CDM-710G

High-Speed Satellite Modem
Installation and Operation Manual

CDM-710G [70-140 MHz] High-Speed Satellite Modem
CDM-710GL [L-Band] High-Speed Satellite Modem
For Firmware Version 5.1.3 or Higher

Part Number MN-CDM710G / CD-CDM710G Revision 2

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

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PREFACE

About this Manual

This manual provides installation and operation information for the Comtech EF Data 70-140 MHz CDM-710G High-Speed Satellite Modem and its L-Band counterpart, the CDM-710GL. This is an informational document intended for the persons responsible for the operation and maintenance of the CDM-710G and the CDM-710GL.

Revision 2 of this manual represents a complete rewrite from Revision 1, in order to update the documentation format to current Comtech EF Data Technical Publications Department Standards and Practices.

Conventions and References

Patents and Trademarks

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

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

Warnings, Cautions, Notes, and References

A **WARNING** gives information about a possible hazard that may cause death or serious injury.

A **CAUTION** gives information about a possible hazard that may cause injury or property damage.

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

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

Examples of Multi-Hazard Notices

Recommended Standard Designations

Electronic Industries Association (EIA) designations supersede Recommended Standard (RS) designations. Reference to the old RS designations may appear when depicting actual text (e.g., RS-232) as it may appear on the product rear panels or on screens or pages in the Serial Remote or HTTP (Web Server) Interfaces. All other references in the manual specify the EIA designations.

CAUTION
YOU SHOULD CAREFULLY REVIEW THE FOLLOWING INFORMATION.

Safety and Compliance

Electrical Safety and Compliance

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

The unit 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.

Class I Pluggable Equipment Type A-Protective Earthing

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

In Finland:
"Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan."

In Norway:
“Apparatet må tilkoples jordet stikkontakt.”

In Sweden:
“Apparaten skall anslutas till jordat uttag.”

In Denmark:
"Apparatets stikprop skal tilsluttes en stikkontakt med jord, som giver forbindelse til stikproppens jord."

Galvanic Isolator Use

In Norway:
"Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i visa fall medfőra risk főr brand. Főr att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet."

Restricted Access Location

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

Battery Warning

CAUTION
There is risk of explosion if you replace your battery with an incorrect type. Dispose of used batteries according to the instructions.

Electrical Installation

CAUTION
Connect the ground stud, located on the modem rear panel, to a power system that has separate ground, line, and neutral conductors. Do not connect the unit without a direct connection to ground.

Chapter 4.2.3. Unit Ground Connection

Fusing

CAUTION
For continued operator safety, always replace the fuses with the correct type and rating.

Chapter 4.2 Unit Connectors

The unit is fitted with two fuses – one each for line and neutral connections. They are contained inside a press-fit fuse holder that is part of the IEC power module:

- Use T2.00A 20mm fuses for 115 and 230 volt AC operation.
- Use T6.25A 6.3 x 32mm fuses for 48 volt DC operation.

Operating Environment

CAUTION

Do not operate the unit in any of these extreme operating conditions:

- Ambient temperatures less than 0° C (32° F) or more than 50° C (122° F).
- Precipitation, condensation, or humid atmospheres of more than 95% relative humidity.
- Unpressurized altitudes of more than 2000 metres (6561.7 feet).
- Excessive dust.
- Flammable gases.
- Corrosive or explosive atmospheres.

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

Independent testing verifies that the unit complies with the European Union R&TTE Directive, its reference to EN 301 489-1 (Electromagnetic compatibility and Radio spectrum Matters [ERM]; ElectroMagnetic Compatibility [EMC] standard for radio equipment and services, Part 1: Common technical requirements), and the Declarations of Conformity for the applicable directives, standards, and practices that follow:

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

- **Emissions: EN 55022 Class B** – Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.
- **Immunity: EN 55024** – Information Technology Equipment: Immunity Characteristics, Limits, and Methods of Measurement.
- **EN 61000-3-2** – Harmonic Currents Emission

- **EN 61000-3-3** – Voltage Fluctuations and Flicker.
- **Federal Communications Commission Federal Code of Regulation FCC Part 15, Subpart B.**

CAUTION
Obey these instructions to make sure that the unit complies with the standards:

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

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

<HAR> **Type of power cord required for use in the European Community.**

CAUTION: **Double-pole/Neutral Fusing**
ACHTUNG: **Zweipolige bzw. Neutralleiter-Sicherung**

International Symbols

Alternating Current

Protective Earth

Fuse

Ground

European Union RoHS Directive (2002/95/EC)

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

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

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

CE Mark

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

Product Support

For all product support, please call:
+1.240.243.1880
+1.866.472.3963 (toll free USA)

Comtech EF Data Headquarters

http://www.comtechefdata.com

Comtech EF Data Corp.
2114 West 7th Street
Tempe, Arizona USA 85281
+1.480.333.2200

Warranty Policy

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

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

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

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

Limitations of Warranty

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

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

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

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

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

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

Exclusive Remedies

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

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

Notes:

Chapter 1. INTRODUCTION

1.1 Overview

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

The CDM-710G and CDM-710GL High-Speed Satellite Modems (**Figure 1-1**) provide transmission of data using the same DVB-S2 techniques developed for video delivery in Digital Video Broadcast (DVB) applications. The CDM-710G/L operates over satellite links with programmable symbol / data rates up to 45 Msps. The unit is intended for transmission of non-MPEG2 data, and is available in modem, modulator-only, and demodulator-only configurations.

Its companion product, the CDM-710, supports MPEG2 formats with a variety of data interfaces.

1.1.1 Applications

With a Gigabit Ethernet data interface (GBEI) and either the CDM-710G (70/140 MHz) or CDM-710GL (L-Band) IF, the unit is ideal for data transmission formats that take advantage of the Ethernet packets for digital one-way, two-way and any network applications. Telecom applications are supported with the Single G.703 interface. The HSSI interface enables IP or other data formats via a serial interface.

The unit'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 broad range of modulation and coding formats, DVB-S2 permits you to tailor a link for the available bandwidth and power to optimize link performance. [1]

Whether the link is point-to-point or point-to-multipoint, there is a format available to suit either application.

1.1.2 Standard and Optional Features

Chapter 2. SPECIFICATIONS

The unit is available in two operating frequency versions:

- The CDM-710G (70/140 MHz), with 52 to 88 MHz or 104 to 176 MHz in 100 Hz resolution. The 'J1 | Tx' port is a BNC female connector that is programmable for either 50Ω or 75Ω impedance operations. The 'J3 | Rx' port is a BNC female connector.
- The CDM-710GL (L-Band), with 950 to 1950 MHz in 100 Hz resolution. The 'J1 | Tx' and 'J3 | Rx' ports are Type 'N' female connectors.

Various modulations and coding combinations compliant with DVB-S2 are provided. The unit operates in DVB-S2 (QPSK, 8PSK, 16APSK, and 32APSK) mode only. Constant Coding and Modulation (CCM) operation with a single input stream is provided. Spectral rolloffs of 20%, 25%, and 35% are available.

The CDM-710G/L does not support DVB-S or DVB-DSNG.

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

Figure 1-2. CDM-710G/L Rear Panel Data Interface Slots

The unit rear panel (**Figure 1-2**) features two terrestrial data interface slots that accept field-removable modules:

- CDI-10-1 Single G.703 (E3/T3/STS1) Interface in Interface Slot 1 only.
- CDI-60 HSSI Interface in Interface Slot 1 only.
- CDI-70 1000 Base-T Gigabit Ethernet Interface (GBEI) in Interface Slot 2 only.

For detailed information, see:

- Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE
- Appendix D. CDI-60 HSSI DATA INTERFACE
- Appendix E. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET INTERFACE (GBEI)

1.1.2.1 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&Q phase and amplitude balance. When normal operation is again selected, all previous operating parameters and values are restored.

1.1.2.2 Firmware Update

Chapter 5. FIRMWARE UPDATE

It is important that you operate the CDM-710G/L with its latest available operating firmware. You may update the firmware without opening the unit by connecting the unit to the Ethernet port of a Windows-based user PC. Firmware updates are available for download via the Internet from Comtech EF Data's web site (www.comtechefdata.com). You may also acquire updates through e-mail by request from Comtech EF Data Product Support.

1.1.2.3 Product Upgrade Using Fully Accessible System Topology (FAST)

Chapter 6. FAST ACTIVATION PROCEDURE

The CDM-710G/L offers a number of optional features. To permit a lower initial cost, you may purchase the unit with only the desired features enabled. If you wish to upgrade the functionality of your unit at a later date, Comtech EF Data provides FAST – **F**ully **A**ccessible **S**ystem **T**opology.

FAST permits the purchase and activation of options through special authorization codes. You may load these Fast Access Codes into the unit locally using the front panel keypad, or remotely via the serial remote interface located on the modem rear panel.

You may purchase these unique access codes during normal business hours from Comtech EF Data Product Support.

1.2 Functional Description

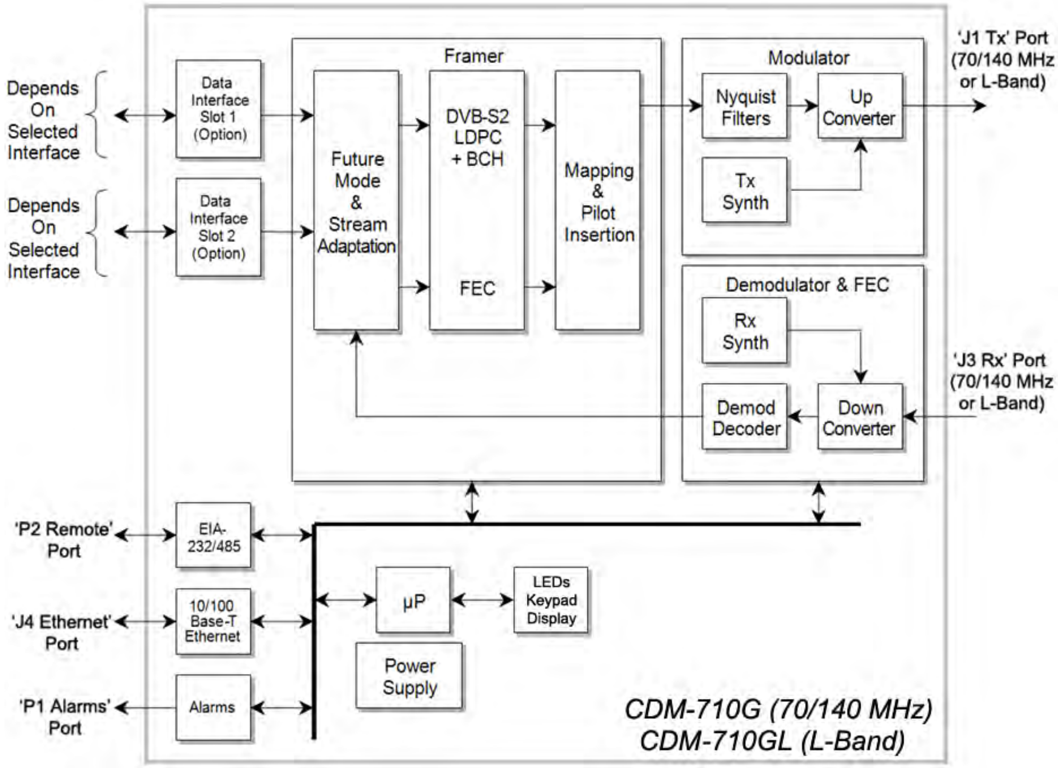


Figure 1-3. CDM-710G/L Block Diagram

Figure 1-3 shows a block diagram of the unit. The unit 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&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&Q signals to produce a frequency range, as follows:

- CDM-710G (70/140 MHz), 52 to 88 MHz or 104 to 176 MHz IF output signal at the rear panel connector
- CDM-710GL (L-Band), 950 to 1950 MHz output signal at the rear panel frequency connector

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/L is comprised of several main card assemblies:

- The optional Data Interface Modules may be quickly plugged into or removed from the rear panel interface slots.

  CAUTION
  You must first power down the unit in order to install or remove a data interface module. Any attempt to install or remove a module 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 EIA-232 and EIA-485 2-Wire/4-Wire remote port and the 10/100 ‘J7 | Ethernet’ M&C port. Interface with the other modules in the unit 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 Product Features

1.3.1 Physical Description

The unit is constructed as 1RU-high rack-mounting chassis. Handles at the front allow easy removal from and placement into a user-supplied rack cabinet. The unit can be free-standing if desired.

The unit is compact – 1RU high x 19.0 inches wide x 18.65 inches deep – with low power consumption. You may configure, operate, and monitor the unit locally using the front panel keypad, Vacuum Fluorescent Display (VFD), and Light Emitting Diode (LED) array. Remote monitor and control is available using the rear panel ‘P2 | Remote’ EIA-232/EIA-485 2- or 4-wire bus connector (for serial operation), or the ‘J4 | Ethernet’ 10/100 Base-T port (for SNMP, Telnet, and HTTP operation).

1.3.2 Major Assemblies (Standard or Optional)

- CEFD P/N PL/10002-1 – Assembly, Modulator, 70/140 MHz
- CEFD P/N PL/12113-1 – Assembly, Modulator, L-Band card
- CEFD P/N PL/10003-1 – Assembly, Demodulator, 70/140 MHz
- CEFD P/N PL/11571-1 – Assembly, Demodulator, L-Band
- CEFD P/N PL/12148-1 – Encoder Assembly, Tx DVB-S2 Long/Short Frame
- CEFD P/N PL/12169-1 – Decoder Assembly, Rx DVB-S2 Long/Short Frame
- CEFD P/N PL/10008-2 – Optional CDI-10-1 Single G.703 E3/T3/STS1G.703 Interface Module

- CEFD P/N PL/11582-1 – Optional CDI-60 HSSI Interface Module
- CEFD P/N PL/11509-3 – Optional CDI-70 10/100/1000 Base-T Ethernet (GBEI) Interface Module (running Firmware FW12738)
- CEFD P/N KT/6228-2 – Optional 4" Rear-Mounting Support Brackets Kit
- CEFD P/N KT/6228-3 – Optional 10" Rear-Mounting Support Brackets Kit

1.3.3 Dimensional Envelope

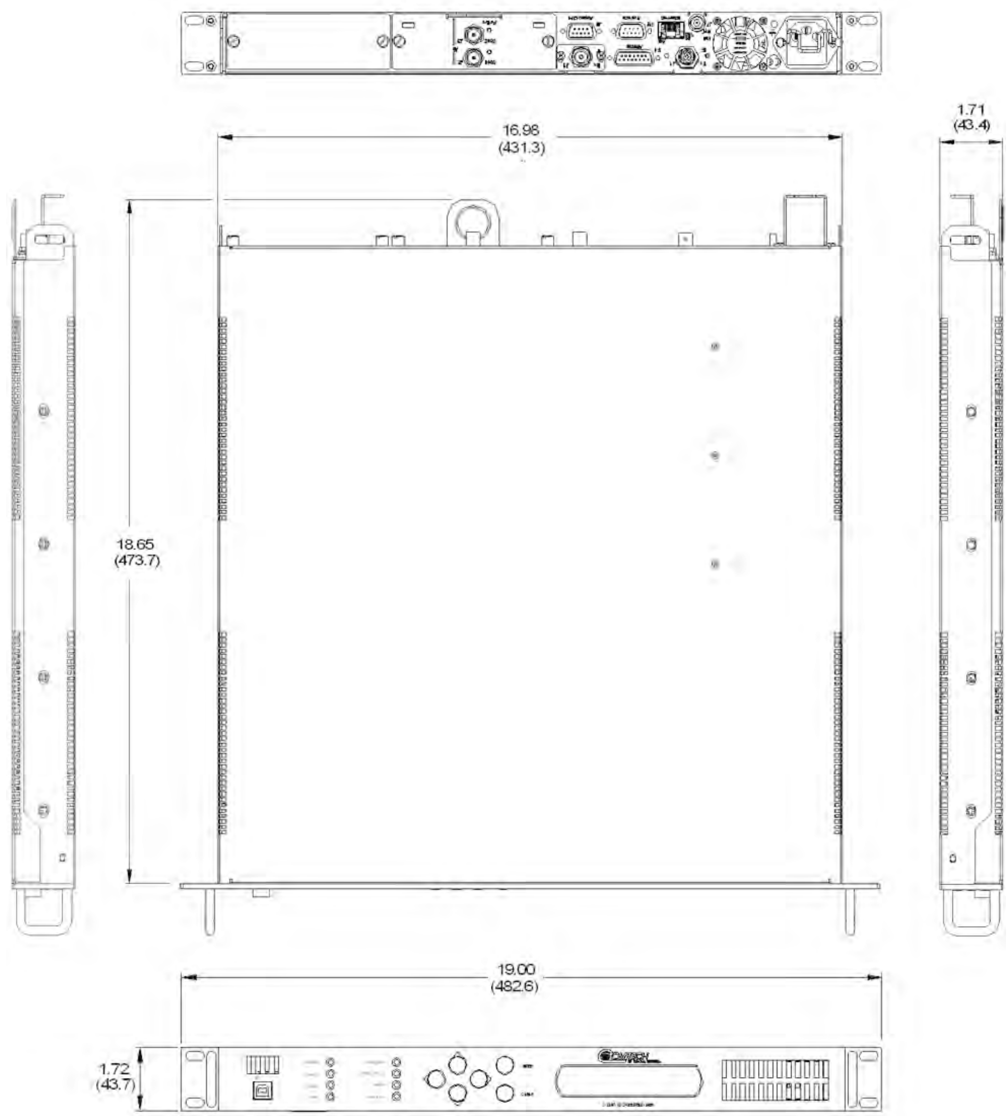


Figure 1-4. Dimensional Envelope

1.3.4 Front Panel

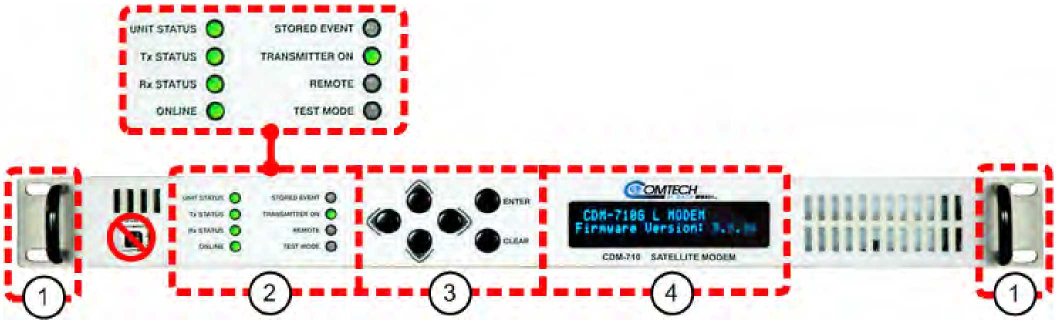


Figure 1-5. Front Panel View

The front panel USB 1.1 port is non-functional.

The unit front panel (**Figure 1-5**) provides the following features:

Item 1 – These handles ease removal and replacement of the chassis into the user-provided rack enclosure.

Item 2 –Eight (8X) Light-Emitting Diode (LED) indicators convey operational states as follows:

UNIT STATUS

- Lights GREEN when there are no Unit Faults or Alarms.
- Lights AMBER when there are no Unit Faults, but an Alarm exists.
- Lights RED when a Unit Faults exists (Example: PSU Fault).

Tx STATUS

- Lights GREEN when there are no Tx Traffic Faults or Alarms.
- Lights AMBER when a Tx Traffic Alarm exists.
- Lights RED when a Tx traffic Fault exists.
- Remains OFF when the transmitter is turned OFF (e.g., when the unit is not configured as a Modulator).

Rx STATUS

- Lights GREEN when there are no Rx Traffic Faults or Alarms.
- Lights AMBER when an Rx Traffic Alarm exists.
- Lights RED when an Rx traffic Fault exists.

- Remains OFF when the receiver is turned OFF (e.g., when the unit is not configured as a Demodulator).

ONLINE

- Lights GREEN when the Unit is On Line, and carrying traffic.
- Remains OFF when the Unit is Off Line (standby) – forced by an externally connected 1:1 or 1:N Redundancy System).

STORED EVENT

- Lights AMBER when there is a Stored Event in the log.
- Remains OFF when there are no Stored Events.

TRANSMITTER ON

- Lights GREEN when the Transmitter Carrier is ON. This indicator reflects the actual condition of the transmitter, as opposed to the programmed condition.
- Remains OFF when the Transmitter carrier is OFF.

REMOTE

- Lights GREEN when the unit is in Remote Communication Mode. Local monitoring is possible, but there is no local control.
- Remains OFF when the unit is in Local Mode. Remote monitoring is possible, but no there is no remote control.

TEST MODE

- Lights GREEN when a BERT (Bit Error Rate test) is active.
- Remains OFF when the unit is operating normally.

Item 3 –The keypad comprises six individual keyswitches. Operation of the individual keys is as follows:

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

- Use the ▲ (UP) and ▼ (DOWN) keys to change configuration data (numbers). You may also use these keys to move from one section to another.

The keys have a positive 'click' action that provides tactile feedback. Enter data via the keypad. Data, prompts, and messages are displayed on the VFD.

Item 4 – The Vacuum Fluorescent Display (VFD) is an active display showing two lines of 24 characters each. It produces a blue light with adjustable brightness. Nested menus display all available options and prompt you to carry out a required action.

1.3.5 Rear Panel

Sect. 4.2 Rear Panel Connectors

External cables are attached to connectors provided on the rear panel of the unit (**Figure 1-6**).

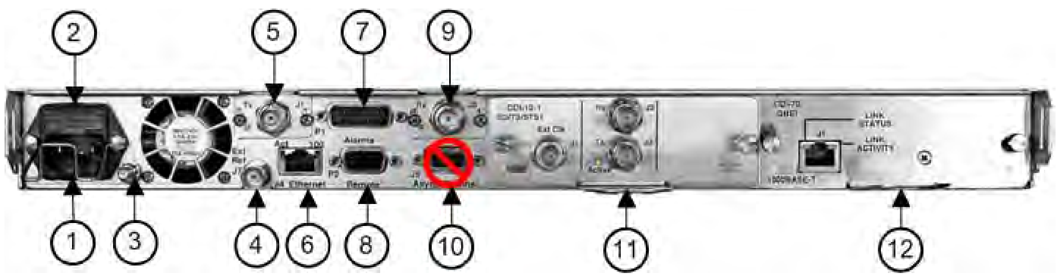


Figure 1-6. CDM-710G/L Rear Panel View (CDM-710G shown with Optional CDI-10-1 Single G.703 and CDI-70 Data Interface Modules)

From left to right:

Item 1 –Power Connection (part of Power Supply module)

- The standard AC unit features a 115/230 VAC Primary Input Power Supply (IEC-60320 Type C14 three-prong male connector)
- The optional -48V DC unit features a terminal block power interface.

Item 2 – Unit Fusing (part of Power Supply module)

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

The unit uses two Slo-Blo fuses, one each for line and neutral fusing:

- The standard 115/230 VAC unit retains the T2.00A 5x20 mm fuses (250VAC time lag) in a press-fit fuse holder.
- The optional -48V DC unit retains the T6.25A 6.3x32 mm fuses in individual screw-in receptacles.

Item 3 – Unit Ground Lug

Use this #10-32 stud as the command chassis ground.

CAUTION
PROPER GROUNDING PROTECTION IS REQUIRED. You must connect the equipment to the protective earth connection at all times. Use this ground stud during installation, configuration, and operation.

Item 4 – 'J7 | Ext Ref' Utility Connector

Use this female BNC connector to supply a master reference to the entire chassis.

Item 5 – 'J1 | Tx (Transmit)' IF Connector

CAUTION
THERE MAY BE DC VOLTAGES OF UP TO 48 VOLTS MAXIMUM PRESENT ON THIS CONNECTOR.

Use this connector for Tx operation:

- **CDM-710G (70/140 MHz)** – BNC female connector
- **CDM-710GL (L-Band)** – Type 'N' female connector

Item 6 – 'J4 | ETHERNET' Ethernet Management Utility Port

Use this 10/100 Base-T Ethernet RJ-45 port for operation of the Ethernet remote control interfaces.

Item 7 – 'P1 | ALARMS' Utility Connector

Use this DB-15M EIA-232 connector to access the Form C Alarms (relay closures).

Item 8 – 'P2 | Remote' Serial Management Utility Connector

Use this DB-9M EIA-232/EIA-485 connector for operation of the Serial Interface.

Item 9 – 'J7 | Rx (Receive)' IF Connector

CAUTION
THERE MAY BE DC VOLTAGES OF UP TO 48 VOLTS MAXIMUM PRESENT ON THIS CONNECTOR.

Use this connector for Rx operation:

- **CDM-710G (70/140 MHz)** – BNC female connector
- **CDM-710GL (L-Band)** – Type 'N' female connector

Item 10 – 'J6 | Async Channel' Utility Connector (NOT USED)

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

Item 11 – Optional Data Interface Module Slot 1
See Sect. 1.3.5.1 for further details.

Item 12 – Optional Data Interface Module Slot 2
See Sect. 1.3.5.1 for further details.

1.3.5.1 Optional Data Interface Modules

- Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE
- Appendix D. CDI-60 HSSI DATA INTERFACE
- Appendix E. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET INTERFACE (GBEI)

The optional data interface modules are installed or removed from the chassis rear panel Interface Slots 1 and 2. See **Table 1-1** for the allowable combination of data interfaces and the data interfaces that are supported for redundancy. In all cases, *only one data interface is active at a time*.

Table 1-1. Data Interface Information

Interface	CEFD P/N	1:1 Capability	1:N Capability
CDI-10-1 Single G.703	PL/10008-2	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex
CDI-60 HSSI	PL/11582-1	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex
CDI-70 GBEI	PL/11509-3	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex

1.3.5.1.1 Data Interface Support in 1:1 or 1:N Redundancy Configurations

1:1 Redundancy with the CRS-180 (70/140 MHz) or CRS-170A (L-Band) Redundancy Switch: The **"CDM-710G/L Unit Configuration"** column in **Table 1-2** shows the CDM-710G/L data interface combinations that are supported by the CRS-180 or CRS-170A 1:1 Redundancy Switches. You must first select a 1:1 switch based on the operating frequency. You must then choose your Slot 1 and Slot 2 modules. See the CRS-170A or CRS-180 1:1 Redundancy Switch datasheet and Installation and Operation manuals for further information.

When you use a CDM-710G/L as a Tx Only unit in 1:1 Redundancy, you must remove the demodulator card. Similarly, when you use a CDM-710G/L as an Rx Only unit in 1:1 Redundancy, you must remove the modulator card.

1:N Redundancy with the CRS-300: The CRS-300 was originally designed for operation with the CDM-600. It has since been adapted for use with 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/L.

Table 1-2. Allowable Unit/Switch Data Interface Configurations

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

1) The Redundant Unit must have the same interface cards in each slot as any of the Traffic Units.
2) Your Traffic Unit must have the same interface cards installed in each slot identically as any other Traffic Units. You must otherwise install a blank panel. **<u>Interface Slots 1 and 2 are not active simultaneously</u>**.

Chapter 2. SPECIFICATIONS

2.1 Physical and Environmental Specifications

All information is typical for the CDM-710G (70/140 MHz) or CDM710GL (L-Band) High-Speed Satellite Modem unless noted.

2.1.1 Regulatory Compliance

- "CE" as follows:
  - EN 30489-1
  - EN 55022 Class B (Emissions)
  - EN 55024 (Immunity)
  - EN 60950 (Safety)
- FCC Part 15 Subpart B.
- RoHS-Compliant.

2.1.2 Physical Specifications

- Dimensions: 1.72 H x 19.00 W x 18.65 D inches
  (43.7 mm H x 482.6 mm W x 473.7 mm D)
- Weight: 15lbs (6.8 kg)

2.1.3 Temperature Range

- Operating: 32° to 122 F° (0° to 50° C)
- Storage: -4° to 158 F° (-20° to 70° C)

2.1.4 Humidity (Non-condensing)

- Operating: 95% maximum
- Storage: 99% maximum

2.1.5 Front Panel Features

2.1.5.1 LED Monitoring

(8X) Status LEDs:
- UNIT STATUS (Green/Amber/Red)
- Tx STATUS (Green/Amber/Red)
- Rx STATUS (Green/Amber/Red)
- ONLINE (Green)
- STORED EVENT (Amber)
- TRANSMITTER ON (Green)
- REMOTE (Green)
- TEST MODE (Green)

2.1.5.2 Keypad

Six Keys: ◀ (LEFT), ▶ (RIGHT), ▲ (UP), ▼ (DOWN), ENTER, CLEAR

2.1.5.3 Vacuum Fluorescent Display (VFD)

2 lines, 24 characters per line.

2.1.6 Rear Panel Features

2.1.6.1 Chassis AC Power Cord Retainer

Standard

2.1.6.2 Chassis Power Supply Input

- AC: 100-240V AC 50/60Hz, auto-ranging. IEC-60320 Type C14 (male) three-prong connector, for connection with an IEC-60320 Type C13 (female) three-prong plug.
- DC: -48V DC via terminal block power interface.

2.1.6.3 Chassis Power Consumption

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

2.1.6.4 Chassis Fusing

- AC: T2.00A 5mm x 20 mm 250VAC time lag.
- DC: T6.25A 6.3 mm x 32 mm (3AG), 250VAC time lag.

2.1.6.5 IF Connectors

CDM-710G:
(2X) BNC female connectors for 70/140 MHz (52 to 88 MHz or 104 to 176 MHz in 100Hz steps), impedance programmable @ 75Ω or 50Ω, 18 dB minimum return loss: ‘J1 |Tx’ and ‘J2 | Rx’

CDM-710GL:
(2X) 50Ω Type ‘N’ female connectors for L-Band (950 to 2150 MHz in 100 Hz steps @ 15 dB minimum return loss: ‘J1 |Tx’ and ‘J2 | Rx’

2.1.6.6 Ethernet Connector

(1X) 10/100 BaseT Ethernet RJ-45 'J4 | Ethernet' Ethernet Management Utility Port for operation of the Ethernet remote control interfaces (SNMP, Telnet, HTTP).

2.1.6.7 Serial Connectors

(1X) DB-15M (D-Subminiature) 'P1 | Alarms' Utility Connector to access the Form C Alarms (relay closures).

(1X) DB-9M (D-Subminiature) 'P2 | Remote' EIA-232/EIA-485 (2-Wire/4-Wire) connector for operation of the Serial Interface.

(1X) DB-9F (D-Subminiature) 'J6 | Async' connector – **NOT USED**.

2.1.6.8 Utility Connector

(1X) Type BNC female 'J7 | Ext Ref' connector, used to supply a master reference to the entire chassis.

2.2 Operational Specifications

All information is typical for the CDM-710G or CDM710GL unless noted.

2.2.1 Unit Configuration

Non-volatile for 1-year minimum and returns upon power up.

2.2.2 Forward Error Correction (FEC) Type

DVB-S2 per EN 302 307:

- 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

2.2.3 DVB-S2 Symbol Rate

- QPSK, 8PSK: 1 Msps to 45 Msps
- 16APSK: 1 Msps to 35 Msps
- 32APSK: 1 Msps to 28 Msps

2.2.4 Operating Modes

Only Constant Coding and Modulation (CCM) is supported.

2.2.5 Transport Streams

Only Single Transport Stream is supported.

2.2.6 Physical Layer (PL) Scrambling

User specified value (one) of n = 0 to 262,141, per EN 302 307.

2.2.7 Pilot Insertion

Selectable ON or OFF.

2.2.8 1:1 Redundancy

Built-in controller for operation with an optional Comtech EF Data 1:1 Redundancy Switch:

- The CDM-710G uses the CRS-180 switch for 70/140 MHz operation.
- The CDM-710GL uses the CRS-170A switch for L-Band operation.

2.2.9 1:N Redundancy

1:N redundancy is supported by the Comtech EF Data CRS-300 1:10 Redundancy Switch.

2.2.10 Fault Handling

Form 'C' via the DB-15M 'P1 | Alarms' rear panel connector– see Chapter 4. REAR PANEL CONNECTIONS for pinout information.

2.2.11 External Tx Carrier Off

TTL Low Signal - path bypasses microprocessor (DB-15M 'P1 | Alarms' rear panel connector– see Chapter 4. REAR PANEL CONNECTIONS for pinout information).

2.2.12 Frequency Reference (Selectable)

- Internal Reference: 10 MHz for data and IF, stability ± 1.5 ppm
- External Reference: 1, 2, 5, 10 or 20 MHz for IF, internally phase locked. Input is 50Ω or 75Ω compatible with 0.5 to 4.0 V_{p-p} sine or square wave. Requires high stability source.
- External Clock: For data interfaces only, not IF. Clock Input depends upon the installed data interface module(s).

2.2.13 Test Functions

- 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

2.2.14 Monitor Functions

- LED Status Indicators are provided on the front panel (see Sect. **2.1.5.1**).
- Fault logs providing fault type and time/date stamp are viewable on the VFD.
- Receive Signal Level is reported within ± 5 dB (typical).
- E_S/N_0 is reported within ± 0.5 dB (typical).
- E_b/N_0 is reported within ± 0.5 dB (typical).

2.2.15 Remote M&C Operations

Using a Windows-based user PC to access the serial or Ethernet interfaces:

- Ethernet-based M&C – See Chapter 8. ETHERNET INTERFACE OPERATION. Use the RJ-45 ‘J4 | ETHERNET’ port for Ethernet-based monitor and control:
    - Telnet – Ethernet issuance of remote command and queries using a user-supplied terminal emulator.
    - SNMP –Simple Network Management Protocol (SNMPv1 and SNMPv2c) operation using the CDM-710G SNMP agent.
    - HTTP – Use of the HTTP Interface with a user-supplied web browser.
- Serial-based M&C – See Chapter 9. SERIAL INTERFACE OPERATION. Use the DB-9M ‘P2 | Remote’ EIA-232/EIA-485 (2-Wire/4-Wire) connector for issuance of remote command and queries.

2.2.16 Spectral Mask

20%, 25%, or 35% per DVB- S2. See **Figure 2-1**, **Table 2-1**.

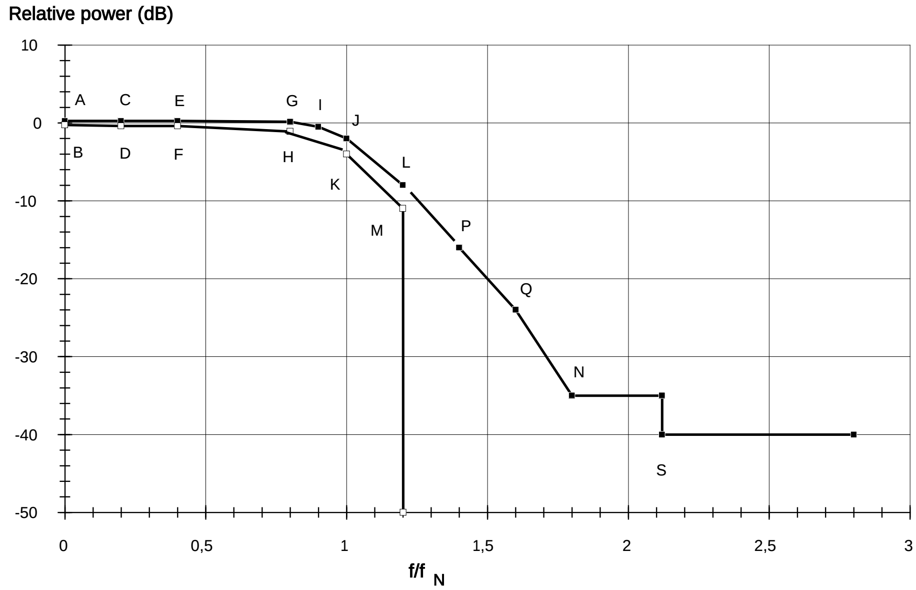


Figure 2-1. Spectral Mask

Table 2-1. 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	-

2.2.17 Modulator (Transmit) Specifications

2.2.17.1 Frequency Range

Bandwidth of transmitted spectrum is within IF frequency range:

- **CDM-710G:** 52 to 88 MHz or 104 to 176 MHz in 100Hz steps.
- **CDM-710GL:** 950 to 1950 MHz in 100Hz steps.

2.2.17.2 Impedance

- **CDM-710G:** 75Ω or 50Ω, programmable.
- **CDM-710GL:** 50Ω

2.2.17.3 ‘J1 | Tx’ Connector Type

- **CDM-710G:** BNC female
- **CDM-710GL:** Type ‘N’ female.

2.2.17.4 Return Loss

- **CDM-710G:** 18 dB
- **CDM-710GL:** 15 dB

2.2.17.5 Output Power

Carrier is not interrupted when changing between output power levels or removing data connections:

- **CDM-710G:** 0 to -20 dBm in 0.1 dB steps.
- **CDM-710GL:** -5 to -25 dBm in 0.1 dB steps.

2.2.17.6 Output Power Accuracy

± 0.5 dB at 25°C

2.2.17.7 Output Power Stability

Within ± 0.5 dB of 25°C value over all specified environments.

2.2.17.8 Carrier Mute

55 dB below main carrier output.

2.2.17.9 Carrier Null

35 dB below an unmodulated carrier.

2.2.17.10 Harmonics and Spurious

-55 dBc/4 kHz over operating frequency range (excludes spectral mask area) and is with a modulated carrier

- **CDM-710G:** -55 dBc/4 kHz 10 to 52 MHz, 176 to 250 MHz
- **CDM-710GL:** -55 dBc/4 kHz 250 to 950 MHz, 1950 to 2500 MHz

2.2.17.11 Integrated Phase Noise

Continuous component <1° RMS double-sided, 100 Hz to 10 MHz.

2.2.17.12 Spectral Inversion

Normal or Inverted.

2.2.17.13 Quadrature Phase Error

<2°

2.2.17.14 Quadrature Amplitude Imbalance

0.2 dB maximum.

2.2.17.15 Combined Amplitude Imbalance and Quadrature Phase Error

Single sideband test with suppressed sideband 35 dB minimum below unmodulated carrier.

2.2.18 Demodulator (Receive) Specifications

2.2.18.1 Frequency Range

- **CDM-710G:** 52 to 88 MHz or 104 to 176 MHz in 100Hz steps.
- **CDM-710GL:** 950 to 1950 MHz in 100Hz steps.

2.2.18.2 ‘J2 | Rx’ Connector Type/Impedance

- **CDM-710:** BNC female/50Ω (standard) or 75Ω (optional).
- **CDM-710L:** Type ‘N’ female/50Ω

2.2.18.3 Return Loss

- **CDM-710G:** 18 dB
- **CDM-710GL:** 15 dB

2.2.18.4 Input Power, Minimum

-58 + 10_{log}(Symbol Rate in MHz) dBm:

- **CDM-710G:** -58 dBm at 1 Msps, -41.5 dBm at 45 Msps. See **Figure 2-2**.
- **CDM-710GL:** -58 dBm at 1 Msps, -41.5 dBm at 45 Msps

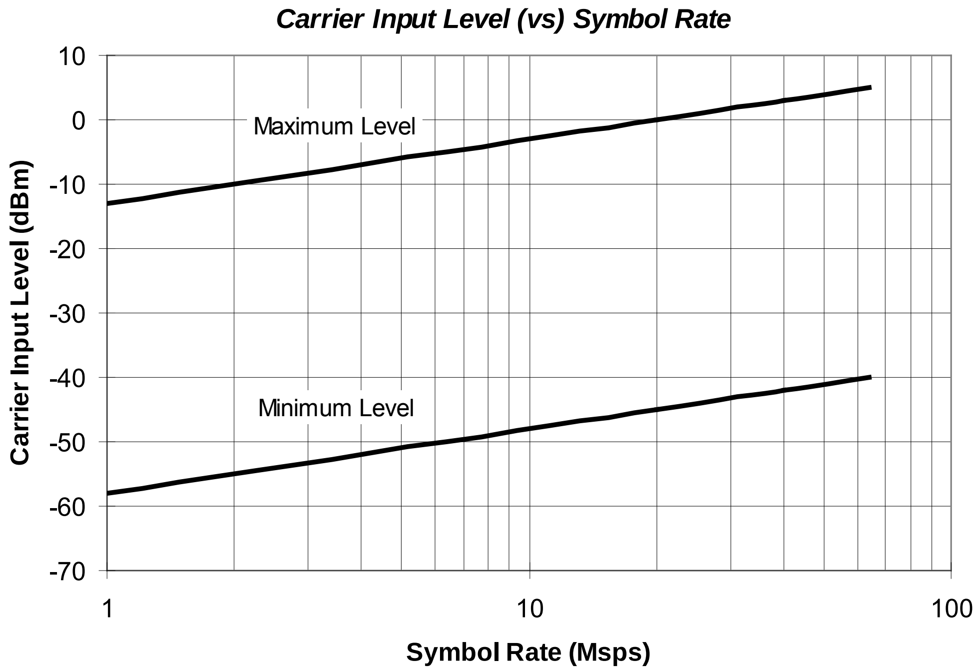


Figure 2-2. Demodulator Input Level

2.2.18.5 AGC (Automatic Gain Control) Range

45 dB above minimum.

2.2.18.6 Maximum Composite Level

- **CDM-710G:** +20 dBc composite to desired up to +10 dBm
- **CDM-710GL:** +30 dBc composite to desired up to +10 dBm

2.2.18.7 Acquisition Range

±100 kHz programmable in 1 kHz steps.

2.2.18.8 Acquisition Time

Typical <10 seconds (DVB-S2 Pilots ON).

2.2.18.9 Adaptive Equalizer

Up to 3 dB tilt.

2.2.18.10 BER Performance

See Table 2-2.

Table 2-2. 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		Specified Es/No (dB) See Notes	Eb/No (dB) See Notes
		FECFrame = 64,800 bits	FECFrame = 16,200 bits		
QPSK (Note 1)	1/4	0.490243	0.365324	-1.85	1.25
	1/3	0.656448	0.629060	-0.74	1.09
	2/5	0.789412	0.760928	0.20	1.23
	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	N/A	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	N/A	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	N/A	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	N/A	17.05	10.56

Notes:

1) QPSK 1/4, 1/3, and 2/5 are provided for reference only.
2) Eb/No = Es/No – 10_{log} (Spectral Efficiency).
3) BER $\approx 10^{-9}$ at PER = 10^{-7}

4) Performance with FECFRAME = 16,200 Bits and no pilot is typically 0.2 to 0.3 dB higher.

2.2.18.11 IQ Test Point

Accessible from the rear panel DB-15M ‘P1 | ALARMS’ connector.

2.3 Data Rate Ranges

For the Symbol Rate and Data Rate Ranges for DVB-S2, there is some roundoff in the last digit of the values as listed. **Table 2-3** is for the Standard FEC frame, and **Table 2-4** is for the Short Frame. QPSK 1/4, 1/3, and 2/5 data is provided for reference only. 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.

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

Table 2-3. 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
		1/4			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
	LDPC+BCH	2/3	1	45*	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
		3/5			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
8PSK	LDPC+BCH	3/4	1	45*	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
		2/3			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
16APSK	LDPC+BCH	4/5	1	35*	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
		3/4			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
32APSK	LDPC+BCH	5/6	1	28*	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 2-3. For more information on this interface, see Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE.
3) HSSI data rate limit of 70 Mbps may be reached before symbol rate limit is reached. For more information on this interface, see Appendix D. CDI-60 HSSI DATA INTERFACE.

Table 2-4. 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:

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 2-4. For more information on this interface, see Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE.
3) HSSI data rate limit of 70 Mbps may be reached before symbol rate limit is reached. For more information on this interface, see Appendix D. CDI-60 HSSI DATA INTERFACE.

Chapter 3. INSTALLATION

3.1 Unpack and Inspect the Shipment

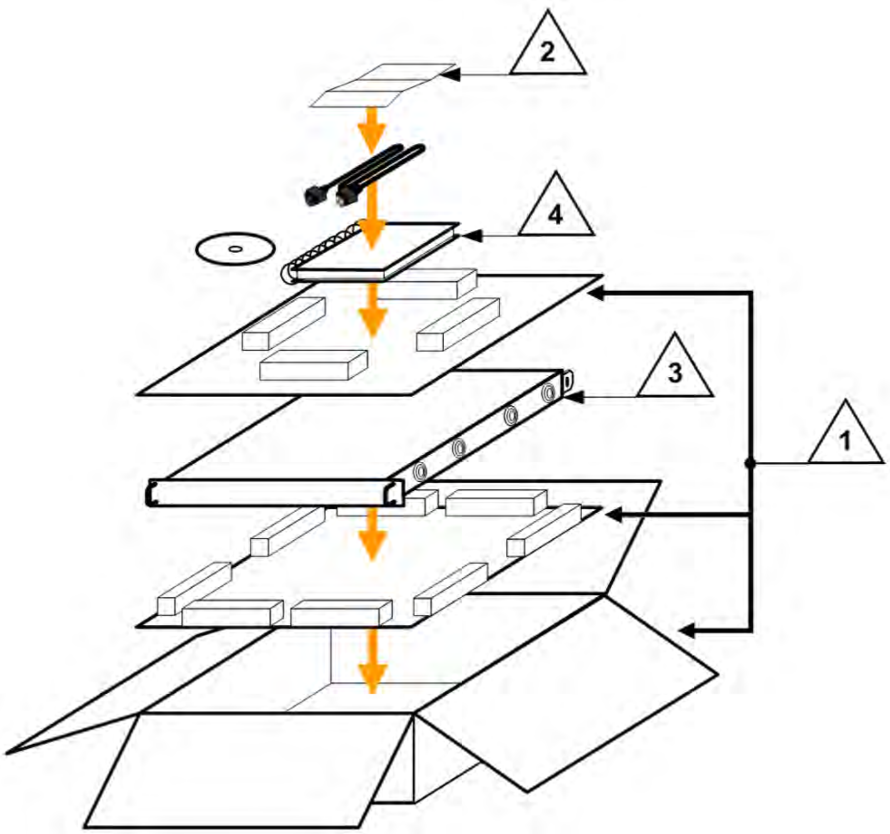


Figure 3-1. Unpack and Inspect the Shipment

The CDM-710G/L High-Speed Satellite Modem, its optional Installation and Operation Manual (available online at http://www.comtechefdata.com), and its power cord were packaged and shipped in a reusable cardboard carton containing protective foam spacing (**Figure 3-1**).

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

Inspect the shipment. Do these steps:

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

3.2 Install the Modem into a Rack Enclosure

Install the modem in its assigned position in a rack enclosure (**Figure 3-2**). You must install the rack in a location with a controlled environment. Failure to obey this requirement can cause damage to the equipment, and denial of subsequent warranty claims. You may use:

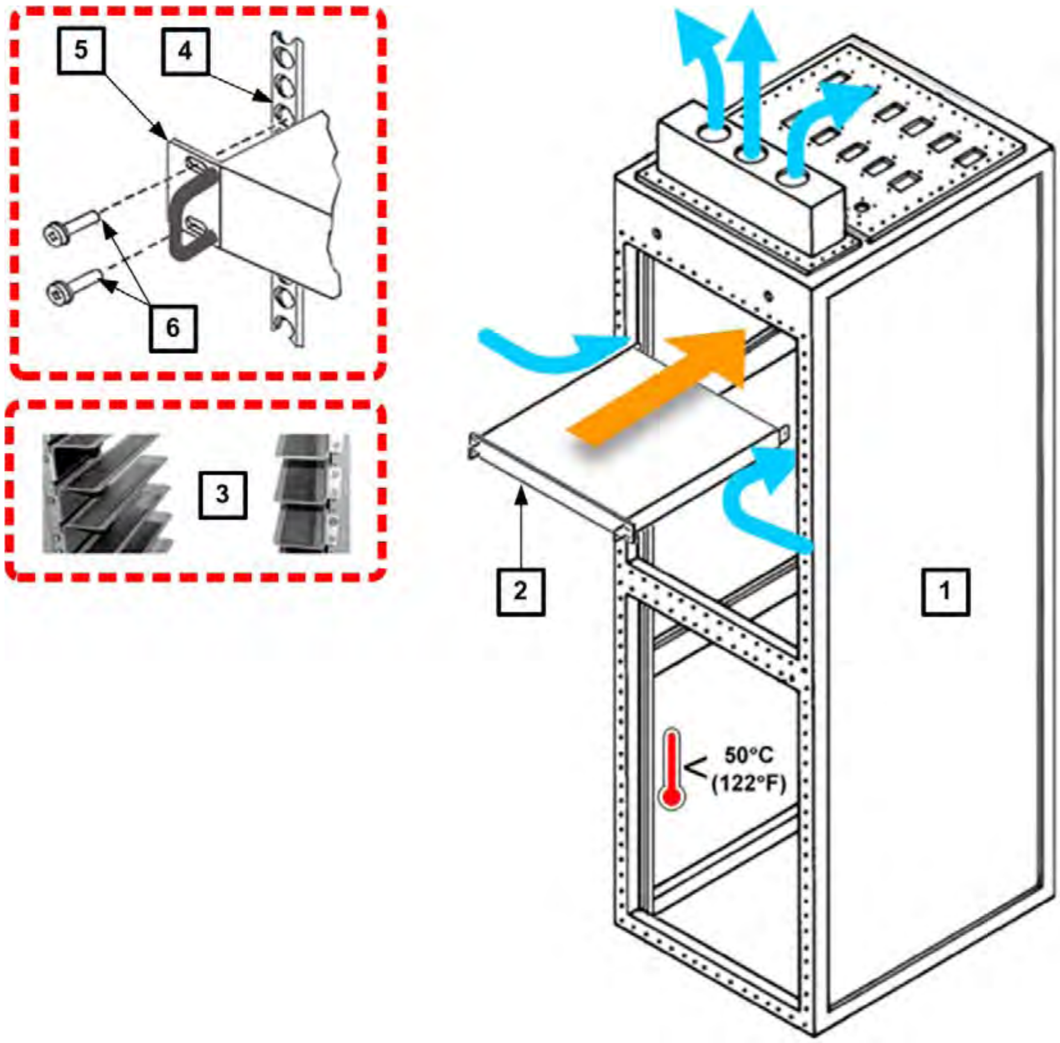
- A standard rack-mounted shelf;
- User-supplied screws to secure the front panel to the rack enclosure threaded front mounting rails;
- Comtech EF Data's optional KT/6228-2 (4") or KT/6228-3 (10") Rear Support Brackets Kit (**Figure 3-3**).
- Comtech EF Data's optional FP/SL0006 Bearingless 26" Rack Slide Set (**Figure 3-4**).
- For information about custom rack enclosures, contact Comtech EF Data Product Support.

