CDM-710G

High-Speed Satellite Modem
Installation and Operation Manual

(Includes data for the CDM-710G [70-140 MHz]
and CDM-710GL [L-Band] Configurations)

Comtech EF Data is an
AS9100 Rev B / ISO9001:2000
Registered Company

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

Part Number **MN-CDM710G** Revision 1

Errata A

Comtech EF Data Documentation Update

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Part Number MN-CDM710G
Revision 1

Subject:	Update 'FLT' serial remote control query in Appendix A. REMOTE CONTROL
Original Manual Part Number/Rev:	MN-CDM710G Rev 1
Errata Number/ PLM Document ID:	ER-CDM710G-EA1
PLM CO Number:	C-0025029
Comments:	The updated information will be incorporated into the next formal revision of the manual. **Update the 'FLT' Serial Remote Control Query as highlighted on pages 3 and 4 of this document – see Appendix A. REMOTE CONTROL, pp. A-9 / A10, and A-35 / A36.**

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Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status	N/A	4 bytes	Query Only. Unit returns the current fault and status codes for the Unit (hardware), Tx Traffic and Rx Traffic, in the form abcde, where: a = Unit Faults: 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5 Volts, Framer Card 3=Power supply fault, +1.5 Volts, Interface #1 4=Power supply fault, +1.5 Volts, Interface #2 5=Power supply fault, +3.3 Volts, Framer Card 6=Power supply fault, +5.0 Volts, Framer Card 7=Power supply fault, +12.0 Volts, Framer Card 8=Power supply fault, -12.0 Volts, Framer Card 9=Power supply faulit, +18.0 Volts, Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface #1 Load E=Interface #2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface #1 Removed L=Interface #2 Removed b = Tx Traffic Status: 0=No faults 1= +1.5V Power Supply Unit (Modulator Card) 2= FPGA Failed to Load (Modulator Card) 3= Symbol Rate PLL Clock 4= Tx Synthesizer Unlocked 5= Tx Digital Clock Manager Unlocked 6= I & Q Baseband Channels are Inactive 7= FPGA Temperature (Modulator Card) 8= Reserved 9= TX Clock Failure (Interface 1)	FLT? FLT*	FLT?	FLT=abcde d= New faults since last check Note: Each section has faults listed in order of priority. For each section, only the highest priority fault is returned. There maybe multiple faults for each section, but only the highest fault is returned.

			A= TX Clock Failure (Interface 2) B= GBEI Card Data rate > + 200 PPM C= GBEI Card Data rate < - 200 PPM D= GBEI No PHY Link E= Encoder FIFO Empty F= Encoder FIFO Full G= SERDES Parity Errors H=Reserved. I=Tx Ais Interface 1 J=Tx Ais Interface 2 K=Tx Cable Interface 1 L=Tx Cable Interface 2 c=Rx Traffic Status 0=No faults d=New Faults 0=No new faults 1=New faults, since last check e=Configuration change 0=Modem configuration has not been changed 1= Modem configuration has been changed			

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Part Number MN-CDM710G
Revision 1
September 21, 2009

Comtech EF Data, 2114 West 7th Street, Tempe, Arizona 85281 USA, 480.333.2200, FAX: 480.333.2161

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data CDM-710G High-Speed Satellite Modem. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the 70-140 MHz CDM-710G and its L-Band counterpart, the CDM-710GL.

Reporting Comments or Suggestions Concerning this Manual

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

TechnicalPublications@comtechefdata.com

Metric Conversion

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

Cautions and Warnings

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

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

IMPORTANT or NOTE Indicates information critical for proper equipment function.

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when

depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations.

The user should make special note of the following information and instructions:

Electrical Safety

The CDM-710G High-Speed Satellite Modem has been shown to comply with safety standard ***EN 60950: Safety of Information Technology Equipment, including Electrical Business Machines.***

The equipment is rated for operation over the range 100 to 240 VAC. It has a maximum power consumption of 88 watts, and draws a maximum of 770 mA.

Fuses

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

The CDM-710G is fitted with two fuses - one each for line and neutral connections. These are contained within the body of the IEC power inlet connector, behind a small plastic flap.

- For 115 and 230 volt AC operation, use T2.00A, 20mm fuses.
- For 48 VDC operation, use T6.25A, 6.3x32mm fuses.

Environmental

The CDM-710G shall not be operated in an environment where the unit is exposed to extremes of temperature outside the ambient range 0 to 50°C (32° to 122°F), precipitation, condensation, or humid atmospheres above 95% RH, altitudes (unpressurized) greater than 2000 meters, excessive dust or vibration, flammable gases, corrosive or explosive atmospheres.

Operation in vehicles or other transportable installations that are equipped to provide a stable environment is permitted. If such vehicles do not provide a stable environment, safety of the equipment to EN60950 may not be guaranteed.

Installation

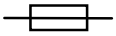
The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.

The CDM-710G is designed for connection to a power system that has separate ground, line and neutral conductors. The equipment is not designed for connection to power system that has no direct connection to ground.

The CDM-710G is shipped with a line inlet cable suitable for use in the country of operation. If it is necessary to replace this cable, ensure the replacement has an equivalent specification. Examples of acceptable ratings for the cable include HAR, BASEC and HOXXX-X. Examples of

acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

International Symbols

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

Telecommunications Terminal Equipment Directive

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

CE Mark

Comtech EF Data declares that the CDM-710G High-Speed Satellite Modem meets the necessary requirements for the CE Mark.

RoHS Compliancy

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

EMC (Electromagnetic Compatibility)

In accordance with European Directive 89/336/EEC, the CDM-710G High-Speed Satellite Modem has been shown, by independent testing, to comply with the following standards:

Emissions: EN 55022 Class B - Limits and methods of measurement of radio interference characteristics of Information Technology Equipment.

(Also tested to FCC Part 15 Class B)

Immunity: EN 50082 Part 1 - Generic immunity standard, Part 1: Domestic, commercial and light industrial environment.

Additionally, the CDM-710G has been shown to comply with the following standards:

EN 61000-3-2	Harmonic Currents Emission
EN 61000-3-3	Voltage Fluctuations and Flicker
EN 61000-4-2	ESD Immunity
EN 61000-4-4	EFT Burst Immunity

EN 61000-4-5	Surge Immunity
EN 61000-4-6	RF Conducted Immunity
EN 61000-4-8	Power frequency Magnetic Field Immunity
EN 61000-4-9	Pulse Magnetic Field Immunity
EN 61000-4-11	Voltage Dips, Interruptions, and Variations Immunity
EN 61000-4-13	Immunity to Harmonics

To ensure that the Modem continues to comply with these standards, observe the following instructions:

- Connections to the transmit and receive IF ports (‘N’ type female connectors) should be made using a good quality coaxial cable - for example, RG213/U.
- All 'D' type connectors attached to the rear panel must have back-shells that provide continuous metallic shielding. Cable with a continuous outer shield (either foil or braid, or both) must be used, and the shield must be bonded to the back-shell.
- The equipment must be operated with its cover on at all times. If it becomes necessary to remove the cover, the user should ensure that the cover is correctly re-fitted before normal operation commences.

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.

Customer Support

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Reporting comments or suggestions concerning manuals
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data number)
480.333.4357 (Customer Support Desk)
480.333.2161 FAX

To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

- **Contact** the Comtech EF Data Customer Support Department. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.
- **Request** a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support representative.
- **Pack** the product in its original shipping carton/packaging to ensure that the product is not damaged during shipping.
- **Ship** the product back to Comtech EF Data. (Shipping charges should be prepaid.)

Online Customer Support

An RMA number request can be requested electronically by contacting the Customer Support Department through the online support page at **www.comtechefdata.com/support.asp**:

- **Click** on "**Service**" for detailed instructions on our return procedures.
- **Click** on the "**RMA Request Form**" hyperlink, then fill out the form completely before sending.
- **Send** e-mail to the Customer Support Department at **service@comtechefdata.com**.

For information regarding this product's warranty policy, refer to the **Warranty Policy**, p. xvi.

Notes:

Chapter 1. INTRODUCTION

1.1 Overview

The CDM-710G High-Speed Satellite Modem (**Figure 1-1**) provides transmission of data using the same powerful DVB-S2 techniques developed for video delivery in Digital Video Broadcast (DVB) applications. It operates over satellite links with programmable symbol / data rates up to 45 Msps. The CDM-710G is intended for transmission of non-MPEG2 data. Its companion product, the CDM-710, supports MPEG2 formats with various data interfaces.

Figure 1-1. CDM-710G High-Speed Satellite Modem (L-Band version shown)

Various modulations and coding combinations compliant with DVB-S2 are provided. The modulation types supported include DVB-S2 QPSK, 8PSK, 16APSK and 32APSK.

Note: DVB-S and DVB-DSNG are not supported.

Constant Coding and Modulation (CCM) operation with a single input stream is provided for operation. The unit is available in modulator only, demodulator only, and modem configurations.

The operating frequency of the CDM-710G is available in the following versions:

CDM-710G (70/140 MHz)	52 to 88 MHz and 104 to 176 MHz in 100 Hz resolution
CDM-710GL (L-Band)	950 to 1950 MHz in 100 Hz resolution

The terrestrial data interfaces, as depicted in the block diagram shown in **Figure 1-2**, are field removable to allow different interface types:

- CDI-10-1 Single G.703 E3/T3/STS1 Interface
- CDI-60 HSSI Interface
- CDI-70 1000 Base-T Ethernet (GigE) Interface

The CDM-710G is compact, being 1RU high x 18.65 inches deep, with low power consumption. It has a front panel Vacuum Fluorescent Display (VFD) and keypad for local configuration and

control, although it can be fully remote-controlled via its RS-485 bus or 10/100 Base-T Ethernet Interface.

1.1.1 Standard and Optional Features

The CDM-710G operates in DVB-S2 (QPSK, 8PSK, 16APSK, and 32APSK) mode only. The CDM-710G is operated from the front panel using the keypad and display or remote controlled via an RS-232 / RS-485 2/4 Wire bus or 10/100 Base-T Ethernet port located on the base unit.

The CDM-710G is available for either 70/140 MHz or L-Band applications. The standard 70/140 MHz Tx-IF port has a BNC female connector that is programmable for either with 50Ω or 75Ω impedance operations. Spectral rolloffs of 20, 25, and 35% are available.

1.1.2 Applications

The CDM-710G's bandwidth and power-efficient operation is ideal for:

- Transmission of non-transport stream data (referred to as Generic Data in DVB-S2)
- Business enterprise data distribution
- Broadband Interactive and Internet services
- Any networking application relying on
    - Point-to-point transmission
    - Point-to-multipoint transmission
    - Arbitrary topology

With a Gigabit Ethernet (GigE) data interface and either a 70/140 MHz (CDM-710G) or L-Band (CDM-710GL) IF, the CDM-710G is equipped with the configuration most frequently requested by users. This is ideal for data transmission formats that take advantage of the Ethernet packets for digital one-way, two-way and any network applications. The HSSI interface enables IP or other data formats via a serial interface, and telecom applications are supported with the G.703 interface.

DVB-S2 offers new opportunities for data transmission applications. With a broad range of modulation and coding formats, it permits the user to tailor a link for the available bandwidth and power to optimize link performance. Whether a link is point-to-point or point-to-multipoint, there is a format available to suit each application.[1]

[1]The DVB-S2 logo is a trademark of the DVB Digital Video Broadcasting Project (1991 to 1996).

1.2 Functional Description

A block diagram of the CDM-710G is shown in **Figure 1-2**.

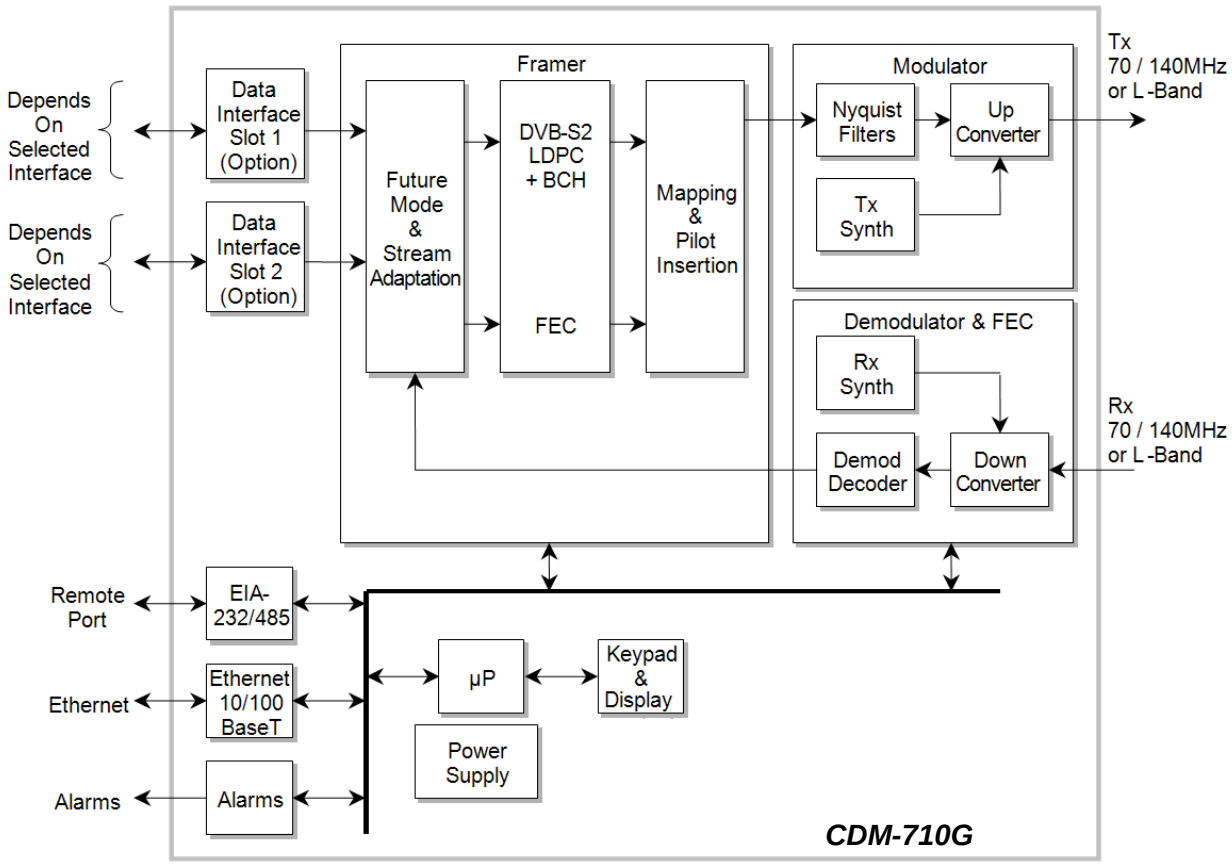


Figure 1-2. CDM-710G Block Diagram

The CDM-710G is constructed as a 1RU-high rack-mounting chassis, which can be freestanding if desired. Rack handles at the front facilitate removal from and placement into a rack.

The CDM-710G performs several key functions:

- It accepts incoming data from the terrestrial interface and converts it into appropriate clock and data signals.
- The modulator operates on the data to frame and encode it for transmission.
- Encoded information is mapped for modulation.
- A modulated carrier is transmitted from the IF interface for use by uplink equipment for delivery to the satellite.
- A carrier received from the satellite link is acquired and demodulated to recover symbols and timing.
- Error correction and deframing are performed.
- User data is delivered to the to the data interface.

Transmit (Tx) data is delivered to the data interface where it is converted to clock and data signals for further processing. Depending upon the type of interface, clock and data are provided or in other cases the clock is embedded in the data and clock recovery is performed to generate clock and data signals.

A **F**irst-**I**n–**F**irst-**O**ut (FIFO) follows the terrestrial interface to facilitate delivery of the data to the framing card. Data is passed to the **F**orward **E**rror **C**orrection (FEC) Encoder where the data is framed and encoded in accordance with only DVB-S2 formats.

After encoding, the data is passed to the modulator where the I and Q signals are mapped to generate the appropriate constellation (QPSK, 8PSK, 16APSK, and 32APSK) and filtered to provide the desired spectral rolloff.

Finally, a carrier is generated by a frequency synthesizer in conjunction with the I and Q signals to produce a frequency range, as follows:

CDM-710G (70/140 MHz)	52 to 88 MHz and 104 to 176 MHz IF output signal at the connector on the CDM-710G.
CDM-710GL (L-Band)	950 to 1950 MHz output signal at the Frequency connector on the CDM-710GL.

An Rx carrier from the satellite is received by the demodulator and reverses the process performed by the modulator. The demodulator has an FEC decoder that corrects errors incurred during transmission to improve the integrity of the data delivered to the data interface. A synthesizer in the demodulator is programmed to select the desired carrier from the transponder.

Physically, the CDM-710G is comprised of several main card assemblies:

- The Data Interface card is a plug-in module that is readily installed or removed at the rear of the unit.

  Note: Power must be turned off to remove or install the data interfaces. Any attempt to remove or install a data face without first turning off the power to the unit will result in damage to the data interface.

- The Framer Card receives signals from the data interface card and routes signals to the FEC Encoder and Modulator. The microcontroller for the unit also resides on the Framer Card and is the embedded controller for the entire unit. The microcontrollers handles all of the monitor and control for unit including the front panel keypad and display, the RS-232 and RS-485 2Wire / 4Wire remote port and the 10/100 Ethernet port. Interface with the other the modules in the CDM-710G is provided by the framer assembly.

- The FEC Encoder and Decoder cards are plug-in modules that reside on the Framer card. They generate the encoded streams used by the modulator card.

- Depending on the ordered configuration, a modulator and/or demodulator card may be installed.

1.3 Features

1.3.1 Physical Description

The CDM-710G is constructed as a 1RU-high rack-mount chassis, which can be free-standing if desired. Rack handles at the front facilitate removal from and placement into a rack.

The operator may configure and monitor the CDM-710G from the front panel, or through the remote M&C port. Control and status is provided through the RS-232, RS-485 (2Wire or 4Wire) port or 10/100 Base-T Ethernet port. The management Ethernet port supports SNMP, Telnet and HTTP (Web browser) operation.

1.3.2 Major Assemblies

Assembly	Description
PL/10002-1	Modulator, 70/140 MHz
PL/12113-1	Modulator, L-Band Card
PL/10003-1	Demodulator, 70/140 MHz
PL/11571-1	Demodulator, L-Band
PL/12148-1	Encoder Assembly, Tx DVB-S2 Long/Short Frame
PL/12169-1	Decoder Assembly, Rx DVB-S2 Long/Short Frame
PL/10008-2	CDI-10-1 G.703 Interface
PL/11582-1	CDI-60 HSSI Interface
PL/11509-3	CDI-70 10/100/1000 Base-T Ethernet (GigE) Interface (FW12738)

1.3.3 Dimensional Envelope

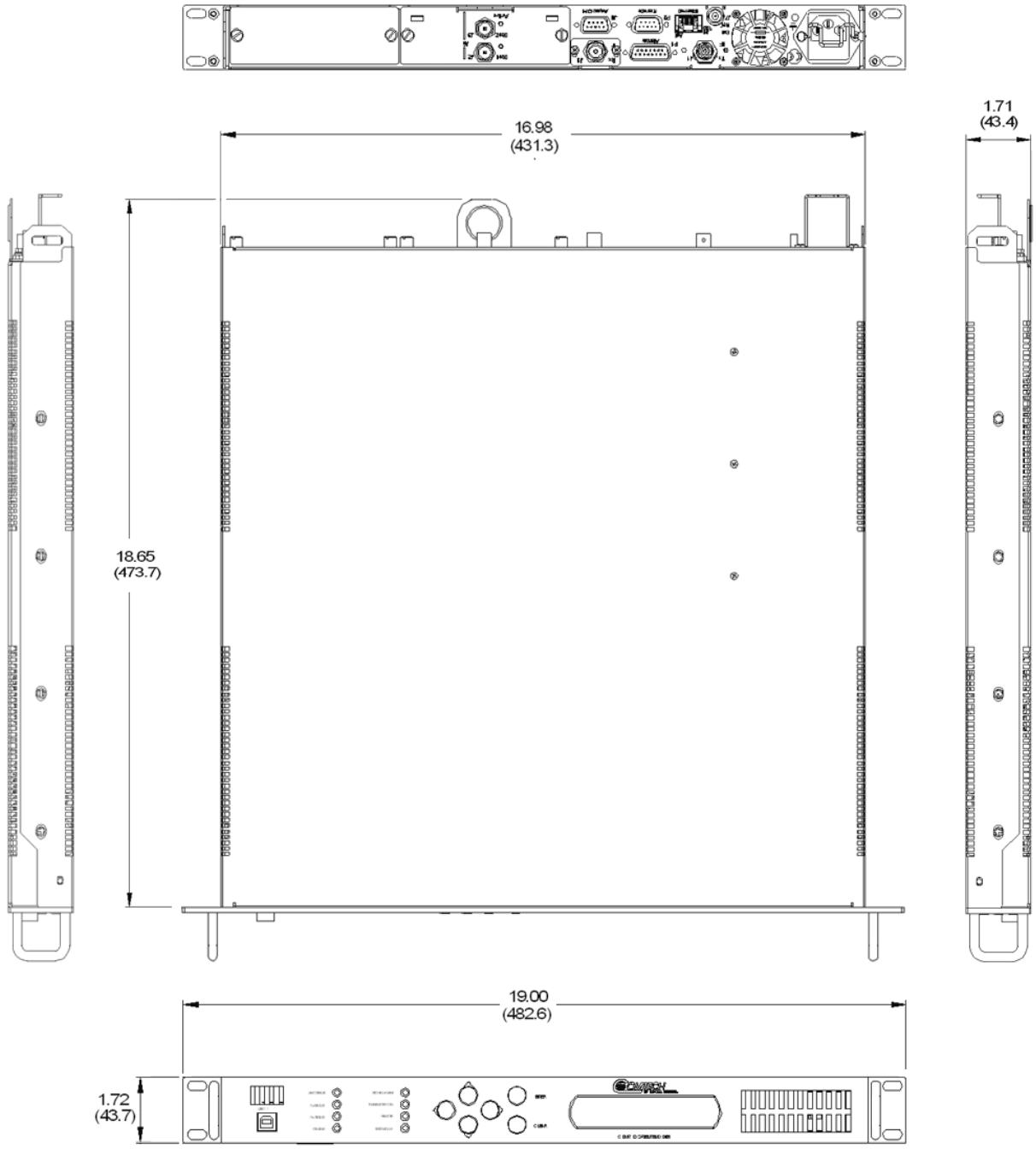


Figure 1-3. Dimensional Envelope

1.3.4 Physical Features

1.3.4.1 Front Panel

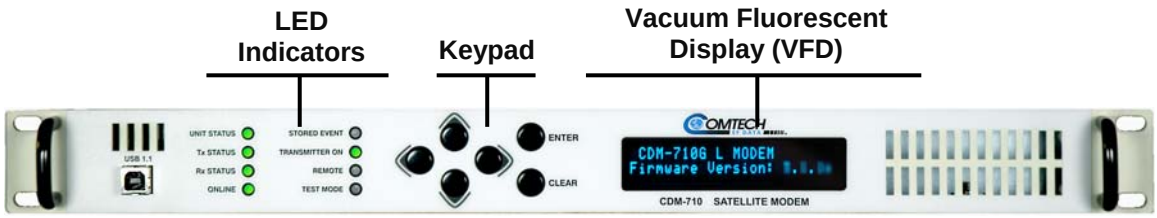


Figure 1-4. Front Panel View

Figure 1-4 shows the front panel of the CDM-710G High-Speed Satellite Modem. The front panel features (from left) **L**ight-**E**mitting-**D**iode (LED) indicators; a keypad; and a **V**acuum **F**luorescent **D**isplay (VFD):

- The eight (8) LEDs indicate, in a summary fashion, the status of the unit.
- The keypad comprises six individual keyswitches. They have a positive 'click' action, which provides tactile feedback. The user enters data via the keypad, and messages are displayed on the VFD.
- The 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), the VFD has greatly superior viewing characteristics and does not suffer problems of viewing angle or contrast.

The function and behavior of the LED indicators, keypad, and VFD is described in detail in **Chapter 6. FRONT PANEL OPERATION**.

1.3.4.2 Rear Panel

Figure 1-5. Rear Panel View (shown with optional G.703 and GigE Interfaces)

Figure 1-5 shows the rear panel of the CDM-710G. External cables are attached to connectors on the rear panel of the CDM-710G. Each connector is described in detail in **Chapter 4. REAR PANEL CONNECTOR PINOUTS**. They comprise:

Connector Group (Chapter 4 Sect. Ref.)	**Ref Des / Name**	**Connector Type**	**Function**
IF (Sect 4.2)	J1 Tx	**CDM-710G (70/140 MHz band):** BNC female	IF Output
		CDM-710GL (L-Band): Type 'N' female	
	J3 Rx	**CDM-710G (70/140 MHz band):** BNC female	IF Input
		CDM-710GL (L-Band): Type 'N' female	
Terrestrial Data (Sect 4.3)	J4 Ethernet	RJ-45 Female	10/100 Base-T Remote Interface
	J6 Async Channel (non-operational)	9-pin Type 'D' female	Asynchronous Engineering Channel
Utility (Sect 4.4)	P1 Alarms	15-pin Type 'D' male	Form C Alarms (relay closures)
	P2 Remote	9-pin Type 'D' male	Serial Remote Interface (RS232/485)
	J7 Ext Ref	BNC female	External Reference Input

1.3.5 Allowable Data Interface Combinations

Data interfaces are installed or removed from the rear of the CDM-710G chassis into Slot 1 and Slot 2 of the CDM-710G. The allowable combination of data interfaces and the data interfaces that are supported for redundancy are found in the table below. In all cases, *only one data interface is active at a time*.

1.3.5.1 Additional Data Interface Information

Interface	**Number**	**1:1 Capability**	**1:N Capability**
G.703 (CDI-10-1)	PL/10008-2 (Also see Chapter 12)	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex
HSSI (CDI-60)	PL/11582-1 (Also see Chapter 13)	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex
Gigabit Ethernet (CDI-70)	PL/11509-3 (Also see Chapter 14)	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex

1.3.5.2 Data Interface Support in 1:1, 1:N Redundancy Configurations

1:1 Redundancy with the CRS-180 (70/140 MHz) or CRS-170A (L-Band) Redundancy Switch: The **"CDM-710G Unit Configuration"** column in **Table 1-1** shows the CDM-710G data interface combinations that are supported by the CRS-180 and CRS-170A 1:1 Redundancy Switches. First, the 1:1 switch is selected depending upon the operating frequency, and then a data interface kit for Slot 1 and Slot 2 is chosen. More information on these kits is provided in the CRS-170A or CRS-180 1:1 Redundancy Switch datasheet and Installation and Operation manual.

IMPORTANT

When a CDM-710G is used as a Tx Only unit in 1:1 Redundancy, the demodulator card must be removed. Similarly, when used as an Rx Only unit in 1:1 Redundancy, the modulator card must be removed.

1:N Redundancy with the CRS-300: The CRS-300 was originally designed for operation with the CDM-600 and subsequently adapted to a number of other modems. It is capable of supporting interfaces up to the point where there are no more paths left to route traffic; this is the reason why the CRS-300 supports a limited set of the interface combinations supported by the CDM-710G.

Table 1-1. Allowable Unit/Switch Data Interface Configurations

CDM-710G Unit Configuration		1:N CRS-300 Configuration		Notes
Interface Slot 1	Interface Slot 2	TMI Card	RMI Card	
G.703 (CDI-10-1)	None	CRS-325	CRS-306	-
G.703 (CDI-10-1)	GigE (CDI-70)			Can be used as Redundant Unit
HSSI (CDI-60)	None	CRS-336		-
None	GigE (CDI-70)		CRS-306	-
HSSI (CDI-60)	GigE (CDI-70)			Can be used as Redundant Unit

Notes:

1. The Redundant Unit must have the same interface cards in each slot as any of the Traffic Units.
2. The Traffic Unit must have the same interface cards in each slot as any of the other Traffic Units have, or a blank panel installed.
3. **Interface Slots 1 and 2 are not active simultaneously**.

1.3.6 Verification

The unit includes a number of tests for rapid verification of the correct functioning of the unit. Selection of a CW carrier permits measurement of carrier center frequency or phase noise characteristic. A single-sideband carrier also is available at the operating symbol rate to check I and Q phase and amplitude balance. When normal operation is again selected, all of the previous values are restored.

1.3.7 Flash Upgrading Modem Firmware

The internal firmware is both powerful and flexible, permitting storage and retrieval of up to 10 different modem configurations. The CDM-710G uses 'flash memory' technology internally, and new firmware can be uploaded to the unit from an external PC. This simplifies software upgrading, and updates can be sent via the Internet (from Comtech EF Data's Web server), E-mail, or on CD. The upgrade can be performed without opening the unit, by simply connecting the CDM-710G to the Ethernet port of a computer. See **Chapter 5. FLASH UPGRADING** for further information.

1.3.8 Fully Accessible System Topology (FAST)

The CDM-710G is extremely flexible and powerful, and incorporates a large number of optional features. In order to permit a lower initial cost, the modem may be purchased with only the desired features enabled.

If, at a later date, a user wishes to upgrade the functionality of a modem, Comtech EF Data provides **F**ully **A**ccessible **S**ystem **T**opology (**FAST**), which permits the purchase and installation of options through special authorization codes loaded into the unit either via the front panel keypad or entered remotely via the remote port located on the modem rear panel.

These unique access codes may be purchased at any time from Comtech EF Data.

FAST System Theory

FAST facilitates on-location upgrade of the operating feature set without removing a modem from the setup.

With **FAST** technology, operators have maximum flexibility for enabling functions as they are required. **FAST** allows an operator to order a modem precisely tailored for the initial application.

When service requirements change, the operator can upgrade the topology of the modem to meet those requirements within minutes. This accelerated upgrade can be accomplished because of **FAST**'s extensive use of the programmable logic devices incorporated into Comtech EF Data products.

FAST Implementation

Comtech EF Data's **FAST** system is factory-implemented in the modem. All **FAST** options are available through the basic platform unit at the time of order – **FAST** allows immediate activation of available options, after confirmation by Comtech EF Data, through the front panel keypad or via the remote control interface.

See **Appendix C. FAST ACTIVATION PROCEDURE** for further information.

FAST Accessible Options

Hardware options for basic modems can be ordered and installed either at the factory or in the field. The operator can select options that can be activated easily in the field, depending on the current hardware configuration of the modem. A unique access code enables configuration of the available hardware.

The following tables show the available FAST and FAST-accessible hardware options:

Transmit Configurations			
Tier	**FAST Option**	**Modulation**	**Max Symbol Rate (Msps)**
3	DVB-S2	QPSK, 8PSK	45
4	DVB-S2	QPSK, 8PSK	45
		16APSK	35
8	DVB-S2	QPSK, 8PSK	45
		16APSK	35
		32APSK	28

Receive Configurations			
Tier	**FAST Option**	**Modulation**	**Max Symbol Rate (Msps)**
1	DVB-S2	QPSK, 8PSK	45
2	DVB-S2	QPSK, 8PSK	45
		16APSK	35
4	DVB-S2	QPSK, 8PSK	45
		16APSK	35
		32APSK	28

1.4 New in this Manual

Firmware revisions incorporate additional features and operational fixes/enhancements. Users are strongly urged to upgrade the CDM-710G to its most current firmware release – for further information, refer to **Chapter 5. FLASH UPGRADING**.

1.4.1 CDM-710G Modem Firmware Release Notes

FW-0000114 Release Ver. 5.1.2 (9/16/09)

New Features:

- Enhanced Front Panel and/or Web Server Interface Operation functionality:
  - Invalid Tx parameter display via unit front panel;
  - Rx/Tx symbol rate configuration matching;
  - BER Monitor/Threshold configuration features;
  - Provision of Organized GBEI Statistics;
  - Progress displays to guide the user through the GBEI reflash process.

For detailed information, refer to **Chapter 6. FRONT PANEL OPERATION** or **Chapter 7. WEB SERVER INTERFACE**.

FW-0000114 Release Ver. 5.1.1 (4/10/09)

New Features:

- Initial bulk firmware release for the CDM-710G and CDM-710GL modems.

1.5 Summary of Specifications

Description	Requirements
Type: DVB-S2	EN 302 307
Symbol Rate: DVB-S2	1 to 45 Msps (QPSK, 8PSK), 35 Msps (16APSK), 28 Msps (32APSK)
Data Rate	Corresponds to symbol rate. See paragraph 1.5.7
Symbol Rate / Data Rate	See modulator/demodulator
Modulation/FEC: DVB-S2	QPSK 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 LDPC + BCH 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 LDPC + BCH 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 LDPC + BCH 32APSK 3/4, 4/5, 5/6, 8/9, 9/10
Operating Modes	CCM only
Transport Streams	Only Single Transport Stream supported
Spectral Mask	20%, 25%, or 35% (per DVB- S2) – See **Figure 1-6** and **Table 1-2**.
M&C/Remote Port	RS-232 and RS-485 2W/4W with Comtech EF Data protocol 10/100 Base-T Ethernet with HTTP, SNMP or Telnet
Physical (PL) Layer Scrambling	User specified value (one) of n = 0 to 262,141, per EN 302 307.
Pilot Insertion	Selection for On or Off
Reflash	Ethernet port
Frequency Reference	Selectable
Internal Reference	10 MHz for data and IF, stability ± 1.5 ppm
External Clock	For data interfaces only, not IF. Clock Input depends upon data interface module.
External Ref	1, 2, 5, 10 or 20 MHz for IF, internally phase locked. Input is 50 or 75Ω compatible with 0.5 to 4.0 V_{p-p} sine or square wave. Requires high stability source.
1:1 Redundancy	Built in controller for operation with optional CRS-170A for L-Band and CRS-180 for 70/140 MHz
1: N Redundancy	Supported by CRS-300
Fault	Form C, see connector pinout information and notes
Configuration	Non-volatile for 1-year minimum and returns upon power up.
External Tx Carrier Off	TTL low signal – path bypasses microprocessor (Alarm Conn)
Agency Approval	Safety, conducted and radiated emissions and Immunity sufficient for CE certification

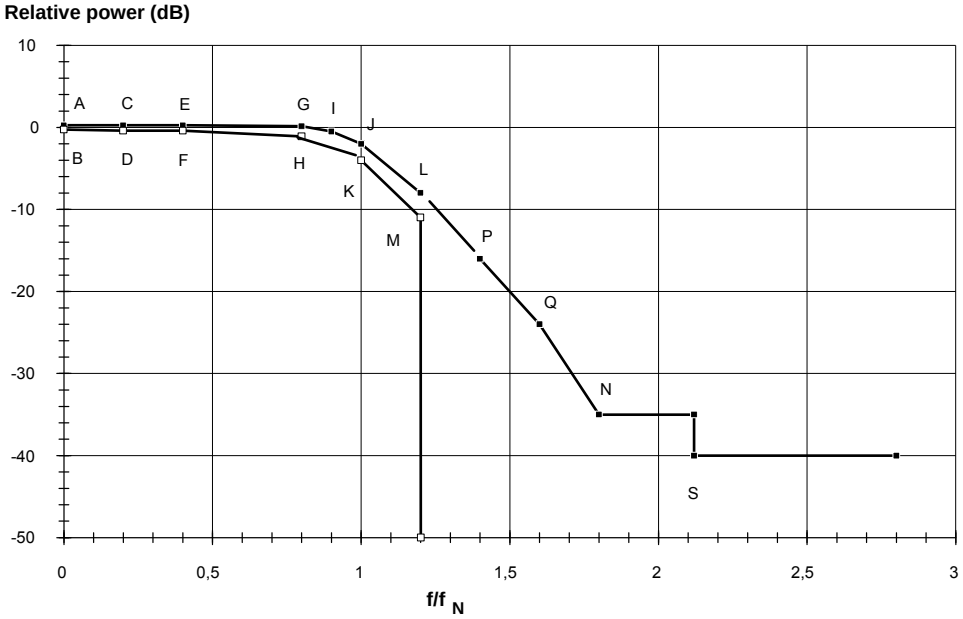


Figure 1-6. Spectral Mask

Table 1-2. Definition of Points For Spectral Mask

Point	Frequency for α=0,35	Frequency for α=0,25	Frequency for α=0,20	Relative power (dB)	Group delay
A	0,0 f_N	0,0 f_N	0,0 f_N	+0,25	+0,07/f_N
B	0,0 f_N	0,0 f_N	0,0 f_N	-0,25	-0,07/f_N
C	0,2 f_N	0,2 f_N	0,2 f_N	+0,25	+0,07/f_N
D	0,2 f_N	0,2 f_N	0,2 f_N	-0,40	-0,07/f_N
E	0,4 f_N	0,4 f_N	0,4 f_N	+0,25	+0,07/f_N
F	0,4 f_N	0,4 f_N	0,4 f_N	-0,40	-0,07/f_N
G	0,8 f_N	0,86f_N	0,89 f_N	+0,15	+0,07/f_N
H	0,8 f_N	0,86 f_N	0,89 f_N	-1,10	-0,07/f_N
I	0,9 f_N	0,93 f_N	0,94 f_N	-0,50	+0,07/f_N
J	1,0 f_N	1,0 f_N	1,0 f_N	-2,00	+0,07/f_N
K	1,0 f_N	1,0 f_N	1,0 f_N	-4,00	-0,07/f_N
L	1,2 f_N	1,13 f_N	1,11 f_N	-8,00	-
M	1,2 f_N	1,13 f_N	1,11 f_N	-11,00	-
N	1,8 f_N	1,60 f_N	1,5 f_N	-35,00	-
P	1,4 f_N	1,30 f_N	1,23 f_N	-16,00	-
Q	1,6 f_N	1,45 f_N	1,4 f_N	-24,00	-
S	2,12 f_N	1,83 f_N	1,7 f_N	-40,00	-

1.5.1 Environmental and Physical

Description		Requirements
Temperature	Operating	0 to 50ºC (32 to 122ºF)
	Storage	-20 to 70ºC (-4 to 158ºF)
Humidity	Operating	95% maximum, non-condensing
	Storage	99% maximum, non-condensing
Power Supply Input	AC	100-240AC 50/60Hz, auto-ranging
	DC	48 VDC
Fuse	AC	T2.00A 5x20 mm 250VAC time lag
	DC	T6.25A 6.3x32 mm
Power Consumption		See **Table 1-3**
AC Power Cord Retainer		Standard
Modular design		Simplex or Duplex
Dimensional Envelope, 1RU		1.72H x 19.00W x 18.65D inches (4.37H x 48.26W x 47.37D cm)
Weight		15lbs (6.8 kg)
Front Panel Operational Features	Keypad	Up, down, left, right, Clear, and Enter keys
	Display	24-characters/line x 2 lines Vacuum Fluorescent Display (VFD)
	LEDs	8 status LEDs

Table 1-3. CDM-710/710G Power Consumption

Product	Configuration	Voltage	Frequency	Watts	Amps	VA
CDM-710G (70/140 MHz)	LDPC+BCH 32APSK 8/9 28Msps S2-TS 120 MHz	48 VDC	N/A	81.2	1.69	-
		120 VAC	60	83.5	0.738	89
		230 VAC	50	83.0	0.503	116
CDM-710GL (L-Band)	LDPC+BCH 32APSK 8/9 28Msps S2-TS 120 MHz	48 VDC	N/A	85.92	1.79	-
		120 VAC	60	87.2	0.770	93
		230 VAC	50	86.5	0.579	133

1.5.2 Modulator

1.5.2.1 CDM-710G 70/140 MHz Modulator

Description	Requirements
Frequency	52 to 88 MHz or 104 to 176 MHz in 100Hz steps. Bandwidth of transmitted spectrum is within IF frequency range.
Impedance	75 Ω or 50 Ω, programmable
Connector	BNC Female
Return Loss	18 dB
Output Power	0 to -20 dBm in 0.1 dB steps. Carrier is not interrupted when changing between output power levels or removing data connections.
Output Power Accuracy	± 0.5 dB at 25°C
Output Power Stability	Within ± 0.5 dB of 25C value over all specified environments
Carrier Mute	55 dB below main carrier output
Harmonics and Spurious	-55 dBc/4 kHz over operating frequency range (excludes spectral mask area) and is with a modulated carrier -55 dBc/4 kHz 10 to 52 MHz, 176 to 250 MHz
Integrated Phase Noise	Continuous component < 1 degrees RMS double-sided, 100 Hz to 10 MHz
Spectral Inversion	Normal or Inverted
Quadrature Phase Error	< 2°
Quadrature Amplitude Imbalance	0.2 dB maximum
Carrier Null	35 dB below an unmodulated carrier
Combined Amplitude Imbalance and Quadrature Phase Error	Single sideband test with suppressed sideband 35 dB minimum below unmodulated carrier

1.5.2.2 CDM-710GL L-Band Modulator

Description	Requirements
Frequency	950 to 1950 MHz in 100Hz steps. Bandwidth of transmitted spectrum is within IF frequency range.
Impedance	50 Ω
Connector	Type N Male
Return Loss	15 dB
Output Power	-5 to -25 dBm in 0.1 dB steps. Carrier is not interrupted when changing between output power levels or removing data connections.
Output Power Accuracy	± 0.5 dB at 25°C
Output Power Stability	Within ± 0.5 dB of 25C value over all specified environments
Carrier Mute	55 dB below main carrier output
Harmonics and Spurious	-55 dBc/4 kHz over operating frequency range (excludes spectral mask area) and is with a modulated carrier -55 dBc/4 kHz 250 to 950 MHz, 1950 to 2500 MHz
Integrated Phase Noise	Continuous component < 1 degrees RMS double-sided, 100 Hz to 10 MHz
Spectral Inversion	Normal or Inverted
Quadrature Phase Error	< 2°
Quadrature Amplitude Imbalance	0.2 dB maximum
Carrier Null	35 dB below an unmodulated carrier
Combined Amplitude Imbalance and Quadrature Phase Error	Single sideband test with suppressed sideband 35 dB minimum below unmodulated carrier

1.5.3 Demodulator

1.5.3.1 CDM-710G 70/140 MHz Demodulator

Description	Requirements
Frequency Range	52 to 88 and 104 to 176 MHz in 100 Hz steps
Impedance/Connector	50 Ω or optional 75 Ω/BNC Female
Return Loss	18 dB
Input Power, Minimum	-58 + 10xLog(Symbol Rate in MHz) dBm, -58 dBm at 1 Msps, -41.5 dBm at 45 Msps. See **Figure 1-7**.
AGC Range	45 dB above minimum
Max Composite Level	+20 dBc composite to desired up to +10 dBm
Acquisition Range	± 100 kHz programmable in 1 kHz steps
Acquisition Time	Typical < 10 seconds, DVB-S2 Pilots On.
Adaptive Equalizer	Up to 3 dB tilt
BER Performance	See **Table 1-4**.
IQ Test Point	Accessible from rear panel Alarm connector

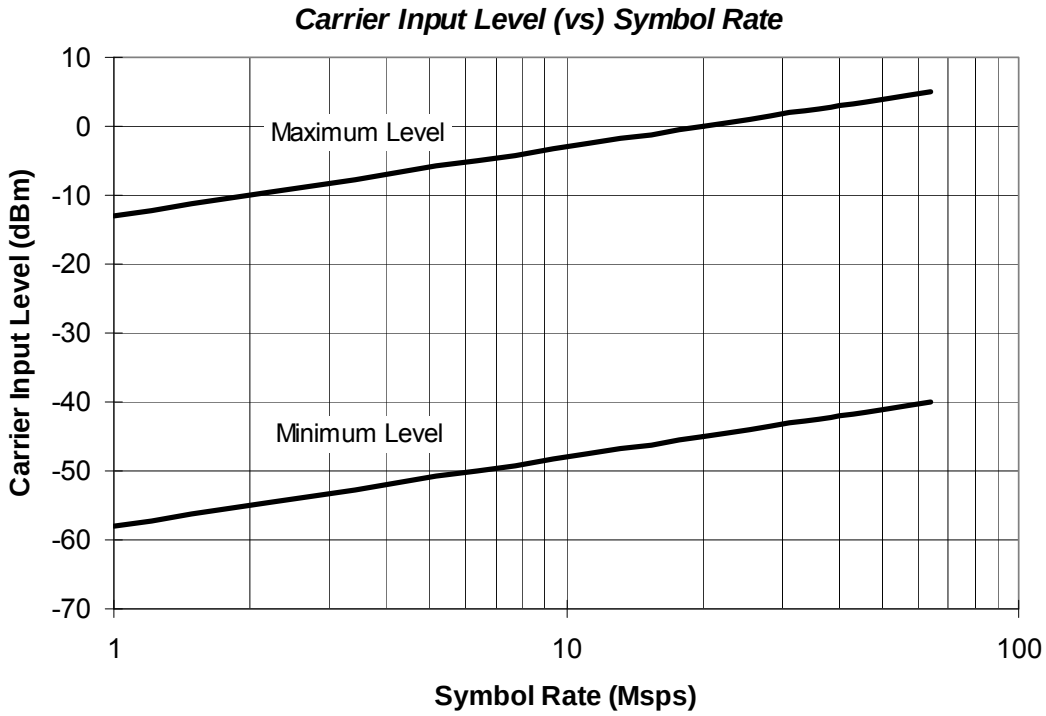


Figure 1-7. Demodulator Input Level

1.5.3.2 CDM-710GL L-Band Demodulator

Description	Requirements
Frequency Range	950 MHz to 1950 MHz in 100 Hz steps
Impedance/Connector	50 Ω/Type N Female
Return Loss	15 dB
Input Power, Minimum	-58 + 10xLog(Symbol Rate in MHz) dBm, -58 dBm at 1 Msps, -41.5 dBm at 45 Msps
AGC Range	45 dB above minimum
Max Composite Level	+30 dBc composite to desired up to +10 dBm
Acquisition Range	± 100 kHz programmable in 1 kHz steps
Acquisition Time	Typical < 10 seconds, DVB-S2 Pilots On
Adaptive Equalizer	Up to 3 dB tilt
BER Performance	See **Table 1-4**
IQ Test Point	Accessible from rear panel Alarm connector

Table 1-4. Eb/No Performance at Quasi Error Free PER = 10^{-7} with AWGN for DVB-S2 Operations

FECFRAME = 64,800 or 16,200 Bits and no pilot						
Modulation DVB-S2	**Code Rate**	**Spectral Efficiency FECFrame = 64,800 bits**	**Spectral Efficiency FECFrame = 16,200 bits**	**Specified Es/No (dB) See Notes**	**Eb/No (dB) See Notes**	**Remarks**
QPSK	1/4	0.490243	0.365324	-1.85	1.25	Information
	1/3	0.656448	0.629060	-0.74	1.09	Information
	2/5	0.789412	0.760928	0.20	1.23	Information
	1/2	0.988858	0.848840	1.50	1.55	
	3/5	1.188304	1.156532	2.73	1.98	
	2/3	1.322253	1.288400	3.60	2.39	
	3/4	1.487473	1.420269	4.53	2.81	
	4/5	1.587196	1.508181	5.18	3.17	
	5/6	1.654663	1.596093	5.68	3.49	
	8/9	1.766451	1.727961	6.70	4.23	
	9/10	1.788612	NA	6.92	4.39	
8PSK	3/5	1.779991	1.725319	6.20	3.70	
	2/3	1.980636	1.922040	7.32	4.35	
	3/4	2.228124	2.118761	8.61	5.13	
	5/6	2.478562	2.381056	10.15	6.21	
	8/9	2.646012	2.577778	11.49	7.26	
	9/10	2.679207	NA	11.78	7.50	
16APSK	2/3	2.637201	2.548792	9.97	5.76	
	3/4	2.966728	2.809662	11.21	6.49	
	4/5	3.165623	2.983575	12.03	7.03	
	5/6	3.300184	3.157488	12.61	7.42	
	8/9	3.523143	3.418357	13.89	8.42	
	9/10	3.567342	NA	14.13	8.61	
32APSK	3/4	3.703295	3.493093	13.73	8.04	
	4/5	3.951571	3.709309	14.64	8.67	
	5/6	4.119540	3.925526	15.28	9.13	
	8/9	4.397854	4.249850	16.69	10.26	
	9/10	4.453027	NA	17.05	10.56	

Notes:

1. Eb/No = Es/No – 10 Log (Spectral Efficiency).
2. BER ≈ 10^{-9} at PER = 10^{-7}
3. Performance with FECFRAME = 16,200 Bits and no pilot is typically 0.2 to 0.3 dB higher.

1.5.4 Test Functions

Description	Requirements
CW	Generates a narrow carrier at the programmed frequency at the programmed power level. Used in testing.
SSB Carrier	Provides desired sideband, suppressed carrier and suppressed sideband.
Loopback Modes	• Modulator to Demodulator • I/O Loopback where applicable • Digital Loopback where applicable

1.5.5 Monitor Functions

Description	Requirements
Status Items – available via Front Panel	Fault Log with fault type and time stamp
Receive Signal Level	Report within ± 5 dB, typical
Es/No	Report within ± 0.5 dB, typical
Eb/No	Report within ± 0.5 dB, typical

1.5.6 Remote Port Operation

Description	Requirements
Comtech EF Data Remote Port	See Appendix A. REMOTE CONTROL
Ethernet Telnet	Ethernet transport of standard Remote Control commands.
Ethernet SNMP	See **Chapter 8. SNMP**.
Ethernet HTTP	Support all control and monitor parameters.

1.5.7 Data Rate Range

Symbol Rate and Data Rate Range for DVB-S2. There is some roundoff in the data rate ranges in the last digit. **Table 1-5** is for the Standard FEC frame, and **Table 1-6** is for the Short Frame. The tables are based on a 188-byte transport stream packet (only 188 is available).

DVB recommends turning the Pilot **ON** for 8PSK and higher modulation orders, particularly when phase noise is present.

The following modes may need Pilot **ON** for low C/N operation: 8PSK 1/2, 16APSK 2/3 and 3/4, and 32APSK 3/4 to assist carrier recovery.

QPSK 1/4, 1/3, and 2/5 data is for information only.

Table 1-5. Data Rate Range: Standard FECFrame* (188 Byte Format)

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
QPSK	LDPC+BCH	1/4	1	45*	0.490243	0.490243	22.060942	0.478577	0.478577	21.535965
		1/3			0.656448	0.656448	29.540166	0.640827	0.640827	28.837209
		2/5			0.789412	0.789412	35.523546	0.770627	0.770627	34.678204
		1/2			0.988858	0.988858	44.498615	0.965327	0.965327	43.439697
		3/5			1.188304	1.188304	53.473684	1.160026	1.160026	52.201190
		2/3			1.322253	1.322253	59.501385	1.290788	1.290788	58.085452
		3/4			1.487473	1.487473	66.936288	1.452076	1.452076	65.343429
		4/5			1.587196	1.587196	71.423823	1.549426	1.549426	69.724175
		5/6			1.654663	1.654663	74.459834	1.615288	1.615288	72.687939
		8/9			1.766451	1.766451	79.490305	1.724416	1.724416	77.598702
		9/10			1.788612	1.788612	80.487535	1.746049	1.746049	78.572201
8PSK	LDPC+BCH	3/5	1	45*	1.779991	1.779991	80.099585	1.739569	1.739569	78.280616
		2/3			1.980636	1.980636	89.128631	1.935658	1.935658	87.104623
		3/4			2.228124	2.228124	100.265560	2.177525	2.177525	97.988646
		5/6			2.478562	2.478562	111.535270	2.422276	2.422276	109.002433
		8/9			2.646012	2.646012	119.070539	2.585924	2.585924	116.366586
		9/10			2.679207	2.679207	120.564315	2.618365	2.618365	117.826440
16APSK	LDPC+BCH	2/3	1	35*	2.637201	2.637201	92.302026	2.574613	2.574613	90.111471
		3/4			2.966728	2.966728	103.835482	2.896320	2.896320	101.371209
		4/5			3.165623	3.165623	110.796808	3.090495	3.090495	108.167326
		5/6			3.300184	3.300184	115.506446	3.221863	3.221863	112.765192
		8/9			3.523143	3.523143	123.310006	3.439530	3.439530	120.383555
		9/10			3.567342	3.567342	124.856967	3.482680	3.482680	121.893803
32APSK	LDPC+BCH	3/4	1	28*	3.703295	3.703295	103.692261	3.623332	3.623332	101.453291
		4/5			3.951571	3.951571	110.643985	3.866247	3.866247	108.254911
		5/6			4.119540	4.119540	115.347126	4.030589	4.030589	112.856500
		8/9			4.397854	4.397854	123.139923	4.302894	4.302894	120.481032
		9/10			4.453027	4.453027	124.684751	4.356875	4.356875	121.992503

*** Notes:**

- DVB-S2 – Standard FECFrame = 64,800 Bits.
- For G.703 fixed data rates, limit maximum symbol rate to less than the maximum indicated in **Table 1-5**. For more information on this interface, refer to **Chapter 12. SINGLE G.703 (E3/T3/STS-1) INTERFACE (CDI-10-1)**.
- HSSI data rate limit of 70 Mbps may be reached before symbol rate limit is reached. For more information on this interface, refer to **Chapter 13. HSSI INTERFACE (CDI-60)**.

Table 1-6. Data Rate Range: Short FECFrame* (188 Byte Format)

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
QPSK	LDPC+BCH	1/4	1	45*	0.365324	0.365324	16.439560	0.357467	0.357467	16.086022
		1/3			0.629060	0.629060	28.307692	0.615532	0.615532	27.698925
		2/5			0.760928	0.760928	34.241758	0.744564	0.744564	33.505376
		1/2			0.848840	0.848840	38.197802	0.830585	0.830585	37.376344
		3/5			1.156532	1.156532	52.043956	1.131661	1.131661	50.924731
		2/3			1.288400	1.288400	57.978022	1.260693	1.260693	56.731183
		3/4			1.420269	1.420269	63.912088	1.389725	1.389725	62.537634
		4/5			1.508181	1.508181	67.868132	1.475747	1.475747	66.408602
		5/6			1.596093	1.596093	71.824176	1.561768	1.561768	70.279570
		8/9			1.727961	1.727961	77.758242	1.690800	1.690800	76.086022
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
8PSK	LDPC+BCH	3/5	1	45*	1.725319	1.725319	77.639344	1.692033	1.692033	76.141479
		2/3			1.922040	1.922040	86.491803	1.884959	1.884959	84.823151
		3/4			2.118761	2.118761	95.344262	2.077885	2.077885	93.504823
		5/6			2.381056	2.381056	107.147541	2.335120	2.335120	105.080386
		8/9			2.577778	2.577778	116.000000	2.528046	2.528046	113.762058
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
16APSK	LDPC+BCH	2/3	1	35*	2.548792	2.548792	89.207729	2.505223	2.505223	87.682811
		3/4			2.809662	2.809662	98.338164	2.761633	2.761633	96.657170
		4/5			2.983575	2.983575	104.425121	2.932574	2.932574	102.640076
		5/6			3.157488	3.157488	110.512077	3.103514	3.103514	108.622982
		8/9			3.418357	3.418357	119.642512	3.359924	3.359924	117.597341
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
32APSK	LDPC+BCH	3/4	1	28*	3.493093	3.493093	97.806607	3.419165	3.419165	95.736626
		4/5			3.709309	3.709309	103.860661	3.630805	3.630805	101.662551
		5/6			3.925526	3.925526	109.914715	3.842446	3.842446	107.588477
		8/9			4.249850	4.249850	118.995796	4.159906	4.159906	116.477366
		9/10			N/A	N/A	N/A	N/A	N/A	N/A

*** Notes:**

- DVB-S2 – Short FECFrame = 16,200 Bits.
- For G.703 fixed data rates, limit maximum symbol rate to less than the maximum indicated in **Table 1-6**. For more information on this interface, refer to **Chapter 12. SINGLE G.703 (E3/T3/STS-1) INTERFACE (CDI-10-1)**.
- HSSI data rate limit of 70 Mbps may be reached before symbol rate limit is reached. For more information on this interface, refer to **Chapter 13. HSSI INTERFACE (CDI-60)**.

Notes:

Chapter 2. INSTALLATION

2.1 Unpacking and Inspection

The CDM-710G High-Speed Satellite Modem and its Installation and Operation Manual are packaged in a pre-formed, reusable, cardboard carton containing foam spacing for maximum shipping protection.

Be sure to keep all shipping materials for the carrier's inspection.

Inspect shipping containers for damage. If the shipping containers are damaged, keep them until the contents of the shipment have been carefully inspected and checked for normal operation.

Do not use any cutting tool that will extend more than 1" into the container and cause damage to the unit.

Unpack and inspect the modem as follows:

Step	Description
1	Cut the tape at the top of the carton indicated by **"OPEN THIS END."**
2	Remove the cardboard/foam space covering the modem.
3	Remove the modem, manual, and power cord from the carton.
4	Save the packing material for storage or reshipment purposes.
5	Inspect the equipment for any possible damage incurred during shipment.
6	Check the equipment against the packing list to ensure the shipment is correct.
7	Refer to the following sections for further installation instructions.

2.2 Mounting

If the modulator is to be mounted in a rack, ensure that there is adequate clearance for ventilation, particularly at the sides. In rack system where there is high heat dissipation, forced air-cooling must be provided by top or bottom mounted fans or blowers. Under no circumstance should the highest internal rack temperature be allowed to exceed 50°C (122°F).

2.2.1 Method A: Optional Rear-Mounting Support Brackets

Install optional rear-mounting support brackets using mounting kit KT/6228-2:

Optional Rear-Mounting Support Brackets Kit KT/6228-2		
Quantity	**CEFD Part Number**	**Description**
2	HW/10-32SHLDR	Screw, #10 Shoulder
4	HW/10-32FLT	Washer, #10 Flat
2	HW/10-32SPLIT	Washer, #10 Split
2	HW/10-32HEXNUT	Nut, #10 Hex
2	FP/6138-1	Bracket, Rear Support
4	HW/10-32x1/2RK	Bolt, #10 Rack Bracket

The tools required for this installation are a **medium Phillips™ screwdriver** and a **5/32-inch SAE Allen™ Wrench.** The kit is installed as illustrated in **Figure 2-1** and per the following procedure:

Step	Description
1	Secure the #10 shoulder screws to the unit chassis through the rear right and left side mounting slots, using the #10 flat washers, #10 split washers, and #10 hex nuts as shown.
2	Install the rear support brackets onto the equipment rack threaded rear mounting rails, using the #10 rack bracket bolts.
3	Mount the unit into the equipment rack, ensuring that the shoulders of the #10 shoulder screws properly engage into the rear support bracket slots.

