COMTECH EF DATA™

CDM-710

Broadcast Satellite Modem
Installation and Operation Manual

CDM-710 [70-140 MHz] Broadcast Satellite Modem
CDM-710L [L-Band] Broadcast Satellite Modem
For Firmware Version 4.1.10 or Higher

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-710 Broadcast Satellite Modem and its L-Band counterpart, the CDM-710L. This is an informational document intended for the persons responsible for the operation and maintenance of the CDM-710 and the CDM-710L.

Revision 12 of this manual represents a complete rewrite from Revision 11, 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
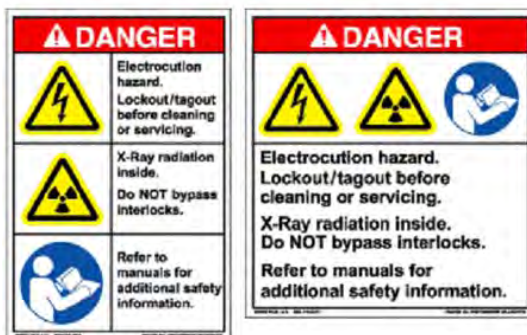
Recommended Standard Designations

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

Symbol	Description
	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:

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Chapter 1. INTRODUCTION

1.1   Overview

Chassis - Initially released version

Chassis – Rev. A and later versions

Figure 1-1. CDM-710/L Broadcast Satellite Modem (Original and Current Production Versions)

The CDM-710 and CDM-710L Broadcast Satellite Modems (**Figure 1-1**) provide transmission of data in Digital Video Broadcast (DVB) and generic data transmission applications. The CDM-710/L operates over satellite links with programmable symbol / data rates up to 45 Msps in DVB-S2, DVB-S, and DVB-DSNG modes. The unit is available in modem, modulator-only, and demodulator-only configurations.

Its companion products, the CDM-710G and CDM-710GL, support non-MPEG2 formats with a variety of data interfaces.

1.1.1   Applications

With an ASI interface and either the CDM-710 (70/140 MHz) or CDM-710L (L-Band) IF, the unit is ideal for video or data transmission formats that take advantage of the frame structures developed for digital video applications. Further opportunities are opened with the Gigabit Ethernet option installed. The terrestrial data interface modules are field-removable to allow swap-out of interface types. These modules include the CDI-40 ASI, CDI-60 HSSI, and CDI-70 Gigabit Ethernet (GBEI) Data Interfaces.

The CDM-710/L's bandwidth and power-efficient operation is ideal for:
- Digital Video Broadcast (DVB)
- Digital Satellite News Gathering (DSNG)
- Primary or Backhaul Transmission for:
  - Direct-to-Home (DTH)
  - Contribution
  - Distribution
- Business enterprise data distribution
- Broadband Interactive services

DVB-S2 offers new opportunities for broadcast applications. 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. Whether a link is for Direct-to-Home (DTH) or Digital Satellite News Gathering (DSNG), Contribution or Distribution, there is a format available to suit each application. [1]

1.1.2   Standard and Optional Features

Chapter 2. SPECIFICATIONS

The unit is available in two operating frequency versions:
- The CDM-710 (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

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[1] ID Number 3424 for the CDM-710. The DVB-S2 logo is a trademark of the DVB Digital Video Broadcasting Project (1991 to 1996).

programmable for either 50Ω or 75Ω impedance operations. The 'J3 | Rx' port is a BNC female connector.

- The CDM-710L (L-Band), with 950 to 2000 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. This includes DVB-S (QPSK), DVB-DSNG (8PSK and 16QAM), and DVB-S2 (QPSK, 8PSK, 16APSK, and 32APSK) modes. Constant Coding and Modulation (CCM) operation is provided. Spectral rolloffs of 20%, 25%, and 35% are available.

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

The unit front panel (Figure 1-1) features Light Emitting Diode (LED) array, keypad and display for local monitor and control of the modem. Remote control is available via an RS-232 / RS-485 2- or 4-wire bus or 10/100 Base-T Ethernet port located on the base modem rear panel (**Figure 1-2**). The rear panel features two terrestrial data interface slots that accept field-removable modules:

- CDI-40 ASI Data Interface.
- CDI-60 HSSI Data Interface.
- CDI-70 1000 Base-T Gigabit Ethernet Interface (GBEI).

For detailed information, see:
- Appendix B. CDI-40 ASI DATA INTERFACE
- Appendix C. CDI-60 HSSI DATA INTERFACE
- Appendix D. 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-710/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-710/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
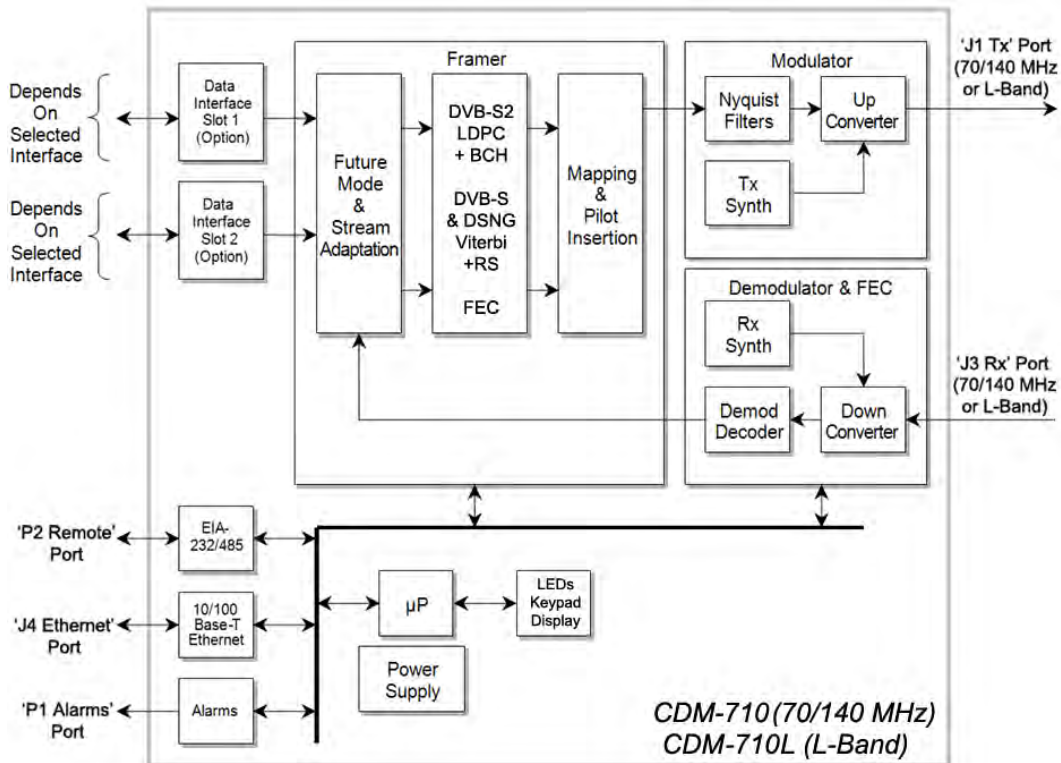
Figure 1-3. CDM-710/L Block Diagram

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 the DVB-S, DVB-DSNG, or 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, 16QAM, 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-710 (70/140 MHz), 52 to 88 MHz or 104 to 176 MHz IF output signal at the rear panel connector
- CDM-710L (L-Band), 950 to 2000 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-710/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- or 4-wire remote port and the 'J7 | Ethernet' Base-T 10/100 M&C port. Interface with the other modules in the unit is provided by the framer assembly.

- The FEC Encoder card is a plug-in module that resides on the Framer card. It generates the encoded stream used by the modulator card.
- The Demodulator card also plugs into the Framer card. It maps and spectrally shapes the I&Q data for delivery to thew IF interface.
- 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)

(!) "Earlier Units" refers to original production run units. "Later Units" refer to the Rev A chassis later production run units. See Figure 1-1 and refer to the notes that follow this table for further information.

Earlier Units	Later Units	Description
PL/10002-1	PL/10002-1	Modulator, 70/140 MHz
PL/11230-1	PL/12113-1	Modulator, L-Band Card
PL/10003-1	PL/10003-1	Demodulator, 70/140 MHz
PL/11571-1	PL/11571-1	Demodulator, L-Band
PL/10005-1	N/A	Encoder FEC, Tx LDPC and DVB-S
N/A	PL/12148-1	Encoder FEC, Tx LDPC and DVB-S, DVB-DSNG, and DVB-S2
N/A	PL/12169-1	Decoder FEC, Rx LDPC and DVB-S, DVB-DSNG, DVB-S2
PL/10012-1	N/A	Framing Card with 1.5 ppm reference
N/A	PL/12000-1	Framing Card
PL/10881-3	N/A	Optional CDI-40 DVB-ASI Data Interface Module for 1:N [Note 2]
N/A	PL/10881-4	Optional CDI-40 DVB-ASI Interface Module for 1:1 and 1:N [Note 2]
N/A	PL/11582-1	Optional CDI-60 HSSI Data Interface Module [Note 3]
PL/11509-1	N/A	Optional CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface Module (GBEI) (running Firmware FW11509) [Note 4]
N/A	PL/11509-2	Optional CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface Module (GBEI) (running Firmware FW12547) [Note 4]

Notes:

1) "Earlier" and "Later" units differ as follows:

   - "Earlier Units" operate using Firmware FW/12050 (Version 1.1.3 or earlier). "Later Units" operate using Firmware FW/12437 (Version 2.1.1 or later).
   - "Earlier Units"are "Tx only" (modulator only) and are not upgradeable to 16APSK or higher.
   - "Earlier Units" do not support redundancy and are not upgradeable.

2) CDI-40 ASI Data Interface Modules PL/10881-3 (for "Earlier Units") and PL/10881-4 (for "Later Units") have hardware differences that can not be upgraded through the Firmware Update process (e.g., CReflash). See para. 1.2.3 for 1:1 and 1:N application information.

3) The CDI-60 HSSI Data Interface Module PL/11582-1 requires Firmware Version 3.0.1 or later. Generic operation requires Firmware Version 4.1.1 or later.

4) The CDI-70 GBEI Data Interface Module PL/11509-1 can be upgraded to PL/11509-2 function using the Firmware Update process (e.g., CReflash).

1.3.3   Dimensional Envelope
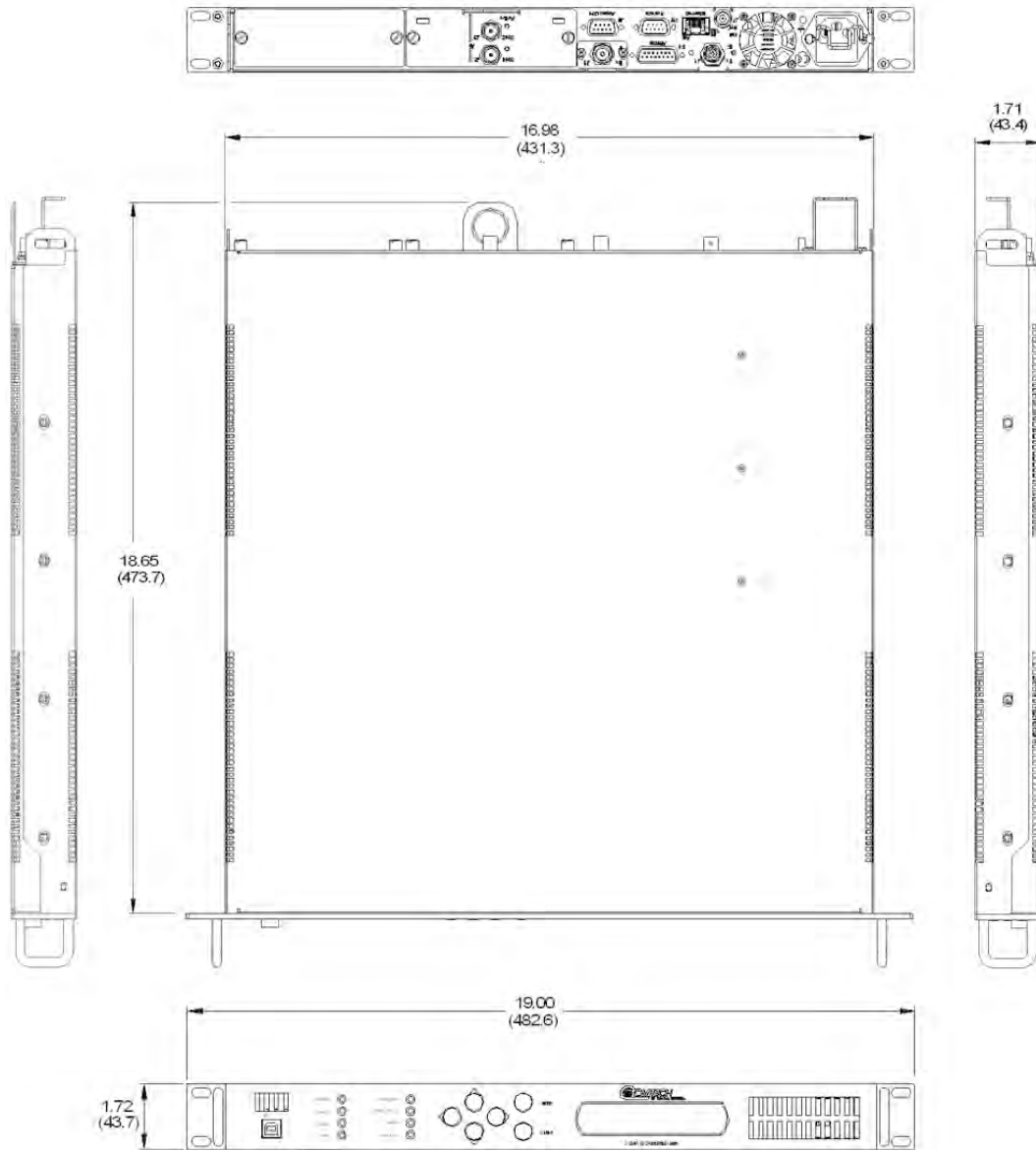
Figure 1-4. Dimensional Envelope

1.3.4   Front Panel
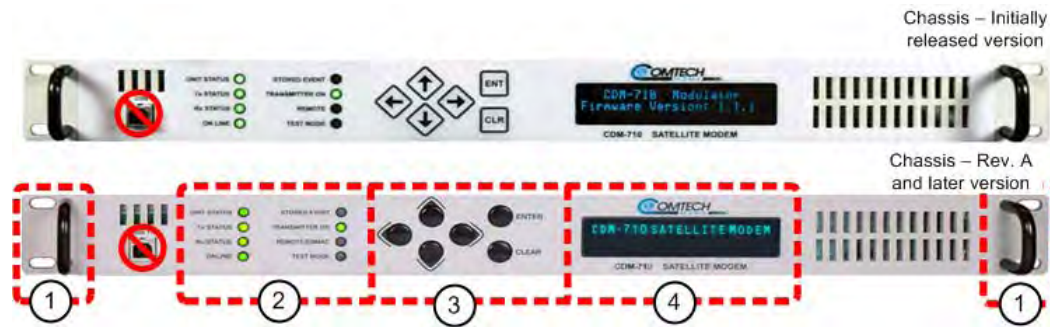
Figure 1-5. Front Panel View

> ⓘ   **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.

🛈 **The initially-released chassis featured a membrane switch keypad.**

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 for the Rev. A and later chassis 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
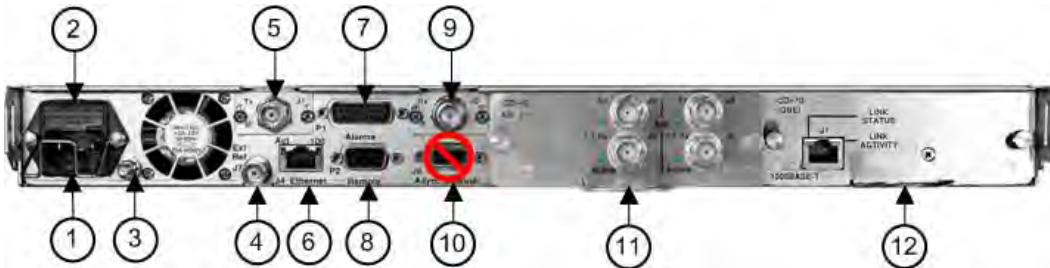
Figure 1-6. CDM-710/L Rear Panel View (CDM-710 Shown with Optional CDI-40 ASI and CDI-70 GBEI Data Interface Modules)

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

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

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

> 1) **Asynchronous Engineering Channel operation is not implemented in the CDM-710/L; this DB-9F connection is therefore *non-operational*.**
> 2) **This connection exists on Rev. A and later chassis only. The original production unit provided an RJ-45 connector, labeled 'J6 | SerDes'. It served as a private communications link and was not intended for customer use.**

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 B. CDI-40 ASI DATA INTERFACE
- Appendix C. CDI-60 HSSI DATA INTERFACE
- Appendix D. 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-40 ASI (Earlier Units)	PL/10881-3 See Appendix B for more information	See Note 1	
CDI-40 ASI (Later Units)	PL/10881-4 See Appendix B for more information	See Note 2	
CDI-60 HSSI	PL/11582-1	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex
CDI-70 GBEI	PL/11509-2 or PL/11509-3	OK Tx, Rx or Duplex	OK Tx, Rx or Duplex

Notes:
1) The original ("Earlier Units") CDI-40 supports Tx, Rx, or Duplex operation in _non-redundant_ applications, or _Tx-only_ in 1:1 applications. For 1:N applications, the module supports Tx, Rx, or Duplex operation, where the CDI-40 'Rx | J2' and '1:1 Rx | J3' outputs provide the standard ASI level.
2) The current ("Later Units") CDI-40 supports Tx, Rx, or Duplex operation in 1:1 or _non-redundant_ applications, where the CDI-40 'Rx | J2' output is the standard ASI level, and the '1:1 Rx | J3' output is higher so the standard level is delivered after a 3 dB combiner. For 1:N applications, the CDI-40 supports Tx, Rx, or Duplex operation, excluding the CDI-40 '1:1 Rx | J3' output.

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-710/L Unit Configuration"** column in **Table 1-2** shows the CDM-710/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-710/L as a Tx Only unit in 1:1 Redundancy, you must remove the demodulator card. Similarly, when you use a CDM-710/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-710/L.

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

CDM-710/L Unit Configuration		1:N CRS-300 Configuration		Notes
Interface Slot 1	Interface Slot 2	TMI Card	RMI Card	
CDI-40 ASI	None	CRS-325	CRS-306	-
CDI-40 ASI	CDI-70 GBEI			Can be used as a Redundant Unit
CDI-60 HSSI	None	CRS-336	CRS-306	-
None	CDI-70 GBEI			-
CDI-60 HSSI	CDI-70 GBEI			Can be used as a 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. **Interface Slots 1 and 2 are not active simultaneously**.

Notes:

Chapter 2. SPECIFICATIONS

2.1 Physical and Environmental Specifications

All information is typical for the CDM-710 (70/140 MHz) or CDM710L (L-Band) Broadcast Satellite Modem unless noted.

2.1.1 Regulatory Compliance

- "CE" as follows:
  - o EN 30489-1
  - o EN 55022 Class B (Emissions)
  - o EN 55024 (Immunity)
  - o 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 Modular Design

Simplex or Duplex

2.1.4   Temperature Range

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

2.1.5   Humidity (Non-condensing)

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

2.1.6   Front Panel Features

2.1.6.1   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)

2.1.6.2   Keypad

Six Keys: ◄ (LEFT), ► (RIGHT), ▲ (UP), ▼ (DOWN), ENTER, CLEAR

2.1.6.3   Vacuum Fluorescent Display (VFD)

2 lines, 24 characters per line.

2.1.7   Rear Panel Features

2.1.7.1   Chassis AC Power Cord Retainer

Standard

2.1.7.2   Chassis Power Supply Input

- AC: 100-240VAC 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.

2.1.7.3   Chassis Power Consumption

<75W, 55W typical

2.1.7.4   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.

2.1.7.5   IF Connectors

CDM-710:
(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-710L:
(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'

2.1.7.6   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).

2.1.7.7   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)**.

2.1.7.8   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-710 or CDM710L unless noted.

2.2.1 Unit Configuration

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

2.2.2 Symbol Rates

- DVB-S: 1 to 45 Msps
- DVB-S2: 1 to 45 Msps (QPSK, 8PSK); 35 Msps (16APSK); 28 Msps (32APSK)
- DVB-DSNG: 1 to 45 Msps

2.2.3 Data Rate

Corresponds to Symbol Rate. See Sect. 2.3.

2.2.4 Symbol Rate/Data Rate

See Sect. 2.2.20 Modulator (Transmit) Specifications/Sect. 2.2.21 Demodulator (Receive) Specifications.

2.2.5 Forward Error Correction (FEC) Types

- DVB-S per EN 301 421
  QPSK 1/2, 2/3, 3/4, 5/6, 7/8 Convolutional + Reed Solomon
- 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
- DVB-DSNG per EN 301 210
  8PSK: 2/3, 5/6, 8/9 Convolutional + Reed Solomon
  16QAM: 3/4, 7/8 Convolutional + Reed Solomon

2.2.6   Operating Modes

Only Constant Coding and Modulation (CCM) is supported.

2.2.7   Transport Streams

Only Single Transport Stream is supported.

2.2.8   Physical Layer (PL) Scrambling

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

2.2.9   Pilot Insertion

Selectable ON or OFF.

2.2.10   1:1 Redundancy

Built-in controller for operation with an optional Comtech EF Data 1:1
Redundancy Switch:
*   The CDM-710 uses the CRS-180 switch for 70/140 MHz operation.
*   The CDM-710L uses the CRS-170A switch for L-Band operation.

2.2.11   1:N Redundancy

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

2.2.12   Fault Handling

Form 'C' via the DB-15M 'P1 | Alarms' rear panel connector– see Chapter 5.
REAR PANEL CONNECTIONS for pinout information.

2.2.13   External Tx Carrier Off

TTL Low Signal - path bypasses microprocessor (DB-15M 'P1 | Alarms' rear panel connector– see Chapter 5. REAR PANEL CONNECTIONS for pinout information).

2.2.14   Frequency Reference (Selectable)

- Internal Reference: 10 MHz for data and IF, stability $\pm$ 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).

2.2.15   Test Functions

- Data Test Patterns: 2047 and 2^{23-1} compatible with BERT on Tx data tributaries on applicable data interfaces
- 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

2.2.16   Monitor Functions

- LED Status Indicators are provided on the front panel (see Sect. 2.1.6.1).
- Fault logs providing fault type and time/date stamp are viewable on the VFD.
- Receive Signal Level is reported within $\pm$ 5 dB (typical).
- E_S/N_0 is reported within $\pm$ 0.5 dB (typical).
- E_b/N_0 is reported within $\pm$ 0.5 dB (typical).

2.2.17 Remote M&C Operations

Using a Windows-based user PC to access the Ethernet or serial interfaces:
- Ethernet-based M&C – See Chapter 8. ETHERNET INTERFACE OPERATION. Use the RJ-45 'J4 | ETHERNET' port for Ethernet-based monitor and control:
  - o Telnet – Ethernet issuance of remote command and queries using a user-supplied terminal emulator.
  - o SNMP –Simple Network Management Protocol (SNMPv1 and SNMPv2c) operation using the CDM-710 SNMP agent.
  - o 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.

2.2.18 Spectral Mask

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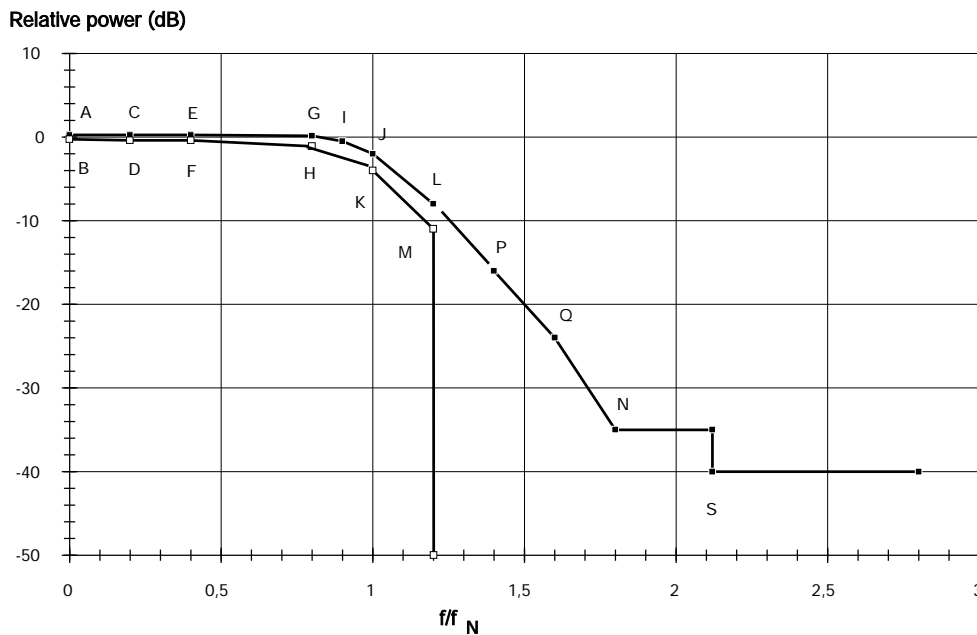
Figure 2-1. Spectral Mask

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	$0,8\,f_N$	$0,86\,f_N$	$0,89\,f_N$	+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	-

2.2.19   Firmware Update

CReflash utility via 10/100 BaseT Ethernet RJ-45 'J4 | Ethernet' Utility Port.

2.2.20   Modulator (Transmit) Specifications

2.2.20.1   Frequency Range

Bandwidth of transmitted spectrum is within IF frequency range:
- **CDM-710:** 52 to 88 MHz or 104 to 176 MHz in 100Hz steps.
- **CDM-710L:** 950 to 2000 MHz in 100Hz steps.

2.2.20.2   Impedance

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

2.2.20.3   'J1 | Tx' Connector Type

- **CDM-710:** BNC female
- **CDM-710L:** Type 'N' female.

2.2.20.4   Return Loss

- **CDM-710:** 18 dB
- **CDM-710L:** 15 dB

2.2.20.5   Output Power

Carrier is not interrupted when changing between output power levels or removing data connections:
- **CDM-710:**   0 to -20 dBm in 0.1 dB steps.
- **CDM-710L:**   -5 to -25 dBm in 0.1 dB steps.

2.2.20.6   Output Power Accuracy

±0.5 dB at 25°C

2.2.20.7   Output Power Stability

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

2.2.20.8   Carrier Mute

55 dB below main carrier output.

2.2.20.9   Carrier Null

35 dB below an unmodulated carrier.

2.2.20.10   Harmonics and Spurious

-55 dBc/4 kHz over operating frequency range (excludes spectral mask area) and is with a modulated carrier
- **CDM-710:**   -55 dBc/4 kHz 10 to 52 MHz, 176 to 250 MHz
- **CDM-710L:**   -55 dBc/4 kHz 250 to 950 MHz, 1950 to 2500 MHz

2.2.20.11   Integrated Phase Noise

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

2.2.20.12   Spectral Inversion

Normal or Inverted.

2.2.20.13   Quadrature Phase Error

< 2°

2.2.20.14   Quadrature Amplitude Imbalance

0.2 dB maximum.

2.2.20.15 Combined Amplitude Imbalance and Quadrature Phase Error

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

2.2.21 Demodulator (Receive) Specifications

2.2.21.1 Frequency Range

- **CDM-710:** 52 to 88 MHz or 104 to 176 MHz in 100Hz steps.
- **CDM-710L:** 950 to 2150 MHz in 100Hz steps.

2.2.21.2 'J2 | Rx' Connector Type/Impedance

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

2.2.21.3 Return Loss

- **CDM-710:** 18 dB
- **CDM-710L:** 10 dB

2.2.21.4 Input Power, Minimum

-58 + 10$_{log}$(Symbol Rate in MHz) dBm:
- **CDM-710:** -58 dBm at 1 Msps, -41.5 dBm at 45 Msps. See **Figure 2-2**.
- **CDM-710L:** -58 dBm at 1 Msps, -41.5 dBm at 45 Msps

Carrier Input Level (vs) Symbol Rate
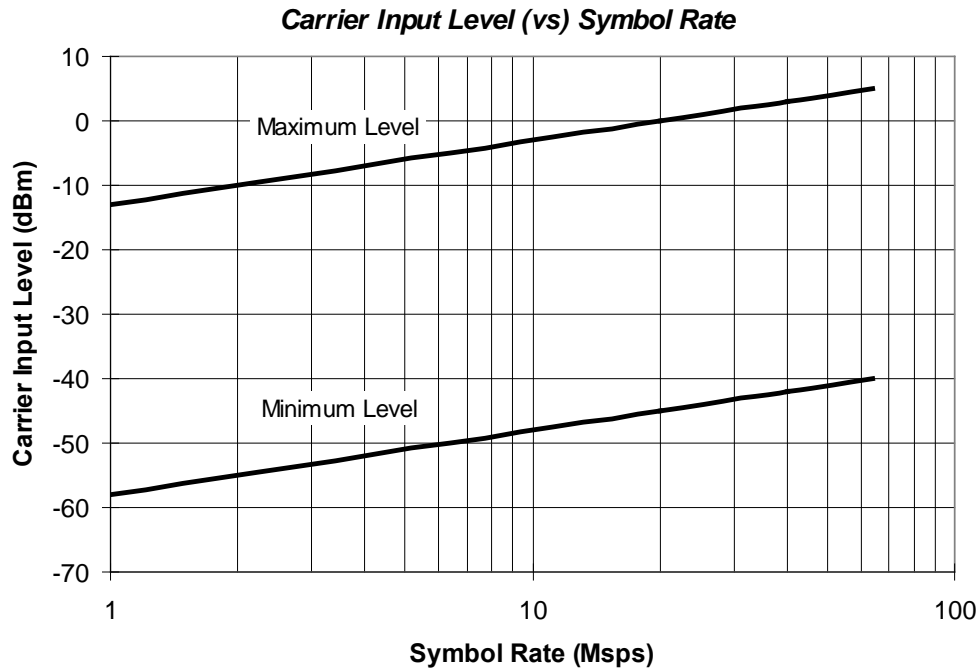
Figure 2-2. Demodulator Input Level

2.2.21.5   AGC (Automatic Gain Control) Range

45 dB above minimum.

2.2.21.6   Maximum Composite Level

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

2.2.21.7   Acquisition Range

±100 kHz programmable in 1 kHz steps.

2.2.21.8   Acquisition Time

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

2.2.21.9   Adaptive Equalizer

Up to 3 dB tilt.

2.2.21.10   BER Performance

See Table 2-2 through Table 2-5.

2.2.21.11   IQ Test Point

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

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
8-PSK	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
16-APSK	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
32-APSK	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.

Table 2-3. Eb/No Performance for DVB-S QPSK Operations

BER	Eb/No (dB)				
	1/2	2/3	3/4	5/6	7/8
10^{-6}	3.7	4.4	5.0	5.6	5.9
10^{-8}	4.0	4.7	5.3	5.9	6.3
10^{-11}	4.5	5.1	5.8	6.4	6.9

Table 2-4. Eb/No Performance for DSNG 8PSK Operations

BER	Eb/No (dB)		
	2/3	5/6	8/9
10^{-4}	6.0	7.5	8.5
10^{-6}	6.3	7.9	8.8
10^{-8}	6.6	8.3	9.1
10^{-10}	6.9	8.8	9.4

Table 2-5. Eb/No Performance for DSNG 16QAM Operations

BER	Eb/No (dB)	
	3/4	7/8
10^{-4}	8.1	10.0
10^{-6}	8.3	10.2
10^{-8}	8.6	10.4
10^{-10}	8.9	10.6

2.3   Data Rate Ranges

For the Symbol Rate and Data Rate Ranges for DVB-S, DVB-S2 and DVB-DSNG, there is some roundoff in the last digit of the values as listed. Table 2-6 is for the Standard FEC frame, and Table 2-7 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. When a 204-byte frame size is selected, the data rate increases by 204/188.