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

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

CORRECT AIR VENTILATION IS REQUIRED – Air flow must not be impeded. Make sure there is proper air ventilation. Do not block the top of the rack or the presence of a rack blower. The air temperature inside the rack must never exceed 50°C (122°F).

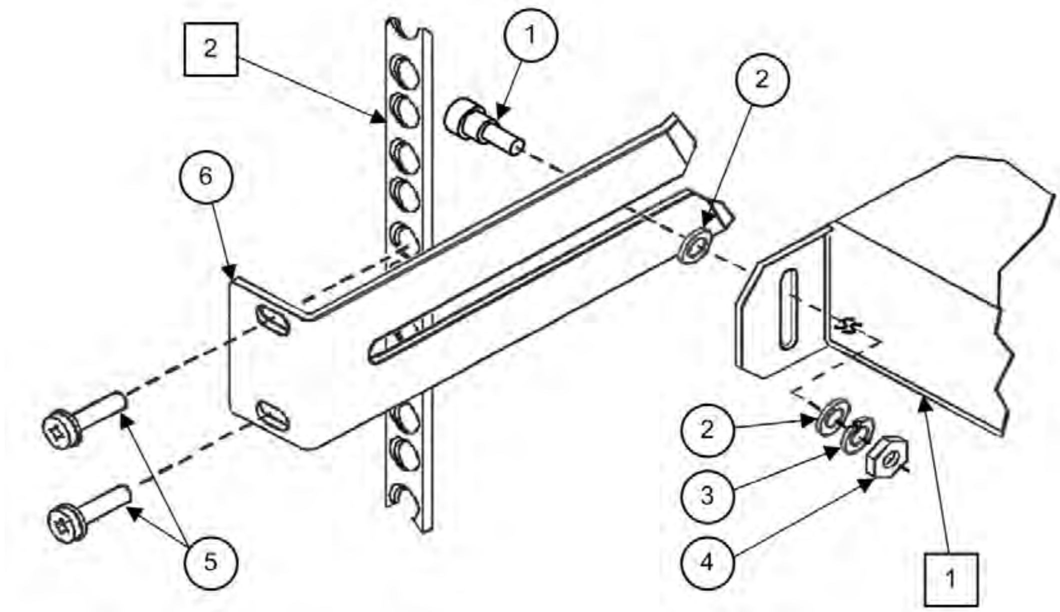
If there is any doubt, contact Comtech EF Data Product Support during normal business hours.



Feature	Description
1	Custom Rack Enclosure
2	CDM-710G/L chassis
3	Standard Rack Shelving
4	Rack Enclosure Threaded Front Rail (typical)
5	Modem Front Panel
6	User-supplied Screws

Figure 3-2. Install the Modem into a Rack Enclosure

3.2.1 Install the Optional Rear Support Brackets Kit



Feature	Description
1	Back of modem
2	Rack Enclosure Threaded Rear Mounting Rail (typical)

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

Figure 3-3. Install the Optional Rear-Mounting Support Brackets Kit

Tools needed to install the optional KT/6228-2 (4”) or KT/6228-3 (10”) Brackets Kit:

- A medium Phillips™ screwdriver
- A 5/32-inch SAE Allen™ Wrench
- An adjustable Crescent™ wrench.

Do these steps to install the brackets kit (**Figure 3-3**):

1. Use the #10 flat washers, #10 split washers, and #10 hex nut to secure the #10 shoulder screws to the modem chassis through the rear right and left side mounting slots as shown.
2. Mount the Rear Support Brackets to the rack enclosure threaded rear mounting rails using the #10 Rear Support Bracket Bolts.
3. Slide the modem into the front of the rack enclosure. Make sure that the #10 Shoulder Screws properly engage into the slots of the Rear Support Brackets.

3.2.2 Install the Optional Rack Slide Set

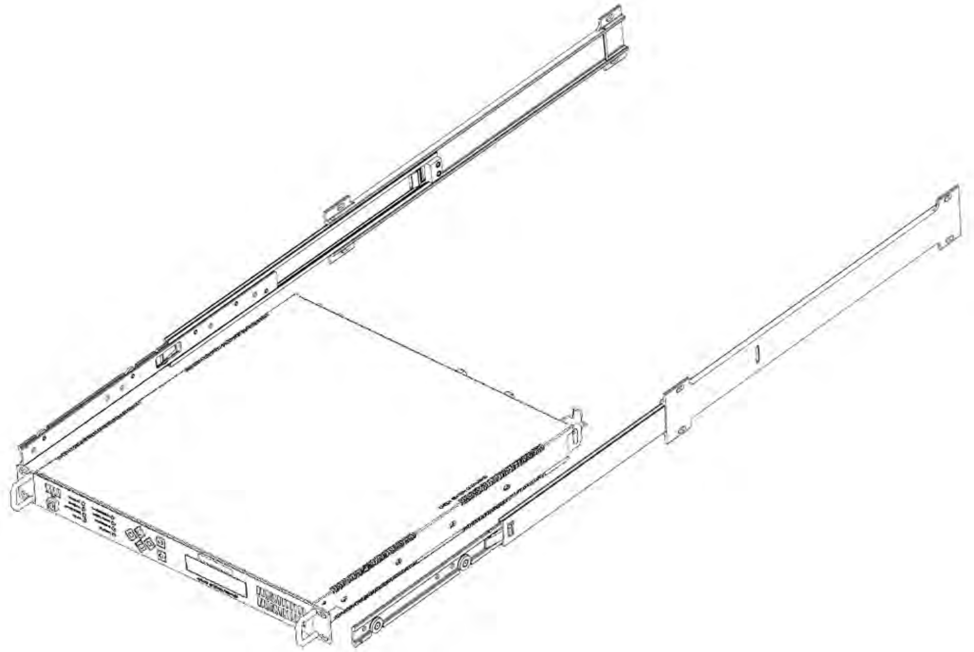


Figure 3-4. Install the Optional Rack Slide Set

You may install the optional FP/SL0006 Bearingless 26” Rack Slide Set into the equipment rack cabinet and onto the sides of the modem as shown.

Do these steps to install the slide set (**Figure 3-4**):

1. Use the provided hardware to install one slide onto each side of the modem chassis.
2. Use the provided hardware to install the slide rail components into each interior side of the equipment rack cabinet.
3. Install the modem into the front of the equipment rack. Ensure that the slides properly engage the cabinet-mounted slide rails.
4. Continue to slide the modem into the equipment rack to its final operating position. Then, use four user-provided screws to secure the modem to the equipment rack’s right and left threaded front rails (through the front panel slots).

Notes:

Chapter 4. REAR PANEL CONNECTORS

4.1 Overview – Cabling Connection Types

Comtech EF Data's CDM-710G and CDM-710GL High-Speed Satellite Modems use a number of different cables. Each cable type is typically dedicated to a specific mode of operation.

1) **Not all of these operational interface types may be available.**
2) **The European EMC Directive (EN55022, EN50082-1) requires using properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.**

4.1.1 Coaxial Cable Connections

(TOP) Bayonet Coupling Plug and Jack (Type 'BNC' Shown)
(BOTTOM) Threaded Coupling Plug and Jack (Type 'N' Shown)

Figure 4-1. Coaxial Connector Examples

The types of coaxial cables used by Comtech EF Data are 'BNC', 'TNC', 'N', 'F', and 'SMA'. Coaxial cables (plugs) and their mating connectors (jacks/sockets) are available in two coupling styles – Bayonet or Threaded:

Bayonet Coupling Style – The jack has a pair of guideposts that accommodate the plug's lockdown slots. This lockdown design provides secure assembly without over-tightening the connection.

Threaded Coupling Style – The jack features external threads. The plug shell features internal threads, and has either a knurled outer surface to permit hand-tightening of the connection, or hex flats to accommodate torqued installation.

Connection Instructions:

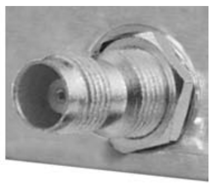
Bayonet Coupling Connections – Use the plug slots to guide, and then slide the plug onto the jack posts. Then, turn the plug clockwise until the jack posts are fully seated within the plug slot.

Threaded Coupling Connections – Engage the plug onto the jack threads, and then turn the plug clockwise until it is fully threaded onto the jack. Do not over-tighten the connection.

4.1.1.1 Type ‘BNC’


BNC plugs and jacks feature a Bayonet Coupling design.

4.1.1.2 Type ‘TNC’

TNC plugs and jacks feature a Threaded Coupling design similar to Type ‘N’, Type ‘F,’ and Type ‘SMA’ connectors.

4.1.1.3 Type ‘N’


Type ‘N’ connectors feature a Threaded Coupling design similar to Type ‘TNC’, Type ‘F’, and Type ‘SMA’ connectors.

4.1.1.4 Type ‘F’

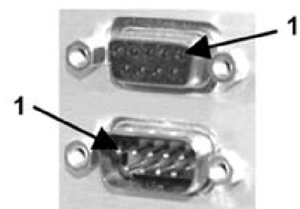

Type ‘F’ connectors feature a Threaded Coupling design similar to Type ‘TNC’, Type ‘N’, and Type ‘SMA’ connectors.

4.1.1.5 Type 'SMA'

Type 'SMA' connectors feature a Threaded Coupling design similar to Type 'TNC', Type 'N', and Type 'F' connectors.

4.1.2 D-Subminiature Cable Connections

**Type 'D' Cable with Jack Screws
(Female Shown)**



**Type 'D' Chassis Receptacles with Jack Nuts:
(TOP) Female
(BOTTOM) Male**

Figure 4-2. D-Subminiature Connector Examples

D-Subminiature connectors are also called Type 'D' or 'D-Sub' connectors. The cable plug and chassis receptacle each feature a D-shaped profile that interlock to ensure proper pin orientation and connector seating. The connector pair features multiple rows of pins (male side) coupled to mating sockets (female side).

Whether the gender is male or female, the cable plug features two jack screws for secure connection to the jack nuts provided on the mating chassis receptacle.

Connection Instructions: Orient the plug to the receptacle in the proper position. Press firmly into place. Hand tighten, or use a standard flat-blade screwdriver, to secure the plug jack screws to the receptacle jack nuts. Do not over-tighten.

About connector pinout tables: Figure 4-2 identifies the Pin 1 location for either gender connector. The connector pinout tables provided in this manual base the order of information (i.e., the "Pin #" column) on this orientation, except where noted.

4.1.3 RJ-45, RJ-48 Cable Connections

Figure 4-3. RJ-45/RJ-48 Connector Example

The plug for an RJ-45 or RJ-48 cable features a flexible tab. The RJ-45 or RJ-48 receptacle features a mating slot. This design configuration ensures a secure installation.

Connection Instructions (Figure 4-3): Press down the tab on the cable plug, and then insert the plug into the receptacle. The connection is complete when the tab 'clicks' into position inside the receptacle.

4.1.4 USB Cable Connections

(TOP) Type 'A' USB Plug and Receptacle
(BOTTOM) Type 'B' USB Plug and Receptacle

Figure 4-4. USB Connector Examples

Universal Serial Bus connectors are also called USB connectors. A USB connection is used as a bus-type communications or power interface between peripheral devices. The connector pair (**Figure 4-4**) features a plug (male side) coupled to its mating receptacle (female side).

Connection Instructions:

Type 'A' Connections – Slide the plug firmly into the chassis receptacle.

Type 'B' Connections – Orient the plug to the receptacle and push in firmly. The Type 'B' cable plug and chassis receptacle each feature a D-shaped profile that interlock to ensure proper orientation and connector seating. By design, it is impossible to incorrectly insert the plug into the receptacle.

4.2 Unit Connectors

External cables are attached to connectors provided on the rear panel of the unit (**Figure 4-5**).

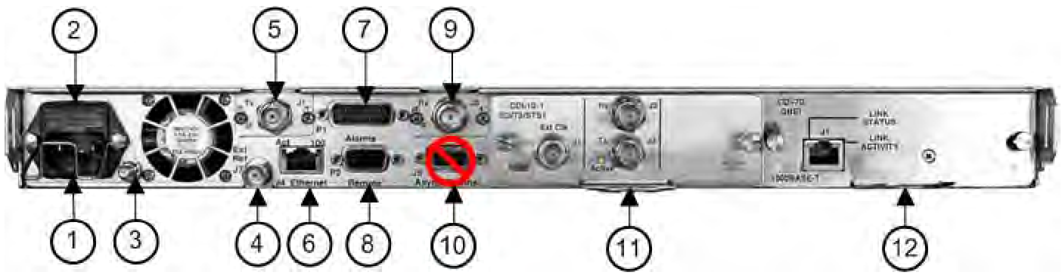


Figure 4-5. Heights Remote Gateway – Rear Panel View

4.2.1 Power Interface Module – Standard AC Unit

As shown in **Figure 4-5**, the AC power interface module consists of the following components:

Item 1 – AC Power Connector
This connector is an IEC-60320 Type C14 (male) three-prong connector, for connection with an IEC-60320 Type C13 (female) three-prong plug. Note the following:

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

Item 2 – Press-fit Fuse Holder

Two 20mm Slo-blo type fuses are installed here for line and neutral fusing.

4.2.1.1 AC Operation – Replace the Fuses

Figure 4-6. Replace the AC Fuses

As shown in Figure 4-5 (Item 2) and (Figure 4-6): The unit rear panel features a fuse holder that is press-fit into the body of the IEC power module. The unit uses two 20mm Slo-blo fuses – one each for line and neutral connections.

WARNING!
DISCONNECT THE POWER SUPPLY BEFORE PROCEEDING!

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

Do these steps to replace the AC fuses (Figure 4-6):

1. Unseat the fuse holder from the IEC power module.
    a. Use the slot to pry the holder outward from the IEC power module.
    b. Pull the holder straight out, and then swing the holder away from the module.
2. Remove and replace the fuses as needed. Use T2.00A 20mm fuses for 115 and 230 volt AC operation.
3. Re-seat the fuse holder in the IEC power module.

4.2.1.2 AC Operation – Apply Power

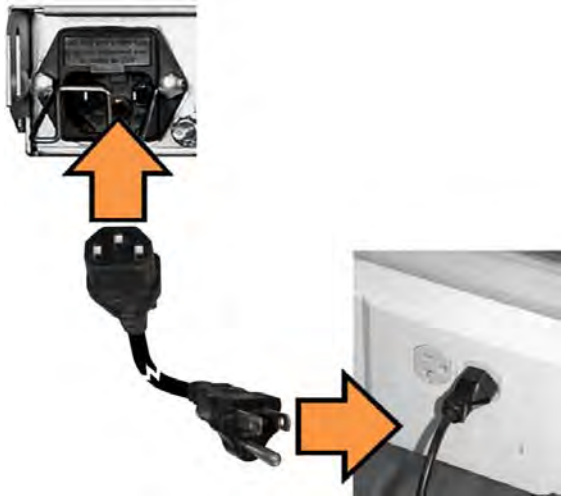


Figure 4-7. Apply AC Power to the Unit

Do these steps to apply AC power to the unit (Figure 4-7):

1. Plug the provided AC power cord female end into the unit.
2. Plug the AC power cord male end into the user-supplied power source.
3. Switch the unit ON.

4.2.2 Power Interface Module – Optional 48V DC Unit

Contact Comtech EF Data Product Support for detailed information about connecting and supplying power, and replacing the fuses for the optional DC-powered CDM-710G or CDM-710GL. Note the following:

Product	Configuration	Voltage	Frequency	Watts	Amps	VA
CDM-710G (70/140 MHz)	LDPC+BCH 32APSK 8/9 28 Msps S2-TS 120 MHz	48V DC	N/A	81.2	1.69	-
CDM-710GL (L-Band)	LDPC+BCH 32APSK 8/9 28 Msps S2-TS 120 MHz	48V DC	N/A	85.92	1.79	-

4.2.2.1 DC Operation – Replace the Fuses

For DC operation, the unit requires two different fuses. The fuses are located on the rear panel in individual screw-in receptacles found adjacent to the terminal block.

WARNING!
DISCONNECT THE POWER SUPPLY BEFORE PROCEEDING!

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

Do these steps to replace the DC fuses:

1. Disconnect the power supply leads.
2. Unscrew either fuse holder from the receptacle.
3. Remove and replace the T6.25A 6.3 mm x 32 mm fuses as needed.
4. Screw the fuse holder(s) back into the receptacle.

4.2.2.2 DC Operation – Apply Power

Do these steps to apply DC power to the unit:

1. Connect the user-supplied (+) and (–) DC power leads to their respective terminals.

   Number 18 AWG minimum wires are recommended.

2. Connect the user-supplied DC power leads to the user power source.
3. Energize the power source to turn the unit ON.

4.2.3 Unit Ground Connection

Figure 4-8. Unit Ground Connection

CAUTION
PROPER GROUNDING PROTECTION IS REQUIRED. You must connect the equipment to the protective earth connection at all times. Use this ground stud during installation, configuration, and operation.

The AC power interface provides the safety ground.

As shown in Figure 4-5 and Figure 4-8 (Item 3): This #10-32 stud, located adjacent to the power interface module, is used for connecting a common chassis ground among equipment.

4.2.4 Operational Connections

See Sect. 4.1 Overview – Cabling Connections Types for information about each connector type and its connection instructions.

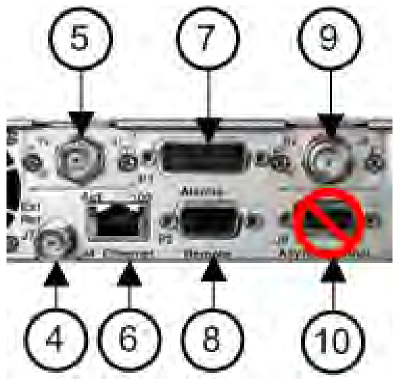


Figure 4-9. Rear Panel Operational Connections

As shown in Figure 4-5 and Figure 4-9 (Items 4 through 10):

Item 4 – 'J7 | Ext Ref' Utility Connector
Use this female BNC connector 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 appendices in this manual for details.

Item 5 – 'J1 | Tx (Transmit)' IF Connector

CAUTION
THERE MAY BE DC VOLTAGES OF UP TO 48 VOLTS MAXIMUM PRESENT ON THIS CONNECTOR.

Use this connector for Tx operation:

- **CDM-710G (70/140 MHz)** – BNC female connector
- **CDM-710GL (L-Band)** – Type 'N' female connector

Item 6 – ‘J4 | ETHERNET’ Ethernet Management Utility Port

Use this 10/100 BaseT Ethernet RJ-45 port for operation of the Ethernet remote control interfaces.

Table 4-1. ‘J4 | Ethernet’ Connector Pinouts

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	--

Item 7 – ‘P1 | ALARMS’ Utility Connector

Use this DB-15M EIA-232 connector to access the Form C Alarms (relay closures). The connector pinout depends upon whether the unit is in the Normal or Redundancy mode for use with the CRS-170A (L-Band), CRS-180 (70/140 MHz), or CRS-300 redundancy switches.

Use the front panel keypad to put the unit into 1:1 mode: **Config: AUX → 1:1 Mask → Ena/Dis → Enable**.

Table 4-2. 'P1 | Alarms' Connector Pinouts

Normal Mode			
Pin #	**Description**	**Name**	**Direction**
8 15 7	Rx Traffic (De-energized, Faulted) (See notes) Rx Traffic (Energized, No Fault) Rx Traffic	Rx-NC Rx-NO Rx-COM	I/O I/O I/O
14 6 13	Tx Traffic (De-energized, Faulted) (See notes) Tx Traffic (Energized, No Fault) Tx Traffic	Tx-NC Tx-NO Tx-COM	I/O I/O I/O
5 12 4	Unit Fault (De-energized, Faulted) (See notes) Unit Fault (Energized, No Fault) Unit Fault	Unit-NC Unit-NO Unit-Com	I/O I/O I/O
11 3	Rx I Channel (Constellation Monitor) Rx Q Channel (Constellation Monitor)	Rx-I Rx-Q	O 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

1:N (CRS-300/710G) *and* 1:1 Mode (CRS-170A, CRS-180)			
Pin #	**Description**	**Name**	**Direction**
8 15 7	Summary Relay NC (De-energized, Faulted) Summary Relay NO (Energized, No Fault) Summary Relay COM (Notes 1, 2)	PR-NC PR-NO PR-COM	I/O I/O 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

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.

Item 8 – ‘P2 | Remote’ Serial Management Utility Connector

This DB-9M connector is intended for connection to an M&C computer or terminal device. It is user selectable for either EIA-232 or EIA-485 (2-Wire/4-Wire) operation.

Table 4-3. ‘P2 | Remote’ Connector Pinouts

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 EIA-485 operation

Item 9 – ‘J3 | Rx (Receive)’ IF Connector

CAUTION
THERE MAY BE DC VOLTAGES OF UP TO 48 VOLTS MAXIMUM PRESENT ON THIS CONNECTOR.

Use this connector for Rx operation:

- **CDM-710G (70/140 MHz)** – BNC female connector
- **CDM-710GL (L-Band)** – Type ‘N’ female connector

Item 10 – ‘J6 | Async Channel’ Utility Connector (NOT USED)

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

Notes:

Chapter 5. FIRMWARE UPDATE

5.1 Firmware Update Overview

Make sure to operate the Comtech EF Data CDM-710G or CDM-710GL High-Speed Satellite Modem with its latest available firmware.

The CDM-710G/L is factory-shipped with the latest version of operating firmware. If you need to update the firmware, you can apply the update to the modem without having to remove it from operation. You may directly acquire the download from Comtech EF Data's web site (www.comtechefdata.com), or receive the archive file by e-mail from Comtech EF Data Product Support.

5.1.1 Firmware Update Procedure Summary

1. Download the firmware update archive file to a user-supplied PC. The user PC must be Microsoft Windows® compatible.
2. Make sure the User PC is connected to the modem rear panel **'J4 | Ethernet'** Base-T 10/100 Ethernet port.
3. Use Windows Command-line to transfer, via File Transfer Protocol (FTP), the extracted firmware files from the User PC to the modem's standby firmware image.
4. Use the modem front panel or the CDM-710G/L HTTP Interface to configure the modem to operate using the updated firmware image.

5.1.2 About Firmware Numbers, File Versions, and Formats

Comtech EF Data's Web site catalogues its firmware update files by product type (e.g., modem, converter, etc.) and specific model/optional configuration. For example, the firmware download hyperlink appears as **F0000114*_V###** (where '###' indicates the firmware version number, and '*' is the revision letter of that version).

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

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

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

5.2 Prepare for the Firmware Download

5.2.1 Required User-supplied Items

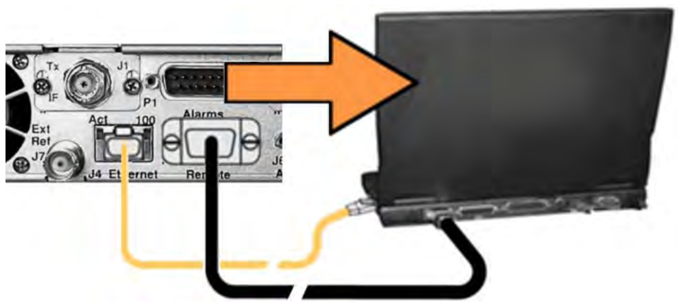
You will need:

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

5.2.1.1 Modem Connections

Connect the User PC to the modem:

- Use the 9-pin serial cable to connect the modem **'P2 | Remote'** port to a serial port on the User PC.
- Use an Ethernet hub, switch, or direct cable connection to connect the modem **'J4 | Ethernet'** port to the Ethernet port on the User PC.



BASE MODEM firmware can only be loaded via the 'J4 | Ethernet' M&C port; do **not** use the Ethernet Traffic port available on the CDI-70 Data Interface Module.

5.2.2 Configure the Terminal Emulator Program

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

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

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

5.2.3 Get the Management IP Address and Firmware Information

- Chapter 7. FRONT PANEL OPERATION
- Chapter 8. ETHERNET INTERFACE OPERATION
- Chapter 9. SERIAL INTERFACE OPERATION

Do these steps:

1. On the modem – Apply power to the unit. Your power connection varies depending on your ordered unit (i.e., AC vs. DC operation).
2. Identify your default Management IP Address. You will not be able to access the HTTP (Web Server) Interface without this information. See Section 5.2.3.1.
3. Get the firmware information using one of these methods:
   - To use the modem Front Panel, see Section 5.2.3.2.
   - To use the Serial Remote Interface, see Section 5.2.3.3.
   - To use the HTTP Interface, seer Section 5.2.3.4.

5.2.3.1 Use Front Panel Operation to Find the Management IP Address

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

You may view the assigned Management IP Address on the **SELECT: Config→ Remote → Ethernet → Address** screen.

5.2.3.2 Use Front Panel Operation to Find the Firmware Information

```
    CDM-710G L MODEM
 Firmware Version: X.X.X
```

```
Bulk:             05/28/10
FW00114-             5.1.3
```

You may view the base modem running M&C version at the top level screen. Press the **CLEAR** key several times to view this information.

The detailed firmware information can be found within the **SELECT: UTIL→ Firmware → Info → Image#1** or **Image#2 → Bulk** nested submenus.

5.2.3.3 Use the Serial Interface to Find the Firmware Information

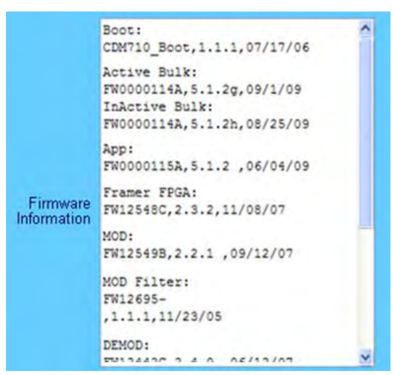
Use your terminal emulator to execute remote queries with the modem. Use either of these remote queries to find the firmware information:

- Condensed : **<0/SWR?{CR}**
  (returns the firmware version numbers running under Boot, Bulk1, and Bulk2, in the form B.B.BB)
- Detailed : **<0/FRW?{CR}**
  (returns the complete information of the firmwares running under Boot, Bulk1, and Bulk2 in the form similar to FW-AAAAAAA B.B.BB DD/MM/YY, where:
    - FW-AAAAAAA = the firmware part number
    - B.B.BB = the firmware version number
    - DD/MM/YY = the firmware release date (Day/Month/Year)

5.2.3.4 Use the HTTP Interface to Find the Firmware Information

Do these steps:

1. The 'Firmware Information' section of the 'Maint | Unit Info' page provides the firmware details as Boot, Active Bulk, and Inactive Bulk, as shown in this example:



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

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

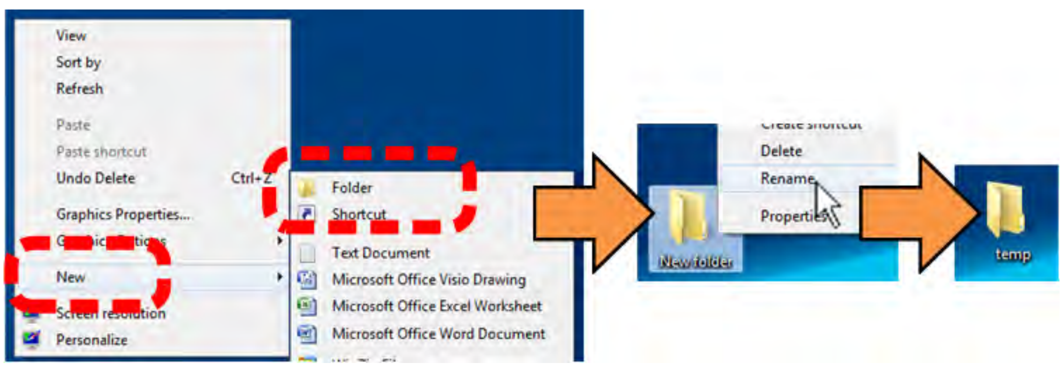
The temporary folder is where you store the firmware archive download. There are several ways you can make a temporary folder on a Windows PC:

- To use the Windows Desktop, see Section 5.2.4.1.
- To use Windows Explorer, see Section 5.2.4.2.
- To use the Run and Browse windows, see Section 5.2.4.3.
- To use Windows Command-line or the Command Prompt, see Section 5.2.4.4.

After you make the temporary folder, proceed to Section 5.2.5 to download and extract the firmware files.

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

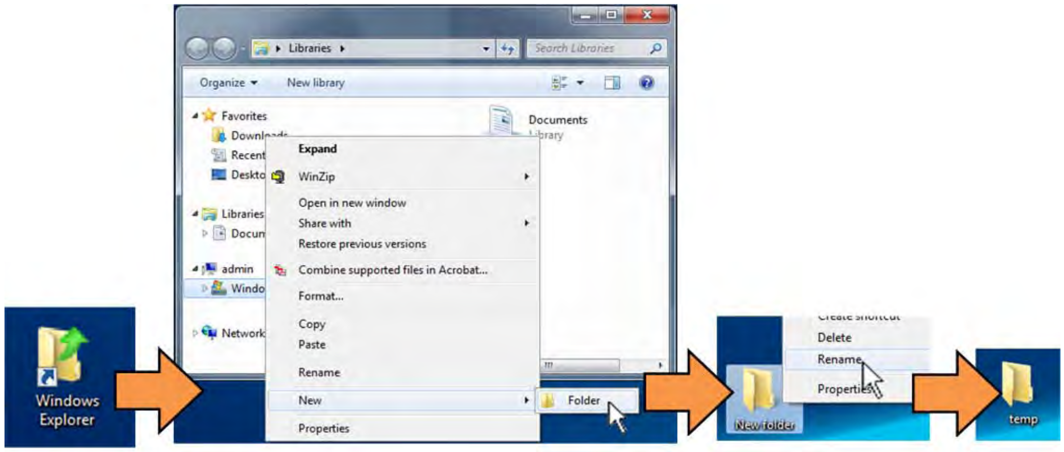
5.2.4.1 Use Windows Desktop to Make a Folder



Do these steps:

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

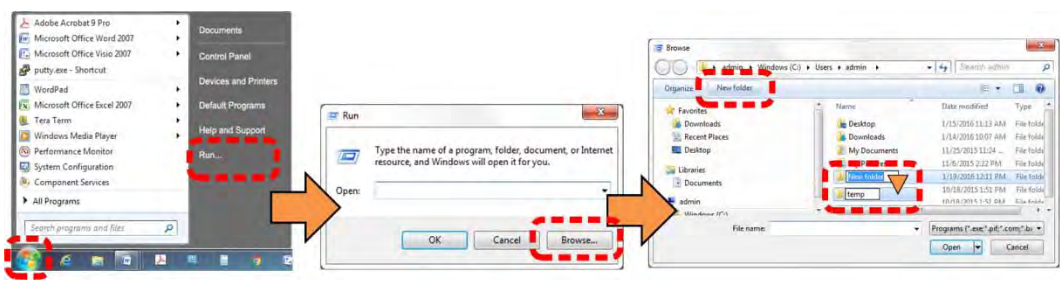
5.2.4.2 Use Windows Explorer to Make a Folder



Do these steps:

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

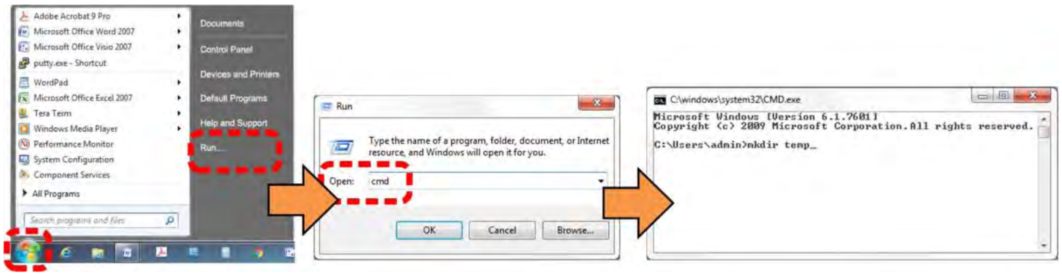
5.2.4.3 Use the Run and Browse Windows to Make a Folder



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

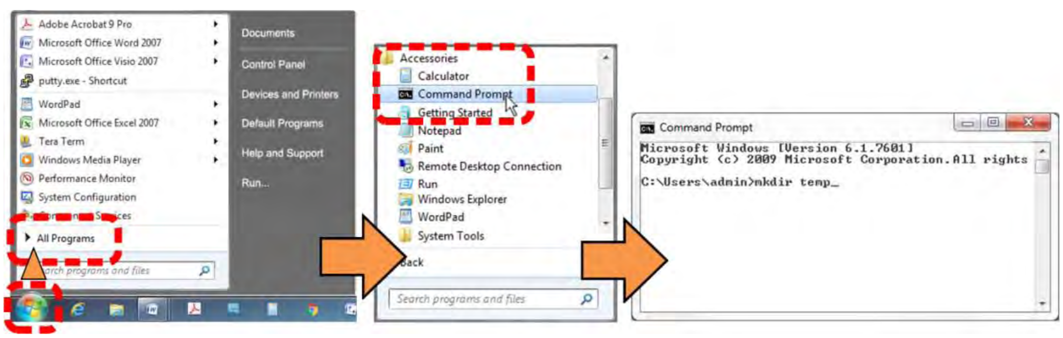
1. Click **Run…** to open the **Run** window.
2. Click **Browse…** to open the **Browse** window.
3. Click **New Folder**. This can be an icon or a text label, depending on the Windows OS version.
4. Right-click the **New Folder** folder name, and then **Rename** this folder to “temp” or some other convenient,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

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



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

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



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

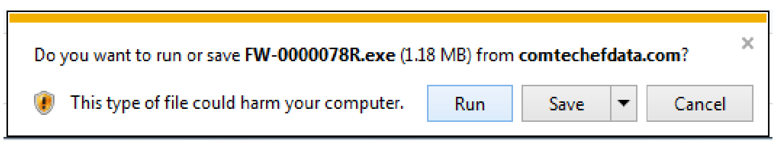
There will now be a “temp” folder created and available for placement of the firmware file download.

5.2.5 Download and Extract the Firmware Update Files

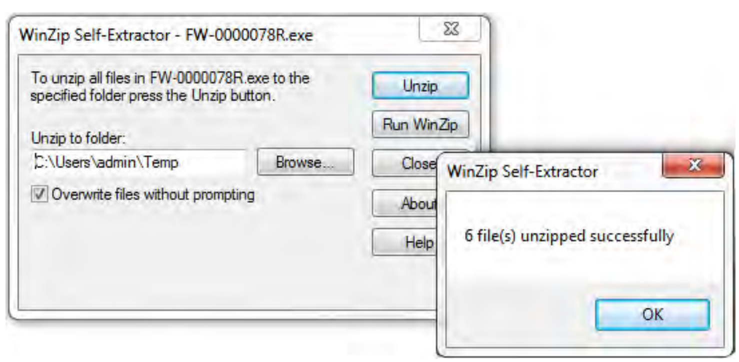
The example figures in this section are provided for reference only. Your firmware information will be different.

Do these steps:

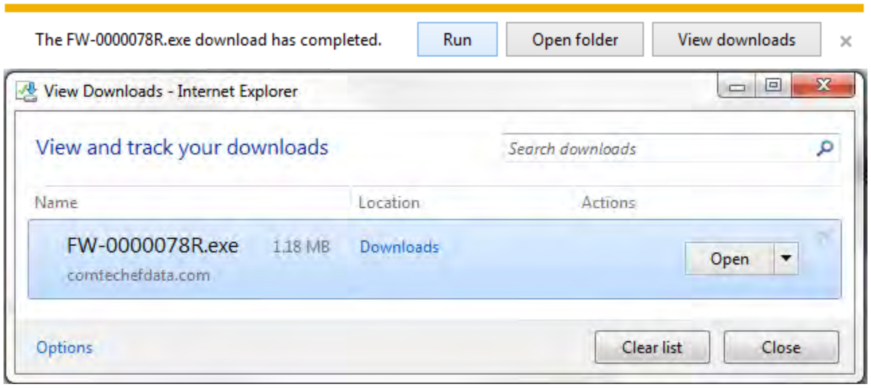
1. Go online to www.comtechefdata.com.
2. On the Main page – Under **Support Information** or the **Support** tab, select the **Software Downloads** hyperlink.
3. On the **Software Downloads** page – Click **Download Flash and Software Update Files**.
4. On the **Flash Updates Index** page – Select the **(Select a Product Line) Satellite Modems** hyperlink.
5. On the Modems product page – Select the **CDM-710G/L** product hyperlink;
6. Select the appropriate firmware archive EXE or ZIP file download hyperlink.
7. Once you select the EXE or ZIP hyperlink, the **File Download** dialogue opens on your browser and prompts an action. You may otherwise click **[Cancel]** to quit the file download process. Note the following:
   - For EXE files:



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



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



- For ZIP files:

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

8. If not already done with **File Download > Open**, you must extract, at a minimum, these files (filenames are subject to change):
   - FW0000114.bin (bulk image file).
   - CDM710G Release Notes.pdf (firmware notes).
9. Confirm availability of the firmware files in the temporary folder. There are several ways you can view the contents of the temporary folder on a Windows-based PC:
   - To use the Windows Desktop, see Section 5.2.5.1.
   - To use Windows Command-line or Command Prompt, see Section 5.2.5.2.
   - After you confirm the firmware files are in the folder, proceed to Section 5.3 to upload the firmware update to the modem.

5.2.5.1 Use Windows Desktop to View Folder Contents

From the Windows Desktop:

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

5.2.5.2 Use Windows Command-line to View Folder Contents

Using Command-line or Command Prompt:

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

5.3 Upload the Firmware Files and Update the Modem

5.3.1 Important Considerations

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

- You connect the modem to the user PC using one of the methods described in Section 5.2.1.1.
- Your PC is running a terminal emulation program for operation of the modem Serial or Ethernet Telnet interfaces.
- You have noted your modem Management IP Address.
- Your PC is running a compatible Web browser for operation of the modem HTTP Interface.
- You download or otherwise have Comtech’s latest firmware files available on the User PC in an accessible temporary folder.

5.3.2 Steps to FTP Upload the Firmware Files

1) Typical for all steps: “xxx.xxx.xxx.xxx” represents the assigned unit Management IP Address.
2) Type all commands without quotes, and press Enter to execute.

1. Use Windows Command-line to send a ping command. To ping the unit, type “ping xxx.xxx.xxx.xxx” at the Windows Command-line prompt. The response should confirm whether the unit is connected and communicating correctly with the User PC.
2. Use Windows Command-line to transfer the files from the User PC to the modem via FTP:
    a. Type “ftp xxx.xxx.xxx.xxx” to open the FTP session.
    b. Type “bin” to set the binary transfer mode.
    c. Type “prompt”.
    d. Type “hash”.
    e. To begin the file transfer, type “put FW0000114.bin bulk:”

    The destination “bulk:” must be all lower-case.

    The process sequences through several blocks – this may take several minutes for the transfer to occur. The modem front panel reports the status as follows:

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

    Wait for the file transfer to end. When it has finished, the modem front panel will display:

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

    If you receive the “Connection closed by remote host” message, wait another minute before continuing. The modem update sometimes takes longer than the FTP client allows.
    f. Type “bye” to close the FTP session.
    g. Close the Command-line window.
3. Select the alternate Boot Slot (Image) from the modem front panel:

SELECT: UTIL → Firmware → Select, and then use the keypad ◀ (LEFT) and ▶ (RIGHT) arrows to select the alternate image.

```
Firmware Info: Bootrom
Image#1  Image#2
```

4. Power down the modem, and then power up to reboot.
5. To verify that the PC-to-unit FTP file transfer was successful, find the current firmware information via the front panel, or the HTTP or Serial interface (see Sections 5.2.3.2, 5.2.3.3, or 5.2.3.4).

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

5.4 CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface (GBEI) FTP Upload Procedure

See Appendix E. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET DATA INTERFACE (GBEI) for information on and instructions for updating the firmware for this optional data interface.

5.5 USB Firmware Update Procedure

Use of the front panel USB port for the firmware update process is not available in this firmware release. Please contact Comtech EF Data Product Support for this feature's release schedule.

Notes:

Chapter 6. FAST ACTIVATION PROCEDURE

6.1 FAST Overview

The CDM-710G and CDM-710GL High-Speed Satellite Modems incorporate a number of optional features. In order to permit a lower initial cost, you may purchase the unit with only the desired features enabled.

If you wish to upgrade the functionality of a unit at a later date, Comtech EF Data provides Fully Accessible System Topology (FAST), which permits the purchase and activation of options through special authorization codes. You may contact Comtech EF Data Product Support to purchase these unique, register-specific Fast Access Codes, and then load these codes into the modem using the front panel keypad or the HTTP (Web Server) Interface (accessible by connecting your PC Ethernet port to the CDM-710/L 'J4 | Ethernet' 10/100 Base-T M&C Ethernet port).

FAST System Theory: FAST facilitates on-site upgrade of the operating feature set without removing a unit from the setup. FAST technology allows you to order a unit precisely tailored for the initial application. When your service requirements change, you can upgrade the topology of the unit to meet these requirements within minutes. This accelerated upgrade is possible because of FAST's extensive use of the programmable logic devices incorporated into Comtech EF Data products.

FAST Implementation: Comtech EF Data implements the FAST system in the modem at the factory. All FAST Features 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 modem's front panel or via the HTTP (Web Server) Interface.

FAST Accessible Options: You may order hardware options for installation either at the factory, or you can install and activate them on-site. The FAST Access Code that you purchase from Comtech EF Data enables configuration of the available hardware.

6.1.1 CDM-710G/L Available FAST and FAST-accessible Hardware Options

Register tiers not listed here are invalid for CDM-710G/L operation.

6.1.1.1 Transmit Configurations

Tier	FAST Option	Modulation	Maximum 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

6.1.1.2 Receive Configurations

Tier	FAST Option	Modulation	Maximum 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

6.2 FAST Activation Procedure

Do these steps:

1. Obtain the unit serial number:
   - From the front panel **SELECT:** (Main) menu, select **UTIL** (Utility) → **FAST**, and then press **[ENTER]**.
   - The modem motherboard Serial Number is displayed on the bottom line:

```
FAST: Cnfg   View
MainBoard S/N: 0123456789
```

   - Record serial number: ______________________
2. Review the currently installed features:
   - From the **UTIL** → **FAST** menu, select **VIEW**, and then press **[ENTER]**.
   - Use the ▲▼ arrow keys to scroll through the modem Options. Note which options are '**Installed**' or '**Not Installed**'. You may purchase any option labeled '**Not Installed**' as a **FAST** upgrade:

```
View Options: 01 (▲▼)
IF Modulator Installed
```

3. Contact Comtech EF Data Product Support to order features and acquire the FAST Access (configuration) Code. You will be asked to provide the modem Serial Number. Comtech EF Data Product Support will verify the order and provide an invoice, instructions, and a 20-character FAST Access Code.
4. Enter the FAST Access Code.
   - Press [CLEAR] to return to the UTIL → FAST menu:

```
FAST: Cnfg   View
MainBoard S/N: 0123456789
```

   - Use the ◄ ► arrow keys to select Cnfg. Press **[ENTER]**:

```
FAST Configuration:
Edit Code    Demo Mode
```

- Use the ◄ ► arrow keys to select Edit Code. Press **[ENTER]**.

```
Edit 20 digit FAST Code:
 00000000000000000000 ENT
```

- Enter the 20-character FAST code *carefully*. Use the ◄ ► arrow keys to move the cursor to each character, and then use the ▲▼ arrow keys to edit that character. Press ENTER when done.

  If you enter an invalid FAST code, the modem rejects the code and displays the following message:

```
 FAST Code Rejected!
         (ENTER or CLEAR)
```

- Press **[ENTER]** or **[CLEAR]** as directed, and then re-enter the FAST code. Contact Comtech EF Data Customer Support if the problem persists. 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.

6.3 Using FAST Demo Mode

The **FAST Demo Mode** enables all FAST options for a limited time. When enabled, Demo Mode allows access to ***ALL*** CDM-710G/L FAST options for 45 days. Older units running earlier firmware versions allow Demo Mode for 604800 seconds (7 full days). Demo Mode may be turned on and off an unlimited number of times until the available time has expired.

Do these steps to enable or disable FAST Demo Mode:

1. From anywhere in the front panel menus, press **[CLEAR]** to return to the top-level menu. Use the ◄ ► arrow keys to select **SELECT: UTIL → FAST**. Press **[ENTER]**.

```
FAST: Cnfg   View
MainBoard S/N: 0123456789
```

2. Use the ◄ ► arrow keys to select **Cnfg**. Press **[ENTER]:**

```
FAST Configuration:
Edit Code     Demo Mode
```

3. Use the ◄ ► arrow keys to select **Demo Mode**. Press **[ENTER]**.

```
FAST Demo Mode: Off  On
  604800 seconds remain
```

4. Use the ◄ ► arrow keys to select Demo Mode as **Off** or **On**. Press **[ENTER]**.

When *On*, the second line will display the number of seconds remaining available for the free Demo Mode. (The countdown proceeds only when the mode is *On*.)

Once the Demo period expires, a message displays on the bottom line of the menu as follows:

```
FAST Demo Mode: Off  On
  Demo Period Expired
```

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.

Notes:

Chapter 7. FRONT PANEL OPERATION

7.1 Front Panel Overview

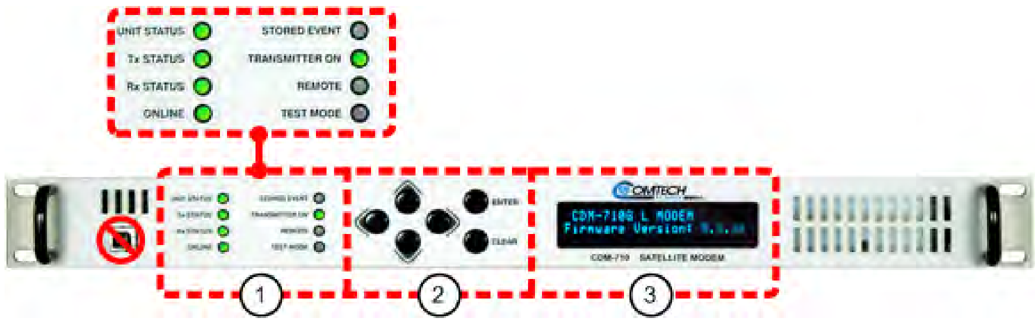


Figure 7-1. Front Panel View

The front panel USB 1.1 port is non-functional.

You may fully control and monitor the operation of the CDM-710G or CDM-710GL from the front panel. The front panel (**Figure 7-1**) provides the following features:

Item 1 – Eight (8X) Light-Emitting Diode (LED) indicators convey operational states as follows:

UNIT STATUS

- Lights GREEN when there are no Unit Faults or Alarms.
- Lights AMBER when there are no Unit Faults, but an Alarm exists.
- Lights RED when a Unit Faults exists (Example: PSU Fault).

Tx STATUS

- Lights GREEN when there are no Tx Traffic Faults or Alarms.
- Lights AMBER when a Tx Traffic Alarm exists.
- Lights RED when a Tx traffic Fault exists.
- Remains OFF when the transmitter is turned OFF (e.g., when the unit is not configured as a Modulator).

Rx STATUS

- Lights GREEN when there are no Rx Traffic Faults or Alarms.
- Lights AMBER when an Rx Traffic Alarm exists.
- Lights RED when an Rx traffic Fault exists.
- Remains OFF when the receiver is turned OFF (e.g., when the unit is not configured as a Demodulator).

ONLINE

- Lights GREEN when the Unit is On Line, and carrying traffic.
- Remains OFF when the Unit is Off Line (standby) – forced by an externally connected 1:1 or 1:N Redundancy System).

STORED EVENT

- Lights AMBER when there is a Stored Event in the log.
- Remains OFF when there are no Stored Events.

TRANSMITTER ON

- Lights GREEN when the Transmitter Carrier is ON. This indicator reflects the actual condition of the transmitter, as opposed to the programmed condition.
- Remains OFF when the Transmitter carrier is OFF.

REMOTE

- Lights GREEN when the unit is in Remote Communication Mode. Local monitoring is possible, but there is no local control.
- Remains OFF when the unit is in Local Mode. Remote monitoring is possible, but no there is no remote control.

TEST MODE

- Lights GREEN when a BERT (Bit Error Rate test) is active.
- Remains OFF when the unit is operating normally.

In general, the Alarm relay state reflects 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 is activated only if a Transmit Traffic Fault exists – it does not reflect the state of the Tx carrier.

Item 2 –The keypad comprises six individual keyswitches. Operation of the individual keys is as follows:

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

The keys have a positive 'click' action that provides tactile feedback. Data, prompts, and messages appear on the Vacuum Fluorescent Display (VFD). Enter data via the keypad.

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.

Item 3 – The Vacuum Fluorescent Display (VFD) is an active display showing two lines of 24 characters each. It produces a blue light with adjustable brightness. Compared to a Liquid Crystal Display (LCD), it has superior viewing characteristics and does not suffer problems of viewing angle or contrast.

```
CDM-710G L MODEM
Firmware Version: X.X.X
```

The opening screen displays once you apply power to the unit. The top line identifies the unit model (i.e., CDM-710G, or CDM-710GL). The bottom line displays the running Firmware Version (this number may vary).

While this example shows a CDM-710GL (L-Band) screen, this chapter and the screen examples that follow infer use of either a CDM-710G 70/140 MHz or a CDM-710GL L-Band Broadcast Satellite Modem.

