address when it comes online. This causes networked device on the LAN to update their ARP tables and start sending their IP traffic to the Online Modem.

The Offline Modem always filters all IP packets received from the WAN that are destined to LAN. This keeps duplicate IP packets off the LAN. In addition, the offline Network Processor changes all its WAN routes so that their "Next Hop IP Address" is the Online Modem's management IP address. This allows remote access to the offline Network Processor from both the LAN interface and WAN interface.

4.2.4.2.3 Ethernet Bridge Mode Configuration via Optional Network Processor (NP) Interface

Ethernet Bridge Mode redundancy, when using SLM-5650/5650A modems equipped with the optional Network Processor (NP) Interface, is provided by a single IP address scheme.

Follow these steps to verify Single IP Address Mode on the **Online** Modem:

Step	Task
1	From the SLM-5650A front panel, navigate to **Config: Remote** → **EthernetConfig** → **Option Card Addr** → **Network Proc**.
2	Verify that the **Mode** appears as **Single**.

Follow these steps to verify Single IP Address Mode on the **Offline** Modem:

Step	Task
1	From the SLM-5650A front panel, navigate to **Config: Remote** → **EthernetConfig** → **Option Card Addr** → **Network Proc**.
2	Set the **Traffic IP** Address of the **Online** Modem *only.*
3	Verify that the **Traffic IP** Address also appears on the **Offline** Modem.

In Ethernet Bridge Mode, the CRS-311 will keep the Online Modem's Ethernet Ports 2-4 turned **on**. The CRS-311 will keep the Offline Modem's Ethernet Ports 2-4 turned **off**. The traffic IP address is only accessible on the Online Modem; there is **NO** access to the Offline Modem.

Furthermore, in Ethernet Bridge Mode, the parameter backup mechanism is unsupported; therefore, you must make sure that all parameters match in the Online and Offline modems.

See the *SLM-5650* or the *SLM-5650A Installation and Operation Manual* for detailed configuration information.

4.2.4.2.4 Ethernet Bridge Mode Configuration via Optional GbE Interface

Ethernet Bridge Mode redundancy, when using SLM-5650/5650 modems equipped with the optional 10/100/1000 Base-T (GbE) Interface, is provided by a Single IP Address scheme.

To configure the SLM-5650/5650A for Ethernet Bridge Mode 1:1 redundancy, for each modem enter a unique IP Address for the optional 10/100/1000 Base-T (GbE) Interface Module that is on the same subnet:

CONFIG → MODE → INTERFACE → GIGABIT ETHERNET

See the *SLM-5650 or the SLM-5650A Installation and Operation Manual* for detailed configuration information.

4.3   RMI Jumper Configuration Reference (CRS-505)

This section is provided for RMI identification purposes only. All RMIs are shipped preconfigured and do not require user adjustments.

The CRS-505 RMI (CEFD P/N PL-0000293) comes preconfigured for proper operation with the CRS-311 1:1 Redundancy Switch using SLM-5650/5650A modems. Configuration of the 'JMP1' jumper setting on the PCB determines whether the module is configured for use with the CRS-311 1:1 Redundancy Switch, or for use with the CRS-500 M:N Redundancy System. **Figure 4-3** shows the 'JMP1' jumper location identified on the CRS-505 PCB.

Figure 4-3. CEFD P/N PL-0000293 CRS-505 RMI PCB

Table 4-1 illustrates the 'JMP1' jumper settings that are factory-set for each RMI that is used with the CRS-311 1:1 Redundancy Switch and SLM-5650/5650A modems.

Table 4-1. CRS-505 RMI Factory-configured Jumper Settings

CRS-505 Jumper 'JMP1' Control Settings	
CRS-500 *Pins 1 to 2 jumped*	CRS-311 *Pins 3 to 4 jumped* **AS SHIPPED**

4.4 TMI Jumper Configuration Reference (CRS-515)

This section is provided for TMI identification purposes only. All TMIs are shipped preconfigured and do not require user adjustments.

The CRS-515 TMI (CEFD P/N PL-0000294) comes preconfigured for proper operation with the CRS-311 1:1 Redundancy Switch using SLM-5650/5650A modems. **Figure 4-4** shows (from left) the 'JMP3' and 'JMP1' jumper location identified on the CRS-515 PCB. Configuration of the jumper setting determines the designated operation:

- The 'JMP3' pin group 1-4 establishes operation of the TMI for use with the CDM-750 or SLM-5650/5650A modems.

- The 'JMP1' pin group 1-4 establishes operation of the CRS-515 TMI for use with the CRS-311 1:1 Redundancy Switch, or with the CRS-500 M:N Redundancy System.
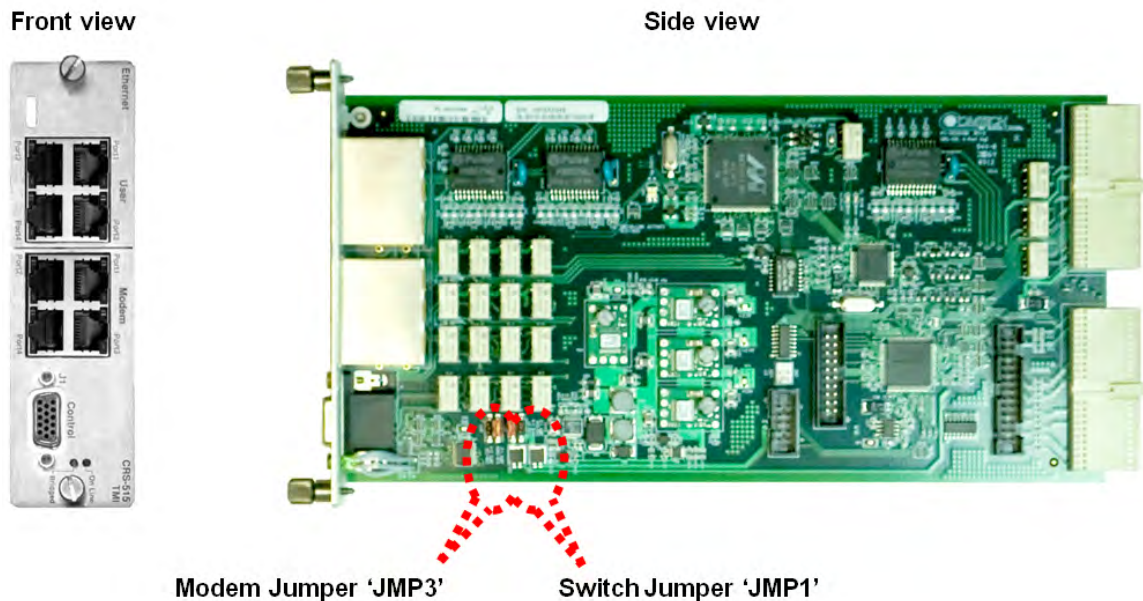
Figure 4-4. CEFD P/N PL-0000294 CRS-515 TMI PCB

Table 4-2 illustrates the 'JMP3' and 'JMP1' jumper settings that are factory-set for each CRS-515 TMI that is used with the CRS-311 1:1 Redundancy Switch and SLM-5650/5650A modems.

Table 4-2. CRS-515 TMI Factory-configured Jumper Settings

Modem Jumper 'JMP3'			Switch Jumper 'JMP1'		
Control Setting	Jumpers	Settings	Control Setting	Jumpers	Settings
SLM-5650/5650A **AS SHIPPED**		*Pins 1 to 2 jumped*	CRS-311 **AS SHIPPED**		*Pins 3 to 4 jumped*
CDM-750		*Pins 3 to 4 jumped*	CRS-500		*Pins 1 to 2 jumped*

4.5   Switch Configuration

4.5.1 Switch Power

Follow these steps to connect the power cords:

Step	Task
1	Each CRS-311 is supplied with two power cords. Connect the female end of the supplied power cords (one to each power supply power input).
2	Plug both power cords into the power source(s). The CRS-311 will power **ON**. *Note: The auto-sensing power supplies do not require any adjustments.*

If only one power supply module is used, mask the fault for the unused power supply as follows:

Step	Task
1	Go to the **CONFIG: MASKS → SW-ALARMS** menu.
2	Select to mask the unused power supply.

The power supplies contain two fuses, one each for line and neutral connections (or L1, L2 where appropriate). These are contained within the body of the connector, behind the small plastic flap.

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.

4.5.2 Updating Firmware

> *TO ENSURE OPTIMAL PERFORMANCE, IT IS IMPORTANT TO OPERATE THE CRS-311 WITH ITS LATEST AVAILABLE FIRMWARE.*

The CRS-311 is factory-shipped with the latest version of operating firmware. If a firmware update is needed, it can be acquired by download from the Comtech EF Data Web site (www.comtechefdata.com); or from Comtech EF Data Customer Support during normal business hours via e-mail or on CD by standard mail delivery.

The CRS-311 Firmware Update process is as follows:

- Transfer the new firmware update for upgrading the CRS-311 to a user-provided PC intended for Monitor and Control (M&C) of the CRS-311 1:1 Redundancy System.

- Connect the CRS-311 to an available serial port on the user PC. The upgrade can then be performed without opening the CRS-311 chassis.

- Extract the firmware update from the transferred archive file, and then execute the upgrade process via use of the provided **CCCFLASH.EXE** utility program.

4.5.2.1 Getting Started: Preparing for the Firmware Download

1. **First, identify the firmware version number.**

   User-supplied items needed:

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

   - A 9-pin serial cable to connect the PC to the CRS-311 (details are shown in the cable details box on the Uploader screen, as well as in **Appendix A. CABLE DRAWINGS**).

A. Use the 9-pin serial cable to connect the CRS-311 '**Remote Control**' port (located on the CRS-230 Controller module) to a serial port on the user PC.
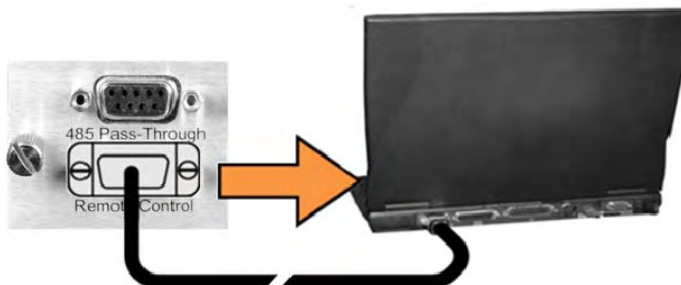
B. **On the PC:** Open the terminal emulator program.

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

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

- 19200 bps (Baud Rate)
- 8 Data Bits
- 1 Stop Bit
- Parity = NO
- Port Flow Control = NONE
- Display New line Rx/Tx: CR
- Local Echo = ON

C. Apply power to the CRS-311:
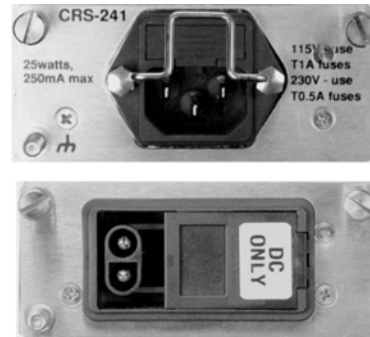
(Top) Standard CRS-241 AC Unit Power Module
(Bottom) Optional CRS-251 DC Unit Power Module

D. **On the PC:** Using serial remote control, obtain the CRS-311 firmware version by typing the following query: **<0/SWR?**

The firmware release version is identified in the form #.#.# (e.g., 1.2.3)

See **Chapter 6. SERIAL-BASED REMOTE PRODUCT MANAGEMENT** *for information and instructions on using the CRS-311 Serial Remote Control Interface.*

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

Drive letter "c:" is used in these examples. Any valid, writable drive letter can be used.

Typical for all tasks: Type the command <u>without quotes</u>, and then press Enter to execute.

There are several ways you may create a temporary folder on a Windows-based PC:

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

- Right-click anywhere on the desktop to open the popup submenu, and then select **New > Folder** to create the temporary folder. The new folder will be created on the desktop.

- Right-click on the new folder and then select "**Rename**" from the popup submenu. Rename this folder to "**temp**" or some other convenient, unused name.
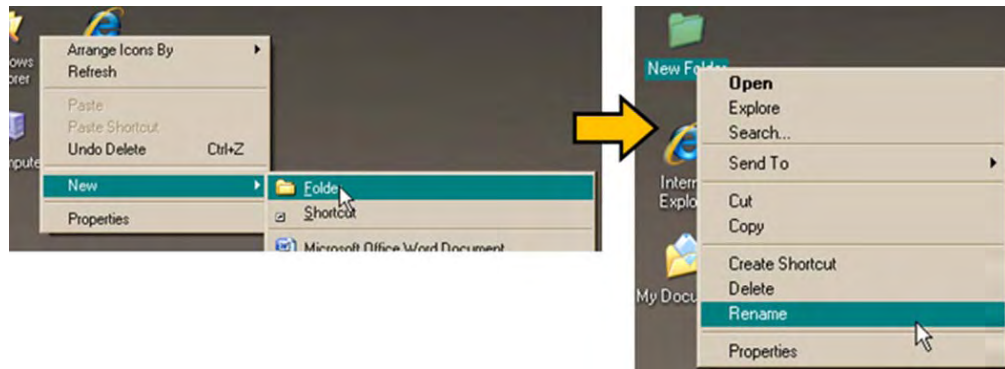
B.   Use Windows Explorer to create and rename the temporary folder.

- Select **File > New > Folder** to create the temporary folder. The new folder will be created in the active folder.

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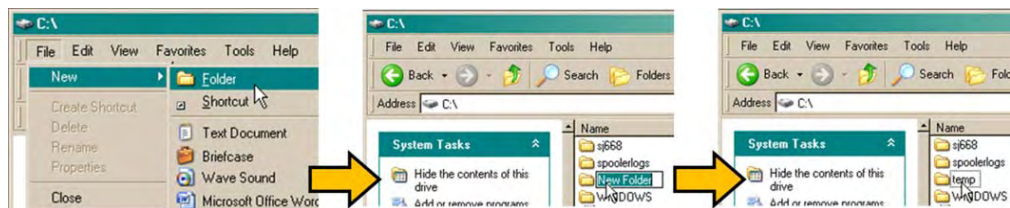
C.   Use the 'Run' and 'Browse' windows to create and rename the temporary folder.

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

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

- Click the **Create New Folder** icon in the '**Browse**' window. The new folder will be created.

- Right-click the "**New Folder**" folder name, and then rename this folder to "**temp**" or some other convenient, unused name.

D.   Use Windows Command-line to create the temporary folder.

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

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

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

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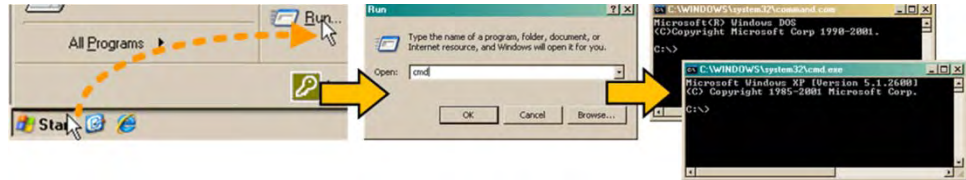
  o *Alternately,* from **[Start]**, select **All Programs > Accessories > Command Prompt**.

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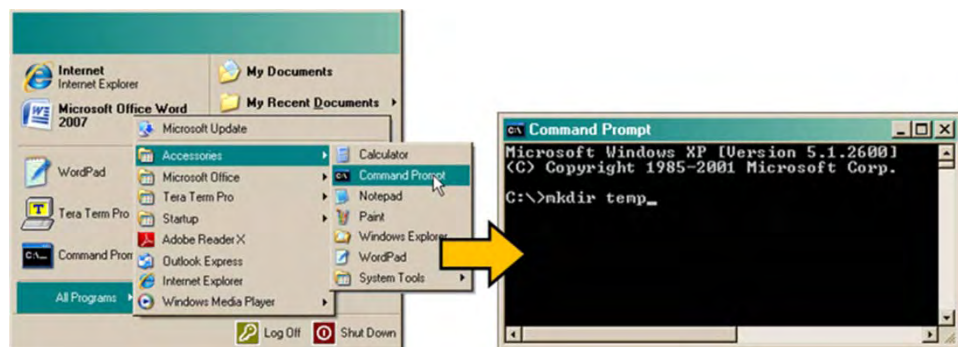
There should now be a "temp" folder created and available for placement of the firmware file download.

4.5.2.2   Downloading and Extracting the Firmware Update

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

   A. **Go online** to www.comtechefdata.com.

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

   C. **On the *Software Downloads* page** – click **Download Flash and Software Update Files**.

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

   E. **On the *Modem Accessories* product page** – select the **CRS-311** product hyperlink;

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

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

  Where '**X**' denotes the revision letter and '**###**' represents the firmware version (e.g., V127= Version 1.2.7), the CRS-311 firmware download hyperlinks appear as follows:

  - o **For the SLM-5650A and SLM-5650: F12427X_V###**;

  - o **For the CDM-Qx and CDM-QxL: F0000069X_V###.**

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

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

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

G. Download the archive file to the temporary folder.
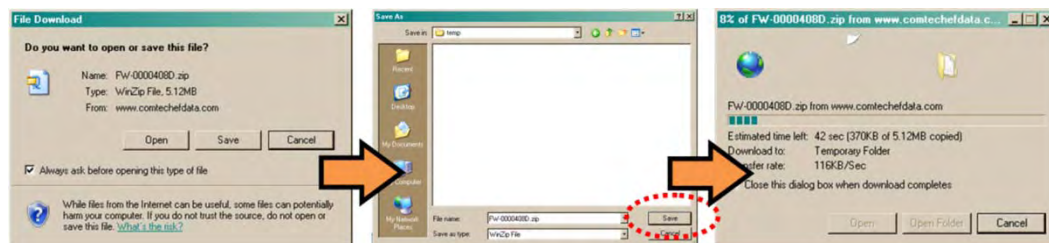
- Once the **EXE** or **ZIP** hyperlink is selected, the '**File Download'** window opens and prompts selection of **[Open]** or **[Save]**:

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

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

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

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

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

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

    ▪ **CCCflash.hlp**: CEFD Flash Upload Utility Program Help File.

    ▪ **CCCFlash.exe** or **Cccflshc.exe**: CEFD Flash Upload Utility Program, designed to run under Windows 95/98/2000® or Windows NT®

    ▪ **fw#####x.ccc**, where "#" denotes the firmware number, and "x" denotes the revision letter.

    ▪ **ReleaseNotesCRS-311_MN_vX-X-X.pdf**, where "MN" denotes the modem, and "vX_X_X" denotes the firmware version.
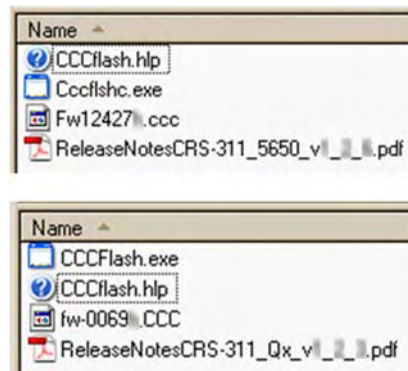
  If these four files as identified are displayed, you should be ready to perform the firmware update.

3. **Finally, run the CCFLASH upload utility program.**

Double-click the CCFLASH executable file. You should follow the instructions presented on the screen, and the upload will take place automatically.

Firmware Updating help: Full on-line help is provided with CCCFLASH.EXE. Please contact Comtech EF Data Customer Support if you have questions or need additional assistance.
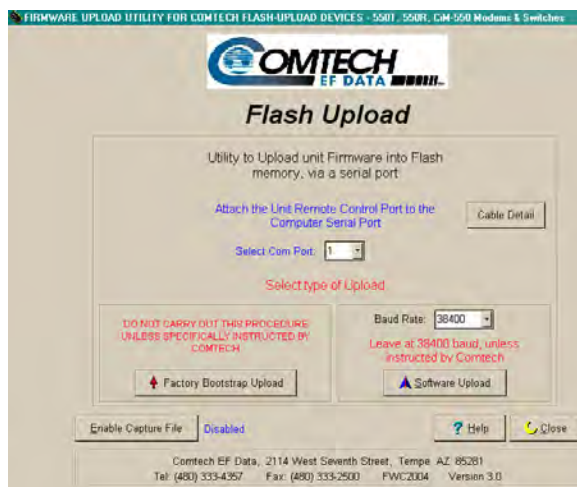
4.6   CRS-311 Front Panel Configuration

The CRS-311 should show a **GREEN** "Unit Status" LED. If this LED is **RED**, go to **MONITOR →** **SW-ALARM** to view the faults. Make sure that the preceding Redundant Modem setup is complete and that it is operating correctly before proceeding. Use the front panel keypad and display to configure the Switch as described in this section.

The **Switch Status** LED will turn **RED** until the Switch has polled the Traffic Modem and correctly programmed the Traffic Modem configuration into the Redundant Modem. Once the programming is completed successfully, the **RED** LED will turn **GREEN**.

The Redundant Modem may take several seconds to configure. If the LED remains **RED**, check the communication status using the menus to investigate the problem:

MONITOR → COMMS or **MONITOR → SW-ALARM**

Another option is to view the I/O using **MONITOR → IO.** This menu will show the actual messages to and from the modem. If there are no responses from a modem, check the addressing scheme carefully and verify correct modem communication setups. Communication is slowed to aid viewing.

For modems: Use the **INFO** and **MONITOR** menus to view the status of the modems, in addition to viewing the LEDs.

For Switch: Use **MONITOR → COMMS** to verify the modems that are responding via remote control.

For real-time monitoring: Use **MONITOR → IO** to verify the modems that are responding via remote control. Communication is slowed to aid viewing.

Do not leave the CRS-311 in this view

4.6.1.1   Set Operation Mode

The CRS-311 was shipped in the Auto-Off (i.e. Manual) operating mode. This setting causes the Stored Event LED to blink. The system is operational; however, it is still operating in **Manual** mode. In the menu, this manual mode is called **Auto-off**. While in **Manual** mode, you can manually select which modem (Traffic Modem or Redundant Modem) will be bridged or backed up.

While in **Manual** mode, the Switch does not *automatically* react to Traffic Modem failures it detects. Comtech EF Data recommends that an unattended system be configured to operate in **Auto On** mode.

When **Auto On** mode is enabled, when a fault occurs, the online modem is first bridged by the offline modem, and then backed up.

Follow these steps to enable **Auto On** mode:

Step	Task
1	Go to the **CONFIG → AUTO** menu and select **AUTO ON** mode.
2	Verify that the Stored Event LED stops blinking.

4.6.1.2   Set Holdoff Period

A *holdoff period* prevents unwarranted backups due to an intermittent fault. When in **Auto** mode, additional delays may be introduced to the backup procedure by setting the number of seconds for "holdoff" before the faulted Traffic Modem cedes operation to the Redundant Modem (*backup*), or operation is returned from the Redundant Modem back to the Traffic Modem (*restore*).

The process is further explained:

If a fault occurs in the Traffic Modem, and the Redundant Modem operation is fault-free, *backup* is initiated once the configured **Backup Holdoff Period** lapses. However, if the fault clears within the holdoff's configured timeframe, no transfer of operation occurs.

Similarly, if a fault occurs in the Redundant Modem while it is online, and the Traffic Modem's operation is fault-free, *restore* is initiated once the configured **Restore Holdoff Period** lapses. The default holdoff period is 10 seconds (a minimum of 1 second and a maximum of 99 seconds is allowed).

4.6.1.2.1   Set Backup Holdoff Period

If the Traffic Modem fails, the Switch waits for the backup holdoff time to determine two things:

   1)   Does the Traffic Modem remain faulted?

                                        and

   2)   Is the Redundant Modem not exhibiting the same fault?

If the answer is *yes* to both questions for the entire Backup Holdoff Period, then the Switch first bridges the faulted Traffic Modem with the Redundant Modem. If the fault is sustained, then the switchover to the Redundant Modem is completed and the Redundant Modem carries the traffic.