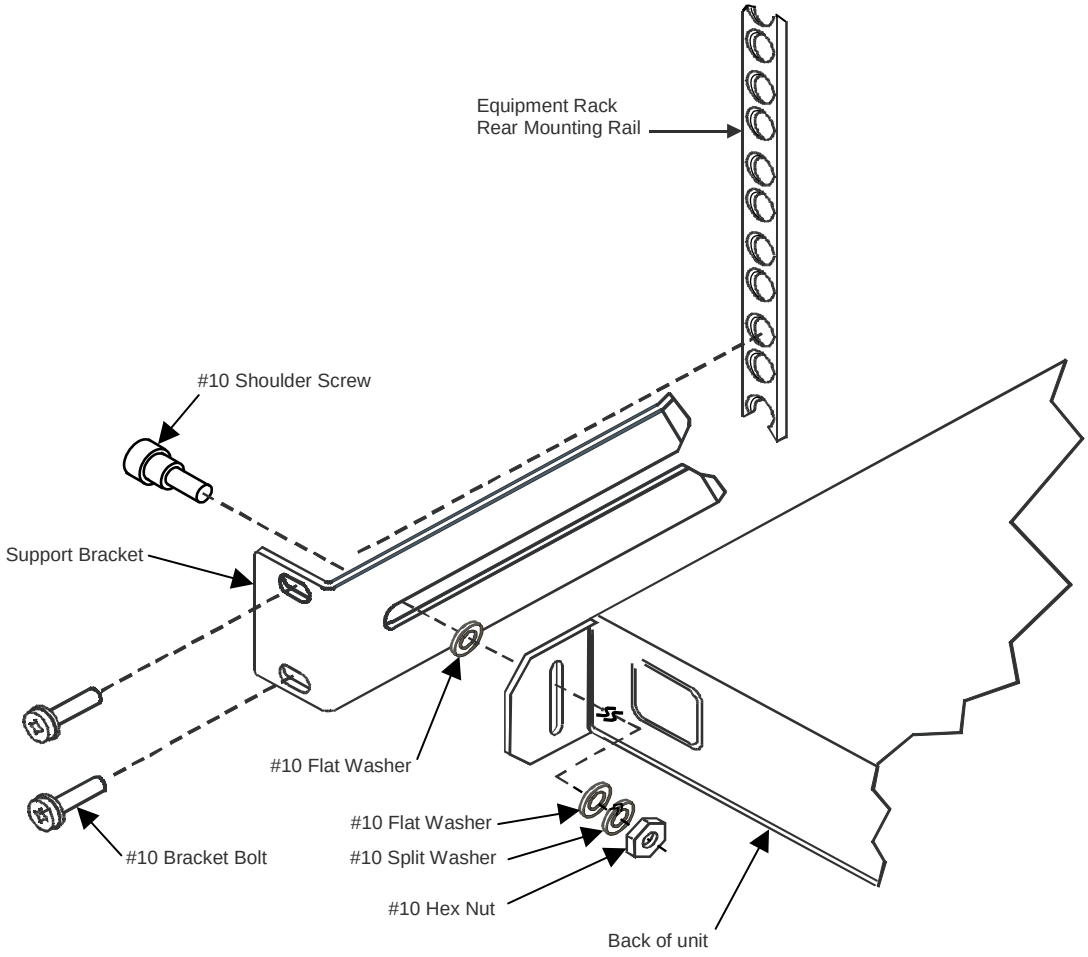
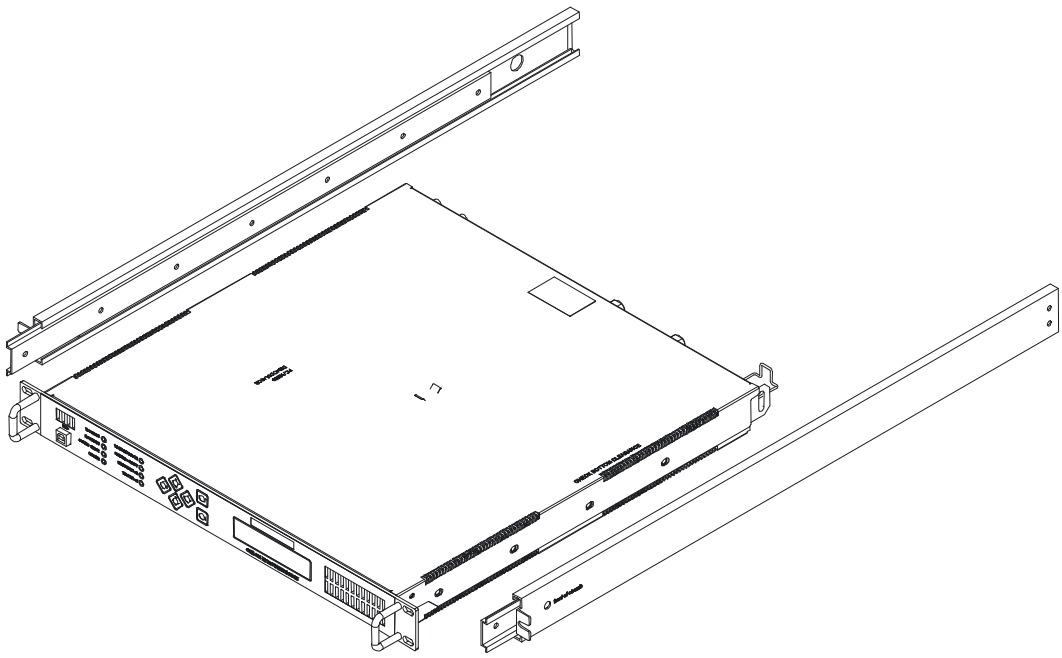


Figure 2-1. Installation of Optional Rear-Mounting Support Brackets (KT/6228-2)

2.2.2 Method B: Optional Bearingless Side-Railings

Figure 2-2 depicts installation of the optional side-railings FP/SL0006, using standard shop tooling and customer-furnished standard shop hardware:



Optional Side-railings FP/SL0006		
Quantity	**CEFD Part Number**	**Description**
2	FP/SL0006	Bearingless Side-Railing

Figure 2-2. Installation of Optional Side-Railings (FP/SL0006)

Chapter 3. ETHERNET NETWORK CONFIGURATIONS

3.1 Introduction

For operations requiring Ethernet-based terrestrial data handling, it is important to emphasize the need for users to avoid Ethernet looping connection problems – with or without use of the CDM-710G in redundancy. These issues are specifically addressed with a CDM-710G redundancy configuration that uses Comtech EF Data's CRS-300 1:10 Redundancy Switch.

3.2 Ethernet Routers and Switches

Routers and switches allow connection of one or more computers or networked devices to other computers or network devices. Each has two or more connectors, called ports, in which cables connect to other network devices.

An **Ethernet switch** examines the traffic that comes across it, and learns where particular MAC addresses are. An Ethernet switch maintains what is known as a **C**ontent **A**ddressable **M**emory (**CAM**) table, listing the MAC addresses for each switch port. The Ethernet switch uses the CAM table to determine where to forward Ethernet frames. By default, Ethernet switches will update the CAM table automatically; for example, if an Ethernet switch sees traffic from 'Machine A' coming in on 'Port 2', it now knows that 'Machine A' is connected to that port, and that traffic destined for 'Machine A' needs to only be sent to that port and not any of the others.

An **Ethernet router** determines where to forward IP traffic based upon the destination IP address and the Route table entries in the router. An Ethernet router can be programmed to understand and route the data it is directed to handle; for example, broadband routers include the ability to "hide" computers behind a type of firewall, which involves slightly modifying the packets of network traffic as they traverse the device. All routers include some kind of user interface for configuring how the router will treat traffic: larger routers include the equivalent of a full-blown programming language to describe how they should operate, as well as the ability to communicate with other routers to describe or determine the best way to direct network traffic from 'Point A' to 'Point B'.

3.3 Ethernet Configuration Examples

This section explains the problems with **Ethernet Networking Loops**, and how to properly design applications architecture for handling **Standard traffic** and **Split-path traffic.** *Standard traffic* is defined as Rx and Tx Ethernet traffic using the same port on the same router or switch, whereas *split-path traffic* is Rx and Tx Ethernet traffic using different ports of the same router or switch.

The following sections in this chapter provide examples of applications architecture designed to handle near-to-far end Ethernet network configurations:

- **Chapter 3.3.3** Hub-to-Hub with Standard Traffic using Switches
- **Chapter 3.3.4** Hub-to-Hub with Standard Traffic using Routers
- **Chapter 3.3.5** Hub-to-Remotes with Standard Traffic using Routers or Switches
- **Chapter 3.3.6** Hub-to-Remotes, Split-path Traffic using Routers (Point-to-Multipoint)
- **Chapter 3.3.7** Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

3.3.1 Ethernet Network Overview

When placing modems in a network, there are a number of issues that must be addressed – first and foremost on the list of concerns is whether implementation of the switches in the network will cause a **Networking Loop**. This is problematic because a Networking Loop will cause a **Broadcast Storm**, which shuts down the network and causes harm to devices in that network.

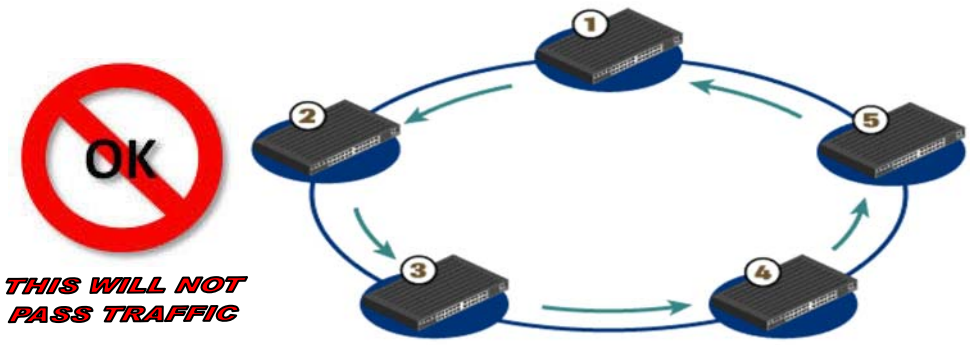


Figure 3-1. Networking Loop with Switches

Figure 3-1 illustrates a Networking Loop with switches. The problem with this configuration is that **'Switch 1'** will send out an ARP request looking for a particular MAC, then each subsequent switch passes along that request until **'Switch 1'** receives it again. At this point, two things could happen:

1. The switch could continue to forward all requests out all ports, creating more and more traffic on the network until there is no bandwidth available and the switch either reboots or locks up.
2. The switch could sense that the ARP request came back to the switch on a different port. The switch could then stop forwarding traffic out the proper port.

Other factors will affect the network: e.g., if the switch is running Spanning Tree Protocol, VLANs, etc.

3.3.2 Ethernet Redundancy with CRS-300

After the customer has determined the best configuration for near-to-far end Ethernet networks, the CRS-300 1:10 Redundancy Switch may now be added to one or both ends of the link(s). Ethernet redundancy using the CRS-300 can be accomplished using a **wired-thru** or **wired-around** configuration.

3.3.2.1 Wired-thru Connection

This redundancy approach is the recommended ***and*** preferred ***connection method.***

The wired-thru Ethernet connection on the CRS-300 is the easiest and simplest choice for Ethernet redundancy. This connection method – the same as used on the standard serial data interface – provides a single connection for the User Data Interface and provides simple Form-C relays that route the Ethernet connection from the user connection to either the Traffic or Redundant Modem.

3.3.2.2 Wired-around Connection

This redundancy approach is not ***recommended.***

The wired-around Ethernet connection is used with the CDM-710G modem and CRS-300 1:10 Redundancy Switch, where both modem data interface slots are needed; e.g., where one slot is HSSI or G.703 and the other slot is GigE. With the Ethernet slot configured for the wired-around method, this gives full redundancy capability to both data slots. However, care must be taken to ensure there are no Ethernet network loops or connection problems – *this method should* **only** *be used if both modem data slots are used.* In general, the wired-around approach can be used in a hub-to-remotes configuration with standard traffic.

3.3.3 Hub-to-Hub with Standard Traffic using Switches

When connecting two or more "hub-sites" where there are multi-paths between each site, care must be taken to ensure no network loops occur. **Figure 3-2** depicts two hub-sites connected with two or more modems where all the traffic being transmitted and received is on the same LAN/VLAN.

Figure 3-3 shows a simplified version of the Networking Loop. Since there is no router in the network and all the traffic is destined to the same network, routing loops have been created.

As illustrated, two switches have been connected, each with two or more separate connections. This is not how the Ethernet switches were designed to be used, and this configuration will cause a network outage.

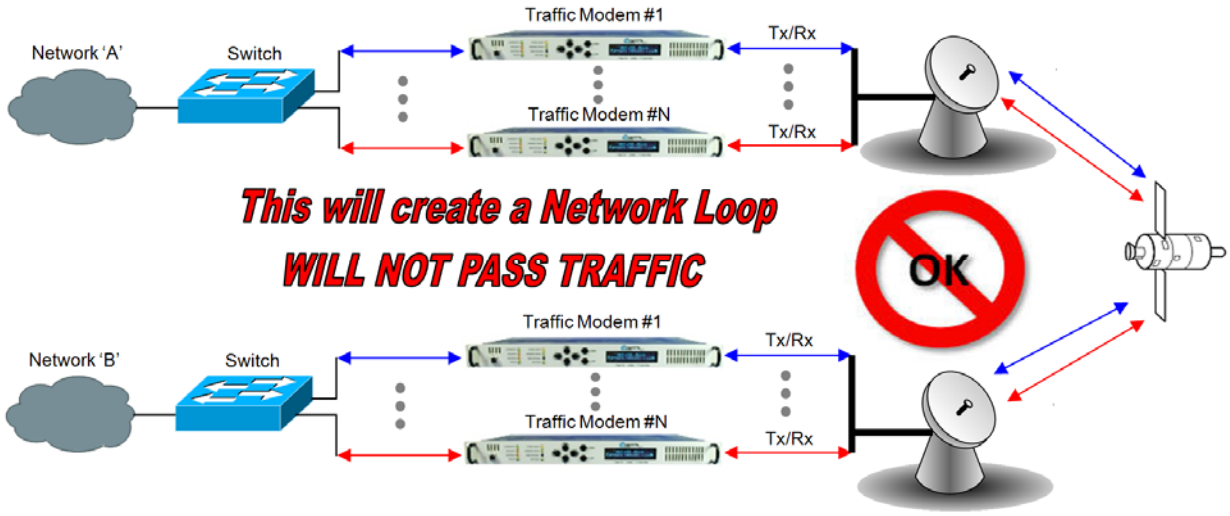


Figure 3-2. Networking Loop Example

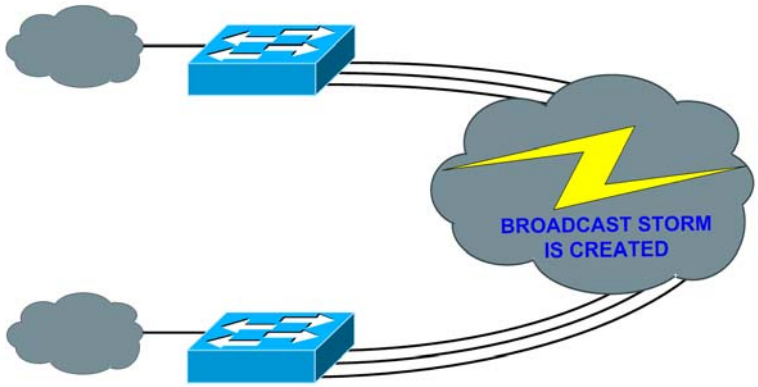


Figure 3-3. Networking Loop Example (Simplified)

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3.3.4 Hub-to-Hub with Standard Traffic using Routers

Figure 3-4 shows two hub-sites connected with standard Ethernet traffic, using routers instead of switches for Ethernet connection. The routers will block the broadcasts coming from the remote network. Therefore, no broadcast storm can be created or the possibility of having a remote MAC on the Hub networks.

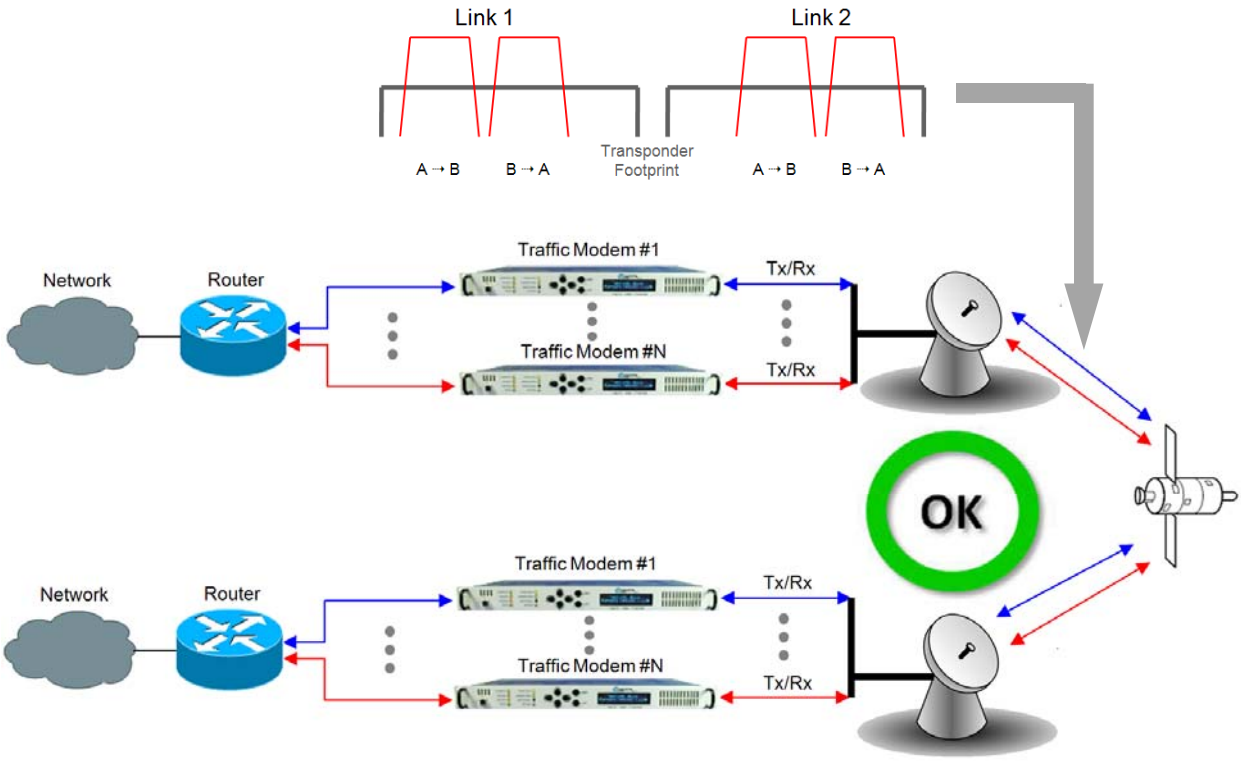


Figure 3-4. Hub-to-Hub with Standard Traffic using Routers

A wired-thru Ethernet redundancy example is shown in **Figure 3-5**. When the CRS-300 1:10 Redundancy Switch "backs-up" a faulted Traffic Modem, the physical port on the router does not change, because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example is shown for the CDM-710G user in **Figure 3-6**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the router needs to change from the Traffic Modem port to the Redundant Modem port. Because of this, special router configuration is required for successful operation – the user may need to consult with the router manufacturer.

IMPORTANT

The wired-around redundancy approach is not recommended.

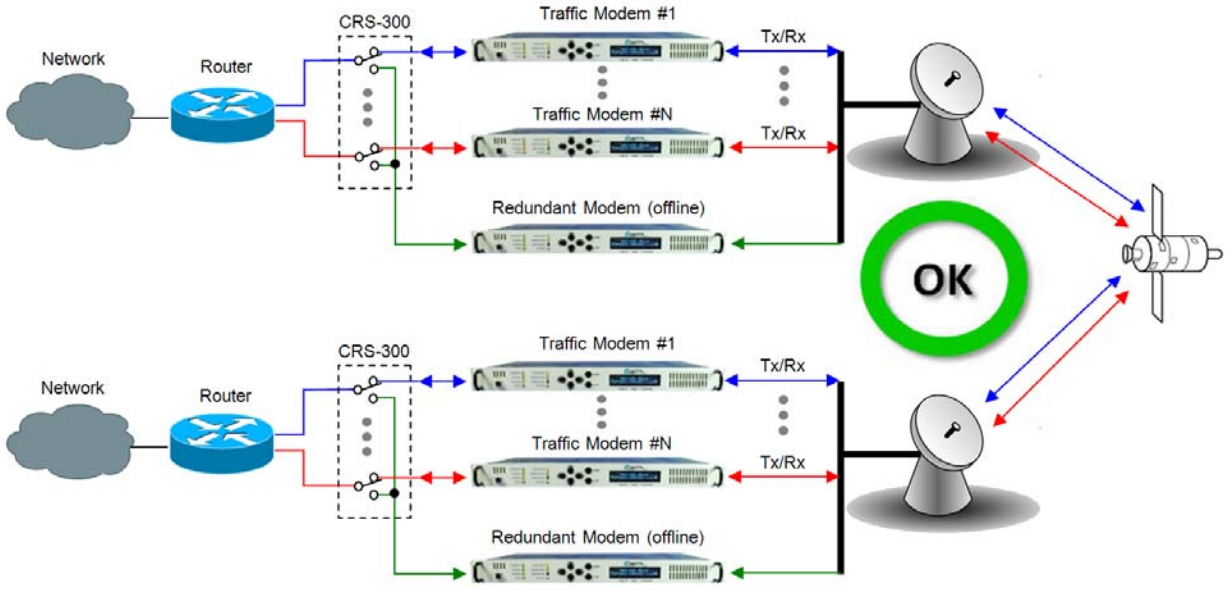


Figure 3-5. Wired-thru for Hub-to-Hub with Standard Traffic using Routers

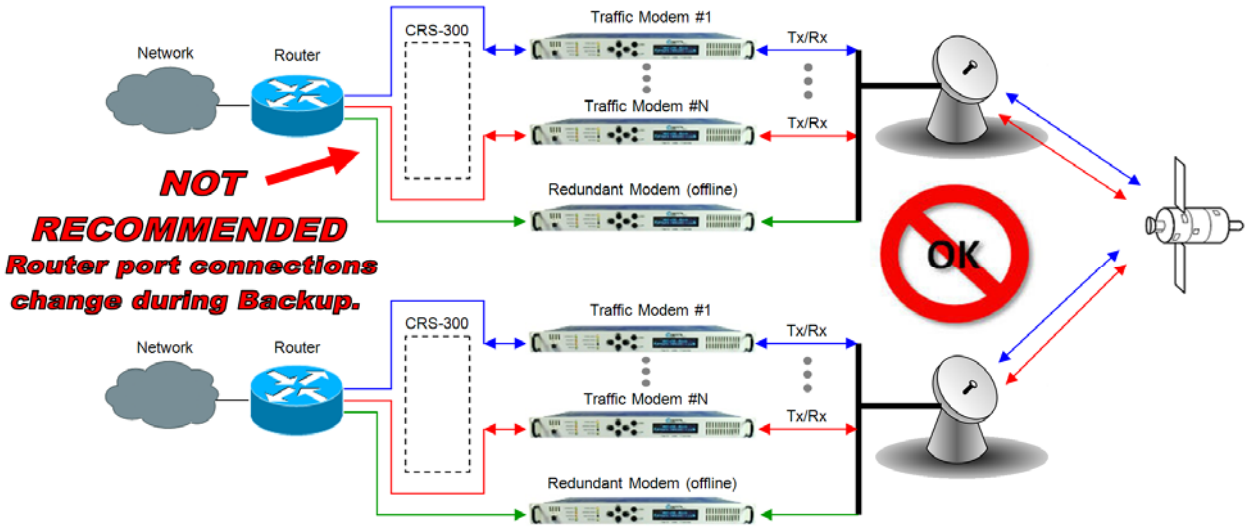


Figure 3-6. Wired-around for Hub-to-Hub with Standard Traffic using Routers

3.3.5 Hub-to-Remotes with Standard Traffic using Routers or Switches

Figure 3-7 shows hub-to-remotes configuration with standard Ethernet traffic using routers or switches. The routers/switches will block broadcasts coming from the hub and remote networks. Therefore, no broadcast storm can be created or the possibility of having a remote MAC on the Hub networks.

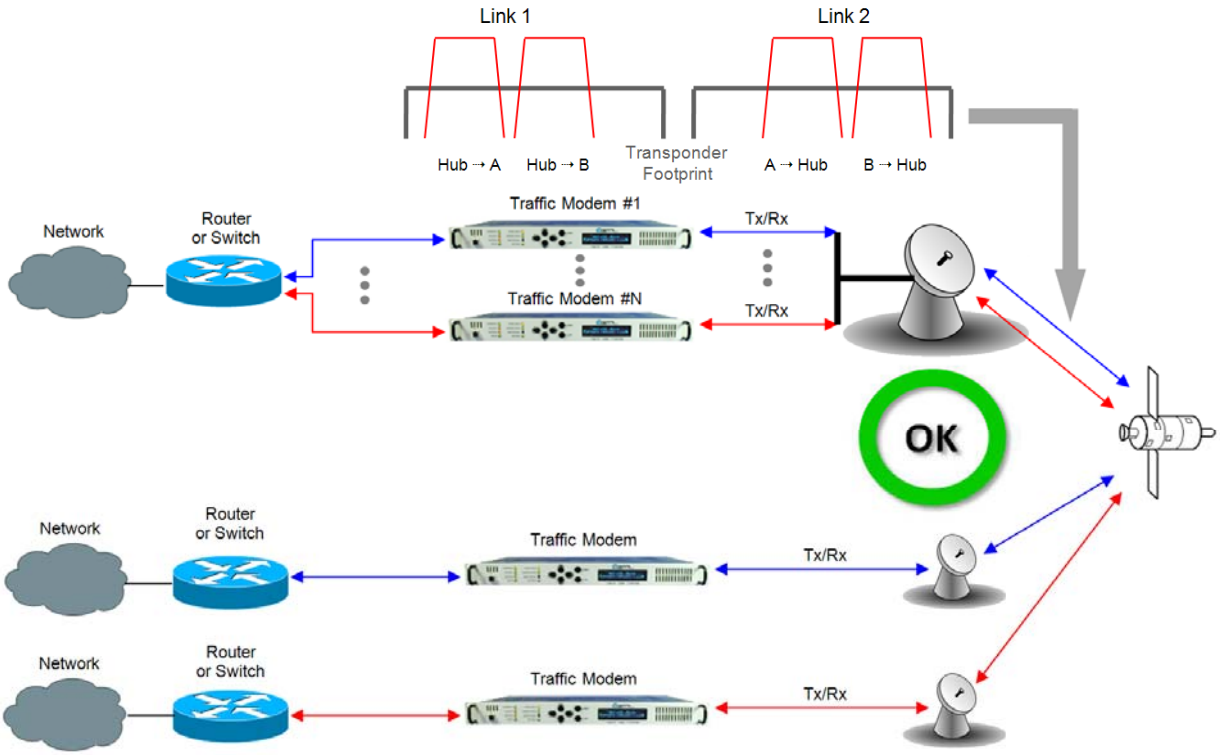


Figure 3-7. Hub-to-Remotes with Standard Traffic using Routers or Switches

A wired-thru Ethernet redundancy example is shown in **Figure 3-8**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port, (on the router) does not change because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example for the CDM-710G user is shown **Figure 3-9**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the Dwitch will learn the new MAC address of the redundant unit and traffic will be passed again. This type of architecture will slow down the switching time, because the Switch will need to re-learn the correct port connection.

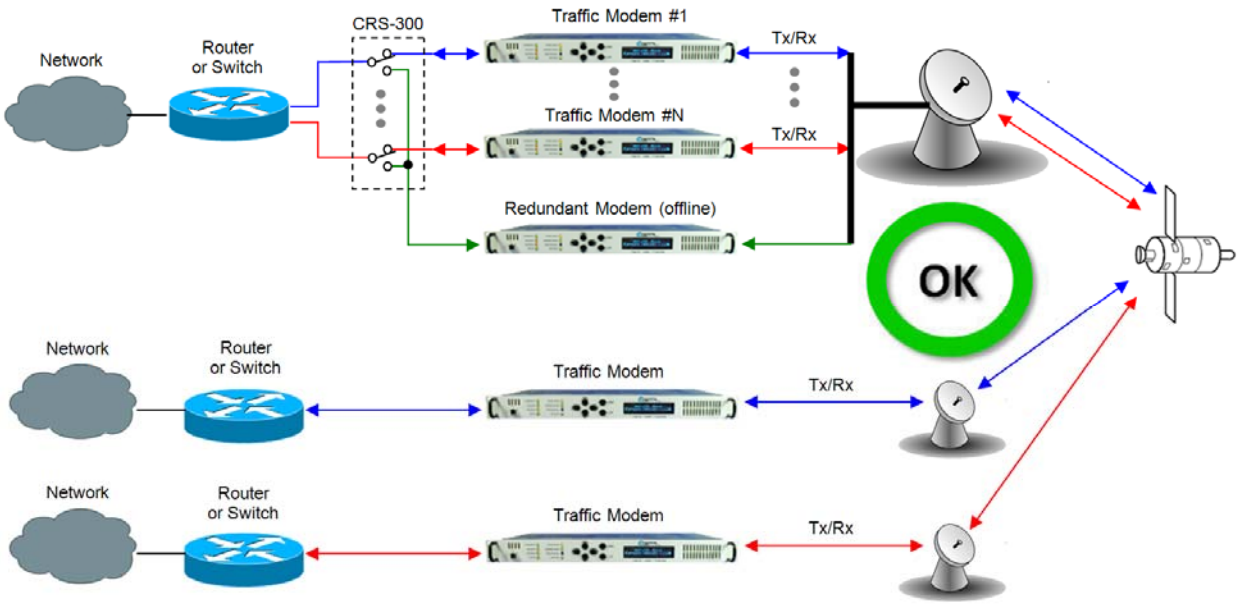


Figure 3-8. Wired-thru for Hub-to-Remotes with Standard Traffic using Routers or Switches

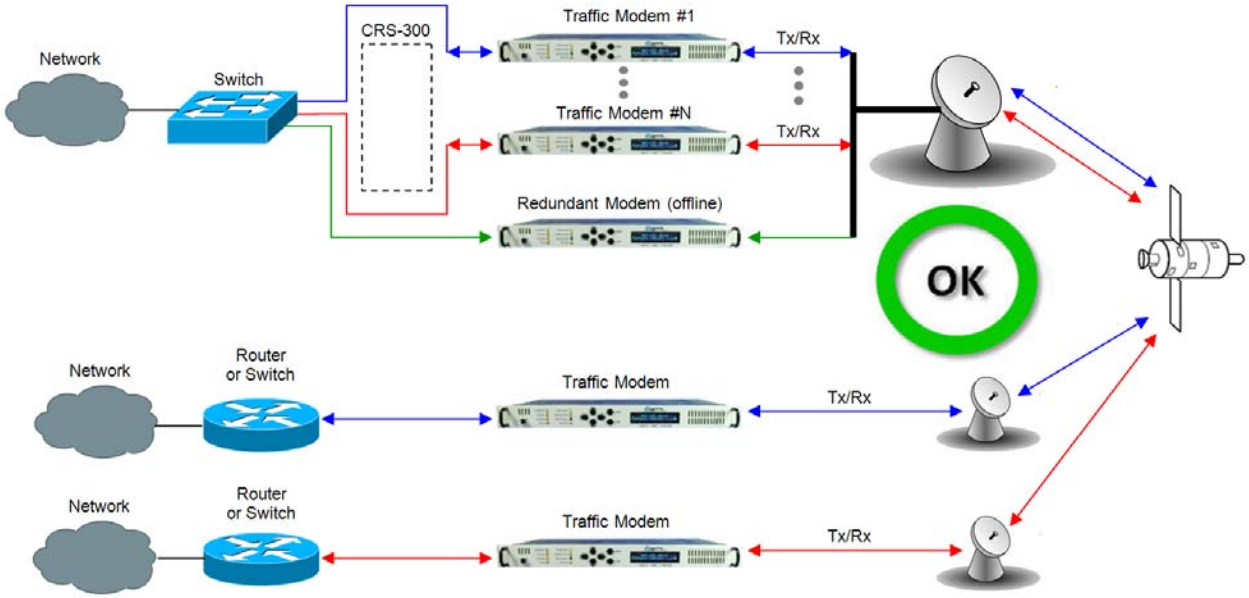


Figure 3-9. Wired-around for Hub-to-Remotes with Standard Traffic using Routers or Switches

3.3.6 Hub-to-Remotes, Split-path Traffic using Routers (Point-to-Multipoint)

Figure 3-10 shows hub-to-remotes configuration with standard and split-path Ethernet traffic, using routers. A Static ARP Entry is needed in the switch so that routing of the Tx side of the modems will be on the correct port of the router. For example, the Rx side of the Ethernet connection for **'Traffic Modem #N'** comes in the bottom port of the Router, but the Tx Ethernet connection must be connected through the same port as **'Traffic Modem #1'**, as shown in this figure.

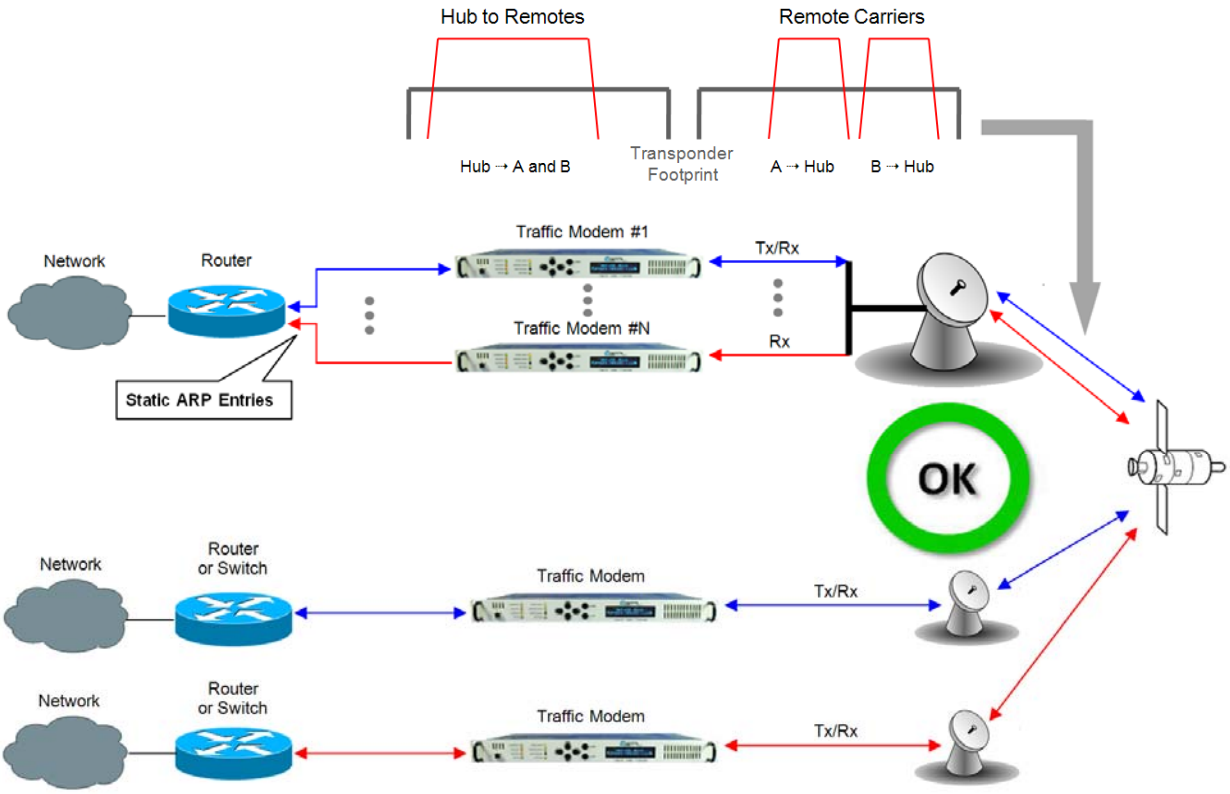


Figure 3-10. Point-to-Multipoint using Routers

A wired-thru Ethernet redundancy example is shown in **Figure 3-11.** When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the router does not change, because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example is shown for the CDM-710G user in **Figure 3-12**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the router needs to change from the Traffic Modem port to the Redundant Modem port. Because of this, special router configuration is required for successful operation – the user may need to consult with the router manufacturer.

IMPORTANT

The wired-around redundancy approach is not ***recommended.***

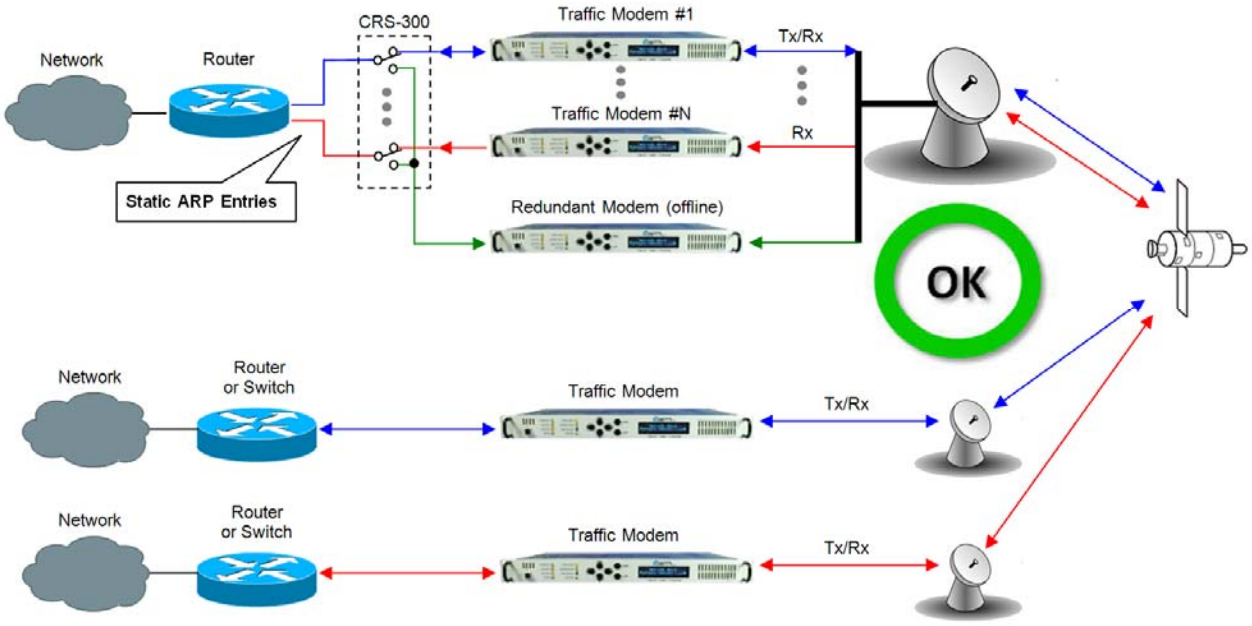


Figure 3-11. Wired-thru for Point-to-Multipoint with Routers

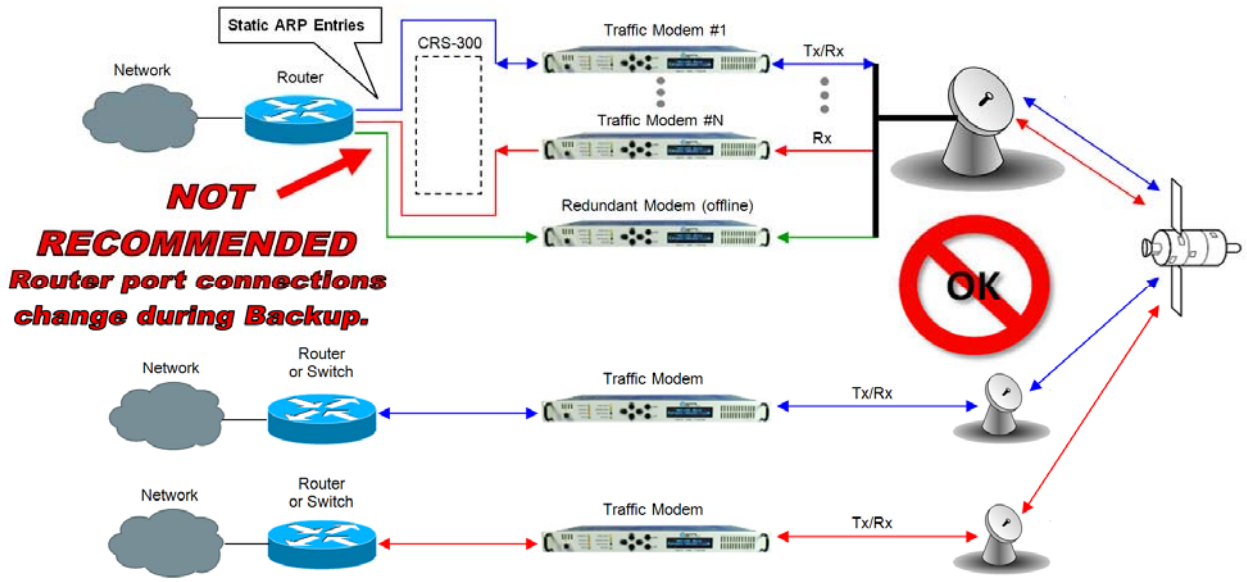


Figure 3-12. Wired-around for Point-to-Multipoint with Routers

3.3.7 Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

With switches used, the hub and remote are on the same subnet as shown in **Figure 3-13**, meaning that broadcasts will be allowed to transverse the network. Learning Mode must be disabled on the Hub Tx/Rx modem, because if a computer on the remote sends a broadcast out to the Hub, the modem learns that MAC is local – when in fact it is not.

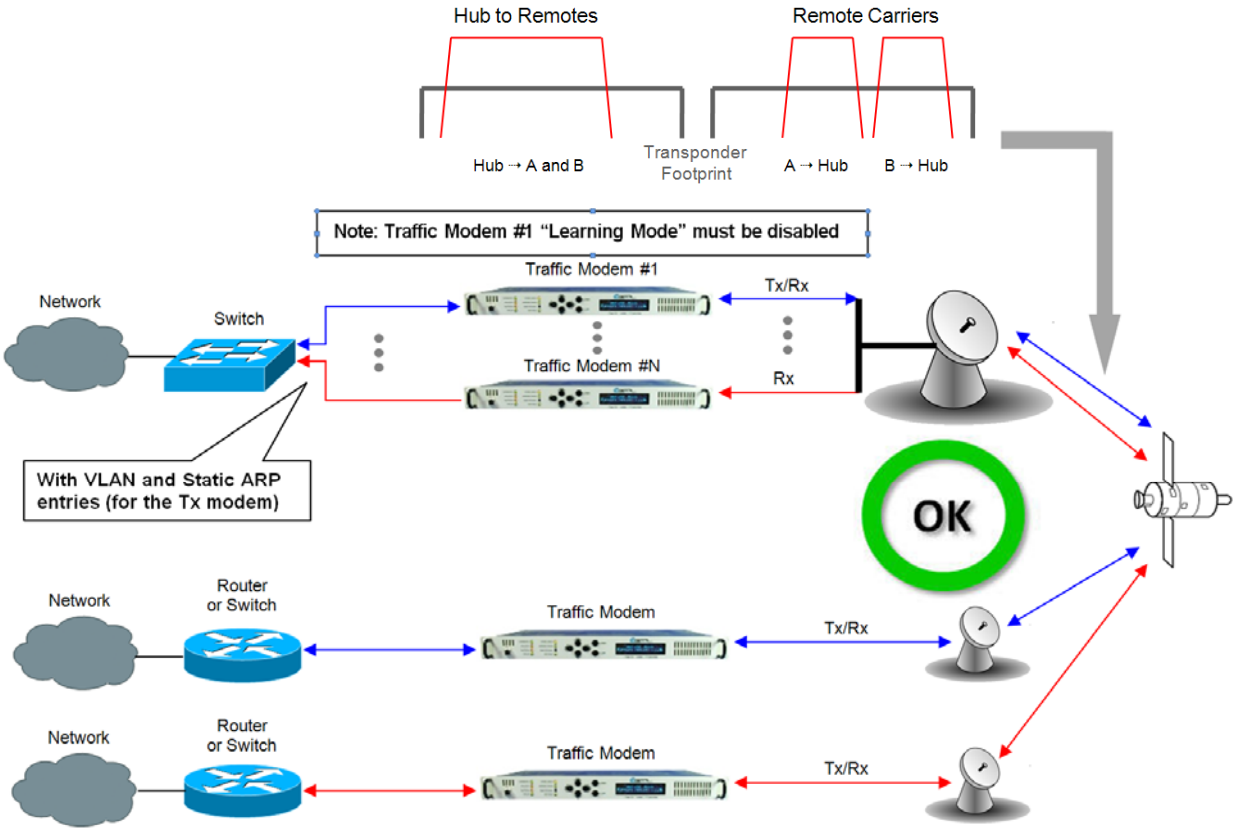


Figure 3-13. Point-to-Multipoint using Switches

A wired-thru Ethernet redundancy example is shown in **Figure 3-14**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the physical port on the Switch does not change, because the Ethernet connection is properly rerouted within the CRS-300 from the Traffic Modem to the Redundant Modem.

A wired-around Ethernet redundancy example is shown for the CDM-710G user in **Figure 3-15**. When the CRS-300 1:10 Redundancy Switch backs-up a faulted Traffic Modem, the Switch will learn the new MAC address of the redundant unit and traffic will be passed again. This type of architecture will slow down the switching time, because the Switch will need to re-learn the correct port connection.

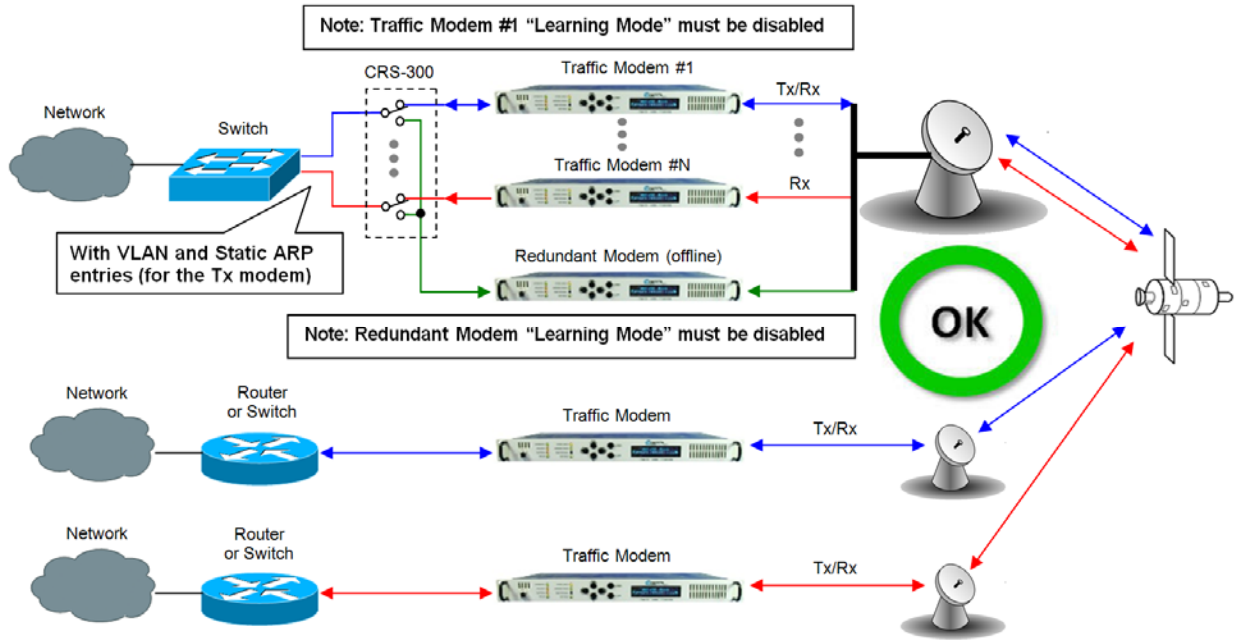


Figure 3-14. Wired-thru, Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

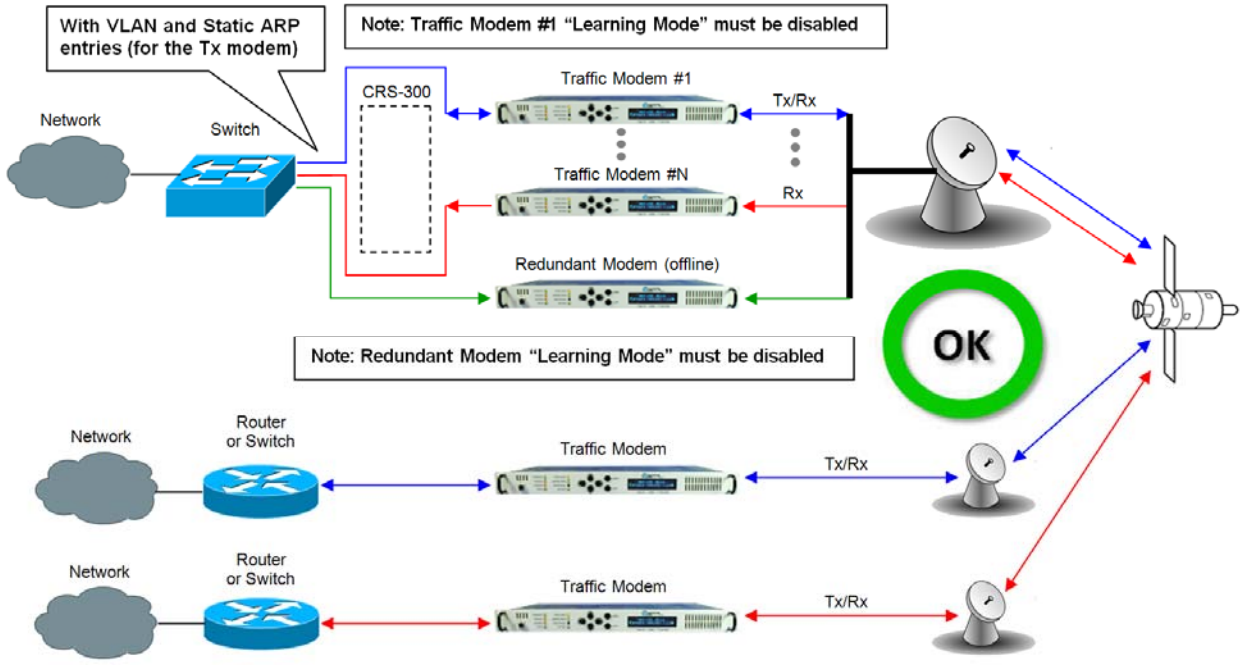


Figure 3-15. Wired-around, Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

Notes:

Chapter 4. REAR PANEL CONNECTOR PINOUTS

4.1 External Connections

Figure 4-1 shows the rear panel view of the CDM-710G High-Speed Satellite Modem. External cables are attached to connectors on the rear panel. The connector configurations differ based upon the operating frequency offered via the specific chassis (*70/140 MHz* [CDM-710G] vs. *L-Band* [CDM-710GL]).

Figure 4-1. Rear Panel View (CDM-710G shown w/optional interfaces installed)

Note: The CDM-710G supports Simplex (Tx Only or Rx Only) operation; Duplex (Tx/Rx) operation; and 1:1 or 1:N redundant operation.

The European EMC Directive (EN55022, EN50082-1) requires using properly shielded cables for DATA I/O. These cables are double-shielded from end-to-end, ensuring a continuous ground shield. **Table 4-1** summarizes the connectors provided on the CDM-710G rear panel. Refer to the applicable Data Interface chapter in this manual for information on, and connector pinouts for, the available G.703, HSSI, and GigE Data Interfaces.

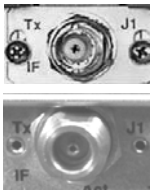
Table 4-1. CDM-710G Rear Panel Connectors Reference

Connector Group	Ref Des / Name	Connector Type	Function
IF Sect. 4.2	J1 Tx	CDM-710G (70/140 MHz band): BNC female	IF Output
		CDM-710GL (L-Band): Type 'N' female	
	J3 Rx	CDM-710G (70/140 MHz band): BNC female	IF Input
		CDM-710GL (L-Band): Type 'N' female	
Terrestrial Data Sect. 4.3	J4 Ethernet	RJ-45 Female	10/100 BaseT Remote Interface
	J6 Async Channel *(non-operational)*	9-pin Type 'D' female	Asynchronous Engineering Channel
Utility Sect. 4.4	P1 Alarms	15-pin Type 'D' male	Form C Alarms (relay closures)
	P2 Remote	9-pin Type 'D' male	Serial Remote Interface (RS232/485)
	J7 Ext Ref	BNC female	External Reference Input
Power/Ground	AC	IEC	Chassis prime power input
	DC	Terminal block	Chassis prime power input
	Ground	#10-32 stud	Common Chassis Ground

4.2 IF Connections

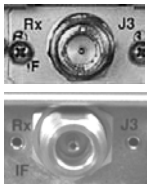
There may be DC voltages present on the Type 'N' Rx and Tx IF connectors, up to a maximum of 48 volts.

4.2.1 J1 Tx IF Connectors



Ref Des	Connector Type	Description	Direction
J1	**CDM-710G (70/140 MHz band):** BNC female	70/140 MHz Tx IF signal	Out
	CDM-710GL (L-Band): Type 'N' female	L-Band Tx IF signal	

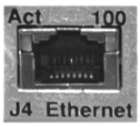
4.2.2 J3 Rx IF Connectors



Ref Des	Connector Type	Description	Direction
J2	**CDM-710G (70/140 MHz band):** BNC female	70/140 MHz Rx IF Signal	In
	CDM-710GL (L-Band): Type 'N' female	L-Band Rx IF Signal	

4.3 Terrestrial Data Connections

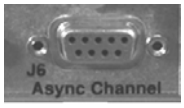
4.3.1 J4 10/100 Ethernet Remote Port Connector, RJ-45



The J4 Ethernet connector is a RJ-45 female interface. The J4 connector pinout is as follows:

Pin #	Description	Direction
1	Tx+	Out
2	TX-	Out
3	Rx+	In
4	N/A	
5	N/A	
6	Rx-	In
7	N/A	
8	N/A	

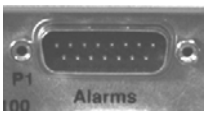
4.3.2 J6 ASYNC Channel Port Connector, DB-9F *(Non-operational)*



At present, Asynchronous Engineering Channel operation is not implemented in the CDM-710G; this connection is therefore *non-operational*.

4.4 Utility Connections

4.4.1 P1 Alarms Connector, DB-15M



The P1 Alarms connector is a 15-Pin Type 'D' male interface with threaded jack nuts. The pinout depends upon whether the unit is in the Normal or Redundancy mode for use with the CRS-170A (L-Band) and CRS-180 (70/140 MHz) or CRS-300 redundancy switches. The unit is put into 1:1 mode under the **Config: AUX → 1:1 Mask → Ena/Dis** menu by selecting **Enable**. The P2 connector pinout is as follows:

P1 Alarms Connector Pinout – Normal Mode			
Pin #	**Description**	**Name**	**Direction**
8	Rx Traffic (De-energized, Faulted) Note 1, 2	Rx-NC	I/O
15	Rx Traffic (Energized, No Fault)	Rx-NO	I/O
7	Rx Traffic	Rx-COM	I/O
14	Tx Traffic (De-energized, Faulted) Note 1, 2	Tx-NC	I/O
6	Tx Traffic (Energized, No Fault)	Tx-NO	I/O
13	Tx Traffic	Tx-COM	I/O
5	Unit Fault (De-energized, Faulted) Note 1, 2	Unit-NC	I/O
12	Unit Fault (Energized, No Fault)	Unit-NO	I/O
4	Unit Fault	Unit-Com	I/O
11	Rx I Channel (Constellation Monitor)	Rx-I	O
3	Rx Q Channel (Constellation Monitor)	Rx-Q	O
10	No Connection	NC	NC
2	AGC Voltage (Rx signal level, 0-10 volts)	AGC	O
9	Ext Carrier Off (TTL Lo = Mute, Open = Tx)	EXT-OFF	I
1	Ground	GND	Gnd

P1 Alarms Connector Pinout – 1:N (CRS-300/710G) *and* 1:1 Mode (CRS-170A, CRS-180)			
Pin #	**Description**	**Name**	**Direction**
8	Summary Relay NC (De-energized, Faulted)	PR-NC, *	I/O
15	Summary Relay NO (Energized, No Fault)	PR-NO	I/O
7	Summary Relay COM Note 1, 2	PR-COM	I/O
14	Clock Detect	Clk Det	I
6	Aux Tx Enable	Red_Out_4	O
13	No Connection	NC	NC
5	Fused -12 VDC Output (160 mA max)	-12VDC	O
12	Fused +12 VDC Output (160 mA max)	+12VDC	O
4	Online	Red_In_2	I
11	Serial Clock	Red_Out_1	O
3	Serial Data	Red_Out_2	O
10	Receive Serial Data – auxiliary channel	Red_In_3	I
2	Transmit Serial Data – auxiliary channel	Red_Out_3	O
9	Ext Carrier Off (TTL Lo = Mute, Open = Tx)	Red_In_1	I
1	Ground	GND	Gnd

P1 Notes :

1. The relays have low voltage contacts with transient suppressors across each pin to ground. The Summary Relay combines Tx, Rx, and Unit Faults into a single relay.
2. The maximum working voltage is 18VDC or 13VAC. The maximum current rating is 1 Amp DC or 0.5 Amp AC.