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 2-6. Data Rate Range: Standard FEC Frame (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
DVB-S2 - Standard FEC Frame = 64,800 Bits										
QPSK	LDPC+BCH	1/4	1	45	0.490243	0.490243	22.060942	0.478577	0.478577	21.535965
		1/3			0.656448	0.656448	29.540166	0.640827	0.640827	28.837209
		2/5			0.789412	0.789412	35.523546	0.770627	0.770627	34.678204
		1/2			0.988858	0.988858	44.498615	0.965327	0.965327	43.439697
		3/5			1.188304	1.188304	53.473684	1.160026	1.160026	52.201190
		2/3			1.322253	1.322253	59.501385	1.290788	1.290788	58.085452
		3/4			1.487473	1.487473	66.936288	1.452076	1.452076	65.343429
		4/5			1.587196	1.587196	71.423823	1.549426	1.549426	69.724175
		5/6			1.654663	1.654663	74.459834	1.615288	1.615288	72.687939
		8/9			1.766451	1.766451	79.490305	1.724416	1.724416	77.598702
		9/10			1.788612	1.788612	80.487535	1.746049	1.746049	78.572201
8PSK	LDPC+BCH	3/5	1	45	1.779991	1.779991	80.099585	1.739569	1.739569	78.280616
		2/3			1.980636	1.980636	89.128631	1.935658	1.935658	87.104623
		3/4			2.228124	2.228124	100.265560	2.177525	2.177525	97.988646
		5/6			2.478562	2.478562	111.535270	2.422276	2.422276	109.002433
		8/9			2.646012	2.646012	119.070539	2.585924	2.585924	116.366586
		9/10			2.679207	2.679207	120.564315	2.618365	2.618365	117.826440
16APSK	LDPC+BCH	2/3	1	35	2.637201	2.637201	92.302026	2.574613	2.574613	90.111471
		3/4			2.966728	2.966728	103.835482	2.896320	2.896320	101.371209
		4/5			3.165623	3.165623	110.796808	3.090495	3.090495	108.167326
		5/6			3.300184	3.300184	115.506446	3.221863	3.221863	112.765192
		8/9			3.523143	3.523143	123.310006	3.439530	3.439530	120.383555
		9/10			3.567342	3.567342	124.856967	3.482680	3.482680	121.893803
32APSK	LDPC+BCH	3/4	1	28	3.703295	3.703295	103.692261	3.623332	3.623332	101.453291
		4/5			3.951571	3.951571	110.643985	3.866247	3.866247	108.254911
		5/6			4.119540	4.119540	115.347126	4.030589	4.030589	112.856500
		8/9			4.397854	4.397854	123.139923	4.302894	4.302894	120.481032
		9/10			4.453027	4.453027	124.684751	4.356875	4.356875	121.992503
DVB-S & DVB-DSNG FEC Frame Does Not Apply										
QPSK	Conv+RS	1/2	1	45	0.921569	0.921569	41.470588	-	-	-
		2/3			1.228758	1.228758	55.294118	-	-	-
		3/4			1.382353	1.382353	62.205882	-	-	-
		5/6			1.535948	1.535948	69.117647	-	-	-
		7/8			1.612745	1.612745	72.573529	-	-	-
8-PSK	Conv+RS	2/3	1	45	1.843137	1.843137	82.941176	-	-	-
		5/6			2.303922	2.303922	103.676471	-	-	-
		8/9			2.457516	2.457516	110.588235	-	-	-
16-QAM	Conv+RS	3/4	1	45	2.764706	2.764706	124.411765	-	-	-
		7/8			3.225490	3.225490	145.147059	-	-	-

Table 2-7. Data Rate Range: Short Frame (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
DVB-S2 - Short FEC Frame = 16,200 Bits										
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

Chapter 3. INSTALLATION

3.1 Unpack and Inspect the Shipment
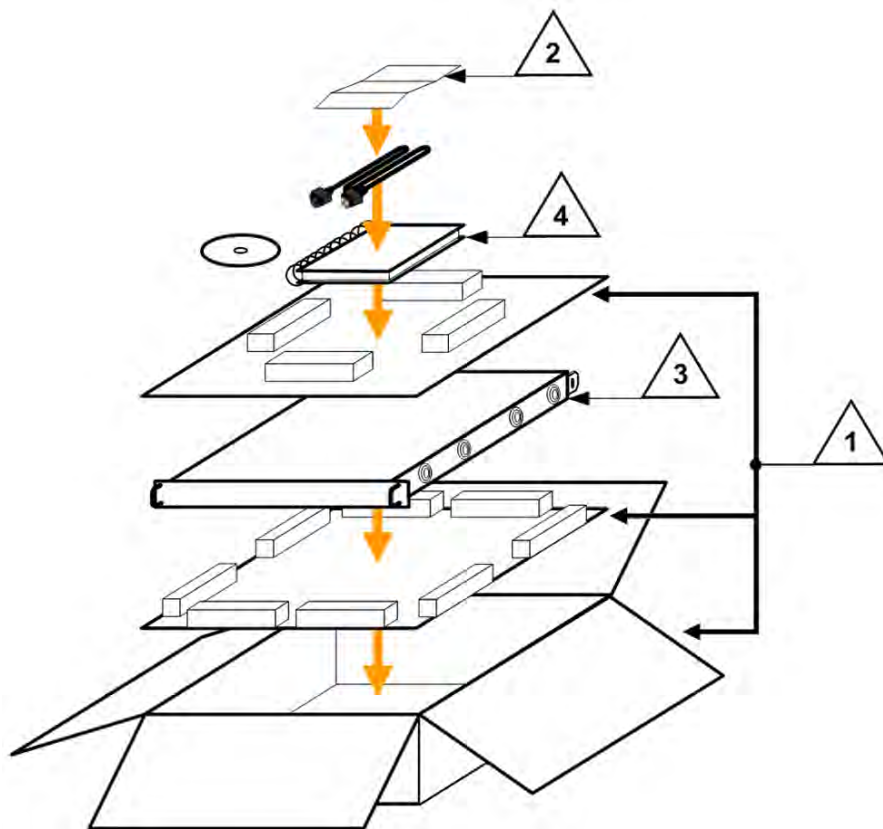
Figure 3-1. Unpack and Inspect the Shipment

The CDM-710/L Broadcast 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 EQUIPMEN**T.**

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 <u>never</u> exceed 50°C (122°F).

If there is any doubt, contact Comtech EF Data Product Support during normal business hours.
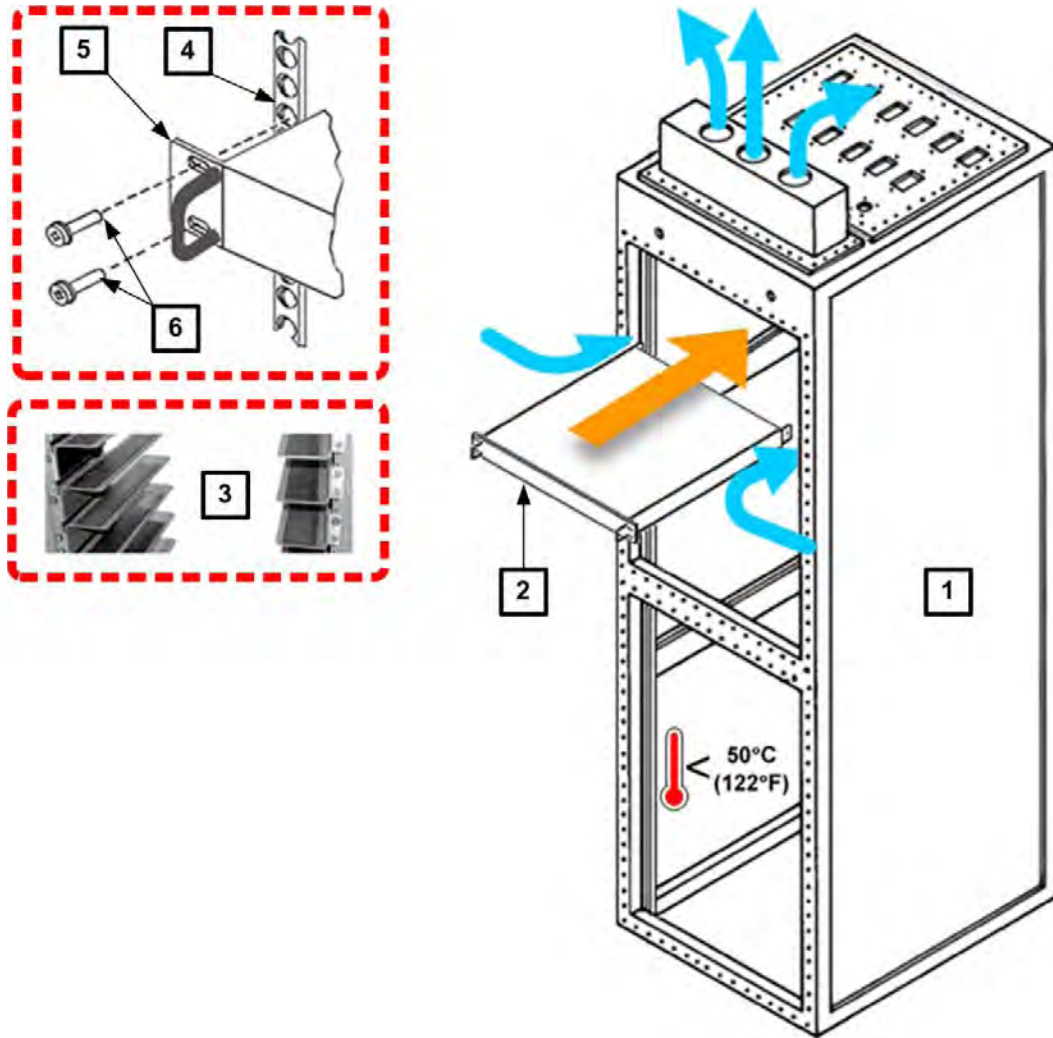
Feature	Description
1	Custom Rack Enclosure
2	CDM-710/L chassis
3	Standard Rack Shelving
4	Rack Enclosure Threaded Front Rail (typical)
5	Modem Front Panel
6	User-supplied Screws

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

3.2.1   Install the Optional Rear Support Brackets Kit
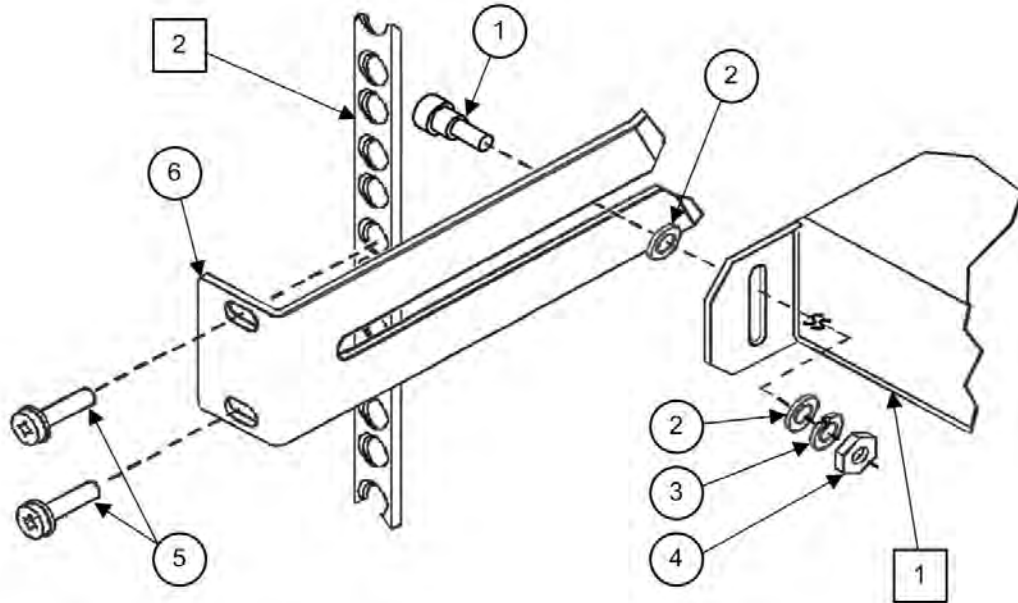
Feature	Description
1	Back of modem
2	Rack Enclosure Threaded Rear Mounting Rail (typical)

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
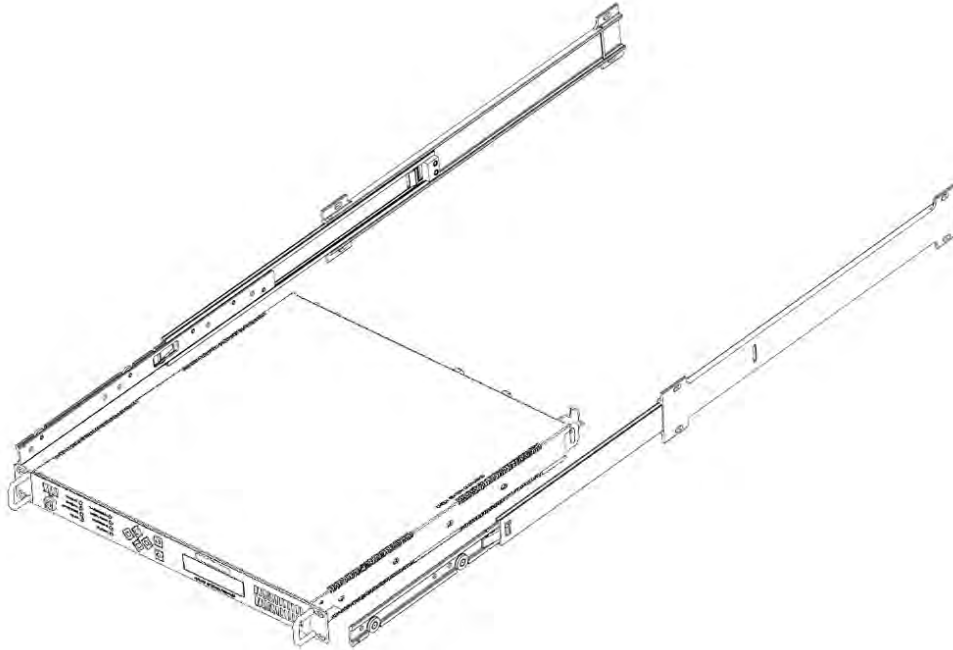
Figure 3-4. Install the Optional Rack Slide Set

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-710 and CDM-710L 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'
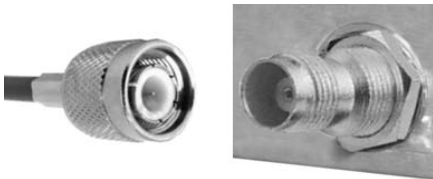
TNC plugs and jacks feature a Threaded Coupling design similar to Type 'N', Type 'F,' and Type 'SMA' connectors.

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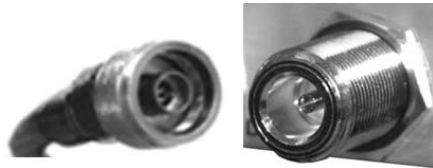
Type 'N' connectors feature a Threaded Coupling design similar to Type 'TNC', Type 'F', and Type 'SMA' connectors.

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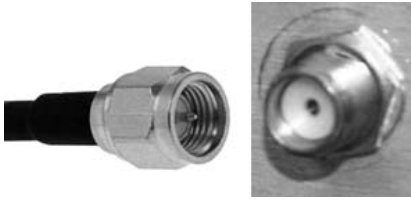
Type 'SMA' connectors feature a Threaded Coupling design similar to Type 'TNC', Type 'N', and Type 'F' connectors.

4.1.2   D-Subminiature Cable Connections

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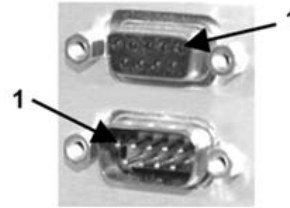
**Type 'D' Chassis Receptacles with Jack Nuts:
(TOP) Female
(BOTTOM) Male**

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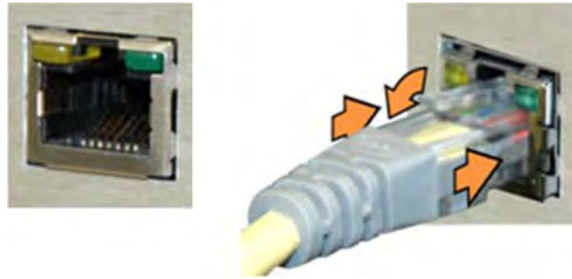
Figure 4-3. RJ-45/RJ-48 Connector Example

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**).
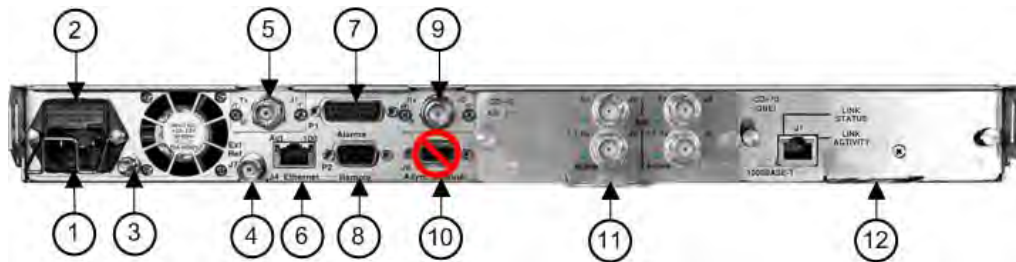
Figure 4-5. CDM-710/G Rear Panel View (Rev A. and Later Chassis Shown)

1) The initially released chassis is *Tx only* and does *not* support 1:1 operation. It does not support 1:N operation and is not upgradeable. This chassis is also not upgradeable to Rx only or Duplex operation.

2) The Rev. A and later chassis is *required* for 1:1 or 1:N operation. It supports Tx Only, Rx Only, and Duplex operation.

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-710 (70/140 MHz)	LDPC+BCH 32APSK 8/9 28 Msps S2-TS 120 MHz	120V AC	60	83.5	0.738	89
		230V AC	50	83.0	0.503	116
CDM-710L (L-Band)	LDPC+BCH 32APSK 8/9 28 Msps 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
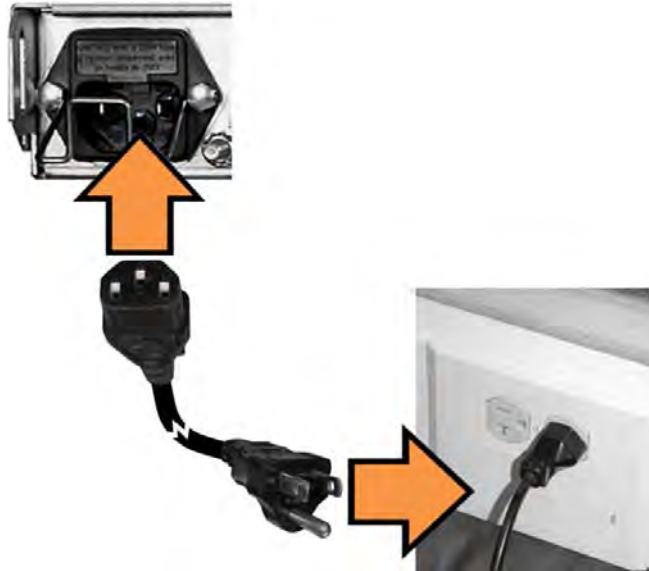
Figure 4-7. Apply AC Power to the Unit

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-710 or CDM-710L. Note the following:

Product	Configuration	Voltage	Frequency	Watts	Amps	VA
CDM-710 (70/140 MHz)	LDPC+BCH 32APSK 8/9 28Msps S2-TS 120 MHz	48V DC	N/A	81.2	1.69	-
CDM-710L (L-Band)	LDPC+BCH 32APSK 8/9 28Msps 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 its receptacle.
3. Remove and replace the T6.25A 6.3 mm x 32 mm fuses as needed.
4. Screw the fuse holder back into its 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.
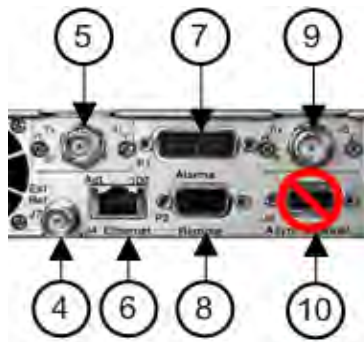
Figure 4-9. Rear Panel Operational Connections

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-710 (70/140 MHz)** – BNC female connector
- **CDM-710L (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.

You may use the front panel keypad to place 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	Rx Traffic (De-energized, Faulted) (See notes)	Rx-NC	I/O
15	Rx Traffic (Energized, No Fault)	Rx-NO	I/O
7	Rx Traffic	Rx-COM	I/O
14	Tx Traffic (De-energized, Faulted) (See notes)	Tx-NC	I/O
6	Tx Traffic (Energized, No Fault)	Tx-NO	I/O
13	Tx Traffic	Tx-COM	I/O
5	Unit Fault (De-energized, Faulted) (See notes)	Unit-NC	I/O
12	Unit Fault (Energized, No Fault)	Unit-NO	I/O
4	Unit Fault	Unit-Com	I/O
11	Rx I Channel (Constellation Monitor)	Rx-I	O
3	Rx Q Channel (Constellation Monitor)	Rx-Q	O
10	No Connection	NC	NC
2	AGC Voltage (Rx signal level, 0-10 volts)	AGC	O
9	Ext Carrier Off (TTL Lo = Mute, Open = Tx)	EXT-OFF	I
1	Ground	GND	Gnd

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

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 13V AC. 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-710 (70/140 MHz)** – BNC female connector
* **CDM-710L (L-Band)** – Type 'N' female connector

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

1) **Asynchronous Engineering Channel operation is not implemented in the CDM-710/L; this DB-9F connection is therefore *non-operational*.**

2) **This connection exists on Rev. A and later chassis only. The original production unit provided an RJ-45 connector, labeled 'J6 | SerDes'. It served as a private communications link and was not intended for customer use.**

Notes:

Chapter 5. FIRMWARE UPDATE

5.1   Firmware Update Overview

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

The CDM-710/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 base modem rear panel **'J4 |
   Ethernet'** 10/100 Base-T Ethernet M&C port. (Do NOT use the CDI-70 'J1'
   10/100/1000 Base-T Gigabit Ethernet traffic port.)
3. Use Windows Command-line or Command Prompt 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-710/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 CDM-710 firmware download hyperlink appears as **F12437x_V####** (where '####' indicates the firmware version number, and 'x' is the revision letter of that version).

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

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

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

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.

Examples of these screens are as follows:

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



 Bulk:                08/06/09
 FW12437P                4.1.5
```

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
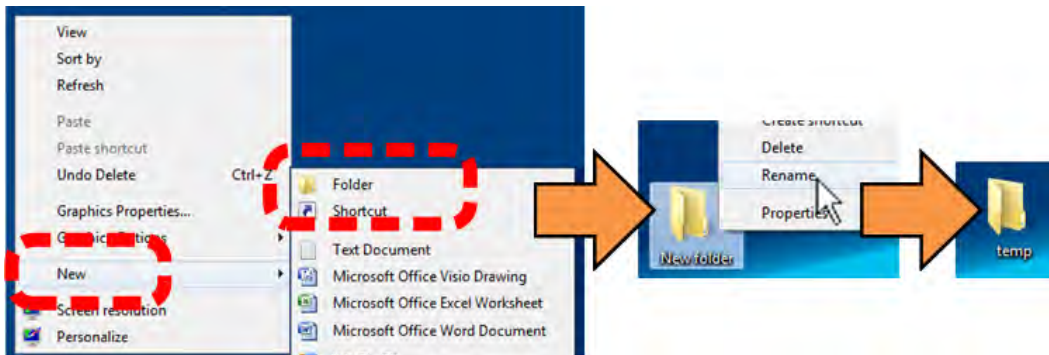
Do these steps:
1. Right-click anywhere on the desktop to open the popup submenu.
2. Select **New > Folder** to make the new, temporary folder on the desktop.

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
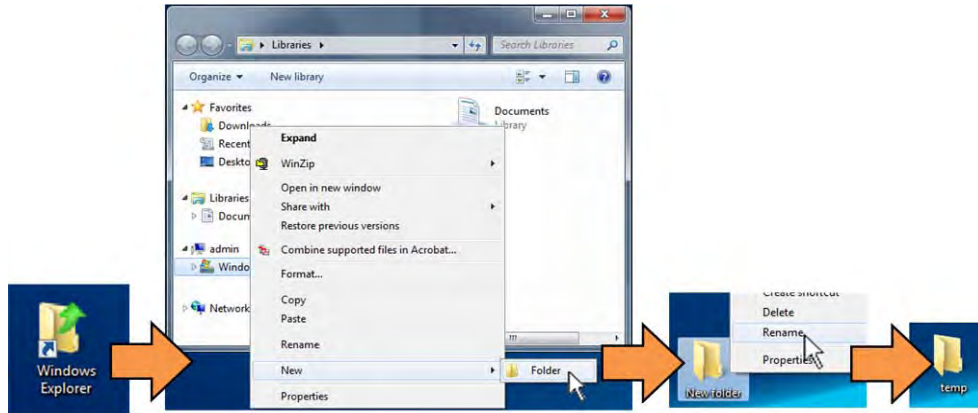
Do these steps:
1. Left-double-click the Windows Explorer icon on the Windows Desktop.
2. Depending in your Windows OS version: select **File > New > Folder**, or click your Folder Destination (e.g., **Windows (C:)** and then **New Folder** to make the new, temporary folder in the active location.
3. 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
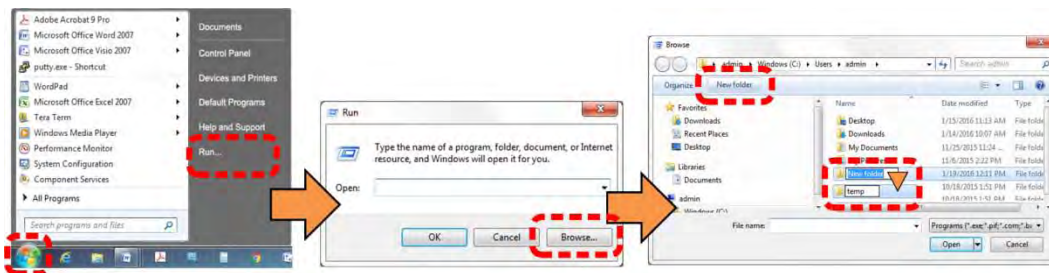
Select **Start** on the Windows taskbar and then do these steps:
1. Click **Run…** to open the **Run** window.
2. Click **Browse…** to open the **Browse** window.

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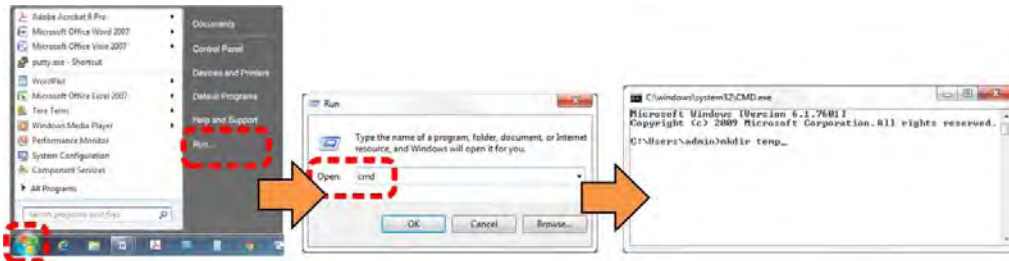
Select **Start** on the Windows taskbar and then do these steps:

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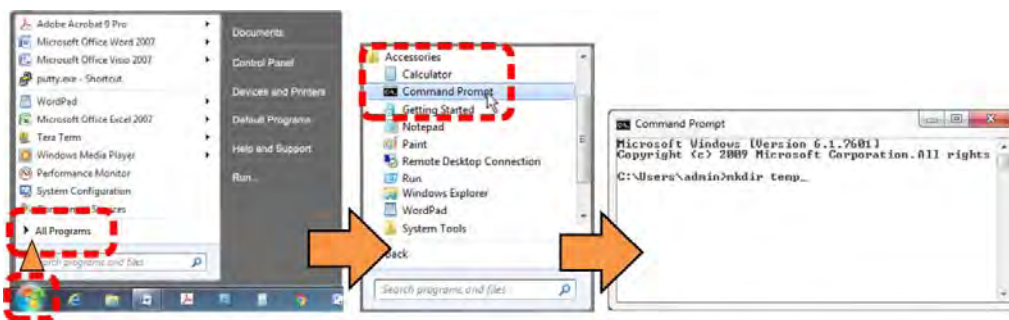
3. From the c:\> prompt, type either "mkdir temp" or "md temp" (both "mkdir" and "md" mean "make directory"), and then press **Enter**.

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

5.2.5   BEFORE PROCEEDING: CDM-710/L Firmware Update Restrictions

The update to FW12437x Version 4.0.X from an earlier version is a one-way update path. Once an update to 4.0.1 (or higher) is completed, it is no longer possible to revert to earlier versions – if you attempt to update the firmware to an earlier version, the modem will detect this and disallow it as a protective measure.

The one-way update effect is necessary because reallocation of internal memory for additional space has resulted in an incompatibility between Firmware Ver. 4.0.1 and all earlier versions.

If you are updating your modem from Firmware Version 4.1.1 to 4.1.2 or later, you may proceed to the Bulk Firmware Update procedure described in the next chapter section.

Note the following:

- If updating to Firmware Ver. 4.1.1 or later from a firmware version *prior to* Firmware Version 4.0.1, you must *first* update the modem with Firmware Version 4.0.1 in both images *before* you can update the modem to run Firmware Version 4.1.1.

  With the modem running pre-FW Ver. 4.1.1 in both images, do these steps:
    1. Update the first image with Firmware Version 4.0.1.
    2. Switch images.
    3. Reboot the modem.
    4. Update the opposite image with Firmware Version 4.0.1.
    5. Reboot the modem.
    6. Switch images.
    7. Reboot the modem once again.
    8. Proceed with the Firmware Version 4.1.1 update.

- If you are running FW Ver. 4.1.1 or later and you intend to update your modem to a firmware version that is *earlier* than Firmware Version 4.1.1, do these steps to downgrade:

1. Confirm that you are running Firmware Version 4.1.1 or later in both images.
2. Update the first image with the lower firmware version.
3. BEFORE YOU REBOOT THE MODEM, MAKE SURE TO SWITCH TO THE OTHER IMAGE.
4. Reboot the modem.
5. Update the opposite image with the lower firmware version.
6. Reboot the modem once again.

> If you reboot the modem without switching images per Step 3, you may simply put both images back to the higher version and start over.

5.2.6   Download and Extract the Firmware Update Files

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

Do these steps:
1. Go online to www.comtechefdata.com.
2. On the Main page – Under **Support Information** or the **Support** tab, select the **Software Downloads** hyperlink.
3. On the **Software Downloads** page – Click **Download Flash and Software Update Files**.
4. On the **Flash Updates Index** page – Select the **(Select a Product Line) Satellite Modems** hyperlink.
5. On the **Modems** product page – Select the **CDM-710** 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:

   Do you want to run or save **FW-0000078R.exe** (1.18 MB) from **comtechefdata.com**?

   This type of file could harm your computer.   [Run] [Save ▼] [Cancel]
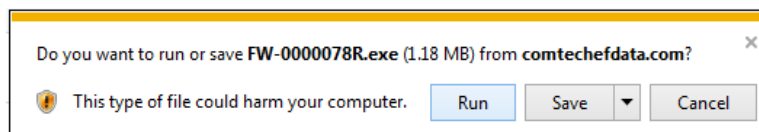
   o Click **[Run]** to open the self-extractor dialogue window. Use **[Browse]** to select your destination folder. Click **[Unzip]** to extract

the files. Your results display as per this example – click **[OK]** to close. Your files are now available for transfer to the modem.
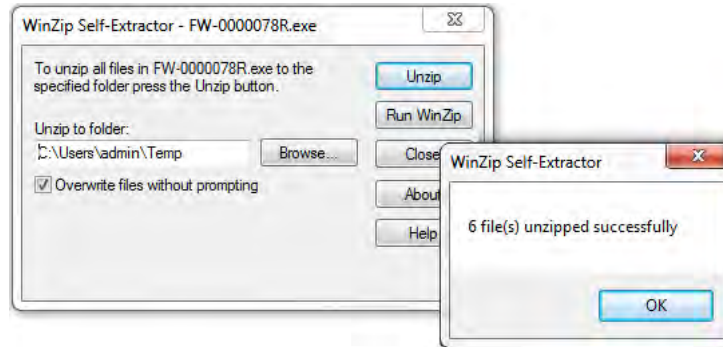
o   Click **[Save]** to download the EXE file to your Downloads folder. Once the download is complete the dialogue prompts you to either **[Run]** the self-extracting file, or to open or view the Windows Downloads folder for further action.
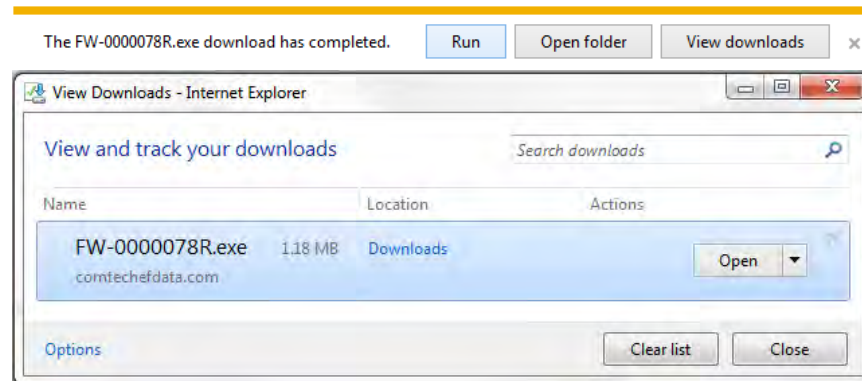
- For ZIP files:

o   Click **[Open]** to open the archive file. Use the WinZip features to select the files for extraction to your destination folder.

o   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):

- FW12437x_CDM-710_Broadcast_X_X_X.bin (bulk image file).

- ReleaseNotes_CDM710B_X_X_X.pdf (firmware release notes).
- ftp_upgrade.pdf (firmware update procedure 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.

5.2.6.1   Use Windows Desktop to View Folder Contents

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

5.2.6.2   Use Windows Command-line to View Folder Contents

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

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 'J4 | Ethernet' M&C port to the user PC as described in Section 5.2.1.1.

> The BASE MODEM firmware MUST be loaded <u>only</u> through the 10/100 Base-T 'J4 | Ethernet' M&C port. Do NOT use the CDI-70 'J1' 10/100/1000 Base-T Gigabit Ethernet traffic port.

- 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.

Do these steps:
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 FW12437x_CDM-710_Broadcast_X_X_X.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…**

1) If you stop the transfer before the "PROGRAMMING FLASH SECTOR#xx PLEASE WAIT" messaging sequence is complete, this could lead to an incomplete download, and you must repeat the "put" command (Step 2e).
2) You must make sure to update both images with the same firmware version for the unit to function properly.
3) The upgrade from an earlier version to 4.x.x is a one-way update path. Once you complete an update to FW Ver. 4.0.1, it is no longer possible to revert to earlier versions. If you attempt to update to an earlier firmware version, the modem will detect and disallow this as a protective measure. The unit will also disallow an attempt to switch to an image that contains an earlier version of firmware.

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 D. 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:

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Notes:

Chapter 6. FAST ACTIVATION PROCEDURE

6.1 FAST Overview

The CDM-710 and CDM-710L Broadcast 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, using the modem 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-710/L Available FAST and FAST-accessible Hardware Options

6.1.1.1   Transmit Configurations

Tier	FAST Option	Modulation	Maximum Symbol Rate (Msps)
1	DVB-S	QPSK	45
2	DVB-S	QPSK	45
	DVB-DSNG	8PSK, 16QAM	45
3	DVB-S2	QPSK, 8PSK	45
4	DVB-S2	QPSK, 8PSK	45
		16APSK	35
5	DVB-S2	QPSK, 8PSK	45
	DVB-S	QPSK	45
6	DVB-S2	QPSK, 8PSK	45
		16APSK	35
	DVB-S	QPSK	45
7	DVB-S2	QPSK, 8PSK	45
		16APSK	35
	DVB-S	QPSK	45
	DVB-DSNG	8PSK, 16QAM	45
8	DVB-S2	QPSK, 8PSK	45
		16APSK	35
		32APSK	28
	DVB-S	QPSK	45
	DVB-DSNG	8PSK, 16QAM	45

6.1.1.2   Receive Configurations

Tier	FAST Option	Demodulation	Maximum Symbol Rate (Msps)
1	DVB-S2	QPSK, 8PSK	45
	DVB-S	QPSK	45
2	DVB-S2	QPSK, 8PSK	45
		16APSK	35
	DVB-S	QPSK	45
3	DVB-S2	QPSK, 8PSK	45
		16APSK	35
	DVB-S	QPSK	45
	DVB-DSNG	8PSK,16QAM	45
4	DVB-S2	QPSK, 8PSK	45
		16APSK	35
		32APSK	28
	DVB-S	QPSK	45
	DVB-DSNG	8PSK,16QAM	45

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
```