Press any key to display the top-level Select menu. On most menu screens, you 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: Config Monitor
Test Info Save/Load Util
```

Where this solid block cursor obscures the item under edit (e.g., a numeric field), the cursor automatically changes 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. This message constantly scrolls and wraps across the screen. The top line displays the Circuit ID (the user-assigned name of the unit); 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.

Nested menus display all available options and prompt you to carry out a required action. Use the keypad to navigate between screens.

7.2 Front Panel Operation – Menu Matrix

Chapter Sect.	Menu Screen Description	Submenu Selections
7.2	Opening Screen	–
7.2	Select (Main) Menu	*Select:* Config; Monitor; Test; Info; Save/Load; Util
7.2.1	Configuration	*Select:* Remote; Tx; Rx: Int1; Int2; Ref, Aux, Alarms
7.2.1.1	(Config:) Remote Control	*Select:* Local; Serial; Ethernet
7.2.1.2	(Config:) Tx	*Select:* FEC; Mod; Code; SymRate; Freq, Pwr; Scram
7.2.1.3	(Config:) Rx	*Select:* FEC; Dem; Code; SymRate; Freq; Eb/No; PLL
7.2.1.4	(Config:) Intfc1	–
7.2.1.4.1	(Config:) Intfc1 (CDI-10-1 E3T3STS1 Interface only)	*Select:* Tx; Rx; Config
7.2.1.4.2	(Config:) Intfc1 (CDI-60 HSSI Interface only)	*Select:* Tx, Rx, CTS/RTS
7.2.1.5	(Config:) Intfc2 (CDI-70 Gigabit Ethernet Interface only)	*Select:* Tx; Rx; Man; Stats; SWOP
7.2.1.6	(Config:) Ref	–
7.2.1.7	(Config:) Aux	*Select:* Ena/Dis; Force (1:1)
7.2.1.8	(Config:) Alarms	*Select:* Tx; Intfc1; Intfc2
7.2.2	Monitor	*Select:* Alarms; Rx_Stats; Event-Log
7.2.2.1	(Monitor:) Alarms	*Select:* Transmit; Receive; Unit
7.2.2.2	(Monitor:) Rx Stats	–
7.2.2.3	(Monitor:) Event-Log	*Select:* View; Clear-All
7.2.3	Test	*Select:* Mode
7.2.4	Info	*Select:* Rem; Tx; Rx; Intfc1; Intfc2
7.2.5	Save/Load	*Select:* Save; Load
7.2.5.1	(Save/Load:) Save	–
7.2.5.2	(Save/Load:) Load	–
7.2.6	Utility	*Select:* RT-CLK; Ref; ID; Display; Firmware; FAST
7.2.6.1	(Utility:) RT-Clk	–
7.2.6.2	(Utility:) Ref	–
7.2.6.3	(Utility:) ID	–
7.2.6.4	(Utility:) Display	–
7.2.6.5	(Utility:) Firmware	*Select:* Info; Select
7.2.6.6	(Utility:) FAST	*Select:* Cnfg; View

1) Because the CDM-710G/L operates only in DVB-S2 mode, many of the Rx parameters are *read-only.* Further, the Scrambler and Pilot selections are always available.
2) The Impedance selection appears only when the 70/140 MHz Modulator card is installed.

Opening Screen

The CDM-710GL (L-Band) unit is shown in the screen shots throughout this chapter. The information that follows is applicable to either the CDM-710G or CDM-710GL High-Speed Satellite Modems. Any operational restrictions are noted.

```
CDM-710G L MODEM
Firmware Version: X.X.X
```

The opening screen displays once you apply power to the unit. The top line identifies the unit model. The bottom line displays the running Firmware Version (this number may vary).

Main Menu

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

Use the ◄ ► arrow keys to move the cursor to the desired choice. Press **ENTER**. The function of each menu branch is as follows:

- Config (Configuration) Menu Branch – These screens provide you with selections for the desired Interface, Transmit, and Receive operations.
- Monitor Menu Branch – These screens permit you to monitor the alarm status of the unit, to view the log of stored events, and to display the Rx Parameters screen.
- Test Menu Branch – These screens permit you to configure the modem into one of several available BERT (Bit Error Rate Test) modes (e.g., CW or Loopback).
- Info Menu Branch – These screens provide summary/display screens for the Interface, Transmit, Receive, and M&C configurations.

- Save/Load Menu Branch – These screens permit you to save (store) and retrieve (load) up to 10 different modem configurations.
- Util (Utility) Menu Branch – These screens permit you to configure various unit operation functions, such as setting the Real-Time Clock, adjusting the display brightness, loading FAST options, etc.

7.2.1 (SELECT:) Config (Configuration) Menu Branch

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

The Config (Configuration) Menu Branch provides submenus for configuring the following Interface, Transmit, and Receive operations:

- Remote (Remote Control) Submenu – The selections here configure whether the unit is being controlled locally or remotely (see IMPORTANT note).
- Tx (Transmit) Submenu – The selections here configure, on a parameter-by-parameter basis, the Tx operation of the unit. For example, use these submenus if you wish to change only the Tx Frequency.
- Rx (Receive) Submenu – The selections here configure, on a parameter-by-parameter basis, the Rx operation of the unit. For example, use these submenus if you wish to change only the Rx Frequency.
- Int (Interface) Submenus – The selections here configure the optional Data Interface Modules plugged into rear panel Slots 1 or 2. The submenus change depending on the installed interface – as of this manual revision, the following interfaces are available:
  - Int1 CDI-10-1 Single G.703 Interface.
  - Int1 CDI-60 HSSI Interface.
  - Int2 CDI-70 Gigabit Ethernet Interface.
- Ref (Reference) Submenu – The selections here configure the internal 10MHz Reference or allow 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 (Auxiliary) Submenu – The selections here define the 1:1 Modem Switching parameters of the unit.
- Alarms Submenu – The selections here configure the Alarm states for various parameters.

7.2.1.1 (Config:) Remote Control

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

Use the ◄ ► arrow keys to select **Local**, **Serial** or **Ethernet.** Press **ENTER**. Note that:

- "Local" disables remote control. Remote monitoring is still possible.
- "Serial" allows access to the RS232, RS485-2W, and RS485-4W submenus.
- "Ethernet" allows access to the Ethernet submenus.

(Config:) Remote Control → Local

When you select "Local" you disable remote control and enable local control. Once you press **ENTER** the unit returns you to the **(Select) Config:** menu.

When you select "Remote" you disable menu operations associated with Local control, and you may see the following messages and prompts when you attempt to access Local control menus or commands:

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

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

Follow the prompts. Press **ENTER** to change to "Local" mode. Press **CLEAR** to remain in "Remote" mode.

(Config:) Remote Control → Serial

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

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

(Config:) Remote Control → Serial → Interface

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

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

(Config:) Remote Control→Serial →Interface→RS232

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

(Config:) Remote Control→Serial →Interface→RS485-2W or RS485-4W

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

The valid range of addresses is from 0001 to 9999. Edit the RS485 address of the modem. Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

(Config:) Remote Control→Serial→Baudrate

```
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 select the baud rate. Press **ENTER**.

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)
```

Use the ◄ ► arrow keys to select **Gateway**, **Address**, **MAC**, or **SNMP**. Press **ENTER**.

(Config:) Remote Control→Ethernet→Gateway

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

Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

(Config:) Remote Control→Ethernet→Address

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

Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change the value of that digit. Press **ENTER**.

(Config:) Remote Control→Ethernet→MAC

This example is representative of a typical MAC Address.

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

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

(Config:) Remote Control→Ethernet→SNMP

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

Use the ◄ ► arrow keys to select **Community** or **Traps**. Press **ENTER**.

(Config:) Remote Control→Ethernet→SNMP→ Community

```
SNMP:
Read  Write
```

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

(Config:) Remote Control→Ethernet→SNMP→ Community→Read

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

Edit the SNMP Read Community string. Use the ◄ ► arrow keys to select a character. Then, use the ▲▼ arrow keys to change that character. All printable ASCII characters are available, except for the backslash (ASCII code 92) and tilde ~ (ASCII code 126).

Press **ENTER** after you compose the string. The unit removes all trailing spaces from the string upon entry.

(Config:) Remote Control→Ethernet→SNMP→ Community→Write

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

Edit the SNMP Write Community string. Use the ◄ ► arrow keys to select a character, and then use the ▲▼ arrow keys to change that character. All printable ASCII characters are available, except for the backslash (ASCII code 92) and tilde ~ (ASCII code 126).

Press **ENTER** after you compose the string. The unit removes all trailing spaces from the string upon entry.

(Config:) Remote Control→Ethernet→SNMP→Traps

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

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

(Config:) Remote Control→Ethernet→SNMP→Traps→ IP1 or IP2

```
Trap ID #X:
000.000.000.000  (◄ ►▲▼ E )
```

Edit the #1 or #2 IP Address. Use the ◄ ► arrow keys to select a digit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**. You may disable SNMP Traps by setting both Trap IP Addresses as **000.000.000.000**.

(Config:) Remote Control→Ethernet→SNMP→Traps→ Version

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

Use the ◄ ► arrow keys to select **SNMPv1** or **SNMPv2**. Press **ENTER**.

7.2.1.2 (Config:) Tx (Transmit)

The CDM-701G and CDM-710GL operate only in DVB-S2 mode.

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

Use the ◄ ► arrow keys to select **FEC**, **Mod** (Modulation), **Code**, **SymRate**, **Freq**, **Pwr**, or **Scram**. Press **ENTER**.

(Config:) Tx → FEC

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

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

(Config:) Tx → Mod (Modulation)

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

Use the ◄ ► arrow keys to select **Type**, **Inv**, α, **Pilot**, or **Frame**. Press **ENTER**.

(Config:) Tx →Mod→Type

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

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

Use the ◄ ► arrow keys to select the Transmit Modulation Type as **QPSK**, **8PSK**, **16APSK**, or **32APSK**. Press **ENTER**.

If the Tx Modulation selection results in an invalid data rate or symbol rate, the unit queries the configuration change for a valid configuration, and a screen similar to this example displays:

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

If you select 'N' (No), the unit returns to the original configuration. If you select 'Y' (Yes), this configures the unit with the displayed parameters.

(Config:) Tx→Mod→Inv

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

Use the ◄ ► arrow keys to select **Normal** or **Invert**. Press **ENTER**.

(Config:) Tx→Mod→α

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

The Tx Alpha Rolloff (α) setting 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%.

The default Tx Alpha Rolloff (α) setting is **20%**. Whenever the Mode is changed, (α) reverts to **20%**. Use the ◄ ► arrow keys to otherwise select **25%** or **35%**. Press **ENTER**.

(Config:) Tx→Mod→Pilot

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

Use the ◄ ► arrow keys to select **Off/On** or **Avg/Peak**. Press **ENTER**.

(Config:) Tx→Mod→Pilot→Off/On

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

Use the ◄ ► arrow keys to select **Off** or **On**. Press **ENTER**.

- 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.

(Config:) Tx →Mod→Pilot→Avg/Peak

Take care when using this feature. Not all commercially available demodulators will function well with the Peak pilot level.

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

Use the ◄ ► arrow keys to select **Average** or **Peak**. Press **ENTER**.

The solid cursor indicates the current configuration choice. The modem automatically adjusts, but the default value is **Average**. Note that:

- When you select **Average**, the unit sets the pilots and header to the average power band of the transmitted constellation (QPSK, 8PSK, 16APSK or 32APSK) per DVB-S2.
- When you select **Peak**, the unit sets the pilots and header to the outer ring of the transmitted constellation (QPSK, 8PSK, 16APSK or 32APSK).

(Config:) Tx →Mod→Frame

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

Use the ◄ ► arrow keys to select **Long** or **Short** . Press **ENTER**. The default value is **Long**. Note that:

- When you select **Long**, the unit enables the standard FECFRAME = 64,800 bits.

- When you select **Short**, the unit enables the 16,200 bit frame.

(Config:) Tx →Code

This menu displays all possible code rates. 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 cursor will skip past the unavailable choice.

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

Use the ◄ ► arrow keys to select a valid code rate. Press **ENTER**. If the Tx Code Rate selection results in an invalid data rate or symbol rate, the unit will query the configuration change for a valid configuration, and a screen similar to this example displays:

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

If you select 'N' (No), the unit returns to the original configuration. If you select 'Y' (Yes), this configures the unit with the displayed parameters.

(Config:) Tx →SymRate

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

Use the ◄ ► arrow keys to select the digit of the Symbol Rate, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**. If the Tx Symbol Rate selection results in an invalid data rate or symbol rate, the unit will query the configuration change for a valid configuration, and a screen similar to this example displays:

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

If you select 'N' (No), the unit returns to the original configuration. If you select 'Y' (Yes), this configures the unit with the displayed parameters.

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

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.

G.703 fixed Data Rates E3 (34.368), T3 (44.736) and STS-1 (51.840) are set with 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 7-1. Symbol Rate / Data Rate Range – Standard FECFrame* and 188 Byte Format

Mod	FEC Code	Inner Code Rate	Symbol Rate (Msps) Min	Symbol Rate (Msps) Max	Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF Min	Data Rate (Mbps) Pilot OFF Max	Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON Min	Data Rate (Mbps) Pilot ON 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

*** Table Notes:**

1) QPSK 1/4, 1/3 and 2/3 data is provided for reference only.
2) DVB-S2 Standard FECFrame = 64,800 Bits.
3) For G.703 fixed Data Rates, limit maximum Symbol Rate to less than the maximum indicated in this table. For more information on this optional interface, see **Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE.**
4) HSSI Data Rate limit of 70 Mbps may be reached before Symbol Rate limit is reached. For more information on this optional interface, see **Appendix D. CDI-60 HSSI DATA INTERFACE.**
5) 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 7-2. Symbol Rate / Data Rate Range – Short FECFrame* and 188 Byte Format

Mod	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

***Table 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 this table. For more information on this interface, see **Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE.**
3) HSSI Data Rate limit of 70 Mbps may be reached before Symbol Rate limit is reached. For more information on this interface, see **Appendix D. CDI-60 HSSI DATA INTERFACE.**
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 →Freq (Frequency)

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

To edit the Tx Frequency: Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**. Note that:

- For the CDM-710G (70/140 MHz), the configurable frequency range is from 52 to 88 MHz and from 104 to 176 MHz with a resolution of 100 Hz.
- For the CDM-710GL (L-Band), the configurable frequency range is from 950 to 1950 MHz with 100 Hz resolution.

CAUTION
The bandwidth of the modulated Tx carrier must stay within the IF frequency range. If your setting falls outside the permitted range, the modem disallows the configuration and turns off the Tx Carrier.

(Config:) Tx →Pwr

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

Use the ◄ ► arrow keys to select **Level**, **On/Off**, or **Imped**. Press **ENTER**.

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

(Config:) Tx→Pwr→Level

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

Use the ◄ ► arrow keys to select the digit of the Tx Power Level, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**. Note that:

- For the CDM-710G (70/140 MHz), the configurable Tx Power Level range is from -20 to 0 dBm.
- For the CDM-710GL (L-Band), the configurable Tx Power Level range is from -25 to -5 dBm.

(Config:) Tx→Pwr→On/Off

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

Use the ◄ ► arrow keys to select the Tx Output State as **ON** or **OFF**. Press **ENTER**.

(Config:) Tx→Pwr→Imped (CDM-710G ONLY)

This menu is not available on the CDM-710GL (L-Band). It is available/displayed only when the 70/140 MHz Modulator card is installed.

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

For the CDM-710G only, use the ◄ ► arrow keys to select the Tx Impedance (Ohms) as **50** or **75**. Press **ENTER**.

(Config:) Tx →Scram

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

The Gold-n Index indicates the Physical Layer spreading sequence number. It can be set from **000000** to **262,141**. The default setting is all **0**s.

Use the ◄ ► arrow keys to select the digit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

7.2.1.3 (Config:) Rx (Receive)

The CDM-701G and CDM-710GL operate only in DVB-S2 mode. this makes several Rx parameters *read-only*. The modem resolves the following parameters automatically (no configuration is needed):

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

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

Use the ◄ ► arrow keys to select **FEC**, **Dem** (Demodulation), **Code**, **SymRate**, **Freq**, **EbNo**, or **PLL**. Press **ENTER**.

(Config:) Rx→FEC

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

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

(Config:) Rx→Dem (Demodulation)

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

Use the ◄ ► arrow keys to select **Type**, **Inv**, **Acq**, α, **Eq**, **IQ-TP**, **Pilot**, or **Scr**. Press **ENTER**.

(Config:) Rx→Dem→Type

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

1) This screen displays a *read-only* status message. T**he demodulation type is determined automatically.**
2) While it is displayed here, 16QAM is not supported in DVB-S2 mode.

Prior to synchronization of the Rx path, the cursor may reside in any position. After synchronization (the front panel 'Rx TRAFFIC' LED is **Green**), you may re-access this screen to update the display – the cursor will rest under the active demodulation type.

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

(Config:) Rx→Dem→Inv

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

This screen displays a *read-only* status message. **The demodulator automatically resolves frequency inversion.**

Unlike the **(Config:) Tx →Mod→Inv** screen, **Normal** and **Inverted** are *not* displayed on this *read-only* screen. Press **ENTER** or **CLEAR** to return to the previous menu.

(Config:) Rx→Dem→Acq

```
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.

The range varies from **±001** kHz to **±100** kHz. To edit the demodulator acquisition search range value: Use the ◄ ► arrow keys to select the digit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

(Config:) Rx →Dem →α

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

The Rx Alpha Rolloff (α) setting 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%.

The default Rx Alpha Rolloff setting is **20%**. Whenever the Mode is changed, (α) reverts to **20%**. Use the ◄► arrow keys to otherwise select **25%** or **35%**. Press **ENTER**.

(Config:) Rx →Dem→ Eq

```
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.

Use the ◄ ► arrow keys to select operation as **Off** or **On**. Press **ENTER**.

(Config:) Rx →Dem→ IQ-TP

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

This selection determines whether the IQ test point, located on the rear panel 'J2 | Alarms' connector, samples the IQ signal before or after the Adaptive Equalizer. "J2-11" and "J2-3" refer to the pins on the connector that an oscilloscope connects to, to monitor I and Q.

Use the ◄ ► arrow keys to select operation as **Pre-EQ** or **Post-Eq**. Press **ENTER**.

(Config:) Rx→Dem→Pilot

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

This screen displays a *read-only* status message. **The demodulator automatically determines whether Pilots are ON or OFF.**

Unlike the **(Config:) Tx →Mod→Pilot** screen, **Off and On** are *not selectable* on this *read-only* screen. A solid bar indicates the operating state. Press **ENTER** or **CLEAR** to return to the previous menu.

(Config:) Rx→Dem→Scr (Descrambler)

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

The Gold-n Index indicates the Physical Layer spreading sequence number. It can be set from **000000** to **262,141**. The default setting is all **0**s.

Use the ◄ ► arrow keys to select the digit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

(Config:) Rx→Code

This screen displays a *read-only* status message. **The demodulator automatically resolves the Code Rate.**

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

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

(Config:) Rx→SymRate

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

If the Rx Path is not locked, the message should appear as shown in the preceding example.

To change the Symbol Rate, use the ◄ ► arrow keys to select the digit to be edit, and then use the ▲▼ arrow keys to change that digit. 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 and modulation type. When configuring a new Symbol Rate (or, indirectly, a Data Rate) the value is not accepted unless it is within a valid range.

The G.703 Interface Data Rate is fixed. You must **ENTER** the correct Symbol Rate.

'Demod unlocked' appears while the Rx path is not synchronized. After synchronization, the correct Data Rate appears in the display and the demodulator automatically resolves 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**

See **Table 7-1** and **Table 7-2** (under the **(Config:) Tx→SymRate** menu) for the Symbol Rate / Data Rate Range tabulation.

(Config:) Rx →Freq (Frequency)

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

To edit the Rx Frequency: Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**. Note that:

- For the CDM-710G (70/140 MHz), the configurable frequency range is from 52 to 88 MHz and from 104 to 176 MHz with a resolution of 100 Hz.

- For the CDM-710GL (L-Band), the configurable frequency range is from 950 to 1950 MHz with 100 Hz resolution.

CAUTION
The bandwidth of the demodulated Rx carrier must stay within the IF frequency range. If your setting falls outside the permitted range, the modem disallows the configuration.

(Config:) Rx→Eb/No

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

Use the ◄ ► arrow keys to select **Threshold, Alarm/Fault**, or **Masked**. Press **ENTER**.

(Config:) Rx→Eb/No→Threshold

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

The range of E_b/N_0 alarm point values is from **0.1** to **16.0** dB. If the E_b/N_0 falls below the selected value, the unit generates a receive traffic fault.

To edit the Threshold: Use the ◄ ► arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

(Config:) Rx→Eb/No→Alarm/Fault

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

Use the ◄ ► arrow keys to define the E_b/N_0 Alarm as an **Alarm**, as a **Fault**, or (this choice affects operation under 1:1 redundancy) to completely **Mask** the alarm. Press **ENTER**.

(Config:) Rx→PLL (Phase Lock Loop)

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

Use this feature when high phase noise is present. **1x** is the normal operating mode. Use the ◄ ► arrow keys to select **1x** or **2x**. Press **ENTER**.

7.2.1.4 (Config:) Int1

1) Due to limitations of the backplane, the CDM-710G/L allows only one data interface to be active. For example, if Interface 2 is active, and you then enable Interface 1, the unit automatically disables Interface 2.
2) The menu branches and submenus depicted in the sections that follow are dependent on the presence of an optional Interface Data Module installed in Interface Slot 1 *only*:
   - CDI-10-1 Single G.703 Interface (see Sect. 7.2.1.4.1)
   - CDI-60 HSSI Interface (see Sect. 7.2.1.4.2)

7.2.1.4.1 (Config:) Int1 (Optional CDI-10-1 Single G.703 Interface ONLY)

1) The menu branch and submenus depicted in this section are dependent on the presence of the optional CDI-10-1 Single G.703 Interface Module, installable in Interface Slot 1 *only*.
2) This optional interface module provides a single Tx/Rx port pair, and a common reference that may be used as an Rx Buffer reference clock for either port. This selection affects 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)
```

Use the ◄ ► arrow keys to select **Port1** or **Ext-Clk**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1

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

Use the ◄ ► arrow keys to select **Type**, **Line-Code**, **Tx**, or **Rx**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1→Type

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

Use the ◄ ► arrow keys to select **E3**, **T3**, or **STS1**. Press **ENTER**. The cursor will flash below the active interface type, and the screen will display the port type's Data Rate:

- For Port Type E3, the Data Rate is 34.368 Mbps.
- For Port Type T3, the Data Rate is 44.768 Mbps.
- For Port Type STS1, the Data Rate is 51.84 Mbps.

(Config:) Intfc1 E3/T3/STS1:→Port1→Line-Code

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

This screen displays the port type selected previously for Port 1 (on the **(Config:) Intfc1 E3/T3/STS1:→Port1→Type** menu) and allows enabling or disabling of the Line Code specific to that selection.

The appearance of the **Line-Code** menu depends upon the selected port type. For each screen, the port type is shown first, and the applicable line code appears in parentheses:

- For Port Type E3, the Line Code as displayed is (HDB3).
- For Port Type T3, the Line Code as displayed is (B3ZS).
- For Port Type STS1, the Line Code as displayed is (B3ZS).

Use the ◄► arrow keys to select the Line Coding as **On** or **Off**. Press **ENTER**. If you select **Off**, the modem treats the data stream as alternate-mark-inversion (AMI) – that is, no line coding.

(Config:) Intfc1 E3/T3/STS1:→Port1→Tx

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

Use the ◄► arrow keys to select **Inv**, **Data**, or **Ena/Dis**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1→Tx→Inv

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

Use the ◄► arrow keys to select **Normal** or **Inverted**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1→Tx→Data

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

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

This *read-only* status screen displays information for the active interface type as selected via the **(Config:) Intfc1 E3/T3/STS1:→ Port1→Type** menu. Note that:

- 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.

(Config:) Intfc1 E3/T3/STS1:→Port1→Tx→Ena/Dis

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

Use the ◄ ► arrow keys to select **Enable or Disable**. Press **ENTER**. Note that:

- **Enable** *activates* the Tx (transmit) side of Port1;
- **Disable** *de-activates* the Tx (transmit) side of Port1 and sets the Data Rate to 0.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx

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

Use the ◄ ► arrow keys to select **Inv**, **Data**, **Buf**, **Clk**, or **Ena/Dis**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Inv

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

Use the ◄ ► arrow keys to select **Normal** or **Inverted**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Data

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

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

This *read-only* status screen displays information for the active interface type as selected via the **(Config:) Intfc1 E3/T3/STS1:→ Port1→Type** menu. Note that:

- 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.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Buf

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

Use the ◄ ► arrow keys to select **Frame-Type**, **Size**, or **ReCENTER**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Buf→Frame-Type

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

Use the ▲▼ arrow keys to select the Frame Type and bits/frame for the active interface type as selected via the **(Config:) Intfc1 E3/T3/STS1:→Port1→Type** menu. The available Frame Type/(Bits) are:

- For Port Type E3, the available Frame Type/(Bits) are None (default), G.751 (1536 Bits), and G.753 (2148 Bits);
- For Port Type T3, the available Frame Type/(Bits) are None (default) and G.752 (4760 Bits);
- For Port Type STS1, the available Frame Type/(Bits) are None (default) and STA-1 (6480 Bits).

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

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Buf→Size

```
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.

Use the ◄ ► arrow keys to select the digit to edit, and then the ▲▼ arrow keys to change that digit. Press **ENTER**. Note that:

- The minimum Rx buffer size is determined by the the number of bits in the frame. The Rx buffer has a minimum value of **0.5 ms** (default). If you selecting the minimum value and program the Rx-CLK for Rx-SAT, this disables the buffer and sets it to minimum.

- The maximum Rx buffer size is based upon the integral number of frames that can fit in the buffer memory:
  - 61 ms for G.751;
  - 44 ms for G.752;
  - 61 ms for G.753;
  - 40 ms for STS-1.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Buf→Re-CENTER

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

The value in parentheses (e.g., 65%) indicates the current buffer fill status. To reset the buffer to the midpoint (50%), use the ◄ ► arrow keys to select **Re-CENTER**. Press **ENTER**.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Clk

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

Use the ◄ ► arrow keys to select which source clocks the output of the Rx Buffer for delivering data to the Rx port at the user interface. Press **ENTER**. Note that:

- **Rx-Sat**, the default, 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 optional CDI-10-1 E3/T3/STS-1 Interface Module.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Clk→Ext-Clk

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

Use the ▲▼ arrow keys to set the frequency for the Ext-Clk connector on the optional CDI-10-1 E3/T3/STS-1 Interface Module. Press **ENTER**. Note that:

- 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 range is from **0.5** to **5.0** volts peak-to-peak.

(Config:) Intfc1 E3/T3/STS1:→Port1→Rx→Ena/Dis

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

Use the ◄ ► arrow keys to select **Enable or Disable**. Press **ENTER**. Note that:

- **Enable** *activates* the Rx (receive) side of Port1;
- **Disable** *de-activates* the Rx (receive) side of Port1 and sets the Data Rate to 0.

7.2.1.4.2 (Config:) Int1 (Optional CDI-60 HSSI Interface ONLY)

1) Due to limitations of the backplane, the CDM-710G/L allows only one data interface to be active. For example, if Interface 2 is active, and you then enable Interface 1, the unit automatically disables Interface 2.
2) The menu branch and submenus depicted in this section are dependent on the presence of the optional CDI-60 HSSI Interface Module, installable in Interface Slot 1 *only*.

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

Use the ◄ ► arrow keys to select **Tx, Rx, or CTS/RTS**. Press **ENTER**.

(Config:) Intfc1 HSSI→Tx

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

Use the ◄ ► arrow keys to select **Data, Clock**, or **Enable**. Press **ENTER**.

(Config:) Intfc1 HSSI→Tx→Data

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

Use the ◄ ► arrow keys to select **Datarate** or **Invert**. Press **ENTER**.

(Config:) Intfc1 HSSI→Tx→Data→Datarate

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

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

(Config:) Intfc1 HSSI→Tx→Data→Invert

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

Use this feature to ensure compatibility with certain older equipment. Use the ◄ ► arrow keys to select **Normal** or **Inverted**. Press **ENTER**.

(Config:) Intfc1 HSSI→Tx→Clock

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

Use this feature to ensure compatibility with certain older equipment. Use the ◄ ► arrow keys to select **Normal** or **Inverted**. Press **ENTER**.

(Config:) Intfc1 HSSI→Tx→Enable

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

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

(Config:) Intfc1 HSSI→Rx

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

Use the ◄ ► arrow keys to select **Data, Buffer, Clock**, or **Enable**. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Data

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

Use the ◄ ► arrow keys to select **Datarate** or **Invert**. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Data→Datarate

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

This *read-only* status message indicates the Data Rate of the Rx (receive) MPEG-2 transport stream. Press **ENTER** or **CLEAR** to return to the previous menu.

(Config:) Intfc1 HSSI→Rx→Data→Invert

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

Use this feature to ensure compatibility with certain older equipment. Use the ◄ ► arrow keys to select **Normal** or **Inverted**. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Buffer

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

Use the ◄ ► arrow keys to select **Size** or **Recenter**. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Buffer→Size

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

The Rx Buffer Size range is from **5.0** to **32.0** mSec in **0.1** mSec increments. Use the ◄ ► arrow keys to select the digit to edit, and then the ▲▼ arrow keys to change that digit. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Buffer→Recenter

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

The value in parentheses (e.g., 046%) indicates the current buffer fill status. To reset the buffer to the midpoint (50%), use the ◀ ▶ arrows keys to select **ReCENTER**. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Clock

```
Intfc1 Rx Clock:
Source  Invert       (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Source** or **Invert**. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Clock→Source

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

Use this menu to determine which source clocks the output of the Rx Buffer for delivering data to the Rx port at the user interface. Use the ◀ ▶ arrows keys to select **Rx-Sat, Tx-Terr**, or **Internal**. Press **ENTER**. Note that:

- **Rx-Sat**, the default, 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.

(Config:) Intfc1 HSSI→Rx→Clock→Invert

```
Intfc1 Rx Clock Invert:
Normal  Inverted       (◀ ▶E)
```

Use this menu to control clock inversion (to ensure compatibility with certain older equipment). Use the ◀ ▶ arrows keys to select **Normal** or **Inverted**. Press **ENTER**.

(Config:) Intfc1 HSSI→Rx→Enable

```
Intfc1 Rx Enable:
Enable Disable       (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Enable** to *activate* the Rx side of this interface, or **Disable** to *de-activate* the Rx side and set the Data Rate to 0. Press **ENTER**.

(Config:) Intfc1 HSSI→CTS/RTS

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

Use the ◀ ▶ arrow keys to select **Normal** or **Fault**. Press **ENTER**. Note that CTS is the same as CA, and RTS is the same as TA. Additionally:

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

7.2.1.5 (Config:) Int2 (Optional CDI-70 Gigabit Ethernet Interface ONLY)

1) Due to limitations of the backplane, the CDM-710G/L allows only one data interface to be active. For example, if Interface 2 is active, and you then enable Interface 1, the unit automatically disables Interface 2.
2) The menu branch and submenus depicted in this section are dependent on the presence of the optional CDI-70 Gigabit Ethernet Interface Data Module, installed in Interface Slot 2 *only.*

See **Appendix A. ETHERNET NETWORKCONFIGURATIONS** for information on valid Ethernet network configuration connections.

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

Use the ◄ ► arrow keys to select **Tx, Rx, Man**, **Stats**, or **SWOP**. Press **ENTER**.

(Config:) Intfc2 Gigabit Ethernet→Tx

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

Use the ◄ ► arrow keys to select **Data** or **Enable**. Press **ENTER.**

(Config:) Intfc2 Gigabit Ethernet→Tx→Data

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

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

This screen displays a *read-only* status message. The first example shows the interface as *enabled* with an active data rate. The second example shows that, when the interface is *disabled*, the port is turned **off**. Press **ENTER** or **CLEAR** to return to the previous menu.

(Config:) Intfc2 Gigabit Ethernet→Tx→Enable

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

Use the ◄ ► arrow keys to select **Enable** or **Disable**. Press **ENTER. Note that:**

- **Enable** *activates* the Tx (transmit) side of this interface.
- **Disable** *de-activates* the Tx (transmit) side of this interface.

(Config:) Intfc2 Gigabit Ethernet→Rx

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

Use the ◄ ► arrow keys to select **Data** or **Enable**. Press **ENTER.**

(Config:) Intfc2 Gigabit Ethernet→Rx→Data

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

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

This screen displays a *read-only* status message. The first example shows the interface as *enabled* with an active data rate. The second example shows that, when the interface Rx is *disabled*, the port is turned **off**. Press **ENTER** or **CLEAR** to return to the previous menu.

(Config:) Intfc2 Gigabit Ethernet→Rx→Enable

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

Use the ◄ ► arrow keys to select **Enable** or **Disable**. Press **ENTER. Note that:**

- **Enable** *activates* the Rx (receive) side of this interface.
- **Disable** *de-activates* the Rx (receive) side of this interface.

(Config:) Intfc2 Gigabit Ethernet→Man

```
Intfc2 Management IP:
192.168.001.001/30 (◀ ▶▲ ▼ E)
```

You may use the Gigabit Ethernet Interface Management IP Address and Mask Range for one of two purposes:

- You can use PING with this IP address as a diagnostic tool to ensure the interface is active and the external cabling is properly connected.
- You can use this IP address in the event that new firmware is provided by Comtech for the CDI-70 Gigabit Ethernet Interface.

Edit the GigE Interface Management IP Address and Mask Range: Use the ◀ ▶ arrow keys to select the digit to edit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

(Config:) Intfc2 (Gigabit Ethernet)→Stats

```
Intfc1 Statistics:
View  Clear        (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **View** or **Clear**. Press **ENTER**.

(Config:) Intfc2 (Gigabit Ethernet)→Stats→View

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

These nested screens display *read-only* status messages. Use the ◀ ▶ arrow keys to select **FPGA**, **LAN**, **WAN**, **MNG**, or **ALL**. Press **ENTER**.

The screen shots that follow provide examples of each statistics screen.

(Config:) Intfc2 (Gigabit Ethernet)→Stats→View→FPGA

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

Use the ▲▼ arrow keys to scroll through the available 1000 BaseT 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 E_S/N_0 or E_b/N_0 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.

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

(Config:) Intfc2 (Gigabit Ethernet)→Stats→View→LAN

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

Use the ▲▼ arrow keys to scroll through the available LAN Port statistics:

- "LAN Good Octets (In)" indicates the sum of the lengths of all good Ethernet frames received from the LAN.
- "LAN Bad Octets (In)" indicates the sum of the lengths of all bad Ethernet frames received from the LAN.
- "LAN Unicast (In)" indicates the sum of good frames received from the LAN that have a Unicast destination MAC address.
- "LAN Broadcast (In)" indicates the sum of good frames received from the LAN that have a Broadcast destination MAC address.
- "LAN Multicast (In)" indicates the sum of good frames received from the LAN that have a Multicast destination MAC address.

- “LAN Pause (In)” indicates the number of good flow control frames received from the LAN.
- “LAN Undersize (In)” indicates the total frames received from the LAN with a length of less than 64 octets but with a valid FCS.
- “LAN Fragments (In)“ indicates the total frames received from the LAN with a length of less than 64 octets and an invalid FCS.
- “LAN Oversize (In)” indicates the total frames received from the LAN with a length greater than the maximum size of octets but with a valid FCS.
- “LAN” Jabber (In)” indicates the 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)” indicates the total frames received from the LAN for which an error was detected at the physical interface.
- “LAN FCS Err (In)” indicates the total frames received from the LAN with a CRC error that was not counted in the Fragments or Rx Err totals.
- “LAN Octets (Out)” indicates the sum of the lengths of all Ethernet frames transmitted to the LAN.
- “LAN Unicast (Out)” indicates the sum of frames transmitted to the LAN that have a Unicast destination MAC address.
- “LAN Broadcast (Out)” indicates the sum of frames transmitted to the LAN that have a Broadcast destination MAC address.
- “LAN Multicast (Out)” indicates the sum of frames transmitted to the LAN that have a Multicast destination MAC address.

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

(Config:) Intfc2 (Gigabit Ethernet)→Stats→View→WAN

```
WAN Good Octets(Out)
0000000000000000000 (▲ ▼ E)
```

Use the ▲▼ arrow keys to scroll through the available WAN Port statistics:

- “WAN Octets (Out)” indicates the sum of the lengths of all good Ethernet frames forwarded to the WAN.
- “WAN Unicast (Out)” indicates the sum of good frames forwarded to the WAN that have a Unicast destination MAC address.
- “WAN Broadcast (Out)” indicates the sum of good frames forwarded to the WAN that have a Broadcast destination MAC address.

- "WAN Multicast (Out)" indicates the sum of good frames forwarded to the WAN that have a Multicast destination MAC address.
- "WAN Good Octets (In)" indicates the sum of lengths of all good Ethernet frames received from the IP encapsulation logic.
- "WAN Unicast (In)" indicates the sum of good frames received from the WAN IP encapsulation logic that have a Unicast destination MAC address.
- "WAN Broadcast (In)" indicates the sum of good frames received from the WAN IP encapsulation logic that have a broadcast destination MAC address.
- "WAN Multicast (In)" indicates the sum of good frames received from the WAN IP encapsulation logic that have a multicast destination MAC address.

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

(Config:) Intfc2 (Gigabit Ethernet)→Stats→View→MNG

```
MNG Good Octets(In)
0000000000000000000 (▲ ▼ E)
```

Use the ▲▼ arrow keys to scroll through the available Management Port statistics:

- "MNG Good Octets (In)" indicates the sum of the lengths of all good Ethernet frames received from the local GBEI management processor.
- "MNG Bad Octets (In)" indicates the sum of the lengths of all bad Ethernet frames received from the local GBEI management processor.
- "MNG Unicast (In)" indicates the sum of good frames received from the local GBEI management processor that have a Unicast destination MAC address.
- "MNG Broadcast (In)" indicates the sum of good frames received from the local GBEI management processor that have a Broadcast destination MAC address.
- "MNG Multicast (In)" indicates the sum of good frames received from the local GBEI management processor that have a Multicast destination MAC address.
- "MNG Oversize (In)" indicates the total frames received from the local GBEI management processor with a length greater than the maximum size of octets but with a valid FCS.

- “MNG” Jabber (In)” indicates the total frames received from the local GBEI management processor with a length greater than the maximum size of octets but with an invalid FCS.
- “MNG Rx Err (In)” indicates the total frames received from the local GBEI management processor for which an error was detected at the physical interface.
- “MNG FCS Err (In)” indicates the 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)” indicates the number of good flow control frames received from local GBEI management processor.
- “MNG Undersize (In)” indicates the 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)” indicates the total frames received from the local GBEI management processor with a length of less than 64 octets and an invalid FCS.
- “MNG Octets (Out)” indicates the sum of the lengths of all Ethernet frames transmitted to the local GBEI management processor.
- “MNG Unicast (Out)” indicates the sum of frames transmitted to the local GBEI management processor that have a Unicast destination MAC address.
- “MNG Broadcast (Out)” indicates the sum of frames transmitted to the local GBEI management processor that have a Broadcast destination MAC address.
- “MNG Multicast (Out)” indicates the sum of frames transmitted to the local GBEI management processor that have a Multicast destination MAC address.

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

(Config:) Intfc2 (Gigabit Ethernet)→Stats→View→ALL

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

Use the ▲▼ arrow keys to scroll through all available 1000 BaseT, LAN Port, WAN Port, and Management Port statistics.

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

(Config:) Intfc2 (Gigabit Ethernet)→Stats→Clear

```
Clear Intfc2 Statistics?
YES NO                 (◄ ►E)
```

Use the ◄ ► arrow keys to select **YES** or **NO**. Press **ENTER**.

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

```
Intfc2 SWOP:
AutoCx   Learning   (◄ ►E)
```

Use the ◄ ► arrow keys to select **AutoCx** or **Learning**. Press **ENTER**.

(Config:) Intfc2 (Gigabit Ethernet)→SWOP→AutoCx

```
Intfc2 Auto Crossover:
Enable Disable      (◄ ►E)
```

Use the ◄ ► arrow keys to select **Enable** or **Disable**. Press **ENTER**. Note that:

- *Enable allows the* Gigabit Ethernet Interface automatically detect the type of connection, and configures the interface appropriately as *straight-through* (MDI) or *crossover* (MDIX).
- *Disable configures* the Gigabit Ethernet port as *straight-through* (MDI).

(Config:) Intfc2 (Gigabit Ethernet)→SWOP→Learning

You must ***always*** cycle the unit power any time you change this setting.

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

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. Note that:

- 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.

Use the ◄ ► arrow keys to select **Enable** or **Disable**. Press **ENTER**, and then ***cycle the unit power*.**

7.2.1.6 (Config:) Ref (Reference)

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

The unit phase locks to an external input at the rear panel 'J7 | Ext Ref' BNC connector. Other selections are available for External 1, 2, 5, 10, or 20 MHz input. Note that:

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

7.2.1.7 (Config:) Aux (Auxiliary/Redundancy)

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

Use the ◄ ► arrow keys to select **Ena/Dis** or **Force (1:1)**. Press **ENTER**.

(Config:) Aux (Redundancy)→Ena/Dis

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

The solid cursor indicates the current configuration choice. Use the ◄► arrow keys to select **Enable** or **Disable**. Note that:

- "Enable" sets up the unit for operation with the 1:1 IF switch. An internal auxiliary relay sets the 'P2 | Alarms' connector for the 1:1 operation mode.
- You may select "Disable" only when the unit is in "Local" mode. If you attempt to select "Disable" while the unit is in "Remote" mode, the following messages display:

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

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

Follow the prompts. Press **ENTER** to change to "Local" mode. Press **CLEAR** to remain in "Remote" mode.

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.

(Config:) Aux (Redundancy)→ Force (1:1)

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

Press **ENTER** to initiate switchover. You must use **Force (1:1)** only 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 modem front panel.

7.2.1.8 (Config:) Alarms

If you attempt to select an alarms state and the unit is in “Remote” mode, the following messages display:

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

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

Follow the prompts. Press **ENTER** to change to “Local“ mode. Press **CLEAR** to remain in “Remote” mode.

Otherwise, the following menu displays:

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

Use the ◄ ► arrow keys to select **Tx**, **Rx**, **Intfc1**, or **Intfc2**. Press **ENTER**.

(Config:) Alarm Mask: → Tx

```
Tx Alarm Mask: None
```

Currently, masking of Tx Alarms (associated with the modulator) is not allowed. Press **ENTER** or **CLEAR** to return to the previous menu.

(Config:) Alarm Mask: → Rx

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

Use the ◄ ► arrow keys to select **Alarm**, **Fault**, **or Mask**. Press **ENTER**.

(Config:) Alarm Mask:→ Intfc1

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

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

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

2) Typical for all menus, you have the choice to configure the alarm state for the operational condition as an **Alarm**, **Fault**, or **Mask.**

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

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

Use the ◄ ► arrow keys to select **Tx**, **Rx**, or **ExtClk**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 E3T3STS1 Alarms:→Tx

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

Use the ◄ ► arrow keys to select **Tx-Cable** or **Tx-AIS**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 E3T3STS1 Alarms:→Tx-Cable

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

Use the ◄ ► arrow keys to select **Alarm**, **Fault**, or **Mask**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 E3T3STS1 Alarms:→Tx-AIS

```
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. Use the ◄► arrow keys to select **Alarm**, **Fault**, or **Mask**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 E3T3STS1 Alarms:→Rx

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

Use the ◄► arrow keys to select **Rx-AIS** or **Buffer-Slip**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 E3T3STS1 Alarms:→Rx→Rx-AIS

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

Rx-AIS Alarm 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. Use the ◄► arrow keys to select **Alarm**, **Fault**, or **Mask**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 E3T3STS1 Alarms:→Rx→Buffer-Slip

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

Use the ◄► arrow keys to select **Alarm**, **Fault**, or **Mask**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 E3T3STS1 Alarms:→Ext-Clk

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

Ext-Clk reports the loss of the External Clock. Use the ◄ ► arrow keys to select **Alarm**, **Fault**, or **Mask**. Press **ENTER**.

(Config:) Alarm Mask: → Intfc1 (CDI-60 HSSI Interface Module)

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

Use the ◄ ► arrow keys to select **Tx** or **Rx**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 HSSI Alarms: →Tx

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

Use the ◄ ► arrow keys to select **Alarm**, **Fault**, **or Mask**. Press **ENTER**.

(Config:) Alarm Mask:→Intfc1 HSSI Alarms:→Rx

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

Use the ◄ ► arrow keys to select **Alarm**, **Fault**, **or Mask**. Press **ENTER**.

(Config:) Alarm Mask:→ Intfc2 (CDI-70 Gigabit Ethernet Interface Module)

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

Use the ◄ ► arrow keys to select **Alarm**, **Fault**, **or Mask**. Press **ENTER**.

7.2.2 (SELECT:) Monitor Menu Branch

These screens permit you to monitor the alarm status of the unit, to view the log of stored events, and to display the Rx Parameters screen.

See Sect. 7.2.2.1 for the listings events and alarms addressed with operation of the Monitor menu branch Alarm, Rx_Stats, and Event-Log submenus.

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

Use the ◄► arrow keys to select **Alarm, Rx_Stats**, or **Event-log**. Press **ENTER**.

7.2.2.1 (Monitor:) Alarms

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

Use the ◄► arrow keys to select **Transmit** (for Tx path alarms), **Receive** (for Rx path alarms), or **Unit** (for alarms common to the unit). Press **ENTER**.

(Monitor:) Alarms→Transmit

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

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

The message depicted in this example usually indicates that the Ethernet data cable is disconnected from the modem.

(Monitor:) Alarms→Receive

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

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

(Monitor:) Alarms→Unit

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

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

7.2.2.2 (Monitor:) Rx_Stats

```
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 screen reports E_b/N_0, PER (packet error rate), ΔF (frequency offset of incoming carrier) and RSL (receive signal level).

Link Margin = [E_S/N_0 (measured) - E_S/N_0 (threshold)]

See **Chapter 2. SPECIFICATIONS** for threshold information.

Additionally, note that:

- For QPSK modulation, the typical usable E_S/N_0 range is 0.0 to 14.0 dB.
- For 8QPSK modulation, the typical usable E_S/N_0 range is 4.5 to 18.5 dB.
- For 16APSK modulation, the typical usable E_S/N_0 range is 8.0 to 22.0 dB.
- For 32APSK modulation, the typical usable E_S/N_0 range is 11.5 to 25.0 dB.

7.2.2.3 (Monitor:) Event-Log

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

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

(Monitor:) Event-Log→View

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

The **Event-Log** stores the live alarms, along with a timestamp for review and troubleshooting. The date is in international format: *dd/mm/yy*.

Use the ▲▼ arrow keys to scroll through the events log. Up to 253 events may be stored.

(Monitor:) Event-Log→Clear-All

Use the ◄ ► arrow keys to select **No** or **Yes**. Press **ENTER**. Note that:

- **No** cancels the clear-all request and the unit retains all stored events in the buffer.
- **Yes** clears the buffer of all stored events.

If you attempt to select clear the buffer while the unit is in “Remote” mode, the following messages display:

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

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

Follow the prompts. Press **ENTER** to change to “Local“ mode. Press **CLEAR** to remain in “Remote” mode.

7.2.2.4 Summary of Faults and Alarms (As Reported By Category

Transmit (Modulator) Faults and Alarms

- Tx Clock Loss Slot 1 – A Transmit Clock is not present at Slot 1.
- Tx Clock Loss Slot 2 – A Transmit Clock is not present at Slot 2.
- GBEI Card DataRate > +200PPM – The data rate from the GBEI to the modulator exceeds the nominal by >+200 ppm.
- GBEI Card DataRate > -200PPM – The data rate from the GBEI to the modulator exceeds the nominal by >-200 ppm.
- GBEI Card PHY Not Connected – Either the Ethernet cable is not physically connected to the GBEI, or a cable fault exists.
- Tx AIS Interface 1 – Applies to the CDI-10-10 Single G.703 Slot 1.
- Tx AIS Interface 2 – Applies to the CDI-10-1 Single G.703 Slot 2.
- Tx Cable Interface 1 – Applies to the CDI-10-1 Single G.703 Tx Cable 1.
- Tx Cable Interface 1 – Applies to the CDI-10-1 Single G.703 Tx Cable 2.
- Encoder FIFO Empty – The Transmit Encoder FIFO is empty.
- Encoder FIFO Full – The Transmit Encoder FIFO is full.
- SERDES Parity Errors – Serializer/deserializer parity errors have occurred.

Receive (Demodulator) Faults and Alarms

- +1.5V PSU Demodulator Card – The 1.5VDC regulator has exceeded ±5%.
- FPGA Load Demodulator Card – The Demod FPGA is not loaded.
- Demod Unlocked – The Demodulator is not locked.
- FPGA Temp – The Demod FPGA is outside its temperature range.
- BER limit Exceeded – The bit error rate limit is exceeded.
- AGC Level Out of Range – The automatic gain control level is out of range.
- Eb/No limit exceeded – The E_b/N_0 limit is exceeded.
- Demodulator Synth 1 PLL – Indicates a Synth 1 phase lock loop fault on the Demod.
- Demodulator Synth 2 PLL – Indicates a Synth 2 phase lock loop fault on the Demod.
- Demodulator SERDES Dmd->Framer – Indicates a serializer/deserializer framer fault on the Demod.
- Demodulator SERDES Framer->FEC 1 – Indicates a aserializer/deserializer fault on the Demod.

- Demodulator SERDES Framer->FEC2 – Indicates a serializer/deserializer fault on the Demod.
- FAST option not installed – The FAST option for a selected feature is not installed.
- RX DCM Unlocked – The Demod Digital Clock Manager is unlocked.
- Intf1 RX Buffer Underflow – The Rx buffer has underrun Slot 1.
- Intf1 RX Buffer Overflow – The Rx buffer has overrun Slot 1.
- Intf2 RX Buffer Underflow – The Rx buffer has underrun Slot 2.
- Intf2 RX Buffer Overflow – The Rx buffer has overrun Slot 2.
- SERDES Par Framer -> Intf1 – Indicates a serializer/deserializer parity error on framer FPGA Interface 1.
- SERDES Par Framer -> Intf2 – Indicates a serializer/deserializer parity error on framer FPGA Interface 2.
- Rx Clock Source Interface 1 – Indicates a Rx Clock Source Interface 1 fault.
- Rx Clock Source Interface 2 – Indicates a Rx Clock Source Interface 1 fault.
- Intf1 RXAIS Slot1 Port1 – Indicates a RX AIS Slot 1 fault.
- Intf2 RXAIS Slip Slot2 – Indicates a RX AIS Slot 2 fault.
- Intf1 EXT Clock Slot1 – Indicates a EXT CLOCK Slot 1 fault.
- Intf2 EXT Clock Slot2 – Indicates a EXT CLOCK Slot 2 fault.

Unit Faults and Alarms

- FPGA Loader Card – The Framer FPGA is not loading.
- +1.5V PSU Framer Card – The 1.5VDC Framer/FEC regulator exceeds ±5%.
- +1.5V PSU Interface Card #1 – The 1.5VDC Slot 1 regulator exceeds ±5%.
- +1.5V PSU Interface Card #2 – The 1.5VDC Slot 2 regulator exceeds ±5%.
- +3.3V PSU Framer Card – The 3.3VDC Framer regulator exceeds ±10%.
- +5V PSU Framer Card – The 5.0VDC Framer regulator exceeds ±5%.
- +12V PSU Framer Card – The 12VDC Framer regulator exceeds ±10%.
- -12V PSU Framer Card – The -12VDC Framer regulator exceeds ±10%.
- +18V PSU Framer Card – The 18VDC Framer regulator exceeds ±10%.
- FLASH Checksum Error indicates that there is a FLASH (firmware) load error.
- FPGA Load Encoder Card – The Encoder FPGA is not loading.
- FPGA Load Decoder Card – The Decoder FPGA is not loading.
- FPGA Load Interface Card #1 – The Slot 1 FPGA is not loading.
- FPGA Load Interface Card #2 – The Slot 2 FPGA is not loading.