4.4.2 P2 Remote Port Connector (RS-232/-485), DB-9M

The P2 Remote port connector is a 9-pin Type 'D' male interface with threaded jack nuts. It is intended for connection to an M&C computer or terminal device, and is user selectable for either RS-232 or RS-485.The connector pinout is as follows:

Pin #	Description	Direction
1	Ground	-
2	RS-232 Transmit Data	Out
3	RS-232 Receive Data	In
4	Not Used	-
5	Not Used	-
6	RS-485 Receive Data B *	In
7	RS-485 Receive Data A *	In
8	RS-485 Transmit Data B	Out
9	RS-485 Transmit Data A	Out

* Use for 2-wire RS-485 operation

4.4.3 J7 External Reference Input

The Ext Ref (External Reference) input is a female BNC connector, used to supply a master reference to the entire chassis. The clocks on the Framer Card and the Modulator and Demodulator Synthesizers are locked to this input, when it is used. Note that some data interfaces have an Ext-Clk input for synchronizing the data sources. Refer to the applicable Data Interface chapter in this manual for details.

Notes:

Chapter 5. FLASH UPGRADING

5.1 Flash Updating via Internet

The CDM-710G High-Speed Satellite Modem eliminates the need for updating firmware by physically replacing EPROMs. Instead, the CDM-710G uses 'Flash memory' technology internally. This makes software upgrading very simple, and updates can now be sent via the Internet (**Figure 5-1**), via E-mail, or on CD.

This chapter outlines the complete upgrading process as follows:

- New firmware can be downloaded via the Internet to an external PC.
- The upgrade can be performed without opening the CDM-710G by simply connecting the unit to the Ethernet port of a computer.
- Once downloaded, the firmware update is transferred via **F**ile **T**ransfer **P**rotocol (FTP) to the CDM-710G; the update is then activated upon modem reboot.

Figure 5-1. Flash Update via Internet

5.2 Base Modem Ethernet FTP Upload Procedure

1. **Identify** the reflashable product, firmware number, and version for download.

   The current base modem M&C version can be viewed at the top level menu of the front panel display (press the **CLEAR** key several times to view). The firmware information can also be found within the **SELECT: UTIL→ Firmware → Info → Image#1** or **Image#2** menu trees.

   Using serial remote control, the firmware revision levels can be queried with the remote queries **<0/SWR?** (*abbreviated*) **or <0/FRW?** (*detailed*). See **Appendix A. REMOTE CONTROL** for more information on using remote commands and queries.

   Alternately, when using the Base Modem Web Server Interface, the Bootrom, Bulk1 and Bulk2 firmware loads may be viewed after selecting the **Unit Info** hyperlink (available under the **Maint** [Maintenance] page tab). For more information, refer to **Chapter 7. WEB SERVER INTERFACE**.

2. **Create** a temporary directory (folder) on an external PC.

   Windows: Select **File > New > Folder**, then rename the New Folder to "temp" or another convenient, unused name. Assuming "temp" works, a "*c:\temp*" folder should now be created.

   Note: The **c:** is the drive letter used in this example. Any valid writable drive letter can be used.

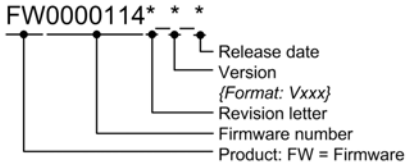
   CMD Prompt: At the command prompt (c:\>), type "**mkdir temp**" or "**MD temp**" without quotes (**mkdir** and **MD** stand for *make directory*). This is the same as creating a new folder from Windows. There should now be a "*c:\temp*" subdirectory created (where **c:** is the drive letter used in the example).

3. **Download** the correct firmware file to this temporary folder.

   Access the download server with the flash firmware data files link as shown in **Figure 5-1**:

   1. **Go online** to: www.comtechefdata.com;
   2. **Click on:** ***Support*** tab;
   3. **Click on:** ***Software Downloads*** drop-down *or* hyperlink from ***Support*** page;
   4. **Click on:** ***Download Flash and Software Update Files*** icon;
   5. **Click on:** ***(Select a Product Line) Satellite Modems*** hyperlink;
   6. **Select** the **CDM-710G** product hyperlink;
   7. **Select** the appropriate firmware hyperlink.

   About Firmware Numbers, File Versions, and Formats: The flashable files on the download server are organized by product prefix; firmware number (verify that the correct firmware number is known – see Step 1); revision letter, if applicable; version; and release date. The base modem bulk firmware for the CDM-710G is **FW0000114*_*_*** (where the asterisks signify revision, version and release date).

   The current version firmware release is provided. If applicable, a minimum of one version prior to the current release is also available. Be sure to identify and download the desired version.

The downloadable files are stored in two formats: *.exe (self-extracting) and *.zip (compressed). Some firewalls will not allow the downloading of *.exe files. In this case, download the *.zip file instead.

For additional help with "zipped" file types, refer to *PKZIP for Windows*, *WinZip*, or *ZipCentral* help files. *PKZIP for DOS* is not supported due to file naming conventions.

4. **Unzip** the files in the temporary folder on the PC. At least three files should be extracted:
   - FW0000114x.bin, where "x" is the version (bulk image file).
   - CDM710G Release Notes.pdf (or a variation of this filename).
   - Readme_vx.txt, where "x" is the version (installation notes).
5. **Confirm** that the files have been extracted to the specified temporary folder on the PC. In DOS, use "**cd c:\temp**" to change to the temporary directory created in Step 2, then use the "**dir**" command to list the files extracted from the downloaded archive file.
6. **Connect** the external PC to the CDM-710G modem 10/100 Ethernet M&C port via a hub or a switch, or directly to a PC with a crossover cable.

BASE MODEM firmware can only be loaded via the Ethernet M&C port; do not use the Ethernet Traffic port.

7. **Send a "ping" command** to the modem to verify the connection and communication.

   First, determine the IP address of the modem remotely or using the front panel:
   - Remotely - use the **<0/IPA?** command
   - Front panel – Use the **SELECT: CONFIG → Remote → Remote →Ethernet** menu.

   Then**, using DOS** to PING (and FTP): Click "**Start**" on the Windows toolbar, then select the "**Run...**" option. As an alternative, use the "**DOS Prompt**" or "**Command Prompt**" icons in the **Start Menu:**
   - **Using Win95 or Win98:** Type "**command**".
   - **Using WinNT, Win2K or WinXP:** Type "**cmd**".

   At the DOS prompt, type "**ping *xxx.xxx.xxx.xxx***" (where "*xxx.xxx.xxx.xxx*" is the modem IP address). The results should confirm whether or not the modem is connected and communicating.

8. **Initiate** an FTP session with the modem (the example uses a DOS window):
   a. From the PC, type "**ftp xxx.xxx.xxx.xxx**" where "xxx.xxx.xxx.xxx" is the IP address of the CDM-710G.
   b. ENTER your admin user name and password to complete login.
   c. Verify the FTP transfer is binary by typing "**bin**".
   d. Type "**prompt**" then type "**hash**" to facilitate the file transfers.

9. **Transfer** the files.

   Type "**put FW0000114*.bin bulk:**" to begin the file transfers. The destination "**bulk:**" must be all lower case. It will take approximately one minute to transfer the file.

10. **Verify** the file transfer.

    a. The PC should report that the file transfer has occurred, and the display on the modem will report:

    ```
    Programming flash sector #xx
    Please wait…
    ```

    b. The process sequences through several blocks – this will take several minutes. When it has finished, the modem front panel will display:

    ```
    Bulk FTP done. Press CLEAR.
    ```

    c. **Terminate the FTP session** by typing "bye" and closing the DOS window.

    d. **Verify** that the new file loaded using the procedure in Step 1.

    e. **Change** the desired image to boot from the modem font panel menu: **SELECT: UTIL → Firmware → Select** and use the left or right arrows (◄►) on the front panel keypad to change to the other image, **then reboot the modem.**

    f. **Verify** the new software versions are booting by observing the following messages on the modem display:

    ```
    CDM-710G Modem
    Firmware Ver x.x.x
    ```

5.3 10/100/1000 BASE-T (GigE) INTERFACE (CDI-70) FTP Upload Procedure

Refer to **Chapter 14. 10/100/1000 BASE-T (GigE) INTERFACE (CDI-70)** for information on and instructions for flash upgrading this optional data interface.

5.4 USB Procedure

IMPORTANT

USB reflash is not available in this firmware release – please consult Comtech EF Data Customer Support for release schedule.

Chapter 6. FRONT PANEL OPERATION

6.1 Introduction

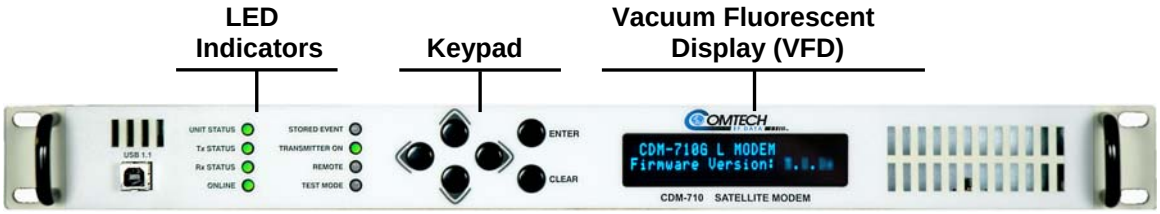
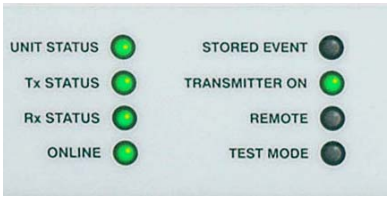


Figure 6-1. CDM-710G Front Panel View (L-Band version shown)

The user can fully control and monitor the operation of the CDM-710G from the front panel using the keypad and display. Nested menus are used that display all available options and prompt the user to carry out a required action.

Figure 6-1 identifies the key features of the front panel that are explained in greater detail in this section.

6.1.1 Front Panel LED Indicators



IMPORTANT

In general, the Alarm relay state will reflect the state of the Front Panel LEDs. For instance, if the Unit Status LED is red, the Unit Alarm relay will be active, etc. The one exception is the Transmit Traffic relay; this will only be activated if a Transmit Traffic Fault exists – it does not reflect the state of the Tx carrier.

The behavior of the eight front panel LEDs adjacent to the keypad indicate the operation status of the CDM-710G, and are described as follows:

LED	COLOR	CONDITION/STATE
UNIT STATUS	Green	No Unit Faults or Alarms exists.
	Orange	A Unit Alarm exists.
	Red	A Unit Fault exists.
Tx STATUS	Green	No Tx Traffic Faults or Alarms exists.
	Orange	A Tx Traffic Alarm exists.
	Red	A Traffic Fault exists.
	Off	Unit not configured for Modulator.
Rx STATUS	Green	No Rx Traffic Faults or Alarms exists.
	Orange	An Rx Traffic Alarm exists.
	Red	An Rx Fault exists.
	Off	Unit not configured for Demodulator.
ONLINE	Green	The Unit is On Line, and carrying traffic
	Off	The Unit is Off Line (standby) – forced by externally connected 1:1 or 1:N redundancy system
STORED EVENT	Orange	There is a Stored Event in the log that may either be viewed from the front panel or retrieved via the remote control interface.
	Off	There are no Stored Events.
TRANSMITTER ON	Green	Transmitter is currently on. This indicator reflects the actual condition of the transmitter, as opposed to the programmed condition.
	Off	Transmitter is currently OFF.
REMOTE	Green	The Unit is in Remote Communication Mode. Local monitoring is possible, but no local control.
	Off	The Unit is in Local Mode – remote monitoring is possible, but no remote control.
TEST MODE	Green	A Test Mode is selected; e.g., IF Loopback.
	Off	There is no Test Mode currently selected.

6.1.2 Front Panel Keypad

IMPORTANT

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

The keypad features six individual key switches with a positive 'click' action – this provides the user with tactile feedback. These function of these keys is as follows:

ENTER	Used to select a displayed function or to execute a modem configuration change.
CLEAR	Used to back out of a selection or to cancel a configuration change that has not been executed using ENTER. Pressing CLEAR generally returns the display to the previous selection.
◀ ▶ **(Left, Right)**	Used to move to the next selection or to move the cursor functions. At times, they may also used to move from one section to another.
▲ ▼ **(Up, Down)**	Used primarily to change configuration data (numbers). At times, they may also be used to move from one section to another.

6.1.3 Front Panel Vacuum Fluorescent Display (VFD)

The CDM-710G features a **V**acuum **F**luorescent **D**isplay (VFD). The VFD is an active display showing two lines of 24 characters each. It produces a blue light, the brightness of which can be controlled by the user. 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.

As shown above, the 'welcome screen' is displayed whenever power is first applied to the unit. The top line identifies the unit model (i.e., CDM-710G, or CDM-710GL as shown); the bottom line displays the CDM-710G's installed Firmware Version (version number varies).

Pressing any key takes the user to the top-level Select menu. On most menu screens, users will see a flashing, solid-block cursor that blinks at a once-per-second rate. This indicates the currently selected item, digit, or field:

```
CONFIG: Remote  Tx  Rx
Int1 Int2 Ref Aux Alarms
```

Where this solid block cursor would obscure the item being edited (e.g., a numeric field), the cursor will automatically change to an underline cursor:

```
Tx Freq: 0140.0000 MHz
           (◄ ► ▲ ▼ ENTER)
```

To prevent the display from becoming burnt by a constant image, the unit employs a screen saver feature that activates after one hour and constantly scrolls and wraps a message across the screen. The top line of the screen saver display shows the Circuit ID, which is user-configurable; the bottom line displays the message '**Press any key**...' as shown:

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

Press any key to restore the previously active screen.

6.1.4 Menu Matrix

Sect.	Description	Remarks
6.2	**Opening Screen**	
6.3	**Select (Main) Menu**	*Select:* Config; Monitor; Test; Info; Save/Load; Util
6.3.1	**Configuration**	*Select:* Remote; Tx; Rx: Int1; Int2; Ref, Aux, Alarms
6.3.1.1	(CONFIG:) Remote Control	*Select:* Local; Serial; Ethernet
6.3.1.2	(CONFIG:) Tx	*Select:* FEC; Mod; Code; SymRate; Freq, Pwr; Scram
6.3.1.3	(CONFIG:) Rx	*Select:* FEC; Dem; Code; SymRate; Freq; Eb/No; PLL
6.3.1.4	(CONFIG:) Intfc1 (CDI-10-1 E3T3STS1 Interface only)	*Select:* Tx; Rx; Config
6.3.1.5	(CONFIG:) Intfc1 (CDI-60 HSSI Interface only)	*Select:* Tx, Rx, CTS/RTS
6.3.1.6	(CONFIG:) Intfc2 (CDI-70 Gigabit Ethernet Interface only)	*Select:* Tx; Rx; Man; Stats; SWOP
6.3.1.7	(CONFIG:) Ref	
6.3.1.8	(CONFIG:) Aux	*Select:* Ena/Dis; Force (1:1)
6.3.1.9	(CONFIG:) Alarms	*Select:* Tx; Intfc1; Intfc2
6.3.2	**Monitor**	*Select:* Alarms; Rx_Stats; Event-Log
6.3.2.1	(Monitor:) Alarms	*Select:* Transmit; Receive; Unit
6.3.2.2	(Monitor:) Rx Stats	
6.3.2.3	(Monitor:) Event-Log	*Select:* View; Clear-All
6.3.3	**Test**	*Select:* Mode
6.3.4	**Info**	*Select:* Rem; Tx; Rx; Intfc1; Intfc2
6.3.5	**Save/Load**	*Select:* Save; Load
6.3.5.1	(Save/Load:) Save	
6.3.5.2	(Save/Load:) Load	
6.3.6	**Utility**	*Select:* RT-CLK; Ref; ID; Display; Firmware; FAST
6.3.6.1	(Utility:) RT-Clk	
6.3.6.2	(Utility:) Ref	
6.3.6.3	(Utility:) ID	
6.3.6.4	(Utility:) Display	
6.3.6.5	(Utility:) Firmware	*Select:* Info; Select
6.3.6.6	(Utility:) FAST	*Select:* Cnfg; View

Notes:

1. Because the CDM-710G operates only in DVB-S2 mode, many of the Rx parameters are *read-only*.
2. Refer to **CONFIG: Tx → SymRate** for the Data Rate table.
3. The Impedance selection appears when the 70/140 MHz Modulator card is installed.
4. Because the CDM-710G operates only in DVB-S2 mode, the Scrambler and pilot selections are always available.

6.2 Opening Screen

The opening 'welcome screen' shown here is representative of what displays whenever power is first applied to the unit (the Firmware Version may differ). Pressing any key takes the user to the top-level **Select** menu.

IMPORTANT

For purposes of this documentation, a CDM-710GL (L-Band) unit is shown; the unit in use could be either a CDM-710G or CDM-710GL High-Speed Satellite Modem.

6.3 SELECT: (Main) Menu

```
SELECT: Config  Monitor
Test Info Save/Load Util
```

Move the cursor to the desired choice using the ◄ ► arrow keys, then press **ENTER**. The following table describes the function of each menu branch (along with the section in this chapter that provides information on that branch and its accompanying submenus):

SELECTION	MENU BRANCH DESCRIPTION
Config	**(Configuration)** Provides the user selections for the desired Interface, Transmit, and Receive operations
Monitor	Permits the user to monitor the alarm status of the unit, to view the log of stored events, and to display the Receive Parameters screen.
Test	Permits the user to configure the modem into one of several Test modes; e.g., CW and Loopback
Info	**(Information)** Provides a summary/display of the Interface, Transmit, Receive, and M&C configurations.
Save/Load	Permits the user to save and retrieve up to 10 different modem configurations.
Util	**(Utility)** Permits the user to perform miscellaneous functions, such as setting the Real-Time Clock, adjusting the display brightness, etc.

6.3.1 (SELECT:) Config

```
CONFIG: Remote Tx Rx
Int1 Int2 Ref Aux Alarms
```

The submenus available are:

SELECTION	SECT	SUBMENU DESCRIPTION
Remote	6.3.1.1	**(Remote Control)** Permits defining whether the unit is being controlled locally or remotely (see **IMPORTANT** note).
Tx	6.3.1.2	**(Transmit)** Permits defining, on a parameter-by-parameter basis, the Tx configuration of the unit. These submenu branches would be used if the user wished to change, e.g., just the Tx Frequency.
Rx	6.3.1.3	**(Receive)** Permits defining, on a parameter-by-parameter basis, the Rx configuration of the unit. These submenu branches would be used if the user wished to change, e.g., just the Rx Frequency.
		(Interface) Permits configuring Interfaces plugged into Slot 1 or Slot 2 on the back of the unit. The menus change depending on the type of interface – as of this manual revision, Single G.703, HSSI, or Gigabit Ethernet (GigE) are available:
Int1	6.3.1.4	Int1 CDI-10-1 Single G.703 Interface only.
	6.3.1.5	Int1 CDI-60 HSSI Interface only.
Int2	6.3.1.6	Int2 CDI-70 Gigabit Ethernet Interface only.
Ref	6.3.1.7	**(Reference)** Permits selection of the internal 10MHz Reference or allows the unit to phase lock to an External Reference of 1, 2, 5, 10, or 20 MHz. The unit reverts to Internal if the External Reference is not present or is faulted.
Aux	6.3.1.8	**(Auxiliary)** Permits configuring the 1:1 Modem Switching parameters of the unit.
Alarms	6.3.1.9	Provides **Alarm** action of certain parameters.

IMPORTANT

The modem may be monitored over the remote control bus at any time. When in Local mode, however, configuration parameters may only be changed through 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.

6.3.1.1 (CONFIG:) Remote Control

```
Remote Control:
Local  Serial  Ethernet
```

Select **Local**, **Serial** or **Ethernet** using the ◄ ► arrow keys, then press **ENTER**. Note the following:

SELECTION	ACTION
Local	Remote control is disabled. Remote monitoring is still possible.
Serial	RS232, RS485-2W, and RS485-4W menus are accessed.
Ethernet	Additional sub-menus will be displayed.

(CONFIG:) Remote Control → Local

IMPORTANT

When* Local *is selected, remote control is disabled and local control enabled. Once ENTER is pressed, the user is returned to the CONFIG: menu.

When* Remote *is selected, menu operations associated with Local control are disabled, and the user may see the following messages and prompts when menu or command access associated with Local control is attempted (follow the prompt as shown):

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

```
DO YOU WANT IN LOCAL
MODE? ENT=Yes CLR=No
```

(CONFIG:) Remote Control → Serial

```
Serial CONFIG:
Interface  Baudrate   (◄ ►E)
```

Select **Interface** or **Baudrate** using the ◄ ► arrow keys, then press **ENTER**.

If **Serial CONFIG: → Interface** is selected:

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

Select **RS232** or **RS485-2W** (2-wire) or **RS485-4W** (4-wire) using the ◄ ► arrow keys, then press **ENTER**.

Note: At this point the user will be further prompted to enter the bus address.

If **Interface → RS232** is selected:

```
In RS232 Mode the Bus
Address is fixed at 0000
```

If **Interface → RS485** is selected, the user will be further prompted:

```
RS485 Mod Address: 0001
                 (◄ ► ▲ ▼ E)
```

The valid range of addresses is from 1 to 9999. To edit the RS485 address of the modem, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

If **Serial CONFIG: → Baudrate** is selected:

```
Local M&C Bus Baud Rate:
9600 Baud          (▲ ▼  E )
```

Values of 1200, 2400, 4800, 9600, 19200, 38400, and 57600 baud are possible for the Baud rate of the remote control bus connected locally to the M&C computer. Use the ▲▼ arrow keys to change the value, then press **ENTER**.

Note: The Asynchronous character format is FIXED at 8 data bits, No parity, and 1 stop bit (8-N-1).

(CONFIG:) Remote Control → Ethernet

```
Ethernet CONFIG: Gateway
Address  MAC SNMP    (◄ ►  E)
```

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

If **Ethernet CONFIG: → Gateway** is selected:

```
Ethernet IP Gateway:
063.168.001.127  (◄ ► ▲ ▼  E )
```

Use the ◄ ► arrow keys to select the digit to be edited, then use the ◄ ► arrow keys to change the value of the digit. Press **ENTER** when done.

If **Ethernet CONFIG: → Address** is selected:

```
Ether IP Address/Range:
192.168.001.001/24  (◄ ► ▲ ▼)
```

The range is adjustable from **08** to **30**. Use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

If **Ethernet CONFIG: → MAC** is selected:

```
M&C Port MAC Address:
00-06-B0-00-56-33
```

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

Note: The preceding address is representative of a typical MAC address.

If **Ethernet CONFIG: → SNMP** is selected:

```
SNMP:
Community Traps    (LRE)
```

This is a 'status only' message. Submenus enable setting of the destination IP address for SNMP traps. Press **ENTER** or **CLEAR** to return to the previous menu.

If **SNMP → Community** is selected:

```
SNMP Community:
Read                  (▲▼ E )
```

If **Community →Read** is selected:

```
Read Community:   (◀ ▶▲▼ E )
public
```

If **SNMP → Traps** is selected:

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

Select **IP1**, **IP2**, or **Version** using the ◀ ▶ arrow keys, then press **ENTER**.

If **SNMP Trap IP Address: → IP1 or IP2** is selected:

```
Trap ID #X:
000.000.000.000   (◀ ▶▲▼ E )
```

To edit the SNMP Trip IP#1 or IP#2 Address, use the ◀ ▶ arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

If **SNMP Trap IP Address: → Version** is selected:

```
Trap Version:
SNMPv1 SNMPv2        (◀ ▶E )
```

Select **SNMPv1** or **SNMPv2** using the ◀ ▶ arrow keys, then press **ENTER**.

6.3.1.2 CONFIG: Tx

The CDM-710G operates only in DVB-S2 mode.

```
Tx: FEC  Mod Code  SymRate
Freq Pwr Scram       (◄ ►E)
```

Select **FEC**, **Mod**, **Code**, **SymRate**, **Freq**, **Pwr**, or **Scram** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Tx → FEC

```
Tx FEC:
LDPC + BCH           (◄ ►E)
```

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

(CONFIG:) Tx → Mod

```
Tx Modulation: Type Inv
α Pilot Frame        (◄ ►E)
```

Select **Type**, **Inv**, **α**, **Pilot**, or **Frame** using the ◄ ► arrow keys, then press **ENTER**.

If **Tx Modulation → Type** is selected:

```
Tx Mod: QPSK  8PSK  16QAM
16APSK  32APSK       (◄ ►E)
```

Use the ◄ ► arrow keys to select the Transmit Modulation Type (**QPSK**, **8PSK**, **16APSK**, or **32APSK**), then press **ENTER**.

Note: While16QAM is displayed in this menu, it is not selectable and not supported in DVB-S2 mode.

If the Tx Modulation selection gives an invalid data rate or symbol rate, the following menu appears after the error message – it will query the configuration change for a valid configuration:

```
Cfg TXMod=8PSK  TxCR=2/3
TxSR=18.903085 Msps? Y N
```

If '**N**' (No) is selected, the unit returns to the original configuration. If '**Y**' (Yes) is selected, the unit is configured with the displayed parameters.

If **Tx Modulation → Inv** is selected:

```
Tx Spectrum:          Normal
Inverted               (◄ ►E)
```

Select **Normal** or **Invert** using the ◄ ► arrow keys, then press **ENTER**.

If **Tx Modulation → α** is selected:

```
Tx (α) Rolloff %:  20  25
35                    (◄ ►E)
```

The default **Rolloff (α)** setting is **20%**. Whenever the Mode is changed, **(α)** reverts to **20%**, but **(α)** can be modified to **25%** or **35%** from this menu. Select the value using the ◄ ► arrow keys, then press **ENTER**.

```
Tx Modulation Pilot:
Off/On   Avg/Peak     (◄ ►E)
```

Select **Off/On** or **Avg/Peak** using the ◄ ► arrow keys, then press **ENTER**.

```
Tx Modulation Pilot:
Off/On   Avg/Peak     (◄ ►E)
```

The default value is **Off.** Select **Off** to disable insertion of pilot symbols into the physical layer frame. Select **On** to enable insertion of pilot symbols into the physical layer frame. Use the ◄ ► arrow keys to make the selection, then press **ENTER**.

```
Tx Modulation Pilot:
Average  Peak         (◄ ►E)
```

The solid cursor indicates the current configuration choice. The CDM-710G automatically adjusts, but the default value is **Average**. Select **Average** or **Peak** using the ◄ ► arrow keys, then press **ENTER**.

- Select **Average** to set the pilots and header to the average power band of the transmitted constellation (QPSK, 8PSK, 16APSK or 32APSK) per DVB-S2.
- Select **Peak** to set the pilots and header to the outer ring of the transmitted constellation (QPSK, 8PSK, 16APSK or 32ASK).

IMPORTANT

Not all commercially available demodulators will function well with the Peak pilot level.

```
Tx Frame Size:
Long  Short           (◄ ►E)
```

The default value is **Long**. When **Long** is selected, the standard FECFRAME = 64,800 bits is enabled. If **Short** is selected, the 16,200 bit frame is enabled. Select **Long** or **Short** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Tx → Code

```
Tx CodeRate: 1/2 3/5 2/3
3/4 4/5 5/6 7/8 8/9 9/10
```

Refer to the Data Rate menu for valid code rates.

All possible choices are presented at all times. If an option is not installed (either Hardware or FAST) or is not valid, or if a code rate is not available for the Mode selected, the ◄ ► arrow keys will force the cursor to skip past the unavailable choice.

Use the ◄ ► arrow keys to select the code rate, then press **ENTER**.

If the Tx Code Rate selection gives an invalid data rate or symbol rate, the following menu will appear after the error message – it will query the configuration change for a valid configuration:

```
Cfg TXMod=8PSK  TxCR=2/3
TxSR=18.903085 Msps?Y N
```

If '**N**' (No) is selected, the unit returns to the original configuration. If '**Y**' (Yes) is selected, the unit is configured with the displayed parameters.

(CONFIG:) Tx → SymRate

```
Data: 038.723635 Mbps
Sym: 017.379483 Msps(E)
```

Use the ◄ ► arrow keys to select the desired digit of the Symbol Rate, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

The Data Rate digits also change as the Symbol Rate values are edited. The value of the Data Rate depends upon the code rate, modulation type, and the Mode type selected.

When modulation, code rate and other parameters are changed the modem attempts to maintain the same Symbol Rate, provided it is still in range when one of the other parameters is changed.

The valid range of Symbol Rate and Data Rate Range for DVB-S2 are shown in the following table. When programming a new data or Symbol Rate the modulator will not accept it unless it is in the range, and it will turn off the Tx Carrier. If a new rate is not accepted, change the Modulator Code Rate or Mode. There is some round off in the Data Rate ranges in the last digit. The first table is for the standard FEC Frame and the second table is for the short frame.

The tables are based on a 188-byte frame format; the 204-byte frame is not available.

If Tx Symbol Rate selection gives an invalid data rate or symbol rate, the following menu appears after the error message to query the configuration change for a valid configuration:

```
Cfg TXDR=70.00000 Mbps
TxSR=18.903085 Msps?Y N
```

If '**N**' (No) is selected, the unit returns to the original configuration. If '**Y**' (Yes) is selected, the unit is configured with the displayed parameters.

IMPORTANT

G.703 fixed Data Rates E3 (34.368), T3 (44.736) and STS-1 (51.840) are set using the Int1 (CDI-10-1 Single G.703) menu. The Tx Symbol Rate is automatically entered from the selected Data Rate from modulation type, code rate, pilot and FEC frame setting. The Rx Symbol Rate is entered manually.

HSSI maximum Data Rate (70 Mbps) may limit symbol maximum.

Table 6-1. Symbol Rate / Data Rate Range – Standard FECFrame* and 188 Byte Format

(QPSK 1/4, 1/3 and 2/3 data is for informational purposes only)

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
QPSK	LDPC+BCH	1/4	1	45*	0.490243	0.490243	22.060942	0.478577	0.478577	21.535965
		1/3			0.656448	0.656448	29.540166	0.640827	0.640827	28.837209
		2/5			0.789412	0.789412	35.523546	0.770627	0.770627	34.678204
		1/2			0.988858	1.000000	44.498615	0.965327	1.000000	43.439697
		3/5			1.188304	1.188304	53.473684	1.160026	1.160026	52.201190
		2/3			1.322253	1.322253	59.501385	1.290788	1.290788	58.085452
		3/4			1.487473	1.487473	66.936288	1.452076	1.452076	65.343429
		4/5			1.587196	1.587196	71.423823	1.549426	1.549426	69.724175
		5/6			1.654663	1.654663	74.459834	1.615288	1.615288	72.687939
		8/9			1.766451	1.766451	79.490305	1.724416	1.724416	77.598702
		9/10			1.788612	1.788612	80.487535	1.746049	1.746049	78.572201
8PSK	LDPC+BCH	3/5	1	45*	1.779991	1.779991	80.099585	1.739569	1.739569	78.280616
		2/3			1.980636	1.980636	89.128631	1.935658	1.935658	87.104623
		3/4			2.228124	2.228124	100.265560	2.177525	2.177525	97.988646
		5/6			2.478562	2.478562	111.535270	2.422276	2.422276	109.002433
		8/9			2.646012	2.646012	119.070539	2.585924	2.585924	116.366586
		9/10			2.679207	2.679207	120.564315	2.618365	2.618365	117.826440
16APSK	LDPC+BCH	2/3	1	35*	2.637201	2.637201	92.302026	2.574613	2.574613	90.111471
		3/4			2.966728	2.966728	103.835482	2.896320	2.896320	101.371209
		4/5			3.165623	3.165623	110.796808	3.090495	3.090495	108.167326
		5/6			3.300184	3.300184	115.506446	3.221863	3.221863	112.765192
		8/9			3.523143	3.523143	123.310006	3.439530	3.439530	120.383555
		9/10			3.567342	3.567342	124.856967	3.482680	3.482680	121.893803
32APSK	LDPC+BCH	3/4	1	28*	3.703295	3.703295	103.692261	3.623332	3.623332	101.453291
		4/5			3.951571	3.951571	110.643985	3.866247	3.866247	108.254911
		5/6			4.119540	4.119540	115.347126	4.030589	4.030589	112.856500
		8/9			4.397854	4.397854	123.139923	4.302894	4.302894	120.481032
		9/10			4.453027	4.453027	124.684751	4.356875	4.356875	121.992503

*** Notes:**

1. DVB-S2 - Standard FECFrame = 64,800 Bits.
2. For G.703 fixed Data Rates, limit maximum Symbol Rate to less than the maximum indicated in **Table 6-1**. For more information on this interface, see **Chapter 12. SINGLE G.703 (E3/T3/STS-1) INTERFACE (CDI-10-1)**.
3. HSSI Data Rate limit of 70 Mbps may be reached before Symbol Rate limit is reached. For more information on this interface, see **Chapter 13. HSSI INTERFACE (CDI-60)**.

4. HSSI Data Rate Limit of 1 Mbps is violated with QPSK 1/2 at 1Msps, so the minimum symbol rate is 1.011270 Msps (pilot *off*) and 1.035920 Msps (pilot *on*).

Table 6-2. Symbol Rate / Data Rate Range – Short FECFrame* and 188 Byte Format

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
QPSK	LDPC+BCH	1/4	1	45*	0.365324	0.365324	16.439560	0.357467	0.357467	16.086022
		1/3			0.629060	0.629060	28.307692	0.615532	0.615532	27.698925
		2/5			0.760928	0.760928	34.241758	0.744564	0.744564	33.505376
		1/2			0.848840	1.000000	38.197802	0.830585	1.000000	37.376344
		3/5			1.156532	1.156532	52.043956	1.131661	1.131661	50.924731
		2/3			1.288400	1.288400	57.978022	1.260693	1.260693	56.731183
		3/4			1.420269	1.420269	63.912088	1.389725	1.389725	62.537634
		4/5			1.508181	1.508181	67.868132	1.475747	1.475747	66.408602
		5/6			1.596093	1.596093	71.824176	1.561768	1.561768	70.279570
		8/9			1.727961	1.727961	77.758242	1.690800	1.690800	76.086022
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
8PSK	LDPC+BCH	3/5	1	45*	1.725319	1.725319	77.639344	1.692033	1.692033	76.141479
		2/3			1.922040	1.922040	86.491803	1.884959	1.884959	84.823151
		3/4			2.118761	2.118761	95.344262	2.077885	2.077885	93.504823
		5/6			2.381056	2.381056	107.147541	2.335120	2.335120	105.080386
		8/9			2.577778	2.577778	116.000000	2.528046	2.528046	113.762058
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
16APSK	LDPC+BCH	2/3	1	35*	2.548792	2.548792	89.207729	2.505223	2.505223	87.682811
		3/4			2.809662	2.809662	98.338164	2.761633	2.761633	96.657170
		4/5			2.983575	2.983575	104.425121	2.932574	2.932574	102.640076
		5/6			3.157488	3.157488	110.512077	3.103514	3.103514	108.622982
		8/9			3.418357	3.418357	119.642512	3.359924	3.359924	117.597341
		9/10			N/A	N/A	N/A	N/A	N/A	N/A
32APSK	LDPC+BCH	3/4	1	28*	3.493093	3.493093	97.806607	3.419165	3.419165	95.736626
		4/5			3.709309	3.709309	103.860661	3.630805	3.630805	101.662551
		5/6			3.925526	3.925526	109.914715	3.842446	3.842446	107.588477
		8/9			4.249850	4.249850	118.995796	4.159906	4.159906	116.477366
		9/10			N/A	N/A	N/A	N/A	N/A	N/A

*** Notes:**

1. DVB-S2 - Short FECFrame = 16,200 Bits.
2. For G.703 fixed Data Rates, limit maximum Symbol Rate to less than the maximum indicated in **Table 6-2**. For more information on this interface, see **Chapter 12. SINGLE G.703 (E3/T3/STS-1) INTERFACE (CDI-10-1)**.
3. HSSI Data Rate limit of 70 Mbps may be reached before Symbol Rate limit is reached. For more information on this interface, see **Chapter 13. HSSI INTERFACE (CDI-60)**.
4. HSSI Data Rate Limit of 1 Mbps is violated with QPSK 1/2 at 1Msps so the minimum symbol rate is 1.178079 Msps (pilot *off*) and 1.203980 Msps (pilot *on*).

(CONFIG:) Tx → Frequency

```
TX Freq: 0140.0000 MHz
                (◄ ► ▲ ▼ E)
```

To edit the TX IF Frequency, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

Note the following:

70/140 MHz	The ranges of frequencies are from 52 to 88 MHz and from 104 to 176 MHz with a resolution of 100 Hz.
L-Band	The range is 950 to 1950 MHz with 100 Hz resolution.

CAUTION

The bandwidth of the modulated Tx carrier must stay within the IF frequency range. The modem disallows settings that exceed the range, and will turn off the Tx Carrier.

(CONFIG:) Tx → Pwr

```
TX Power: Level
On/Off Imped        (◄ ► E)
```

Select **Level, On/Off,** or **Imped** using the ◄ ► arrow keys, then press **ENTER**.

IMPORTANT

The Imped(ance) selection is only available/displayed when the 70/140 MHz Modulator card is installed.

If **TX Power → Level** is selected:

```
TX Output Power Level:
-10.0 dBm       (◄ ► ▲ ▼ E)
```

To edit the TX Power level, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

Note the following:

70/140 MHz	The range is from 0 to -20 dBm.
L-Band	The range is from -5 to -25 dBm.

If **TX Power → On/Off** is selected:

```
Tx Output State:
Off On                (◄ ► E)
```

Select **On** or **Off** using the ◄ ► arrow keys, then press **ENTER**.

If **TX Power → Imped**(ance) is selected (*this menu selection is available/displayed only when the 70/140 MHz Modulator card is installed*):

```
TX Impedance (Ohms):
50 75                (◄ ► E)
```

Note the following:

70/140 MHz	Select 50 or 75(Ω) using the ◄ ► arrow keys, then press **ENTER.**
L-Band	**Not applicable.**

(CONFIG:) Tx → Scram

```
Tx Scrambling Index:
Gold-n = 000000    (◄ ►▲ ▼ E)
```

The Gold-n Index indicates the Physical Layer spreading sequence number, and can be set from **0** to **262,141**. The default setting is all **0**s. To edit, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

6.3.1.3 CONFIG: Rx

```
Rx: FEC Dem Code SymRate
Freq EbNo PLL          (◄ ►E)
```

Select **FEC**, **Dem**(od), **Code**, **SymRate**, **Freq**, **EbNo**, or **PLL** using the ◄ ► arrow keys, then press **ENTER**. Note the following:

IMPORTANT

The CDM-710G operates only in DVB-S2 mode; this makes several Rx parameters* read-only*. These parameters are resolved automatically and do not need to be configured:

- **Rx: Dem (Demodulation Type)**
- **Rx Dem → Inv (Spectrum Invert)**
- **Rx Dem → Pilot**
- **Rx: Code Rate**

(CONFIG:) Rx → FEC

If **Rx → FEC** is selected:

```
Rx FEC:
LDPC + BCH             (◄ ►E)
```

This is a *read-only* status message. Press **ENTER** or **CLEAR** to return to the previous menu.

(CONFIG:) Rx → Dem (Demod)

```
Rx Demod: Type Inv Acq α
Eq IQ-TP Pilot Scr (◄ ►E)
```

Select **Type**, **Inv**, **Acq**, α, Eq, **IQ-TP**, **Pilot**, or **Scr** using the ◄ ► arrow keys, then press **ENTER**.

If **Rx Demod: → Type** is selected:

```
Rx Dem:  QPSK 8PSK 16QAM
16APSK  32APSK    (◄ ►E)
```

This menu is *read-only*, as the type of modulation is determined automatically. Prior to synchronization of the Rx path, the cursor may reside in any position. After synchronization (Rx Traffic LED is **Green**), re-access the **Rx Demod: → Type** menu to update the display – the cursor rests under the modulation type.

Note: While 16QAM is displayed in this menu, it is *not* selectable and *not supported* in DVB-S2 mode.

If **Rx Demod: → Inv** is selected:

```
Rx Spectrum:RX PARAMETERS
AUTOMATICALLY SELECTED.
```

This menu is *read-only*, as the demodulator automatically resolves frequency inversion. Normal or **Inverted** is *not* reported in the demodulation. Press **ENTER** or **CLEAR** to return to the previous menu.

If **Rx Demod: → Acq** is selected:

```
Demod Acquisition Range:
+/-010 kHz        (◄ ►▲ ▼ E)
```

The value entered here determines the amount of frequency uncertainty the demodulator will search over in order to find and lock to an incoming carrier.

To edit the demodulator acquisition search range value, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done. The range varies from ±**001** kHz to ±**100** kHz.

If **Rx Demod: → α** is selected:

```
RX (α) Rolloff %: 20  25
35                 (◄ ►E)
```

The rolloff or α dictates how fast the spectral edges of the carrier are attenuated beyond the 3 dB bandwidth. With 20% rolloff the edge falls off more quickly than with 25% and 35%. Select the value using the ◄ ► arrow keys, then press **ENTER**.

The default **Rolloff (α)** setting is **20%**; whenever the mode is changed, **(α)** reverts to **20%** but can be modified to **25%** or **35%** using this menu.

If **Rx Demod: → Eq** is selected:

```
Rx Adaptive Equalizer:
 Off On             (◄ ►E)
```

The adaptive equalizer helps correct for linear distortion in the rest of the link. Linear distortion includes amplitude and phase that would occur due to imperfect filtering effects, but it does not include distortion due to non linear amplifiers. Select operation as **Off** or **On** using the ◄ ► arrow keys, then press **ENTER**.

If **Rx Demod: → IQ-TP** is selected:

```
Rx IQ TPs (J2-11,J2-3):
Pre-EQ   Post-EQ    (◄ ►E)
```

This selection determines whether the IQ test point located on the Alarm Connector samples the IQ signal before or after the Adaptive Equalizer. J2-11 and J2-3 refer to the pins on the Alarm Connector that an oscilloscope is connected to monitor I and Q. Select **Pre-Eq** or **Post-Eq** using the ◄ ► arrow keys, then press **ENTER**.

If **Rx Demod: → Pilot** is selected:

```
Rx Demodulation Pilot:
Off On              (◄ ►E)
```

This menu is *read-only*, as the demodulator automatically determines if the pilots are *On* or *Off*. Press **ENTER** or **CLEAR** to return to the previous menu.

If **Rx Demod: → Scr** (Descrambler**)** is selected:

```
Rx Descrambling Index:
Gold-n = 000000  (◄ ►▲ ▼ E)
```

The Gold-n Index indicates the Physical Layer spreading sequence number, and can be set from **0** to **262,141**. The default setting is all **0**s.

To edit the index, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

(CONFIG:) Rx → Code

```
Code Rate: 1/2 3/5 2/3
3/4 4/5 5/6 7/8 8/9 9/10
```

This menu is *read-only,* as the demodulator automatically resolves the code rate. Press **ENTER** or **CLEAR** to return to the previous menu.

(CONFIG:) Rx → SymRate

```
Data: DEMOD unlocked
 Sym: 017.379483 Msps    (E)
```

If the Rx Path is not locked, the message should as shown in the above example. To change the Symbol Rate, use the ◄ ► arrow keys to select the digit to be edited. Use the ▲▼ arrow keys to change the value of the digit, then press **ENTER**.

The Data Rate digits also change as the Symbol Rate values are edited. The value of the Data Rate depends upon the code rate, modulation type. When programming a new Symbol Rate (or indirectly a Data Rate) the value is not accepted unless it is within a valid range.

Note: G.703 Interface Data Rate is fixed. The user must enter the correct Symbol Rate.

See the tables under the **(CONFIG:) Tx → SymRate** menu for the valid range of Symbol/Data Rates.

'Demod unlocked' appears while the Rx path is not synchronized. After synchronization the correct Data Rate appears in the display and the demodulator has automatically resolved the modulation type, code rate, pilots ON/OFF, FEC frame length, spectral inversion, etc. from the DVB-S2 carrier.

The Symbol Rate is calculated using the equation **SR = DR/SE**, where:

SR = Symbol Rate;
DR = Data Rate;
SE = Spectral Efficiency.

The following example illustrates the Symbol Rate as calculated for 8PSK 3/4 and E3:

SR = 34.368/2.22814 = **15.424524 Msps**

Refer to **Tables 6-1** and **6-2** for Symbol Rate / Data Rate Range tablature.

(CONFIG:) Rx → Freq

```
RX Freq: 0140.0000 MHz
                  (◄ ►▲ ▼ E)
```

Edit the RX IF Frequency. Use the ◄ ► arrow keys to select the digit to be edited. Use the ▲▼ arrow keys to change the value of the digit, then press **ENTER**.

Note the following:

70/140 MHz	The ranges of frequencies are from 52 to 88 MHz and from 104 to 176 MHz with a resolution of 100 Hz.
L-Band	The range is 950 to 1950 MHz with 100 Hz resolution.

IMPORTANT

The bandwidth of the modulated carrier MUST stay within the IF frequency range, or the frequency is not accepted.

(CONFIG:) Rx → Eb/No

```
Eb/No Alarm: Threshold
Alarm/Fault        (◄ ►E)
```

Select **Threshold, Alarm/Fault**, or **Masked** using the ◄ ► arrow keys, then press **ENTER**.

If **Eb/No Alarm: → Threshold** is selected:

```
Eb/No Alarm Threshold:
2.0 dB  Masked    (◄ ►▲ ▼ E)
```

The range of Eb/No alarm point values is from **0.1** to **16.0** dB. If the Eb/No falls below the selected value, a receive traffic fault is generated.

To edit the threshold, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲ ▼ arrow keys to change the value of the digit. Press **ENTER** when done.

If **Eb/No Alarm: → Alarm/Fault** is selected:

```
Eb/No Alarm:
Alarm  Fault  Mask    (◄ ►E)
```

The available choices define the Eb/No Alarm as an **Alarm**, as a **Fault**, or to completely **Mask** the alarm. This choice affects operation in 1:1 redundancy. Select **Alarm, Fault**, or **Masked** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Rx → PLL

```
Carrier PLL Bandwidth:
1x 2x               (◄ ►E)
```

This selection is sometimes useful when high phase noise is present. **1x** is the normal operating mode. Select **1x** or **2x** using the ◄ ► arrow keys, then press **ENTER**.

6.3.1.4 CONFIG: Int1 (CDI-10-1 Single G.703 Interface Only)

Due to limitations of the backplane, the CDM-710G allows only one interface to be active. For example, if Interface 2 is active, and Interface 1 is then enable selected, the unit will automatically disable Interface 2.

Note: The menu branch and submenus depicted in this section are dependent on the presence of the CDI-10-1 Single G.703 Interface card, installable in Interface Slot 1 *only*.

There is a single Tx/Rx port pair on this interface; there is also a common reference that may be used as a Rx Buffer reference clock for either port. This selection will affect the reporting status in the event of loss of External Clock – and subsequently, the switching logic – when the modem is in a 1:1 redundancy configuration.

```
Intfc1 E3/T3/STS1:
Port1  Ext-Clk        (◄ ►E)
```

Select **Port1** or **Ext-Clk** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Intfc1 E3/T3/STS1 → Port1

```
Intfc1 Port1 E3/T3/STS1:
Type Line-Code Tx Rx (◄ ► E)
```

Select **Type**, **Line-Code**, **Tx**, or **Rx** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 E3/T3/STS1: → Type** is selected:

```
Intfc1 Port1 Type: E3  T3
STS1 34.368 Mbps    (◄ ► E)
```

This menu allows port type selection for the interface.

The interface is data rate based with fixed data rates so the CDM-710G will automatically adjust the symbol rate. Although the data rate does not change, the symbol rate will with changes to any of the following: modulation, code rate, pilots, FEC frame.

Select **E3**, **T3**, or **STS1** using the ◄ ► arrow keys, then press **ENTER**.

Upon entering the menu, the cursor blinks below the currently active interface and its Data Rate is shown:

Port Type Selection	Data Rate
E3	34.368 Mbps
T3	44. 768 Mbps
STS1	51.84 Mbps

If **Intfc1 Port1 E3/T3/STS1: → Line-Code** is selected:

```
Intfc1 Port1 E3CODE
(HDB3S):  On  Off   (◄ ► E)
```

This display indicates which port type was selected for Port 1 under **Intfc1 Port1 E3/T3/STS1: → Type** and allows enabling or disabling of the line code specific to that selected port type.

The appearance of the **Line-Code** menu display depends upon the selected port type. For each display, the port type is shown first, and the applicable line code appears in parentheses; the **On** or **Off** selections that follow enable or disable line coding.

Selected Port Type (as displayed)	Line Code (as displayed)
E3 CODE	(HDB3)
T3 CODE	(B3ZS)
STS1 CODE	(B3ZS)

By selecting **Off**, the modem treats the data stream as alternate-mark-inversion (AMI) – that is, no line coding. After making the selection, press **ENTER**.

If **Intfc1 Port1 E3/T3/STS1: → Tx** is selected:

```
Intfc1 Port1 Tx:
Inv Data Ena/Dis    (◄ ► E)
```

Select **Inv, Data** or **Ena/Dis** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 Tx: → Inv** is selected:

```
Intfc1 Port 1 Tx Data:
Normal  Inverted   (◄ ► E)
```

Select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 Tx: → Data** is selected:

```
Intfc1 Port 1 Data Rate
Tx: 34.368000 Mbps     (E)
```

```
Intfc1 Port 1 Data Rate
Tx: Disabled           (E)
```

This is a *read-only* status window to display the data selected via the **Intfc1 Port1: → Type** menu. When Port1 Tx is enabled or disabled via **Intfc1 Port1 Tx: → Ena/Dis** (see next section), that status is reflected in this display. Note the following:

- When Port1 Tx is *enabled*, the Data Rate associated with Port 1 is displayed as shown in the top example.
- When Port1 Tx is *disabled*, that status is reflected in this display as shown in the bottom example.

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

If **Intfc1 Port1 Tx: → Ena/Dis** is selected:

```
Intfc1 Port1 Status
Enable Disable      (◄ ► E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the transmit (Tx) side of Port1, or select **Disable** to *de-activate* the transmit (Tx) side of Port1 and change the Data Rate to 0, then press **ENTER**.

If **Intfc1 Port1 E3/T3/STS1: → Rx** is selected:

```
Intfc1 Port 1 Rx:
Inv Data Buf Clk Ena/Dis
```

Select **Inv, Data**, **Buf**, **Clk**, or **Ena/Dis** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 Rx: → Inv** is selected:

```
Intfc1 Port 1 Rx Data:
Normal  Inverted   (◄ ► E)
```

Select **Normal** or **Inverted** using the ◄ ► arrow keys, to control data inversion, then press **ENTER**.

If **Intfc1 Port1 Rx: → Data** is selected:

```
Intfc1 Port 1 Data Rate
Rx: 34.368000          (E)
```

```
Intfc1 Port 1 Data Rate
Rx: Disabled           (E)
```

This is a *read-only* status window to display the data selected via the **Intfc1 Port1: → Type** menu. When Port1 Rx is enabled or disabled via **Intfc1 Port1 Rx: → Ena/Dis** (see next section), that status is reflected in this display. Note the following:

- When Port1 Rx is *enabled*, the Data Rate associated with Port 1 is displayed, as shown in the top example.
- When Port1 Rx is *disabled*, that status is reflected in this display, as shown in the bottom example.

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

If **Intfc1 Port1 Rx: → Buf** is selected:

```
Intfc1 Port1 Rx Buffer:
Frame-Type Size ReCenter
```

Select **Frame-Type, Size**, or **ReCenter** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 Rx Buffer: → Frame-Type** is selected:

```
Intfc1 Port1 Rx Frame:
G.751  (1536 Bits)  (▲▼ E)
```

Select **Frame-Type, Size**, or **ReCenter** using the ◄ ► arrow keys, then press **ENTER**.

The Frame Type and the number of bits in the frame displayed are dependent on the choice selected under **Intfc1 Port1: → Type**. In the above example, G.751 (1536 Bits) shows the frame when the Port Type is E3. The available Frame Type / (Bits) are as follows:

Selected Port Type (as displayed)	Frame Type (Frame Size, in bits, as displayed)
E3	None - default G.751 (1536 Bits) G.753 (2148 Bits)
T3	None - default G.752 (4760 Bits)
STS1	None - default STS-1 (6480 Bits)

The minimum buffer size is determined by the the number of bits in the frame and the maximum buffer size is based upon the integral number of frames that can fit in the buffer memory.

If **Intfc1 Port1 Rx Buffer: → Size** is selected:

```
Intfc1 Port1 Rx Buffer:
10.0 mSec (0344.064 Bits)
```

The Rx Buffer is programmed in 0.5 ms steps rounded to the increment closest to an integral number of bits based upon the Frame Type.

The maximum buffer size is:

G.751 61 ms; **G.752** 44 ms; **G.753** 61 ms; **STS-1** 40 ms.

The Rx buffer has a minimum value of **0.5 ms** (default). Selecting the minimum value and programming Rx-CLK for Rx-SAT disables the buffer and sets it to minimum.

Use the ◄ ► arrow keys to select the digit to be edited. Use the ▲▼ arrow keys to change the value of the digit, then press **ENTER**.

If **Intfc1 Port1 Rx Buffer: → ReCenter** is selected:

```
Intfc1 Port1 Rx Buffer:
(65%) Re-Center        (E)
```

The percentage (65%) indicates the current buffer fill status. To reset the buffer to the midpoint (50%), select **Re-Center** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 Rx Buffer: → Clk** is selected:

```
Intfc1 Port1 Rx Clk:
Rx-Sat  Tx-Terr Ext-Clk
```

This selection determines which source clocks the output of the Rx Buffer for delivering data to the Rx port at the user interface. Select **Rx-Sat, Tx-Terr** or **Ext-Clk** using the ◄ ► arrow keys, then press **ENTER**.

Note the following:

Rx-Sat (default)	Effectively disables the Rx Buffer because the input and output clocks are the same. Normally, the Rx Buffer is set for minimum when Rx-Sat is selected.
Tx-Terr	Uses the clock from the Tx input to clock out the Rx Buffer.
Ext-Clk	Derives a clock from a signal input to the Ext-Clk connector on the E3/T3/STS-1 Interface Card.

If **Intfc1 Port1 Rx: → Ena/Dis** is selected:

```
Intfc1 Port1 Rx Status
Enable Disable      (◄ ►E)
```

Using the ◄ ► arrow keys, select **Enable** to activate the receive side of Port1, or select **Disable** to *de-activate* the receive side of Port1 and change the Data Rate to 0. Press **ENTER** when done.

(CONFIG:) Intfc1 E3/T3/STS1 → Ext-Clk

```
Intfc1 Ext-Clk Freq:
1.000 Mbps          (▲▼ E)
```

Set the input frequency for the Ext-Clk connector on the E3/T3/STS-1 Interface Card by using the ▲▼ arrow keys, then press **ENTER**. Note the following:

- The Ext-Clk Frequency source selections (in MHz) are: **0** (None), **1**, **2**, **5**, **10**, **2.048**, **34.368**, **44.736**, and **51.84**.
- The input level ranges from **0.5** to **5.0** volts peak-to-peak.

6.3.1.5 CONFIG: Int1 (CDI-60 HSSI Interface Only)

Note: The menu branch and submenus depicted in this section are dependent on the presence of the CDI-60 HSSI Interface card, installable in Interface Slot 1 *only*.

```
Intfc1  HSSI:
Tx Rx CTS/RTS          (◄ ►E)
```

Select **Tx, Rx**, or **CTS/RTS** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Intfc1 HSSI → Tx

```
Intfc1  Tx
Data  Clock  Enable    (◄ ►E)
```

Select **Data, Clock**, or **Enable** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Tx → Data** is Selected:

```
Intfc1  Tx Data:
Datarate  Invert       (◄ ►E)
```

Select **Datarate** or **Invert** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Tx Data: → Datarate** is selected:

```
Intfc1  Data Rate:
Tx: 032.000000 Mbps
```

This is a *read-only* status message that indicates the Data Rate of the transmit MPEG-2 transport stream. Press **ENTER** or **CLEAR** to return to the previous menu.

If **Intfc1 Tx Data: → Invert** is selected:

```
Intfc1  Tx Data Invert:
Normal Inverted        (◄ ►E)
```

To control data inversion (added for compatibility with certain older equipment), select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Tx → Clock** is Selected:

```
Intfc1  Tx Clock:
Normal  Inverted       (◄ ►E)
```

To control clock inversion (added for compatibility with certain older equipment), select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Tx → Enable** is selected:

```
Intfc1  Tx Enable:
Enable  Disable       (◄ ►E)
```

Using the ◄ ► arrow keys, select **Enable** to activate the Tx side of this interface, or select **Disable** to de-activate the Tx side and set the Data Rate to 0. Press **ENTER** when done.

(CONFIG:) Intfc1 HSSI → Rx

```
Intfc1  Rx:
Data Buffer Clock Enable
```

Select **Data, Buffer, Clock**, or **Enable** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Rx: → Data** is selected:

```
Intfc1  Rx Data:
Datarate  Invert     (◄ ►E)
```

Select **Datarate** or **Invert** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Rx Data: → Datarate** is selected:

```
Intfc1  Data Rate:
Rx: 032.000000 Mbps
```

This is a *read-only* status message that indicates the Data Rate of the received MPEG-2 transport stream. Press **ENTER** or **CLEAR** to return to the previous menu.

If **Intfc1 Rx Data: → Invert** is selected:

```
Intfc1  Rx Data Invert:
Normal Inverted      (◄ ►E)
```

To control data inversion (added for compatibility with certain older equipment), select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Rx → Buffer** is selected:

```
Intfc1  Rx Buffer:
Size  Recenter       (◄ ►E)
```

Select **Size** or **Recenter** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Rx Buffer: → Size** is selected:

```
Intfc1 Rx Buffer Size:
10.0 mSec (0343,680 Bits)
```

The range of Rx Buffer Size values is from **5.0** to **32.0** mSec in **0.1** mSec increments. To edit, use the ◄ ► arrow keys to select the digit to be edited, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

If **Intfc1 Rx Data: → Recenter** is selected:

```
Intfc1 Rx Buffer Fill:
(046%) ReCenter     (◄ ►E)
```

The percentage (046%) indicates the current buffer fill status. To reset the buffer to the midpoint (50%), select **ReCenter** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Rx: → Clock** is selected:

```
Intfc1 Rx Clock:
Source  Invert      (◄ ►E)
```

Select **Source** or **Invert** using the ◄ ► arrow keys, then press **ENTER**.

If Intfc1 **Rx Clock: → Source** is selected:

```
Intfc1  Rx Clock:
Rx-Sat Tx-Terr Internal
```

This selection determines which source clocks the output of the Rx Buffer for delivering data to the Rx port at the user interface. Select **Rx-Sat, Tx-Terr**, or **Internal** using the ◄ ► arrow keys, then press **ENTER**. Note the following:

Rx-Sat (default)	Effectively disables the Rx Buffer because the input and output clocks are the same. Normally, the Rx Buffer is set for minimum when Rx-Sat is selected.
Tx-Terr	Uses the clock from the Tx input (TT) to clock out the Rx Buffer.
Internal	Derives a clock from the internal 10 MHz reference clock.

If **Intfc1 Rx Clock: → Invert** is selected:

```
Intfc1 Rx Clock Invert:
Normal  Inverted      (◄ ►E)
```

This selection controls clock inversion (added for compatibility with certain older equipment). Select **Normal** or **Inverted** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Rx: → Enable** is selected:

```
Intfc1 Rx Enable:
Enable Disable        (◄ ►E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the Rx side of this interface, or select **Disable** to *de-activate* the Rx side and set the Data Rate to 0. Press **ENTER** when done.