This list is representative, and subject to change:

Option Number (top line)	Description (bottom line)
01	IF Modulator (for CDM-710 70/140 MHz units) L-Band Mod (for CDM-710L L-Band units)
02	IF Demodulator (for CDM-710 70/140 MHz units) L-Band Demod (for CDM-710L L-Band units)
03	FEC Slot 1
04	FEC Slot 2
05	Interface #1
06	GBEI Intf2
07	Tx QPSK
08	Tx 8PSK
09	Tx 16-QAM
10	Tx 16APSK
11	Tx 32 APSK
12	Rx QPSK
13	Rx 8PSK
14	Rx 16QAM
15	Rx 16APSK
16	Rx 32 APSK
17	Tx <=15.0 MS
18	Tx <=22.5 MS
19	Tx <=30.0 MS
20	Tx <=37.5 MS
21	Tx <=45.0 MS
22	Rx <=15.0 MS
23	Rx <=22.5 MS
24	Rx <=30.0 MS
25	Rx <=37.5 MS
26	Rx <=45.0 MS
27	Tx DVB-S1
28	Tx DVB-S2
29	Tx DVB-DSNG
30	Rx DVB-S1
31	Rx DVB-S2
32	Rx DVB-DSNG

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-710/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:

_____

_____

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Notes:

Chapter 7. FRONT PANEL OPERATION

7.1   Front Panel Overview
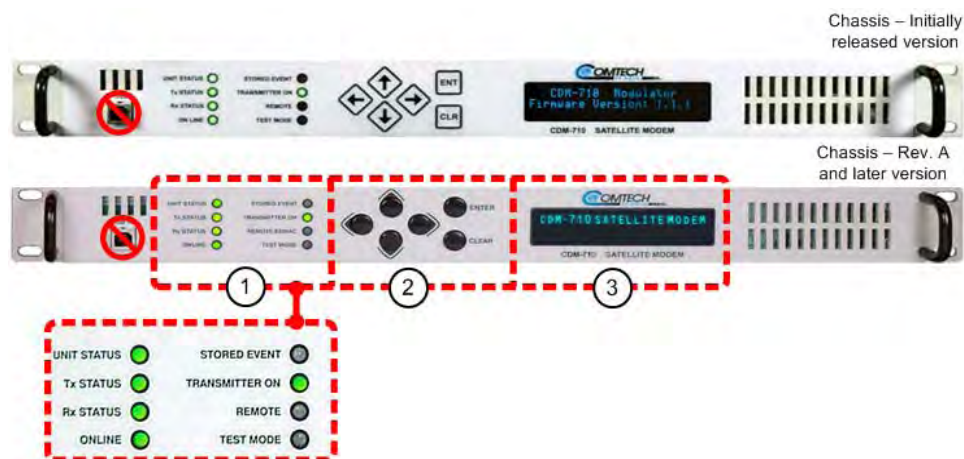
Figure 7-1. Front Panel View (CDM-710 Shown)

(!)   **The front panel USB 1.1 port is non-functional.**

You may fully control and monitor the operation of the CDM-710 or CDM-710L 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. **Figure 7-2** shows the
initially-released version of the keypad (membrane switch) versus the current
production version.
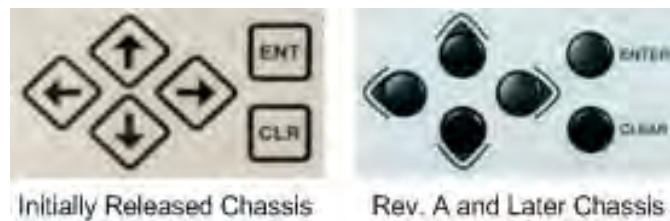
Figure 7-2. Front Panel Keypad

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 appear on the Vacuum
Fluoresecent Display (VFD).

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-710 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-710, or CDM-710L). The bottom line displays the running Firmware Version (this number may vary).

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-defined name for 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; Ser+Eth
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-40 ASI 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:* Ingress; Egress; Man; Stats
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; Test Patterns
7.2.3.1	(Test:) Mode	Select: Norm; IF; I/O; RF; Tx-CW; Tx-1,0
7.2.3.2	(Test:) TestPatterns	–
7.2.3.2	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) The **(CONFIG:) Tx → Pwr → Imp** (Impedance) selection appears only when the 70/140 MHz Modulator card is installed.
2) Refer to **(CONFIG:) Tx → SymRate** for the Data Rate table.
3) *The following **CONFIG:** submenus are available **only** when the Mode selection is **DVB-S2***: **Tx → Scram**; **Tx → Mod → Pilot**; **Tx → Mod → Frame**; **Rx → Dem → Pilot**; and **Rx → Dem → Scr**.

Opening Screen

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

```
         CDM-710 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.

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

- 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:
    - o Int1 CDI-40 ASI Data Interface.
    - o Int1 CDI-60 HSSI Data Interface.
    - o Int2 CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface (GBEI).
- 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 Ser+Eth
```

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.
- "Ser+Eth" allows access to both the Serial and Ethernet M&C ports.

> There are no submenus for this selection. All subsequent configuration of these ports is accomplished using the **(CONFIG:) Remote: Serial** or **(CONFIG:) Remote: Ethernet** menus.

(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

```
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.

(!)   This example is representative of a typical MAC Address.

(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 Scram(bler) selection operates only if the Mode selection is DVB-S2.

```
Tx: FEC Mod Code SymRate
Mode Freq Pwr Scram    (◀ ▶E)
```

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

(Config:) Tx: → FEC

```
Tx FEC:
Viterbi + Reed-Solomon (◀ ▶E)
```

This screen provides a *read-only* status message. Its appearance depends on the selection made under the **(CONFIG:) Tx → Mode** menu.

For DVB-S2 Mode only:

```
Tx FEC:
LDPC + BCH               (◀ ▶E)
```

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

(Config:) Tx: → Mod (Modulation)

ⓘ The Pilot and Frame selections appear only if the Mode selection is DVB-S2.

```
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

```
Tx Mod: QPSK 8PSK 16QAM 16APSK
32APSK                     ( ◀ ▶ E)
```

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

The selections are mode-dependant:
* QPSK – DVB-S and DBVB-S2
* 8PSK – DVB-S2 and DVB-DSNG
* 16QAM – DVB-DSNG
* 16APSK – DVB-S2
* 32APSK – DVB-S2

(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 (DVB-S2 Mode only)

```
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 (DVB-S2 Mode only)

```
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 (DVB-S2 Mode only)

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:
- With **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.
- With **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 (DVB-S2 Mode only)

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

Use the ◄ ► arrow keys to select **Long** or **Short**. Press **ENTER**. Note that:
- With **Long**, the unit enables the standard FECFRAME = 64,800 bits. The default value is **Long**.
- With **Short**, the unit enables the 16,200 bit FECFRAME.
- Only DVB-S2 allowesd a FECFRAME choice.

(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
```

(Config:) Tx: → SymRate

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

Use the ◄ ► arrow keys to select the desired digit of the Symbol Rate, and then use the ▲▼ arrow keys to change the value of 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, 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, DVB-S and DVB-DSNG are shown in Table 7-1 and Table 7-2. When programming a new data

or symbol rate, the modulator will not accept the change unless it is within range, and it will turn off the Tx Carrier. If the modem does not accept the new rate, change the Modulator Code Rate or Mode. There is some round off in the data rate ranges in the last digit. Table 7-1 is for the standard FECFrame. Table 7-2 is for the short frame.

The tables are based on a 188 byte frame format. When a 204 byte format is selected the data rate increases by 204/188.

Table 7-1. Symbol Rate/Data Rate Range – Standard FECFrame and 188 Byte Format

(QPSK 1/4, 1/3 and 2/3 data is provided for reference only)

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
DVB-S2 - Standard FECFrame=64,800 Bits										
QPSK	LDPC+BCH	1/4	1	45	0.490243	0.490243	22.060942	0.478577	0.478577	21.535965
		1/3			0.656448	0.656448	29.540166	0.640827	0.640827	28.837209
		2/5			0.789412	0.789412	35.523546	0.770627	0.770627	34.678204
		1/2			0.988858	0.988858	44.498615	0.965327	0.965327	43.439697
		3/5			1.188304	1.188304	53.473684	1.160026	1.160026	52.201190
		2/3			1.322253	1.322253	59.501385	1.290788	1.290788	58.085452
		3/4			1.487473	1.487473	66.936288	1.452076	1.452076	65.343429
		4/5			1.587196	1.587196	71.423823	1.549426	1.549426	69.724175
		5/6			1.654663	1.654663	74.459834	1.615288	1.615288	72.687939
		8/9			1.766451	1.766451	79.490305	1.724416	1.724416	77.598702
		9/10			1.788612	1.788612	80.487535	1.746049	1.746049	78.572201
8PSK	LDPC+BCH	3/5	1	45	1.779991	1.779991	80.099585	1.739569	1.739569	78.280616
		2/3			1.980636	1.980636	89.128631	1.935658	1.935658	87.104623
		3/4			2.228124	2.228124	100.265560	2.177525	2.177525	97.988646
		5/6			2.478562	2.478562	111.535270	2.422276	2.422276	109.002433
		8/9			2.646012	2.646012	119.070539	2.585924	2.585924	116.366586
		9/10			2.679207	2.679207	120.564315	2.618365	2.618365	117.826440
16APSK	LDPC+BCH	2/3	1	35	2.637201	2.637201	92.302026	2.574613	2.574613	90.111471
		3/4			2.966728	2.966728	103.835482	2.896320	2.896320	101.371209
		4/5			3.165623	3.165623	110.796808	3.090495	3.090495	108.167326
		5/6			3.300184	3.300184	115.506446	3.221863	3.221863	112.765192
		8/9			3.523143	3.523143	123.310006	3.439530	3.439530	120.383555
		9/10			3.567342	3.567342	124.856967	3.482680	3.482680	121.893803
32APSK	LDPC+BCH	3/4	1	28	3.703295	3.703295	103.692261	3.623332	3.623332	101.453291
		4/5			3.951571	3.951571	110.643985	3.866247	3.866247	108.254911
		5/6			4.119540	4.119540	115.347126	4.030589	4.030589	112.856500
		8/9			4.397854	4.397854	123.139923	4.302894	4.302894	120.481032
		9/10			4.453027	4.453027	124.684751	4.356875	4.356875	121.992503
DVB-S & DVB-DSNG FECFrame Does Not Apply										
QPSK	Conv+RS	1/2	1	45	0.921569	0.921569	41.470588	-	-	-
		2/3			1.228758	1.228758	55.294118	-	-	-
		3/4			1.382353	1.382353	62.205882	-	-	-
		5/6			1.535948	1.535948	69.117647	-	-	-
		7/8			1.612745	1.612745	72.573529	-	-	-
8PSK	Conv+RS	2/3	1	45	1.843137	1.843137	82.941176	-	-	-
		5/6			2.303922	2.303922	103.676471	-	-	-
		8/9			2.457516	2.457516	110.588235	-	-	-
16QAM	Conv+RS	3/4	1	45	2.764706	2.764706	124.411765	-	-	-
		7/8			3.225490	3.225490	145.147059	-	-	-

Table 7-2. Symbol Rate/Data Rate Range – Short FECFrame and 188 Byte Format

Modulation	FEC Code	Inner Code Rate	Symbol Rate (Msps)		Spectral Efficiency Pilot OFF	Data Rate (Mbps) Pilot OFF		Spectral Efficiency Pilot ON	Data Rate (Mbps) Pilot ON	
			Min	Max		Min	Max		Min	Max
DVB-S2 - Short FECFrame=16,200 Bits										
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

(CONFIG:) Tx: → Mode

```
Transmission Mode:
S2-G/S2-TS S DSNG
```

The Tx Mode is a key parameter for setting all modem parameters. Configuration and operatin is generally easier when you set Tx Mode first.

The Mode determines which modulation, code rates, FEC type and symbol rate range are available and also if Pilots or Gold Code settings are available. Changing the Mode will change one or more of these.

Use the ◀ ▶ arrow keys to select **S2-G/S2-TS**, **S**, or **DSNG**. Press **ENTER**. Be sure to check the modulation, code, and data rate selections after you change the Mode.

(CONFIG:) Tx: → Mode → S2-G/S2-TS (DVB-S2 Mode only)

This operation applies only to modems equipped with the optional CDI-60 HSSI Data Interface, running in DVB-S2 mode.

When you select **S2-G/S2-TS**, the **(CONFIG:) Tx → Mode → S2-G/S2-TS** option becomes available:

```
Transport Mode: Generic
TransportStream        (◀ ▶E)
```

The default Transport Mode is **TransportStream**, regardless of mode or interface type. Use the ◀ ▶ arrow keys to select **Generic** or **TransportStream.** Press **ENTER**.

(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-710 (70/140 MHz), you may configure a frequency range from 52 to 88 MHz and from 104 to 176 MHz, in 100 Hz steps.
- For the CDM-710L (L-Band), you may configure a frequency range from 950 to 2000 MHz, in 100 Hz steps.

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 only 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-710 (70/140 MHz), the configurable Tx Power Level range is from -20 to 0 dBm.
*   For the CDM-710L (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-710 ONLY)

(!) This menu is not available with the CDM-710L (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-710 only, use the ◀ ▶ arrow keys to select the Tx Impedance (Ohms) as **50** or **75**. Press **ENTER**.

(Config:) Tx: → Scram (DVB-S2 Mode only)

```
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)

```
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:
Viterbi + Reed-Solomon (◄ ►E)
```

This screen displays a *read-only* status message. its appearance depends on the selection made under the **(CONFIG: Rx) Mode** submenu.

For DVB-S2 Mode only:

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

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

(Config:) Rx: → Dem (Demodulation)

The Pilot and Scr(ambler) selections appear only when the Mode selection is DVB-S2.

```
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)
```

Use the ◀ ▶ arrow keys to select the demodulatoion type. Press **ENTER**.

1) If you select the Mode as DVB-DSNG, the selectable types are dependant upon your purchased FAST options.
2) If you select the Mode as DVB-S, this screen is '*status only*' and the cursor rests under QPSK.
3) If you select the Mode as DVB-S2, this screen is '*status only*' and the demodulation type is automatically determined. Before synchronization of the Rx path, the cursor may reside in any position. After synchronization (i.e., the Rx TRAFFIC LED is Green), re-enter the Type menu to update the display; the cursor will rest under the demodulation type.

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

(Config:) Rx: → Dem → Inv

```
Rx Spectrum:
Automatically Detected.
```

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 (DVB-S2 Mode only)

```
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 o*n 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) (DVB-S2 Mode only)

```
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

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

> 1) In DVB-S2 mode, this screen displays a *read-only* status message. The demodulator automatically resolves the Code Rate.
> 2) All possible choices are displayed. The cursor only lands on valid code rates depending upon the active mode and purchased FAST options.

Refer to the Data Rate (the top line "Data:" on the **(Config:) Rx: →SymRate**
menu) for valid code rates. Prior to synchronization of the Rx path, the cursor
may reside in any position.

Use the ◄ ► arrow keys to select the Code Rate. Press **ENTER**.

(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**.

In DVB-S and DVB-DSNG Mode, the Data Rate digits also change as you edit the
Symbol Rate value. 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.

In DVB-S2 Mode, '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, FECrame length, spectral inversion, etc. from the DVB-S2 carrier.

> 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-710 (70/140 MHz), you may configure a frequency range
    from 52 to 88 MHz and from 104 to 176 MHz, in 100 Hz steps.

- For the CDM-710L (L-Band), you may configure a frequency range from 950 to 2000 MHz, in 100 Hz steps.

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-710/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-40 ASI Data Interface (see Sect. 7.2.1.4.1)
   • CDI-60 HSSI Data Interface (see Sect.0)

7.2.1.4.1   (Config:) Int1 (Optional CDI-40 ASI Data Interface ONLY)

1) Due to limitations of the backplane, the CDM-710/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-40 ASI Data Interface Module, installable in Interface Slot 1 *only*.

```
Intfc1 ASI:
Tx Rx  Config           (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Tx**, **Rx**, or **Config**. Press **ENTER**.

(CONFIG:) Intfc1 ASI: → Tx

```
Intfc1 ASI Tx:
Ena/Dis  Frame  (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Ena/Dis** or→ **Frame**. Press **ENTER**.

(CONFIG:) Intfc1 ASI: → Tx → Ena/Dis

```
Intfc1 ASI Tx:
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 ASI: → Tx → Frame

```
Intfc1 ASI Tx Frame:
188  204                (◀ ▶E)
```

To enable the desired sync mode: Use the ◀ ▶ arrow keys to select **188** or **204**. Press **ENTER**.

(CONFIG:) Intfc1 ASI: → Rx

```
Intfc1 ASI Rx:
Ena/Dis  Frame          (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Ena/Dis** or **Frame**. Press **ENTER**.

(CONFIG:) Intfc1 ASI: → Rx → Ena/Dis

```
Intfc1 ASI Rx:
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 ASI: → Rx → Frame

```
Intfc1 ASI Rx Frame:
188  204                 (◀ ▶E)
```

To enable the desired sync mode: Use the ◀▶ arrow keys to select **188** or **204**. Press **ENTER**.

(CONFIG:) Intfc1 ASI: → Config

```
Intfc1 ASI CONFIG:
Port Bandwidth          (◀ ▶E)
```

Use the ◀▶ arrow keys to select **Port** or **Bandwidth**. Press **ENTER**.

(CONFIG:) Intfc1 ASI: → Config → Port

```
Intfc1 ASI Port:
J4  J5                  (◀ ▶E)
```

Use the ◀▶ arrow keys to select **J4** or **J5**. Press **ENTER**.

Also see **(CONFIG:) AUX → 1:1 Mode** for redundancy operation.

(CONFIG:) Intfc1 ASI: → Config → Bandwidth

```
Intfc1 ASI Bandwidth:
Wide Narrow             (◀ ▶E)
```

To select the loop bandwidth of the ASI input: Use the ◀▶ arrow keys to select **Wide** or **Narrow**. Press **ENTER**.

Terrestrial jitter sometimes increases when data is sent across the **P**ublic **S**witched **T**elecom **N**etwork (PSTN). **Wide** corresponds to about 2 Hz and **Narrow** is approximately 0.5 Hz. Normally, the **Wide** selection is adequate, but when higher amounts of terrestrial jitter are present in the incoming ASI data stream the **Narrow** setting will help reduce jitter.

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

1) Due to limitations of the backplane, the CDM-710/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 Data Interface Module, installable in Interface Slot 1 *only*.

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

There is a single port on the CDI-60 HSSI Data Interface. 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 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-710/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.*

```
Intfc2 Gigabit Ethernet:
Ingress Egress Man Stats
```

Use the ◀ ▶ arrow keys to select **Ingress**, **Egress**, **Man**, or **Stats**. Press **ENTER**.

Where it concerns this data interface, note that:
- "Ingress" refers to IP packets received from the LAN.
- "Egress" refers to IP packets transmitted to the LAN.
- "Transmit" refers to MPEG packets transmitted to the WAN.
- "Receive" refers to MPEG packets received from the WAN.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress

```
Intfc2 Gigabit Ingress:
Ena/Dis FEC Str    (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Ena/Dis**, **FEC**, or **Str**. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Ena/Dis

```
Intfc2 Ingress Enable:
Enable Disable
```

Use the ◀ ▶ arrow keys to select **Enable or Disable.** Press **ENTER**. Select **Enable** for transmission of the ingress MPEG-2 transmission stream. Select **Disable** to *turn off* the MPEG-2 transmission to the WAN.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → FEC

```
Intfc2 Ingress FEC
Enable Disable
```

Use the ◄ ► arrow keys to select **Enable** or **Disable**. Press **ENTER**. Select **Enable** to allow the GBEI to perform SMPTE 2022 / Pro-MPEG COP3 error recovery. Select **Disable** to direct the GBEI to *bypass* the SMPTE 2022 / Pro-MPEG COP3 function.

> SMPTE has incorporated the per-MPEG Forum into the release of SMPTE 2022.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str

```
Intfc2 Streams    Act=1
IP Mode Pri Red Timeout
```

The top line indicates the active stream. On the bottom line, use the ◄ ► arrow keys to select **IP**, **Mode**, **Pri**, **Red**, or **Timeout.** Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str → IP

```
Intfc2 Multicast Streams
1  2  Port
```

Use the ◄ ► arrow keys to select **1**, **2**, or **Port.** Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str → IP → 1/2

```
Intfc2 Address #
Group Source
```

Where # is the selected stream (1 or 2): Use the ◄ ► arrow keys to select **Group** or **Source.** Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet:→ Ingress→Str→IP→1/2→Group

```
Intfc2 Multicast #
224.001.001.002        ◄ ► ▲ ▼
```

Where # is the selected stream (1 or 2): To enter the Group Multicast IP Address, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet:→ Ingress→Str→IP→1/2→Source

```
Intfc2 Source IP #
224.001.001.002       ◄ ► ▲ ▼
```

Where # is the selected stream (1 or 2): To enter the Source Multicast IP Address, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str → IP → Port

```
Intfc2 UDP Port
05060
```

To enter the Destination UDP port for ingress streams, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str → Mode

```
Intfc2 Multicast Mode
Single   Dual
```

Use the ◄ ► arrow keys to select **Single** or **Dual.** Select **Single** if one IP connection carrying an MPEG-2 transport stream is present, or if automatic redundancy switching is disabled. Select **Dual** for redundancy operation with dual IP connections, each transporting an MPEG-2 transport stream, and automatic switching between the two streams is performed. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str → Pri

```
Intfc2 Primary Stream
1  2
```

Use the ◄ ► arrow keys to select **1** (Single) or **2** (Redundancy) Mode, Press
ENTER. Note that:

- **Single** mode assigns which (of up to two) stream(s) to process.
- **Redundancy** mode identifies which of the two streams is initially
  processed before any redundancy switch takes place.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str → Red

```
Intfc2 Redundancy
Revertive  Non-Revertive
```

Use the ◄ ► arrow keys to select **Revertive** or **Non-Revertive**. Press **ENTER**.
Note that:

- In **Revertive** Redundancy mode, either stream can be processed in the
  event of the failure of the other stream.
- In **Non-Revertive** Redundancy mode, a switch can occur from the
  primary stream to the secondary stream, but a switch from the
  secondary stream to the primary stream will not occur in the event of a
  failure of the secondary stream. The latter case will require user
  intervention.

(CONFIG:) Intfc2 Gigabit Ethernet: → Ingress → Str → Timeout

```
Intfc2 Stream Timeout
0500 mS
```

For use in Dual Stream Mode only: Use the ▲ ▼ arrow keys to assign the period
(in 100 mS steps) for a primary connection failure to be present before
switchover to the secondary connection occurs. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress

```
Intfc2 Gigabit Egress:
Ena/Dis FEC IP        (◄ ►E)
```

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

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → Ena/Dis

```
Intfc2 Egress Enable:
Enable Disable
```

Use the ◄ ► arrow keys to select **Enable** or **Disable**. Press **ENTER**. Select **Enable** to *allow* reception of the IP-encapsulated MPEG packets to the LAN. Select **Disable** to *turn off* the egress packets to the LAN.

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → FEC

```
Intfc2 FEC
Ena/Dis Matrix        (◄ ►E)
```

This menu allows enabling and configuration of the SMPTE 2022/Pro-MPEG COP3 FEC stream to the LAN. Use the ◄ ► arrow keys to select **Enable**, **Disable**, or **Matrix.** Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → FEC → Ena/Dis

```
Intfc2 Egress FEC:
Enable Disable
```

Use the ◄ ► arrow keys to select **Enable** or **Disable**. Press **ENTER**. Select **Enable** to *generate* SMPTE 2022/Pro-MPEG COP3 FEC IP packets to the LAN, *in addition to* the stream of IP-encapsulated MPEG packets. Select **Disable** to *run off* the generation of FEC packets to the LAN.

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → FEC → Matrix

```
Intfc2 Egress FEC Matrix:
Length = 10,  Depth = 10
```

To configure the dimension of the egress FEC matrix, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**. Valid values for **Length** and **Depth** are as follows:

- **L * D ≤ 100**
- **1 ≤ L ≤ 20**
- **4 ≤ D ≤ 20**

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → IP

```
Intfc2 Egress IP:
Group SrcPort DestPort
```

To allow configuration of IP header fields for the egress packets, use the ◄► arrow keys to select **Group**, **ScrPort**, or **DestPort**. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → IP → Group

```
Intfc2 Egress Multicast:
239.010.010.010     (◄ ►▲▼)
```

To enter a valid destination IP Multicast Group Address for egress IP packets, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → IP → SrcPort

```
Intfc2 Egress Src Port:
01024               (◄ ►▲▼)
```

To enter a valid UDP Source Port Address for the network, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Egress → IP → DestPort

```
Intfc2 Egress Multicast:
01024                    (◄ ► ▲ ▼)
```

To enter a valid UDP Destination Port Address for the egress packet stream, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**.

> ⓘ Media packets will be addressed to this UDP port; FEC packets (if FEC generation is enabled) will be addressed to (UDP destination port +2).

(CONFIG:) Intfc2 Gigabit Ethernet: → Man

```
Intfc2 Management IP
192.168.001.008/24
```

To enter the Management IP Address/subnet mask for Gigabit Ethernet Interface Management Channel, first use the ◄ ► arrow keys to select the digit, and then use the ▲ ▼ arrow keys to change that digit. Press **ENTER**.

(CONFIG:) Intfc2 Gigabit Ethernet: → Stats

```
Intfc2 Statistics
View Clear
```

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

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

```
FPGA Packets Dropped
00000000000000000000  (▲ ▼)
```

The nested screens present statistics on a per-category basis. Use the ▲ ▼ arrow keys to page through the available statistics reports. Press **ENTER** or **CLEAR** when done.

7.2.1.5.1   Summary of GBEI Statistics (As Reported By Category)

1000 Base-T Link Statistics:

- LAN Good Octets (In) – The sum of lengths of all good Ethernet frames received from the LAN.
- LAN Bad Octets (In) – The sum of lengths of all bad Ethernet frames received from the LAN.
- LAN Unicast (In) – The sum of good frames received from the LAN that have a unicast destination MAC address.
- lAN Broadcast (In) –The sum of good frames received from the LAN that have a broadcast destination MAC address.
- LAN Multicast (In) – The sum of good frames received from the LAN that have a multicast destination MAC address.
- LAN Pause (In) – The number of good flow control frames received from the LAN.
- LAN Undersize (In) – Total frames received from the LAN with a length of less than 64 octets but with a valid FCS.
- LAN Fragments (In) – Total frames received from the LAN with a length of less than 64 octets and an invalid FCS.
- LAN Oversize (In) – Total frames received from the LAN with a length greater than the maximum size of octets but with a valid FCS.
- LAN Jabber (In) – Total frames received from the LAN with a length greater than the maximum size of octets but with an invalid FCS.
- LAN Rx Err (In) – Total frames received from the LAN for which an error was detected at the PHY.
- LAN FCS Err (In) – Total frames received from the LAN with a CRC error that was not counted in the Fragments or Rx Err totals.
- LAN Octets (Out) – The sum of the lengths of all Ethernet frames transmitted to the LAN.
- LAN Unicast (Out) – The sum of frames transmitted to the LAN that have a unicast destination MAC address.
- LAN Broadcast (Out) – The sum of frames transmitted to the LAN that have a broadcast destination MAC address.
- LAN Multicast (Out) – The sum of frames transmitted to the LAN that have a multicast destination MAC address.