There will be no switchover if the Redundant Modem is faulted. Ensure that the Holdoff times are long enough (default 10 seconds) for the Redundant Modem to be configured and to lock onto the signal.

If the CDM-Qx/QxL configuration includes Carrier-in-Carrier® this holdoff time should be no less than 8 seconds.

Follow these steps to set the **Backup Holdoff Period**:

Step	Task
1	Go to the CONFIG → HOLDOFFS menu.
2	Change the BACKUP HOLDOFF to any number in the range of 1 to 99 seconds.

4.6.1.2.2   Set Restore Holdoff Period

The "**Restore Holdoff**" setting, which is also programmable from 1 to 99 seconds, determines the ability of the Switch to automatically put the backed up Traffic Modem online again if its fault clears.

Normally, the failed Traffic Modem taken offline remains offline indefinitely. If the fault clears, traffic will be returned to the unit (in **Auto** mode) only if the Redundant Modem fails.

Follow these steps to set the **Restore Holdoff Period**:

Step	Task
1	Go to the CONFIG → HOLDOFFS menu.
2	Change the RESTORE HOLDOFF to any number in the range of 1 to 99 seconds.

4.6.1.3   Set Alarm Masking

Another way to adjust the Switch's reaction in Auto mode is to mask modem faults. You may disable modem Rx, Tx or both fault types so that the Switch does not react to them. This masking prevents the Switch from taking automatic action and prevents the logging of the faults in the stored events list. These masks are global to all the modems attached to the Switch.

Follow these steps to set **Alarm Masks**:

Step	Task
1	Go to **CONFIG → MASKS → MODEM ALARMS**.
2	Set the mask parameters as desired.

Notes:

Chapter 5. FRONT PANEL OPERATION

5.1   Overview
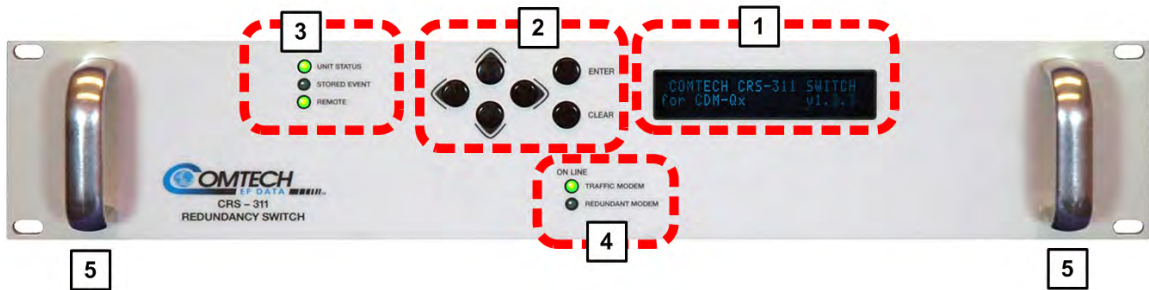
Feature	Description	Function
1	Vacuum Fluorescent Display (VFD)	Displays menus, prompts, and messages
2	6-button keypad	Menu navigation
3	(3) Light-Emitting Diodes (LEDs)	Switch status monitoring
4	(2) Light-Emitting Diodes (LEDs)	Modem status monitoring
5	Rack Handles	Installation into / removal from a rack

Figure 5-1. CRS-311 Front Panel

You can fully monitor and control operation of the CRS-311 from its front panel (**Figure 5-1**). The CRS-311 uses nested menus that display all available options; the displayed messages and prompts guide you to use the keypad to carry out a required action.

5.1.1 Front Panel Vacuum Fluorescent Display (VFD)

The Front Panel **V**acuum **F**luorescent **D**isplay (VFD) is an active display showing two lines of 24 characters each. It produces a blue light with adjustable brightness. Compared to a **L**iquid **C**rystal **D**isplay (LCD), it has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

The CRS-311 "splash" screen appears once power is applied to the unit. The top line of this screen identifies the product; the second line identifies the modem for which the CRS-311 is configured (e.g., SLM-5650A, CDM-Qx, etc.), and the version of the CRS-311's installed firmware.

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

```
CONFIG:  MANUAL  AUTO[ON]
HOLDOFFS   MASKS   REMOTE
```
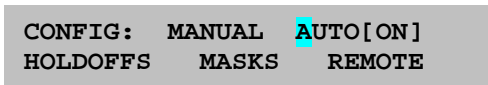
Where a solid block cursor would obscure the numeral or character under edit, the cursor automatically changes to an underline cursor:

```
BACKUP HOLDOFF SEC:  05
RESTORE HOLDOFF SEC: 04
```
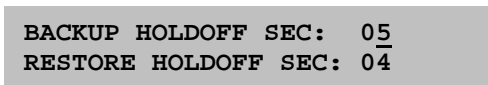
If you were to leave the unit displaying the same screen for weeks at a time, the display could become 'burnt' with this image. To prevent this, the unit has a 'screen saver' feature that activates after 1 hour and constantly scrolls a message across the screen. The top line of this message shows the user-created Switch ID; the bottom line shows the current status of the Switch followed by the message '**Press any key…**':

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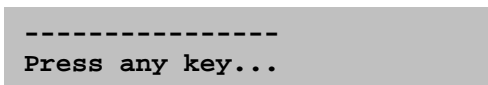
The message moves from right to left across the display, then wraps around. Press any key to restore the previous display.

5.1.2 Front Panel Keypad
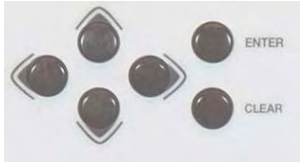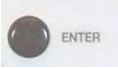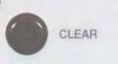
The keypad on the front panel contains six individual key switches with a positive "click" action for tactile feedback.

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

The function of these keys, and their reference throughout this chapter, is as follows:

Key	Mnemonic	Functional Description
ENTER	ENTER	Use this key to select a displayed function or to execute a modem configuration change.
CLEAR	CLEAR	Use this key to back out of a selection or to cancel a configuration change that has yet to be executed using ENTER. Pressing CLEAR generally returns the display to the previous selection.
◄ ►	◄ ► (Left, Right)	Use these arrow keys to move to the next selection or to move the cursor position.
▲ ▼	▲ ▼ (Up, Down)	Use these arrow keys to edit the configuration data (numbers) or operational selection at the current cursor position.

5.1.3 Front Panel LED Indicators

5.1.3.1 Switch Status LED Indicators
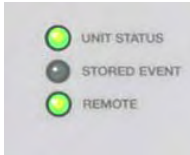
The three LEDs featured to the left of the front panel keypad indicated the operational status of the Switch itself. The function of these LEDs is as follows:

LED	Color	Condition
UNIT STATUS	Red	A Switch Fault exists. **Example: PSU** fault or **COMMS** failure
	Green	No Switch Faults
STORED EVENT	Off	No Stored Events
	Orange	Stored Events exist for the Switch.
	Orange (Flashing)	**CAUTION:** Switch is in Manual Mode.
	Orange (Flashing 2X rate)	**CAUTION:** Switch is in Independent Mode.
REMOTE	Off	Switch is in Local Mode. Remote monitoring is possible; remote configuration control is not allowed.
	Orange	Switch is in Remote Mode. Configuration changes are disabled via the front panel keypad

5.1.3.2 Modem On Line Status LED Indicators
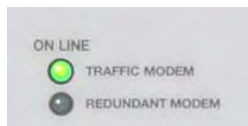
The two LEDs featured at the bottom center of the front panel indicate the ON LINE status of the Traffic or Redundant modem.

5.2   CRS-311 Menu Structure

Figure 5-2 shows the menu structure of the CRS-311. The screens and menus are described individually in the chapter sections that follow.

SELECT:

CONFIG → **CONFIG:**
MANUAL → **MANUAL SELECT:**
TRAFFIC
REDUNDANT

AUTO → **OPERATING MODE**
AUTO-OFF
AUTO-ON

HOLDOFFS → **(HOLDOFFS)**
BACKUP (SEC)
RESTORE (SEC)

MASKS → **ALARM MASK:**
MODEM-ALARMS → **MODEM ALARM MASK:**
NONE
TX
RX

SW-ALARMS → **SWITCH ALARM MASK:**
NONE
↖PSU-A
↙PSU-B

AUDIO → **AUDIO MASK:**
NONE
SW-ALARMS
MODEM-ALMS
BOTH

REMOTE → **SELECT REMOTE CONTROL:**
LOCAL
REMOTE → **REMOTE CONTROL:**
BAUDRATE
INTERFACE → **ELECT. INTERFACE**
RS232
RS485-2W
RS485-4W
FORMAT → **SELECT DATA FORMAT:**
8-N-1
7-E-2
7-O-2

INFO → **INFO:**
S/N
ID
SETUP
IF-SWITCH
REMCONT
MASK

MONITOR → **MONITOR:**
STATUS
SW-ALARM
STORED-EVENTS → **STORED EVENTS:**
VIEW
CLEAR-ALL
COMMS → **COMM STATE:**
TRAFFIC
REDUNDANT
IO

STORE/LD → **STORE/LOAD CONFIG:**
STORE
LOAD

UTIL → **UTILITY:**
SET-RTC
DISPLAY
SW-ID
TYPE *(INT USE ONLY)*
INDEP-MODE

Figure 5-2. CRS-311 Menu Tree

5.2.1 Main Select Menu

```
SELECT:    CONFIG   INFO
MONITOR   STORE/LD  UTIL
```

Use the ◄► arrow keys to move the cursor to the desired menu branch, and then press **ENTER**.

Menu Branch	Chapter Sect.	Description
CONFIG	6.2.2	**(Configuration)** Use this menu branch to fully configure the Switch.
INFO	6.2.3	**(Information)** Use this menu branch to view information on the Switch, without having to go into configuration screens.
MONITOR	6.2.4	Use this menu branch to monitor the status of the Switch and to view the log of stored events for both the Switch and its attached modems.
STORE/LD	6.2.5	**(Store/Load)** Use this menu branch to store and to retrieve up to 10 different Switch configurations.
UTIL	6.2.6	**(Utility)** Use this menu branch to perform miscellaneous functions, such as setting the real-time clock, adjusting the display brightness, etc.

5.2.2 CONFIG (Configuration)

```
CONFIG:  MANUAL  AUTO[OFF]
HOLDOFFS   MASKS   REMOTE
```

Use the ◄► arrow keys to move the cursor to the desired submenu, and then press **ENTER**.

The available submenus are:

Submenu	Chapter Sect.	Function
MANUAL	6.2.2.1	Use this submenu to select which Traffic Modem the Switch should bridge or back up.
AUTO [ON / OFF]	6.2.2.2	Use this submenu to turn **AUTO** mode **OFF** or **ON**. The currently selected state is always shown on this menu
HOLDOFFS	6.2.2.3	Use this submenu to set several operating parameters of the Switch that pertain to enabling or disabling the availability of Traffic Modems, the reporting of faults and time delays for responding to faults.
MASKS	6.2.2.4	Use this submenu to set several operating parameters of the Switch that pertain to enabling or disabling the availability of Traffic Modems, the reporting of faults and time delays for responding to faults.
REMOTE	6.2.2.5	Use this submenu to define the remote control settings. *The Switch may be monitored over the remote control bus at any time. When in Local mode, however, only configuration parameters may be changed using the 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.*

5.2.2.1   (CONFIG:) MANUAL

```
ONLINE:
TRAFFIC   REDUNDANT  (ENT)
```

When the Switch is in **AUTO-OFF** (manual) Mode, you may select which modem should be online. Use the ◄►arrow keys to select the **TRAFFIC** Modem as online (i.e., bridging) or the **REDUNDANT** Modem as online (i.e., backing up). Press **ENTER** to configure.

When the Switch is in **AUTO-ON** (automatic) Mode, manual selection is not available. The Switch has control and automatically backs up the Traffic Modem based on its fault relay activity. The Switch learns and retains the configuration of the **Traffic** Modem – use this configuration information to program the **Redundant** Modem.

In **AUTO-ON** Mode, the **(CONFIG:) MANUAL** screen appears as follows:

```
ONLINE:            (AUTO)
TRAFFIC   REDUNDANT  (ENT)
```

5.2.2.2   (CONFIG:) AUTO [OFF or ON]

```
OPERATING MODE:
AUTO-OFF  AUTO-ON (ENTER)
```

Select the operating mode as **AUTO-OFF** (manual) or **AUTO-ON** (automatic). In **AUTO-OFF** Mode, the Switch does not respond automatically to any modem faults and simply performs as per the current setting of the **(CONFIG:) MANUAL** submenu.

The front panel "**STORED EVENT**" LED indicator blinks when in **AUTO-OFF** Mode to alert you that the Switch is effectively not in use.

5.2.2.3   (CONFIG:) HOLDOFFS

```
BACKUP HOLDOFF SEC:  05
RESTORE HOLDOFF SEC: 10
```

Set the holdoffs, or 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 checks that the Redundant Modem 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 the 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. Both holdoffs can be set from 1 to 99 seconds.

5.2.2.4 (CONFIG:) MASKS

```
ALARM MASK:   MODEM-ALARMS
SW-ALARMS   AUDIO   (ENTER)
```

The Switch logs and reacts to both its switch faults and modem faults. Mask either type of fault using this submenu. In addition, use this submenu to enable a buzzer as an audible indicator.

5.2.2.4.1 (CONFIG: MASKS) → MODEM ALARM MASK

```
MODEM ALARM MASK:   NONE
TX   RX               (ENTER)
```

Select **TX** or **RX** to mask the pertinent traffic 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.

Note that these selections are global to all the modems. If masking of individual modem faults is desired, it should be done directly on the modem. Unmasked modem faults are logged on active modems only.

5.2.2.4.2 (CONFIG: MASKS) → SWITCH ALARM MASK

```
SWITCH ALARM MASK: NONE
↖PSU-A      ↙PSU-B  (ENTER)
```

Select which, if either, of the plug-in power supply units should be ignored in case any of their voltage outputs are monitored by the Switch as being out of range. Press **ENTER** when done.

You can mask only one unit at a time. Normally this is done if you choose to run with only one supply, or if a bad supply has been removed for service or replacement.

5.2.2.4.3 (CONFIG: MASKS) → AUDIO MASK

```
AUDIO MASK:   NONE   SW-ALMS
MODEM-ALMS   BOTH   (ENT)
```

For all Switch or modem alarms that are unmasked, you may select which alarm types should force the Switch to react with an audible buzzer located behind the front panel. In addition, a relay closure to ground activates on pin 20 of the System Alarms connector so that you may attach other indicators.

5.2.2.5   (CONFIG:) REMOTE

```
SELECT REMOTE CONTROL:
LOCAL REMOTE (PRESS ENT)
```

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

5.2.2.5.1   (CONFIG: REMOTE) → LOCAL

Selecting **LOCAL** *disables* remote control, although remote monitoring is always possible.

5.2.2.5.2   (CONFIG: REMOTE) → REMOTE

```
REMOTE CONTROL: BAUDRATE
INTERFACE   FORMAT  (ENT)
```

Use the ◄► arrow keys to select **BAUDRATE**, **INTERFACE**, or **FORMAT**, and then press **ENTER**.

5.2.2.5.2.1 (CONFIG: REMOTE → REMOTE) BAUDRATE

```
 EDIT SWITCH BAUDRATE:
 9600 BAUD  (PRESS ENT)
```

Use this submenu to select the baud rate of the remote control bus connected locally to the M&C computer. Use the ▲▼ arrow keys to select a baud rate of **300**, **1200**, **2400**, **4800**, **9600**, or **19200,** and then press **ENTER**.

> ***This setting does not affect the internal communications between the Switch and the modems. For the SLM-5650, this is fixed at RS-232, 9600 baud, 8-N-1.***

5.2.2.5.2.2 (CONFIG: REMOTE → REMOTE) INTERFACE

```
ELECT. INTERFACE:  RS232
RS485-2W   RS485-4W (ENT)
```

Use the ◄► arrow keys to select the remote interface as **RS-232**, **RS485-2W** (2-wire), or **RS485-4W** (4-wire). Press **ENTER** to enter the bus address:

```
IN RS232 MODE THE BUS
ADDRESS IS FIXED AT 0000
```

In the previous screen, RS-232 mode is selected and the bus address is fixed at 0.

```
EDIT SWITCH BUS ADDRESS:
3000        (PRESS ENTER)
```

Available in RS-485 mode. Use the ▲▼ arrow keys to change the value of the address, and then press **ENTER**. The only valid addresses, as explained in **Chapter 6. SERIAL-BASED REMOTE PRODUCT MANAGEMENT**, are **1000**, **3000**, **5000**, and **7000**.

5.2.2.5.2.3   (CONFIG: REMOTE → REMOTE) FORMAT

```
SELECT DATA FORMAT:
8-N-1   7-E-2   7-O-2
```

> *This setting does not affect the internal communications between the Switch and the modems. For the SLM-5650, this is fixed at RS-232, 9600 baud, 8-N-1.*

5.2.3 INFO (INFORMATION)

```
INFO:  S/N    ID    SETUP
IF-SWITCH  REMCONT   MASK
```

Use the ◄► arrow keys to select **S/N, ID**, **SETUP**, **IF-SWITCH**, **REMCONT**, or **MASK**, and then press **ENTER**. These screens provide *read-only* information on the current configuration of the Switch without risking inadvertent alterations.

5.2.3.1   (INFO:) S/N

```
Serial Number:
    XXXXXXXXX    (CLEAR)
```

This screen displays the nine-digit serial number unique to this CRS-311 unit. Press **CLEAR** to return to the previous menu.

5.2.3.2   (INFO:) ID

```
SWITCH ID:
-------------------------
```

This screen displays the user-defined Switch ID string. Use the **UTILITY: SW-ID** submenu to enter or edit this information. Press **ENTER** or **CLEAR** to return to the previous menu.

5.2.3.3   (INFO:) SETUP

```
TRAFFIC MODEM IS ONLINE.
AUTO:OFF   BKUP:05   REST:04
```

The information provided here reflects some of the settings defined with the **CONFIG:** submenus.

On the top line: The active (online) modem is listed here.

On the bottom line: The active AUTO mode and the two holdoff times are displayed here.

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

5.2.3.4   (INFO) IF-SWITCH

```
TRANSPONDER SWITCH IS
       PRESENT
```

This screen indicates the presence of the CRS-281 IF Transponder Switch. Press **ENTER** or **CLEAR** to return to the previous menu.

5.2.3.5   (INFO:) REMCONT (Remote Control Info)

```
REM CNTL: ON      RS232
ADDR:0000   9600 BAUD   8N1
```

This screen displays whether the unit is in **LOCAL** or **REMOTE** mode; identifies the electrical interface type; and specifies the unit address, the baud rate, and data format. Press **ENTER** or **CLEAR** to return to the previous menu.

5.2.3.6   (INFO:) MASK (Alarms Masked Info)

```
ALARMS MASKED:   MODEM-TX
MODEM-RX   ↖PSU-A   ↙PSU-B
```

This screen displays the masked alarms. If an alarm is unmasked, a blank space occupies the relevant screen position. Although Power Supplies A and B cannot be masked at the same time, they are shown together in this example to reference their respective screen positions. Press **ENTER** or **CLEAR** to return to the previous menu.

5.2.4 MONITOR

```
MONITOR:  STATUS   SW-ALARM
STORED-EVENTS  COMMS     IO
```

Use the ◄► arrow keys to select **STATUS**, **SW-ALARM**, **STORED-EVENTS**, **COMMs** (COMM-STATE), or **IO**, and then press **ENTER**.

5.2.4.1   (MONITOR:) STATUS

```
TRAFFIC MODEM IS ONLINE.
BACKUP HOLDOFF: 05 SEC
```

This submenu displays the Switch status as follows:

*   If Auto Mode is **ON**, it will also show the backup holdoff time should the bridged Traffic Modem fail.

*   If Auto Mode is **OFF**, the second line displays "**OFF**". Once the Switch takes the Traffic Modem offline and replaces it with the Redundant Modem – whether manually or automatically – the screen changes as follows:

```
REDUNDANT IS ONLINE.
RESTORE HOLDOFF:  05 SEC
```

The restore holdoff time displays on the second line if Auto Mode is **ON**.

5.2.4.2   (MONITOR:) SW-ALARM

```
SWITCH ALARM:     NONE
```

This Switch Alarm screen example shows that *there are no faults*; accordingly, the front panel "**Unit Status**" LED indicator is lit **GREEN**.

```
SWITCH ALARM:   -12V PS-B
      ↙ IS UNDERVOLTAGE
```

This Switch Alarm screen example shows that *there is a fault* – Power Supply "B" is under voltage; accordingly, the front panel "**Unit Status**" LED indicator is lit **RED**.

Suggested corrective actions include:

*   Ensure power supply power cord is connected and the power switch is **ON;**

- Replace defective power supply module;

- If the second power supply module is not needed, you can mask this alarm.

```
SWITCH ALARM: RM PROBLEM
          RM I/O TIMEOUT
```

-OR-

```
SWITCH ALARM: MODEM COMMS
    PROBLEM, TRAFFIC MODEM
```

These Switch Alarm screen examples show that *there are faults* – communication has been lost to the Redundant or the Traffic Modem; accordingly, the front panel "**Unit Status**" LED indicator is lit **RED**.

Suggested corrective actions include:

- **Check cable connections.**
  See **Chapter 3. CABLES AND CONNECTIONS**.

- **Check cable operation.**
  Ensure the cables are OK by swapping them with others. For cable information refer to **Chapter 3. CABLES AND CONNECTIONS** and **Appendix A. CABLE DRAWINGS**.

- **Check modem configurations.**
  See **Chapter 4. MODEM, RMI/TMI, AND SWITCH CONFIGURATION** and the pertinent modem's *Installation and Operation Manual.*

```
SWITCH ALARM:  RM PROBLEM
MGC refused, cpde: 12 TFT
```

This Switch Alarm screen example shows that *there is a fault* – here, COMMs are good to the Redundant Modem, but the configuration of the Traffic Modem cannot be configured into the Redundant Modem. The front panel "**Unit Status**" is lit **RED**.

Suggested corrective actions include:

- Ensure that the most capable modem (latest hardware revision, firmware version, FAST options, installed options e.g. Turbo card) is set up as the Redundant Modem.

  The code indicates the parameter within the modem's "MGC" (Global Configuration) remote command/query configuration string that is causing the Redundant Modem to refuse it.

The three-letter instruction code is indicated also to assist decoding the problem parameter:

► ***For the CDM-Qx modem***, the code is the decimal number indicating the problem parameter within its MGC configuration code:

00		NO ERROR		01	ITF	Interface
02	LBO	T1 Line Build-Out		03	FRM	Framing mode
04	TFQ	Tx Frequency		05	TFT	Tx FEC Type
06	TMD	Tx Modulation		07	TCR	Tx FEC Code Rate
08	TDR	Tx Data Rate		09	TSI	Tx Spectrum Invert
10	TSC	Tx Scrambler state		11	TPL	Tx Power Level
12	TCK	Tx Clock		13	TDI	Tx Data Invert
14	TXO	Tx Carrier State		15	AUP	AUPC enable
16	APP	AUPC parameters		17	WUD	Warm-Up Delay
18	TXC	Tx common output state		19	TRS	Tx Reed-Solomon
20	TXA	Tx roll-off (alpha) factor		21	TCI	Tx Data Clock Invert
22	RFQ	Rx Frequency		23	RFT	Rx FEC Type
24	RMD	Rx Modulation		25	RCR	Rx FEC Code Rate
26	RDR	Rx Data Rate		27	RSI	Rx Spectrum Invert
28	RDS	Rx DeScrambler state		29	RDI	Rx Data Invert
30	RSW	Rx Sweep Width		31	EBA	Eb/No Alarm point
32	BCS	Rx Buffer clock source		33	RRS	Rx Reed-Solomon
34	RBS	Rx Buffer size/enable		35	RCI	Rx Data Clock Invert
36	ERF	External Reference setting		37	EFM	EDMAC Framing mode
38	ESA	EDMAC Slave Address range		39	TST	Test mode (read-only)
40	MSK	Alarm Masks		41	RTS	Request-To-Send control
42	SSI	Statistics Sample Interval		43	CNM	CnC Mode
44	CFO	CnC Frequency Offset		45	CSD	CnC Min/Max Search Delay
46	CRA	CnC Re-acquisition Time				

See the remote control section in the pertinent modem's Installation and Operation Manual for detailed information on the MGC (Global Configuration) remote command/query.