(CONFIG:) Intfc1 HSSI → RTS/CTS

```
Intfc1 CTS/RTS:
Normal  Fault
```

Select **Normal** or **Fault** using the ◄ ► arrow keys, then press **ENTER**.

Note: CTS is the same as CA, and RTS is the same as TA. The selections operate as follows:

- Normal: CTS = RTS
- Fault: CTS = RTS when no fault is present. CTS is not asserted when a fault is present.

6.3.1.6 CONFIG: Int2 (CDI-70 Gigabit Ethernet Interface Only)

IMPORTANT

Due to limitations of the backplane, the CDM-710G allows only one interface to be active. For example, if Interface 1 is active, and Interface 2 is then enable selected, the unit will automatically disable Interface 2.

For information on valid Ethernet network configuration connections, refer to **Chapter 3. ETHERNET NETWORK CONFIGURATIONS**.

Note: The CDM-710G supports a single CDI-70 Gigabit Ethernet Interface (Intfc2), installable in Slot 2 **only**; there is a single RJ-45 port on the CDI-70 Gigabit Ethernet Interface. The menu branch and submenus depicted in this section show what is available when the CDI-70 Gigabit Ethernet Interface card is installed in Interface Slot 2.

```
Intfc2 Gigabit Ethernet:
Tx Rx Man Stats SWOP(◄ ►E)
```

Select **Tx, Rx, Man**, **Stats**, or **SWOP** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet → Tx

```
Intfc2 Tx:
Data  Enable  (◄ ►E)
```

Select **Data** or **Enable** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Tx: → Data** is selected:

```
Intfc2 Data Rate:
Tx:075.000000 Mbps     (E)
```

This display is *read-only*. If **Tx: Disabled** is displayed, the port is turned *off*:

```
Intfc2 Data Rate:
Tx: Disabled           (E)
```

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

If **Intfc2 Tx: → Enable** is selected:

```
Intfc2 Tx Enable:
Enable  Disable    (◄ ► E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the transmit (Tx) side of this interface, or select **Disable** to *de-activate* the transmit side of this interface. Press **ENTER** when done.

(CONFIG:) Intfc2 Gigabit Ethernet → Rx

```
Intfc2 Rx:
Data  Enable      (◄ ► E)
```

Select **Data** or **Enable** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc2 Rx: → Data** is selected:

```
Intfc2 Data Rate:
Rx:075.000000 Mbps     (E)
```

This display is *read-only*. If **Rx: Disabled** is displayed, the port is turned *off***:**

```
Intfc2 Data Rate:
Rx: Disabled           (E)
```

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

If **Intfc2 Rx: → Enable** is selected:

```
Intfc1 Rx Enable:
Enable  Disable      (◄ ►E)
```

Using the ◄ ► arrow keys, select **Enable** to *activate* the receive (Rx) side of this interface, or select **Disable** to *de-activate* the receive side of this interface. Press **ENTER** when done.

(CONFIG:) Intfc2 Gigabit Ethernet → Man

```
Intfc2 Management IP:
192.168.001.001/30 (◄ ►▲ ▼ E)
```

Edit the Gigabit Ethernet Interface Management IP Address and Mask Range. This is the IP address that can be used for one of two purposes:

- First, PING can be used with this IP address as a diagnostic tool to ensure the interface is active and the external cabling in properly connected.

- Second, this is the IP address that will be used in the event that new firmware is provided by CEFD for the CDI-70 Gigabit Ethernet interface.

To edit, use the ◄ ► arrow keys to select the digit, then use the ▲▼ arrow keys to change the value of the digit. Press **ENTER** when done.

(CONFIG:) Intfc2 Gigabit Ethernet → Stats

```
Intfc1 Statistics:
View  Clear        (◄ ►E)
```

Select **View** or **Clear** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Statistics: → View** is selected:

```
Intfc1 Statistics:
FPGA LAN WAN MNG ALL
```

Select **FPGA**, **LAN**, **WAN**, **MNG**, or **ALL** using the ◄ ► arrow keys, then press **ENTER**. The available statistics for the Gigabit Ethernet Interface, as depicted in these example screen shots, are shown in **Table 6-3** – examples of these *read only* displays are as follows:

If **Intfc1 Statistics: → FPGA** is selected:

```
FPGA Link Errors
00000000000000000000 (▲ ▼ E)
```

If **Intfc1 Statistics: → LAN** is selected:

```
LAN Good Octets(Out)
00000000000000000000 (▲ ▼ E)
```

If **Intfc1 Statistics: → WAN** is selected:

```
WAN Good Octets(Out)
00000000000000000000 (▲ ▼ E)
```

If **Intfc1 Statistics: → MNG** is selected:

```
MNG Good Octets(In)
00000000000000000000 (▲ ▼ E)
```

If **Intfc1 Statistics: → ALL** is selected:

```
FPGA Link Errors
00000000000000000000 (▲ ▼ E)
```

Table 6-3. Statistics for the Gigabit Ethernet Interface

GBEI Statistics Summary		
Category	Message	Description
1000Base-T Link Statistics	FPGA Link Errors	Indicates the number of HDLC link errors that have occurred on the Rx WAN interface. If the FPGA Link Errors are incrementing while the Es/No or Eb/No is high, this often indicates the presence of interference in the link.
	FPGA Overrun Errors	Indicates the number of times that a GBEI buffer overrun has occurred in the Rx direction.
	FPGA Rx Packets	Indicates the number of Ethernet packets received from the WAN.
	FPGA Overflow Errors	Indicates the number of times that a GBEI Rx buffer overrun condition has occurred.
	FPGA Tx Packet Count	Indicates the number of Ethernet packets transmitted to the WAN.
	LAN Good Octets (In)	The sum of lengths of all good Ethernet frames received from the LAN.
	LAN Bad Octets (In)	The sum of lengths of all bad Ethernet frames received from the LAN.
	LAN Unicast (In)	The sum of good frames received from the LAN that have a unicast destination MAC address.
	LAN Broadcast (In)	The sum of good frames received from the LAN that have a broadcast destination MAC address.
	LAN Multicast (In)	The sum of good frames received from the LAN that have a multicast destination MAC address.
	LAN Pause (In)	The number of good flow control frames received from the LAN.
	LAN Undersize (In)	Total frames received from the LAN with a length of less than 64 octets but with a valid FCS.
	LAN Fragments (In)	Total frames received from the LAN with a length of less than 64 octets and an invalid FCS.
	LAN Oversize (In)	Total frames received from the LAN with a length greater than the maximum size of octets but with a valid FCS.
	LAN Jabber (In)	Total frames received from the LAN with a length greater than the maximum size of octets but with an invalid FCS.
	LAN Rx Err (In)	Total frames received from the LAN for which an error was detected at the PHY.
	LAN FCS Err (In)	Total frames received from the LAN with a CRC error that was not counted in the Fragments or Rx Err totals.
	LAN Octets (Out)	The sum of the lengths of all Ethernet frames transmitted to the LAN.
	LAN Unicast (Out)	The sum of frames transmitted to the LAN that have a unicast destination MAC address.
	LAN Broadcast (Out)	The sum of frames transmitted to the LAN that have a broadcast destination MAC address.
	LAN Multicast (Out)	The sum of frames transmitted to the LAN that have a multicast destination MAC address.
WAN Port Statistics	WAN Octets (Out)	The sum of the lengths of all Ethernet frames that are forwarded to the WAN.
	WAN Unicast (Out)	The number of good frames with unicast destination MAC addresses that are forwarded to the WAN.
	WAN Broadcast (Out)	The number of good frames with broadcast destination MAC addresses that are forwarded to the WAN.
	WAN Multicast (Out)	The number of good frames with multicast destination MAC addresses that are forwarded to the WAN.
	WAN Good Octets (IN)	The sum of lengths of all good Ethernet frames received from the IP encapsulation logic.
	WAN Unicast (IN)	The sum of good frames received from the WAN IP encapsulation logic that have a unicast destination MAC address.
	WAN Broadcast (IN)	The sum of good frames received from the WAN IP encapsulation logic that have a broadcast destination MAC address.
	WAN Multicast (IN)	The sum of good frames received from the WAN IP encapsulation logic that have a multicast destination MAC address.

GBEI Statistics Summary		
Category	Message	Description
Management Port Statistics	Mng Good Octets (In)	The sum of lengths of all good Ethernet frames received from the local GBEI management processor.
	Mng Bad Octets (In)	The sum of lengths of all bad Ethernet frames received from local GBEI management processor.
	Mng Unicast (In)	The sum of good frames received from the local GBEI management processor that have a unicast destination MAC address.
	Mng Broadcast (In)	The sum of good frames received from the local GBEI management processor that have a broadcast destination MAC address.
	Mng Multicast (In)	The sum of good frames received from the local GBEI management processor that have a multicast destination MAC address.
	Mng Oversize (In)	Total frames received form the local GBEI management processor with a length greater than the maximum size of octets but with a valid FCS.
	Mng Jabber (In)	Total frames received form the local GBEI management processor with a length greater than the maximum size of octets but with an invalid FCS.
	Mng Rx Err (In)	Total frames received from the local GBEI management processor for that an error was detected by its physical interface.
	Mng FCS Err (In)	Total frames received from the local GBEI management processor with a CRC error that was not counted in the Fragments or Rx Err totals.
	Mng Pause (In)	The number of good flow control frames received from local GBEI management processor.
	Mng Undersize (In)	Total frames received from the local GBEI management processor with a length of less than 64 octets but with a valid FCS.
	Mng Fragments (In)	Total frames received from the local GBEI management processor with a length of less than 64 octets and an invalid FCS.
	Mng Octets (Out)	The sum of the lengths of all Ethernet frames transmitted to the local GBEI management processor.
	Mng Unicast (Out)	The sum of frames transmitted to the local GBEI management processor that have a unicast destination MAC address.
	Mng Broadcast (Out)	The sum of frames transmitted to the local GBEI management processor that have a broadcast destination MAC address.
	Mng Multicast (Out)	The sum of frames transmitted to the local GBEI management processor that have a multicast destination MAC address.

(CONFIG:) Intfc2 Gigabit Ethernet → SWOP (SWitch OPeration)

```
Intfc2 SWOP:
AutoCx   Learning  (◀ ▶E)
```

Select **AutoCx** or **Learning** using the ◀ ▶ arrow keys, then press **ENTER**.

If **Intfc2 SWOP: → AutoCx** is selected:

```
Intfc2 Auto Crossover:
Enable Disable     (◀ ▶E)
```

Select **Enable** or **Disable** using the ◀ ▶ arrow keys, then press **ENTER**. If *Enabled*, the Gigabit Ethernet Interface automatically detects the type of connection and configures the interface appropriately as *straight-through* (MDI) or *crossover* (MDIX). If *Disabled*, the Gigabit Ethernet port is configured as *straight-through* (MDI).

If **Intfc2 SWOP: → Learning** is selected:

```
Intfc2 Learning:
Enable Disable    (◄ ► E)
```

Unit power must be cycled whenever Learning mode is enabled or disabled.

Learning is an Ethernet switch function that allows the LAN (user) side of the Gigabit Ethernet port to learn the MAC addresses of the equipment connected to the Gigabit port.

Learning applies only to the LAN (user) side of the port. There is no learning on the WAN (modem) side of the Gigabit Ethernet port.

If *enabled,* the interface is in LAN-to-WAN learning mode, and the Gigabit Ethernet Interface (GBEI) learns connections based on source MAC addresses and ingress ports. The hub thinks the remote site network nodes are local to the hub site network and does not send the traffic over the outbound carrier to the remote site.

If *disabled,* the GBEI passes all packets from the LAN to the WAN.

Select **Enable** or **Disable** using the ◄ ► arrow keys. Press **ENTER, *then cycle the unit power***.

6.3.1.7 CONFIG: Ref

```
Frequency Reference
External  10 MHz    (◄ ► E)
```

External 10 MHz	The unit phase locks to an external input at the BNC connector labeled **EXT REF**. Other selections are available for External 1, 2, 5, 10, or 20 MHz input.

Note the following:

- Internal selection is available at 10 MHz.
- If there is a faulted/no **External Reference In**, the unit reverts to using an **Internal Reference**.

6.3.1.8 CONFIG: Aux

```
Redundancy
Ena/Dis  Force (1:1) (◄ ► E)
```

Select **Ena/Dis** or **Force (1:1)** using the ◄ ► arrow keys, then press **ENTER**.

If (**Aux) Redundancy → Ena/Dis** is selected:

```
Redundancy Mode:
Enable   Disable     (◄ ► E)
```

The solid cursor indicates the current configuration choice. Select **Enable** to set up the unit for operation with the 1:1 IF switch. Internally, an auxiliary relay sets the alarms connector for the 1:1 operation mode.

Note: Disable is selectable only when the unit is in **Local** mode. When the unit is in **Remote** mode and the user attempts to select **Disable** using the ◄ ► arrow keys, the following message displays (follow the prompt as shown):

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

```
DO YOU WANT IN LOCAL
MODE?ENT=Yes CLR=No
```

Note: When 1:1 redundancy operation is selected, J5 becomes the active port – J4 is not available. For 1:N redundancy operation, either J4 or J5 is available.

If **(Aux) Redundancy → Force (1:1)** is selected:

```
Press ENT To Force Modem
To Standby  (1:1 Only)
```

The **Force (1:1)** selection is only available for use with a 1:1 switch to force switchover, and only from the modem that is currently Online. The modem that is online is indicated by the Online LED on the front of the modem. To initiate switchover, press **ENTER**.

6.3.1.9 CONFIG: Alarms

Note: When the unit is in **Remote** mode and the user attempts to select an alarm state using the ◄ ► arrow keys, the following message displays (follow the prompt as shown):

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

```
DO YOU WANT IN LOCAL
MODE?ENT=Yes CLR=No
```

Otherwise, the following menu is displayed:

```
Alarm Mask: Tx Rx
Intfc1 Intfc2      (◄ ► E)
```

Select **Tx**, **Rx**, **Intfc1**, or **Intfc2** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Alarm Mask: → Tx

```
Tx Alarm Mask: None
```

Currently, masking of Tx Alarms (associated with the modulator) is not allowed.

(CONFIG:) Alarm Mask: → Rx

```
Eb/No Threshold Alarm:
Alarm  Fault  Mask  (◄ ► E)
```

Select **Alarm**, **Fault**, **or Mask** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Alarm Mask: → Intfc1

The appearance of the menu branch for **CONFIG: Alarms (Alarm Mask:) → Intfc1** is dependent on whether the CDI-10-1 Single G.703 or the CDI-60 HSSI Interface card is installed into Interface Slot 1.

```
Intfc1 E3T3STS1 Alarms:
Tx  Rx  ExtClk     (◄ ► E)
```

```
Intfc1 HSSI Alarms:
Port1  Ext-Clk     (◄ ► E)
```

(CONFIG:) Alarm Mask: → Intfc1 (CDI-10-1 Single G.703 Interface Card)

```
Intfc1 E3T3STS1 Alarms:
Tx  Rx  ExtClk     (◄ ► E)
```

Select **Tx**, **Rx**, or **ExtClk** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 E3T3STS1 Alarms: → Tx** is selected:

```
Intfc1 Port1 Tx Alarms:
Tx-Cable Tx-AIS    (◄ ► E)
```

To configure each as an Alarm or Fault condition or to mask the alarm, select **Tx-Cable** or **Tx-AIS** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 Tx Alarms: → Tx-Cable** is selected:

```
Tx Cable Alarm:
Alarm  Fault  Mask (◄ ► E)
```

Select **Alarm**, **Fault**, or **Mask** using the ◄ ► arrow keys, then press **ENTER.** The default selection is **Alarm**.

If **Intfc1 Port1 Tx Alarms: → Tx-AIS** is selected:

```
Tx-AIS Alarm:
Alarm  Fault  Mask (◄ ► E)
```

Tx-AIS Alarm affects the event reporting status upon detection of a Tx AIS condition, and subsequently the switching logic, when the modem is in a 1:1 redundancy configuration.

Select **Alarm**, **Fault**, or **Mask** using the ◄► arrow keys, then press **ENTER.** The default selection is **Alarm**.

If **Intfc1 E3T3STS1 Alarms: → Rx** is selected:

```
Intfc1 Port1 Rx Alarms:
Rx-AIS Buffer-Slip (◄ ► E)
```

To configure each as an Alarm or Fault condition or to mask the alarm, select **Rx-AIS** or **Buffer-Slip** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 Port1 Tx Alarms: → Rx-AIS** is selected:

```
Rx-AIS Alarm:
Alarm  Fault  Mask (◄ ► E)
```

This selection affects the event reporting status upon detection of a Rx AIS condition, and subsequently the switching logic, when the modem is in a 1:1 redundancy configuration.

Select **Alarm**, **Fault**, or **Mask** using the ◄ ► arrow keys, then press **ENTER.** The default selection is **Alarm**.

If **Intfc1 Port1 Tx Alarms: → Buffer-Slip** is selected:

```
Buffer Slip Alarm:
Alarm  Fault  Mask (◄ ► E)
```

The default selection is **Alarm**. Select **Alarm**, **Fault**, or **Mask** using the ◄ ► arrow keys, then press **ENTER.**

If **Intfc1 E3T3STS1 Alarms: → Ext-Clk** is selected:

```
Intfc1 Ext-Clk Alarm:
Alarm  Fault  Mask (◄ ► E)
```

The default selection is **Alarm**. To configure the loss of External Clock as either an Alarm or a Fault condition or to mask the alarm, select **Alarm**, **Fault**, or **Mask** using the ◄ ► arrow keys, then press **ENTER**.

(CONFIG:) Alarm Mask: → Intfc1 (CDI-60 HSSI Interface Card)

```
Intfc1 HSSI Alarms:
Tx  Rx             (◄ ► E)
```

Select **Tx** or **Rx** using the ◄ ► arrow keys, then press **ENTER**.

If **Intfc1 HSSI Alarms: → Tx** is selected:

```
Intfc1 Tx Clock Alarm:
Alarm  Fault  Mask (◄ ► E)
```

Select **Alarm**, **Fault**, or **Mask** using the ◄ ► arrow keys, then press **ENTER.** The default selection is **Alarm**.

If **Intfc1 HSSI Alarms: → Rx** is selected:

```
Buffer Slip Alarm:
Alarm  Fault  Mask (◄ ► E)
```

Select **Alarm**, **Fault**, or **Mask** using the ◄ ► arrow keys, then press **ENTER.** The default selection is **Alarm**.

(CONFIG:) Alarm Mask: → Intfc2 (CDI-70 GigE Interface Card)

```
GBEI Tx Cable Alarm:
Alarm  Fault  Mask (◄ ► E)
```

Select **Alarm**, **Fault**, or **Mask** using the ◄ ► arrow keys, then press **ENTER**. The default selection is **Alarm**.

6.3.2 SELECT: Monitor

```
Monitor: Alarms  Rx_Stats
Event-Log
```

Alarms are reported under three main categories:

- Tx path alarms are displayed under the Tx Category
- Rx path alarms are displayed under the Rx Category
- Alarms common to the unit are available under the Unit selection

Refer to **Table 6-4** for a listing of alarms.

Select **Alarms**, **Rx_Stats**, or **Event-Log** using the ◄ ► arrow keys, then press **ENTER**.

6.3.2.1 (SELECT:) Monitor → Alarms

```
Live Alarms: Transmit
Receive  Unit   (◄ ►  E)
```

Select **Transmit**, **Receive**, or **Unit** using the ◄ ► arrow keys, then press **ENTER**.

If **Live Alarms: → Transmit** is selected:

```
TX Traffic:  GBEI Card
PHY Not Connected   (E)
```

This will report only if there are modulator errors; otherwise, it will report "**No Errors**." Press **ENTER** or **CLEAR** to return to the previous menu.

NOTE: The alarm message depicted in the above example usually indicates that the Ethernet data cable is disconnected from the modem.

If **Live Alarms: → Receive** is selected:

```
RX Traffic:
Demod  Unlocked     (E)
```

This will report only if Demod is unlocked; otherwise, it will report "**No Errors**." Press **ENTER** or **CLEAR** to return to the previous menu.

If **Live Alarms: →Unit** is selected:

```
Unit Fault: No Errors
                    (E)
```

This will report only if there are unit faults; otherwise, it will report "**No Errors**." Press **ENTER** or **CLEAR** to return to the previous menu.

6.3.2.2 (SELECT:) Monitor → Rx_Stats

For DVB-S2 only:

```
EsNo=14.0  BUF=050%
EbNo=12.8  BER=1.0E-09     ▼
```

```
EbNo=12.8  BER=1.0E-09     ▲
ΔF=-000.2k RSL=-16         ▼
```

```
ΔF=-000.2k RSL=-16         ▲
Link_Margin=+10.4
```

When the demodulator is locked, this menu reports Eb/No, PER (packet error rate), ΔF (frequency offset of incoming carrier) and RSL (receive signal level).

Link Margin = [Es/No (measured) – Es/No (threshold)]. Refer to **Chapter 1. INTRODUCTION** for threshold information.

Additionally:

Usable Es/No Range (Typical)	
Modulation	**Es/No Range (dB)**
QPSK	0.0 to 14.0
8QPSK	4.5 to 18.5
16APSK	8.0 to 22.0
32APSK	11.5 to 25.00

6.3.2.3 (SELECT:) Monitor: → Event-Log

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

Select **View** or **Clear-All** using the ◄ ► arrow keys, then press **ENTER**.

If **Stored Events: → View** is selected:

```
Log015 23/05/06  09:27:15
Fault – No PHY Link  (▲▼)
```

- This window displays up to 253 Alarms.
- Use the ▲▼ arrow keys to display individual alarms.
- The **Event-Log** stores the live alarms, along with a timestamp for review and troubleshooting. The date is in international format: *dd/mm/yy*
- Refer to **Table 6-4** for the listing of available alarms:

Table 6-4. Summary of Faults/Alarms (as reported per category)

Unit Faults / Alarms	
Menu Mnemonic	**Description**
FPGA Load Framer Card	Framer FPGA not loading
+1.5V PSU Framer Card	1.5V Vdc Framer / FEC regulator exceeds +/- 5%
+1.5V PSU Interface Card #1	1.5V Vdc Slot 1 regulator exceeds +/- 5%
+1.5V PSU Interface Card #2	1.5V Vdc Slot 2 regulator exceeds +/- 5%
+3.3V PSU Framer Card	3.3 Vdc Framer regulator exceeds +/- 10%
+5 PSU Framer Card	5.0 Vdc Framer regulator exceeds +/- 10%
+12V PSU Framer Card	12 Vdc Framer regulator exceeds +/- 10%
-12V PSU Framer Card	-12 Vdc Framer regulator exceeds +/- 10%
+18V PSU Framer Card	+18 Vdc Framer regulator exceeds +/- 10%
FLASH Checksum Error	Flash Load Error
FPGA Load Decoder Card	Decoder FPGA not loading
FPGA Load Encoder Card	Encoder FPGA not loading
FPGA Load Interface Card #1	Slot 1 FPGA not loading
FPGA Load Interface Card #2	Slot 2 FPGA not loading
PLL Clock Framer – 192MHz	192MHz PLL Clock Framer failure
PLL Clock Framer – Ext Ref	External Reference PLL Clock Framer failure
FPGA Temp Framer Card	Framing FPGA temperature out of range
Modem Ambient Temp	Framing card (modem) ambient temperature out of range
Modem Cooling Fans	Framing card – sense cooling fan problem
Intfc1 has been removed	Slot 1 interface card removed
Intfc2 has been removed	Slot 2 interface card removed
+1.5V PSU Modulator Card	1.5 Vdc regulator exceeds +/- 5%
FPGA Load Modulator Card	Mod FPGA not loading
PLL Clock Symbol Rate	Mod Symbol Rate defitter PLL unlocked over overflowing
Tx Synth Unlocked	Mod synthesizer unlocked
Tx CDM Unlocked	Mod Digital Clock Manager unlocked
I & Q are inactive	Mod I or Q no activity
FPGA Temp Modulator Card	Mod FPGA outside temperature range
Nyq Filter Clipping	Mod Nyquist filter clipping
Modulator Faults / Alarms	
Menu Mnemonic	**Description**
Tx Clock Loss Slot 1	Transmit clock not present at Slot 1
Tx Clock Loss Slot 2	Transmit clock not present at Slot 2
GBEI Card DataRate > +200PPM	Data rate from GBEI to modulator exceeds nominal by >+200PPM
GBEI Card DataRate < -200PPM	Data rate from GBEI to modulator exceeds nominal by <-200PPM
GBEI Card PHY Not Connected	Ethernet cable not connected to GBEI, or cable fault
Tx Ais Interface 1	TX AIS Slot 1 (Valid for G.703)
Tx Ais Interface 2	TX AIS Slot 2()Valid for G.703)
Tx Cable Interface 1	Tx Cable Interface 1
Tx Cable Interface 2	Tx Cable Interface 2
Encoder FIFO Empty	Transmit Encoder FIFO is empty
Encoder FIFO Full	Transmit Encoder FIFO is full
SERDES Parity Errors	SERDES parity errors have been detected

Demodulator Faults / Alarms	
Menu Mnemonic	**Description**
+1.5V PSU Demodulator Card	1.5 Vdc regulator exceeds +/- 5%
FPGA Load Demodulator Card	Demod FPGA not loading
Demod Unlocked	Demodulator is not locked
FPGA Temp Demodulator Card	Demod FPGA outside temperature range
BER limit Exceeded	Bit error rate limit exceeded
AGC Level Out of Range	AGC level is out of range
Eb/No limit exceeded	EB/No limit has been exceeded
Demodulator Synth 1 PLL	Demodulator Synth 1 PLL fault
Demodulator Synth 2 PLL	Demodulator Synth 2 PLL fault
Demodulator SERDES Dmd->Framer	Demodulator SERDES fault
Demodulator SERDES Framer > FEC1	Demodulator SERDES fault
Demodulator SERDES Framer > FEC2	Demodulator SERDES fault
FAST option not installed	FAST option for selected feature has not been installed
Rx DCM Unlocked	Demod Digital Clock Manager unlocked
Intf1 Rx Buffer Underflow	Rx buffer has underrun Slot 1
Intff Rx Buffer Overflow	Rx buffer has overflowed Slot 1
Intf2 Rx Buffer Underflow	Rx buffer has underrun Slot 2
Intf2Rx Buffer Overflow	Rx buffer has overflowed Slot 2
SERDES Par Framer -> Intf1	SERDES parity error detected on framer FPGA interface 1
SERDES Par Framer ->Intf2	SERDES parity error detected on framer FPGA interface 2
Rx Clock Source Interface 1	Rx Clock Source fault Interface 1
Rx Clock Source Interface 2	Rx Clock Source fault Interface 2
Intf1 Rx AIS Slot 1 Port1	RX AIS slot1
Intf2 RXAIS Slip Slot 2	RX AIS slot2
Intf1 EXT Clock Slot1	EXT Clock Slot1
Intf2 Clock Slot2	EXT Clock Slot2

If **Stored Events: →Clear-All** is selected:

```
Clear All Stored Events
No  Yes     (◀ ▶E)
```

When In **Local** mode, use the ◄ ► arrow keys to select **No** to retain, or **Yes** to clear the buffer of all stored events, then press **ENTER**.

Note: When the unit is in **Remote** mode, and the user attempts to select an option, the following message is displayed (follow the prompt as shown):

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

```
DO YOU WANT IN LOCAL
MODE? ENT=Yes CLR=No
```

6.3.3 SELECT: Test

```
Test:
Mode       (◄ ►E)
```

Test options for the Tx carrier are selected in this menu. Select **Mode** using the ◄ ► arrow keys, then press **ENTER**.

6.3.3.1 (SELECT:) Test → Mode

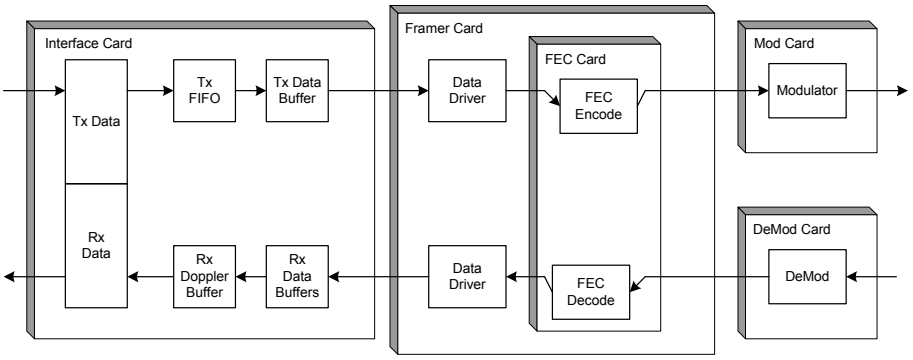
```
Test: Normal  RF  IF  I/O
Tx-CW  Tx-1,0     (◄ ►  E)
```

The CDM-710G supports many useful test modes. Not all modes are available in all configurations – they depend upon the modem configuration (Duplex, Rx-Only, Tx-Only) and the data interface(s).

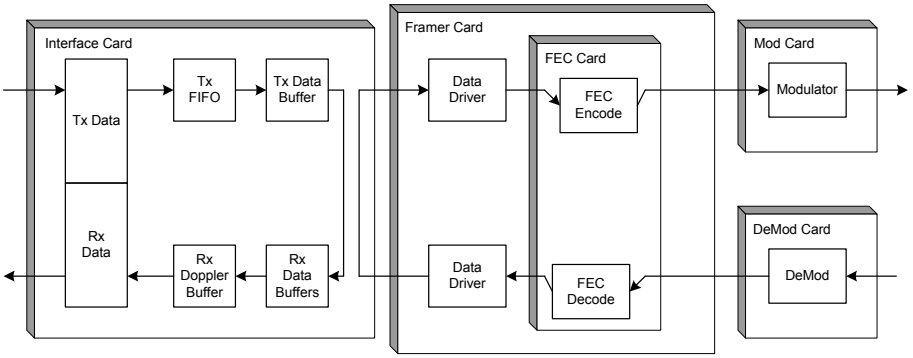
Select **Norm, IF** (Loop)**, I/O** (Loop)**, RF** (Loop)**, Tx-CW** or **Tx-1.0** using the ◄ ► arrow keys, then press **ENTER**.

Each test mode option is further explained as follows:

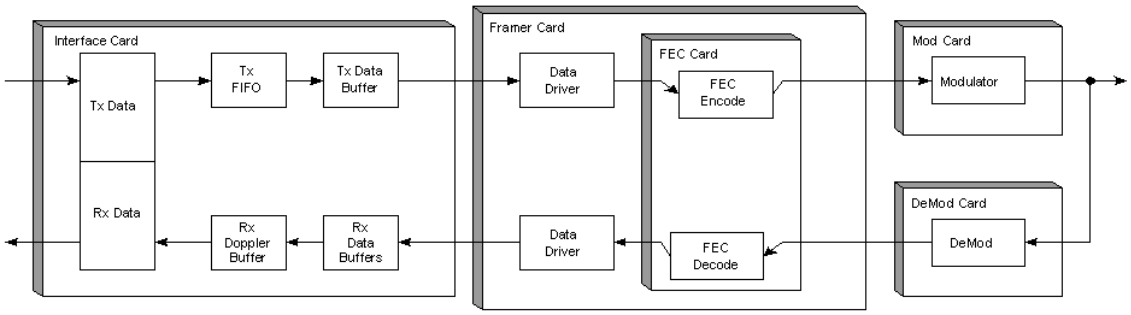
SELECTION	DESCRIPTION
Norm	**(Normal)** This clears any test modes or loopbacks and places the unit back into an operational state.
IF	**(IF Loop)** This test mode invokes an internal IF loop. This is a particularly useful feature, as it permits the user to perform a quick diagnostic test without having to disturb external cabling. Furthermore, all of the Rx configuration parameters are temporarily changed to match those of the Tx-side. When Norm is again selected, all of the previous values are restored.
I/O	**(Input / Output Loop**) This test mode invokes two distinct loopbacks. The first Loopback is an inward loop that takes data being received from the satellite direction, and passes it directly to the modulator. Simultaneously, the outward loop is invoked, whereby data being fed to the Tx data interface is routed directly back out of the Rx data interface.
RF	**(RF Loop)** This RF loop is almost identical to the IF loop mode. All of the Rx configuration parameters (except Rx Spectrum Invert) are temporarily changed to match those of the Tx-side, however, no internal connection is made. This is useful for performing a satellite Loopback. When Norm is again selected, all of the previous values are restored.
Tx-CW	**(Transmit CW)** This test mode forces the modulator to transmit a pure carrier (unmodulated).
Tx-1,0	**(Tx 1, 0, 1, 0 Pattern)** This is a test mode that forces the modulator to transmit a carrier modulated with an alternating 1,0,1,0 pattern, at the currently selected Symbol Rate. This causes single sideband spectral lines to appear, spaced at ± half the Symbol Rate, about the carrier frequency. This mode is used to check the carrier suppression of the Modulator. Also, it verifies quadrature and amplitude balance.



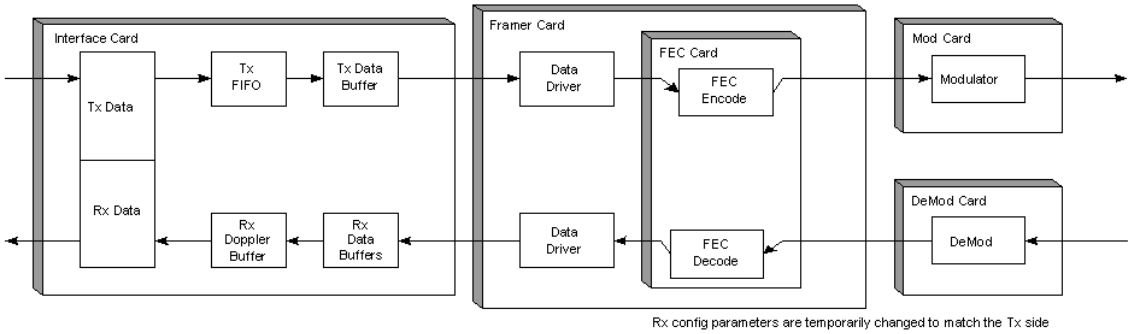
Normal



I/O Loop *(Available Some Interfaces)*



IF Loop *(Not Available For Simplex Operation)*



RF Loop *(Not Available For Simplex Operation)*

Figure 6-2. Traffic Data Flow – Loopback Block Diagrams

6.3.4 SELECT: INFO

Note: INFO screens provide *read-only* information on the current configuration of the modem without risking inadvertent changes. The user may only view, but not edit, an **Info** screen.

```
INFO: Rem  Tx  Rx
Intfc1 Intfc2   (◄ ►E)
```

Select **Rem**, **Tx**, **Rx**, **Intfc1**, or **Intfc2** using the ◄ ► arrow keys, then press **ENTER**.

6.3.4.1 (SELECT:) INFO → Rem

```
Remote M&C: 100BaseTx
IP Addr: 192.168.001.006
```

This display provides the status, as applicable, of the Remote Monitor & Control configuration.

6.3.4.2 (SELECT:) INFO → Tx

```
Tx: 0140.0000  17.379483
DVBS2 8P 3/4  -10.0 ON
```

Using the example shown, a typical transmit data info screen may be broken down as follows:

Value	Description
`Tx: 0140.0000`	Tx Frequency in MHz
`17.379483`	Data rate in Mbps
`DVBS2`	Transmission mode
`8P`	*(Modulation:)* QP=QPSK 8P=8-PSK 16A=16-APSK 32A=32-APSK
`3/4`	Code Rate
`-10.0`	Tx Power level in dBm
`ON`	Tx Power: **ON** = On, **OF** = Off

6.3.4.3 (SELECT:) INFO → Rx

```
RX: 0140.0000 17.379483
DVBS2 QP 1/2 LF
```

Using the example shown, a typical receive data info screen may be broken down as follows:

Value	Description
RX: 0140.0000	Rx Frequency in MHz
17.279483	Data rate in Mbps
DVBS2	Transmission mode
8P	*(Demodulation:)* QP=QPSK 8P=8-PSK 16A=16-APSK 32A=32-APSK
1/2	Code Rate
LF	*FECFrame Type:* SF = Short Frame LF = Long Frame

6.3.5 SELECT: Save/Load

```
Save/Load Configuration:
Save  Load    (◄ ►E)
```

Note: When the unit is in **Remote** mode, and the user attempts to select an option, the following message is displayed:

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

```
DO YOU WANT IN LOCAL
MODE?ENT=Yes CLR=No
```

When in **Local** mode: Select **Save** or **Load** using the ▲▼ arrow keys, then press **ENTER**. The **Save** and **Load** submenus permit the user to store or load up to 10 different modem configurations in a non-volatile memory of the modem.

6.3.5.1 (SELECT:) Save/Load → Save

```
Save Config to Loc: 9
Empty           (▲▼ E)
```

Using **Loc 9:** as the example, if **Save** is selected and no configuration has been saved, the second line reads '**Empty'**, as shown in the preceding example.

However, if the selected **Loc: 9** already contains data, what displays is similar to the next example:

```
Save Config to Loc: 9
01:02:43  05/08/05   (▲▼ E)
```

The user is shown the time and date stamp of the previously stored configuration, for identification purposes.

Select the location where the current configuration is to be stored using the ▲▼ arrow keys, then press **ENTER**. There are 10 available locations, numbered 0 through 9.

If the selected location does not contain a previously stored configuration, the following screen is displayed:

```
New Config has been
Saved to Loc 9   (E)
```

However, if the selected location *does* contain a previously stored configuration, the following screen is displayed:

```
Loc 0 Contains Data !
Overwrite? NO YES (◀ ▶E)
```

Selecting **Yes** overwrites the existing configuration at the selected location.
Select **No** or **Yes** using the ◀ ▶ arrow keys, then press **ENTER**.

6.3.5.2 (SELECT:) Save/Load → Load

```
Load Config from Loc: 9
11:02:43  05/08/05  (▲▼ E)
```

Using **Loc: 9** as the example, if **Load** is selected and there is a configuration stored at the selected location, what displays is similar to the preceding example. Note that the stored configuration is identified with a date and time stamp.

If the selected location contains **no** data, what displays is similar to the next example:

```
Load Config from Loc: 9
Empty              (▲▼ E)
```

Select the location from where the current configuration is to be loaded using the ▲▼ arrow keys, then press **ENTER**. There are 10 locations numbered 0 through 9..

If the selected location contains ***valid*** data, what displays is similar to the following example:

```
New Config has been
Loaded from Loc #      (E)
```

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

If the selected location contains ***invalid*** data, what displays is similar to the next example:

```
Warning! Loc 9 Contains
No Data!               (E)
```

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

6.3.6 SELECT: Util (Utility)

```
UTIL: RT-Clk Ref ID
Display Firmware FAST
```

Select **RT-Clk**, **Ref**, **ID**, **Display**, **Firmware**, or **FAST** using the ◄ ► arrow keys, then press **ENTER**.

6.3.6.1 (SELECT:) UTIL → RT-Clk

```
Edit Real-Time Clock:
10:23:51 23/05/06 (◄ ►▲▼ E)
```

Edit the time and date settings of the real-time clock. Use the ◄ ► arrow keys to select the digit. Use the ▲▼ arrow keys to change the value of the digit, then press **ENTER**.

Note: In accordance with international convention, the date is shown in **DAY/MONTH/YEAR** format.

6.3.6.2 (SELECT:) UTIL → Ref

```
Internal 10 MHz Ref Freq
Fine Adjust:+1911
```

This menu provides a fine adjustment for the internal 10 MHz reference.

For 'Tx Only' or 'Full Duplex' units, use the Tx IF Carrier to check the reference frequency by first placing the unit in the **Tx-CW** mode from the **Test** menu.

In 'Rx Only' units, 10 MHz is available at J6-8 or J6-9 only while within the **Utility: Ref** menu.

6.3.6.3 (SELECT:) UTIL → ID

```
Edit Circuit ID:  (◄ ►▲▼ E)
----------------------
```

To edit the Circuit ID string, select the cursor position on the bottom line using the ◄ ► arrow keys, then edit the selected character using the ▲▼ arrow keys. Note that only the bottom line (0 to 24 characters) is available. The following characters are available:

<Space> ( ) * + - , . / 0-9 and A-Z

When the string has been composed, press **ENTER**.

6.3.6.4 (SELECT:) UTIL →Display

```
Edit Display Brightness:
100%   (▲▼ E)
```

Select a brightness levels of **25%, 50%**, **75%** or **100%** using the ▲▼ arrow keys. Press **ENTER** when done.

6.3.6.5 (SELECT:) UTIL → Firmware

These commands are for DIAGNOSTIC PURPOSES ONLY. DO NOT CHANGE an image unless instructed to do so by Comtech EF Data customer service technicians.

The sub-menus available through **UTIL: Firmware** allow viewing information about the CDM-710G internal firmware. The modem stores two complete firmware images, and the user can select which image will be loaded the next time the unit reboots.

```
Firmware Images:
Info  Select       (◄ ► E)
```

Select either **Info** or **Select** using the ◄ ► arrow keys, then press **ENTER**.

(Firmware:) Firmware Images → Info

```
Firmware Info: Bootrom
Image#1  Image#2
```

To view information on the Bootrom and the two images, select **Bootrom**, **Image#1**, or **Image#2** using the ◄ ► arrow keys, then press **ENTER** to continue.

If **Firmware Info: → Bootrom** is selected:

```
Bootrom:            07/17/06
CDM710_Boot            1.1.1
```

This screen provides information on the installed Bootrom firmware. The release date is provided on the top line in DAY/MONTH/YEAR format; the bottom line identifies the installed Firmware by its release name/number and its version number.

Note: The firmware information shown above is representative. Current status is obtained via the **Firmware Info: → Bootrom** submenu.

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

If **Firmware Info: → Image#1** or **→ Image#2** is selected:

```
Image#X: Bulk   App   Framer
FEC Mod   Demod   Interfaces
```

On the next page, **Table 6-5** provides an overall summary of examples for each available firmware info screen. As shown, the first column for either Image provides the available selection; the second column provides an example of the information provided for that selection.

Note: The information in this table is representative; the firmware numbers/revision letters/versions/release dates are subject to change.

(Firmware:) Firmware Images → Select

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

The top line shows the active image. To select the active software image, on the second line, select the desired image using the ◄ ► arrow keys, then press **ENTER**.

To make the selected image the active choice, power cycle the modem to reboot the new software.

Table 6-5. Summary of Firmware Info Screens (Image#1 and Image#2)

Utility: Firmware → Info → Image#1	
Image#1:	**Bulk App Framer FEC Mod Interfaces**
Bulk	Bulk: 09/04/08 FW00114- 5.1.1.
App	App: 10/16/06 FW00115- 5.1.1
Framer	Framer: 11/08/07 FW12548C 2.3.2
FEC	**Enc-S2 Enc-S Dec-S2**
FEC: Enc-S2	DVB-S2 Enc 09/19/07 FW12439C 1.2.1
FEC: Enc-S	DVB-S Enc 04/03/07 FW12440A 1.0.2
FEC: Dec-S2	DVB-S2 Dec 12/12/07 FW12436B 1.1.3
Mod	**Filters FPGA**
Mod: Filters	Mod Filters: 11/23/05 FW12695- 1.1.1
Mod: FPGA	Mod FPGA 09/12/07 FW12549B 2.2.1
Demod	**Filters UDD Equalizer**
Demod: Filters	Dem Filters: 08/27/06 FW12694- 1.1.1
Demod: UDD	UDD FPGA: 06/12/07 FW12442C 2.4.0
Demod: Equalizer	EQ FPGA: 06/28/07 FW12441- 1.3.0
Interfaces	**E3T3 GBEI HSSI**
Intfc: E3T3	E3T3STS1: 03/21/06 FW10249A 1.0.2
Intfc: GBEI [Note 2]	GBEI: 06/26/07 FW12738A 1.1.9
Intfc: HSSI	HSSI: 11/02/07 FW0000024A 1.0.1a
Intfc2: GBEI [Note 2] (Slot 2 only)	**GBEI: 6/26/07 FW12738A 1.1.9**

Utility: Firmware → Info → Image#2	
Image#2	**Image#2: Bulk App Framer FEC Mod Interfaces**
Bulk	Bulk: 08/15/08 FW00114- 5.1.1
App	App: 06/06/08 FW00115- 5.1.1
Framer	Framer: 11/08/07 FW12548C 2.3.2
FEC	**Enc-S2 Enc-S Dec-S2**
FEC: Enc-S2	DVB-S2 Enc 09/19/07 FW12439C 1.2.1
FEC: Enc-S	DVB-S Enc 04/03/07 FW12440A 1.0.2
FEC: Dec-S2	DVB-S2 Dec 12/12/07 FW12436B 1.1.3
Mod	**Filters FPGA**
Mod: Filters	Mod Filters: 11/23/05 FW12695- 1.1.1
Mod: FPGA	Mod FPGA 09/12/07 FW12549B 2.2.1
Demod	**Filters UDD Equalizer**
Demod: Filters	Dem Filters: 08/27/06 FW12694- 1.1.1
Demod: UDD	UDD FPGA: 06/12/07 FW12442C 2.4.0
Demod: Equalizer	EQ FPGA: 06/28/07 FW12441- 1.3.0
Interfaces	**E3T3 GBEI HSSI**
Intfc: E3T3	E3T3STS1: 03/21/06 FW10249A 1.0.2
Intfc: GBEI [Note 2]	GBEI: 06/26/07 FW12738A 1.1.9
Intfc: HSSI	HSSI: 11/02/07 FW0000024A 1.0.1a

Notes:

1. The following information is representative. Current status is obtained via the **Firmware Info: → Image#***x* submenus.
2. The firmware for the CDI-70 Gigabit Ethernet Interface (GBEI) is installed on the interface itself; information is returned only when a CDI-70 module is installed in Slot 2.

6.3.6.6 (SELECT:) UTIL → FAST

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

Comtech EF Data's FAST (Fully Accessible System Topology) system permits the purchase and installation of options through special authorization codes, entered remotely or through the front panel. FAST allows immediate implementation of different options through the user interface keypad. All FAST options are available through the basic platform unit.

Select either **Cnfg** or **View** using the ◄ ► arrow keys, then press **ENTER**.

(UTIL:) FAST →Cnfg (Configuration)

```
FAST Configuration
Edit Code  Demo Mode
```

Select **Edit Code** or **Demo Mode** using the ◄ ► arrow keys, then press **ENTER**.

If **FAST Configuration: → Edit Code** is selected:

```
Edit 20 digit FAST Code:
00000000000000000000 ENT
```

Enter the code ***carefully*** on the bottom line by using the ◄ ► arrow keys to move to each character position, then editing the character in that position by using the ▲▼ arrow keys. Once the 20-digit FAST Code has been correctly edited into place, press **ENTER**. The CDM-710G will respond with "**Configured Successfully**" if the new FAST option has been accepted:

If **FAST Configuration: → Demo Mode** is selected:

```
FAST Demo Mode: Off On
3888000 seconds remain
```

The **Demo Mode** enables all FAST options for a limited time. For newer units with the latest firmware version, the **Demo Mode** lasts 45 days.

Select **Off** or **On** using the ◄ ► arrow keys, then press **ENTER**. The display indicates the time remaining on the demo counter. The demo time may be paused either by turning demo mode off, or by unplugging the unit. However, whenever the unit is turned back on, the demo counter will resume.

(UTIL:) FAST → View