WAN Port Statistics:

- WAN Octets (Out) – The sum of the lengths of all Ethernet frames that are forwarded to the WAN.
- WAN Unicast (Out) – The number of good frames with unicast destination MAC addresses that are forwarded to the WAN.
- WAN Broadcast (Out) – The number of good frames with broadcast destination MAC addresses that are forwarded to the WAN.
- WAN Multicast (Out) – The number of good frames with multicast destination MAC addresses that are forwarded to the WAN.
- FPGA Media Received – When FEC is enabled, indicates the number of media packets received by the FEC logic; does not include FEC packets.
- FPGA Media Recovered – When FEC is enabled, indicates number of bad or lost Ethernet packets which have been recovered using FEC.
- FPGA Media Unrecovered – When FEC is enabled, indicates number of bad or lost Ethernet packets that could not be recovered, for which a packet with a payload of null MPEG packets has been substituted.
- FPGA UDP Checksum Error – Indicated number of Ethernet packets received with incorrect UDP checksums.
- FPGA Non-Compliant Pkt – Indicates number of Ethernet packets received which are not valid transport stream packets.
- FPGA Packets Dropped – Indicates number of IP packets that have been dropped due to a buffer overrun condition.
- FPGA Null Underrun – Indicated number of Null MPEG packets generated to the WAN due to buffer underrun conditions.
- FPGA Null Out-of-Sync – Indicates the number of null MPEG packets that have been generated to the WAN due to a loss of (MPEG packet) synchronization condition.
- FPGA Overrun Events – Indicates the number of times that a buffer overrun condition has occurred.
- FPGA Underrun Events – Indicates the number of times that a buffer underrun condition has occurred.
- FPGA Out-of-Sync Events – Indicates the number of times that a loss of MPEG synchronization condition has occurred.
- WAN Good Octets (In) – The sum of lengths of all good Ethernet frames received from the IP encapsulation logic.
- WAN Unicast (In) – The sum of good frames received from the WAN IP encapsulation logic that have a unicast destination MAC address.

- WAN Broadcast (In) – The sum of good frames received from the WAN IP encapsulation logic that have a broadcast destination MAC address.
- WAN Multicast (In) – The sum of good frames received from the WAN IP encapsulation logic that have a multicast destination MAC address.

Management Port Statistics:

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

- Mng Unicast (Out) – The sum of frames transmitted to the local GBEI management processor that have a unicast destination MAC address.
- Mng Broadcast (Out) – The sum of frames transmitted to the local GBEI management processor that have a broadcast destination MAC address.
- Mng Multicast (Out) – The sum of frames transmitted to the local GBEI management processor that have a multicast destination MAC address.

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.

7.2.1.7   (Config:) Aux (Auxiliary/Redundancy)

```
Redundancy: Auto/Manual
Ena/Dis  Force (1:1)    (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Auto/Manual**, **Ena/Dis,** or **Force (1:1)**. Press **ENTER**.

(Config:) Aux (Redundancy): → Auto/Manual

```
1:1 Modem Switching:
Auto-(On) Manual-(Off) (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Auto-(On)** or **Manual-(Off). Press ENTER.** Note the following:

- **Auto-(On)** is the default mode of operation. When an online modem is in a fault state, the switch places the backup modem online if it is <u>not</u> in a fault state.
- Select **Manual-(Off)** to disable the redundancy switch. Even when an online modem is in a fault state, no switch occurs regardless of the backup modem's fault state.

(Config:) Aux (Redundancy): → Ena/Dis

```
Redundancy Mode:
█nable  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 message displays:

```
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 may only use **Force (1:1)** with a 1:1 switch to force switchover, and only from the modem that is currently "Online." (The online modem 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
Intfc1 Intfc2          ( ◀ ▶ E)
```

Use the ◀ ▶ arrow keys to select **Tx**, **Intfc1**, or **Intfc2**. Press **ENTER**.

(Config:) Alarms → 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:) Alarms → Intfc1

```
Intfc1 Alarms: TxClk
                       ( ◀ ▶ E)
```

Use the ◀ ▶ arrow keys to select **TxClk**. Press **ENTER**. This submenu appears:

```
Intfc1 All Faults: Alarms
Fault  Mask  Flt  IFOn ( ◀ ▶ E)
```

Use the ◄ ► arrow keys to report the interface incident as an **Alarm**, to **Mask** the incident, or report the incident as a **Fault**. When you select **IFOn**, this allows the modem to perform a redundancy switch upon sensing a fault state, while allowing the output power of the interface to remain ON. Press **ENTER**.

7.2.2 (SELECT:) Monitor Menu Branch

See Sect. 7.2.2.1.1 for the listings of the events and alarms that are addressed with operation of the Monitor menu branch Alarm, Rx_Stats, and Event-Log submenus.

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.

```
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.

7.2.2.1.1   Summary of Alarms and Faults (As Reported By Category)

Transmit (Modulator) Alarms and Faults

- Tx Clock Loss Slot 1 – A Transmit Clock is not present at Interface Slot 1.
- Tx Clock Loss Slot 2 – A Transmit Clock is not present at Interface 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 TX AIS Slot 1 (valid for G.703).
- Tx AIS Interface 2 – Applies to the TX AIS Slot 2 (valid for G.703).
- Tx Cable Interface 1 – Applies to the TX AIS Slot 1 cable.
- Tx Cable Interface 2 – Applies to the TX AIS Slot 2 cable.
- 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 are detected.

Receive (Demodulator) Alarms and Faults

- +1.5V PSU Demodulator Card – The 1.5VDC regulator has exceeded ±5%.
- FPGA Load Demodulator Card – The Demod FPGA is not loading.
- Demod Unlocked – The Demodulator is not locked.
- FPGA Temp Demodulator Card – 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 Demod Synth 1 phase lock loop fault.
- Demodulator Synth 2 PLL – Indicates a Demod Synth 2 phase lock loop fault.
- Demodulator SERDES Dmd->Framer – Indicates a serializer/deserializer framer fault on the Demod.
- Demodulator SERDES Framer > FEC 1 – Indicates a serializer/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 an RX AIS Slot 1 fault.
- Intf2 RXAIS Slip Slot2 – Indicates an RX AIS Slot 2 fault.
- Intf1 EXT Clock Slot1 – Indicates an EXT CLOCK Slot 1 fault.
- Intf2 EXT Clock Slot2 – Indicates an EXT CLOCK Slot 2 fault.

Unit Alarms and Faults

- FPGA Loader Framer 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 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 - 192MHz – Indicates a 192 MHz phase lock loop clock framer 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 – 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 – There is no modulator I&Q activity.

- FPGA Temp Modulator Card – The modulator FPGA is outside its temperature range.
- Nyq Filter Clipping – There is modulator Nyquist Filter clipping.

7.2.2.2 (Monitor:) Rx_Stats

For DVB-S2 Mode only:

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

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

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

When the demodulator is locked, this screen reports E_b/N_0, PER (packet error rate), ΔF (frequency offset of incoming carrier), and RSL (receive signal level).

For DVB-S or DVB-DSNG Modes only – in these modes, BER monitoring is not available:

```
EsNo=16.0   PER=N/A
EbNo=15.1   BER=0.0E+00     ▼
```

```
EbNo=15.1   BER=0.0E+00     ▲
ΔF=-000.2k RSL=-16          ▼
```

```
ΔF=-000.4k RSL=-16          ▲
Link_Margin=+10.1
```

The Link_Margin corresponds, depending on the active mode, as follows:

For DVB-S2 Mode:

```
Link Margin = [Es/N0 (measured) - Es/N0 (threshold)]
```

$$\text{Link Margin} = [E_S/N_0 \text{ (measured)} - E_S/N_0 \text{ (threshold)}]$$

For DVB-S or DVB-DSNG Modes:

```
Link Margin = [Eb/N0 (measured) - Eb/N0 (threshold)]
```

$$\text{Link Margin} = [E_b/N_0 \text{ (measured)} - E_b/N_0 \text{ (threshold)}]$$

Additionally, note the following:

For DVB-S2 Mode:
- 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.

For DVB-S or DVB-DSNG Modes:
- For QPSK modulation, the typical usable E_S/N_0 range is 2.0 to 16.0 dB.
- For 8PSK modulation, the typical usable E_S/N_0 range is 8.5 to 20.0 dB.
- For 16QAM modulation, the typical usable E_S/N_0 range is 11.0 to 21.0 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

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

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.

7.2.3   (SELECT:) Test Menu Branch

```
Test:
Mode   TestPatterns    (◀ ▶E)
```

Use the ◀ ▶ arrow keys to select **Mode** or **TestPatterns**. Press **ENTER**.

7.2.3.1 (Test:) Mode

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

The CDM-710 supports many useful test modes. Not all modes are available in all configurations – they depend upon the modem configuration (i.e., Simplex (Tx-only or Rx-only) or Duplex (Tx/Rx)) and the installed data interface module(s).

Use the ◀ ▶ arrow keys to select **Norm**, **IF** (Loop), **I/O** (Loop), **RF** (Loop), **Tx-CW** or **Tx-1.0**. Press **ENTER** to execute the test mode. 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 7-3**
- **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 7-3**.
- **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 7-3**.

- **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.
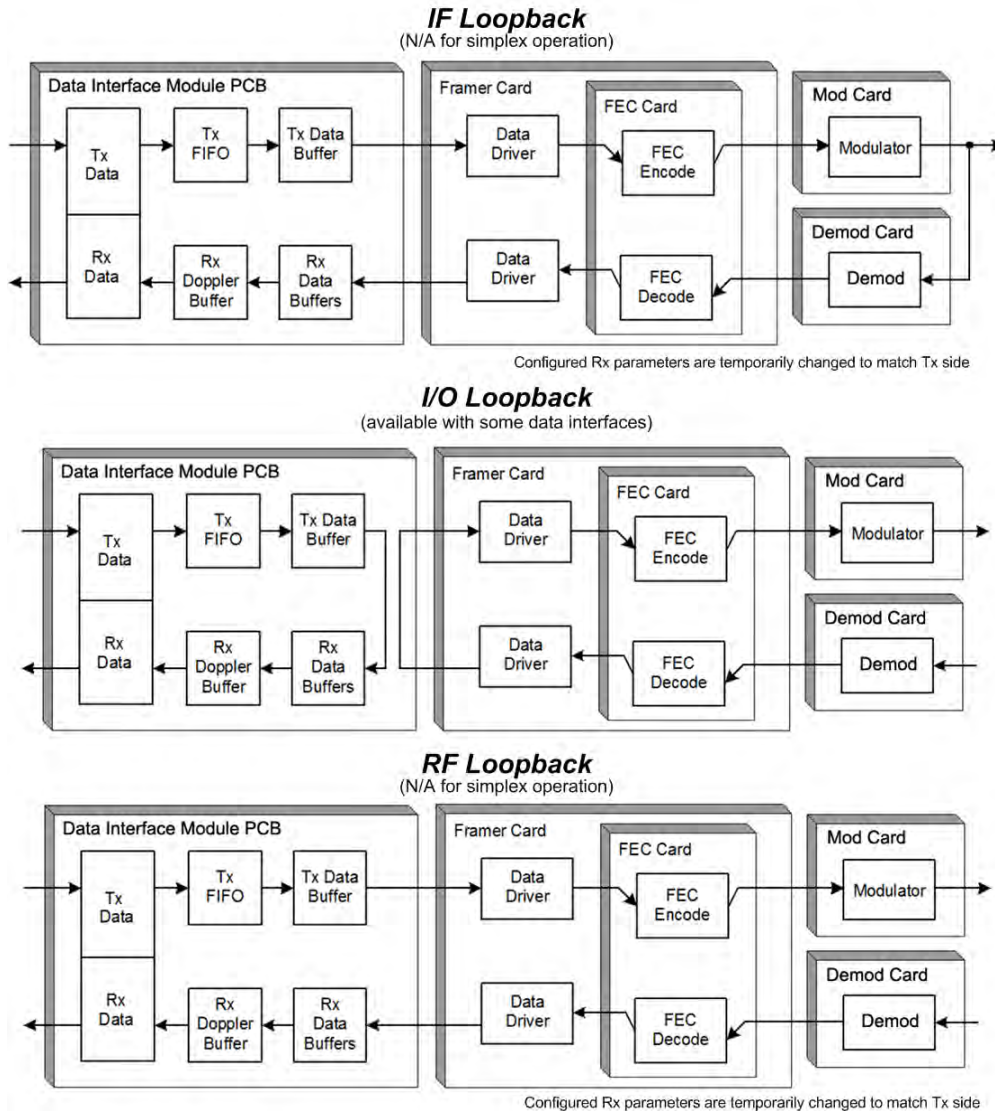
Figure 7-3. Traffic Data Flow Diagrams – Loopback Test Mode Examples

7.2.3.2 (Test:) TestPatterns

The availability of test patterns depends on the installed and enabled optional data interface:

- If the CDI-40 ASI Data Interface is installed in Interface Slot 1, or the CDI-70 10/100/1000 Base-T Gigabit Ethernet Data Interface (GBEI) is installed in Interface Slot 2, a menu appears as follows:

```
Test Pattern Subst:
Off  2047  2^23-1
```

Use the ◄ ► arrow keys to select **Off**, **2047**, or **2^23-1.** Press **ENTER**.

- If the CDI-60 HSSI Data Interface is installed and enabled in Interface Slot 1, the following message displays:

```
Test Pattern Subst:
N/A on HSSI Intfc
```

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

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                  ( ◄ ► E)
```

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

7.2.4.1 (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.

7.2.4.2 (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)

7.2.4.3 (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 adjust the brightness level for the front panel Vacuum Fluorescent Display (VFD). Select **25%**, **50%**, **75%** or **100%**. Press **ENTER**.

7.2.6.5 (UTIL:) Firmware

```
Firmware Images:
Info  Select          (◀ ▶E)
```

These submenus allow viewing information about the CDM-710 internal firmware. The modem stores two complete firmware images. You can select which image will be loaded the next time the unit reboots. Use the ◀ ▶ arrow keys to select **Info** or **Select**. Press **ENTER**.

1) This submenu is intended for DIAGNOSTIC PURPOSES ONLY. Do NOT 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.

(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:              08/06/09
FW12437P              4.1.5
```

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

(UTIL:) Firmware: → Info → Image#X → App

```
App:               08/06/09
FW12438P              4.1.5
```

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      03/13/09
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

```
ASI    GBEI    HSSI
```

Use the ◄ ► arrow keys to select **ASI**, **GBEI**, or **HSSI**. Press **ENTER**.

(UTIL:) Firmware: → Info → Image#X → Interfaces → ASI

```
ASI:                    07/25/07
FW12546D                   2.2.1
```

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

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:   0123456789
```

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 displays themessage "FAST Code Rejected!" The unit prompts you to press **ENTER** or **CLEAR**. You must then 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
```

The **FAST Demo Mode** enables all FAST options for a limited time. When enabled, Demo Mode allows access to *ALL* CDM-710/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.

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.

(UTIL:) FAST → View

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

These screens display *read-only* status messages about each FAST or hardware 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.

This list is representative, and subject to change:

Option Number (top line)	Description (bottom line)
01	IF Modulator (for CDM-710 70/140 MHz units) L-Band Mod (for CDM-710L L-Band units)
02	IF Demodulator (for CDM-710 70/140 MHz units) L-Band Demod (for CDM-710L L-Band units)
03	FEC Slot 1
04	FEC Slot 2
05	Interface #1
06	GBEI Intf2

Option Number (top line)	Description (bottom line)
07	Tx QPSK
08	Tx 8PSK
09	Tx 16-QAM
10	Tx 16APSK
11	Tx 32 APSK
12	Rx QPSK
13	Rx 8PSK
14	Rx 16QAM
15	Rx 16APSK
16	Rx 32 APSK
17	Tx <=15.0 MS
18	Tx <=22.5 MS
19	Tx <=30.0 MS
20	Tx <=37.5 MS
21	Tx <=45.0 MS
22	Rx <=15.0 MS
23	Rx <=22.5 MS
24	Rx <=30.0 MS
25	Rx <=37.5 MS
26	Rx <=45.0 MS
27	Tx DVB-S1
28	Tx DVB-S2
29	Tx DVB-DSNG
30	Rx DVB-S1
31	Rx DVB-S2
32	Rx DVB-DSNG

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-710 or CDM710L Broadcast 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 unit 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 CDM-710/L'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 the CDM-710/L.
- The SNMP Agent. This software runs on the unit. 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-710 Common MIB File

- FW12438-2x.mib
- MIB file provides modem family common components.

8.2.1.3   CDM-710 Modulator MIB File

- FW12051-4x.mib
- MIB file provides modem family Modulator components.

8.2.1.4   CDM-710 ASI MIB File

- FW12051-5xx.mib
- MIB file provides modem family ASI Interface components.

8.2.1.5   CDM-710 Redundancy MIB File

- FW12051-6x.mib
- MIB file provides modem family 1:1 Redundancy components.

8.2.1.6   CDM-710 Traps MIB File

- FW12438-3x.mib
- Trap MIB file provides SNMPv1 traps common for modem.

8.2.1.7   CDM-710 Gigabit Ethernet Interface (GBEI) MIB File

- FW12051-8x.mib
- MIB file provides modem family SNMPv1 traps for Gigabit Ethernet Interface (GBEI).

8.2.1.8   CDM-710 Private MIBs

The CDM-710 SNMP agent also implements private MIBs. For detailed OID information please refer to the actual MIB file

8.2.1.8.1   CDM-710 Common Private MIBs

The CDM-710 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. This includes the Local/Remote State, Physical Interface (EIA-232 or EIA-485), Address and baud rate selections. This group also provides address selection for the 1:1 redundancy controller.
- The "Remote Ethernet Group" provides parameters of the Ethernet interface. This includes the IP Address and Mask, IP Gateway, and MAC Address.
- The "Ethernet SNMP Group" provides parameters necessary to configure the SNMP interface.
- The "Interface FEC Group" provides parameters that control the unit's two FEC Slots and the capabilities of the cards loaded in those slots.
- The "Modem Reference Group" provides the parameters that control the unit's frequency reference.
- The "Monitor Group" provides access to the unit's current Alarm/Fault Status as well as the Stored Alarms/Events.
- The "Test Group" provides access to the unit's test modes.
- The "Save/Load Group" provides control of the unit's Store and Load Configuration capabilities.
- The "Utilities Group" provides access to the unit's Real-Time Clock (Time and Date), Internal Reference Adjustment, Circuit ID, and Front Panel Display Brightness Control.
- The "Firmware Group" provides Firmware Numbers, Revision Numbers, and Release Dates for all firmware within the unit.

8.2.1.8.2   Modulator Private MIB

The CDM-710 Modem MIB holds all unit parameters associated with the
Modulator.

8.2.1.8.3   ASI Private MIB

The CDM-710 ASI MIB holds all unit parameters associated with the ASI interface board.

8.2.1.8.4   Redundancy-Switch Private MIB

The CDM-710 Modem MIB holds all unit parameters associated with 1:1 Redundancy operations.

8.2.1.8.5   Gigabit Ethernet MIB

The CDM-710 Modem MIB holds all unit parameters associated with the Gigabit Ethernet Interface.

8.2.1.9   HSSI MIB

SNMP for the HSSI interface is not supported at this time.

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 unit MIB files must be used with the associated version of the unit M&C. See the CDM-710/L FW Release Notes for information on the required FW/SW compatibility.

The CDM-710/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-710/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-710/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-710/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-710/L supports the following MIB2 SNMPv1 traps and v2 notifications:
- Unit faults
- TX Traffic faults
- RX Traffic faults
- ODU (outdoor unit) faults.
- 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-710/L Broadcast 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 CDM-710/L Ethernet M&C in a "Telnet wrapper". When the user Telnets to the unit, it emulates a local EIA-232 or EIA-485 serial connection. You can then type the same command 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 unit 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
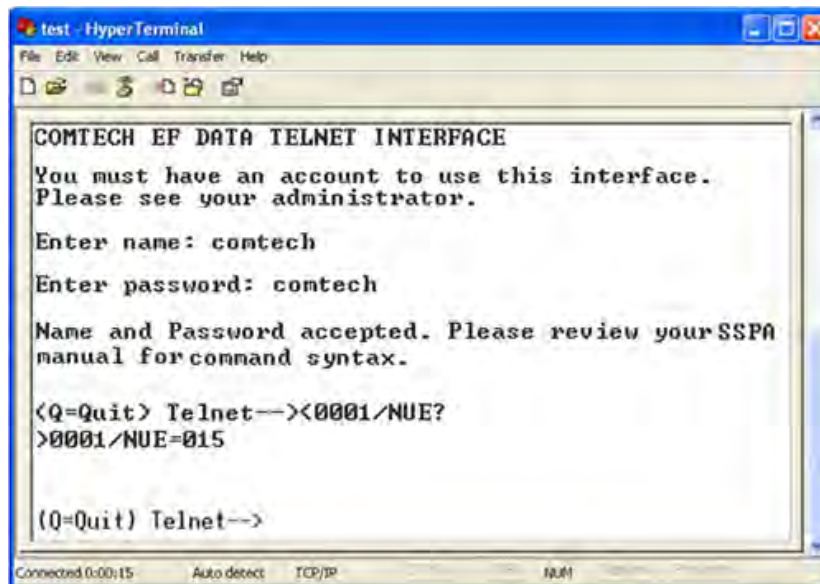
Figure 8-2. Telnet Interface Example – HyperTerminal

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
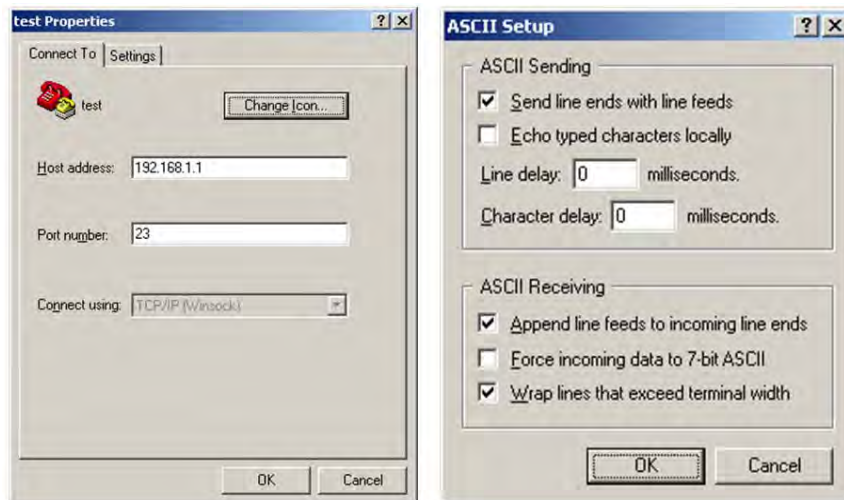
Figure 8-3. Configure HyperTerminal

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-710/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-710/L Front Panel operation to select "Ethernet" as your mode of operation prior to login. Failure to configure the CDM-710/L 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.
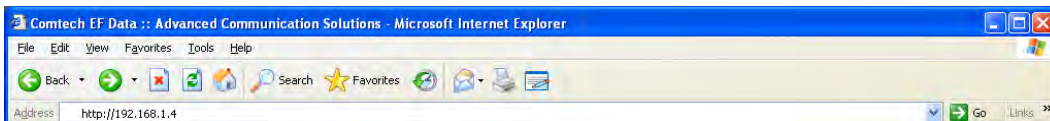
You may obtain your assigned address from the CDM-710/L front panel menu: **SELECT: CONFIG→Remote→Ethernet→Address. See Chapter 7. FRONT PANEL OPERATION** for further details. You may also need to consult with your network administrator to determine the appropriate IP address assignment for your modem.

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

> The appearance and function of the CDM-710L Web Server Interface is, for all purposes, otherwise identical to that of the CDM-710 Web Server 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. 4.1.10)

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.
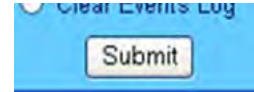
If you change any parameters, make sure to click the related action button before you leave the page. If you go to another page without first clicking the action button, your changes are not saved.

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.
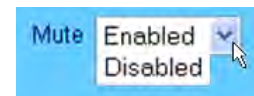
8.4.2.6　Text or Data Entry

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.
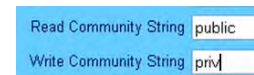
Click the related action button to save the data.

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

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-710 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 CDM-710/L.

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-40 ASI 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 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;
- Select the Clock Mode;
- Select and run a Test Mode;
- Assign a Circuit ID.

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.
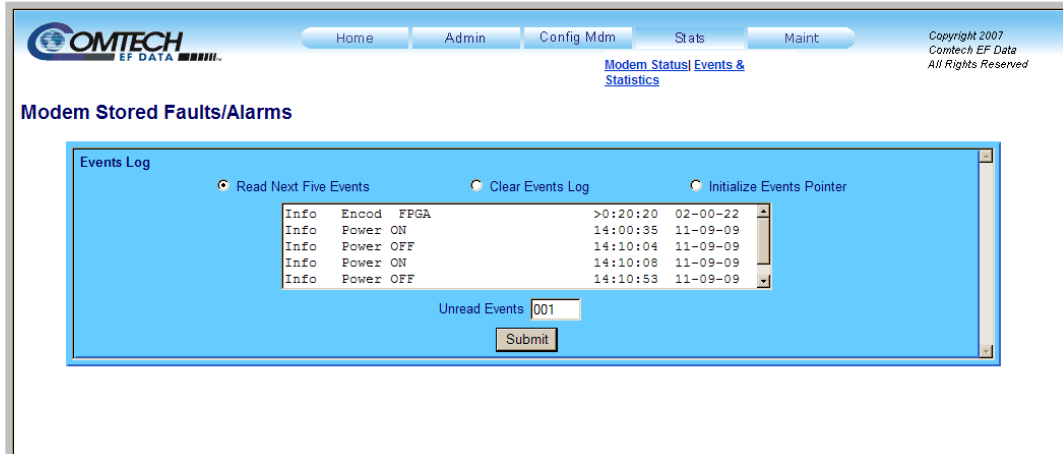
Figure 8-16. 'Stats | Events & Statistics' Page

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
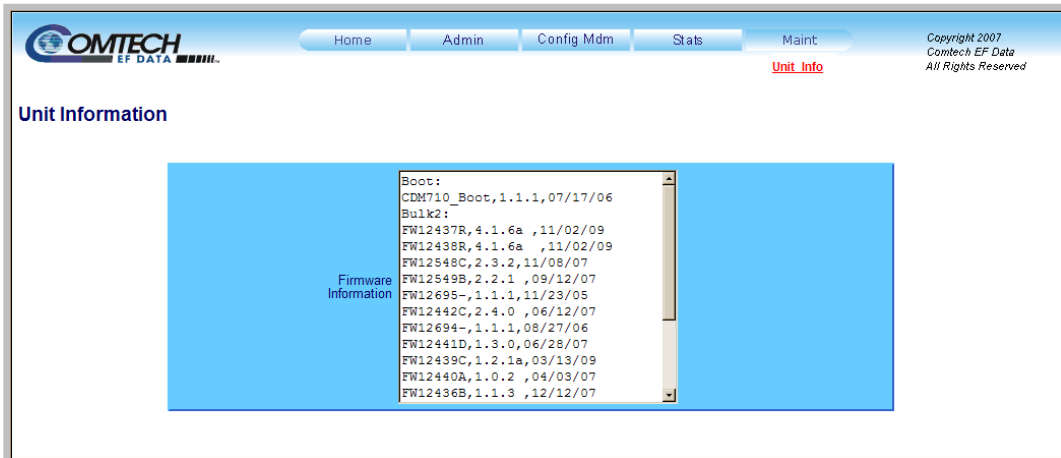
Figure 8-17. 'Maint | Unit Info' Page

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.

Notes:

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.

9.4.1   Modulator Only Commands and Queries

Priority System=(From highest to lowest priority) TMM>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 Mode	TMM=	TMM?	1 byte	Command or Query. Sets or returns the Tx Mode* in the form x where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **COMMAND EXAMPLE:** <0001/TMM=0{CR} (sets DVB-S mode) ***NOTE:** See **Chapter 2. SPECIFICATIONS** for available code rates, modulation types, and symbol rates for each mode.	TMM= TMM? TMM* TMM#	TMM=x
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=16QAM 3=16APSK 4=32APSK **COMMAND EXAMPLE:** <0001/TMD=1{CR} (sets as 8PSK) ***NOTE:** See **Chapter 2. SPECIFICATIONS** for available code rates, modulation types, and symbol rates for each mode.	TMD= TMD? TMD* TMD#	TMD=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 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=Rate 7/8 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
Auto Switch Mode	ASW=	ASW?	1 byte	Command or Query. Unit returns the redundancy auto/manual mode of the unit in the form x where: 0=Manual 1=Automatic **EXAMPLE:** <0001/ASW=0{CR} (sets Manual switching mode)	ASW= ASW? ASW* ASW#	ASW=x
ASI Tx Frame	ATF=	ATF?	2 bytes	Command or Query. Sets or returns the ASI Tx Frame Size (CDI-40 ASI Interface Module only) in the form sf, where: s=1 (Interface Slot 1 only) f=frame size, where 0=188 bytes, 1=204 bytes **COMMAND EXAMPLE:** <0001/ATF=11{CR} (sets Slot 1 to 204 byte frame size)	ATF= ATF? ATF* ATF#	ATF=sf
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

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
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=ComtechCDM-710L{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 (710, 71L) 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 (DVB-S1, DVB-DSNG modes only), 4=45.0 Msps (DVB-S1, DVB-DSNG modes only) d=S/W option Tx 8PSK where 0=Not installed, 1=Installed e=S/W option Tx 16QAM 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	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)				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 (DVB-S1, DVB-DSNG modes only) , 4=45.0 Msps (DVB-S1, DVB-DSNG modes only) m=S/W option Rx 8PSK where 0=Not installed, 1=Installed n=S/W option Rx 16QAM 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= CDI-40 ASI, 2=CDI-70 GBEI **(NOT USED)**, 3=CDI-60 HSSI u=Interface Slot 2 where 0=None, 1=CDI-40 ASI **(NOT USED)**, 2=CDI-70 GBEI, 3=CDI-60 HSSI **(NOT USED)** **NOTE:** When unit is 'MODULATOR ONLY' query returns '0 (Not Installed)' for Rx options. When unit is 'DEMODULATOR ONLY' query returns '0 (Not Installed)' for Tx options.		
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
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

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)	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)
				   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)
					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)				8=Reserved
				9=CDI-40 ASI Port Transmit FIFO Empty (Interface Slot 1)
				A=Reserved
				B=CDI-40 ASI Port Transmit FIFO Empty (Interface Slot 1)
				C=Reserved
				D= CDI-40 ASI Port Transmit Data Loss (Interface Slot 1)
				E=Reserved
				F= CDI-40 ASI Frame Not Synchronized (Interface Slot 1)
				G=Reserved
				H=CDI-60 HSSI Tx Clock Failure (Interface Slot 1)
				I=Reserved
				J=CDI-70 GBEI Module Datarate >+ 200 PPM (Interface Slot 2)
				K= CDI-70 GBEI Module Datarate <- 200 PPM (Interface Slot 2)
				L=CDI-70 GBEI No PHY Link
				M=Encoder FIFO Empty
				N=Encoder FIFO Full
				O=CDI-40 ASI Tx Input Datarate Offset > +110PPM (Interface Slot 1)
				P=Reserved
				Q=CDI-40 ASI Tx Input Datarate Offset < -110PPM (Interface Slot 1)
				R=Reserved
				S=SERDES Parity Errors
				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.		