5.2.4.3   (MONITOR:) STORED EVENTS

```
STORED EVENTS:     VIEW
CLEAR-ALL (PRESS ENTER)
```

Use the ◄► arrow keys to select **VIEW** or **CLEAR-ALL**, and then press **ENTER**.

If **CLEAR-ALL** is selected, the event log is cleared and you are returned to the previous menu. However, if there are faults present on the unit at this time, new log entries are generated for those faults.

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

5.2.4.3.1   (MONITOR: STORED-EVENTS) → VIEW

```
LOG23: 26/01/00 10:37:32
FT-06 RX ALARM (UP/DN)
```

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

The event log can store up to 98 events. When a fault (FT) condition occurs, it is time-stamped and placed in the log.

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

```
LOG24: 26/01/04 10:37:35
OK-06  RX ALARM  (UP/DN)
```

Next to the **FT/OK** indicator is a code for the faulted unit: the **TM**, (for Traffic Modem), **RM** (for Redundant Modem) or **SW** (for the Switch).

5.2.4.4   (MONITOR:) COMMS (Communications State)

```
COMMS:       TRAFFIC: OK
             REDUNDANT: FT
```

This screen indicates whether the Switch I/O communications with the modems is good (OK) or bad (FT). *This does not indicate fault status.*

5.2.4.5   (MONITOR:) IO

```
T <0000/LRS ?
  >0000/LRS=1
```

This screen shows actual communication strings between the Switch and the modems. While in this mode, communication is slowed to enable viewing of messages. Because of this, it should only be used for troubleshooting purposes.

- **On the top line:** Switch controller's outbound messages. The first character indicates the device being addressed (**T** = Traffic Modem; **R** = Redundant Modem).

- **On the bottom line:** Modem responses.

5.2.5 STORE/LD (Store or Load Configuration)

```
STORE/LOAD CONFIG:
STORE  LOAD  (PRESS ENTER)
```

Use these submenus to store or load up to 10 different Switch configurations in the CRS-311's non-volatile memory. These are configurations for the Switch itself; they do not affect the connected Traffic or Redundant modems.

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

> *This feature is operational in LOCAL MODE ONLY. If you attempt to save or load a configuration while in Remote Mode, the following message displays:*

```
THE SWITCH IS CURRENTLY
IN REMOTE MODE!! (CLEAR)
```

5.2.5.1   (STORE/LD) STORE

```
STORE CONFIGURATION TO
   LOCATION: 10   (ENTER)
```

Once all desired configuration changes have been made, use the ▲▼ arrow keys to select the location to store the current configuration, and then press **ENTER**.

Locations 1 through 10 are available. If the selected location does not contain a previously stored configuration, the action is confirmed as follows:

```
YOUR CONFIGURATION HAS
BEEN STORED!    (ENTER)
```

Press **ENTER** or **CLEAR** to return to the previous menu. If, however, the selected location contains a previously stored configuration, you are alerted to this state as follows:

```
WARNING!  LOC 10 CONTAINS
DATA!  OVERWRITE?  NO  YES
```

Use the ◄► arrow keys to select **NO** or **YES**, and then press **ENTER**. Selecting **YES** overwrites the selected location's existing configuration.

5.2.5.2   (STORE/LD) LOAD

```
LOAD CONFIGURATION FROM
LOCATION: 10  (ENTER)
```

Use the ▲ ▼ arrow keys to select the location from which to load (recall) a configuration, and then press **ENTER**.

Locations 1 through 10 are available. If the selected location contains valid data, the choice is confirmed as follows:

```
THE NEW CONFIGURATION
HAS BEEN LOADED  (ENTER)
```

Press **ENTER** or **CLEAR** to return to the previous menu. If, however, the selected location does not contain valid data, you are alerted to this state as follows:

```
WARNING! LOC 10 CONTAINS
NO DATA!        (ENTER)
```

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

5.2.6 UTILITY

```
UTILITY: SET-RTC DISPLAY
SW-ID   TYPE  INDEP-MODE
```

Use the ◄ ► arrow keys to select **SET-RTC**, **DISPLAY**, **SW-ID**, or **INDEP-MODE**, and then press **ENTER**.

*While selectable, TYPE is intended for CEFD internal (factory) test / diagnostic use **only** and provides <u>no</u> functional user purpose.*

5.2.6.1   (UTILITY:) SET-RTC (Set Real-Time Clock)

```
EDIT REAL TIME CLOCK:
12:00:00  24/04/00  (ENT)
```

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

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

5.2.6.2   (UTILITY:) DISPLAY (Display Brightness)

```
EDIT DISPLAY BRIGHTNESS:
100%       (PRESS ENTER)
```

Use the ▲▼ arrow keys to set the brightness level of the Vacuum Fluorescent Display. Select a brightness level of **25%**, **50%**, **75%**, or **100%**, and then press **ENTER**.

5.2.6.3   (UTILITY:) SW-ID (Switch ID)

```
EDIT SWITCH ID:   (ENTER)
---- THIS IS A TEST ----
```

To edit the Switch ID string, first use the ◄► arrow keys to select the character to edit, and then use the ▲▼ arrow keys to change that character. Press **ENTER** when done.

The following characters are available: **[Space] ( ) * + - , . / 0-9** and **A-Z**.

5.2.6.4   (UTILITY:) INDEP-MODE (Independent Mode)

This feature is for use **ONLY** *with the SLM-5650/5650A.*

```
INDEPENDENT MODE:
NORMAL-OP   ENABLE-INDEP
```

Use the ◄► arrow keys to select between **NORMAL-OP** (*NORMAL-OP*erations) and **ENABLE-INDEP** (*ENABLE INDEP*endent Mode). Press **ENTER** to configure.

With Independent Mode enabled, each SLM-5650/5650A operates independently and simultaneously (dual-carrier). In this mode, the CRS-311 is used only to enable control and monitoring of both modems via a single EIA-232/485 control line.

Notes:

Chapter 6. SERIAL-BASED REMOTE PRODUCT MANAGEMENT

6.1 Introduction

1. *To proceed with Serial-based Remote Product Management, assumptions are made that:*

    *   *The CRS-311 and its modems are operating with their latest version firmware files.*

    *   *The CRS-311 is connected to a user-supplied, Windows-based PC, and:*

        o   *The PC serial port is connected to the CRS-311 rear panel CRS-230 System Controller "REMOTE CONTROL" port using a user-supplied serial cable.*

        o   *The PC is running a terminal emulation program (for M&C of the CRS-311 over its EIA-232 or EIA-485 Interface).*

2. *COMTECH EF DATA RECOMMENDS USE OF THE SERIAL-BASED REMOTE PRODUCT MANAGEMENT INTERFACE FOR ADVANCED USERS ONLY. ALL OTHERS ARE STRONGLY ENCOURAGED TO USE THE CRS-311 FRONT PANEL FOR MONITOR AND CONTROL (M&C) OF THE CRS-311. SEE CHAPTER 5. FRONT PANEL OPERATION.*

3. *The pinout table for the EIA-232/485 Interface connector is shown in Appendix B.1.3 Remote Control – DB-9M Connector.*

The serial remote product management interface is an electrical interface that is either an EIA-485 multi-drop bus (for the control of many devices) or an EIA-232 connection (for the control of a single device). Data is transmitted in asynchronous serial form, using ASCII

characters. Control and status information is transmitted in packets of variable length, in accordance with the structure and protocol defined in later sections.

6.2   Interface Overview

6.2.1 EIA-485

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

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

In the other direction: On the other pair, each Target has a Tri-State line driver connected; the Controller has a line-receiver connected. All the line drivers are held in high-impedance mode until one – and *only* one – Target transmits back to the Controller. Each Target has a unique address; each time the Controller transmits, the address of the intended recipient Target is included in a framed 'packet' of data. All of the Targets receive the packet, but only one (the intended) will reply. The Target enables its output line driver and transmits its return data packet back to the Controller in the other direction on the physically separate pair.

EIA-485 (full duplex) summary:

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

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

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

6.2.2 EIA-232

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

6.2.3 Basic Protocol

Whether in EIA-232 or EIA-485 mode, all data is transmitted as asynchronous serial characters, suitable for transmission and reception by a UART. The asynchronous character format may be selected from 8-N-1 (8 data bits, no parity, one stop bit), 7-E-2 (7 data bits, even parity, 2 stop bits) or 7-O-2 (7 data bits, odd parity, 2 stop bits). The baud rate may vary between 300 and 19,200 baud.

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

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

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

6.2.3.1 Rules for Remote Serial Communications with the CRS-311

1. Always wait for a response (or up to 15 seconds) from the CRS-311 before sending the next query or command.

2. If a "time-out" response ('~') is sent from the CRS-311, you must resend the previous command.

   The '~' response indicates that a pass-through command to a modem/transceiver attached to the CRS-311 has "timed-out" and there was no response from the other device. During this wait, do not communicate with the CRS-311. After the '~' response is sent by the CRS-311, it is now ready to receive a message again. The CRS-311 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 command 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; remember that the modem being addressed may be at the distant end of an EDMAC link!

  Types of pass-through commands:

  o To a local modem;

  o To a modem at the distant end (EDMAC);

  o To a local BUC or transceiver connected to a local modem;

  o To a distant end BUC or transceiver through the distant end modem.

6.2.4 Packet Structure

The exchange of information is transmitted, Controller-to-Target and Target-to-Controller, in '**packets**'. Each packet contains a finite number of bytes consisting of printable ASCII characters, excluding ASCII code 127 (DELETE).

In this context, the Carriage Return and Line Feed characters are considered printable. With one exception, all messages from Controller-to-Target require a response – this will be either to return data that has been requested by the Controller, or to acknowledge reception of an instruction to change the configuration of the Target.

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

Target-to-Controller (Response to Command or Query)						
Start of Packet	Target Address	Address Delimiter	Instruction Code	Code Qualifier	Optional Arguments	End of Packet
> ASCII code 62 (1 character)	 (4 characters)	/ ASCII code 47 (1 character)	 (3 characters)	= *or* ? ASCII codes 61 *or* 63 (1 character)	 (n characters)	Carriage Return ASCII code 13 (1 character)

Detailed description of the packet components follow.

6.2.4.1   Start of Packet

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

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

The '**<**' and '**>**' characters indicate the start of packet. They may not appear anywhere else within the body of the message.

6.2.4.2   Target Address

While up to 9,999 devices can be uniquely addressed, connection to the CRS-311 imposes some basic limitations:

In **EIA-232** applications, the Switch address is fixed at 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.

Remote commands and queries that can be sent to the modems via the Switch depend upon the modem protocol and the installed options. Please consult the appropriate modem manual for further information. An external M&C application can monitor the modems, transparently through the Switch, using *virtual* addressing:

- 0100 for the Traffic Modem, and

- 1100 for the Redundant Modem, which are **added to the address of the Switch**.

Note that, regardless of the Switch remote communications being configured for either EIA-232 or EIA-485 mode, the *internal* link between the Switch and the modems is always fixed at EIA-232, 9600 baud, 8-N-1, address 0.

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.

6.2.4.3   Address Delimiter

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

6.2.4.4   Instruction Code

This three-character alphabetic sequence identifies the message subject. Wherever possible, each instruction code is named to serve as a mnemonic for its intended operation – e.g., **BKH** for **B**ac**K**up **H**oldoff time, or **SID** for **S**witch **ID**, etc. This aids in the readability of the message, should it be displayed in its raw ASCII form. Only upper case alphabetic characters may be used ('**A**' to '**Z**', ASCII codes 65 - 90).

6.2.4.5   Instruction Code Qualifier

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

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

Character	Definition
= (ASCII code 61)	This character is used as the **Assignment Operator** (AO). It establishes that the Instruction Code that precedes it is to be used as a *command* to assign or configure operation. The instruction set that follows serves to assign the Target's new parameter setting or operational value. **Example:** In a message from Controller-to-Target, **BKH=12** means "set the BacKup Holdoff time for **12** seconds."
? (ASCII code 63)	This character is used as the **Query Operator** (QO). It establishes that the Instruction Code that precedes it is to be used as a *query* that returns the Target's current configured parameter setting or operational value. **Example:** *From Controller-to-Target*, **BKH?** means, "what is the BacKup Holdoff time?"

2. **_Target-to-Controller_**, the only permitted characters are:

Character	Definition
= (ASCII code 61)	This character is used in two ways: a. If the Controller sends a query to the Target – for example, **BKH?** means, "what is the BacKup Holdoff time?" – the Target responds with **BKH=xx**, where 'xx' represents the time in question. b. If the Controller sends an instruction to set a parameter to a particular value, and the value sent is valid, the Target acknowledges the message and responds with **BKH=** (with no message arguments).
? (ASCII code 63)	If the Controller sends an instruction to set a parameter to a particular value, and the value sent is not valid, the Target then acknowledges the message and responds with, for example, **BKH?** (with no message arguments). This indicates that there was an error in the message sent by the Controller.
! (ASCII code 33)	If the Controller sends an instruction code that the Target does not recognize, the Target responds by echoing the invalid instruction, followed by **!** (**Example:** XYZ!)
* (ASCII code 42)	If the Controller sends the command to set a parameter to a particular value, and the value sent is valid BUT the router will not permit that particular parameter to be changed at present, the Target acknowledges the message and responds with, for example, **MLC*** (with message arguments).
# (ASCII code 35)	If the Controller sends a correctly formatted command, BUT the unit is not in Remote Mode, it does not allow reconfiguration and responds, for example, with **MLC#**.
~ (ASCII Code 126)	If a message was sent via the Switch to an attached modem or ODU, the message was transmitted transparently through the Switch. In the event of the other device not responding, the Switch would generate a response e.g. >0100/MGC~ indicating that it had finished waiting for a response and was now ready for further COMs.

6.2.4.6   Optional Message Arguments

Arguments are not required for all messages. Arguments are ASCII codes for the characters '**0**' to '**9**' (ASCII codes 48 to 57); 'A' to 'Z' (ASCII codes 65 to 90); period '**.**' (ASCII code 46); and comma '**,**' (ASCII code 44).

6.2.4.7   End of Packet

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

- **Target-to-Controller:** This is the two-character sequence 'Carriage Return', 'Line Feed' ([cr][lf]) (ASCII codes 13 and 10).

  Both indicate the valid termination of a packet.

6.3   Remote Commands and Queries

The table that follows provides a 'quick reference' to the Instruction Codes available at present for M&C of the CRS-311. The '**C**' and '**Q**' columns, when marked with an '**X**', denote whether that Instruction Code is *Command Only*, *Query Only*, or *Command and Query*.

Instr Code	C	Q	Page
AAM	X	X	7-9
ACT		X	7-9
AMQ		X	7-9
BBU	X	X	7-9
BKH	X	X	7-9
CAE	X		7-10
CLD	X		7-10
CST	X	X	7-10
DAY	X	X	7-10
EID		X	7-10
FLT		X	7-11
IMS	X	X	7-11
LRS	X	X	7-11
MAM	X	X	7-11
MOD		X	7-12
NUE		X	7-12
OPM	X	X	7-12
RNE		X	7-12
RSH	X	X	7-13
SAM	X	X	7-13
SGC	X	X	7-13
SID	X	X	7-13
SNO		X	7-13
SWR		X	7-13
TIM	X	X	7-14
XMI		X	7-14

Note: The following codes are used in the '**Response to Command**' column:

Code	Meaning
=	Message OK
?	Received OK, but invalid arguments found
*	Message OK, but not permitted in **Current** mode
#	Message OK, but only permitted in **Remote** mode
~	Timed out a pass-through message
!	Unknown command

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes: i.e., ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Audio Alarm Mask	AAM=	1 byte, numerical	Command or Query. x indicates the Audio alarm mask: 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= (message OK) AAM? (received OK, but invalid arguments found) AAM* (message OK, but not permitted in current mode)	AAM?	AAM=x (see description of arguments)
Active Modems	N/A	11 bytes, numerical	Query only. The active state of the two modems – for the 311 Switch the TM is always active. (Retained for CRS-311 Switch compatibility) x indicates the Traffic Modem y indicates the Redundant Modem 0 = Modem is not active 1 = Modem active	N/A	ACT?	ACT=x000000000y (see description of arguments)
Active Modem Query	N/A	11 bytes, numerical	Query only. Indicates the state of the two Modems (Command format maintained to keep compatible with the CRS-300) x Indicates the Traffic Modem y Indicates the Redundant Modem Value: 0 = TMI/RMI not present. Modem cannot be activated. 1 = TMI/RMI present, but modem not activate. 2 = TMI/RMI present, modem active and responding. 3 = TMI/RMI present, modem active but not responding.	N/A	AMQ?	AMQ=x0000000000y (see description of arguments)
Bridge/Backup Mode	BBU=	3 bytes, value of 0 or 1	Command or Query. The bridge/backup state: yy = fixed at 01 for CRS-311 0 = bridging mode, ie TM is online 1 = backing-up mode, ie RM is online. This parameter can only be changed when in Manual mode.	BBU= (message OK) BBU? (received OK, but invalid arguments) BBU* (message OK, but not permitted in current mode)	BBU?	BBU=xyy (see description of arguments)
Backup Holdoff Time	BKH=	2 bytes, numerical	Command or Query. The backup holdoff time is the delay when auto mode prepares to backup a faulted modem: 01-99 = # of seconds delay after Redundant Modem has acquired Traffic Modem's configuration before online swap actually takes place.	BKH= (message OK) BKH? (received OK, but invalid arguments) BKH* (message OK, but not permitted in current mode)	BKH?	BKH=xx (see description of arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes: i.e., ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Clear All Stored Events	CAE=	None	Command only. Instructs the unit to clear all Stored Events. This command takes no arguments.	CAE= (message OK) CAE* (message OK, but not permitted in current mode)	N/A	N/A
Config Load	CLD=	1 byte, numerical, 0 to 9	Command only. Forces the Switch to retrieve the Configuration Memory location defined by the argument **n** (0 to 9) and to re-program the Switch with that stored configuration.	CLD= (message OK) CLD? (received OK, but invalid arguments found) CLD* (message OK, but the memory location does not contain configuration info)	N/A	N/A
Config Store	CST=	1 byte, numerical, 0 to 9	Command or Query. The command forces the Switch to store its current configuration in the Configuration Memory location defined by the argument **n** (0 to 9). **Example:** CST=4 (Store current configuration in location 4) **WARNING:** Use with caution! If the location already contains data, it will be automatically overwritten. If in doubt, query the location first. The query returns the contents of the location.	CST= (message OK) CST? (received OK, but invalid arguments found) CST* (message OK, but not permitted in current mode)	CST?n where n is 0 to 9	Returns the same format as the SGC, with the form: CST=xxx....xxx for a valid config, and CST* where no valid config is found
Date	DAY=	6 bytes, numerical	Command or Query. The date, in the form ddmmyy (international date convention), where: **dd** = day of the month, between 01 and 31, **mm** = month of the year, between 01 and 12, and **yy** = year, between 97 and 96 (1997 to 2000, then 2000 to 2096) **Example:** DAY=240457 would be April 24, 2057.	DAY= (message OK) DAY? (received OK, but invalid arguments) DAY* (message OK, but not permitted in current mode)	DAY?	DAY=ddmmyy (see description of arguments)
Equipment ID	N/A	4 bytes, alpha-numeric	Query only. Unit returns information concerning the equipment identification. S311 indicates this CRS-311 1:1 Switch unit. (S300 indicates CRS-300 1:N Switch).	N/A	EID?	EID=xxxx (see description of arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes: i.e., ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Faults and Status	N/A	15 bytes, alpha-numeric	Query only. Unit returns the current fault and status codes for the Switch itself, where: **r** = Redundant Modem: 0 = OK, 1 = RMI not present 2 = RM I/O timeout 3 = RM comms problem 4 = RM is in a test mode 5= RM is rejecting an MGC configuration string Power supply information, values 0 or 1 only. **A/a** = + 5V PSU-A under/over **B/b** = +5V PSU-B under/over **C/c** = +12V PSU-A under/over **D/d** = +12V PSU-B under/over **E/e** = -12V PSU-A under/over **F/f** = -12V PSU-B under/over **m** is TMI: interface mismatch: 0 = no problem, 1 indicates the TM position of a TMI interface mismatch **i** is modem I/O communications: 0 = no problem, 1 indicates the traffic modem is activated but is not responding.	N/A	FLT?	FLT=rAaBbCcDdEeFfmi (see description of arguments)
Independent Mode	IMS=	1 byte, value of 0 or 1	Command or Query. **x** indicates the normal/Independent Mode operational status of the Switch: 0 = normal operation 1 = Independent Mode enabled	IMS= (message OK) IMS? (received OK, but invalid arguments found)	IMS?	IMS=x (see description of arguments)
Local/ Remote Status	LRS=	1 byte, value of 0 or 1	Command or Query. **x** indicates the local/remote status of the Switch: 0 = local 1 = remote	LRS= (message OK) LRS? (received OK, but invalid arguments found)	LRS?	LRS=x (see description of arguments)
Modem Alarm Mask	MAM=	1 byte, numerical	Command or Query. **x** indicates the Modem alarm mask: 0 = no faults masked 1 = Tx faults masked 2 = Rx faults masked	MAM= (message OK) MAM? (received OK, but invalid arguments found) MAM* (message OK, but not permitted in current mode)	MAM?	MAM=x (see description of arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes: i.e., ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Modem type	N/A	4 bytes, numeric	Query only. Unit returns information concerning the model of the Redundant Modem attached, where **xxxx** may be 5650 indicating the SLM-5650 modem.	N/A	MOD?	MOD=xxxx (see description of arguments)
Number of Unread Stored Events	N/A	2 bytes, numerical	Query only. Switch returns the number of Stored Events, which remain unread, *over the remote control*. Viewing the stored events from the front panel of the modem does not affect this value. **Example:** NUE=98	N/A	NUE?	NUE=xx (see description of arguments)
Operating Mode	OPM=	1 byte, numerical	Command or Query. **x** indicates the operating mode, where: 0 = manual mode 1 = auto mode	OPM= (message OK) OPM? (received OK, but invalid arguments) OPM* (message OK, but not permitted in current mode)	OPM?	OPM=x (see description of arguments)
Retrieve Next 5 unread Stored Events	N/A	80 bytes	Query only. Switch returns the oldest 5 Stored Events, which have not yet been read over the remote control. Reply format: [cr]Sub-body[cr]Sub-body[cr]Sub-body[cr]Sub-body[cr]Sub-body, where Sub-body=KLMddmmyyhhmmss, **K** is the fault/clear indicator, where F = Fault, C = Clear, I = Info **L** is the faulting/clearing unit, values: 1 through 9, A =TM, B=RM, C=Switch, D=Info **M** is the fault code, where the value depends on faulting unit: Switch codes are 1 to F, indicating the **position** of the fault within the FLT string. Modem codes are: 1= Unit, 2= Rx traffic, 3= Tx traffic Info codes are: 0= Power off, 1= Power on, 2= Log cleared **ddmmyy** is the date of the event (international format). **hhmmss** is the time of the event. If there are no new events, the unit replies with RNE*. If fewer than 5 events remain, the last positions are filled with zeroes.	N/A	RNE?	RNE=[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss[cr]KLMddmmyyhhmmss (see description of arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes: i.e., ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Restore Holdoff Time	RSH=	2 bytes, numerical	Command or Query. The restore holdoff time is the delay when auto mode prepares to return a modem (previously faulted, now good) back online due to a different Traffic Modem's failure: 01-99 = # of seconds after offline Traffic Modem lost its fault before it is put back online..	RSH= (message OK) RSH? (received OK, but invalid arguments found) RSH* (message OK, not permitted in current mode)	RSH?	RSH=xx (see description of arguments)
Switch Alarm Mask	SAM=	1 byte, numerical	Command or Query. **x** indicates the Switch alarm mask: 0 = no faults masked 1 = PSU-A faults masked 2 = PSU-B faults masked	SAM= (message OK) SAM? (received OK, but invalid arguments found) SAM* (message OK, but not permitted in current mode)	SAM?	SAM=x (see description of arguments)
Switch Global Configuration	SGC=	29 bytes, numerical	Command or Query. Global configuration of the Switch, in the form: OassssssssssBNNbbrrMSAsssssssss, where: **O** = Operating Mode – same as OPM (1 bytes) **a** = Active Modem – same as ACT for TM (1 byte) **s** = 9 spare bytes **B** = Bridge/Backup State – same as BBU (1 byte) **NN** = always 01 for the 311 **bb** = Backup Holdoff Time – same as BKH (2 byte) **rr** = Restore Holdoff Time – same as RSH (2 byte) **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 bytes) **s** = 8 spare bytes	SGC= (message OK) SGC? (received OK, but invalid arguments found) SGC* (message OK, but not permitted in current mode)	SGC?	SGC=OassssssssssBNNbbrr MSAsssssssss (see description of arguments)
Switch ID	SID=	24 bytes, ASCII	Command or Query. A user-defined Switch ID, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + - , . / 0-9 and A-Z.	SID= (message OK) SID? (received OK, but invalid arguments found) SID* (message OK, but not permitted in current mode)	SID?	SID=xxxxxxxxxxxxxxxxxxxxxx xxx (see description of arguments)
Serial Number	N/A	9 bytes, numerical	Query only. Unit returns its 9-digit serial number. **Example:** SNO=176512523	N/A	SNO?	SNO=xxxxxxxxx (see description of arguments)
Software Revision	N/A	5 bytes, numerical	Query only. Unit returns the value of internal software revision installed in the unit, in the form **x.x.x** **Example:** SWR=1.0.1 (indicating Version 1.0.1)	N/A	SWR?	SWR=x.x.x (see description of arguments)