```
View Options: 01 (▲▼)
IF Modulator Installed
```

Scroll through the available option numbers by using the ▲▼ arrow keys. The description of each option and its installation status (**Installed** or **Not Installed**) appears on the lower line of the display.

Notes:

Chapter 7. WEB SERVER INTERFACE

7.1 Overview

This chapter describes the functionality of the CDM-710G High-Speed Satellite Modem Web Server (HTTP) Interface. Please refer to **Chapter 6. FRONT PANEL OPERATION**, and the Remote Commands Specifications tables found in **Appendix A. REMOTE CONTROL** for detailed descriptions of the configuration parameters featured on the individual Web pages shown in this chapter.

This interface is available via the RJ-45 J4 10/100 Ethernet Remote Port Connector on the rear panel of the CDM-710G. Refer to **Chapter 4. REAR PANEL CONNECTOR PINOUTS (Sect. 4.3.1)** for details and pinout information.

Note: Only one remote method can be in control of either Ethernet or Serial, while the other can be used for query.

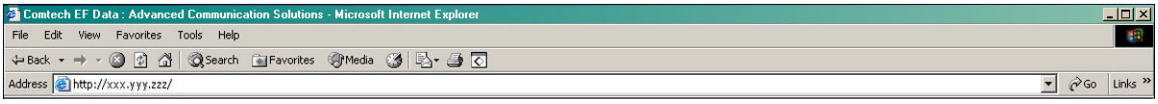
7.1.1 Web Server Interface Introduction

The embedded Web Server application provides the user with an easy to use interface to configure and monitor all aspects of the CDM-710G. These Web pages have been designed for optimal performance when using Microsoft's Internet Explorer Version 5.5 or higher (the examples shown in this chapter use Internet Explorer Version 6.0).

The user can fully control and monitor base operations of the CDM-710G from the Web Server Interface. By rolling the cursor over the navigation tabs located at the top of each page (right), the user can select from the available nested hyperlinks.

7.2 User Login

The Web Server Interface is accessible, using a Web browser, by typing "http://www.xxx.yyy.zzz" in the browser's **Address** box, where "www.xxx.yyy.zzz" is the IP address of the modem (as configured from the CDM-710G front panel menu: **SELECT: CONFIG → Remote → Ethernet → Address.** Refer to **Chapter 6. FRONT PANEL OPERATION** for further details). Additionally, confer with your network administrator to determine the appropriate IP address assignment for your modem.



The user is prompted to type in a valid User Name and Password, similar to the dialogue box shown to the right:

HTTP Login Access Levels, Default User Names and Passwords are defined as follows:

CDM-710G High-Speed Satellite Modem HTTP Login Access Levels			
User Interface	**User Login Access Level**		
	Admin User	**Read/Write User**	**Read Only User**
Web	Full Access to all Web Pages	No Access to Admin Web pages	No Access to Admin or Web pages
		Full Access for all other Web Pages	View Only Access for all other Web Pages

CDM-710G High-Speed Satellite Modem Web Server Default Names/Passwords		
Admin User	**Read/Write User**	**Read Only User**
comtech/comtech	opcenter/1234	monitor/1234

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

IMPORTANT

The Ethernet option must be selected from the CDM-710G Front Panel prior to entering the correct Username and Password. Failure to configure the modem accordingly will cause the Login dialogue box to return the user to a blank window.

Once the valid User Name and Password is accepted, the user will see the CDM-710G High-Speed Satellite Modem Web Server Interface top-level "splash" page:

This splash page identifies the model in use as either the CDM-710G (70/140 MHz) or CDM-710GL (L-Band) Satellite Modem unit. This identification is also provided on each subsequent page under the Comtech EF Data logo at the left-hand top side (as shown at right):

While the CDM-710G Web Server Interface is depicted throughout this chapter, the appearance and function of the CDM-710GL Web Server Interface is, for all purposes, otherwise identical to that of the CDM-710G Web Server Interface.

7.2.1 Web Server Menu Tree

From the splash page, the user has access to five (5) navigation tabs. The following menu tree illustrates the options available through this interface:

Home	Admin	Config Mdm	Stats	Maint
Home	Access	Interface	Modem Status	Unit Info
Contact	Remote	Modem	Events & Statistics	
Support		Modem Utilities		

Click any tab or hyperlink to continue.

7.3 Web Server Page Descriptions

Refer to the following subsections in this chapter for further information about each page available under the tabs that comprise the Web Server Interface:

Interface Tab	Refer to:
Home	**Sect. 7.3.1**
Admin (Administration)	**Sect. 7.3.2**
Config Mdm (Modem Configuration)	**Sect. 7.3.3**
Stats (Status/Statistics)	**Sect 7.3.4**
Maint (Maintenance)	**Sect 7.3.5**

For a complete and detailed description of each configuration parameter available via each page under this interface, refer elsewhere in this manual to **Chapter 6. FRONT PANEL OPERATIONS** or **Appendix A. REMOTE CONTROL**.

7.3.1 Home Page

7.3.1.1 Home | Home Page

Figure 7-1. CDM-710G Satellite Modem Home page

From any location within the Web Server Interface, the user can select the **Home** tab and/or hyperlink to return back to this top-level page.

7.3.1.2 Home | Contact Page

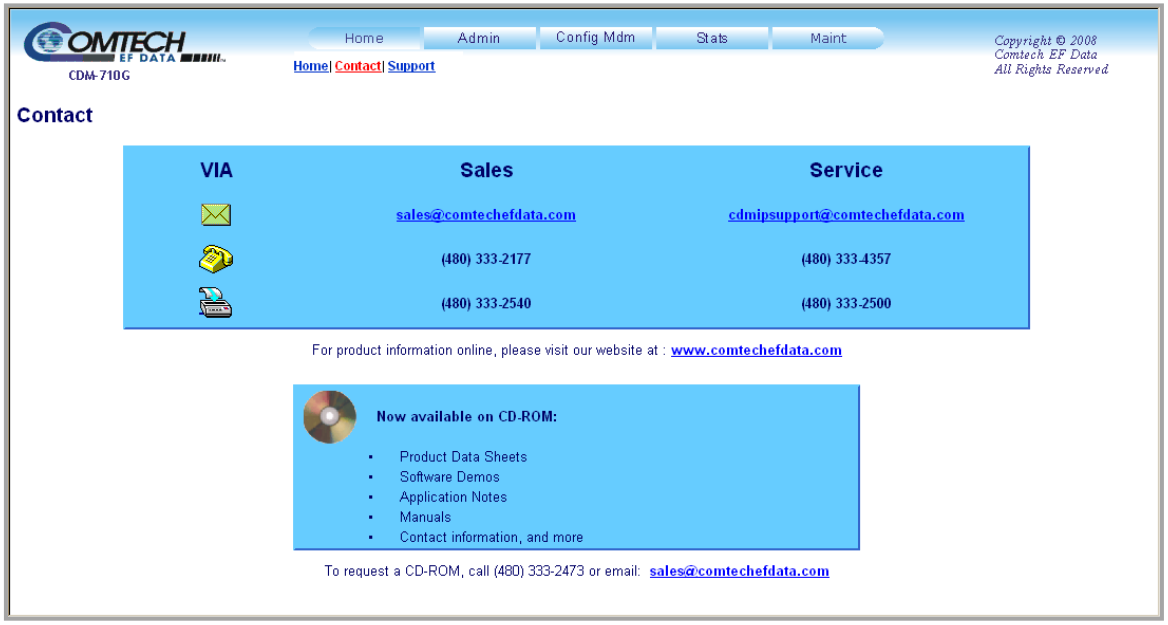


Figure 7-2. Home | Contact Information page

Use the '**Home | Contact'** page (**Figure 7-2**) to obtain basic contact information to reach Comtech EF Data Sales and Customer Support via phone or automated e-mail links.

7.3.1.3 Home | Support Page

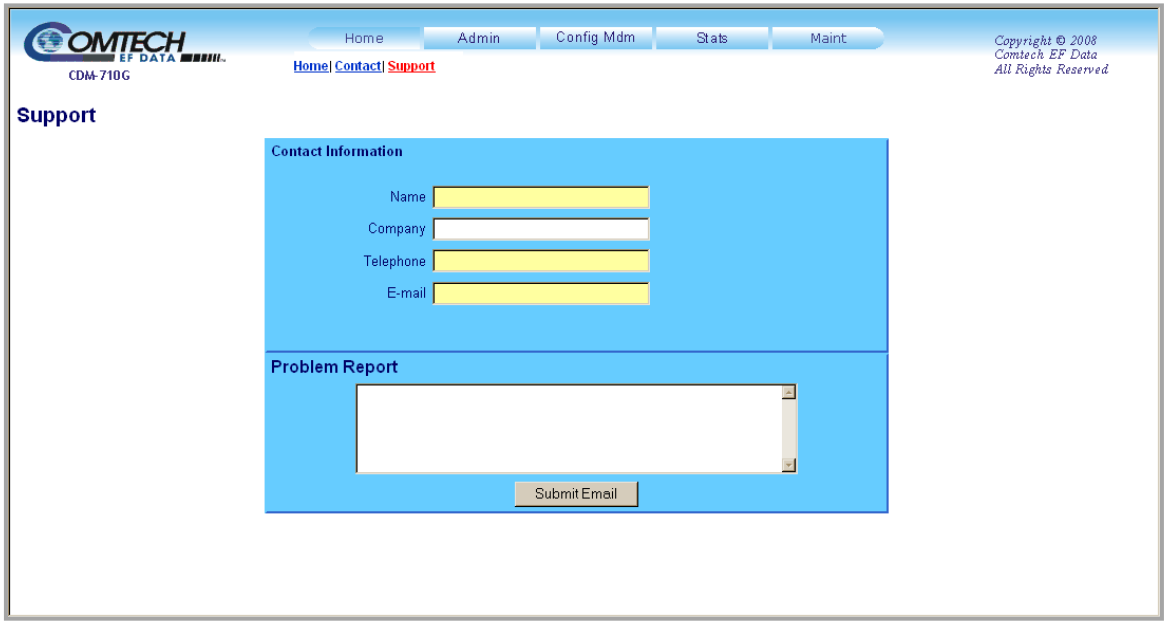


Figure 7-3. Home | Customer Support page

Use the '**Home | Support'** page (**Figure 7-3**) to compose an e-mail message for questions or problems with the modem.

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

The CDM-710G Support Web Page uses Simple Mail Transport Protocol (SMTP) to send E-mail to Comtech EF Data Modem Support (cdmipsupport@comtechefdata.com).

IMPORTANT

For this page to operate correctly, the modem's administrator is required to specify the SMTP server, domain name, and destination on the* Admin | Remote *page (see Sect. 7.3.2.2).

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

7.3.2 Admin Pages

The '**Admin'** pages provide the means to set up the access parameters required to facilitate communication with the CDM-710G Web Server.

IMPORTANT

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

7.3.2.1 Admin | Access

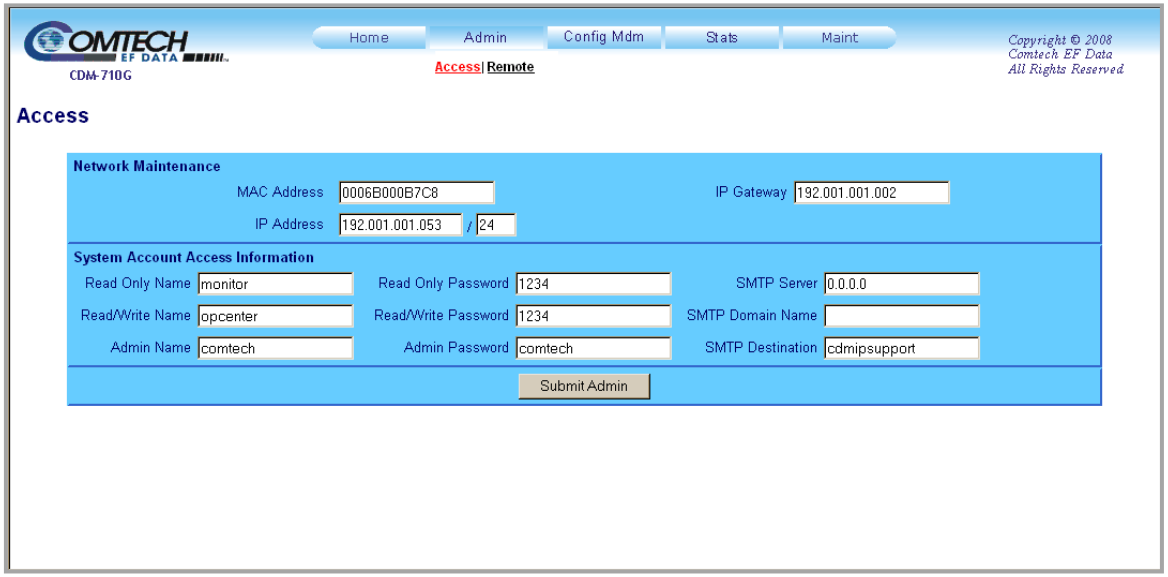


Figure 7-4. Admin | Access page

Use the '**Admin | Access'** page (**Figure 7-4)** as the means to set up user names, passwords, the E-mail server, and the host IP addresses as needed to facilitate communication with the CDM-710G Web Server.

Network Maintenance

- **MAC Address:** This parameter is ***read-only*** and cannot be changed.
- **IP Gateway:** This entry allows a user to specify the IP Gateway Address for the Ethernet M&C port for this unit.
- **IP Address:** This entry allows a user to specify an IP address and a subnet mask to define a unique class of machines that are allowed access.

System Account Access Information

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

  The factory defaults for these names/passwords are:

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

- **Read Only** monitor/1234

Note the following:

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

- **SMTP Server:** Specify the mail server IP address from where you want to send the e-mail.
- **SMTP Domain Name / Destination:** The Administrator can assign the SMTP Domain Name and Destination. This is required if the e-mail feature of the Support Page (Sect. 6.1.4.1.3) is to be used.
  - For **SMTP Domain Name**, specify the domain of the e-mail server (usually found to the right of the @ symbol in an e-mail address).
  - For **SMTP Domain Destination**,specify the e-mail recipient name (usually found to the left of the @ symbol in an e-mail address).

Once the desired configuration settings have been made on this page, click [**Submit Admin]** to save these changes.

7.3.2.2 Admin | Remote

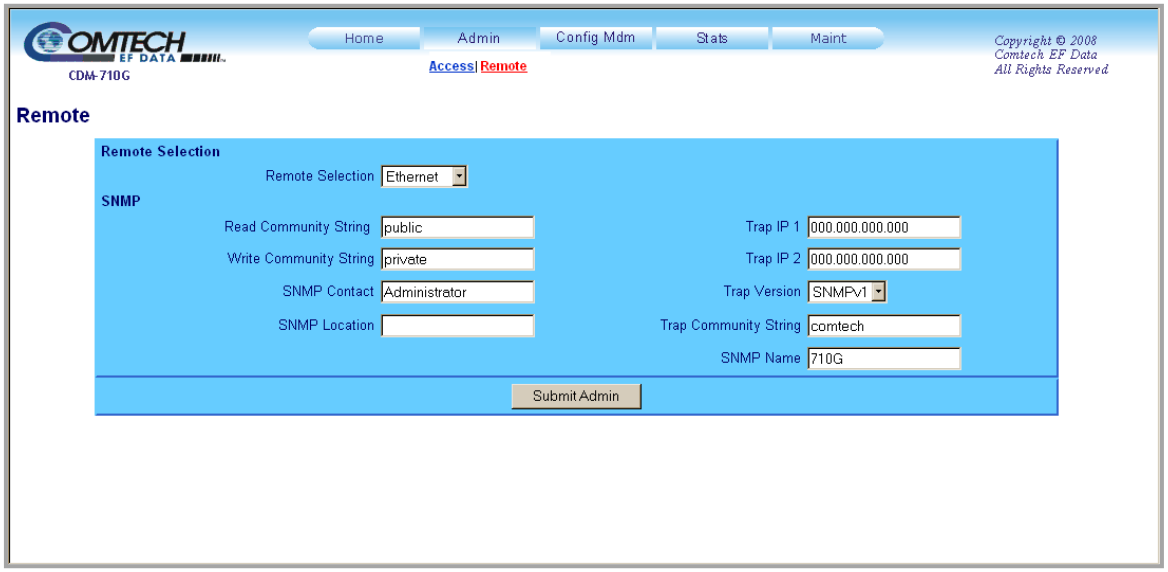


Figure 7-5. Admin | Remote page

Use the '**Admin | Remote'** page (**Figure 7-5**) to set and return administration information for the CDM-710G Simple Network Management Protocol (SNMP) feature.

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

The Administrator can assign a **SNMP Trap Community String**. The factory default for this parameter is **public**. The SNMP Trap Community String field can be any combination of characters and a length of 0 - 20 characters.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 6. FRONT PANEL OPERATION** and **Chapter 8. SNMP INTERFACE**.

Once the desired configuration settings have been made on this page, click **[Submit Admin]** to save these changes.

7.3.3 Config Mdm (Configure Modem)

The '**Config Mdm**' pages (**Figure 7-6** through **Figure 7-9**) are used to configure all modem parameters.

7.3.3.1 Config Mdm | Interface

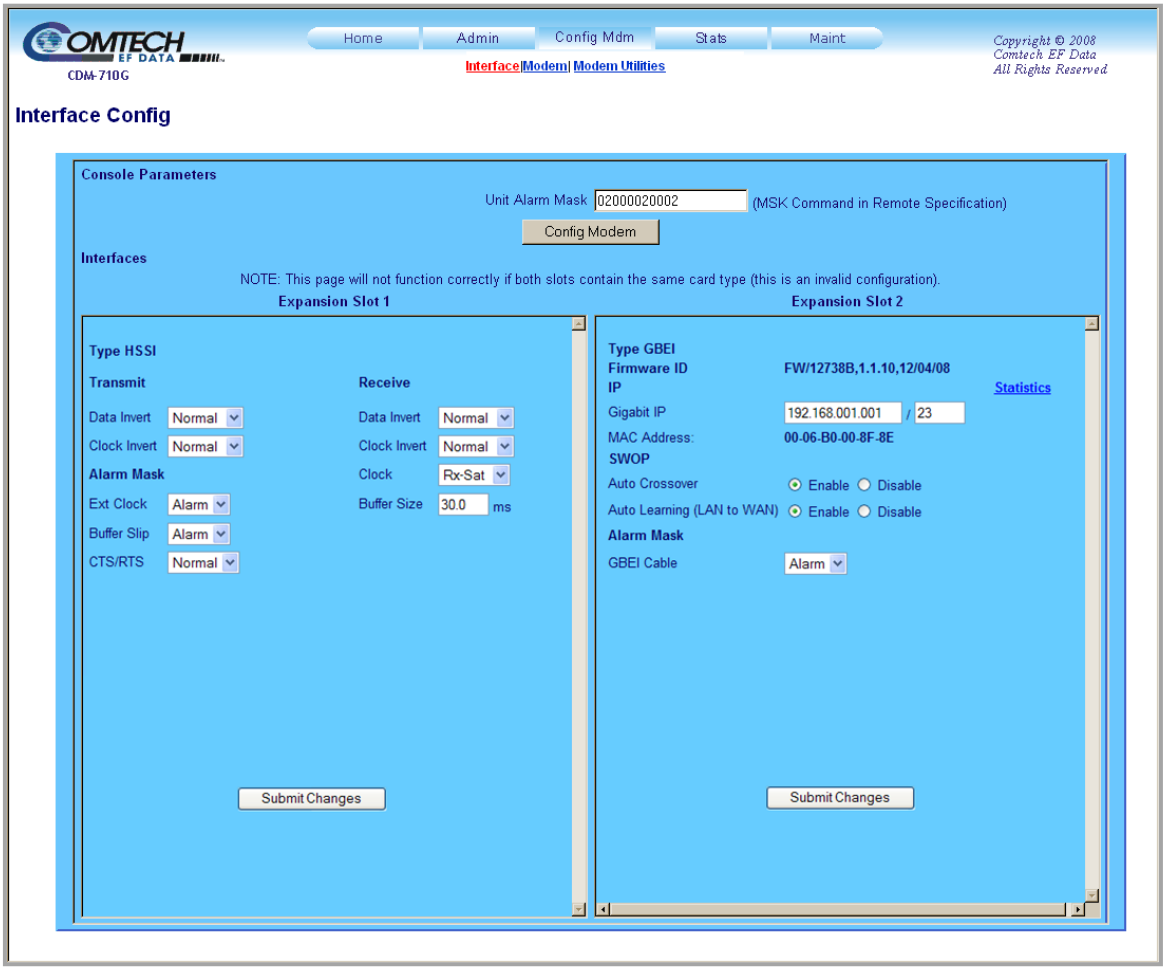


Figure 7-6. Config Mdm | Interface page

Use the '**Config Mdm | Interface**' page (**Figure 7-6**) to configure the modem's installed data interfaces. The appearance of this page is dependent on the interfaces installed in Expansion Slot 1 (Intfc1) and Expansion Slot 2 (Intfc2). In the above example, a CDI-60 HSSI Interface Module has been installed in Expansion Slot 1, and a CDI-70 Gigabit Ethernet Interface (GBEI) Module has been installed in Expansion Slot 2 (for a table of the applicable interfaces and installable combinations, refer to **Sect. 1.3.5 Allowable Data Interface Combinations**).

For either slot, the modem automatically detects the interface present and adjusts the appearance of this page accordingly. If needed, define the desired interface operating parameters, then click [**Submit Changes]** to save these changes.

If there is no interface module present, as shown in **Figure 7-7** the message "**Interface Not Installed.**" is displayed in place of an operable configuration window. In this example, a CDI-10-1 Single G.703 E3/T3/STS1 Interface Module has been installed in Expansion Slot 1, while Expansion Slot 2 is empty:

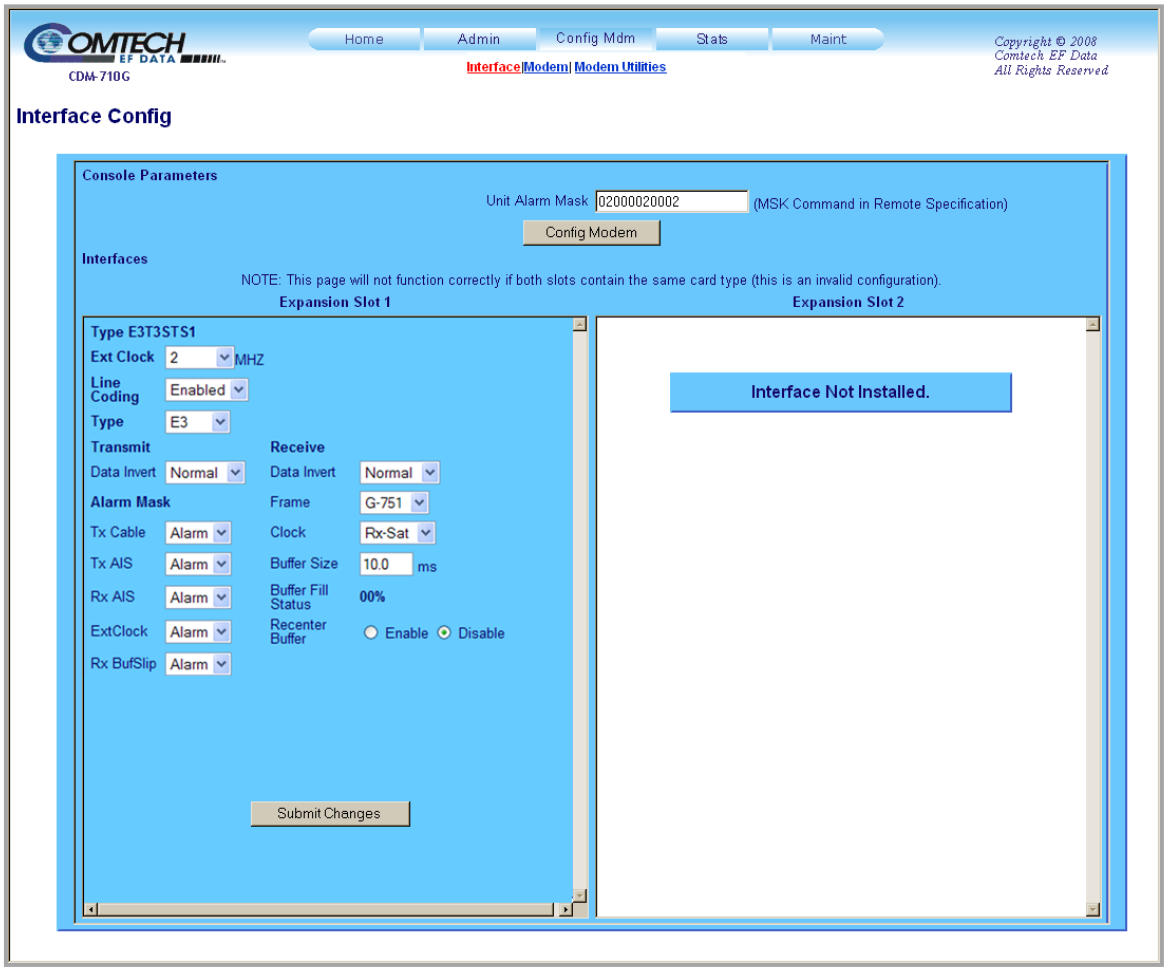


Figure 7-7. Config Mdm | Interface Page (with Empty Slot)

7.3.3.2 Config Mdm | Modem

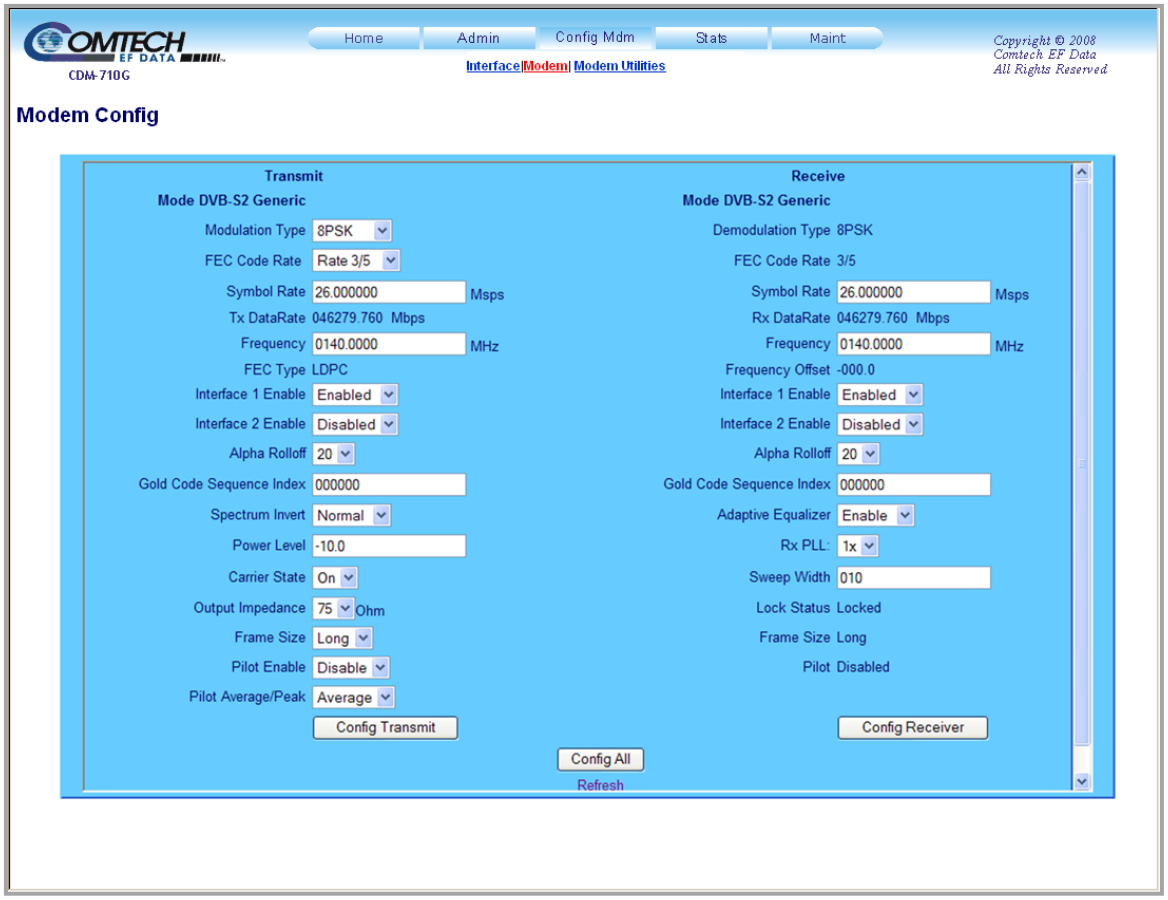


Figure 7-8. Config Mdm | Modem page

Use the '**Config | Modem'** page (**Figure 7-8**) to configure modem DVB-S2 (Generic) operating (Tx / Rx) parameters.

IMPORTANT

The Tx / Rx Interface Types and Framing Modes have higher priority than other parameters, and should be configured before setting other parameters.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 6. FRONT PANEL OPERATION**.

Once the desired configuration settings have been made on this page, click **[Config Transmit], [Config Receiver]**, or **[Config All]** to save these changes.

7.3.3.3 Config Mdm | Modem Utilities

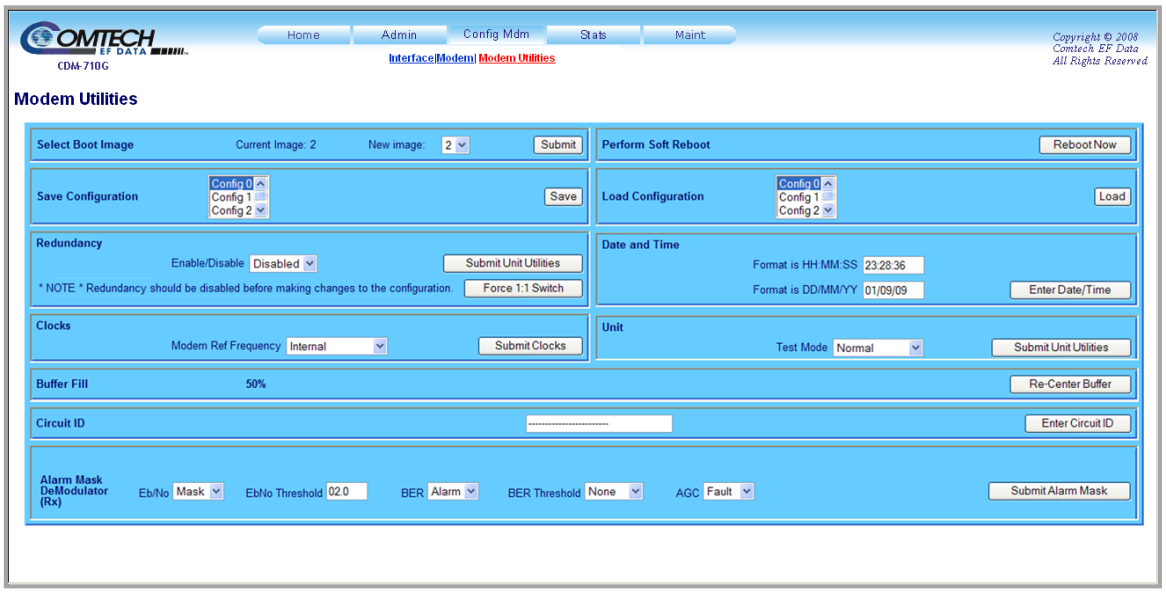


Figure 7-9. Config Mdm | Modem Utilities page

Use the '**Config Mdm | Modem Utilities**' page (**Figure 7-9**) to perform the following Modem Utilities tasks:

- **Selecting the Boot Image;**
- **Performing a Soft Reboot;**
- **Saving and Loading Configurations;**
- **Setting up Redundancy Operation;**
- **Setting the Date and Time;**
- **Setting the Clock Mode;**
- **Selecting the Test Mode;**
- **Re-centering the Buffer;**
- **Assigning a Circuit ID;**
- **Setting the Rx Alarm Masks.**

Once the desired configuration settings have been made in each section, click the action tab provided in that section (e.g., **[Submit]**, **[Save]**, **[Load]**, etc.) to save those changes.

For details pertaining to the configuration parameters available on this page, refer to **Chapter 6. FRONT PANEL OPERATION**.

7.3.4 Stats (Statistics) Pages

The **Stats** pages provide the user with status, event logging, and operational statistics windows.

7.3.4.1 Stats | Modem Status

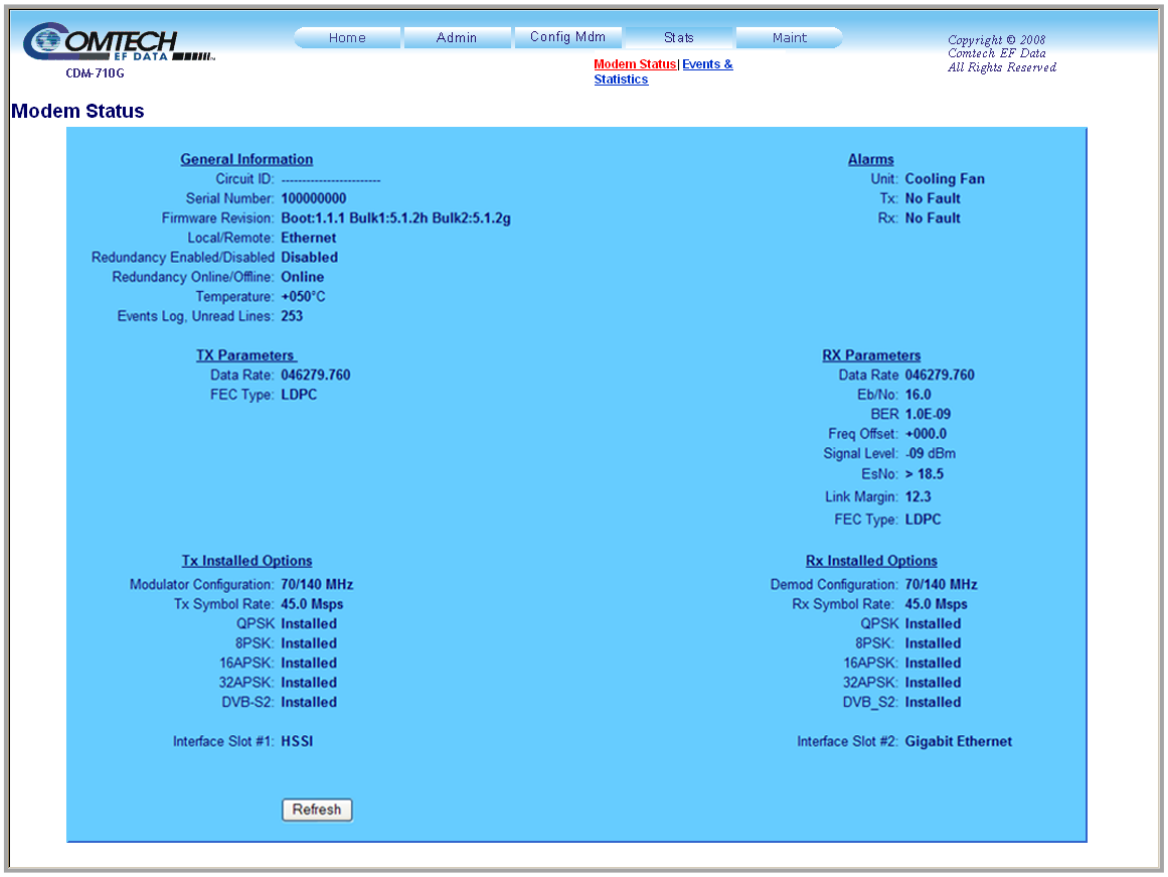


Figure 7-10. Stats | Modem Status page

Use the '**Stats | Modem Status'** page (**Figure 7-10)** to review ***read-only*** status information pertaining to:

- **General modem operating and configuration information;**
- **Alarms;**
- **Tx and Rx Parameters;**
- **Tx and Rx Installed options (Data Interfaces, FAST, etc.).**

Click **[Refresh]** as needed to execute update of the information provided on this page.

7.3.4.2 Stats | Events & Statistics

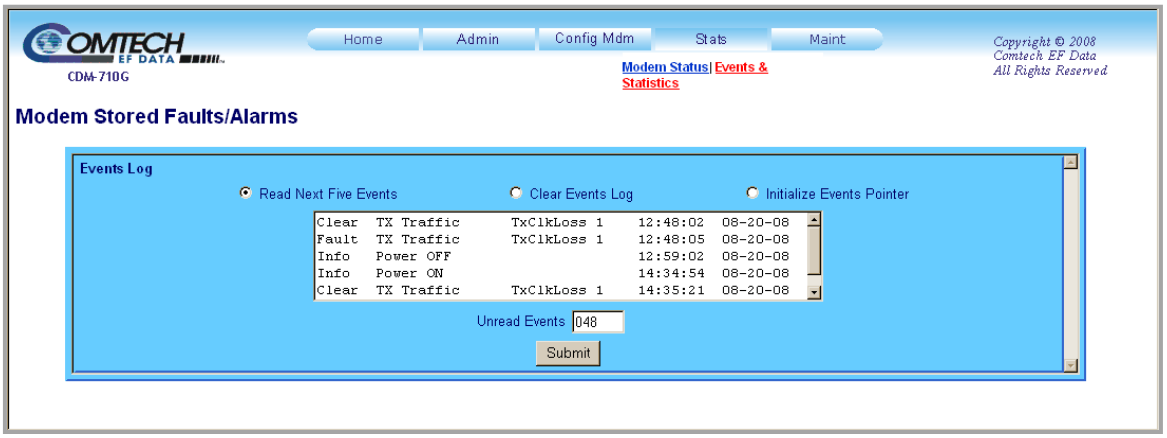


Figure 7-11. Stats | Events & Statistics page

Use the '**Stats | Events & Statistics'** page (**Figure 7-11)** to review a scrollable text record of the modem's stored events.

- **Read Next Five Events:** Select to buffer the next group of five stored events into the scrollable **Events** window.
- **Clear Events Log:** Select to wipe clean the stored events log.
- **Initialize Events Pointer:** Select to reset the log's internal pointer.
- **Unread Events:** Displays the total number of *unread* stored events in the **Events** window. As stored event groups are displayed, this number adjusts downward accordingly.

Once the desired settings have been entered, click **[Submit]** as needed to execute update of the scrollable window contents.

7.3.5 Maint | Unit Info Page

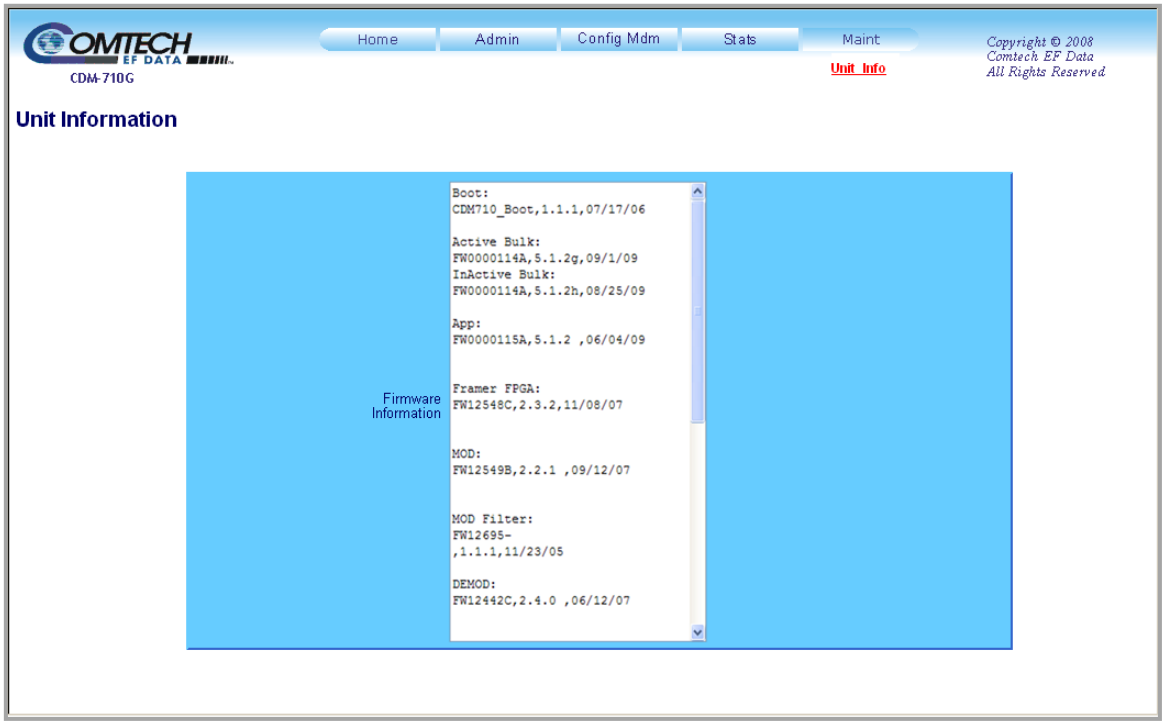


Figure 7-12. Maint | Unit Info page

Use the '**Maint | Unit Info**' page (**Figure 7-12**) to review a *read-only*, scrollable status window which provides information about the currently loaded Bootrom; for Image 1 and Image 2, the user can scroll through information of all the constituent firmware blocks that make up the bulk.

Chapter 8. SNMP INTERFACE

8.1 SNMP Interface

The *Simple Network Management Protocol* (SNMP) is an application-layer protocol designed to facilitate the exchange of management information between network devices. The CDM-710G SNMP agent supports both SNMPv1 and v2c.

IMPORTANT

For proper SNMP operation, the CDM-710G MIB files must be used with the associated version of the CDM-710G modem M&C Software. Refer to the CDM-710G SW Release Notes for information on the required FW/SW compatibility.

8.2 Management Information Base (MIB) Files

MIB files are used for SNMP remote management and consist of Object Identifiers (OIDs). Each OID is a node that provides remote management of a particular function. A MIB file is a tree of nodes that is unique to a particular device.

There are three MIB files associated with the CDM-710G:

MIB File/Name	Description
Fw10874-2-.mib ComtechEFData MIB file	ComtechEFData MIB file gives the root tree for ALL Comtech EF Data products and consists of only the following OID: **Name:** comtechEFData **Type:** MODULE-IDENTITY **OID:** 1.3.6.1.4.1.6247 **Full path:** iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).comtechEFData(6247) **Module:** ComtechEFData
Fw0000116-.mib CDM-710G Common MIB file	CDM-710G High Speed modem family common components.
Fw0000117-.mib CDM-710G Traps MIB file	CDM-710G High Speed modem family Trap MIB file is provided for SNMPv1 traps

These MIB files should be compiled in a MIB Browser or SNMP Network Monitoring System server.

Note: The CDM-710G SNMP agent supports both SNMPv1 and v2c. The CDM-710G/ 710GL Traps file only needs to be compiled if SNMPv1 traps are to be used.

8.3 SNMP Community Strings

The CDM-710G uses community strings as a password scheme that provides authentication before gaining access to the CDM-710G agent's MIBs.

In SNMP v1/v2c, the community string is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern. A packet sniffer can easily obtain the community string by viewing the SNMP traffic on the network.

The community string is entered into the MIB Browser or Network Node Management software and is used to authenticate users and determine access privileges to the SNMP agent.

The user defines three Community Strings for SNMP access:

- Read Community default = **public**
- Write Community default = **private**
- Trap Community default = **comtech**

8.4 SNMP Traps

The CDM-710G has the ability to send out SNMP traps when certain events occur in the modem. For example, the CDM-710G also sends out traps when an alarm or a fault occurs in the modem. These include unit faults, TX faults, and RX faults. A trap is sent both when a fault occurs and is cleared.

The following SNMP traps are provided:

- Unit Alarm
- TX Traffic Alarm
- RX Traffic Alarm
- Clear Stored Events
- Monitor Interface Redundancy Switch State

8.5 Common Private MIB

The CDM-710G SNMP agent also implements private MIBs. The CDM-710G Common MIB holds all unit parameters not associated with Modulator, Demodulator, FEC, or Interface boards.

For detailed OID information please refer to the actual MIB file.

System Information Group	Provides hardware configuration information as well as serial and model numbers
Remote Serial Group	Provides parameters to the legacy serial interface parameters
Remote Ethernet Group	Provides parameters of the Ethernet interface
Ethernet SNMP Group	Provides parameters necessary to configure the SNMP interface
Interface TX Group	Provides parameters that control the modulator options
Interface RX Group	Provides parameters that control the demodulator options
Config Interface Group	Provides parameters for selection of the modems frequency response
Monitor Group	Provides access to Alarm/Fault/Events log
Save/Load Group	Provides control of the unit configuration Store/Load capabilities
Utilities Group	Provides access to the units Real-Time clock, Internal Reference Adjustment, Circuit ID, and Front Panel Brightness Control
Firmware Group	Provides Revision Numbers, and Release Dates for all firmware within the unit
Modulator Private MIB	Provides access to all modulator specific functions such as redundancy, GigE Interface, HSSI Interface, and G.703 Interface

Notes:

Chapter 9. TELNET INTERFACE

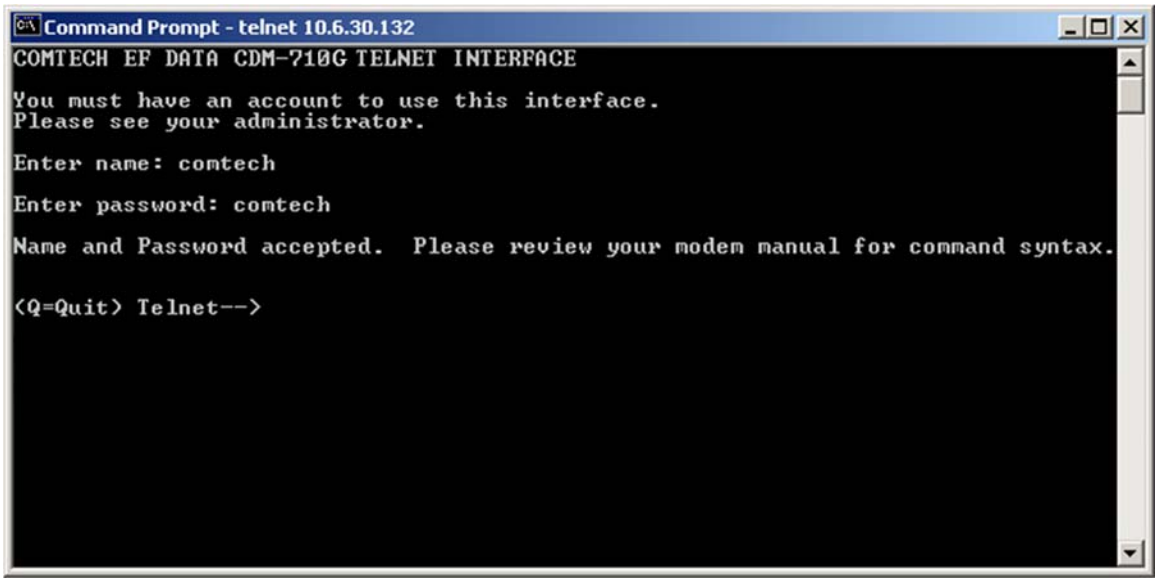
9.1 Telnet Interface

The CDM-710G High-Speed Satellite Modem provides a Telnet interface for two primary functions:

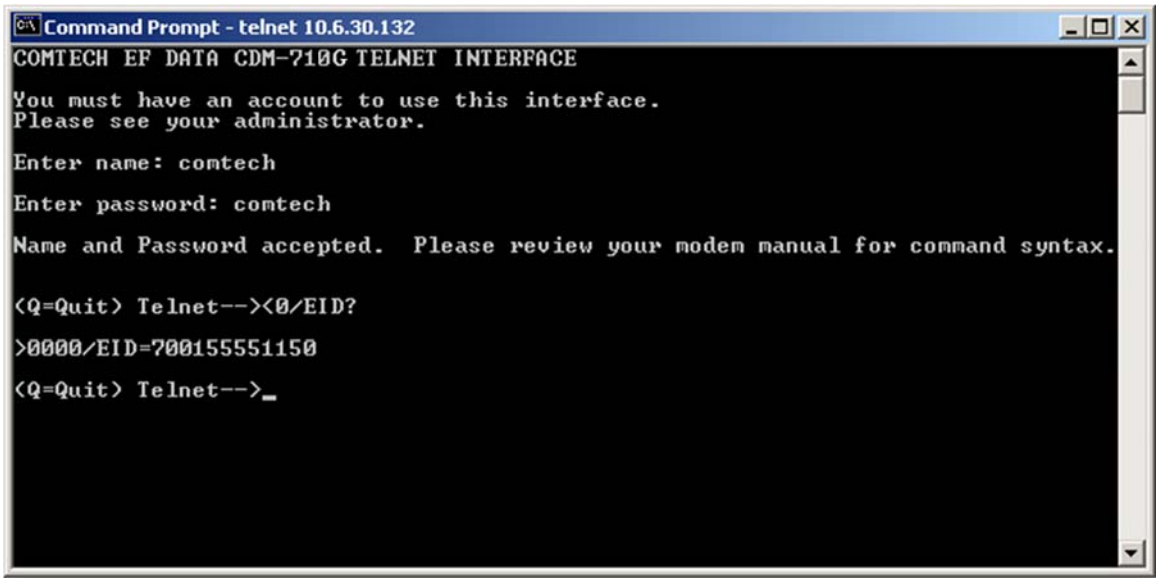
- Equipment M&C via the standard equipment Remote Control protocol.
- Equipment M&C via Comtech Monitor and Control System (CMCS) application.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level.

The login process is shown in the following example:



Once logged into the Telnet interface as the Administrator, the user can access the standard remote control interface defined in **Appendix A. REMOTE CONTROL**, as shown in this example:

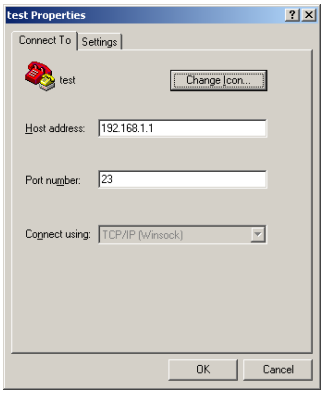


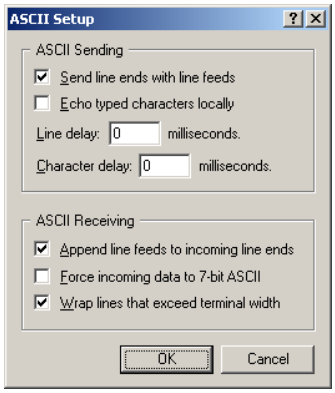
9.2 Caution Using Windows Telnet Client

There is a disadvantage when using Windows DOS as Telnet Client. Since Windows DOS cannot translate a '\r' to a '\r\n' for the messages coming from Telnet Server, the multi-line command response (for example, **FRW?** response) will be displayed as one line, with the latter lines overwriting the previous lines.

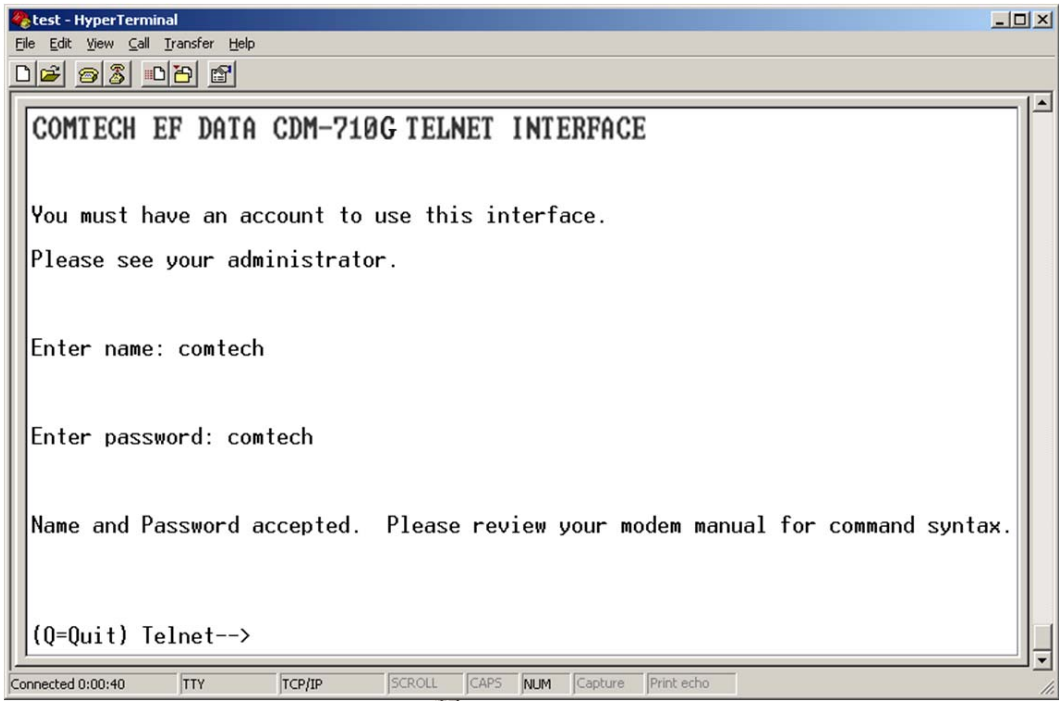
In order to view the full response messages, CEFD recommends using HyperTerminal configured as Telnet Client. To do so, configure the HyperTerminal as following:

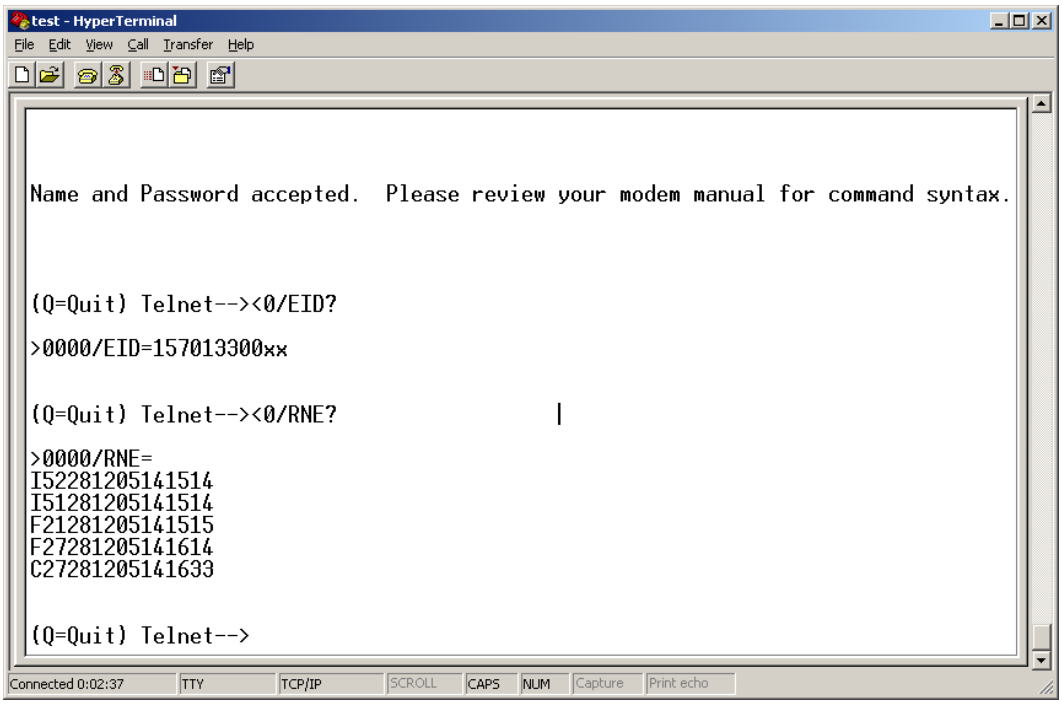
1. Connect using TCP/IP instead of COM1 or COM2 (see example shown at left).
2. ASCII setup: Check both the "Send line ends with line feeds" and "Append line feeds to incoming line ends" options (see example to right).





The following screen captures depict examples of HyperTerminal configured as Telnet Client:





9.3 Using Telnet

Please refer to **Appendix A. REMOTE CONTROL** in this manual for the syntax and list of commands and status queries for the modem.

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

To summarize:

- Start of Packet is either a '<' or a '>' where '<' is used to send a command/query to the modem and '>' is the modem response.
- Defines the address of the modem (always is 0 in RS-0232).
- The 3 digit instruction code of the specific command/query.
- Instruction Code Qualifier. When sending, = will set a parameter, ? is used to query.
- The modem response will be either =, ?, !, *, #, or ~ (see the specific definitions in the Remote Control Section).
- Optional argument.
- End of packet (CR).

9.3.1 Telnet Examples

1. A controller sends the following command to the modem to program its Tx frequency:

   <0135/TFQ=0070.2345 {CR}

   The modem returns:

   >0135/TFQ=

2. The message below requests Tx frequency status:

   <0654/TFQ?

   The modem response is:

   >0654/TFQ= 0070.2345 {CR}{LF}

Chapter 10. CLOCK MODES

10.1 Introduction

This chapter describes the various clocking options that are available with the CDM-710G High-Speed Satellite Modem. The CDM-710G allows the operation of single ports on single data interfaces plugged into the two slots at the rear of the modem. For the most part, each port operates independently and generally does the clocking for each port. When dealing with satellite modems, the subject of clocking often becomes a complex issue.

The CDM-710G is always **D**ata **C**ommunications **E**quipment (DCE) and is normally connected to **D**ata **T**erminal **E**quipment (DTE).

Figure 10-1 presents a diagram of a typical interface; a general description of the clocking and clock modes is provided below. The particular clocking modes available depend upon the data interface and its characteristics. The available clocking for each data interface module is discussed in the chapter sections that follow. For further information about the specific interface, refer to its pertinent interface chapter in this manual.

Ext Ref	This signal is applied to J7 on the rear of the modem; it is located on the main part of the modem – not on a data interface module. The modem locks its internal IF synthesizers and signal processing circuitry to the **Ext Ref** signal. It is a low-phase noise, highly stable signal. When the **Ext Ref** is used, it replaces the internal reference (**Int Ref**) oscillator (10 MHz) inside the modem and it is the master reference for all signals in the modem. It is normally the source for ST clock.
Ext Clk	This input appears on some data interface modules. It is associated only with the clock circuitry in the data interface and is not linked to the internal IF synthesizers. When an **Ext Clk** signal is used in conjunction with a G.703 port, this is the signal used to derive a signal to clock out the Rx Buffer.
Int Clk	The **Int Clk** or **Internal Clock** is the actual signal used on the data interface module. It is derived from either the **Ext Ref** or **Int Ref** oscillator in the main part of the modem – not from the data interface.
Tx-Terr	The signal sent to the modem by equipment external to the modem is the **Tx-Terr** clock. It is SD on a G.703 interface, and TT on the HSSI interface. The modem dejitters and phase locks to this signal and uses it to clock data into the modem.
Rx-Sat	**Rx-Sat** is the clock derived from the signal received from the satellite. It is the signal sent from the distant end plus Doppler induced by the motion of the satellite. **Rx-Sat** is the clock exiting the modem (RD or RT) when the Rx Buffer is disabled.

Rx Loop-Timed	In **Rx Loop-Timed** applications, **ST** is derived from the **Rx-Sat** clock. Depending upon the interface, the Tx clock and Rx clock may be the same or different rates.
Buffer Enabled	When the Rx Buffer is enabled, one of several clocks is available to clock receive data out of the modem and send the received data to the DTE, depending upon the data interface. The Rx Buffer Clocks include **Tx-Terr** (TT or SD), **Int Clk** (derived from **Int Ref** or **Ext Ref**) or **Ext Clk**. Some interfaces require the Tx = Rx data rate and other allow Tx ≠ Rx.

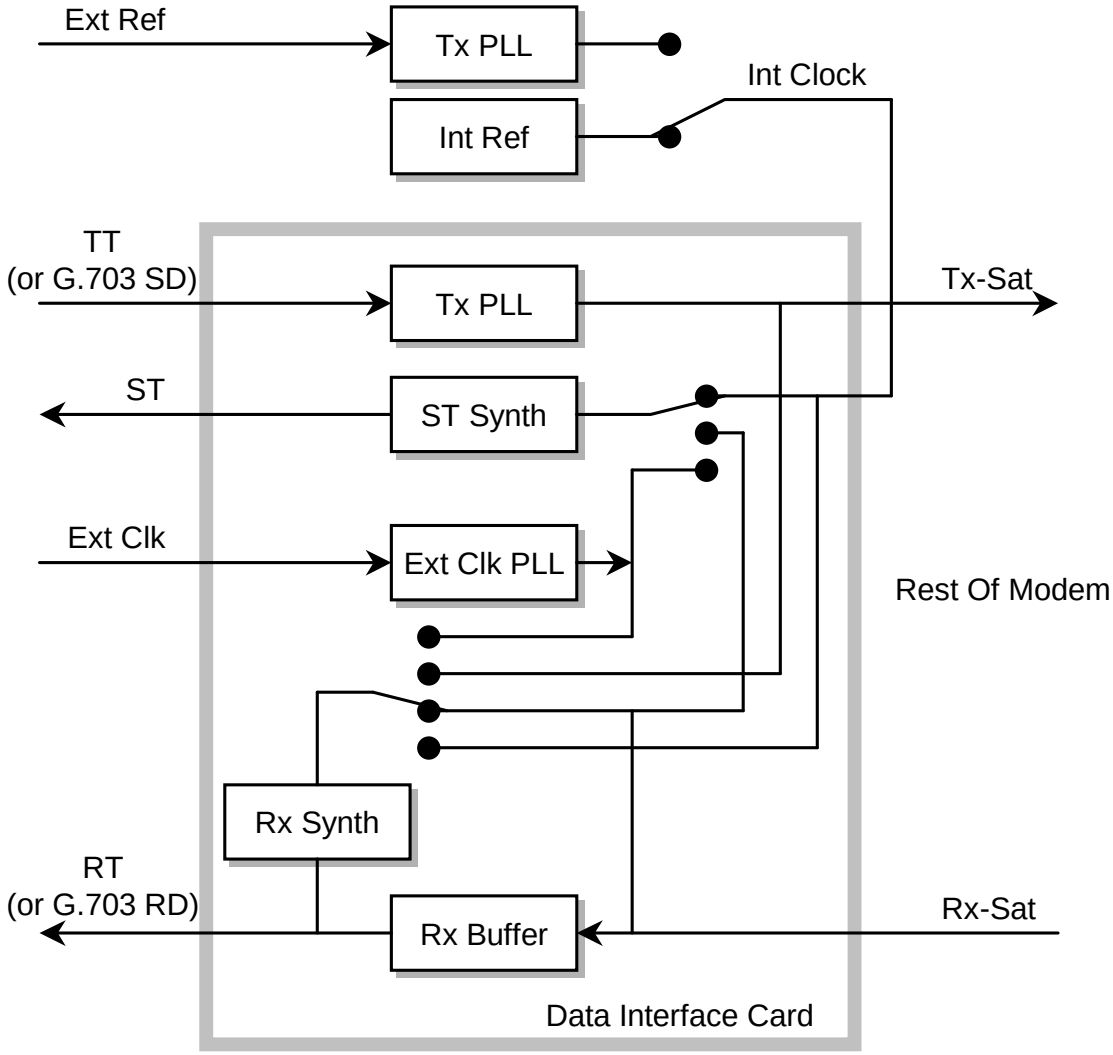


Figure 10-1. Typical Data Interface (Features Vary By Interface)

10.2 CDI-10-1 Single G.703 Interface

The CDI-10-1 Single G.703 interface has a single port that operates at an E3, T3, or STS-1 data rate. A port is a Tx/Rx pair. **Figure 10-2** shows the interface.

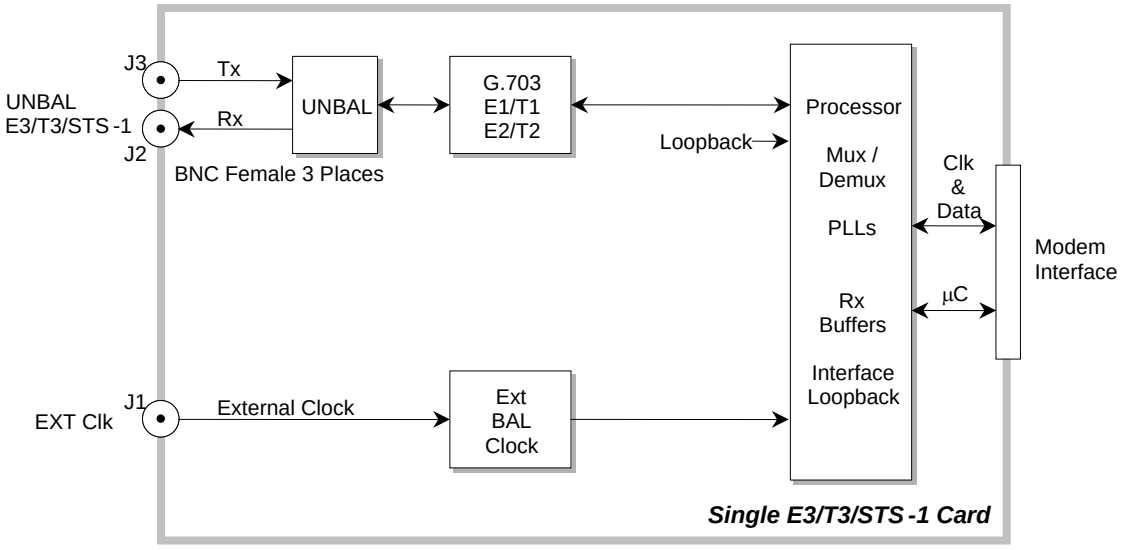


Figure 10-2. CDI-10-1 Single G.703 Interface

10.2.1 CDI-10-1 Single G.703 Interface Transmit Clocking

For the G.703 interface, the only clock allowed is the SD signal applied to the Tx input. Internal Clock and Rx Loop-Timed operation do not apply to G.703 applications.

10.2.2 CDI-10-1 Single G.703 Interface Receive Clocking

When the Rx Buffer is disabled, the receive clock is the Rx-Sat. In this mode, ensure the Rx Buffer is set to minimum to reduce latency.

When the Rx Buffer is enabled, the Rx clock selections are as follows:

Rx-Sat (default)	Selecting this clock disables the Rx Buffer because the input and output clocks are both Rx-Sat. Normally, the Rx Buffer is set for minimum when Rx-Sat is selected.
Tx-Terr	Uses the clock from the Tx input (SD) to clock out the Rx Buffer. The Tx and Rx data rates are the same on this interface, so asymmetrical data rates where Tx ≠ Rx is not permitted. The two data ports are independent, so Port 1 may have a different data rate than Port 2.
Ext-Clk	Derives a clock from a signal input to the **Ext-Clk** connector on the E3/T3/STS-1 Interface Module, not J7 on the modem.

10.3 CDI-60 HSSI Interface

The CDI-60 HSSI Interface has a single rate programmable port. **Figure 10-3** shows the interface.

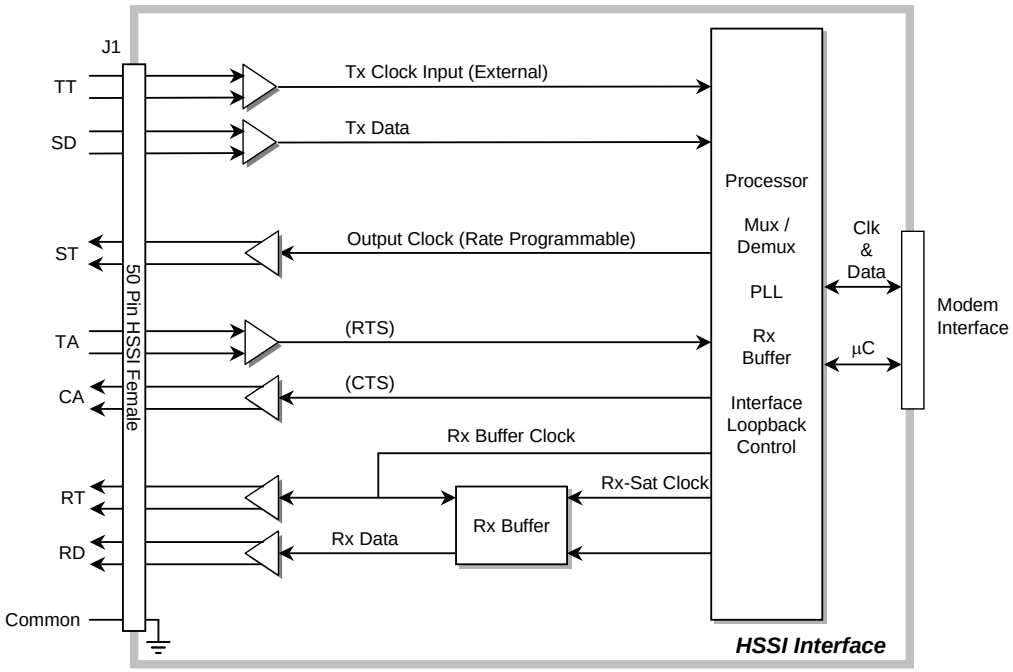


Figure 10-3. CDI-60 HSSI Data Interface

10.3.1 CDI-60 HSSI Interface Transmit Clocking

TT is the transmit clock source for the HSSI interface. It is sent in conjunction with the data, SD, by the DTE to the modem. The data interface dejitters and phase locks to the TT clock rate.

Internal clocking – where ST is supplied to the DTE and TT is not returned to the modem – is not allowed. Programming the Tx data rate at the interface programs the clock rate for ST sent to the DTE. When operating with HSSI interfaces, always send ST to the DTE and assure that TT derived from ST is delivered to the DCE.

Rx Loop-Timed – where ST is programmed to a rate derived from the Rx-Sat clock from the satellite – is not available. For loop timed operation, disconnect ST at the DTE and connect RT from the DCE (modem) to both RT and ST at the DTE.

10.3.2 CDI-60 HSSI Interface Receive Clocking

When the Rx Buffer is disabled the receive clock is the Rx-Sat. In this mode make sure the Rx Buffer is set to minimum to reduce latency.

When the Rx Buffer is enabled the Rx clock selections are as follows:

Rx-Sat (default)	Effectively disables the Rx Buffer because the input and output clocks are the same. Normally, the Rx Buffer is set for minimum when Rx-Sat is selected. This is the selection usually used with routers.
Tx-Terr	Uses the clock from the Tx input (TT) to clock out the Rx Buffer. The Tx and Rx data rates may differ on this interface, and asymmetric clocking where data rate for Tx ≠ Rx is allowed.
Internal	The **Internal Clock** comes from the modem It is derived from either the **Ext Ref** (J7) or **Int Ref** oscillator in the main part of the modem, not from the data interface.

10.4 CDI-70 10/100/1000 Base-T Gigabit Ethernet (GigE) Interface

There are no transmit or receive clocking options for the Gigabit Ethernet Interface:

- The Tx or Rx data rate is programmed into the data interface and the established rate data is passed between the interface and the modem.
- Transmit data is accepted at the data interface at the native Ethernet rate and placed in a buffer for transfer to the modulator at the programmed Tx data rate.
- Rx data from the satellite is placed in a buffer and assembled into packets and sent to the terrestrial interface at the Ethernet rate.

Notes:

Chapter 11. FORWARD ERROR CORRECTION OPTIONS

11.1 Introduction

DVB-S2 has defined a new generation of performance that boosts throughput by about 30% over the same transponders using a new type coding that exceeds the capability of concatenated Viterbi and Reed Solomon coding.

The CDM-710G High-Speed Satellite Modem operates with error correction base upon the DVB-S2 standard: QPSK, 8PSK, 16APSK and 32APSK with concatenated Low Density Parity Code (LDPC) and Bose-Chaudhuri-Hocquenghem (BCH).

11.2 LDPC and BCH

LDPC and BCH is a concatenation technique. LDPC is a very powerful coding scheme with significant, Near-Shannon Bound Performance. In some cases, as the carrier-to-noise ratio increases, the LDPC error correction starts flaring toward an error floor so BCH error correction follows LDPC and eliminates the flare for any practical range of error rates.

LDPC also functions differently than Viterbi decoding by using iterative decoding. In this process the data initially corrected by the LDPC decoder is re-encoded and run through the decoder again to correct additional errors. Key to this is the soft decision output from the LDPC decoder and a high-speed processor operating at a rate much higher than the data rate. The LDPC decoder runs the iterative process as many times as possible before corrected data is finally outputted to make way for a new block of data entering the decoder. LDPC also uses interleaving to spread the errors. In contrast, Viterbi error correction operates by passing data through the convolutional error correction process a single time.

The error correcting capability of LDPC is improved by using large block sizes. This also increases latency. However, in one-way broadcast applications this is not a drawback. Links with LDPC normally operate at multi-megabit data rates where latency effects are reduced. The standard block size for LDPC is 64,800 bits, and for lower data rate applications there is a short frame block at 16,800 bits that suffers only a small error correcting loss (0.2 to 0.3 dB) compared to the standard block.

11.2.1 Range of Data Rates

For a detailed Data Rate Range refer to **Sect. 1.6 SUMMARY OF SPECIFICATIONS**.

11.2.2 Eb/No, Es/No Spectral Efficiency and Occupied Bandwidth

Depending upon the operating mode DVB standard uses different modes of specifying performance with a modem in IF Loop and Additive White Gaussian Noise (AWGN):

- **DVB-S2 (QPSK, 8PSK, 16APSK and 32APSK with LDPC and BCH):** PER (packet error rate) = 10-7 after LDPC and BCH at the specified Es/No. This is a theoretical value with perfect carrier recovery and symbol synchronization, and no modem oscillator phase noise. The manufacturer decides the implementation margin and specifies performance.

The other difference is the use of PER (packet error rate) based upon a 188 or 204 byte MPEG frame size instead of BER (bit error rate).

Note: The CDM-710G uses only a 188 byte MPEG frame size.

Also, note the use of Es/No instead of Eb/No. When links operate at constant symbol rate so this is good method for comparing the performance of different modulation types and code rates.

The relation between the two quantities is given by:

Eb/No = Es/No - 10xLog(Spectral Efficiency)

The tables that follow provide the spectral efficiency DVB-S2 schemes. Another useful parameter is the occupied bandwidth is the bandwidth between -10 dB points of the power spectral density, which are approximately:

Occupied Bandwidth = 1.19 x Symbol Rate, for 35% Rolloff
= 1.15 x Symbol Rate, for 25% Rolloff
= 1.12 x Symbol Rate, for 20% Rolloff

Figure 11-1 through **Figure 11-4** illustrate the error performance characteristics.

Table 11-1. Occupied Bandwidth for DVB-S2 Standard FECFrame = 64, 800 bits

(QPSK 1/4, 1/3 and 2/5 are for information purposes)

Type	Inner FEC Code	**Es/No At PER = 10^{-7}	Pilots Off			Pilots On		
			Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	* Occupied BW for 10 Mbps (25% Rolloff)	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	* Occupied BW for 10 Mbps (25% Rolloff)
QPSK	1/4	-1.85	0.490243	2.040	23.458	0.478577	2.090	24.030
QPSK	1/3	-0.74	0.656448	1.523	17.519	0.640827	1.560	17.946
QPSK	2/5	0.20	0.789412	1.267	14.568	0.770627	1.298	14.923
QPSK	1/2	1.50	0.988858	1.011	11.630	0.965327	1.036	11.913
QPSK	3/5	2.73	1.188304	0.842	9.678	1.160026	0.862	9.914
QPSK	2/3	3.60	1.322253	0.756	8.697	1.290788	0.775	8.909
QPSK	3/4	4.53	1.487473	0.672	7.731	1.452076	0.689	7.920
QPSK	4/5	5.18	1.587196	0.630	7.245	1.549426	0.645	7.422
QPSK	5/6	5.68	1.654663	0.604	6.950	1.615288	0.619	7.119
QPSK	8/9	6.70	1.766451	0.566	6.510	1.724416	0.580	6.669
QPSK	9/10	6.92	1.788612	0.559	6.430	1.746049	0.573	6.586
8PSK	3/5	6.20	1.779991	0.562	6.461	1.739569	0.575	6.611
8PSK	2/3	7.32	1.980636	0.505	5.806	1.935658	0.517	5.941
8PSK	3/4	8.61	2.228124	0.449	5.161	2.177525	0.459	5.281
8PSK	5/6	10.15	2.478562	0.403	4.640	2.422276	0.413	4.748
8PSK	8/9	11.49	2.646012	0.378	4.346	2.585924	0.387	4.447
8PSK	9/10	11.78	2.679207	0.373	4.292	2.618365	0.382	4.392
16APSK	2/3	9.97	2.637201	0.379	4.361	2.574613	0.388	4.467
16APSK	3/4	11.21	2.966728	0.337	3.876	2.896320	0.345	3.971
16APSK	4/5	12.03	3.165623	0.316	3.633	3.090495	0.324	3.721
16APSK	5/6	12.61	3.300184	0.303	3.485	3.221863	0.310	3.569
16APSK	8/9	13.89	3.523143	0.284	3.264	3.439530	0.291	3.343
16APSK	9/10	14.13	3.567342	0.280	3.224	3.482680	0.287	3.302
32APSK	3/4	13.73	3.703295	0.270	3.105	3.623332	0.276	3.174
32APSK	4/5	14.64	3.951571	0.253	2.910	3.866247	0.259	2.974
32APSK	5/6	15.28	4.119540	0.243	2.792	4.030589	0.248	2.853
32APSK	8/9	16.69	4.397854	0.227	2.615	4.302894	0.232	2.673
32APSK	9/10	17.05	4.453027	0.225	2.583	4.356875	0.230	2.640

* Taken at the -10 dB points on the plot of power spectral density, the occupied bandwidth is 1.19 x Symbol Rate for 35%, and 1.15 x Symbol Rate for 25%.

** Includes implementation loss.

Table 11-2. Occupied Bandwidth for DVB-S2 Short FECFrame = 16,200 bits*

(QPSK 1/4, 1/3 and 2/5 are for information purposes)

Type	Inner FEC Code	***Es/No At PER = 10^{-7}	Pilots Off			Pilots On		
			Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	** Occupied BW for 10 Mbps (25% Rolloff)	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (= Bit Rate x)	** Occupied BW for 10 Mbps (25% Rolloff)
QPSK	1/4	-1.55	0.365324	2.737	31.479	0.357467	2.797	32.171
QPSK	1/3	-0.44	0.629060	1.590	18.281	0.615532	1.625	18.683
QPSK	2/5	0.50	0.760928	1.314	15.113	0.744564	1.343	15.445
QPSK	1/2	1.80	0.848840	1.178	13.548	0.830585	1.204	13.846
QPSK	3/5	3.03	1.156532	0.865	9.944	1.131661	0.884	10.162
QPSK	2/3	3.90	1.288400	0.776	8.926	1.260693	0.793	9.122
QPSK	3/4	4.83	1.420269	0.704	8.097	1.389725	0.720	8.275
QPSK	4/5	5.48	1.508181	0.663	7.625	1.475747	0.678	7.793
QPSK	5/6	5.98	1.596093	0.627	7.205	1.561768	0.640	7.363
QPSK	8/9	7.00	1.727961	0.579	6.655	1.690800	0.591	6.802
QPSK	9/10	7.22	NA	NA	NA	NA	NA	NA
8PSK	3/5	6.50	1.725319	0.580	6.665	1.692033	0.591	6.797
8PSK	2/3	7.62	1.922040	0.520	5.983	1.884959	0.531	6.101
8PSK	3/4	8.91	2.118761	0.472	5.428	2.077885	0.481	5.534
8PSK	5/6	10.45	2.381056	0.420	4.830	2.335120	0.428	4.925
8PSK	8/9	11.79	2.577778	0.388	4.461	2.528046	0.396	4.549
8PSK	9/10	12.08	NA	NA	NA	NA	NA	NA
16APSK	2/3	10.27	2.548792	0.392	4.512	2.505223	0.399	4.590
16APSK	3/4	11.51	2.809662	0.356	4.093	2.761633	0.362	4.164
16APSK	4/5	12.33	2.983575	0.335	3.854	2.932574	0.341	3.921
16APSK	5/6	12.91	3.157488	0.317	3.642	3.103514	0.322	3.705
16APSK	8/9	14.19	3.418357	0.293	3.364	3.359924	0.298	3.423
16APSK	9/10	14.43	NA	NA	NA	NA	NA	NA
32APSK	3/4	14.03	3.493093	0.286	3.292	3.419165	0.292	3.363
32APSK	4/5	14.94	3.709309	0.270	3.100	3.630805	0.275	3.167
32APSK	5/6	15.58	3.925526	0.255	2.930	3.842446	NA	NA
32APSK	8/9	16.99	4.249850	0.235	2.706	4.159906	0.240	2.764
32APSK	9/10	17.35	NA	NA	NA	NA	NA	NA

* Es/No for short FECFrame is about 0.3 dB higher than the standard. Values in the table are approximate.

** Taken at the -10 dB points on the plot of power spectral density, the occupied bandwidth is 1.19 x Symbol Rate for 35% and 1.15 x Symbol Rate for 25%

*** Includes implementation loss.

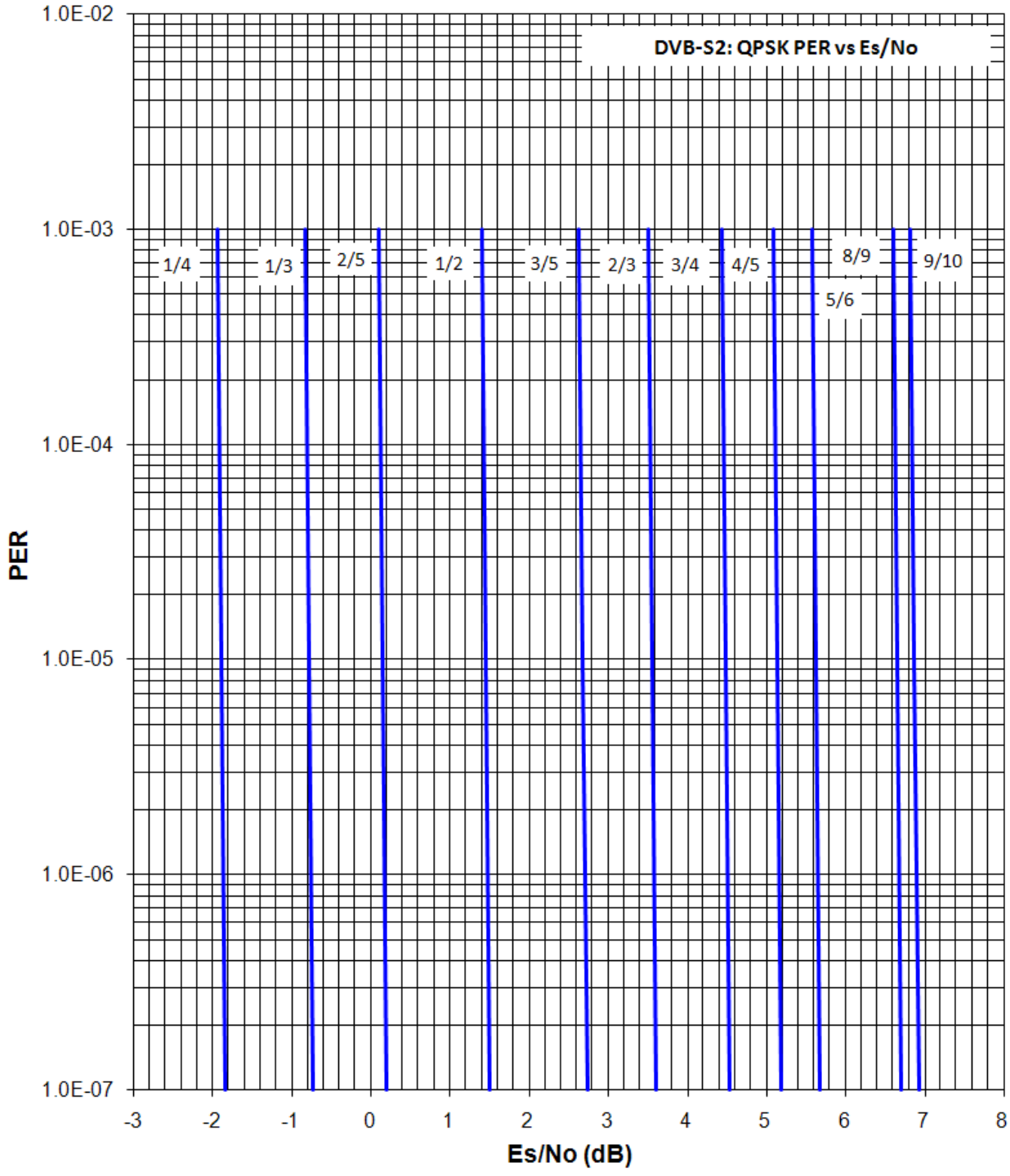


Figure 11-1. DVB-S2 QPSK Packet Error Rate versus Es/No
(QPSK 1/4, 1/3, and 2/5, Information Only)

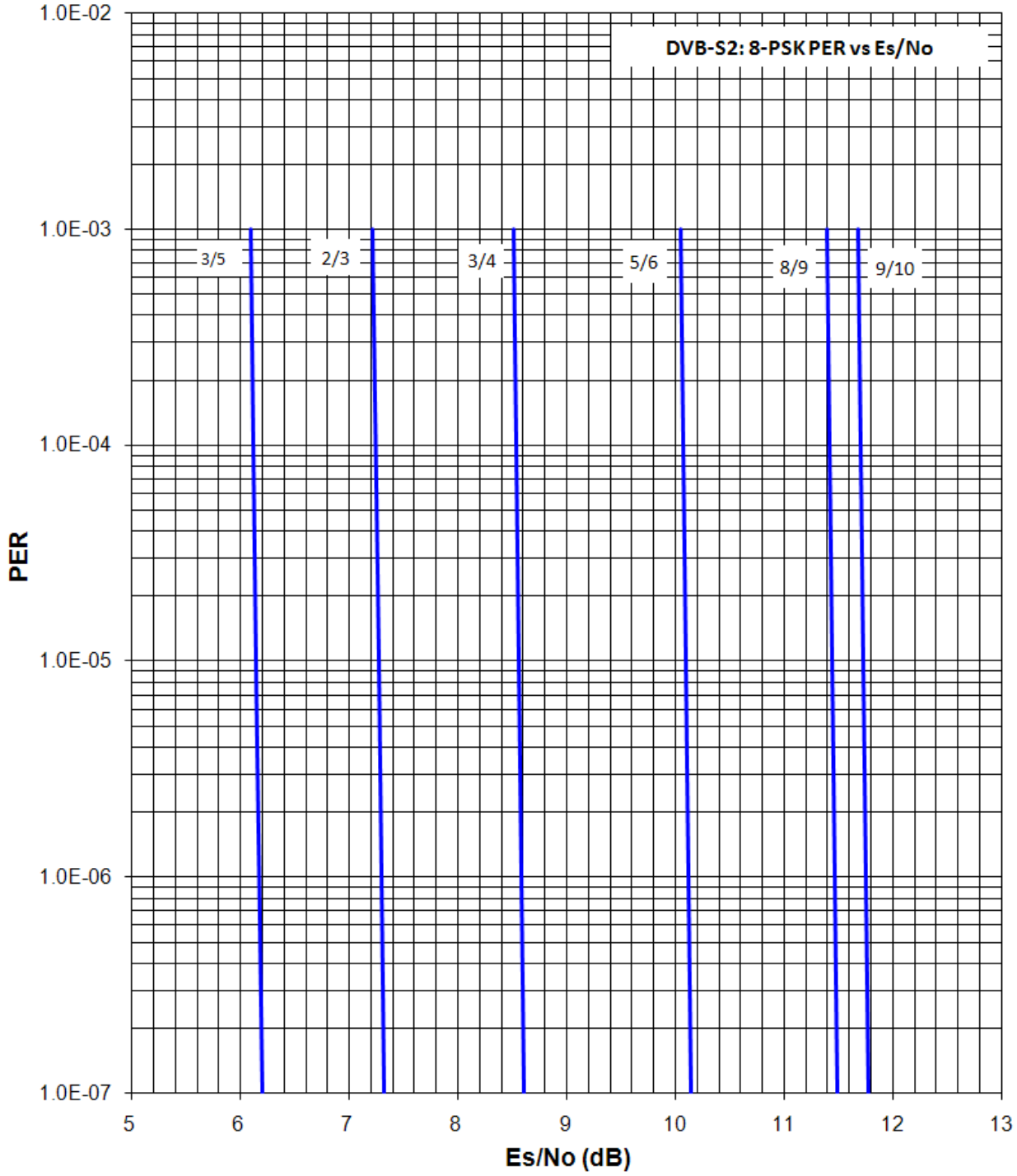


Figure 11-2. DVB-S2 8PSK Packet Error Rate versus Es/No

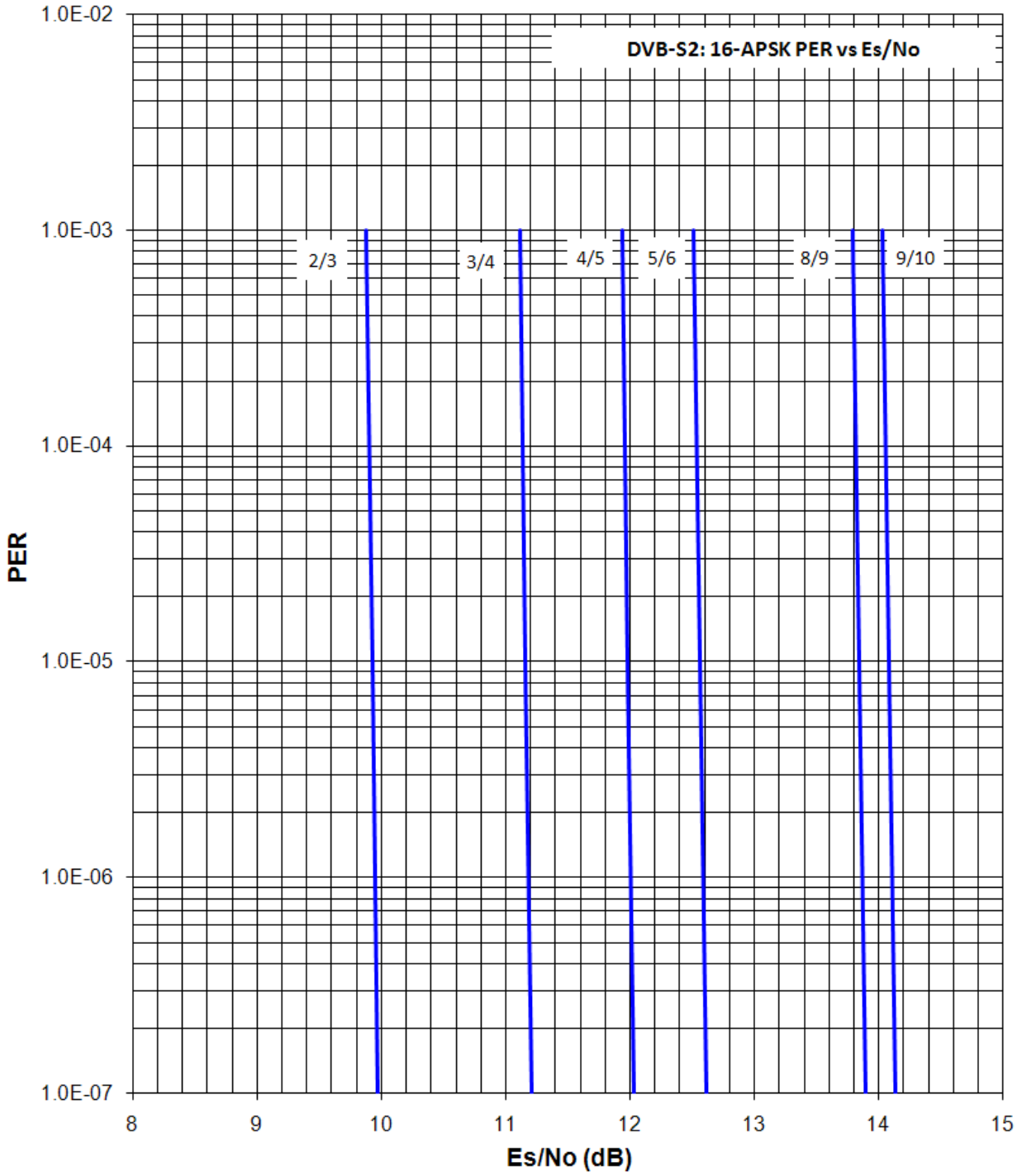


Figure 11-3. DVB-S2 16APSK Packet Error Rate versus Es/No

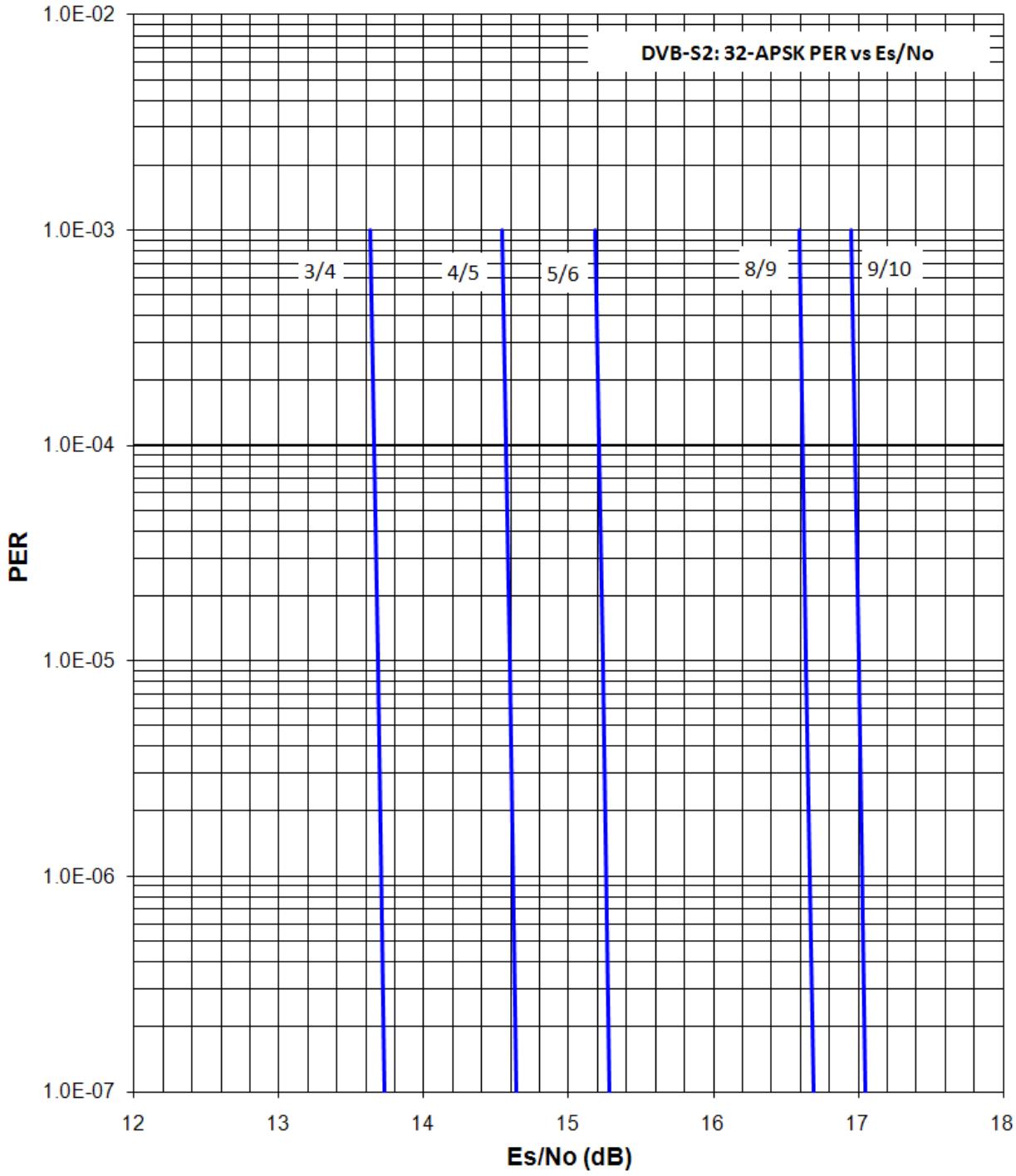


Figure 11-4. DVB-S2 32APSK Packet Error Rate versus Es/No

11.3 End-to-End Processing Delay (Latency)

For DVB-S2 operation with the Gigabit Ethernet and HSSI Data Interfaces, the effects of delay through the modulator and demodulator are more problematic at low data rates and generally negligible at higher data rates.

Delay for the Gigabit Ethernet and HSSI interfaces is shown in **Figure 11-5** and **Figure 11-6** with the Rx Buffer (HSSI) at minimum. In packet networks, minimum Rx Buffer is the normal setting. Expected performance for the G.703 interface is similar to HSSI.

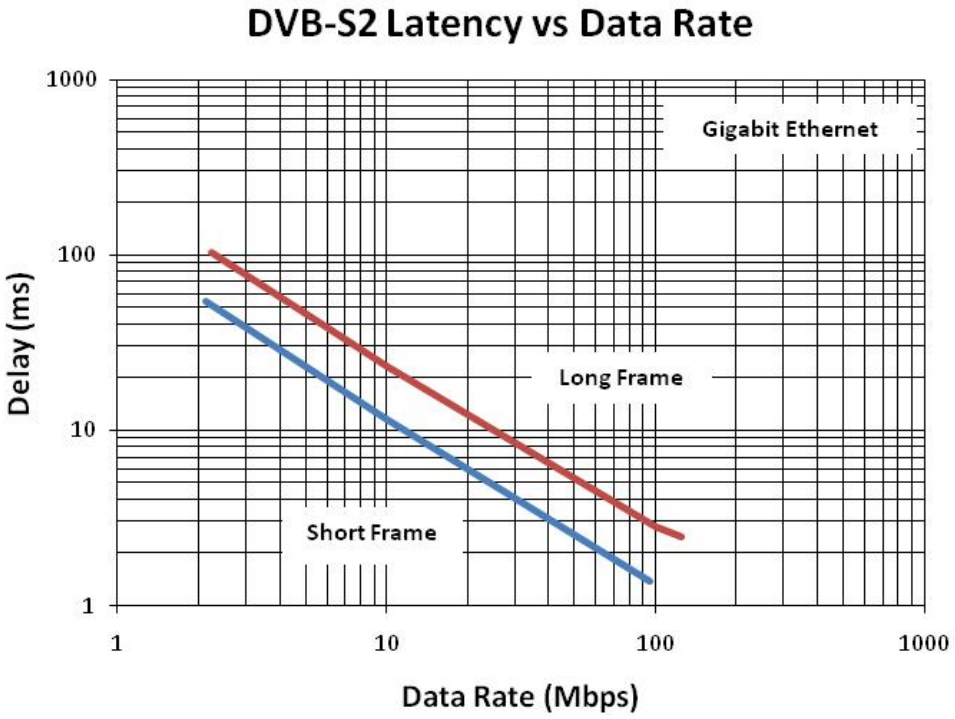


Figure 11-5. CDM-710G Gigabit Ethernet Latency With Modem In IF Loopback

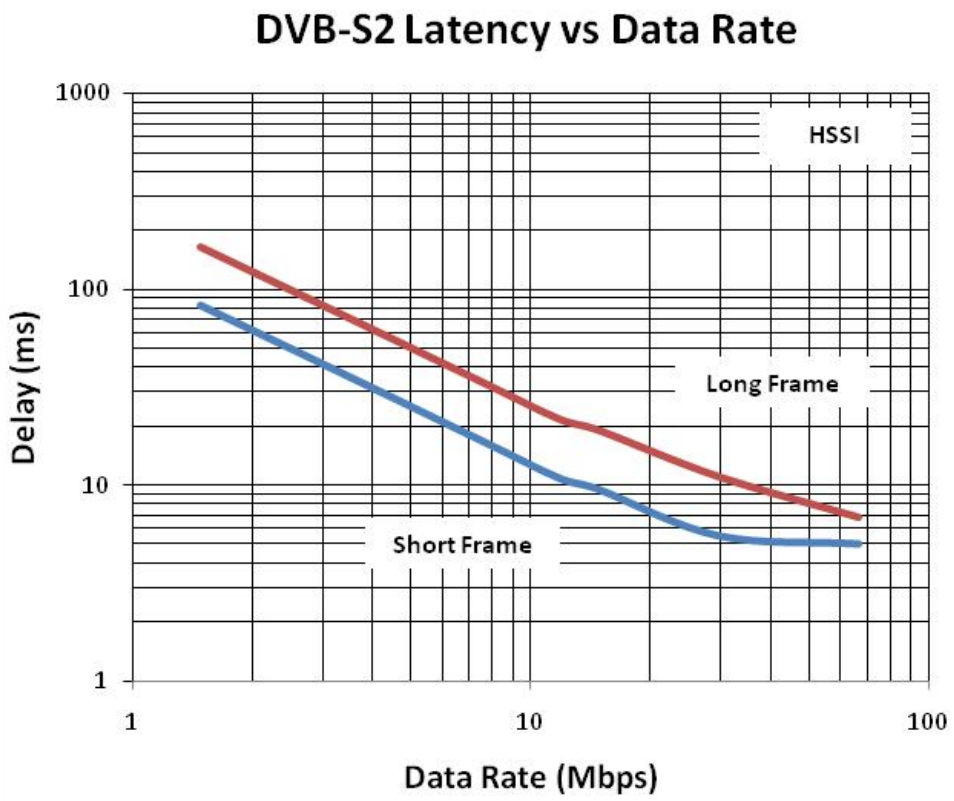


Figure 11-6. CDM-710G HSSI Latency With Modem In IF Loopback

Chapter 12. SINGLE G.703 (E3/T3/STS-1) INTERFACE (CDI-10-1)

12.1 Introduction

The CDI-10-1 Single E3/T3/STS-1 Data Interface (**Figure 12-1**) is a plug-in module that is installed into the rear of the CDM-710G High-Speed Satellite Modem chassis. It provides physical and electrical connection between the external terrestrial device and the internal circuitry of the modulator or demodulator.

Figure 12-1. CDI-10-1 Single G.703 (E3/T3/STS-1) Data Interface Module

By convention, a modem is **D**ata **C**ommunications **E**quipment (DCE) where Tx data enters the data interface and Rx data exits. The plug-in interface has full duplex capability. In addition, the module is automatically configured for simplex-transmit or simplex-receive operation when the module is plugged into a simplex chassis configured for 'modulator only' or 'demodulator only' operation.

Slot 1 of the CDM-710G – located at the center right of the chassis rear panel – is filled with a data interface module first; Slot 2 – located at the right side end of the chassis rear panel – is assigned a blank panel or a CDI-70 10/100/1000 Base-T Gigabit Ethernet interface, depending upon configurations allowed at time of order.

For a table of the applicable interfaces and installable combinations, refer to **Sect. 1.3.5 Allowable Data Interface Combinations**.

12.2 Physical Description

Figure 12-2 depicts the block diagram of the interface; **Figure 12-3** shows the rear panel of the interface. The data interfaces provided here are as follows (left to right):

- External Clock Input Port (J1)
- The CDI-10-1 module provides a Single G.703 Interface Port – Rx / J2 (top) and Tx / J3 (bottom) – that is operable/selectable as **E3**, **T3**, **STS-1** or **OFF**.

Additionally, a Light-Emitting Diode (LED) labeled **Active** lights when G.703 data activity is sensed.

Refer to the next section for connector information.

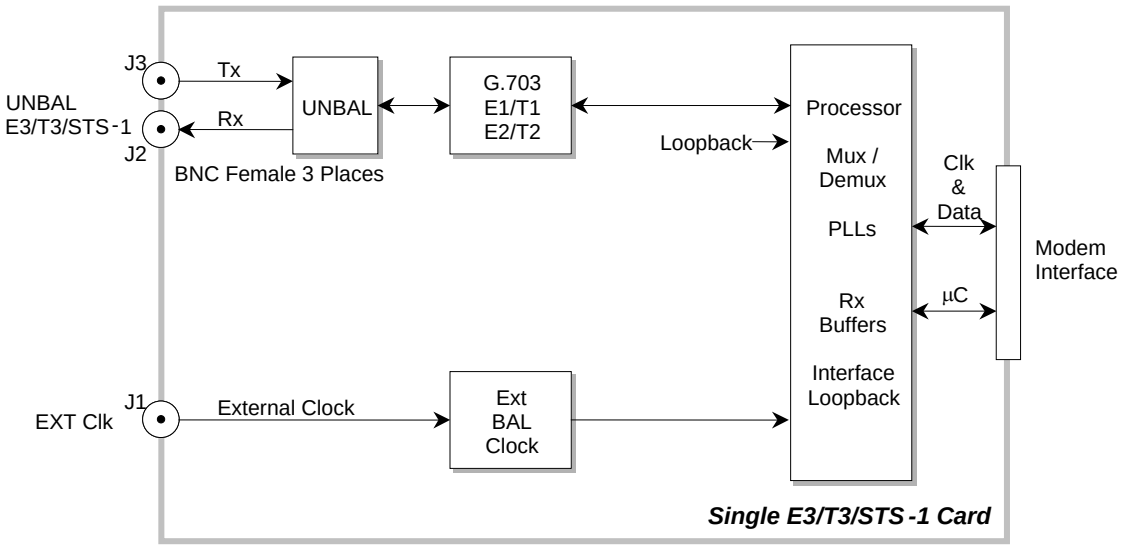


Figure 12-2. CDI-10-1 Block Diagram

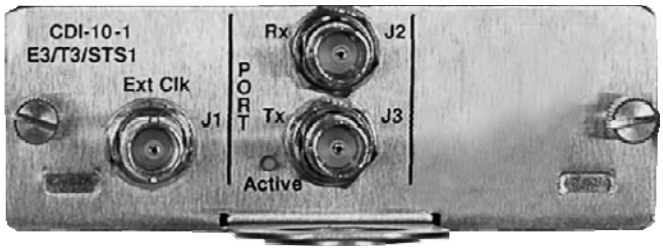
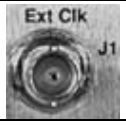


Figure 12-3. CDI-10-1 Rear Panel View

12.3 CDI-10-1 Connector Pinouts

Connector	Description	Direction	Connector Type
	Ext Clk J1	In	BNC Female
	Rx J2	Data Out	
	Tx J3	Data In	

12.4 Summary of Specifications

Item			Requirements		
General	Interfaces		1 each Independent G.703 ports, E3, T3, and STS-1		
	External Clock Input		1 input		
	Interface Selection		Each of the interfaces is individually enabled		
	Rx Buffer: G.703 Frame Types		Type	Bits	Bytes
			G.751 G.752 G.753 STS-1	1536 4760 2148 6480	192 595 268.5 810
			Note: Programmable in 0.5 ms increments.		
	Minimum Buffer Size for any rate		0.5 ms		
	Maximum Buffer Size		G.751 61 ms G.752 44 ms G.753 61 ms STS-1 40 ms		
	Clock Options		Tx Clock = Tx, Rx (satellite) or External Rx Clock = Tx, Rx, External or Internal Note: Asymmetric operation is not supported		
	Acquisition Range		Programmed Tx data rate ± 100 ppm		
	Test		Baseband Loopback (at interface) Interface Loopback (through interface module)		
	Hot Swap Capability		None		
Interfaces	G.703 Unbalanced:	Connector Type	1 independent channel supporting G.703 E3, T3, and STS-1. BNC, female		
		Signals Supported	ITU-T-G.703 SD, RD		
		Data Rate	34.368, 44.736 and 51.84 Mbps		
		Tx and Rx Data Rates	Tx and Rx data rates are programmed the same		
		Line Coding	HDB3 (for E3), B3ZS (for DS3 STS-1), AMI (Common)		
		Pulse Mask	ITU-T-G.703		
		Jitter	Bellcore GR-499 core For T3 and STS-1, G.823 for E3		
		Impedance	75 Ω Per ITU-T-G.703		
	External Clock Input	Connector	BNC, female		
		Impedance	75 Ω ± 5%		
		Input Amplitude	0.5 to 5.0 V peak to peak		
		Input Frequency	1, 2, 5, 10, 2.048, 34.368, 44.736, and 51.84		
		Signal Characteristics	Sine wave or square with duty cycle of 50 ± 10%		
	Alarms		Loss of Signal All 1's		
Physical and Environmental	Environmental	Humidity	0 to 50 °C (32 to 122°F)		
		Temperature	0 to 95% non-condensing		
	Dimensions		3.95 W x 8.14 D x 1.5 H inches (10.03 W x 20.67 D x 3.81H cm)		

Chapter 13. HSSI INTERFACE (CDI-60)

13.1 Introduction

The CDI-60 HSSI Data Interface (Figure 13-1) is a plug-in module that is installed into the rear of the CDM-710G High-Speed Satellite Modem chassis. It provides physical and electrical connection between the external terrestrial device and the internal circuitry of the modulator or demodulator.

Figure 13-1. CDI-60 HSSI Data Interface Module

By convention, a modem is **D**ata **C**ommunications **E**quipment (DCE) where Tx data enters the data interface and Rx data exits. The plug-in interface has full duplex capability. In addition, the module is automatically configured for simplex-transmit or simplex-receive operation when the module is plugged into a simplex chassis configured for 'modulator only' or 'demodulator only' operation.

Slot 1 of the CDM-710G – located at the center right of the chassis rear panel – is filled with a data interface module first; Slot 2 – located at the right side end of the chassis rear panel – is assigned a blank panel or a CDI-70 10/100/1000 Base-T Gigabit Ethernet interface, depending upon configurations allowed at time of order.

For a table of the applicable interfaces and installable combinations, refer to **Sect. 1.3.5 Allowable Data Interface Combinations**.

13.2 Physical Description

Figure 13-2 depicts the block diagram for the interface. The HSSI data interface is implemented on a 3.95 x 7.022 inch (10.03 x 17.83 cm) PCB. Connection to the modem is provided when the 96-pin DIN connector is engaged into the modem slot.

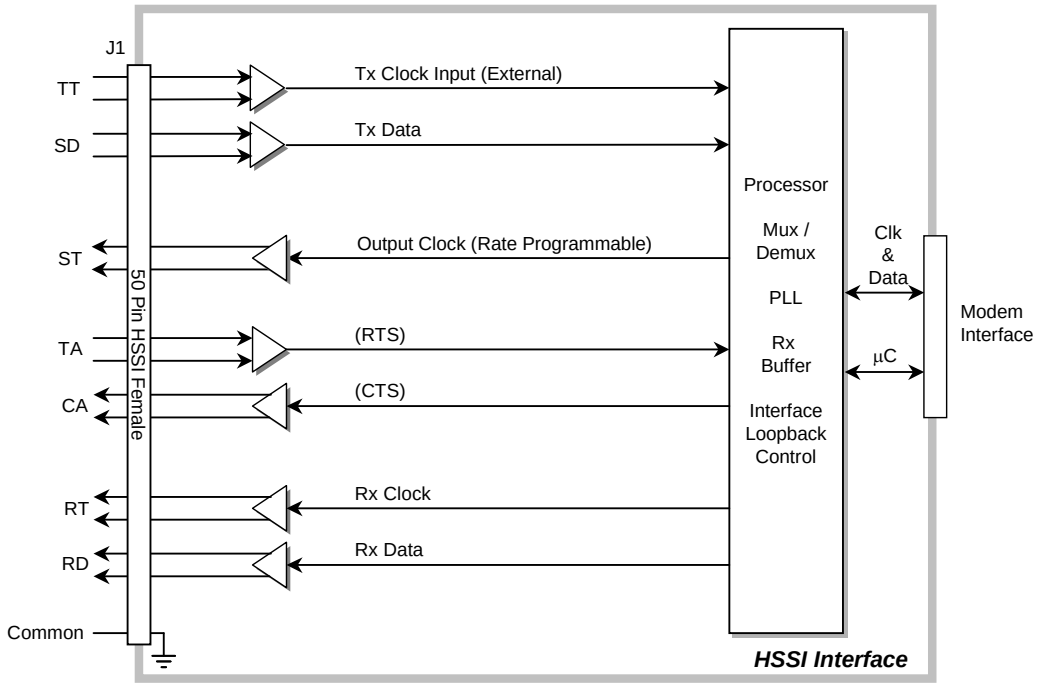


Figure 13-2. CDI-60 HSSI Data Interface Module Block Diagram

Figure 13-3 shows the CDI-60 HSSI interface, looking towards the real panel. The 50-pin SCSI-2 connector serves as the data port, and a Light-Emitting Diode (LED), labeled **Activity**, is lit green when the interface is enabled.

The CDI-60 HSSI interface provides:

- A single HSSI interface;
- DCE Connection;
- ST clock is sourced to the terrestrial interface for use as reference by DTE;
- TT is treated as an incoming External Clock, and the interface phase locks to it;
- TA / CA is supported.

The connector pinout for the interface is provided in **Sect. 13-3; a** summary of specifications for the interface is provided in **Sect. 13-4**.

Figure 13-3. CDI-60 HSSI Data Interface Module – Rear Panel View

13.3 Connector Pinout

As shown in **Figure 13-3**, the CDI-60 HSSI data interface has a 50-pin female SCSI-2 (mini-D) connector; the pinout is as follows:

CDI-60 HSSI/EIA-613 Interface Connector Pinout					
Signal Function	**HSSI Signal**	**EIA-613 Circuit**	**Pin # (+,-)**	**Circuit Direction**	**Comment**
Signal Ground	SG	102	1, 26		Ground
Receive Timing	RT	115	2, 27	From DCE	
DCE Available	CA	107	3, 28	From DCE	
Receive Data	RD	104	4, 29	From DCE	
Loopback circuit C	LC	undefined	5, 30	From DCE	Not used
Send Timing	ST	114	6, 31	From DCE	
Signal Ground	SG	102	7, 32		Ground
DTE Available	TA	108/2	8, 33	to DCE	
Terminal Timing	TT	113	9, 34	to DCE	
Loopback circuit A	LA	143	10, 35	to DCE	Not used
Send Data	SD	103	11, 36	to DCE	
Loopback Circuit B	LB	144	12, 37	to DCE	Not used
Signal Ground	SG	102	13, 38		Ground
Not used		undefined	14, 39		Not used
TX DVALID		undefined	15, 40		Not used
reserved (to DCE)			16, 41		Not used
reserved (to DCE)			17, 42		Not used
reserved (to DCE)			18, 43		Not used
Signal Ground	SG	102	19, 44		Ground
		undefined	20		Not used
		undefined	45		Not used
		undefined	21		Not used
reserved (to DTE)			46		Not used
		undefined	22, 47	from DCE	Not used
		undefined	23, 48	from DCE	Not used
Test Mode	TM	142	24, 49	from DCE	Not used
Signal Ground	SG	102	25, 50		Ground

13.4 General Specifications

Item		Requirement
Data Rate Range		1 to 70 Mbps Note: HSSI data rate limit of 70 Mbps may be reached before symbol rate limit is reached.
Interfaces Per Module		One HSSI
Signals Supported		ST, TT (or external) , SD, TA, CA, RT, RD, SG
Connector		DCE, 50-pin mini-D female per EIA-613 (HSSI)
Electrical		Per EIA-612 (10KH ECL compatible).
Electrical Typical		Differential output voltage: ≥ 590 mV pp into 110Ω load Differential Input voltage: 150 to 1000 mV pp with 110Ω load
Minimum Buffer Size		5.0 mS smallest buffer setting, 0.1 mS step size, 32 mS maximum size
Impedance	Rx	110Ω for TT, SD, TA
	Tx	ST, CA, RT, RD will drive 110Ω and meet HSSI voltage levels
Signal Characteristics		The A terminal is negative with respect to the B terminal for a binary 0 (Space or OFF) state. The A terminal is positive with respect to the B Terminal for a binary 1 (Mark or ON) state.
Clock / Data Relationship		The data transitions occur during the OFF to ON transition of the clock. Data is stable during the ON to Off transition of the clock.
Tx Clock Modes		TT (Input clock) continuous. ST (output clock) is continuous output, programmable in 1 bps steps or phase locked to satellite clock
Rx Clock Modes		RT (output clock) is continuous from satellite, ST (internal clock), continuous from TT
Gap Clock (See Figure 13-4)		Not allowed – Send ST to external equipment so it will return a continuous clock
Tx / Rx Clock		Asymmetrical clocking with Rx Doppler buffer disabled
Acquisition Range		Programmed Tx data rate ± 100 ppm
TA / CA	Default	CA looped to TA
	Selection:	CA is asserted when there is no modem fault
Test		I/O Loopback per the Appendix Interface Loopback per the Appendix
Operation		Simplex (Tx only or Rx only) or full duplex
Signal Sense		Programmable Normal or Inverted for TT and TD, RT and RD
Modules Per Modem		The interface operates in Slot 1, Slot 2, or both slots.