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
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}	FRW? FRW* FRW#	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c...
GBEI FEC Enable	GFE=	GFE?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI FEC mode in the form sn, where: s=2 (Interface Slot 2 only) n=Disable/Enable where 0=Disabled, 1=Enabled	GFE= GFE# GFE? GFE*	GFE=sn
GBEI FEC Base Port	GFP=	GFP?	6 bytes	Command or Query. Sets or returns the CDI-70 GBEI FEC Base Port number in the form snnnnn, where: s=2 (Interface Slot 2 only) n=Port Number (0 to 65535)	GFP= GFP# GFP? GFP*	GFP=snnnnn
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 Multicast IP Address	GMI=	GMI?	17 bytes	Command or Query. Sets or returns the CDI-70 GBEI Multicast Address in the form smxxx.xxx.xxx.xxx, where: s=2 (Interface Slot 2 only) m=Multicast Stream (1 or 2) xxx.xxx.xxx.xxx=IP Address	GMI= GMI# GMI? GMI*	GMI=smxxx.xxx.xxx.xxx
GBEI Active Stream	GSA=	GSA?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Active Stream in the form sm, where: s=2 (Interface Slot 2 only) m=Active Multicast Stream (1 or 2)	GSA= GSA# GSA? GSA*	GSA=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 Source IP Address	GSI=	GSI?	17 bytes	Command or Query. Sets or returns the CDI-70 GBEI Source IP Address in the form smxxx.xxx.xxx.xxx, where: s=2 (Interface Slot 2 only) m=Multicast Stream (1 or 2) xxx.xxx.xxx.xxx=IP Address	GSI= GSI# GSI? GSI*	GSI =smxxx.xxx.xxx. xxx
GBEI Stream Mode	GSM=	GSM?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Stream Mode in the form sm, where: s=2 (Interface Slot 2 only) m=Mode, where 1=Single Stream, 2=Dual Stream (Redundancy Mode)	GSM= GSM# GSM? GSM*	GSM=sm
GBEI Primary Stream	GSP=	GSP?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Primary Stream in the form sm, where: s=2 (Interface Slot 2 only) m=Multicast Stream (1 or 2)	GSP= GSP# GSP? GSP*	GSP=sm
GBEI Stream Timeout Mode	GTM=	GTM?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Stream Timeout Mode in the form sm, where: s=2 (Interface Slot 2 only) m=Mode where 0=Non-revertive, 1=Revertive **NOTE:** Used in Dual Stream Mode ONLY. When in redundancy mode, this parameter controls whether the GBEI switches back and forth between the two input streams for a valid MPEG stream. Revertive (GSM=1) means the interface will switch back and forth between the two streams. Non-revertive (GSM=0) is a latching scheme where the interface will only switch to the secondary stream.	GTM= GTM# GTM? GTM*	GTM=sm
GBEI Stream Timeout	GTO=	GTO?	3 bytes	Command or Query. Sets or returns the CDI-70 GBEI Stream Timeout in the form stt, where: s=2 (Interface Slot 2 only) t=Timeout, from 0 to 10, in 100 mS steps **NOTE:** Used in Dual Stream Mode ONLY.	GTO= GTO# GTO? GTO*	GTO=stt

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} (resets stored events log internal pointer)	IEP= IEP? IEP* IEP#	N/A
Boot Image	IMG=	IMG?	1 byte	Command only. Selects the Boot image in the form n where: n=FW Image 1 or 2 **COMMAND EXAMPLE:** <0001/IMG=1{CR} (sets Image 1 for bootup)	IMG= IMG? IMG* IMG#	IMG=n
Tx Output Impedance	IMP=	IMP?	1 byte	**(CDM-710 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 impedance 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
Interface Type	N/A	ITF?s	2 bytes	Query only. Returns Interface Type in the form s, where: s=Interface Slot 1 or 2 **QUERY EXAMPLE:** <0001/ITF?1{CR} >0001/ITF=1x{CR}{LF} where x=active interface type: 0=CDI-40 ASI (Interface Slot 1 only) 1=CDI-70 GBEI (Interface Slot 2 only) 2=CDI-60 HSSI (Interface Slot 1 only)	ITF? ITF* ITF#	ITF=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
Local/Remote Status	LRS=	LRS?	1 byte	Command or Query. Sets or returns the Local/Remote operation in the form x, where: 0=Local 1=Serial 2=Reserved 3=Ethernet 4=Serial+Ethernet **COMMAND EXAMPLE:** <0001/LRS=4 (sets Serial+Ethernet remote mode)	LRS= LRS? LRS* LRS#	LRS=x
Unit MAC Address	N/A	MAC?	12 bytes	Query only. Returns the MAC address for the unit, in hexadecimal format, in the form AABBCCDDEEFF. **EXAMPLE:** <0001/MAC?{CR} >0001/MAC=006B000D2A7{CR}{CR}{LF} (The unit MAC Address is 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 in the form ab, where: a=Tx AIS, where 0=Alarm, 1=Fault, 2=Masked b=spare **COMMAND EXAMPLE:** <0001/MSK=00{CR}	MSK= MSK? MSK* MSK#	MSK=ab
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**Error! Bookmark not defined.**=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 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 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. 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{CR}Sub-body
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=012345678{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/SWR1?{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

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 ASI Bandwidth	TAB=	TAB?s	2 bytes	Command or Query. Sets or returns the CDI-40 Tx ASI Bandwidth in the form sx, where: s=1 (Interface Slot 1 only) x=ASI Bandwidth, where 0=Wide, 1=Narrow **COMMAND EXAMPLE:** <0001/TAB=11{cr} (sets Narrow bandwidth)	TAB= TAB? TAB* TAB#	TAB=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:** Valid only for CDI-60 HSSI operation. **COMMAND EXAMPLE:** <0001/TCI=11{CR} (sets Intfc #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:** Valid only for CDI-60 HSSI operation. **COMMAND EXAMPLE:** <0001/TDI=11{CR} (sets Intfc #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 the form xxxxxx.xxx where: xxxxxx.xxx=rate in ksps. **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-710 (70/140 MHz) Modulator: 52-88 MHz and 104-176 MHz CDM-710L (L-Band) Modulator: 950-1950 MHz **COMMAND EXAMPLE:** <0001/TFQ=0950.0000{CR} (sets as 950 MHz)	TFQ= TFQ? TFQ* TFQ#	TFQ=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
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 Intfc #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, i.e., 11:12:59 P.M.)	TIM= TIM? TIM* TIM#	TIM=hhmmss
Tx Interface Port	TIP=	TIP?	2 bytes	Command or Query. Indicates which Tx port on the CDI-40 ASI Interface is to be used in the form sp, where: s=1 (Interface Slot 1 only) p=CDI-40 Interface port where 1= 'Tx	J4' port or 2= '1:1 Tx	J5' port **NOTE:** Valid only for CDI-40 ASI Interface Module. **COMMAND EXAMPLE:** <0001/TIP=11{CR} (selects CDI-40 ASI 'Tx | J4' port).	TIP= TIP? TIP* TIP#	TIP=sp

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 Pilot Location	TLP=	TLP?	1 byte	Command or Query. Sets or returns the Tx Pilot location in the form x where: 0=Average 1=Peak **NOTE:** Valid only in DVB-S2 Mode. **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 Operation	TPI=	TPI?	1 byte	Command or Query. Sets or returns Tx Pilot operation in the form x where: 0=Off 1=On **NOTE:** Valid only in DVB-S2 Mode. **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-710 (70/140 MHz) range is from -20.0 to +00.0 dBm
				    CDM-710L (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

Test Pattern	TPT=	TPT?	1 byte	Command or Query. Sets or returns the Test Pattern in the form x where: 0=Off 1=2047 2=2^23-1 **COMMAND EXAMPLE:** <0001/TPT=1{CR} (sets 2047)	TPT= TPT? TPT * TPT #	TPT=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
Transmit & Receive Configuration	TRC=	TRC?	69 bytes	Command or Query. Sets or returns the current transmit and receive configuration in the form aaa.aaaabcc.cccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqrssssssstuvv, where: aaaa.aaaa=Tx Frequency (in MHz) (same as TFQ) b=Tx Mode (same as TMM) cc.cccccc=Tx Symbol Rate (same as TSR) d=Tx FEC Type (same as TFT **) e=Tx Modulation type (same as TMD) f=Tx FEC Rate (same as TCR) g=Tx Spectrum Inversion (same as TSI) hhhhhh=Tx Gold Code Sequence (same as TGS) iii.i=Tx Power Level (same as TPL) j=Tx Carrier State (same as TXO) k=Tx Alpha Roll-off (same as TAR) llll.llll=Rx Frequency (in MHz) (same as RFQ) m=Rx Mode (same as RMM) nn.nnnnnn=Rx Symbol Rate (same as RSR) o=Rx FEC Type (same as RFT **) p=Rx Modulation type (same as RMD) q=Rx FEC Rate (same as RCR) x=spare ssssss=Rx Gold Code Sequence (same as RGS) t=Rx Alpha Roll-off (same as RAR) u=Unit test Mode (same as TST**) vv=Unit Alarm Mask (same as MSK) **NOTES:** 1) ** indicates Read-only. 2) Unit returns 'x's for Rx parameters if unit is Modulator Only. 3) Unit returns 'x's for Tx parameters if unit is Demodulator Only. 4) If Rx is in DVB-S2 mode, the Rx Modulation Type and FEC rate are ignored because these are automatically detected.	TRC= TRC? TRC* TRC#	TRC= aaaa.aaaabcc.ccccccdefghhhhhh iii.ijkllll.llllmnn.nnnnnnopqxssssss stuvv

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 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 Transport Mode	TTM=	TTM?	1 byte	Command or Query. Sets or returns the transport mode for DVB-S2 mode in the form x where: 0=Generic Mode 1=Transport Stream Mode (DEFAULT) **NOTE:** Valid only with DVB-S2 mode and HSSI operation. For any other mode, set TTM=1. **COMMAND EXAMPLE:** <0001/TTM=1{CR} (sets Transport Stream mode)	TTM= TTM? TTM* TTM#	TTM=?
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) RMM>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 Mode	RMM=	RMM?	1 byte	Command or Query. Sets or returns the Rx Mode in the form x where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **NOTE:** See **Chapter 2. SPECIFICATIONS** for available code rates, demodulation types, and symbol rates for each mode. **COMMAND EXAMPLE:** <0001/RMM=0{CR} (sets DVB-S Mode)	RMM= RMM? RMM* RMM#	RMM=x
Rx Modulation Type	RMD=	RMD?	1 byte	Command or Query. Sets or returns the Rx Demodulation type in the form x where: 0=QPSK 1=8PSK 2=16QAM 3=16APSK 4=32APSK **NOTES:** 1) See **Chapter 2. SPECIFICATIONS** for available code rates, demodulation types, and symbol rates for each mode. 2) If the demodulator is set to DVB-S2 Mode, RMD functions as query-only because the demodulation type is automatically detected. 3) If the unit is not locked, the query returns 'x'. **COMMAND EXAMPLE:** <0001/RMD=1{CR} (sets 8PSK)	RMD= RMD? RMD* RMD#	RMD=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 FEC Code Rate	RCR=	RCR?	1 byte	Command or Query Sets or returns the Rx Code Rate in the form x where: 0=Rate 3/4 1=Rate 7/8 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 **NOTES:** 1) See **Chapter 2. SPECIFICATIONS** for available code rates for each mode. 2) If the demodulator is set to DVB-S2 Mode, RCR functions as query-only because the demodulation type is automatically detected. 3) If the unit is not locked, the query returns 'x'. **COMMAND EXAMPLE:** <0001/RCR=0{CR} (sets Rate 3/4)	RCR= 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 symbol rates for each mode. **COMMAND EXAMPLE:** <0001/RSR=20.000000 (sets as 20 Msps)	RSR= RSR? RSR* RSR#	RSR=ss.ssssss
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
ASI Rx Frame	ARF=	ARF?	2 bytes	Command or Query. Sets or returns the ASI Rx Frame Size in the form sf, where: s=1 (Interface Slot 1 only) f=Frame size, where 0=188 bytes, 1=204 bytes **NOTE:** Valid only for CDI-40 ASI Interface Module operation. **COMMAND EXAMPLE:** <0001/ARF=11{CR} (sets Slot 1 to 204 byte frame size)	ARF= ARF? ARF* ARF#	ARF=sf

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
Auto Switch Mode	ASW=	ASW?	1 byte	Command or Query. Unit returns the redundancy auto/manual mode of the unit in the form x where: 0=Manual 1=Automatic **COMMAND EXAMPLE:** <0001/ASW=0{CR} (sets Manual switching mode)	ASW= ASW? ASW* ASW#	ASW=x
Rx BER	N/A	BER?	7 bytes	Query only. Returns the value of the estimated BER in the form a.bEscc, (representing **ab x 10^{-c}**), where: a.b=BER value E=exponent indicator s= sign (+/-) cc=exponent value. **NOTE:** Unit returns 0.0E+00 if the demodulator is unlocked. **EXAMPLE:** <0001/BER?{CR} >0001/BER=4.8E-03{CR}{LF} (returns BER of 4.8 x 10^{-3})	BER? BER* BER#	BER=a.bEscc
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=ComtechCDM-710L{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

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
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
Eb/No Alarm Point	EBA=	EBA?	4 bytes	Command or Query. Sets or returns the Eb/No alarm point xx.x=Alarm point value, in dB, from 0.1 to 16, in 0.1 dB steps. **COMMAND EXAMPLE:** <0001/EBA=12.3{CR} (sets alarm point to 12.3 dB)	EBA= EBA? EBA* EBA#	EBA=xx.x
Rx Eb/No	N/A	EBN?	4 bytes	Query only. Returns the value of Eb/No in the form xx.x, where: xx.x= value from 0 to 16 dB, in 0.1 dB steps. **NOTES:** 1) Valid in DVB-S or DVB-DSNG Modes only. 2) Returns 99.9 if demod is unlocked. 3) For values greater than 16.0 dB, the response is EBN=+016 **EXAMPLE:** <0001/EBN?{CR} >0000/EBN=12.3{CR}{LF} (reports Eb/No of 12.3 dB)	EBN? EBN* EBN#	EBN=xx.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 (710, 71L) 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 (DVB-S1, DVB-DSNG modes only), 4=45.0 Msps (DVB-S1, DVB-DSNG modes only) d=S/W option Tx 8PSK where 0=Not installed, 1=Installed e=S/W option Tx 16QAM 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)				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 (DVB-S1, DVB-DSNG modes only) , 4=45.0 Msps (DVB-S1, DVB-DSNG modes only) m=S/W option Rx 8PSK where 0=Not installed, 1=Installed n=S/W option Rx 16QAM 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= CDI-40 ASI, 2=CDI-70 GBEI **(NOT USED)**, 3=CDI-60 HSSI u=Interface Slot 2 where 0=None, 1=CDI-40 ASI **(NOT USED)**, 2=CDI-70 GBEI, 3=CDI-60 HSSI **(NOT USED)** **NOTE:** When unit is 'MODULATOR ONLY' query returns '0 (Not Installed)' for Rx options. When unit is 'DEMODULATOR ONLY' query returns '0 (Not Installed)' for Tx options.		
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

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 Es/No	N/A	ESN?	4 bytes	Query only. Returns the value of Es/No in the form xx.x where: xx.x=Value from 0 to 22 dB, in 0.1 dB steps. **NOTES:** 1) Valid in DVB-S2 Mode only. 2) Returns 99.9 if demod is unlocked. 3) 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
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 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	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)				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
				c=Rx Traffic Status where:
				   0=No faults
				   1=+1.5V Demod Power Supply Unit (Demodulator Card)
				   2=FPGA Load (Demodulator Card)
				   3=Demod Unlocked
				   4=DSNG Sync Error
				   5=FPGA Temperature (Demodulator Card)
				   6=Reserved
				   7=AGC Level Out of Range
				   8=Eb/No Limit Exceeded
				   9=Demodulator Synth 1 PLL
				   A=Demodulator Synth 2 PLL
				   B= SERDES Demod to Framer
				   C= SERDES Framer to FEC1
				   D= SERDES Framer to FEC2
				   E=Reserved
				   F= MPEG transport stream error.
				   G=ASI Rx PLL Empty (Interface Slot 1)
				   H=ASI Rx PLL Full (Interface Slot 1)
				   I=ASI Rx PLL Lower Limit Reached (Interface Slot 1)
				   J=ASI Rx PLL Upper Limit Reached (Interface Slot 1)
				   K=Reserved
				   L=Reserved
				   M=Reserved
				   N=Reserved
				   O=Reserved
				   P=ASI Rx SERDES Error (Interface Slot 1)
				   Q=ASI Rx SERDES DCM Unlocked (Interface Slot 1)		

| 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)				R= Reserved
				S= Reserved
				T=HSSI Rx Buffer Underrun (Interface Slot 1)
				U=HSSI Rx Buffer Overflow (Interface Slot 1)
				V=Reserved
				W=Reserved
				X=Framer SERDES Rx Fault (Interface Slot 1)
				Y=Framer SERDES Rx Fault (Interface Slot 2)
				Z=Reserved
				[=Reserved
				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 Egress FEC Enable	GEF=	GEF?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Egress FEC operation in the form sn, where: s=2 (Interface Slot 2 only) n=Disable/enable, where 0=Disabled, 1=Enabled	GEF= GEF# GEF? GEF*	GEF=sn

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 Egress Multicast Group Address	GEG=	GEG?	16 bytes	Command or Query. Sets or returns the CDI-70 GBEI Egress Multicast Group Address. The multicast stream egressing from the CDI-70 GBEI will have this source IP address in the form sxxx.xxx.xxx.xxx, where: s=2 (Interface Slot 2 only) xxx.xxx.xxx.xxx=IP Address	GEG= GEG# GEG? GEG*	GEG=sxxx.xxx.xxx.xxx
GBEI Egress Port Numbers	GEP=	GEP?s	11 bytes	Command or Query. Sets or returns the CDI-70 GBEI Egress Port Numbers in the form snnnnnppppp, where: s=2 (Interface Slot 2 only) nnnnn = Source Port Number, value in the range from 0 to 65535 ppppp = Destination Port Number, vale in the range from 0 to 65535 **NOTE:** Both Source Port and Destination Port must be valid for set command to take effect.	GEP= GEP# GEP? GEP*	GEP=snnnnnppppp
GBEI Egress FEC Matrix	GFM=	GFM?s	11 bytes	Command or Query. Sets or returns the CDIU-70 GBEI Egress FEC Matrix in the form sll,dd where: s=2 (Interface Slot 2 only) ll = Length, two digit number (leading zero) from 1 to 20. dd = Depth, two digit number (leading zero) from 4 to 20. **NOTE:** Length x Depth, must be (less than or equal to) ≤100	GFM= GFM # GFM? GFM*	GFM=sll,dd
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
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} (resets stored events log internal pointer)	IEP= IEP? IEP* IEP#	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
Boot Image	IMG=	IMG?	1 byte	Command only. Selects the Boot image in the form n where: n=FW Image 1 or 2 **COMMAND EXAMPLE:** <0001/IMG=1{CR} (sets Image 1 for bootup)	IMG= IMG? IMG* IMG#	IMG=n
Management IP Address	IPA=	IPA?	18 bytes	Command or Query. Sets or returns the Management 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 BaseT 'J4 | 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

Interface Type	N/A	ITF?s	2 bytes	Query only.
				Returns Interface Type in the form in response to query 's' where:
				s=Interface Slot 1 or 2
				QUERY EXAMPLE: <0001/ITF?1{CR}
				        >0001/ITF=1x{CR}{LF} where x=active interface type:
				        0=CDI-40 ASI (Interface Slot 1 only)
				        1=CDI-70 GBEI (Interface Slot 2 only)
				        2=CDI-60 HSSI (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. **EXAMPLE:** <0001/LNK?{CR} >0000/LNK=12.3{CR}{LF}	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. Sets or returns the Local/Remote status in the form x where: 0=Local 1=Serial 2=Reserved 3=Ethernet 4=Serial+Ethernet **COMMAND EXAMPLE:** <0001/LRS=1{CR} (sets Serial Remote mode)	LRS= LRS? LRS* LRS#	LRS=x
Unit MAC Address	N/A	MAC?	12 bytes	Query only. Returns the MAC address for the unit, in hexadecimal format, in the form AABBCCDDEEFF. **EXAMPLE:** <0001/MAC?{CR} >0001/MAC=006B000D2A7{CR}{CR}{LF} (The unit MAC Address is 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 in the form ab where: a=Tx AIS Interface Slot 1 where 0=Alarm, 1=Fault, or 2=Masked b=spare **QUERY EXAMPLE:** <0001/MSK?{CR} >0000/MSK=00{CR}{LF}	MSK= MSK? MSK* MSK#	MSK=abcdefghij klmxxx
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 PER	N/A	PER?	7 bytes	Query only. Returns the value of the estimated PER in the form a.bEscc, (representing **ab x 10^{-c}**), where: a.b=PER value E=exponent indicator s= sign (+/-) cc=exponent value. **NOTE:** Unit returns 0.0E+00 if the demodulator is unlocked. **EXAMPLE:** <0001/PER?{CR} >0001/PER=4.8E-03{CR}{LF} (returns PER of 4.8 x 10^{-3})	PER? PER* PER#	PER=a.bEscc

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 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 Rx Alpha Rolloff to 20%)	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 for HSSI value from 5.0 to 32.0 ms, in 0.1 ms steps **NOTE:** Valid for Slot 1 CDI=-60 HSSI operation only. Not valid for Slot 1 CDI-40 ASI operation, or Slot 2 CDI-70 GBEI operation. **COMMAND EXAMPLE:** <0001/RBS=130.0{CR} (sets 30.0 ms on Intfc #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
Rx Clock Inverted	RCI=	RCI?s	2 bytes	Command or Query. Sets or returns CDI-60 HSSI Inverted Rx Clock in the form sx where: s=1 (Interface Slot 1 only) x=CDI-60 HSSI Inverted Rx Clock where 0=Normal, 1=Inverted **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 GBEI operation.	RCI = RCI? RCI * RCI #	RCI=sx
Rx Clock Source	RCK=	RCK?s	2 bytes	Command or Query. Sets or returns CDI-60 HSSI 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 **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI=70 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 CDI-60 HSSI Invert Rx Data in the form sx where: s=1 (Interface Slot 1 only) x=Invert Rx Data where 0=Normal, 1=Inverted **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 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. **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 returns 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 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 $\pm$ 0 to 100 kHz, in 100 Hz steps **NOTE:** Returns 999999 if the demodulator is unlocked. **EXAMPLE:** <0001/RFO?{CR} >0001/RFO=+002.3{CR}{LF} (reports +2.3 kHz offset)	RFO? RFO* RFO#	RFO=sxxx.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 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-710 (70/140 MHz) Demodulator: 52-88 MHz and 104-176 MHz 　　CDM-710L (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 **NOTES:** 1)　Valid only in DVB-S2 mode. 2)　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 FEC Type	N/A	RFT?	1 byte	Query only. Returns the active Rx FEC coding type in the form x where: 0=Viterbi + Reed-Solomon 1=LDPC **NOTE:** FEC is dependent on the RX Mode Type. **EXAMPLE:** <0001/RFT=1{CR} 　　　　>0001/RFT=1{CR}{LF} (type is set to LDPC coding)	RFT? RFT* RFT#	RFT=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, value from 000000 to 262141 **NOTE:** Valid in DVB-S2 Mode only. **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 operating 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 Intfc #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:** 1) Valid in DVB-S2 Mode only. 2) 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
Rx Transport Mode	RTM=	RTM?	1 byte	Query only. Returns the transport mode in the form x where: 0=Generic Mode 1=Transport Stream Mode (Default) **NOTE:** Query valid only with HSSI operation in DVB-S2 Mode. For any other mode, RTM reports as 1. **EXAMPLE:** <0001/RTM?{CR} >0001/RTM=1 (reports Transport Stream selected)	RTM? RTM* RTM#	RTM=x
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=123456789{CR}{LF}	SNO? SNO* SNO#	SNO=xxxxxxxxx
Software Revision	N/A	SWR?	5 bytes	Query only. Returns the revision numbers of the installed firmware, in the form: Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z **EXAMPLE:** <0001/SWR1?{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, from 00 to 23 mm=minutes, from 00 to 59 ss=seconds, from 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
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
Transmit & Receive Configuration	TRC=	TRC?	69 bytes	Command or Query. Sets or returns the global configuration in the form aaa.aaaabcc.cccccccdefghhhhhhiii.ijkllll.lllllmnn.nnnnnnopqrsssssssstuvv, where: aaaa.aaaa=Tx Frequency, in MHz (same as TFQ) b=Tx Mode (same as TMM) cc.ccccccc=Tx Symbol Rate (same as TSR) d=Tx FEC Type (same as TFT **) e=Tx Modulation type (same as TMD) f=Tx FEC Rate (same as TCR) g=Tx Spectrum Inversion (same as TSI) hhhhhh=Tx Gold Code Sequence (same as TGS) iii.i=Tx Power Level (same as TPL) j=Tx Carrier State (same as TXO) k=Tx Alpha Roll-off (same as TAR) llll.llll=Rx Frequency, in MHz (same as RFQ) m=Rx Mode (same as RMM) nn.nnnnnn=Rx Symbol Rate (same as RSR) o=Rx FEC Type (same as RFT **) p=Rx Modulation Type (same as RMD) q=Rx FEC Rate (same as RCR) x=spare ssssss=Rx Gold Code Sequence (same as RGS) t=Rx Alpha Roll-off (same as RAR) u=Unit test Mode (same as TST**) vv =Unit Alarm Mask (same as MSK)	TRC= TRC? TRC* TRC#	TRC= aaaa.aaaabcc.cc ccccdefghhhhhh iii.ijkllll.llllmnn.n nnnnnopqxssssss stuvv

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
Transmit & Receive Configuration (continued)				**NOTES:** 1) ** = Read-only. 2) Unit returns 'x's for Rx parameters if unit is Modulator only. 3) Unit returns 'x's for Tx parameters if unit is Demodulator only. 4) If Rx is in DVB-S2 mode, the Rx Modulation Type (RMD) and Rx FEC Rate (RCR) are ignored because they are automatically detected.		

9.4.3 Modem (Modulator+Demodulator) Commands and Queries

Priority System=(From highest to lowest priority) TMM>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 Mode	TMM=	TMM?	1 byte	Command or Query. Sets or returns the Tx Mode* in the form x where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **COMMAND EXAMPLE:** <0001/TMM=0{CR} (sets DVB-S mode) ***NOTE:** See **Chapter 2. SPECIFICATIONS** for available code rates, modulation types, and symbol rates for each mode.	TMM= TMM? TMM* TMM#	TMM=x
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=16QAM 3=16APSK 4=32APSK **COMMAND EXAMPLE:** <0001/TMD=1{CR} (sets as 8PSK) ***NOTE:** See **Chapter 2. SPECIFICATIONS** for available modulation types for each mode.	TMD= TMD? TMD* TMD#	TMD=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 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=Rate 7/8 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. Depending on FEC type, not all of these selections will be valid.	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
Auto Switch Mode	ASW=	ASW?	1 byte	Command or Query. Sets or returns the redundancy auto/manual mode of the unit in the form x where: 0=Manual 1=Automatic **EXAMPLE:** <0001/ASW=0{CR} (sets Manual switching mode)	ASW= ASW? ASW* ASW#	ASW=x
Tx Output Impedance	IMP=	IMP?	1 byte	**(CDM-710 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

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 ASI Bandwidth	TAB=	TAB?s	2 bytes	Command or Query. Sets or returns the CDI-40 Tx ASI Bandwidth in the form sx, where: s=1 (Interface Slot 1 only) x=ASI Bandwidth, where 0=Wide, 1=Narrow **COMMAND EXAMPLE:** <0001/TAB=11{cr} (sets Narrow bandwidth)	TAB= TAB? TAB* TAB#	TAB=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 CDI-60 HSSI Invert Transmit Clock in the form sa where: s=1 (Interface Slot 1 only) a=0 (Normal), 1 (Inverted) **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 GBEI operation. **COMMAND EXAMPLE:** <0001/TCI=11{CR} (sets Interface 1 as inverted)	TCI = TCI? TCI * TCI #	TCI =sa
Tx Data Invert	TDI=	TDI?sc	2 bytes	Command or Query. Sets or returns CDI-60 HSSI Invert Transmit Data in the form sa where: s=1 (Interface Slot 1 only) a=0 (Normal), 1 (Inverted) **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 GBEI operation. **COMMAND EXAMPLE:** <0001/TDI=11{CR} (sets Interface 1 as Inverted)	TDI = TDI? TDI * TDI #	TDI =sa
Tx Data Rate	N/A	TDR?	10 bytes	Query only. Returns the Composite Tx Data rate in the form xxxxxx.xxx where: xxxxxx.xxx=data rate, in kbps, in 1 bps steps. **QUERY EXAMPLE:** <0001/TDR?{CR} >0000/TDR=002047. 999{CR}{LF} (reports 2047.999 kbps data rate.)	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-710 (70/140 MHz) Modulator: From 52-88 MHz and 104-176 MHz
				    CDM-710L (L-Band) Modulator: From 950-1950 MHz
				COMMAND EXAMPLE: <0001/TFQ=0950. 0000{CR} (sets as 950 MHz)
					TFQ=
					TFQ?
					TFQ*
					TFQ#
						TFQ=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
Tx Frame Size	TFS=	TFS?	1 byte	Command or Query. Sets or returns the Tx Frame Size selection in the form x where: 0=Short 1=Long **NOTE:** Valid only in DVB-S2 Mode. **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: 0=Viterbi+Reed-Solomon 1=LDPC **NOTE:** FEC is dependent on the TX Mode Type. **EXAMPLE:** <0001/TFT?{CR} >0001/TFT=1{CR}{LF} (returns LDPC code type)	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 value, from 000000 to 262141 **NOTE:** Valid only in DVB-S2 Mode. **COMMAND 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 Interface Slot 1 Tx)	TIE= TIE? TIE* TIE#	TIE=sx
Tx Interface Port	TIP=	TIP?s	2 bytes	Command or Query. Indicates which CDI-40 ASI Interface Tx port is to be used in the form sp, where: s=1 (Interface Slot 1 only) p=CDI-40 Interface port where 1= 'Tx | J4' port or 2= '1:1 Tx | J5' port **NOTE:** Not valid for Slot 1 CDI-60 HSSI or Slot 2 CDI-70 GBEI. **COMMAND EXAMPLE:** <0001/TIP=11{CR} (selects CDI-40 ASI 'Tx | J4' port).	TIP= TIP? TIP* TIP#	TIP=sp

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 Pilot Location	TLP=	TLP?	1 byte	Command or Query. Sets or returns the Tx Pilot location where: 0=Average 1=Peak **NOTE:** Valid only in DVB-S2 Mode. **COMMAND EXAMPLE:** <0001/TLP=0{CR} (sets as Average)	TLP= TLP? TLP* TLP#	TLP=x
Tx Pilot Operation	TPI=	TPI?	1 byte	Command or Query. Sets or returns Tx Pilot operation in the form x where: 0=Off 1=On **NOTE:** Valid in DVB-S2 Mode only. **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-710 (70/140 MHz) range is from -20. 0 to +00. 0 dBm
				    CDM-710L (L-Band) range is from -25. 0 to -05. 0 dBm
				NOTE: <-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
Tx Transport Mode	TTM=	TTM?	1 byte	Command or Query. Sets or returns the Tx Transport Mode for DVB-S2 Mode in the form x where: 0=Generic Mode 1=Transport Stream (Default) **NOTE:** Command applies only to CDI-60 HSSI operation in DVB-S2 Mode. For any other mode, set TTM=1 **COMMAND EXAMPLE:** <0001/TTM=1{CR} (sets mode to Transport Stream)	TTM= TTM? TTM* TTM#	TTM=x