- PLL Clock Framer – 192 MHz – Indicates a 192 MHz phase lock loop failure.
- PLL Clock Framer – Ext Ref indicates an External Reference phase lock loop failure.
- FPGA Temp Framer card – The Framing FPGA temperature is out of range.
- Modem Ambient Temp indicates the Framing card (modem) ambient temperature is out of range.
- Modem Cooling Fans – The framing card senses a cooling fan problem.
- Intfc1 has been removed – The Slot 1 interface module has been removed.
- Intfc2 has been removed – The Slot 2 interface module has been removed.
- +1.5V PSU Modulator Card – The 1.5VDC modulator regulator exceeds ±5%.
- FPGA Load Modulator Card – The modulator FPGA is not loading.
- PLL Clock Symbol rate – The modulator symbol rate defitter is unlocked and overflowing.
- Tx Synth Unlocked – The modulator synthesizer is unlocked.
- Tx DCM Unlocked – The modulator Digital Clock Manager is unlocked.
- I & Q are inactive indicates that there is no modulator I&Q activity.
- FPGA Temp Modulator Card – The modulator FPGA is outside its temperature range.
- Nyq Filter Clipping indicates modulator Nyquist Filter clipping.

7.2.3 (SELECT:) Test Menu Branch

```
Test:
Mode                       (◄ ►E)
```

Use the ◄ ► arrow keys to select **Mode**. Press **ENTER**.

(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).

Use the ◄ ► arrow keys to select **Norm**, **IF** (Loop), **I/O** (Loop), **RF** (Loop), **Tx-CW** or **Tx-1.0**. Press **ENTER**. Note that:

- **Norm** (Normal) clears any test modes or loopbacks and places the unit back into an operational state.
- **IF** (IF Loop) test mode invokes an internal IF loop. This is a particularly useful feature that permits you to perform a quick diagnostic test without having to disturb external cabling. Further, this mode temporarily changes all of the Rx configuration parameters to match those of the Tx-side. When you select Norm once again, the modem restores all previous operating values. See Figure 7-2.
- **I/O** (Input/Output Loop) 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. See Figure 7-2.
- **RF** (RF Loop) test mode 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. See Figure 7-2.

- **Tx-CW** (Transmit CW) test mode forces the modulator to transmit a pure carrier (unmodulated).
- **Tx-1,0** (Tx 1, 0, 1, 0 Pattern) test mode 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. Use this mode to check the carrier suppression of the Modulator. It also verifies quadrature and amplitude balance.

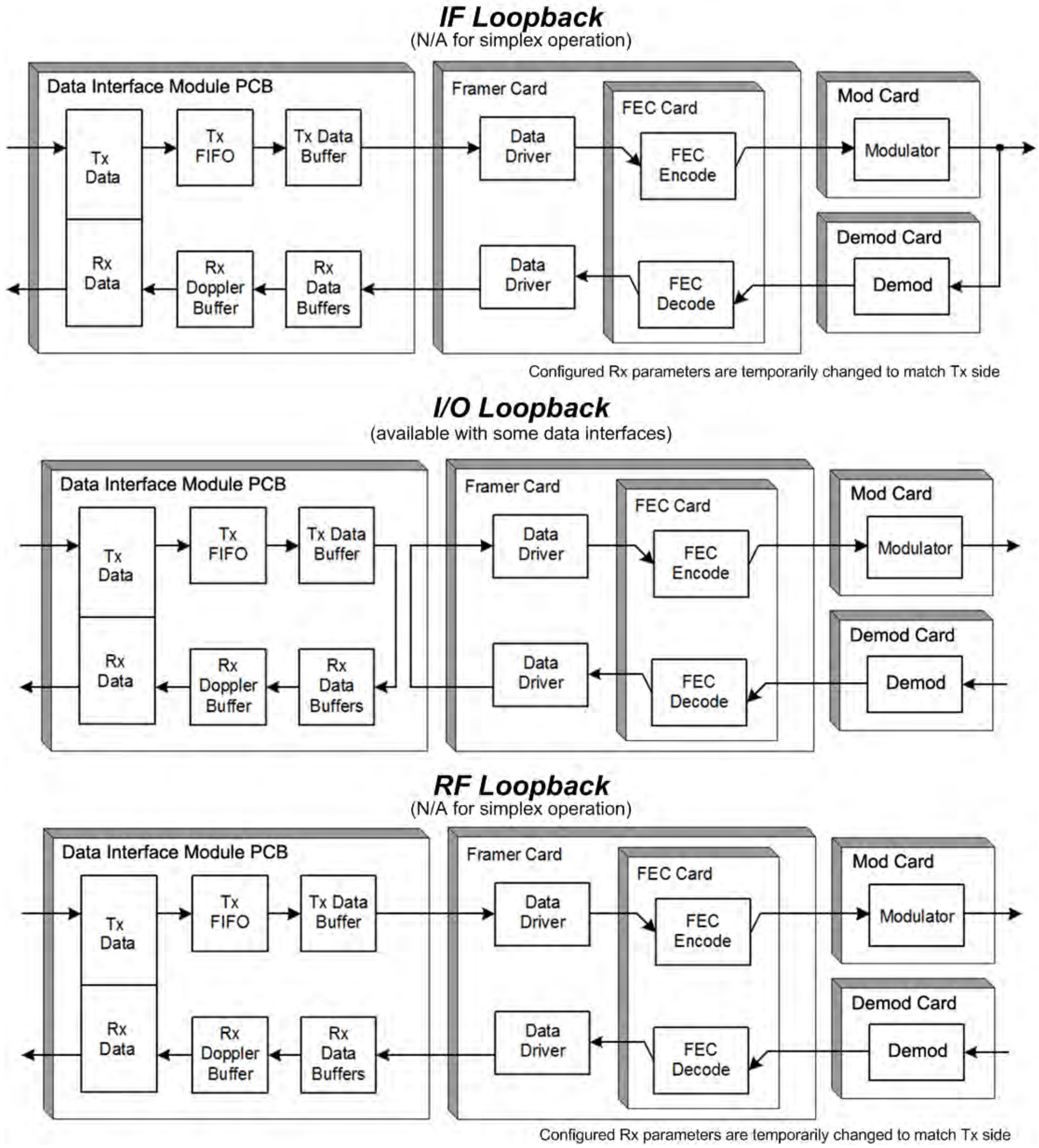


Figure 7-2. Traffic Data Flow Diagrams – Loopback Test Mode Examples

7.2.4 (SELECT:) Info (Information) Menu Branch

1) **INFO** screens provide *read-only* information on the current configuration of the modem. This allows you to review parameters without risking inadvertent changes to operation. From any screen, press **ENTER** or **CLEAR** to return to the previous menu.
2) All screens shown in this section are representative examples. Your configuration will be different.

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

Use the ◄ ► arrow keys to select **Rem**, **Tx**, **Rx**, **Intfc1**, or **Intfc2**. Press **ENTER**.

(Info:) Rem (Remote)

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

This screen displays the status, as applicable, of the Remote Monitor & Control configuration.

(Info:) Tx (Transmit)

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

This screen displays the status, as applicable, of the operational modulator configuration. Using the example shown, a typical transmit data info screen may be broken down as follows:

- "Tx: 0140.0000" displays the operating Tx frequency in MHz.
- "17.379483" displays the operating data rate in Mbps.
- "DVBS2" displays the operating transmission mode.
- "8P" displays the operating modulation mode, where
    - "QP" = QPSK;
    - "8P" = 8PSK;
    - "16A" = 16APSK;
    - "32A" = 32APSK.

- “3/4” displays the operating code rate.
- “-10.0” displays the Tx Power Level, in dBm.
- “ON” indicates that Tx Power is “ON” (“OF” = Off)

(Info:) Rx (Receive)

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

This screen displays the status, as applicable, of the operational demodulator configuration. Using the example shown, a typical receive data info screen may be broken down as follows:

- “Rx: 0140.0000” displays the operating Rx frequency in MHz.
- “17.379483” displays the operating data rate in Mbps.
- “DVBS2” displays the operating transmission mode.
- “8P” displays the operating demodulation mode, where
  - “QP” = QPSK;
  - “8P” = 8PSK;
  - “16A” = 16APSK;
  - “32A” = 32APSK.
- “3/4” displays the operating code rate.
- “LF” displays the FECFrame Type, where
  - SF = Short Frame
  - LF = Long Frame

7.2.5 (SELECT:) Save/Load Menu Branch

You may use this menu only when the unit is in "Local" mode. If you attempt to use this menu while the unit is in "Remote" mode, the following messages display:

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

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

Follow the prompts. Press **ENTER** to change to "Local" mode. Press **CLEAR** to remain in "Remote" mode. You may proceed once you are operating in "Local" mode.

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

The **Save** and **Load** submenus permit you to store or load up to 10 different modem configurations in the non-volatile memory of the modem.

Use the ◄ ► arrow keys to select **Save** or **Load**. Press **ENTER**.

7.2.5.1 (Save/Load Configuration:) Save

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

Using **Loc #9** as the example, if you select **Save** and no configuration exists in this slot, the second line reads '**Empty'** as shown here. However, if the selected **Loc #9** already contains data, what displays is similar to this next example:

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

You will see the time and date stamp of the stored configuration, for identification purposes.

Use the ▲▼ arrow keys to select the location to where the current configuration is to be stored. Press **ENTER**. There are 10 available locations, numbered 0 through 9.

If you select **Save** and this location does not contain a previously stored configuration, a screen similar to this example will display:

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

If, however, you select **Save** and this location *does* contain a previously stored configuration, a screen similar to this examples will display:

```
Loc 9 Contains Data !
Overwrite? NO YES (◄ ►E)
```

Use the ◄ ► arrow keys to select **NO** to cancel the action, or **YES** to overwrite the existing configuration. Press **ENTER**.

7.2.5.2 (Save/Load Configuration:) Load

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

Use the ▲▼ arrow keys to select the location where the current configuration is stored. Press **ENTER**. There are 10 available locations, numbered 0 through 9.

Using **Loc #9** as the example, if you select **Load** and no configuration exists in this slot, the second line reads '**Empty'** as shown here. However, if the selected **Loc #9** contains data, what displays is similar to this next example:

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

You will see the time and date stamp of the stored configuration, for identification purposes. Press **ENTER** to continue. If the selected location contains ***valid*** data, what displays is similar to this next example:

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

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

If, however, this location contains ***invalid*** data, a screen similar to this example will display:

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

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

7.2.6 (SELECT:) Util (Utility) Menu Branch

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

Use the ▲▼ arrow keys to select **RT-Clk**, **Ref**, **ID**, **Display**, **Firmware**, or **FAST**. Press **ENTER**.

7.2.6.1 (UTIL:) RT-Clk

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

Use this screen to edit the time and date settings of the real-time clock. Use the ◄► arrow keys to select the digit, and then use the ▲▼ arrow keys to change that digit. Press **ENTER**.

The date is shown in **DAY/MONTH/YEAR** format in accordance with international convention.

7.2.6.2 (UTIL:) Ref

```
Internal 10 MHz Ref Freq
Fine Adjust:+1911
```

Use this screen to perform 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** test mode (from the (Select): **Test→ Mode** menu).

7.2.6.3 (UTIL:) ID

```
Edit Circuit ID: (◄ ►▲▼E)
------------------------
```

The “Circuit ID” string is the label you can assign to the unit. Use the ◄► arrow keys to select the cursor position on the bottom line, and then use the ▲▼ arrow keys to edit that character. Note that:

- Only the bottom line (0 to 24 characters) is available.
- The following characters are available: <Space> ( ) * + - , . / 0-9 and A-Z

Press **ENTER** once you compose the Circuit ID string.

7.2.6.4 (UTIL:) Display

```
Edit Display Brightness:
100%    (▲▼ E)
```

Use the ▲▼ arrow keys to select a brightness level for the front panel Vacuum Fluorescent Display (VFD). Select **25%, 50%**, **75%** or **100%**. Press **ENTER**.

7.2.6.5 (UTIL:) Firmware

1) This submenu is intended for DIAGNOSTIC PURPOSES ONLY. Do <u>NOT</u> change an image unless instructed to do so by Comtech EF Data Product Support.
2) The information shown on the screen shots that follow are provided for example only. The firmware numbers, versions, dates and times will vary.

These submenus allow viewing information about the CDM-710G internal firmware. The modem stores two complete firmware images. You can select which image will be loaded the next time the unit reboots.

```
Firmware Images:
Info  Select       (◄ ► E)
```

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

(UTIL:) Firmware→Info

```
Firmware Info: Bootrom
Image#1  Image#2
```

To view information on the Bootrom and the two images: Use the ◄ ► arrow keys to select **Bootrom**, **Image#1**, or **Image#2**. Press **ENTER**.

(UTIL:) Firmware→Info→Bootrom

```
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.

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

(UTIL:) Firmware→Info→Image#1 or Image#2

```
Image#x: Bulk  App   Framer
FEC  Mod  Demod  Interfaces
```

Typical for Image 1 or Image 2, these nested screens display *read-only* information about the firmware load for that image. Use the ◄ ► arrow keys to select **Bulk**, **App**, **Framer**, **FEC**, **Mod**, **Demod**, or **Interfaces**. Press **ENTER**.

(UTIL:) Firmware→Info→Image#X→Bulk

```
Bulk:              05/28/10
FW00114-             5.1.3.
```

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

(UTIL:) Firmware→Info→Image#X→App

```
App:               10/16/06
FW00115-             5.1.1
```

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

(UTIL:) Firmware→Info→Image#X→Framer

```
Framer:             11/08/07
FW12548C               2.3.2
```

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

(UTIL:) Firmware→Info→Image#X→FEC

```
Enc-S2   Enc-S   Dec-S2
```

Use the ◄ ► arrow keys to select **Enc-S2**, **Enc-S**, or **Dec-S2**. Press **ENTER**.

(UTIL:) Firmware→Info→Image#X→FEC→Enc-S2

```
DVB-S2 Enc         09/19/07
FW12439C             1.2.1
```

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

(UTIL:) Firmware→Info→Image#X→FEC→Enc-S

```
DVB-S Enc             04/03/07
FW12440A                 1.0.2
```

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

(UTIL:) Firmware→Info→Image#X→FEC→Dec-S2

```
DVB-S2 Dec           12/12/07
FW12436B                1.1.3
```

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

(UTIL:) Firmware→Info→Image#X→Mod

```
Filters   FPGA
```

Use the ◄ ► arrow keys to select **Filters** or **FPGA**. Press **ENTER**.

(UTIL:) Firmware→Info→Image#X→Mod→Filters

```
Mod Filters:          11/23/05
FW12695-                 1.1.1
```

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

(UTIL:) Firmware→Info→Image#X→Mod→FPGA

```
Mod FPGA              09/12/07
FW12549B                 2.2.1
```

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

(UTIL:) Firmware→Info→Image#X→Demod

```
Filters   UDD    Equalizer
```

Use the ◄ ► arrow keys to select **Filters**, **UDD,** or **Equalizer**. Press **ENTER**.

(UTIL:) Firmware→Info→Image#X→Demod→Filters

```
Dem Filters:      08/27/06
FW12694-            1.1.1
```

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

(UTIL:) Firmware→Info→Image#X→Demod→UDD

```
UDD FPGA:        06/12/07
FW12442C           2.4.0
```

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

(UTIL:) Firmware→Info→Image#X→Demod→Equalizer

```
EQ FPGA:           06/28/07
FW12441-              1.3.0
```

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

(UTIL:) Firmware→Info→Image#X→Interfaces

```
E3T3     GBEI     HSSI
```

Use the ◄ ► arrow keys to select **E3T3**, **GBEI**, or **HSSI**. Press **ENTER**.

(UTIL:) Firmware→Info→Image#X→Interfaces→E3T3

```
E3T3STS1:          03/21/06
FW10249A              1.0.2
```

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

(UTIL:) Firmware→Info→Image#X→Interfaces→GBEI (INTERFACE SLOT 2 ONLY)

The firmware for the CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface (GBEI) is installed on the GBEI module itself; information is returned only when a CDI-70 module is installed in Interface Slot 2.

```
GBEI:               6/26/07
FW12738A              1.1.9
```

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

(UTIL:) Firmware: → Select

```
Current Active Image: #2
Next Reboot Image: #1 #2
```

The top line displays the active image. Use the ◄► arrow keys on the bottom line to select #1 or #2 as the active software image. Press **ENTER**.

You must power cycle / reboot the modem to make the selected image the active choice.

7.2.6.6 (UTIL:) FAST

Chapter 6. FAST ACTIVATION PROCEDURE

Comtech EF Data’s FAST (Fully Accessible System Topology) options are available through the basic platform unit. The FAST system permits the purchase and installation of options through special authorization codes, entered remotely or through the front panel. FAST allows immediate implementation of available options upon acceptance of the FAST Access Code.

```
FAST: Cnfg   View
MainBoard S/N: 333333333
```

Use the ◄ ► arrow keys to select **Cnfg** or **View**. Press **ENTER**.

(UTIL:) FAST→Cnfg (Configuration)

```
FAST Configuration
Edit Code  Demo Mode
```

Use the ◄ ► arrow keys to select **Edit Code** or **Demo Mode**. Press **ENTER**.

(UTIL:) FAST→Cnfg→Edit Code

```
Edit 20 digit FAST Code:
00000000000000000000 ENT
```

ENTER the code ***carefully*** on the bottom line: Use the ◄ ► arrow keys to move to each digit, and then use the ▲▼ arrow keys to edit that digit.

Once you correctly compose the 20-digit FAST Code, press **ENTER**. The modem responds with “**Configured Successfully**” if the unit accepts the code and activates the FAST option.

However, if you enter an invalid code, the modem rejects the entry and the unit prompts you to re-enter the code. Repeat the FAST access code entry procedure. Should the code entry error persist, contact Comtech EF Data Product Support for further assistance.

(UTIL:) FAST→Cnfg→Demo Mode

```
FAST Demo Mode: Off On
3888000 seconds remain
```

FAST Demo Mode enables all FAST options for a limited time. Use the ◄ ► arrow keys to select **Off** or **On**. 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. For newer units running the latest firmware version, **Demo Mode** lasts 45 days.

(UTIL:) FAST→View