Parameter Type	Command (Code and qualifier)	Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes: i.e., ASCII codes between 48 and 57)	Response to Command (Target-to-Controller)	Query (Code and qualifier)	Response to query (Target-to-Controller)
Time	TIM=	6 bytes, numerical	Command or Query. 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 **Example:** TIM=231259 would be 23 hours, 12 minutes and 59 seconds from midnight.	TIM= (message OK) TIM? (received OK, but invalid arguments) TIM* (message OK, but not permitted in current mode)	TIM?	TIM=hhmmss (see description of arguments)
TMI/RMI types	N/A	11 Bytes	Query only. x indicates the TMI/RMI type detected in each slot position: Positions 1 through 10 are TMIs, where **x** may be: 0 = none present 1 = CRS-320 rev A 2 = CRS-330 3 = CRS-340 rev A 4 = CRS-340 rev B 5 = CRS-370 6 = CRS-320 rev C 7 = undefined 8 = CRS-341 9 = CRS-316 A = CRS-336 B = undefined C = CRS-315 D = CRS-325 E = CRS-335 F = CRS-345 G = CRS-365 H = CRS-365D Position11 is the RMI, where **y** may be: 0 = none present 7 = CRS-310 D = CRS-307 E = CRS-306 F = CRS-305 **Example:** XMI=20000000007	N/A	XMI?	XMI=xxxxxxxxxxy (see description of arguments)

Appendix A.   CABLE DRAWINGS

A.1   Introduction

This appendix identifies the cables used with the CRS-311 1:1 Redundancy Switch. It divides these cables into three usage categories: User/Utility Cables, Control Cables, and Data Traffic / IF Cables. Each category / appendix section includes illustrations of the cables' technical specifications; additionally, the tables featured in the Control or Data Traffic / IF Cables sections cross-reference to the illustrations found in **Chapter 3. CABLES AND CONNECTIONS**.

> *All dimensions, where specified in the illustrations provided in this appendix, are in inches.*

A.2   User / Utility Cables

App. A FIG	REF Ch. 3 FIG	CEFD CABLE P/N	DESCRIPTION	USED WITH CRS-311 → …	USED FOR (DATA TYPE)
A-1	N/A	N/A	N/A	User Data	EIA-530 → EIA-422/449 DCE (Data Conversion Equipment)
A-2	N/A	N/A	N/A	User Data	EIA-530 → V.35 DCE
A-3	N/A	N/A	N/A	User EIA-232 Switch M&C / Firmware Update	CRS-311 Remote Control → PC Serial Port

A.2.1   EIA-530 to EIA-422 DCE Cable

Use the EIA-530 to EIA-422/449 DCE Cable (**Figure A-1)** for connections between the CRS-311 and the User Data.
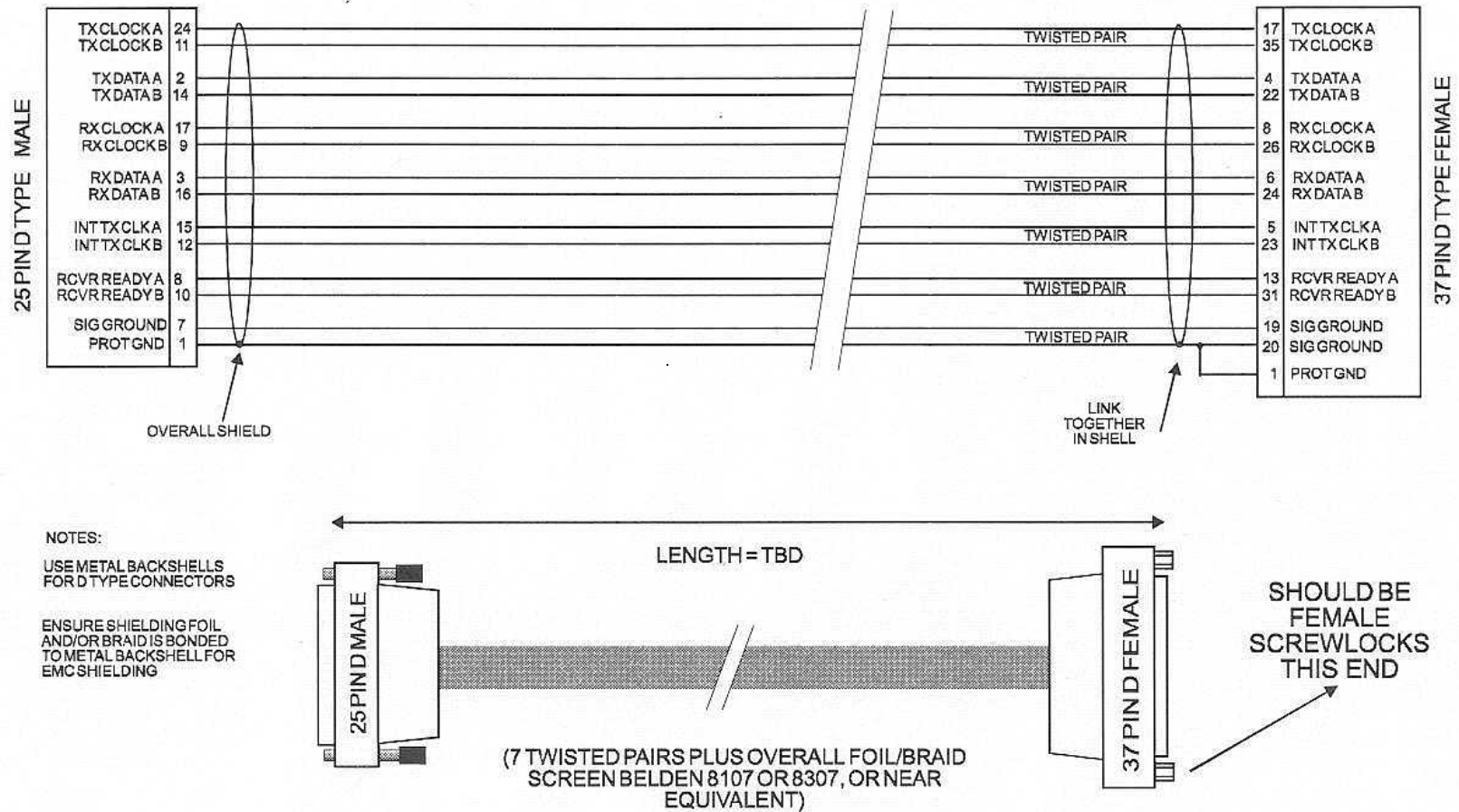
Figure A-1. DCE Conversion Cable: EIA-530 to EIA-422/449

A.2.2   EIA-530 to V.35 DCE Cable

Use the EIA-530 to V.35 DCE Cable (**Figure A-2**) for connections between the CRS-311 and the User Data.
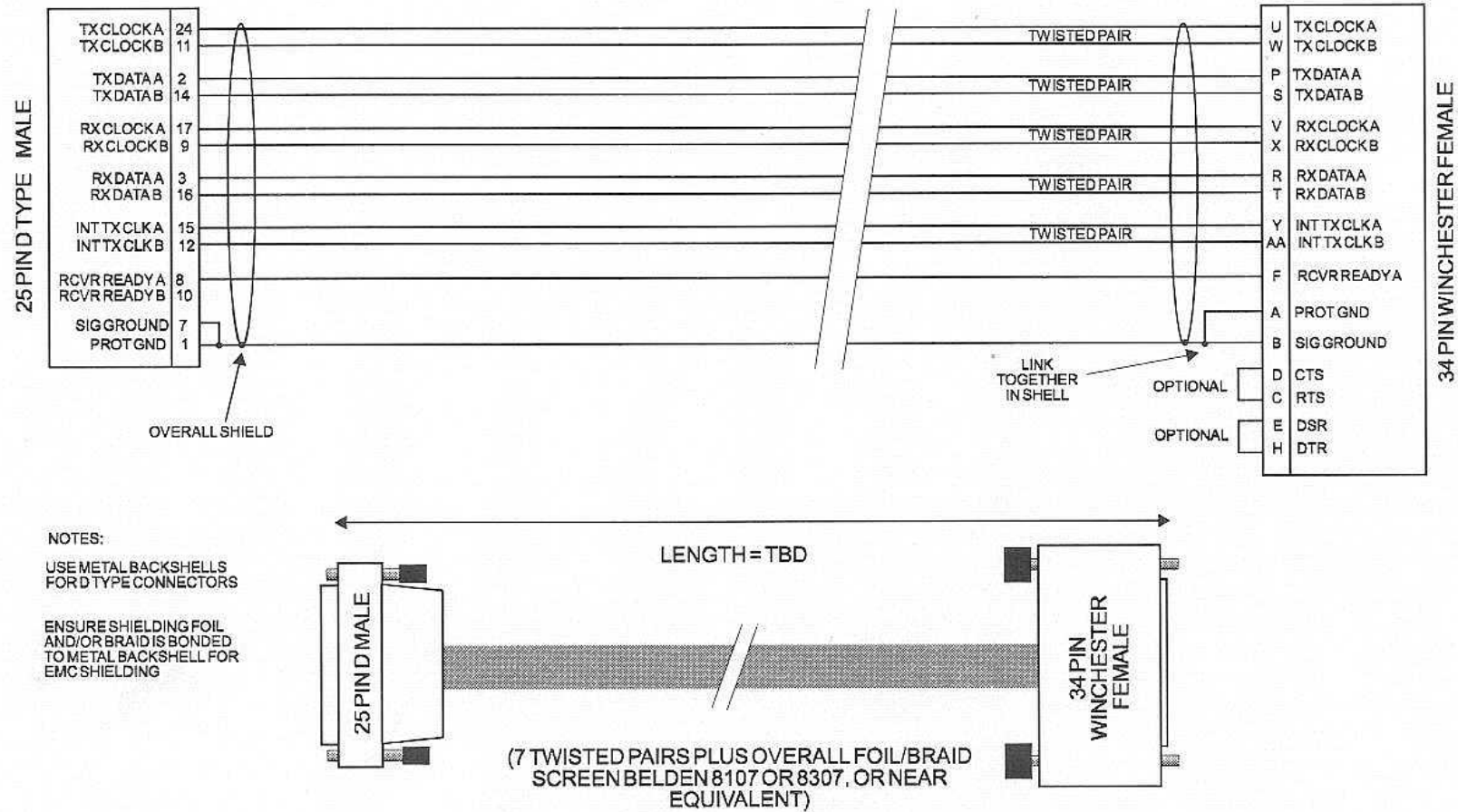
Figure A-2. DCE Conversion Cable: EIA-530 to V.35

A.2.3   Switch M&C / Firmware Update Cable

The EIA-232 connection cable (**Figure A-3**) is required for the serial-based M&C of the CRs-311, and for the firmware update process. Use this on the CRS-230 System Controller Module "Remote Control" port at the CRS-311 end and a user PC serial port.
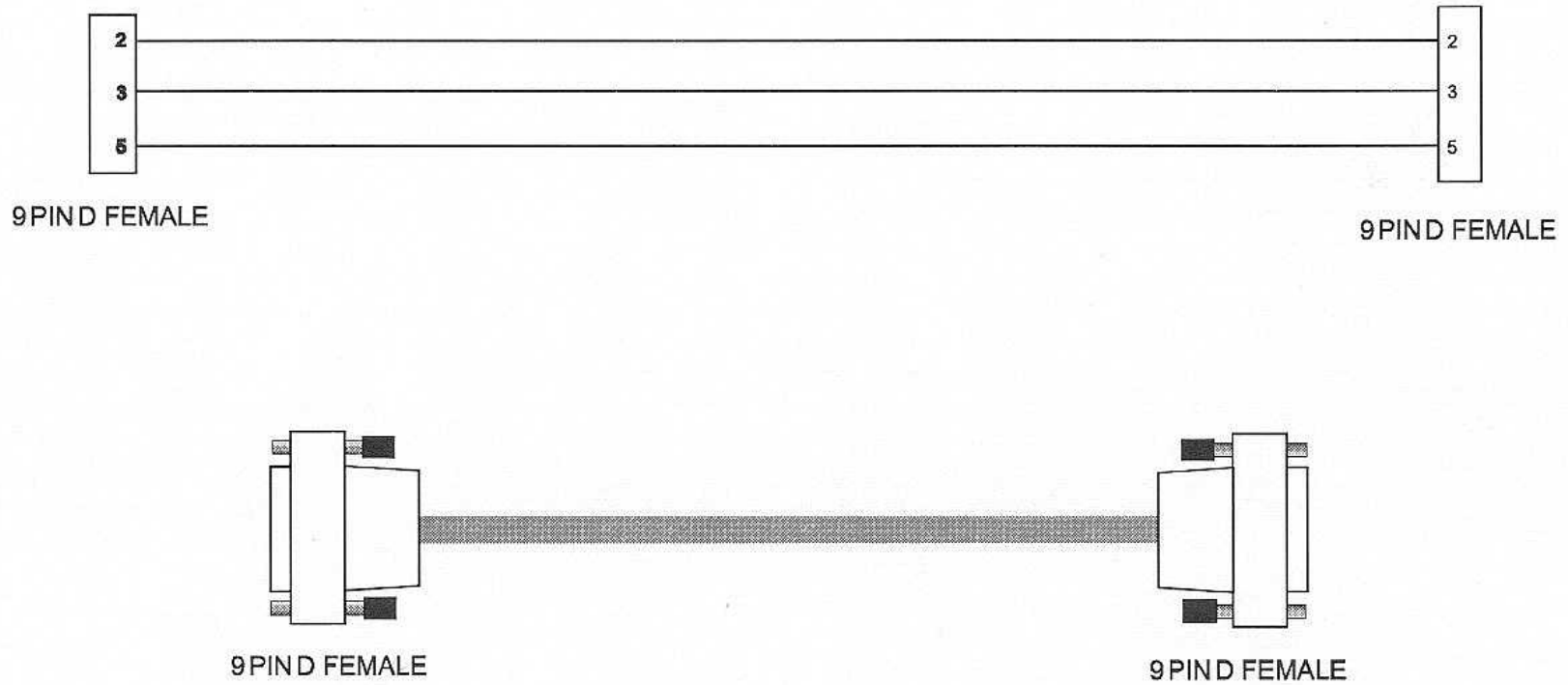
Figure A-3. Switch M&C / Firmware Update Cable

A.3   Control Cables

App. A FIG	REF Ch. 3 FIG	CEFD CABLE P/N	DESCRIPTION	USED WITH CRS-311 →	USED FOR (TYPE)
A-4	3-1	CA-0000095	(6X) DB-9F Ribbon		EIA-485 Multi-drop (*optional*)
A-5	3-1	CA-0000096	(6X) DB-9F Shielded	CDM-Qx/QxL	EIA-485 Multi-drop (*standard*)
A-6	3-1	CA/WR11418-1	Terminal		Terminal
A-7	3-1	CA/WR11419-1	DB-9M → DB-9M, 6″		Null Modem
A-8	3-2 3-3 3-4 3-5 3-6	CA-0000009	HD-15M → (2X) DB-15F, 4′	CDM-Qx/QxL	Control 'Y'
A-9	3-9 3-10 3-11 3-17 3-18 3-19 3-20 3-21	CA/WR12136-2	HD-15M → HD-15M, 4′	SLM-5650/5650A	Control
A-10	3-22	CA-0000006	DB-50M → (2X) DB-25F, 4′	(CRS-351) → SLM-5650/5650A	Control 'Y' (Overhead Data)
A-11	N/A	CA/WR12842-4	HD-15M → DB-9M, HD-15M, 4′	RMI/TMI → SLM-5650/5650A Overhead → User	Control 'Y'

A.3.1   Optional EIA-485 Multi-drop Ribbon Cable (6X DB-9F)

Use this optional EIA-485 Multi-drop Ribbon Cable (**Figure A-4**) to daisy-chain the CDM-Qx/QxL Redundant and Traffic Modems together for communications with the CRS-311. If Electromagnetic Compatibility (EMC) **is** a concern, then use the standard EIA-485 Multi-Drop Shielded Cable (**Figure A-5**).
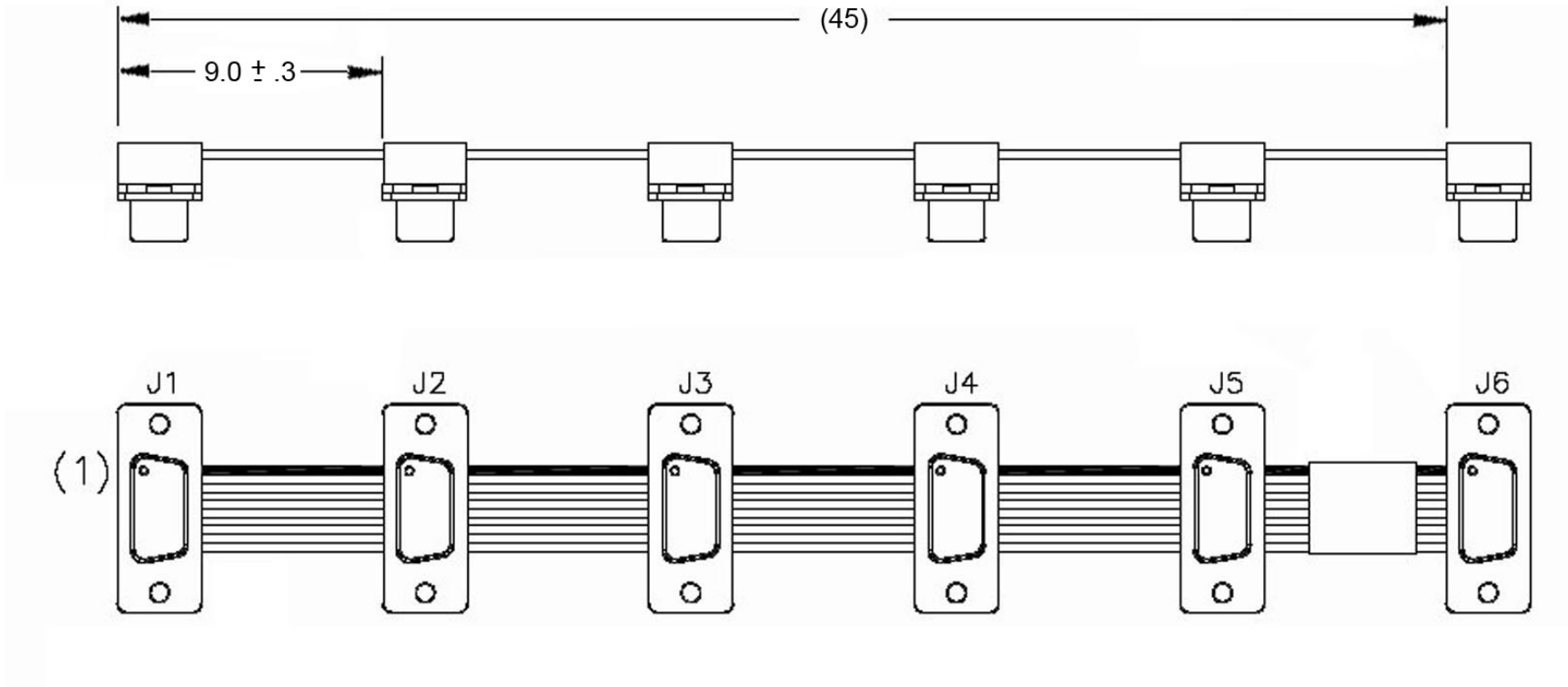
Figure A-4. Optional EIA-485 Multi-Drop Ribbon Cable (CEFD P/N CA-0000095)

A.3.2   Standard EIA-485 Multi-drop Shielded Cable (6X DB-9F)

Use this standard EIA-485 Multi-drop Shielded Cable (**Figure A-5**) to daisy-chain the CDM-Qx/QxL Redundant and Traffic Modems together for communications with the CRS-311. If Electromagnetic Compatibility (EMC) is **not** a concern, then use the optional EIA-485 Multi-drop Ribbon Cable (**Figure A-4**).