9.4.4   Priority System Commands and Queries

Priority System = (Highest to lowest priority) RMM>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 Mode	RMM=	RMM?	1 byte	Command or Query. Sets or returns the Rx Mode in the form x where: 0=DVB-S 1=DVB-S2 2=DVB-DSNG **NOTE:** See **Chapter 2. SPECIFICATIONS** for available code rates, demodulation types, and symbol rates for each mode. **COMMAND EXAMPLE:** <0001/RMM=0{CR} (sets DVB-S Mode)	RMM= RMM? RMM* RMM#	RMM=x
Rx Modulation Type	N/A	RMD?	1 byte	Command or Query. Sets or returns the Rx Modulation type in the form x where: 0=QPSK 1=8PSK 2=16QAM 3=16APSK 4=32APSK **NOTES:** 1) See **Chapter 2. SPECIFICATIONS** for available code rates, demodulation types, and symbol rates for each mode. 2) If the demodulator is set to DVB-S2 mode, RMD functions as query-only because the demodulation type is automatically detected 3) If the unit is not locked, the query returns 'x'. **COMMAND EXAMPLE:** <0001/RMD=1{CR} (sets 8PSK)	RMD? RMD* RMD#	RMD=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 FEC Code Rate	N/A	RCR?	1 byte	Command or Query Sets or returns the Rx Code Rate in the form x where: 0=Rate 3/4 1=Rate 7/8 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 **NOTES:** 1) See **Chapter 2. SPECIFICATIONS** for available code rates for each mode. 2) If the demodulator is set to DVB-S2 Mode, RCR functions as query-only because the demodulation type is automatically detected. 3) If the unit is not locked, the query returns 'x'. **COMMAND EXAMPLE:** <0001/RCR=0{CR} (sets 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. **QUERY EXAMPLE:** <0001/RSR?{CR} <0001/RSR=20.000000{CR}{LF} (returns 20 Msps Rx Symbol Rate)	RSR= RSR? RSR* RSR#	RSR=ss.ssssss
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 operation)	AEQ= AEQ? AEQ* AEQ#	AEQ=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
ASI Rx Frame	ARF=	ARF?	2 bytes	Command or Query. Sets or returns the CDI-40 ASI Rx Frame Size in the form sf, where: s=1 (Interface Slot 1 only) f=Frame size, where 0=188 bytes, 1=204 bytes **NOTE:** Not valid for Slot 1 CDI-60 HSSI or Slot 2 CDI-70 GBEI operation. **COMMAND EXAMPLE:** <0001/ARF=11{CR} (sets Interface Slot 1 to 204 byte frame size)	ARF= ARF? ARF* ARF#	ARF=sf
Auto Switch Mode	ASW=	ASW?	1 byte	Command or Query. Unit returns the redundancy auto/manual mode of the unit in the form x where: 0=Manual 1=Automatic **COMMAND EXAMPLE:** <0001/ASW=0{CR} (sets Manual switching mode)	ASW= ASW? ASW* ASW#	ASW=x
ASI Tx Frame	ATF=	ATF?	2 bytes	Command or Query. Sets or returns the CDI-40 ASI Tx Frame Size in the form sf, where: s=1 (Interface Slot 1 only) f=frame size, where 0=188 bytes, 1=204 bytes **NOTE:** Not valid for Slot 1 CDI-60 HSSI or Slot 2 CDI-70 GBEI operation. **COMMAND EXAMPLE:** <0001/ATF=11{CR} (sets Interface Slot 1 to 204 byte frame size)	ATF= ATF? ATF* ATF#	ATF=sf
Rx BER	N/A	BER?	7 bytes	Query only. Returns the value of the estimated BER in the form a.bEscc, (representing $ab \times 10^{-c}$), where: a.b=BER value E=exponent indicator s= sign (+/-) cc=exponent value. **NOTE:** Unit returns 0.0E+00 if the demodulator is unlocked. **EXAMPLE:** <0001/BER?{CR} >0001/BER=4.8E-03{CR}{LF} (returns BER of 4.8×10^{-3})	BER? BER* BER#	BER=a.bEscc
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

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
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 **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 configuration into 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 from 01 to 31 mm=month of the year from 01 to 12 yy=year from 00 to 99 **EXAMPLE:** <0001/DAY=240416{CR} (sets date to April 24, 2016)	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 **QUERY EXAMPLE:** <0001/DLK?{CR} <0001/DLK=1{CR}{LF} (returns Demodulator as 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 **COMMAND EXAMPLE:** <0001/EBA=12.3{CR} (sets alarm point at 12.3 dB)	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 xx.x where: xx.x=value, in 0.1 dB steps, from 0 to 16 dB. **NOTES:** 1) Valid in DVB-S or DVB-DSNG modes only. 2) Returns 99.9 if demod is unlocked. 3) For values greater than 16.0 dB, the response is **EBN=+016** **EXAMPLE:** <0001/EBN?{CR} >0001/EBN=12.3{CR}{LF} (returns Eb/No of 12.3 dB)	EBN? EBN* EBN#	EBN=xx.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 (710, 71L) 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 (DVB-S1, DVB-DSNG modes only), 4=45.0 Msps (DVB-S1, DVB-DSNG modes only) d=S/W option Tx 8PSK where 0=Not installed, 1=Installed e=S/W option Tx 16QAM 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 (DVB-S1, DVB-DSNG modes only) , 4=45.0 Msps (DVB-S1, DVB-DSNG modes only) m=S/W option Rx 8PSK where 0=Not installed, 1=Installed n=S/W option Rx 16QAM 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	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)				t=Interface Slot 1 where 0=None, 1= CDI-40 ASI, 2=CDI-70 GBEI **(NOT USED)**, 3=CDI-60 HSSI u=Interface Slot 2 where 0=None, 1=CDI-40 ASI **(NOT USED)**, 2=CDI-70 GBEI, 3=CDI-60 HSSI **(NOT USED)** **NOTES:** 1) When unit is 'MODULATOR ONLY' query returns '0 (Not Installed)' for <u>Rx</u> options. 2) When unit is 'DEMODULATOR ONLY' query returns '0 (Not Installed)' for <u>Tx</u> options.		
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 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 **COMMAND EXAMPLE:** <0001/ESW=1{CR} (enables Redundancy Mode)	ESW= ESW? ESW* ESW#	ESW=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
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) 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)	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)				8=Reserved
				9=CDI-40 ASI Port Transmit FIFO Empty (Interface Slot 1)
				A=Reserved
				B=CDI-40 ASI Port Transmit FIFO Empty (Interface Slot 1)
				C=Reserved
				D= CDI-40 ASI Port Transmit Data Loss (Interface Slot 1)
				E=Reserved
				F= CDI-40 ASI Frame Not Synchronized (Interface Slot 1)
				G=Reserved
				H=CDI-60 HSSI Tx Clock Failure (Interface Slot 1)
				I=Reserved
				J=CDI-70 GBEI Module Datarate >+ 200 PPM (Interface Slot 2)
				K= CDI-70 GBEI Module Datarate <- 200 PPM (Interface Slot 2)
				L=CDI-70 GBEI No PHY Link
				M=Encoder FIFO Empty
				N=Encoder FIFO Full
				O=CDI-40 ASI Tx Input Datarate Offset > +110PPM (Interface Slot 1)
				P=Reserved
				Q=CDI-40 ASI Tx Input Datarate Offset < -110PPM (Interface Slot 1)
				R=Reserved
				S=SERDES Parity Errors
				c=Rx Traffic Status where:
				  0=No faults
				  1=+1.5V Demod Power Supply Unit (Demodulator Card)
				  2=FPGA Load (Demodulator Card)
				  3=Demod Unlocked
				  4=DSNG Sync Error
				  5=FPGA Temperature (Demodulator Card)
				  6=Reserved
				  7=AGC Level Out of Range
				  8=Eb/No Limit Exceeded
				  9=Demodulator Synth 1 PLL
				  A=Demodulator Synth 2 PLL
				  B= SERDES Demod to Framer
				  C= SERDES Framer to FEC1		

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)				D= SERDES Framer to FEC2
				E=Reserved
				F= MPEG transport stream error.
				G=ASI Rx PLL Empty (Interface Slot 1)
				H=ASI Rx PLL Full (Interface Slot 1)
				I=ASI Rx PLL Lower Limit Reached (Interface Slot 1)
				J=ASI Rx PLL Upper Limit Reached (Interface Slot 1)
				K=Reserved
				L=Reserved
				M=Reserved
				N=Reserved
				O=Reserved
				P=ASI Rx SERDES Error (Interface Slot 1)
				Q=ASI Rx SERDES DCM Unlocked (Interface Slot 1)
				R= Reserved
				S= Reserved
				T=HSSI Rx Buffer Underrun (Interface Slot 1)
				U=HSSI Rx Buffer Overflow (Interface Slot 1)
				V=Reserved
				W=Reserved
				X=Framer SERDES Rx Fault (Interface Slot 1)
				Y=Framer SERDES Rx Fault (Interface Slot 2)
				Z=Reserved
				[=Reserved
				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
Firmware Revisions	N/A	FRW?i	1 byte	Query only. Returns the firmware information of the system: i=Bulk Image number (1 or 2) a=Firmware Image b=Firmware Revision c=Firmware Date	FRW? FRW* FRW#	FRW={CR}Boot:{CR}a,b,c{CR}Bulki:{CR}a,b,c{CR}a,b,c...
GBEI Egress FEC Enable	GEF=	GEF?	2 bytes	Command or Query. Sets or returns CDI-70 GBEI Egress FEC operation in the form sn, where: s=2 (Interface Slot 2 only) n=Disable/enable, where 0=Disabled, 1=Enabled	GEF= GEF# GEF? GEF*	GEF=sn
GBEI Egress Multicast Group Address	GEG=	GEG?	16 bytes	Command or Query. Sets or returns the CDI-70 GBEI Egress Multicast Group Address. The multicast stream egressing from the CDI-70 GBEI will have this IP address as the source IP address in the form sxxx.xxx.xxx.xxx, where: s=2 (Interface Slot 2 only) xxx.xxx.xxx.xxx=IP Address	GEG= GEG# GEG? GEG*	GEG=sxxx.xxx.xxx.xxx
GBEI Egress Port Numbers	GEP=	GEP?s	11 bytes	Command or Query. Sets or returns the CDI-70 GBEI Egress Port Numbers in the form snnnnnppppp, where: s=2 (Interface Slot 2 only) nnnnn = Source Port Number, value in the range from 0 to 65535 ppppp = Destination Port Number, vale in the range from 0 to 65535 **NOTE:** Both Source Port and Destination Port must be valid for set command to take effect.	GEP= GEP# GEP? GEP*	GEP=snnnnnppppp
GBEI Egress FEC Matrix	GFM=	GFM?s	11 bytes	Command or Query. Sets or returns the CDI-70 GBEI Egress FEC Matrix in the form sll,dd where: s=2 (Interface Slot 2 only) ll = Length, two digit number (leading zero) from 1 to 20. dd = Depth, two digit number (leading zero) from 4 to 20. **NOTE:** Length x Depth must be (less than or equal to) ≤100	GFM= GFM # GFM? GFM*	GFM=sll,dd
GBEI FEC Base Port	GFP=	GFP?	6 bytes	Command or Query. Sets or returns the CDI-70 GBEI Base Port number in the form snnnnn, where: s=2 (Interface Slot 2 only) n=Port Number (0 to 65535)	GFP= GFP# GFP? GFP*	GFP=snnnnn

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 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
GBEI Multicast IP Address	GMI=	GMI?	17 bytes	Command or Query. Sets or returns the CDI-70 GBEI Multicast Address in the form smxxx.xxx.xxx.xxx, where: s=2 (Interface Slot 2 only) m=Multicast Stream (1 or 2) xxx.xxx.xxx.xxx=IP Address	GMI= GMI# GMI? GMI*	GMI=smxxx.xxx. xxx.xxx
GBEI Active Stream	GSA=	GSA?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Active Stream in the form sm, where: s=2 (Interface Slot 2 only) m=Active Multicast Stream (1 or 2)	GSA= GSA# GSA? GSA*	GSA=sm
GBEI Source IP Address	GSI=	GSI?	17 bytes	Command or Query. Sets or returns the CDI-70 GBEI Source IP Address in the form smxxx.xxx.xxx.xxx, where: s=2 (Interface Slot 2 only) m=Multicast Stream (1 or 2) xxx.xxx.xxx.xxx=IP Address	GSI= GSI# GSI? GSI*	GSI =smxxx.xxx.xxx. xxx
GBEI Stream Mode	GSM=	GSM?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Stream Mode in the form sm, where: s=2 (Interface Slot 2 only) m=Mode, where 1=Single Stream, 2=Dual Stream (Redundancy Mode)	GSM= GSM# GSM? GSM*	GSM=sm
GBEI Primary Stream	GSP=	GSP?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Primary Stream in the form sm, where: s=2 (Interface Slot 2 only) m=Multicast Stream (1 or 2)	GSP= GSP# GSP? GSP*	GSP=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 Stream Timeout Mode	GTM=	GTM?	2 bytes	Command or Query. Sets or returns the CDI-70 GBEI Stream Timeout Mode in the form sm, where: s=2 (Interface Slot 2 only) m=Mode where 0=Non-revertive, 1=Revertive **NOTE:** Used in Dual Stream Mode ONLY. When in redundancy mode, this parameter controls whether the GBEI switches back and forth between the two input streams for a valid MPEG stream. Revertive (GSM=1) means the interface will switch back and forth between the two streams. Non-revertive (GSM=0) is a latching scheme where the interface will only switch to the secondary stream.	GTM= GTM# GTM? GTM*	GTM=sm
GBEI Stream Timeout	GTO=	GTO?	3 bytes	Command or Query. Sets or returns the CDI-70 GBEI Stream Timeout in the form stt, where: s=2 (Interface Slot 2 only) t=Timeout, from 0 to 10, in 100 mS steps **NOTE:** Used in Dual Stream Mode ONLY.	GTO= GTO# GTO? GTO*	GTO=stt
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} (resets stored events log internal pointer)	IEP= IEP? IEP* IEP#	N/A
Boot Image	IMG=	IMG?	1 byte	Command only. Selects the Boot image in the form n where: n=FW Image 1 or 2 **COMMAND EXAMPLE:** <0001/IMG=1{CR} (sets Image 1 for bootup)	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) **COMMAND EXAMPLE:** <0001/IPA=010.006.030.001.24{CR}	IPA= IPA? IPA* IPA#	IPA=xxx.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
Gateway IP Address	IPG=	IPG?	15 bytes	Command or Query. Sets or returns the Gateway IP Address for the 10/100 BaseT 'J4 | Ethernet' management port in the form xxx.xxx.xxx.xxx where: xxx.xxx.xxx.xxx=IP Address **COMMAND EXAMPLE:** <0001/IPA=010.006.030.002{CR}	IPG= IPG? IPG* IPG#	IPG=xxx.xxx.xxx.xxx
Interface Type	N/A	ITF?s	2 bytes	Query only. Returns Interface Type in the form s, where: s=Interface Slot 1 or 2 **QUERY EXAMPLE:** <0001/ITF?1{CR} 　　　　　　　　　>0001/ITF=1x{CR}{LF} where x=active interface type: 　　　　　　　　　　0=CDI-40 ASI (Interface Slot 1 only) 　　　　　　　　　　1=CDI-70 GBEI (Interface Slot 2 only) 　　　　　　　　　　2=CDI-60 HSSI (Interface Slot 1 only)	ITF? ITF* ITF#	ITF=s
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
Local/Remote Status	LRS=	LRS?	1 byte	Command or Query. Sets or returns the Local/Remote operation in the form x, where: 0=Local 1=Serial 2=Reserved 3=Ethernet 4=Serial+Ethernet **COMMAND EXAMPLE:** <0001/LRS=4 (sets Serial+Ethernet remote mode)	LRS= LRS? LRS* LRS#	LRS=x
Unit MAC Address	N/A	MAC?	12 bytes	Query only. Returns the MAC address for the unit, in hexadecimal format, in the form AABBCCDDEEFF. **EXAMPLE:** <0001/MAC?{CR} 　　　　　　　>0001/MAC=006B000D2A7{CR}{CR}{LF} 　　　　　　　(The unit MAC Address is 00:06:B0:00:D2:A7)	MAC? MAC* MAC#	MAC=AABBCCDDEEFF

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 in the form ab, where: a=Tx AIS, where 0=Alarm, 1=Fault, 2=Masked b=spare **COMMAND EXAMPLE:** <0001/MSK=00{CR}	MSK= MSK? MSK* MSK#	MSK=ab
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 PER	N/A	PER?	7 bytes	Query only. Returns the value of the estimated PER in the form a.bEscc, (representing **ab x 10^{-c}**), where: a.b=PER value E=exponent indicator s= sign (+/-) cc=exponent value. **NOTE:** Unit returns 0.0E+00 if the demodulator is unlocked. **EXAMPLE:** <0001/PER?{CR} >0001/PER=4.8E-03{CR}{LF} (returns PER of 4.8 x 10^{-3})	PER? PER* PER#	PER=a.bEscc
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=1{CR} (sets Rx Alpha Rolloff to 25%)	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=CDI-60 HSSI Rx Buffer Size value from 5.0 to 32.0 ms, in 0.1 ms steps **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 GBEI operation. **COMMAND EXAMPLE:** <0001/RBS=130{CR} (Sets 30 ms buffers size 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	RBT? RBT* RBT#	RBT=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 Clock Inverted	RCI=	RCI?s	2 bytes	Command or Query. Sets or returns CDI-60 HSSI Inverted Rx Clock in the form sx where: s=1 (Interface Slot 1 only) x=CDI-60 HSSI Inverted Rx Clock where 0=Normal, 1=Inverted **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 GBEI operation.	RCI = RCI? RCI * RCI #	RCI=sx
Rx Clock Source	RCK=	RCK?s	2 bytes	Command or Query. Sets or returns CDI-60 HSSI 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 **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 GBEI operation. **COMMAND EXAMPLE:** <0001/RCK=11{CR} (sets Tx-Terrestrial)	RCK= RCK? RCK* RCK#	RCK=sx
Rx Data Invert	RDI=	RDI?s	2 bytes	Command or Query. Sets or returns the CDI-60 HSSI Invert Rx Data in the form sx where: s=1 (Interface Slot 1 only) x=Invert Rx Data where 0=Normal, 1=Inverted **NOTE:** Not valid for Slot 1 CDI-40 ASI or Slot 2 CDI-70 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. **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.	RED= RED? RED* RED#	RED=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 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?{CR} >0001/RFO=+002.3{CR}{LF} (reports +2.3 kHz offset)	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-710 (70/140 MHz) Demodulator: 52-88 MHz and 104-176 MHz CDM-710L (L-Band) Demodulator: 950-1950 MHz	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 **NOTES:** 1) Valid only in DVB-S2 mode. 2) 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 FEC Type	N/A	RFT?	1 byte	Query only. Returns the active Rx FEC coding type in the form x where: 0=Viterbi + Reed-Solomon 1=LDPC **NOTE:** FEC is dependent on the RX Mode Type. **EXAMPLE:** <0001/RFT=1{CR} >0001/RFT=1{CR}{LF} (type is set to LDPC coding)	RFT? RFT* RFT#	RFT=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

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 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{CR} (ENABLES Slot 1 operation)	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{CR}Sub-body
Rx Pilot On/Off	N/A	RPI?	1 byte	Command or Query. Sets or returns the Rx Pilot status in the form x where: 0=Off 1=On **NOTES:** 1) Valid in DVB-S2 Mode only. 2) This is automatically detected on demod acquisition, but if the unit is not locked, the query returns 'x'.	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 in dBm, from -99.0 to +3.0, in 0.1 dBm steps.	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.	RSW= RSW? RSW* RSW#	RSW=xxx
Rx Transport Mode	RTM=	RTM?	1 byte	Query only. Returns the transport mode in the form x where: 0=Generic Mode 1=Transport Stream Mode (Default) **NOTE:** Query valid only with CDI-60 HSSI operation in DVB-S2 Mode. For any other mode, RTM reports as RTM=1. **EXAMPLE:** <0001/RTM?{CR} >0001/RTM=1 (reports Transport Stream selected)	RTM? RTM* RTM#	RTM=x
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 revision numbers of the installed firmware, in the form: Boot:X.X.X Bulk1:Y.Y.Y Bulk2: Z.Z.Z **EXAMPLE:** <0001/SWR1?{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=231255{CR} (sets time to 11:12:55 PM)
					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 **EXAMPLE:** <0001/TMP>{CR} >0001/TMP=+026{CR}{LF} (reports temperature as 26°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
Test Pattern	TPT=	TPT?	1 byte	Command or Query. Sets or returns the Test Pattern in the form x where: 0=Off 1=2047 2=2^23-1 **COMMAND EXAMPLE:** <0001/TPT=1{CR} (sets 2047)	TPT= TPT? TPT * TPT #	TPT=x

Transmit & Receive Configuration	TRC=	TRC?	69 bytes	Command or Query.
				Sets or returns the current transmit and receive (global) configuration in form aaa.aaaabcc.cccccccdefghhhhhhiii.ijkllll.llllmnn.nnnnnnopqrssssssstuvv, where:
				  aaaa.aaaa=Tx Frequency (in MHz) (same as TFQ)
				  b=Tx Mode (same as TMM)
				  cc.cccccc=Tx Symbol Rate (same as TSR)
				  d=Tx FEC Type (same as TFT **)
				  e=Tx Modulation type (same as TMD)
				  f=Tx FEC Rate (same as TCR)
				  g=Tx Spectrum Inversion (same as TSI)
				  hhhhhh=Tx Gold Code Sequence (same as TGS)
				  iii.i=Tx Power Level (same as TPL)
				  j=Tx Carrier State (same as TXO)
				  k=Tx Alpha Roll-off (same as TAR)
				  llll.llll=Rx Frequency (in MHz) (same as RFQ)
				  m=Rx Mode (same as RMM)
				nn.nnnnnn=Rx Symbol Rate (same as RSR)
				  o=Rx FEC Type (same as RFT **)
				  p=Rx Modulation type (same as RMD)
				  q=Rx FEC Rate (same as RCR)
				  x=spare
				  ssssss=Rx Gold Code Sequence (same as RGS)
				  t=Rx Alpha Roll-off (same as RAR)
				  u=Unit test Mode (same as TST**)
				  vv=Unit Alarm Mask (same as MSK)
					TRC=
					TRC?
					TRC*
					TRC#
						TRC=
						aaaa.aaaabcc.cc
						ccccdefghhhhhh
						iii.ijkllll.llllmnn.n
						nnnnnopqxssssss
						stuvv

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
Transmit & Receive Configuration (continued)				**NOTES:** 1) ** indicates Read-only. 2) Unit returns 'x's for Rx parameters if unit is Modulator Only 3) Unit returns 'x's for Tx parameters if unit is Demodulator Only. If Rx is in DVB-S2 mode, the Rx Modulation Type and FEC rate are ignored because these are automatically detected.		
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

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 as follows:

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' indicates CDI-40 ASI Interface; '2' indicates CDI-70 Gigabit Ethernet Interface (GBEI); '3' indicates CDI-60 HSSI 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' indicates CDI-40 ASI; '2' indicates CDI-70 Gigabit Ethernet Interface (GBEI); '3' indicates CDI-60 HSSI.

MGC CDI-40 ASI Example:
<0000/MGC=TRU111250.0000101.0000001070-10.0101000000001xxxxxxxxx1250.0000101.00
000010701010100000002.01xxxxxxxxx00000xxxxxxxxxxxxxx0100xxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxx

MGC CDI-60 HSSI Example:
<0000/MGC=TRU111250.0000101.0000001070-10.0101000000001xxxxxxxxx1250.0000101.00
000010701010100000002.01xxxxxxxxx00000xxxxxxxxxxxxxx0000321.1xxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxx

[Tx Block] consists of 50 bytes for Transmit configuration, in the form
aaaa.aaaabcc.ccccccdefghhh.hijklmmmmmmmnoxxxxxxxxx where:

aaaa.aaaa=Tx Frequency (in MHz)	same as TFQ
b=Tx Mode	same as TMM
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   same as TTM (in DVB-S2 & HSSI mode)

    xxxxxxxxxx=spare bytes

[Rx Block] consists of 50 bytes for Receive configuration, in the form
aaaa.aaaabcc.cccccccdefggghijklllllllmm.mnxxxxxxxxxx where:

    aaaa.aaaa=Rx Frequency (in MHz)   same as RFQ

    b=Rx Mode   same as RMM

    cc.ccccccc=Rx Symbol Rate   same as RSR

    d=Rx FEC Type   same as RFT (read-only)

    e=Rx Modulation Type   same as RMD (read-only in DVB-S2 mode)

    f=Rx FEC Rate   same as RCR (read-only in DVB-S2 mode)

    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   same as RTM (read-only in DVB-S2 & HSSI mode)

    xxxxxxxxxx=spare bytes

[Unit Block] consists of 20 bytes for Unit Configuration in the form **abccdxxxxxxxxxxxxxxx** where:

    a=Test Mode   same as TST

b=Test Pattern	same as TPT
cc=Alarm Mask	same as MSK
d=External Reference Frequency	same as ERF
xxxxxxxxxxxxxx=spare bytes	

[Interface Block] consists of 130 bytes and contains the configuration of the current enabled interface on the unit. The format of the configuration bytes depends on the interface type indicated by the 5th byte in the MGC command or query.

If CDI-40 ASI Interface (I=1) – The **[Interface Block]** is in the form **abcdx…xxx** where:

a=ASI Bandwidth	same as TAB (omit interface slot parameter)
b=ASI Port	same as TIP (omit interface slot parameter)
c=ASI Tx Frame Size	same as ATF (omit interface slot parameter)
d=ASI Rx Frame Size	same as ARF (omit interface slot parameter)
x…xxx=spare bytes	

If CDI-70 Gigabit Ethernet Interface (I=2) – The **[Interface Block]** is in the form
aaa.aaa.aaa.aaabbb.bbb.bbb.bbbccc.ccc.ccc.cccddd.ddd.ddd.dddeefghiiiiijkkk.kkk.kkk.kkklmmmmmnnnnnoop pxxx…xxx where:

aaa.aaa.aaa.aaa=Ingress Multicast Group Address #1	same as GMI (omit interface slot parameter)
bbb.bbb.bbb.bbb=Ingress Multicast Group Address #2	same as GMI (omit interface slot parameter)
ccc.ccc.ccc.ccc=Ingress Multicast Source Address #1	same as GSI (omit interface slot parameter)
ddd.ddd.ddd.ddd=Ingress Multicast Source Address #2	same as GSI (omit interface slot parameter)
ee=Buffer Timeout	same as GTO (omit interface slot parameter)
f=Primary Stream	same as GSP (omit interface slot parameter)
g=Stream Mode	same as GSM (omit interface slot parameter)
h=Ingress FEC Enable	same as GFE (omit interface slot parameter)

iiiii=Ingress UDP Port   same as GFP (omit interface slot parameter)
j=Buffer Timeout Mode   same as GTM (omit interface slot parameter)
kkk.kkk.kkk.kkk=Egress Multicast Group   same as GEG (omit interface slot parameter)
l=Egress FEC Enable   same as GEF (omit interface slot parameter)
mmmmm=Egress Source Port   same as GEP (omit interface slot parameter)
nnnnn=Egress Destination Port   same as GEP (omit interface slot parameter)
oo=FEC Matrix Length   same as GFM (omit interface slot parameter)
pp=FEC Matrix Depth   same as GFM (omit interface slot parameter)
xxx…xxx=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

Appendix A. FORWARD ERROR CORRECTION OPTIONS

A.1   Overview

The CDM-710 Broadcast Satellite Modem operates with error correction based on DVB standards:

- **DVB-S –** QPSK with concatenated Viterbi and Reed Solomon.
- **DVB-DSNG –** 8PSK and 16QAM with concatenated Viterbi and Reed Solomon.
- **DVB-S2 –** QPSK, 8PSK, 16APSK and 32APSK with concatenated Low Density Parity Code (LDPC) and Bose-Chaudhuri-Hocquenghem (BCH).

DVB-S and DVB-DSNG anchored one the most widely adopted modulation and coding schemes deployed, and were universally employed for satellite broadcast and related applications. DVB-S2 now defines the latest 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.

A.2   Viterbi and Reed Solomon

The concatenated Viterbi and Reed Solomon coding technique produces significant improvement over Viterbi decoding alone. Simplistically, a Reed Solomon block decoder follows the convolutional Viterbi decoder to further enhance error correction. Errors exiting the Viterbi decoder tend to occur in

clusters or errors bursts. The Reed Solomon decoder works well correcting burst errors so the combination delivers improved performance. To further improve the error correcting capability, an interleaver is placed between the two schemes to spread the errors so fewer occur in a given block.

A.3 LDPC and BCH

LDPC and BCH is also 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.

A.3.1   Range of Data Rates

For the detailed Range of Data Rates see **Chapter 2. SPECIFICATIONS**.

A.3.2   Eb/No, Es/No Spectral Efficiency and Occupied Bandwidth

Depending upon the operating mode, the DVB standard uses different modes of specifying performance with a modem in IF Loop and Additive White Gaussian Noise (AWGN):

- **DVB-S (QPSK with Viterbi and Reed Solomon):** BER=2 x 10^{-4} after Viterbi (before Reed Solomon) and QEF after Reed Solomon at the specified Eb/No and includes a modem implementation loss of 0.8 dB and the noise bandwidth increase due to the outer code ($10_{\log}$ 188/204=0.36 dB).

  Quasi-Error-Free (QEF) corresponds to less than one uncorrected error event per hour, or BER=10^{-10} to 10^{-11} at the input of an MPEG-2 demultiplexer. This is the error rate most commonly used.

- **DVB-DSNG (8PSK and 16QAM with Viterbi and Reed Solomon):** Similar to DVB-S. The modem implementation ranges from 1.0 dB (8PSK 2/3) to 2.1 dB (16QAM 7/8).

- **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).

  Also, note the use of Es/No instead of Eb/No. When links operate at constant symbol rate, this is a good method for comparing the performance of different modulation types and code rates. The relation between the two quantities is given by:

$$Eb/No = Es/No - 10_{Log}(\text{Spectral Efficiency})$$

Another useful parameter is the occupied 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

Table A-1 provides the Eb/No, spectral efficiency, and occupied bandwidth for the CDM-710.

Table A-2 and **Table A-3** outline these parameters per the modem's DVB schemes.

Figure 7-1 through **Figure 7-7** illustrate the error performance characteristics.

Table A-1. Eb/No, Spectral Efficiency and Occupied Bandwidth*

Mode	Type	FEC Code	Inner Code Rate	Eb/No at QEF	Spectral Efficiency (bps/Hz)	Normalized Symbol Rate (=Bit Rate x)	Occupied * Bandwidth for 10 Mbps (35% Rolloff)
DVB-S	QPSK	Conv+RS	1/2	4.5	0.921569	1.085	12.913
	QPSK	Conv+RS	2/3	5.0	1.228758	0.814	9.685
	QPSK	Conv+RS	3/4	5.5	1.382353	0.723	8.609
	QPSK	Conv+RS	5/6	6.0	1.535948	0.651	7.748
	QPSK	Conv+RS	7/8	6.4	1.612745	0.620	7.379
DVB-DSNG	8PSK	Conv+RS	2/3	6.9	1.843137	0.543	6.456
	8PSK	Conv+RS	5/6	8.9	2.303922	0.434	5.165
	8PSK	Conv+RS	8/9	9.4	2.457516	0.407	4.842
	16QAM	Conv+RS	3/4	9.0	2.764706	0.362	4.304
	16QAM	Conv+RS	7/8	10.7	3.225490	0.310	3.689

* 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%.