Cable Length to 52 Mbps		2 m (6 ft) nominal, up to 15 m (49 ft) maximum – Note higher data rates usually require shorter cable lengths.
LED		Green LED indicates channel is enabled

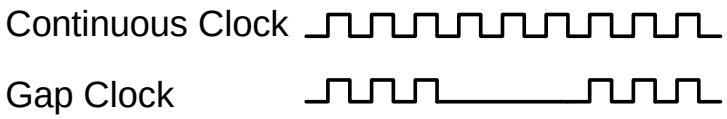


Figure 13-4. Continuous and Gap Clock at TT

13.5 Environmental And Physical Specifications

Item	Requirement
Operating Temperature	0 to 50ºC (32 to 122ºF)
Storage Temperature	-40 to +70ºC (-40 to 158ºF)
Humidity	95% maximum, non-condensing
Mechanical	Compatible with CDM-700 / 800 slots
Agency Approval	CE in conjunction with the modem

Notes:

Chapter 14. 10/100/1000 Base-T GIGABIT ETHERNET (GigE) INTERFACE (CDI-70)

14.1 Introduction

The CDI-70 10/100/1000 Base-T Gigabit Ethernet (GigE) Interface (**Figure 14-1**) – referred to hereafter as the CDI-70 or the GigE Interface – is a plug-in module that is installed into the rear of the CDM-710G High-Speed Satellite Modem chassis. It serves as an Ethernet bridge for data traffic. **M**onitor and **C**ontrol (M&C) information is not supported on the GigE Interface but is available through the 10/100 Base-T remote port of the modem.

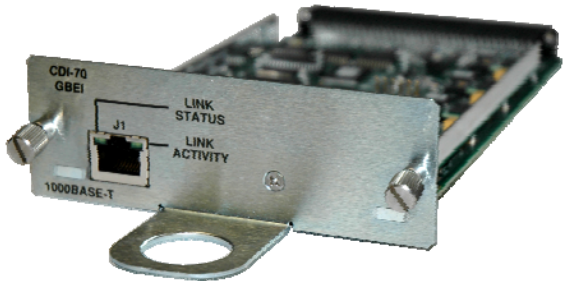


Figure 14-1. CDI-70 10/100/1000 Base-T Gigabit Ethernet (GigE) Interface Module

The GigE Interface provides 10/100/1000 Base-T connectivity and supports data rates from 1 Mbps to 155 Mbps. IP traffic entering the interface is encapsulated in HDLC protocol for transmission over the satellite link. In normal mode, the packets are passed unaltered. For VLAN mode, native VLAN processing and/or VLAN tagging is supported. HDLC CRS-16 verification is performed on all received (from WAN) HDLC frames.

Slot 1 of the CDM-710G – located at the center right of the chassis rear panel – is typically filled with a blank panel or a data interface module first; however, due to backplane limitations, Slot 2 – located at the right side end of the chassis rear panel – serves as the dedicated slot for the CDI-70 10/100/1000 Base-T Gigabit Ethernet interface.

For a table of the applicable interfaces and installable combinations, refer to **Sect. 1.3.5 Allowable Data Interface Combinations**.

14.2 Physical Description

The CDI-70 data interface is implemented on a 3.95 x 7.022 inch (10.03 x 17.83 cm) PCB. Connectivity to the CDM-710G is implemented with a 96-pin DIN receptacle. The LAN interface consists of a single IEEE 802.3ab 1000 Base-T copper-compliant female RJ-45 connector – refer to **Sect. 14.3** for the connector pinout. This connector features Light-Emitting Diode (LED) indicators for Link Status and Link Activity.

Figure 14-2 shows a block diagram for the CDI-70 interface.

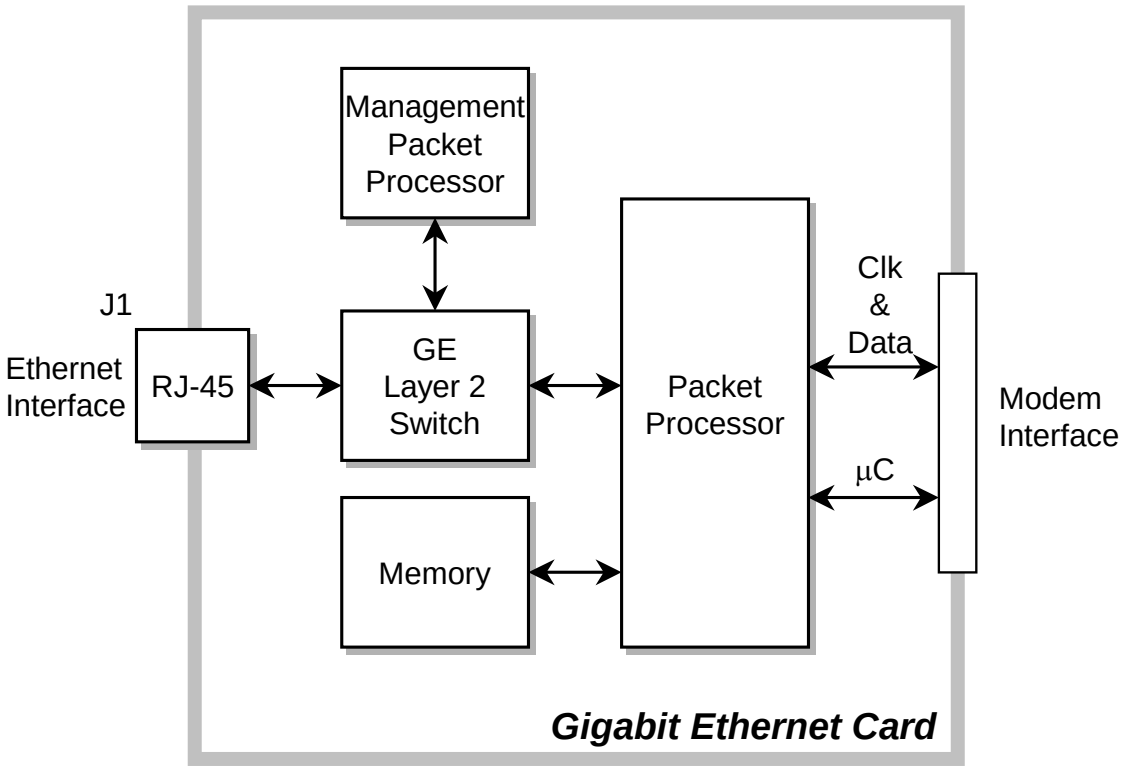
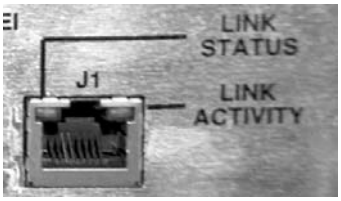


Figure 14-2. CDI-70 Interface Module Block Diagram

14.3 J1 Connector Pinout, RJ45



The J1 LAN interface is comprised of one IEEE 802.3ab 1000Base-T copper compliant female RJ-45 connector. This connector features Light-Emitting Diode (LED) indicators labeled **LINK STATUS** and **LINK ACTIVITY**. The connector pinout is as follows:

Pin #	Description	Direction
1	BI_DA+	bidirectional
2	BI_DA-	bidirectional
3	BI_DB+	bidirectional
4	BI_DC+	bidirectional
5	BI_DC-	bidirectional
6	BI_DB-	bidirectional
7	BI_DD+	bidirectional
8	BI_DD-	bidirectional

14.4 Specifications

Specification	Feature	Description
General	Data Framing	10/100/1000 Base-T Interface: RFC-894 “Ethernet”
	Frame Size, Max	1632 bytes
	Data Framing Format (WAN)	HDLC (Standard Single Channel)
	Connectors	RJ-45 female, 100Ω
	Electrical Properties	Per IEEE 802.3ab
	Packet Types	Burst or distributed IPV4
	Signal Types	Serial data
	Voltage Level	Per IEEE- 802.3ab
	Packet Latency	50 ms maximum
	Flow Control	None
	Cable Length, Maximum	100 meters CAT 5 cable, patch cords and connecting hardware, per ISO/IEC 11801:1995 and ANSI/EIA/TIA-568-A (1995)
	Hot Pluggable (cable)	Yes
	Hot Pluggable (card)	NO
	LEDs	Link status, link activity
Monitor and Control (M&C)	Data Rate	1.5 to 155.52 Mbps
	Packet Filtration Parameters (generic)	IP address match value configuration for management packets; Optional VLAN processing, VLAN configuration, enabled VLID’s.
	1000Base-T Link Statistics	Ingress good octets Ingress bad octets Ingress unicast packets Ingress broadcast packets Ingress multicast packets Ingress pause packets Ingress undersize packets Ingress fragments Ingress oversize packets Ingress jabber Ingress Rx errors Ingress Frame Check Sequence Errors Egress oclets Egress unicast packets Egress broadcast packets Egress multicast packets
	WAN Port Statistics	Ingress good oclets Ingress bad oclets Ingress unicast packets Ingress broadcast packets Ingress multicast packets Ingress pause packets Ingress undersize packets Ingress fragments Ingress oversize packets Ingress jabber Ingress Rx errors

Specification	Feature	Description
Monitor and Control (M&C) (continued)	WAN Port Statistics (continued)	Ingress Frame Check Sequence Errors Egress oclets Egress unicast packets Egress broadcast packets Egress multicast packets HDLC link errors Rx packet count Tx packet count
	Management Port Statistics	Ingress good oclets Ingress bad oclets Ingress unicast packets Ingress broadcast packets Ingress multicast packets Ingress pause packets Ingress undersize packets Ingress fragments Ingress oversize packets Ingress jabber Ingress Rx errors Ingress Frame Check Sequence Errors Egress oclets Egress unicast packets Egress broadcast packets Egress multicast packets
	Controlled Functions	TX data rate Rx data rate Tx enable/disable Rx enable/disable Management IP Address and Mask

14.5 Flash Upgrading the CDI-70 GigE Interface

The CDM-710G's CDI-70 GigE Interface module contains its own processor and memory. On occasion, CEFD may release new software to fix anomalies or add functionality to this interface. Both the CDM-710G and the CDI-70 GBEI module use 'flash memory' technology internally. This makes software upgrading very simple, and updates can now be obtained via the Internet (**Figure 14-3**), E-mail, or on CD.

This section outlines the complete upgrading process as follows:

- New firmware can be downloaded via the Internet to an external PC.
- The upgrade can be performed without opening the unit by simply connecting the GigE Interface's 'J1' 10/100/1000 Ethernet Traffic port to the Ethernet port of a computer.
- Once downloaded, the firmware update is transferred using the CEFD application, **CReflash.exe**.

For complete information about firmware numbers, file versions, and formats, see **Chapter 5. FLASH UPGRADING.**

Figure 14-3. Flash Update via Internet

1. Download the Files

a) **Create** a temporary directory (folder) on a PC:

- ***Windows:*** Select **File > New > Folder**, then rename the New Folder to "temp" or another convenient, unused name. Assuming "temp" works, a "*c:\temp*" folder should now be created.

  Note: The **c:** is the drive letter used in this example. Any valid writable drive letter can be used.

- ***CMD Prompt:*** At the command prompt (c:\>), type "**mkdir temp**" or "**MD temp**" without quotes (**mkdir** and **MD** stand for *make directory*). This is the same as

creating a new folder from Windows. There should now be a "*c:\temp*" subdirectory created (where **c:** is the drive letter used in the example).

b) **Download** the correct firmware file provided by Comtech EF Data:

As shown in **Figure 14-3**:

1. **Go online** to: www.comtechefdata.com;
2. **Click** on: ***Support*** tab;
3. **Click** on: ***Software Downloads*** drop-down *or* hyperlink from ***Support*** page;
4. **Click** on: ***Download Flash and Software Update Files*** icon;
5. **Click** on: ***(Select a Product Line) Satellite Modems*** hyperlink;
6. **Select** the CDM-710G or, alternately, the CDM-700 product hyperlink;

c) **Select** the desired GBEI firmware version hyperlink (the firmware number for the CDM-710G's CDI-70 Gigabit Ethernet Interface module is **FW12738**).

d) **Unzip** the files in the temporary folder that was created in Step 1(a). At least four (4) files must be extracted (file naming is approximate):

- **FW12738x.bin** – Bulk Image file, where "x" is the revision;
- **ReleaseNotes_FW12738_vxxx.pdf** – Where "xxx" is the complete version;
- **readme_vxxx_GBEI.TXT** – Installation notes text file;
- **CReflash.exe** – The executable used to upload the firmware to the GBEI.

2. Connect the PC to the Interface

a) **Connect** the client PC to the CDI-70 GBEI via an Ethernet hub or a switch, or directly to a PC with a crossover cable.

b) **Enable** the GBEI on the CDM-710G to enable the PHY interface on the GBEI.

IMPORTANT

GBEI firmware can only be loaded via the Ethernet Traffic port; do not use the J4 Ethernet M&C port.

3. Reflash the Unit

a) **Double-click** on *CReflash.exe* to start the Comtech Modem Reflash Application (shown at right):

b) **Type the IP Address** assigned to the GBEI in the *IP Address:* field.

c) **Enter** the bulk image load by either (1) typing the path and filename, or (2) using the **[Browse]** button to select the file.

d) **Leave** the *Remote Filename* selection as **"bulk:"**.

e) **Click [Start].**

f) The *CReflash.exe* executable automatically FTPs the filename to the IP address entered, and displays the progress of the update.

Once the CReflash.exe application has been started, the program will not respond to user input for approximately 5 minutes. During this time, a message indicating this progress phase will also display on the modem's front panel.

DO NOT CLOSE THE CREFLASH.EXE PROGRAM ON THE PC!

DO NOT REBOOT THE MODEM!

g) ***When the update is complete:*** The message '**Successful!**' appears in the **[/]** status field of the CReflash.exe application window; a similar message displays on the modem's front panel.

h) **Cycle power** to the CDM-710G to have the new firmware loaded on the GBEI.

i) **Verify** that the version update has successfully loaded upon reboot:

- **From the CDM-710G front panel: SELECT: UTIL→ Firmware→ Info→ Image# (Image1** *or* **Image2)→ Interfaces→ GBEI**
- **From the Serial Console port:** View the GBEI information by selecting **Operations**, then selecting **Maintenance/Unit Information**.
- **From Telnet via the 10/100 Ethernet Traffic port:** View the GBEI information by selecting **Operations**, then selecting **Maintenance/ Unit Information**.
- **From HTTP Web Server Inteface via the 10/100 Ethernet Traffic port**: View the GBEI information by selecting the **MAINT** tab, then selecting the **Unit Info** hyperlink.

14.6 GigE Operational Setups

The CDM-710G GigE Interface operates as a bridge device and passes traffic between hosts at different geographic locations on a common **L**ocal **A**rea **N**etwork (LAN).

The GigE Interface operates like a network hub device which means it acts like a “direct wire” connection and passes all Ethernet traffic and broadcasts. **Figure 14-4** is an example of using the GigE Interface to bridge a remote host on a common LAN over the satellite.

It also may be desirable to separate the M&C Ethernet port from the traffic on the GigE Interface ‘J1’ port. **Figure 14-5** shows an example where the M&C Ethernet port has been assigned an IP address that is **NOT** on the common LAN. A router is in place at both locations to isolate access to the M&C port.

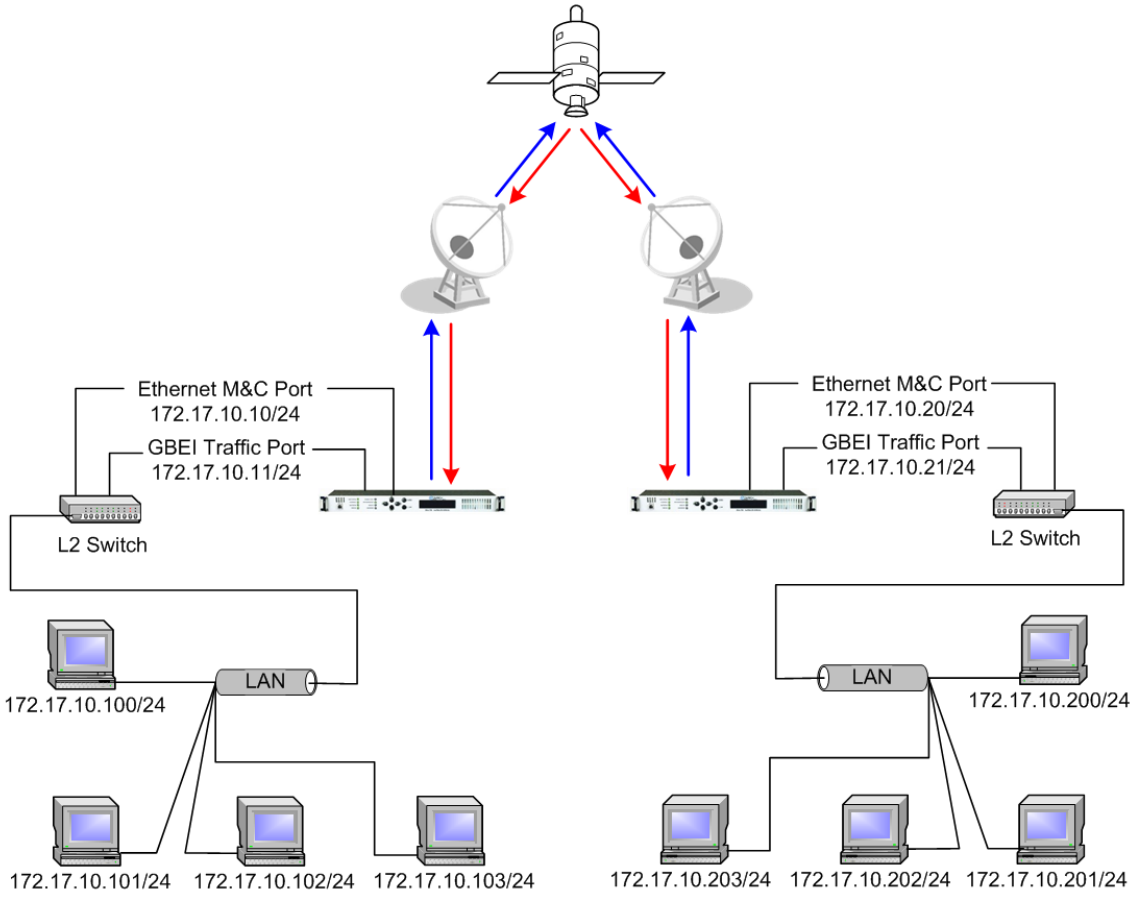


Figure 14-4. GigE Interface Example: Bridging Remote Host on Common LAN Over Satellite

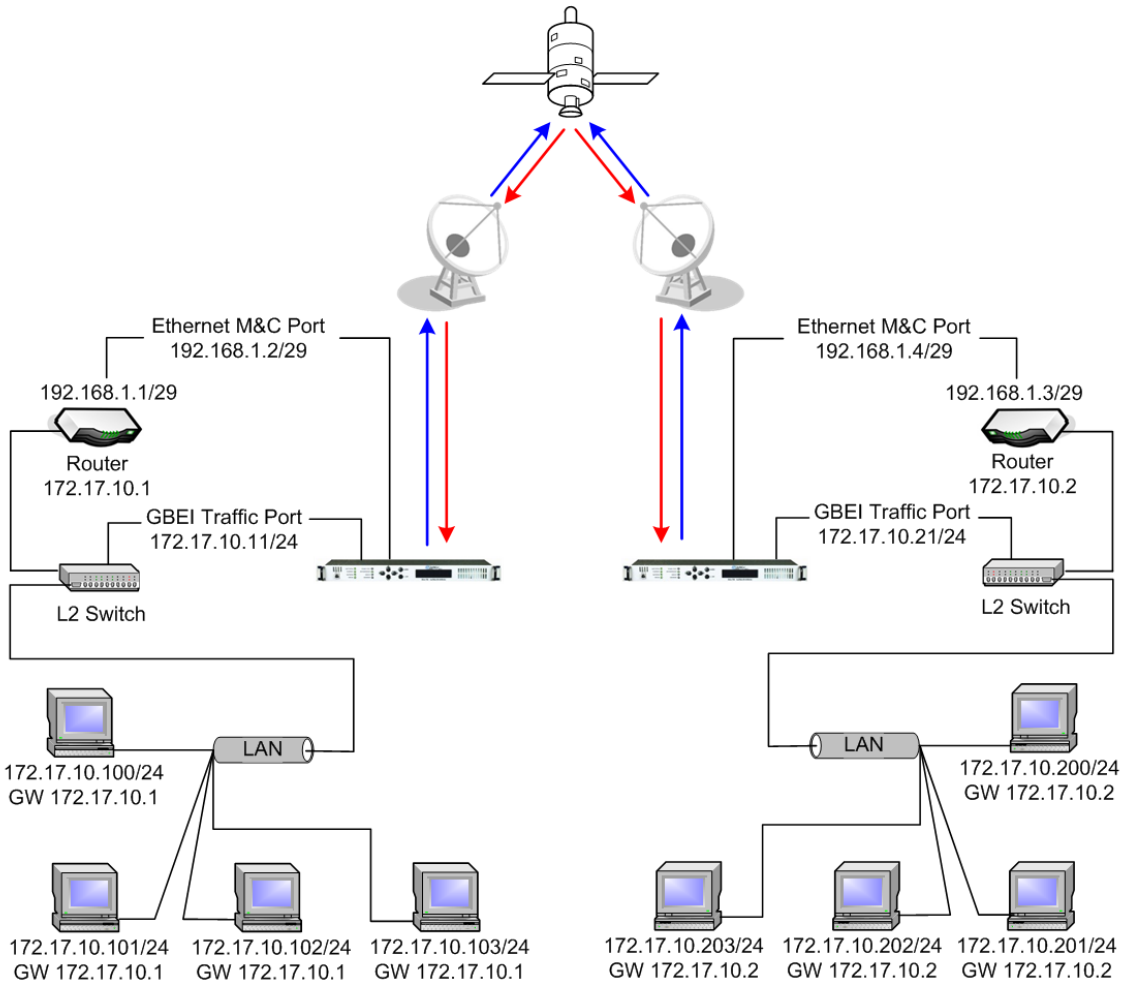


Figure 14-5. M&C Port Assignment Example: IP Address NOT on Common LAN

Appendix A. REMOTE CONTROL

A.1 Overview

This appendix describes the protocol and message command set for remote monitor and control of the CDM-710G High-Speed Satellite Modem.

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

A.2 RS-485

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

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

In the other direction, on the other pair each target has a tri-stateable line driver connected and the controller has a line-receiver connected. All the line drivers are held in high-impedance mode until one (and only one) target transmits back to the controller.

Each target has a unique address, and each time the controller transmits, in a framed 'packet' of data, the address of the intended recipient target is included. All of the targets receive the packet, but only one (the intended) will reply. The target enables its output line driver, and transmits its return data packet back to the controller, in the other direction, on the physically separate pair.

RS 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.

A.3 RS-232

This 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 RS-232 electrical levels, on one conductor, and target-to-controller data is carried in the other direction on the other conductor.

A.4 Basic Protocol

Whether in RS-232 or RS-485 mode, all data is transmitted as asynchronous serial characters, suitable for transmission and reception by a UART. In this case, the asynchronous character formats is 8N1. The baud rate may vary between 1200 and 57,600 baud.

All data is transmitted in framed packets. The controller is assumed to be a PC or ASCII dumb terminal, which is in charge of the process of monitor and control. The controller is the only device which 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 which 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 RS-485 mode.

A.5 Packet Structure

Controller-to-Target						
Start of Packet	**Target Address**	**Address De-limiter**	**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 code 61 or 63 (1 character)	 (n characters)	Carriage Return ASCII code 13 (1 character)

Example: <0135/TFQ=0070.2345{CR}

Target-to-Controller						
Start of Packet	**Target Address**	**Address De-limiter**	**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 code 61, 63, 33 or 42 (1 character)	 (From 0 to n characters)	Carriage Return, Line Feed ASCII code 13,10 (2 characters)

Example: >0654/TFQ=0070.2345{CR}{LF}

A.5.1 Start Of Packet

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

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

Because this is used to provide a reliable indication of the start of packet, these two characters may not appear anywhere else within the body of the message.

A.5.2 Address

Up to 9,999 devices can be uniquely addressed. In RS-232 applications this value is set to 0. In RS-485 applications, the permissible range of values is 1 to 9999. It is programmed into a target unit using the front panel keypad.

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.

A.5.3 Instruction Code

This is a three-character alphabetic sequence which identifies the subject of the message. Wherever possible, the instruction codes have been chosen to have some significance. **For example: TFQ** for **T**ransmit **F**re**Q**uency, 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-Z, ASCII codes 65 - 90).

A.5.4 Instruction Code Qualifier

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

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

= **(ASCII code 61**	The **=** (ASCII code 61) is used as the **assignment** operator, and is used to indicate that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. **For example:** In a message from controller to target, TFQ=0070.0000 would mean 'set the Transmit frequency to 70 MHz'
? **(ASCII code 63)**	The **?** (ASCII code 63) is used as the **query** operator, and is used to indicate that the target should return the current value of the parameter defined by the preceding byte. **For example:** In a message from controller to target, TFQ? would mean 'return the current value of the transmit frequency'.

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

= **(ASCII code 61)**	The **=** code (target to controller) is used in two ways: **First**, if the controller has sent a query code to a target (**for example:** TFQ?, meaning '*what is the Transmit frequency?*'), the target would respond with TFQ=xxxx.xxxx, where xxxx.xxxx represents the frequency in question. **Second**, if the controller sends an instruction to set a parameter to a particular value, then, providing the value sent in the argument is valid, the target will acknowledge the message by replying with TFQ= (with no message arguments).
? **(ASCII code 63)**	The ? code (target to controller) is only used as follows: If the controller sends an instruction to set a parameter to a particular value, then, if the value sent in the argument is not valid, the target will acknowledge the message by replying, for example, with TFQ? (with no message arguments). This indicates that there was an error in the message sent by the controller.
! **(ASCII code 33)**	The **!** code (target to controller) is only used as follows: If the controller sends an instruction code which the target does not recognize, the target will acknowledge the message by echoing the invalid instruction, followed by the ! character. **Example:** XYZ!
***** **(ASCII code 42)**	The * code (target to controller) is only used as follows: If the controller sends an instruction to set a parameter to a particular value, then, if the value sent in the argument is valid, BUT the modem will not permit that particular parameter to be changed at that time, the target will acknowledge the message by replying, for example, with TFQ* (with no message arguments).
# **(ASCII code 35)**	The # code (target to controller) is only used as follows: If the controller sends a correctly formatted command, BUT the modem is not in remote mode, it will not allow reconfiguration, and will respond with TFQ#.
~ **(ASCII Code 126)**	The ~ code (target to controller) is only used as follows: If a message was sent via a local modem to a distant end device or ODU, the message was transmitted transparently through the local modem. In the event of the distant-end device not responding, the local modem would generate a response. **Example:** 0001/RET**~**, indicating that it had finished waiting for a response and was now ready for further comms.

A.5.5 Message Arguments

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

A.5.6 End Of Packet

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

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

A.6 Remote Commands and Queries

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

CODE	C	Q	PAGE
A			
AEQ	**X**	**X**	A-16, A-33
B			
BFS		**X**	A-16, A-28
BTH			A-16
C			
CAE	**X**		A-6, A-16, A-34
CID	**X**	**X**	A-6, A-16, A-34
CLD	**X**		A-6, A-16, A-34
CST	**X**		A-7, A-17, A-34
D			
DAY	**X**	**X**	A-7, A-17, A-34
DLK		**X**	A-17, A-34
E			
EBA	**X**	**X**	A-18, A-34
EBN		**X**	A-18, A-34
EFI	**X**	**X**	A-19, A-28
EID		**X**	A-8, A-18
ERF	**X**	**X**	A-10, A-19, A-37
ESN		**X**	A-19, A-37
ESW	**X**	**X**	A-7, A-19, A-37
ETS	**X**	**X**	A-20, A-28
F			
FLT		**X**	A-9, A-30, A-35
FRW		**X**	A-7, A-19, A-37

CODE	C	Q	PAGE
G			
GIP	**X**	**X**	A-7, A-20, A-37
GMC		**X**	A-20, A-28
GSW		**X**	A-20, A-28
H			
I			
IEP	**X**		A-7, A-20, A-37
IMG	**X**		A-7, A-20, A-37
IMP	**X**	**X**	A-8, A-20, A-29
IPA	**X**	**X**	A-8, A-21, A-38
IPG	**X**	**X**	A-10, A-21, A-38
ITF		**X**	A-10, A-21, A-38
J			
K			
L			
LNK		**X**	A-21, A-38
LRS	**X**	**X**	A-10, A-21, A-38

CODE	C	Q	PAGE
M			
MAC		**X**	A-16, A-21, A-38
MGC	**X**	**X**	A-43
MSK	**X**	**X**	A-11, A-22
N			
NUE		**X**	A-17, A-22, A-39
O			
P			
Q			
R			
RAR	**X**	**X**	A-22, A-39
RBS	**X**	**X**	A-22, A-29, A-39
RBT	**X**		A-11, A-23, A-39
RCB	**X**		A-23, A-29
RCI	**X**	**X**	A-23, A-39
RCK	**X**	**X**	A-23, A-29
RCR	**X**	**X**	A-15, A-33
RDI	**X**	**X**	A-23, A-39
RDR		**X**	A-23, A-40
RED	**X**	**X**	A-12, A-24, A-40
RFM	**X**	**X**	A-24, A-29
RFO		**X**	A-24, A-40
RFQ	**X**	**X**	A-24, A-40
RFS		**X**	A-24, A-40
RFT		**X**	A-25, A-40

CODE	C	Q	PAGE
RGS	**X**	**X**	A-25, A-41
RIE	**X**	**X**	A-25, A-41
RMD	**X**	**X**	A-15, A-33
RNE		**X**	A-11, A-25, A-41
RPI	**X**	**X**	A-25, A-41
RSL		**X**	A-26, A-42
RSR	**X**	**X**	A-16, A-33
RSW	**X**	**X**	A-26, A-42
S			
SCX	**X**	**X**	A-12, A-26, A-42
SLM	**X**	**X**	A-12, A-26, A-42
SNO		**X**	A-12, A-26, A-42
SWR		**X**	A-12, A-26, A-42
T			
TAR	**X**	**X**	A-12, A-30
TCI	**X**	**X**	A-12, A-30
TCR	**X**	**X**	A-6, A-27
TDI	**X**	**X**	A-13, A-30
TDR		**X**	A-13, A-30
TFQ	**X**	**X**	A-13, A-30
TFS	**X**	**X**	A-13, A-30
TFT		**X**	A-13, A-31
TGS	**X**	**X**	A-13, A-31
TIE	**X**	**X**	A-13, A-31
TIM	**X**	**X**	A-14, A-26, A-42
TLC	**X**	**X**	A-26, A-31
TLP	**X**	**X**	A-14, A-31

CODE	C	Q	PAGE
TMD	**X**	**X**	A-6, A-27
TMP		**X**	A-14, A-27, A-42
TPI	**X**	**X**	A-14, A-31
TPL	**X**	**X**	A-14, A-32
TSI	**X**	**X**	A-14, A-32
TSR	**X**	**X**	A-6, A-27
TST	**X**	**X**	A-14, A-43
TXO	**X**	**X**	A-15, A-32
U			
V			
W			
X			
Y			
Z			

Note: In the tabulature that follows, the following codes are used in the 'Response to Command' column (as per **Sect. A.5.4 Instruction Code Qualifier**):

=	Message ok
?	Received ok, but invalid arguments found
*	Message ok, but not permitted in current mode
#	Message ok, but unit is not in **Remote** mode

A.6.1 Modulator

Priority System = (Highest priority) TMD, TCR, and (Lowest Priority) TSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Modulation Type	TMD=	1 byte	Command or Query. Tx Modulation type, where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **Example:** TMD=1 (which is 8PSK)	TMD= TMD? TMD* TMD#	TMD?	TMD=x
Tx FEC Code Rate	TCR=	1 byte	Command or Query. Tx Code Rate, where: 0 = Rate 3/4 1 = Reserved 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 **Example:** TCR=0 (which is Rate 3/4) ***NOTE:** Please refer to **Sect. 1.8 Summary of Specifications** for a list of available code rates for each modulation type.	TCR= TCR? TCR* TCR#	TCR?	TCR=x
Tx Symbol Rate	TSR=	9 bytes	Command or Query. Tx Symbol Rate, where: s=Symbol Rate in Msps **Example:** TSR=20.000000 (20 Msps.)	TSR= TSR? TSR* TSR#	TSR?	TSR=ss.ssssss
Clear All Stored Events	CAE=	None	Command Only. Forces the software to clear the software events log. **Example:** CAE= **Note:** This command takes no arguments	CAE= CAE? CAE* CAE#	N/A	N/A
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Configuration Load	CLD=	1 byte	Command Only. Retrieves a previously stored configuration from the specified configuration location (0 to 9). **Example:** CLD=4 (retrieve configuration from location 4)	CLD= CLD? CLD* CLD#	N/A	N/A
Configuration Save	CST=	1 byte	Command Only. Stores the current configuration in the specified configuration location (0 to 9). **Example:** CST=4 (store the current configuration in location 4)	CST= CST? CST* CST#	N/A	N/A
Real-time Clock Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where: dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) **Example:** DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy
Enable Redundancy Switch Mode	ESW=	1 byte, value of 0 or 1	Command or Query. Set redundancy mode, where : 0 = Disable 1 = Enable **Example:** ESW=1 (Enable redundancy mode)	ESW= ESW? ESW* ESW#	ESW?	ESW=x
Firmware Revisions	N/A	1 byte	Query Only. Query the version information of the system, where: i = Bulk Image number (1 or 2) a = Firmware Image b = Firmware Revision c = Firmware Date **Example:** FRW?1	FRW? FRW* FRW#	FRW?i	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c…
Gigabit Management IP Address and Subnet	GIP=	19 bytes	Command or Query. Gigabit Management IP address and subnet mask. s=Slot (1, 2) i=IP Address n=Netmask	GIP= GIP# GIP? GIP*	GIP?s	GIP=siii.iii.iii.iii.nn
Initialize Events Pointer	IEP=	None	Command Only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP? IEP* IEP#	N/A	N/A
Boot Image	IMG=	1 byte	Command Only. Boot image selection, where n is the image number: 1=Image #1 2=Image #2 **Example:** IMG=1 (Selects Image #1 for booting.)	IMG= IMG? IMG* IMG#	IMG?	IMG=n

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Output Impendance	IMP=	1 byte	Command or Query. Tx output impedance, where: 0=50 Ohm 1=75 Ohm **Example:** IMP=0 (Set impedance to 50 Ohms) *** NOTE:** Setting Tx Impedence is only possible on 70/140 Mhz units.	IMP= IMP? IMP* IMP#	IMP?	IMP=x
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseTx Ethernet management port, in the format: xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (00..31) **Example:** IPA=010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xxx.xxx.xxx.xxx.yy
Equipment ID	N/A	23 bytes	Query Only. Unit returns equipment identification and configuration, where: **aaa = defines the modulator model number (71G)** **b = Modulator configuration**: 1=70/140 Mhz, 2=L-Band **c = Tx Symbol Rate S/W option:** 0 = 15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 and DSNG only), 4 = 45.0 Msps (S1 and DSNG only) **d = S/W option Tx 8PSK:** 0=Not installed, 1=Installed **e = S/W option Tx 16-QAM:** 0=Not installed, 1=Installed **f = S/W option Tx 16APSK:** 0=Not installed, 1=Installed **g = S/W option Tx 32APSK:** 0=Not installed, 1=Installed **h = S/W option Tx DVB-S1:** 0=Not installed, 1=Installed **i = S/W option Tx DVB-DSNG:** 0=Not installed, 1=Installed **j = S/W option Tx DVB-S2:** 0=Not installed, 1=Installed **k = Demodulator configuration:** 0=None, 1=70/140 Mhz, 2=L-Band **l = Rx Symbol Rate S/W option:** 0=15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 & DSNG only), 4 = 45.0 Msps (S1 & DSNG only) **m = S/W option Rx 8PSK:** 0=Not installed, 1=Installed **n = S/W option Rx 16-QAM:** 0=Not installed, 1=Installed **o = S/W option Rx 16APSK:** 0=Not installed, 1=Installed **p = S/W option Rx 32APSK:** 0=Not installed, 1=Installed **q = S/W option Rx DVB-S1:** 0=Not installed, 1=Installed **r = S/W option Rx DVB-DSNG:**0=Not installed, 1=Installed **s = S/W option Rx DVB-S2:** 0=Not installed, 1=Installed **t = Interface slot #1:** 0 = None, 1 = Reserved, 2 = Gigabit Ethernet Interface, 3 = HSSI, 4 = E3T3STS1 **u = Interface slot #2:** 0 = None, 1 = Reserved, 2 = Gigabit Ethernet Interface, 3 = HSSI, 4 = E3T3STS1	EID? EID* EID#	EID?	EID= aaabcdefghijklmnopqrstu **Notes:** Unit returns 'Not Installed' for Rx options if unit is modulator only. Unit returns 'Not Installed' for Tx options if unit is demodulator only.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status	N/A	4 bytes	Query Only. Unit returns the current fault and status codes for the Unit (hardware), Tx Traffic and Rx Traffic, in the form abcd, where: a = Unit Faults: 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5 Volts, Framer Card 3=Power supply fault, +1.5 Volts, Interface #1 4=Power supply fault, +1.5 Volts, Interface #2 5=Power supply fault, +3.3 Volts, Framer Card 6=Power supply fault, +5.0 Volts, Framer Card 7=Power supply fault, +12.0 Volts, Framer Card 8=Power supply fault, -12.0 Volts, Framer Card 9=Power supply fauilt, +18.0 Volts, Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface #1 Load E=Interface #2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface #1 Removed L=Interface #2 Removed b = Tx Traffic Status: 0=No faults 1= +1.5V Power Supply Unit (Modulator Card) 2= FPGA Failed to Load (Modulator Card) 3= Symbol Rate PLL Clock 4= Tx Synthesizer Unlocked 5= Tx Digital Clock Manager Unlocked 6= I & Q Baseband Channels are Inactive 7= FPGA Temperature (Modulator Card) 8= Reserved 9= TX Clock Failure (Interface 1) A= TX Clock Failure (Interface 2) B= GBEI Card Data rate > + 200 PPM C= GBEI Card Data rate < - 200 PPM D= GBEI No PHY Link E= Encoder FIFO Empty F= Encoder FIFO Full G= SERDES Parity Errors H=Reserved.	FLT? FLT* FLT#	FLT?	FLT=abcd d=Change in fault status since last poll. **Note:** Each section has faults listed in order of priority. For each section, only the highest priority fault is returned. There maybe multiple faults for each section, but only the highest fault is returned.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status (cont.)			I=Tx Ais Interface 1 J=Tx Ais Interface 2 K=Tx Cable Interface 1 L=Tx Cable Interface 2 c=Rx Traffic Status 0=No faults d=New Faults 0=No new faults 1=New faults, since last check			
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP addess for the 10/100 Base Tx Ethernet management port, in the format: xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address **Example:** IPG = 010.006.030.001	IPG= IPG? IPG* IPG#	IPG?	IPG = xxx.xxx.xxx.xxx
Interface Type	N/A	2 bytes	Query Only. Interface Type, where: s=Defines which interface slot (1 or 2) x=Defines the interface type, where: 0=Reserved 1=Reserved 2=Gigabit Ethernet 3=HSSI 4=E3T3STS1 **Example:** ITF?1	ITF? ITF* ITF#	ITF?s	ITF=sx
Local/Remote Status	LRS=	1 byte	Command or Query. Local/Remote status, where: 0=Local 1=Serial 2=Reserved 3=Ethernet **Example:** LRS=1 (which is remote Serial)	LRS= LRS? LRS* LRS#	LRS?	LRS=x
Unit MAC Address	N/A	12 bytes	Query Only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=0006B000D2A7 (The MAC address of the unit is 00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC?	MAC=AABBCCDDEEFF
Number of Unread stored Events	N/A	3 bytes	Query Only. Unit returns the Number of stored Events, which remain Unread, in the form xxx. **Note:** This means unread over the remote control. **Example:** NUE=126	NUE? NUE* NUE#	NUE?	NUE=xxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Unit Alarm Mask	MSK=	13 bytes	Command or Query. Alarm mask conditions, in form ab, where: a=Tx Cable Slot 1 b=Tx AIS Slot 1 c=Rx AIS Slot 1 d=Bufferslip Alarm Slot 1 e=External Clock Alarm Slot 1 f=Tx Cable Slot 2 g=Tx AIS Slot 2 h=Rx AIS Slot 2 i=Bufferslip Alarm Slot 2 j=External Clock Alarm Slot 2 k=EBNO Alarm L=Ber Alarm m=Rx AGC Alarm xxx -spares Mask (Alarm=0, Fault = 1,Masked =2)) **Example:** MSK=110101100000xxx (alarm masks for Interface Slot 1 ,Slot 2 ,	MSK= MSK? MSK* MSK#	MSK?	MSK=abcdefghijkLmxxx
Soft Reboot	RBT=1	1 byte	Command Only. Soft Reboot. 1= Reboot System	RBT? RBT* RBT#	N/A	RBT=
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query Only. Unit 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= ABCddmmyyhhmmss, **A** being the fault/clear indicator. F=Fault C=Clear I=Info **B** being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=Log **C** is Fault Code numbers, as in FLT? or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Redundancy State	RED=	1 byte	Command or Query. Unit returns the redundancy state of the unit, where: 0 = Offline 1 = Online *** This command can be used to force the unit offline, this is done by sending RED=0. This is only valid if redundancy mode is enabled. If redundancy is not enabled, then RED=0 will return an error. The unit cannot be forced online. *** If the unit is not in redundancy mode, then the unit will always be online. **Example:** RED=0 (force unit offline)	RED= RED? RED* RED#	RED?	RED=x (see description of arguments)
Gigabit Auto Autocrossover	SCX	2 bytes	Command or Query. s=Slot2 Only a= 1 GBEI Cable Auto Crossover Enabled. a=0 GBEI Cable Auto Crossover Disabled	SCX= SCX# SCX? SCX*	SCX?s	SCX=a
Gigabit Learning Mode	SLM	2 bytes	Command or Query. s=Slot2 Only a= 1 GBEI Learning Enabled. a=0 GBEI Learning Disabled	SLM= SLM# SLM? SLM*	SLM?s	SLM=a
Serial Number	N/A	9 bytes	Query Only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143	SNO? SNO* SNO#	SNO?	SNO=xxxxxxxxx
Software Revision	N/A	5 bytes	Query Only. Unit returns the value of the internal software revision installed in the unit, in the form: Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z **Example:** SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0	SWR? SWR* SWR#	SWR?	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Tx Alpha Rolloff	TAR=	1 byte	Command or Query. Tx Alpha Rolloff, where: 0 = 20% 1 = 25% 2 = 35% **Example:** TAR=0 (which is a Tx Alpha Rolloff of 20%)	TAR= TAR? TAR* TAR#	TAR?	TAR=x
Tx Clock Invert	TCI=	2 bytes	Command or Query. Invert Transmit Clock, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Clock, where: 0=Normal 1=Inverted Note**:** Command valid with HSSI or E3T3STS1) **Example:** TCI = 11 (selects Inverted TX Clock, Slot 1)	TCI = TCI? TCI * TCI #	TCI?s	TCI =sx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Data Invert	TDI=	2 bytes	Command or Query. Invert Transmit Data, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Data, where: 0=Normal 1=Inverted **Note:** Command valid with HSSI or E3T3STS1) **Example:** TDI = 11 (selects Inverted TX Data)	TDI = TDI? TDI * TDI #	TDI?sc	TDI =sx (see description of arguments)
Tx Data Rate	N/A	10 bytes	Query Only. Composite Tx Data rate, in kbps. Resolution=1 bps. **Example:** TDR=002047.999 (which is 2047.999 kbps)	TDR? TDR* TDR#	TDR?	TDR=xxxxxx.xxx
Tx Frequency	TFQ=	9 bytes	Command or Query. Tx Frequency (in MHz) 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** TFQ=0950.0000	TFQ= TFQ? TFQ* TFQ#	TFQ?	TFQ=xxxx.xxxx
Tx Frame Size	TFS=	1 byte	Command or Query. Tx Frame Size Long/Short selection, where: 0=Short, 1=Long **Example:** TFS =0 (which is Short FEC Frame Size)	TFS = TFS? TFS * TFS #	TFS?	TFS =x
Tx FEC Type	N/A	1 byte	Query Only. Tx FEC coding type, where: 1=LDPC (FEC is dependent on the TX Mode Type.) **Example:** TFT=1 (which is LDPC coding)	TFT? TFT* TFT#	TFT?	TFT=x
Tx Gold Code Sequence Index	TGS=	6 bytes	Command or Query. Tx Gold Code Sequence Index: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** TGS=189063	TGS= TGS? TGS* TGS#	TGS?	TGS=xxxxxx
Tx Interface Enable	TIE=	2 bytes	Command or Query. Interface Slot Enable/Disable, where: s=Defines which interface slot (1 or 2) x=Tx Interface Status, where: 0=Disabled 1=Enabled **Example:** TIE =11 (Enables transmit interface)	TIE= TIE? TIE* TIE#	TIE?s	TIE=sx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Real-time Clock Time	TIM=	6 bytes	Command or Query. A time in the form hhmmss, indicating the time from midnight, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) **Example:** TIM=231259 (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss
Tx Location of the Pilot	TLP=	1 byte	Command or Query. Tx Pilot On/Off selection, where: 0=Average, 1=Peak **Example:** TLP=0 (which is Pilot Average)	TLP= TLP? TLP* TLP#	TLP?	TLP=x
Temperature	N/A	3 bytes	Query Only. Unit returns the value of the internal temperature, in the form of sxxx (degrees C). Where s is the sign and and xxx is the number of degrees. **Example:** TMP=+026	TMP? TMP* TMP#	TMP?	TMP=sxxx
Tx Pilot On/Off	TPI=	1 byte	Command or Query. Tx Pilot On/Off selection, where: 0=Off, 1=On **Example:** TPI=0 (which is Pilot Off)	TPI= TPI? TPI* TPI#	TPI?	TPI=x
Tx Power Level	TPL=	5 bytes	Command or Query. Tx Output power level, where: s=sign (+ / -) xx.x = Tx Output power level, +05.0 and –20.0 dBm. L-Band: -25.0 to –05.0 dBm 70/140 MHz: -20.0 to +00.0 dBm **Note:** Beyond –20 dBm is beyond the specification. **Example:** TPL = -13.4	TPL= TPL? TPL* TPL#	TPL?	TPL=sxx.x
Tx Spectrum Invert	TSI=	1 byte	Command or Query. Tx Spectrum Invert selection, where: 0=Normal 1=Tx Spectrum Inverted **Example:** TSI=0 (which is normal)	TSI= TSI? TSI* TSI#	TSI?	TSI=x
Unit Test Mode	TST=	1 byte	Command or Query. Test Mode, where: 0=Normal Mode (no test) 1=IF Loop 2=I/O Loop 3=RF Loop 4=Tx CW 5=Tx Alternating 1,0 Pattern **Example:** TST=4 (Tx CW)	TST= TST? TST* TST#	TST?	TST=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Carrier State	TXO=	1 byte	Command or Query. Tx Carrier State, where: 0=OFF due to front panel or remote control command 1=ON **Example:** TXO=1 (Tx Carrier ON)	TXO= TXO? TXO* TXO#	TXO?	TXO=x

A.6.2 Demodulator

Priority System = (Highest priority) RMD, RCR, and (Lowest Priority) RSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Modulation Type	N/A	1 byte	Query only. Rx Modulation type, where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **Example:** RMD=1 (which is 8PSK) ***NOTE:** This command is query-only because the demodulation type is automatically detected, but if the unit is not locked, the query returns 'x'.	RMD? RMD* RMD#	RMD?	RMD=x
Rx FEC Code Rate	N/A	1 byte	Query only. Rx Code Rate, where: 0 = Rate 3/4 1 = Reserved 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 **Example:** RCR=0 (which is Rate 3/4) ***NOTE:** This command is query-only because the code rate is automatically detected, but if the unit is not locked, the query returns 'x'.	RCR? RCR* RCR#	RCR?	RCR=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Symbol Rate	RSR=	9 bytes	Command or Query. Rx Symbol Rate, where: s=Symbol Rate in Msps **Example:** RSR=20.000000 (20 Msps.) ***NOTE:** Please refer to **Sect. 1.8 Summary of Specifications** for a list of available code rates for each modulation type.	RSR= RSR? RSR* RSR#	RSR?	RSR=ss.ssssss
Enable/Disable Adaptive Equalizer	AEQ=	1 byte	Command or Query. Adaptive Equalizer status, where: 0=Disable 1=Enable **Example:** AEQ=1 (which is Enable)	AEQ= AEQ? AEQ* AEQ#	AEQ?	AEQ=x
Buffer Fill State	N/A	3 bytes	Query only. s=Defines which interface slot (1 or 2) xx = value of the buffer fill state, between 1 to 99%. Returns 00 if demodulator is unlocked. **Note:** Command not valid for Gigabit interface. **Example:** BFS=133 (which is 33%, on interface slot 1 channel 1)	N/A	BFS?s	BFS=sxx
Rx BER Alarm Threshold	BTH	1bytes	Command or Query. Sets and Returns BerThreshold a=Ber Threshold 0= NONE 3= 1E10-3 4 =1E10-4 5= 1E10-5 6= 1E10-6 7= 1E10-7 8 =1E10-8 Example BTH=3(Sets Ber Alarm Threshold to 1E10-3)	BTH= BTH? BTH#	BTH=a	BTA=a
Clear All Stored Events	CAE=	None	Command Only. Forces the software to clear the software events log. **Example:** CAE= **Note:** This command takes no arguments	CAE= CAE? CAE* CAE#	N/A	N/A
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxxx
Configuration Load	CLD=	1 byte	Command Only. Retrieves a previously stored configuration from the specified configuration location (0 to 9). **Example:** CLD=4 (retrieve configuration from location 4)	CLD= CLD? CLD* CLD#	N/A	N/A

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Configuration Save	CST=	1 byte	Command Only. Stores the current configuration in the specified configuration location (0 to 9). **Example:** CST=4 (store the current configuration in location 4)	CST= CST? CST* CST#	N/A	N/A
Real-time Clock Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) **Example:** DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy
Demodulator Lock Status	N/A	1 byte	Query only. Demodulator Lock Status, where: 0 = Demodulator Unlocked 1 = Demodulator Locked **Example:** DLK=1 (Demodulator Locked)	DLK? DLK* DLK#	DLK?	DLK=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Equipment ID	N/A	23 bytes	Query Only. Unit returns equipment identification and configuration, where: **aaa = defines the modulator model number (71G)** **b = Modulator configuration**: 0 = None, 1=70/140 Mhz, 2=L-Band **c = Tx Symbol Rate S/W option:** 0 = 15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 and DSNG only), 4 = 45.0 Msps **d = S/W option Tx 8PSK:** 0=Not installed, 1=Installed **e = Reserved** **f = S/W option Tx 16APSK:** 0=Not installed, 1=Installed **g = S/W option Tx 32APSK:** 0=Not installed, 1=Installed **h = Reserved** **i = Reserved** **j = S/W option Tx DVB-S2:** 0=Not installed, 1=Installed **k = Demodulator configuration:** 0=None, 1=70/140 Mhz, 2=L-Band **l = Rx Symbol Rate S/W option:** 0=15.0 Msps, 1 = 22.5 Msps, 2 = 30.0 Msps, 3 = 37.5 Msps (S1 & DSNG only), 4 = 45.0 Msps **m = S/W option Rx 8PSK:** 0=Not installed, 1=Installed **n = Reserved** **o = S/W option Rx 16APSK:** 0=Not installed, 1=Installed **p = S/W option Rx 32APSK:** 0=Not installed, 1=Installed **q = Reserved** **r = Reserved** **s = S/W option Rx DVB-S2:** 0=Not installed, 1=Installed **t = Interface slot #1:** 0 = None, 1 = Reserved, 2 = Gigabit Ethernet, Interface, 3 = HSSI, 4 = E3T3STS1 **u = Interface slot #2:** 0 = None, 1 = Reserved, 2 = Gigabit Ethernet, Interface, 3 = HSSI, 4 = E3T3STS1	EID? EID* EID#	EID?	EID= aaabcdefghijklmnopqrstu Note: Unit returns 'Not Installed' for Rx options if unit is modulator only. Unit returns 'Not Installed' for Tx options if unit is demodulator only.
Eb/No AlarmPoint	EBA=	4 bytes	Command or Query. Eb/No alarm point in dB, with a range between 0.1 and 16 dB. Resolution=0.1 dB **Example:** EBA=12.3	EBA= EBA? EBA* EBA#	EBA?	EBA=xx.x (see description of arguments)
Rx Eb/No	N/A	4 bytes	Query only. Unit returns the value of Eb/No, between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example**: EBN=12.3 (which is Eb/No = 12.3 dB) For values greater than 16.0 dB, the reply will be: EBN=+016	EBN? EBN* EBN#	EBN?	EBN=xxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Interface Reference Clock	EFI=	2 bytes	Command or Query. s=Defines which interface slot (1 or 2) x=EXT CLK (Data Rate Accuracy), where: 0 = 1 MHz 1 = 2 MHz 2 = 2.048 MHz 3 = 5 MHz 4 = 10 MHz 5 = 20 MHz 6 = 34.368 MHz 7 = 44.736 MHz 8 = 51.840 MHz **Note:** Command valid only with CDI-10-1 G.703 interface **Example:** EFI=14 (Selects 10MHz on slot 1)	EFI= EFI? EFI* EFI#	EFI?s	EFI=sx (see description of arguments)
External Reference Frequency	ERF=	1 byte	Command or Query. External Reference Frequency, where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz **Example:** ERF=0 (External reference not used - uses internal)	ERF= ERF? ERF* ERF#	ERF?	ERF=x
Rx Es/No	N/A	4 bytes	Query only. Unit returns the value of EsNo (when in DVB-S2 mode), between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example:** ESN=12.3 (which is Es/No = 12.3 dB) For values greater than 22.0 dB, the reply will be: ESN=+022	ESN? ESN* ESN#	ESN?	ESN=xxxx
Enable Redundancy Switch Mode	ESW=	1 byte, value of 0 or 1	Command or Query. Set redundancy mode, where : 0 = Disable 1 = Enable **Example:** ESW=1 (Enable redundancy mode)	ESW= ESW? ESW* ESW#	ESW?	ESW=x
Firmware Revisions	N/A	1 byte	Query Only. Query the version information of the system. Where: i = Bulk Image number (1 or 2) a = Firmware Image b = Firmware Revision c = Firmware Date **Example:** FRW?1	FRW? FRW* FRW#	FRW?i	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c…

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
E3/T3/STS1 Mode Select	ETS=	2 bytes	Command or Query. Sets the E3/T3/STS1 interface card mode. s=Interface Slot (1 or 2) m=Mode 0=E3 1=T3 2=STS1 **Note:** Command valid only with CDI-10-1 G.703 interface. This sets the selected G.703 DATA rate. The unit will adjust the symbol rate based on modulation type and code rate to keep the selected data rate. **Example:** ETS=11 (sets Interface 1, Port 1 to T3 mode)	ETS= ETS? ETS# ETS*	ETS?s	ETS=sm
Gigabit Management IP Address and Subnet	GIP=	19 bytes	Command or Query. Gigabit Management IP address and subnet mask. s= Slot2 Only i=IP Address n=Netmask	GIP= GIP# GIP? GIP*	GIP?s	GIP=siii.iii.iii.iii.nn
Gigabit Interface Management MAC Address	GMC?	N/A	Query Only. s=Defines Interface slot (2) **Example:** To get MAC address for Gigabit in Slot 1 GMC?2 GMC=2s0006B0004717	GMC? GMC* GMC#	GMC?s	Gigabit Interface Management MAC Address
Gigabit Interface Software Revision	GSW?	N/A	Query Only. s=Defines Interface slot (2) **Example:** To get Software Revision for Gigabit in Slot 2 GSW?2 GSW=2FW/12738-,1.1.8,02/16/07	GSW? GSW* GSW#	GSW?s	Gigabit Interface Software Revision
Initialize Events Pointer	IEP=	None	Command Only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP? IEP* IEP#	N/A	IEP=
Boot Image	IMG=	1 byte	Command or Query. Boot image selection, where n is the image number: 1=Image #1 2=Image #2 **Example:** IMG=1 (Selects Image #1 for booting.)	IMG= IMG? IMG* IMG#	IMG?	IMG=n
Tx Output Impendance	IMP=	1 byte	Command or Query. Tx output impedance, where: 0=50 Ohm 1=75 Ohm **Example:** IMP=0 (Set impedance to 50 Ohms) *** NOTE:** Setting Tx Impedence is only possible on 70/140 Mhz units.	IMP= IMP? IMP* IMP#	IMP?	IMP=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseTx Ethernet management port, in the format: xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (00..31) **Example:** IPA=010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xxx.xxx.xxx.xxx.yy
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP addess for the 10/100 Base Tx Ethernet management port, in the format: xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address **Example:** IPG = 010.006.030.001	IPG= IPG? IPG* IPG#	IPG?	IPG = xxx.xxx.xxx.xxx
Interface Type	N/A	2 bytes	Query Only. Interface Type, where: s=Defines which interface slot (1 or 2) x=Defines the interface type, where: 0=Reserved 1=Reserved 2=Gigabit Ethernet 3=HSSI 4=E3T3STS1 **Example:** ITF?1	ITF? ITF* ITF#	ITF?s	ITF=sx
Rx Link Margin	N/A	4 bytes	Query only. Unit returns the value of the Link Margin. Returns 00.0 if demod is unlocked. **Example:** LNK=12.3	LNK? LNK* LNK#	LNK?	LNK=xxxx
Local/Remote Status	LRS=	1 byte	Command or Query. Local/Remote status, where: 0=Local 1=Serial 2=Reserved 3=Ethernet **Example:** LRS=1 (which is remote Serial)	LRS= LRS? LRS* LRS#	LRS?	LRS=x
Unit MAC Address	N/A	12 bytes	Query Only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=0006B000D2A7 (The MAC address of the unit is 00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC?	MAC=AABBCCDDEEFF

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Unit Alarm Mask	MSK=	13 bytes	Command or Query. Alarm mask conditions, in form abcdefghijkLmxxx, where: a=Tx Cable Slot 1 b=Tx AIS Slot 1 c=Rx AIS Slot 1 d=Bufferslip Alarm Slot 1 e=External Clock Alarm Slot 1 f=Tx Cable Slot 2 g=Tx AIS Slot 2 h=Rx AIS Slot 2 i=Bufferslip Alarm Slot 2 j=External Clock Alarm Slot 2 k=EBNO Alarm L=BER Alarm m=Rx AGC Alarm xxx-spares. Mask (Alarm=0, Fault = 1,Masked =2) **Example:** MSK=110101100000xxx (Alarm masks for interface slot ,Slot 2 ,Ebno, Rx Agc)	MSK= MSK? MSK* MSK#	MSK?	MSK=abcdefghijkLmxxx
Number of Unread stored Events	N/A	3 bytes	Query Only. Unit returns the Number of stored Events, which remain Unread, in the form xxx. **Note:** This means unread over the remote control. **Example:** NUE=126	NUE? NUE* NUE#	NUE?	NUE=xxx
Rx Alpha Rolloff	RAR=	1 byte	Command or Query. Rx Alpha Rolloff, where: 0 = 20% 1 = 25% 2 = 35% **Example:** RAR=0 (which is a Rx Alpha Rolloff of 20%)	RAR= RAR? RAR* RAR#	RAR?	RAR=x
Rx Buffer Size	RBS=	5 bytes	Command or Query. Rx Buffer Size (in milliseconds), where: s=Defines which interface slot (1 or 2) xx.x= Rx Buffer Size, HSSI = 5.0 to 32.0 ms, in 0.1 ms steps E3T3STS1 E3 mode = 0.5 to 61.0 ms, in 0.5 ms steps T3 mode = 0.5 to 44.0 ms, in 0.5 ms steps STS1 mode = 0.5 to 40.0 ms, in 0.5 ms steps GBEI = N/A **Example:** RBS=130.0 (selects 30.0 ms on interface 1)	RBS= RBS? RBS* RBS#	RBS?s	RBS=sxx.x (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Soft Reboot	RBT=1	1 byte	Command Only.. Soft Reboot. 1= Reboot System	RBT= RBT? RBT* RBT#	N/A	RBT=x
ReCenter Buffer	RCB=	2 bytes	Command only. Forces the software to recenter the receive Plesiochronous/Doppler buffer. s=Defines which interface slot (1 or 2) **Example:** RCB=11 (ReCenter buffer on interface 1 channel 1) GBEI = N/A	RCB= RCB? RCB* RCB#	N/A	N/A
Rx Clock Invert	RCI=	2 bytes	Command or Query. Invert Receive Clock, where: s=Defines which interface slot (1 or 2) x=Invert Receive Clock, where: 0=Normal 1=Inverted **Note:** Command valid with HSSI **Example:** RCI=11 (selects Inverted RX Clock, Slot 1)	RCI = RCI? RCI * RCI #	RCI?s	RCI =sx (see description of arguments)
Rx Clock Source	RCK=	2 bytes	Command or Query. Rx Clock Source (For Data Rate Accuracy), where: s=Defines which interface slot (1 or 2) x=Rx Clock Source, where: 0=Rx Satellite 1=Tx-Terrestrial 2=External Reference Clock 3=Internal (HSSI Only) Valid with HSSI and E3T3STS1. **Example:** RCK=11 (selects Tx-Terrestrial)	RCK= RCK? RCK* RCK#	RCK?s	RCK=sx (see description of arguments)
Rx Data Invert	RDI=	2 bytes	Command or Query. Invert Receive Data, where: s=Defines which interface slot (1 or 2) x=Invert Receive Data, where: 0=Normal 1=Inverted **Note:** Command valid with HSSI or E3T3STS1. **Example:** RDI=11 (selects Inverted RX Data)	RDI = RDI? RDI* RDI#	RDI?s	RDI =sx (see description of arguments)
Rx Data Rate	N/A	10 bytes	Query Only. Composite Rx Data rate, in kbps. Resolution=1 bps. **Example:** RDR=002047.999 (which is 2047.999 kbps)	RDR? RDR* RDR#	RDR?	RDR=xxxxxx.xxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Redundancy State	RED=	1 byte, value of 0 or 1	Command or Query. Unit returns the redundancy state of the unit, where: 0 = Offline 1 = Online *** This command can be used to force the unit offline, this is done by sending RED=0. This is only valid if redundancy mode is enabled. If redundancy is not enabled, then RED=0 will return an error. The unit cannot be forced online. *** If the unit is not in redundancy mode, then the unit will always be online. **Example:** RED=0 (force unit offline)	RED= RED? RED* RED#	RED?	RED=x (see description of arguments)
Restore Factory Defaults	RFD=	0Bytes	Command Only Restore Modem to Factory Defaylts	RFD=	RFD=	N/A
Rx Buffer Frame	RFM=	3 bytes	Command or Query. (G.703 Parameters) Rx Buffer Frame, where: s=Defines which interface slot (1 or 2) x=Rx Ternary Code, where: 0=None (Valid for E3, T3, and STS-1) 1=G.751 (Valid for E3) 2=G.752 (Valid for T3) 3=G.753 (Valid for E3) 4=STS-1 (Valid for STS-1) **Note:** Command valid only with CDI-10-1l G.703 interface. **Example:** RFM=11 (selects G.751 for slot #1, channel #1)	RFM= RFM? RFM* RFM#	RFM?s	RFM=sx (see description of arguments)
Rx Frequency Offset	N/A	5 bytes	Query only. Unit returns the value of the measured frequency offset of the carrier being demodulated. Values range from ± 0 to ± 100 kHz, 100 Hz resolution. Returns 999999 if the demodulator is unlocked. **Example:** RFO=+002.3 (which is + 2.3 kHz)	RFO? RFO* RFO#	RFO?	RFO=sxxx.x
Rx Frequency	RFQ=	9 bytes	Command or Query. Rx Frequency (in MHz) 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** RFQ=0950.0000	RFQ= RFQ? RFQ* RFQ#	RFQ?	RFQ=xxxx.xxxx
Rx Frame Size	N/A	1 byte	Query Only. Rx Frame Size Long/Short selection, where: 0=Short, 1=Long **Example:** RFS =0 (which is Short Frame Size) ***NOTE:** This is automatically detected on demod acquisition, but if the unit is not locked, the query returns 'x'.	RFS? RFS #	RFS?	RFS =x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx FEC Type	N/A	1 byte	Query Only. Rx FEC coding type, where: 1=LDPC (FEC is dependent on the RX Mode Type.) **Example:** RFT=1 (which is LDPC coding)	RFT? RFT* RFT#	RFT?	RFT=x
Rx Gold Code Sequence Index	RGS=	6 bytes	Command or Query. Rx Gold Code Sequence Index: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** RGS=189063	RGS= RGS? RGS* RGS#	RGS?	RGS=xxxxxx
Rx Interface Enable	RIE=	2 bytes	Command or Query. Interface Slot Enable/Disable, where: s=Defines which interface slot (1 or 2) x=Rx Interface Status, where: 0=Disabled 1=Enabled **Example:** RIE =11 (Enables receive interface)	RIE= RIE? RIE* RIE#	RIE?s	RIE=sx
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query Only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control in the form: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss, **A** being the fault/clear indicator. F=Fault C=Clear I=Info **B** being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=Log **C** is Fault Code numbers, as in FLT? or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss
Rx Pilot On/Off	N/A	1 byte	Query. Rx Pilot On/Off selection, where: 0=Off, 1=On **Example:** RPI=0 (which is Pilot Off) ***NOTE:** This is automatically detected on demod acquisition, but if the unit is not locked, the query returns 'x'.	RPI? RPI* RPI#	RPI?	RPI=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Signal Level	N/A	3 bytes	Query Only. Unit returns the value of the Rx signal level, in dBm, between +3.0 and –99.0 dBm, where; xxx is the Rx signal level. **Examples:** RSL=+03 RSL=-41	RSL? RSL* RSL#	RSL?	RSL=xxx
Rx Demod Acquisition Sweep Width	RSW=	3 bytes	Command or Query. Rx ± acquisition sweep range of demodulator, in kHz, ranging from ± 1 to ± 100 kHz. **Example:** RSW=009 (selects ± 9 kHz)	RSW= RSW? RSW* RSW#	RSW?	RSW=xxx (see description of arguments)
Gigabit Auto Autocrossover	SCX	2 bytes	Command or Query. s=Slot2 Only a= 1 GBEI Cable Auto Crossover Enabled. a=0 GBEI Cable Auto Crossover Disabled	SCX= SCX# SCX? SCX*	SCX?s	SCX=a
Gigabit Learning Mode	SLM	2 bytes	Command or Query. s=Slot2 Only a= 1 GBEI Learning Enabled. a=0 GBEI Learning Disabled	SLM= SLM# SLM? SLM*	SLM?s	SLM=a
Serial Number	N/A	9 bytes	Query Only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143	SNO? SNO* SNO#	SNO?	SNO=xxxxxxxxx
Software Revision	N/A	5 bytes	Query Only. Unit returns the value of the internal software revision installed in the unit, in the form: Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z **Example:** SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0	SWR? SWR* SWR#	SWR?	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Real-time Clock Time	TIM=	6 bytes	Command or Query. A time in the form hhmmss, indicating the time from midnight, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) **Example:** TIM=231259 (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss
Tx Line Code	TLC=	2 bytes	Command or Query. (G.703 Parameters) Tx Line Code, where: s=Defines which interface slot (1 or 2) x=Defines Tx Line Code, where: 0=None (Valid for E3, T3, and STS-1) 1=HDB3 (Valid for E3) 2=B3ZS (Valid for T3 and STS-1) **Note:** Command valid only with CDI-10-1Single G.703 interface **Example:** TLC=11 (sets Line Code to HDB3 for interface 1 channel 1)	TLC= TLC? TLC* TLC#	TLC?s	TLC=sx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Temperature	N/A	3 bytes	Query Only. Unit returns the value of the internal temperature, in the form of sxxx (degrees C). Where s is the sign and and xxx is the number of degrees. **Example:** TMP=+026	TMP? TMP* TMP#	TMP?	TMP=sxxx

A.6.3 Modem

Priority System = (Highest priority) TMD, TCR, and (Lowest Priority) TSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Modulation Type	TMD=	1 byte	Command or Query. Tx Modulation type, where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **Example:** TMD=1 (which is 8PSK)	TMD= TMD? TMD* TMD#	TMD?	TMD=x
Tx FEC Code Rate	TCR=	1 byte	Command or Query. Tx Code Rate, where: 0 = Rate 3/4 1 = Reserved 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 **Example:** TCR=0 (which is Rate 3/4)	TCR= TCR? TCR* TCR#	TCR?	TCR=x
Tx Symbol Rate	TSR=	9 bytes	Command or Query. Tx Symbol Rate, where: s=Symbol Rate in Msps **Example:** TSR=20.000000 (20 Msps.)	TSR= TSR? TSR* TSR#	TSR?	TSR=ss.ssssss

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Buffer Fill State	N/A	3 bytes	Query only. s=Defines which interface slot (1 or 2) xx = value of the buffer fill state, between 1 to 99%. Returns 00 if demodulator is unlocked. **Note:** Command not valid for GbEI. **Example:** BFS=133 (which is 33%, on interface slot 1 channel 1)	N/A	BFS?s	BFS=sxx
Interface Reference Clock	EFI=	2 bytes	Command or Query. s=Defines which interface slot (1 or 2) x=EXT CLK (Data Rate Accuracy), where: 0 = 1 MHz 1 = 2 MHz 2 = 2.048 MHz 3 = 5 MHz 4 = 10 MHz 5 = 20 MHz 6 = 34.368 MHz 7 = 44.736 MHz 8 = 51.840 MHz **Note:** Command valid only with CDI-10-1 G.703 interface. **Example:** EFI=14 (Selects 10MHz on slot 1)	EFI= EFI? EFI* EFI#	EFI?s	EFI=sx (see description of arguments)
E3/T3/STS1 Mode Select	ETS=	2 bytes	Command or Query. Sets the E3/T3/STS1 interface card mode, where: s=Interface Slot (1 or 2)) m=Mode 0=E3 1=T3 2=STS1 **Note:** Command valid only with CDI-10-1 G.703 interface. This sets the selected G.703 data rate. The unit will adjust the symbol rate based on modulation type and code rate to keep the selected data rate. **Example:** ETS=11 (sets Interface 1, Port 1 to T3 mode)	ETS= ETS? ETS# ETS*	ETS?s	ETS=sm
Gigabit Interface Management MAC Address	GMC?	N/A	Query Only. s= Slot 2 Only **Example:** To get MAC address for Gigabit in Slot 2 GMC?2 GMC=2;00-06-B0-00-47-17	GMC? GMC* GMC#	GMC?s	Gigabit Interface Management MAC Address
Gigabit Interface Software Revision	GSW?	N/A	Query Only. s= Slot 2 Only **Example:** To get Software Revision for Gigabit in Slot 2 GSW?2 GSW=2 FW/12738-,1.1.8,02/16/07	GSW? GSW* GSW#	GSW?s	Gigabit Interface Software Revision

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Output Impendance	IMP=	1 byte	Command or Query. Tx output impedance, where: 0=50 Ohm 1=75 Ohm **Example:** IMP=0 (Set impedance to 50 Ohms) *** NOTE:** Setting Tx Impedence is only possible on 70/140 Mhz units.	IMP= IMP? IMP* IMP#	IMP?	IMP=x
Rx Buffer Size	RBS=	5 bytes	Command or Query. Rx Buffer Size (in milliseconds), where: s=Defines which interface slot (1 or 2) xx.x= Rx Buffer Size, HSSI = 5.0 to 32.0 ms, in 0.1 ms steps E3T3STS1 E3 mode = 0.5 to 61.0 ms, in 0.5 ms steps T3 mode = 0.5 to 44.0 ms, in 0.5 ms steps STS1 mode = 0.5 to 40.0 ms, in 0.5 ms steps **Note:** Command not valid for GBEI. **Example:** RBS=130.0 (selects 30.0 ms on interface 1)	RBS= RBS? RBS* RBS#	RBS?s	RBS=sxx.x (see description of arguments)
ReCenter Buffer	RCB=	2 bytes	Command only. Forces the software to recenter the receive Plesiochronous/Doppler buffer. s=Defines which interface slot (1 or 2) **Example:** RCB=11 (ReCenter buffer on interface 1 channel 1) **Note:** Command not valid for GBEI.	RCB= RCB? RCB* RCB#	N/A	N/A
Rx Clock Source	RCK=	2 bytes	Command or Query. Rx Clock Source (For Data Rate Accuracy), where: s=Defines which interface slot (1 or 2) x=Rx Clock Source, where: 0=Rx Satellite 1=Tx-Terrestrial 2=External Reference Clock 3=Internal (HSSI Only) **Example:** RCK=11 (selects Tx-Terrestrial)	RCK= RCK? RCK* RCK#	RCK?s	RCK=sx (see description of arguments)
Rx Buffer Frame	RFM=	2 bytes	Command or Query. (G.703 Parameters) Rx Buffer Frame, where: s=Defines which interface slot (1 or 2) x=Rx Ternary Code, where: 0=None (Valid for E3, T3, and STS-1) 1=G.751 (Valid for E3) 2=G.752 (Valid for T3) 3=G.753 (Valid for E3) 4=STS-1 (Valid for STS-1) **Note:** Command valid only with CDI-10-1G.703 interface. **Example:** RFM=11 (selects G.751 for slot #1, channel #1)	RFM= RFM? RFM* RFM#	RFM?s	RFM=sx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Alpha Rolloff	TAR=	1 byte	Command or Query. Tx Alpha Rolloff, where: 0 = 20% 1 = 25% 2 = 35% **Example:** TAR=0 (which is a Tx Alpha Rolloff of 20%)	TAR= TAR? TAR* TAR#	TAR?	TAR=x
Tx Clock Invert	TCI=	2 bytes	Command or Query. Invert Transmit Clock, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Clock, where: 0=Normal 1=Inverted **Note:** Command valid with HSSI. **Example:** TCI = 11 (selects Inverted TX Clock, Slot 1)	TCI = TCI? TCI * TCI #	TCI?s	TCI =sx (see description of arguments)
Tx Data Invert	TDI=	2 bytes	Command or Query. Invert Transmit Data, where: s=Defines which interface slot (1 or 2) x=Invert Transmit Data, where: 0=Normal 1=Inverted **Note:** Command valid with HSSI or E3T3STS1. **Example:** TDI = 11 (selects Inverted TX Data)	TDI = TDI? TDI * TDI #	TDI?sc	TDI =sx (see description of arguments)
Tx Data Rate	N/A	10 bytes	Query Only. Composite Tx Data rate, in kbps. Resolution=1 bps. **Example:** TDR=002047.999 (which is 2047.999 kbps)	TDR? TDR* TDR#	TDR?	TDR=xxxxxx.xxx
Tx Frequency	TFQ=	9 bytes	Command or Query. Tx Frequency (in MHz) 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** TFQ=0950.0000	TFQ= TFQ? TFQ* TFQ#	TFQ?	TFQ=xxxx.xxxx
Tx Frame Size	TFS=	1 byte	Command or Query. Tx Frame Size Long/Short selection, where: 0=Short, 1=Long **Example:** TFS =0 (which is Short FEC Frame Size)	TFS = TFS? TFS * TFS #	TFS?	TFS =x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx FEC Type	N/A	1 byte	Query Only. Tx FEC coding type, where: 0=Viterbi + Reed-Solomon 1=LDPC (FEC is dependent on the TX Mode Type.) **Example:** TFT=1 (which is LDPC coding)	TFT? TFT* TFT#	TFT?	TFT=x
Tx Gold Code Sequence Index	TGS=	6 bytes	Command or Query. Tx Gold Code Sequence Index, where: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** TGS=189063	TGS= TGS? TGS* TGS#	TGS?	TGS=xxxxxx
Tx Interface Enable	TIE=	2 bytes	Command or Query. Interface Slot Enable/Disable, where: s=Defines which interface slot (1 or 2) x=Tx Interface Status, where: 0=Disabled 1=Enabled **Example:** TIE =11 (Enables transmit interface)	TIE= TIE? TIE* TIE#	TIE?s	TIE=sx
Tx Location of Pilot	TLP=	1 byte	Command or Query. Tx Pilot On/Off selection, where: 0=average, 1=Peak **Example:** TLP=0 (which is Pilot Average)	TLP= TLP? TLP* TLP#	TLP?	TLP=x
Tx Line Code	TLC=	2 bytes	Command or Query. (G.703 Parameters) Tx Line Code, where: s=Defines which interface slot (1 or 2) x=Defines Tx Line Code, where: 0=None (Valid for E3, T3, and STS-1) 1=HDB3 (Valid for E3) 2=B3ZS (Valid for T3 and STS-1) **Note:** Command valid only with CDI-10-1 G.703 interface. **Example:** TLC=11 (sets Line Code to HDB3 for interface 1 channel 1)	TLC= TLC? TLC* TLC#	TLC?s	TLC=sx (see description of arguments)
Tx Pilot On/Off	TPI=	1 byte	Command or Query. Tx Pilot On/Off selection, where: 0=Off, 1=On **Example:** TPI=0 (which is Pilot Off)	TPI= TPI? TPI* TPI#	TPI?	TPI=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Tx Power Level	TPL=	5 bytes	Command or Query. Tx Output power level, where: s=sign (+ / -) xx.x = Tx Output power level, +05.0 and –20.0 dBm. L-Band: -25.0 to –05.0 dBm 70/140 MHz: -20.0 to +00.0 dBm **Note:** Beyond –20 dBm is beyond the specification. **Example:** TPL = -13.4	TPL= TPL? TPL* TPL#	TPL?	TPL=sxx.x
Tx Spectrum Invert	TSI=	1 byte	Command or Query. Tx Spectrum Invert selection, where: 0=Normal 1=Tx Spectrum Inverted **Example:** TSI=0 (which is normal)	TSI= TSI? TSI* TSI#	TSI?	TSI=x
Tx Carrier State	TXO=	1 byte	Command or Query. Tx Carrier State, where: 0=OFF due to front panel or remote control command 1=ON **Example:** TXO=1 (Tx Carrier ON)	TXO= TXO? TXO* TXO#	TXO?	TXO=x

A.6.4 Priority System

Priority System = (Highest priority) RMD, RCR, and (Lowest Priority) RSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Modulation Type	N/A	1 byte	Query Only. Rx Modulation type, where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **Example:** RMD=1 (which is 8PSK) Returns RMD=x if Demodulator unlocked. This is automatically detected on demod acquisition.	N/A	RMD?	RMD=x
Rx FEC Code Rate	N/A	1 byte	Query Only. Rx Code Rate, where: 0 = Rate 3/4 1 = Reserved 2 = Rate 3/5 3 = Rate 4/5 4 = Rate 5/6 5 = Rate 8/9 6 = Rate 9/10 7 = Rate 2/3 8 = Rate 1/2 **Example:** RCR=0 (which is Rate 3/4) Returns RCR=x if Demodulator unlocked. This is automatically detected on demod acquisition.	N/A	RCR?	RCR=x
Rx Symbol Rate	RSR=	9 bytes	Command or Query. Rx Symbol Rate, where: s=Symbol Rate in Msps **Example:** RSR=20.000000 (20 Msps.) ***NOTE:** Please refer to **Sect. 1.8 Summary of Specifications** for available symbol rates for each modulation.	RSR= RSR? RSR* RSR#	RSR?	RSR=ss.ssssss
Enable/Disable Adaptive Equalizer	AEQ=	1 byte	Command or Query. Adaptive Equalizer status, where: 0=Disable 1=Enable **Example:** AEQ=1 (which is Enable)	AEQ= AEQ? AEQ* AEQ#	AEQ?	AEQ=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Clear All Stored Events	CAE=	None	Command Only. Forces the software to clear the software events log. **Example:** CAE= **Note:** This command takes no arguments	CAE= CAE? CAE* CAE#	N/A	N/A
Circuit ID String	CID=	24 bytes	Command or Query. Sets or queries the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z	CID= CID? CID* CID#	CID?	CID=xxxxxxxxxxxxxxxxxxxxxx
Configuration Load	CLD=	1 byte	Command Only. Retrieves a previously stored configuration from the specified configuration location (0 to 9). **Example:** CLD=4 (retrieve modulator configuration from location 4)	CLD= CLD? CLD* CLD#	N/A	N/A
Configuration Save	CST=	1 byte	Command Only. Stores the current modulator configuration in the specified configuration location (0 to 9). **Example:** CST=4 (store the current configuration in location 4)	CST= CST? CST* CST#	N/A	N/A
Real-time Clock Date	DAY=	6 bytes	Command or Query. A date in the form ddmmyy, where dd = day of the month (01 to 31), mm = month (01 to 12) yy = year (00 to 99) **Example:** DAY=240457 (April 24, 2057)	DAY= DAY? DAY* DAY#	DAY?	DAY=ddmmyy
Demodulator Lock Status	N/A	1 byte	Query Only. Demodulator Lock Status, where: 0 = Demodulator Unlocked 1 = Demodulator Locked **Example:** DLK=1 (Demodulator Locked)	DLK? DLK* DLK#	DLK?	DLK=x
Eb/No Alarm Point	EBA=	4 bytes	Command or Query. Eb/No alarm point in dB, with a range between 0.1 and 16 dB. Resolution=0.1 dB **Example:** EBA=12.3	EBA= EBA? EBA* EBA#	EBA?	EBA=xx.x (see description of arguments)
Rx Eb/No	N/A	4 bytes	Query only. Unit returns the value of Eb/No, between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example:** EBN=12.3 (which is Eb/No = 12.3 dB) For values greater than 16.0 dB, the reply will be: EBN=+016	EBN? EBN* EBN#	EBN?	EBN=xxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status	N/A	5 Bytes	Query Only. Unit returns the current fault and status codes for the Unit (hardware), Tx Traffic and Rx Traffic, in the form abcd, where: a = Unit Faults: 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5 Volts, Framer Card 3=Power supply fault, +1.5 Volts, Interface #1 4=Power supply fault, +1.5 Volts, Interface #2 5=Power supply fault, +3.3 Volts, Framer Card 6=Power supply fault, +5.0 Volts, Framer Card 7=Power supply fault, +12.0 Volts, Framer Card 8=Power supply fault, -12.0 Volts, Framer Card 9=Power supply faulit, +18.0 Volts, Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface #1 Load E=Interface #2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface #1 Removed L=Interface #2 Removed M=Reserved(Unit Factory Fault) N=Interface1 Wrong Type O=Interface2 Wrong Type b = Tx Traffic Status: 0=No faults 1= +1.5V Power Supply Unit (Modulator Card) 2= FPGA Failed to Load (Modulator Card) 3= Symbol Rate PLL Clock 4= Tx Synthesizer Unlocked 5= Tx Digital Clock Manager Unlocked 6= I & Q Baseband Channels are Inactive 7= FPGA Temperature (Modulator Card) 8= Reserved 9= TX Clock Failure (Interface 1) A= TX Clock Failure (Interface 2) B= GBEI Card Data rate > + 200 PPM C= GBEI Card Data rate < - 200 PPM D= GBEI No PHY Link	FLT? FLT* FLT#	FLT?	FLT=abcde d=Change in fault status since last poll. **Note:** Each section has faults listed in order of priority. For each section, only the highest priority fault is returned. There maybe multiple faults for each section, but only the highest fault is returned. e=Configuration Change

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Faults and Status (cont.)			E= Encoder FIFO Empty F= Encoder FIFO Full G= SERDES Parity Errors H=Reserved.I=Tx Ais Interface 1 J=Tx Ais Interface 2 K=Tx Cable Interface 1 L=Tx Cable Interface 2 c=Rx Traffic Status 0=No faults 1=+1.5V Demod Power Supply Unit (Demodulator Card) 2=FPGA Load (Demodulator Card) 3=Demod Unlocked 4=FPGA Temperature (Demodulator Card) 5=Ber Limit excedded 6=AGC Level Out of Range 7=Eb/No Limit Exceeded 8=Demodulator Synth 1 PLL 9=Demodulator Synth 2 PLL A=SERDES Demod to Framer B=SERDES Framer to FEC1 C=SERDES Framer to FEC2 D=Reserved(Fast Options) E=Rx DCM Unlocked F=Slot 1 Buffer Underflow G=Slot 1 Buffer Overflow H Slot 2 Buffer Underflow I Slot 2 Buffer Overflow J=Framer SERDES Rx Fault (Interface 1) K=Framer SERDES Rx Fault (Interface 2) L=Rx Clock Source Slot 1 M=Rx Clock Source Slot 1 N=Reserved. O=Rx AIS Slot 1 Port1 P=RXAIS Slip Slot 2 Port1, Q=EXT Clock Slot1,R EXT Clock Slot2 d=New Faults 0=No new faults 1=New faults, since last check e=Configuration Change 0= No Configuration Change 1=Configuration Change (cleared when read)			

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
External Reference Frequency	ERF=	1 byte	Command or Query. External Reference Frequency, where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz **Example:** ERF=0 (External reference not used - uses internal)	ERF= ERF? ERF* ERF#	ERF?	ERF=x
Rx Es/No	N/A	4 bytes	Query only. Unit returns the value of EsNo (when in DVB-S2 mode), between 0 and 16 dB, resolution 0.1 dB. Returns 99.9 if demod is unlocked. **Example:** ESN=12.3 (which is Es/No = 12.3 dB) For values greater than 22.0 dB, the reply will be: ESN=+022	ESN? ESN* ESN#	ESN?	ESN=xxxx
Enable Redundancy Switch Mode	ESW=	1 byte	Command or Query. Set redundancy mode, where : 0 = Disable 1 = Enable **Example:** ESW=1 (Enable redundancy mode)	ESW= ESW? ESW* ESW#	ESW?	ESW=x
Firmware Revisions	N/A	1 byte	Query Only. Query the version information of the system. Where: i = Bulk Image number (1 or 2) a = Firmware Image b = Firmware Revision c = Firmware Date **Example:** FRW?1	FRW? FRW* FRW#	FRW?i	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c…
Gigabit Management IP Address and Subnet	GIP=	19 bytes	Command or Query. Gigabit Management IP address and subnet mask. s=Slot 2 Only i=IP Address n=Netmask	GIP= GIP# GIP? GIP*	GIP?s	GIP=siii.iii.iii.iii.nn
Initialize Events Pointer	IEP=	None	Command Only. Resets internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP? IEP* IEP#	N/A	N/A
Boot Image	IMG=	1 byte	Command or Query. Boot image selection, where n is the image number: 1=Image #1 2=Image #2 **Example:** IMG=1 (Selects Image #1 for booting.)	IMG= IMG? IMG* IMG#	IMG?	IMG=n

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
IP Address	IPA=	18 bytes	Command or Query. Used to set the IP address and network prefix for the 10/100 BaseTx Ethernet management port, in the format: xxx.xxx.xxx.xxx.yy, where: xxx.xxx.xxx.xxx is the IP address, and yy is the network prefix (00..31) **Example:** IPA=010.006.030.001.24	IPA= IPA? IPA* IPA#	IPA?	IPA= xxx.xxx.xxx.xxx.yy
Gateway Address	IPG=	15 bytes	Command or Query. Used to set the Gateway IP addess for the 10/100 Base Tx Ethernet management port, in the format: xxx.xxx.xxx.xxx, where: xxx.xxx.xxx.xxx is the IP address **Example:** IPG = 010.006.030.001	IPG= IPG? IPG* IPG#	IPG?	IPG = xxx.xxx.xxx.xxx
Interface Type	N/A	2 bytes	Query Only. Interface Type, where: s=Defines which interface slot (1 or 2) x=Defines the interface type, where: 0=Reserved 1= Reserved 2= Gigabit Ethernet 3= HSSI 4= E3T3STS1 **Example:** ITF?1	ITF? ITF* ITF#	ITF?s	ITF=sx
Rx Link Margin	N/A	4 bytes	Query only. Unit returns the value of the Link Margin. Returns 00.0 if demod is unlocked. **Example:** LNK=12.3	LNK? LNK* LNK#	LNK?	LNK=xxxx
Local/Remote Status	LRS=	1 byte	Command or Query. Local/Remote status, where: 0=Local 1=Serial 2=Reserved 3=Ethernet **Example:** LRS=1 (which is remote Serial)	LRS= LRS? LRS* LRS#	LRS?	LRS=x
Unit MAC Address	N/A	12 bytes	Query Only. MAC address of the unit, reported in hexadecimal. **Example:** MAC=0006B000D2A7 (The MAC address of the unit is 00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC?	MAC=AABBCCDDEEFF

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Number of Unread stored Events	N/A	3 bytes	Query Only. Unit returns the Number of stored Events, which remain Unread, in the form xxx. **Note:** This means unread over the remote control. **Example:** NUE=126	NUE? NUE* NUE#	NUE?	NUE=xxx
Rx Alpha Rolloff	RAR=	1 byte	Command or Query. Rx Alpha Rolloff, where: 0 = 20% 1 = 25% 2 = 35% **Example:** RAR=0 (which is a Rx Alpha Rolloff of 20%)	RAR= RAR? RAR* RAR#	RAR?	RAR=x
Rx Buffer Size	RBS=	5 bytes	Command or Query. Rx Buffer Size (in milliseconds), where: s=Defines which interface slot (1 or 2) xx.x= Rx Buffer Size, HSSI = 5.0 to 32.0 ms, in 0.1 ms steps GBEI = N/A E3T3STS1= .5 TO 64 MS IN.5MS STEPS **Example:** RBS=130.0 (selects 30.0 ms on interface 1)	RBS= RBS? RBS* RBS#	RBS?s	RBS=sxx.x (see description of arguments)
Soft Reboot	RBT=1	1 byte	Command Only. Soft Reboot. 1= Reboot System	RBT= RBT? RBT* RBT#	N/A	RBT=x
Rx Clock Invert	RCI=	2 bytes	Command or Query. Invert Receive Clock, where: s=Defines which interface slot (1 or 2) x=Invert Receive Clock, where: 0=Normal 1=Inverted **Note:** Command valid only with HSSI. **Example:** RCI = 11 (selects Inverted RX Clock, Slot 1)	RCI = RCI? RCI * RCI #	RCI?s	RCI =sx (see description of arguments)
Rx Data Invert	RDI=	2 bytes	Command or Query. Invert Receive Data, where: s=Defines which interface slot (1) x=Invert Receive Data, where: 0=Normal 1=Inverted **Note:** Command valid with HSSI or E3T3STS1.	RDI = RDI? RDI* RDI#	RDI?sc	RDI =sx (see description of arguments)

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Data Rate	N/A	10 bytes	Query Only. Composite Rx Data rate, in kbps. Resolution=1 bps. **Example:** RDR=002047.999 (which is 2047.999 kbps)	RDR? RDR* RDR#	RDR?	RDR=xxxxxx.xxx
Redundancy State	RED=	1 byte	Command or Query. Unit returns the redundancy state of the unit, where: 0 = Offline 1 = Online *** This command can be used to force the unit offline, this is done by sending RED=0. This is only valid if redundancy mode is enabled. If redundancy is not enabled, then RED=0 will return an error. The unit cannot be forced online. *** If the unit is not in redundancy mode, then the unit will always be online. **Example:** RED=0 (force unit offline)	RED= RED? RED* RED#	RED?	RED=x (see description of arguments)
Rx Frequency Offset	N/A	5 bytes	Query only. Unit returns the value of the measured frequency offset of the carrier being demodulated. Values range from ± 0 to ± 100 kHz, 100 Hz resolution. Returns 999999 if the demodulator is unlocked. **Example:** RFO=+002.3 (which is + 2.3 kHz)	RFO? RFO* RFO#	RFO?	RFO=sxxx.x
Rx Frequency	RFQ=	9 bytes	Command or Query. Rx Frequency (in MHz) 52 to 88 MHz, and 104 to 176 MHz (70/140 Modulator) 950 to 1950 MHz (L-Band Modulator) Resolution=100Hz. **Example:** RFQ=0950.0000	RFQ= RFQ? RFQ* RFQ#	RFQ?	RFQ=xxxx.xxxx
Rx Frame Size	N/A	1 byte	Query Only. Rx Frame Size Long/Short selection, where: 0=Short, 1=Long **Example:** RFS =0 (which is Short FEC Frame Size) Returns RFS=x if Demodulator unlocked. This is automatically detected on demod acquisition.	N/A	RFS?	RFS =x
Rx FEC Type	N/A	1 byte	Query Only. Rx FEC coding type, where: 1=LDPC (FEC is dependent on the RX Mode Type.) **Example:** RFT=1 (which is LDPC coding)	RFT? RFT* RFT#	RFT?	RFT=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Gold Code Sequence Index	RGS=	6 bytes	Command or Query. Rx Gold Code Sequence Index: xxxxxx = Gold Code Sequence index (0 to 262141) **Example:** RGS=189063	RGS= RGS? RGS* RGS#	RGS?	RGS=xxxxxx
Rx Interface Enable	RIE=	2 bytes	Command or Query. Interface Slot Enable/Disable, where: s=Defines which interface slot (1 or 2) x=Rx Interface Status, where: 0=Disabled 1=Enabled **Example:** RIE =11 (Enables receive interface)	RIE= RIE? RIE* RIE#	RIE?s	RIE=sx
Retrieve next 5 unread Stored Events	N/A	75 bytes	Query Only. Unit returns the oldest 5 Stored Events which have not yet been read over the remote control in the form: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body= ABCddmmyyhhmmss: **A** being the fault/clear indicator. F=Fault C=Clear I=Info **B** being the fault type where: 1=Unit 2=Rx Traffic 3=Tx Traffic 4=Log **C** is Fault Code numbers, as in FLT? or Info Code, which is: 0=Power Off 1=Power On 2=Log Cleared 3=Global Config Change 4=Redundancy Config Change If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE?	RNE={CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss{CR}ABCddmmyyhhmmss
Rx Pilot On/Off	N/A	1 byte	QueryOnly . Rx Pilot On/Off selection, where: 0=Off, 1=On **Example:** RPI=0 (which is Pilot Off) Returns RPI=x if Demodulator unlocked. This is automatically detected on demod acquisition.	N/A	RPI?	RPI=x

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Rx Signal Level	N/A	3 bytes	Query Only. Unit returns the value of the Rx signal level, in dBm, between +3.0 and –99.0 dBm, where; xxx is the Rx signal level. **Examples:** RSL=+03 RSL=-41	RSL? RSL* RSL#	RSL?	RSL=xxx
Rx Demod Acquisition Sweep Width	RSW=	3 bytes	Command or Query. Rx ± acquisition sweep range of demodulator, in kHz, ranging from ± 1 to ± 100 kHz. **Example:** RSW=009 (selects ± 9 kHz)	RSW= RSW? RSW* RSW#	RSW?	RSW=xxx (see description of arguments)
Gigabit Learning Mode	SLM	2 bytes	Command or Query. s=Slot 2 Only a=1 GBEI Learning Enabled. a=0 GBEI Learning Disabled	SLM= SLM# SLM? SLM*	SLM?s	SLM=a
Gigabit Auto Autocrossover	SCX	2 bytes	Command or Query. s=Slot 2 Only a=1 GBEI Cable Auto Crossover Enabled. a=0 GBEI Cable Auto Crossover Disabled	SCX= SCX# SCX? SCX*	SCX?s	SCX=a
Serial Number	N/A	9 bytes	Query Only. Used to query the unit 9-digit serial number. Unit returns its S/N in the form xxxxxxxxx. **Example:** SNO=176500143	SNO? SNO* SNO#	SNO?	SNO=xxxxxxxxx
Software Revision	N/A	5 bytes	Query Only. Unit returns the value of the internal software revision installed in the unit, in the form: Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z **Example:** SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0	SWR? SWR* SWR#	SWR?	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Real-time Clock Time	TIM=	6 bytes	Command or Query. A time in the form hhmmss, indicating the time from midnight, where: hh = hours (00 to 23) mm = minutes (00 to 59) ss = seconds (00 to 59) **Example:** TIM=231259 (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM?	TIM=hhmmss
Temperature	N/A	3 bytes	Query Only. Unit returns the value of the internal temperature, in the form of sxxx (degrees C). Where s is the sign and and xxx is the number of degrees. **Example:** TMP=+026	TMP? TMP* TMP#	TMP?	TMP=sxxx

Parameter Type	Command (Instruction Code and Qualifier)	Arguments for Command or Response to Query	Description of Arguments	Response to Command	Query (Instruction Code and Qualifier)	Response to Query
Unit Test Mode	TST=	1 byte	Command or Query. Test Mode, where: 0=Normal Mode (no test) 1=IF Loop 2=I/O Loop 3=RF Loop 4=Tx CW 5=Tx Alternating 1,0 Pattern **Example:** TST=4 (Tx CW)	TST= TST? TST* TST#	TST?	TST=x

A.6.5 Modem Global Configuration (MGC) Command

The MGC command can be used to configure the whole modem or parts of the modem. This command also contains spare bytes for future development, but the length of the command is fixed to 255 bytes. The MGC command can be used on modulator-only units, demodulator-only units, and modem units.

A.6.5.1 MGC Format

The format for the response to the MGC command/query is as follows:

MGC=TRUSI[Tx Block][Rx Block][Unit Block][Interface Block].

For a query, the first 5 bytes indicates whether the corresponding block is present in the response:

T – 'T' if transmit block is present in the response, '0' means the block is not present and 'x's are returned.
R – 'R' if receive block is present in the response, '0' means the block is not present and 'x's are returned.
U – 'U' if unit block is present in the response, '0' means the block is not present and 'x's are returned.
S – Indicates which interface slot is enabled. '1' indicates that slot 1 is enabled. '2' indicates that slot 2 is enabled.
I – Indicates the interface type for the interface block. '4' indicates G.703, '2' indicates Gigabit Ethernet interface, '3' indicates HSSI.

For a set command, the first 5 bytes indicates whether the corresponding block should be reprogrammed:

T – 'T' if transmit configuration should be changed, '0' means the Tx configuration should be skipped over.
R – 'R' if receive configuration should be changed, '0' means the Rx configuration should be skipped over.
U – 'U' if unit configuration should be changed, '0' means the unit configuration should be skipped over.
S – Indicates which slot should be enabled. '1' indicates that slot 1 should be enabled. '2' indicates that slot 2 should be enabled.
I – Indicates the interface type for the interface block. '4' indicates G.703, '2' indicates Gigabit Ethernet interface, '3' indicates HSSI.

MGC HSSI Example:

<0000/MGC=TRU111250.0000101.0000001070-10.0101000000001xxxxxxxxxx1250.0000101.00
00001070101010000000002.01xxxxxxxxxx00000xxxxxxxxxxxxxxx0000321.1xxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxx

[Tx Block] consists of 50 bytes for Transmit configuration. The format is: aaaa.aaaabcc.ccccccdefghhh.hijklmmmmmmnoxxxxxxxxxx

aaaa.aaaa = Tx Frequency (in MHz)	same as TFQ
b = Tx Mode	(read-only)
cc.cccccc = Tx Symbol Rate	same as TSR
d = Tx FEC Type	same as TFT (read-only)
e = Tx Modulation type	same as TMD
f = Tx FEC Rate	same as TCR
g = Tx Spectrum Inversion	same as TSI
hhh.h = Tx Power Level	same as TPL
i = Tx Carrier State	same as TXO
j = Tx Alpha Roll-off	same as TAR
k = Tx Frame Size	same as TFS
l = Tx Pilots	same as TPI
mmmmmm = Tx Gold Code Sequence	same as TGS
n = Tx Location of Pilot	same as TLP
o = Tx Transport Stream	(read-only)
xxxxxxxxxx = Spare bytes.	

[Rx Block] consists of 50 bytes for Receive configuration. The format is: aaaa.aaaabcc.ccccccdefggghijkllllllmm.mnopxxxxxxxx

aaaa.aaaa = Rx Frequency (in MHz)	same as RFQ
b = Rx Mode	(read-only)
cc.cccccc = Rx Symbol Rate	same as RSR
d = Rx FEC Type	same as RFT (read-only)
e = Rx Modulation Type	same as RMD (read-only)
f = Rx FEC Rate	same as RCR (read-only)
ggg = Rx Sweep Width	same as RSW
h = Rx Adaptive Equalizer	same as AEQ
i = Rx Alpha Roll-off	same as RAR
j = Rx Frame Size	same as RFS (read-only)
k = Rx Pilots	same as RPI (read-only)
llllll = Rx Gold Code Sequence	same as RGS
mm.m = Rx EbNo Alarm Point	same as EBA
n = Rx Transport Stream	(read-only)
o=Rx PLL	same as RPL
p=Ber Threshold	same as BTH
xxxxxxxx = Spare bytes.	

[Unit Block] consists of 20 bytes for Unit Configuration. The format is: ab ccccccccccccccccdx

a = Test Mode	same as TST
b = *Reserved*	
ccccccccccccccc = Alarm Mask	same as MSK
d = External Reference Frequency	same as ERF
x = Spare bytes.	

[Interface Block] consists of 130 bytes and contains the configuration of the current enabled interface on the unit. The format of the configuration bytes **depend on the interface type indicated by the 5th byte in the MGC query or command.**

If E3T3STS1 interface, then format is: abcdeff.fx…xxx

a = Tx Data Inversion	same as TDI (omit interface slot parameter)
b = Rx Data Inversion	same as RDI (omit interface slot parameter)
c = Rx Clock Source	same as RCK (omit interface slot parameter)
dd.d = Rx Buffer Size	same as RBS (omit interface slot parameter)
f= ET3STS1 Type	same as ETS (omit interface slot parameter)
e = E3T3STS1 Rx FRAME	same as RFM (omit interface slot parameter)
g= E3T3STS1 Tx Line Code	same as TLC (omit interface slot parameter)
h=E3T3STS1 External Ref	same as EFI (omit interface slot parameter)

If Gigabit Ethernet interface then format is: ab…xxxx

a=autocrossover
b=learning

If HSSI interface, then format is: abcdeff.fx…xxx

a = Tx Data Inversion	same as TDI (omit interface slot parameter)
b = Rx Data Inversion	same as RDI (omit interface slot parameter)
c = Tx Clock Inversion	same as TCI (omit interface slot parameter)
d = Rx Clock Inversion	same as RCI (omit interface slot parameter)
e = Rx Clock Source	same as RCK (omit interface slot parameter)
ff.f = Rx Buffer Size	same as RBS (omit interface slot parameter)
x…xxx = spare bytes	

Appendix B. Eb/No MEASUREMENT

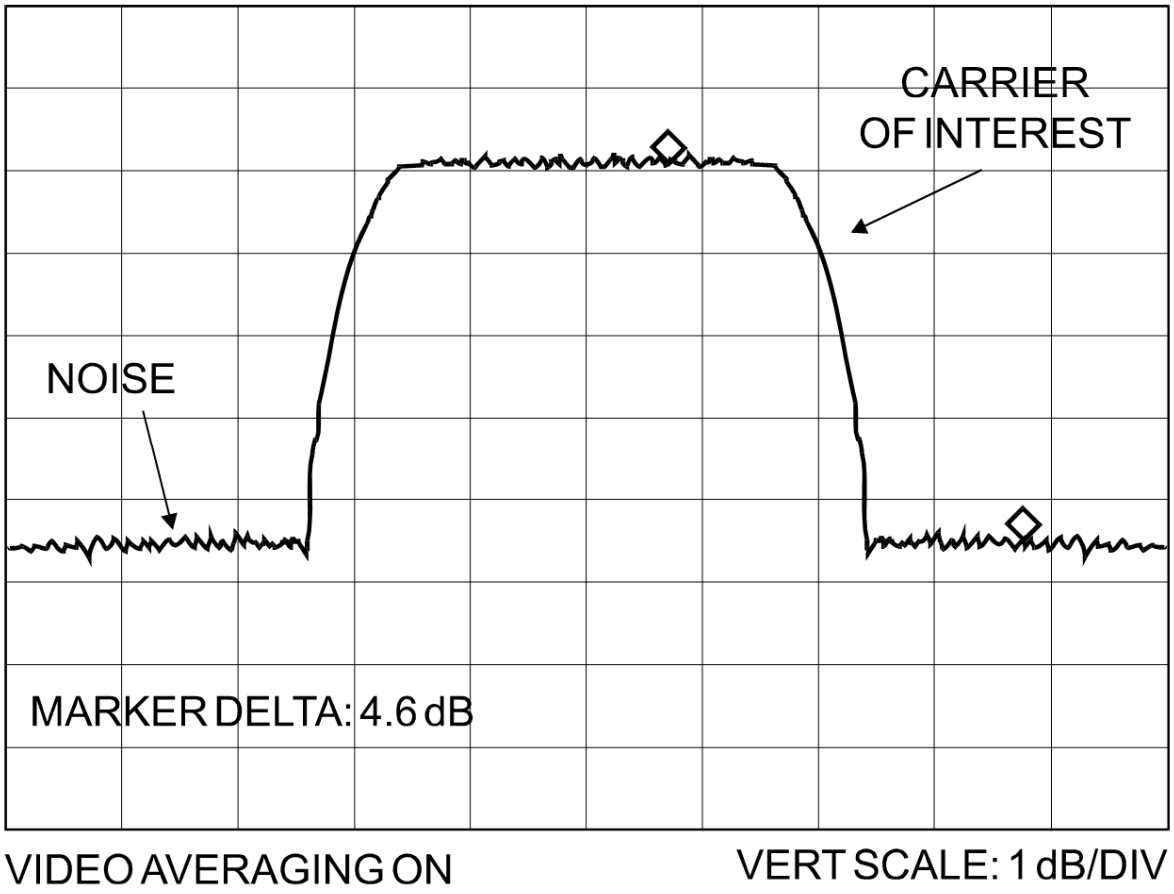
Although the CDM-710G calculates and displays the value of receive Eb/No on the front panel of the unit, it is sometimes useful to measure the value using a spectrum analyzer, if one is available.

The idea is to accurately measure the value of (Co+No)/No, (Carrier density + Noise density/Noise density). This is accomplished by tuning the center frequency of the Spectrum analyzer to the signal of interest, and measuring the difference between the peak spectral density of the signal (the flat part of the spectrum shown) and the noise density. To make this measurement:

- Use a vertical scale of 1 or 2 dB/division.
- Set the Resolution Bandwidth of the Spectrum Analyzer to < 20 % of the symbol rate.
- Use video filtering and/or video averaging to reduce the variance in the displayed trace to a low enough level that the difference can be measured to within 0.2dB.
- Place a marker on the flat part of the signal of interest, then use the MARKER DELTA function to put a second marker on the noise to the side of the carrier. This value is (Co+No)/No, in dB.
- Use this value of (Co+No)/No in the table on the following page to determine the Eb/No. You will need to know the operating mode to read from the appropriate column.
- If the (Co+No)/No value measured does not correspond to an exact table entry, interpolate using the two nearest values.

Note that the accuracy of this method degrades significantly at low values of (Co+No)/No (approximately less than 6 dB).

Example: In the diagram that follows, the (Co+No)/No measured is 4.6 dB. If Rate 1/2 QPSK is used, this corresponds to an Eb/No of approximately 2.8 dB (DVB-S2).



The relationship used to derive the table values is as follows (only simple way for DVB-S2):

$$\text{Eb/No} = 10 \log_{10} (10^{(\text{Co+No/No})/10)} - 1) - 10 \log_{10} (\text{Spectral Efficiency})$$

and:

- Eb/No and (Co+No)/No are expressed in dB;
- Spectral Efficiency includes the modulation type, code rate, overhead and framing and is shown in **Tables B-1** and **B-2**.

Table B-1. CDM-710G Co+No/No to C/N (Es/No) and Eb/No (dB) for DVB-S2 QPSK and 8PSK

(DVB-S2 uses C/N (Es/No), and Eb/No is shown for information)

		Code Rate																
		QPSK											8PSK					
Spectral Efficiency		0.490243	0.656448	0.789412	0.988858	1.188304	1.322253	1.487473	1.587196	1.654663	1.766451	1.788612	1.779991	1.980636	2.228124	2.478562	2.646012	2.679207
		1/4	1/3	2/5	1/2	3/5	2/3	3/4	4/5	5/6	8/9	9/10	3/5	2/3	3/4	5/6	8/9	9/10
(Co+No)/No	C/N = Es/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No
2.0	-2.3	0.8	-0.5	-1.3	-2.3	-3.1	-3.5	-4.1	-4.3	-4.5	-4.8	-4.9	-4.8	-5.3	-5.8	-6.3	-6.6	-6.6
2.5	-1.1	2.0	0.7	-0.1	-1.0	-1.8	-2.3	-2.8	-3.1	-3.3	-3.6	-3.6	-3.6	-4.1	-4.6	-5.0	-5.3	-5.4
3.0	0.0	3.1	1.8	1.0	0.0	-0.8	-1.2	-1.7	-2.0	-2.2	-2.5	-2.5	-2.5	-3.0	-3.5	-4.0	-4.2	-4.3
3.5	0.9	4.0	2.8	2.0	1.0	0.2	-0.3	-0.8	-1.1	-1.3	-1.5	-1.6	-1.6	-2.0	-2.5	-3.0	-3.3	-3.4
4.0	1.8	4.9	3.6	2.8	1.8	1.0	0.6	0.1	-0.2	-0.4	-0.7	-0.7	-0.7	-1.2	-1.7	-2.1	-2.4	-2.5
4.5	2.6	5.7	4.4	3.6	2.6	1.8	1.4	0.9	0.6	0.4	0.1	0.1	0.1	-0.4	-0.9	-1.3	-1.6	-1.7
5.0	3.3	6.4	5.2	4.4	3.4	2.6	2.1	1.6	1.3	1.2	0.9	0.8	0.8	0.4	-0.1	-0.6	-0.9	-0.9
5.5	4.1	7.2	5.9	5.1	4.1	3.3	2.8	2.3	2.1	1.9	1.6	1.5	1.6	1.1	0.6	0.1	-0.2	-0.2
6.0	4.7	7.8	6.6	5.8	4.8	4.0	3.5	3.0	2.7	2.6	2.3	2.2	2.2	1.8	1.3	0.8	0.5	0.5
6.5	5.4	8.5	7.2	6.4	5.4	4.7	4.2	3.7	3.4	3.2	2.9	2.9	2.9	2.4	1.9	1.5	1.2	1.1
7.0	6.0	9.1	7.9	7.1	6.1	5.3	4.8	4.3	4.0	3.8	3.6	3.5	3.5	3.1	2.6	2.1	1.8	1.8
7.5	6.6	9.7	8.5	7.7	6.7	5.9	5.4	4.9	4.6	4.5	4.2	4.1	4.1	3.7	3.2	2.7	2.4	2.4
8.0	7.3	10.3	9.1	8.3	7.3	6.5	6.0	5.5	5.2	5.1	4.8	4.7	4.7	4.3	3.8	3.3	3.0	3.0
8.5	7.8	10.9	9.7	8.9	7.9	7.1	6.6	6.1	5.8	5.7	5.4	5.3	5.3	4.9	4.4	3.9	3.6	3.6
9.0	8.4	11.5	10.2	9.4	8.5	7.7	7.2	6.7	6.4	6.2	5.9	5.9	5.9	5.4	4.9	4.5	4.2	4.1
9.5	9.0	12.1	10.8	10.0	9.0	8.2	7.8	7.3	7.0	6.8	6.5	6.5	6.5	6.0	5.5	5.0	4.8	4.7
10.0	9.5	12.6	11.4	10.6	9.6	8.8	8.3	7.8	7.5	7.4	7.1	7.0	7.0	6.6	6.1	5.6	5.3	5.3
10.5	10.1	13.2	11.9	11.1	10.1	9.3	8.9	8.4	8.1	7.9	7.6	7.6	7.6	7.1	6.6	6.2	5.9	5.8
11.0	10.6	13.7	12.5	11.7	10.7	9.9	9.4	8.9	8.6	8.5	8.2	8.1	8.1	7.7	7.2	6.7	6.4	6.4
11.5	11.2	14.3	13.0	12.2	11.2	10.4	10.0	9.5	9.2	9.0	8.7	8.7	8.7	8.2	7.7	7.2	7.0	6.9
12.0	11.7	14.8	13.5	12.7	11.8	11.0	10.5	10.0	9.7	9.5	9.2	9.2	9.2	8.7	8.2	7.8	7.5	7.4
12.5	12.2	15.3	14.1	13.3	12.3	11.5	11.0	10.5	10.2	10.1	9.8	9.7	9.7	9.3	8.8	8.3	8.0	8.0
13.0	12.8	15.9	14.6	13.8	12.8	12.0	11.6	11.1	10.8	10.6	10.3	10.3	10.3	9.8	9.3	8.8	8.6	8.5
13.5	13.3	16.4	15.1	14.3	13.4	12.6	12.1	11.6	11.3	11.1	10.8	10.8	10.8	10.3	9.8	9.4	9.1	9.0
14.0	13.8	16.9	15.7	14.9	13.9	13.1	12.6	12.1	11.8	11.6	11.4	11.3	11.3	10.9	10.3	9.9	9.6	9.5
14.5	14.3	17.4	16.2	15.4	14.4	13.6	13.1	12.6	12.3	12.2	11.9	11.8	11.8	11.4	10.9	10.4	10.1	10.1
15.0	14.9	18.0	16.7	15.9	14.9	14.1	13.6	13.1	12.9	12.7	12.4	12.3	12.4	11.9	11.4	10.9	10.6	10.6
15.5	15.4	18.5	17.2	16.4	15.4	14.6	14.2	13.7	13.4	13.2	12.9	12.9	12.9	12.4	11.9	11.4	11.1	11.1
16.0	15.9	19.0	17.7	16.9	15.9	15.1	14.7	14.2	13.9	13.7	13.4	13.4	13.4	12.9	12.4	11.9	11.7	11.6
16.5	16.4	19.5	18.2	17.4	16.5	15.7	15.2	14.7	14.4	14.2	13.9	13.9	13.9	13.4	12.9	12.5	12.2	12.1
17.0	16.9	20.0	18.7	17.9	17.0	16.2	15.7	15.2	14.9	14.7	14.4	14.4	14.4	13.9	13.4	13.0	12.7	12.6
17.5	17.4	20.5	19.3	18.4	17.5	16.7	16.2	15.7	15.4	15.2	15.0	14.9	14.9	14.5	13.9	13.5	13.2	13.1
18.0	17.9	21.0	19.8	19.0	18.0	17.2	16.7	16.2	15.9	15.7	15.5	15.4	15.4	15.0	14.5	14.0	13.7	13.7
18.5	18.4	21.5	20.3	19.5	18.5	17.7	17.2	16.7	16.4	16.3	16.0	15.9	15.9	15.5	15.0	14.5	14.2	14.2
19.0	18.9	22.0	20.8	20.0	19.0	18.2	17.7	17.2	16.9	16.8	16.5	16.4	16.4	16.0	15.5	15.0	14.7	14.7

Notes:

1. Eb/No = Es/No – 10 Log (Spectral Efficiency). **2.** The Required C/N for QEF with FECFrame = 16,200 bits is typically 0.2 to 0.3 dB higher. **3.** Shaded values are high error rate or unusable.

Table B-2. CDM-710G Co+No/No to C/N (Es/No) and Eb/No (dB) for DVB-S2 16APSK and 32APSK

(DVB-S2 uses C/N (Es/No), and Eb/No is shown for information)

		Code Rate										
		16APSK						32APSK				
Spectral Efficiency		2.637201	2.966728	3.165623	3.300184	3.523143	3.567342	3.703295	3.951571	4.119540	4.397854	4.453027
		2/3	3/4	4/5	5/6	8/9	9/10	3/4	4/5	5/6	8/9	9/10
(Co+No)/No	C/N = Es/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No
9.0	8.4	4.2	3.7	3.4	3.2	2.9	2.9	2.7	2.4	2.3	2.0	1.9
9.5	9.0	4.8	4.3	4.0	3.8	3.5	3.5	3.3	3.0	2.8	2.6	2.5
10.0	9.5	5.3	4.8	4.5	4.4	4.1	4.0	3.9	3.6	3.4	3.1	3.1
10.5	10.1	5.9	5.4	5.1	4.9	4.6	4.6	4.4	4.1	3.9	3.7	3.6
11.0	10.6	6.4	5.9	5.6	5.5	5.2	5.1	5.0	4.7	4.5	4.2	4.2
11.5	11.2	7.0	6.5	6.2	6.0	5.7	5.7	5.5	5.2	5.0	4.7	4.7
12.0	11.7	7.5	7.0	6.7	6.5	6.2	6.2	6.0	5.7	5.6	5.3	5.2
12.5	12.2	8.0	7.5	7.2	7.1	6.8	6.7	6.6	6.3	6.1	5.8	5.8
13.0	12.8	8.6	8.1	7.8	7.6	7.3	7.3	7.1	6.8	6.6	6.3	6.3
13.5	13.3	9.1	8.6	8.3	8.1	7.8	7.8	7.6	7.3	7.2	6.9	6.8
14.0	13.8	9.6	9.1	8.8	8.6	8.4	8.3	8.1	7.9	7.7	7.4	7.3
14.5	14.3	10.1	9.6	9.3	9.2	8.9	8.8	8.7	8.4	8.2	7.9	7.9
15.0	14.9	10.6	10.1	9.9	9.7	9.4	9.3	9.2	8.9	8.7	8.4	8.4
15.5	15.4	11.2	10.7	10.4	10.2	9.9	9.9	9.7	9.4	9.2	8.9	8.9
16.0	15.9	11.7	11.2	10.9	10.7	10.4	10.4	10.2	9.9	9.7	9.5	9.4
16.5	16.4	12.2	11.7	11.4	11.2	10.9	10.9	10.7	10.4	10.3	10.0	9.9
17.0	16.9	12.7	12.2	11.9	11.7	11.4	11.4	11.2	10.9	10.8	10.5	10.4
17.5	17.4	13.2	12.7	12.4	12.2	12.0	11.9	11.7	11.5	11.3	11.0	10.9
18.0	17.9	13.7	13.2	12.9	12.7	12.5	12.4	12.2	12.0	11.8	11.5	11.4
18.5	18.4	14.2	13.7	13.4	13.3	13.0	12.9	12.8	12.5	12.3	12.0	12.0
19.0	18.9	14.7	14.2	13.9	13.8	13.5	13.4	13.3	13.0	12.8	12.5	12.5
19.5	19.5	15.2	14.7	14.4	14.3	14.0	13.9	13.8	13.5	13.3	13.0	13.0
20.0	20.0	15.7	15.2	15.0	14.8	14.5	14.4	14.3	14.0	13.8	13.5	13.5
20.5	20.5	16.2	15.7	15.5	15.3	15.0	14.9	14.8	14.5	14.3	14.0	14.0
21.0	21.0	16.8	16.2	16.0	15.8	15.5	15.4	15.3	15.0	14.8	14.5	14.5
21.5	21.5	17.3	16.7	16.5	16.3	16.0	15.9	15.8	15.5	15.3	15.0	15.0
22.0	22.0	17.8	17.2	17.0	16.8	16.5	16.4	16.3	16.0	15.8	15.5	15.5
22.5	22.5	18.3	17.8	17.5	17.3	17.0	17.0	16.8	16.5	16.3	16.0	16.0
23.0	23.0	18.8	18.3	18.0	17.8	17.5	17.5	17.3	17.0	16.8	16.5	16.5
23.5	23.5	19.3	18.8	18.5	18.3	18.0	18.0	17.8	17.5	17.3	17.0	17.0
24.0	24.0	19.8	19.3	19.0	18.8	18.5	18.5	18.3	18.0	17.8	17.6	17.5
24.5	24.5	20.3	19.8	19.5	19.3	19.0	19.0	18.8	18.5	18.3	18.1	18.0
25.0	25.0	20.8	20.3	20.0	19.8	19.5	19.5	19.3	19.0	18.8	18.6	18.5
25.5	25.5	21.3	20.8	20.5	20.3	20.0	20.0	19.8	19.5	19.3	19.1	19.0
26.0	26.0	21.8	21.3	21.0	20.8	20.5	20.5	20.3	20.0	19.8	19.6	19.5

Notes:

1. Eb/No = Es/No – 10 Log (Spectral Efficiency).
2. The Required C/N for QEF with FECFrame = 16,200 bits is typically 0.2 to 0.3 dB higher.
3. Shaded values are high error rate or unusable.

Appendix C. FAST ACTIVATION PROCEDURE

C.1 Introduction

Fully **A**ccessible **S**ystem **T**opology (FAST) is an enhancement feature available in Comtech EF Data products, enabling on-location upgrade of the operating feature set – in the rack – without removing a CDM-710G from the setup.

This accelerated upgrade can be accomplished only because of FAST's extensive use of programmable devices incorporating Comtech EF Data-proprietary signal processing techniques. These techniques allow the use of a unique access code to enable configuration of the available hardware.

The access code can be purchased at any time from Comtech EF Data. Once obtained from Comtech EF Data Customer Support, the access code is manually loaded into the CDM-710G via the modem's front panel keypad.

The FAST options are linked to three option registers:

- Register 1 is for Data Rate options
- Register 2 is for L-Band, Modulation type and Framing options
- Register 3 is reserved for future options

When an unlock FAST code is obtained from Comtech EF Data, it is associated with a specifically purchased unit (as identified by the unit's unique serial number); the FAST access code unlocks the pertinent options in all option registers.

C.2 Activation Procedure

C.2.1 Obtain Unit Serial Number

Obtain the modem serial number as follows:

a) From the front panel **SELECT:** (main) menu, select **UTILITY → FAST,** then press [**ENTER]**.

b) The modem motherboard Serial Number is displayed on the bottom line, to the left:

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

c) Record serial number: _____

C.2.2 View currently installed features

To view the currently installed features, proceed as follows:

a) From the **UTILITY → FAST** menu, select **VIEW**, then press [**ENTER]**.

b) Scroll through the modem Options using the ▲▼ arrow keys, and note which options are '**Installed**' or '**Not Installed**'. Any that are '**Not Installed**' may be purchased as a **FAST** upgrade:

```
View Options: 01 (▲▼)
IF Modulator Installed
```

C.2.3 Purchase FAST Access Code

Contact a Comtech EF Data sales representative to order features. You will be asked to provide the modem Serial Number. Comtech EF Data Customer Support will verify the order and provide an invoice, instructions, and a 20-character FAST access (configuration) code.

C.2.4 Enter FAST Access Code

Enter the FAST access code as follows:

a) Press **[CLEAR]** to return to the **UTILITY → FAST** menu:

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

b) Select **Cnfg**, then press [**ENTER]**:

```
FAST Configuration:
Edit Code    Demo Mode
```

c) Select **Edit Code**, then press [**ENTER].**

d) Enter the 20-character FAST code *carefully*. Use the ◄ ► arrow keys to move the cursor to each character, then use the ▲ ▼ arrow keys to edit that character:

```
Edit 20 digit FAST Code:
 00000000000000000000 ENT
```

c) Press **ENTER** when done. The modem responds with "**Configured Successfully**" if the new FAST option is accepted:

```
Configured Successfully
        (ENTER or CLEAR)
```

Press **[ENTER]** or **[CLEAR]** as directed. The modem will then reset to its default configuration.

d) If, on the other hand, the FAST code is not valid, the code is rejected and following message is displayed:

```
FAST Code Rejected!
        (ENTER or CLEAR)
```

e) Press [**ENTER]** or **[CLEAR]** as directed, then re-enter the FAST code. Contact Comtech EF Data Customer Support if the problem persists.

C.3 Using FAST Demo Mode

FAST Demo Mode may be enabled or disabled as follows:

a. Press [**CLEAR]** to return to the FAST menu:

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

b. Select **Cnfg**, then press [**ENTER]:**

```
FAST Configuration:
Edit Code    Demo Mode
```

c. Use the ◄ ► arrow keys to select **Demo Mode**, then press [**ENTER]**.

```
FAST Demo Mode: Off  On
  604800 seconds remain
```

d. Use the ◄ ► arrow keys to select **Off** or **On**. When *On*, the second line will display the under of seconds remaining available for the free Demo Mode.

When enabled, Demo Mode allows access to ***ALL*** CDM-710G FAST options for 604800 seconds (7 full days). Demo Mode may be turned on and off an unlimited number of time until the 604800 seconds have expired. The seconds count is only decrement when the mode is *On*.

When the Demo period expires the following menu is displayed:

```
FAST Demo Mode: Off  On
  Demo Period Expired
```

IMPORTANT

IF THE DEMO MODE STATE (OFF/ON) IS CHANGED, OR IF DEMO MODE IS ENABLED AND THE TIMER EXPIRES, THE MODEM FIRMWARE WILL AUTO-REBOOT AFTER 5 SECONDS.

NOTE THAT VALIDATION OF AUTHORIZED FAST OPTIONS OCCURS ON AUTO-REBOOT; IF AN INVALID CONFIGURATION IS FOUND, THE MODEM CONFIGURATION WILL RESET TO DEFAULT VALUES.

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute 0	-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	—

2114 WEST 7TH STREET TEMPE ARIZONA 85281 USA
480 • 333 • 2200 PHONE
480 • 333 • 2161 FAX