```
View Options: 01 (▲▼)
IF Modulator Installed
```

These screens display *read-only* status messages about each FAST option and the installation status (**Installed** or **Not Installed**) for that option.

Use the ▲▼ arrow key to browse through these screens.

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

Notes:

Chapter 8. ETHERNET INTERFACE OPERATION

8.1 Overview

Operation of the Ethernet Interface is available when you connect a user-supplied, Windows-based PC to the CDM-710G or CDM710GL High Speed Satellite Modem rear panel 'J4 | Ethernet' RJ-45 10/100 BaseT Ethernet port.

Three protocols are available to use for Ethernet remote M&C. Operate these protocols separately.

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

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

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

8.1.1 Prerequisites

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

- The CDM-710G/L is operating with the latest version firmware files.
- The User PC is running a terminal emulation program for operation of the unit Telnet Interface.
- The User PC is running a compatible web browser for operation of the unit HTTP Interface.
- The User PC is connected to the unit's RJ-45 'J4 | Ethernet' port.
- You have recorded the unit's Management IP Address.

8.2 SNMP Interface

SNMP is an Internet-standard protocol for managing devices over IP networks. An SNMP-managed network has three key components:

- The managed device. This includes this unit.
- The SNMP Agent. This software runs on the CDM-710G/L. The unit SNMP Agent supports both SNMPv1 and SNMPv2c.
- The user-supplied Network Management System (NMS). This software runs on the User PC.

8.2.1 Management Information Base (MIB) Files

An MIB file is used for SNMP remote management of a unique device, and consist of a tree of nodes called Object Identifiers (OIDs). Each OID provides remote management of a particular function. These MIB files should be compiled in a user-supplied MIB Browser or SNMP Network Monitoring System server. In these modem MIB file names, the letter 'x' represents the revision of the file.

8.2.1.1 ComtechEFData Root MIB File

- Fw10874-2x.mib
- ComtechEFData MIB file gives the root tree for all Comtech EF Data modem products and consists of only the following OID:
  - Name: comtechEFData
  - Type: MODULE-IDENTITY
  - OID: 1.3.6.1.4.1.6247
  - Full path: iso(1).org(3).dod(6).internet(1).private(4).enterprises(1). comtechEFData(6247)
  - Module: ComtechEFData

8.2.1.2 CDM-710G Common MIB File

- Fw0000116x.mib
- MIB file consists of all of the OID's for management of the unit functions

8.2.1.3 CDM-710G Traps MIB File

- Fw0000117x.mib
- Trap MIB file provides SNMPv1 traps common for modem.

8.2.1.4 CDM-710G Common Private MIBs

For detailed OID information please refer to the actual MIB file.

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:

- The "System Information Group" provides hardware configuration information as well as serial and model numbers.
- The "Remote Serial Group" provides parameters to the legacy serial interface parameters.
- The "Remote Ethernet Group" provides parameters of the Ethernet interface.
- The "Ethernet SNMP Group" provides parameters necessary to configure the SNMP interface.
- The "Interface TX Group" provides parameters that control the modulator options.
- The "Interface RX Group" provides parameters that control the demodulator options.
- The "Config Interface Group" provides parameters for selection of the unit's frequency response.
- The "Monitor Group" provides access to Alarm/Fault/Events log.
- The "Save/Load Group" provides control of the unit configuration Store/Load capabilities.
- The "Utilities Group" provides access to the unit's Real-Time clock, Internal Reference Adjustment, Circuit ID, and Front Panel Brightness Control.

- The “Firmware Group” provides Revision Numbers, and Release Dates for all firmware within the unit.
- The “Modulator Private MIB provides access to all modulator specific functions such as redundancy, GigE Interface, HSSI Interface, and G.703 Interface.

8.2.2 SNMP Community Strings

CAUTION
In SNMP v1/v2c, the SNMP Community String is sent unencrypted in the SNMP packets. Caution must be taken by the network administrator to ensure that SNMP packets travel only over a secure and private network if security is a concern.

For correct SNMP operation, the CDM-710G/L MIB files must be used with the associated version of the unit M&C. See the CDM-710G/L FW Release Notes for information on the required FW/SW compatibility.

The CDM-710G/L uses Community Strings as a password scheme that provides authentication before gaining access to the router agent’s MIBs. They are used to authenticate users and determine access privileges to the SNMP agent. The CDM-710G/L defines three Community Strings for SNMP access:

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

Type the SNMP Community String into the user-supplied MIB Browser or Network Node Management software.

8.2.3 SNMP Traps

The CDM-710G/L SNMP agent supports both SNMPv1 and v2c. The Traps file needs to be compiled only if SNMPv1 traps are to be used.

The CDM-710G/L has the ability to send out SNMP traps when certain events occur in the unit. For example, the unit also sends out traps when an alarm or a fault occurs or clears.

The CDM-710G/L supports the following MIB2 SNMPv1 traps and v2c notifications:

- Unit Alarm
- TX Traffic Alarm
- RX Traffic Alarm
- Clear Stored Events
- Monitor Interface Redundancy Switch State

8.3 Telnet Interface

See Chapter 9. SERIAL INTERFACE OPERATION for detailed information about using remote command and queries.

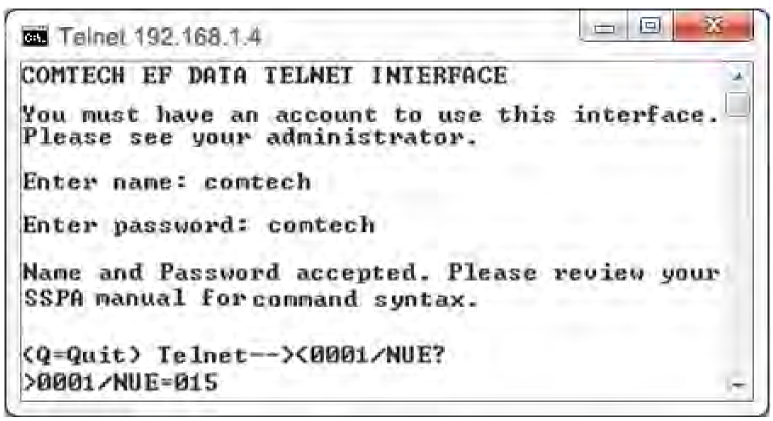


Figure 8-1. Telnet Interface Example – Windows Command-line

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 the Comtech Monitor and Control System (CMCS) application.

Telnet is implemented in the Ethernet M&C in a "Telnet wrapper". When the user Telnets to the unit, it emulates a local EIA-232 or EIA-485 serial connection to the unit. You 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.

The Telnet interface requires user login at the **Administrator** level and **Read/Write** level. Once logged into the Telnet interface as the Administrator, you have access to the optional serial-based Remote Control Interface. Figure 8-1 shows an example of the login process and remote control operation.

8.3.1 Using HyperTerminal for Telnet Remote Control Operation

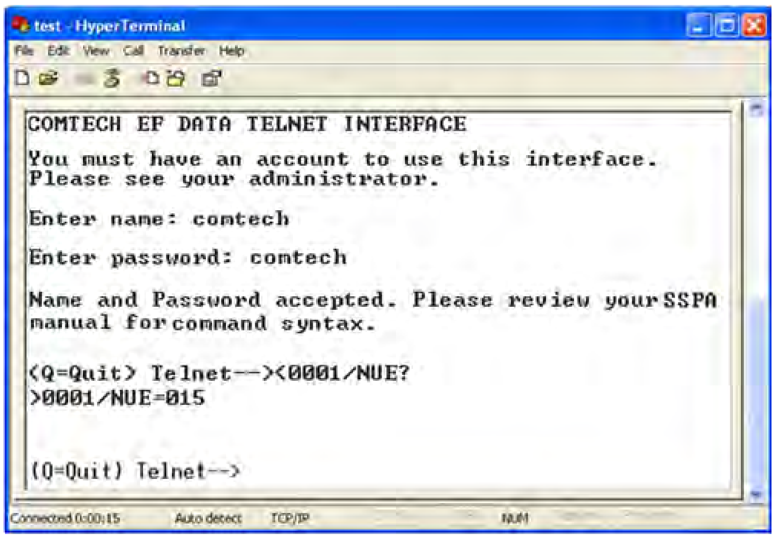


Figure 8-2. Telnet Interface Example – HyperTerminal

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

To see the full response messages, you can use the HyperTerminal terminal emulation program configured as a Telnet client. Figure 8-2 shows an example of the login process and remote control operation, when using HyperTerminal as the Telnet interface.

8.3.1.1 Configure HyperTerminal for Telnet Remote Control Operation

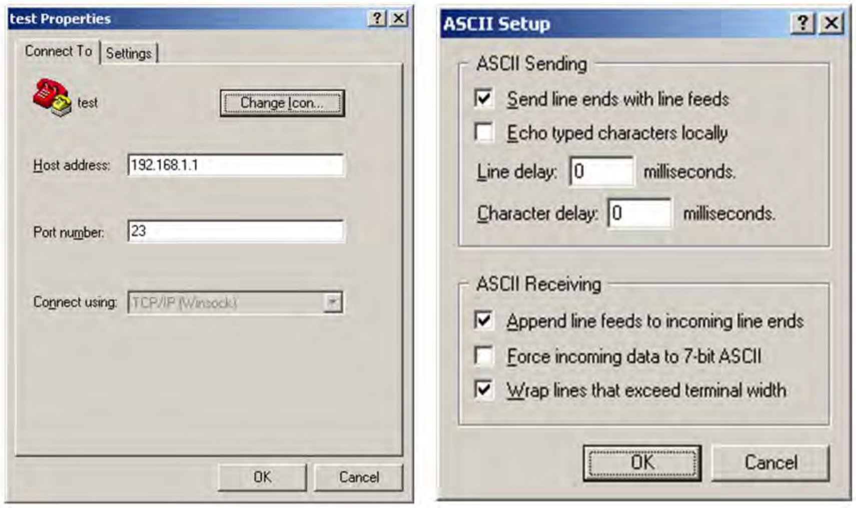


Figure 8-3. Configure HyperTerminal

See **Figure 8-3**. Do these steps:

1. Make sure to define the Connect To Telnet connection properties correctly (File → Properties) (Figure 8-3, left):
   a. Enter the unit's Traffic/Management IP Address as the "Host address" (e.g., 192.168.1.1).
   b. Enter TCP Port 23 as the "Port number".
   c. Set "Connect using" to TCP/IP (Winsock) instead of COM1 or COM2.
   d. Click [OK] to save your settings.
2. For ASCII Setup (File → Properties → Settings → ASCII Setup) (Figure 8-3, right):
   a. Check the "Send line ends with line feeds" option in the 'ASCII Sending' section.
   b. Check the "Append line feeds to incoming line ends" option in the 'ASCII Receiving' section.
   c. Click [OK] to save your settings.

8.4 HTTP (Web Server) Interface

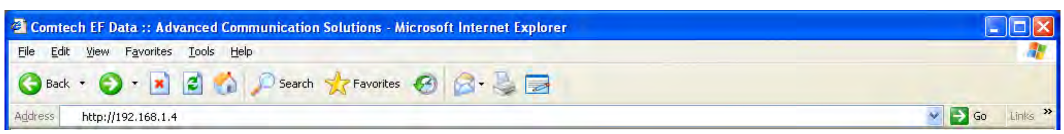
A user-supplied web browser allows the full monitoring and control (M&C) of the CDM-710G/L from its HTTP Interface. This non-secure embedded web application is designed for, and works best with, Microsoft Internet Explorer Version 7.0 or higher.

8.4.1 HTTP Interface User Login

You must use CDM-710G/L Front Panel operation to select “Ethernet” as your mode of operation prior to login. Failure to configure the unit accordingly will cause the Login dialogue box to return you to a blank web page.

Do these steps:

1. From the PC, enter the default Management IP Address for the unit (i.e., **http://192.168.1.4**) into the **Address** area of the browser.



You may obtain your assigned address from the CDM-710G/L front panel menu: **SELECT: CONFIG→Remote→Ethernet→Address. See Chapter 7. FRONT PANEL OPERATION** for further details. You may also need to consult with your network administrator to determine the appropriate IP address assignment for your modem.

2. In the Login window, type the **User name** and **Password**, and then click **OK**.

The system defaults for both are as follows:

- Admin User: comtech/comtech
- Read/Write User: opcenter/1234
- Read Only User: monitor/1234

HTTP Login Access Levels are defined as follows:

- “Admin Users” have full access to all web pages.
- “Read/Write Users” have access to all web pages except for the Admin pages.
- “Read Only Users” have no access to the Admin pages, and view-only access to all other web pages.

Once the valid User Name and Password is accepted, the HTTP Interface splash page shows (**Figure 8-4**). The unit and firmware version in this example will differ from your setup.

Figure 8-4. HTTP Interface “Splash” Page Example

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 here):

The appearance and function of the CDM-710GL HTTP Interface is, for all purposes, otherwise identical to that of the CDM-710G HTTP Interface.

8.4.2 HTTP Interface Features

8.4.2.1 Menu Tree

Figure 8-5 Illustrates the menu hierarchy for the HTTP Interface. It features five navigation tabs (shown in blue). Primary page hyperlinks (grey) grant access to individual web pages.

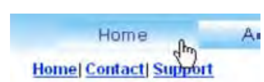
Home	Admin	Config Mdm	Stats	Maint
Home	Access	Interface	Modem Status	Unit Info
Contact	Remote	Modem	Events & Statistics	
Support		Modem Utilities		

Figure 8-5. HTTP Interface Menu Tree (FW Ver. 5.1.3)

8.4.2.2 Page Navigation

The HTTP Interface has five navigation tabs at the top of each page. Click a navigation tab to see its page hyperlinks. Click a page hyperlink to open a page.

This manual uses a convention for all web pages to show you how to navigate to the featured page: Navigation Tab | Page Hyperlink. For example, “Home | Home” instructs you to click the ‘Home’ navigation tab, and then click the ‘Home’ page hyperlink.

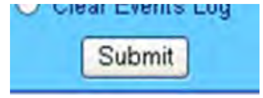


8.4.2.3 Page Sections

This manual explains the purpose and operation for each Web page and its sections. Each page has one or more sections. The title at the upper-left corner of each page or

section describes its operational features. Each section can have editable fields, action buttons and read-only displays for a specific function.

8.4.2.4 Action Buttons



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

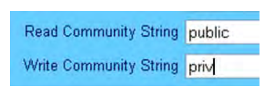
- Click **[Refresh]** to see the latest page data.
- Reset changed parameters to remove **unsaved** changes.
- Click **[Submit]** to save changes.

If you change any parameters, make sure to click the related action button before you leave the page. If you go to another page without first clicking the action button, your changes are not saved.

8.4.2.5 Drop-down Lists

A drop-down list lets you choose from a list of selections. Left-click the drop-down button to open the list. Then, left-click on an item to select that choice.

8.4.2.6 Text or Data Entry



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

Click the related action button to save the data.

8.5 HTTP Interface Page Examples and Descriptions

See Chapter 7. FRONT PANEL OPERATION for detailed descriptions of the configuration and monitoring features available throughout this interface.

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

8.5.1 Home Pages

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

8.5.1.1 Home | Home

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

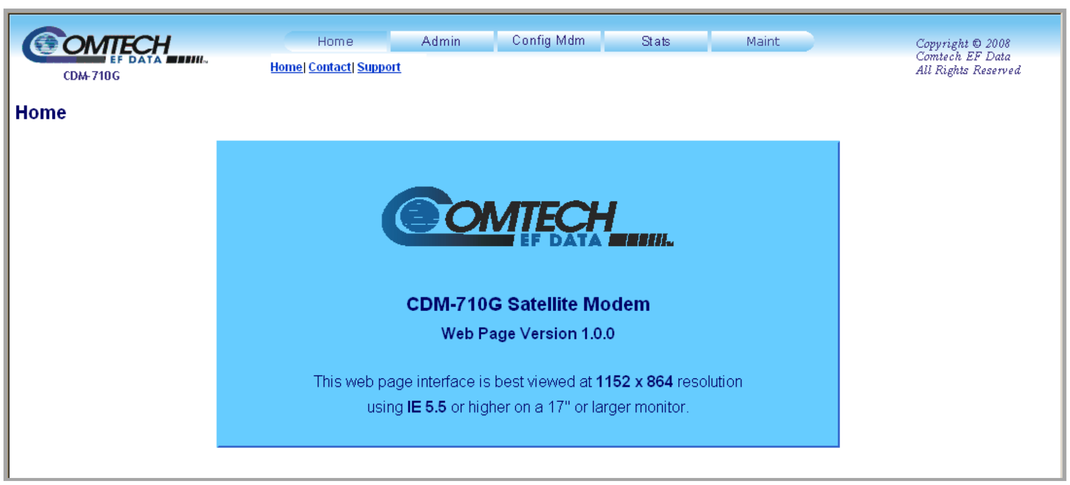


Figure 8-6. 'Home | Home' Page

Note that the product is identified as either the CDM-710G (70/140 MHz unit) or the CDM-710GL (L-Band unit) under the Comtech EF Data logo in the upper left-hand side of each page throughout the HTTP Interface.

8.5.1.2 Home | Contact

For all product support, please call:

+1.240.243.1880

+1.866.472.3963 (toll free USA)

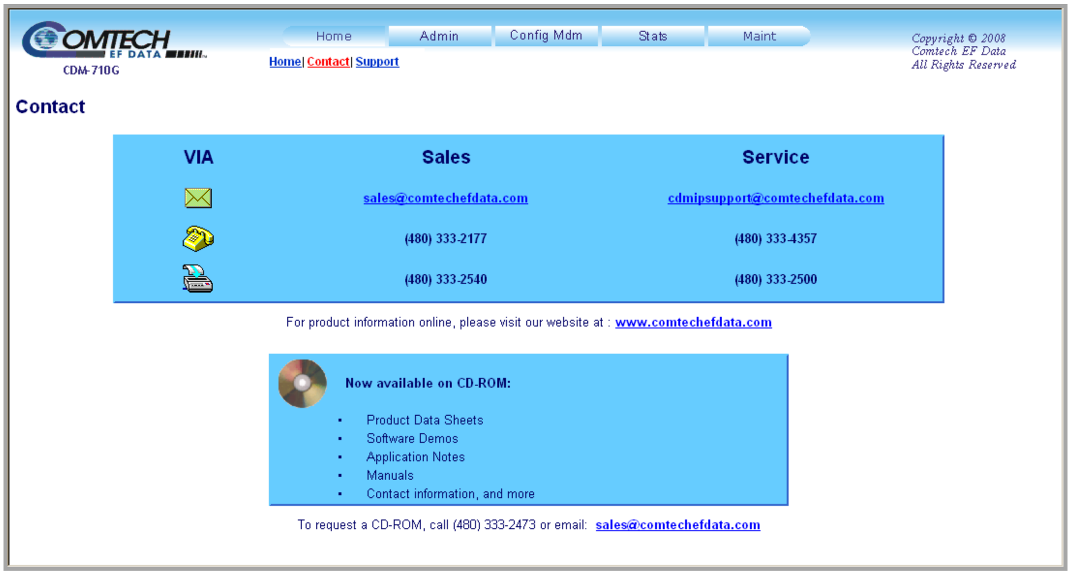


Figure 8-7. 'Home | Contact' Page

8.5.1.3 Home | Support Page

The Administrator must configure the SMTP server, domain name, and destination on the 'Admin | Remote' page (Sect. 8.5.2.2) in order to use this page.

Use this page to compose an e-mail message when you have questions about or problems with the unit.

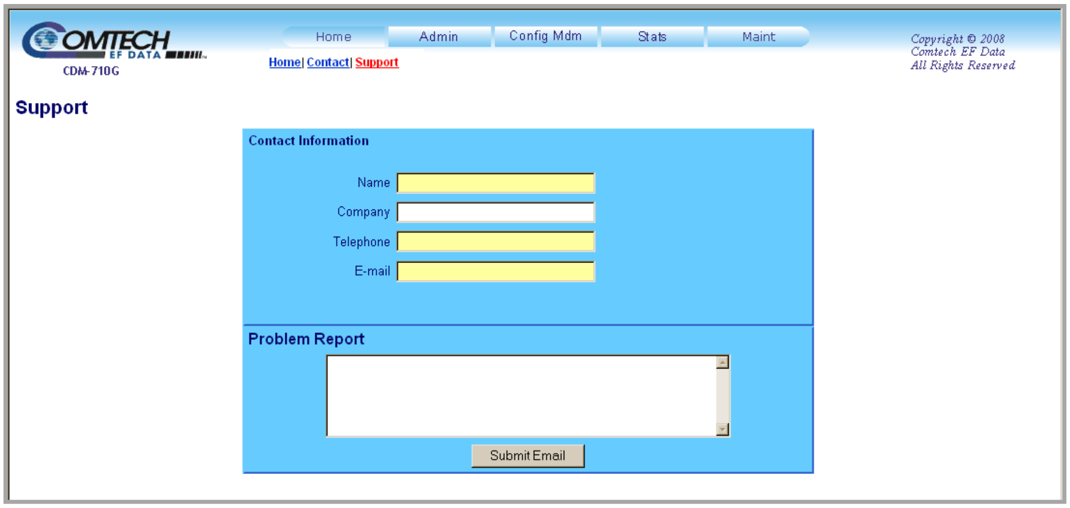


Figure 8-8. 'Home | Support' Page

The 'Home | Support' page (**Figure 8-8**) uses Simple Mail Transport Protocol (SMTP) to send E-mail to Comtech EF Data Product Support: cdmipsupport@comtechefdata.com

Enter the **Contact Information** and compose a message in the **Problem Report** text window. The **Problem Report** section allows up to 256 characters maximum.

Click [**Submit E-mail]** to send the message.

8.5.2 Admin (Administration) Pages

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

Click **Access** or **Remote** to continue.

8.5.2.1 Admin | Access

The Administrator must use this page 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/L HTTP Interface.

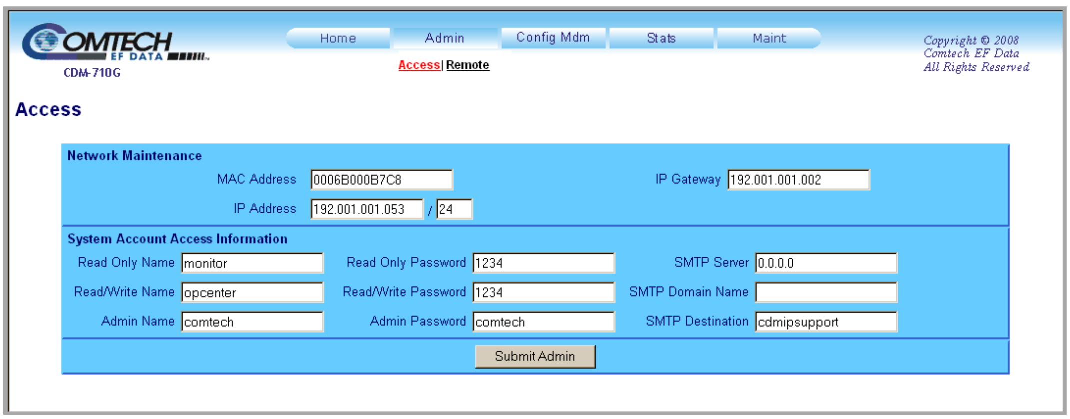


Figure 8-9. 'Admin | Access' Page

Network Maintenance

MAC Address – This parameter is ***read-only*** and cannot be changed.

IP Gateway – Enter the IP Gateway Address for the unit 'J4 | Ethernet' M&C port.

IP Address – Enter 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 User name and Password can be any alphanumeric combination with a maximum length of 10 characters. The factory defaults for these names/passwords are:

- Admin comtech/comtech
- Read/Write opcenter/1234
- Read Only monitor/1234

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

SMTP Domain Name / Destination – The Administrator can assign the SMTP Domain Name and Destination. This is required if the e-mail feature of the 'Home | Support' Page (Sect.8.5.1.3) is to be used.

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

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

Click [**Submit Admin]** to save.

8.5.2.2 Admin | Remote

Sect. 8.2 SNMP Interface

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

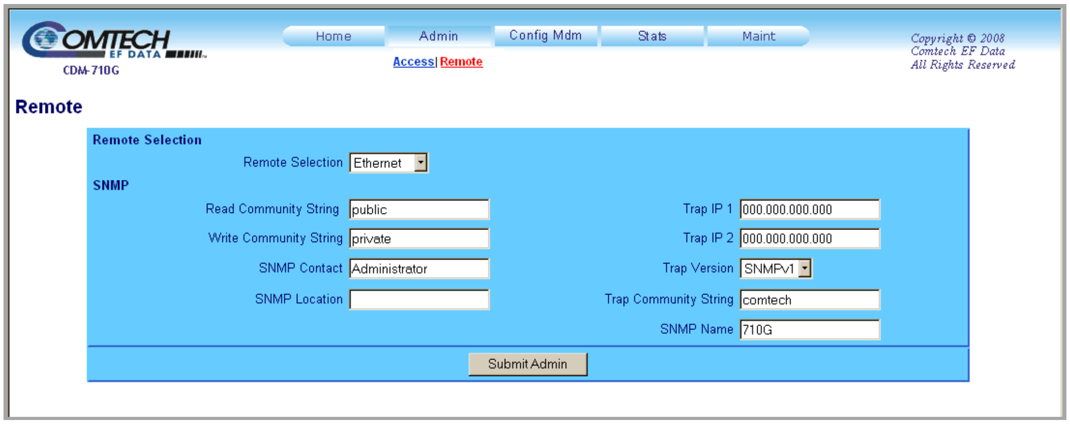


Figure 8-10. 'Admin | Remote' Page

Remote

Remote Selection

You must always set the operating mode as "Ethernet" in order to maintain access to the HTTP Interface.

SNMP

Read / Write / Trap Community Strings – Enter a Community string in any alphanumeric combination with a length 0 to 20 characters. The factory default string for each is "public."

SNMP Contact / SNMP Location / SNMP Name – Enter this identity information in any alphanumeric combination with a length of 0 to 20 characters.

Trap IP 1 / Trap IP 2 – Enter the address in the form XXX.XXX.XXX.XXX. The Administrator can assign up to two Trap IP addresses.

Trap Version – Use the drop-down list to select SNMPv1 or SNMP v2c.

Click **[Submit Admin]** to save.

8.5.3 Config Mdm (Configure Modem) Pages

Use these pages to configure all operating parameters for the unit.

Click **Interface**, **Modem**, or **Modem Utilities** to continue.

8.5.3.1 Configuration | Interface

See Chapter 2. SPECIFICATIONS the listing of applicable data interfaces and installable combinations.

Use this page to configure data interfaces as they may be installed in modem Expansion Slot 1 (Intfc1) and Expansion Slot 2 (Intfc2).

This page appearance depends on the presence of installed interfaces. For either slot, the unit automatically detects the interface type and adjusts the appearance of the Expansion Slot sections to suit.

In **Figure 8-11**, a CDI-60 HSSI Interface Module is present in Expansion Slot 1, and a CDI-70 Gigabit Ethernet Interface (GBEI) Module is present in Expansion Slot 2.

Figure 8-12 shows how the page appears when no interface module is present. In this example, a CDI-10-1 Single G.703 E3/T3/STS1 Interface Module is present in Expansion Slot 1, while Expansion Slot 2 is empty. The message "**Interface Not Installed.**" displays in place of a functional configuration window.

Define the desired interface operating parameters. Click **[Submit Changes]** to save.

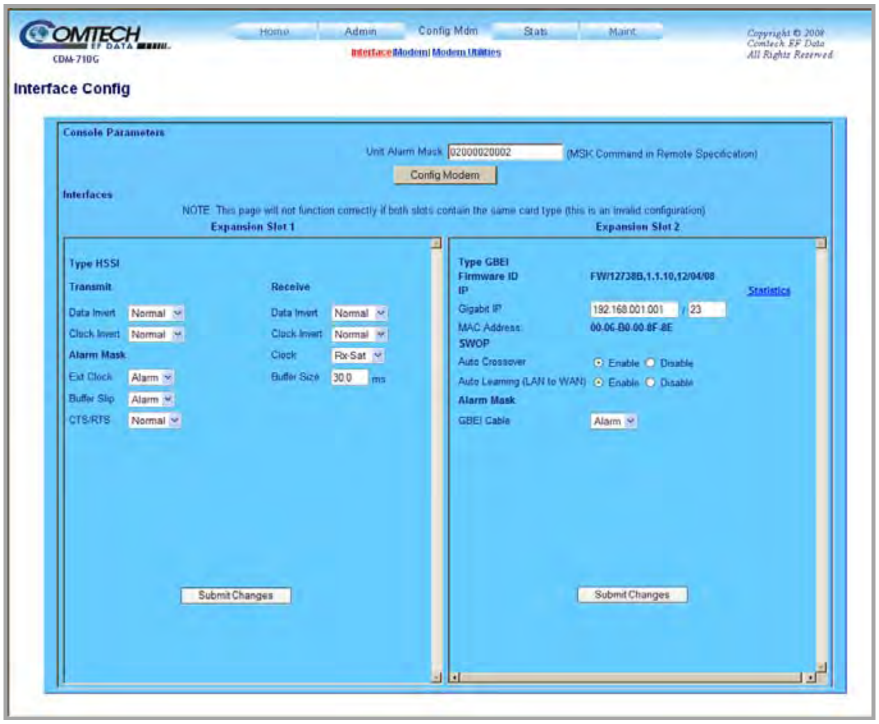


Figure 8-11. Config 'Mdm | Interface' Page

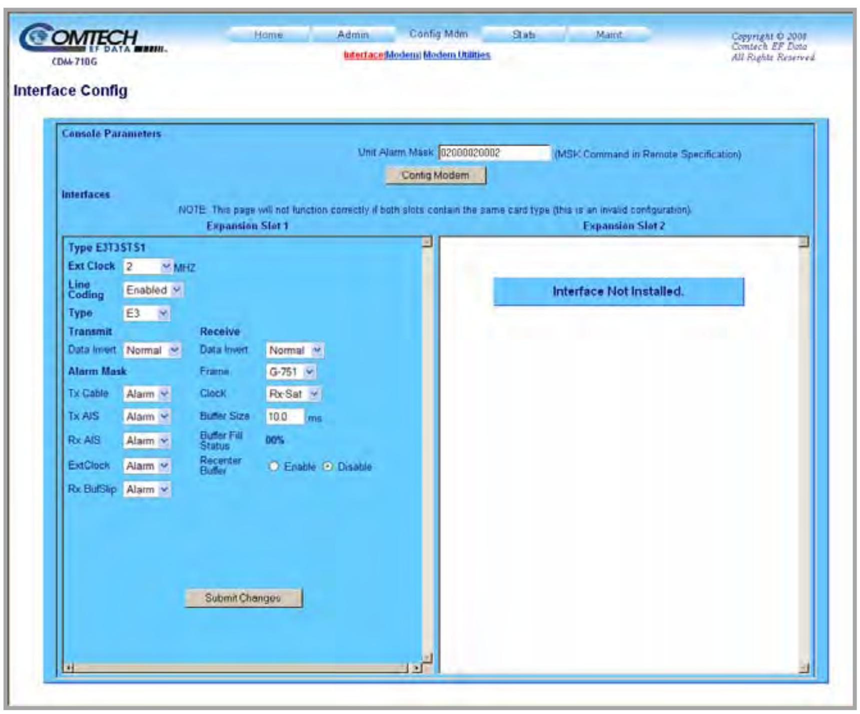


Figure 8-12. 'Config Mdm | Interface' Page (Slot 2 Empty)

8.5.3.2 Config Mdm | Modem

Use this page to configure modem DVB-S2 (Generic) operating (Tx / Rx) parameters.

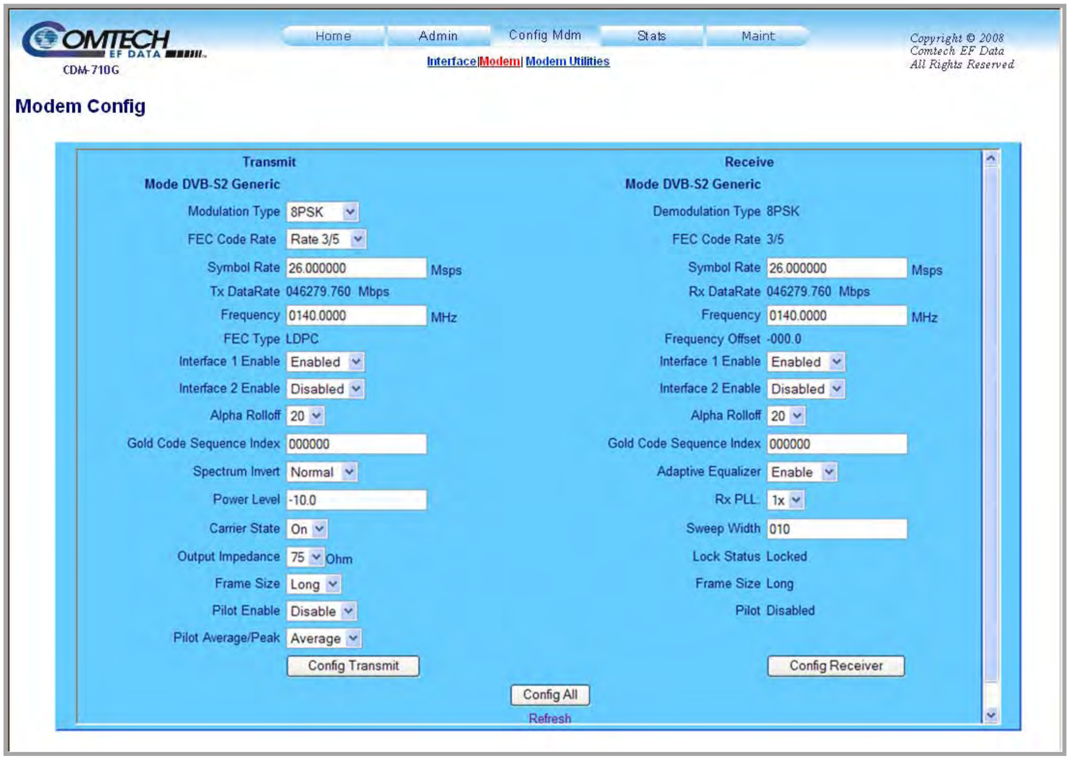


Figure 8-13. Config Mdm | Modem page

The Tx / Rx Interface Types and Framing Modes have higher priority than other parameters, and should be configured before setting other parameters.

Make your configuration settings changes as needed in each section. Click **[Config Transmit]**, **[Config Receiver]**, or **[Config All]** to save.

8.5.3.3 Config Mdm | Modem Utilities

Figure 8-14. Config Mdm | Modem Utilities page

Use this page (**Figure 8-14**) to perform the following Modem Utilities tasks:

- Select the Boot Image;
- Perform a Soft Reboot;
- Save and Load Configurations;
- Set up Redundancy Operation;
- Set the Date and Time;
- Set the Clock Mode;
- Select and run a Test Mode;
- Re-center the Buffer;
- Assign a Circuit ID;
- Set the Rx Alarm Masks.

Make your configuration settings changes as needed in each section. Click the action buttons as provided (e.g., **[Submit]**, **[Save]**, **[Load]**, etc.) to save.

8.5.4 Stats (Statistics) Pages

Use the **Stats** pages to view status, event logging, and operational statistics windows.

Click **Modem Status** or **Events & Statistics** to continue.

8.5.4.1 Stats | Modem Status

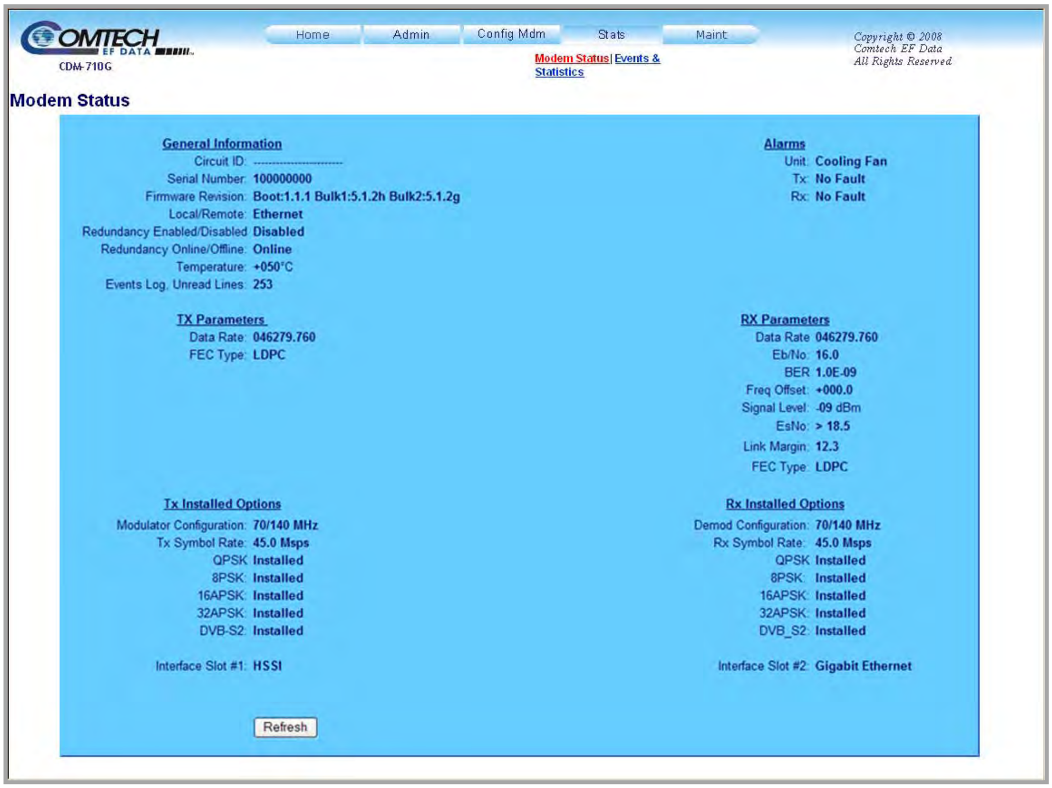


Figure 8-15. Stats | Modem Status page

Use the '**Stats | Modem Status**' page (Figure 8-16) to review *read-only* status information for:

- General modem operating and configuration information;
- Alarms;
- Tx and Rx Parameters;
- Tx and Rx Installed options (Data Interfaces, FAST features, etc.).

Click **[Refresh]** to update the information provided on this page.

8.5.4.2 Stats | Events & Statistics

Use this page to review a scrollable record of the unit's stored events.

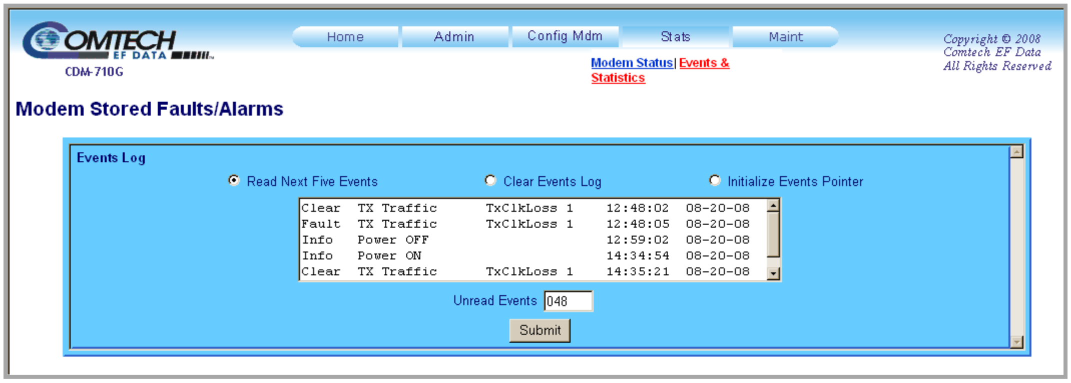


Figure 8-16. 'Stats | Events & Statistics' Page

Modem Stored Faults/Alarms (Events Log)

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

Select **Clear Events Log** to wipe clean the stored events log.

Select **Initialize Events Pointer** to reset the log's internal pointer.

Unread Events – This text box displays the total number of *unread* stored events in the Events window. As stored event groups are displayed, this number decrements accordingly.

Click **[Submit]** to execute your settings selections. The scrollable window contents will update accordingly

8.5.5 Maint | Unit Info Page

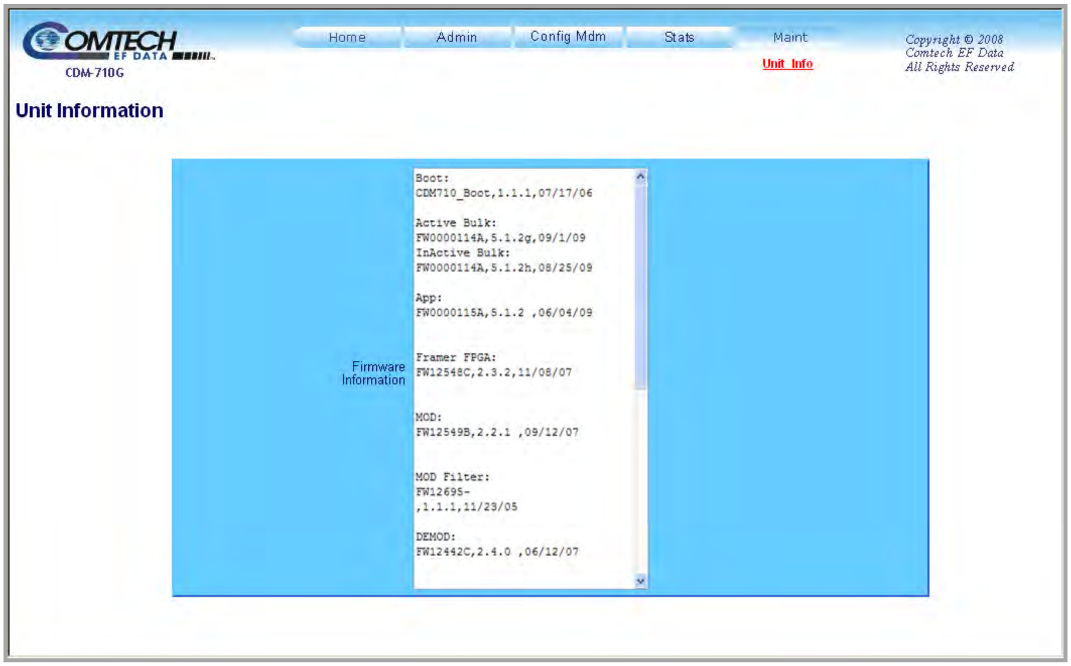


Figure 8-17. 'Maint | Unit Info' Page

Use the '**Maint | Unit Info**' page (**Figure 8-17**) to review a *read-only*, scrollable status window containing information about the currently loaded Bootrom. You may scroll through the Image 1 and Image 2 content for information about all of the constituent firmware blocks that make up the bulk.

Chapter 9. SERIAL INTERFACE OPERATION

9.1 Overview

The serial interface is an electrical interface. It is either an EIA-232 connection to control one remote device, or an EIA-485 multi-drop bus to control multiple remote devices. The interface transmits data as ASCII characters in asynchronous serial form. This control or status data occurs in packets of variable length.

9.1.1 EIA-232

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

9.1.2 EIA-485

A full-duplex (or 4-wire plus ground) EIA-485 is best when multiple devices are monitored and controlled. In full-duplex EIA-485 communication, there are two separate and isolated differential-mode twisted pairs. Each independent pair carries serial data in different directions:

- A Controller device (a PC or dumb terminal) transmits data in a broadcast mode on one of the pairs.
- Multiple Target devices are connected to this pair. All Targets receive data from the Controller at the same time.

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-State line driver connected. The Controller has a line receiver connected. All the line drivers are held in high-impedance mode until just one Target transmits back to the Controller. Each Target has a unique address. Each time the Controller transmits, the address of the intended Target is included in a framed packet of data. All of the Targets receive the packet, but only the intended one replies.

The Target starts its output line driver and transmits the return data packet back to the Controller in the other direction, on the physically separated pair.

EIA-485 (full duplex) summary:

- Two differential pairs – one pair for Controller-to-Target, one pair for Target-to-Controller.
- The Controller-to-Target pair has one line driver (Controller), and all Targets have line receivers.
- The Target-to-Controller pair has one line receiver (Controller), and all Targets have Tri-State drivers.

The use of Half-duplex (2-wire plus ground) EIA-485 is possible, but is not preferred.

9.2 Basic Serial Protocol

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

Serial data is transmitted as asynchronous serial characters:

- Asynchronous character format is 8-N-1 (8 data bits, no parity, 1 stop bit)
- Baud rate can vary from 1200 through 57600 baud.

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

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

- Acknowledging receipt of a “command” – an instruction message issued by the Controller – to change the configuration of the Target.
- Returning data that was requested by the Controller – the Target response to a “query” – that requests information from the Target.
- When the Controller broadcasts a message using Address 0 and the Target is set to EIA-485 mode.
- Target devices can transmit data only when the Controller tells them to.

9.3 Serial Packet Structure

Table 9-1. Serial Packet Structure

Direction	Start of Packet 1 character	Target Address 4 characters	Address Delimiter 1 character	Instruction Code 3 characters	Code Qualifier 1 character	Optional Arguments	End of Packet
Controller-to-Target	< ASCII code 60		/ ASCII code 47		= or ? ASCII code 61 or 63	‘n’ characters	Carriage Return ({CR}) ASCII code 13 (1 character)
Target-to-Controller	> ASCII code 60		/ ASCII code 47		=, ?, !, *, #, ^ ASCII codes 61, 63, 33, 42, 35, 94	0 through ‘n’ characters	Carriage Return and Line Feed ({CR}{LF}) ASCII codes 13,10 (2 characters)

Each packet has a finite number of bytes. The bytes contain printable ASCII characters, excluding ASCII code 127 (DELETE):

- Controller-to-Target **EXAMPLE:** <0135/TFQ=70. 2345{CR}
- Target-to-Controller **EXAMPLE:** >0654/RSW=32{CR}{LF}

9.3.1 Start of Packet

The characters “<” or “>” show the start of the packet. They must not be anywhere else in the body of the message.

- Controller-to-Target: < (ASCII code 60)
- Target-to-Controller: > (ASCII code 62)

9.3.2 Target Address

A Controller does not have its own address. The Controller sends a packet with the address of a Target. This is the destination of the packet. When the Target responds, it uses that same address. This shows the Controller which Target is the source of the response packet. Up to 9999 Target devices can have unique addresses:

- In EIA-232 applications, this address is set to 0.
- In EIA-485 applications, the range of addresses is 0001 to 9999. Use the Target device's HTTP Interface to set its address.

9.3.3 Address Delimiter

This is the / character (ASCII code 47). It is sometimes known as the forward slash character.

9.3.4 Instruction Code

This code consists of three alphanumeric characters. Only upper-case alphabetic characters A through Z (ASCII codes 65 through 90), and numerals 0 through 9 (ASCII codes 48 through 57) are valid.

The Instruction Code identifies the subject of the message (the "command" or "query"). As much as possible, the instruction code characters are related to the message. For example, TFQ means "transmit frequency", or RMD means "receive modulation type".

9.3.5 Instruction Code Qualifier

This single character qualifies the preceding instruction code as a "command" or as a "query. " Instruction Code Qualifiers obey specific rules.

9.3.5.1 Controller-to-Target Rules

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

= (ASCII code 61)

The "=" qualifier is the Assignment Operator (AO). It means that the parameter defined by the preceding byte should be set to the value of the argument(s) that follow it. For example: TFQ=0950. 0000 tells the Target to set its transmit frequency to 950 MHz.

? (ASCII code 63)

The "?" qualifier is the Query Operator (QO). It means that the Target should return the value of the parameter(s) defined by the preceding byte. For example: TFQ? asks the Target to report the value of the transmit frequency to the Controller.

9.3.5.2 Target-to-Controller Rules

From Target-to-Controller, the symbols =, ?, !, *, #, or ^ (ASCII codes 61, 63, 33, 42, 35, or) are transmitted by the Target device to the Controller:

= (ASCII code 61)

"=" is used in two ways:

1. If the Controller sends a command to set a parameter's value, and the value is valid, the Target accepts the command by replying with no message arguments. **For example,** TFQ=
2. If the Controller sends a query to a Target (for example, TFQ? means "what is the Transmit frequency?"), the Target responds with TFQ=xxxx. xxxx, where xxxx. xxxx is the operating frequency.

? (ASCII code 63)

"?" is used when the Controller sends a command to set a parameter's value, and the value is not valid. The Target rejects the message by echoing the valid instruction, followed by this character. **For example,** TFQ? (with no message arguments)

! (ASCII code 33)

"!" is used when the Controller sends an instruction code that the Target does not recognize. The Target rejects the message by echoing the invalid instruction, followed by this character. **For example,** XYZ!

* (ASCII code 42)

"*" is used when the Controller sends a command to set a parameter's value, and the value is valid but the Target cannot permit that parameter to be changed at that time. The Target rejects the command by echoing the prohibited instruction, followed by this character and message arguments. **For example,** TFQ* (with no message arguments).

(ASCII code 35)

"#" is used when the Controller sends a correctly formatted command, but the Target is in Local Mode. The Target rejects the command by echoing the prohibited instruction, followed by this character. **For example,** TFQ#

~ (ASCII code 126)

"~" is used when the local Controller sends a message to a distant-end device or ODU. If the distant-end device does not respond, the local Controller generates a response. **For example,** RET~ (indicates that the local Controller has finished waiting for a response and is now ready for further communications.

9.3.6 Optional Message Arguments

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

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

9.3.7 End of Packet

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

9.4 Serial Remote Commands and Queries

See Sect. 9.3.5.2 for the description of codes that are used in the ‘Response to Command’ columns. See Sect. 9.4.5 for detailed information about the MGC Modem Global Configuration command/query.

Adaptive Equalizer Operation, 9–24, 9–46
Boot Image, 9–16, 9–29, 9–50
Buffer Fill State, 9–24, 9–39
Circuit ID String, 9–12, 9–24, 9–46
Clear All Stored Events, 9–12, 9–24, 9–46
Configuration Load, 9–12, 9–25, 9–46
Configuration Save, 9–12, 9–25, 9–46
Demodulator Lock Status, 9–25, 9–46
E3T3STS1 Interface Mode Select, 9–28, 9–39
E3T3STS1 Interface Reference Clock, 9–27, 9–39
Eb/No AlarmPoint, 9–26, 9–46
Equipment ID, 9–12, 9–25
External Reference Frequency, 9–27, 9–49
Faults and Status, 9–13, 9–47
Firmware Revisions, 9–15, 9–28, 9–49
Gateway IP Address, 9–16, 9–29, 9–50
GBEI Cable Auto Crossover, 9–19, 9–36, 9–54
GBEI Learning Mode, 9–19, 9–36, 9–54
GBEI MAC Address, 9–28, 9–40
GBEI Management IP Address and Subnet, 9–15, 9–28, 9–49
GBEI Software Revision, 9–29, 9–40
Initialize Events Pointer, 9–16, 9–29, 9–50
Interface Type, 9–17, 9–30, 9–50
Local/Remote Status, 9–17, 9–30, 9–51
Management IP Address, 9–16, 9–29, 9–50
Number of Unread stored Events, 9–18, 9–31, 9–51
Query Rx Eb/No, 9–26, 9–47
Query Rx Es/No, 9–27, 9–49
Real-time Clock Date, 9–12, 9–25, 9–46
Real-time Clock Time, 9–21, 9–36, 9–54
ReCenter Buffer, 9–32, 9–40
Redundancy State, 9–18, 9–33, 9–52
Redundancy Switch Mode, 9–13, 9–28, 9–49
Restore Factory Defaults, 9–33
Retrieve Next 5 unread stored Events, 9–18, 9–35, 9–53
Rx Alpha Rolloff, 9–31, 9–51
Rx BER Alarm Threshold, 9–24
Rx Buffer Frame, 9–33, 9–41
Rx Buffer Size, 9–32, 9–40, 9–51
Rx Clock, 9–32, 9–41, 9–51
Rx Clock Source, 9–32
Rx Data Invert, 9–33, 9–52
Rx Data Rate, 9–33, 9–52
Rx Demod Acquisition Sweep Width, 9–36, 9–54
Rx FEC Code Rate, 9–23, 9–45
Rx Frame Size, 9–34, 9–53
Rx Frequency, 9–34, 9–52
Rx Frequency Offset, 9–34, 9–52
Rx Gold Code Sequence Index, 9–34, 9–53
Rx Interface Enable, 9–34, 9–53
Rx Link Margin, 9–30, 9–50
Rx Modulation Type, 9–23, 9–45, 9–57
Rx Pilot On/Off, 9–35, 9–53
Rx Signal Level, 9–35, 9–54
Rx Symbol Rate, 9–23, 9–45
Serial Number, 9–19, 9–36, 9–54
Soft Reboot, 9–18, 9–32, 9–51
Software Revision, 9–19, 9–36, 9–54
Temperature, 9–21, 9–37, 9–54
Tx Alpha Rolloff, 9–19, 9–41
Tx Carrier State, 9–22, 9–44

Tx Clock, 9–20, 9–41
Tx Data Invert, 9–20, 9–41
Tx Data Rate, 9–20, 9–42
Tx FEC Code Rate, 9–11, 9–38
Tx FEC Type, 9–20, 9–42
Tx Frame Size, 9–20, 9–42
Tx Frequency, 9–20, 9–42
Tx Gold Code Sequence Index, 9–21, 9–42
Tx Interface Enable, 9–21, 9–42
Tx Line Code, 9–37, 9–43
Tx Location of the Pilot, 9–21, 9–43
Tx Modulation Type, 9–11, 9–38
Tx Output Impendance, 9–16, 9–29, 9–40
Tx Pilot On/Off, 9–21, 9–43
Tx Power Level, 9–22, 9–43
Tx Spectrum Invert, 9–22, 9–43
Tx Symbol Rate, 9–11, 9–38
Unit Alarm Mask, 9–17, 9–31
Unit MAC Address, 9–17, 9–30, 9–51
Unit Test Mode, 9–22, 9–55

9.4.1 Modulator Only Commands and Queries

Priority System=(From highest to lowest priority) TMD>TCR>TSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Tx Modulation Type	TMD=	TMD?	1 byte	Command or Query. Sets or returns Tx Modulation type in the form x where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **COMMAND EXAMPLE:** <0001/TMD=1{CR} (sets as 8PSK)	TMD= TMD? TMD* TMD#	TMD=x
Tx FEC Code Rate	TCR=	TCR?	1 byte	Command or Query. Sets or returns Tx Code Rate* in the form x 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 **COMMAND EXAMPLE:** <0001/TCR=0{CR} (sets as Rate 3/4) ***NOTE:** See Chapter 2. SPECIFICATIONS for a list of available code rates for each modulation type.	TCR= TCR? TCR* TCR#	TCR=x
Tx Symbol Rate	TSR=	TSR?	9 bytes	Command or Query. Sets or returns Tx Symbol Rate in the form ss. ssssss where: ss. ssssss=Symbol Rate in Msps **COMMAND EXAMPLE:** <0001/TSR=20. 000000{CR} (sets as 20 Msps)	TSR= TSR? TSR* TSR#	TSR=ss.ssssss

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Clear All Stored Events	CAE=	N/A	None	Command only. **THIS COMMAND TAKES NO ARGUMENTS.** Forces the unit to clear the stored events log. **EXAMPLE:** <0001/CAE={CR}	CAE= CAE? CAE* CAE#	N/A
Circuit ID String	CID=	CID?	24 bytes	Command or Query. Sets or returns the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , . / 0 9 and A thru Z **NOTE:** Trailing spaces are removed upon entry. **COMMAND EXAMPLE:** <0001/CID=ComtechCDM710GL{CR}	CID= CID? CID* CID#	CID=xxxxxxxxxxx xxxxxxxxxxxxx
Configuration Load	CLD=	N/A	1 byte	Command only. Retrieves previously stored configuration from the specified location in the form x where: x=0 to 9 **EXAMPLE:** <0001/CLD=4{CR} (retrieves configuration from location 4)	CLD= CLD? CLD* CLD#	N/A
Configuration Save	CST=	N/A	1 byte	Command only. Stores the current configuration in the specified location in the form x where: x=0 to 9 **EXAMPLE:** <0001/CST=4{CR} (stores the current configuration in location 4)	CST= CST? CST* CST#	N/A
Real-time Clock Date	DAY=	DAY?	6 bytes	Command or Query. Sets or returns the date in the form ddmmyy where: dd=day of the month (01 to 31) mm=month (01 to 12) yy=year (00 to 99) **COMMAND EXAMPLE:** <0001/DAY=240415{CR} (sets April 24, 2015)	DAY= DAY? DAY* DAY#	DAY=ddmmyy
Equipment ID	N/A	EID?	23 bytes	Query only. Returns the equipment identification and configuration in the form aaabcdefghijklmnopqrstu where: aaa=the unit model number (71G) b=Modulator configuration where 1=70/140 Mhz, 2=L-Band c=Tx Symbol Rate S/W option where 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 where 0=Not installed, 1=Installed e=S/W option Tx 16-QAM where 0=Not installed, 1=Installed f=S/W option Tx 16APSK where 0=Not installed, 1=Installed	EID? EID* EID#	EID=aaabcdefgh ijklmnopqrstu

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Equipment ID (continued)				g=S/W option Tx 32APSK where 0=Not installed, 1=Installed h=S/W option Tx DVB-S1 where 0=Not installed, 1=Installed i=S/W option Tx DVB-DSNG where 0=Not installed, 1=Installed j=S/W option Tx DVB-S2 where 0=Not installed, 1=Installed k=Demodulator configuration where 0=None, 1=70/140 Mhz, 2=L-Band l=Rx Symbol Rate S/W option where 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 where 0=Not installed, 1=Installed n=S/W option Rx 16-QAM where 0=Not installed, 1=Installed o=S/W option Rx 16APSK where 0=Not installed, 1=Installed p=S/W option Rx 32APSK where 0=Not installed, 1=Installed q=S/W option Rx DVB-S1 where 0=Not installed, 1=Installed r=S/W option Rx DVB-DSNG where 0=Not installed, 1=Installed s=S/W option Rx DVB-S2 where 0=Not installed, 1=Installed t=Interface Slot 1 where 0=None, 1=Reserved, 2=CDI-70 GBEI **(NOT USED)**, 3=CDI-60 HSSI, 4=CDI-10-1 E3T3STS1 u=Interface Slot 2 where 0=None, 1=Reserved, 2=CDI-70 GBEI, 3=CDI-60 HSSI **(NOT USED)**, 4=CDI-10-1 E3T3STS1 **(NOT USED)** **NOTE:** When unit is 'MODULATOR ONLY' query returns '0 (Not Installed)' for Rx options.		
Redundancy Switch Mode	ESW=	ESW?	1 byte	Command or Query. Sets or returns redundancy mode in the form x, where : 0=Disable 1=Enable **COMMAND EXAMPLE:** <0001/ESW=1{CR} (enables redundancy mode)	ESW= ESW? ESW* ESW#	ESW=x
Faults and Status	N/A	FLT?	4 bytes	Query only. Returns the current fault and status codes for the Unit (hardware), Tx Traffic, and Rx Traffic in the form abcde where: a=Unit Faults where: 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5V Framer Card 3=Power supply fault, +1.5V Interface Slot 1 4=Power supply fault, +1.5V Interface Slot 2	FLT? FLT* FLT#	FLT=abcde

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Faults and Status (continued)				5=Power supply fault, +3.3V Framer Card 6=Power supply fault, +5.0V Framer Card 7=Power supply fault, +12.0V Framer Card 8=Power supply fault, -12.0V Framer Card 9=Power supply fault, +18.0V Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface Slot 1 Load E=Interface Slot 2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface Slot 1 Removed L=Interface Slot 2 Removed b=Tx Traffic Status where: 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 Slot 1) A=TX Clock Failure (Interface Slot 2) B=CDI-70 GBEI Module Data rate >+ 200 PPM C=CDI-70 GBEI Module Data rate <- 200 PPM D=CDI-70 GBEI No PHY Link E=Encoder FIFO Empty F=Encoder FIFO Full G=SERDES Parity Errors		

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Faults and Status (continued)				H=Reserved. I=Tx AIS Interface Slot 1 J=Tx AIS Interface Slot 2 K=Tx Cable Interface Slot 1 L=Tx Cable Interface Slot 2 c=Rx Traffic Status where: 0=No faults d=New Faults where: 0=No new faults 1=New faults since last check e=Configuration change where: 0=Unit configuration has not been changed 1=Unit configuration has been changed 2=Reserved 3=Gateway IP Address has been changed **NOTE:** Typical for each parameter – Faults are listed in order of priority.While multiple faults may exist, only the highest priority fault for that parameter is returned.		
Firmware Revisions	N/A	FRW?i	1 byte	Query only. Returns the firmware information of the system where: i=Bulk Image number (1 or 2) a=Firmware Image b=Firmware Revision c=Firmware Date **EXAMPLE:** <0001/FRW?1{CR} (queries the Bulk Image 1 firmware load)	FRW? FRW* FRW#	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c…
GBEI Management IP Address and Subnet	GIP=	GIP?s	19 bytes	Command or Query. Sets or returns the Gigabit Ethernet Interface Management IP Address and Subnet Mask in the form sxxx.xxx.xxx.xxx.yy where: s=2 (Interface Slot 2 only) xxx.xxx.xxx.xxx=IP Address yy=Subnet Mask **COMMAND EXAMPLE:** <0001/GIP=2192.168.001.001.24{CR}	GIP= GIP# GIP? GIP*	GIP=sxxx.xxx.xxx.xxx.yy

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Initialize Events Pointer	IEP=	N/A	None	Command only. **THIS COMMAND TAKES NO ARGUMENTS.** Resets the internal pointer to allow RNE? queries to start at the beginning of the stored events log. **EXAMPLE:** <0001/IEP={CR}	IEP= IEP? IEP* IEP#	N/A
Boot Image	IMG=	IMG?	1 byte	Command only. Selects the Boot image in the form n where: n=image number 1 or 2 **EXAMPLE:** <0001/IMG=1{CR} (sets Image #1 for booting)	IMG= IMG? IMG* IMG#	IMG=n
Tx Output Impedance	IMP=	IMP?	1 byte	**(CDM-710G 70/140 MHz UNIT ONLY)** Command or Query. Sets or returns the Tx output impedance in the form x where: 0=50 Ohm 1=75 Ohm **COMMAND EXAMPLE:** <0001/IMP=0{CR} (Sets as 50 Ohms)	IMP= IMP? IMP* IMP#	IMP=x
Management IP Address	IPA=	IPA?	18 bytes	Command or Query. Sets or returns the IP Address and Subnet Mask for the 10/100 BaseT 'J4 | Ethernet' management port, in the form xxx.xxx.xxx.xxx.yy where: xxx.xxx.xxx.xxx=IP Address yy=Subnet Mask (00 to 31) **COMMAND EXAMPLE:** <0001/IPA=010.006.030.001.24{CR}	IPA= IPA? IPA* IPA#	IPA=xxx.xxx.xxx.xxx.yy
Gateway IP Address	IPG=	IPG?	15 bytes	Command or Query. Sets or returns the Gateway IP Address for the 10/100 Base-T Ethernet management port in the form xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx=IP Address **COMMAND EXAMPLE:** <0001/IPG=010.006.030.001{CR}	IPG= IPG? IPG* IPG#	IPG=xxx.xxx.xxx.xxx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Interface Type	N/A	ITF?s	2 bytes	Query only. Returns Interface Type in the form sx, where: s=Interface Slot 1 or 2 x=Interface type where: 0=Reserved 1=Reserved 2=CDI-70 GBEI (Interface Slot 2 only) 3=CDI-60 HSSI (Interface Slot 1 only) 4=CDI-10-1 E3T3STS1 (Interface Slot 1 only) **EXAMPLE:** <0001/ITF?1{CR} >0000/ITF=13{CR}{LF} (Slot 1, CDI-60 HSSI module active)	ITF? ITF* ITF#	ITF=sx
Local/Remote Status	LRS=	LRS?	1 byte	Command or Query. Local/Remote status where: 0=Local 1=Serial 2=Reserved 3=Ethernet **COMMAND EXAMPLE:** <0001/LRS=3{CR} (sets Ethernet Remote mode)	LRS= LRS? LRS* LRS#	LRS=x
Unit MAC Address	N/A	MAC?	12 bytes	Query only. Returns MAC address of the unit, in hexadecimal. **EXAMPLE:** <0001/MAC?{CR} >0000/MAC=0006B000D2A7{CR}{LF} (00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC=AABBCCDD EEFF
Unit Alarm Mask	MSK=	MSK?	13 bytes	Command or Query. Sets or returns reporting conditions as 0=Alarm, 1=Fault, or 2=Masked for each item in the form abcdefghijkLmxxx where: a=Tx Cable Interface Slot 1 b=Tx AIS Interface Slot 1 c=Rx AIS Interface Slot 1 d=Buffer slip Alarm Interface Slot 1 e=External Clock Alarm Interface Slot 1 f=Tx Cable Interface Slot 2 g=Tx AIS Interface Slot 2 h=Rx AIS Interface Slot 2 i=Buffer slip Alarm Interface Slot 2 j=External Clock Alarm Interface Slot 2	MSK= MSK? MSK* MSK#	MSK=abcdefghij klmxxx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Unit Alarm Mask (continued)				k=EbNo Alarm l=BER Alarm m=Rx AGC Alarm xxx=spares **NOTE:** Interface 1 items a thru e set to report as Alarm; Interface 2 items f thru j set to report as Fault; EbNo, BER, Rx AGC alarms reporting is MASKED. **QUERY EXAMPLE:** <0001/MSK?{CR} >0000/MSK=1111100000222xxx{CR}{LF}		
Number of Unread stored Events	N/A	NUE?	3 bytes	Query only. Returns the number of stored events that have not yet been read over the remote interface in the form xxx. **EXAMPLE:** <0001/NUE?{CR} >0000/NUE=126{CR}{LF}	NUE? NUE* NUE#	NUE=xxx
Soft Reboot	RBT=1	N/A	1 byte	Command only. Executes a soft reboot of the unit in the form x where: 1=Reboot System **EXAMPLE:** <0001/RET=1{CR}	RBT? RBT* RBT#	RBT=x
Redundancy State	RED=	RED?	1 byte	Command or Query. Sets or returns the redundancy state of the unit in the form x where: 0=Offline 1=Online **NOTES:** 1) The unit cannot be forced online. You can force the unit offline 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. 2) The unit is always online if Redundancy Mode is not selected. **COMMAND EXAMPLE:** <0001/RED=0{CR} (force unit offline)	RED= RED? RED* RED#	RED=x
Retrieve Next 5 unread stored Events	N/A	RNE?	75 bytes	Query only. Returns the oldest 5 Stored Events that have not yet been read over the remote interface in the form: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body=ABCddmmyyhhmmss: A=fault/clear indicator where F=Fault, C=Clear, I=Info B=fault type where 1=Unit, 2=Rx Traffic, 3=Tx Traffic, 4=Log	RNE? RNE* RNE#	RNE={CR}Sub-body{CR}Sub-body{CR}Sub-body {CR}Sub-body{CR}Sub-body

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Retrieve Next 5 unread stored Events (continued)				C=Fault Code numbers, as in FLT? or Info Code where: 0=Power Off, 1=Power On, 2=Log Cleared, 3=Global Config Change, 4=Redundancy Config Change ; hhmmss=Time in hours/minutes/seconds format **NOTES:** 1) If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. 2) If there are no new events, the response is RNE*.		
GBEI Cable Auto Crossover	SCX	SCX?s	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Cable Auto Crossover in the form sa where: s=2 (Interface Slot 2 only) a= 0 (Disabled) or 1 (Enabled) **COMMAND EXAMPLE:** <0001/SCX=21{CR} (enables crossover)	SCX= SCX# SCX? SCX*	SCX=sa
GBEI Learning Mode	SLM	SLM?s	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Learning Mode in the form sa where: s=2 (Interface Slot 2 only) a=0 (Disabled) or 1 (Enabled) **COMMAND EXAMPLE:** <0001/SLM=21{CR} (enables Learning Mode)	SLM= SLM# SLM? SLM*	SLM=sa
Serial Number	N/A	SNO?	9 bytes	Query only. Returns the unit 9-digit serial number in the form xxxxxxxxx. **EXAMPLE:** <0001/SNO?{CR} >0000/SNO=176500143{CR}{LF}	SNO? SNO* SNO#	SNO=xxxxxxxxx
Software Revision	N/A	SWR?	5 bytes	Query only. 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:** <0001/SWRG1?{CR} >0000/SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0{CR}{LF}	SWR? SWR* SWR#	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Tx Alpha Rolloff	TAR=	TAR?	1 byte	Command or Query. Sets or returns the Tx Alpha Rolloff in the form x where: 0=20% 1=25% 2=35% **COMMAND EXAMPLE:** <0001/TAR=0{CR} (sets as 20%)	TAR= TAR? TAR* TAR#	TAR=x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Tx Clock Invert	TCI=	TCI?s	2 bytes	Command or Query. Sets or returns the Invert Transmit Clock in the form sa where: s=1 (Interface Slot 1 only) a=0 (Normal), 1 (Inverted) **NOTE:** Not applicable to Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/TCI=11{CR} (sets Slot 1, inverted)	TCI = TCI? TCI * TCI #	TCI =sa
Tx Data Invert	TDI=	TDI?sc	2 bytes	Command or Query. Sets or returns Invert Transmit Data in the form sa where: s=1 (Interface Slot 1 only) a=0 (Normal), 1 (Inverted) **NOTE:** Not applicable to Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/TDI=11{CR} (sets Slot 1, Inverted)	TDI = TDI? TDI * TDI #	TDI =sa
Tx Data Rate	N/A	TDR?	10 bytes	Query only. Returns the Composite Tx Data rate, in ksps, in the form xxxxxx. xxx. **QUERY EXAMPLE:** <0001/TDR?{CR} >0000/TDR=002047. 999{CR}{LF}	TDR? TDR* TDR#	TDR=xxxxxx.xxx
Tx Frequency	TFQ=	TFQ?	9 bytes	Command or Query. Sets or returns the Tx Frequency in the form xxxx.xxxx where: xxxx.xxxx=frequency in MHz, in 100 Hz steps: CDM-710G (70/140 MHz) Modulator: 52-88 MHz and 104-176 MHz CDM710GL (L-Band) Modulator: 950-1950 MHz **COMMAND EXAMPLE:** <0001/TFQ=0950.0000{CR} (sets as 950 MHz)	TFQ= TFQ? TFQ* TFQ#	TFQ=xxxx.xxxx
Tx Frame Size	TFS=	TFS?	1 byte	Command or Query. Sets or returns the Tx Frame Size Long/Short selection in the form x where: 0=Short 1=Long **COMMAND EXAMPLE:** <0001/TFS=0{CR} (sets as short size)	TFS= TFS? TFS * TFS #	TFS =x
Tx FEC Type	N/A	TFT?	1 byte	Query only. Returns the Tx FEC coding type in the form x where: 1=LDPC **NOTE:** Returns LDPC only.	TFT? TFT* TFT#	TFT=x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	**Query**			**Response to Command**	**Response to Query**
Tx Gold Code Sequence Index	TGS=	TGS?	6 bytes	Command or Query. Sets or returns the Tx Gold Code Sequence Index in the form xxxxxx,where: xxxxxx=Gold Code Sequence index (0 to 262141) **EXAMPLE:** <0001/TGS=189063{CR}	TGS= TGS? TGS* TGS#	TGS=xxxxxx
Tx Interface Enable	TIE=	TIE?s	2 bytes	Command or Query. Sets or returns Interface Slot operation in the form sx where: s=Specifies the Interface Slot (1 or 2) x=Tx Interface Status where 0=Disable, 1=Enable **COMMAND EXAMPLE:** <0001/TIE=11{CR} (enables Slot 1 interface Tx)	TIE= TIE? TIE* TIE#	TIE=sx
Real-time Clock Time	TIM=	TIM?	6 bytes	Command or Query. Sets or returns the time, from midnight, in the form hhmmss where: hh=hours (00 to 23) mm=minutes (00 to 59) ss=seconds (00 to 59) **COMMAND EXAMPLE:** <0001/TIM=231259{CR} (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM=hhmmss
Tx Location of the Pilot	TLP=	TLP?	1 byte	Command or Query. Sets or returns the Tx Pilot location where: 0=Average 1=Peak **COMMAND EXAMPLE:** <0001/TLP=0{CR} (sets as Average)	TLP= TLP? TLP* TLP#	TLP=x
Temperature	N/A	TMP?	3 bytes	Query only. Returns the value of the internal temperature (degrees C), in the form sxxx where: s=sign (+/-) xxx= temperature in degrees C **EXAMPLE:** <0001/TMP?{CR} >0000/TMP=+026{CR}{LF}	TMP? TMP* TMP#	TMP=sxxx
Tx Pilot On/Off	TPI=	TPI?	1 byte	Command or Query. Sets or returns Tx Pilot operation in the form x where: 0=Off 1=On **COMMAND EXAMPLE:** <0001/TPI=0{CR} (sets Off)	TPI= TPI? TPI* TPI#	TPI=x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	**Query**			**Response to Command**	**Response to Query**
Tx Power Level	TPL=	TPL?	5 bytes	Command or Query. Sets or returns the Tx Output power level in the form sxx.x where: s=sign (+/-) xx.x=Tx Output power level where: CDM-710G (70/140 MHz) range is from -20.0 to +00.0 dBm CDM-710GL (L-Band) range is from -25.0 to -05.0 dBm **NOTE:** Beyond -20 dBm is outside of the specification. **COMMAND EXAMPLE:** <0001/TPL=-13.4{CR}	TPL= TPL? TPL* TPL#	TPL=sxx.x
Tx Spectrum Invert	TSI=	TSI?	1 byte	Command or Query. Sets or returns the Tx Spectrum Invert selection in the form x where: 0=Normal 1=Tx Spectrum Inverted **COMMAND EXAMPLE:** <0001/TSI=0{CR} (sets as normal)	TSI= TSI? TSI* TSI#	TSI=x
Unit Test Mode	TST=	TST?	1 byte	Command or Query. Sets or returns the Test Mode in the form x 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 **COMMAND EXAMPLE:** <0001/TST=4{CR} (sets Tx CW test mode)	TST= TST? TST* TST#	TST=x
Tx Carrier State	TXO=	TXO?	1 byte	Command or Query. Sets or returns the Tx Carrier State in the form x where: 0=OFF due to front panel or remote command 1=ON **COMMAND EXAMPLE:** <0001/TXO=1{CR} (sets as Tx Carrier ON)	TXO= TXO? TXO* TXO#	TXO=x

9.4.2 Demodulator Only Commands and Queries

Priority System =(Highest to lowest priority) RMD>RCR>RSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	**Query**			**Response to Command**	**Response to Query**
Rx Modulation Type	N/A	RMD?	1 byte	Query only. (**SEE NOTE**) Returns the Rx Modulation type in the form x where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **NOTE:** This command is query-only because the demodulation type is automatically detected. If the unit is not locked, the query returns 'x'. **EXAMPLE:** <0001/RMD?{CR} >0000/RMD=1{CR}{LF} (returns type 8PSK)	RMD? RMD* RMD#	RMD=x
Rx FEC Code Rate	N/A	RCR?	1 byte	Query only. (**SEE NOTE**) Returns the Rx Code Rate in the form x 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 ½ **NOTE:** This command is query-only because the code rate is automatically detected. If the unit is not locked, the query returns 'x'. **EXAMPLE:** <0001/RCR=0{CR} >0000/RCR=0{CR}{LF} (returns Rate 3/4)	RCR? RCR* RCR#	RCR=x
Rx Symbol Rate	RSR=	RSR?	9 bytes	Command or Query. Sets or returns the Rx Symbol Rate in the form ss.ssssss where: ss.ssssss=Symbol Rate in Msps **NOTE:** See Chapter 2. Specifications for a list of available code rates for each demodulation type. **COMMAND EXAMPLE:** <0001/RSR=20.000000 (sets as 20 Msps)	RSR= RSR? RSR* RSR#	RSR=ss.ssssss

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Adaptive Equalizer Operation	AEQ=	AEQ?	1 byte	Command or Query. Sets or returns the Adaptive Equalizer operation in the form x where: 0=Disable 1=Enable **COMMAND EXAMPLE:** <0001/AEQ=1{CR} (enables EQ)	AEQ= AEQ? AEQ* AEQ#	AEQ=x
Buffer Fill State	N/A	BFS?s	3 bytes	Query only. Returns the buffer fill state in the form sxx where: s=1 (Interface Slot 1 only) xx=value of the buffer fill state, from 1 to 99%.Returns 00 if demodulator is unlocked. **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **EXAMPLE:** <0001/BFS?{CR} >0000/BFS=133{CR}{LF} (Slot 1 Ch 1 buffer reports @ 33%)	N/A	BFS=sxx
Rx BER Alarm Threshold	BTH=	BTH?	1 bytes	Command or Query. Sets or returns BER Alarm Threshold in the form x where: 0=NONE 3=1E10-3 4 =1E10-4 5=1E10-5 6=1E10-6 7=1E10-7 8 =1E10-8 **EXAMPLE:** <0001/BTH=3{CR} (Sets BER Alarm Threshold to 1E10-3)	BTH= BTH? BTH#	BTH=x
Clear All Stored Events	CAE=	N/A	None	Command only. **THIS COMMAND TAKES NO ARGUMENTS.** Forces the unit to clear the stored events log. **EXAMPLE:** <0001/CAE={CR}	CAE= CAE? CAE* CAE#	N/A
Circuit ID String	CID=	CID?	24 bytes	Command or Query. Sets or returns the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , ./ 0 9 and A thru Z **NOTE:** Trailing spaces are removed upon entry. **COMMAND EXAMPLE:** <0001/CID=ComtechCDM710GL{CR}	CID= CID? CID* CID#	CID=xxxxxxxxxxx xxxxxxxxxxxxx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Configuration Load	CLD=	N/A	1 byte	Command only. Retrieves previously stored configuration from the specified location in the form x where: x=0 to 9 **EXAMPLE:** <0001/CLD=4{CR} (retrieves configuration from location 4)	CLD= CLD? CLD* CLD#	N/A
Configuration Save	CST=	N/A	1 byte	Command only. Stores the current configuration in the specified location in the form x where: x=0 to 9 **EXAMPLE:** <0001/CST=4{CR} (stores the current configuration in location 4)	CST= CST? CST* CST#	N/A
Real-time Clock Date	DAY=	DAY?	6 bytes	Command or Query. Sets or returns the date in the form ddmmyy where: dd=day of the month (01 to 31) mm=month (01 to 12) yy=year (00 to 99) **COMMAND EXAMPLE:** <0001/DAY=240415{CR} (sets April 24, 2015)	DAY= DAY? DAY* DAY#	DAY=ddmmyy
Demodulator Lock Status	N/A	DLK?	1 byte	Query only. Returns the Demodulator Lock Status in the form x where: 0=Demodulator Unlocked 1=Demodulator Locked **EXAMPLE:** <0001/DLK?{CR} >0000/DLK=1{CR}{LF} (Demodulator Locked)	DLK? DLK* DLK#	DLK=x
Equipment ID	N/A	EID?	23 bytes	Query only. Returns the equipment identification and configuration in the form aaabcdefghijklmnopqrstu where: aaa=the unit model number (71G) b=Modulator configuration where 1=70/140 Mhz, 2=L-Band c=Tx Symbol Rate S/W option where 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 where 0=Not installed, 1=Installed	EID? EID* EID#	EID=aaabcdefghijklmnopqrstu

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Equipment ID (continued)				e=S/W option Tx 16-QAM where 0=Not installed, 1=Installed f=S/W option Tx 16APSK where 0=Not installed, 1=Installed g=S/W option Tx 32APSK where 0=Not installed, 1=Installed h=S/W option Tx DVB-S1 where 0=Not installed, 1=Installed i=S/W option Tx DVB-DSNG where 0=Not installed, 1=Installed j=S/W option Tx DVB-S2 where 0=Not installed, 1=Installed k=Demodulator configuration where 0=None, 1=70/140 Mhz, 2=L-Band l=Rx Symbol Rate S/W option where 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 where 0=Not installed, 1=Installed n=S/W option Rx 16-QAM where 0=Not installed, 1=Installed o=S/W option Rx 16APSK where 0=Not installed, 1=Installed p=S/W option Rx 32APSK where 0=Not installed, 1=Installed q=S/W option Rx DVB-S1 where 0=Not installed, 1=Installed r=S/W option Rx DVB-DSNG where 0=Not installed, 1=Installed s=S/W option Rx DVB-S2 where 0=Not installed, 1=Installed t=Interface Slot 1 where 0=None, 1=Reserved, 2=CDI-70 GBEI **(NOT USED)**, 3=CDI-60 HSSI, 4=CDI-10-1 E3T3STS1 u=Interface Slot 2 where 0=None, 1=Reserved, 2=CDI-70 GBEI, 3=CDI-60 HSSI **(NOT USED)**, 4=CDI-10-1 E3T3STS1 **(NOT USED)** **NOTE:** When unit is 'DEMODULATOR ONLY' query returns '0 (Not Installed)' for Tx options.		
Eb/No Alarm Point	EBA=	EBA?	4 bytes	Command or Query. Sets or returns the Eb/No alarm point in the form xx.x where: xx.xx=value from 0.1 to 16 dB, in 0.1 dB steps. **COMMAND EXAMPLE:** <0001/EBA=12.3{CR}	EBA= EBA? EBA* EBA#	EBA=xx.x
Query Rx Eb/No	N/A	EBN?	4 bytes	Query only. Returns the value of Eb/No in the form xxxx where: xxxx=value, in 0.1 dB steps, from 0 to 16 dB. **NOTES:** 1) Returns 99.9 if demod is unlocked. 2) For values greater than 16.0 dB, the response is EBN=+016 **EXAMPLE:** <0001/EBN?{CR} >0000/EBN=12.3{CR}{LF}	EBN? EBN* EBN#	EBN=xx.x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
E3T3STS1 Interface Reference Clock	EFI=	EFI?s	2 bytes	Command or Query. Sets or returns the Interface Reference Clock in the form sx where: s=1 (Interface Slot 1 only) 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:** Valid only with the CDI-10-1 E3T3STS1 module interface. **COMMAND EXAMPLE:** <0001/EFI=14{CR} (sets 10MHz on Slot 1)	EFI= EFI? EFI* EFI#	EFI=sx
External Reference Frequency	ERF=	ERF?	1 byte	Command or Query. Sets or returns the External Reference Frequency in the form x where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz **COMMAND EXAMPLE:** <0001/ERF=0{CR} (sets internal reference – external reference not used)	ERF= ERF? ERF* ERF#	ERF=x
Query Rx Es/No	N/A	ESN?	4 bytes	Query only. Returns the value of Es/No (when in DVB-S2 mode) in the form xx.x where: xx.x=Value from 0 to 22 dB, in 0.1 dB steps. **NOTES:** 1) Returns 99.9 if demod is unlocked. 2) For values greater than 22.0 dB, the reply will be ESN=+022 **EXAMPLE:** <0001/ESN=?{CR} >0000/ESN=12.3{CR}{LF} (Es/No reports as 12.3 dB)	ESN? ESN* ESN#	ESN=xx.x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Redundancy Switch Mode	ESW=	ESW?	1 byte	Command or Query. Sets or returns redundancy mode in the form x, where : 0=Disable 1=Enable **COMMAND EXAMPLE:** <0001/ESW=1{CR} (enables redundancy mode)	ESW= ESW? ESW* ESW#	ESW=x
E3T3STS1 Interface Mode Select	ETS=	ETS?s	2 bytes	Command or Query. Sets the CDI-10-1 E3T3STS1 module interface mode in the form sm where:. s=1 (Interface Slot 1 only) m=Mode where 0=E3, 1=T3, 2=STS1 **NOTE:** Valid only with the CDI-10-1 E3T3STS1 module 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. **COMMAND EXAMPLE:** <0001/ETS=11{CR} (sets Slot 1, Port 1 to T3 mode)	ETS= ETS? ETS# ETS*	ETS=sm
Firmware Revisions	N/A	FRW?i	1 byte	Query only. Returns the firmware information of the system where: i=Bulk Image number (1 or 2) a=Firmware Image b=Firmware Revision c=Firmware Date **EXAMPLE:** <0001/FRW?1{CR} (queries the Bulk Image 1 firmware load)	FRW? FRW* FRW#	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c…
GBEI Management IP Address and Subnet	GIP=	GIP?s	19 bytes	Command or Query. Sets or returns the CDI-70 GBEI Management IP Address and Subnet Mask in the form sxxx.xxx.xxx.xxx.yy where: s=2 (Interface Slot 2 only) xxx.xxx.xxx.xxx=IP Address yy=Subnet Mask **COMMAND EXAMPLE:** <0001/GIP=2192.168.001.001.24{CR}	GIP= GIP# GIP? GIP*	GIP=sxxx.xxx.xxx.xxx.yy
GBEI MAC Address	GMC?	GMC?s	N/A	Query only. Returns MAC address for the CDI-70 GBEI in the form sAABBCCDDEEFF where: s=2 (Interface Slot 2 only) AABBCCDDEEFF=MAC Address in hexadecimal format **EXAMPLE:** <0001/GMC?2{CR} >0000/GMC=20006B000D2A7{CR}{LF}	GMC? GMC* GMC#	GMC=sAABBCCDDEEFF

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
GBEI Software Revision	N/A	GSW?s	N/A	Query only. Returns firmware information for CDI-70 GBEI in the form s where: s=2 (Interface Slot 2 only) **EXAMPLE:** <0001/GSW?2{CR} >0000/GSW=2FW/12738-,1.1.8,02/16/07{CR}{LF}	N/A	GSW=s{FW#},X.X.X,mm/dd/yy
Initialize Events Pointer	IEP=	N/A	None	Command only. **THIS COMMAND TAKES NO ARGUMENTS.** Resets the internal pointer to allow RNE? queries to start at the beginning of the stored events log. **EXAMPLE:** <0001/IEP={CR}	IEP= IEP? IEP* IEP#	N/A
Boot Image	IMG=	IMG?	1 byte	Command only. Selects the Boot image in the form n where: n=image number 1 or 2 **EXAMPLE:** <0001/IMG=1{CR} (sets Image #1 for booting)	IMG= IMG? IMG* IMG#	IMG=n
Tx Output Impedance	IMP=	IMP?	1 byte	**(CDM-710G 70/140 MHz UNIT ONLY)** Command or Query. Sets or returns the Tx output impedance in the form x where: 0=50 Ohm 1=75 Ohm **COMMAND EXAMPLE:** <0001/IMP=0{CR} (Sets as 50 Ohms)	IMP= IMP? IMP* IMP#	IMP=x
Management IP Address	IPA=	IPA?	18 bytes	Command or Query. Sets or returns the IP Address and Subnet Mask for the 10/100 BaseT 'J4 | Ethernet' management port, in the form xxx.xxx.xxx.xxx.yy where: xxx.xxx.xxx.xxx=IP Address yy=Subnet Mask (00 to 31) **COMMAND EXAMPLE:** <0001/IPA=010.006.030.001.24{CR}	IPA= IPA? IPA* IPA#	IPA=xxx.xxx.xxx.xxx.yy
Gateway IP Address	IPG=	IPG?	15 bytes	Command or Query. Sets or returns the Gateway IP Address for the 10/100 Base Tx Ethernet management port in the form xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx=IP Address **COMMAND EXAMPLE:** <0001/IPG=010.006.030.001{CR}	IPG= IPG? IPG* IPG#	IPG=xxx.xxx.xxx.xxx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	**Query**			**Response to Command**	**Response to Query**
Interface Type	N/A	ITF?s	2 bytes	Query only. Returns Interface Type where: s=Interface Slot 1 or 2 x=Interface type where: 0=Reserved 1=Reserved 2=CDI-70 GBEI (Slot 2 only) 3=CDI-60 HSSI (Interface Slot 1 only) 4=CDI-10-1 E3T3STS1 (Interface Slot 1 only) **EXAMPLE:** <0001/ITF?1{CR} >0000/ITF=13{CR}{LF} (Slot 1, CDI-60 HSSI module interface active)	ITF? ITF* ITF#	ITF=sx
Rx Link Margin	N/A	LNK?	4 bytes	Query only. Returns the value of the Link Margin in the form xx.x. **NOTE:** Returns 00.0 if demod is unlocked. **EXAMPLE:** <0001/LNK? >0000/LNK=12.3{CR}{LF}	LNK? LNK* LNK#	LNK=xx.x
Local/Remote Status	LRS=	LRS?	1 byte	Command or Query. Local/Remote status where: 0=Local 1=Serial 2=Reserved 3=Ethernet **COMMAND EXAMPLE:** <0001/LRS=3{CR} (sets Ethernet Remote mode)	LRS= LRS? LRS* LRS#	LRS=x
Unit MAC Address	N/A	MAC?	12 bytes	Query only. Returns MAC address of the unit, in hexadecimal. **EXAMPLE:** <0001/MAC?{CR} >0000/MAC=0006B000D2A7{CR}{LF} (00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC=AABBCCDD EEFF

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Unit Alarm Mask	MSK=	MSK?	13 bytes	Command or Query. Sets or returns reporting conditions as 0=Alarm, 1=Fault, or 2=Masked for each item in the form abcdefghijkLmxxx where: a=Tx Cable Interface Slot 1 b=Tx AIS Interface Slot 1 c=Rx AIS Interface Slot 1 d=Buffer slip Alarm Interface Slot 1 e=External Clock Alarm Interface Slot 1 f=Tx Cable Interface Slot 2 g=Tx AIS Interface Slot 2 h=Rx AIS Interface Slot 2 i=Buffer slip Alarm Interface Slot 2 j=External Clock Alarm Interface Slot 2 k=EbNo Alarm l=BER Alarm m=Rx AGC Alarm xxx=spares **QUERY EXAMPLE:** <0001/MSK?{CR} >0000/MSK=1111100000222xxx{CR}{LF} (Interface Slot 1 items a thru e set to report as Alarm; Interface Slot 2 items f thru j set to report as Fault; EbNo, BER, Rx AGC alarms reporting is MASKED)	MSK= MSK? MSK* MSK#	MSK=abcdefghijklmxxx
Number of Unread stored Events	N/A	NUE?	3 bytes	Query only. Returns the number of stored events that have not yet been read over the remote interface in the form xxx. **EXAMPLE:** <0001/NUE?{CR} >0000/NUE=126{CR}{LF}	NUE? NUE* NUE#	NUE=xxx
Rx Alpha Rolloff	RAR=	RAR?	1 byte	Command or Query. Sets or returns the Rx Alpha Rolloff in the form x where: 0=20% 1=25% 2=35% **COMMAND EXAMPLE:** <0001/RAR=0{CR} (sets Rolloff of 20%)	RAR= RAR? RAR* RAR#	RAR=x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Rx Buffer Size	RBS=	RBS?s	5 bytes	Command or Query. Sets or returns the Rx Buffer Size, in milliseconds, in the form sxx.x where: s=1 (Interface Slot 1 only) xx.x=Rx Buffer Size where: HSSI=value from 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:** Not applicable to Interface Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/RBS=130.0{CR} (sets 30.0 ms on Slot 1)	RBS= RBS? RBS* RBS#	RBS=sxx.x
Soft Reboot	RBT=1	N/A	1 byte	Command only. Executes a soft reboot of the unit in the form x where: 1=Reboot System **EXAMPLE:** <0001/RET=1{CR}	RBT? RBT* RBT#	RBT=x
ReCenter Buffer	RCB=	N/A	2 bytes	Command only. Forces the software to recenter the receive Plesiochronous/Doppler buffer in the form x, where:. x=1 (Interface Slot 1 only) **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **EXAMPLE:** <0001/RCB=11{CR} (ReCenter buffer on Slot 1 Ch #1)	RCB= RCB? RCB* RCB#	N/A
Rx Clock Inverted	RCI=	RCI?s	2 bytes	Command or Query. Sets or returns Inverted Receive Clock in the form sx where: s=1 (Interface Slot 1 only) x=Inverted Receive Clock where 0=Normal, 1=Inverted **NOTE:** Applicable to HSSI operation only. **COMMAND EXAMPLE:** <0001/RCI=11{CR} (sets Slot 1, Inverted RX Clock)	RCI = RCI? RCI * RCI #	RCI=sx
Rx Clock Source	RCK=	RCK?s	2 bytes	Command or Query. Sets or returns Rx Clock Source (For Data Rate Accuracy) in the form sx, where: s=1 (Interface Slot 1 only) x=Rx Clock Source where 0=Rx Satellite, 1=Tx-Terrestrial, 2=External Reference Clock, 3=Internal (HSSI Only) **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/RCK=11{CR} (sets Tx-Terrestrial)	RCK= RCK? RCK* RCK#	RCK=sx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Rx Data Invert	RDI=	RDI?s	2 bytes	Command or Query. Sets or returns the Invert Receive Data in the form sx where: s=1 (Interface Slot 1 only) x=Invert Receive Data where 0=Normal, 1=Inverted **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/RDI=11{CR} (sets Inverted RX Data)	RDI = RDI? RDI* RDI#	RDI=sx
Rx Data Rate	N/A	RDR?	10 bytes	Query only. Returns the Composite Rx Data rate, in the form xxxxxx.xxx where: xxxxxx.xxx=rate in kbps, in 1 bps steps. **EXAMPLE:** <0001/RDR?{CR} >0000/RDR=002047.999 (Reports 2047.999 kbps data rate)	RDR? RDR* RDR#	RDR=xxxxxx.xxx
Redundancy State	RED=	RED?	1 byte	Command or Query. Sets or returns the redundancy state of the unit in the form x where: 0=Offline 1=Online **NOTES:** 1) The unit cannot be forced online. You can force the unit offline 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. 2) The unit is always online if Redundancy Mode is not selected. **COMMAND EXAMPLE:** <0001/RED=0{CR} (force unit offline)	RED= RED? RED* RED#	RED=x
Restore Factory Defaults	RFD=	N/A	0 bytes	Command only. **THIS COMMAND TAKES NO ARGUMENTS.** Restores the unit to factory default configuration. **EXAMPLE:** <0001/RFD={CR}	RFD=	N/A
Rx Buffer Frame	RFM=	RFM?s	3 bytes	Command or Query. (G.703 Parameters) Sets or returns the Rx Buffer Frame in the form sx where: s=1 (Interface Slot 1 only) x=Rx Ternary Code where 0=None (E3, T3, or STS-1), 1=G.751 (E3 only), 2=G.752 (T3 only), 3=G.753 (E3 only), 4=STS-1 (STS-1) **NOTE:** Valid only with Interface Slot 1 CDI-10-1 E3T3STS1 module. **COMMAND EXAMPLE:** <0001/RFM=11{CR} (sets G.751 for Slot 1, Ch #1)	RFM= RFM? RFM* RFM#	RFM=sx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Rx Frequency Offset	N/A	RFO?	5 bytes	Query only. Returns the value of the measured frequency offset of the carrier being demodulated in the form sxxx.x where: s=sign (+/-) xxx.x=value in range from ± 0 to 100 kHz, in 100 Hz steps **NOTE:** Returns 999999 if the demodulator is unlocked. **EXAMPLE:** <0001/RFO=+002.3{CR} (+2.3 kHz)	RFO? RFO* RFO#	RFO=sxxx.x
Rx Frequency	RFQ=	RFQ?	9 bytes	Command or Query. Sets or returns the Rx Frequency in the form xxxx.xxxx where: xxxx.xxxx=frequency in MHz, in 100 Hz steps: CDM-710G (70/140 MHz) Demodulator: 52-88 MHz and 104-176 MHz CDM710GL (L-Band Demodulator: 950-1950 MHz **COMMAND EXAMPLE:** <0001/RFQ=0950.0000{CR}	RFQ= RFQ? RFQ* RFQ#	RFQ=xxxx.xxxx
Rx Frame Size	N/A	RFS?	1 byte	Query only. Returns the Rx Frame Size Long/Short selection in the form x where: 0=Short 1=Long **NOTE:** This is automatically detected on demod acquisition, but if the unit is not locked, the query returns 'x'. **EXAMPLE:** <0001/RFS?{CR} >0000/RFS=0 (Short Frame Size)	N/A	RFS=x
Rx Gold Code Sequence Index	RGS=	RGS?	6 bytes	Command or Query. Sets or returns the Rx Gold Code Sequence Index in the form xxxxxx where: xxxxxx=Gold Code Sequence index (0 to 262141) **COMMAND EXAMPLE:** <0001/RGS=189063{CR}	RGS= RGS? RGS* RGS#	RGS=xxxxxx
Rx Interface Enable	RIE=	RIE?s	2 bytes	Command or Query. Sets or returns the Interface Slot status in the form sx where: s=Interface Slot 1 or 2 x=Rx Interface Status where 0=Disabled, 1=Enabled **COMMAND EXAMPLE:** <0001/RIE =11 (enables Slot 1 receive interface)	RIE= RIE? RIE* RIE#	RIE=sx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Retrieve Next 5 unread stored Events	N/A	RNE?	75 bytes	Query only. Returns the oldest 5 Stored Events that have not yet been read over the remote interface in the form: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body=ABCddmmyyhhmmss: A=fault/clear indicator where F=Fault, C=Clear, I=Info B=fault type where 1=Unit, 2=Rx Traffic, 3=Tx Traffic, 4=Log C=Fault Code numbers, as in FLT? or Info Code where 0=Power Off, 1=Power On, 2=Log Cleared, 3=Global Config Change, 4=Redundancy Config Change ddmmyy=Date in day/month/year format hhmmss=Time in hours/minutes/seconds format **NOTES:** 1) If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. 2) If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE={CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body
Rx Pilot On/Off	N/A	RPI?	1 byte	Query only. Sets or returns the Rx Pilot status in the form x where: 0=Off 1=On **NOTE:** This is automatically detected on demod acquisition, but if the unit is not locked, the query returns 'x'. **EXAMPLE:** <0001/RPI?{CR} >0000/RPI=0{CR}{LF} (Pilot Off)	RPI? RPI* RPI#	RPI=x
Rx Signal Level	N/A	RSL?	3 bytes	Query only. Returns the value of the Rx signal level in the form sxx where: s=sign (+/-) xx=Value from -99.0 to +3.0 dBm, in 0.1 dBm steps **EXAMPLE 1:** <0001/RSL?{CR} >0000/RSL=+03{CR}{LF} **EXAMPLE 2:** <0001/RSL?{CR} >0000/RSL=-41{CR}{LF}	RSL? RSL* RSL#	RSL=sxx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Rx Demod Acquisition Sweep Width	RSW=	RSW?	3 bytes	Command or Query. Sets or returns the Rx ± acquisition sweep range of demodulator in the form xxx where: xxx=value in KHz from ± 1 to 100 kHz. **COMMAND EXAMPLE:** <0001/RSW=009{CR} (sets ± 9 kHz)	RSW= RSW? RSW* RSW#	RSW=xxx
GBEI Cable Auto Crossover	SCX	SCX?s	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Cable Auto Crossover in the form sa where: s=2 (Interface Slot 2 only) a= 0 (Disabled) or 1 (Enabled) **COMMAND EXAMPLE:** <0001/SCX=21{CR} (enables crossover)	SCX= SCX# SCX? SCX*	SCX=sa
GBEI Learning Mode	SLM	SLM?s	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Learning Mode in the form sa where: s=2 (Interface Slot 2 only) a=0 (Disabled) or 1 (Enabled) **COMMAND EXAMPLE:** <0001/SLM=21{CR} (enables Learning Mode)	SLM= SLM# SLM? SLM*	SLM=sa
Serial Number	N/A	SNO?	9 bytes	Query only. Returns the unit 9-digit serial number in the form xxxxxxxxx. **EXAMPLE:** <0001/SNO?{CR} >0000/SNO=176500143{CR}{LF}	SNO? SNO* SNO#	SNO=xxxxxxxxx
Software Revision	N/A	SWR?	5 bytes	Query only. 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:** <0001/SWRG1?{CR} >0000/SWR=Boot:1.0.3 Bulk1:1.0.1 Bulk2:1.0.0{CR}{LF}	SWR? SWR* SWR#	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Real-time Clock Time	TIM=	TIM?	6 bytes	Command or Query. Sets or returns the time, from midnight, in the form hhmmss where: hh=hours (00 to 23) mm=minutes (00 to 59) ss=seconds (00 to 59) **COMMAND EXAMPLE:** <0001/TIM=231259{CR} (23 hours:12 minutes:59 seconds)	TIM= TIM? TIM* TIM#	TIM=hhmmss

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Tx Line Code	TLC=	TLC?s	2 bytes	Command or Query. (**G.703 Parameters)** Sets or returns the Tx Line Code in the form sx where: s=1 (Interface Slot 1 only) x= Tx Line Code where 0=None (valid for E3, T3, and STS-1), 1=HDB3 (valid for E3), or 2=B3ZS (Valid for T3 and STS-1) **NOTE:** Valid only with the CDI-10 Single G.703 module interface. **COMMAND EXAMPLE:** <0001/TLC=11{CR} (sets Slot 1 Channel 1 Line Code to HDB3).	TLC= TLC? TLC* TLC#	TLC=sxx
Temperature	N/A	TMP?	3 bytes	Query only. Returns the value of the internal temperature (degrees C), in the form sxxx where: s=sign (+/-) xxx= temperature in degrees C **EXAMPLE:** <0001/TMP?{CR} >0000/TMP=+026{CR}{LF}	TMP? TMP* TMP#	TMP=sxxx

9.4.3 Modem (Modulator+Demodulator) Commands and Queries

Priority System=(From highest to lowest priority) TMD>TCR>TSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Tx Modulation Type	TMD=	TMD?	1 byte	Command or Query. Sets or returns Tx Modulation type in the form x where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **COMMAND EXAMPLE:** <0001/TMD=1{CR} (sets as 8PSK)	TMD= TMD? TMD* TMD#	TMD=x
Tx FEC Code Rate	TCR=	TCR?	1 byte	Command or Query. Sets or returns Tx Code Rate* in the form x 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 **COMMAND EXAMPLE:** <0001/TCR=0{CR} (sets as Rate 3/4) ***NOTE:** See Chapter 2. SPECIFICATIONS for a list of available code rates for each modulation type.	TCR= TCR? TCR* TCR#	TCR=x
Tx Symbol Rate	TSR=	TSR?	9 bytes	Command or Query. Sets or returns Tx Symbol Rate in the form ss. ssssss where: ss. ssssss=Symbol Rate in Msps **COMMAND EXAMPLE:** <0001/TSR=20. 000000{CR} (sets as 20 Msps)	TSR= TSR? TSR* TSR#	TSR=ss.ssssss

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Buffer Fill State	N/A	BFS?s	3 bytes	Query only. Returns the buffer fill state in the form sxx where: s=1 (Interface Slot 1 only) xx=value of the buffer fill state, from 1 to 99%. Returns 00 if demodulator is unlocked. **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **EXAMPLE:** <0001/BFS?{CR} >0000/BFS=133{CR}{LF} (Slot 1 Ch 1 buffer reports @ 33%)	N/A	BFS=sxx
E3T3STS1 Interface Reference Clock	EFI=	EFI?s	2 bytes	Command or Query. Sets or returns the Interface Reference Clock in the form sx where: s=1 (Interface Slot 1 only) 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:** Valid only with the CDI-10-1 E3T3STS1 module. **COMMAND EXAMPLE:** <0001/EFI=14{CR} (sets 10MHz on Slot 1)	EFI= EFI? EFI* EFI#	EFI=sx
E3T3STS1 Interface Mode Select	ETS=	ETS?s	2 bytes	Command or Query. Sets the CDI-10-1 E3T3STS1 module interface mode in the form sm where:. s=1 (Interface Slot 1 only) m=Mode where 0=E3, 1=T3, 2=STS1 **NOTE:** Valid only with the CDI-10-1 E3T3STS1 module. 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. **COMMAND EXAMPLE:** <0001/ETS=11{CR} (sets Slot 1, Port 1 to T3 mode)	ETS= ETS? ETS# ETS*	ETS=sm

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
GBEI MAC Address	GMC?	GMC?s	N/A	Query only. Returns MAC address for the CDI-70 GBEI in the form sAABBCCDDEEFF where: s=2 (Interface Slot 2 only) AABBCCDDEEFF=MAC Address in hexadecimal format **EXAMPLE:** <0001/GMC?2{CR} >0000/GMC=20006B000D2A7{CR}{LF}	GMC? GMC* GMC#	GMC=sAABBCCD DEEFF
GBEI Software Revision	N/A	GSW?s	N/A	Query only. Returns firmware information for CDI-70 GBEI in the form s where: s=2 (Interface Slot 2 only) **EXAMPLE:** <0001/GSW?2{CR} >0000/GSW=2FW/12738-,1. 1. 8,02/16/07{CR}{LF}	N/A	GSW=s{FW#},X. X.X,mm/dd/yy
Tx Output Impedance	IMP=	IMP?	1 byte	**(CDM-710G 70/140 MHz UNIT ONLY)** Command or Query. Sets or returns the Tx output impedance in the form x where: 0=50 Ohm 1=75 Ohm **COMMAND EXAMPLE:** <0001/IMP=0{CR} (Sets as 50 Ohms)	IMP= IMP? IMP* IMP#	IMP=x
Rx Buffer Size	RBS=	RBS?s	5 bytes	Command or Query. Sets or returns the Rx Buffer Size, in milliseconds, in the form sxx. x where: s=1 (Interface Slot 1 only) xx. x=Rx Buffer Size where: HSSI=value from 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:** Not applicable to Interface Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/RBS=130. 0{CR} (sets 30. 0 ms on Slot 1)	RBS= RBS? RBS* RBS#	RBS=sxx.x
ReCenter Buffer	RCB=	N/A	2 bytes	Command only. Forces the software to recenter the receive Plesiochronous/Doppler buffer in the form x, where:. x=1 (Interface Slot 1 only) **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **EXAMPLE:** <0001/RCB=11{CR} (ReCenter buffer on Slot 1 Ch #1)	RCB= RCB? RCB* RCB#	N/A

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	**Query**			**Response to Command**	**Response to Query**
Rx Clock Source	RCK=	RCK?s	2 bytes	Command or Query. Sets or returns Rx Clock Source (For Data Rate Accuracy) in the form sx, where: s=1 (Interface Slot 1 only) x=Rx Clock Source where 0=Rx Satellite, 1=Tx-Terrestrial, 2=External Reference Clock, 3=Internal (HSSI Only) **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/RCK=11{CR} (sets Tx-Terrestrial)	RCK= RCK? RCK* RCK#	RCK=sx
Rx Buffer Frame	RFM=	RFM?s	3 bytes	Command or Query. (G. 703 Parameters) Sets or returns the Rx Buffer Frame in the form sx where: s=1 (Interface Slot 1 only) x=Rx Ternary Code where 0=None (E3, T3, or STS-1), 1=G. 751 (E3 only), 2=G. 752 (T3 only), 3=G. 753 (E3 only), 4=STS-1 (STS-1) **NOTE:** Valid only with Interface Slot 1 CDI-10-1 E3T3STS1 module. **COMMAND EXAMPLE:** <0001/RFM=11{CR} (sets G. 751 for Slot 1, Ch #1)	RFM= RFM? RFM* RFM#	RFM=sx
Tx Alpha Rolloff	TAR=	TAR?	1 byte	Command or Query. Sets or returns the Tx Alpha Rolloff in the form x where: 0=20% 1=25% 2=35% **COMMAND EXAMPLE:** <0001/TAR=0{CR} (sets as 20%)	TAR= TAR? TAR* TAR#	TAR=x
Tx Clock Invert	TCI=	TCI?s	2 bytes	Command or Query. Sets or returns the Invert Transmit Clock in the form sa where: s=1 (Interface Slot 1 only) a=0 (Normal), 1 (Inverted) **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/TCI=11{CR} (sets Slot 1, inverted)	TCI = TCI? TCI * TCI #	TCI =sa
Tx Data Invert	TDI=	TDI?sc	2 bytes	Command or Query. Sets or returns Invert Transmit Data in the form sa where: s=1 (Interface Slot 1 only) a=0 (Normal), 1 (Inverted) **NOTE:** Not applicable to Interface Slot 2 GBEI operation. **COMMAND EXAMPLE:** <0001/TDI=11{CR} (sets Slot 1, Inverted)	TDI = TDI? TDI * TDI #	TDI =sa

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Tx Data Rate	N/A	TDR?	10 bytes	Query only. Returns the Composite Tx Data rate in the form xxxxxx. xxx where: xxxxxx. xxx=rate in ksps, in 1 bps steps. **EXAMPLE:** <0001/TDR=002047. 999{CR} (sets as 2047. 999 kbps)	TDR? TDR* TDR#	TDR=xxxxxx.xxx
Tx Frequency	TFQ=	TFQ?	9 bytes	Command or Query. Sets or returns the Tx Frequency in the form xxxx. xxxx where: xxxx. xxxx=frequency in MHz, in 100 Hz steps: CDM-710G (70/140 MHz) Modulator: 52-88 MHz and 104-176 MHz CDM710GL (L-Band) Modulator: 950-1950 MHz **COMMAND EXAMPLE:** <0001/TFQ=0950. 0000{CR} (sets as 950 MHz)	TFQ= TFQ? TFQ* TFQ#	TFQ=xxxx.xxxx
Tx Frame Size	TFS=	TFS?	1 byte	Command or Query. Sets or returns the Tx Frame Size Long/Short selection in the form x where: 0=Short 1=Long **EXAMPLE:** <0001/TFS=0{CR} (sets as short size)	TFS= TFS? TFS * TFS #	TFS =x
Tx FEC Type	N/A	TFT?	1 byte	Query only. Returns the Tx FEC coding type in the form x where: 1=LDPC **NOTE:** Returns LDPC only.	TFT? TFT* TFT#	TFT=x
Tx Gold Code Sequence Index	TGS=	TGS?	6 bytes	Command or Query. Sets or returns the Tx Gold Code Sequence Index in the form xxxxxx,where: xxxxxx=Gold Code Sequence index (0 to 262141) **EXAMPLE:** <0001/TGS=189063{CR}	TGS= TGS? TGS* TGS#	TGS=xxxxxx
Tx Interface Enable	TIE=	TIE?s	2 bytes	Command or Query. Sets or returns Interface Slot operation in the form sx where: s=Specifies the Interface Slot (1 or 2) x=Tx Interface Status where 0=Disable, 1=Enable **COMMAND EXAMPLE:** <0001/TIE=11{CR} (enables Slot 1 Tx)	TIE= TIE? TIE* TIE#	TIE=sx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Tx Line Code	TLC=	TLC?s	2 bytes	Command or Query. **(G. 703 Parameters)** Sets or returns the Tx Line Code in the form sx where: s=1 (Interface Slot 1 only) x= Tx Line Code where 0=None (valid for E3, T3, and STS-1), 1=HDB3 (valid for E3), or 2=B3ZS (Valid for T3 and STS-1) **NOTE:** Valid only with the CDI-10 Single G. 703 module interface. **COMMAND EXAMPLE:** <0001/TLC=11{CR} (sets Slot 1 Channel 1 Line Code to HDB3).	TLC= TLC? TLC* TLC#	TLC=sxx
Tx Location of the Pilot	TLP=	TLP?	1 byte	Command or Query. Sets or returns the Tx Pilot location where: 0=Average 1=Peak **COMMAND EXAMPLE:** <0001/TLP=0{CR} (sets as Average)	TLP= TLP? TLP* TLP#	TLP=x
Tx Pilot On/Off	TPI=	TPI?	1 byte	Command or Query. Sets or returns Tx Pilot operation in the form x where: 0=Off 1=On **COMMAND EXAMPLE:** <0001/TPI=0{CR} (sets Off)	TPI= TPI? TPI* TPI#	TPI=x
Tx Power Level	TPL=	TPL?	5 bytes	Command or Query. Sets or returns the Tx Output power level in the form sxx. x where: s=sign (+/-) xx. x=Tx Output power level where: CDM-710G (70/140 MHz) range is from -20. 0 to +00. 0 dBm CDM-710GL (L-Band) range is from -25. 0 to -05. 0 dBm **NOTE:** Beyond -20 dBm is outside of the specification. **COMMAND EXAMPLE:** <0001/TPL=-13. 4{CR}	TPL= TPL? TPL* TPL#	TPL=sxx.x
Tx Spectrum Invert	TSI=	TSI?	1 byte	Command or Query. Sets or returns the Tx Spectrum Invert selection in the form x where: 0=Normal 1=Tx Spectrum Inverted **COMMAND EXAMPLE:** <0001/TSI=0{CR} (sets as normal)	TSI= TSI? TSI* TSI#	TSI=x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Tx Carrier State	TXO=	TXO?	1 byte	Command or Query. Sets or returns the Tx Carrier State in the form x where: 0=OFF due to front panel or remote command 1=ON **COMMAND EXAMPLE:** <0001/TXO=1{CR} (sets as Tx Carrier ON)	TXO= TXO? TXO* TXO#	TXO=x

9.4.4 Priority System Commands and Queries

Priority System = (Highest to lowest priority) RMD>RCR>RSR. Any change to a higher priority parameter can override any of the parameters of lower priority.

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	**Query**			**Response to Command**	**Response to Query**
Rx Modulation Type	N/A	RMD?	1 byte	Query only. (**SEE NOTE)** Returns the Rx Modulation type in the form x where: 0=QPSK 1=8PSK 2=Reserved 3=16APSK 4=32APSK **NOTE:** This command is query-only because the demodulation type is automatically detected. If the unit is not locked, the query returns ‘x’.	RMD? RMD* RMD#	RMD=x
Rx FEC Code Rate	N/A	RCR?	1 byte	Query only. (**SEE NOTE)** Returns the Rx Code Rate in the form x 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 ½ **NOTE:** This command is query-only because the code rate is automatically detected. If the unit is not locked, the query returns ‘x’.	RCR? RCR* RCR#	RCR=x
Rx Symbol Rate	RSR=	RSR?	9 bytes	Command or Query. Sets or returns the Rx Symbol Rate in the form ss.ssssss where: ss.ssssss=Symbol Rate in Msps **NOTE:** See Chapter 2. Specifications for a list of available code rates for each demodulation type.	RSR= RSR? RSR* RSR#	RSR=ss.ssssss

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Adaptive Equalizer Operation	AEQ=	AEQ?	1 byte	Command or Query. Sets or returns the Adaptive Equalizer operation in the form x where: 0=Disable 1=Enable	AEQ= AEQ? AEQ* AEQ#	AEQ=x
Clear All Stored Events	CAE=	N/A	None	Command only. **THIS COMMAND TAKES NO ARGUMENTS.** Forces the unit to clear the stored events log.	CAE= CAE? CAE* CAE#	N/A
Circuit ID String	CID=	CID?	24 bytes	Command or Query. Sets or returns the user-defined Circuit ID string, which is a fixed length of 24 characters. Valid characters include: Space ( ) * + – , ./ 0 9 and A thru Z **NOTE:** Trailing spaces are removed upon entry.	CID= CID? CID* CID#	CID=xxxxxxxxxxx xxxxxxxxxxxxx
Configuration Load	CLD=	N/A	1 byte	Command only. Retrieves previously stored configuration from the specified location in the form x where: x=0 to 9	CLD= CLD? CLD* CLD#	N/A
Configuration Save	CST=	N/A	1 byte	Command only. Stores the current configuration in the specified location in the form x where: x=0 to 9	CST= CST? CST* CST#	N/A
Real-time Clock Date	DAY=	DAY?	6 bytes	Command or Query. Sets or returns the date in the form ddmmyy where: dd=day of the month (01 to 31) mm=month (01 to 12) yy=year (00 to 99)	DAY= DAY? DAY* DAY#	DAY=ddmmyy
Demodulator Lock Status	N/A	DLK?	1 byte	Query only. Returns the Demodulator Lock Status in the form x where: 0=Demodulator Unlocked 1=Demodulator Locked	DLK? DLK* DLK#	DLK=x
Eb/No Alarm Point	EBA=	EBA?	4 bytes	Command or Query. Sets or returns the Eb/No alarm point in the form xx.x where: xx.xx=value from 0.1 to 16 dB, in 0.1 dB steps	EBA= EBA? EBA* EBA#	EBA=xx.x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Query Rx Eb/No	N/A	EBN?	4 bytes	Query only. Returns the value of Eb/No in the form xxxx where: xxxx=value, in 0.1 dB steps, from 0 to 16 dB. **NOTES:** 1) Returns 99.9 if demod is unlocked. 2) For values greater than 16.0 dB, the response is EBN=+016	EBN? EBN* EBN#	EBN=xx.x
Faults and Status	N/A	FLT?	4 bytes	Query only. Returns the current fault and status codes for the Unit (hardware), Tx Traffic, and Rx Traffic in the form abcde where: a=Unit Faults where 0=No faults 1=Framer FPGA Load 2=Power supply fault, +1.5V Framer Card 3=Power supply fault, +1.5V Interface Slot 1 4=Power supply fault, +1.5V Interface Slot 2 5=Power supply fault, +3.3V Framer Card 6=Power supply fault, +5.0V Framer Card 7=Power supply fault, +12.0V Framer Card 8=Power supply fault, -12.0V Framer Card 9=Power supply fault, +18.0V Framer Card A=FLASH Checksum B=FEC1 Load C=FEC2 Load D=Interface Slot 1 Load E=Interface Slot 2 Load F=192 MHz PLL G=External Reference H=Framer Card Temperature I=Modem Temperature J=Cooling Fans K=Interface Slot 1 Removed L=Interface Slot 2 Removed b=Tx Traffic Status where 0=No faults 1=+1.5V Power Supply Unit (Modulator Card)	FLT? FLT* FLT#	FLT=abcde

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Faults and Status (continued)				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 Slot 1) A=TX Clock Failure (Interface Slot 2) B=CDI-70 GBEI Module Data rate >+ 200 PPM C=CDI-70 GBEI Module Data rate <- 200 PPM D=CDI-70 GBEI No PHY Link E=Encoder FIFO Empty F=Encoder FIFO Full G=SERDES Parity Errors H=Reserved. I=Tx AIS Interface Slot 1 J=Tx AIS Interface Slot 2 K=Tx Cable Interface Slot 1 L=Tx Cable Interface Slot 2 c=Rx Traffic Status where 0=No faults 1=New faults since last check d=New Faults where 0=No new faults 1=New faults since last check e=Configuration change where 0=Unit configuration has not been changed 1=Unit configuration has been changed 2=Reserved 3=Gateway IP Address has been changed **NOTE:** Typical for each parameter – Faults are listed in order of priority.While multiple faults may exist, only the highest priority fault for that parameter is returned.		

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
External Reference Frequency	ERF=	ERF?	1 byte	Command or Query. Sets or returns the External Reference Frequency in the form x where: 0=Internal 1=External 1 MHz 2=External 2 MHz 3=External 5 MHz 4=External 10 MHz 5=External 20 MHz	ERF= ERF? ERF* ERF#	ERF=x
Query Rx Es/No	N/A	ESN?	4 bytes	Query only. Returns the value of EsNo (when in DVB-S2 mode) in the form xx.x where: xxxx=Value from 0 to 22 dB, in 0.1 dB steps. **NOTES:** 1) Returns 99.9 if demod is unlocked. 2) For values greater than 22.0 dB, the reply will be ESN=+022	ESN? ESN* ESN#	ESN=xxxx
Redundancy Switch Mode	ESW=	ESW?	1 byte	Command or Query. Sets or returns redundancy mode in the form x, where : 0=Disable 1=Enable	ESW= ESW? ESW* ESW#	ESW=x
Firmware Revisions	N/A	FRW?i	1 byte	Query only. Returns the firmware information of the system where: i=Bulk Image number (1 or 2) a=Firmware Image b=Firmware Revision c=Firmware Date **EXAMPLE:** <0001/FRW?1{CR} (queries the Bulk Image 1 firmware load)	FRW? FRW* FRW#	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c…
GBEI Management IP Address and Subnet	GIP=	GIP?s	19 bytes	Command or Query. Sets or returns the CDI-70 GBEI Management IP Address and Subnet Mask in the form sxxx.xxx.xxx.xxx.yy where: s=2 (Interface Slot 2 only) xxx.xxx.xxx.xxx=IP Address yy=Subnet Mask	GIP= GIP# GIP? GIP*	GIP=sxxx.xxx.xxx.xxx.yy

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Initialize Events Pointer	IEP=	N/A	None	Command only. **THIS COMMAND TAKES NO ARGUMENTS.** Resets the internal pointer to allow RNE? queries to start at the beginning of the stored events log.	IEP= IEP? IEP* IEP#	N/A
Boot Image	IMG=	IMG?	1 byte	Command only. Selects the Boot image in the form n where: n=image number 1 or 2	IMG= IMG? IMG* IMG#	IMG=n
Management IP Address	IPA=	IPA?	18 bytes	Command or Query. Sets or returns the IP Address and Subnet Mask for the 10/100 BaseT ‘J4 | Ethernet’ management port, in the form xxx.xxx.xxx.xxx.yy where: xxx.xxx.xxx.xxx=IP Address yy=Subnet Mask (00 to 31)	IPA= IPA? IPA* IPA#	IPA=xxx.xxx.xxx.xxx.yy
Gateway IP Address	IPG=	IPG?	15 bytes	Command or Query. Sets or returns the Gateway IP Address for the 10/100 Base Tx Ethernet management port in the form xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx=IP Address	IPG= IPG? IPG* IPG#	IPG=xxx.xxx.xxx.xxx
Interface Type	N/A	ITF?s	2 bytes	Query only. Returns Interface Type where: s=Interface Slot 1 or 2 x=Interface type where: 0=Reserved 1=Reserved 2=CDI-70 GBEI (Interface Slot 2 only) 3=CDI-60 HSSI (Interface Slot 1 only) 4=CDI-10-1 E3T3STS1 (Interface Slot 1 only)	ITF? ITF* ITF#	ITF=sx
Rx Link Margin	N/A	LNK?	4 bytes	Query only. Returns the value of the Link Margin in the form xx.x. **NOTE:** Returns 00.0 if demod is unlocked.	LNK? LNK* LNK#	LNK=xx.x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Local/Remote Status	LRS=	LRS?	1 byte	Command or Query. Local/Remote status where: 0=Local 1=Serial 2=Reserved 3=Ethernet	LRS= LRS? LRS* LRS#	LRS=x
Unit MAC Address	N/A	MAC?	12 bytes	Query only. Returns MAC address of the unit, in hexadecimal.	MAC? MAC* MAC#	MAC=AABBCCDD EEFF
Number of Unread stored Events	N/A	NUE?	3 bytes	Query only. Returns the number of stored events that have not yet been read over the remote interface in the form xxx.	NUE? NUE* NUE#	NUE=xxx
Rx Alpha Rolloff	RAR=	RAR?	1 byte	Command or Query. Sets or returns the Rx Alpha Rolloff in the form x where: 0=20% 1=25% 2=35%	RAR= RAR? RAR* RAR#	RAR=x
Rx Buffer Size	RBS=	RBS?s	5 bytes	Command or Query. Sets or returns the Rx Buffer Size, in milliseconds, in the form sxx.x where: s=1 (Interface Slot 1 only) xx.x=Rx Buffer Size where: HSSI=value from 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:** Not applicable to Interface Slot 2 GBEI operation.	RBS= RBS? RBS* RBS#	RBS=sxx.x
Soft Reboot	RBT=1	N/A	1 byte	Command only. Executes a soft reboot of the unit in the form x where: 1=Reboot System	RBT? RBT* RBT#	RBT=x
Rx Clock Inverted	RCI=	RCI?s	2 bytes	Command or Query. Sets or returns Inverted Receive Clock in the form sx where: s=1 (Interface Slot 1 only) x=Inverted Receive Clock where 0=Normal, 1=Inverted **NOTE:** Applicable to HSSI operation only.	RCI = RCI? RCI * RCI #	RCI=sx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Rx Data Invert	RDI=	RDI?s	2 bytes	Command or Query. Sets or returns the Invert Receive Data in the form sx where: s=1 (Interface Slot 1 only) x=Invert Receive Data where 0=Normal, 1=Inverted **NOTE:** Not applicable to Interface Slot 2 GBEI operation.	RDI = RDI? RDI* RDI#	RDI=sx
Rx Data Rate	N/A	RDR?	10 bytes	Query only. Returns the Composite Rx Data rate, in the form xxxxxx.xxx where: xxxxxx.xxx=rate in kbps, in 1 bps steps.	RDR? RDR* RDR#	RDR=xxxxxx.xxx
Redundancy State	RED=	RED?	1 byte	Command or Query. Sets or returns the redundancy state of the unit in the form x where: 0=Offline 1=Online **NOTES:** 1) The unit cannot be forced online. You can force the unit offline 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. 2) The unit is always online if Redundancy Mode is not selected.	RED= RED? RED* RED#	RED=x
Rx Frequency Offset	N/A	RFO?	5 bytes	Query only. Returns the value of the measured frequency offset of the carrier being demodulated in the form sxxx.x where: s=sign (+/-) xxx.x=value in range from ± 0 to 100 kHz, in 100 Hz steps **NOTE:** Returns 999999 if the demodulator is unlocked.	RFO? RFO* RFO#	RFO=sxxx.x
Rx Frequency	RFQ=	RFQ?	9 bytes	Command or Query. Sets or returns the Rx Frequency in the form xxxx.xxxx where: xxxx.xxxx=frequency in MHz, in 100 Hz steps: CDM-710G (70/140 MHz) Demodulator: 52-88 MHz and 104-176 MHz CDM710GL (L-Band) Demodulator: 950-1950 MHz	RFQ= RFQ? RFQ* RFQ#	RFQ=xxxx.xxxx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Rx Frame Size	N/A	RFS?	1 byte	Query only. Returns the Rx Frame Size Long/Short selection in the form x where: 0=Short 1=Long **NOTE:** This is automatically detected on demod acquisition, but if the unit is not locked, the query returns ‘x’.	N/A	RFS=x
Rx Gold Code Sequence Index	RGS=	RGS?	6 bytes	Command or Query. Sets or returns the Rx Gold Code Sequence Index in the form xxxxxx where: xxxxxx=Gold Code Sequence index (0 to 262141)	RGS= RGS? RGS* RGS#	RGS=xxxxxx
Rx Interface Enable	RIE=	RIE?s	2 bytes	Command or Query. Sets or returns the Interface Slot status in the form sx where: s=Interface Slot 1 or 2 x=Rx Interface Status where 0=Disabled, 1=Enabled	RIE= RIE? RIE* RIE#	RIE=sx
Retrieve Next 5 unread stored Events	N/A	RNE?	75 bytes	Query only. Returns the oldest 5 Stored Events that have not yet been read over the remote interface in the form: {CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body, where Sub-body=ABCddmmyyhhmmss: A=fault/clear indicator where F=Fault, C=Clear, I=Info B=fault type where 1=Unit, 2=Rx Traffic, 3=Tx Traffic, 4=Log C=Fault Code numbers, as in FLT? or Info Code where 0=Power Off, 1=Power On, 2=Log Cleared, 3=Global Config Change, 4=Redundancy Config Change ddmmyy=Date in day/month/year format hhmmss=Time in hours/minutes/seconds format **NOTES:** 1) If there are less than 5 events to be retrieved, the remaining positions are padded with zeros. 2) If there are no new events, the response is RNE*.	RNE? RNE* RNE#	RNE={CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body{CR}Sub-body
Rx Pilot On/Off	N/A	RPI?	1 byte	Query only. Sets or returns the Rx Pilot status in the form x where: 0=Off 1=On **NOTE:** This is automatically detected on demod acquisition, but if the unit is not locked, the query returns ‘x’.	RPI? RPI* RPI#	RPI=x

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Rx Signal Level	N/A	RSL?	3 bytes	Query only. Returns the value of the Rx signal level in the form sxx where: s=sign (+/-) xx=Value from -99.0 to +3.0 dBm, in 0.1 dBm steps	RSL? RSL* RSL#	RSL=sxx
Rx Demod Acquisition Sweep Width	RSW=	RSW?	3 bytes	Command or Query. Sets or returns the Rx ± acquisition sweep range of demodulator in the form xxx where: xxx=value in KHz from ± 1 to 100 kHz.	RSW= RSW? RSW* RSW#	RSW=xxx
GBEI Cable Auto Crossover	SCX=	SCX?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Cable Auto Crossover in the form sa where: s=2 (Interface Slot 2 only) a= 0 (Disabled) or 1 (Enabled)	SCX= SCX# SCX? SCX*	SCX=sa
GBEI Learning Mode	SLM=	SLM?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Learning Mode in the form sa where: s=2 (Interface Slot 2 only) a=0 (Disabled) or 1 (Enabled)	SLM= SLM# SLM? SLM*	SLM=sa
Serial Number	N/A	SNO?	9 bytes	Query only. Returns the unit 9-digit serial number in the form xxxxxxxxx.	SNO? SNO* SNO#	SNO=xxxxxxxxx
Software Revision	N/A	SWR?	5 bytes	Query only. 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	SWR? SWR* SWR#	SWR=Boot:X.X.X Bulk1:Y.Y.Y Bulk2:Z.Z.Z
Real-time Clock Time	TIM=	TIM?	6 bytes	Command or Query. Sets or returns the time, from midnight, in the form hhmmss where: hh=hours (00 to 23) mm=minutes (00 to 59) ss=seconds (00 to 59)	TIM= TIM? TIM* TIM#	TIM=hhmmss
Temperature	N/A	TMP?	3 bytes	Query only. Returns the value of the internal temperature (degrees C), in the form sxxx where: s=sign (+/-) xxx= temperature in degrees C	TMP? TMP* TMP#	TMP=sxxx

Parameter Type	Controller-to-Target Instruction Code & Qualifier		Number of Arguments for Command or Response to Query	Description of Arguments (Note that all arguments are ASCII numeric codes from 48 and 57)	Target-to-Controller (See Description of Arguments)	
	Command	Query			Response to Command	Response to Query
Unit Test Mode	TST=	TST?	1 byte	Command or Query. Sets or returns the Test Mode in the form x 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	TST= TST? TST* TST#	TST=x

9.4.5 Modem Global Configuration (MGC) Command and Query

The MGC command/query can be used to configure/report on the whole modem or parts of the modem. It contains spare bytes for future development, but the length is fixed to 255 bytes. MGC can be used with modulator-only units, demodulator-only units, and modem units.

9.4.5.1 MGC Format

The format for the MGC command/query is:
MGC=TRUSI[Tx Block][Rx Block][Unit Block][Slot Identifier][Interface Block].

For a command, the first 5 bytes indicates whether the corresponding block should be configured:
T – ‘T’ means you should *change* the Transmit (Tx) configuration; ‘0’ means you should *skip* the Tx configuration.
R – ‘R’ means you should *change* the Receive (Rx) configuration; ‘0’ means you should *skip* the Rx configuration.
U – ‘U’ means you should *change* the Unit configuration; ‘0’ means you should *skip* the Unit configuration.
S – Indicates which Interface Slot should be enabled: ‘1’ indicates that you should *enable* Interface Slot 1; ’2’ indicates that you should *enable* Interface Slot 2.
I – Indicates which interface type is *active* for the Interface block: ‘1’ is NOT USED; ‘2’ indicates CDI-70 Gigabit Ethernet Interface (GBEI); ‘3’ indicates CDI-60 HSSI Interface; ‘4’ indicates CDI-10-1 Single G.703 (E3T3STS1) Interface.

For a query, the first 5 bytes indicates whether the corresponding block is present in the response:
T – ‘T’ if transmit block is present; ‘0’ means the block is not present and ‘x’s are returned.
R – ‘R’ if receive block is present; ‘0’ means the block is not present and ‘x’s are returned.
U – ‘U’ if unit block is present; ‘0’ means the block is not present and ‘x’s are returned.
S – Indicates which interface slot is *enabled*: ‘1’ indicates Interface Slot 1; ‘2’ indicates Interface Slot 2.

I – Indicates the *active* interface type for the interface block. ‘1’ is NOT USED; ‘2’ indicates CDI-70 Gigabit Ethernet Interface (GBEI); ‘3’ indicates CDI-60 HSSI; ‘4’ indicates CDI-10-1 Single G.703 Interface.

[Tx Block] consists of 50 bytes for Transmit configuration in the form **aaaa.aaaabcc.ccccccdefghhh.hijklmmmmmmnoxxxxxxxxxx** where:

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 in the form **aaaa. aaaabcc. ccccccdefggghijklllllllmm. mnopxxxxxxxxx** where:

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 in the form **abccccccccccccccccdx** where:

a=Test Mode	same as TST
b=*Reserved*	
cccccccccccccccc=Alarm Mask	same as MSK
d=External Reference Frequency	same as ERF
x=spare byte	

[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 CDI-70 Gigabit Ethernet Interface (GBEI) (I=2) – The **[Interface Block]** is in the form **abxxxx** where:

a=auto crossover mode
b=learning mode
xxxx=spare bytes

If CDI-60 HSSI Interface (I=3) – The **[Interface Block]** is in the form **abcdeff. fx…xxx** where:

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	

If CDI-10-1 Single G.703 (E3T3STS1) Interface (I=4) – The **[Interface Block]** is in the form **abcdeff. fx…xxx** where:

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)
x…xxx=spare bytes	

Notes:

Appendix A. ETHERNET NETWORK CONFIGURATIONS

A.1 Overview

For network operations that include Ethernet-based terrestrial data handling, it is important to stress that users MUST avoid Ethernet looping connection problems – with or without use of the CDM-710G or CDM-710GL in redundancy. This appendix addresses this issue, specifically where it concerns the operation of a CDM-710G/L redundancy configuration that uses Comtech EF Data's CRS-300 1:10 Redundancy Switch.

A.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.

A.2.1 Ethernet Routers

An **Ethernet router** determines where to forward IP traffic based on 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. This 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’.

A.2.2 Ethernet Switches

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 automatically update the CAM table. For example, if an Ethernet switch sees traffic from ‘Device A’ coming in on ‘Port 2’, it now knows that ‘Device A’ is connected to that port, and that traffic destined for ‘Device A’ needs to be sent to that port only and not any of the others.

A.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
- *Split-path traffic* is Rx and Tx Ethernet traffic using different ports of the same router or switch.

For examples of applications architecture designed to handle near-to-far end Ethernet network configurations, see the following sections:

- **Section A.3.3** Hub-to-Hub with Standard Traffic using Switches
- **Section A.3.4** Hub-to-Hub with Standard Traffic using Routers
- **Section A.3.5** Hub-to-Remotes with Standard Traffic using Routers or Switches
- **Section A.3.6** Hub-to-Remotes, Split-path Traffic using Routers (Point-to-Multipoint)
- **Chapter A.3.7** Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

A.3.1 Ethernet Network Overview

When placing modems in a network, there are a number of issues that must be addressed – your primary concern should be 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.

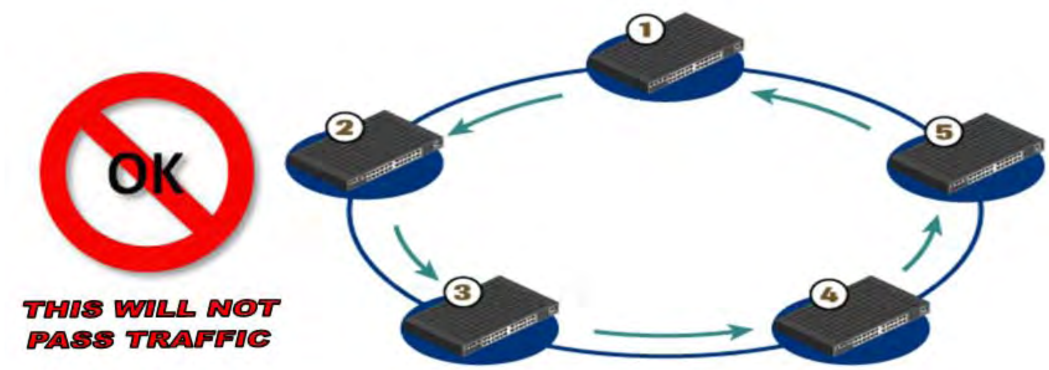


Figure A-1. Networking Loop with Switches

Figure A-1 illustrates a Networking Loop with Switches. The problem here 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 continues 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 senses that the ARP request came back to the switch on a different port. The switch then stops forwarding traffic out the proper port.

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

A.3.2 Ethernet Redundancy with the CRS-300 1:1 Redundancy Switch

Once you determine the best configuration for your near-to-far end Ethernet networks, you may add the Comtech EF Data CRS-300 1:10 Redundancy Switch to one or both ends of the link(s). Ethernet redundancy using the CRS-300 is possible using a **wired-thru** or **wired-around** configuration.

A.3.2.1 Wired-thru Connection

The wired-thru 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.

A.3.2.2 Wired-around Connection

The wired-around redundancy approach is not recommended.

You must use the wired-around Ethernet connection method with the CDM-710G/L and the CRS-300 ***only*** *if both modem data interface slots are used* – i.e. when Interface Slot 1 is HSSI or G.703 and Interface Slot 2 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 Networking Loops or connection problems. Otherwise, hub-to-remotes configurations with *standard traffic* may use the wired-around approach.

A.3.3 Hub-to-Hub with Standard Traffic using Switches

When you connect two or more hub sites where there are multi-paths between each site, you must make sure that no Networking Loops occur. **Figure A-2** shows two hub sites, connected with two or more modems, where all transmitted and received traffic is on the same LAN/VLAN.

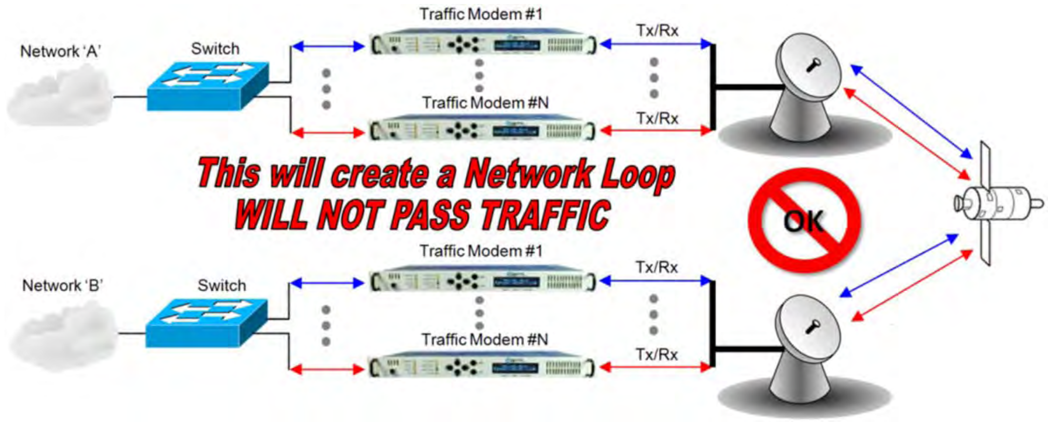


Figure A-2. Networking Loop Example

Figure A-3 shows a simplified version of the Networking Loop. Two switches, each with two or more separate connections, are connected. Since there is no router in the network and all the traffic is destined to the same network, routing loops have occurred. This is not how Ethernet switches were designed for use, and this configuration will cause a network outage.

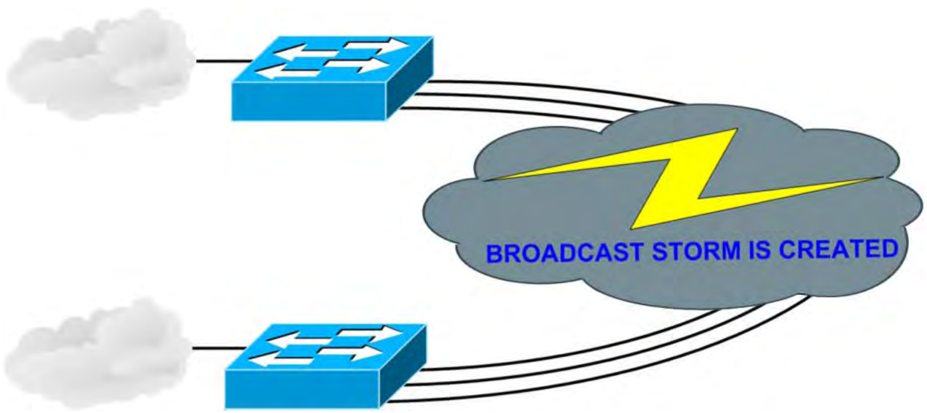


Figure A-3. Networking Loop Example (Simplified)

A.3.4 Hub-to-Hub with Standard Traffic using Routers

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

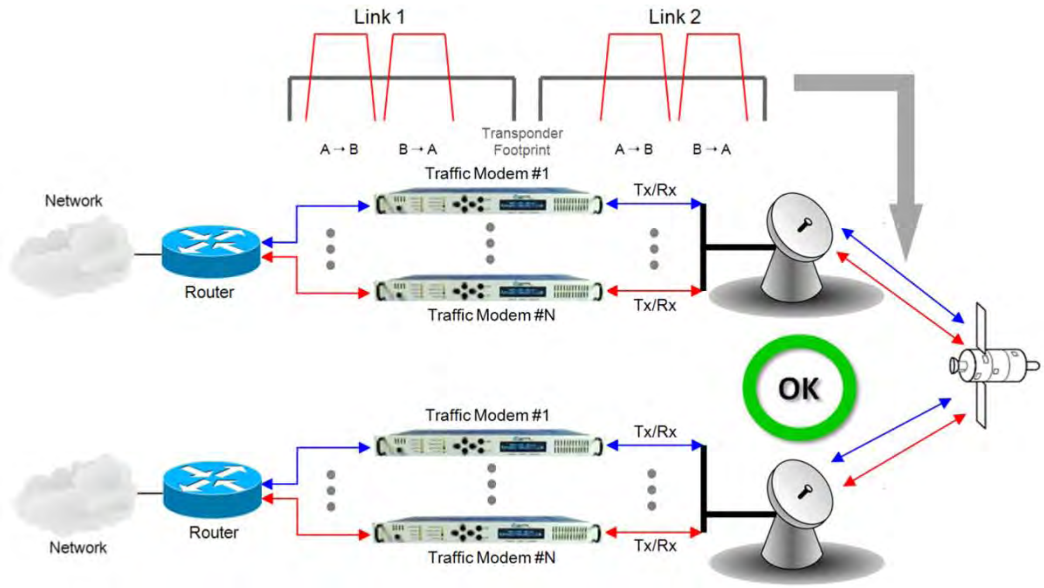


Figure A-4. Hub-to-Hub with Standard Traffic using Routers

Figure A-5 shows a wired-thru Ethernet redundancy example. When the CRS-300 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.

Figure A-6 shows a wired-around Ethernet redundancy example. When the CRS-300 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, successful operation requires use of a special router configuration – you must consult with the router manufacturer.

This wired-around redundancy approach is not recommended.

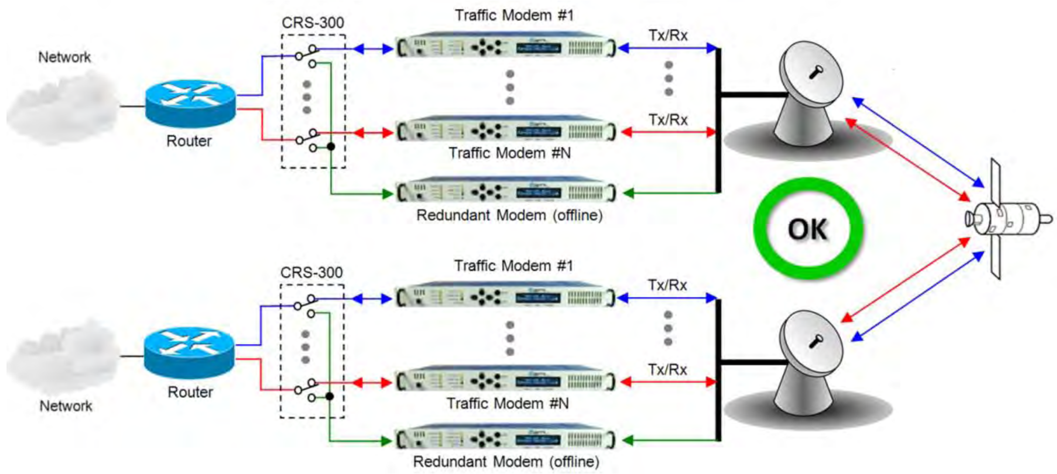


Figure A-5. Wired-thru for Hub-to-Hub with Standard Traffic using Routers

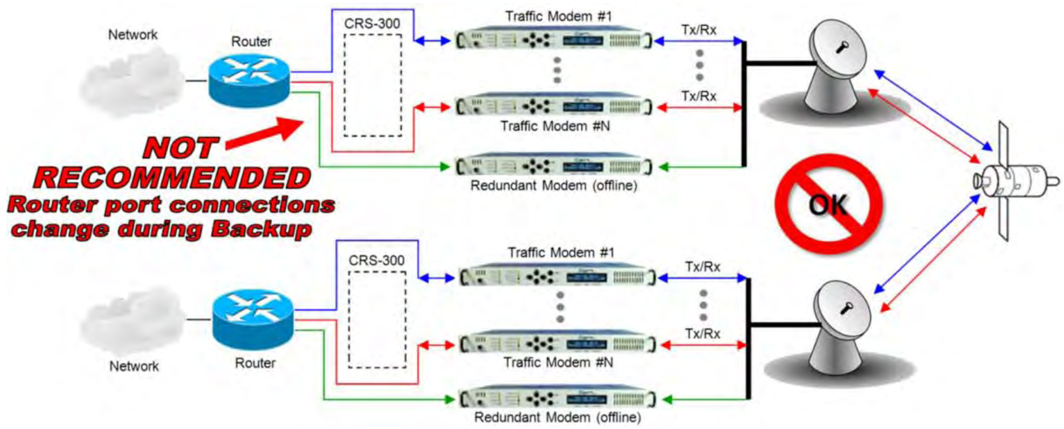


Figure A-6. Wired-around for Hub-to-Hub with Standard Traffic using Routers

A.3.5 Hub-to-Remotes with Standard Traffic using Routers or Switches

Figure A-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, and there is no possibility of having a remote MAC on the Hub networks.

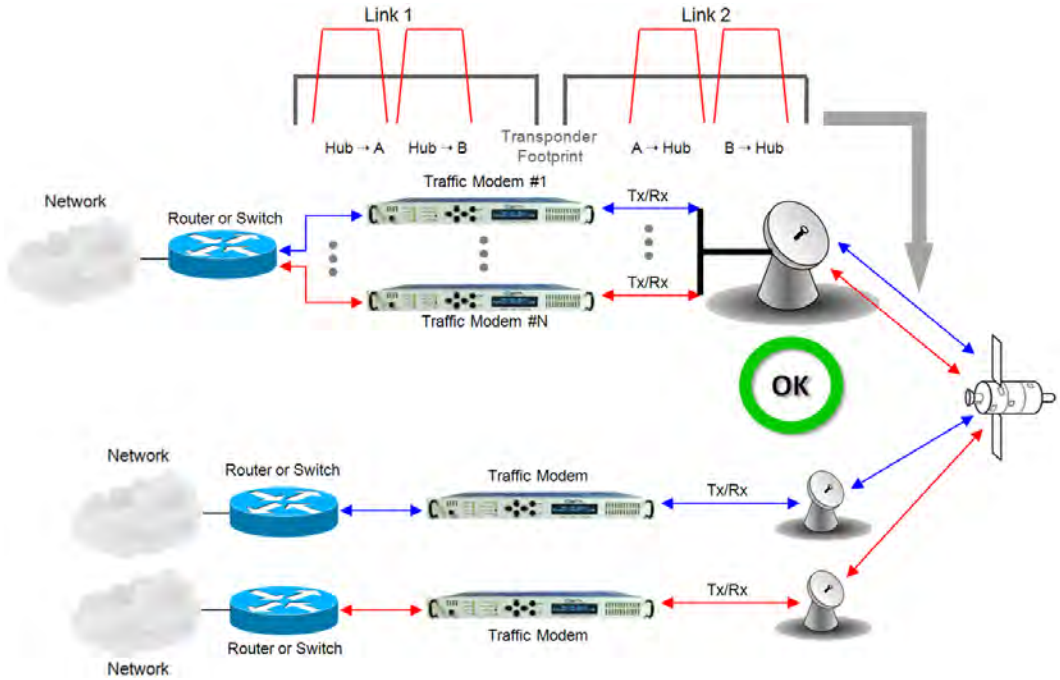


Figure A-7. Hub-to-Remotes with Standard Traffic using Routers or Switches

Figure A-8 shows a wired-thru Ethernet redundancy example. When the CRS-300 backs up a faulted Traffic Modem, the physical port on the router does not change because the CRS-300 properly reroutes the Ethernet connection from the Traffic Modem to the Redundant Modem.

Figure A-9 shows a wired-around Ethernet redundancy example. When the CRS-300 backs up a faulted Traffic Modem, the Switch learns the new MAC address of the redundant unit, and traffic will be passed again. This type of architecture slows down the switching time, because the Switch needs to re-learn the correct port connection.

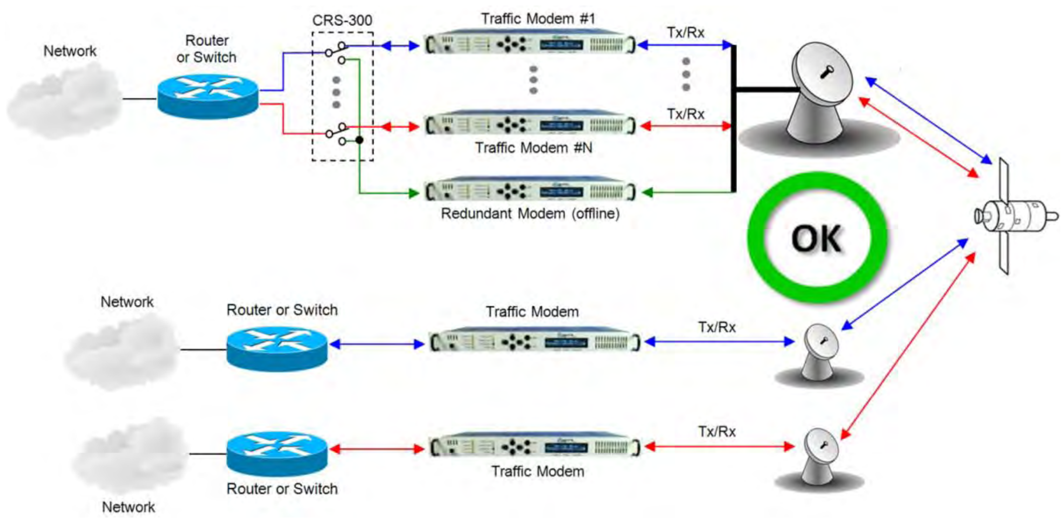


Figure A-8. Wired-thru for Hub-to-Remotes with Standard Traffic using Routers or Switches

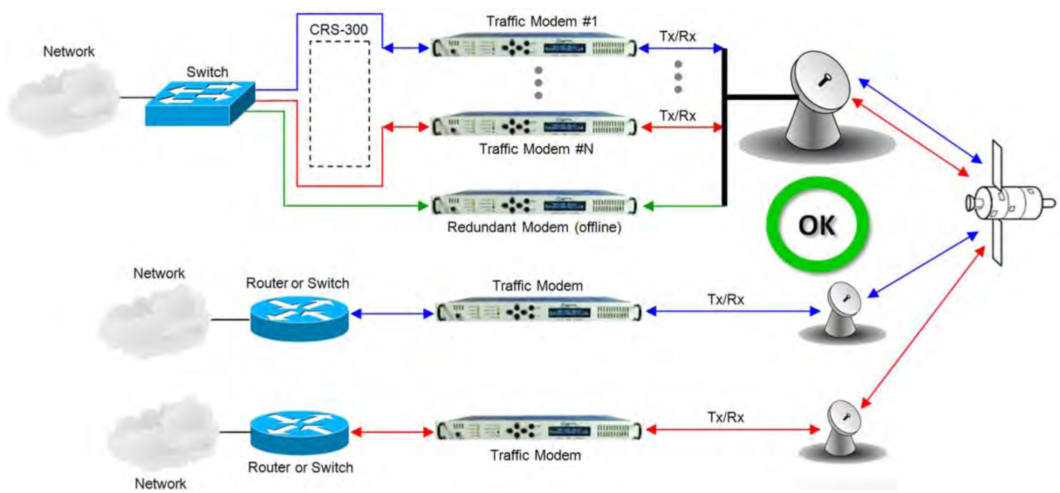


Figure A-9. Wired-around for Hub-to-Remotes with Standard Traffic using Routers or Switches

A.3.6 Hub-to-Remotes, Split-path Traffic using Routers (Point-to-Multipoint)

Figure A-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 is on the correct router port. 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.

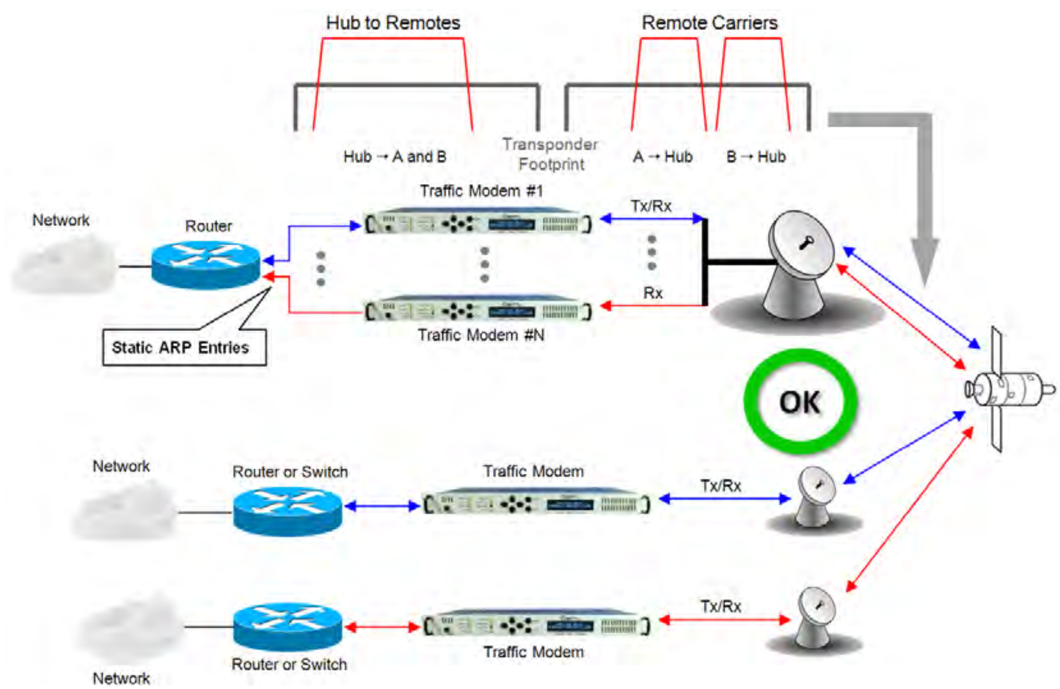


Figure A-10. Point-to-Multipoint using Routers

Figure A-11 shows a wired-thru Ethernet redundancy example. When the CRS-300 backs up a faulted Traffic Modem, the physical port on the router does not change, because the CRS-300 properly reroutes the Ethernet connection from the Traffic Modem to the Redundant Modem.

Figure A-12 shows a wired-around Ethernet redundancy example. When the CRS-300 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, successful operation requires use of a special router configuration – you must consult with the router manufacturer.

This wired-around redundancy approach is not recommended.

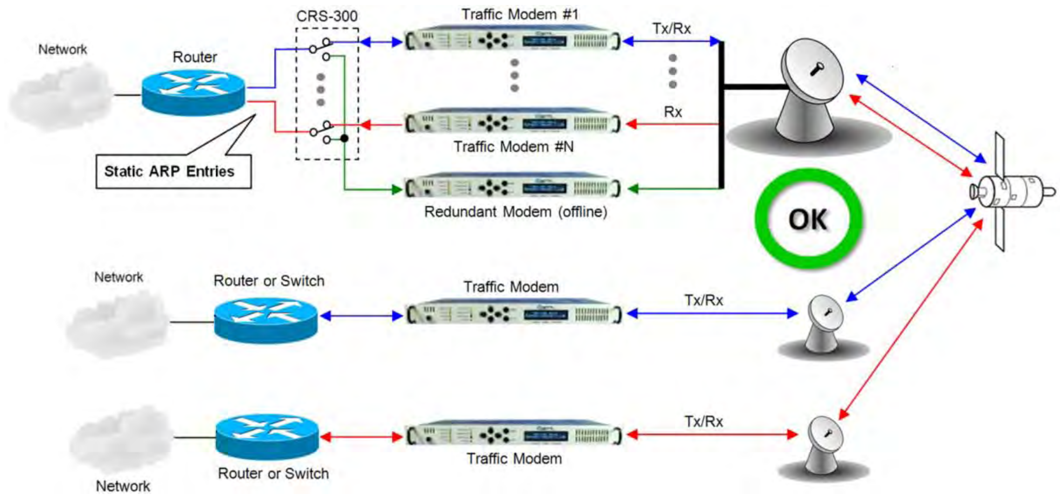


Figure A-11. Wired-thru for Point-to-Multipoint with Routers

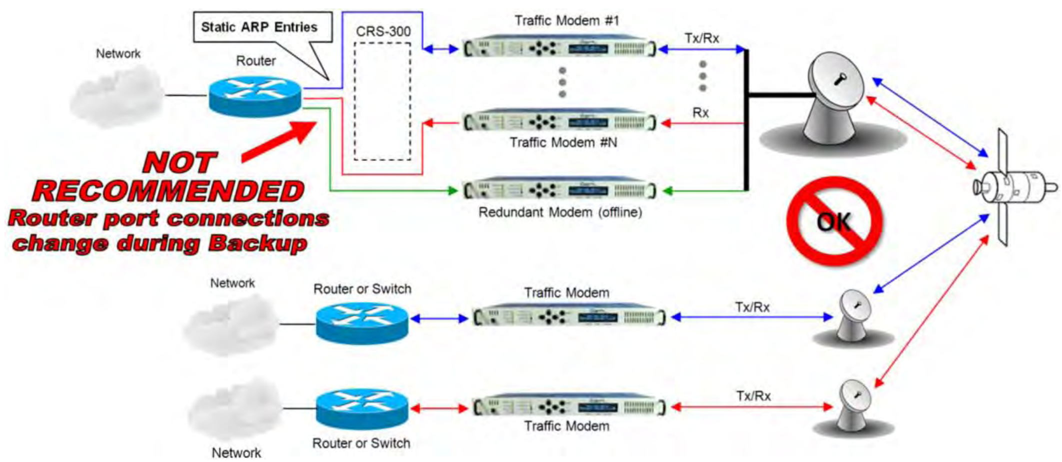


Figure A-12. Wired-around for Point-to-Multipoint with Routers

A.3.7 Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

When you use switches, the hub and remote are on the same subnet as shown in **Figure A-13.** This allows broadcasts 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.

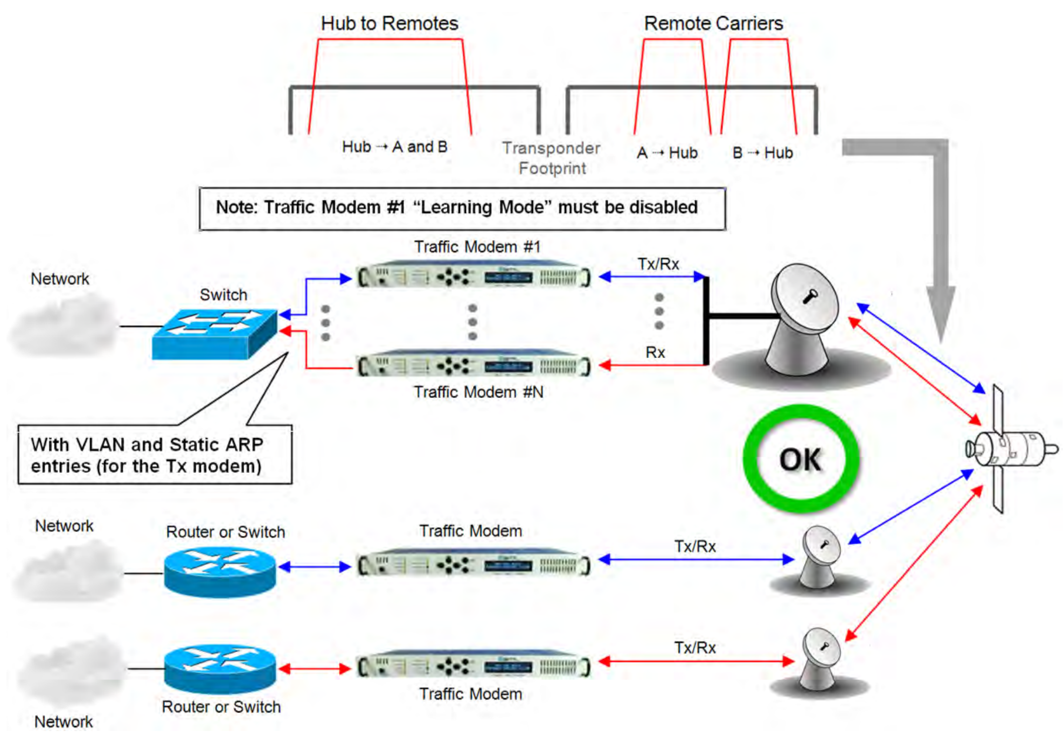


Figure A-13. Point-to-Multipoint using Switches

Figure A-14 shows a wired-thru Ethernet redundancy example. When the CRS-300 backs up a faulted Traffic Modem, the physical port on the Switch does not change, because the CRS-300 is properly rerouting the Ethernet connection from the Traffic Modem to the Redundant Modem.

Figure A-15 shows a wired-around Ethernet redundancy example. When the CRS-300 backs up a faulted Traffic Modem, the Switch learns the new MAC address of the redundant unit, and traffic will be passed again. This type of architecture slows down the switching time, because the Switch needs to re-learn the correct port connection.

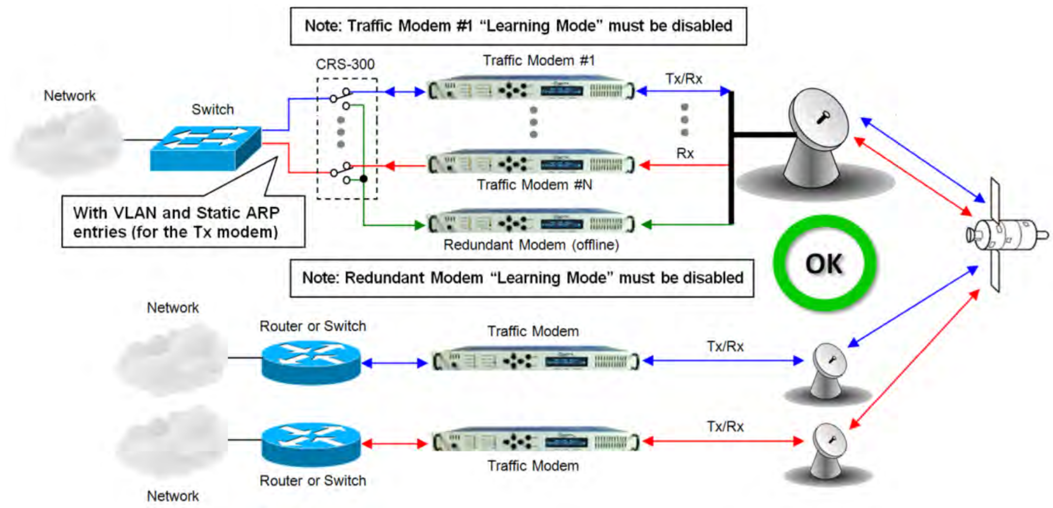


Figure A-14. Wired-thru, Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

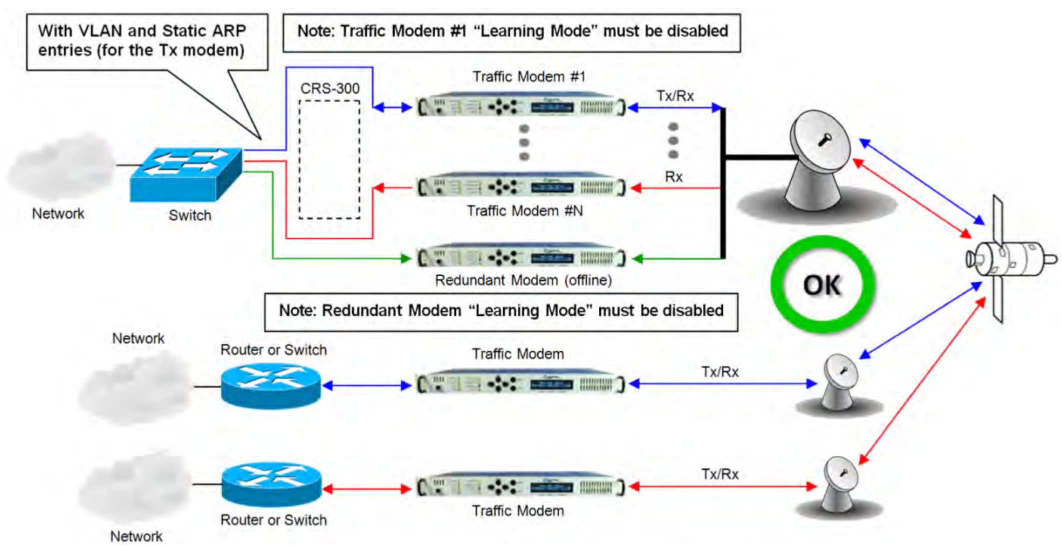


Figure A-15. Wired-around, Hub-to-Remotes, Split-path Traffic using Switches (Point-to-Multipoint)

Notes:

Appendix B. FORWARD ERROR CORRECTION OPTIONS

B.1 Overview

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 and CDM-710GL High-Speed Satellite Modems operate 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).

B.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.

B.2.1 Range of Data Rates

For the detailed Range of Data Rates see **Chapter 2. SPECIFICATIONS**.

B.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).

The CDM-710G/L 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:

$$Eb/No=Es/No-10_{Log}(\text{Spectral Efficiency})$$

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 B-1 through Figure B-4 illustrate the error performance characteristics.

Table B-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 @ 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 B-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 @ 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.

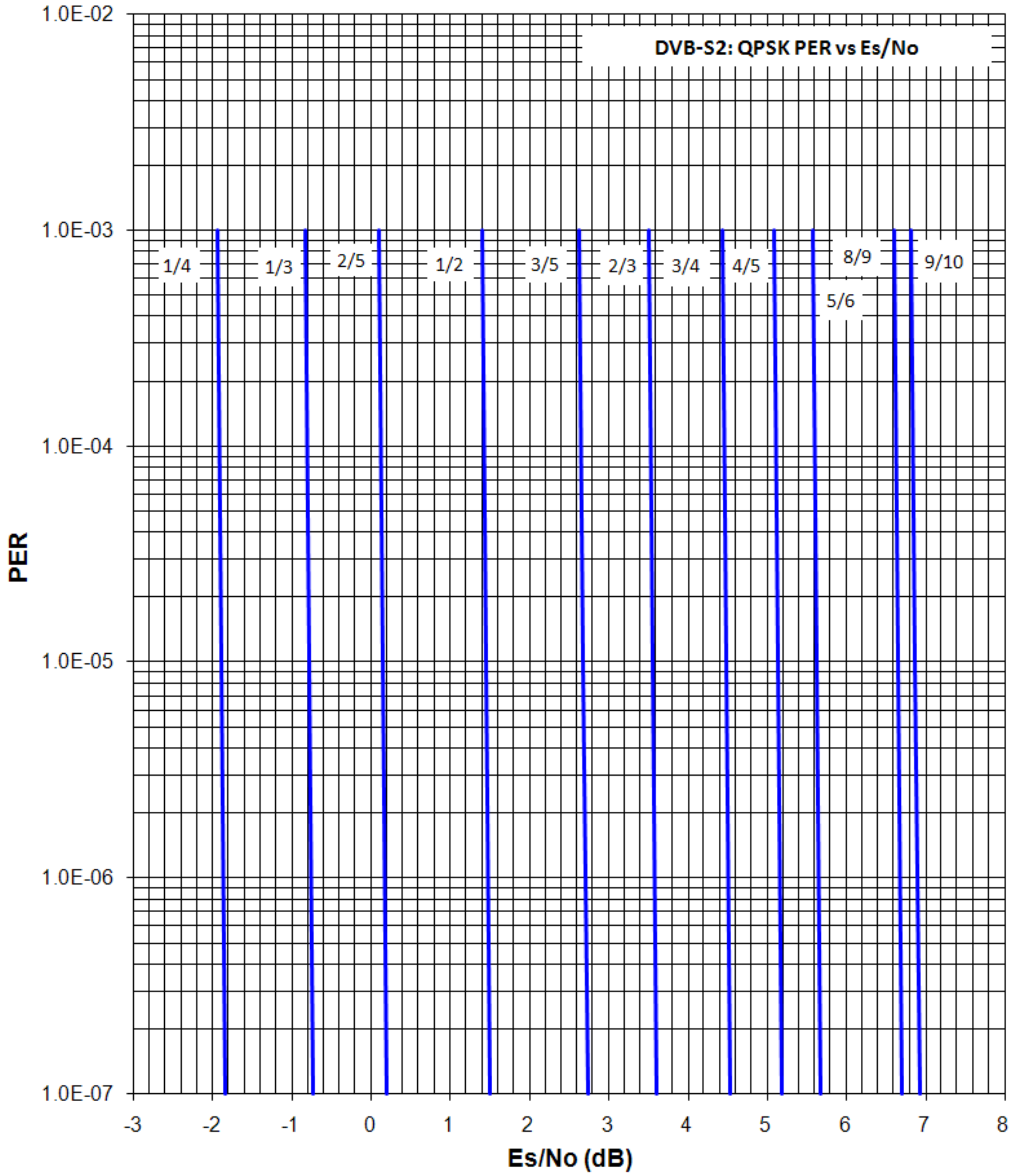


Figure B-1. DVB-S2 QPSK Packet Error Rate versus Es/No

(QPSK 1/4, 1/3, and 2/5, Information Only)

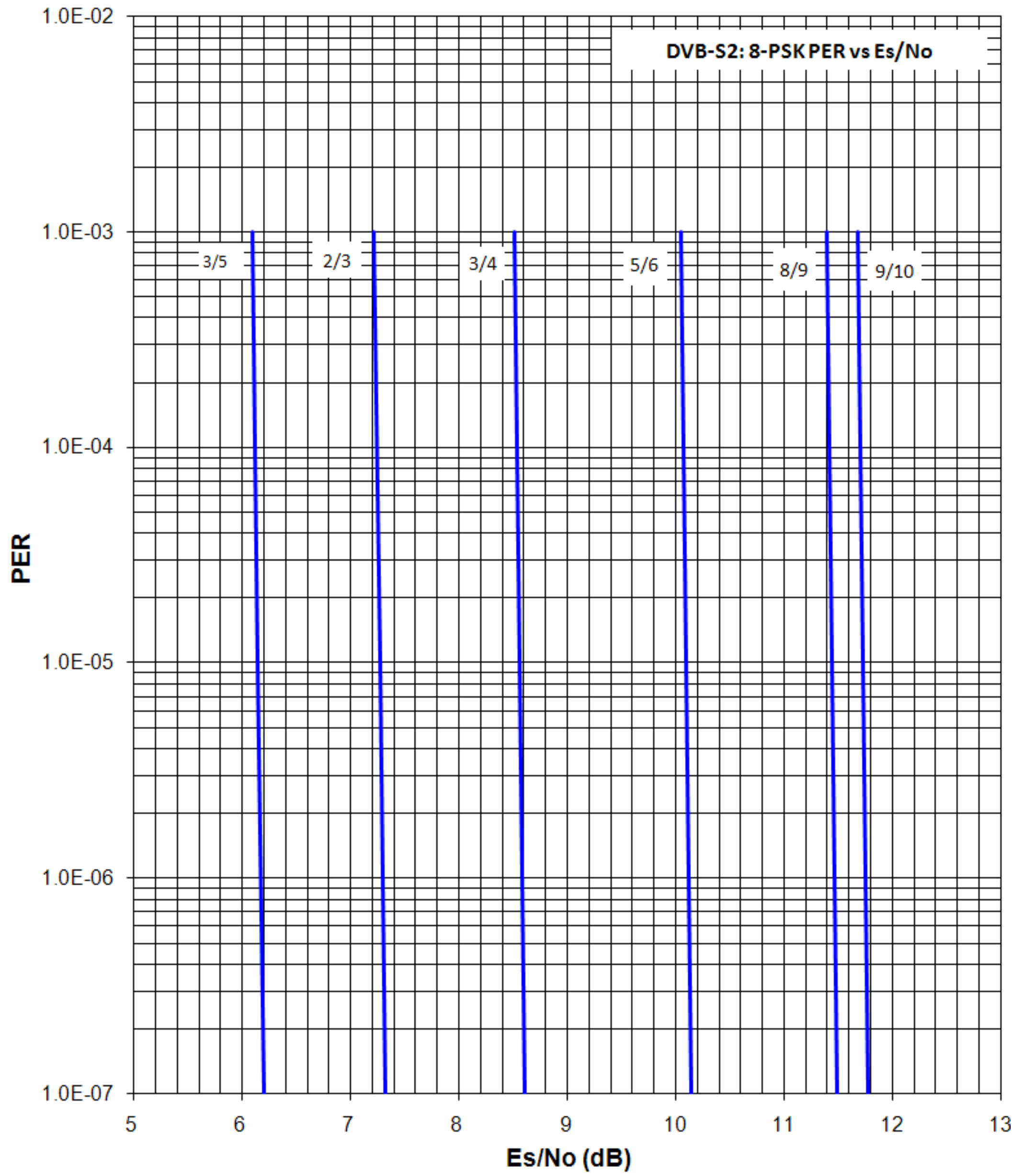


Figure B-2. DVB-S2 8PSK Packet Error Rate versus Es/No

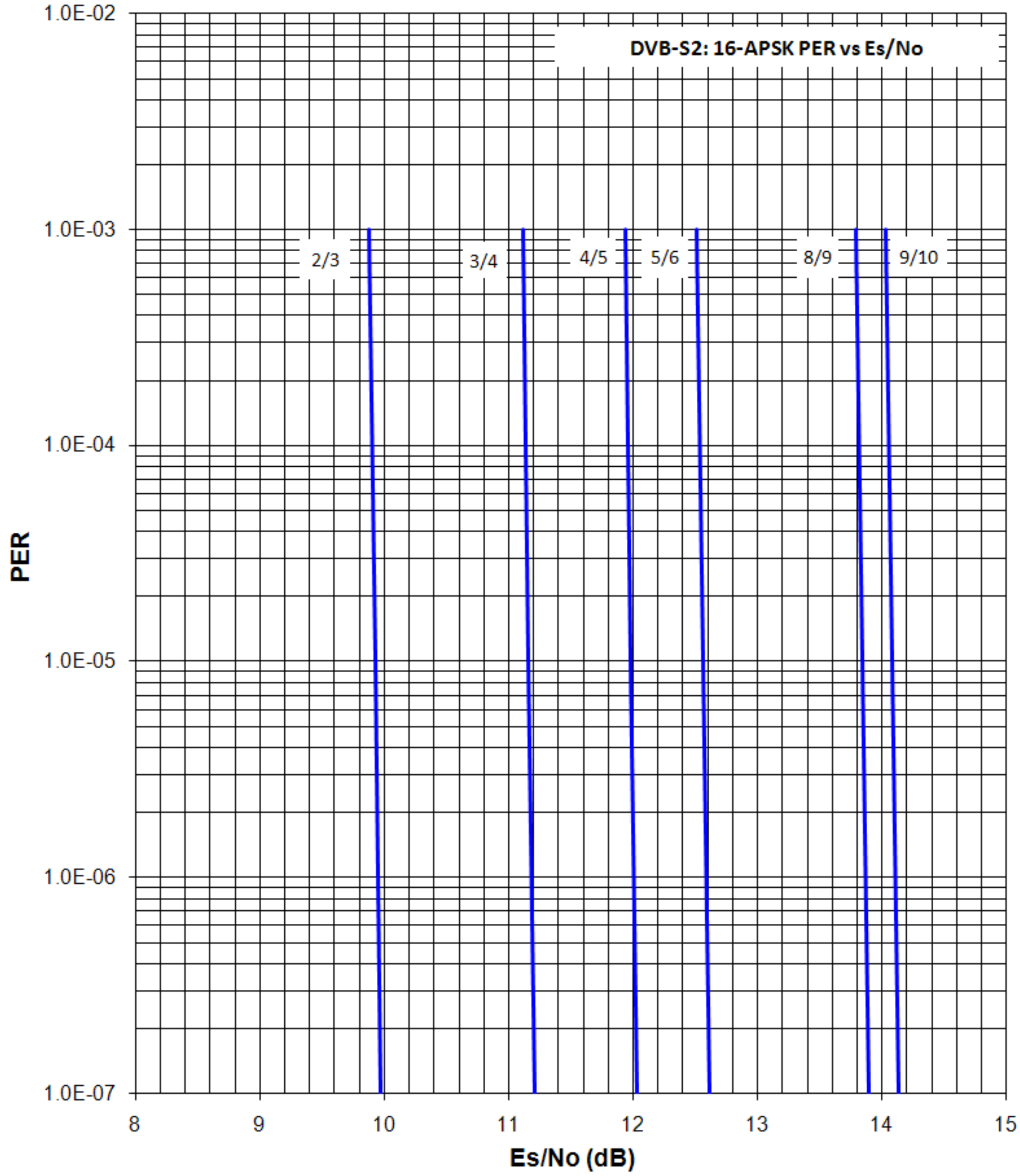


Figure B-3. DVB-S2 16APSK Packet Error Rate versus Es/No

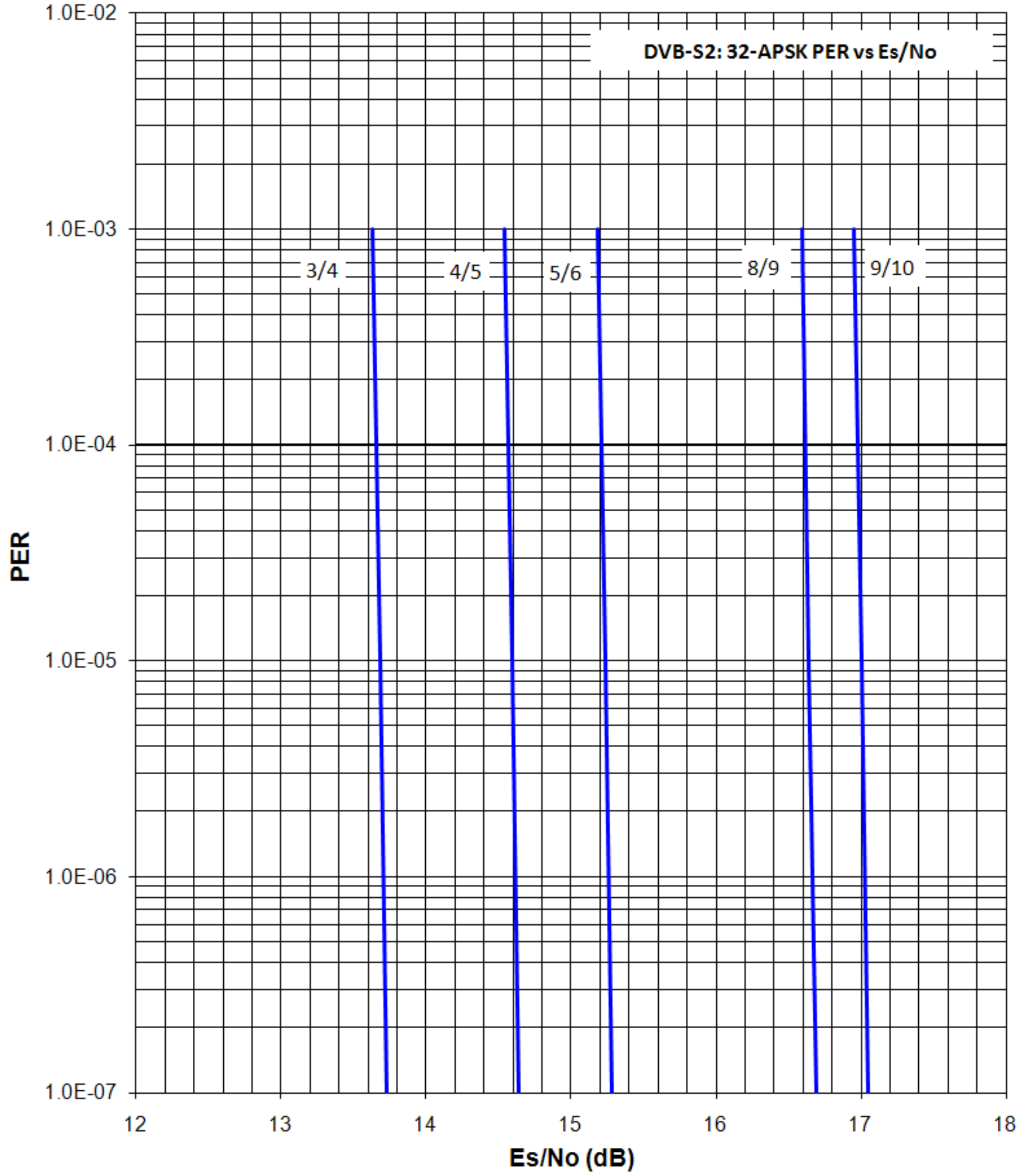


Figure B-4. DVB-S2 32APSK Packet Error Rate versus Es/No

B.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 B-5** and **Figure B-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.

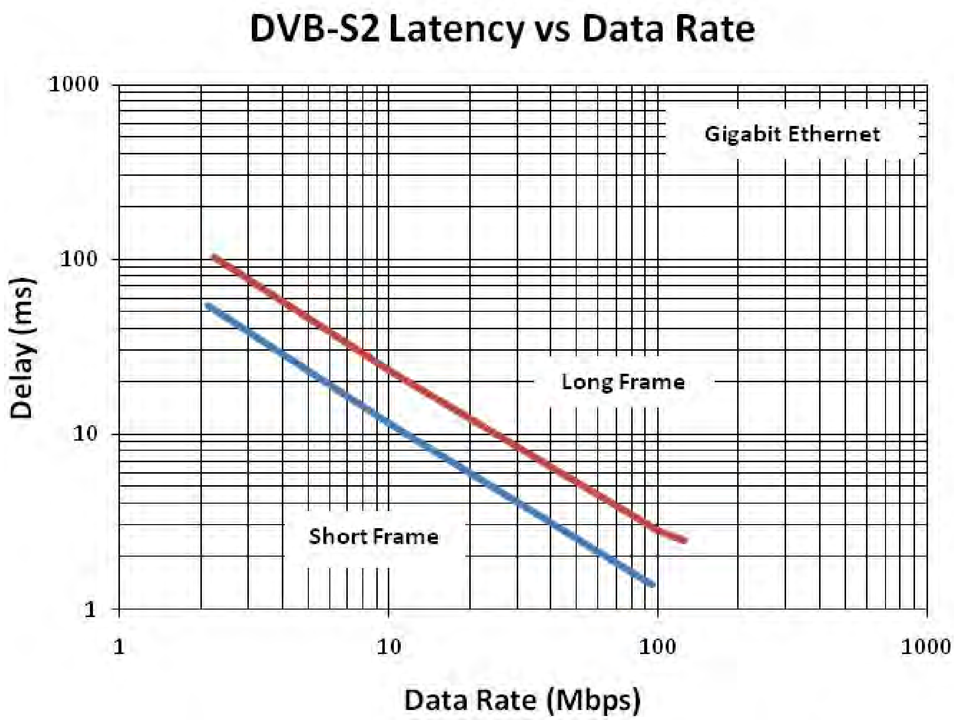


Figure B-5. CDM-710G/L Gigabit Ethernet Latency with Modem in IF Loopback

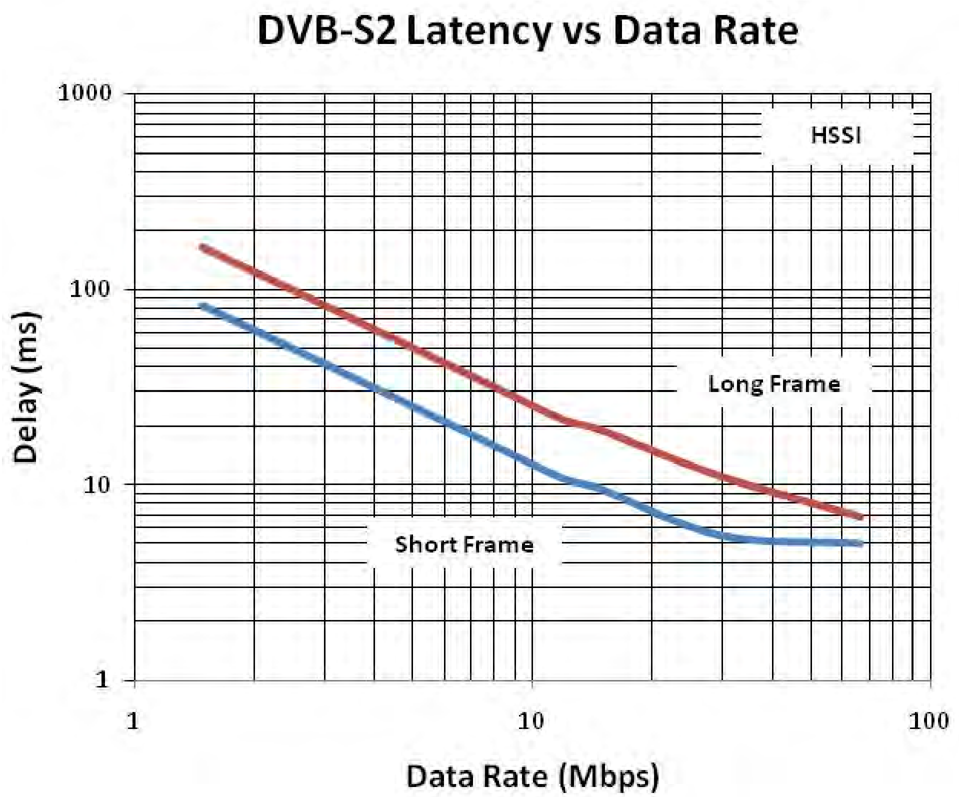


Figure B-6. CDM-710G/LHSSI Latency with Modem in IF Loopback

Notes:

Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE

C.1 Overview

The CDI-10-1 Single G.703 E3/T3/STS-1 Data Interface (**Figure C-1**) is a plug-in module that installs into the rear of the CDM-710G or CDM-710GL High-Speed Satellite Modem chassis (**Figure C-2**). It provides physical and electrical connection between the external terrestrial device and the internal circuitry of the modulator or demodulator.

Figure C-1. CDI-10-1 Single G.703 (E3/T3/STS-1) Data Interface Module

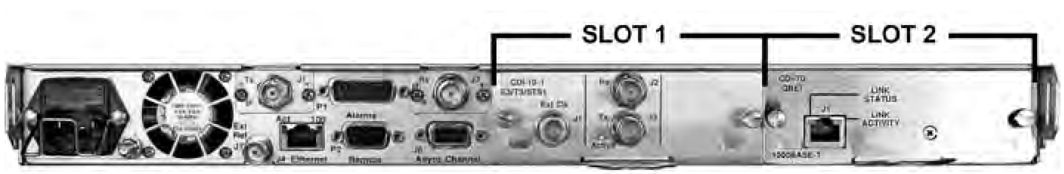


Figure C-2. CDM-710G/L Rear Panel Data Interface Slots

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.

Looking at **Figure C-2**:

- Interface Slot 1 is located at center right of the CDM-710G/L chassis rear panel. It is filled with a data interface module first. Slot 1 will accept either a CDI-10-1 Single G.703 (E3/T3/STS-1) or a CDI-60 HSSI Data Interface Module only.
- Interface Slot 2 is located at the right side end of the chassis rear panel. It is assigned a blank panel or a CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface (GBEI) Module only.

For more information about the available data interfaces and installable module combinations, see:

- **Chapter 2. SPECIFICATIONS**
- **Appendix D. CDI-60 HSSI DATA INTERFACE**
- **Appendix E. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET DATA INTERFACE (GBEI)**

C.2 Physical Description

Figure C-3 shows a block diagram of the CDI-10-1 data interface module; **Figure C-4** shows the rear panel of the module. Connection to the modem is provided when the module's 96-pin DIN connector is engaged into modem Interface Slot 1. The CDI-10-1 provides these features:

- A 96-pin DCE (Modem Interface) connection;
- Three female BNC connectors for these functions:
  - **'Ext Clk | J1'** – External Clock Input Port
  - **'Rx | J2' (top) and 'Tx | J3' (bottom)** – Both connectors comprise the Single G.703 Interface Port. This interface is operable and selectable as OFF, E3, T3, or STS-1.
- A Light-Emitting Diode (LED), labeled 'Active', which lights green when the module senses G.703 data activity.

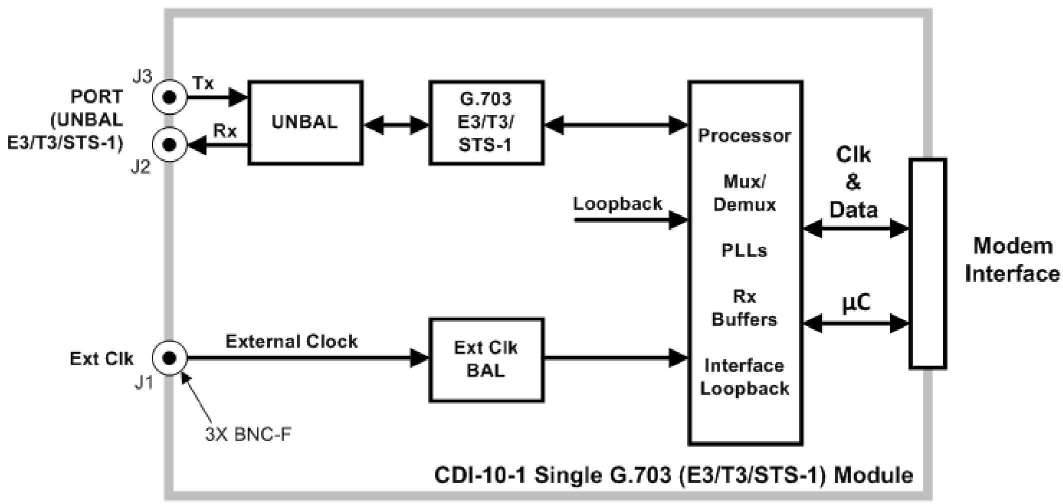


Figure C-3. CDI-10-1 Block Diagram

Figure C-4. CDI-10-1 Rear Panel View

C.3 Summary of Specifications

C.3.1 Physical and Environmental Specifications

Physical Dimensions

3.95 W x 8.14 D x 1.5 H inches (10.03 W x 20.67 D x 3.81H cm) PCB / Plug-in Module

Environmental

Humidity: 95% maximum, non-condensing
Temperature:
- o 0° to 50°C (32° to 122°F) Operating Temperature
- o -40° to +70°C (-40° to 158°F) Storage Temperature

Mechanical: Compatible with CDM-710G and CDM-710GL rear panel Interface Slot 1.
Agency Approval: CE in conjunction with the modem.

C.3.2 General Specifications

Interfaces

(2X) independent BNC female G.703 ports ('Tx | J3' and 'Rx | J2') for E3, T3, and STS-1

External Clock Input

(1X) BNC female input ('Ext Clk | J1')

Interface Selection

Each interface is individually enabled

Rx Buffer, G.703 Frame Types

Each is programmable in 0.5 ms steps
- G.751: 1536 bits, 192 bytes
- G.752: 4760 bits, 595 bytes
- G.753: 2148 bits, 268.5 bytes

- STS-1: 6480 bits, 810 bytes

Minimum Buffer Size (Typical)

0.5 ms

Maximum Buffer Size/Rate

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

Clock Options

Asymmetric operation is not supported:

- Tx Clock = Tx, Rx (satellite) or External
- Rx Clock = Tx, Rx, External or Internal

Acquisition Range

Programmed Tx data rate ±100 ppm

Test

- Baseband Loopback (at interface)
- Interface Loopback (through interface module)

Hot Swap Capability

NONE

C.3.3 Interface Specifications

G.703 Unbalanced

- 1X independent channel supporting G.703 E3, T3, and STS-1
- Connector Type: (2X) BNC female (‘Tx | J3’, ‘Rx | J2’)
- Supported Signals: 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: 75Ω per ITU-T-G.703

External Clock Input

- Connector Type: BNC female ('Ext Clk | J1')
- Impedance: 75Ω ±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%

Appendix D. CDI-60 HSSI DATA INTERFACE

D.1 Overview

The CDI-60 HSSI Data Interface (**Figure D-1**) is a plug-in module that installs into the rear of the CDM-710G or CDM-710GL High-Speed Satellite Modem chassis (**Figure D-2**). It provides physical and electrical connection between the external terrestrial device and the internal circuitry of the modulator or demodulator.

Figure D-1. CDI-60 HSSI Data Interface Module

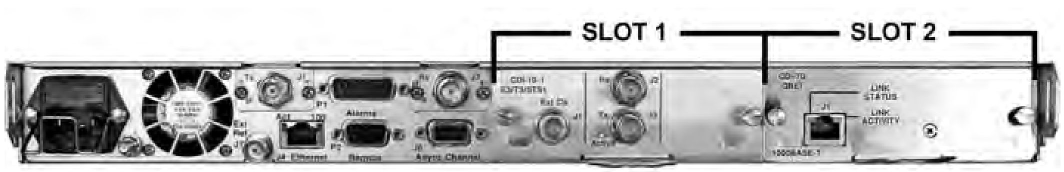


Figure D-2. CDM-710G/L Rear Panel Data Interface Slots

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.

Looking at **Figure D-2**:

- Interface Slot 1 is located at center right of the CDM-710G/L chassis rear panel. It is filled with a data interface module first. Slot 1 will accept either a CDI-10-1 Single G.703 (E3/T3/STS-1) or a CDI-60 HSSI Data Interface Module only.
- Interface Slot 2 is located at the right side end of the chassis rear panel. It is assigned either a blank panel or a CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface (GBEI) Module only.

For more information about the available data interfaces and installable module combinations, see:

- **Chapter 2. SPECIFICATIONS**
- **Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE**
- **Appendix E. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET DATA INTERFACE (GBEI)**

D.2 Physical Description

Figure D-3 shows a block diagram of the module; **Figure D-4** shows the rear panel of the module. Connection to the modem is provided when the module's 96-pin DIN connector is engaged into modem Interface Slot 1.

The CDI-60 HSSI Data Interface Module provides these features:

- A 96-pin DCE (Modem Interface) connection.
- The EIA-613 'HSSI | J1' data interface. See Section D.3.1 for the pinout table for this single HD-50 (50-pin) SCSI-2 mini-D connector.
- An ST clock that is sourced to the terrestrial interface for use as a reference by the DTE.
- A TT that is treated as an incoming External Clock, to which the interface phase locks.
- TA/CA support.
- A Light-Emitting Diode (LED), labeled 'Active', which lights green when the module senses HSSI data activity.

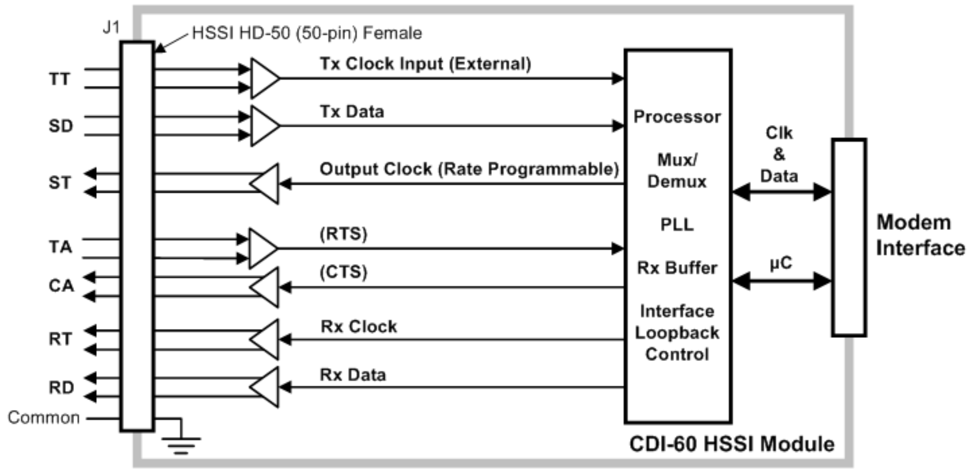


Figure D-3. CDI-60 Block Diagram

Figure D-4. CDI-60 Rear Panel View

D.2.1 ‘HSSI | J1’ (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

D.3 Summary of Specifications

D.3.1 Physical and Environmental Specifications

Physical Dimensions

3.95 W x 7.022 D x 1.5 H inches (10.03 W x 17.83 D x 3.81H cm) PCB / Plug-in Module.

Environmental

- Humidity: 95% maximum, non-condensing.
- Temperature:
  - 0° to 50°C (32° to 122°F) Operating Temperature.
  - -40° to +70°C (-40° to 158°F) Storage Temperature.
- Mechanical: Compatible with CDM-710G and CDM-710GL rear panel Interface Slot 1.
- Agency Approval: CE in conjunction with the modem.

D.3.2 General Specifications

Interfaces per Module

1X HSSI.

Modules per Modem

The interface operates in Interface Slot 1 only.

User Interface Connector

DCE, 50-pin mini-D female per EIA-613 (HSSI).

LED Indicator

The green “Activity” LED lights to indicate channel is enabled.

Operation

Simplex (Tx-ONLY or Rx-ONLY) or full duplex (Tx/Rx).

Supported Signals

ST, TT (or external), SD, TA, CA, RT, RD, SG.

Signal Sense

Programmable Normal or Inverted for TT and TD, RT and RD.

Signal Characteristics

- The ‘A’ terminal is positive with respect to the ‘B’ Terminal for a binary 1 (Mark or ON) state.

- The ‘A’ terminal is negative with respect to the ‘B’ terminal for a binary 0 (Space or OFF) state.

Data Rate Range

1 to 70 Mbps.

HSSI data rate limit of 70 Mbps may be reached before symbol rate limit is reached.

Electrical

- Per EIA-612 (10kH ECL-compatible).
- Typical Differential Output Voltage: $\geq$ 590 mV pp into 110V load.
- Typical Differential Input Voltage: 150 to 1000 mV pp with 110V load.

Minimum Buffer Size

5.0 ms.

Maximum Buffer Size

32 ms (in 0.1 ms steps).

Impedance

- Tx: ST, CA, RT, RD will drive 110V and meet HSSI voltage levels.
- Rx: 110V for TT, SD, TA.

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 / Rx Clock

Asymmetrical clocking with Rx Doppler buffer disabled.

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), TT.

Gap Clock

Not allowed – Send ST to external equipment so that it returns a continuous clock. See **Figure D-5**.

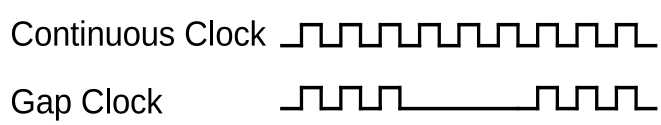


Figure D-5. Continuous and Gap Clock at TT

TA / CA

- Default: CA looped to TA.
- Selection: CA is asserted when there is no modem fault.

Acquisition Range

Programmed Tx data rate ±100 ppm.

Test

- I/O Loopback per **Chapter 7. FRONT PANEL OPERATION**.
- Interface Loopback per **Chapter 7. FRONT PANEL OPERATION**.

Cable Length to 52 Mbps

2m (6 ft) nominal, up to 15m (49 ft) maximum.

Higher data rates usually require shorter cable lengths.

Notes:

Appendix E. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET DATA INTERFACE (GBEI)

E.1 Overview

The CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface (GBEI) (**Figure E-1**) is a plug-in module that installs into the rear of the CDM-710G or CDM-710GL High-Speed Satellite Modem chassis (**Figure E-2**). It serves as an Ethernet bridge for data traffic. **M**onitor and **C**ontrol (M&C) information is not supported on this interface but is available through the 10/100 Base-T remote port of the modem.

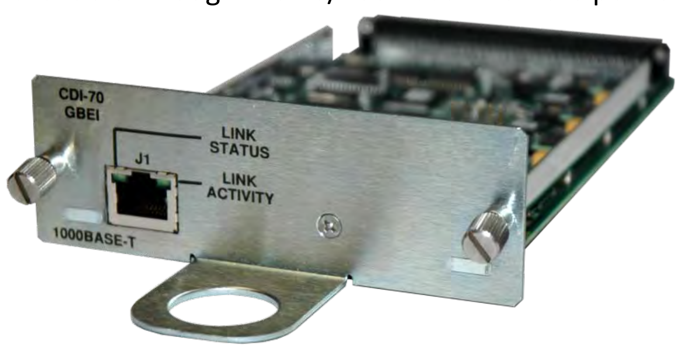


Figure E-1. CDI-70 Gigabit Ethernet Data Interface (GBEI) Module

The CDI-70 GBEI 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.

Figure E-2. CDM-710G/L Rear Panel Data Interface Slots

Looking at **Figure E-2**:

- Interface Slot 1 is located at center right of the CDM-710G/L chassis rear panel. It is filled with a data interface module first. Slot 1 accepts either a CDI-10-1 Single G.703 (E3/T3/STS-1) or a CDI-60 HSSI Data Interface Module only.
- Interface Slot 2 is located at the right side end of the chassis rear panel. It is assigned either a blank panel or the CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface (GBEI) Module only.

For more information about the available data interfaces and installable module combinations, see:

- **Chapter 2. SPECIFICATIONS**
- **Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE**
- **Appendix D. CDI-60 HSSI DATA INTERFACE**

E.2 CDI-70 Physical Description

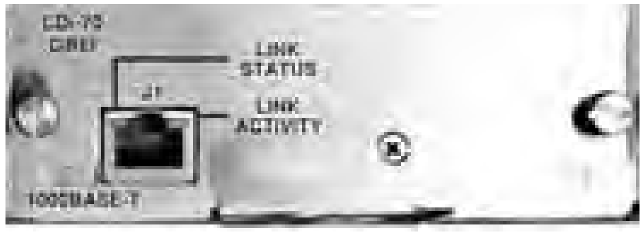


Figure E-3. CDI-70 Rear Panel View

Figure E-3 shows the rear panel of the CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface (GBEI) Data Interface Module. **Figure E-4** shows a block diagram of the module. Connection to the modem is provided when the module's 96-pin DIN connector is engaged into modem Interface Slot 2. The CDI-70 provides these features:

- A 96-pin DCE (Modem Interface) connection.
- The **'GBEI | J1'** LAN interface. See **Section E.2.1** for the pinout table for this single IEEE 802.3ab 1000 Base-T copper-compliant female RJ-45 connector.
- The **'GBEI | J1'** connector features two Light-Emitting Diodes (LEDs):
  - The "Link Status" LED lights amber when the module senses a stable Ethernet connection.
  - "Link Activity" LED flashes green when the module senses Ethernet data activity.

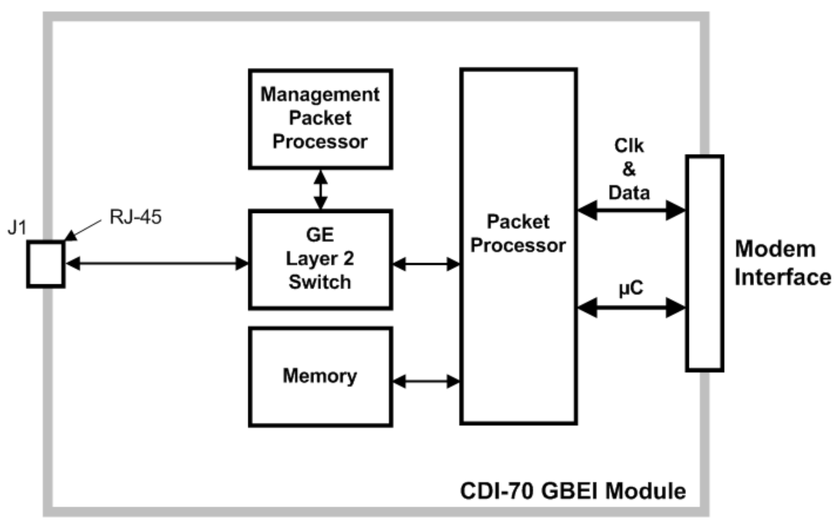


Figure E-4. CDI-70 Block Diagram

E.2.1 CDI-70 'GBEI | J1' RJ-45 Connector Pinout

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

E.3 CDI-70 Specifications

E.3.1 Physical and Environmental Specifications

Physical Dimensions

3.95 W x 7.022 D x 1.5 H inches (10.03 W x 17.83 D x 3.81H cm) PCB / Plug-in Module

Environmental

- Humidity: 95% maximum, non-condensing
- Temperature:
  - 0° to 50°C (32° to 122°F) Operating Temperature
  - -40° to +70°C (-40° to 158°F) Storage Temperature
- Mechanical: Compatible with CDM-710G and CDM-710GL rear panel Interface Slot 2.
- Agency Approval: CE in conjunction with the modem.

E.3.2 General Specifications

Modules per Modem

The interface operates in Interface Slot 2 only.

Connector

1X RJ-45 female, 100Ω

Electrical Properties

Per IEEE 802.3ab

Voltage Level

Per IEEE 802.3ab

LED Indicators

- “LINK STATUS” – amber
- “LINK ACTIVITY” – green

Hot Pluggable – Module

NO

Hot Pluggable – Cable

YES

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)

Data Framing

10/100/1000 Base-T Interface: RFC-894 “Ethernet”

Data Framing Format (WAN)

HDLC (Standard Single Channel)

Maximum Frame Size

1632 bytes

Packet Types

Burst or Distributed IPV4

Maximum Packet Latency

50 ms

Flow Control

NONE

E.3.3 Monitor and Control (M&C) Specifications

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.

1000 Base-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 octets
- Egress Unicast packets
- Egress broadcast packets
- Egress multicast packets

WAN Port 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 octets
- Egress Unicast packets
- Egress broadcast packets
- Egress multicast packets
- HDLC link errors
- Rx packet count
- Tx packet count

Management Port 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 octets
- 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

E.4 CDI-70 GBEI Firmware Update

The CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface module contains its own processor and memory. Because of this, the module operates under its own firmware and requires update separate from that of the CDM-710G/L High-Speed Satellite Modem. You may directly acquire the download from Comtech EF Data's web site (www.comtechefdata.com), or receive the archive file by e-mail from Comtech EF Data Product Support.

This section presumes user familiarity with the tasks required for:

- Creating the temporary folder;
- Downloading the CDI-70 GBEI firmware update archive file to the temporary folder;
- Extracting the CDI-70 GBEI firmware files and user notes from the downloaded archive file and transferring them into the temporary folder.

Chapter 5. FIRMWARE UPDATE

E.4.1 CDI-70 Firmware Update Procedure Summary

1. Download the CDI-70 firmware update archive file to a user-supplied PC. The User PC must be Microsoft Windows® compatible.
2. Make sure the User PC is connected to the CDI-70's 'GBEI | J1' Ethernet traffic port with an Ethernet hub, switch, or direct CAT5 cable connection.

   Do NOT use the CDM-710G/L 'J4 | Ethernet' 10/100 M&C port for this procedure.
3. Use the Comtech EF Data CReflash.exe File Transfer Protocol (FTP) utility to transfer the extracted firmware files from the User PC to the CDI-70's standby firmware image.
4. Use the modem front panel or the CDM-710G/L HTTP Interface to verify that the CDI-70 is operating using the updated firmware image.

E.4.2 Download and Extract the CDI-70 GBEI Firmware Update Files

Do these steps:

1. Go online to www.comtechefdata.com.
2. On the Main page – Under **Support Information** or the **Support** tab, select the **Software Downloads** hyperlink.
3. On the **Software Downloads** page – Click **Download Flash and Software Update Files**.
4. On the **Flash Updates Index** page – Select the **(Select a Product Line) Satellite Modems** hyperlink.
5. On the Modems product page – Select the **CDM-700** or (if available) **CDM-710G** product hyperlink, similar to this example:

6. Select the appropriate firmware archive EXE or ZIP file download hyperlink. Make sure that you do NOT download the CDM-710G modem firmware – you must download the CDM-700 **GBEI FW/12738** firmware.
7. Extract the update files to your temporary folder. If not already done with **File Download > Open**, you must extract, at a minimum, these files (filenames are subject to change):
   - FW12738x.bin (the bulk image file, where 'x' is the firmware revision letter).
   - CReflashV#_#.zip (the CReflash FTP Utility archive file, where #_# is utility version).
   - CReflash_readme_GBEI1.pdf (the GBEI firmware update procedure instructions).
8. Confirm availability of the files in the temporary folder.

E.4.2.1 Steps to Run the CReflash FTP Upload Utility

Do these steps:

1. From the temporary folder – Extract the contents of the CReflashV#_#.zip file. Make sure the "CReflash.exe" utility is accessible in your temporary file location.
2. Locate, and then double-click, the "CReflash.exe" filename or icon. The CReflash utility opens:

3. Enter your upload parameters information into CReflash:
   a. Left-click in the "IP Address:" text box, and enter the IP Address assigned to the GBEI.
   b. Left-click in the "Local Filename:" text box. Then, click **[Browse]** and navigate to the temporary folder created earlier. Click on the firmware "FW12738x.bin" filename, and then click **[Open]**. The filename will appear in the "Local Filename:" text box.
   c. Make sure the"Remote Filename" drop-down list remains set to "**bulk:**".
4. Click **[Start]** to begin the upload process. If the information was correctly entered into CReflash, the utility displays an animated progress bar at the bottom of the window, along with a series of messages:
   - "Opening FTP connection…"
   - "Sending data file to modem:"
   - "Writing FLASH: # of #"
   - "Success!"

Once the CReflash.exe application starts, the program will not respond to user input for approximately 5 minutes. During this time, a message displays on the modem front panel VFD to indicate this progress phase.

- DO NOT CLOSE THE CREFLASH.EXE PROGRAM ON THE PC!
- DO NOT REBOOT THE MODEM!

5. When done, click **[Cancel]** to exit CReflash.
6. Reboot the CDM-710G. The new GBEI firmware will load upon power-up of the unit.
7. Verify that the new firmware load is active upon reboot:
   - **From the CDM-710G front panel:**
     SELECT: UTIL→ Firmware→ Info→ Image# (Image1 or Image2)→ Interfaces→GBEI
   - **From the Serial Console port:** To view the GBEI information, select Operations, and then select Maintenance/Unit Information.
   - **From Telnet via the CDM-710G 'J4 | Ethernet' 10/100 M&C port:** To view the GBEI information, select Operations, and then select Maintenance/Unit Information.
   - **From the CDM-710G HTTP (Web Server) Interface via the CDM-710G 'J4 | Ethernet' 10/100 M&C port:** To view the GBEI information, select the Maint navigation tab, and then select the Unit Info hyperlink.

E.5 CDI-70 GBEI Operational Setups

The CDI-70 GBEI operates on the CDM-710G/L as a bridge device and passes traffic between hosts at different geographic locations on a common Local Area Network (LAN). It functions as a network hub device, meaning that it acts like a “direct wire” connection and passes all Ethernet traffic and broadcasts.

Figure E-5 shows use of the CDI-70 GBEI to bridge a remote host on a common LAN over the satellite.

You may also wish to separate the ‘J4 | Ethernet’ 10/100 M&C port from the traffic on the CDI-70 ‘GBEI | J1’ port. **Figure E-6** shows an example where the ‘J4 | Ethernet’ 10/100 M&C 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.

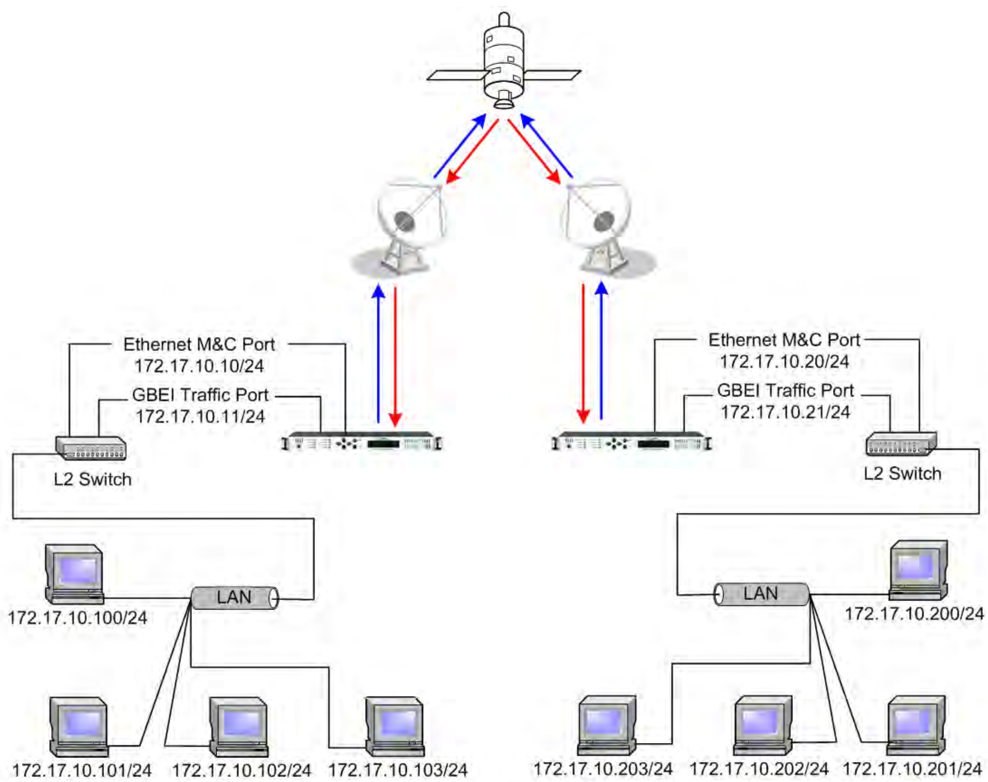


Figure E-5. CDI-70 GBEI Example: Bridging Remote Host on Common LAN over Satellite

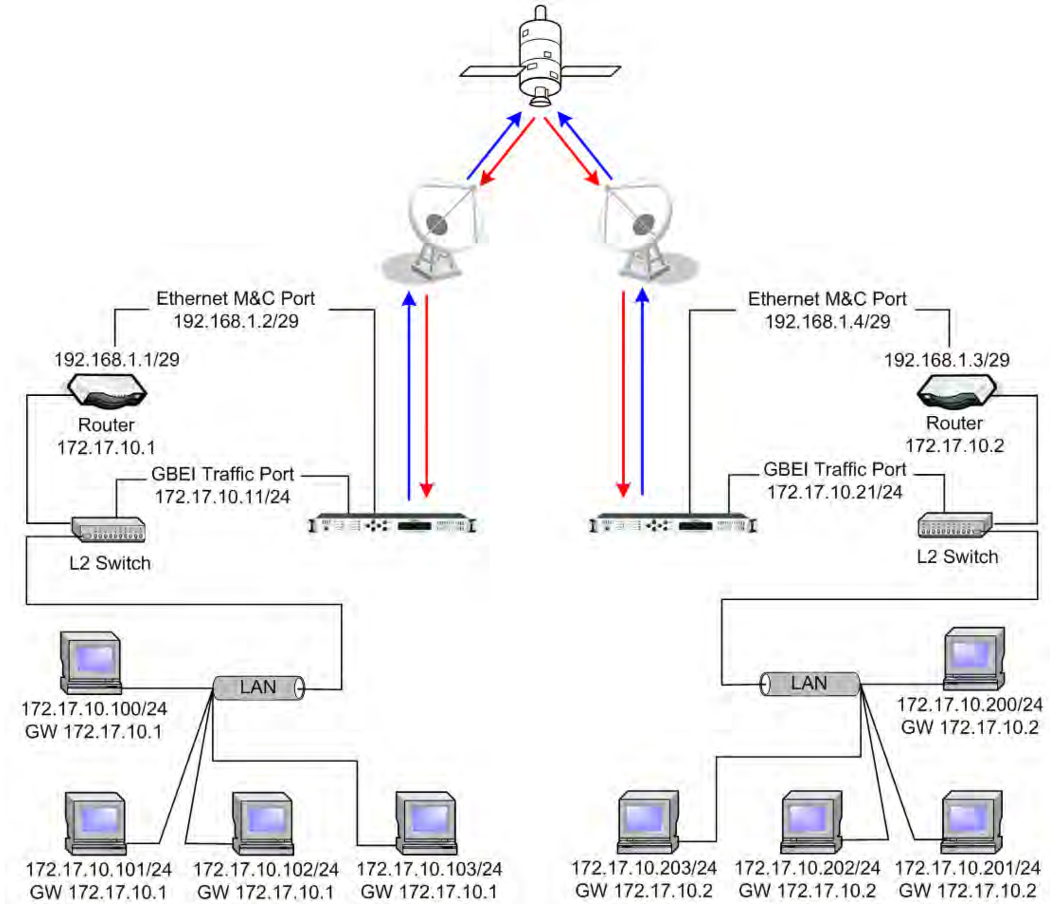


Figure E-6. M&C Port Assignment Example: IP Address NOT on Common LAN

Appendix F. CLOCK MODES

F.1 Overview

When dealing with satellite modems, the subject of clocking often becomes a complex issue. This appendix addresses the various clocking options that are available with the CDM-710G High-Speed Satellite Modem.

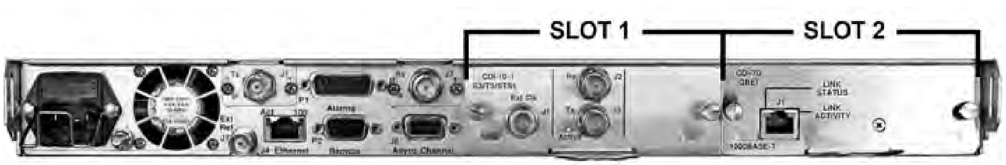


Figure F-1. CDM-710G/L Rear Panel Data Interface Slots

The CDM-710G is always Data Communications Equipment (DCE), and it is normally connected to Data Terminal Equipment (DTE). The CDM-710G allows the operation of single ports on single data interface modules that plug into the two interface slots provided at the modem rear panel (**Figure F-1**). For the most part, clocking operates independently at each port.

Figure F-2 presents a diagram of a typical interface; a general description of the clocking and clock modes follows. The availability of a specific clocking mode depends upon the data interface and its characteristics.

For detailed information about the available data interfaces, see:

- **Appendix C. CDI-10-1 SINGLE G.703 (E3/T3/STS-1) DATA INTERFACE**
- **Appendix D. CDI-60 HSSI DATA INTERFACE**
- **Appendix E. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET INTERFACE (GBEI)**

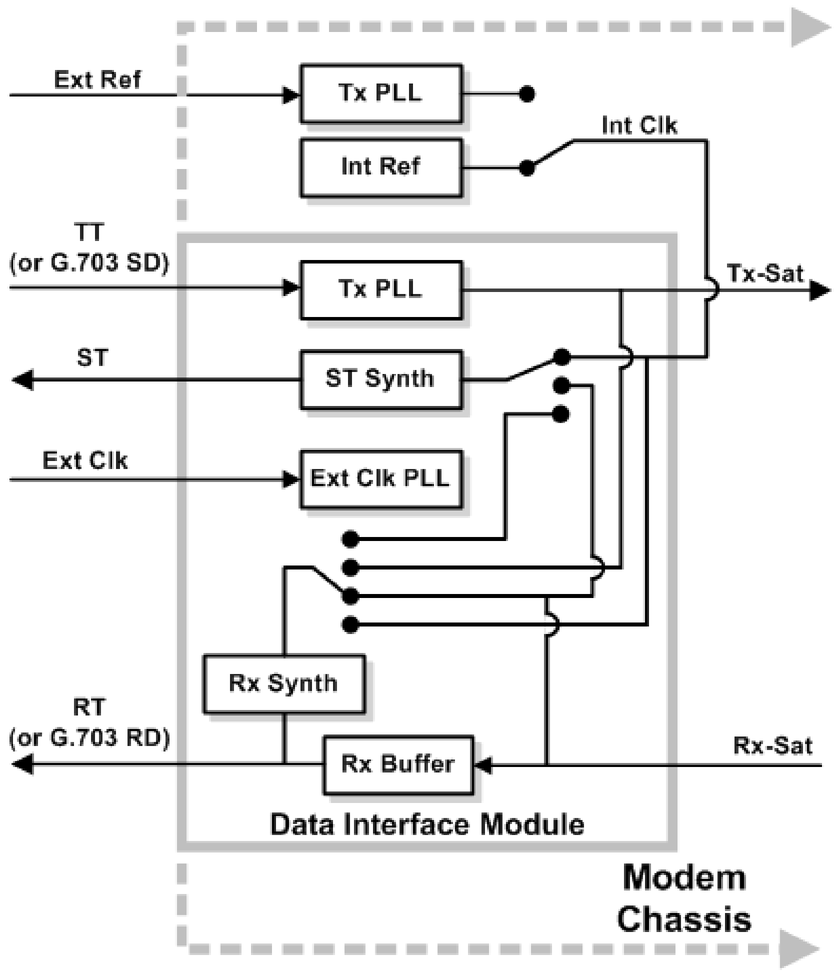


Figure F-2. Typical Data Interface Diagram (Features Vary By Interface)

Ext Clk

This input is provided on the CDI-10-1 Single G.703 (E3/T3/STS-1) Data Interface module. 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 CDI-10-1 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.

Ext Ref

This signal is a low-phase noise, highly stable signal. It is sourced via the CDM-710G 'J7 | Ext Ref' BNC connector, located on the modem chassis rear panel (not on any data interface module). The modem locks its internal IF synthesizers and signal processing circuitry to the Ext Ref 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.

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.

F.2 CDI-10-1 Single G.703 (E3/T3/STS-1) Data Interface Module

The CDI-10-1 Single G.703 Data Interface Module (**Figure F-3**) has a single port that operates at an E3, T3, or STS-1 data rate. A port is a Tx/Rx pair.

Figure F-3. CDI-10-1 Single G.703 (E3/T3/STS-1) Data Interface Module

The CDI-10-1 provides these features:

- A 96-pin DCE (Modem Interface) connection;
- Three female BNC connectors for these functions:
  - **'Ext Clk | J1'** – External Clock Input Port
  - **'Rx | J2' (top) and 'Tx | J3' (bottom)** – Both connectors comprise the Single G.703 Interface Port. This interface is operable and selectable as OFF, E3, T3, or STS-1.
- A Light-Emitting Diode (LED), labeled 'Active', which lights green when the module senses G.703 data activity.

Refer to the next appendix section for the functional block diagram (**Figure F-4**) and descriptions of the module's clocking functions.

F.2.1 CDI-10-1 Single G.703 Interface – Clocking Features

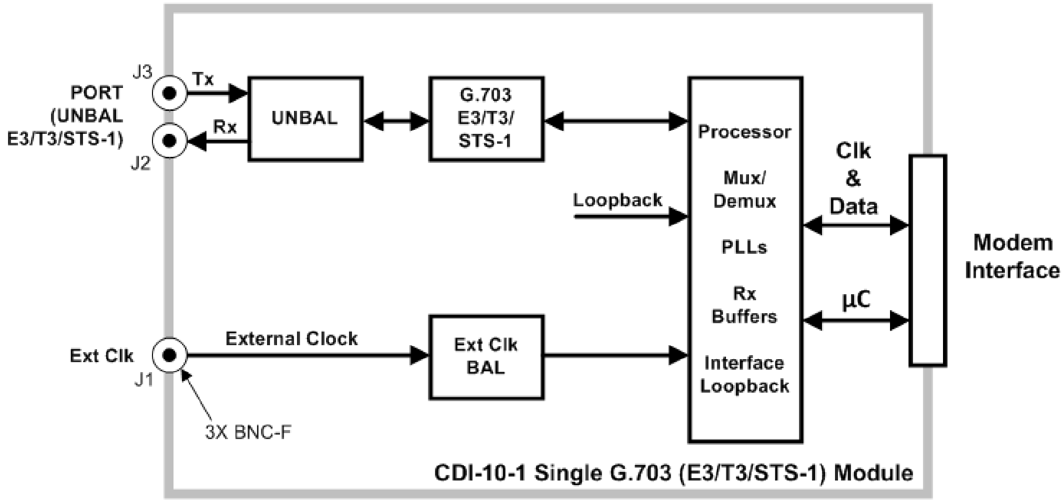


Figure F-4. CDI-10-1 Block Diagram

F.2.1.1 CDI-10-1 Transmit (Tx) 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 operations do not apply to G.703 applications.

F.2.1.2 CDI-10-1 Receive (Rx) Clocking

When the Rx Buffer is disabled, the receive clock is the Rx-Sat. In this mode, make sure to set the Rx Buffer 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

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 allowed.

Ext Clk

Derives a clock from a signal input to the '**Ext-Clk | J1'** connector on the CDI-10-1 module – ***not*** the **'J7 | Ext Ref**' connector on the modem chassis.

F.3 CDI-60 HSSI Data Interface Module

The CDI-60 HSSI Data Interface (**Figure F-5**) features a single rate programmable port.

Figure F-5. CDI-60 HSSI Data Interface Module

The CDI-60 provides these features:

- A 96-pin DCE (Modem Interface) connection.
- The EIA-613 'HSSI | J1' data interface is a single HD-50 (50-pin) SCSI-2 mini-D connector.
- An ST clock that is sourced to the terrestrial interface for use as a reference by the DTE.
- A TT that is treated as an incoming External Clock, to which the interface phase locks.
- TA/CA support.
- A Light-Emitting Diode (LED), labeled 'Active', which lights green when the module senses HSSI data activity.

Refer to the next appendix section for the functional block diagram (**Figure F-6**) and descriptions of the module's clocking functions.

F.3.1 CDI-60 HSSI Interface – Clocking Features

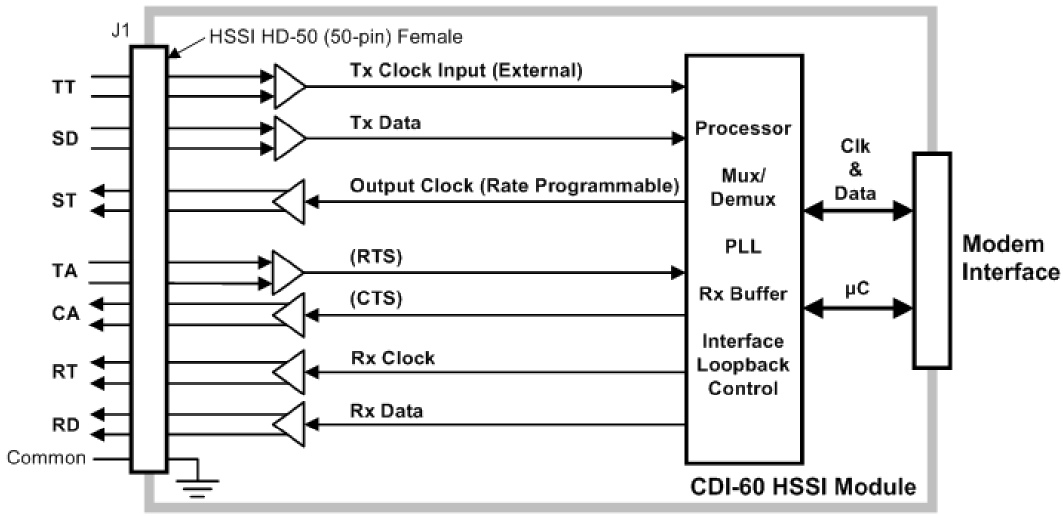


Figure F-6. CDI-10-1 Block Diagram

F.3.1.1 CDI-60 Transmit (Tx) Clocking

TT

This 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

This is where ST is supplied to the DTE, and TT is not allowed and is not returned to the modem. 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 make sure that TT derived from ST is delivered to the DCE.

Rx Loop-Timed

This is 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.

F.3.1.2 CDI-10-1 Receive (Rx) Clocking

When the Rx Buffer is disabled, the receive clock is the Rx-Sat. In this mode, make sure to set the Rx Buffer to minimum to reduce latency.

When the Rx Buffer is enabled, the Rx clock selections are as follows:

Rx-Sat (default)

Selecting this clock 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 typically used with routers.

Tx-Terr

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 asymmetrical data rates where Tx ≠ Rx is allowed.

Internal Clocking

The internal Clock comes from the modem. It derives its signal from either the modem chassis ‘J7 | Ext Ref’ port ort the Int Ref oscillator – ***not*** from the CDI-60.

F.4 CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface (GBEI) Data interface Module

The CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface (GBEI) Data Interface Module (**Figure F-7**) provides no transmit or receive clocking options.

Figure F-7. CDI-70 Gigabit Ethernet Data Interface (GBEI) Module

The CDI-70 provides these features:

- A 96-pin DCE (Modem Interface) connection.
- The 'GBEI | J1' LAN interface. It is a single IEEE 802.3ab 1000 Base-T copper-compliant female RJ-45 connector.
- The 'GBEI | J1' connector features two Light-Emitting Diodes (LEDs):
    - The "Link Status" LED lights amber when the module senses a stable Ethernet connection.
    - "Link Activity" LED flashes green when the module senses Ethernet data activity.

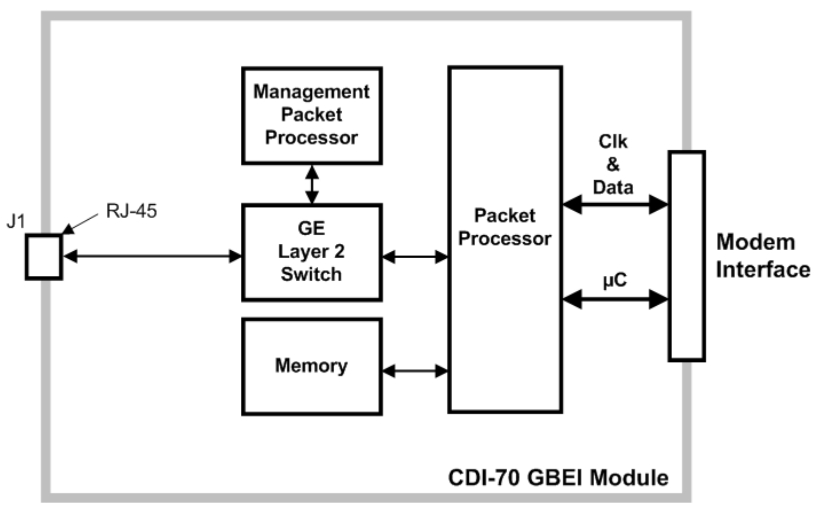


Figure F-8. CDI-70 Block Diagram

Figure F-8 shows a functional block diagram for the CDI-70 module. Note that:

- 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.

Appendix G. Eb/No MEASUREMENT

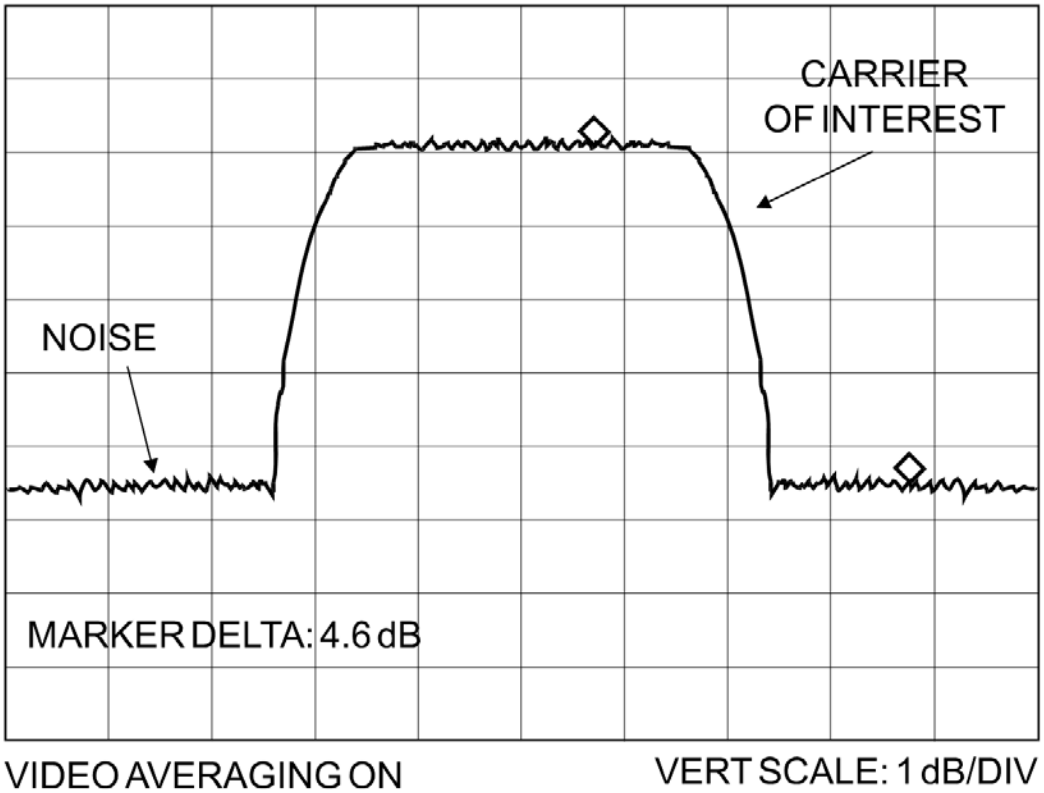
Although the CDM-710G and CDM-710GL High-Speed Satellite Modems calculate and display the value of Rx Eb/No on the front panel of the unit, it is sometimes useful to measure the value using a spectrum analyzer, if one is available.

The idea is to accurately measure the value of (Co+No)/No (i.e., 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 as 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 (this is the only simple way for DVB-S2):

$$Eb/No=10_{log}(10^{(Co+No/No)/10)}-1)-10_{log}\ (Spectral\ Efficiency)$$

and:

- Eb/No and (Co+No)/No are expressed in dB;
- Spectral Efficiency includes the modulation type, code rate, overhead and framing. See **Table G-1** for QPSK and 8PSK, and **Table G-2** for 16APSK and 32APSK.

Table G-1. CDM-710G/L 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 G-2. CDM-710G/L 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)

Spectral Efficiency		Code Rate										
		16APSK						32APSK				
		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.

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