Table A-2. DVB-S2 <u>Standard</u> FECFrame = 64, 800 bits

(QPSK 1/4, 1/3, and 2/5 are for provided for reference purposes)

Type	Inner FEC Code	**Es/No at PER = 10^-7	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)
			Pilots Off			Pilots On		
QPSK	1/4	-1.85	0.490243	2.040	23.458	0.478577	2.090	24.030
	1/3	-0.74	0.656448	1.523	17.519	0.640827	1.560	17.946
	2/5	0.20	0.789412	1.267	14.568	0.770627	1.298	14.923
	1/2	1.50	0.988858	1.011	11.630	0.965327	1.036	11.913
	3/5	2.73	1.188304	0.842	9.678	1.160026	0.862	9.914
	2/3	3.60	1.322253	0.756	8.697	1.290788	0.775	8.909
	3/4	4.53	1.487473	0.672	7.731	1.452076	0.689	7.920
	4/5	5.18	1.587196	0.630	7.245	1.549426	0.645	7.422
	5/6	5.68	1.654663	0.604	6.950	1.615288	0.619	7.119
	8/9	6.70	1.766451	0.566	6.510	1.724416	0.580	6.669
	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
	2/3	7.32	1.980636	0.505	5.806	1.935658	0.517	5.941
	3/4	8.61	2.228124	0.449	5.161	2.177525	0.459	5.281
	5/6	10.15	2.478562	0.403	4.640	2.422276	0.413	4.748
	8/9	11.49	2.646012	0.378	4.346	2.585924	0.387	4.447
	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
	3/4	11.21	2.966728	0.337	3.876	2.896320	0.345	3.971
	4/5	12.03	3.165623	0.316	3.633	3.090495	0.324	3.721
	5/6	12.61	3.300184	0.303	3.485	3.221863	0.310	3.569
	8/9	13.89	3.523143	0.284	3.264	3.439530	0.291	3.343
	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
	4/5	14.64	3.951571	0.253	2.910	3.866247	0.259	2.974
	5/6	15.28	4.119540	0.243	2.792	4.030589	0.248	2.853
	8/9	16.69	4.397854	0.227	2.615	4.302894	0.232	2.673
	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 A-3. DVB-S2 Short FECFrame = 16,200 bits*

(QPSK 1/4, 1/3, and 2/5 are provided for reference purposes)

Type	Inner FEC Code	***Es/No at PER = 10^{-7}	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)
			Pilots Off			Pilots On		
QPSK	1/4	-1.55	0.365324	2.737	31.479	0.357467	2.797	32.171
	1/3	-0.44	0.629060	1.590	18.281	0.615532	1.625	18.683
	2/5	0.50	0.760928	1.314	15.113	0.744564	1.343	15.445
	1/2	1.80	0.848840	1.178	13.548	0.830585	1.204	13.846
	3/5	3.03	1.156532	0.865	9.944	1.131661	0.884	10.162
	2/3	3.90	1.288400	0.776	8.926	1.260693	0.793	9.122
	3/4	4.83	1.420269	0.704	8.097	1.389725	0.720	8.275
	4/5	5.48	1.508181	0.663	7.625	1.475747	0.678	7.793
	5/6	5.98	1.596093	0.627	7.205	1.561768	0.640	7.363
	8/9	7.00	1.727961	0.579	6.655	1.690800	0.591	6.802
	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
	2/3	7.62	1.922040	0.520	5.983	1.884959	0.531	6.101
	3/4	8.91	2.118761	0.472	5.428	2.077885	0.481	5.534
	5/6	10.45	2.381056	0.420	4.830	2.335120	0.428	4.925
	8/9	11.79	2.577778	0.388	4.461	2.528046	0.396	4.549
	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
	3/4	11.51	2.809662	0.356	4.093	2.761633	0.362	4.164
	4/5	12.33	2.983575	0.335	3.854	2.932574	0.341	3.921
	5/6	12.91	3.157488	0.317	3.642	3.103514	0.322	3.705
	8/9	14.19	3.418357	0.293	3.364	3.359924	0.298	3.423
	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
	4/5	14.94	3.709309	0.270	3.100	3.630805	0.275	3.167
	5/6	15.58	3.925526	0.255	2.930	3.842446	NA	NA
	8/9	16.99	4.249850	0.235	2.706	4.159906	0.240	2.764
	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
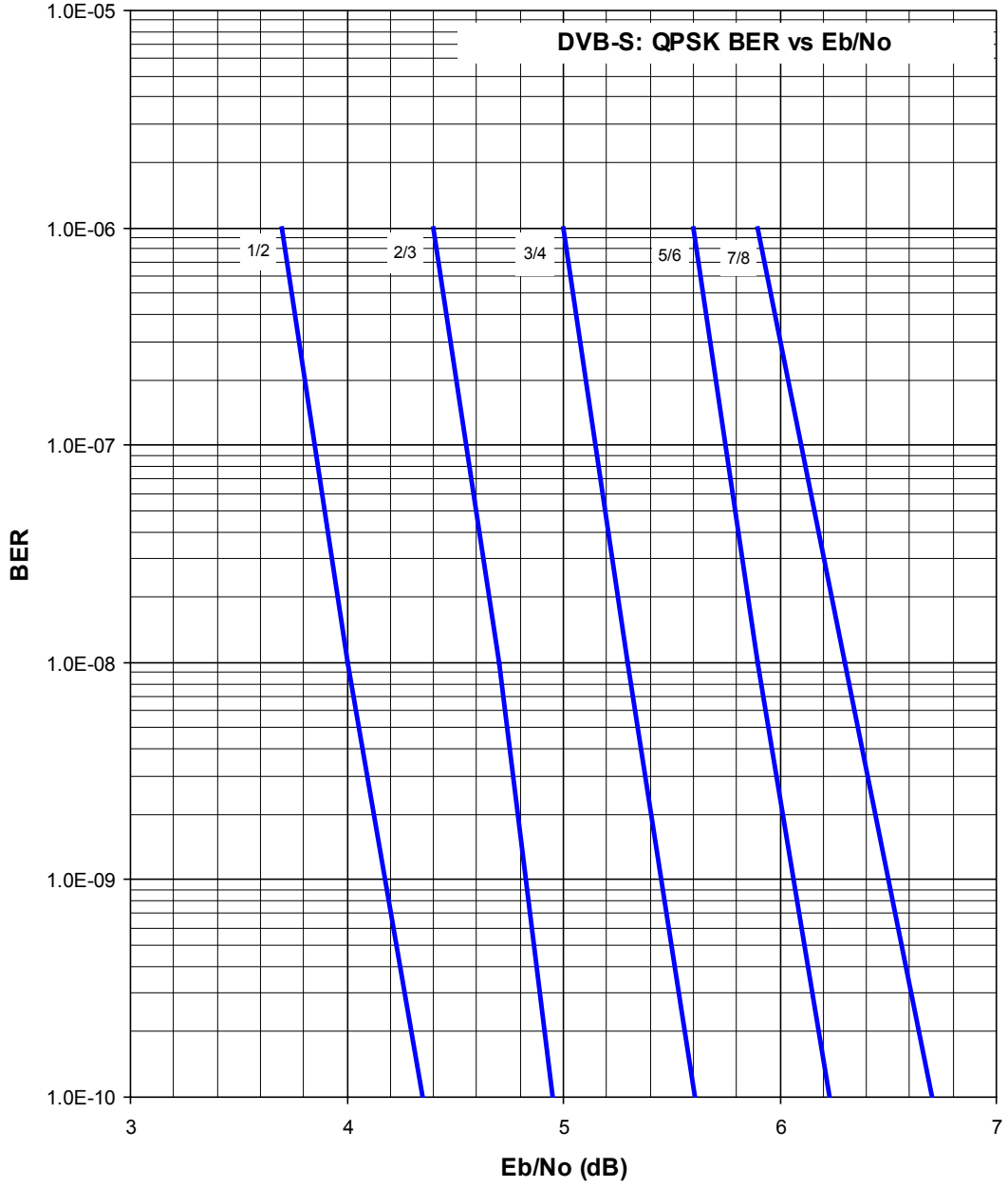
Figure A-1. DVB-S QPSK BER versus Eb/No
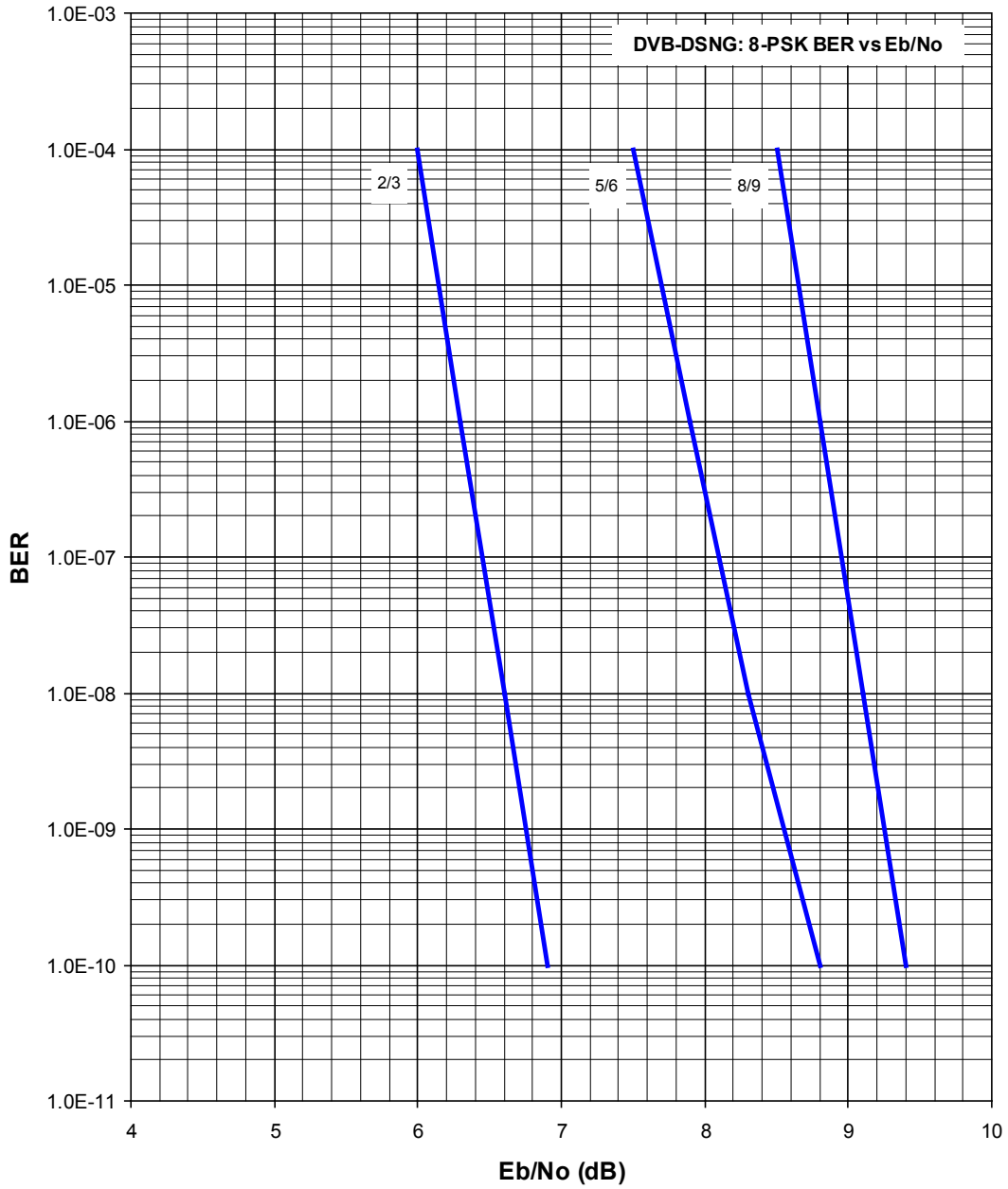
Figure A-2. DVB-DSNG 8PSK BER versus Eb/No
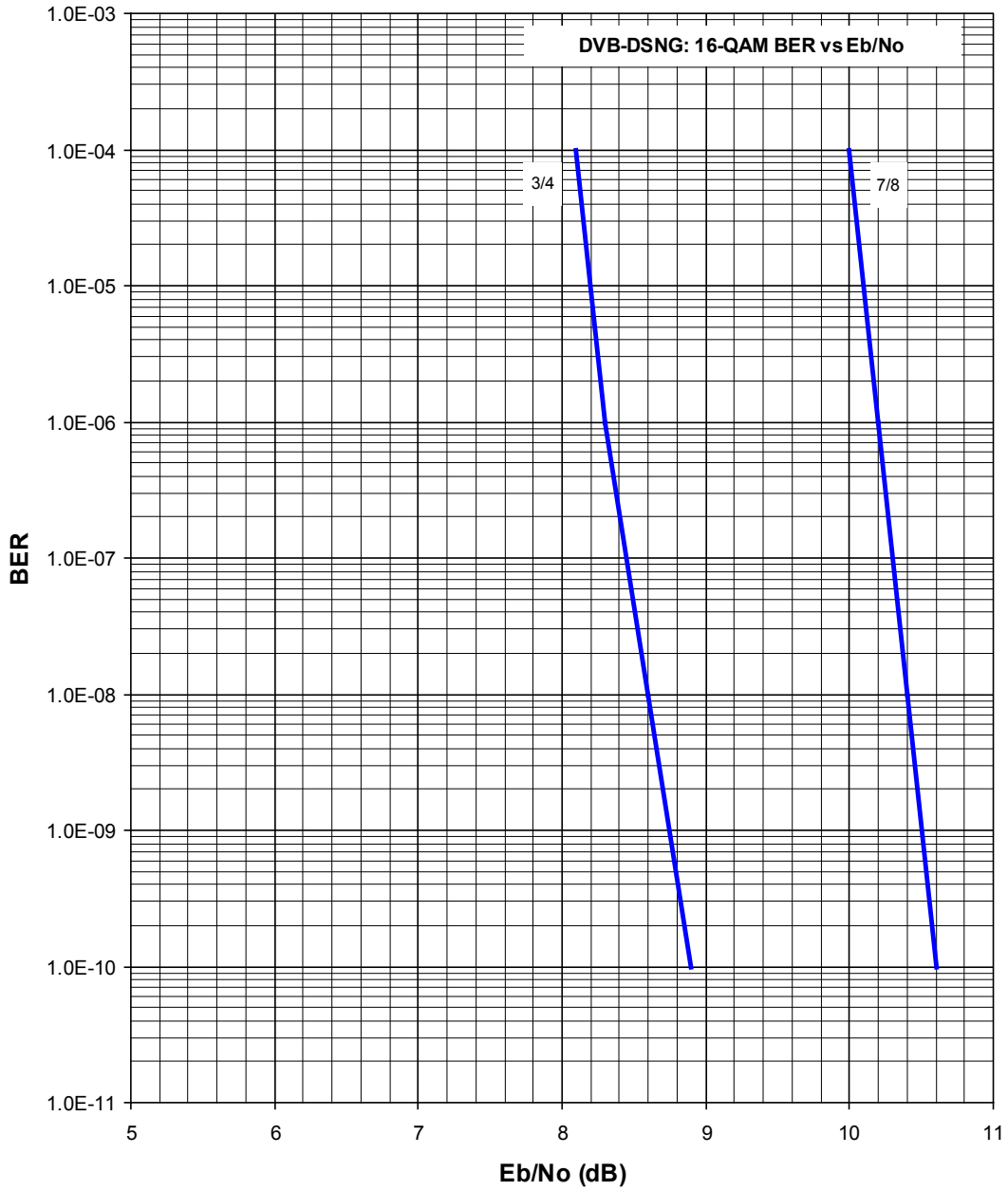
Figure A-3. DVB-DSNG 16QAM
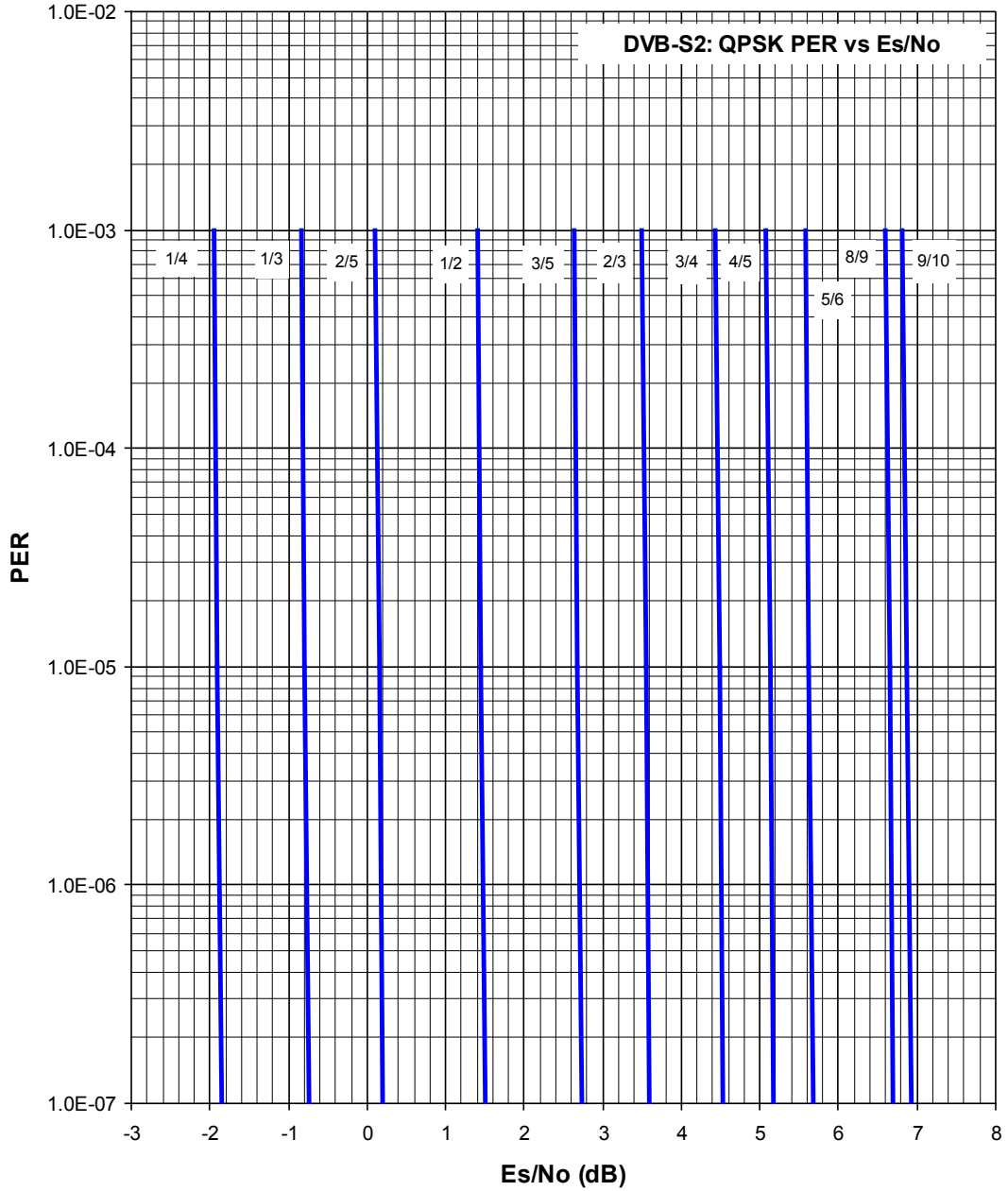
Figure A-4. DVB-S2 QPSK Packet Error Rate versus Es/No

(QPSK 1/4, 1/3, and 2/5, Information Only)
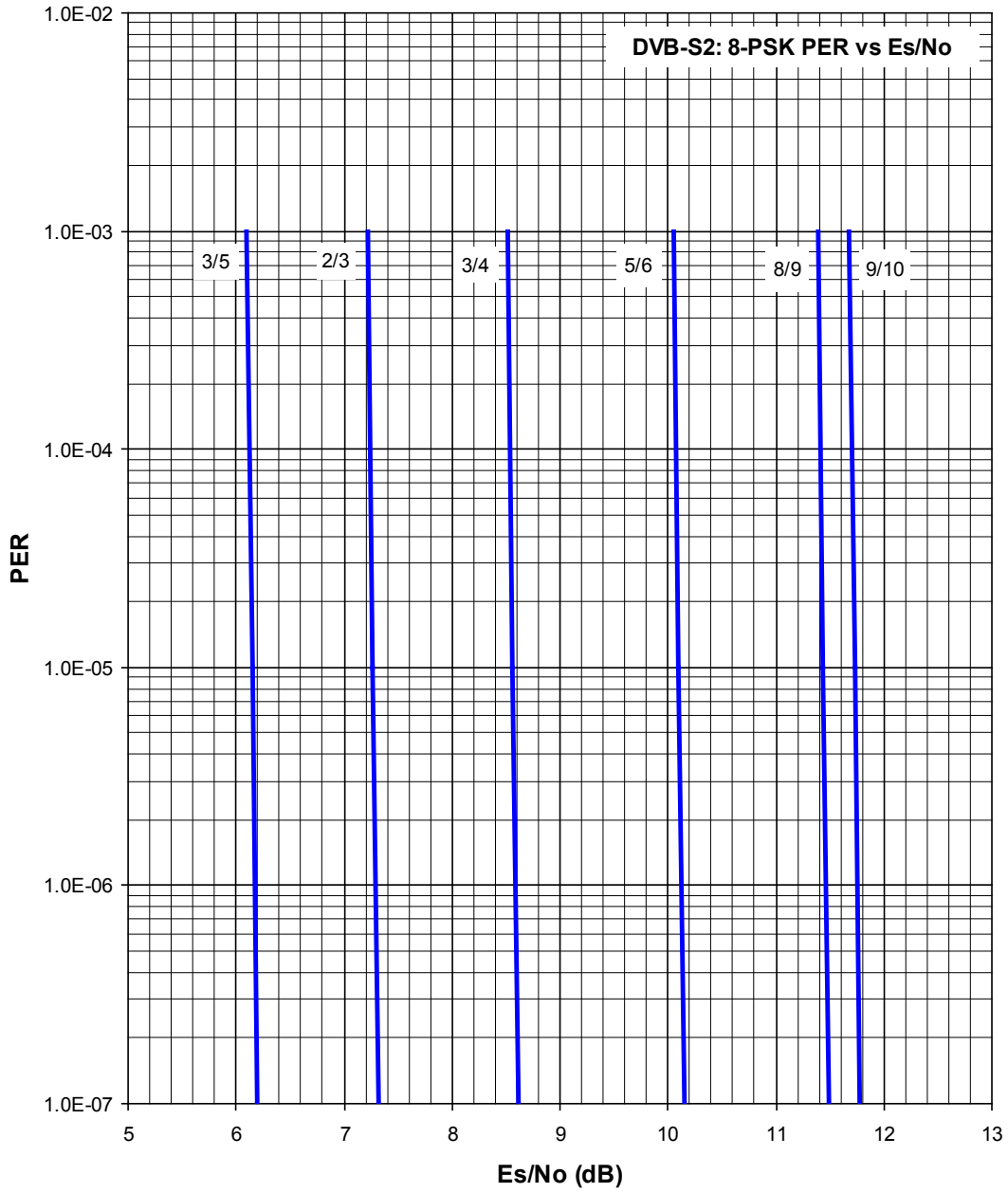
Figure A-5. DVB-S2 8PSK Packet Error Rate versus Es/No
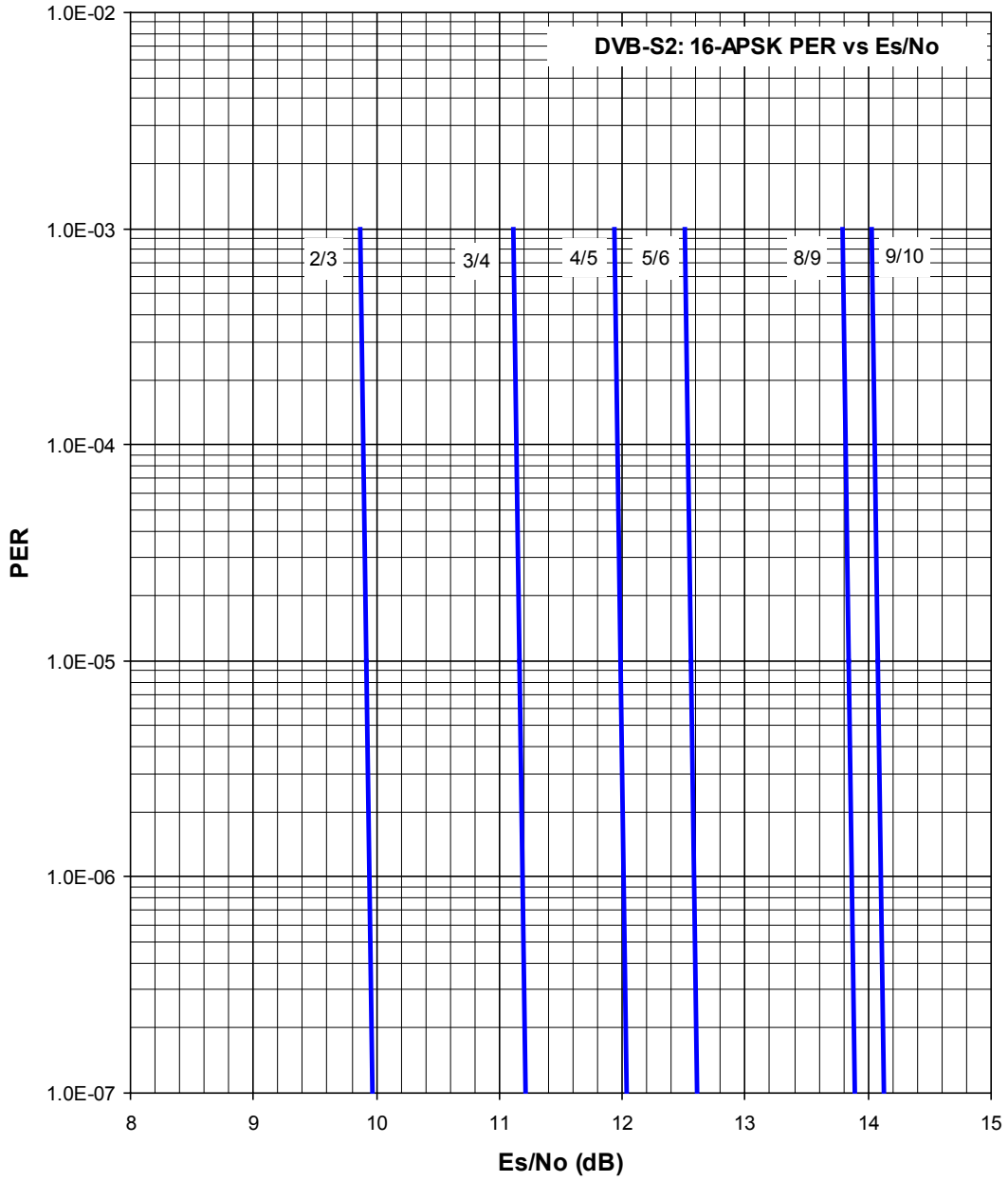
Figure A-6. DVB-S2 16APSK Packet Error Rate versus Es/No
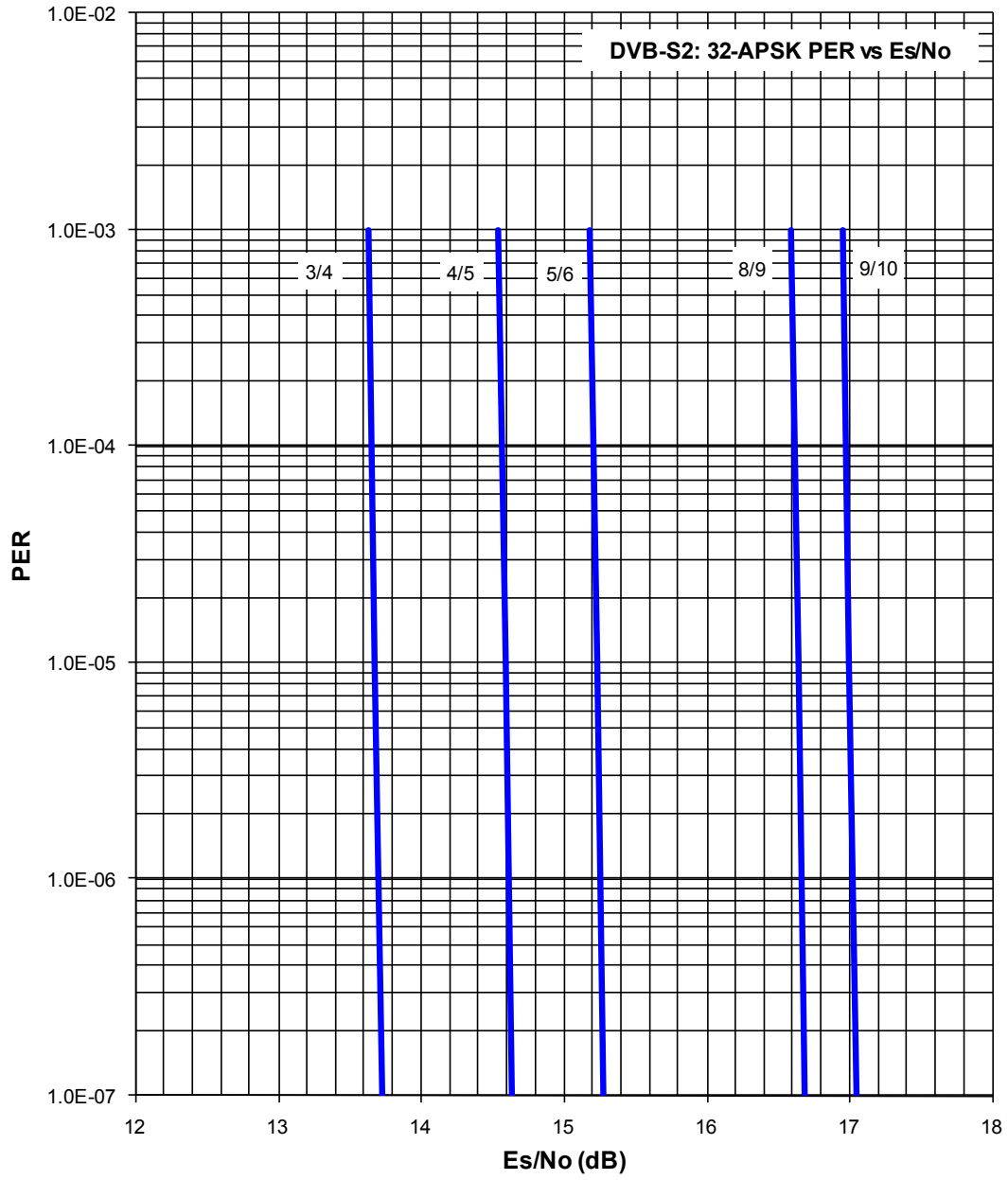
Figure A-7. DVB-S2 32APSK Packet Error Rate versus Es/No

Notes:

Appendix B. CDI-40 ASI DATA INTERFACE

B.1   Overview

The CDI-40 ASI Data Interface (**Figure B-1**) is a plug-in module that installs into the rear of the CDM-710 or CDM-710L Broadcast Satellite Modem chassis (**Figure B-2**). It provides physical and electrical connection between the external terrestrial device and the internal circuitry of the modulator or demodulator.
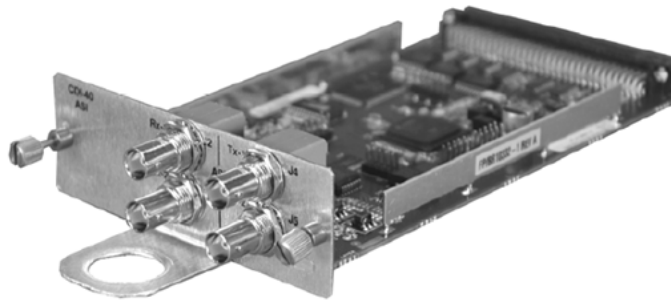
PL/10883-3 – Tx ONLY 1:1 or NON-1:1 Applications

PL/10883-4 – 1:1 Applications

Figure B-1. CDI-40 ASI Data Interface Modules

Figure B-2. CDM-710/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 B-2**:

- Interface Slot 1 is located at center right of the CDM-710/L chassis rear panel. It is filled with a data interface module first. Slot 1 will accept either a CDI-40 ASI 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 C. CDI-60 HSSI DATA INTERFACE**
- **Appendix D. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET DATA INTERFACE (GBEI)**

B.2   Physical Description

Figure B-3 shows the block diagrams for the CDI-40 data interface module. The CDI-40 features differ based on the specific module in use. **Figure B-4** shows the rear panel of the module. The CDI-40 combines two electrical and physical interfaces into a single assembly. The ASI section provides a DVB compliant interface with four BNC-F connectors. Connection to the modem is provided when the module's 96-pin DIN connector is engaged into modem Interface Slot 1. Light-Emitting Diodes (LEDs) light green when the module senses ASI data activity.
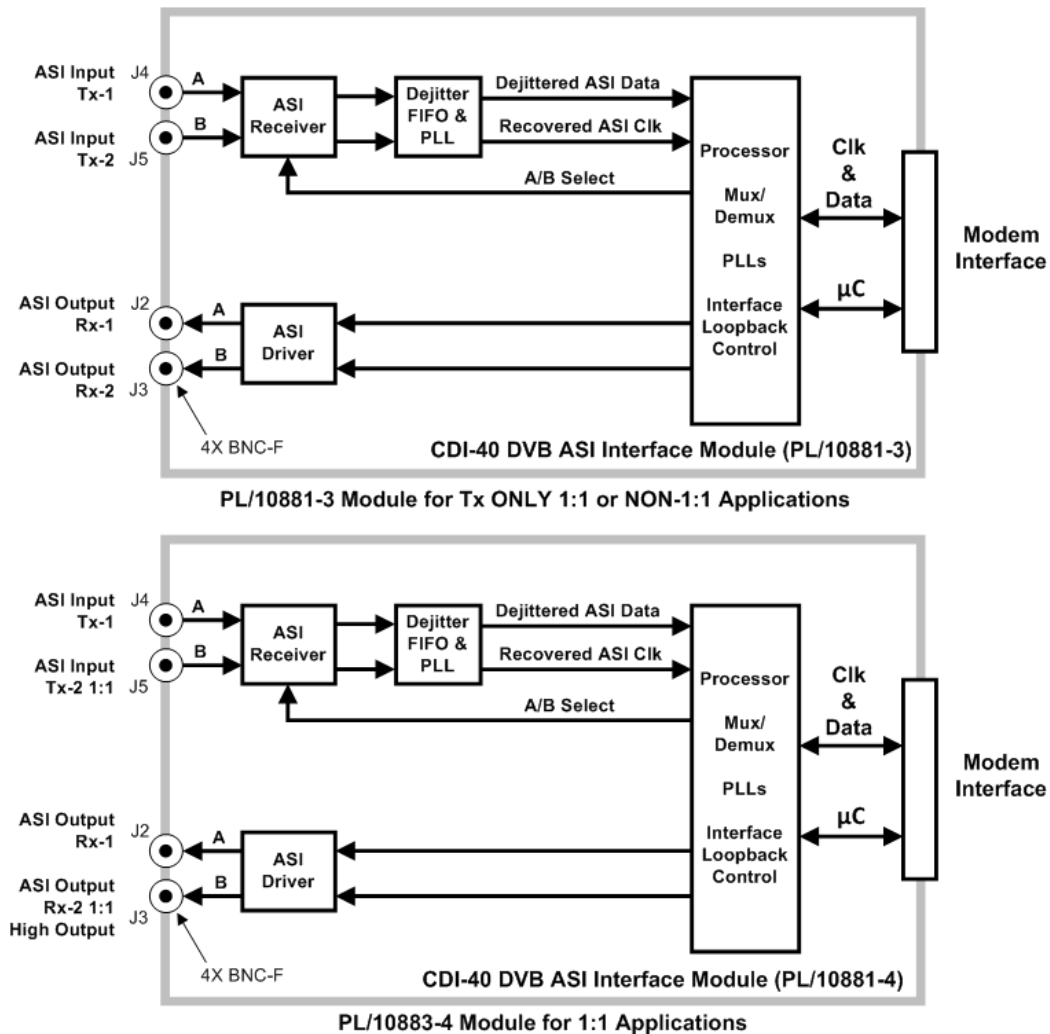
Figure B-3. CDI-40 Block Diagrams

Figure B-4. CDI-40 Rear Panel View (PL/10883-4 Shown)

For the PL/10883-3 Module (standard non-redundant applications):

- Tx-ONLY 1:1 Redundancy – Rx output ('Rx | J2' and '1:1 Rx | J3') is the standard ASI level.
- Full duplex (Rx/Tx) 1:N Redundancy – Rx output ('Rx | J2' and '1:1 Rx | J3') is the standard ASI level.