FROM	TO	TO	TO	TO	TO	COLOR	PAIR
J1-1	J2-1	J3-1	J4-1	J5-1	J6-1	DRAIN	N/A
J1-2	J2-2	J3-2	J4-2	J5-2	J6-2	RED	X
J1-3	J2-3	J3-3	J4-3	J5-3	J6-3	BLK	
J1-4	J2-4	J3-4	J4-4	J5-4	J6-4	BLU	X
J1-5	J2-5	J3-5	J4-5	J5-5	J6-5	BLK	
J1-6	J2-6	J3-6	J4-6	J5-6	J6-6	GRN	X
J1-7	J2-7	J3-7	J4-7	J5-7	J6-7	BLK	
J1-8	J2-8	J3-8	J4-8	J5-8	J6-8	WHT	X
J1-9	J2-9	J3-9	J4-9	J5-9	J6-9	BLK	
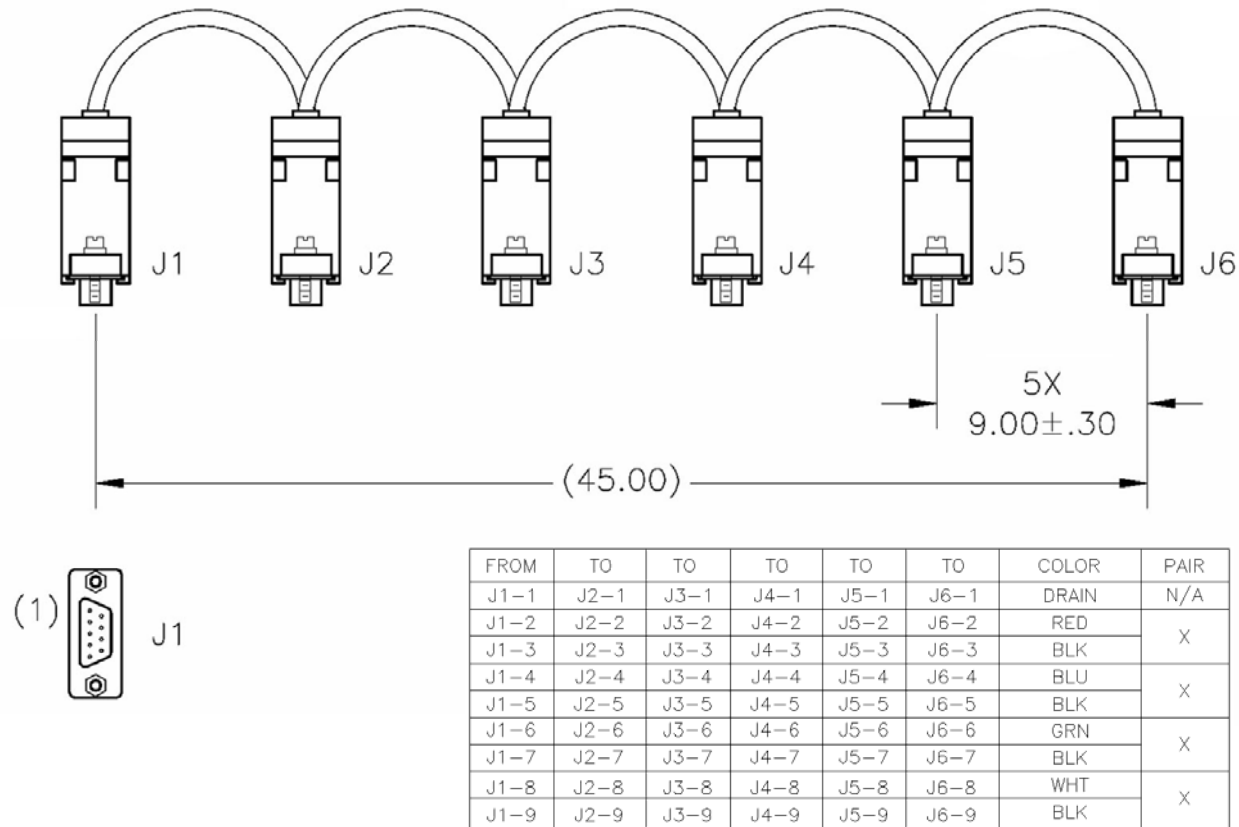
Figure A-5. Standard EIA-485 Multi-Drop Shielded Cable (CEFD P/N CA-0000096)

A.3.3   EIA-485 Cable Termination (DB-9M)

Use the EIA-485 Cable Termination (**Figure A-6**) to terminate the ends of either the optional EIA-485 Multi-Drop Ribbon Cable (CEFD P/N CA-0000095, **Figure A-4**) or the standard EIA-485 Multi-Drop Shielded Cable (CEFD P/N CA-0000096, **Figure A-5**).
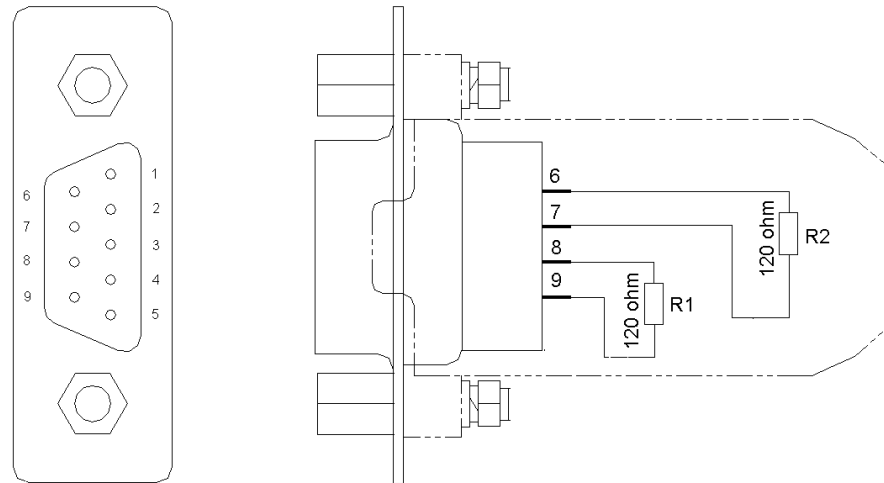
Figure A-6. EIA-485 Cable Termination (CEFD P/N CA/WR11418-1)

A.3.4 EIA-485 Null Modem Cable (DB-9M to DB-9M)

Use this EIA-485 Null Modem Cable (**Figure A-7**) with CDM-Qx/QxL modems: At the CRS-311 end, attach this cable to the DB-9F "485 Pass-through" connector on the CRS-230 System Controller Module. At the modem end, attach this cable either to the optional EIA-485 Multi-Drop Ribbon Cable (CEFD P/N CA-0000095, **Figure A-4**) or to the standard EIA-485 Multi-Drop Shielded Cable (CEFD P/N CA-0000096, **Figure A-5**).
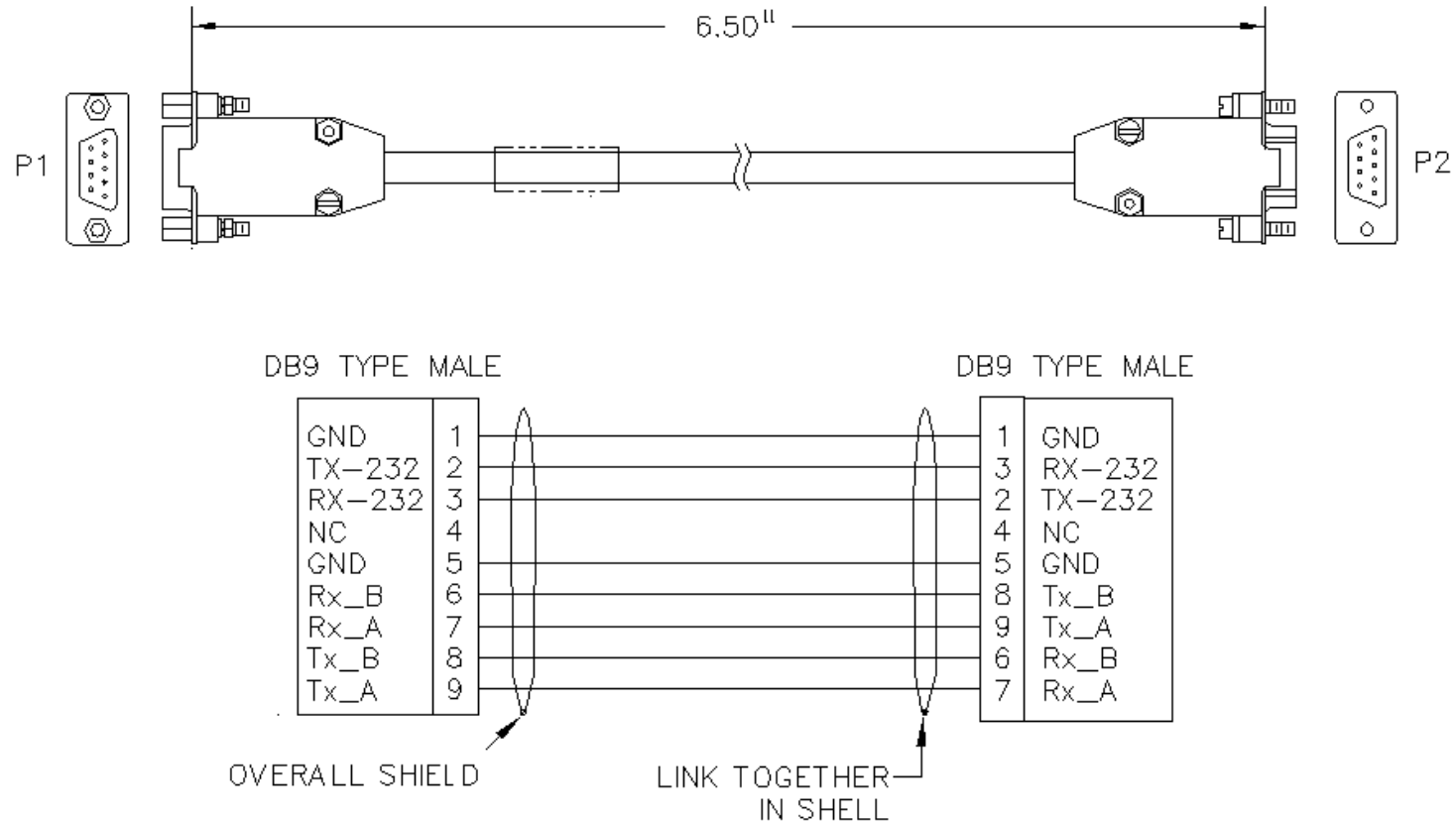
Figure A-7. EIA-485 Null Modem Cable (CEFD P/N CA/WR11419-1)

A.3.5   Control 'Y' Cable for CDM-Qx and CDM-QxL with (HD-15M to 2X DB-15F) CnC®

This cable (**Figure A-8**) is one of the two types of control cables required for the CDM-Qx/QxL modems. It adapts the HD-15F "Faults" connector on the CRS-311 RMI/TMI to the mod and demod DB-15 "Alarms" connectors on the CDM-Qx/QxL Redundant and Traffic Modems. These interfaces are capable of CnC® support.

FROM	TO	SIGNAL	PAIR
P1-3	J1-11	PAIR1_A	x
P1-5	J1-1	PAIR1_B	
P1-8	J1-3	PAIR2_A	x
P1-5	J1-1	PAIR2_B	
P1-2	J2-11	PAIR3_A	x
P1-5	J2-4	PAIR3_B	
P1-7	J2-3	PAIR4_A	x
P1-5	J2-4	PAIR4_B	
P1-4	J2-12	PAIR5_A	x
P1-14	J2-15	PAIR5_B	
P1-13	J2-6	PAIR6_A	x
P1-10	J2-9	PAIR6_B	
J2-4	J2-7	JUMPER	
J2-7	J2-13	JUMPER	
J2-13	J2-1	JUMPER	
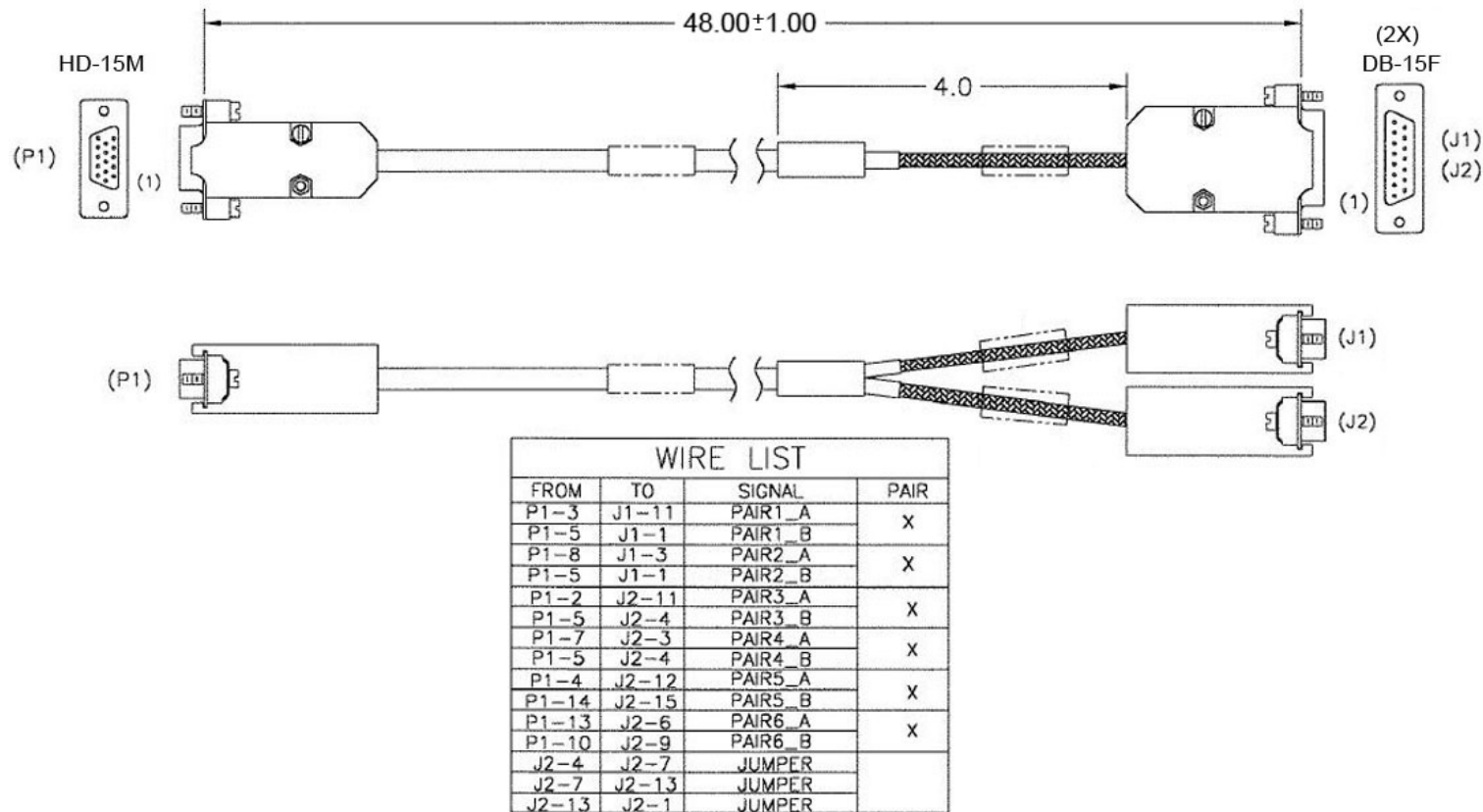
Figure A-8. Control 'Y' Cable for CDM-QxL with CnC® (CEFD P/N CA-0000009)

A.3.6   Control Cable for SLM-5650/5650A (HD-15M to HD-15M)

This cable (**Figure A-9**) connects the HD-15F connector labeled "J1" on the CRS-311 RMI/TMI to the HD-15F connector labeled "J9 Auxiliary" on the SLM-5650/5650A Redundant and Traffic Modems.

WIRE LIST		TWISTED PAIR
FROM	TO	
P1-1	P2-1	X
P1-6	P2-6	
P1-2	P2-2	X
P1-7	P2-7	
P1-3	P2-3	X
P1-8	P2-8	
P1-4	P2-4	
P1-5	P2-5	
P1-9	P2-9	
P1-10	P2-10	
P1-11	P2-11	
P1-12	P2-12	
P1-13	P2-13	
P1-14	P2-14	
P1-15	P2-15	

48.00 ± 3.00

P1

HD TYPE
15-PIN
MALE

P2

HD TYPE
15-PIN
MALE
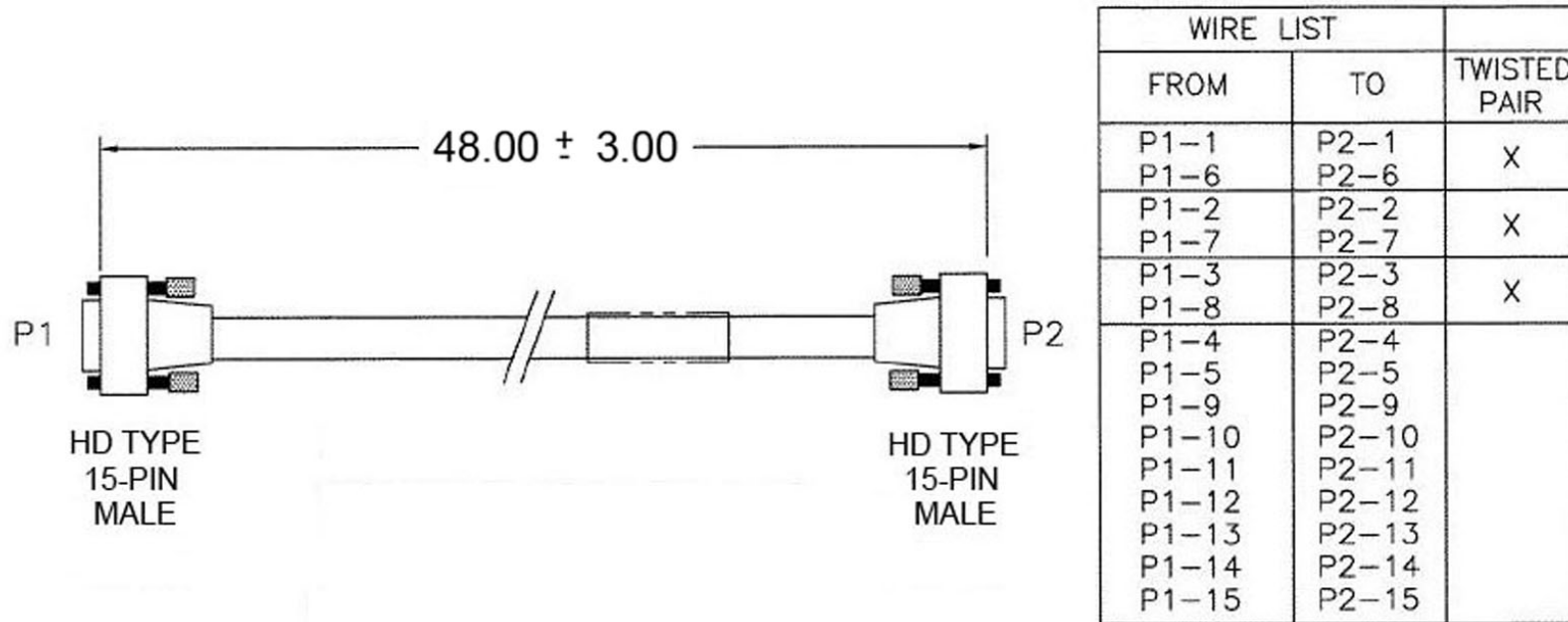
Figure A-9. SLM-5650/5650A Control Cable (CEFD P/N CA/WR12136-2)

A.3.7 Control 'Y' Overhead Cable for CRS-351 to SLM-5650/5650A (DB-50M to 2X DB-25F)

This cable (**Figure A-10**) connects the CRS-351 Overhead Module on the CRS-311 to the SLM-5650/5650A Redundant and Traffic Modem "P1 Overhead Data" ports. Use this cable as needed for protection of the overhead signals (backward alarms, audio ESC, data ESC, etc.).

WIRE LIST (P1 TO J2)

FROM	TO	WIRE COLOR	PAIR
P1-1	J2-1	RED	
P1-34	J2-14	WHT	X
P1-18	J2-2	GRN	
P1-2	J2-15	RED	X
P1-35	J2-3	RED	
P1-19	J2-16	BLK	X
P1-3	J2-4	RED	
P1-36	J2-17	BLU	X
P1-20	J2-5	WHT	
P1-4	J2-18	BLK	X
P1-37	J2-6	YLW	
P1-21	J2-19	RED	X
P1-38	J2-20	BLU	
P1-22	J2-8	BLK	X
P1-6	J2-21	YLW	
P1-7	J2-10	BLK	X
P1-39	J2-9	BRN	
P1-23	J2-22	RED	X
P1-40	J2-23	BLK	
P1-8	J2-24	BRN	X
P1-24	J2-11	BLK	
P1-41	J2-12	GRN	X
P1-25	J2-25	ORN	
P1-9	J2-13	BLK	X
P1-25	J2-7	SHIELD	
P1-46		ITEM 9	

WIRE LIST (P1 TO J3)

FROM	TO	WIRE COLOR	PAIR
P1-42	J3-1	RED	
P1-26	J3-14	WHT	X
P1-10	J3-2	GRN	
P1-43	J3-15	RED	X
P1-27	J3-3	RED	
P1-11	J3-16	BLK	X
P1-44	J3-4	RED	
P1-28	J3-17	BLU	X
P1-12	J3-5	WHT	
P1-45	J3-18	BLK	X
P1-29	J3-6	YLW	
P1-13	J3-19	RED	X
P1-30	J3-20	BLU	
P1-14	J3-8	BLK	X
P1-47	J3-21	YLW	
P1-48	J3-10	BLK	X
P1-31	J3-9	BRN	
P1-15	J3-22	RED	X
P1-32	J3-23	BLK	
P1-49	J3-24	BRN	X
P1-16	J3-11	BLK	
P1-33	J3-12	GRN	X
P1-17	J3-25	ORN	
P1-50	J3-13	BLK	X
P1-46	J3-7	SHIELD	

Figure A-10. SLM-5650/5650A Control 'Y' Overhead Cable (CEFD P/N CA-0000006)

A.3.8   Control 'Y' Cable for SLM-5650/5650A to CRS-311 (HD-15M to HD-15M / DB-9F)

This optional Control 'Y' Cable (**Figure A-11**) connects the HD-15F connector labeled "J1" on the CRS-311 RMI/TMI to the HD-15F connector labeled "J9 Auxiliary" on the SLM-5650/5650A Redundant and Traffic Modems. Use this cable, purchased separately in place of the standard control cable (CEFD P/N CA/WR12136-2, **Figure A-9**), to acquire user access to the AGC and I&Q outputs of the modems.
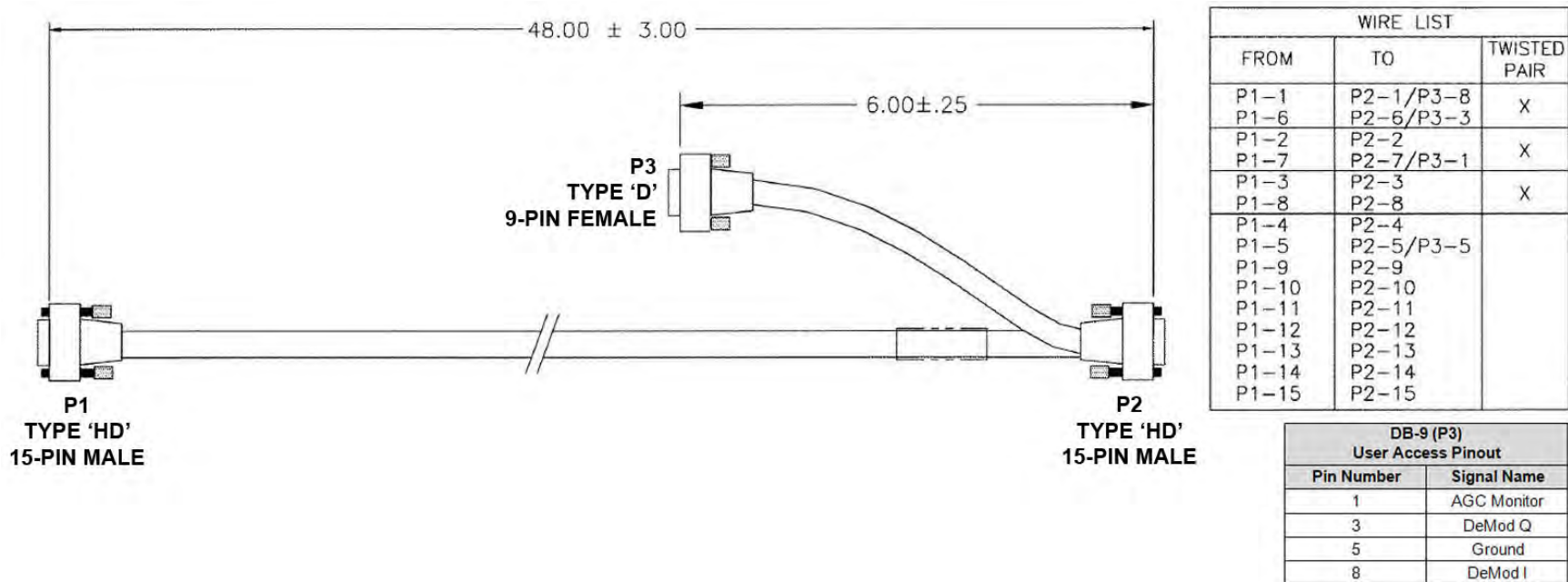
Figure A-11. SLM-5650/5650A Control 'Y' Cable (CEFD P/N CA/WR12842-4)

A.4 Data Traffic / IF Cables

App. A FIG	REF Ch. 3 FIG	CEFD CABLE P/N	DESCRIPTION	USED WITH CRS-311 → … [(CRS-XXX) denotes installed module]	USED FOR (TYPE)
A-12	3-2	CA/WR0066-4	DB-25M → DB-25F, 4'	CDM-Qx/QxL	EIA-422 Data
	3-9			(CRS-351) → SLM-5650/5650A	EIA-422 Data, EIA-530/EIA-232
A-13	3-3	CA/WR9038-4	DB-15M → DB-15F, 4'	CDM-Qx/QxL	Bal G.703 Data
	3-10			SLM-5650/5650A	
A-14	3-4	PL/0813-4	75Ω BNC → 75Ω BNC, 4'	CDM-Qx/QxL	Unbal G.703 Data
	3-7			(CRS-281) → CDM-Qx	IF
	3-10			SLM-5650/5650A	Unbal G.703 Data
A-15	3-5	CA/WR9189-4	HD-50M → HD-50M, 4'	CDM-Qx/QxL	HSSI Data
	3-11			SLM-5650/5650A	
A-16	3-6	CA/WR13018-2	DB-15F → (4X) RJ45, 6'	CDM-Qx/QxL	Quad E1 Data
A-17	3-6	PP/CAT5FF3FTGY	RJ45 → RJ45, 3'	CDM-Qx/QxL	Quad E1Data
	3-12 3-17 3-18 3-19 3-20 3-21			SLM-5650/5650A	CAT5 Ethernet
A-18	3-7	PL/0946-1	50Ω BNC → 50Ω BNC, 4'	(CRS-281) → CDM-Qx	IF
A-19	3-8	CA/RF10453-4	Type 'N' → Type 'N', 4'	(CRS-281A) → CDM-QxL	IF
	3-24 3-25 3-26			(CRS-281L) → SLM-5650/5650A	IF
A-20	3-23 3-25 3-26	CA/3005-1	50Ω TNC → 50Ω TNC, 4'	(CRS-281) → SLM-5650/5650A	IF

A.4.1   EIA-232/422, EIA-530 Control and Data Cable (DB-25M to DB-25F)

Use the EIA-232/422, EIA-530 Data Cable (**Figure A-12)** to connect between the CRS-311 and the Redundant and Traffic Modems, or between the CRS-311 and the User Data.

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

48.00 ± .50

DB-25M   DB-25F
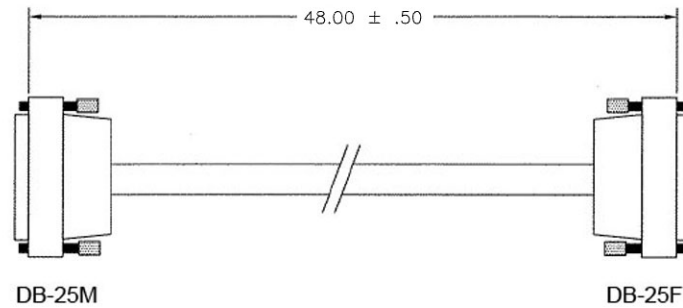
Figure A-12. EIA-232/422, EIA-530 Control and Data Cable (CEFD P/N CA/WR0066-4)

A.4.2   Balanced G.703 Data Cable (DB-15M to DB-15F)

Use this cable (**Figure A-13**) to connect Balanced G.703 Data between the CRS-311 and the Redundant and Traffic Modems, or between the CRS-311 and the User Data.

INDICATORS		
15M	NOTES	15M
1	TO	1
2	TO	2
3	TO	3
4	TO	4
5	TO	5
6	TO	6
7	TO	7
9	TO	9
11	TO	11
12	TO	12
13	TO	13
15	TO	15

48.00 ± 1.50

DB-15M   DB-15F
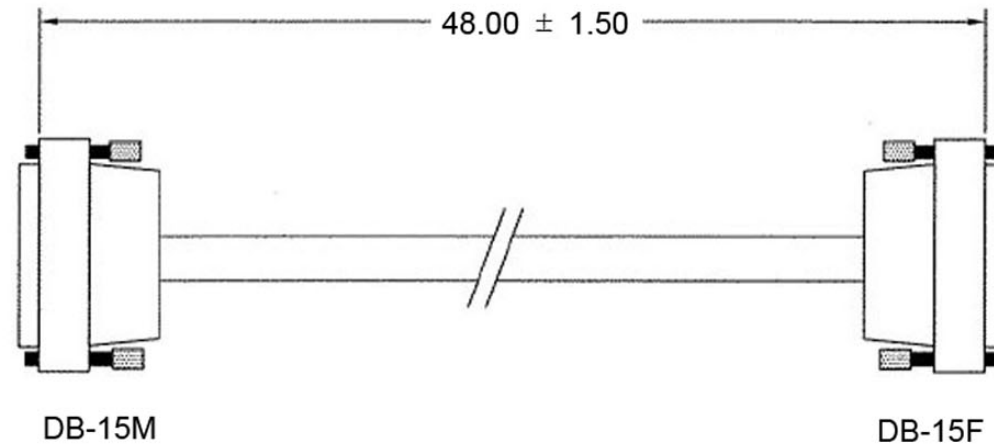
Figure A-13. Balanced G.703 Data Cable (CEFD P/N CA/WR9038-4)

A.4.3   Balanced G.703 / IF Cable, BNC (75Ω)

Use this 75Ω BNC cable (**Figure A-14**) to connect Balanced G.703 data between the CRS-311 and the Redundant and Traffic Modems, and to connect the CRS-311's CRS-281 (70/140 MHz) IF Switch to the modem.
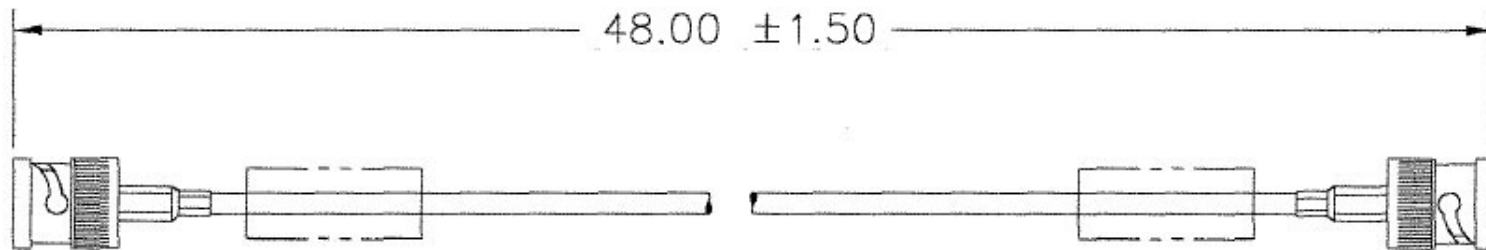
Figure A-14. Balanced G.703 / IF Cable, BNC 75Ω (CEFD P/N PL/0813-4)

A.4.4   HSSI Data Cable (HD-50M to HD-50M)

Use the HSSI Data Cable (**Figure A-15**) for the HSSI data connection between the CRS-311 RMI/TMI and the Redundant and Traffic Modems.
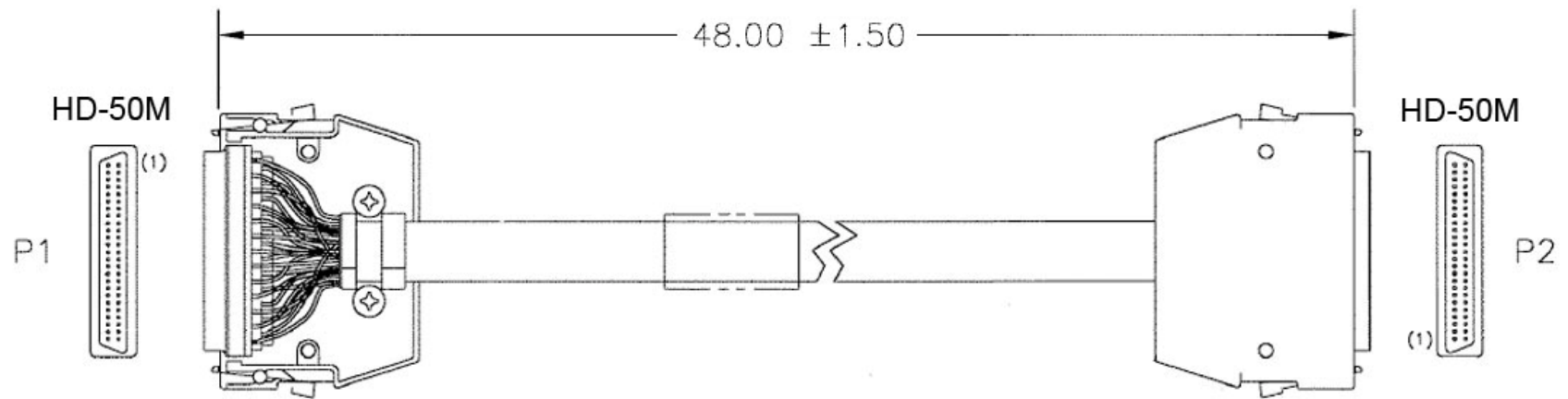
Figure A-15. HSSI Data Cable (CEFD P/N CA/WR9189-4)

A.4.5 Quad E1 Data Cable for CDM-Qx/QxL (DB-15F to 4X RJ-45)

Use the Quad E1 Data Cable (**Figure A-16**) to connect the CRS-311 RMI (CRS-305) to the Redundant CDM-Qx/QxL Quad E1 interface.

WIRE LIST		
FROM	TO	SIGNAL
P5-1	P1-4	RX1
P5-2	P1-2&5	GND
P5-3	P2-4	RX2
P5-4	P1-6, P5-7	GND
P5-5	P3-1	TX3
P5-6	P4-1	TX4
P5-7	P2-2&5, P5-8	GND
P5-8	P2-6, P5-10	GND
P5-9	P1-1	TX1
P5-10	P3-2&5, P5-14	GND
P5-11	P2-1	TX2
P5-12	P3-4	RX3
P5-13	P4-4	RX4
P5-14	P3-6, P5-15	GND
P5-15	P4-2,5&6	GND
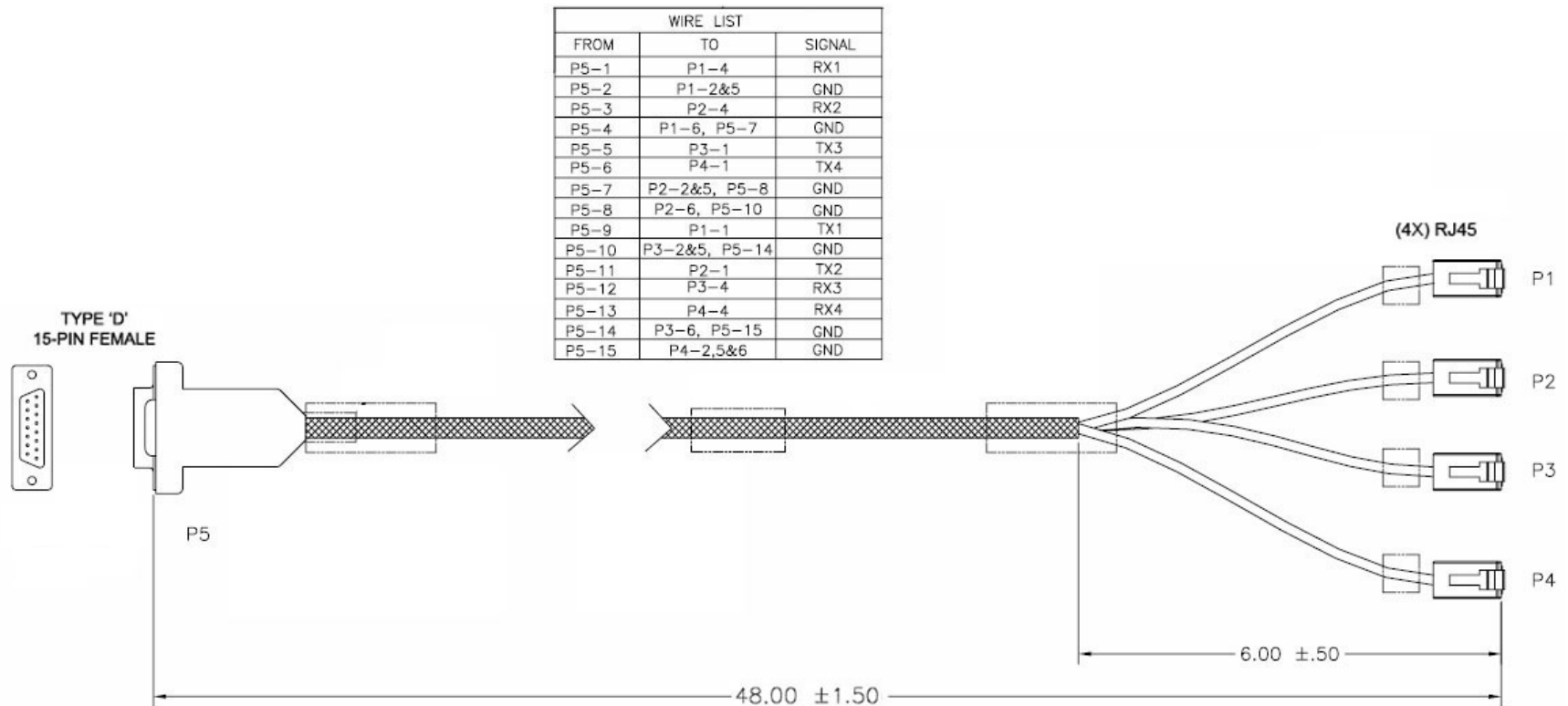
Figure A-16. CDM-Qx/QxL Quad E1 Data Cable (CEFD P/N CA/WR13018-2)

A.4.6   Quad E1 / Gigabit Ethernet Connector Cable (RJ-45 to RJ-45)

Use the Quad E1 / Gigabit Ethernet Connector Cable (**Figure A-17**) for the CRS-311 to CDM-Qx/QxL Redundant and Traffic Modem Quad E1 data connections, and the Gigabit Ethernet connections for the CRS-311 to the SLM-5650/5650A Redundant and Traffic Modems.
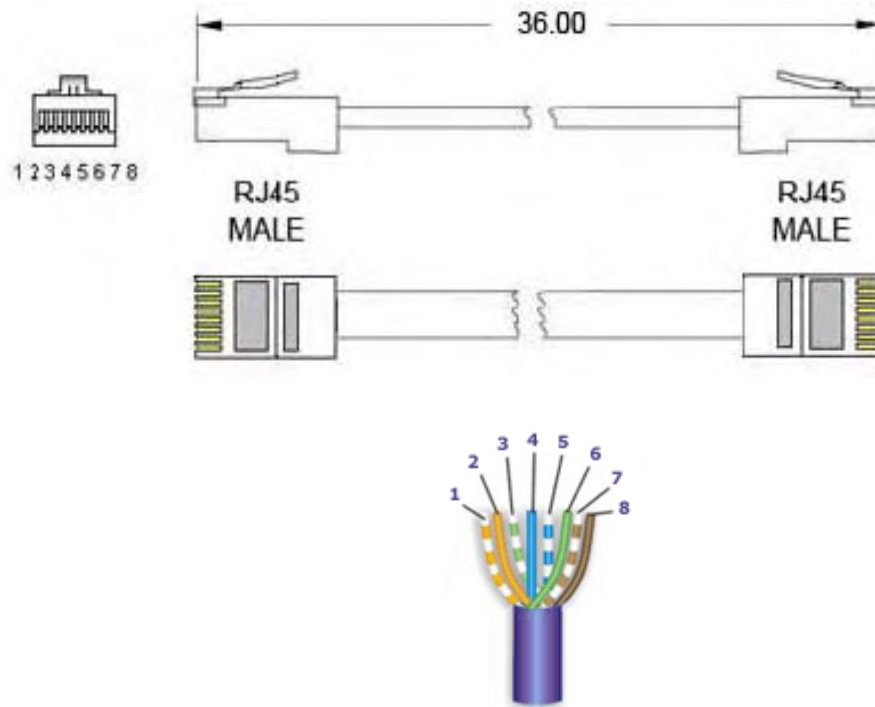
T568B Wiring Diagram		
Pair No.	**Wire**	**Pin No.**
1	Blue/White tracer	5
	Blue	4
2	Orange/White tracer	1
	Orange	2
3	Green/White tracer	3
	Green	6
4	Brown/White tracer	7
	Brown	8

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: 3 ft.

Figure A-17. Quad E1 / Gigabit Ethernet Connector Cable (CEFD P/N PP/CAT5FF3FTGY)

A.4.7   IF Cable, BNC (50Ω)

Use the 50Ω BNC IF Cable (**Figure A-18**) to connect the CRS-311's CRS-281 (70/140 MHz) IF Switch to the Redundant and Traffic Modems.
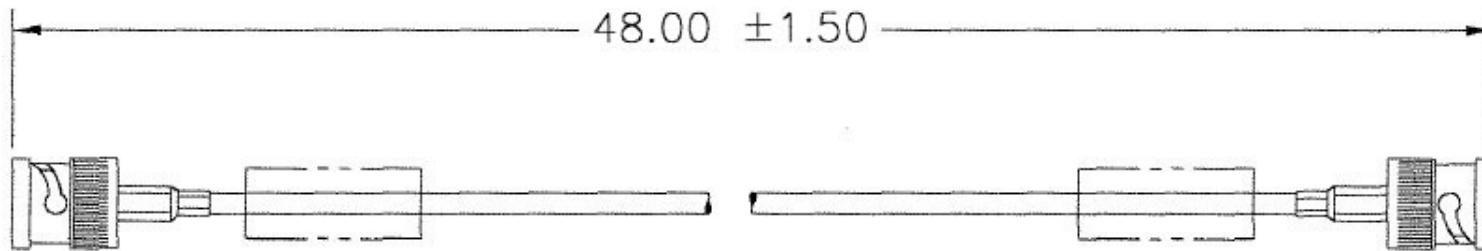
Figure A-18. IF Cable, BNC 50Ω for CRS-281 (70/140 MHz) IF Switch (CEFD P/N PL/0946-1)

A.4.8   IF Cable, Type 'N' (50Ω)

Use the 50Ω Type 'N' IF Cable (**Figure A-19**) to connect the CRS-311's CRS-281L or CRS-281A IF Switch to the Redundant and Traffic Modems.
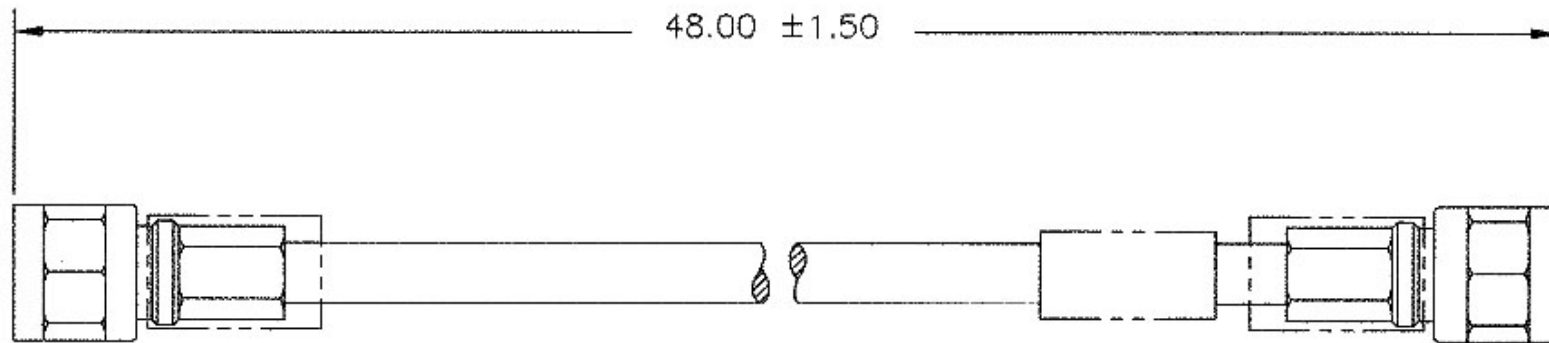
Figure A-19. IF Cable, Type 'N' 50Ω for CRS-281A / CRS-281L (L-Band) IF Switches (CEFD P/N CA/RF10453-4)

A.4.9 IF Cable, TNC (50Ω)

Use the 50Ω TNC IF Cable (**Figure A-20**) to connect the CRS-311's CRS-281 (70/140 MHz) IF Switch to the Redundant and Traffic Modems.
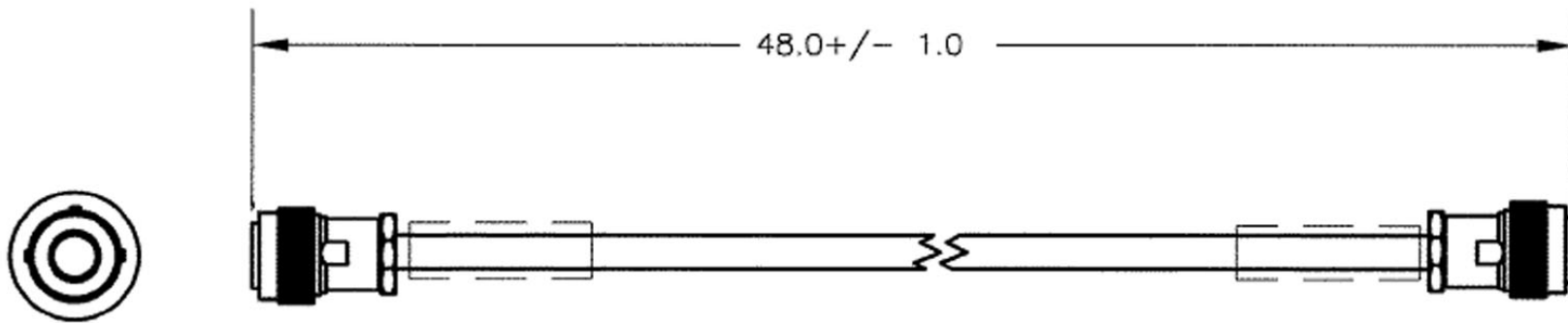
Figure A-20. IF Cable, TNC 50Ω for CRS-281 (70/140 MHz) IF Switch (CEFD P/N CA/3005-1)

Notes:

Appendix B. CONTROLLER / TMI CONNECTOR PINOUTS

B.1   CRS-230 System Controller Module
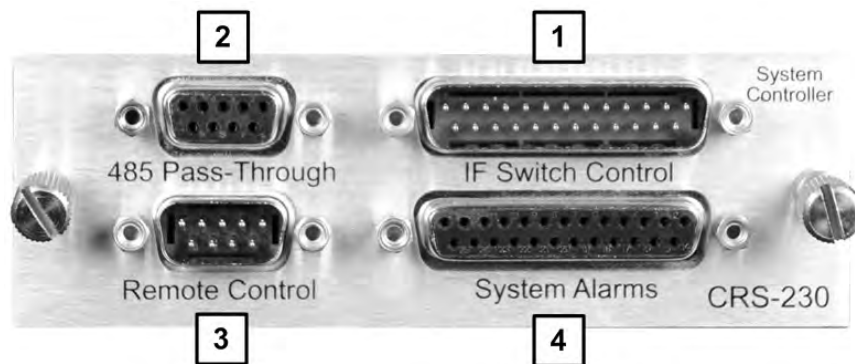
CRS-230 System Controller Module		
Feature	Connector Description	See Appendix Sect.
1	IF Switch Control	B.1.1
2	485 Pass-Through	B.1.2
3	Remote Control	B.1.3
4	System Alarms	B.1.3

B.1.1   CRS-230 "IF Switch Control" Connector (DB-25M)
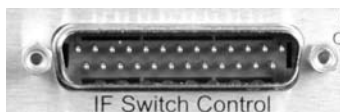
The CRS-230 "IF Switch Control" connector is not used with the CRS-311.

B.1.2   CRS-230 "485 Pass-Through" Connector (DB-9F)

Table B-1 indicates the pinout for the CRS-230 "485 Pass-Through" connector. This connector is used only with the CDM-Qx/QxL modems.

Table B-1. "485 Pass-Through" User Data Connector

Pin #	Description	Direction
1	Ground	–
6	RS-485 Receive Data B (see Note)	In
2	RS-232 Transmit Data	Out
7	RS-485 Receive Data A (see Note)	In
3	RS-232 Receive Data	In
8	RS-485 Transmit Data B	Out
4	Reserved - do not connect to this pin	–
9	RS-485 Transmit Data A	Out
5	Ground	–

Note: Use for 2-wire RS-485 operation.

B.1.3   CRS-230 "Remote Control" Connector (DB-9M)

Table B-2 indicates the pinout for the CRS-230 DB-9M "Remote Control" connector. This connector provides access to the remote control ports of the CRS-311 for both EIA-232 and EIA-485.

Table B-2. "Remote Control" User Data Connector

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.1.4   CRS-230 "System Alarms" Connector (DB-25F)
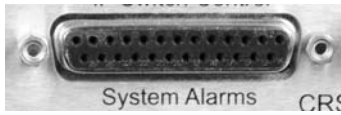
 Table B-3 indicates the pinout for the CRS-230 DB-25F "System Alarms" connector.

Table B-3. "System Alarms" User Data Connector

Pin #	Description
1	Traffic Modem Online Status – Common for Pin 6 (**Note 2**)
14	Not used
2	Not used
15	Not used
3	Not used
16	Not used
4	Not used
17	Not used
5	Not used
18	Not used
6	Traffic Modem Online Status – Normally Open (**Note 2**)
19	No Connection
7	Ground
20	Audio Indicator (Gnd = Auto On / Float = Audio Off)
8	Form C Fault Relay – Common (common for pins 9-12 and 21-24)
21	Switch Unit Fault – Normally Closed
9	Switch Unit Fault – Normally Open
22	Modem Summary Unit Fault – Normally Closed
10	Modem Summary Unit Fault – Normally Open
23	Modem Summary Tx Traffic Fault – Normally Closed
11	Modem Summary Tx Traffic Fault – Normally Open
24	Modem Summary Rx Traffic Fault – Normally Closed
12	Modem Summary Rx Traffic Fault – Normally Open
25	Not Used
13	Not Used

Notes:

1. "Normally" refers to the NON-FAILED state.

2. Traffic Modem Online Status (Open = Online, Closed = Backup)

B.2   TMI User Data Connectors

B.2.1   CRS-316 – EIA-422/530, V.35, Sync EIA-232 Connector (DB-25F)
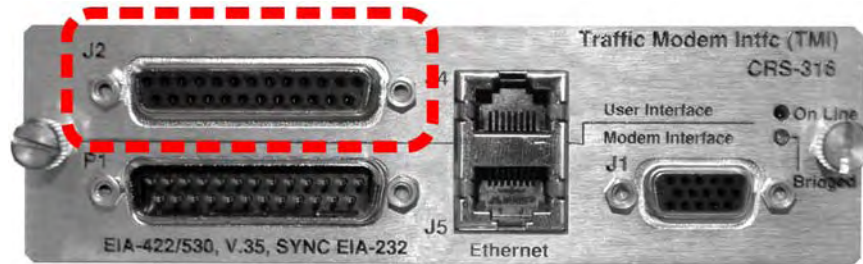
Table B-4 indicates the pinout for the DB-25F **EIA-232/422/V.35** User Interface connector: "J2" on the CRS-316 TMI.

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.
1	Shield	-	Shield	FG	AA	101
14	Transmit Data B	DTE to Modem	SD B	SD B	-	103
2	Transmit Data A	DTE to Modem	SD A	SD A	BA	103
15	Internal Transmit Clock A	Modem to DTE	ST A	SCT A	DB	114
3	Receive Data A	Modem to DTE	RD A	RD A	BB	104
16	Receive Data B	Modem to DTE	RD B	RD B	-	104
4	Request to Send A / Ready for Receiving A	DTE to Modem	RS A	RS A		
17	Receive Clock A	Modem to DTE	RT A	SCR A	DD	115
5	Not used					
18	Not used					
6	DCE Ready A	Modem to DTE	DM_A	DM_A		
19	Request to Send B / Ready for Receiving B	DTE to Modem	RS B	RS B		
7	Signal Ground	-	SG	SG	AB	102
20	Not used					
8	Receiver Ready A	Modem to DTE	RR A	RLSD *	CF	109
21	Not used					
9	Receive Clock B	Modem to DTE	RT B	SCR B	-	115
22	DCE Ready B	Modem to DTE	DM_B	DM_B		
10	Receiver Ready B	Modem to DTE	RR	B	-	109
23	Not Used					
11	Transmit Clock B	DTE to Modem	TT B	SCTE B	-	113
24	Transmit Clock A	DTE to Modem	TT A	SCTE A	DA	113
12	Internal Transmit Clock B	Modem to DTE	ST B	SCT B	-	114
25	Not Used					
13	Not used					

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.2.2   CRS-325 – G.703 Balanced Connector (DB-15F)
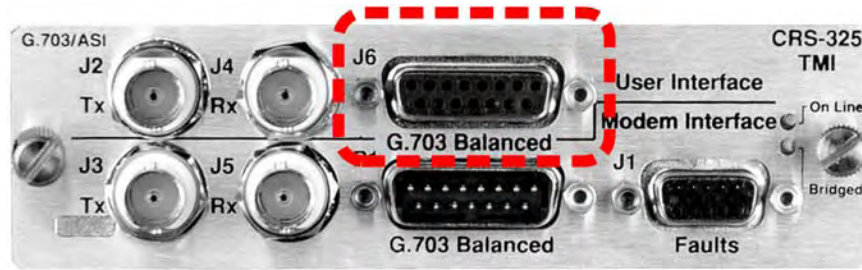
Table B-5 indicates the pinout for the DB-15F **G.703 Balanced** User Interface connector: "J6" on the CRS-325 TMI.

Table B-5. "J6" G.703 Balanced User Data Connector

Pin #	Signal Description	Name	Direction
1	Tx, Drop Data Input (-) (see **Note**)	DDI–	In
9	Tx, Drop Data Input (+) (see **Note**)	DDI+	In
2	Ground	GND	
10	Not Used		
3	Rx, Insert Data Output (-) (see **Note**)	IDO–	Out
11	Rx, Insert Data Output (+) (see **Note**)	IDO+	Out
4	Ground	GND	
12	Drop Data Output (-)	DDO–	Out
5	Drop Data Output (+)	DDO+	Out
13	Insert Data Input (-)	IDI–	In
6	Insert Data Input (+)	IDI+	In
14	Not Used		
7	Not Used		
15	Not Used		
8	Not Used		

Note: Use for all non-Drop and Insert and T2/E2 balanced applications.

B.2.3   CRS-325 – G.703 Unbalanced BNC Connectors

Table B-6 indicates the BNC **G.703 Unbalanced** User Interface connectors: "J2" and "J4" on the CRS-325 TMI.

Table B-6. "J2" / "J4" Unbalanced G.703 User Data Connectors

BNC Connector	Ref Des	Description	Direction
Rx-IDO	J4	Rx, G.703	Out
Tx-IDI	J2	Tx, G.703	In
IDI	—	Insert data input	In
DDO	—	Drop data output	Out

B.2.4   CRS-336 – HSSI Connector (HD-50F)
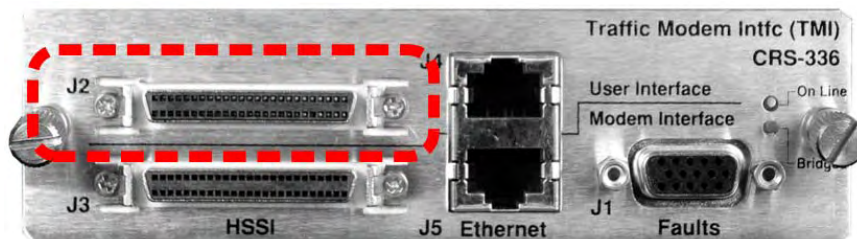
Table B-7 indicates the pinout for the HD-50F Mini-**D/SCSI-II "HSSI" User Int**erface connector: "J2" on the CRS-336 TMI.

Table B-7. "J2" HSSI User Data Connector

Pin # (+, -)	Signal Function	HSSI Signal	RS613 Circuit	Circuit Direction
1, 26	Signal Ground	SG	102	
2, 27	Receive Timing	RT	115	from DCE
3, 28	DCE Available	CA	107	from DCE
4, 29	Receive Data	RD	104	from DCE
5, 30	N/A	N/A	N/A	N/A
6, 31	Send Timing	ST	114	from DCE
7, 32	Signal Ground	SG	102	
8, 33	DTE Available	TA	108/2	to DCE
9, 34	Terminal Timing	TT	113	to DCE
10, 35	N/A	N/A	N/A	N/A
11, 36	Send Data	SD	103	to DCE
12, 37	N/A	N/A	N/A	N/A
13, 38	Signal Ground	SG	102	
14,15,17, 18, 39-43	Reserved (to DCE)			not used
16	Tx_Carrier_Off_L [1, 3]	CO	undefined	from DTE
19, 44	Signal Ground	SG	102	
20	Carrier Detect (lock) [1, 2]	CD	undefined	from DCE
21-24, 46-49	Reserved (to DTE)		undefined	not used
25, 50	Signal Ground	SG	102	

Notes:

1. Noted signal function names are non-HSSI defined signals. On Cisco™ routers, there is no connection to those pins.

2. TTL - output.

3. TTL or RS-232 (active low) input.

B.2.5   CRS-316/335 – Single-port Gigabit Ethernet (GbE) Connector (RJ-45F)
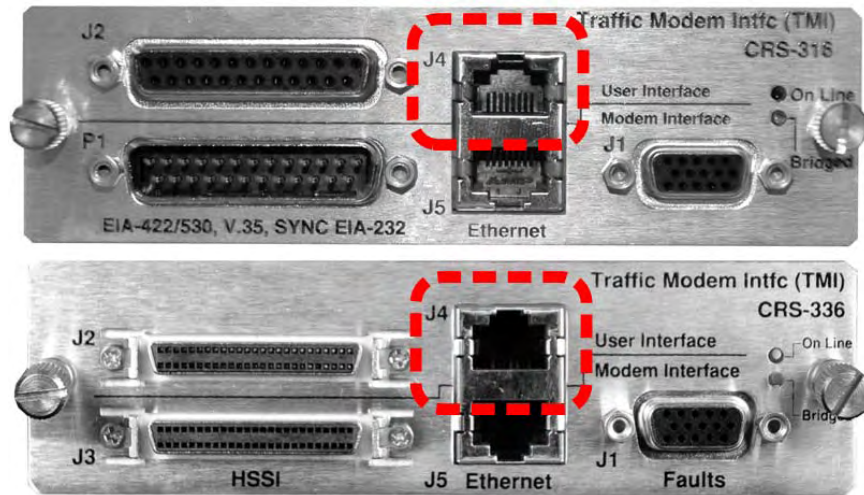
Table B-8 indicates the pinout for the RJ-45F **Single-port Gigabit Ethernet (GbE)** User Interface connector: "J4" on the CRS-316 and the CRS-336 TMIs, used for **Ethernet Bridge Mode**.

Table B-8. "J4" GbE Connector

Pair No.	Pin #
1	5
	4
2	1
	2
3	3
	6
4	7
	8

B.2.6   CRS-365 – Quad E1 Connectors (4X RJ-48F)
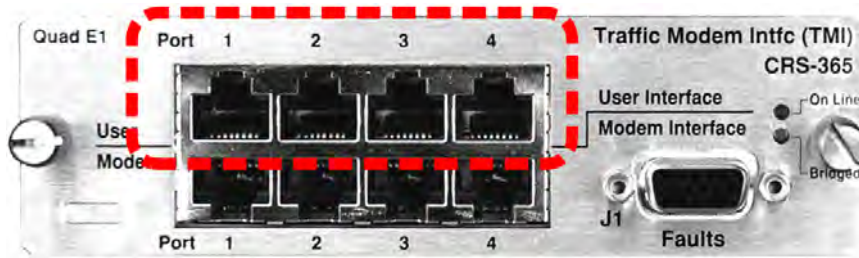
Table B-9 indicates the typical pinout for the four RJ-48F **Quad E1** User Interface connectors: Port "1" through Port "4" on the CRS-365 TMI.

Table B-9. Port "1" through Port "4" Quad E1 Connectors

Pin #	Name (*where* Port # = Port 1, 2, 3 or 4)	Direction
1	Port # Tx+	In
2	Port # Tx−	In
3	Gnd	--
4	Port # Rx+	Out
5	Port # Rx−	Out
6	Gnd	--
7	NC	--
8	NC	--

B.2.7   CRS-515 – Multi-port Gigabit Ethernet (GbE) Connectors (4X RJ-45F)
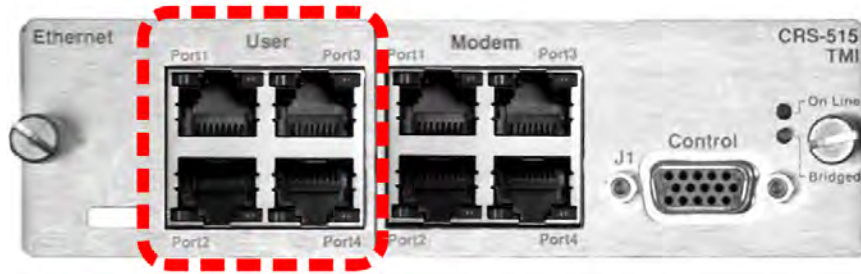
Table B-10 indicates the pinout for the RJ-45F **Multi-port Gigabit Ethernet (GbE)** User Interface connectors: "Port1" through "Port4" on the CRS-515 TMI, used for **Ethernet Bridge**, **Ethernet Router**, or **Ethernet BPM (Bridge-to-Multipoint) Modes**.

Table B-10. "Port 1" through "Port 4" GbE Connectors

Pair No.	Pin #
1	5
	4
2	1
	2
3	3
	6
4	7
	8

B.2.8   CRS-351 – Overhead Module Connector (DB-25M)
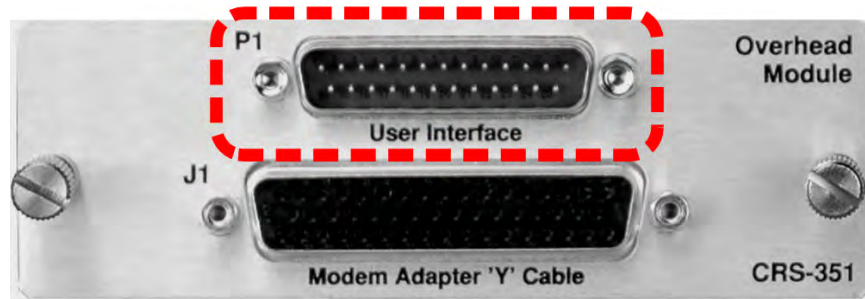
Table B-11 indicates pinout for the DB-25M Overhead "User Interface" connector: "P1" on the CRS-351 Overhead Module. This connector allows for connection of EIA-422, EIA-485 and EIA-232 data interfaces for use with **Overhead Framing**. It also supports signaling for tactical applications.

Table B-11. "P1" Overhead User Data Connector

Pin #		Signal Function	Name
1		EIA-422 Transmit Data "A", Input	Tx Data A
	14	EIA-422 Transmit Data "B", Input	Tx Data B
2		EIA-422 Transmit Clock "A", Output	Tx Clk A
	15	EIA-422 Transmit Clock "B", Output	Tx Clk B
3		EIA-422 Transmit Byte Sync "A", Output	Tx Sync A
	16	EIA-422 Transmit Byte Sync "B", Output	Tx Sync B
4		EIA-422 Receive Data "A", Output	Rx Data A
	17	EIA-422 Receive Data "B", Output	Rx Data B
5		EIA-422 Receive Clock "A", Output	Rx Clk A
	18	EIA-422 Receive Clock "B", Output	Rx Clk B
6		EIA-422 Receive Byte Sync "A", Output	Rx Sync A
	19	EIA-422 Receive Byte Sync "B", Output	Rx Sync B
7		Shield	Ground
	20	EIA-485 Transmit Data "-"	485 Tx Data -
8		EIA-485 Transmit Data "+"	485 Tx Data +
	21	EIA-422 Transmit Handover Sync "A", Input	THS A
9		EIA-485 Receive Data "-"	485 Rx Data -
	22	EIA-485 Receive Data "+"	485 Rx Data +
10		EIA-422 Transmit Handover Sync "B", Input	THS B
	23	EIA-232 Clear to Send	232 CTS
11		EIA-232 Receive Data	232 Rx Data
	24	EIA-232 Request to Send	232 RTS
12		EIA-232 Transmit Data	232 Tx Data
	25	EIA-422 Transmit Handover Control "A", Input	THC A
13		EIA-422 Transmit Handover Control "B", Input	THC B

*For EIA-485 2-Wire Operation:
- Only two wires are required.
- Tie pins 8 and 22 together (both +).
- Tie pins 9 and 20 together (both -).

Notes:

Appendix C. ADDRESSING SCHEME INFORMATION

C.1   Introduction to Addressing

A CRS-311 1:1 Redundancy Switch provides 1:1 modem redundancy; that is, it is capable of controlling one Traffic Modem and one Redundant Modem.

You can remotely communicate to the Switch or either of the modems, using the appropriate addresses, via EIA-232 or EIA-485 using the DB-9M "Remote Control" connector on the CRS-230 System Controller module that is installed in the CRS-311.

- **For Switch-to-modem communication using SLM-5650/5650A modems**: The Switch uses serial communication via the HD-15 Control Cable that is connected between each TMI/RMI and the modems.

- **For Switch-to-modem communication using CDM-Qx/QxL modems:** The Switch uses EIA-485 communications via a DB-9 multi-drop cable that is connected from the "485 Pass-Through" connector on the CRS-230, then daisy-chained to each of the modems.

If the modems 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 modems connected to the Switch, the correct addresses must be used.

This appendix defines the address requirements to allow M&C of the Switch and the modems that may be included in a CRS-311 1:1 Redundancy Switch system.

C.2   Switch Address

The permitted Switch remote control addresses are limited:

-   **For EIA-485** connections, the only permitted addresses are 1000, 3000, 5000, and 7000.

-   **For EIA-232**, the only permitted address is 0000.

> *The Switch settings for external communications are totally independent from the internal communication between Switch and traffic modems.*

C.3   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. An M&C application can then 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:

Abbreviation	Explanation
MCA	Monitor & Control Address, 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, you may change the Switch bus address to 1000, 3000, 5000, 7000, or 9000 (7000 is shown in the figures in this appendix as an example only).
RCA	Remote Control Address, to be configured, via the unit front panel (CONFIG:REMOTE)
ESA	• EDMAC Slave Address (Range) • Local modem is configured as EDMAC master • Distant-end modem is an EDMAC slave

The SLM-5650/5650A modems utilize a point-to-point internal serial communications bus to the Switch within the HD-15 cable. **Figure C-1** illustrates an external EIA-232 addressing scheme for these modems; **Figure C-2** depicts an external EIA-485 connection.

The CDM-Qx/QxL modems require an external multi-drop EIA-485 connection. **Figure C-3** illustrates the external EIA-232 addressing scheme for a system comprising these modems with a Switch; **Figure C-4** depicts the external EIA-485 connection for this configuration. For a distant-end CRS-300/Qx/QxL Switch using Traffic modems in EDMAC Slave mode, refer to **Figure C-5.**
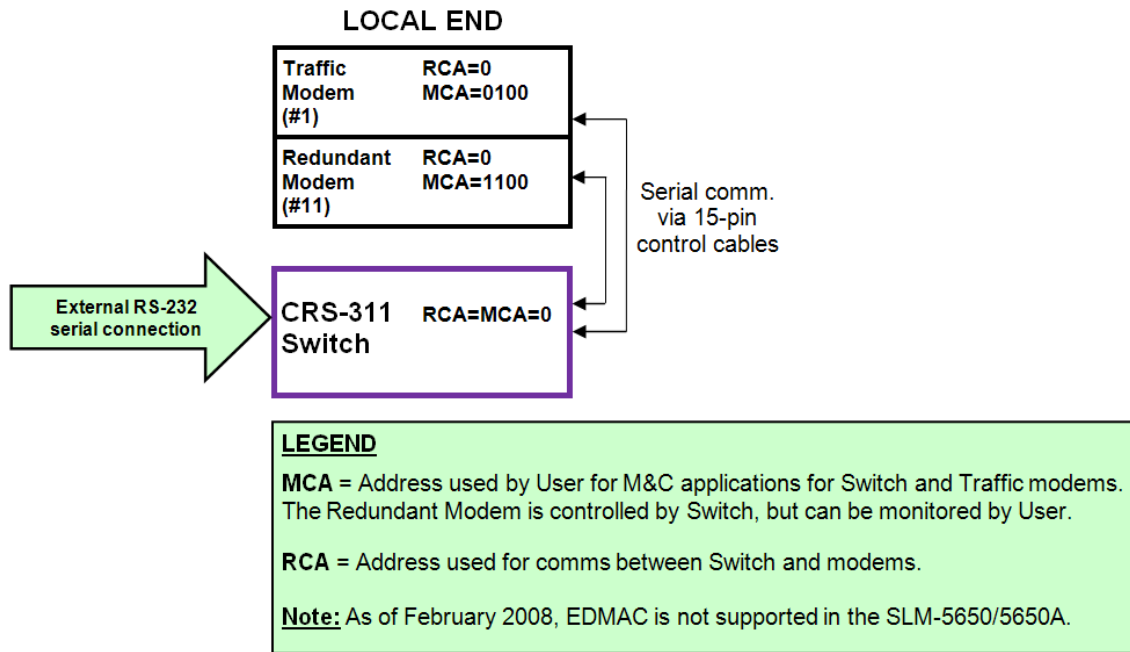
C.3.1 Addressing Scheme Examples

LOCAL END

| Traffic Modem (#1) | RCA=0 MCA=0100 |
| Redundant Modem (#11) | RCA=0 MCA=1100 |

Serial comm. via 15-pin control cables

External RS-232 serial connection → **CRS-311 Switch** RCA=MCA=0

LEGEND

MCA = Address used by User for M&C applications for Switch and Traffic modems. The Redundant Modem is controlled by Switch, but can be monitored by User.

RCA = Address used for comms between Switch and modems.

Note: As of February 2008, EDMAC is not supported in the SLM-5650/5650A.

Figure C-1. External EIA-232 with SLM-5650/5650A Modems

LOCAL END

| Traffic Modem (#1) | RCA=0 MCA=7100 |
| Redundant Modem (#11) | RCA=0 MCA=8100 |

Serial comm. via 15-pin control cables

External RS-485 Multi-drop connection → **CRS-311 Switch** RCA=MCA=0

LEGEND

MCA = Address used by User for M&C applications for Switch and Traffic modems. The Redundant Modem is controlled by Switch, but can be monitored by User.

RCA = Address used for comms between Switch and modems.

Note: As of February 2008, EDMAC is not supported in the SLM-5650/5650A.
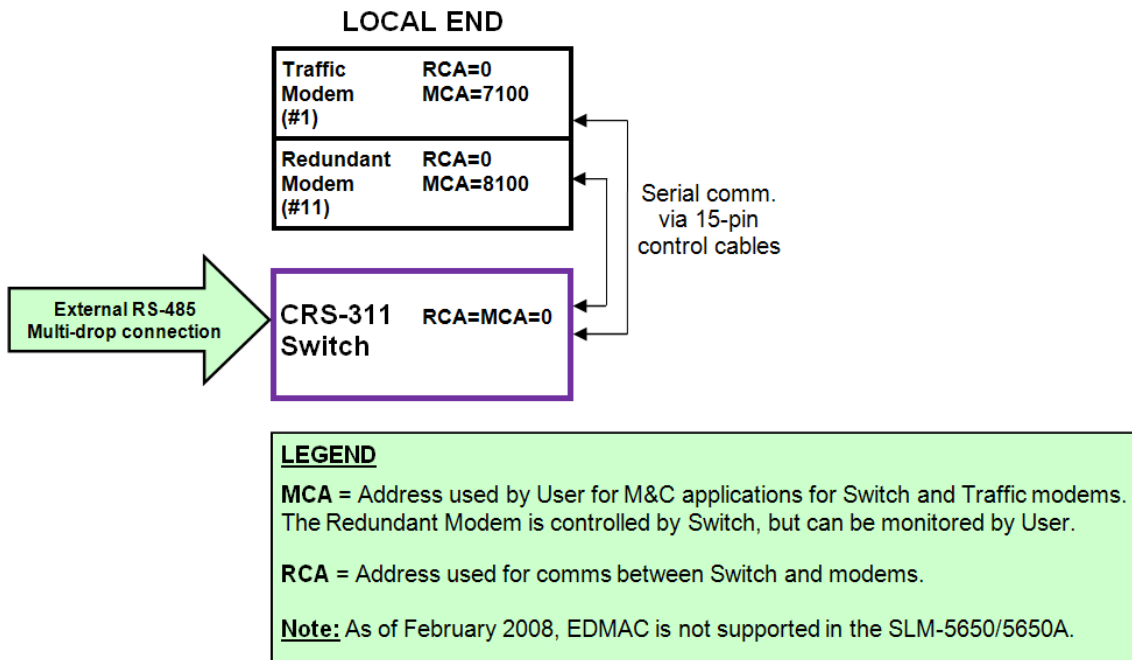
Figure C-2. External EIA-485 with SLM-5650/5650A Modems
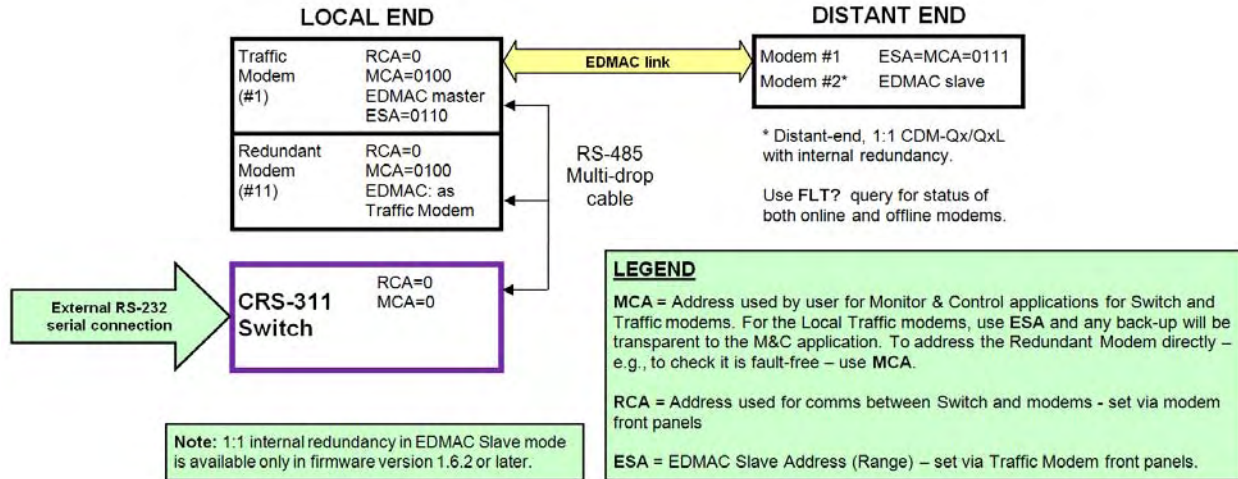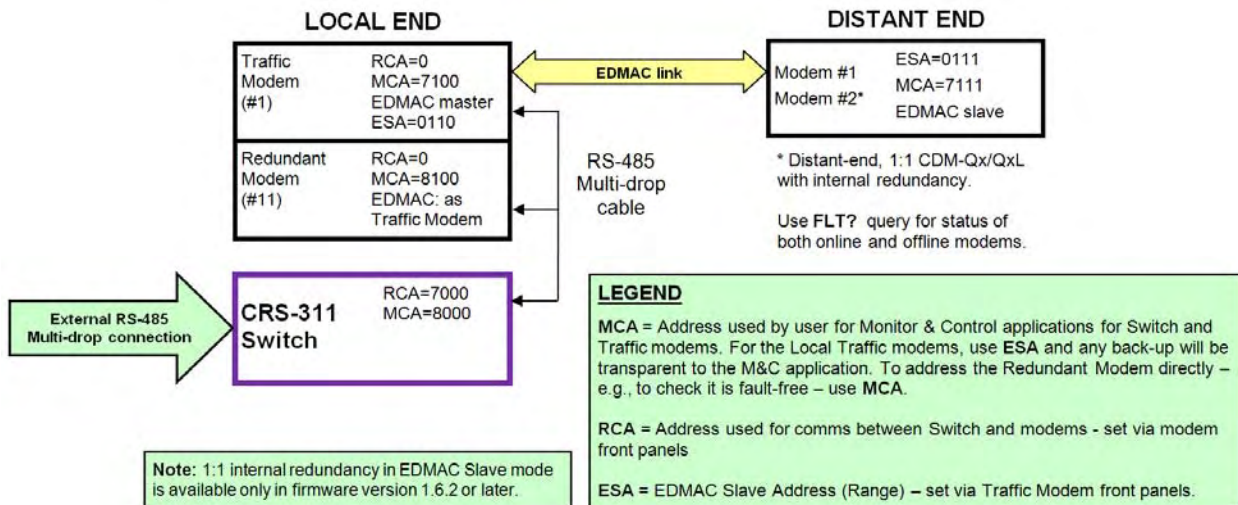
Figure C-3. External EIA-232 with CDM-Qx/QxL Modems

Figure C-4. External EIA-485 with CDM-Qx/QxL Modems

LOCAL END
EDMAC, Master

Modem #1   RCA=0100
            MCA=7100
            EDMAC master
            ESA=0110

Redundant   RCA=1100
Modem   MCA=8100
(#11)   EDMAC: as
            Traffic Modem

CRS-311   RCA=7000
Switch   MCA=8000

RS-485
Multi-drop
cable

External RS-485
Multi-drop connection

EDMAC link

DISTANT END
EDMAC, Slave

Modem #1   RCA=0100
            MCA=7111
            EDMAC slave
            ESA=0111

Redundant   RCA=1100
Modem   MCA=8100 *1
(#11)   EDMAC: as
            Traffic Modem

CRS-311   RCA=7000
Switch   MCA=7000 *1

RS-485
Multi-drop
cable

LEGEND

MCA = Address used by user for Monitor & Control applications for Switch and modems. For the Local Traffic modems, use **ESA** and any back-up will be transparent to the M&C application. To address the Redundant Modem directly – e.g., to check it is fault-free – use **MCA**.

RCA = Address used for comms between Switch and modems - set via modem front panels

ESA = EDMAC Slave Address (Range) – set via Traffic Modem front panels.

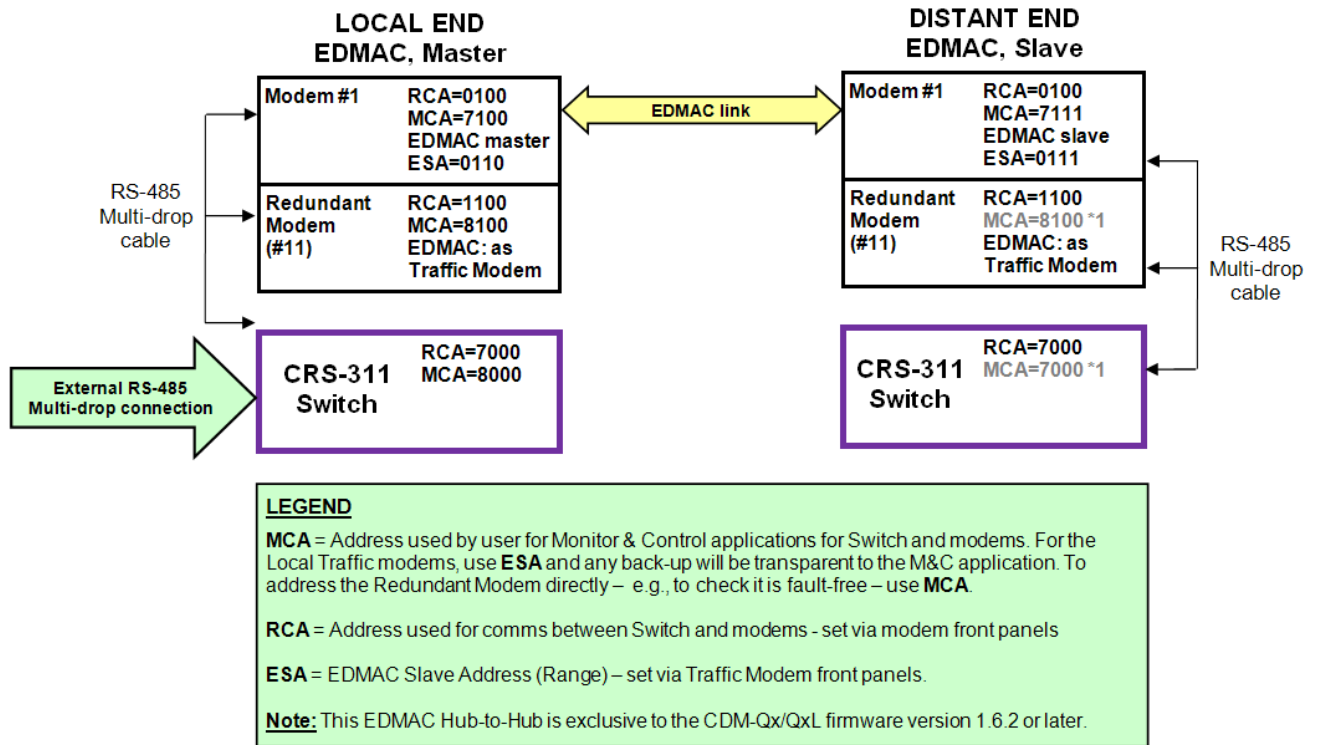**Note:** This EDMAC Hub-to-Hub is exclusive to the CDM-Qx/QxL firmware version 1.6.2 or later.

Figure C-5. External EIA-485 with CDM-Qx/QxL Modems, EDMAC CRS-311 to CRS-311

C.4   Setting Up Modems (CDM-Qx/QxL only)

CDM-Qx Multi-Channel Satellite Modem Installation and Operation Manual

- **Local Traffic Modem** on Switch:

  o   MCA = (Switch RCA) + (100)

  o   Set EDMAC Framing on.

  o   Set as EDMAC master.

  o   Set with EDMAC Slave Address Range, ESA = (Modem RCA) + 10

- **Distant Modem 1** (attached to the Distant end of link to Traffic Modem):

  o   Remote control address: no setting required (Remote control not used).

  o   Set EDMAC Framing on.

  o   Set as an EDMAC slave.

  o   Set Slave Address, ESA = (Master ESA) + 1

  o   MCA = ESA

- **Two Distant Modems** in a 1:1 configuration:

  Set up the online modem as for Distant Modem 1, described previously in this section. The offline modem is automatically configured to match the online modem. M&C can only be achieved to the online modem.

Notes:

1. 1:1 internal redundancy in EDMAC Slave mode is available only in Firmware Version 1.6.2 or later.

2. 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 **FLT** (**F**au**lt**s and Status) – **FLT?** for queries. This command/query is available in available in Firmware Versions 1.6.2 or later.

C.5   M&C Application

The system is set up for communications with a Monitor & Control (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).

Notes:

Notes:

Appendix D. SLM-5650/5650A INDEPENDENT MODE OPERATION

D.1 Introduction

This feature is for use ONLY *with the SLM-5650/5650A.*

Per customer request, an optional Independent Mode of operation is available for use in the CRS-311 1:1 Redundancy Switch with SLM-5650/5650A modems. In Independent Mode, each modem operates independently and simultaneously (dual-carrier); the CRS-311 is used only to enable control and monitoring of both modems via a single EIA-232/EIA-485 control line.

D.2 Feature Description

Figure D-1 shows the CRS-311 connected in the standard way; **Figure D-2** shows the CRS-311 connected in Independent Mode.

Key functionality in **Independent Mode***:*

a. The CRS-311 will not switch if a fault occurs. Switch configuration is "hard-wired" to the primary modem:

    i. Data switch routes data signals to/from the primary modem.

    ii. The CRS-281x IF switch connects the Redundant Modem's Tx IF to the User's Tx IF.

b. No automatic control of the Redundant or primary modem configuration:

    i. Does NOT control the configuration of the Redundant Modem (i.e. no "mirroring" or other control of the Redundant Modem's configuration to match the primary modem).

    ii. Does NOT mute the RF output of primary modem under any circumstances.

c. Supports EIA-232/485 remote monitor and control connectivity to both modems.

    d.   The "Stored Event" LED on the CRS-311 Front Panel will flash at **twice the current rate** when Independent Mode is enabled.

    e.   Independent Mode is selectable via the Front Panel menu or remote control command:

        i.   ***To configure via the CRS-311 Front Panel menu***:

- Use the ◄ ►arrow keys to select `UTIL` ➔ `INDEP-MODE`, and then press **[ENTER]**;

- Use the ◄ ►arrow keys to select `NORMAL-OP` or `ENABLE-INDEP`, and then press **[ENTER]**.

        ii. ***To configure via remote control command:*** **IMS=*x*,** where: *x*=0 (Independent Mode *disabled*) or *x*=1 (Independent Mode *enabled*).
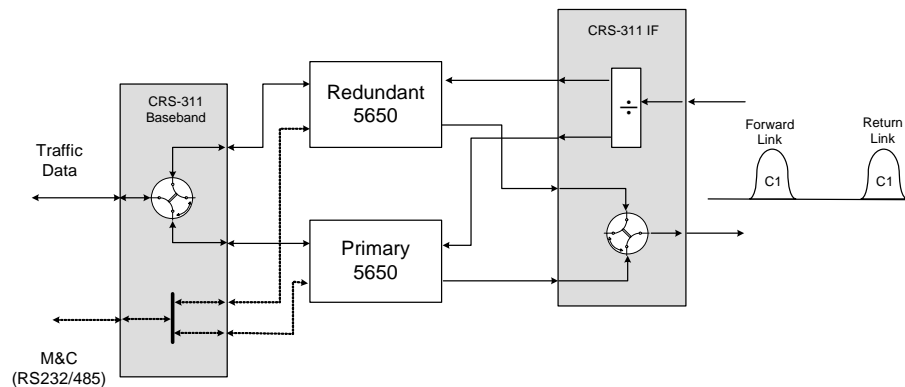
Figure D-1. Standard Connections to CRS-311
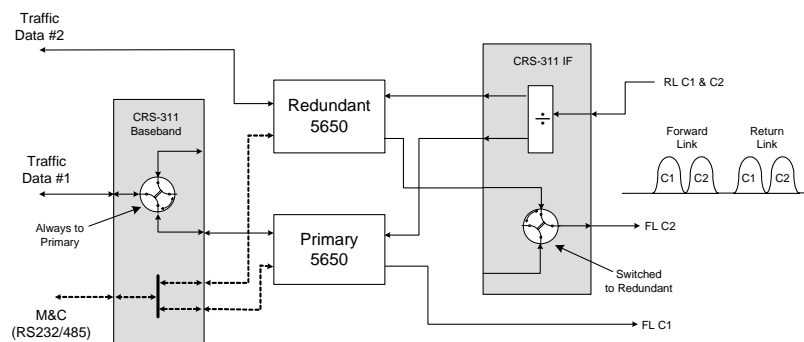
Figure D-2: CRS-311 in Independent Mode

Appendix E. CRS-311 RETROFIT FOR SLM-5650/5650A NP INTERFACE OPERATION
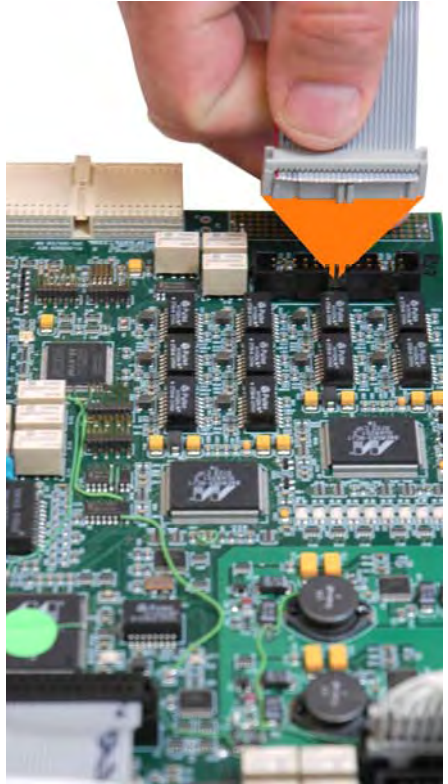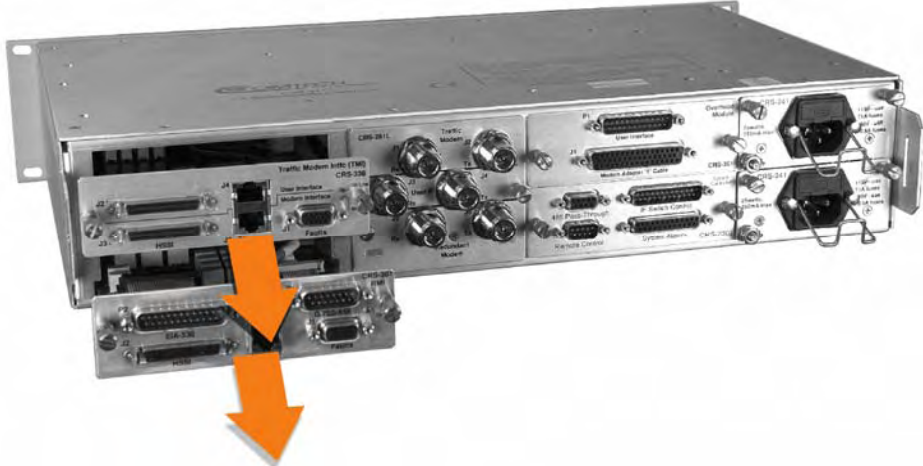
E.1 Introduction

This appendix describes the procedure required to upgrade any CRS-311 1:1 Redundancy Switch from traditional serial terrestrial interface operation to operation in tandem with SLM-5650/5650A Redundant and Traffic Modems that are equipped with the optional Network Processor (NP) Interface Module that is required to handle 4-Port Ethernet data traffic.
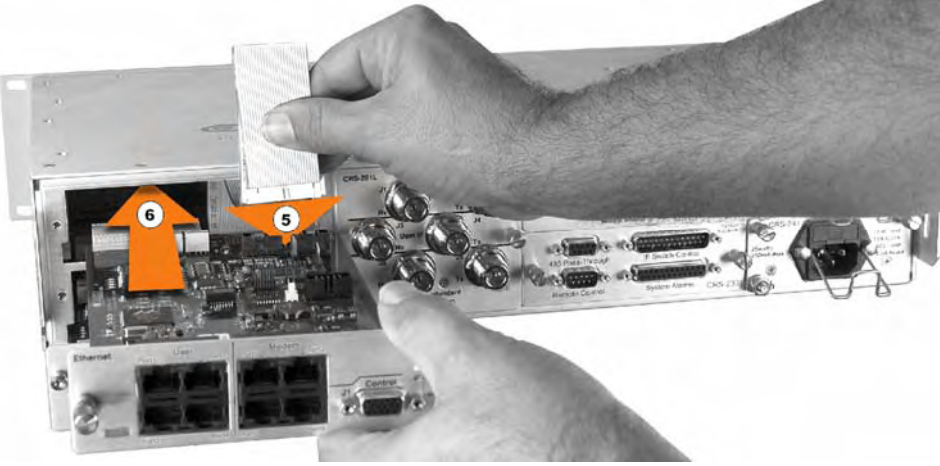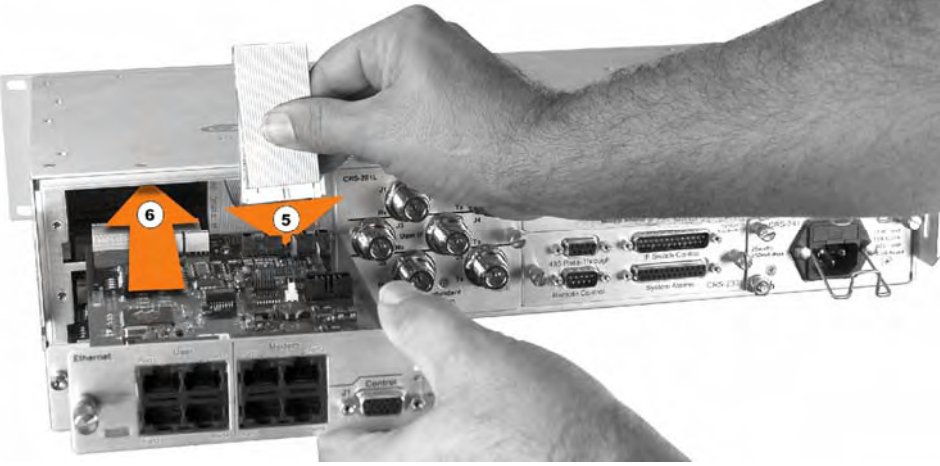
E.1.1 Field Upgrade Kit KT-0000078 (Required for Retrofit)

NP (Network Processor) Upgrade Redundancy Kit KT-0000078		
CEFD P/N	QTY	Description
PL-0000293	1	CRS-505 RMI: EIA-530, G.703, HSSI, 4-Port Ethernet
PL-0000294	1	CRS-515 TMI: 4-Port Ethernet
CA-0000089	1	Ribbon Cable: RMI-to-TMI

E.1.2   Retrofit Procedure

Step	Task
1	Plug the CA-0000089 Ribbon Cable, shipped separately with the new CRS-505 RMI and CRS-515 TMI modules, into the P1 connector on the CRS-505 RMI. (**Note:** This connector is labeled and positioned identically on the CRS-515 TMI – see **Step 5**.) P1 Receptacle for CA-0000089 Ribbon Cable (typical for CRS-505 RMI and CRS-515 TMI)

Step	Task
2	Prepare the CRS-311 Switch Chassis for retrofit by loosening the thumbscrews then removing the existing RMI and TMI modules. (**Note:** The configuration shown here is for illustrative purposes only. The actual redundant/traffic modem interfaces, power modules, and controller interfaces, as originally installed, may vary.)
3	Thread the CA-0000089 Ribbon Cable's unconnected (loose) end through the bottom (RMI) slot opening into the CRS-311 chassis, looping the end out through the top (TMI) slot opening.	
4	Install the CRS-505 RMI into its chassis slot while pulling lightly on the unconnected (loose) end of the CA-0000089 Ribbon Cable. Engage the RMI until it is properly seated in the receptacle on the chassis backplane. Do not tighten the CRS-505 RMI's thumbscrews at this time.	

Step	Task
5	Connect the loose (unconnected) end of the CA-0000089 Ribbon Cable to the P1 socket on the CRS-515 TMI.
6	Install the CRS-515 TMI into its chassis slot. Engage the TMI until it is properly seated in the receptacle on the chassis' backplane.
7	Securely hand-tighten the thumbscrews on both the TMI and RMI.

The retrofit has been completed and the CRS-311 1:1 Redundancy Switch is ready to be connected to the SLM-5650/5650A modems per **Chapter 3. CABLES and CONNECTIONS, Sect. 3.3 SLM-5650/5650A Modem Connections**.

METRIC CONVERSIONS

Units of Length

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

Temperature Conversions

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

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

Units of Weight

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