For the PL/10883-4 Module (standard non-redundant applications, excluding '1:1 Rx | J3'):

- Tx only, Rx only or full duplex (Tx and Rx) 1:1 redundancy (see Sect. B.3.4).
  - Rx output 'Rx | J2' is standard ASI level
  - Rx output '1:1 Rx | J3' is higher so the standard level is delivered after a 3 dB combiner (see Sect. B.3.4).
- Full duplex 1:N redundancy (excluding '1:1 Rx | J3').

B.2.1   CDI-40 Connector Pinouts

The CDI-40 ASI Interface connector pinouts are as follows:

PL/10881-3 CDI-40 ASI Interface for Tx-ONLY 1:1 or <u>non</u>-1:1 Applications		
Connector	**Description**	**Signal Direction**
J2, J3	Rx Data, BNC Female	Output
J4, J5	Tx Data, BNC female	Input

PL/10881-4 CDI-40 ASI Interface for 1:1 Applications		
Connector	**Description**	**Signal Direction**
J2,	Rx Data, BNC Female	Output
J3	Rx Data, BNC Female, 1:1 Redundant (High-Level)	Output
J4, J5	Tx Data, BNC female	Input

B.3   Functional Descriptions

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

Operation for either ASI module is selected by programming the module for operation either from the CDM-710/L front panel keypad and VFD, or from the HTTP (Web Server) or serial remote interfaces.

B.3.1   Input/Output Data Formats

The CDI-40 operates at a 270 Mbps transport rate for all data rates. The required encoding of this transport is defined in EN 80053-9 and the Cypress Hotlink IC data sheets. The information that follows applies to baseband data, not the data transformed to the 270 Mbps physical transport layer.

There are two general modes of operation (note that the Tx interface correlates from sync word or sync signal):

ASI Sync Mode	Description
188 Mode	The unit looks for a DVB/MPEG-2 frame consisting of 1 sync byte (0x47) and 187 bytes of data. The frame structure is acquired by the interface to create a satellite frame of 204 bytes by adding 16 bytes of Reed-Solomon check bytes. The demodulator removes the 16 check bytes and the 188-byte frame is returned to the terrestrial circuit.
204 Mode	The unit expects a DVB/MPEG-2 frame consisting of 1 sync byte (0x47), 187 bytes of data and 16 bytes of filler.

For ASI operation, data is either constant packet arrival or constant burst arrival at the equivalent serial data rate. The standard frame formats / MPEG-2 I/O data formats are as follows:

Data Format	Description
Data	Payload data is byte serial with MSB first.
	For 188 Mode, the payload is 187 bytes in length, preceded by a sync word.
Transport Rate (ASI)	270 Mbps for all data rates.

B.3.2   MPEG-2 Null Packet
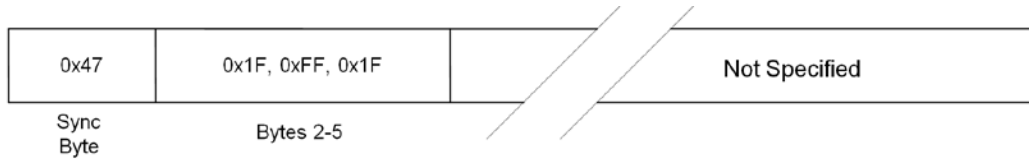
When the data input to the CDI-40 is disconnected or not synchronized the modulator sends MPEG-2 null packets in accordance with ISO/IEC DIS 13818-1 Coding Of Moving Pictures and Associated Audio.

If the interface is in Test mode with the patterns turned ON, the modulator sends a pseudo random pattern over the link in the 187 bytes following the sync byte, whether Tx data into the modem is present or not.

B.3.3   ASI Interface Defaults

Default settings for the interface are as follows:

CDI-40 Interface Defaults	
Parameter	**Default Setting**
Mode	1, ASI active
Active Tx Input	J4
Data or Clock	Normal
ASI Frame Format	188
Loss of Data	Alarm
Loop Bandwidth	Wide

B.3.4   1:1 Applications

Figure B-5 shows the typical operation of the CDM-710/L with ASI in 1:1 Redundancy (using the PL/10881-4 CDI-40 ASI Interface). This diagram applies to CDM-710/L 1:1 operations via the CRS-180 70/140 MHZ 1:1 Redundancy Switch (for use with the CDM-710) or the CRS-170A L-Band 1:1 Redundancy switch (for use with the CDM-710L). For more information about 1:1 Redundant operations with either of these switches, refer to the respective switch *Installation and Operation Manual*.
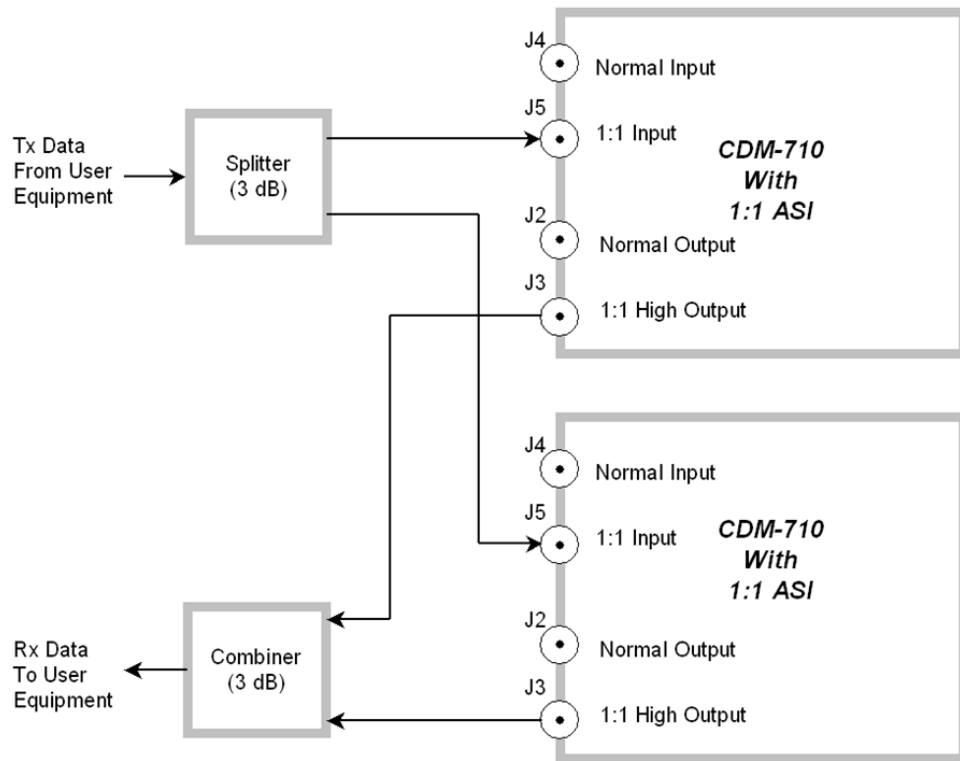
Figure B-5. CDI-40 PL/10881-4 – Typical ASI Interface 1:1 Application

B.4 Summary of Specifications

B.4.1 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-710 and CDM-710L rear panel Interface Slot 1.
- Agency Approval: CE in conjunction with the modem.

B.4.2 General Specifications

Data Framing Formats

ASI: 188 or 204 byte packets per ETS 300 421.

Test Pattern

Tx-ONLY, 2047 or 2^{23}-1 pattern compatible with typical BER tester.

Hot Swap Capability

NONE

B.4.3 ASI Specifications

Data Rate

Up to155 Mbps.

Tx Clock Rate Acquisition

Programmed data rate ± 100 ppm.

ASI Transport Rate

270 Mbps for all data rates.

Impedance

75Ω

Return Loss

13 dB over 5 to 270 MHz.

Connectors

BNC Female.

Electrical Properties

Per EN 500083-9.

Packet Types

Burst or distributed.

Signal Types

Serial data.

Voltage Level Rx Out

- 800 mV ± 10% into 75Ω, (J2, J3 of PL/10881-3 **or** J2 of PL/10881-4).
- '1:1 Rx | J3' on PL/10881-4 is higher for 1:1 applications for 800 mV typical after 3 dB combiner (**Figure B-5**).

ASI Data Loop 3 dB Frequency (Tx-ONLY)

- Wide – 2 Hz
- Narrow – 0.5 Hz

Jitter Tolerance

Meets ITU-T G.823 (3/93) and ITU-T G.824 (3/93).

Jitter transfer

- ≤ 0.5 dB peaking up to cutoff frequency.
- -20 dB per decade beyond cutoff.

Cable Length (Typical)

- 30 meters (100 feet), RG59.
- 40 meters (140 feet), Belden 8281.

Tx Input Selection

Two inputs, with selection to control which is active.

Loss of Tx Input Data

- Null packets are formed and transmitted.
- Loss of Tx Input, can be masked as Fault or Alarm.

B.4.4   Monitor and Control (M&C) Specifications

Controlled Functions

- Interface I/O Loopback, Digital Loopback.
- Data Rate.
- Loss of Data, can be masked as Fault or Alarm.
- Variable ASI Mode.

Monitored Functions

- Loss of Tx Data – The modulator indicates a loss of sync (framed modes) and transmits Null Packets in the data portion of the frame.
- Tx Clock PLL Program Error.
- Data Violations (Tx).
- FIFO Faults.

ASI Input Select

Tx Inputs 'Tx | J4' or '1:1 Tx | J5'.

ASI Data Loop BW Selection

Wide and Narrow (Tx Input Data).

PCR Jitter (Rx Output)

- Less than 100ns after settling.
- Settling to < 500ns, 20 seconds.
- Peak PCR jitter < 1000ns typical during settling.

Notes:

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Appendix C. CDI-60 HSSI DATA INTERFACE

C.1   Overview

The CDI-60 HSSI Data Interface (**Figure D-1**) is a plug-in module that installs into the rear of the CDM-710 or CDM-710L Broadcast 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-710/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-710/L chassis rear
  panel. It is filled with a data interface module first. Slot 1 will accept
  either a CDI-40 ASI 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 B. CDI-40 ASI DATA INTERFACE**
- **Appendix D. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET
  DATA INTERFACE (GBEI)**

C.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.
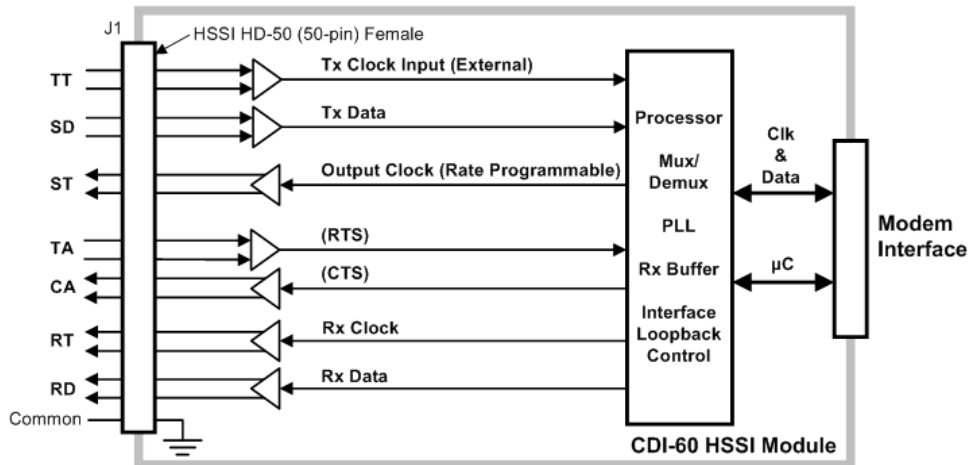
Figure D-3. CDI-60 Block Diagram

Figure D-4. CDI-60 Rear Panel View

C.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

C.3 Summary of Specifications

C.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-710 and CDM-710L rear panel Interface Slot 1.
- Agency Approval: CE in conjunction with the modem.

C.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**.

Continuous Clock
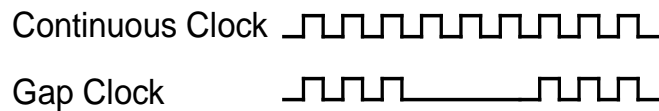
Gap Clock

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:

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Appendix D. CDI-70 10/100/1000 BASE-T GIGABIT ETHERNET DATA INTERFACE (GBEI)

D.1   Overview

The CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface (GBEI) (**Figure D-1**) is a plug-in module that installs into the rear of the CDM-710 or CDM-710L High-Speed Satellite Modem chassis (**Figure D-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.
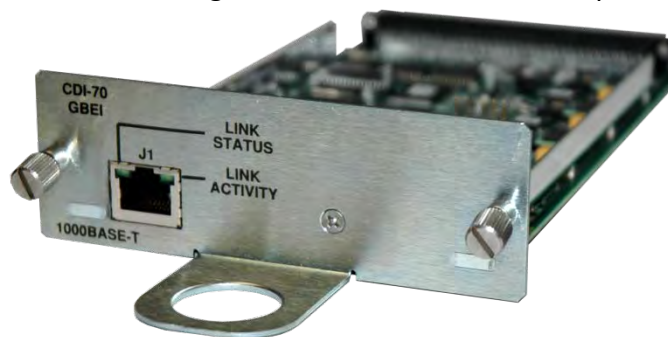
Figure D-1. CDI-70 Gigabit Ethernet Data Interface (GBEI) Module

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 D-2. CDM-710/L Rear Panel Data Interface Slots

Looking at **Figure D-2**:

- Interface Slot 1 is located at center right of the CDM-710/L chassis rear panel. It is filled with a data interface module first. Slot 1 accepts either a CDI-40 ASI 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 B. CDI-40 ASI DATA INTERFACE**
- **Appendix C. CDI-60 HSSI DATA INTERFACE**

D.2   CDI-70 Physical Description

Figure D-3. CDI-70 Rear Panel View

Figure D-3 shows the rear panel of the CDI-70 10/100/1000 Base-T Gigabit Ethernet Interface (GBEI) Data Interface Module. **Figure D-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 D.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.
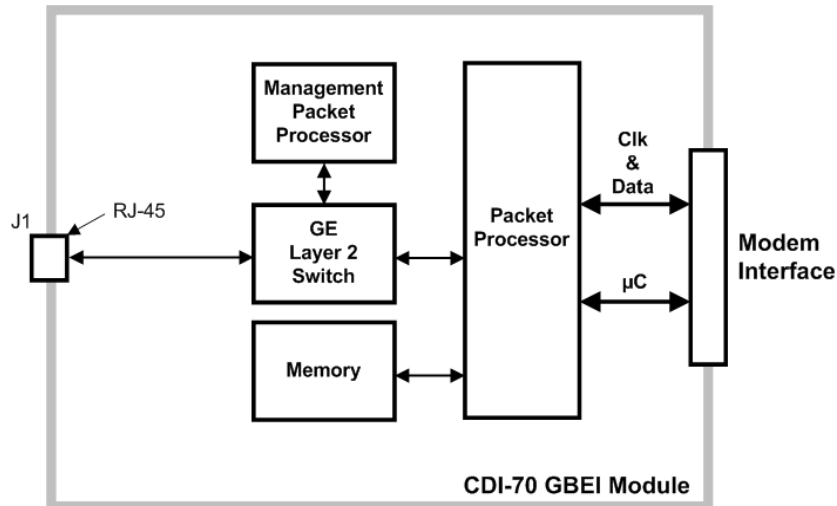
Figure D-4. CDI-70 Block Diagram

D.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

D.3   CDI-70 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-710 and CDM-710L rear panel Interface Slot 2.
- Agency Approval: CE in conjunction with the modem.

D.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.

D.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.

D.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-710/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

D.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-710/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-710/L HTTP Interface to verify that the CDI-70 is operating using the updated firmware image.

D.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-710** product hyperlink, similar to this example (versions are subject to change):

Home » Support » Software Downloads » Flash & Software Update Files » Satellite Modems » CDM-710 Software Downloads

CDM-710 Software Downloads

CDM-710

Version	Date	Files
F12437Y_V4110	07/22/2014	EXE ZIP
F12437W_V419	02/21/2014	EXE ZIP
GBEI		
F12547B_V113	07/21/2008	EXE ZIP

6. Select the appropriate GBEI firmware archive EXE or ZIP file download hyperlink.
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):
    *   FW12547x.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.

D.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:
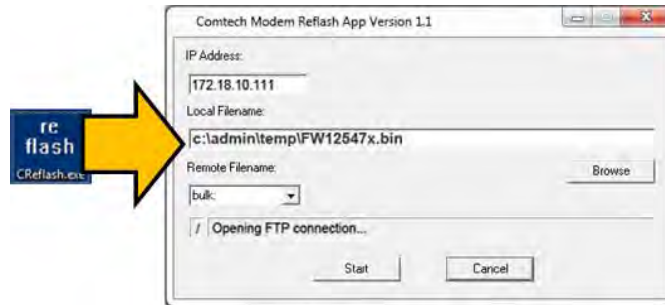
3. Enter your upload parameters information into CReflash:

   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 "FW12547x.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-710. 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-710 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-710 'J4 | Ethernet' 10/100 M&C port:** To view the GBEI information, select Operations, and then select Maintenance/Unit Information.

- **From the CDM-710 HTTP (Web Server) Interface via the CDM-710 'J4 | Ethernet' 10/100 M&C port:** To view the GBEI information, select the Maint navigation tab, and then select the Unit Info hyperlink.

Appendix E. Eb/No MEASUREMENT

Although the CDM-710 and CDM-710L Broadcast 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).
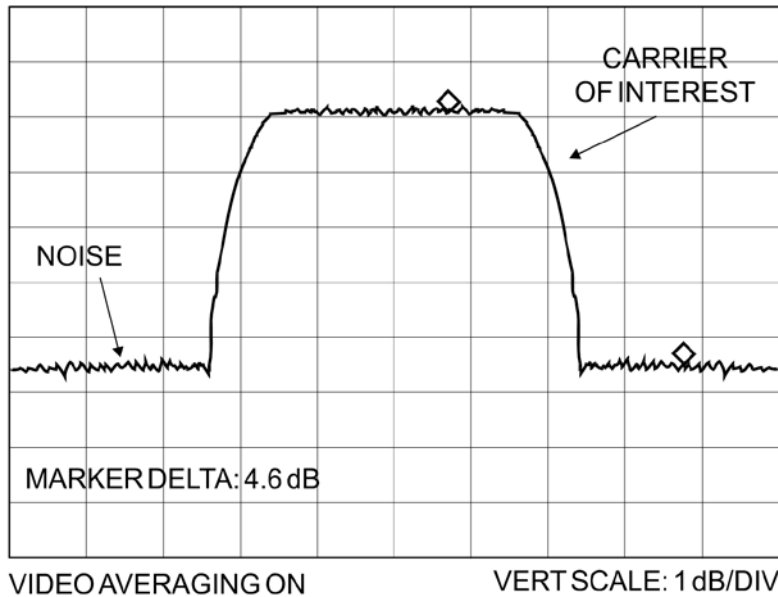
The relationship used to derive the table values is as follows (only simple way for DVB-S2):

$$Eb/No = 10\log_{10}(10^{((Co+No)/No)/10)}-1)-10\log_{10}(\text{Spectral Efficiency})$$

where:

- Eb/No and $(Co+No)/No$ are expressed in dB, *and*
- Spectral Efficiency includes the modulation type, code rate, overhead and framing and is shown in **Table E-1** and **Table E-2**.

This equation applies to DVB-S and DVB-DSNG, or use the traditional relationship:

$$Eb/No = 10\log_{10}(10^{((Co+No)/No)/10)}-1)-10\log_{10}(\text{FEC Code Rate})10\log_{10}$$
$$(\text{bits/symbol})$$

where:

- Eb/No and $(Co+No)/No$ are expressed in dB;
- FEC Code Rate (Composite) = 3/4*(188/204), 7/8*(188/204), etc.
- **bits/symbol** = 2 for QPSK, 3 for 8-PSK, 4 for 16-QAM;
- Pay close attention to the sign of the middle term.

Table E-1. CDM-710 Co+No/No to C/N (Es/No) and Eb/No (dB) For DVB-S and DVB-DSNG

Spectral Efficiency		Code Rate									
		QPSK					8PSK			16QAM	
		0.921569	1.228758	1.382353	1.535948	1.612745	1.843137	2.303922	2.457516	2.764706	3.225490
		1/2	2/3	3/4	5/6	7/8	2/3	5/6	8/9	3/4	7/8
(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
4.0	1.8	2.1	0.9	0.4	-0.1	-0.3	-0.9	-1.8	-2.1	-2.6	-3.3
4.5	2.6	3.0	1.7	1.2	0.7	0.5	-0.1	-1.0	-1.3	-1.8	-2.5
5.0	3.3	3.7	2.5	1.9	1.5	1.3	0.7	-0.3	-0.6	-1.1	-1.7
5.5	4.1	4.4	3.2	2.7	2.2	2.0	1.4	0.4	0.2	-0.4	-1.0
6.0	4.7	5.1	3.8	3.3	2.9	2.7	2.1	1.1	0.8	0.3	-0.3
6.5	5.4	5.8	4.5	4.0	3.5	3.3	2.7	1.8	1.5	1.0	0.3
7.0	6.0	6.4	5.1	4.6	4.2	4.0	3.4	2.4	2.1	1.6	0.9
7.5	6.6	7.0	5.8	5.2	4.8	4.6	4.0	3.0	2.7	2.2	1.6
8.0	7.3	7.6	6.4	5.8	5.4	5.2	4.6	3.6	3.3	2.8	2.2
8.5	7.8	8.2	6.9	6.4	6.0	5.8	5.2	4.2	3.9	3.4	2.8
9.0	8.4	8.8	7.5	7.0	6.6	6.3	5.8	4.8	4.5	4.0	3.3
9.5	9.0	9.3	8.1	7.6	7.1	6.9	6.3	5.4	5.1	4.6	3.9
10.0	9.5	9.9	8.6	8.1	7.7	7.5	6.9	5.9	5.6	5.1	4.5
10.5	10.1	10.4	9.2	8.7	8.2	8.0	7.4	6.5	6.2	5.7	5.0
11.0	10.6	11.0	9.7	9.2	8.8	8.6	8.0	7.0	6.7	6.2	5.6
11.5	11.2	11.5	10.3	9.8	9.3	9.1	8.5	7.6	7.3	6.8	6.1
12.0	11.7	12.1	10.8	10.3	9.9	9.6	9.1	8.1	7.8	7.3	6.6
12.5	12.2	12.6	11.4	10.8	10.4	10.2	9.6	8.6	8.3	7.8	7.2
13.0	12.8	13.1	11.9	11.4	10.9	10.7	10.1	9.2	8.9	8.4	7.7
13.5	13.3	13.7	12.4	11.9	11.4	11.2	10.6	9.7	9.4	8.9	8.2
14.0	13.8	14.2	12.9	12.4	12.0	11.7	11.2	10.2	9.9	9.4	8.7
14.5	14.3	14.7	13.4	12.9	12.5	12.3	11.7	10.7	10.4	9.9	9.3
15.0	14.9	15.2	14.0	13.5	13.0	12.8	12.2	11.2	11.0	10.4	9.8
15.5	15.4	15.7	14.5	14.0	13.5	13.3	12.7	11.8	11.5	11.0	10.3
16.0	15.9	16.2	15.0	14.5	14.0	13.8	13.2	12.3	12.0	11.5	10.8
16.5	16.4	16.8	15.5	15.0	14.5	14.3	13.7	12.8	12.5	12.0	11.3
17.0	16.9	17.3	16.0	15.5	15.0	14.8	14.3	13.3	13.0	12.5	11.8
17.5	17.4	17.8	16.5	16.0	15.6	15.3	14.8	13.8	13.5	13.0	12.3
18.0	17.9	18.3	17.0	16.5	16.1	15.9	15.3	14.3	14.0	13.5	12.8
18.5	18.4	18.8	17.5	17.0	16.6	16.4	15.8	14.8	14.5	14.0	13.4
19.0	18.9	19.3	18.1	17.5	17.1	16.9	16.3	15.3	15.0	14.5	13.9
19.5	19.5	19.8	18.6	18.0	17.6	17.4	16.8	15.8	15.5	15.0	14.4
20.0	20.0	20.3	19.1	18.6	18.1	17.9	17.3	16.3	16.1	15.5	14.9
20.5	20.5	20.8	19.6	19.1	18.6	18.4	17.8	16.8	16.6	16.0	15.4
21.0	21.0	21.3	20.1	19.6	19.1	18.9	18.3	17.3	17.1	16.5	15.9
21.5	21.5	21.8	20.6	20.1	19.6	19.4	18.8	17.8	17.6	17.1	16.4
22.0	22.0	22.3	21.1	20.6	20.1	19.9	19.3	18.3	18.1	17.6	16.9

Notes: 1) Includes 0.36 dB for bandwidth expansion due to Reed Solomon coding.

2) Shaded values are high error rate or unusable.

Table E-2. CDM-710/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 E-3. CDM-710/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)

		Code Rate										
		16APSK						32APSK				
Spectral Efficiency		2.637201	2.966728	3.165623	3.300184	3.523143	3.567342	3.703295	3.951571	4.119540	4.397854	4.453027
		2/3	3/4	4/5	5/6	8/9	9/10	3/4	4/5	5/6	8/9	9/10
(Co+No)/No	C/N = Es/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No	Eb/No
9.0	8.4	4.2	3.7	3.4	3.2	2.9	2.9	2.7	2.4	2.3	2.0	1.9
9.5	9.0	4.8	4.3	4.0	3.8	3.5	3.5	3.3	3.0	2.8	2.6	2.5
10.0	9.5	5.3	4.8	4.5	4.4	4.1	4.0	3.9	3.6	3.4	3.1	3.1
10.5	10.1	5.9	5.4	5.1	4.9	4.6	4.6	4.4	4.1	3.9	3.7	3.6
11.0	10.6	6.4	5.9	5.6	5.5	5.2	5.1	5.0	4.7	4.5	4.2	4.2
11.5	11.2	7.0	6.5	6.2	6.0	5.7	5.7	5.5	5.2	5.0	4.7	4.7
12.0	11.7	7.5	7.0	6.7	6.5	6.2	6.2	6.0	5.7	5.6	5.3	5.2
12.5	12.2	8.0	7.5	7.2	7.1	6.8	6.7	6.6	6.3	6.1	5.8	5.8
13.0	12.8	8.6	8.1	7.8	7.6	7.3	7.3	7.1	6.8	6.6	6.3	6.3
13.5	13.3	9.1	8.6	8.3	8.1	7.8	7.8	7.6	7.3	7.2	6.9	6.8
14.0	13.8	9.6	9.1	8.8	8.6	8.4	8.3	8.1	7.9	7.7	7.4	7.3
14.5	14.3	10.1	9.6	9.3	9.2	8.9	8.8	8.7	8.4	8.2	7.9	7.9
15.0	14.9	10.6	10.1	9.9	9.7	9.4	9.3	9.2	8.9	8.7	8.4	8.4
15.5	15.4	11.2	10.7	10.4	10.2	9.9	9.9	9.7	9.4	9.2	8.9	8.9
16.0	15.9	11.7	11.2	10.9	10.7	10.4	10.4	10.2	9.9	9.7	9.5	9.4
16.5	16.4	12.2	11.7	11.4	11.2	10.9	10.9	10.7	10.4	10.3	10.0	9.9
17.0	16.9	12.7	12.2	11.9	11.7	11.4	11.4	11.2	10.9	10.8	10.5	10.4
17.5	17.4	13.2	12.7	12.4	12.2	12.0	11.9	11.7	11.5	11.3	11.0	10.9
18.0	17.9	13.7	13.2	12.9	12.7	12.5	12.4	12.2	12.0	11.8	11.5	11.4
18.5	18.4	14.2	13.7	13.4	13.3	13.0	12.9	12.8	12.5	12.3	12.0	12.0
19.0	18.9	14.7	14.2	13.9	13.8	13.5	13.4	13.3	13.0	12.8	12.5	12.5
19.5	19.5	15.2	14.7	14.4	14.3	14.0	13.9	13.8	13.5	13.3	13.0	13.0
20.0	20.0	15.7	15.2	15.0	14.8	14.5	14.4	14.3	14.0	13.8	13.5	13.5
20.5	20.5	16.2	15.7	15.5	15.3	15.0	14.9	14.8	14.5	14.3	14.0	14.0
21.0	21.0	16.8	16.2	16.0	15.8	15.5	15.4	15.3	15.0	14.8	14.5	14.5
21.5	21.5	17.3	16.7	16.5	16.3	16.0	15.9	15.8	15.5	15.3	15.0	15.0
22.0	22.0	17.8	17.2	17.0	16.8	16.5	16.4	16.3	16.0	15.8	15.5	15.5
22.5	22.5	18.3	17.8	17.5	17.3	17.0	17.0	16.8	16.5	16.3	16.0	16.0
23.0	23.0	18.8	18.3	18.0	17.8	17.5	17.5	17.3	17.0	16.8	16.5	16.5
23.5	23.5	19.3	18.8	18.5	18.3	18.0	18.0	17.8	17.5	17.3	17.0	17.0
24.0	24.0	19.8	19.3	19.0	18.8	18.5	18.5	18.3	18.0	17.8	17.6	17.5
24.5	24.5	20.3	19.8	19.5	19.3	19.0	19.0	18.8	18.5	18.3	18.1	18.0
25.0	25.0	20.8	20.3	20.0	19.8	19.5	19.5	19.3	19.0	18.8	18.6	18.5
25.5	25.5	21.3	20.8	20.5	20.3	20.0	20.0	19.8	19.5	19.3	19.1	19.0
26.0	26.0	21.8	21.3	21.0	20.8	20.5	20.5	20.3	20.0	19.8	19.6	19.5

Notes:

1) Eb/No =Es/No-10$_{\log}$ (Spectral Efficiency).

2) The Required C/N for QEF with FECFrame=16,200 bits is typically 0.2 to 0.3 dB higher.

3) Shaded values are high error rate or unusable

Notes: